

Hitachi Ops Center API Configuration Manager

11.0.4

REST API Reference Guide

This document provides information and instructions to help you use the Hitachi Ops Center API Configuration Manager.

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Preface

This document provides information and instructions to help you use the Hitachi Ops Center API Configuration Manager.

The REST API provides the Web API, which follows the principles of Representational State Transfer (REST), for getting information about storage systems or changing the configuration of storage systems.

Product version

This document revision applies to Hitachi Ops Center API Configuration Manager v11.0.4 or later.

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on the Hitachi Vantara documentation website: https://docs.hitachivantara.com.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1{,}000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1{,}000^3$ bytes
1 terabyte (TB)	1,000 GB or $1{,}000^4$ bytes
1 petabyte (PB)	1,000 TB or $1{,}000^5$ bytes
1 exabyte (EB)	1,000 PB or $1{,}000^6$ bytes

Logical capacity values (for example, logical device capacity, cache memory capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 cylinder	Mainframe: 870 KB Open-systems: ▪ OPEN-V: 960 KB ▪ Others: 720 KB
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1{,}024^2$ bytes
1 GB	1,024 MB or $1{,}024^3$ bytes
1 TB	1,024 GB or $1{,}024^4$ bytes
1 PB	1,024 TB or $1{,}024^5$ bytes
1 EB	1,024 PB or $1{,}024^6$ bytes

Accessing product documentation

Product user documentation is available on: https://docs.hitachivantara.com. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

The Hitachi Vantara Support Website is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to the Hitachi Vantara Support Website for contact information: https://support.hitachivantara.com/en_us/contact-us.html.

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Comments

Please send comments to doc.feedback@hitachivantara.com. Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Vantara LLC.

Thank you!

Chapter 1: Configuring a REST API environment

This chapter describes the environment configuration required for using the REST API to perform storage system operations.

System configuration of the REST API

The following lists the storage systems that you can manage by using the REST API and the REST API system configuration.

Supported storage systems

The REST API supports the following storage systems.

Storage system	Supported firmware version
VSP One B20	A3-02-21-*XX*/*XX* or later
VSP 5000 series	**For VSP 5100, 5500, 5100H, 5500H** 90-01-42-*XX*/*XX* or later **For VSP 5200, 5600, 5200H, 5600H** 90-08-01-*XX*/*XX* or later
VSP E series	**For VSP E590, VSP E790** 93-03-21-*XX*/*XX* or later **For VSP E990** 93-01-01-*XX*/*XX* or later **For VSP E590H, VSP E790H** 93-05-02-*XX*/*XX* or later **For VSP E1090, VSP E1090H** 93-06-01-*XX*/*XX* or later
VSP Gx00 models	**For VSP G350, G370, G700, G900** 88-01-0*X*-*XX*/*XX* or later

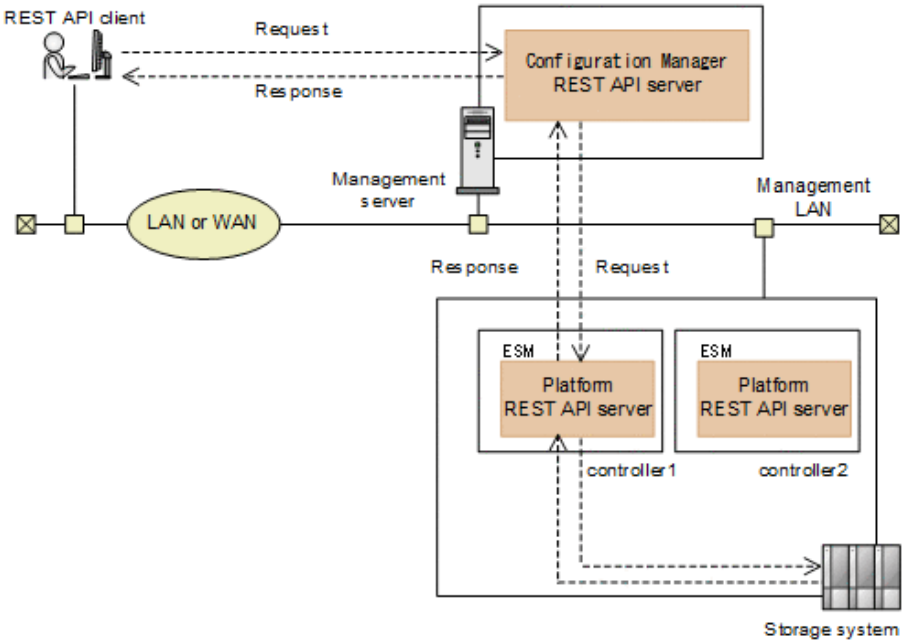
Storage system	Supported firmware version
	For VSP G200, G400, G600, G800 83-01-21-*XX*/*XX* or later#
VSP G1000	80-01-21-*XX*/*XX* or later#
VSP G1500	80-05-*XX*-*XX*/*XX* or later
VSP Fx00 models	**For VSP F350, F370, F700, F900** 88-01-0*X*-*XX*/*XX* or later **For VSP F400, F600, F800** 83-02-01-*XX*/*XX* or later#
VSP F1500	80-05-*XX*-*XX*/*XX* or later
VSP N400, N600, N800	83-06-03-*XX*/*XX* or later

#: For details about firmware version requirements when SSL communication is used between the REST API server and storage systems, see Setting up SSL communication (on page 78).

In this manual, the phrases "VSP G200, G400, G600, G800, VSP F400, F600, F800", "VSP Gx00 models, VSP Fx00 models" should be interpreted to also include the following storage system models: VSP N400, VSP N600, VSP N800.

System configuration of the REST API (VSP One B20)

The following explains the REST API system configuration.



For VSP One B20 storage systems, the REST API is included in the storage system. This REST API is called "Platform REST API" in this manual.

REST API clients

Rest API clients are software programs or scripts that use the REST API to issue requests to the REST API server.

Management server

The server on which the Configuration Manager REST API is installed.

Configuration Manager REST API server

This component receives a REST API request from a REST API client, issues the request to the storage system, and then returns the result to the REST API client.

The Configuration Manager REST API server sends the request received from the REST API client to the Platform REST API server, and then returns the results received from the Platform REST API server to the REST API client.



Note:

In the case of a VSP One B20 storage system, one of the Platform REST API servers on the ESM of CTL01 or of CTL02 is operating. If a failure occurs on the ESM that is operating, the communication destination is switched to the Platform REST API server on the other ESM and information is inherited between the Platform REST API servers, thereby allowing you to continue to perform operations. However, when information is inherited between the Platform REST API servers, the request body of the job information might be truncated or some of the error objects (message, cause, solution) in the job information might be missing.

In addition, if the following conditions are met, the information of the registered remote storage system is also inherited:

- A mutual registration operation was performed for the remote storage system.
- After the communication destination is switched, communication to the remote storage system is normal.

ESM (Embedded Storage Manager)

This is a computer that has basic functions for managing storage systems. You can manage a storage system via an external device that communications with the ESM in the case of a VSP One B20 storage system.

Although ESM exists on both controllers CTL01 and CTL02, it communicates with REST API clients by using an IP address (service IP) that represents these controllers.

Platform REST API server

This is a REST API server included in the ESM of VSP One B20 storage systems. This component receives a REST API request from a REST API client, issues an order to the storage system, and then returns the execution result to the REST API client.

Storage system

By using the REST API, you can get information from the storage system or change the storage system configuration.

Notes on managing VSP One B20

If you are managing VSP One B20 storage systems, note the following.

Notes when performing maintenance work on storage systems

- If an API request is run during controller maintenance or when a controller failure has occurred, the API request might fail, and one of the following error messages might be output: KART40047-E, KART30102-E, KART30011-E, KART00007-E, KART20022-E or KART30000-E.

  If an error occurs, wait until the maintenance work is complete, and then run the API request again.

- If you execute an API request while maintenance work is being performed on the storage system, the API request might fail with the HTTP status code 503 or with the KART40047-E message.

  Check with maintenance staff to see whether maintenance work is being performed. If maintenance work is being performed, wait until the maintenance work is complete, and then execute the API request again.

Platform REST API operations when the ESM is switched

If a failure occurs on the ESM that is operating, the communication destination is switched to the Platform REST API server on the other ESM, thereby allowing you to continue to perform operations. The following describes the Platform REST API operation during the ESM switch.

1. If a failure occurs on the ESM that is operating

   The Platform REST API server does not respond, or the HTTP status code (504) or other code is returned.

2. While the ESM is being switched

   The Platform REST API server does not respond, or the HTTP status code (504) or other code is returned.

3. While the Platform REST API server is starting on the switch-destination ESM

   The Platform REST API server does not respond, or the HTTP status code (500) or other code is returned.

4. While the Platform REST API database is being restored on the switch-destination ESM

   - If you run an API request that involves submitting a job, the HTTP status code (500) or other code is returned.
   - If you run an API request that gets job information, `Unknown` might be returned for the job state (State).

5. When restoration of the Platform REST API database is complete on the switch-destination ESM

   The ESM switch is complete.

Configuration Manager REST API operations when the ESM is switched

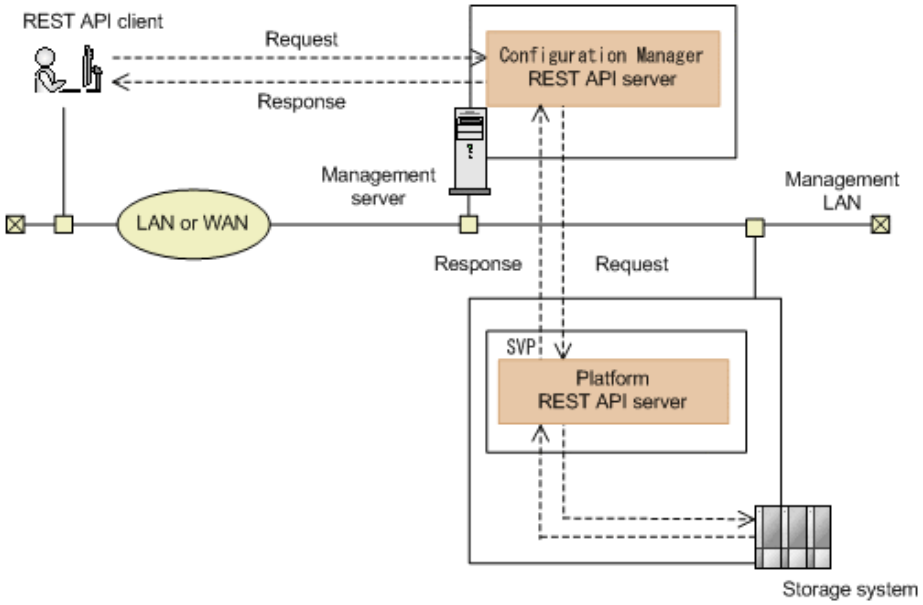
If a failure occurs on the ESM that is operating, the communication destination is switched to the Platform REST API server on the other ESM, thereby allowing you to continue to perform operations. The following describes the Configuration REST API operation during the ESM switch.

1. While the ESM is being switched

   The Configuration Manager REST API server might return HTTP status codes such as 500, 503, or 504, or return errors such as KART30000-E, KART40098-E, or KART00009-E.

System configuration of the REST API (VSP 5000 series)

The following explains the REST API system configuration.



For VSP 5000 series storage systems, the REST API is included in the storage system. This REST API is called "Platform REST API" in this manual.

REST API clients

Rest API clients are software programs or scripts that use the REST API to issue requests to the REST API server.

Management server

The server on which the Configuration Manager REST API is installed.

Configuration Manager REST API server

This component receives a REST API request from a REST API client, issues the request to the storage system, and then returns the result to the REST API client.

The Configuration Manager REST API server sends the request received from the REST API client to the Platform REST API server, and then returns the results received from the Platform REST API server to the REST API client.

SVP

This is the computer that has basic management functions for managing the storage system. An external device can manage the storage system through communications with the SVP.

Platform REST API server

This is a REST API server included in the SVP of VSP 5000 series storage systems. This component receives a REST API request from a REST API client, issues the request to the storage system, and then returns the result to the REST API client.

Storage system

By using the REST API, you can get information from the storage system or change the storage system configuration.

Notes on managing VSP 5000 series storage systems

If you are managing VSP 5000 series storage systems, note the following.

Notes when performing maintenance work on storage systems

- If an API request is run during controller maintenance or when a controller failure has occurred, the API request might fail, and one of the following error messages might be output: KART40047-E, KART30102-E, KART30011-E, KART00007-E or KART20022-E.

  If an error occurs, wait until the maintenance work is complete, and then run the API request again.

- If you execute an API request while maintenance work is being performed on the storage system, the API request might fail with the HTTP status code 503 or with the KART40047-E message.

  Check with maintenance staff to see whether maintenance work is being performed. If maintenance work is being performed, wait until the maintenance work is complete, and then execute the API request again.

Backing up and restoring storage system settings files

You can use Hitachi Device Manager - Storage Navigator to back up a Platform REST API database file as the settings file of a VSP 5000 series storage system. You can restore the backed up files by using Storage Navigator.

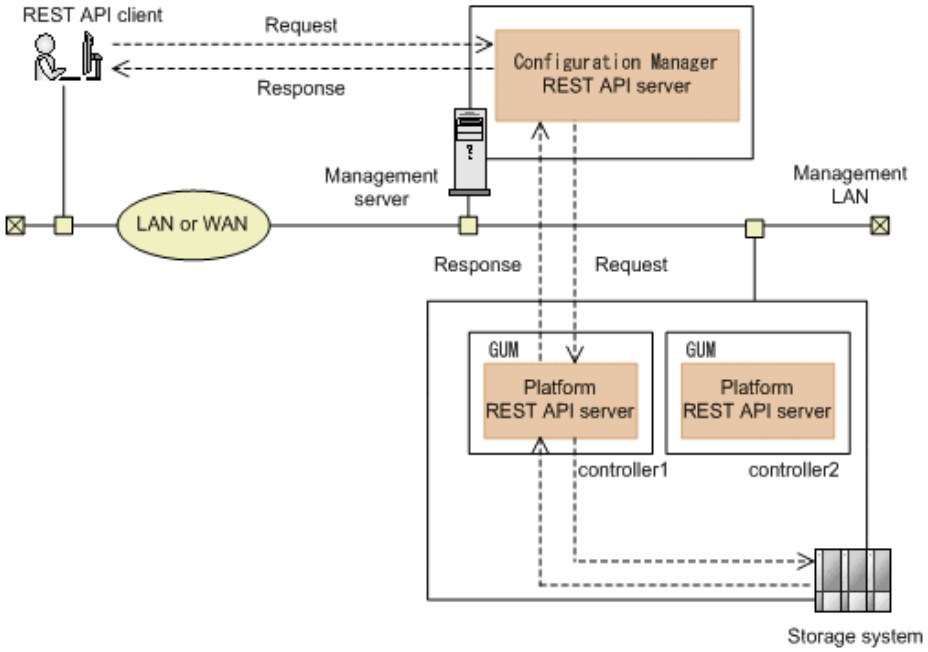
When the REST API is used to perform the following operations, a good practice is to back up the storage system settings files to back up the Platform REST API database.

- Registering or deleting local storage system information
- Registering or deleting remote storage system information
- Registering or deleting destinations for sending notifications about changes to storage system configurations

For details about backing up storage system settings files, see the *System Administrator Guide*.

System configuration of the REST API (VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900)

The following explains the REST API system configuration.



For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems, the REST API is included in the storage system. This REST API is called "Platform REST API" in this manual.

REST API clients

Rest API clients are software programs or scripts that use the REST API to issue requests to the REST API server.

Management server

The server on which the Configuration Manager REST API is installed.

Configuration Manager REST API server

This component receives a REST API request from a REST API client, issues the request to the storage system, and then returns the result to the REST API client.

The Configuration Manager REST API server sends the request received from the REST API client to the Platform REST API server, and then returns the results received from the Platform REST API server to the REST API client.

Note:

The Platform REST API servers in controller1 and in controller2 operate independently.

By default, the Platform REST API server in controller1 is used. But you can choose to use the Platform REST API server in controller2. In this case, change the target controller by using the API for registering a storage system or for changing information about a storage system.

Important: The combination of Configuration Manager REST API version 8.4.1 or later and Hitachi Command Suite version 8.4.0 or earlier is not supported. If you installed only the Configuration Manager REST API first, do not install Hitachi Command Suite version 8.4.0 or earlier on the same management server.

GUM (Gateway for Unified Management)

The computer that has basic management functions for the storage system. You can manage the storage system from an external device through communications with the GUM, which exists in each controller, controller1 and controller2.

Platform REST API server

This is a REST API server included in the GUM of VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems. This component receives a REST API request from a REST API client, issues an order to the storage system, and then returns the execution result to the REST API client.

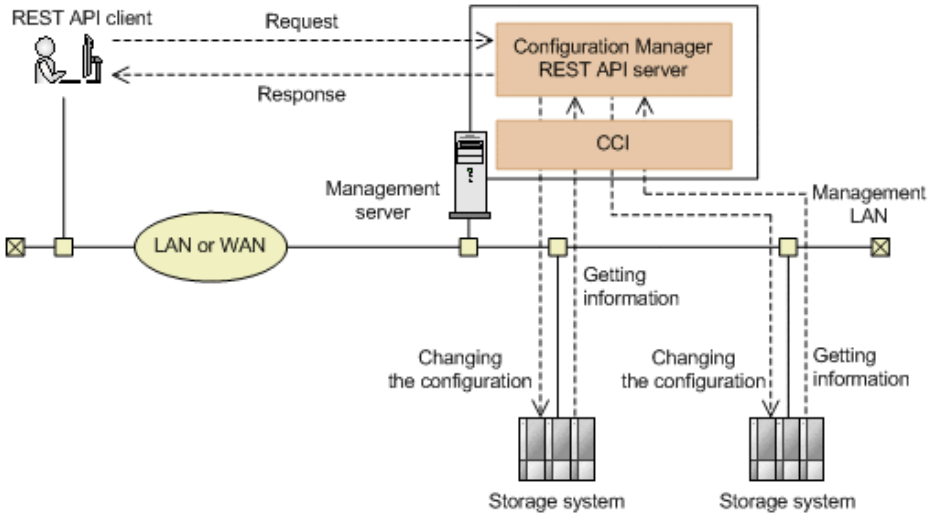
Storage system

By using the REST API, you can get information from the storage system or change the storage system configuration.

Tip: In addition to this configuration, you can also set up a configuration in which you set up a link with the SVP. For details on this type of configuration, see the description of VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900 configurations in which a link to the SVP is established.

System configuration of the REST API (VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500)

The following explains the REST API configuration.



REST API clients

Rest API clients are software programs or scripts that use the REST API to issue requests to the REST API server.

Management server

The server on which the Configuration Manager REST API is installed.

Configuration Manager REST API server

This component receives a REST API request from a REST API client, issues the request to the storage system, and then returns the result to the REST API client.

Important: The combination of Configuration Manager REST API version 8.4.1 or later and Hitachi Command Suite version 8.4.0 or earlier is not supported. If you installed only the Configuration Manager REST API first, do not install Hitachi Command Suite version 8.4.0 or earlier on the same management server.

CCI

This prerequisite software for using the REST API. The CCI runs instructions issued from the Configuration Manager REST API server to a storage system.

If the CCI is not installed on the management server, the CCI provided with Configuration Manager REST API will be installed.

Storage system

By using the REST API, you can get information from the storage system or change the storage system configuration.

Tip:

You can change the number of storage systems to manage with the Configuration Manager REST API server by using the rest.storage.scale property.

Methods for installing the REST API

You can install the REST API by using one of the following methods.

Select one of the following installation methods based on your environment:

- Use the Ops Center OVA install

  When VMware ESXi is used, you can use the Ops Center OVA installation to create a virtual machine on which the Hitachi Ops Center products and REST API are installed. For details about how to use the OVA installation, see the *Hitachi Ops Center Installation and Configuration Guide*.

- Install only the REST API

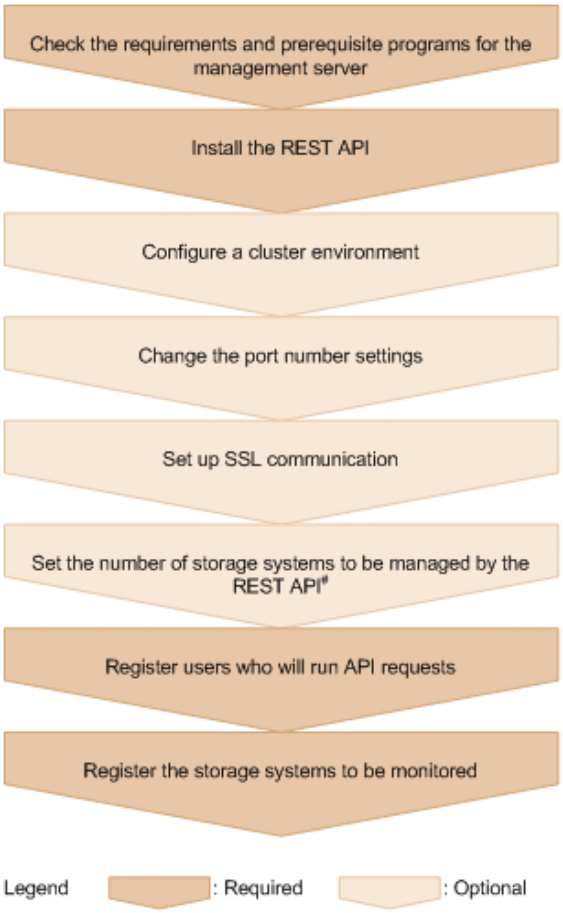
  You can install only the REST API by running the REST API installer as described in the following sections.

  If the management server is running a Linux OS and you want to install the REST API only, you can install the REST API either as the root user or as a non-root user. For details about how to install the REST API as a non-root user, see Operation in an environment where the REST API is installed by a non-root user (in Linux OS) (on page 136).

Workflow for preparing to use the REST API

The following workflow shows the general procedure for environment settings and tasks required to use the REST API.

The following workflow shows how to prepare the REST API for a Windows OS environment or in a Linux OS environment where the REST API was installed by a root user.



#: You must specify this setting if the number of storage systems to be managed by the REST API is 71 or more.

If the management server is running a Linux OS and you want to install the REST API as a non-root user, the workflow for preparing to use the REST API is different from the one shown above. For details, see Operation in an environment where the REST API is installed by a non-root user (in Linux OS) (on page 136).

Checking management server requirements and prerequisite programs

Before installing the REST API, check the management server requirements and OS requirements, and install the OS libraries as prerequisite programs. Also, check the installation status of the CCI instance, if necessary.

For details about the management server requirements and prerequisite programs for a non-root user installing the REST API when the management server is running Linux OS, see Operation in an environment where the REST API is installed by a non-root user (in Linux OS) (on page 136).

Management server requirements

For details on the management server requirements and the required OS libraries, see *Hitachi Ops Center API Configuration Manager System Requirements* in advance.

The REST API cannot be used in a DHCP environment on hosts which IP addresses are dynamically allocated. Set a static IP address for the management server (Configuration Manager REST API server).

If the command device of a single storage system is mapped to multiple guest OSs and the REST API is installed on each of those guest OSs and used to manage the storage system, each of those guest OSs must run on a different physical server. If the guest OSs on which the REST API is installed are running on the same physical server, unexpected errors might occur because the storage system is unable to distinguish among the guest OSs.

If you are using a guest OS in Hyper-V and connect to a storage system by using the In-Band method, you must use NPIV to map the command device to the guest OS.

CCI

This version of the REST API is provided with version 01-80-03/*XX* (the recommended version) of CCI. To use all of the functionality of the REST API, the provided version or a later version of CCI is required.

If the version of CCI is earlier than the recommended version, you might not be able to run the API or obtain some attributes. If necessary, check the version of CCI. If the version being used is not the recommended or later version, upgrade the version of CCI.

Note:

- If the version of Configuration Manager is 10.0.0 or later and the version of CCI is earlier than 01-52-03/*XX*, the DTLS encrypted communication method of the storage systems (VSP G200, G400, G600, G800 and VSP F400, F600, F800 model storage systems) cannot be used.
- If the CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to perform an upgrade installation, overwrite installation, or uninstallation of the REST API. To perform these operations, first stop the program that is using CCI.

If you install the REST API when CCI is not installed on the management server, CCI that was provided with the REST API will be installed together. At this time, a symbolic link to the installation destination of CCI is created.

In a Windows OS:

A symbolic link to *REST-API-installation-destination*\HORCM is created in the root folder of the drive to which the REST API is installed.

In a Linux OS:

A symbolic link to *REST-API-installation-destination*/HORCM is created in the root directory.

Note:

In an environment where CCI provided with the REST API is installed, to separately install and use a new CCI (to switch the CCI that is used by the REST API), stop the REST API service in advance, and then perform the following operation. After that, start the REST API service.

In a Windows OS:

Remove the HORCM symbolic link in the root folder of the drive where CCI is to be installed. Then perform a new installation of CCI.

In a Linux OS:

Remove the HORCM symbolic link in the root directory. Then use the normal procedure to perform a new installation of CCI in the root directory.

If you install the REST API when CCI is already installed on the management server, the following occurs:

If the version of the installed CCI is 01-37-03/*XX* or later:
CCI remains as is, and only the REST API is installed. However, if the version of the CCI is earlier than the recommended version, some REST API functions cannot be used.

If the version of the installed CCI is earlier than 01-37-03/*XX*:
The REST API cannot be installed. Uninstall CCI, and then install the REST API.

Note:

- To install CCI in an environment in which the management server is already installed, check the version and provider (Hitachi or HPE) of CCI before installing the REST API. You can use the `raidqry -h` command to check both the version and provider.

  To identify the version of CCI, check the value of `Ver&Rev` in the execution result of the `raidqry -h` command.

  To identify the provider of CCI, check the value of `Model` in the execution result of the `raidqry -h` command.

  CCI provided by Hitachi: The value of `Model` is `RAID-Manager`.

  CCI (RAID Manager XP) provided by HPE: The value of `Model` is `XP8 RAID-Manager`.

  To manage Hitachi storage systems by using the REST API, use CCI provided by Hitachi. To manage HPE storage systems by using the REST API, use RAID Manager XP provided by HPE.

  To manage both Hitachi and HPE storage systems by using the REST API, CCI and RAID Manager XP can coexist on the management server. To have both CCI and RAID Manager XP coexist, install RAID Manager XP first, and then install CCI. In this case, the value of `Model` in the execution result of the `raidqry -h` command is `RAID-Manager`.

- If the CCI that was provide with the REST API is installed, the value of `Model` in the execution results of the `raidqry -h` command is always `RAID-Manager`.
- The REST API uses CCI installed in the following locations:

  In a Windows OS: The `HORCM` folder on the drive on which the REST API is installed (this folder has priority) or the `HORCM` folder on the drive whose drive letter (such as C, D, or E) comes first in the alphabet

  In a Linux OS: The `/HORCM` directory
- To run the CCI commands manually or from user scripts or to use a program that uses CCI, we recommend that you use a machine other than the management server on which the REST API server is installed. When using the machine on which the REST API server is installed for these operations, do not use the same user account for both the REST API and CCI. If the same

user account is used between the REST API and CCI, command execution might fail because the account will be inappropriately logged out during execution.

Note that the following programs use CCI.

- Hitachi Ops Center Automator
- Hitachi Ops Center Protector
- Device Manager agent

For details on how to install and uninstall CCI, see the *Command Control Interface Installation and Configuration Guide*.

Installing and upgrading the REST API

Install the REST API server on the management server.

Before installation, check the following information that you must specify during installation:

- Installation destination path:

  You must specify this information if you are performing a new installation.

- Database backup destination path:

  You must specify this information if you want to obtain a backup during an upgrade installation or overwrite installation.

If the management server is running a Linux OS, you can install the REST API either as the root user or as a non-root user. For details about how to install the REST API as a non-root user, see Operation in an environment where the REST API is installed by a non-root user (in Linux OS) (on page 136).

Note:

- When you install the Configuration Manager REST API, the JDK (Amazon Corretto 17) that is provided with the Configuration Manager REST API will also be installed.
- If you perform an upgrade installation of the Configuration Manager REST API from version 10.6.1 or earlier, the JDK used by the REST API will automatically change to Amazon Corretto.

REST API installation destination

The following provides information on the REST API destination location.

The default installation destination of the REST API is as follows:

In a Windows OS:

```
%ProgramFiles%\hitachi\ConfManager
```

In a Linux OS:

```
/opt/hitachi/ConfManager
```

The default installation destination of Configuration Manager REST API version 10.0 and later is different from that of earlier versions. However, if you perform an upgrade installation, the installation destination will be inherited.

When changing the installation destination of the REST API from the default to another destination, prepare an installation destination that meets requirements such as path length and character type. The REST API will be installed in the `ConfManager` directory under the installation path specified during the installation process.

The following table shows the requirements for specifying the absolute path of the installation destination of the REST API.

Description	Requirements
Absolute path name length	64 bytes maximum
Allowed path name characters	**In a Windows OS:** `A` to `Z`, `a` to `z`, `0` to `9`, periods (`.`), underscores (_), left parentheses (`(`), right parentheses (`)`), spaces, backslashes (`\`), and colons (`:`) **In a Linux OS:** `A` to `Z`, `a` to `z`, `0` to `9`, underscores (_), and forward slashes (`/`)

Description	Requirements
Path name restrictions	**In a Windows OS:** ▪ Do not include consecutive spaces. ▪ Do not include a period or space at the end of a folder name. ▪ Do not use parentheses, except for the character string `(x86)`. ▪ If `(x86)` is included in the installation path, also include a space somewhere in the installation path. ▪ Do not include a symbolic link and junction for the installation folder. ▪ Do not specify the root of a drive as the destination. ▪ Do not specify a network drive. ▪ Do not specify a folder where drives or network file systems are mounted. **In a Linux OS:** ▪ Do not include a path delimiter (`/`) at the end of the directory path. ▪ Do not specify a directory where drives or network file systems are mounted.

Installing the REST API (in a Windows OS)

Use the installation media to install the REST API.

Before you begin

- Log on to the management server as a user with Administrator permissions.
- Stop the event log monitoring program.

  If the event log monitoring program is running, the REST API installation might end in an error. In this case, check the output error message and take action as appropriate.
- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to perform an upgrade or overwrite installation of the REST API.

Note:

If the REST API installation path includes a space and there is a file with a path that matches the installation path up to the first space, the REST API installation might end in an error. For example, if the installation destination is `C:\Program Files\hitachi\ConfManager` and `C:\` contains a file named `Program`, the installation might end in an error. In this case, change the file name, or move or delete the file.

Procedure

1. Download or insert the installation media.
2. Run the installer (`setup.exe`) to start the installation wizard.

   For DVD media, the installer is stored in the following location:

   DVD-ROM-drive`\Windows`
3. Follow the instructions in the installation wizard and specify the required information in each window.
4. In the **Installation Complete** window, click the **Finish** button.

   Note: After the REST API is installed, the Configuration Manager REST API Start Task, which automatically starts the REST API services when the OS starts, is registered in the Windows Task Scheduler. Do not delete this task.
5. (When upgrading) Check the refresh status of the storage system configuration information. You can skip this step if you are installing the REST API in a cluster environment.
   a. Run the API request that gets the refresh status of the storage system configuration information, and then check the value of the `status` attribute that is returned.
   b. If the REST API database was expanded as a result of an upgrade installation, `Failed` is displayed as the value of the `status` attribute. In this case, check the error information, and then run the API request that refreshes the storage system configuration information.
6. (When upgrading from version 8.4.1 or earlier) If the following storage systems are managed, run the API request that registers the destinations for sending notifications about changes made to storage system configurations. You can skip this step if you are installing the REST API in a cluster environment.
   - VSP G200, G400, G600, G800, VSP F400, F600, F800 with microcode version 83-04-*XX*-*XX*/*XX* or later
   - VSP G1000 with microcode version 80-05-*XX*-*XX*/*XX* or later

Installing the REST API as the root user (in a Linux OS)

Use the installation media to install the REST API.

Note:

During the REST API installation, do not set the `noexec` option that restricts running programs in the `/tmp` and `/var/tmp` directories.

You can check whether the `noexec` option is set by running the `mount` command.

After the REST API installation finishes, setting the option to restrict running programs in those directories will not affect REST API operations.

Before you begin

- You must log in to the management server as the root user.
- The COLUMNS environment variable must not be set.

  If you perform an upgrade or overwrite installation while the COLUMNS environment variable is set, the installation might not end normally.
- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you cannot perform an upgrade or overwrite installation of the REST API.

Procedure

1. Download or insert the installation media.

   If the media is not mounted automatically, mount the media manually.

   Tip:

   These characters can be used in the mount path of a DVD-ROM: `A` to `Z`, `a` to `z`, `0` to `9`, underscores (_), forward slashes (`/`).
2. Go to the directory containing the installer (`install.sh`).

   For DVD media, the installer is stored in the following location:

   DVD-ROM-mount-directory`/Linux`
3. Run the following command:

   ```
   # ./install.sh
   ```
4. When prompted, specify the required information.

   When the installation finishes, the following message is displayed:

   ```
   Configuration Manager REST API installation completed successfully.
   ```
5. (When upgrading) Check the refresh status of the storage system configuration information.
   a. Run the API request that gets the refresh status of the storage system configuration information, and then check the value of the `status` attribute that is returned.

b. If the REST API database was expanded as a result of an upgrade installation, `Failed` is displayed as the value of the `status` attribute. In this case, check the error information, and then run the API request that refreshes the storage system configuration information.

6. (When upgrading from version 8.4.1 or earlier) If the following storage systems are managed, run the API request that registers the destinations for sending notifications about changes made to storage system configurations.
   - VSP G200, G400, G600, G800, VSP F400, F600, F800 with microcode version 83-04-*XX*-*XX*/*XX* or later
   - VSP G1000 with microcode version 80-05-*XX*-*XX*/*XX* or later

Upgrading Amazon Corretto 17

If a vulnerability in the installed Amazon Corretto 17 is announced, you can apply the latest Amazon Corretto 17 version that fixes the vulnerability.

After performing a REST API upgrade installation or overwrite installation, change to the bundled Amazon Corretto. Then by performing the same procedure, you can again apply the latest version.

Before you begin

Log in to the management server as any one of the following user types:

- User with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- Non-root user who installed the REST API

Procedure

1. Expand Amazon Corretto into any folder.

   For the Linux edition, make sure that you have execution permissions for the expanded files.

2. Stop the REST API services.
3. Change the reference destination of the REST API symbolic link.

   In a Windows OS:

   ```
   rmdir "REST-API-installation-destination\base\jdk"

   mklink /d "REST-API-installation-destination\base\jdk"
   "Amazon-Corretto-path"
   ```

   In a Linux OS:

   ```
   rm -rf "REST-API-installation-destination/base/jdk"

   ln -s "Amazon-Corretto-path" "REST-API-installation-
   destination/base/jdk"
   ```

4. Start the REST API services.

Settings required when using virus detection programs and process monitoring software

When a virus detection program accesses files used by the REST API, failures might occur due to I/O delays, locked files, or other reasons. Also, if process monitoring software forcibly terminates the REST API process, the REST API will not work properly.

To prevent these problems, while the REST API is running, exclude the following directories from being scanned by virus detection programs and from being monitored by process monitoring software.

In a Windows OS:

REST-API-installation-destination\ConfManager

root-folder-of-the-drive-on-which-the-REST-API-is-installed\HORCM

In a Linux OS:

REST-API-installation-destination/ConfManager

/HORCM

If you are operating the REST API in a cluster environment, also exclude the following folder from being scanned by virus detection programs and from being monitored by process monitoring software: the shared folder that is used for REST API and that is created on a shared disk.

Building a redundant environment

If you want to set up the REST API server in a redundant configuration, use a cluster (Windows only) or vSphere HA to set up the redundant configuration.

Even if the REST API server is set up in a redundant configuration, if a failure occurs in a communication path or communication destination (for example, in the SVP/GUM/ESM, or command device) of the REST API, the REST API might not run normally. For more details about communication paths and communication destinations of the REST API server, see System configuration of the REST API (on page 23). If there is a failure in a communication path or communication destination of the REST API, resolve the cause of the failure and then run the API.

Configuring a cluster environment (in a Windows OS)

You can improve the availability of the REST API server by clustering two management servers in an active-standby configuration. You can configure a cluster environment where the REST API is used by itself.

Note:

REST API supports Windows cluster environments only. REST API does not support clustering in a Linux OS environment.

Before you begin

- The shared disk is mounted at the same path on both the active node and the standby node.
- The cluster management IP address and the shared disk are registered as resources of the cluster management application.
- If the communication mode for the REST API server will be set to fcConnectionMode, both the active node and the standby node are connected to the storage system by Fibre Channel or iSCSI.

Procedure

1. Log on to the active node as a user with the Administrator permission.
2. For the resource group to which the cluster management IP address and the shared disk are registered, move the owner of that resource group from the standby node to the active node by using the cluster management application.
3. Bring the IP address and shared disk online.
4. (For an upgrade installation or overwrite installation) Take offline the script for the REST API server that is registered to the resource group.
5. (For an upgrade installation or overwrite installation) Delete the script from the resource group.
6. Install the REST API.

   Change the Amazon Corretto version as necessary.
7. Stop the REST API services.
8. (For a new installation) Create a shared folder for the REST API on the shared disk.

   You can specify any path name for the folder. For the path name, use only ASCII characters that are valid in the OS. Do not use this folder for any other purpose or store any other file.
9. (For a new installation) Copy the database file to the shared disk.

   In the shared folder for the REST API created in Step 8, create a `db` folder for storing the REST API database, and then copy the following files:

   REST-API-installation-destination`\data\db\restapi.sqlite.db`

   REST-API-installation-destination`\data\db\search.sqlite.db`

   If the files do not exist, it is not necessary to copy them.
10. (For a new installation) Run the following command to specify cluster environment settings:

    REST-API-installation-destination`\bin\configureCluster.bat -set` *path-of-the-shared-folder virtual-IP-address*

    Option

    `set`

    Configures a cluster environment. Specify the following information:

Item	Description
Path of the shared folder	Specify the absolute path of the shared folder for the REST API.
Virtual IP address	Specify the virtual IP address to use in the cluster environment.

11. (For a new installation) Run the following command to verify that the settings are correct:

```
REST-API-installation-destination\bin\configureCluster.bat -get
```

Option

get

Displays the settings specified for the shared folder path and the virtual IP address. If they are not set, - is displayed.

12. (For a new installation) Copy the following environment settings files from the active node to the shared folder for the REST API:

- *REST-API-installation-destination*\data\properties\StartupV.properties
- *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\rabbitmq-env-conf.bat
- *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\advanced.config
- *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\rabbitmq.conf
- *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\.erlang.cookie

13. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Run the following command, specifying a character string of your choice to be used in notifications about changes made to storage system configurations:

```
REST-API-installation-destination\bin
\setChangeNotificationSecret.bat character-string-of-your-choice
```

In Step 23, you will need to specify the same character string for the standby node. Specify a character string of no more than 32 characters and using only alphanumerical characters and the following symbols:

```
- _
```

14. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Start the REST API services to apply the settings to the REST API database.

15. (For a new installation or an upgrade installation from version 8.4.1 or earlier) To verify that the REST API services work properly, run the API request for obtaining version information, and then check whether the request is processed properly.
16. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Stop the REST API services.
17. Run the following command to change the settings so that the REST API service does not automatically start when the OS on the active node starts:

    REST-API-installation-destination\bin\deltask.bat
18. Move the owner of the resource group to which the REST API services are registered from the active node to the standby node by using the cluster management application.
19. Log on to the standby node as a user with the Administrator permission.
20. Install the REST API.

    Specify the same installation settings as those specified for the active node.
21. Stop the REST API services.
22. (For a new installation) Copy the environment settings files that were copied to the shared folder for the REST API in Step 12 to the standby node as shown below:

    - *REST-API-installation-destination*\data\properties\StartupV.properties
    - *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\rabbitmq-env-conf.bat
    - *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\advanced.config
    - *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\rabbitmq.conf
    - *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq\.erlang.cookie
23. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Run the following command, specifying the same character string as the one you specified for the active node:

    REST-API-installation-destination\bin\setChangeNotificationSecret.bat *character-string-specified-for-the-active-node*
24. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Start the REST API services to apply the settings to the REST API database.
25. (For a new installation or an upgrade installation from version 8.4.1 or earlier) To verify that the REST API services work properly, run the API request for obtaining version information, and then check whether the request is processed properly.
26. (For a new installation or an upgrade installation from version 8.4.1 or earlier) Stop the REST API services.
27. Run the following command to change the settings so that the REST API service does not automatically start when the OS on the standby node starts:

    REST-API-installation-destination\bin\deltask.bat

28. In the cluster management application, register, to the resource group, a script for controlling the startup of the REST API service as a generic script.

a. In the cluster management application window, select a resource group, and then select **Add a resource** > **Generic Script**.

b. In the **Generic Script Info** window, specify the following file for the script file path:
REST-API-installation-destination\bin\clusterscript.vbs

c. Click **Next** to register the script.

29. Select the added script, and then from the right-click context menu, select **Properties**.

Specify a name of your choice for the resource name.

Set a shared disk and virtual IP address for a dependency relationship.

30. Start operations in the cluster environment.

Move the resource group to the active node, and then bring the resource group online by using the cluster management application.

31. (For an upgrade installation) Check the refresh status of the storage system configuration information.

a. Run the API request that gets the refresh status of the storage system configuration information, and then check the value of the `status` attribute that is returned.

b. If the REST API database was expanded as a result of an upgrade installation, `Failed` is displayed as the value of the `status` attribute. In this case, check the error information, and then run the API request that refreshes the storage system configuration information.

32. (For an upgrade installation from version 8.4.1 or earlier) If the following storage systems are being managed, run the API request that registers the destinations for sending notifications about changes made to storage system configurations:

- VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
- VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later

33. To manage any of the following storage systems, run the API request that registers storage systems, with `true` specified for the `isNotifiable` attribute:

- VSP One B20
- VSP 5000 series
- VSP E series
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
- VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
- VSP G1500 or VSP F1500

Next steps

To change the following settings after a cluster environment is configured, change the settings on both the active node and the standby node:

- Port settings for the REST API server
- Port settings for CCI
- Host information settings for the REST API server

Setting the port numbers used by the REST API

You can change the ports and port numbers that are used by the REST API.

- Ports used by the REST API

  Refers to the ports used for communication between REST API clients, the management server, and the storage system.

  If remote copy operations are to be performed, in addition to these ports, the ports used for remote copy operations ports will also be used.

- Ports used during remote copy operations

  Refers to the ports used for communication between the REST API server at the primary site and the REST API server at the secondary site, or to the ports used for communication between CCI at the primary site and CCI at the secondary site.

Note:

- Make sure the REST API does not use the same port numbers as those used by other programs on the management server. If the REST API is using a port number that is used by another program, change either the port number used by the REST API or the port number used by the other program.
- When using the REST API, the firewall settings are modified to establish the necessary communication. In a Linux environment, if you are using `iptables` and `firewalld`, the REST API will automatically make the required changes. However, if you are using `nftables`, you will need to manually modify the firewall settings.
- If a firewall is installed between the communication-source device and the communication-destination device, change the settings of the firewall to enable communication from the ports on the communication-source device to the ports on the communication-destination device.

  If you are using Linux, the following ports must be open.

  - 23450
  - 23451
  - 23452 (Specify settings so that only loopback connections are allowed.)
  - 23453 (Specify settings so that only loopback connections are allowed.)
  - 23454
  - 23455 (Specify settings so that only loopback connections are allowed.)
  - 23459 (Specify settings so that only loopback connections are allowed.)

  If the REST API was installed by a non-root user in Linux, the firewall settings must be changed by a root user.

Ports used by the REST API

The REST API uses the following port numbers by default.

When a remote copy is performed, in addition to the following ports, the ports for communications between the primary site and the secondary site are also used. For details about the ports for communications between the primary site and the secondary site, see the descriptions regarding ports used during remote copy operations.

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
REST API clients	any/tcp	Management server	23450/tcp	Used for HTTP communications from REST API clients to the REST API server.

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				You can change the port number of the communication-destination device.
			23451/tcp	Used for HTTPS communications from REST API clients to the REST API server. You can change the port number of the communication-destination device.
Management server	any/tcp	Management server (same as the originator)	4369/tcp	In Windows, this port number is used for internal communications of the REST API server when using notifications about changes made to the configuration.
			23452/tcp 23453/tcp	Used for the internal communication of the REST API server. You can change the port number of the communication-destination device.
			23455/tcp	In Linux, this port number is used for internal communications of the REST API server when using notifications about changes made to the configuration. You can change the port number of the communication-destination device.
			23459/tcp	Used for internal communications of the REST API server when using notifications about changes made to the configuration.
	any/tcp	Storage system (SVP)	443/tcp	Used for SSL communication between the REST API server and the following storage systems: ▪ VSP 5000 series ▪ VSP E series (when linked with SVP) ▪ VSP G350, G370, G700, G900 (when linked with SVP)

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used) ▪ VSP G1000 (when the communication with the REST API server is SSL communication) ▪ VSP G1500 (when the communication with the REST API server is SSL communication) ▪ VSP F350, F370, F700, F900 (when linked with SVP) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used) ▪ VSP F1500 (when the communication with the REST API server is SSL communication) For VSP E series, VSP Gx00 models and VSP Fx00 models, you can change the port number of the communication-destination device.
			1099/tcp 51099/tcp 51100/tcp	Used for RMI communication between the REST API server and the following storage systems: ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F1500
			11099/tcp 51099/tcp 51100/tcp	Used for RMI communication between the REST API server and the following storage systems: ▪ VSP 5000 series
			1099/tcp 51099/tcp	Used for RMI communication between the REST API server and the following storage system:

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
			51100 to 51355/tcp	▪ VSP E series (when linked with SVP) ▪ VSP G350, G370, G700, G900 (when linked with SVP) ▪ VSP G200, G400, G600, G800 ▪ VSP F350, F370, F700, F900 (when linked with SVP) ▪ VSP F400, F600, F800 If concurrent connections are established from one SVP to multiple storage systems, the number of ports used for RMI communication is the number of the connected storage systems. The range of ports used is from 51100/tcp to 51355/tcp by default. However, the port number might be changed on the storage system side. In this case, check the port number used for the SVP on the storage system side. For details, see the storage system manual.
	35049 to 36048/udp		31001/udp	Used for non-SSL communication from REST API server to the following storage systems: ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F1500
	any/tcp	Storage system (GUM/ ESM)	443/tcp	Used for communication between the REST API server and the following storage systems: ▪ VSP One B20 ▪ VSP E series ▪ VSP Gx00 models ▪ VSP Fx00 models
	35049 to 36048/udp		31001/udp	Used for non-SSL communication from REST API server to the following storage systems.

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				▪ VSP G200, G400, G600, G800 ▪ VSP F400, F600, F800
			37001/udp	Used for SSL communication from REST API server to the following storage systems. ▪ VSP G200, G400, G600, G800 ▪ VSP F400, F600, F800
Storage system (SVP)	any/tcp	Management server	23454/tcp	Used when the REST API server receives notifications about changes made to the configurations of the following storage systems: You can change the port number of the communication-destination device. ▪ VSP 5000 series ▪ VSP G200, G400, G600, G800 ▪ VSP F400, F600, F800 ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F1500
	31001/udp		35049 to 36048/udp	Used for the response of non-SSL communication from REST API server to the following storage systems: ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F1500
Storage system (GUM/ESM)	any/tcp	Management server	23454/tcp	Used when the REST API server receives notifications about changes made to the configurations of the following storage systems: You can change the port number of the communication-destination device. ▪ VSP One B20 ▪ VSP E series

Originator		Destination		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900
	31001/udp		35049 to 36048/udp	Used for the response of non-SSL communication from REST API server to the following storage systems : ▪ VSP G200, G400, G600, G800 ▪ VSP F400, F600, F800
	37001/udp			Used for the response of SSL communication from REST API server to the following storage systems : ▪ VSP G200, G400, G600, G800 ▪ VSP F400, F600, F800
Storage system (SVP)	any/tcp	Storage system (SVP)	1099/tcp	Used for the internal communication of the SVP. ▪ VSP E series (when linked with SVP) ▪ VSP G350, G370, G700, G900 (when linked with SVP) ▪ VSP F350, F370, F700, F900 (when linked with SVP) ▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)
			51099/tcp 51100/tcp	If concurrent connections are established from one SVP to multiple storage systems of the following models, the number of ports used for RMI communication is the number of the connected storage systems. The range of ports used is from 51100/tcp

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				to 51355/tcp by default. However, the port number might be changed on the storage system side. In this case, check the port number used for the SVP on the storage system side. For details, see the storage system manual. ▪ VSP E series (when linked with SVP) ▪ VSP G350, G370, G700, G900 (when linked with SVP) ▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used) ▪ VSP F350, F370, F700, F900 (when linked with SVP) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)
	any/tcp	Storage system (GUM)	443/tcp	Used when the SVP communicates with GUM. ▪ VSP E series (when linked with SVP) ▪ VSP G350, G370, G700, G900 (when linked with SVP) ▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				▪ VSP F350, F370, F700, F900 (when linked with SVP) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)
	35049 to 36048/udp		31001/udp	Used for SSL communication from REST API server to the following storage systems. ▪ VSP E series (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP G350, G370, G700, G900 (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP G200, G400, G600, G800 (when the SSL TLS encrypted communication mode is used) ▪ VSP F350, F370, F700, F900 (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP F400, F600, F800 (when the SSL TLS encrypted communication mode is used)
			37001/udp	Used for SSL communication from REST API server to the following storage systems. ▪ VSP E series (when linked with an SVP and when the DTLS SVP encrypted communication mode is used) ▪ VSP G350, G370, G700, G900 (when linked with an SVP and when the DTLS SVP encrypted communication mode is used)

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode is used) ▪ VSP F350, F370, F700, F900 (when linked with an SVP and when the DTLS SVP encrypted communication mode is used) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode is used)
Storage system (GUM)	31001/udp	Storage system (SVP)	35049 to 36048/udp	Used for the response of SSL communication from REST API server to the following storage systems: ▪ VSP E series (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP G350, G370, G700, G900 (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP G200, G400, G600, G800 (when the SSL TLS encrypted communication mode is used) ▪ VSP F350, F370, F700, F900 (when linked with an SVP and when the SSL TLS encrypted communication mode is used) ▪ VSP F400, F600, F800 (when the SSL TLS encrypted communication mode is used)
	37001/udp			Used for the response of SSL communication from REST API server to the following storage systems: ▪ VSP E series (when linked with an SVP and when the DTLS SVP encrypted communication mode is used)

Originator		Destination		Description
Machine	**Port number**	**Machine**	**Port number**	
				▪ VSP G350, G370, G700, G900 (when linked with an SVP and when the DTLS SVP encrypted communication mode is used) ▪ VSP G200, G400, G600, G800 (when the DTLS SVP encrypted communication mode is used) ▪ VSP F350, F370, F700, F900 (when linked with an SVP and when the DTLS SVP encrypted communication mode is used) ▪ VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode is used)
Management server	37001 to 38000/udp	Relay server	proxyPort/udp#	Used for the following storage systems when the communication mode is `proxyMode`. ▪ VSP G200, G400, G600, G800 ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F400, F600, F800 ▪ VSP F1500
Relay server	proxyPort/udp#	Management server	37001 to 38000/udp	Used for the following storage systems when the communication mode is `proxyMode`. ▪ VSP G200, G400, G600, G800 ▪ VSP G1000 ▪ VSP G1500 ▪ VSP F400, F600, F800 ▪ VSP F1500

#: proxyPort means the port numbers that are set only if the communication mode has been changed to `proxyMode`.

Ports used during remote copy operations

The following describes the ports used for communications between the primary site and the secondary site when a remote copy is performed. When a remote copy is performed, in addition to the ports used by the REST API, the ports for communications between the primary site and the secondary site are also used.

The communication source and communication destination vary depending on the type of communication between the REST API server and the storage system, and depending on the microcode version of the storage system.

In a one-site configuration, the management server of the primary site is the same as the management server of the secondary site.

In a configuration where the primary site and the secondary site might be switched, make sure that the port of the communication source can communicate with the port of the communication destination.

When VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500 is used for the storage system of the primary site

- The following table describes the ports used for remote copy operations when the storage system at the primary site is one of the following:
  - VSP G200, G400, G600, G800, VSP F400, F600, F800

    (The communication with the REST API server is either non-SSL communication, or SSL communication in DTLS encrypted communication mode.)
  - VSP G1000, VSP G1500, VSP F1500

    (The communication with the REST API server is non-SSL communication.)

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
Originator: Management server	any/tcp	Destination: Management server[#]	23451/tcp	Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP G1000, VSP G1500, VSP F1500 ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				This is the same port that is used for HTTPS communication from the REST API client to the REST API server. You can change the port number of the communication destination.
		Destination: Storage system (SVP)	443/tcp	Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP 5000 series ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)		Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900
	37001 to 38000/udp	Destination: Management server#	37001 to 38000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is non-SSL communication)
			36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either non-SSL communication, or SSL communication in DTLS encrypted communication mode)
		Destination: Storage system (SVP)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP 5000 series

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series ▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900

#: In a one-site configuration, this is the same as the originator.

- The following table describes the ports used for remote copy operations when the storage system at the primary site is one of the following:
  - VSP 5000 series
  - VSP G1000, VSP G1500, VSP F1500

    (The microcode version is 80-05-2*X*-*XX*/*XX* or later and the communication with the REST API server is SSL communication.)
  - VSP G200, G400, G600, G800, VSP F400, F600, F800

    (The communication with the REST API server is either SSL communication in SSL TLS encrypted communication mode, or SSL communication in DTLS SVP encrypted communication mode.)

Primary site		Secondary site		Description
Machine	**Port number**	**Machine**	**Port number**	
Originator: Storage system (SVP)	any/tcp	Destination: Management server#	23451/tcp	Used for communication between the encryption module and the REST API server when the storage system at the secondary site is one of the following: ▪ VSP G1000, VSP G1500, VSP F1500 ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 This is the same port that is used for HTTPS communication from the REST API client to the REST API server. You can change the port number of the communication destination.
		Destination: Storage system (SVP)	443/tcp	Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP 5000 series

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)	443/tcp	Used for communication between the encryption module and the REST API server when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series ▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900
	36000 to 37000/udp	Destination: Management server[#]	37001 to 38000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following:

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is non-SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either non-SSL communication, or SSL communication in DTLS encrypted communication mode)
		Destination: Storage system (SVP)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP 5000 series ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication)

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
				▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series ▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900

#: In a one-site configuration, this is the same as the originator.

When VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 is used for the storage system of the primary site

Primary site		Secondary site		Description
Machine	**Port number**	**Machine**	**Port number**	
Originator: Storage system (GUM/ESM)	any/tcp	Destination: Management server[#]	23451/tcp	Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP G1000, VSP G1500, VSP F1500 ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 This is the same port that is used for HTTPS communication from the REST API client to the REST API server. You can change the port number of the communication destination.

Primary site		Secondary site		Description
Machine	**Port number**	**Machine**	**Port number**	
		Destination: Storage system (SVP)	443/tcp	Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP 5000 series ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)		Used for communication between the REST API server when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series ▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900

Primary site		Secondary site		Description
Machine	**Port number**	**Machine**	**Port number**	
	36000 to 37000/udp	Destination: Management server[#]	37001 to 38000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is non-SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either non-SSL communication, or SSL communication in DTLS encrypted communication mode)

Primary site		Secondary site		Description
Machine	**Port number**	**Machine**	**Port number**	
		Destination: Storage system (SVP)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP 5000 series ▪ VSP G1000, VSP G1500, VSP F1500 (when the communication with the REST API server is SSL communication) ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the communication with the REST API server is either SSL communication in DTLS SVP encrypted communication mode, or SSL communication in SSL TLS encrypted communication mode)
		Destination: Storage system (GUM/ESM)	36000 to 37000/udp	Used for communication between CCI when the storage system at the secondary site is one of the following: ▪ VSP One B20 ▪ VSP E series ▪ VSP G350, G370, G700, G900 ▪ VSP F350, F370, F700, F900

#: In a one-site configuration, this is the same as the originator.

Changing the port number to be used for HTTPS communication

Perform the following procedure to change the port number to be used for HTTPS communication between REST API clients and the REST API server.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Open the following file by using a text editor:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra\user-httpd-ssl.conf

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra/user-httpd-ssl.conf

3. Change the port number specified for `Listen` and `VirtualHost`.

   You can specify values in the range from `1` to `65535`.

   ```
   Listen new-port-number
   <VirtualHost _default_:new-port-number>
   ```

4. Save the file.
5. Start the REST API services.

Changing the port number to be used for HTTP communication

Perform the following procedure to change the port number to be used for HTTP communication between REST API clients and the REST API server.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.

2. Open the following file by using a text editor:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra\user-httpd-port.conf

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra/user-httpd-port.conf

3. Change the port number specified for `Listen`.

   You can specify a value in the range from `1` to `65535`.

   ```
   Listen new-port-number
   ```

4. Save the file.
5. Start the REST API services.

Disabling HTTP communication

When using only HTTPS for communication between REST API clients and the REST API server, you can disable HTTP communication.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Open the following file by using a text editor:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra\user-httpd-port.conf

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra/user-httpd-port.conf

3. Enter a hash mark (`#`) at the beginning of the `Listen` line to make it a comment line:

   ```
   # Listen port-number
   ```

4. Save the file.
5. Start the REST API services.

Enabling HTTP communication

To use HTTP for communication between REST API clients and the REST API server, enable HTTP communication.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Open the following file by using a text editor:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra\user-httpd-port.conf

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra/user-httpd-port.conf

3. Delete the hash mark (#) at the beginning of the `Listen` line:

   ```
   Listen port-number
   ```

4. Save the file.
5. Start the REST API services.

Re-initializing the port number settings used for HTTP and HTTPS

You can return the port number settings used for HTTP and HTTPS communication to the initial state.

If you edit or delete the file used for the port number settings, you can return the settings to the initial state by performing the following steps.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.

2. To save the content of the current settings file, copy the file in the following location to another location:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra

3. Copy the initial settings file in the following location to the location in Step 2:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userdefault

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userdefault

4. Specify the port number settings again, as needed.
5. Start the REST API services.

Changing the port numbers used by the REST API server

You can change the port numbers used by the REST API server for internal communications from the default.

If another program that uses the following port numbers is installed on the management server, change the settings of the REST API server to prevent conflicts among the port numbers:

- 23452
- 23453
- 23455 (in a Linux OS)

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Change the configuration of the port number 23452 as follows:

a. Use a text editor to open the following file:

   In a Windows OS:

   REST-API-installation-destination\data\usercnf\user-api-port.ini

   In a Linux OS:

   REST-API-installation-destination/data/usercnf/user-api-port.ini

b. Change the port number specified for `-Djetty.port`, and then save the file.

```
-Djetty.port=new-port-number
```

c. Use a text editor to open the following file:

   In a Windows OS:

   REST-API-installation-destination\oss\apache\conf\userextra\user-proxy-path.conf

   In a Linux OS:

   REST-API-installation-destination/oss/apache/conf/userextra/user-proxy-path.conf

d. Change the port number specified for `ProxyPass`, and then save the file.

```
ProxyPass http://localhost:new-port-number/restapi disablereuse=on nocanon
```

3. Change the configuration of the port number 23453 as follows:

a. Use a text editor to open the following file:

   In a Windows OS:

   REST-API-installation-destination\data\usercnf\user-api-port.ini

   In a Linux OS:

   REST-API-installation-destination/data/usercnf/user-api-port.ini

b. Change the port number specified for `-DSTOP.PORT`, and then save the file.

```
-DSTOP.PORT=new-port-number
```

4. To change the settings of port number 23455, execute the `setChangeNotificationPort` command, and then change the port number:

> **Note:** To check which port number is currently used for receiving notifications about changes made to storage system configurations, check the value of `Internal Port` in the execution results of the `setChangeNotificationPort` command.
>
> *REST-API-installation-destination*/bin/setChangeNotificationPort.sh -get_port

```
REST-API-installation-destination/bin/
setChangeNotificationPort.sh -set_internal_port new-port-number
```

Option

set_internal_port
: Specify the port number to be used for receiving notifications about changes made to storage system configurations. You can specify a value in the range from `1` to `65535`.

5. Start the REST API services.

Changing the port numbers used for communications with CCI

The REST API changes the configuration of the storage system by CCI. You can change the port numbers used for communications with CCI.

Before you begin

Log in as a user who has the Administrator permission (in a Windows OS), or as a root user (in a Linux OS).

Procedure

1. Run the `changeRMPort` command to change port numbers:

   In a Windows OS:

   ```
   REST-API-installation-destination\bin\changeRMPort.bat -set
   minimum-port-number maximum-port-number
   ```

   In a Linux OS:

   ```
   REST-API-installation-destination/bin/changeRMPort.sh -set
   minimum-port-number maximum-port-number
   ```

   Option

   set
   : Specify the range of the port numbers to be used by CCI. For the minimum and maximum port numbers, you can specify a value in the range from `1` to `65535`. Be sure that you specify a range that includes at least 300 port numbers to be used.

2. When a message asking whether you want to restart the REST API server service appears, enter `Y`.

Returning the port numbers used for CCI communications to their initial state

You can return the port numbers used for communications with CCI to their initial state (37001 to 38000).

Before you begin

Log in as a user who has the Administrator permission (in a Windows OS), or as a root user (in a Linux OS).

Procedure

1. Run the `changeRMPort` command to return the port numbers to their initial state:

   In a Windows OS:

   ```
   REST-API-installation-destination\bin\changeRMPort.bat -reset
   ```

   In a Linux OS:

   ```
   REST-API-installation-destination/bin/changeRMPort.sh -reset
   ```

   The port numbers used for communications with CCI are returned to their initial state.

2. When a message asking whether you want to restart the REST API server service appears, enter `Y`.

Changing the port number for receiving notifications about changes made to storage system configurations

You can change the port number for receiving notifications about changes made to storage system configurations.

Note: To check which port number is currently used for receiving notifications about changes made to storage system configurations, check the value of `SSL Port` in the execution results of the `setChangeNotificationPort` command:

In a Windows OS:

```
REST-API-installation-destination\bin
\setChangeNotificationPort.bat -get_port
```

In a Linux OS:

```
REST-API-installation-destination/bin/
setChangeNotificationPort.sh -get_port
```

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Run the `setChangeNotificationPort` command to change port numbers:

In a Windows OS:

REST-API-installation-destination\bin
\setChangeNotificationPort.bat -set_ssl_port *new-port-number*

In a Linux OS:

REST-API-installation-destination/bin/
setChangeNotificationPort.sh -set_ssl_port *new-port-number*

Option

set_ssl_port

Specify the port number for receiving notifications about changes made to storage system configurations. You can specify a value in the range from 1 to 65535.

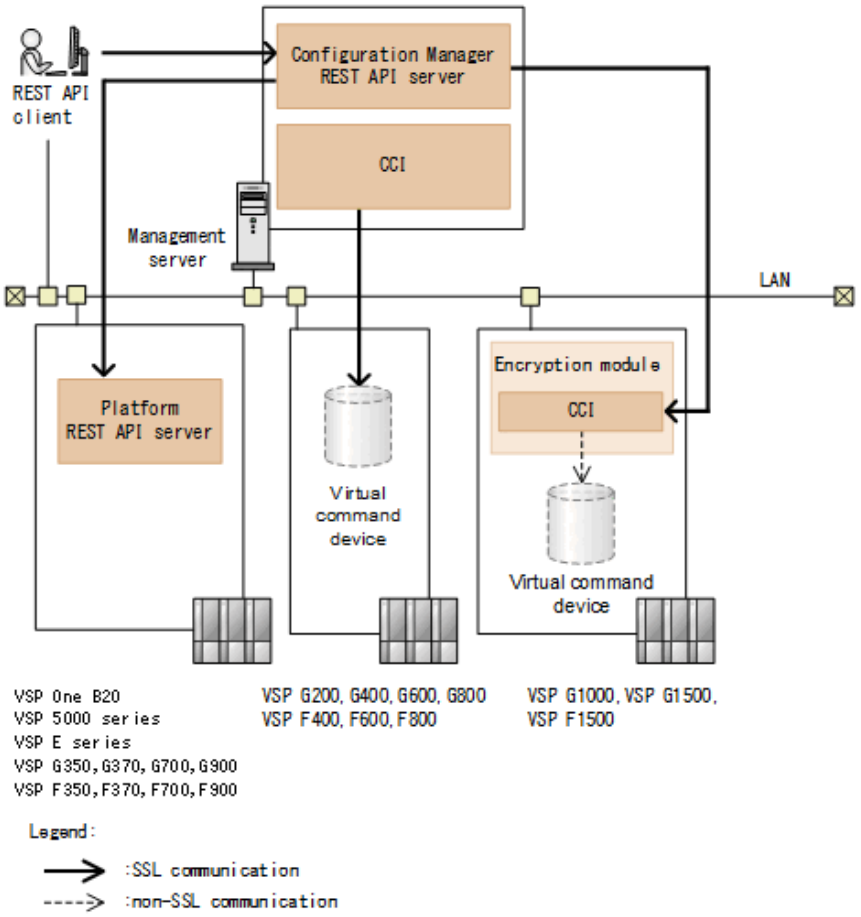
3. Start the REST API services.
4. To use the new port number to receive notifications about changes made to storage system configurations, delete the currently registered destination to which notifications about changes made to storage system configurations are to be sent, and then register a destination again.

Setting up SSL communication

You can set up SSL communication from REST API clients to the Configuration Manager REST API server, and the communication from the Configuration Manager REST API server to storage systems.

Note:

- If Common Services is installed on the same management server, you can use the cssslsetup command. By using the cssslsetup command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the cssslsetup command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.



Communication from REST API clients to the Configuration Manager REST API server:

SSL communication from REST API clients to the Configuration Manager REST API server uses the server certificate installed in the Configuration Manager REST API server. The default server certificate is a self-signed certificate. To further enhance security, you can change the setting to use a different self-signed certificate or a certificate signed by a certificate authority.

To create a private key and a server certificate, you need a program for creating certificates, such as OpenSSL. To use OpenSSL, obtain it from the website (http://www.openssl.org/), and then install it.

Tip:

If you use the default server certificate for SSL communication from REST API clients to the Configuration Manager REST API server, a communication error might occur depending on the client program. You can correct client programs to prevent such errors.

The approach taken to correct client programs to avoid errors varies by programming language.

For example, if the Requests library is used with Python, you can skip verification of the server certificate by specifying `verify=False` when issuing a request.

Note:

TLS version 1.3 or TLS version 1.2 can be used for SSL communication between REST API clients and the Configuration Manager REST API server.

The following cipher suites can be used:

- `TLS_AES_128_GCM_SHA256(0x13,0x01)`
- `TLS_AES_256_GCM_SHA384(0x13,0x02)`
- `TLS_CHACHA20_POLY1305_SHA256(0x13,0x03)`
- `TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256(0xC0,0x2B)`
- `TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384(0xC0,0x2C)`
- `TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384(0xC0,0x30)`
- `TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256(0xC0,0x2F)`
- `TLS_RSA_WITH_AES_256_GCM_SHA384(0x00,0x9D)`
- `TLS_RSA_WITH_AES_128_GCM_SHA256(0x00,0x9C)`

Note that the cipher suites that can be used vary depending on the key authentication method of the certificate.

The default server certificate uses the RSA key authentication method.

The cipher suites that can be used for each key authentication method for server certificates are as follows.

Cipher suites	RSA certificate	ECDSA certificate
TLS_AES_128_GCM_SHA256	Y	Y
TLS_AES_256_GCM_SHA384	Y	Y
TLS_CHACHA20_POLY1305_SHA256	Y	Y
TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	N	Y
TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	N	Y
TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	Y	N
TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	Y	N
TLS_RSA_WITH_AES_256_GCM_SHA384	Y	N
TLS_RSA_WITH_AES_128_GCM_SHA256	Y	N

(Legend)

Y: Can be used

N: Cannot be used

Communication from the Configuration Manager REST API server to the storage system:

When the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

SSL communication is always used between the Configuration Manager REST API server and the Platform REST API server. SSL communication will be automatically enabled after the storage system is registered. For details, see the description about the SSL communication routes used between the Configuration Manager REST API server and the Platform REST API server.

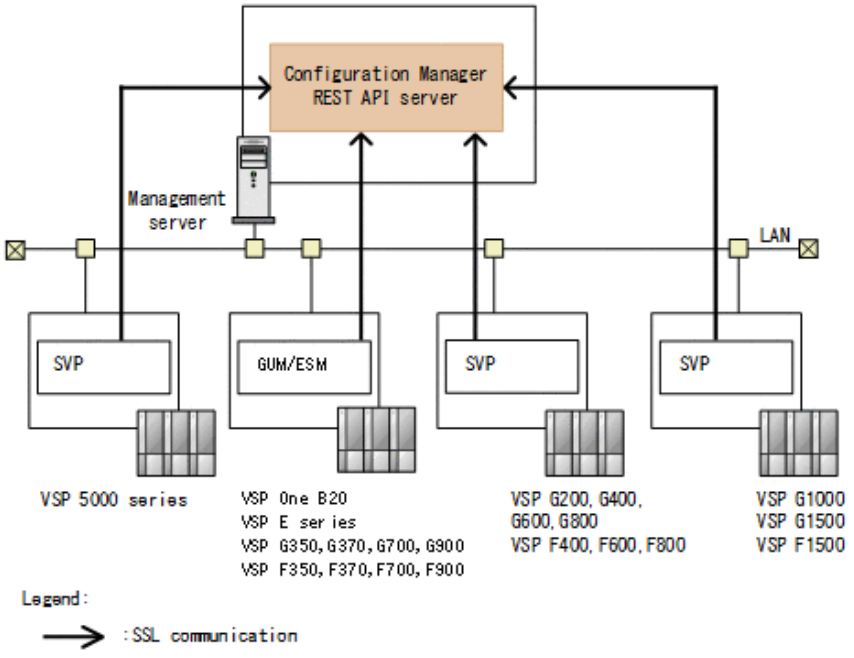
When the storage system is VSP G200, G400, G600, G800, VSP F400, F600, F800

The SSL communication routes differ for each encrypted communication mode. By default, you can use SSL communication between a CCI instance on the management server and a virtual command device on the storage system. For details, see the description about the SSL communication routes used between the Configuration Manager REST API server and the storage system.

When the storage system is VSP G1000, VSP G1500, or VSP F1500

You can use SSL communication between the Configuration Manager REST API server and the encryption module installed by default in the SVP. For details, see the description about the SSL communication routes between the Configuration Manager REST API server and the storage system.

The following describes the communication from storage systems to the Configuration Manager REST API server.



Communication from the storage system to the Configuration Manager REST API server:

SSL communications is always used when the Configuration Manager REST API server receives notifications. SSL communication from the storage system to the Configuration Manager REST API server uses the server certificate installed on the Configuration Manager REST API server. The default server certificate is a self-signed certificate. To further enhance security, you can change the setting to use a certificate signed by a certificate authority.

Note:

You can use TLS 1.3 or TLS 1.2 for communication from the storage system to the Configuration Manager REST API server.

The following cipher suites can be used:

- `TLS_AES_128_GCM_SHA256(0x13,0x01)`
- `TLS_AES_256_GCM_SHA384(0x13,0x02)`
- `TLS_CHACHA20_POLY1305_SHA256(0x13,0x03)`
- `TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256(0xC0,0x2B)`
- `TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384(0xC0,0x2C)`
- `TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384(0xC0,0x30)`
- `TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256(0xC0,0x2F)`
- `TLS_RSA_WITH_AES_256_GCM_SHA384(0x00,0x9D)`
- `TLS_RSA_WITH_AES_128_GCM_SHA256(0x00,0x9C)`
- `TLS_RSA_WITH_AES_128_CBC_SHA256(0x00,0x3C)`

Note that the cipher suites that can be used vary depending on the key authentication method of the certificate.

The default server certificate uses the RSA key authentication method.

The cipher suites that can be used for each key authentication method for server certificates are as follows.

Cipher suites	RSA certificate	ECDSA certificate
TLS_AES_128_GCM_SHA256	Y	Y
TLS_AES_256_GCM_SHA384	Y[#1]	Y
TLS_CHACHA20_POLY1305_SHA256[#2]	Y	Y
TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	N	Y
TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	N	Y
TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	Y[#1]	N
TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	Y[#1]	N
TLS_RSA_WITH_AES_256_GCM_SHA384[#2]	Y[#1]	N
TLS_RSA_WITH_AES_128_GCM_SHA256[#2]	Y[#1]	N
TLS_RSA_WITH_AES_128_CBC_SHA256[#2]	Y[#1]	N

(Legend)

Y: Can be used

N: Cannot be used

#1: Cipher suite that can be used with the default server certificate

#2: Cannot be used for VSP One B20 storage systems

Server certificate verification function (VSP One B20)

The following describes certificate verification during SSL communication between the storage system (VSP One B20) and an external server.

When the storage system is VSP One B20 (firmware version A3-04-01-*XX* or later), the Platform REST API server verifies the server certificate of the communication counterpart during SSL communication where the Platform REST API server acts as the client. The following two communication paths are the targets for verification:

- Operation related to notifications of configuration changes (communication from the Platform REST API server to the Configuration Manager REST API server)

  Certificate verification is performed in the following cases:

  - When registering a storage system (when registering VSP One B20 with settings specified to receive notifications of configuration changes)
  - When registering a notification destination for configuration changes (when registering VSP One B20 as the notification destination for configuration changes)

- Remote copy operation (communication from the Platform REST API server to the remote storage system or the Configuration Manager REST API server)

If a server certificate that meets the certificate verification criteria is not uploaded to the Configuration Manager REST API server or the remote storage system, SSL communication will fail due to server certificate verification when an operation related to notifications of configuration changes or a remote copy operation (TrueCopy, Universal Replicator, and global-active device) is performed. Before performing such operations, make sure to take the following actions.

Tip:

- For details on server certificate requirements, see the local storage system manual *System Administrator Guide*.
- The server certificate for the Configuration Manager REST API server supports IPv4 addresses. If you do not want to use an IPv4 address for certificate verification, see "Changing host information for the Configuration Manager REST API server" for details.

When performing operations related to notifications of configuration changes

Use the following procedure to create a server certificate for receiving notifications of configuration changes for the Configuration Manager REST API server, and upload the root certificate of the created server certificate to VSP One B20.

1. Creating a server certificate for the Configuration Manager REST API server

   Set a server certificate for receiving notifications of configuration changes with the subjectAltName correctly specified on the Configuration Manager REST API server.

   For details on how to create a server certificate, see "Changing the certificate used for SSL communication between the Configuration Manager REST API server and the storage system (when a notification about configuration changes is received)".

2. Uploading the root certificate file to the storage system

   Upload the root certificate of the server certificate created in steps 1 to VSP One B20 by referring to "Uploading the certificate files (for external server verification)".

Note:

When the storage system is VSP One B20 (firmware version A3-04-01-*XX* or later) and the certificate verification function is enabled, the following certificates for receiving notifications of configuration changes can no longer be used. Notifications of configuration changes will not work correctly until you create a server certificate and upload the root certificate to the storage system side by performing the above steps.

- The default server certificate
- A server certificate issued by the certification authority that was created for Configuration Manager 11.0.3 or earlier and does not meet the certificate verification criteria

When performing remote copy operations

Use the following procedure to create an HTTPS server certificate for the Configuration Manager REST API server or a server certificate for the remote storage system, and upload the root certificate of the created server certificate to the local storage system (VSP One B20).

One-site configuration: When the local storage system is VSP One B20 and the remote storage system is VSP G200, G400, G600, G800, VSP F400, F600, F800

1. Creating a server certificate for the Configuration Manager REST API server

   Set an HTTPS server certificate with the subjectAltName correctly specified on the Configuration Manager REST API server.

   For details on how to create a server certificate, see "Specifying settings for using SSL communication between REST API clients and the REST API server (when using a self-signed certificate)" or "Specifying settings for using SSL communication between REST API clients and the REST API server (when using a server certificate issued by a certificate authority)".

2. Uploading the root certificate file to the local storage system

   Upload the root certificate of the server certificate created in steps 1 to the local storage system by referring to "Uploading the certificate files (for external server verification)".

Two-site configuration: When the local storage system is VSP One B20 and the remote storage system is VSP G200, G400, G600, G800, VSP F400, F600, F800

1. Creating a server certificate for the Configuration Manager REST API server of the secondary site

   Set an HTTPS server certificate with the subjectAltName correctly specified on the Configuration Manager REST API server of the secondary site.

   For details on how to create a server certificate, see "Specifying settings for using SSL communication between REST API clients and the REST API server (when using a self-signed certificate)" or "Specifying settings for using SSL communication between REST API clients and the REST API server (when using a server certificate issued by a certificate authority)".

2. Uploading the root certificate file to the local storage system

   Upload the root certificate of the server certificate created in steps 1 to the local storage system by referring to "Uploading the certificate files (for external server verification)".

Two-site configuration: When the local storage system is VSP One B20 and the remote storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

1. Uploading the server certificate file to the remote storage system

   Use the maintenance utility or Hitachi Device Manager - Storage Navigator to upload a server certificate that meets the certificate verification items to SVP/GUM/ESM on the remote storage system side. For details on how to upload a server certificate, see the *System Administrator Guide*.

2. Uploading the root certificate file to the local storage system

   Upload the root certificate of the server certificate created in steps 1 to the local storage system by referring to "Uploading the certificate files (for external server verification)".

Note:

The server certificate requirements used for SSL communication where the Platform REST API server acts as the client might increase or decrease depending on the version of the Platform REST API on the local storage system side. In addition, the root certificate uploaded to the Platform REST API on the local storage system side is inherited even after a firmware update. However, to prevent communication between the Platform REST API servers from failing immediately after a firmware update, the Platform REST API operates according to the server certificate requirements of the previous firmware version until a new root certificate is uploaded from the Configuration Manager REST API or the Platform REST API.

Enabling the certificate verification function

The certificate verification function is enabled the first time you upload the root certificate by using the API request described in "Uploading the certificate files (for external server verification)". Once enabled, the certificate verification function cannot be disabled. If you use multiple communication destination servers, uploading the root certificate of any one of those servers enables the certificate verification function for all communication destination servers. If the destination server cannot be verified, communication will fail.

What to do if communications fail due to server certificate verification

If server certificate verification fails, configuration change notification operations and remote copy operations will fail with the KART40389-E, KART40390-E, or KART40098-E error. If the KART40389-E or KART40390-E error occur, make sure that the server certificate requirements are met. If the KART40098-E error occur, in addition to checking the network environment, make sure that the server certificate requirements are met.

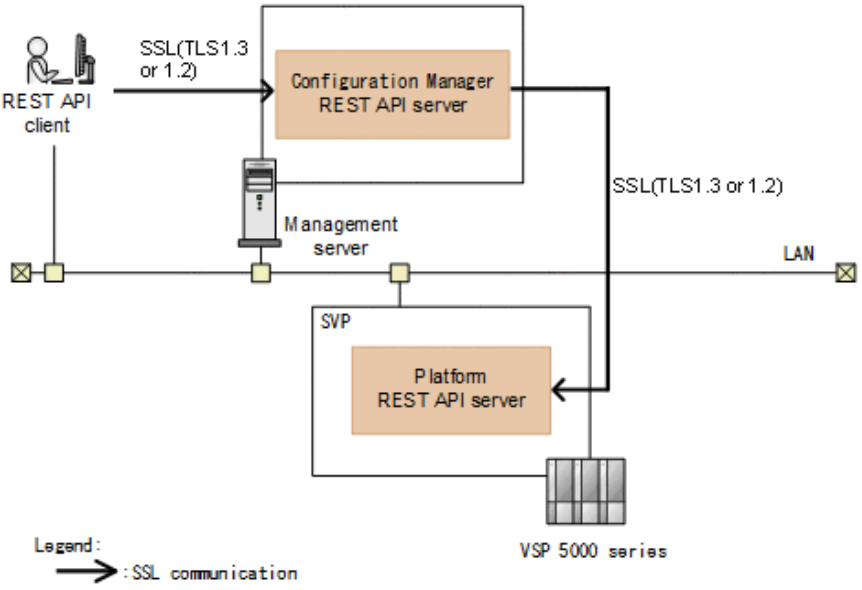
Notes when downgrading the firmware version

When downgrading the firmware from A3-04-01-*XX* or a later version to a version earlier than A3-04-01-*XX*, you need to delete all root certificates that have been uploaded to the local storage system side.

Even if you downgrade the firmware version, the certificate verification function that was enabled once will not be disabled. If you downgraded the firmware from A3-04-01-*XX* or a later version to a version earlier than A3-04-01-*XX*, and then want to update the firmware to A3-04-01-*XX* or a later version, you will need to upload the root certificate again.

SSL communication routes between the Configuration Manager REST API server and the Platform REST API server (VSP 5000 series)

The following describes the communication routes from the Configuration Manager REST API server to the Platform REST API server on the storage system side.

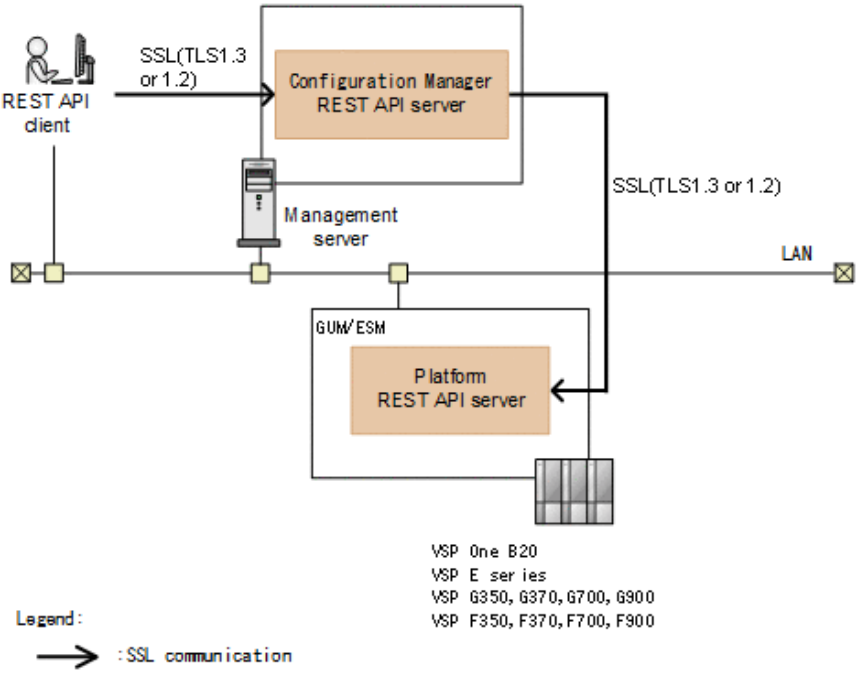


The Configuration Manager REST API server sends the request received from the REST API client to the Platform REST API server. At this point, SSL communication is always used between the Configuration Manager REST API server and the Platform REST API server.

For VSP 5000 series, SSL communication is automatically enabled when a storage system is registered.

SSL communication routes between the Configuration Manager REST API server and the Platform REST API server (VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900)

The following describes the communication routes from the Configuration Manager REST API server to the Platform REST API server on the storage system side.



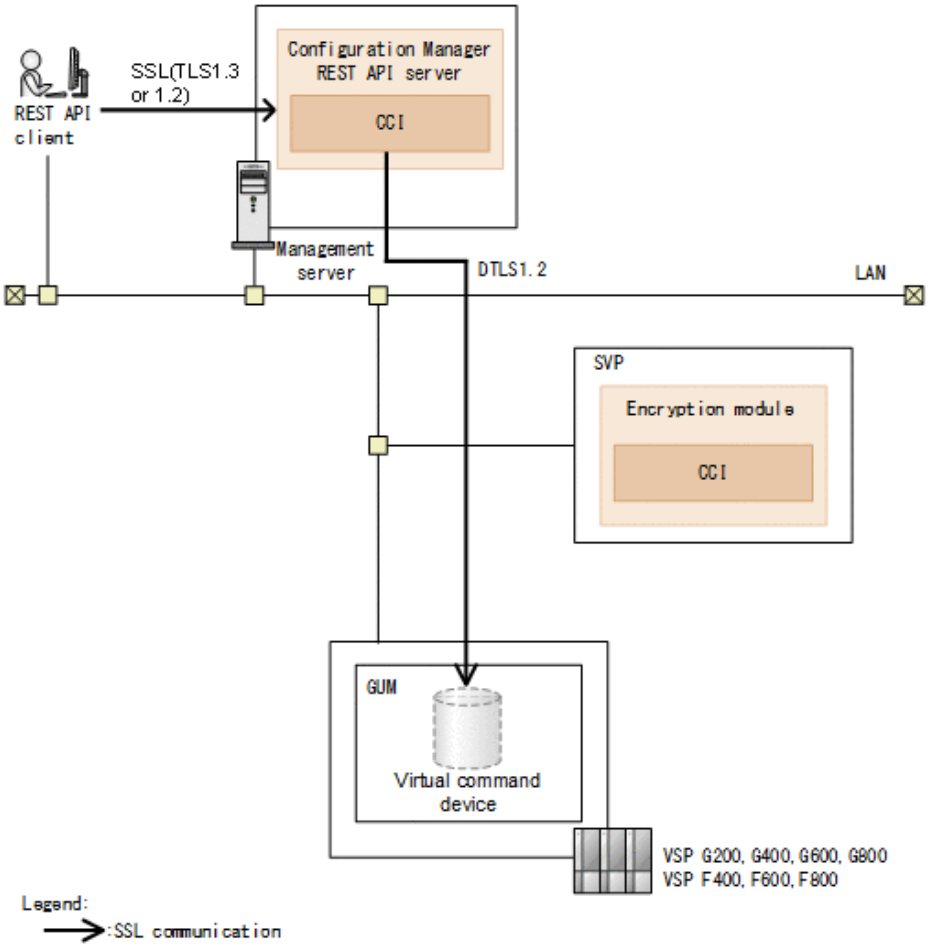
The Configuration Manager REST API server sends the request received from the REST API client to the Platform REST API server. At this point, SSL communication is always used between the Configuration Manager REST API server and the Platform REST API server.

For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, SSL communication is automatically enabled when a storage system is registered.

SSL communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800)

The following figure describes the communication routes from the Configuration Manager REST API server to the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800).

Encrypted communication mode: DTLS (default)



You can use SSL communication between a CCI instance on the management server and a virtual command device on the storage system. Requests from the Configuration Manager REST API server are run by the virtual command device on the storage system.

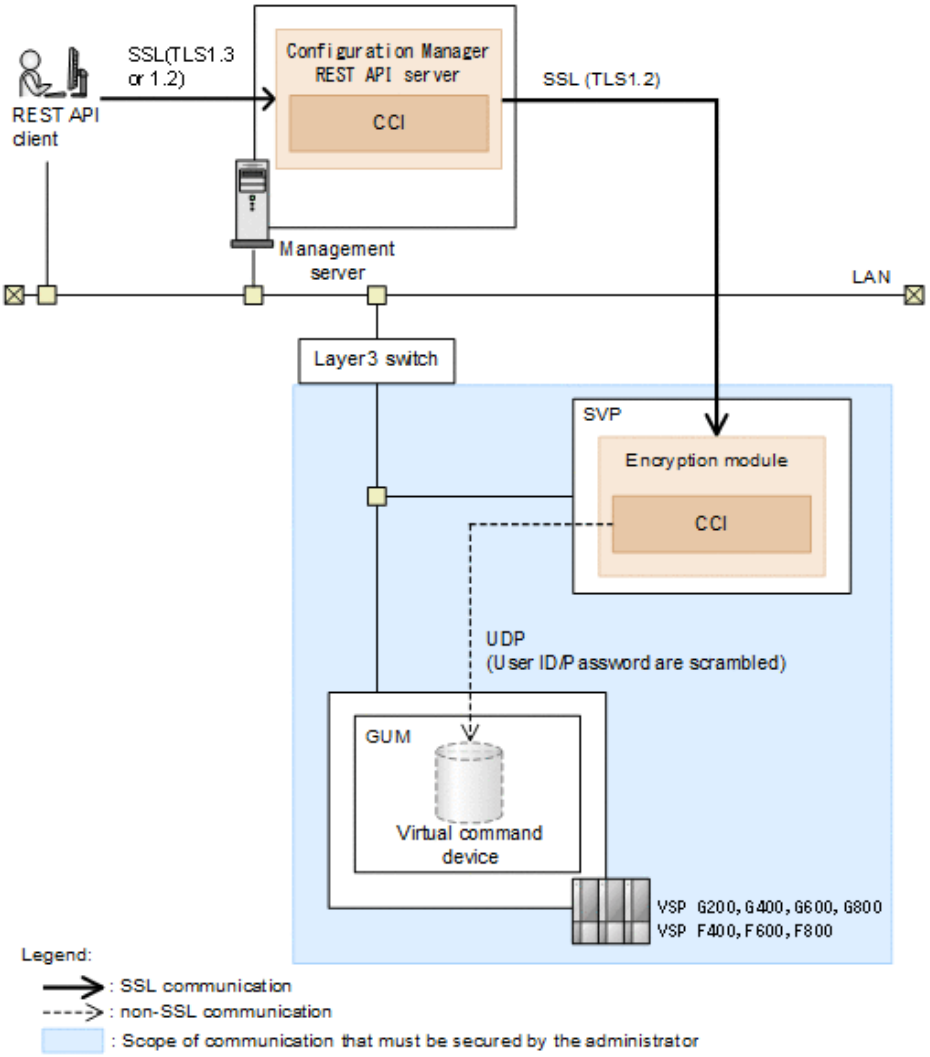
For SSL communication, the server certificate installed in the SVP is used. The default server certificate is a self-signed certificate. If you want to use a different self-signed certificate or a certificate signed by a certificate authority to further enhance security, set up SSL communication again. To use SSL communication, use the API function for registering a storage system or for changing information about a storage system.

Tip:

If Common Services is installed on the same management server, you can use the `cssslsetup` command. By using the `cssslsetup` command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the `cssslsetup` command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.

When the DTLS encrypted communication mode is used, the processing speed decreases because compared to non-SSL communication, more time is required to run the CCI command to set up encryption. To improve processing performance, change the encrypted communication mode from DTLS to SSL TLS.

Encrypted communication mode: SSL TLS



You can use SSL communication between the Configuration Manager REST API server and the encryption module installed by default in the SVP. The encryption module is used to relay the requests from Configuration Manager REST API server to CCI in the encryption module. The requests relayed to CCI are run by a virtual command device in the GUM.

If the SSL TLS encrypted communication mode is used, the SVP and the GUM will communicate by using non-SSL UDP communication. To prevent unauthorized access from external parties, the communication for UDP packets must be secured. Review the system configuration in advance, and make sure that the communication between the SVP and the GUM is secure.

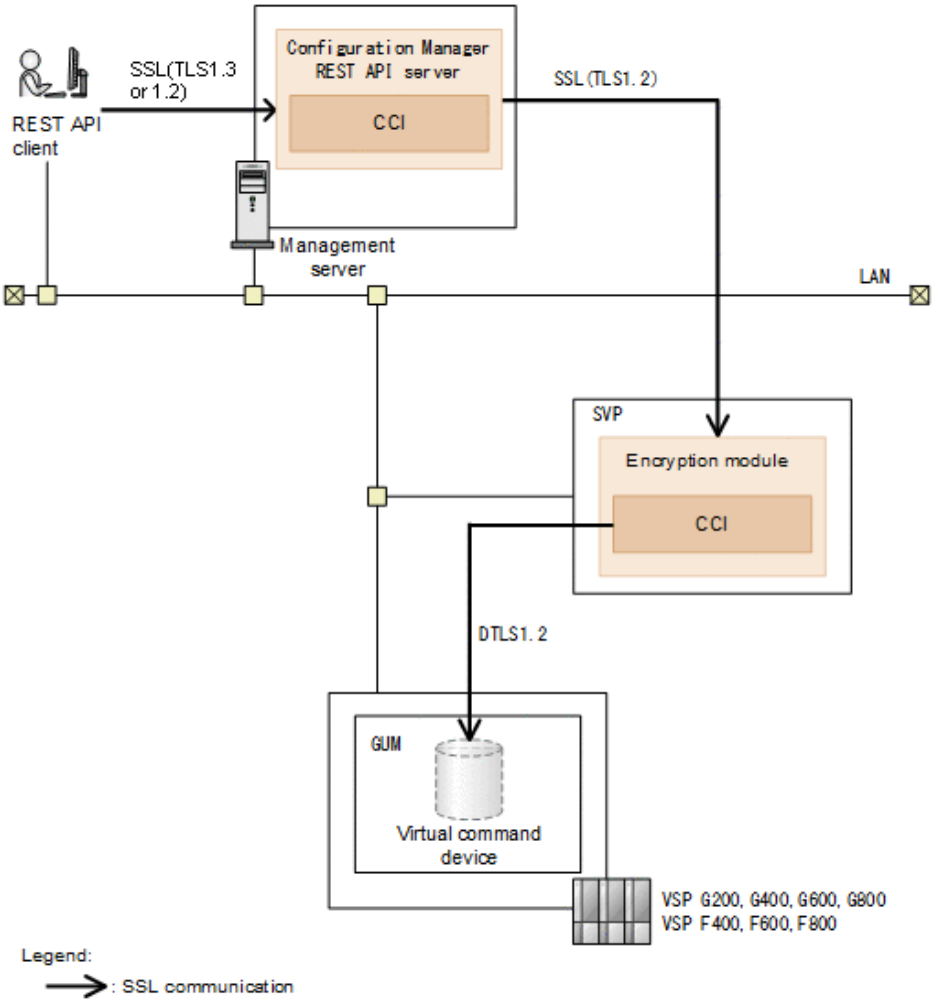
In the example shown in the figure, a layer 3 switch is located to prevent unauthorized access from external parties, thereby ensuring the security of the UDP communication between the SVP and the GUM.

To use SSL communication in the SSL TLS encrypted communication mode, set the `isSecure` attribute to `true` and the `lanConnectionProtocol` attribute to `SSL TLS` by using the API function for registering a storage system or for changing the status.

If the Configuration Manager REST API was installed by a non-root user, when a storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800) is registered, the encrypted communication mode is set to SSL TLS by default.

You can also use DTLS SVP encrypted communication as a system configuration for secure communication between SVP and GUM. When DTLS SVP encrypted communication is used, the execution time of a CCI command, which configures the encryption between SVP and GUM, increases compared to when UDP communication is used. Therefore, the processing speed will be slower than when SSL TLS encrypted communication is used.

Encrypted communication mode: DTLS SVP



You can use SSL communication between the Configuration Manager REST API server and a virtual command device on the storage system. The encryption module is used to relay the requests from the Configuration Manager REST API server to CCI in the encryption module. The requests relayed to CCI are run by a virtual command device in the GUM.

To use SSL communication in the DTLS SVP encrypted communication mode, set the `isSecure` attribute to `true` and the `lanConnectionProtocol` attribute to `DTLS SVP` by using the API function for registering a storage system or for changing the status.

Note:

- When the communication mode is proxyMode, SSL communication cannot be enabled.
- If the communication route specified in the SSL communication setting is different from the route specified in the communication mode setting, the communication route specified in the communication mode setting has priority.

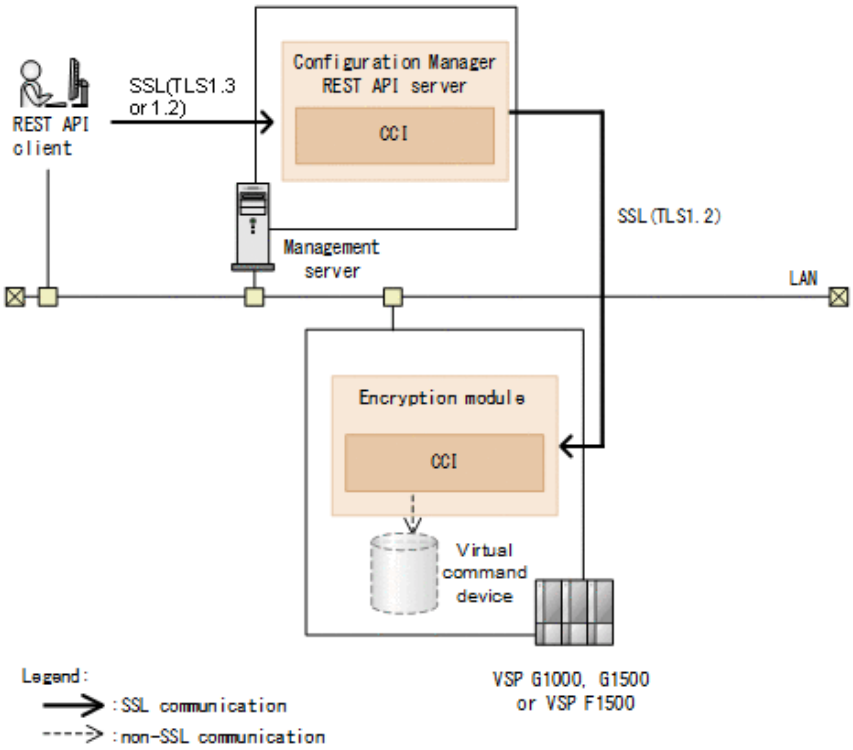
  For example, if SSL communication in the DTLS encrypted communication mode (Out-of-Band) and fcConnectionMode (In-Band) are both specified, the communication route that uses fcConnectionMode has priority.
- In an environment that has redundant communication routes using two encrypted communication modes (lanConnectionMode and fcConnectionMode), if SSL communication is used in DTLS SVP encrypted communication mode or SSL TLS encrypted communication mode, the communication mode will not automatically switch even if a failure occurs.
- Note the following when performing remote copy operations in an environment where Configuration Manager version 8.5.2-02 or earlier and Configuration Manager version 8.5.2-03 or later (using DTLS SVP encrypted communication mode or SSL TLS encrypted communication mode):

  Of the port numbers that are used by storage systems (VSP G200, G400, G600, G800, VSP F400, F600, F800) for the SVP, only the default port number (443) can be used as the MAPPWebServerHttps port number.
- Error message KART20022-E or KART40126-E can be output and the operation can fail if the API is called to obtain information in an environment that uses SSL communication in DTLS SVP encrypted communication mode or SSL TLS encrypted communication mode between the REST API server and the storage system. In this case, if no problem is apparent in the communication environment, the error can be resolved by changing the settings for the timeout value applied to communication between the Configuration Manager REST API server and the encryption module. For reference information about the timeout value and how to configure settings, see the description for the timeout value that is applied to communication between the Configuration Manager REST API server and the encryption module.

SSL communication routes between the Configuration Manager REST API server and the storage system (VSP G1000, VSP G1500, or VSP F1500)

The following describes the communication routes from the Configuration Manager REST API server to the storage system (VSP G1000, VSP G1500, and VSP F1500).

SSL communication routes between the Configuration Manager REST API server and the storage system (VSP G1000, VSP G1500, or VSP F1500)



You can use SSL communication between the Configuration Manager REST API server and the encryption module installed by default in the SVP. The encryption module is used to relay the requests from Configuration Manager REST API server to CCI in the encryption module. The requests relayed to CCI are run by a virtual command device.

To use SSL communication, use the API function for registering a storage system or for changing the status to enable SSL communication.

If the Configuration Manager REST API was installed by a non-root user in Linux, when a storage system (VSP G1000, VSP G1500, or VSP F1500) is registered, SSL communication is enabled by default.

Important:

For the storage system, we recommend using microcode version 80-05-2*X-XX*/*XX* or later.

We do not recommend using SSL communication for storage systems for which the microcode version is 80-04-2*X-XX*/*XX* or later, but 80-05-2*X-XX*/*XX* or earlier, for the following reasons:

- If the same storage system is managed by multiple Configuration Manager REST API servers, the SSL communication settings cannot be enabled simultaneously for multiple Configuration Manager REST API servers.
- The resource lock function cannot be used when the SSL communication settings are enabled.

Note:

- When the communication mode is proxyMode, SSL communication cannot be enabled.
- If the communication route specified in the SSL communication setting is different from the route specified in the communication mode setting, the communication route specified in the communication mode setting has priority.

  For example, if SSL communication (Out-of-Band) and fcConnectionMode (In-Band) are both specified, the communication route that uses fcConnectionMode has priority.
- In an environment that has redundant communication routes using two encrypted communication modes (lanConnectionMode and fcConnectionMode), if SSL communication is used, the communication mode will not automatically switch even if a failure occurs.
- To use SSL communication between the Configuration Manager REST API server and a VSP G1000 storage system whose microcode version is earlier than 80-05-*XX*-*XX*/*XX*, ask maintenance personnel to enable procedure of encrypted communication with Configuration Manager REST API.
- Error message KART20022-E or KART40126-E can be output and the operation can fail if the API is called to obtain information in an environment that uses SSL communication between the Configuration Manager REST API server and a VSP G1000, VSP G1500, or VSP F1500 storage system. In this case, if no problem is apparent in the communication environment, the error can be resolved by changing the settings for the timeout value applied to communication between the Configuration Manager REST API server and the encryption module. For reference information about the timeout value and how to configure settings, see the description for the timeout value that is applied to communication between the Configuration Manager REST API server and the encryption module.
- The encryption module varies depending on the microcode version of storage systems. If the version of Configuration Manager is 8.5.1 or later, the range of API functions that can be used in an environment where SSL communication is used between the Configuration Manager REST API server and a VSP G1000, VSP G1500, or VSP F1500 storage system depends on the microcode version of the storage system.

  For information about compatibility between the version of Configuration Manager and the microcode version of the storage system, see the description on compatible versions of Configuration Manager.

SSL communication routes for performing remote copy operations

The following shows the communication routes when you perform remote copy operations with SSL communication enabled.

The communication path for when the Configuration Manager REST API server receives notifications about changes made to storage system configurations is omitted.

Caution: To perform a remote copy operation in an environment where SSL communication is enabled, enable SSL communication on the storage systems at both the primary and secondary sites.

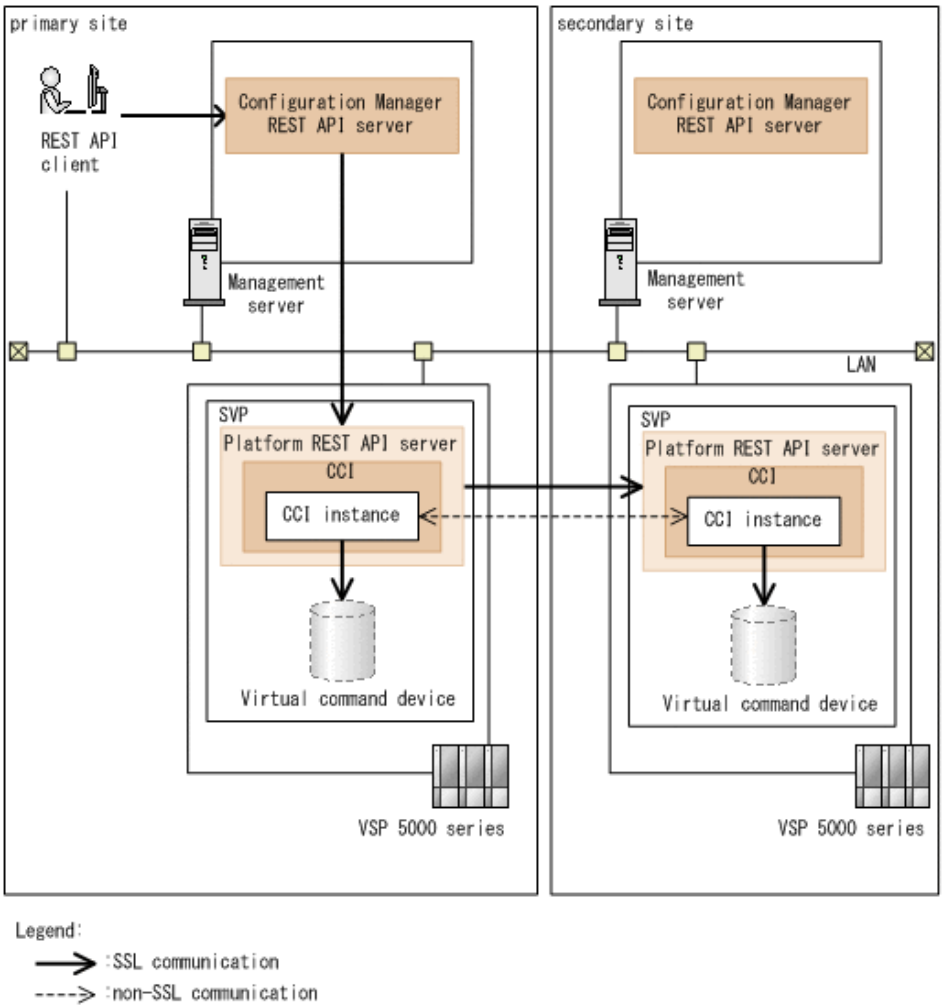
The configuration examples to be described are listed in the following table.

Configuration example	Description
1	When VSP 5000 series is used for the storage systems at the primary and secondary sites (two-site configuration)
2	When VSP G200, G400, G600, G800, VSP F400, F600, F800 is used for the storage systems at the primary and secondary sites (two-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when DTLS encrypted communication mode is used are shown.
3	When VSP G1000, VSP G1500, VSP F1500 is used for the storage systems at the primary and secondary sites (two-site configuration)
4	When VSP 5000 series is used for the storage system of the primary site and VSP G200, G400, G600, G800, VSP F400, F600, F800 is used for the storage system of the secondary site (two-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when DTLS encrypted communication mode is used are shown.
5	When VSP 5000 series is used for the storage system of the primary site and VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500 is used for the storage system of the secondary site (two-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used are shown.

6	When VSP G1000, VSP G1500, or VSP F1500 is used for the storage system of the primary site and VSP G200, G400, G600, G800, VSP F400, F600, F800 is used for the storage system of the secondary site (two-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when DTLS encrypted communication mode is used are shown.
7	When VSP G200, G400, G600, G800, VSP F400, F600, F800 is used for the storage system of the primary site and VSP G1000, VSP G1500, or VSP F1500 is used for the storage system of the secondary site (two-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when DTLS encrypted communication mode is used are shown.
8	When VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 is used for the local storage system and VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500 is used for the remote storage system (one-site configuration) For the communication routes between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800), the communication routes when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used are shown.

If you are using a VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, replace VSP 5000 series with VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Configuration example 1



Storage system of the primary site

VSP 5000 series

Storage system of the secondary site

VSP 5000 series

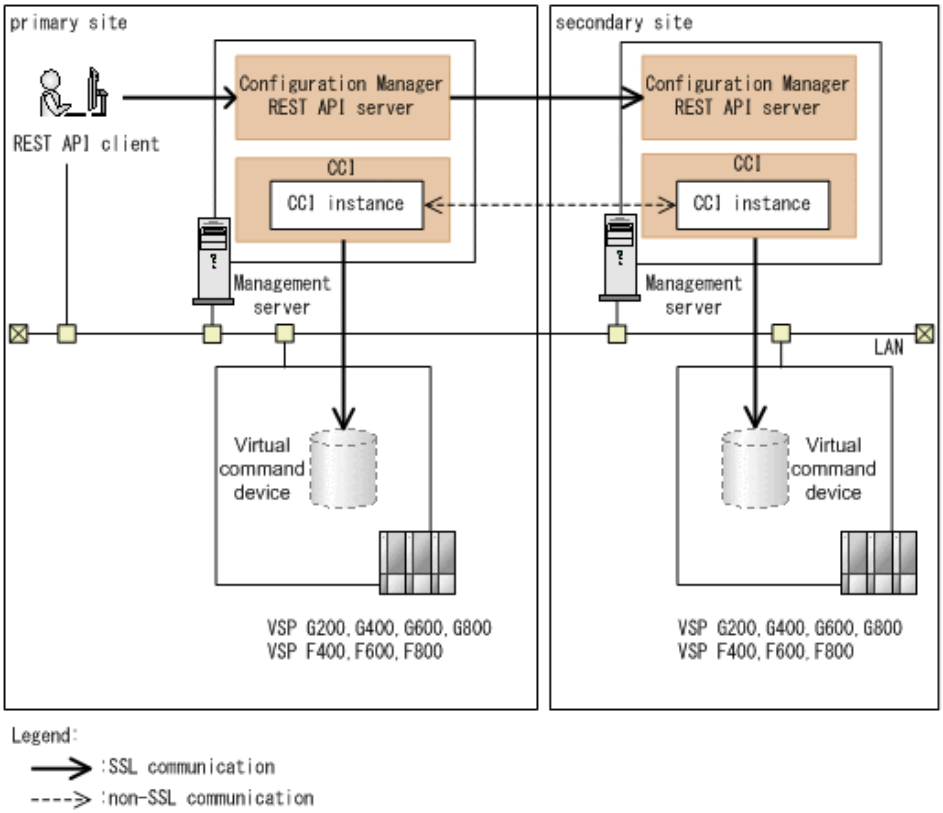
In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the Platform REST API server of the primary site
- Between the Platform REST API server of the primary site and the Platform REST API server of the secondary site

If you are using a VSP One B20 storage system, replace VSP 5000 series with VSP One B20, and replace SVP with ESM.

If you are using a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, replace VSP 5000 series with VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, and replace SVP with GUM.

Configuration example 2



Storage system of the primary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when DTLS encrypted communication mode is used)

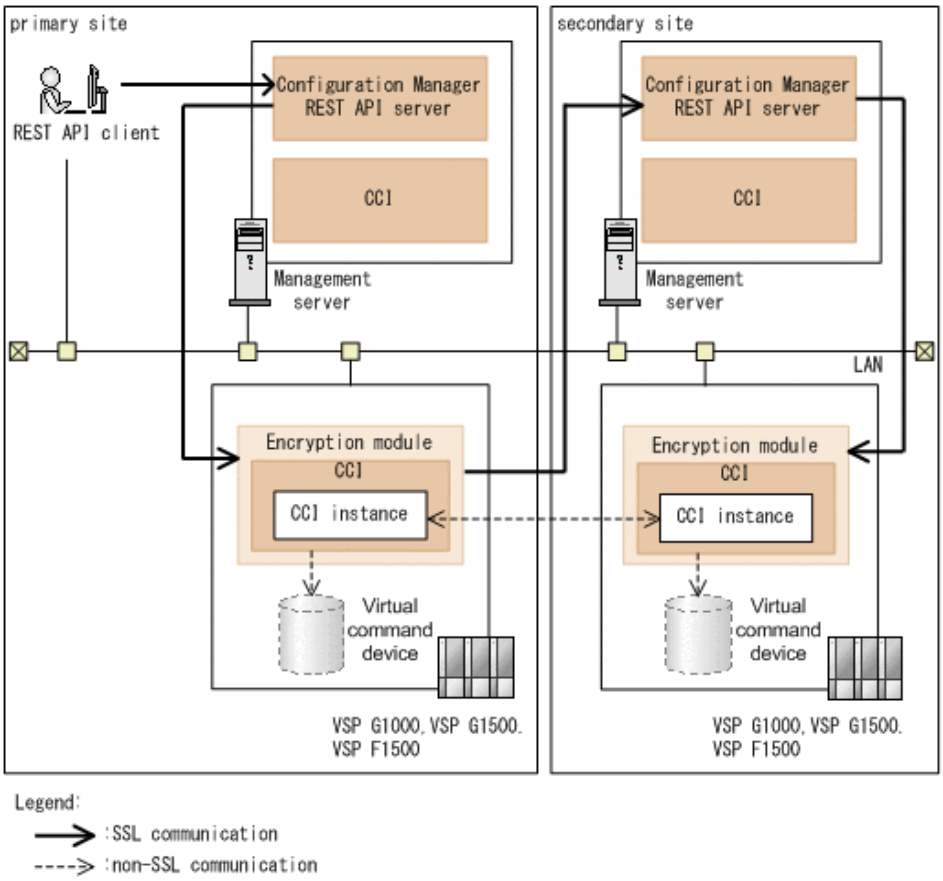
Storage system of the secondary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when DTLS encrypted communication mode is used)

In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the CCI instance on the Configuration Manager REST API server of the primary site and the virtual command device on the storage system of the primary site
- Between the CCI instance on the Configuration Manager REST API server of the secondary site and the virtual command device on the storage system of the secondary site
- Between the Configuration Manager REST API server of the primary site and the Configuration Manager REST API server of the secondary site

Configuration example 3



Storage system of the primary site

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X-XX*/*XX* or later)

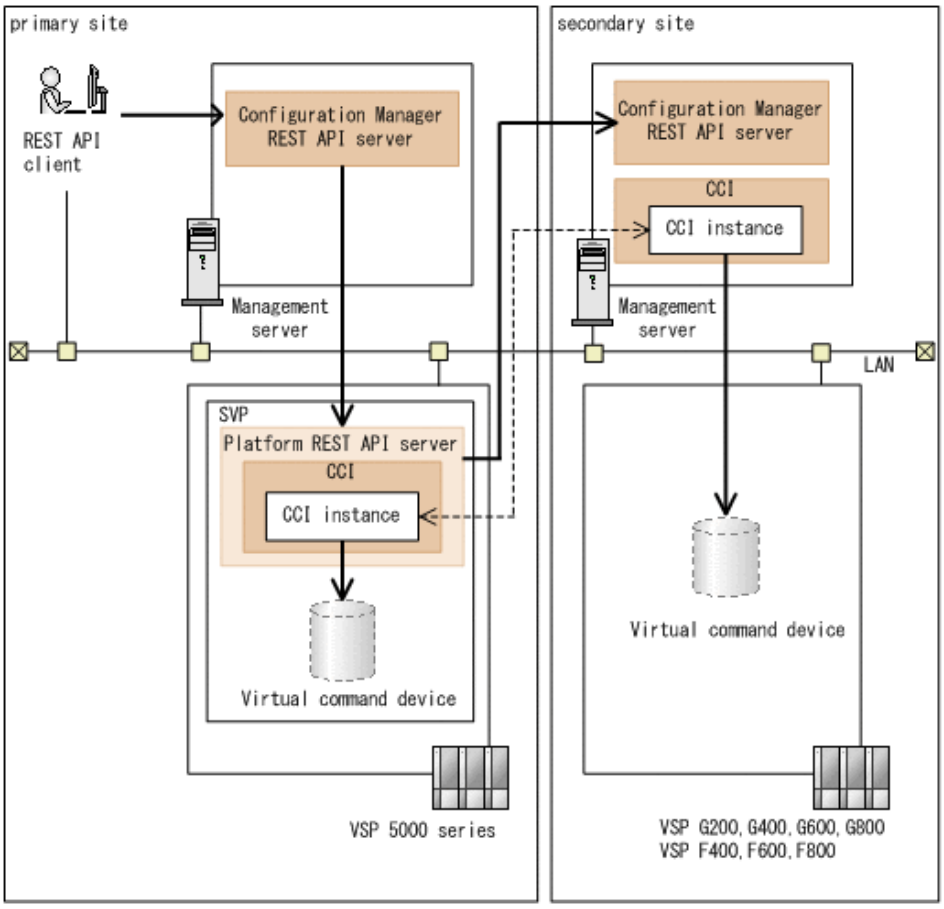
Storage system of the secondary site

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X-XX*/*XX* or later)

In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the encryption module of the primary site
- Between the encryption module of the primary site and the Configuration Manager REST API server of the secondary site
- Between the Configuration Manager REST API server of the secondary site and the encryption module of the secondary site

Configuration example 4



Storage system of the primary site

VSP 5000 series

Storage system of the secondary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when DTLS encrypted communication mode is used)

In this configuration, SSL communication is used for the following routes:

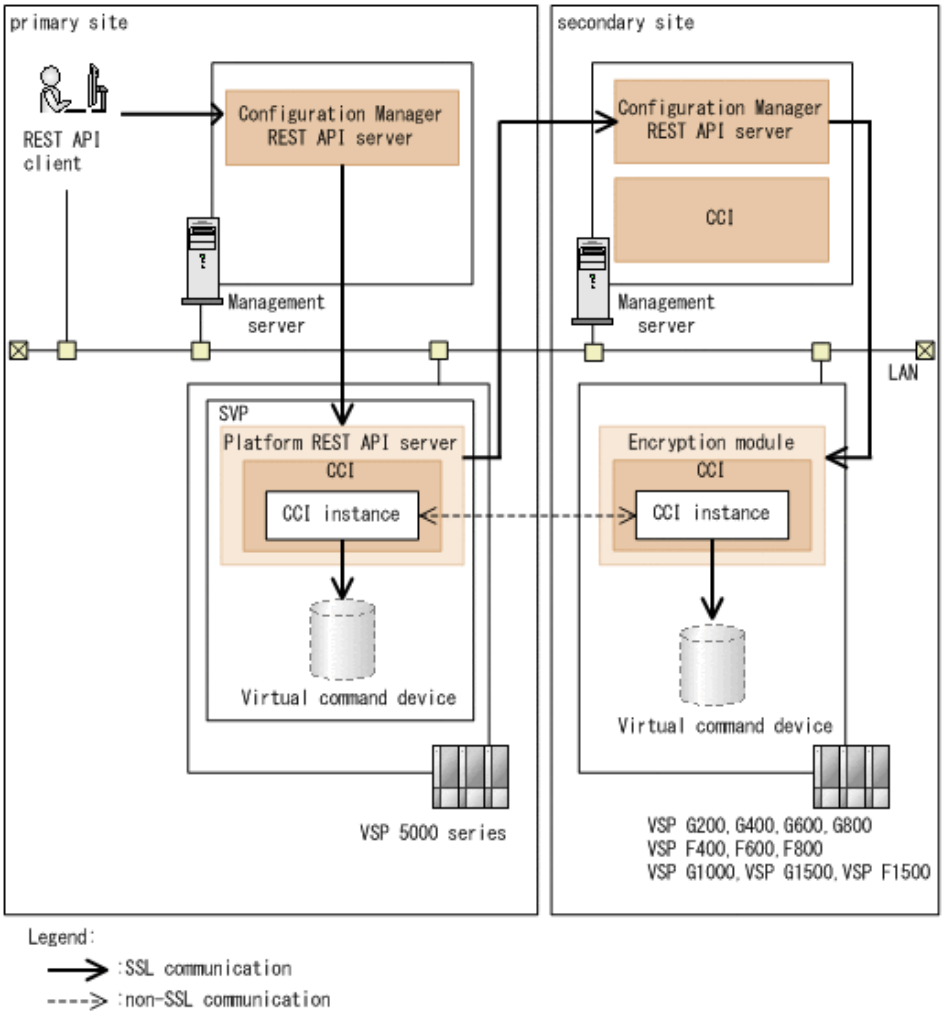
- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the Platform REST API server of the primary site
- Between the CCI instance on the Platform REST API server of the primary site and the virtual command device on the storage system of the primary site

- Between the Platform REST API server of the primary site and the Configuration Manager REST API server of the secondary site
- Between the CCI instance on the Configuration Manager REST API server of the secondary site and the virtual command device on the storage system of the secondary site

If you are using a VSP One B20 storage system, replace VSP 5000 series with VSP One B20, and replace SVP with ESM.

If you are using a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, replace VSP 5000 series with VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, and replace SVP with GUM.

Configuration example 5



Storage system of the primary site

VSP 5000 series

Storage system of the secondary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X*-*XX*/*XX* or later)

The communication routes in the preceding figure are used when both of the following apply.

- The storage system at the secondary site is VSP G200, G400, G600, G800, VSP F400, F600, F800.
- The DTLS SVP encrypted communication mode is used between the Configuration Manager REST API server and the storage system at the secondary site.

In this configuration, SSL communication is used for the following routes:

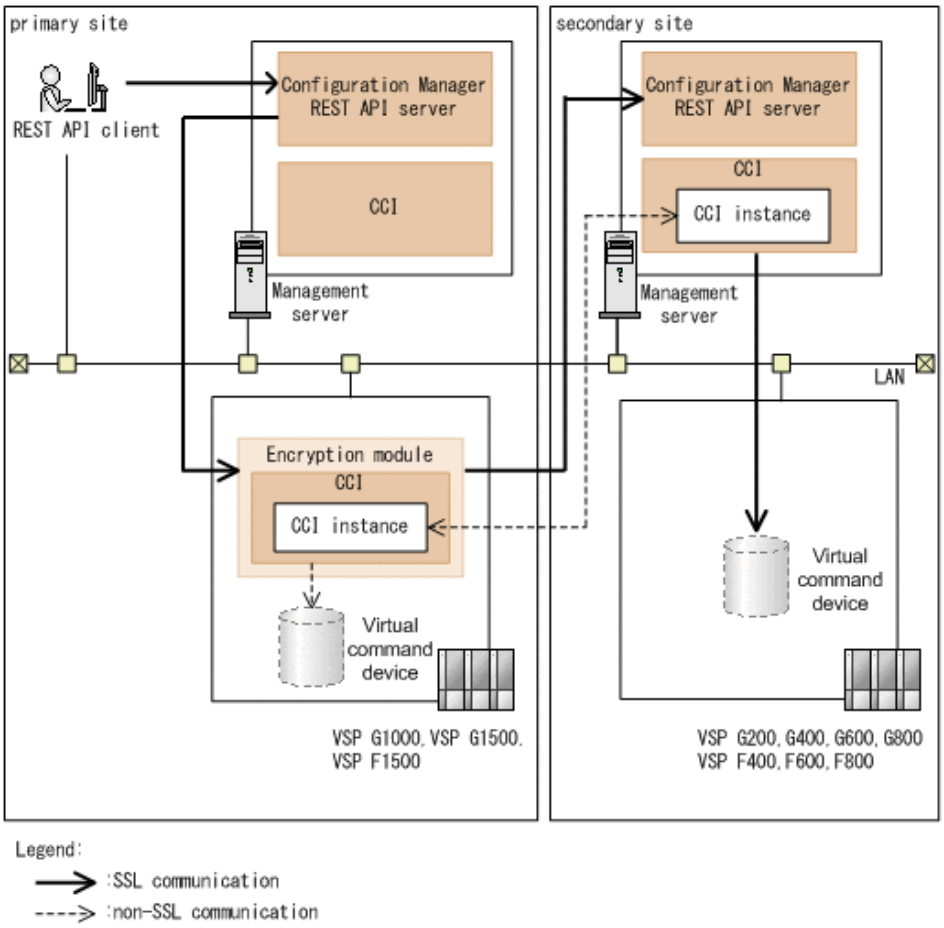
- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the Platform REST API server of the primary site
- Between the CCI instance on the Platform REST API server of the primary site and the virtual command device on the storage system of the primary site
- Between the Platform REST API server of the primary site and the Configuration Manager REST API server of the secondary site
- Between the Configuration Manager REST API server of the secondary site and the encryption module of the secondary site
- Between the CCI instance in the encryption module of the secondary site and the virtual command device on the storage system of the secondary site#

#: For VSP G1000, VSP G1500, and VSP F1500, or if SSL TLS encrypted communication mode is used for VSP G200, G400, G600, G800, VSP F400, F600, F800, non-SSL communication is used.

If you are using a VSP One B20 storage system, replace VSP 5000 series with VSP One B20, and replace SVP with ESM.

If you are using a VSP E series, VSP G350, G370, G700, G900 storage system or a VSP F350, F370, F700, F900 storage system, replace VSP 5000 series with VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900, and replace SVP with GUM.

Configuration example 6



Storage system of the primary site

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X-XX*/*XX* or later)

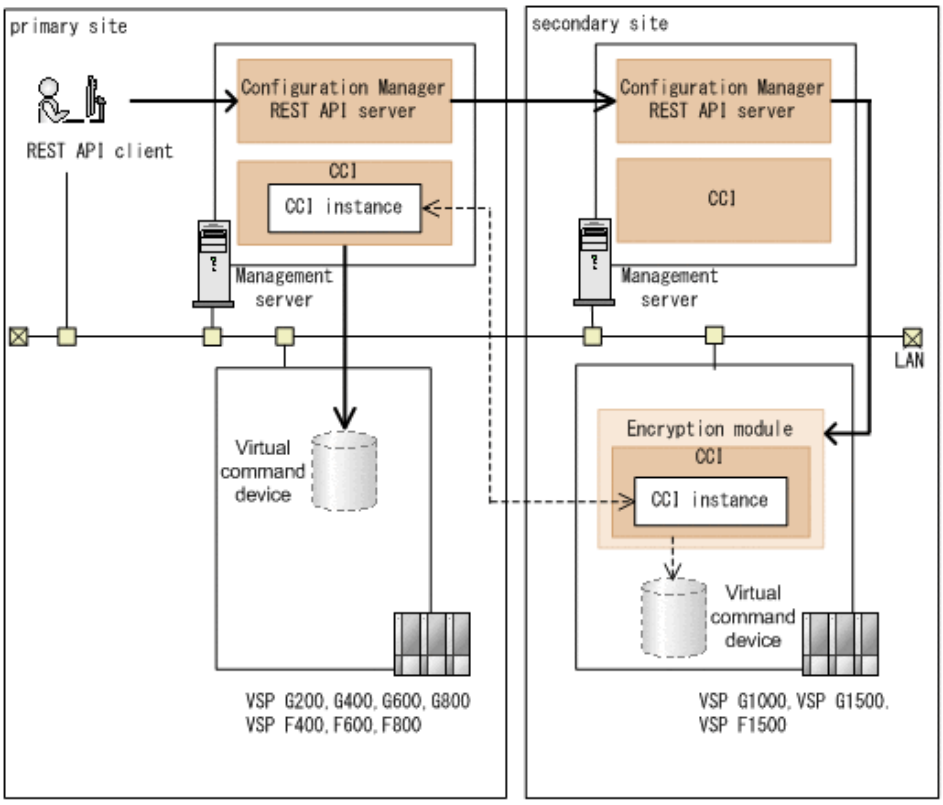
Storage system of the secondary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when DTLS encrypted communication mode is used)

In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the encryption module of the primary site
- Between the encryption module of the primary site and the Configuration Manager REST API server of the secondary site
- Between the CCI instance on the Configuration Manager REST API server of the secondary site and the virtual command device on the storage system of the secondary site

Configuration example 7



Storage system of the primary site

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when DTLS encrypted communication mode is used)

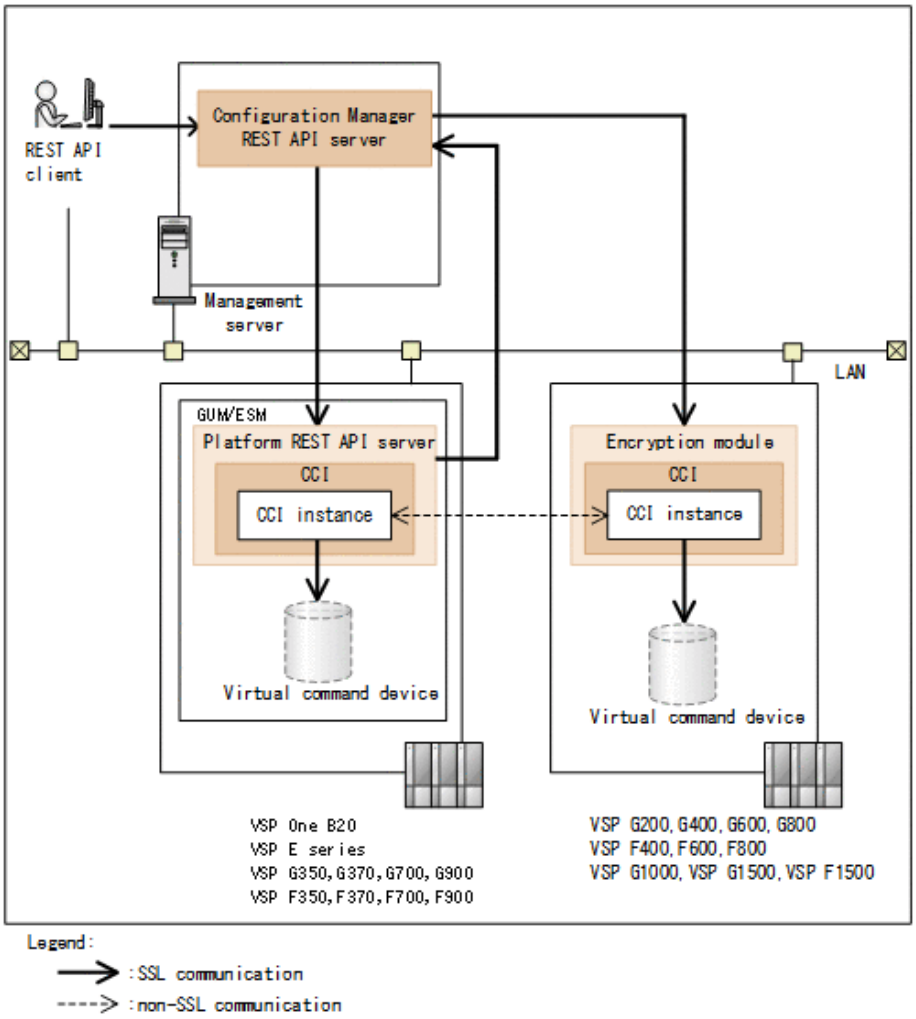
Storage system of the secondary site

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X-XX*/*XX* or later)

In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the CCI instance on the Configuration Manager REST API server of the primary site and the virtual command device on the storage system of the primary site
- Between the Configuration Manager REST API server of the primary site and the Configuration Manager REST API server of the secondary site
- Between the Configuration Manager REST API server of the secondary site and the encryption module of the secondary site

Configuration example 8



Local storage system

VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

Remote storage system

VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode is used)

VSP G1000, VSP G1500, VSP F1500 (The microcode version is 80-05-2*X-XX*/*XX* or later)

The figure above shows the communication routes when the remote storage systems are VSP G200, G400, G600, G800, VSP F400, F600, F800, and the DTLS SVP encrypted communication mode is used between the Configuration Manager REST API server and the storage systems. In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server
- Between the Configuration Manager REST API server and the Platform REST API server

- Between the CCI instance on the Platform REST API server and the virtual command device in the GUM/ESM
- Between the Platform REST API server and the Configuration Manager REST API server
- Between the Configuration Manager REST API server and the encryption module
- Between the CCI instance in the encryption module and the virtual command device on the storage system#

#: For VSP G1000, VSP G1500, and VSP F1500, or if SSL TLS encrypted communication mode is used for VSP G200, G400, G600, G800, VSP F400, F600, F800, non-SSL communication is used.

Specifying settings for using SSL communication between REST API clients and the REST API server (when using a self-signed certificate)

You can set up SSL communication to be used between REST API clients and the REST API server by using a self-signed certificate.

Caution:

All users who are logged in to the REST API server have access to server certificates and private keys. Manage user accounts securely to prevent malicious users from logging in to the server.

Tip:

- If Common Services is installed on the same management server, you can use the `cssslsetup` command. By using the `cssslsetup` command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the `cssslsetup` command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.
- The examples for running commands assume that the `openssl` file is located in *`OpenSSL-installation-destination`*`/bin`.
- You can check the storage location of the `openssl.cnf` file by running the following command:

  In a Windows OS:

  ```
  OpenSSL-installation-destination\bin\openssl version
  -a | find "OPENSSLDIR"
  ```

  In a Linux OS:

  ```
  OpenSSL-installation-destination/bin/openssl version
  -a | grep OPENSSLDIR
  ```

Procedure

1. Run the following command to create a private key file:

The command to be run varies depending on the key authentication method of the private key to be created.

For RSA

In a Windows OS:

```
OpenSSL-installation-destination\bin\openssl genrsa -out
private-key-file 2048
```

In a Linux OS:

```
OpenSSL-installation-destination/bin/openssl genrsa -out
private-key-file 2048
```

For ECDSA

In a Windows OS:

```
OpenSSL-installation-destination\bin\openssl ecparam -genkey
-name prime256v1 -out private-key-file
```

In a Linux OS:

```
OpenSSL-installation-destination/bin/openssl ecparam -genkey
-name prime256v1 -out private-key-file
```

Option

`out`

Specify the path of a file to which the private key to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

Note:

- The cipher suites that can be used vary depending on the type of the private key to be created. For details on the cipher suites that can be used, see the description of the settings for SSL communication.
- If you want to change the certificate, first verify that programs that use the REST API are able to use the cipher suite corresponding to the key authentication method of the certificate. If you change the certificate without first verifying this, you might no longer be able to perform HTTPS communication between the REST API and the programs that use the REST API.

Tip:

We recommend that you store the private key file, with the file name `createdServer.key`, in the following location:

In a Windows OS:

REST-API-installation-destination\oss\apache\conf\ssl.key\createdServer.key

In a Linux OS:

REST-API-installation-destination/oss/apache/conf/ssl.key/createdServer.key

The REST API stores the `server.key` file in one of the preceding directories. Do not overwrite the `server.key` file.

2. Run the following command and enter the information to be written in the certificate to create a certificate signing request file. For details on the storage location of the `openssl.cnf` file, see the tips at the beginning.

   Specify the `addext` option when you are using VSP One B20.

   In a Windows OS:

   OpenSSL-installation-destination\bin\openssl req -config *storage-location-of-openssl.cnf-file*\openssl.cnf -sha256 -new -key *private-key-file* -out *certificate-signing-request-file* -addext *value-of-subjectAltName*

   In a Linux OS:

   OpenSSL-installation-destination/bin/openssl req -config *storage-location-of-openssl.cnf-file*/openssl.cnf -sha256 -new -key *private-key-file* -out *certificate-signing-request-file* -addext *value-of-subjectAltName*

   Option

   key

   Specify the private key file created in Step 1.

   out

   Specify the path of a file to which the certificate signing request to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

   addext

   Specify the value of subjectAltName in the following format:

   - To specify by using domain name: "subjectAltName = DNS:*domain-name*"
   - To specify by using IPv4: "subjectAltName = IP:*IPv4-address-of-the-server*"
   - To specify by using IPv6: "subjectAltName = IP:*IPv6-address-of-the-server*"

   The following table describes the information items to be entered.

Item	Description
Country Name	(Required) Specify the two-letter country code.
State or Province Name	(Required) Specify the name of the state or province.
Locality Name	(Optional) Specify the name of the city, town, or locality.
Organization Name	(Required) Specify the organization name.
Organization Unit Name	(Optional) Specify the name of the organizational unit.
Common Name	(Required) Enter the IP address or host name of the REST API server.
Email Address	(Optional) Specify the email address.
A challenge password	(Optional) Specify the password to use when discarding the certificate.
An optional company name	(Optional) Specify the name of another organization.

3. Run the following command to create a self-signed certificate:

   Specify the `extfile` option and the `extensions` option when you are using VSP One B20.

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl x509 -req -
   sha256 -days number-of-valid-days -signkey private-key-file
   -in certificate-signing-request-file -out self-signed-
   certificate -extfile external-reference-setting-file -
   extensions req_ext
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl x509 -req -
   sha256 -days number-of-valid-days -signkey private-key-file
   -in certificate-signing-request-file -out self-signed-
   certificate -extfile external-reference-setting-file -
   extensions req_ext
   ```

   Option

   `days`

   Specify the validity period for the self-signed certificate as a number of days.

   `signkey`

   Specify the name of the private key file created in Step 1.

   `in`

   Specify the name of the certificate signing request file created in Step 2.

out

Specify the path of a file to which the self-signed certificate to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

extfile

Specify the file name for external reference settings. The following are examples of settings for external reference settings files:

- When setting subjectAltName by using the domain name:

```
[ req_ext ]
subjectAltName = @alt_names

[ alt_names ]
DNS = domain-name
```

- When setting subjectAltName by using IPv4 or IPv6:

```
[ req_ext ]
subjectAltName = @alt_names

[ alt_names ]
IP = IPv4-or-IPv6-address-of-the-server
```



Tip:

We recommend that you store the self-signed certificate file, with the file name `createdServer.crt`, in the following location:

In a Windows OS:

REST-API-installation-destination`\oss\apache\conf\ssl.crt\createdServer.crt`

In a Linux OS:

REST-API-installation-destination`/oss/apache/conf/ssl.crt/createdServer.crt`

The REST API stores the `server.crt` file in one of the preceding directories. Do not overwrite the `server.crt` file.

4. Stop the REST API services.
5. Edit the `user-httpsd-certificate.conf` file to set the private key file and the server certificate file (self-signed certificate file).

   The `user-httpsd-certificate.conf` file is stored in the following location:

   In a Windows OS:

   REST-API-installation-destination`\oss\apache\conf\userextra\user-httpsd-certificate.conf`

In a Linux OS:

REST-API-installation-destination`/oss/apache/conf/userextra/user-httpsd-certificate.conf`

Specify the following for `SSLCertificateKeyFile` and `SSLCertificateFile` in the `user-httpsd-certificate.conf` file:

`SSLCertificateKeyFile`

Use an absolute path to specify the file name for the private key created in Step 1. Do not specify a symbolic link or junction.

`SSLCertificateFile`

Use an absolute path to specify the file name for the server certificate (self-signed certificate) created in Step 3. Do not specify a symbolic link or junction.

Examples of specifying the file paths in the `user-httpsd-certificate.conf` file:

In a Windows OS:

```
SSLCertificateKeyFile "C:\Program Files\hitachi\ConfManager\oss\apache\conf
\ssl.key\createdServer.key"
```

```
SSLCertificateFile "C:\Program Files\hitachi\ConfManager\oss\apache\conf
\ssl.crt\createdServer.crt"
```

In a Linux OS:

```
SSLCertificateKeyFile "/opt/hitachi/ConfManager/oss/apache/conf/ssl.key/
createdServer.key"
```

```
SSLCertificateFile "/opt/hitachi/ConfManager/oss/apache/conf/ssl.crt/
createdServer.crt"
```

6. Start the REST API services.

Specifying settings for using SSL communication between REST API clients and the REST API server (when using a server certificate issued by a certificate authority)

You can set up SSL communication to be used between REST API clients and the REST API server by using a server certificate issued by a certificate authority.

Caution:

All users who are logged in to the REST API server have access to server certificates and private keys. Manage user accounts securely to prevent malicious users from logging in to the server.

Tip:

- If Common Services is installed on the same management server, you can use the `cssslsetup` command. By using the `cssslsetup` command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the `cssslsetup` command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.
- The examples for running commands assume that the `openssl` file is located in *`OpenSSL-installation-destination`*`/bin`.
- You can check the storage location of the `openssl.cnf` file by running the following command:

  In a Windows OS:

  ```
  OpenSSL-installation-destination\bin\openssl version
  -a | find "OPENSSLDIR"
  ```

  In a Linux OS:

  ```
  OpenSSL-installation-destination/bin/openssl version
  -a | grep OPENSSLDIR
  ```

Procedure

1. Run the following command to create a private key file:

   The command to be run varies depending on the key authentication method of the private key to be created.

   For RSA

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl genrsa -out
   private-key-file 2048
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl genrsa -out
   private-key-file 2048
   ```

   For ECDSA

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl ecparam -genkey
   -name prime256v1 -out private-key-file
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl ecparam -genkey
   -name prime256v1 -out private-key-file
   ```

   Option

out

Specify the path of a file to which the private key to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

Note:

- The cipher suites that can be used vary depending on the type of the private key to be created. For details on the cipher suites that can be used, see the description of the settings for SSL communication.
- If you want to change the certificate, first verify that programs that use the REST API are able to use the cipher suite corresponding to the key authentication method of the certificate. If you change the certificate without first verifying this, you might no longer be able to perform HTTPS communication between the REST API and the programs that use the REST API.

Tip:

We recommend that you store the private key file, with the file name `createdServer.key`, in the following location:

In a Windows OS:

REST-API-installation-destination`\oss\apache\conf\ssl.key\createdServer.key`

In a Linux OS:

REST-API-installation-destination`/oss/apache/conf/ssl.key/createdServer.key`

The REST API stores the `server.key` file in one of the preceding directories. Do not overwrite the `server.key` file.

2. Run the following command and enter the information to be written in the certificate to create a certificate signing request file. For details on the storage location of the `openssl.cnf` file, see the tips at the beginning.

   Specify the `addext` option when you are using VSP One B20.

   In a Windows OS:

   OpenSSL-installation-destination`\bin\openssl req -config` *storage-location-of-openssl.cnf-file*`\openssl.cnf -sha256 -new -key` *private-key-file* `-out` *certificate-signing-request-file* `-addext` *value-of-subjectAltName*

   In a Linux OS:

   OpenSSL-installation-destination`/bin/openssl req -config` *storage-location-of-openssl.cnf-file*`/openssl.cnf -sha256 -new -key` *private-key-file* `-out` *certificate-signing-request-file* `-addext` *value-of-subjectAltName*

Option

`key`

Specify the private key file created in Step 1.

`out`

Specify the path of a file to which the certificate signing request to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

`addext`

Specify the value of subjectAltName in the following format:

- To specify by using domain name: "subjectAltName = DNS:*domain-name*"
- To specify by using IPv4: "subjectAltName = IP:*IPv4-address-of-the-server*"
- To specify by using IPv6: "subjectAltName = IP:*IPv6-address-of-the-server*"

The following table describes the information items to be entered.

Item	Description
Country Name	(Required) Specify the two-letter country code.
State or Province Name	(Required) Specify the name of the state or province.
Locality Name	(Optional) Specify the name of the city, town, or locality.
Organization Name	(Required) Specify the organization name.
Organization Unit Name	(Optional) Specify the name of the organizational unit.
Common Name	(Required) Enter the IP address or host name of the REST API server.
Email Address	(Optional) Specify the email address.
A challenge password	(Optional) Specify the password to use when discarding the certificate.
An optional company name	(Optional) Specify the name of another organization.

3. Send the certificate signing request created in Step 2 to a certificate authority.

   You can usually apply for a server certificate online. Send the created certificate signing request for the REST API server to a certificate authority of your choice to receive a digital signature.

   The certificate authority must issue the server certificate in X.509 PEM format. For details about how to apply for a server certificate, check the website of the certificate authority. In addition, make sure that the certificate authority supports the signing algorithm.

Note:

- Keep the response from the certificate authority.
- Certificates issued by certificate authorities have expiration dates. You must have the certificate reissued before it expires.

  Run the following command to check the expiration date of a certificate:

  In a Windows OS:

  ```
  OpenSSL-installation-destination\bin\openssl x509 -in
  server-certificate-file -text -noout
  ```

  In a Linux OS:

  ```
  OpenSSL-installation-destination/bin/openssl x509 -in
  server-certificate-file -text -noout
  ```

Tip:

We recommend that you store the obtained server certificate file, with the file name `createdServer.crt`, in the following location:

In a Windows OS:

```
REST-API-installation-destination\oss\apache\conf
\ssl.crt\createdServer.crt
```

In a Linux OS:

```
REST-API-installation-destination/oss/apache/conf/
ssl.crt/createdServer.crt
```

The REST API stores the `server.crt` file in one of the preceding directories. Do not overwrite the `server.crt` file.

4. Stop the REST API services.
5. Edit the `user-httpsd-certificate.conf` file to set the private key file and the server certificate file.

   The `user-httpsd-certificate.conf` file is stored in the following location:

   In a Windows OS:

   ```
   REST-API-installation-destination\oss\apache\conf\userextra
   \user-httpsd-certificate.conf
   ```

   In a Linux OS:

   ```
   REST-API-installation-destination/oss/apache/conf/userextra/
   user-httpsd-certificate.conf
   ```

   Specify the following for `SSLCertificateKeyFile` and `SSLCertificateFile` in the `user-httpsd-certificate.conf` file:

   `SSLCertificateKeyFile`

   Use an absolute path to specify the file name for the private key created in Step 1. Do not specify a symbolic link or junction.

`SSLCertificateFile`

Use an absolute path to specify the file name for the server certificate issued by a certificate authority in Step 3. Do not specify a symbolic link or junction.

Examples of specifying the file paths in the `user-httpsd-certificate.conf` file:

In a Windows OS:

```
SSLCertificateKeyFile "C:\Program Files\hitachi\ConfManager\oss\apache\conf
\ssl.key\createdServer.key"
```

```
SSLCertificateFile "C:\Program Files\hitachi\ConfManager\oss\apache\conf
\ssl.crt\createdServer.crt"
```

In a Linux OS:

```
SSLCertificateKeyFile "/opt/hitachi/ConfManager/oss/apache/conf/ssl.key/
createdServer.key"
```

```
SSLCertificateFile "/opt/hitachi/ConfManager/oss/apache/conf/ssl.crt/
createdServer.crt"
```

6. Start the REST API services.

Specifying settings for SSL communication between the Configuration Manager REST API server and the Platform REST API server (VSP 5000 series)

If the storage system is VSP 5000 series, SSL communication is always used between the Configuration Manager REST API server and the Platform REST API server.

Before you begin

- Log in to the management server as any one of the following user types:
  - A user with Administrator permissions (in Windows)
  - Root user (if the REST API was installed by the root user in Linux)
  - A non-root user who installed the REST API

Procedure

1. Register the storage system by using the API function for registering storage systems.

   SSL communication between the Configuration Manager REST API server and the Platform REST API server will be automatically enabled after the storage system is registered.

Specifying settings for SSL communication between the Configuration Manager REST API server and the Platform REST API server (VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900)

If the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, SSL communication is always used between the Configuration Manager REST API server and the Platform REST API server.

Before you begin

- Log in to the management server as any one of the following user types:
  - A user with Administrator permissions (in Windows)
  - Root user (if the REST API was installed by the root user in Linux)
  - A non-root user who installed the REST API

Procedure

1. Register the storage system by using the API function for registering storage systems.

   SSL communication between the Configuration Manager REST API server and the Platform REST API server will be automatically enabled after the storage system is registered.

Specifying settings for SSL communication between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800)

You can specify settings so that SSL communication is used between the Configuration Manager REST API server and the storage system (VSP G200, G400, G600, G800, VSP F400, F600, F800).

Tip:

If Common Services is installed on the same management server, you can use the `cssslsetup` command for steps 3 and 4. By using the `cssslsetup` command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the `cssslsetup` command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.

Before you begin

- The microcode version of the storage system is 83-03-2*X*-*XX*/*XX* or later.

  To use the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode, use VSP G200, G400, G600, G800, VSP F400, F600, F800 for which the microcode version is 83-04-44-*XX*/*XX* or later.
- The CCI version installed on the same server as the REST API is 01-37-03/*XX* or later (when DTLS encrypted communication mode is used).
- Log in to the management server as any one of the following user types:
  - A user with Administrator permissions (in Windows)
  - Root user (if the REST API was installed by the root user in Linux)
  - A non-root user who installed the REST API
- The certificate of the storage system (GUM) is the same as the certificate of the SVP (when the DTLS SVP encryption communication mode is used).

  When the certificate of the storage system is updated, you need to upload the same certificate to the SVP. For details on how to upload a certificate to the SVP, see the description about setting up SSL encryption on Hitachi Vantara documentation website.

Procedure

1. Change the certificate of the storage system and SVP to a signed certificate (when DTLS encrypted communication mode is used).

   If you are using the default certificate for the storage system and SVP, this step is not necessary. This step is also not necessary if the communication mode used is not DTLS encrypted. Proceed to Step 5.

   For details on how to obtain a signed certificate and how to update the certificate, see the *System Administrator Guide*.
2. Store the certificate for connecting to the SVP (which was uploaded to the SVP) on the REST API server as a server certificate.
3. Run the following command to set up the server certificate (which you stored in the previous step) for the REST API server:

   In a Windows OS:

   ```
   REST-API-installation-destination\bin\setCertificateFile.bat
   -certificate server-certificate-file-name -storageid
   storage-device-ID
   ```

   In a Linux OS:

   ```
   REST-API-installation-destination/bin/setCertificateFile.sh
   -certificate server-certificate-file-name -storageid
   storage-device-ID
   ```

   Options

   `certificate`

   Specify the name of the server certificate file by using an absolute path.

You can use a server certificate file in the PEM format or DER format.

`storageid`
Specify the storage device ID of the storage system. For details about the storage device ID, see the section that describes the managed resources.

4. When the message confirming that you want to restart the REST API server appears, enter `Y`.
5. Enable SSL communication by using the API function for registering a storage system or for changing storage system information.

   To use the DTLS encrypted communication mode, specify `true` for the `isSecure` attribute.

   To use the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode, specify `true` for the `isSecure` attribute, and also specify `DTLS SVP` or `SSL TLS` for the `lanConnectionProtocol` attribute.
6. Restart the REST API server.

Important:

A certificate signed by a certificate authority has an expiration date. You must have the certificate issued again before it expires.

To check the expiration date of a certificate, run the following command:

In a Windows OS:

REST-API-installation-destination\bin\setCertificateFile.bat -get -storageid *storage-device-ID*

In a Linux OS:

REST-API-installation-destination/bin/setCertificateFile.sh -get -storageid *storage-device-ID*

The certificate type is displayed in the first line. For a certificate that was updated by a user, `Type: User certificate` is displayed. For the default certificate, `Type: Default Certificate` is displayed. In the second and the subsequent lines, details of the current certificate are displayed.

Tip:

The following describes how to restore the changed server certificate to the default certificate:

a. Run the following command:

In a Windows OS:

```
REST-API-installation-destination\bin
\setCertificateFile.bat -default -storageid storage-
device-ID
```

In a Linux OS:

```
REST-API-installation-destination/bin/
setCertificateFile.sh -default -storageid storage-
device-ID
```

b. When the message confirming that you want to restart the REST API server appears, enter `Y`.

Specifying settings for SSL communication between the Configuration Manager REST API server and the storage system (VSP G1000, VSP G1500, or VSP F1500)

You can specify settings so that SSL communication is used between the Configuration Manager REST API server and the storage system (VSP G1000, VSP G1500, or VSP F1500).

Before you begin

- The microcode version of the storage system is 80-04-20-*XX*/*XX* or later

  We recommend using VSP G1000, VSP G1500, or VSP F1500 for which the microcode version is 80-05-2*X*-*XX*/*XX* or later.
- When the microcode version of the VSP G1000 storage system is earlier than 80-05-*XX*-*XX*/*XX*, encryption communication with the Configuration Manager REST API is enabled by maintenance personnel.
- Log in to the management server as any one of the following user types:
  - A user with Administrator permissions (in Windows)
  - Root user (if the REST API was installed by the root user in Linux)
  - A non-root user who installed the REST API

Procedure

1. Enable SSL communication by using the API function for registering a storage system or for changing storage system information.
2. Restart the REST API server.

Setting the timeout value that is applied to communication between the Configuration Manager REST API server and the encryption module

Error messages such as KART20022-E or KART40126-E might be output and the operation might fail if the API is called to obtain information in an environment that uses SSL communication between the Configuration Manager REST API server and the storage system (excluding cases when DTLS encrypted communication mode is used for VSP G200, G400, G600, G800, VSP F400, F600, F800). In this case, if no problem is apparent in the communication environment, a timeout might have occurred in the communication between the REST API server and the encryption module.

The timeout value is set to 10 minutes by default. The number of storage resources handled by the API is large and, if processing takes time, the error might be resolved by changing the timeout value. Here is a description of the timeout value that is applied to communication between the REST API server and the encryption module.

Reference information regarding the timeout value

The following table shows the maximum number of resources that can run information acquisition processing without a timeout when the timeout value is set to the default 10 minutes. If more resources exist on the storage system than the maximums indicated, we recommend that you specify a larger timeout value according to the number of resources.

Resource	Maximum number or resources (approximate)
Internal volumes	16,384
External volumes	16,384
Copy groups	800
Snapshot groups	800
Copy pairs	2,048

Changing the timeout value

To change the timeout value, run the `setProperty` command.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Tip:

You can check the value that is currently set by checking the value of the `rest.storage.connection.timeout` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `rest.storage.connection.timeout` property, this indicates that the default value is set.

In a Windows OS:

REST-API-installation-destination\data\properties\StartupV.properties

In a Linux OS:

REST-API-installation-destination/data/properties/StartupV.properties

Procedure

1. Run the following command:

   In a Windows OS:

   REST-API-installation-destination\bin\setProperty.bat rest.storage.connection.timeout *timeout-value*

   In a Linux OS:

   REST-API-installation-destination/bin/setProperty.sh rest.storage.connection.timeout *timeout-value*

   Specify the timeout value from 1 to 60 minutes.

   After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

   When you run the `setProperty` command, the value of the `rest.storage.connection.timeout` property in the `StartupV.properties` file will be changed to the specified value. If the file does not exist, it will be created.

   Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

Changing the certificate used for SSL communication between the Configuration Manager REST API server and the storage system (when a notification about configuration changes is received)

You can specify the settings so that a certificate issued by the certificate authority is used for SSL communication when the Configuration Manager REST API server receives a notification about changes made to the storage system configuration.

The search function for storage systems obtains the storage system configuration information stored in the REST API server database. By configuring settings so that notifications are sent about changes made to storage system configurations, you can ensure that the configuration information stored in the REST API server database remains up to date.

To send notifications of configuration changes, a self-signed server certificate is used by default. To enhance security, you can change the setting so that a server certificate issued by the certificate authority is used.

Caution:

All users who are logged in to the REST API server have access to server certificates and private keys. Manage user accounts securely to prevent malicious users from logging in to the server.

Tip:

- If Common Services is installed on the same management server, you can use the `cssslsetup` command. By using the `cssslsetup` command, you can use a common secret key and server certificate to configure SSL communication for Hitachi Ops Center products installed on the same server. For details on the scope of support of the `cssslsetup` command, see the description "Configuring SSL communications by using the cssslsetup command" in the *Hitachi Ops Center Installation and Configuration Guide*.
- The examples for running commands assume that the `openssl` file is located in *`OpenSSL-installation-destination`*`/bin`.
- You can check the storage location of the `openssl.cnf` file by running the following command:

  In a Windows OS:

  ```
  OpenSSL-installation-destination\bin\openssl version
  -a | find "OPENSSLDIR"
  ```

  In a Linux OS:

  ```
  OpenSSL-installation-destination/bin/openssl version
  -a | grep OPENSSLDIR
  ```

Before you begin

- Create temporary directory so that you can save the files that are obtained or created by the following procedures. Files are used in Step 5.
- Obtain a server certificate from the certificate authority, change the file name to `cacert.pem`, and then save the file in a temporary directory.

> **Note:**
>
> If the server certificate is issued by an intermediate certificate authority, you can include multiple certificates in one file by using a text editor to combine the multiple certificates. Save the certificate file as `cacert.pem` in a temporary directory.

Procedure

1. Run the following command to create a private key file:

   The command to be run varies depending on the key authentication method of the private key to be created.

   For RSA

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl genrsa -out
   private-key-file 2048
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl genrsa -out
   private-key-file 2048
   ```

   For ECDSA

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl ecparam -genkey
   -name prime256v1 -out private-key-file
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl ecparam -genkey
   -name prime256v1 -out private-key-file
   ```

   Option

   `out`

   Specify the path of a file to which the private key to be created will be output. Name the private key file as `key.pem`. If a file with the same name exists in the output destination path, that file is overwritten.

   > **Note:**
   >
   > The cipher suites that can be used vary depending on the type of the private key to be created. For details on the cipher suites that can be used, see the description of the settings for SSL communication.

2. Run the following command and enter the information to be written in the certificate to create a certificate signing request file. For details on the storage location of the `openssl.cnf` file, see the tips at the beginning.

   Specify the `addext` option when you are using VSP One B20.

   In a Windows OS:

   ```
   OpenSSL-installation-destination\bin\openssl req -config
   storage-location-of-openssl.cnf-file\openssl.cnf -sha256 -
   new -key private-key-file -out certificate-signing-request-
   file -addext value-of-subjectAltName
   ```

   In a Linux OS:

   ```
   OpenSSL-installation-destination/bin/openssl req -config
   storage-location-of-openssl.cnf-file/openssl.cnf -sha256 -
   new -key private-key-file -out certificate-signing-request-
   file -addext value-of-subjectAltName
   ```

   Option:

   `key`

   Specify the private key file created in Step 1.

   `out`

   Specify the path of a file to which the certificate signing request to be created will be output. If a file with the same name exists in the output destination path, that file is overwritten.

   `addext`

   Specify the value of subjectAltName in the following format:

   - To specify by using domain name: "subjectAltName = DNS:*domain-name*"
   - To specify by using IPv4: "subjectAltName = IP:*IPv4-address-of-the-server*"
   - To specify by using IPv6: "subjectAltName = IP:*IPv6-address-of-the-server*"

   If you specify subjectAltName, change the host information by following the procedure described in "Changing host information for the Configuration Manager REST API server."

   The following table describes the information items to be entered.

Item	Description
Country Name	(Required) Specify the two-letter country code.
State or Province Name	(Required) Specify the name of the state or province.
Locality Name	(Optional) Specify the name of the city, town, or locality.
Organization Name	(Required) Specify the organization name.
Organization Unit Name	(Optional) Specify the name of the organizational unit.

Item	Description
Common Name	(Required) Enter the IP address or host name of the REST API server.
Email Address	(Optional) Specify the email address.
A challenge password	(Optional) Specify the password to use when discarding the certificate.
An optional company name	(Optional) Specify the name of another organization.

3. Send the certificate signing request created in Step 2 to a certificate authority.

   You can usually apply for a server certificate online. Send the created certificate signing request for the REST API server to a certificate authority of your choice to receive a digital signature.

   The certificate authority must issue the server certificate in X.509 PEM format. For details about how to apply for a server certificate, check the website of the certificate authority. In addition, make sure that the certificate authority supports the signing algorithm.

   Save the server certificate (the one that received a digital signature from the certificate authority) as `cert.pem` in a temporary directory.

   Note:

   - Keep the response from the certificate authority.
   - Certificates issued by certificate authorities have expiration dates. You must have the certificate reissued before it expires.

     Run the following command to check the expiration date of a certificate:

     In a Windows OS:

     OpenSSL-installation-destination`\bin\openssl x509 -in` *server-certificate-file* `-text -noout`

     In a Linux OS:

     OpenSSL-installation-destination`/bin/openssl x509 -in` *server-certificate-file* `-text -noout`

4. Stop the REST API services.
5. Save the following files in the location specified below: the certificate file (`cacert.pem`) that was issued by the certificate authority, the private key file (`key.pem`), and the server certificate file (`cert.pem`) that were saved in a temporary directory.

   In a Windows OS:

   REST-API-installation-destination`\oss\rabbitmq\etc\rabbitmq\ssl\extra`

In a Linux OS:

REST-API-installation-destination/oss/rabbitmq/etc/rabbitmq/ssl/extra

6. Edit the `advanced.config` file.

   The `advanced.config` file is saved in the following directory. Back up the file if necessary.

   In a Windows OS:

   REST-API-installation-destination\oss\rabbitmq\etc\rabbitmq

   In a Linux OS:

   REST-API-installation-destination/oss/rabbitmq/etc/rabbitmq

   In the `advanced.config` file, edit the lines that include `cacertfile`, `certfile`, and `keyfile`.

   - By default, the path of the directory that stores the certificate file issued by the certificate authority is defined as follows:

     ```
     cacertfile, "REST-API-installation-destination\oss\rabbitmq\etc\rabbitmq\ssl
     \default\cacert.pem"
     ```

     In the path definition, change the word `default` to the word `extra`. Do not change any other part of the path definition.

   - By default, the path of the private key is defined as follows:

     ```
     keyfile, "REST-API-installation-destination/oss/rabbitmq/etc/rabbitmq/ssl/
     default/key.pem"
     ```

     In the path definition, change the word `default` to the word `extra`. Do not change any other part of the path definition.

   - By default, the path of the server certificate is defined as follows:

     ```
     certfile, "REST-API-installation-destination/oss/rabbitmq/etc/rabbitmq/ssl/
     default/cert.pem"
     ```

     In the path definition, change the word `default` to the word `extra`. Do not change any other part of the path definition.

7. Start the REST API services.

Changing host information for the Configuration Manager REST API server

The following describes how to run the `setProperty` command to change the host information for the Configuration Manager REST API server to an IPv4 address, IPv6 address, or host name. By default, an IPv4 address is set.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Caution:

- Make sure that the host name can be accessed from the storage system.
- If both IPv4 and IPv6 addresses are set on the storage system side, IPv4 is used.
- If you change the settings after a cluster environment is configured, and if you run the `setProperty` command on the standby node, specify `-noRestart` so that the REST API server does not restart.

Tip:

- You can check the value that is currently set by checking the value of the `common.restIp` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `common.restIp` property, this indicates that the default value is set.

  In a Windows OS:

  REST-API-installation-destination`\data\properties\StartupV.properties`

  In a Linux OS:

  REST-API-installation-destination`/data/properties/StartupV.properties`

- To reset the changed host information to the default setting, delete the entry in the `StartupV.properties` file, and then restart the REST API server.

Procedure

1. Run the following command:

In a Windows OS:

REST-API-installation-destination\bin\setProperty.bat
common.restIp *IPv4-address-or-IPv6-address-or-host-name*

In a Linux OS:

REST-API-installation-destination/bin/setProperty.sh
common.restIp *IPv4-address-or-IPv6-address-or-host-name*

After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

When you run the `setProperty` command, the value of the `common.restIp` property in the `StartupV.properties` file will be changed to an IPv4 address, IPv6 address or a host name. If the file does not exist, it will be created.

Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

Setting the number of storage systems to be managed by the REST API

Set the number of storage systems to be managed by the REST API by specifying one of three modes: `HighPerformanceMode`, `BalanceMode`, or `HighScalabilityMode`.

Based on the mode, the REST API controls the number of processing operations (synchronous and asynchronous) that can be assigned to one storage system for concurrent execution. By default, `BalanceMode` is set.

If the number of storage systems is 40 or less, operations can be performed in `BalanceMode`. However, if you change the mode to `HighPerformanceMode`, the number of processing operations that can be assigned to one storage system for concurrent execution increases compared to when `BalanceMode` is set. If you want to improve processing performance, change the mode to `HighPerformanceMode`.

If the number of storage systems is 71 or more, you must change the mode to `HighScalabilityMode`. The number of processing operations that can be assigned to one storage system for concurrent execution decreases compared to when `BalanceMode` is set.

The number of storage systems that corresponds to each mode is as follows.

Mode	Number of storage systems
`HighPerformanceMode`	1 to 40
`BalanceMode` (default)	41 to 70
`HighScalabilityMode`	71 to 100

Note:

In the following environments, the number of processing operations that can be assigned to the storage system for concurrent execution will always be the same as `HighPerformanceMode`, regardless of the mode set in the rest.storage.scale property.

- Environments in which SSL communication is used in VSP G1000, VSP G1500, or VSP F1500 for which the microcode version is 80-05-2*X*-*XX*/*XX* or later
- Environments in which SSL communication of either DTLS SVP encrypted communication or SSL TLS encrypted communication is used in VSP G200, G400, G600, G800, VSP F400, F600, F800 for which the microcode version is 83-04-44-*XX*/*XX* or later
- Environments in which the storage system is VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- Environments in which the storage system is VSP E series
- Environments in which the storage system is VSP 5000 series
- Environments in which the storage system is VSP One B20

Changing the mode

To change the current mode for specifying the number of storage systems, run the `setProperty` command.

Before you begin

Log in as a user who has Administrator permissions (in a Windows OS), or as a root user (in a Linux OS).

Tip:

You can check the value that is currently set by checking the value of the `rest.storage.scale` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `rest.storage.scale` property, this indicates that the default value is set.

In a Windows OS:

REST-API-installation-destination\data\properties\StartupV.properties

In a Linux OS:

REST-API-installation-destination/data/properties/StartupV.properties

Procedure

1. Run the following command:

In a Windows OS:

```
REST-API-installation-destination\bin\setProperty.bat
rest.storage.scale mode
```

In a Linux OS:

```
REST-API-installation-destination/bin/setProperty.sh
rest.storage.scale mode
```

After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

When you run the `setProperty` command, the value of the `rest.storage.scale` property in the `StartupV.properties` file will be changed to the specified mode. If the file does not exist, it will be created.

Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

Starting, stopping, and checking the status of the REST API services

You can start, stop, and check the status of the REST API services.

The REST API runs the following services: `ConfManagerWebServer`, `ConfManagerAPIServer`, and `ConfManagerMessageQueueServer`.

Starting the REST API services

You can start the REST API services.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Note:

If the installation path of the REST API includes a space and a file whose path matches the installation path up to the first space, an attempt to start the REST API services might end in an error. For example, if the installation destination is `C:\Program Files\hitachi\ConfManager` and `C:\` contains a file called `Program`, installation might end in an error. In such cases, change the file name, or move or delete the file.

Procedure

1. Perform the following operations.

   In a Windows OS:

   Start the services in one of the following ways:

   - Select **Start**, **All Programs**, **Hitachi Ops Center**, **Configuration Manager**, and then **Start - CONFIG_MGR**.
   - From the Start window, open the application list window, select **Hitachi Ops Center**, and then **Start - CONFIG_MGR**.
   - Run the following command:

     ```
     REST-API-installation-destination\start.bat
     ```

   In a Linux OS:

   Run the following command:

   ```
   REST-API-installation-destination/start.sh
   ```

Stopping the REST API services

You can stop the REST API services.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Note:

If the installation path of the REST API includes a space and a file whose path matches the installation path up to the first space, an attempt to stop the REST API services might end in an error. For example, if the installation destination is `C:\Program Files\hitachi\ConfManager` and `C:\` contains a file called `Program`, installation might end in an error. In such cases, change the file name, or move or delete the file.

Procedure

1. Perform the following operations.

   In a Windows OS:

Stop the services in one of the following ways:

- Select **Start**, **All Programs**, **Hitachi Ops Center**, **Configuration Manager**, and then **Stop - CONFIG_MGR**.
- From the Start window, open the application list window, select **Hitachi Ops Center**, and then **Stop - CONFIG_MGR**.
- Run the following command:

  REST-API-installation-destination\stop.bat

In a Linux OS:

Run the following command:

REST-API-installation-destination/stop.sh

Checking the status of the REST API service

The following describes how to check the status of the REST API service:

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Perform the following operations.

   In a Windows OS:

   Check the services in one of the following ways:

   - Select **Start**, **All Programs**, **Hitachi Ops Center**, **Configuration Manager**, and then **Status - CONFIG_MGR**.
   - From the Start window, open the application list window, select **Hitachi Ops Center**, and then **Status - CONFIG_MGR**.
   - Run the following command:

     REST-API-installation-destination\status.bat

   In a Linux OS:

   Run the following command:

   REST-API-installation-destination/status.sh

Removing the REST API

To discontinue use of the REST API, remove the REST API server.

Use the REST API uninstaller to remove the REST API.

In Linux, if the REST API was installed by a non-root user, the REST API must be removed by the same user. For details, see Operation in an environment where the REST API is installed by a non-root user (in Linux OS) (on page 136).

Note:

In the following cases, CCI will remain (it will not be deleted) even after you remove the REST API. Remove CCI if it is no longer needed.

- If CCI was installed in advance on the management server
- If the OS of the management server is Linux and CCI was installed after the REST API was installed

  In this case, CCI is installed in the `/HORCM` directory.

Removing the REST API (in a Windows OS)

Use the Windows menu Programs and Features to remove the REST API.

Before you begin

- Stop the event log monitoring program.

  If the event log monitoring program is running, the REST API might not be completely removed. In such cases, check the output error message and take action as appropriate.

- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to uninstall the REST API.

Note:

If the installation path of the REST API includes a space and a file whose path matches the installation path up to the first space, an attempt to remove the REST API might end in an error. For example, if the installation destination is `C:\Program Files\hitachi\ConfManager` and `C:\` contains a file called `Program`, installation might end in an error. In such cases, change the file name, or move or delete the file.

Procedure

1. Log on to the management server as a user with Administrator permissions.
2. If necessary, back up the REST API database and the environment settings file.
3. To delete a REST API server, which is to be removed, from the configuration-change notification destinations registered in storage systems, delete the storage system information.
4. Select **Control Panel** > **Programs and Features** > **Configuration Manager REST API**, and then click the **Uninstall** button.
5. Perform operations according to the instructions in the uninstallation wizard.

   If the API is successfully removed, the **Uninstallation Complete** window appears.

Removing the REST API as the root user (in a Linux OS)

Run `uninstall.sh` to remove the REST API.

Note:

During the removal of the REST API, do not set the `noexec` option that restricts the execution of programs in the `/tmp` and `/var/tmp` directories.

You can check whether the `noexec` option is set by running the `mount` command.

After the removal of the REST API finishes, set the option to restrict the execution of programs in those directories as needed.

Before you begin

- The COLUMNS environment variable must not be set.

  If you perform an uninstallation while the COLUMNS environment variable is set, the uninstallation might not end normally.

- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to uninstall the REST API.

Procedure

1. Log in to the management server as the root user.
2. If necessary, back up the REST API database and the environment settings file.
3. To delete a REST API server, which is to be removed, from the configuration-change notification destinations registered in storage systems, delete the storage system information.
4. Move to the root directory.
5. Run the following command:

   ```
   REST-API-installation-destination/inst/uninstall.sh
   ```

6. Perform operations according to the instructions in the message that appears.

   If the API is successfully removed, the following message appears:

   ```
   Configuration Manager REST API removal completed successfully.
   ```

Removing the REST API in a cluster environment

You can remove the REST API when the REST API is used in a cluster environment.

Before you begin

Run one of the following commands to check the path of the shared directory on the shared disk:

In a Windows OS:

```
REST-API-installation-destination\bin\configureCluster.bat -get
```

Procedure

1. If necessary, back up the REST API database and the environment settings file.
2. To delete a REST API server, which is to be removed, from the configuration-change notification destinations registered in storage systems, delete the storage system information.
3. Use the cluster management application to remove the REST API server script that is registered in the resource group or the service group.
4. Stop the REST API service on the active node, and then run the following command to clear the cluster environment settings.

   ```
   REST-API-installation-destination\bin\configureCluster.bat -local
   ```

   Option

   `local`
   The cluster configuration is removed and the node begins operating in a non-cluster configuration.

5. Remove the REST API from the active node.
6. Stop the REST API service on the standby node, and then run the following command to clear the cluster environment settings.

   ```
   REST-API-installation-destination\bin\configureCluster.bat -local
   ```

   Option

   `local`
   The cluster configuration is removed and the node begins operating in a non-cluster configuration.

7. Remove the REST API from the standby node.
8. Remove the shared directory on the shared disk.

Operation in an environment where the REST API is installed by a non-root user (in Linux OS)

The restrictions that apply in an environment where the REST API is installed by a non-root user and the environment configuration that is required to enable a non-root user to perform REST API operations are described.

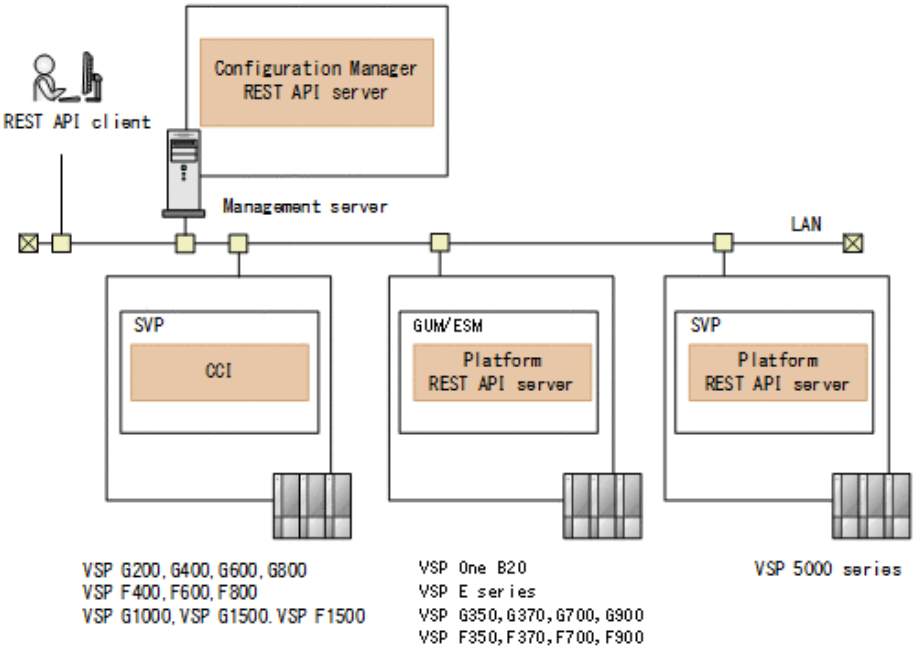
Conditions related to non-root users

The following are conditions for non-root users who can install the REST API:

- The user name consists of the following characters only: `A` to `Z`, `a` to `z`, `0` to `9`, underscores (_), and forward slashes (`/`).
- The non-root user has a home directory.

System configuration

The system configuration when the REST API is installed by a non-root user is as follows.



REST API clients

Rest API clients are software or scripts that use the REST API to issue requests to the REST API server.

Management server

This is the server on which the Configuration Manager REST API is installed.

Configuration Manager REST API server

This component receives a REST API request from a REST API client, issues an order to the storage system, and then returns the execution result to the REST API client.

If the storage systems (VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900) are managed from the Configuration Manager REST API, manage the storage systems on the Configuration Manager REST API server and the Platform REST API server.

Storage system

By using the REST API, you can get information from the storage system or change the configuration of the storage system.

SVP/GUM/ESM

This is the computer that has basic management functions for managing the storage system.

Platform REST API server

This is a REST API server included in the ESM of VSP One B20 storage systems, and in the SVP of VSP 5000 series storage systems, and in the GUM of VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems.

CCI

This is prerequisite software for using the REST API if the storage system is VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500. The CCI runs instructions issued from the Configuration Manager REST API server to a storage system. By default, CCI is installed on the SVP.

Restrictions when REST API operations are performed by a non-root user

In an environment where the REST API is installed by a non-root user, some REST API functions are not available. The following table shows the differences in operation when REST API is installed by the root user and when it is installed by a non-root user.

Item	Root user	Non-root user
Storage systems to be managed	▪ VSP One B20 ▪ VSP 5000 series ▪ VSP E series ▪ VSP Gx00 models ▪ VSP G1000 ▪ VSP G1500 ▪ VSP Fx00 models ▪ VSP F1500	▪ VSP One B20 ▪ VSP 5000 series ▪ VSP E series ▪ VSP Gx00 models[#1] ▪ VSP G1000[#2] ▪ VSP G1500[#2] ▪ VSP Fx00 models[#1] ▪ VSP F1500[#2]
Programs used by the REST API	▪ CCI: This is installed with the REST API.	▪ CCI: This is not installed with the REST API. The instance of CCI installed on the SVP by default is used.

Item	Root user	Non-root user
API function for registering storage systems	The following is a list of the attributes that differ between the two environments, and the values that can be specified for each attribute. ▪ `isSecure` attribute: **For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** `true` (default) **For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500** `true` or `false` (default) ▪ `lanConnectionProtocol` attribute: `DTLS` (default), `DTLS SVP`, or `SSL TLS`	The following is a list of the attributes that differ between the two environments, and the values that can be specified for each attribute. ▪ `isSecure` attribute: `true` (default) You cannot specify `false`. ▪ `lanConnectionProtocol` attribute: `DTLS SVP` or `SSL TLS` (default) You cannot specify `DTLS`.

Item	Root user	Non-root user

API function for changing storage system information	The following is a list of the attributes that differ between the two environments, and the values that can be specified for each attribute.
	▪ `isSecure` attribute:
	For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
	`true`
	For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500
	`true` or `false`
	▪ `lanConnectionProtocol` attribute:
	`DTLS`, `DTLS SVP`, or `SSL TLS`
		The following is a list of the attributes that differ between the two environments, and the values that can be specified for each attribute.
		▪ `isSecure` attribute:
		`true`
		▪ `lanConnectionProtocol` attribute:
		`DTLS SVP` or `SSL TLS`

Changing the communication mode for the REST API server	Enabled	Not enabled
Whether to automatically start the REST AIP service when the OS starts	Automatically started	Not automatically started

#1: For VSP G200, G400, G600, G800, VSP F400, F600, F800, use a storage system whose microcode version is 83-04-44-*XX*/*XX* or later.

#2: Use a storage system whose microcode version is 80-05-2*X*-*XX*/*XX* or later.

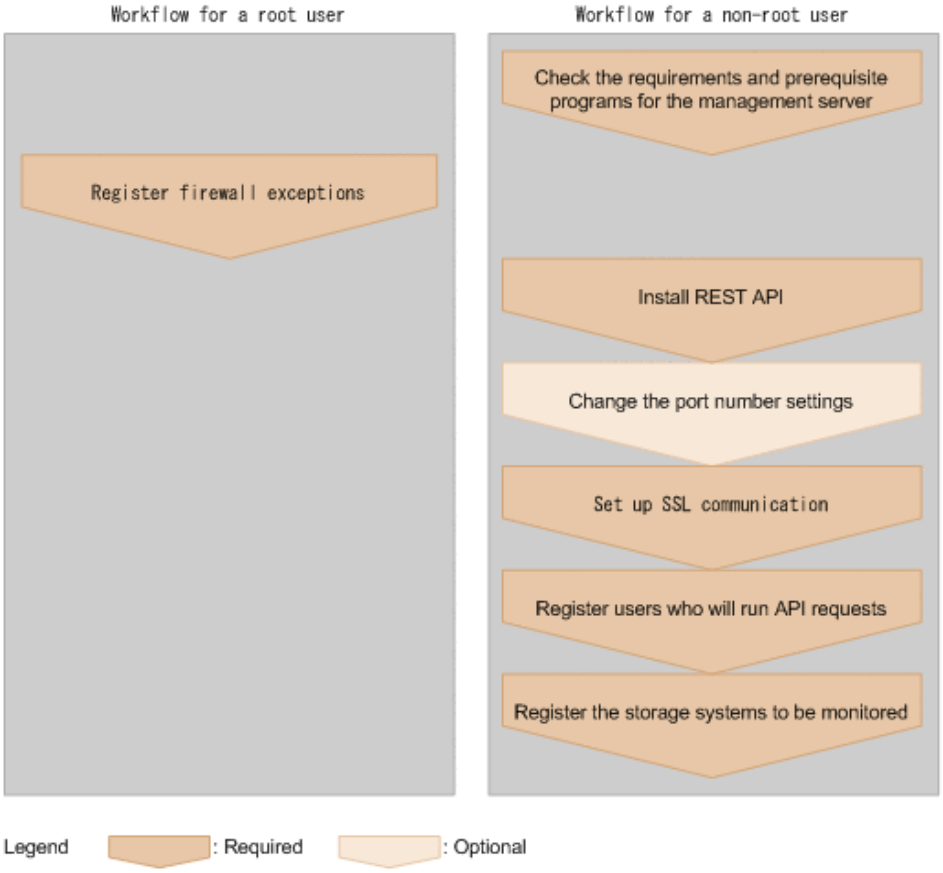
Note:

- Only one REST API server can be allocated to each management server. Do not install multiple REST API instances on a single management server by using multiple accounts (including root user accounts).
- Manually start the REST API service when the OS is restarted.

Workflow for preparing to perform REST API operations as a non-root user

The following workflow shows the environment settings that must be configured and the operations that must be performed to use the REST API in an environment where the REST API is installed by a non-root user.

Some of the environment setting tasks need to be performed by the root user. The following shows the tasks that are to be performed by a root user and the tasks that are to be performed by a non-root user.



Checking management server requirements and prerequisite programs (when the REST API is installed by a non-root user)

Before installing the REST API, check the management server requirements and OS requirements, and install the OS libraries as prerequisite programs.

For details on the management server requirements and the required OS libraries, see *Hitachi Ops Center API Configuration Manager System Requirements*.

For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500 storage system, if the Configuration Manager REST API is installed by a non-root user in Linux, the REST API uses CCI installed by default in the SVP instead of using CCI on the management server. You do not need to install CCI on the management server.

For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, the Configuration Manager REST API server uses the Platform REST API server.

Registering firewall exceptions

The root user must manually register firewall exceptions.

The following is a list of the ports to be opened:

- 23450
- 23451
- 23452 (Specify settings so that only loopback connections are allowed.)
- 23453 (Specify settings so that only loopback connections are allowed.)
- 23454
- 23455 (Specify settings so that only loopback connections are allowed.)
- 23459 (Specify settings so that only loopback connections are allowed.)

Installing the REST API as a non-root user

The following describes how to install the REST API as a non-root user.



Note:

During the installation of the REST API, do not set the `noexec` option that restricts the execution of programs in the `/tmp` and `/var/tmp` directories.

You can check whether the `noexec` option is set by running the `mount` command.

After the installation of the REST API finishes, setting the option to restrict the execution of programs in those directories will not affect the operation of the REST API.

In an environment where the REST API is installed by a non-root user, only that user will be able to perform REST API operations. The root user and other non-root users will not be able to perform REST API operations.

Tip:

To migrate from an environment in which REST API operations are performed by the root user, to an environment in which REST API operations are performed by a non-root user, perform the following procedure.

1. Check environment information in advance before migrating the environment.
2. Remove the REST API as a root user.
3. Install the REST API as a non-root user.
4. Register the storage systems again based on the environment information checked.

   Register information about the remote storage systems again to perform remote copy operations.

Note:

- When you install the Configuration Manager REST API, the JDK (Amazon Corretto 17) that is provided with the Configuration Manager REST API will also be installed.
- If you perform an upgrade installation of the Configuration Manager REST API from version 10.6.1 or an earlier version, the JDK used by the REST API will automatically change to Amazon Corretto.
- If a vulnerability in the installed Amazon Corretto 17 is announced, you can apply the latest Amazon Corretto 17 version that fixes the vulnerability.

  After performing a REST API upgrade installation or overwrite installation, change to the bundled Amazon Corretto. In that case, by performing the same procedure, you can again apply the latest version.

Input items for installation

Before installation, check the following information because you must specify it during installation:

- Path of the installation destination (for a new installation):

  Path of the default installation destination is as follows:

  */home-directory-of-the-user/*hitachi

  The REST API will be installed in the `ConfManager` directory under the installation path specified during the installation process.

  The following describes the conditions for the paths that can be specified as installation destinations of the REST API.

  - Characters that can be specified in the absolute path of the user's home directory or of the installation destination: `A` to `Z`, `a` to `z`, `0` to `9`, underscores (_), and forward slashes (`/`)
  - Absolute path name length: 64 bytes maximum
  - Do not include a path delimiter (`/`) at the end of the directory path.
  - Do not specify a directory where drives or network file systems are mounted.
- Path of the database backup destination (for an upgrade installation or overwrite installation):

  The default backup destination is as follows:

  */home-directory-of-the-user/*hitachi/backup

Before you begin

- The non-root user who is installing the REST API has a home directory.
- The port numbers used by the REST API are registered as an exception.
- The COLUMNS environment variable must not be set.

  If you perform an upgrade installation or overwrite installation while the COLUMNS environment variable is set, the installation might not end normally.

- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to perform an upgrade installation or overwrite installation of the REST API.

Procedure

1. Log in to the management server as a non-root user.
2. Copy all of the files in the installation media to the home directory of the user.
3. Go to the directory containing the installer (`install.sh`).

   The installer is in the directory *directory-where-installation-media-was-copied*/Linux.

4. Run the following command:

```
./install.sh
```

5. Specify the required information, in accordance with the displayed message.

   When the installation finishes, the following message is displayed:

```
Configuration Manager REST API installation completed successfully.
```

6. (For an upgrade installation) Check the refresh status of the storage system configuration information.
   a. Run the API request that gets the refresh status of the storage system configuration information, and then check the value of the `status` attribute that is returned.
   b. If the REST API database was expanded as a result of an upgrade installation, `Failed` is displayed as the value of the `status` attribute. In this case, check the error information, and then run the API request that refreshes the storage system configuration information.

Changing the port numbers (when the REST API is installed by a non-root user)

You can change the port numbers that are used by the REST API.

For details on the port numbers that are used by the REST API and how to change the port numbers, see Setting the port numbers used by the REST API (on page 48).

After port numbers are changed, a root user must set up the firewall again.

Setting up SSL communication (when the REST API is installed by a non-root user)

To use the REST API in an environment where the REST API is installed by a non-root user, set up SSL communication between the REST API server and the storage system.

When the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900,VSP G1000, VSP G1500, VSP F350, F370, F700, F900, or VSP F1500
When a storage system is registered, SSL communication is enabled by default.

When the storage system is VSP G200, G400, G600, G800, VSP F400, F600, F800
Use the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode.

When a storage system is registered, SSL TLS encrypted communication mode is set by default.

For details about other SSL communication routes, see Setting up SSL communication (on page 78).

Removing the REST API as a non-root user

Run `uninstall.sh` to remove the REST API.

Note:

During the removal of the REST API, do not set the `noexec` option that restricts the execution of programs in the `/tmp` and `/var/tmp` directories.

You can check whether the `noexec` option is set by running the `mount` command.

After the removal of the REST API finishes, set the option to restrict the execution of programs in those directories as needed.

Before you begin

- The COLUMNS environment variable must not be set.

  If you perform an uninstallation while the COLUMNS environment variable is set, the uninstallation might not end normally.

- Stop any programs that are using the CCI that was provided with the REST API.

  If CCI files are used in an environment where the CCI provided with the REST API is installed, you will not be able to uninstall the REST API.

Procedure

1. Log in to the management server as a non-root user who installed the REST API.
2. If necessary, back up the REST API database and the environment settings file.
3. To delete a REST API server, which is to be removed, from the configuration-change notification destinations registered in storage systems, delete the storage system information.
4. Go to the home directory, and then run the following command:

   ```
   REST-API-installation-destination/inst/uninstall.sh
   ```

5. Perform operations according to the instructions in the message that appears.

   If the API is successfully removed, the following message appears:

   ```
   Configuration Manager REST API removal completed successfully.
   ```

Chapter 2: Common specifications of the REST API

This chapter describes the method for specifying resources in the REST API, the format of requests and responses, and information about each object.

Specifying the resource to be managed

When the REST API is used, the resource to be managed must be specified in URL format.

In the REST API, domains are separated for each type of operation. The URL format differs for each domain. The domains used in the REST API and the URL format to be specified are as follows:

The objects domain:

A domain for defining operations on each object subject to REST API operations, such as operations on storage system resources (for example, LDEVs or pools). Specify the URL in the following format:

```
protocol://host-name:port-number/ConfigurationManager/version/objects/storages/storage-device-ID
```

The views domain:

A domain for defining operations on the storage system configuration information stored on the REST API server. Examples of such operations are updating information or searching for information. Specify the URL in the following format:

```
protocol://host-name:port-number/ConfigurationManager/version/views
```

The services domain:

A domain for defining the services provided by the REST API server. Services indicate batch operations for multiple objects, or operations for using or changing the configuration of the REST API server, for example, locking the resource group or changing the communication mode. Specify the URL in the following format:

```
protocol://host-name:port-number/ConfigurationManager/version/storage-device-ID/services
```

The configuration domain:

A domain for defining settings related to the REST API server: for example, collecting REST API version information. Specify the URL in the following format:

```
protocol://host-name:port-number/ConfigurationManager/configuration
```

Throughout this manual, the term "base URL" is used to indicate the following:

```
protocol://host-name:port-number/ConfigurationManager
```

- For the protocol, specify `https` or `http`. We recommend using `https` for security.
- For the host name, specify the IP address of the management server or a host name that can be resolved.
- For the port number, specify the port number to be used for communications with the REST API server. The default port number is `23451` for SSL communications, and `23450` for non-SSL communications.
- For the version, specify the version of the REST API. Currently, only `v1` can be specified.
- For the storage device ID, specify a 12-digit value consisting of the value designated for the storage system model where the operation is to be performed, plus the 6-digit serial number.

  If the serial number is less than six digits, pad it with leading zeros. The values designated for storage system models are as follows.

Storage system	Designated value
VSP One B24, VSP One B26, VSP One B28	`A34000`
VSP 5100, 5500, 5100H, 5500H	`900000`#

Storage system	Designated value
VSP 5200, 5600, 5200H, 5600H	
VSP E590, VSP E790, VSP E590H, VSP E790H	`934000`
VSP E990	`936000`
VSP E1090, VSP E1090H	`938000`
VSP G370, G700, G900, VSP F370, F700, F900	`886000`
VSP G350, VSP F350	`882000`
VSP G800, VSP F800, VSP N800	`836000`
VSP G400, G600, VSP F400, F600, VSP N400, N600	`834000`
VSP G200	`832000`
VSP G1000, VSP G1500, VSP F1500	`800000`#

#: These storage systems have serial numbers that are less than 6 digits. Pad the storage device ID with zeros, added after this designated value and before the serial number, to bring the total number of digits for the storage device ID up to 12.

- The following describes the URL formats supported by each domain.

For the objects domain:

URL formats (excluding the base URL)	HTTP method	Operations
`/v1/objects/storages`	GET	Obtain a list of storage systems
	POST	Register storage systems to be managed by using the REST API

URL formats (excluding the base URL)	HTTP method	Operations
`/v1/objects/storages/`*`storage-device-ID`*	GET	Obtain information about a storage system
	PUT	Change an attribute of a storage system
	DELETE	Delete storage systems from the devices to be managed
`/v1/objects/storages/`*`storage-device-ID/object-type`*	GET	Obtain a list of multiple objects
	POST	Create new objects
`/v1/objects/storages/`*`storage-device-ID/object-type/object-ID`*	GET	Obtain an object
	PUT	Change an attribute of an object
	DELETE	Delete an object
`/v1/objects/storages/`*`storage-device-ID/object-type/object-ID`*`/actions/`*`action-name`*	GET	Obtain the action template for an object
`/v1/objects/storages/`*`storage-device-ID/object-type/object-ID`*`/actions/`*`action-name`*`/invoke`	PUT	Run an action on an object

For the views domain:

URL formats (excluding the base URL)	HTTP method	Operations
`/v1/views/view-name`	GET	Search for information about a resource or multiple related resources on a storage system
`/v1/views/actions/action-name/invoke`	PUT	Update the storage system configuration information that is stored on the REST API server

For the services domain:

URL formats (excluding the base URL)	HTTP method	Operations
`/v1/storage-device-ID/services/service-name/actions/action-name/invoke`	PUT	Run a specific action of the service

For the configuration domain:

URL formats (excluding the base URL)	HTTP method	Operations
`configuration/version`	GET	Obtain the version information of the REST API

The following is an example of a URL:

```
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/ldevs
```

Specifying an object ID

An object ID is an ID that is used to uniquely identify a resource. An object ID is used when specifying a specific resource in a URL.

You can use the following two methods to specify an object ID:

- (Recommended) Run the GET operation to obtain the object ID from the execution result.

  Example: When specifying the object ID of an LDEV

  If the object type is `ldevs`, because the object ID of the LDEV is unique in the storage system, use the object ID obtained by running the GET operation without changing the ID. If the object ID of the LDEV is `100`, specify as follows:

  ```
  ldevs/100
  ```

- Generate an object ID by using the character string that connects multiple attribute values with commas.

  Example: When specifying the object ID of a host group

  If the object type is `host-groups`, the object ID of the host group can be generated by connecting, with a comma, the attribute value of the port and the attribute value of the host group that belongs to the port. If the attribute value representing the port is `CL1-A`, and the attribute value representing the host group which belongs to the port is `200`, specify as follows:

  ```
  host-groups/CL1-A,200
  ```

To generate an object ID by connecting multiple attribute values with commas, the attribute value must be encoded in accordance with the RFC3986 on the REST API client. After all attribute values are encoded, specify the character string that connects multiple attribute values with commas to be the object ID. Typical symbols which need encoding are shown below.

Pre-Encode	Post-Encode
`!` (exclamation mark)	`%21`
`#` (number sign)	`%23`
`$` (dollar sign)	`%24`
`%` (percent)	`%25`
`&` (ampersand)	`%26`
`'` (single quotation mark)	`%27`
`(` (left parenthesis)	`%28`
`)` (right parenthesis)	`%29`
`*` (asterisk)	`%2A`
`+` (plus sign)	`%2B`
`,` (comma)	`%2C`
`:` (colon)	`%3A`
`;` (semicolon)	`%3B`
`=` (equal sign)	`%3D`
`?` (question mark)	`%3F`
`@` (at sign)	`%40`
`[` (left square bracket)	`%5B`
`]` (right square bracket)	`%5D`

Here is an example of specifying the object ID of the ShadowImage pair from the following attribute values:

```
"copyGroupName": "localCopyGroup1"
"pvolDeviceGroupName": "localCopyGroup1P_"
"svolDeviceGroupName": "localCopyGroup1S_"
"copyPairName": "pair_1P,1S"
```

In this example, the comma in `copyPairName` is encoded to `%2C`, and then the values are connected with commas. The resulting object ID is as follows.

```
localCopyGroup1,localCopyGroup1P_,localCopyGroup1S_,pair_1P%2C1S
```

Note:

- If the object ID is obtained by performing the GET operation, the REST API server returns an encoded value. To use the object ID obtained by performing the GET operation in a request of another operation, use the object ID without decoding it.
- If you want to create a new object or change an attribute, we recommend that you do not specify values that contain the reserved characters listed above.

Supported HTTP methods

HTTP defines methods, which are operations that can be performed on resources.

The REST API supports the following HTTP methods.

HTTP method	Description	Processing method
GET	This method gets object information. Alternatively, this method gets a list of objects. For example, this method can obtain a list of pools.	Synchronous
POST	This method creates new objects. For example, this method can create pools.	Asynchronous

HTTP method	Description	Processing method
		However, the following APIs are performed in synchronous processing. ▪ Registering a storage system ▪ Generating sessions ▪ Uploading the files required to set the transfer destination of audit log files ▪ Getting information about an iSCSI target of a port on an external storage system ▪ Performing a login test on an iSCSI target of an external storage system that is registered to a port on the local storage system ▪ Backing up encryption keys on the REST API client ▪ Uploading the certificate files (for external server verification)
PUT	This method changes the attributes or the state of an object. For example, this method can change the pool threshold.	Asynchronous However, the following API is performed in synchronous processing. ▪ Changing information about a storage system ▪ Setting the system date and time of a storage system ▪ Updating the cache of storage system configuration information
DELETE	This method deletes objects. For example, this method can delete pools.	Asynchronous

HTTP method	Description	Processing method
		However, the following APIs are performed in synchronous processing. ▪ Deleting information about a storage system ▪ Discarding sessions ▪ Deleting a certificate file (for external server verification)

Tip:

The API whose HTTP method is PUT can also be performed in the following methods:

- PATCH: Operation for changing object attributes and statuses (for example: Changing pool settings)
- POST: Operation for performing specific actions to objects (for example: Expanding a pool)

In the following cases, if you execute an API request in a PATCH or POST method, the results to be returned as the job object or the error message will have assumed that the API request was executed in a PUT method:

- SSL communication is used between the REST API server and the storage system for a VSP G1000, VSP G1500, or VSP F1500 storage system whose microcode version is 80-05-2*X*-*XX*/*XX* or later
- SSL communication in SSL TLS encrypted communication mode or in DTLS SVP encrypted communication mode is used between the REST API server and the storage system for VSP G200, G400, G600, G800, VSP F400, F600, F800 storage systems

The following explains the processing method for the REST API (synchronous processing and asynchronous processing):

- For synchronous processing, the processing results are returned in the response.
- For asynchronous processing, the operation on the resource is registered as a job. In addition, the job information and the HTTP status code 202, which indicates that the processing has been accepted, are returned in the response. Subsequently, the registered job runs asynchronously. If registration of a job fails, the HTTP status code 500 is returned.



Tip:

- If you specify `Completed` for the `Response-Job-Status` in the request header (even for asynchronous processing operations), a response will be returned only after the job is complete.
- For pair operations, you can use `Job-Mode-Wait-Configuration-Change` in the request header to specify the time when the job status changes to `Completed`. If you specify `NoWait` in the request header, the job status will change to `Completed` without waiting for data copying to finish.

User authentication

User authentication is required to operate the storage system. To run any REST API request, you must specify the Authorization header to perform user authentication.

In the REST API, session-based user authentication is performed. A session is always generated first when a REST API client accesses the REST API server and starts an operation. In the request that generates a session, the user ID and password are used for authentication to access the storage system. After a session is created, specify session information for the Authorization header to perform authentication based on the session information.

Note:

- For REST API user authentication, use a user account registered in the storage system, or use a user account managed by the external authentication servers or approved external servers that are connected to the storage system.

  User accounts of other products, such as Hitachi Command Suite products, and user accounts managed by an external authentication servers or an approved external servers that are connected to other products cannot be used for REST API user authentication.

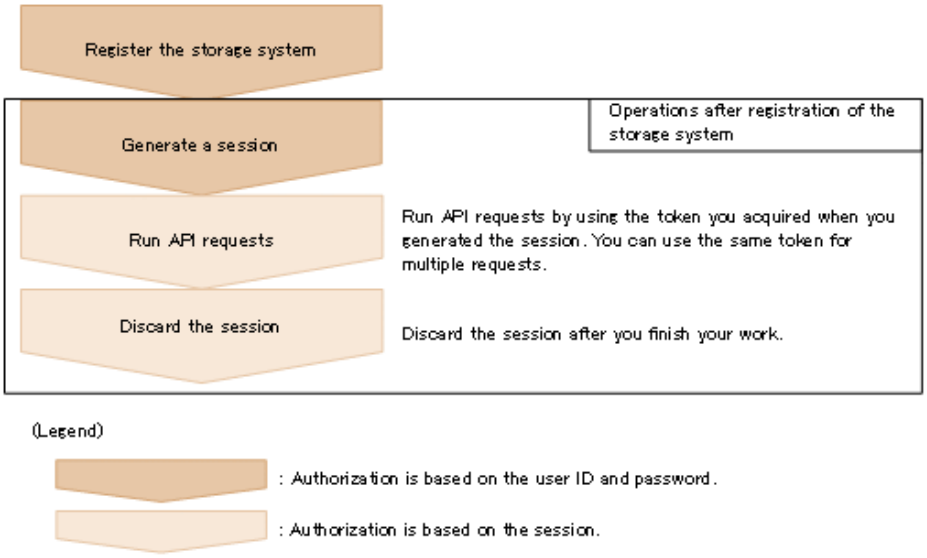
- To perform REST API user authentication when the storage system and the other products, such as a Hitachi Command Suite products, are connected to the same external authentication server or approved external server, create a user account other than the one used by the other products. In such cases, create a user account that meets the following conditions:
  - If you are creating a user account for external authentication, do not register this account in the Hitachi Command Suite products.
  - If you are creating a user account for approved external authentication, do not register the approved external group in the Hitachi Command Suite products.

Selecting the appropriate user authentication method

When using the REST API, use different authorization methods appropriately, as shown below.

- For storage system registration: Authorization is based on the user ID and password.
- For session generation: Authorization is based on the user ID and password.
- For operations other than the above: Authorization is based on the session.

The following provides an overview of authentication based on the operation of the REST API.



Authentication by the user ID and password

When you create a session, specify authentication information in the following format in the Authorization header:

```
Authorization: Basic authentication-information
```

authentication-information

Specify a base64-encoded character string in which the user ID and password are concatenated with a colon (`:`). Use the user ID and password of a user account that can perform operations on storage system resources.

When using the REST API, you can use the following characters for the user ID and password.

Item	Number of characters	Specifiable characters
User ID	1 to 63 characters	You can use the following characters.# ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' * + - . / = ? @ ^ _ ` { | } ~
Password	6 to 63 characters	You can use the following characters.# ▪ Alphanumeric characters ▪ ASCII symbols which can be keyed in except space: ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ` { | } ~

Note:

For storage systems where a password policy can be set, the number of characters and strings that can be used follow the set policy. For details, see the section explaining password policies in the *System Administrator Guide* or the release note.

#: For target storage systems whose microcode versions are earlier than those supported by Configuration Manager 8.6.2, if one of the following conditions is met, specifiable characters are vary:

- The storage system model is VSP G1000, VSP G1500, or VSP F1500, and SSL communication is used for communication with the REST API server.
- The storage system model is VSP G200, G400, G600, G800, or VSP F400, F600, F800, and SSL communication (the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode) is used for communication with the REST API server.
- The storage system model is VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900.

In this case, you can use the following characters for User ID.

- Alphanumeric characters
- The following symbols:

  `- . / @ _`

In this case, you can use the following characters for Password.

- Alphanumeric characters
- The following symbols:

  `, - . / @ _ \`

The following is an example of the Authorization header where the user ID is `sample-user`, and the password is `sample-password`:

```
Authorization: Basic c2FtcGxlLXVzZXI6c2FtcGxlLXBhc3N3b3Jk
```

Authentication by sessions

Specify the token for the session in the following format in the Authorization header:

```
Authorization: Session token
```

Token

A token is authentication information that is returned after a session is created. This information is used to determine whether the request was issued from an authorized user.

Example of the Authorization header:

```
Authorization: Session 550e8400-e29b-41d4-a716-446655440000
```

Note:

For the following storage systems, you cannot use the REST API to perform the following operations if you are using a user account that is managed by an external authentication server and an external authorization server, but that is not registered in the target storage system. To perform one of these operations, use a user account that is registered in the storage system.

Target storage systems

- VSP G1000, VSP G1500, VSP F1500 storage systems whose microcode version is earlier than 80-06-77-*XX*/*XX*

Operations that cannot be performed

- Register or delete a storage system.
- Change information about a storage system.
- Get job information.
- Perform operations related to users.
- Get information about user groups.
- Perform operations related to resource groups.
- Register or delete information about remote storage systems.
- Get a list of sessions.
- Discard a session.
- Create, delete, or change a CLPR.
- Register or delete destinations for sending notifications about changes to storage system configurations.
- Get information by using the search function of a storage system.
- Refresh the configuration information of storage systems.
- Change the communication mode of the REST API server.

Session management

In the REST API, a session is used to identify multiple requests as a series of operations to be performed by the same client. For example, if a user wants to use the same account to run two client programs in parallel, the user must generate a session for each client program. On the REST API server, each program is identified based on session information. In addition, when the REST API is used to exclusively lock the resources to be operated, the REST API controls the locks on a session basis.

A session is always generated when a REST API client accesses the REST API server and starts an operation on a storage system. After a session is generated, a session ID and token are returned to the client. In subsequent operations, specify the token for the Authorization header of each request, as authentication information. To terminate operations from a REST API client, discard sessions to prevent sessions that are no longer required from remaining on the server.

Generating a session

A REST API session is created when the user runs the API that generates a session. A user can generate multiple sessions. The maximum number of sessions that can be used is 64 per storage system.

After the session is generated, the following information is returned to the client as a response:

- Session ID

  ID used for identifying a session on the REST API server. A session ID is used to check whether the session is valid or to discard the session. The user who created the session, or a user who belongs to the Administrator user group (built-in user group) can view the session ID.

- Token

  Information that is used to identify the source that issues requests as a specific user. A token is used to decide whether the request is issued during the same session. Only the user who created the session can view the token.

Running an API request by using a session

To use a session to run an API request, specify a token for the Authorization header of the request as authorization credentials. The requests for which the same token is specified are handled as the operation during the same session. The following is an example of specifying the Authorization header with a token specified.

```
Authorization : Session 550e8400-e29b-41d4-a716-446655440000
```

If a session goes unused for a certain period of time, it is automatically discarded (session timeout). The time that elapses until a session timeout is the time that has elapsed since the session was generated or the execution result of the request for which the session was specified was returned. The wait time during synchronous processing and the wait time for the response of an asynchronous processing API request are not included in that time. If a request that uses that session is issued during the time that elapses until a session timeout, the time is reset. The time until a session timeout is 300 seconds (5 minutes) by default. However, you can specify the time until a session timeout when a session is generated.

To prevent the session for an operation that is in progress from being discarded by a timeout, periodically issue a request that uses the session.

Tip:

If the information (such as the role and resource group) about the user who generated the session is changed while the session is being used, the changes are applied to the operation even while the session is being used. If the password of the user who generated the session is changed, the session might be discarded.

Note:

For VSP One B20, when a failure occurs on an ESM that is operating, the communication destination is switched to the other ESM. At this time, the session used until that time becomes unavailable.

Discarding a session

If you no longer need to manage sessions after finishing a series of operations, discard the sessions. Sessions can be discarded only by the user who generated the sessions, or a user who belongs to the Administrator user group (built-in user group).

If you have locked the resources by specifying a session, the resources will be unlocked when the session is discarded.

Request headers

This section describes the request headers supported by the REST API.

Header	Category	Description	Specifiable value
Accept	Optional	Specifies the media type of the response.	`*/* (json)` Default value: `*/* (json)`
Content-Type	Optional	Specifies the media type of the request body. If a request body is specified, the Content-Type header is specifiable. If a request body is not specified, this header is ignored even if specified.	`application/json` Default value: `application/json`
Content-Length	Optional	Specifies the size of the request body.	Specify the header, in bytes. Default value: None

Header	Category	Description	Specifiable value
		You can specify the Content-Length header when specifying a request body. This header is automatically assigned depending on the specifications of the client software.	
Authorization	Required	Specifies the authorization method and authorization credentials. You do not need to specify this header for the API function that gets version information or for the API function that gets a list of storage systems. When using the REST API, use different authorization methods appropriately, as shown below. ▪ For storage system registration: Authorization is based on the user ID and password. ▪ For session generation: Authorization is based on the user ID and password. ▪ For operations other than the above: Authorization is based on the session.	Specify the header in one of the following formats. Specify the appropriate authentication method depending on the API. ▪ Authentication based on the user ID and password `Basic` *`authorization-credentials`* For the authorization credentials, specify the user ID and password in a character string encoded by using Base64. Use the user ID and password of a user account that can perform operations on storage system resources. ▪ Authorization based on the session `Session` *`token`* When the session was generated: Specify a token that was obtained when the session was generated. Default value: None

Header	Category	Description	Specifiable value
Remote-Authorization	Required (for the API for the object types on the right)	Specifies the authorization credentials to be used when accessing the remote storage system. This header is used in the API for the following object types: ▪ remote-mirror-copygroups ▪ remote-mirror-copypairs ▪ remote-storages	Specify the header in the following format: `Session token` Specify the token for the session that was generated in the remote storage system.# Default value: None
Response-Max-Wait	Optional	Specifies the maximum wait time until a response is returned when an API request for asynchronous processing is issued. A response is returned when the specified time elapses after the REST API server accepted the API request. If the processing finishes before the maximum wait time elapses, a response is returned at the time of completion. Factors such as network status and load of the REST API server can delay acceptance of a response, so the wait time might be longer than the specified maximum time. Take these factors into account when specifying the maximum wait time.	Integers between `0` and `1800` Unit: Seconds Default value: None

Header	Category	Description	Specifiable value
Response-Job-Status	Optional	Specifies the status of the job that is expected to return a response when an API request for asynchronous processing is issued. A response is returned when the job transits to the specified status or when the processing stops due to an error.	Specify the header in one of the following formats: *job-status;* or *job-status; Job-State=state-of-the-job* Default value: None
Job-Mode-Wait-Configuration-Change	Optional	Specifies when the job status is to be changed to `Completed` when an API request for asynchronous processing is issued in pair operations. Use this header for the API functions that meet the following conditions. ▪ The object type is one of the following: • local-clone-copygroups • local-clone-copypairs • remote-mirror-copygroups • remote-mirror-copypairs ▪ The HTTP method is either of the following: • POST • PUT	Specify either of the following values: ▪ `Wait`: Wait for data copying to finish, and then change the job status to `Completed`. ▪ `NoWait`: Change the job status to `Completed` without waiting for data copying to finish. If you specify `NoWait`, data copying continues even after the job status changes to `Completed`. To check whether data copying has finished, check the status of the target resource. Default value: `Wait`

#: Specify at least 60 seconds for the timeout time of a session generated on the remote storage system. If you specify less than 60 seconds, the session on the remote storage system might time out, causing the execution of a request to fail.

If a header other than the above is specified, the specified header is ignored.

Response-Max-Wait and Response-Job-Status can be specified in combination. If both are specified, a response is returned when either condition is satisfied.

If neither Response-Max-Wait nor Response-Job-Status is specified, a response is returned immediately.

Response headers

This section describes the response headers returned by the REST API server.

Header	Description	Default
Content-Type	Indicates the media type of the response data.	`application/json;charset=UTF-8`
Content-Length	Indicates the size of the response data. If the size of the response data is large, instead of this header, `Transfer-Encoding: chunked` is returned, indicating that the response data has been divided and then transferred.	None
Transfer-Encoding	Indicates the encoding format used when the response data was transferred. When a large amount of response data is divided and then transferred, `chunked` is returned.	None

WWW-Authenticate	Indicates that authentication is required when the HTTP status code 401 is returned.	▪ When a session is created:
		`Basic realm="Block storage"`
		▪ For other cases:
		`Session realm="Block storage"`

HTTP status codes

The REST API uses the following standard HTTP status codes to indicate the processing results.

Status codes	Description
200	Success The request has been processed properly. Even if the number of results obtained is 0 in a request to get information, this status code will be returned.
202	Accepted The request for asynchronous processing has been accepted.
400	Bad request The URL, the request header, the query parameter, or the request body is invalid.
401	Unauthorized The Authorization header is not specified in the request header. Alternatively, authentication using the information specified in the Authorization header has failed.
403	Forbidden You do not have the permission required to perform the operation.
404	Not found The resource specified by the URL is not found. Alternatively, you do not have read permission for the resource.
405	Method not allowed The specified method is not allowed for the resource specified by the URL.
406	Not acceptable The media type specified in the Accept header is not supported.
409	Conflict A request is made to change the status of the resource specified by the URL, in a way that the change might cause conflicts or be impossible. Example: A request is made to create one resource that has the same ID as another resource that has already been created.
411	Length Required The Content-Length header must be specified.
412	Precondition failed The conditions for running the API request are not met.
415	Unsupported media type The media type specified in the Content-Type header is not supported.

Status codes	Description
417	Expectation Failed The specified Expect header is invalid, or the Expect header is not supported by the web server (For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900).
500	Server error An internal error has occurred in the REST API server or the storage system that is the operation target.
502	Proxy Error There is no response from the REST API server, or an invalid response was received.
503	Service unavailable The request cannot be accepted, because the REST API server or the storage system is busy. If this status code is returned, run the request again.
504	Gateway Timeout A response was not received from the REST API server in time.

API-specific information about status codes is explained in the sections on the specific APIs.

Request and response formats

Use the JSON format to specify attribute values when creating or changing a resource. Also, use the JSON format for the results of resource information acquisition.

When creating or adding a resource by using the POST method, or when changing or editing a resource by using the PUT method, specify resource attributes in JSON format. When you use the GET method to collect resource information, responses are returned in JSON format.

The supported character encoding is UTF-8.

Request format

- If you specified a null character for a string-type attribute, the value of the attribute is assumed to be null.
- If you specified a null character for an attribute whose type is not string, the attribute is assumed to be unspecified.

- You can use the following characters in attribute values:

  Uppercase letters (`A-Z`), lowercase letters (`a-z`), numbers (`0-9`), commas (`,`), hyphens (`-`), periods (`.`), colons (`:`), at marks (`@`), and underscores (_)

  Allowable characters vary for each API request. For details, refer to individual API command pages.

  Note:

  - If you specified a character string containing a comma, a colon, or an at mark, you must encode the symbol when generating the object ID. We recommend that you do not use these symbols. If you generate the object ID without encoding these symbols, the URL when an API request is issued might be incorrect and cause an error.
  - You cannot specify a hyphen as the first character of the value.

- Do not include backslashes (\) or forward slashes (/) in URLs.
- If you specify an IP address, you cannot use an IPv4-mapped address.

Response format

- If the API processing succeeds, a response is returned in JSON format.
- If the processing fails, depending on the contents of the error, a response in HTML format, instead of JSON format, might be returned.

  To resolve the error based on the HTTP status code in the program, check the value of Content-Type in the response header.

Tip:

The following example is used to describe how to read the error message that appears if the string specified in the request body contains a syntax error.

Request body:

```
{
  "parameters": {
    "status": blk
  }
}
```

Error message:

```
{
  "errorSource": "/ConfigurationManager/v1/objects/storages/800000012345/
ldevs/5/actions/change-status/invoke",
  message": "The format of the string or the content specified in the
request body is invalid. (details = Unexpected character ('b' (code 98)):
expected a valid value (number, String, array, object, 'true', 'false' or
'null')\n at [Source: java.io.ByteArrayInputStream@10f607b; line: 3,
column: 16])",
"  "solution": "Check and, if necessary, revise the specified request body
so that the format and content are correct.",
  "messageId": "KART40046-E"
}
```

The location where the error occurred is output after `at` in the message details. This example indicates the error is in `line: 3, column: 16`.

In column 16 of line 3 in the request body, you can see that the `status` attribute, which should be specified as a string, is specified incorrectly.

Query parameters

If the GET method is used to obtain an object, query parameters can be specified to filter the execution results based on specific conditions.

Query parameters can be specified at the end of the URL in the following format:

```
?parameter=value
```

To specify multiple parameters, concatenate them by using ampersands (&). Multiple parameters are specified in the following example:

```
?parameter=value&parameter=value...
```

For details on parameters that can be specified for queries, see the section describing the specific API request.

Parameters are case sensitive. If you specify a parameter other than those that can be specified for each API, the invalid parameter is ignored, and only the valid parameters are used to filter the execution results.

If a parameter value contains a reserved character defined in RFC 3986, specify an encoded character string. For details about the reserved characters defined in RFC 3986, see the section describing how to specify an object ID.

If you specify an IP address for a parameter value, you cannot use an IPv4-mapped address.

Note:

When you obtain an object by specifying query parameters, if the storage management software or another REST API client is performing a configuration-change operation on the object, you might not be able to obtain the correct information. To obtain the correct information, be sure to obtain a lock before obtaining the object.

Data type

This section describes the data types that can be specified by using the REST API.

The following table shows the data types supported by the REST API and the corresponding JSON data types.

Data type	JSON type	Description
boolean	boolean	A type that represents `true` or `false`. Example :`true`
int	number	A type that represents a 32-bit signed integer. Example :`100`
long	number	A type that represents a 64-bit signed integer. Example :`1048576`
string	string	A type that represents a character string. Example :`"host_group_1"`
ISO8601string	string	A type that represents time in the ISO 8601 extended format (YYYY-MM-DDThh:mm:ssZ). The only time zone that you can specify is UTC. Example :`"2015-03-20T09:27:35Z"`
link	string	A type that represents the path of a URL.

Data type	JSON type	Description
		The link type indicates a URL for a resource. For example, when a request for asynchronous processing is issued, a URL for the job object is returned by using the link type. The link type data is a character string of the URL from which the protocol, host name, and port number are excluded. If the URL is created based on the link type data, you must add the protocol, host name, and port number. Example : `"/ConfigurationManager/v1/objects/storages/836000123456/ldevs/100"`

In addition to the preceding data types, the following JSON data types are also used:

- The object type

  The character string, in which the attribute and value are connected with a colon (`:`), is enclosed in { and }. If more than one attribute-value pair exists, the pairs are separated by commas.

- The array type

  The character string, in which multiple values are separated by commas, is enclosed in [and].

Output format

After an API request is issued, a response is returned based on the API processing method, the API processing type, and the execution result.

The following table shows the response output formats when the processing of the request is successful.

API processing method	API processing type	Status code of the execution result	Output format
Synchronous processing	GET (getting a single object)	200	See the description in the response message for each API function.
	GET (getting multiple objects)	200	Data object
	GET (getting an action template)	200	Action template object
	Other than the preceding	200	See the description in the response message for each API function.
Asynchronous processing	All	202	Job object

If the processing of the request fails, an error object is returned as a response.

Data object

Data object is an object for returning the object list.

Obtaining a list by using the GET operation of the objects domain

The following table shows the data object schema.

Attribute	Data type	Description
data	array	Object list

The following shows an example of a data object:

```
{
  "data": [
      {
          "parityGroupId":"5-2",
          "numOfLdevs":3,
          "usedCapacityRate":45,
          "availableVolumeCapacity":4000,
          "raidLevel":"RAID5",
```

```
            "raidType":"2D+2D",
            "clprId":0,
            "driveType":"DKR5C-J600SS"
        },
        {
            "parityGroupType",
            ...
        },
         ...
    ]
}
```

Obtaining a list by using the GET operation of the views domain

The following table shows the data object schema.

Attribute	Data type	Description
data	array	Resource information list
offset	int	Starting position of data acquisition
count	int	Number of collected data items
totalCount	int	Total number of data items

In the following example, 10 data items, out of a total of 100 data items, are obtained starting from the 51st data item.

```
{
  "data": [
        {
            ...
        },
        ...
  ],
  "offset": 50,
  "count": 10,
  "totalCount": 100
}
```

Job object

A job object represents job information that is returned when an API request for asynchronous processing is issued.

The following table explains the schema of a job object.

Attribute	Data type	Description
jobId	long	Job object ID.
self	link	URL used to access the job information.
userId	string	ID of the user who issued the API request that triggered registration of the job.
status	string	Status of the job. The following values can be returned: ▪ `Initializing`: The job is being initialized. ▪ `Running`: The job is running. ▪ `Completed`: Execution of the job is finished.
state	string	State of the job. The following values can be returned: ▪ `Queued`: The job has been queued. ▪ `Started`: The job has been started. ▪ `StorageAccepted`: The request was received by the storage system#. ▪ `Succeeded`: The job finished successfully. ▪ `Failed`: The job failed. ▪ `Unknown`: The state of the job is unknown.
createdTime	ISO8601string	Time when the job was created.
updatedTime	ISO8601string	Time when the state of the job was updated.
completedTime	ISO8601string	Time when the job ended.
request	Request Object	Object that retains information about the request.
affectedResources	link[]	URL used to access the resource targeted by the operation. If one API request performs operations on multiple resources, the URLs of all those resources are returned. If a job failed, only the URLs of the resources for which processing is confirmed to have been completed are returned.

Attribute	Data type	Description
		If the resource is deleted successfully, the URL of the deleted resource is returned. A 404 error occurs if this URL is accessed. This confirms that the resource has been deleted successfully. The attribute affectedResources is also included in the API response that obtains job information. In this case, the URL used to access the resource targeted by the API command that triggered registration of the job is returned.
error	Error Object	Object that retains error information.

#: The state `StorageAccepted` is returned only for a job that creates a remote copy pair.

Note:

The maximum number of instances of job information that can be retained is as follows. If the number of instances of job information exceeds the maximum, the instances of the oldest "createdTime" are deleted first.

- For VSP One B20: 5,000
- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900: 3,000
- For VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500: 100,000

Example of a job object when the job execution starts:

```
{
  "jobId": 111111,
  "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/111111",
  "userId": "user1",
  "status": "Running",
  "state": "Started",
  "createdTime": "2015-04-01T08:00:00Z",
  "updatedTime": "2015-04-01T08:05:00Z",
  "request": {
    "requestUrl": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs",
    "requestMethod": "POST",
    "requestBody": "{\"ldevId\" : 112, \"poolId\" : 100, \"blockCapacity\" : 1000}"
  }
}
```

Example of a job object when the job is finished successfully:

```
{
  "jobId": 222222,
```

```
  "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/222222",
  "userId": "user1",
  "status": "Completed",
  "state": "Succeeded",
  "createdTime": "2015-04-01T08:00:00Z",
  "updatedTime": "2015-04-01T08:10:00Z",
  "completedTime": "2015-04-01T08:10:00Z",
  "request": {
    "requestUrl": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs",
    "requestMethod": "POST",
    "requestBody": "{\"ldevId\" : 112, \"poolId\" : 100, \"blockCapacity\" : 1000}"
  },
  "affectedResources": [
    "/ConfigurationManager/v1/objects/storages/836000789123/ldevs/112"
  ]
}
```


Example of a job object when the job failed:


```
{
  "jobId": 333333,
  "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/333333",
  "userId": "user1",
  "status": "Completed",
  "state": "Failed",
  "createdTime": "2015-04-01T07:00:00Z",
  "updatedTime": "2015-04-01T07:01:00Z",
  "completedTime": "2015-04-01T07:01:00Z",
  "request": {
    "requestUrl": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs",
    "requestMethod": "POST",
    "requestBody": "{\"ldevId\" : 112, \"poolId\" : 100, \"blockCapacity\" : 1000}"
  },
  "error": {
    "errorSource": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs",
    "messageId": "KART30000-E",
    "message": "An error occurred in the storage system. (message = The state of the
pool is incorrect.)",
    "cause": "An error occurred during execution of a CCI command.",
    "solution": "See the manual of the CCI and remove the cause of the error.",
    "errorCode": {
      "SSB1": "2E10",
      "SSB2": "6014"
    },
    "detailCode": "30000E-2-2E10-6014"
  }
}
```

Error object

An error object represents error information that is returned when the request processing fails.

If the API processing fails, an error object is returned as response data. The following explains the schema of an error object.

Attribute	Data type	Description
errorSource	link	URL where the error occurs
messageId#	string	Message ID
message	string	Content of the error message
cause	string	Cause of the error
solution	string	Solution to the error
solutionType	string	Category of the solution to the error ▪ `RETRY`: Error that can be resolved by retrying the request ▪ `SEE_ERROR_DETAIL`: Error that must be resolved by taking the action described in the error message If `RETRY` is returned as the value of this attribute, retry the request that failed. You can check the details of the request by checking the value of `request` of the job object.
errorCode	object	Error code from the storage system A value is returned only if an error occurs in the storage system and thus one of the following error codes is issued. ▪ The SSB1 code and SSB2 code of CCI ▪ An error code of CCI ▪ Error code 1 and error code 2 of the RMI Storage system error codes are required for maintenance of the storage system.
detailCode	string	Detailed information about the error The information is displayed in the following format: *nnnnnZ-TYPEoutput-format-for-each-TYPE*

Attribute	Data type	Description
		Example: `40097E-1-30000E-2-2EDA-00EE` ▪ *nnnnnZ* Displays the message ID of the REST API. • *nnnnn* Serial number of the message • *Z* Message type `I` : Information `W` : Warning `E` : Error ▪ *TYPE* Displays the type of the error. • `0`: An error that occurred on the REST API server side • `1`: An error that occurred on the REST API server on the remote storage system side (for remote copy) • Other than the preceding: An error that occurred on the storage system side

Attribute	Data type	Description
		▪ *output-format-for-each-TYPE* The output format varies depending on the value of *TYPE*. • When the value is `0`: No information is output. • When the value is `1`: The value of the `detailCode` attribute for the REST API server on the remote storage system side is displayed. • When the value is `2`: Information about the CCI error is displayed in the following format: - *SSB1-code- SSB2-code* For details, see the CCI manual. • When the value is `3`: An error code of CCI is displayed. For details, see the CCI manual. • When the value is `4`: Information about an error that occurs in the GUM/ESM is displayed in the following format: - *part-code- error-code* For details, see the manual *Hitachi Device Manager - Storage Navigator Messages* or documentation related to messages for VSP One B20. • When the value is `5`: Information about an error that occurs in the SVP is displayed in the following format: - *part-code- error-code* For details, see the manual Hitachi Device Manager - Storage Navigator Messages.

#: The name of the attribute is sometimes returned as the `messageID`.

Example of an error object that might be returned if an error occurs in the REST API server:

```
{
  "errorSource": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs",
  "messageId": "KART20008-E",
  "message": "Required parameters are not specified.",
  "solution": "Check parameters.",
  "solutionType": "SEE_ERROR_DETAIL",
  "detailCode": "20008E-0"
}
```

Example of an error object that might be returned if an error occurs in the storage system:

```
{
  "errorSource": "/ConfigurationManager/v1/objects/storages/836000123456/ldevs/16",
  "messageId": "KART30000-E",
  "message": "An error occurred in the storage system. (message = The state of the
pool is incorrect.)",
  "cause": "An error occurred during execution of a CCI command.",
  "solution": "See the manual of the CCI and remove the cause of the error.",
  "solutionType": "SEE_ERROR_DETAIL",
  "errorCode": {
    "SSB1": "2E10",
    "SSB2": "6014"
  },
  "detailCode": "30000E-2-2E10-6014"
}
```

The following shows an output example of the `detailCode` attribute:

If an error occurs on the REST API server (message ID: KART40231-E)

```
"detailCode": "40231E-0"
```

If an error occurs on the REST API server on the remote storage system side (message ID: KART40097-E, value of the `detailCode` attribute for the REST API server on the remote storage system side: 30000E-2-2EDA-00EE)

```
"detailCode": "40097E-1-30000E-2-2EDA-00EE"
```

If an error occurs on the storage system side (message ID: KART30000-E, SSB1 code: 2EDA, SSB2 code: 00EE)

```
"detailCode": "30000E-2-2EDA-00EE"
```

If an error occurs on the storage system side (message ID: KART30000-E, CCI error code: EX_INVARG)

```
"detailCode": "30000E-3-EX_INVARG"
```

If an error occurs on the storage system side (message ID: KART30007-E, part code: 30762, error code: 204092)

```
"detailCode": "30007E-4-30762-204092"
```

If an error occurs on the storage system side (message ID: KART30005-E, part code: 03005, error code: 078040)

```
"detailCode": "30005E-5-03005-078040"
```

Request object

Request objects are objects for retaining request information.

The following explains the schema of a request object.

Attribute	Data type	Description
requestUrl	link	URL requested by the API for asynchronous processing. If the character string of the URL exceeds 2,048 bytes, the character string will be truncated.
requestMethod	string	HTTP method requested by the API for asynchronous processing.
requestBody	string	Request body requested by the API for asynchronous processing. If the character string of the request body exceeds 1,024 bytes, the character string will be truncated.

Action template object

An action template object is a template of request bodies that are required to run actions. Get action template objects by using the GET method. Specify values in the template according to the action that you want to run. Specify the request body, and then run the action.

The following table shows the schema of the action template object.

Attribute	Data type	Description
parameters	object	Parameters required for the operation

The following shows the action template for expanding the volume capacity, as an example of an action template object:

```
{
  "parameters": {
    "additionalBlockCapacity": null
  }
}
```

In an action template, the attributes that must be specified to run an action are written beforehand. For the values, `null` or `[]` is set to indicate that the values are unspecified. Specify a value for these attributes. In the preceding example, the two attributes used to specify the amount of the capacity to be added to a volume are written.

In the following example, values are specified in the collected action template:

```
{
  "parameters": {
    "additionalBlockCapacity": 500
  }
}
```

In the request body, specify an action template in which unnecessary attribute lines have been deleted and attribute values have been set for the remaining necessary attribute lines, and then run the action.

Locking resources

If multiple REST API clients simultaneously attempt to perform operations on the same resource, unexpected configuration changes might be performed, with results other than those anticipated. In the REST API, the user can lock the resource group allocated to them so that other users cannot change the configurations of resources in the locked resource group.

The REST API controls locks on a session basis. All resources of the resource group allocated to the user who generated a session are locked. When the resource group allocated to you is locked by another user, you cannot obtain a lock for the resource group.

Only the session used for the request that locked a resource can run a configuration-change request for the locked resource. If one user account generated multiple sessions, a configuration-change request cannot be run if the specified session is different from the session used to lock the resource. (If the specified session is different, even if it is generated by the same user account, the session cannot run the configuration-change request.)

However, operations that do not change the configurations of the resources on the storage system, such as a change of a pair status and operations for the REST API server, can be run without being affected by exclusive control by locking. The following operations are not affected by locking:

- Registering, changing, or deleting storage system information on the REST API server
- Generating or discarding a session
- Getting information

  Note that, when you obtain information by specifying query parameters, you might not be able to obtain the correct information because the operation might be affected by configuration-change operations performed by other REST API clients or by the storage management software. To obtain the correct information, be sure to lock the relevant resources before performing the operation.
- Sending the ping command to a specified host
- Setting the priority levels of ALUA paths
- Splitting, resynchronizing, or restoring ShadowImage pairs (for each copy pair or in units of copy groups)
- Splitting, resynchronizing, or restoring Thin Image pairs (for each snapshot or in units of snapshot groups)

  Creating, deleting, assigning secondary volumes to, or unassigning secondary volumes from Thin Image pairs (including operations in units of snapshot trees)
- Registering or deleting remote storage system information on the REST API server
- Splitting, resynchronizing, or taking over TrueCopy pairs or Universal Replicator pairs (for each copy pair, or in units of copy groups)
- Operations related to information about an iSCSI target of a port on an external storage system (obtaining information, performing a login test)
- Uploading the files required for initial configuration
- Changing the communication mode for the REST API server
- Updating the cache of storage system configuration information
- Refreshing the configuration information of storage systems
- Registering or deleting destinations for sending notifications about changes to storage system configurations

When a single user account uses multiple sessions, only one of the sessions can be used to lock resources.

When operations are complete and the resources no longer need to be locked, run the API command for unlocking the resource group. If the session used for locking is discarded, the locked resource group will be unlocked at the same time. If the session is discarded due to a session timeout, the locked resource group will also be unlocked at the same time.

Tip:

- A session timeout occurs even when an asynchronous processing API operation is being run. If you want to continue to lock the resources while an asynchronous processing API operation is being run, prevent a session timeout by taking a measure, such as periodically issuing the request that checks the job status.
- If you want to forcibly unlock resources because a REST API client unexpectedly continues to lock the resources or the token is lost, either wait until the session times out or forcibly discard the session by using a user who belongs to the Administrator user group (built-in user group).
- If the locked user information (such as the role and resource group) is changed while the resource is being locked, the changes are applied to operations after the resource is unlocked.

Operation flow for running API requests by using the lock functionality

The following table describes the operation flow for running API requests by locking resource groups.

Step	Operation	Item to be specified for the Authorization header
1	Generate a session.	User ID and password
2	Lock the resource group.	The token of the session generated in step 1
3	Perform operations on the locked resource.	The token of the session generated in step 1
4	Unlock the resource group.	The token of the session generated in step 1
5	Discard the session.	The token of the session generated in step 1

Operation flow for running API requests by using the lock functionality (for remote copy)

For copy operations between storage systems (remote copy), to perform operations to change configurations of a copy group or the resources in a copy group by locking the target resources, lock the resources of both the local and remote storage systems. To lock the both resources and perform operations on the locked resources, specify the token of the session of each storage system for the Authorization header and the Remote-Authorization header. Note that the Remote-Authorization header is used only for the API commands that are used for the following object types:

- remote-mirror-copygroups
- remote-mirror-copypairs
- remote-storages

The following table describes the operation flow for when the resources of both the local and remote storage systems are locked.

Step	Storage system on which operations are performed	Operation	Item to be specified for the Authorization header
1	Local storage system	Generate a session.	User ID and password for the local storage system
2	Remote storage system	Generate a session. Specify at least 60 seconds for the timeout time of a session generated on the remote storage system.	User ID and password for the remote storage system
3	Local storage system	Lock the resource group.	The token of the session generated in step 1
4	Remote storage system	Lock the resource group.	The token of the session generated in step 2
5	Local storage system	Perform operations on a copy group or the resources in a copy group.	The token of the session generated in step 1

Step	Storage system on which operations are performed	Operation	Item to be specified for the Authorization header
			Also, specify the token of the session generated in step 2 for the Remote-Authorization header.
6	Local storage system	Unlock the resource group.	The token of the session generated in step 1
7	Remote storage system	Unlock the resource group.	The token of the session generated in step 2
8	Local storage system	Discard the session.	The token of the session generated in step 1
9	Remote storage system	Discard the session.	The token of the session generated in step 2

Tip:

If creation of a remote copy pair is run, the initial copy processing for creating a pair on the storage system might take a long time. In this case, if resources are locked until the pair is created, other clients cannot use the resources of the resource group for a long time. Resources do not need to be locked by the REST API after the storage system accepts the request that creates a pair. Therefore, when you create a remote pair, we recommend that you unlock the resources after the job status is changed to "StorageAccepted".

Chapter 3: Common operations in the REST API

This chapter describes the common operations in the REST API, such as how to get information about jobs and generate sessions.

Getting the version information

The following request gets information about the version of the REST API.

Execution permission

No role is required to run this API request.

Request headers

This API request does not require authorization. Therefore, the Authorization header does not need to be specified.

Request line

```
GET base-URL/configuration/version
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "productName": "Configuration Manager REST API",
  "apiVersion": "1.57.0"
}
```

Attribute	Type	Description
productName	string	Name of the REST API
apiVersion	string	Version of the REST API

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -X GET
https://192.0.2.100:23451/ConfigurationManager/configuration/version
```

Getting a list of storage systems

The following request gets a list of the storage systems that can be operated from the REST API. You can check information about storage systems, such as the storage device ID and the serial number of the storage system.

Execution permission

No role is required to run this API request.

Request headers

This API request does not require authorization. Therefore, the Authorization header does not need to be specified.

Request line

```
GET base-URL/v1/objects/storages
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "storageDeviceId" : "A34000800556",
      "model" : "VSP One B28",
      "serialNumber" : 800556,
      "ip": "192.0.2.20"
    },
    {
      "storageDeviceId": "834000123456",
      "model": "VSP G400",
      "serialNumber": 123456,
      "svpIp": "192.0.2.100"
    },
    {
      "storageDeviceId": "834000123457",
      "model": "VSP G600",
      "serialNumber": 123457,
      "svpIp": "192.0.2.103"
    },
    {
      "storageDeviceId" : "886000123458",
      "model" : "VSP G900",
      "serialNumber" : 123458,
      "ctl1Ip" : "192.0.2.104",
      "ctl2Ip" : "192.0.2.105",
      "targetCtl" : "CTL1"
    }
  ]
}
```


For VSP One B20:

Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
ip	string	IP address (service IP) used to communicate with the storage system

Attribute	Type	Description
		If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.

For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:

Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
ctl1Ip	string	IP address of controller 1 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
ctl2Ip	string	IP address of controller 2 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
targetCtl	string	Controller operated by the REST API ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2

For VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500:

Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
svpIp	string	IP address of the SVP that manages the storage system

Attribute	Type	Description
		If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -X GET https://192.0.2.100:23451/
ConfigurationManager/v1/objects/storages
```

Getting information about a specific storage system

The following request gets information about a storage system by specifying the storage device ID.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID
```

Request message

Object ID

Specify the `storageDeviceId` value obtained by getting information about the storage systems.

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID

Query parameters

Attribute	Type	Filter Condition
detailInfoType	string	(Optional) Type of detailed information to be obtained The following values can be specified. To specify multiple values, separate the values by using commas. ▪ `version` Additional detailed information about the microcode of the storage system, controller 1, and controller 2 is obtained. ▪ `compressionAcceleration` Additional information indicating whether the compression accelerator of the capacity saving function can be used is obtained.

Body

None.

Response message

Body

For VSP One B20:

The following is an example of output for VSP One B28.

```
{
  "storageDeviceId" : "A34000800556",
  "model" : "VSP One B28",
  "serialNumber" : 800556,
  "ip": "192.0.2.20",
  "dkcMicroVersion" : "A3-00-00/00",
  "communicationModes" : [ {
    "communicationMode" : "lanConnectionMode"
  } ],
  "isSecure" : true,
  "ctlLocation" : "CTL02"
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system

Attribute	Type	Description
serialNumber	int	Serial number of the storage system
ip	string	IP address (service IP) used to communicate with the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
dkcMicroVersion	string	Microcode version of the storage system
communicationModes	object[]	Array of communication modes For the communication mode between the REST API server and the storage system, the following attributes are output: ▪ communicationMode (string) Communication mode ▪ `fcConnectionMode` ▪ `lanConnectionMode`
isSecure	boolean	Settings for SSL communication between the REST API server and the storage system ▪ `true`: SSL communication is enabled.
ctlLocation	string	Location of the storage system that is the communication destination of the REST API server

For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:

The following is an example of output for VSP G900.

```
{
  "storageDeviceId" : "886000123456",
  "model" : "VSP G900",
  "serialNumber" : 123456,
  "svpIp" : "192.0.2.100",
  "mappWebServerHttpsPort" : 443,
  "rmiPort" : 1099,
  "ctl1Ip" : "192.0.10.10",
  "ctl2Ip" : "192.0.10.11",
  "dkcMicroVersion" : "88-02-00/20",
  "communicationModes" : [ {
    "communicationMode" : "lanConnectionMode"
  } ],
```

```
  "isSecure" : true,
  "lanConnectionProtocol" : "DTLS SVP",
  "targetCtl" : "CTL1",
  "usesSvp" : true
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
usesSvp	boolean	Whether to link with an SVP ▪ `true`: Link with an SVP ▪ `false`: Do not link with an SVP
svpIp	string	IP address of the SVP This attribute is displayed if `true` is displayed for the `usesSvp` attribute. If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
rmiPort	int	The port number to be used for RMI communication between the Configuration Manager REST API server and the storage system This attribute is displayed if `true` is displayed for the `usesSvp` attribute.
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication This attribute is displayed if `true` is displayed for the `usesSvp` attribute.
ctl1Ip	string	IP address of controller 1 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
ctl2Ip	string	IP address of controller 2 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.

Attribute	Type	Description
targetCtl	string	Controller operated by the REST API ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2
dkcMicroVersion	string	Microcode version of the storage system
communicationModes	object[]	Array of communication modes For the communication mode between the REST API server and the storage system, the following attributes are output: ▪ communicationMode (string) Communication mode ▪ `fcConnectionMode` ▪ `lanConnectionMode`
isSecure	boolean	Settings for SSL communication between the REST API server and the storage system ▪ `true`: SSL communication is enabled.
lanConnectionProtocol	string	Encrypted communication mode used for SSL communication between the REST API server and the storage system ▪ `DTLS SVP` ▪ `SSL TLS` This attribute is displayed if `true` is displayed for the `usesSvp` attribute.

For VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500:

The following is an example of output for VSP G400.

```
{
  "storageDeviceId" : "834000123456",
  "model" : "VSP G400",
  "serialNumber" : 123456,
  "svpIp" : "192.0.2.100",
  "mappWebServerHttpsPort":443,
  "rmiPort" : 1099,
  "ctl1Ip": "192.0.10.10",
  "ctl2Ip": "192.0.10.11",
```

```
  "dkcMicroVersion" : "83-02-01/96",
  "communicationModes": [
    {
      "communicationMode": "proxyMode",
      "proxies": [
        {
          "proxyIp": "192.0.2.101",
          "proxyPort": 2010
        },
        {
          "proxyIp": "192.0.2.102",
          "proxyPort": 2011
        }
      ]
    },
    {
      "communicationMode": "lanConnectionMode"
    }
  ],
  "isSecure": false
}
```


Attribute	Type	Description
storageDeviceId	string	Storage device ID
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
svpIp	string	IP address of the SVP If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output.
rmiPort	int	The port number to be used for RMI communication between the Configuration Manager REST API server and the storage system This port is used by the API function to generate sessions and manage users.
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication This port is used when SSL communication is used between the REST API server and the storage system.

Attribute	Type	Description
		This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.
ctl1Ip	string	IP address of controller 1 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.
ctl2Ip	string	IP address of controller 2 of the storage system If both an IPv4 address and an IPv6 address are set on the storage system side, the IPv4 address is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.
dkcMicroVersion	string	Microcode version of the storage system
communicationModes	object[]	Array of communication modes If this array contains multiple elements, the top element is used first for communications.

Attribute	Type	Description
		For the communication mode between the REST API server and the storage system, the following attributes are output: ▪ communicationMode (string) Communication mode ▪ `proxyMode` ▪ `fcConnectionMode` ▪ `lanConnectionMode` ▪ proxies (object[]) Array of relay servers The following attributes are output when the `communicationMode` attribute is `proxyMode`: ▪ proxyIp (string) IP address of the relay server ▪ proxyPort (int) Port number of the relay server
isSecure	boolean	Settings for SSL communication between the REST API server and the storage system: ▪ `true`: SSL communication is enabled. ▪ `false`: SSL communication is disabled.
lanConnectionProtocol	string	Encrypted communication mode used for SSL communication between the REST API server and the storage system This attribute is displayed with any of the following values when the value of the `isSecure` attribute is `true`: ▪ `DTLS` ▪ `DTLS SVP` ▪ `SSL TLS` This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.

You can obtain detailed information about the microcode of the storage system by executing the request with `version` specified for the `detailInfoType` query parameter.

```
{
  "storageDeviceId": "886000123456",
  "model": "VSP G900",
  "serialNumber": 123456,
  "ctl1Ip" : "192.0.10.10",
  "ctl2Ip" : "192.0.10.11",
  "dkcMicroVersion": "88-01-01/82",
  "detailDkcMicroVersion": "88-01-01-60/82",
  "ctl1MicroVersion" : "88-01-01/81",
  "ctl2MicroVersion" : "88-01-01/81",
  "communicationModes": [
    {
      "communicationMode": "lanConnectionMode"
    }
  ],
  "isSecure": true
}
```

Attribute	Type	Description
detailDkcMicroVersion	string	Microcode version of the storage system Model identification information is included.
ctl1MicroVersion	string	GUM/ESM version of the controller 1 This attribute is displayed for storage systems VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models. If a failure has occurred in the GUM/ESM of controller 1, this information is not obtained.
ctl2MicroVersion	string	GUM/ESM version of the controller 2 This attribute is displayed for storage systems VSP One B20, VSP E series, VSP Gx00 models , VSP Fx00 models. If a failure has occurred in the GUM/ESM of controller 2, this information is not obtained.

When you specify `compressionAcceleration` for the `detailInfoType` parameter, information indicating whether the compression accelerator can be used is obtained.

```
{
  "storageDeviceId": "900000012345",
  "model": "VSP 5600H",
  "serialNumber": 12345,
  "svpIp": "192.0.2.100",
  "rmiPort" : 1099,
  "dkcMicroVersion": "90-08-01/00",
  "isCompressionAccelerationAvailable": true,
  "communicationModes": [
     {
       "communicationMode": "lanConnectionMode"
     }
  ],
    "isSecure": true
}
```

Attribute	Type	Description
isCompressionAccelerationAvailable	boolean	Whether the capacity saving function that uses a compression accelerator can be used ▪ `true`: Can be used ▪ `false`: Cannot be used If both of the following conditions are met, the value of the attribute will be `true`: ▪ The microcode version is a version for which the compression accelerator can be used or a later version. ▪ Hardware that executes the compression accelerator function is installed in the storage system. For details on the capacity saving function that uses a compression accelerator, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/834000123456
```

Registering a storage system

To start the storage operation from the REST API, register information about the storage system to the REST API server. If information (such as the IP address and port number) about the target storage system is changed, delete the information about the storage system, and then register the storage system again with the new information. For this API request, specify the user ID and password for accessing the storage system in the Authorization header. The specified user information is registered to the REST API server as information about the storage system.

Important:

- The user information registered on the REST API server is used by the REST API server when the storage system configuration information is refreshed or when information is obtained to update the information stored on the REST API server.
- After a storage system is registered on the REST API server, if the password of a registered user is changed by using the REST API or Storage Navigator, the change is not applied to the storage system information registered on the REST API server. To register the new password on the REST API server, use the API function for changing information about storage systems.

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages
```

Request message

Object ID

None.

Query parameters

None.

Body

- For VSP One B20:

  The following shows an example of coding when VSP One B28 is registered.

```
{
  "ip": "192.0.2.20",
  "model" : "VSP One B28",
  "serialNumber" : 800556,
  "changeNotificationSetting" : {
    "isNotifiable" : true
  },
  "isSecure" : true
}
```

Attribute	Type	Description
serialNumber	int	(Required) Serial number of the storage system to be registered
model	string	(Required) Model name of the storage system to be registered Specify one of the following values: ▪ VSP One B24 ▪ VSP One B26 ▪ VSP One B28
ip	string	(Required) IP address (service IP) used to communicate with the storage system You can specify an IPv4 or an IPv6 IP address. If both an IPv4 address and an IPv6 address are set on the storage system side, specify an IPv4 address.
changeNotification Setting	object	(Optional) Settings for receiving configuration-change notifications from the storage system

Attribute	Type	Description
		If the `changeNotificationSetting` attribute is omitted, the system operates in the same way as when the `isNotifiable` attribute is omitted. ▪ (Optional) isNotifiable (boolean) Specify whether to receive configuration-change notifications from the storage system. We strongly recommend that you specify `true` for this attribute. • `true`: Receive notifications • `false`: Do not receive notifications If `true` is specified for the `isNotifiable` attribute, an error occurs if the internal configuration-change notification test cannot be performed. If the attribute is omitted, the system assumes that `true` is specified for the `isNotifiable` attribute, and the internal processing continues even if the test cannot be performed. If the configuration-change notification test cannot be performed, change the value of the `isNotifiable` attribute to `false`. This will allow processing of the API request to end normally. To verify that the settings to receive configuration-change notifications are configured as intended, run the API request that gets a list of the destinations of configuration-change notifications from the storage system. If the Configuration Manager REST API server is registered as a destination for configuration-change notifications, this indicates that settings have been configured with `true` specified for the attribute.
isSecure	boolean	(Optional) Settings for SSL communication between the REST API server and the storage system ▪ `true`: SSL communication is enabled. If this attribute is omitted, `true` is set.

Attribute	Type	Description
		If you want to ensure communication security, you can enable SSL communication only.

- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:

  The following shows an example of coding when VSP G900 is registered.

```
{
  "ctl1Ip" : "192.0.10.10",
  "ctl2Ip" : "192.0.10.11",
  "model" : "VSP G900",
  "serialNumber" : 123456,
  "changeNotificationSetting" : {
    "isNotifiable" : true
  },
  "usesSvp" : true,
  "svpIp" : "192.0.2.100"
}
```

Attribute	Type	Description
serialNumber	int	(Required) Serial number of the storage system to be registered
model	string	(Required) Model name of the storage system to be registered Specify one of the following values: ▪ VSP E590 ▪ VSP E790 ▪ VSP E990 ▪ VSP E1090 ▪ VSP E590H ▪ VSP E790H ▪ VSP E1090H ▪ VSP G350 ▪ VSP G370 ▪ VSP G700 ▪ VSP G900

Attribute	Type	Description
		▪ `VSP F350` ▪ `VSP F370` ▪ `VSP F700` ▪ `VSP F900`
targetCtl	string	(Optional) Controller operated by the REST API Specify one of the following values: ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2 If this attribute is omitted, `CTL1` is set.
ctl1Ip	string	(Optional) IP address of controller 1 of the storage system You can specify an IPv4 or IPv6 IP address. If both an IPv4 and IPv6 IP addresses are specified on the storage system side as the IP address of the controller 1, specify an IPv4 address. If this attribute is omitted, the value is automatically set. If you specified `CTL1` for the `targetCtl` attribute or omitted the `targetCtl` attribute, be sure to specify this attribute.
ctl2Ip	string	(Optional) IP address of controller 2 of the storage system You can specify an IPv4 or IPv6 IP address. If both an IPv4 and IPv6 IP addresses are specified on the storage system side as the IP address of the controller 2, specify an IPv4 address. If this attribute is omitted, the value is automatically set. This attribute must be specified if `CTL2` is specified for `targetCtl`.
usesSvp	boolean	(Optional) Whether to link with an SVP ▪ `true`: Link with an SVP ▪ `false`: Do not link with an SVP If this attribute is omitted, `false` is set.

Attribute	Type	Description
		If you use an SVP to manage the storage system, we recommend linking the storage system with the SVP.
svpIp	string	(Optional) IP address of the SVP that will manage the storage system to be registered You can specify an IPv4 or IPv6 IP address. If both an IPv4 and IPv6 IP addresses are specified on the storage system side as the IP address of the SVP, specify an IPv4 address. This attribute must be specified if `true` is specified for `usesSvp`. If you specified `false` for the `usesSvp` attribute or omitted the `usesSvp` attribute, this attribute will be ignored even if it is specified. Even if the attribute is specified, it will not be registered. In addition, the value is not output by API requests to get storage system information.
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication If you specify `true` for the `usesSvp` attribute, and if the port number has been changed to anything other than the default value (`443`), be sure to specify this attribute. If this attribute is omitted, `443` is set. If you specified `false` for the `usesSvp` attribute or omitted the `usesSvp` attribute, this attribute will be ignored even if it is specified. Even if the attribute is specified, it will not be registered. In addition, the value is not output by API requests to get storage system information.
rmiPort	int	(Optional) The port number to be used for RMI communication between the Configuration Manager REST API server and the storage system If you specify `true` for the `usesSvp` attribute, and if the port number has been changed to anything other than the default value (`1099`), be sure to specify this attribute. If this attribute is omitted, `1099` is set.

Attribute	Type	Description
		If you specified `false` for the `usesSvp` attribute or omitted the `usesSvp` attribute, this attribute will be ignored even if it is specified. Even if the attribute is specified, it will not be registered. In addition, the value is not output by API requests to get storage system information.
isSecure	boolean	(Optional) Settings for SSL communication between the REST API server and the storage system ▪ `true`: SSL communication is enabled. If this attribute is omitted, `true` is set. If you want to ensure communication security, you can enable SSL communication only.
lanConnectionProtocol	string	(Optional) Specifies the encrypted communication mode used for SSL communication between the REST API server and the storage system ▪ `DTLS SVP` ▪ `SSL TLS` If this attribute is omitted, `DTLS SVP` is set. If `false` is specified for the `usesSvp` attribute, this attribute cannot be specified.
changeNotificationSetting	object	(Optional) Settings for receiving configuration-change notifications from the storage system

Attribute	Type	Description
		If the `changeNotificationSetting` attribute is omitted, the system operates in the same way as when the `isNotifiable` attribute is omitted. ▪ (Optional) isNotifiable (boolean) Specify whether to receive configuration-change notifications from the storage system. We strongly recommend that you specify `true` for this attribute. • `true`: Receive notifications • `false`: Do not receive notifications If `true` is specified for the `isNotifiable` attribute, an error occurs if the internal configuration-change notification test cannot be performed. If the attribute is omitted, the system assumes that `true` is specified for the `isNotifiable` attribute, and the internal processing continues even if the test cannot be performed. If the configuration-change notification test cannot be performed, change the value of the `isNotifiable` attribute to `false`. This will allow processing of the API request to end normally. To verify that the settings to receive configuration-change notifications are configured as intended, run the API request that gets a list of the destinations of configuration-change notifications from the storage system. If the Configuration Manager REST API server is registered as a destination for configuration-change notifications, this indicates that settings have been configured with `true` specified for the attribute.

- For storage systems VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500:

  The following shows an example of coding when VSP G400 is registered.

```
{
  "svpIp": "192.0.2.100",
  "serialNumber": 123456,
  "model": "VSP G400",
  "changeNotificationSetting": {
    "isNotifiable": true,
    "mappWebServerHttpsPort": 443
  }
}
```

Attribute	Type	Description
svpIp	string	(Required) IP address of the SVP that will manage the storage system to be registered You can specify an IPv4 or IPv6 IP address. If both an IPv4 and IPv6 IP addresses are specified on the storage system side as the IP address of the SVP, specify an IPv4 address.
rmiPort	int	(Optional) The port number to be used for RMI communication between the Configuration Manager REST API server and the storage system For VSP 5000 series, only `11099` can be specified. If this attribute is omitted, `11099` is set. For other series, if this attribute is omitted, `1099` is set.
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication Use this attribute when SSL communication is used between the REST API server and the storage system. You can use this attribute for VSP G200, G400, G600, G800, VSP F400, F600, F800 for which the microcode version is 83-04-44-*XX*/*XX* or later.

Attribute	Type	Description
		If the port number is changed from the default value `443`, specify the new value. If this attribute is omitted, `443` will be set. If this value has been changed, be sure to specify the same value as the `mappWebServerHttpsPort` attribute that is set when a notification about changes made to the storage system is received.
serialNumber	int	(Required) Serial number of the storage system to be registered
model	string	(Required) Model name of the storage system to be registered Specify one of the following values: ▪ `VSP 5100` ▪ `VSP 5200` ▪ `VSP 5500` ▪ `VSP 5600` ▪ `VSP 5100H` ▪ `VSP 5200H` ▪ `VSP 5500H` ▪ `VSP 5600H` ▪ `VSP G200` ▪ `VSP G400` ▪ `VSP G600` ▪ `VSP G800` ▪ `VSP G1000` ▪ `VSP G1500` ▪ `VSP F400` ▪ `VSP F600` ▪ `VSP F800` ▪ `VSP F1500` ▪ `VSP N400` ▪ `VSP N600` ▪ `VSP N800`

Attribute	Type	Description
isSecure#	boolean	(Optional) Settings for SSL communication between the REST API server and the storage system ▪ `true`: SSL communication is enabled. ▪ `false`: SSL communication is disabled. For VSP 5000 series, only `true` can be specified. If this attribute is omitted, `true` is set. For other series, if this attribute is omitted, `false` is set. For VSP G1000, VSP G1500, and VSP F1500 storage systems, we recommend using microcode version 80-05-2*X*-*XX*/*XX* or later.
lanConnectionProtocol#	string	(Optional) Specifies the encrypted communication mode used for SSL communication between the REST API server and the storage system You can use this attribute for VSP G200, G400, G600, G800, VSP F400, F600, F800 for which the microcode version is 83-04-44-*XX*/*XX* or later. You can set any of these values when `true` is set for the `isSecure` attribute. ▪ `DTLS` ▪ `DTLS SVP` ▪ `SSL TLS` If this attribute is omitted, `DTLS` is set.
changeNotificationSetting	object	(Optional) Settings for receiving configuration-change notifications from the storage system You can specify this attribute for VSP G200, G400, G600, G800, VSP F400, F600, F800 for which the microcode version is 83-04-*XX*-*XX*/*XX* or later, VSP G1000 storage systems for which the microcode version is 80-05-*XX*-*XX*/*XX* or later, VSP 5000 series, VSP G1500, or VSP F1500.

Attribute	Type	Description
		If the `changeNotificationSetting` attribute is omitted, the system operates in the same way as when the `isNotifiable` attribute is omitted. ▪ (Optional) isNotifiable (boolean) Specify whether to receive configuration-change notifications from the storage system. We strongly recommend that you specify `true` for this attribute. • `true`: Receive notifications • `false`: Do not receive notifications If `true` is specified for the `isNotifiable` attribute, an error occurs if the internal configuration-change notification test cannot be performed. If the attribute is omitted, the system assumes that `true` is specified for the `isNotifiable` attribute, and the internal processing continues even if the test cannot be performed. If the configuration-change notification test cannot be performed, change the value of the `isNotifiable` attribute to `false`. This will allow processing of the API request to end normally. To verify that the settings to receive configuration-change notifications are configured as intended, run the API request that gets a list of the destinations for configuration-change notifications from the storage system. If the Configuration Manager REST API server is registered as a destination for configuration-change notifications, this indicates that settings have been configured with `true` specified for the attribute.

Attribute	Type	Description
		▪ (Optional) mappWebServerHttpsPort (int) Port number used by the SVP for HTTPS communication For VSP G200, G400, G600, G800, VSP F400, F600, F800, if the port number has been changed from the default value `443`, specify the new value. You can set this value when `true` is set for the `isNotifiable` attribute. If this attribute is omitted, `443` will be set. If the microcode version of VSP G200, G400, G600, G800, VSP F400, F600, F800 is 83-04-44-*XX*/*XX* or later, and this value is changed, make sure that you specify the same value for the `mappWebServerHttpsPort` attribute that is set when SSL communication is used between the REST API server and the storage system.

#: If the management server is running a Linux OS and the REST API is installed by a non-root user, the values that can be specified will be restricted. For details, see the description of operation in an environment where the REST API is installed by a non-root user.

Response message

Body

```
{
  "storageDeviceId": "834000123456",
  "model": "VSP G400",
  "serialNumber": 123456
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID of the registered storage system
model	string	Model name of the registered storage system
serialNumber	int	Serial number of the registered storage system

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status codes	Message	Description
409	Conflict	The storage system is already registered with the specified storage device ID.
412	Precondition Failed	The specified action cannot be executed because the number of storage systems that can be registered exceeded the maximum.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -u rest-test:rest-api -X POST --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages
```

Changing information about a storage system

The following requests change information about the users of the storage systems registered in the REST API server, and information not about those users.

Run the API request according to your purpose as follows.

To change user information:

Specify the new user ID and password for the Authorization header, and then run an API request without specifying the request body. The user information specified for the Authorization header is applied to the user information of the storage system. Run this request separately from requests for which attributes are specified in the request body.

To change other information:

Run the request with attributes specified in the request body. Only the information that is specified will be changed. The user information of the storage system will not be updated.

To specify the `targetCtl` attribute in the request body (to change the controller on which the REST API operation is performed), run the API request with your user ID and password specified in the Authorization header.

Important:

- To change the following information, first delete the information about the storage system from the REST API server, and then change the settings for the target storage system. Then register the information about the storage system again.
  - Settings such as the IP address and port number of the storage system
  - If the storage system is a VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 model storage system, settings related to SVP link
- After a storage system is registered on the REST API server, if the password of a registered user is changed by using the REST API or Storage Navigator, the change is not applied to the storage system information registered on the REST API server. Use this API request to register the new password on the REST API server.

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `storageDeviceId` value obtained by getting information about the storage systems.

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID

Query parameters

None.

Body

```
{
  "isSecure": true
}
```

Attribute	Type	Description
isSecure#	boolean	(Optional) Settings for SSL communication between the REST API server and the storage system You cannot specify this attribute when the communication mode for the REST API server is proxyMode. ▪ `true`: SSL communication is enabled. ▪ `false`: SSL communication is disabled For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems, `false` cannot be specified. For VSP G1000, VSP G1500, and VSP F1500 storage systems, we recommend using microcode version 80-05-2*X*-*XX*/*XX* or later.
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication If the port number is changed from the default value `443`, specify the new value. **For VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the microcode version is 83-04-44-*XX*/*XX* or later)** Use this attribute when SSL communication is used between the REST API server and the storage system.

Attribute	Type	Description
		If this value has been changed, be sure to set the same value for the `mappWebServerHttpsPort` attribute that is specified during the registration of the destination for notifications about storage system configuration changes. **For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** Specify this attribute for a configuration that includes link to an SVP.
lanConnectionProtocol#	string	(Optional) Specifies the encrypted communication mode used for SSL communication between the REST API server and the storage system You can set any of these values when `true` is set for the `isSecure` attribute. **For VSP G200, G400, G600, G800, VSP F400, F600, F800 (when the microcode version is 83-04-44-*XX*/*XX* or later)** ▪ `DTLS` ▪ `DTLS SVP` ▪ `SSL TLS` **For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** Specify this attribute for a configuration that includes link to an SVP. ▪ `DTLS SVP` ▪ `SSL TLS`
targetCtl	string	(Optional) Controller operated by the REST API You can use this attribute for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Attribute	Type	Description
		Specify one of the following values: ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2

#: If the management server is running a Linux OS and the REST API is installed by a non-root user, the values that can be specified will be restricted. For details, see the description of operation in an environment where the REST API is installed by a non-root user.

Response message

Body

```
{
  "storageDeviceId" : "834000123456",
  "model" : "VSP G400",
  "serialNumber" : 123456
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID of the storage system about which information was changed
model	string	Model name of the storage system about which information was changed
serialNumber	int	Serial number of the storage system about which information was changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -u rest-test:rest-api -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456
```

Deleting information about a storage system

To remove a storage system from the management of the REST API, delete information about the storage system. If settings, such as the IP address or port number of the storage system, are changed or the storage system is removed, run this API request to delete information about the storage system, and then change the settings for the storage system. If you change the settings before deleting information about the storage system, you must specify the `force` attribute to forcibly delete the information. Processing for this API request might take a few minutes to finish.

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID
```

Request message

Object ID

Specify the `storageDeviceId` value obtained by getting information about the storage systems.

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "storageDeviceId" : "834000123456",
  "model" : "VSP G400",
  "serialNumber" : 123456
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID of the deleted storage system
model	string	Model name of the deleted storage system
serialNumber	int	Serial number of the deleted storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456
```

Forcibly deleting storage system information

Before you run this API request, if the settings for the target storage system were changed or the storage system was removed, you can forcibly delete the information about the storage system by specifying the `force` attribute. If you specify the `force` attribute, specify the local host (`localhost`, `127.0.0.1`, or `::1`) for the host name from the management server, and then run this API request. The following is a coding example and description for the `force` attribute:

```
{
  "force": true
}
```

Attribute	Type	Description
force	boolean	(Optional) Specify whether to forcibly delete the storage system information in the REST API. `true`: Forcibly deletes the storage system information. `false`: Does not forcibly delete the storage system information. If you do not specify a value, `false` is assumed.

Note:

Even if you forcibly delete information about a storage system, information about a REST API server that was registered as a configuration-change notification destination will not be deleted. To delete information about notification destinations, register the storage system again, and then run the API request for deleting notification destinations.

Getting summary information about storage systems

This request gets summary information about storage systems.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. You can use this API function for VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900 model storage systems if the storage system is in a configuration that is linked to an SVP.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/storage-summaries/instance
```

Request message

Object ID

Specify a value for `instance`. For objects that have only one instance, the value of `instance` is a fixed value (the object ID).

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `parityGroupCapacity` Gets additional capacity information about parity groups.

Body

None.

Response message

Body


```
{
  "name" : "VSP 5500",
  "svpMicroVersion" : "90-01-40/02",
  "rmiServerVersion" : "10_00_05",
  "numOfDiskBoards" : 8,
  "cacheMemoryCapacity" : 169984,
  "numOfSpareDrives" : 0,
  "totalOpenVolumeCapacity" : 5487,
  "totalOpenVolumeCapacityInKB" : 5754301448,
  "allocatedOpenVolumeCapacity" : 1853,
  "allocatedOpenVolumeCapacityInKB" : 1943911065,
  "allocatableOpenVolumeCapacity" : 877,
  "allocatableOpenVolumeCapacityInKB" : 919741295,
  "unallocatedOpenVolumeCapacity" : 3633,
  "unallocatedOpenVolumeCapacityInKB" : 3810390383,
  "reservedOpenVolumeCapacity" : 2756,
  "reservedOpenVolumeCapacityInKB" : 2890649088,
  "allocatedOpenVolumePhysicalCapacity" : 760,
  "allocatedOpenVolumePhysicalCapacityInKB" : 797214657,
  "allocatableOpenVolumePhysicalCapacity" : 328,
  "allocatableOpenVolumePhysicalCapacityInKB" : 344242149,
  "reservedOpenVolumePhysicalCapacity" : 1745,
  "reservedOpenVolumePhysicalCapacityInKB" : 1829765120,
  "allocatedMainframeVolumeCapacity" : 10,
  "allocatedMainframeVolumeCapacityInKB" : 11397000,
  "reservedMainframeVolumeCapacity" : 9,
  "reservedMainframeVolumeCapacityInKB" : 9744000,
  "totalAllocatedVolumeCapacity" : 1864,
  "totalAllocatedVolumeCapacityInKB" : 1955308065,
  "totalUnallocatedVolumeCapacity" : 3643,
```

```
  "totalUnallocatedVolumeCapacityInKB" : 3820134383,
  "totalReservedVolumeCapacity" : 2766,
  "totalReservedVolumeCapacityInKB" : 2900393088,
  "totalMainframeVolumeCapacity" : 20,
  "totalMainframeVolumeCapacityInKB" : 21141000,
  "totalVolumeCapacity" : 5507,
  "totalVolumeCapacityInKB" : 5775442448,
  "numOfOpenVolumes" : 6502,
  "numOfAllocatedOpenVolumes" : 509,
  "numOfAllocatableOpenVolumes" : 5671,
  "numOfReservedOpenVolumes" : 322
}
```


In the descriptions in this table, the following volumes include internal volumes and external volumes:

- Open system volumes
- Mainframe volumes
- Intermediate volumes

Attribute	Type	Description
name	string	Name of the storage system
svpMicroVersion	string	Microcode version of the SVP
rmiServerVersion	string	Version of the RMI server
numOfDiskBoards	int	Number of disk boards Replace "disk board" with "disk adapter" or "disk blade" depending on the storage system.
cacheMemoryCapacity	long	Current cache capacity (MB)
numOfSpareDrives	int	Number of spare drives This parameter is output if the storage system is VSP 5000 series, VSP G200, G400, G600, G800, VSP F400, F600, F800. This parameter is output if the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP.
totalOpenVolumeCapacity	long	The total capacity of the open system volumes (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.

Attribute	Type	Description
totalOpenVolumeCapacityInKB	long	The total capacity of the open system volumes (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatedOpenVolumeCapacity	long	From among the open system volumes, the total capacity of volumes to which LU paths are allocated or to which namespaces are set (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatedOpenVolumeCapacityInKB	long	From among the open system volumes, the total capacity of volumes to which LU paths are allocated or to which namespaces are set (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatableOpenVolumeCapacity	long	From among the open system volumes, the total capacity of volumes to which LU paths can be allocated or to which namespaces can be set (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatableOpenVolumeCapacityInKB	long	From among the open system volumes, the total capacity of volumes to which LU paths can be allocated or to which namespaces can be set (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.
unallocatedOpenVolumeCapacity	long	From among the open system volumes, the total capacity of volumes to which LU paths are not allocated and to which namespaces are not set (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
unallocatedOpenVolumeCapacityInKB	long	From among the open system volumes, the total capacity of volumes to which LU paths are not allocated and to which namespaces are not set (KB)

Attribute	Type	Description
		This total capacity includes the capacity of DP volumes and other virtual volumes.
reservedOpenVolumeCapacity	long	From among the open system volumes, the total capacity of reserved volumes, pool volumes, and the S-VOLs of snapshots (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
reservedOpenVolumeCapacityInKB	long	From among the open system volumes, the total capacity of reserved volumes, pool volumes, and the S-VOLs of snapshots (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatedOpenVolumePhysicalCapacity	long	From among the open system volumes, the total capacity of volumes to which LU paths are allocated or to which namespaces are set (GB) This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
allocatedOpenVolumePhysicalCapacityInKB	long	From among the open system volumes, the total capacity of volumes to which LU paths are allocated or to which namespaces are set (KB) This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
allocatableOpenVolumePhysicalCapacity	long	From among the open system volumes, the total capacity of volumes to which LU paths can be allocated or to which namespaces can be set (GB) This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
allocatableOpenVolumePhysicalCapacityInKB	long	From among the open system volumes, the total capacity of volumes to which LU paths can be allocated or to which namespaces can be set (KB)

Attribute	Type	Description
		This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
reservedOpenVolumePhysicalCapacity	long	From among the open system volumes, the total capacity of reserved volumes and pool volumes (GB) This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
reservedOpenVolumePhysicalCapacityInKB	long	From among the open system volumes, the total capacity of reserved volumes and pool volumes (KB) This is the total capacity of physical volumes, excluding the capacity of DP volumes and other virtual volumes.
numOfOpenVolumes	int	Total number of open system volumes
numOfAllocatedOpenVolumes	int	Total number of open system volumes to which LU paths are allocated or to which namespaces are set
numOfAllocatableOpenVolumes	int	Total number of open system volumes to which LU paths are not allocated and to which namespaces are not set
numOfReservedOpenVolumes	int	From among the open system volumes, the total number of reserved volumes, pool volumes, and the S-VOLs of snapshots
allocatedMainframeVolumeCapacity	long	From among the mainframe volumes and intermediate volumes, the total capacity of internal volumes and external volumes excluding virtual volumes (excluding reserved volumes and pool volumes) (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
allocatedMainframeVolumeCapacityInKB	long	From among the mainframe volumes and intermediate volumes, the total capacity of internal volumes and external volumes excluding virtual volumes (excluding reserved volumes and pool volumes) (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.

Attribute	Type	Description
reservedMainframeVolumeCapacity	long	From among the mainframe volumes and intermediate volumes, the total capacity of reserved volumes, pool volumes, and the S-VOLs of snapshots (GB) This total capacity includes the capacity of DP volumes and other virtual volumes.
reservedMainframeVolumeCapacityInKB	long	From among the mainframe volumes and intermediate volumes, the total capacity of reserved volumes, pool volumes, and the S-VOLs of snapshots (KB) This total capacity includes the capacity of DP volumes and other virtual volumes.
totalAllocatedVolumeCapacity	long	Total capacity of the volumes (in GB) to which LU paths are allocated or to which namespaces are set from among the open system volumes, and internal volumes and external volumes excluding virtual volumes (excluding reserved volumes and pool volumes) from among the mainframe volumes and intermediate volumes This total capacity includes the capacity of DP volumes and other virtual volumes.
totalAllocatedVolumeCapacityInKB	long	Total capacity of the volumes (in KB) to which LU paths are allocated or to which namespaces are set from among the open system volumes, and internal volumes and external volumes excluding virtual volumes (excluding reserved volumes and pool volumes) from among the mainframe volumes and intermediate volumes This total capacity includes the capacity of DP volumes and other virtual volumes.
totalUnallocatedVolumeCapacity	long	Total capacity of the volumes (in GB) to which LU paths are not allocated and to which namespaces are not set from among the open system volumes, and the reserved volumes, pool volumes, and the S-VOLs of snapshots from among the mainframe volumes and intermediate volumes This total capacity includes the capacity of DP volumes and other virtual volumes.

Attribute	Type	Description
totalUnallocatedVolumeCapacityInKB	long	Total capacity of the volumes (in KB) to which LU paths are not allocated and to which namespaces are not set from among the open system volumes, and the reserved volumes, pool volumes, and the S-VOLs of snapshots from among the mainframe volumes and intermediate volumes This total capacity includes the capacity of DP volumes and other virtual volumes.
totalReservedVolumeCapacity	long	Total number of reserved volumes, pool volumes, and the S-VOLs of snapshots (GB)
totalReservedVolumeCapacityInKB	long	Total number of reserved volumes, pool volumes, and the S-VOLs of snapshots (KB)
totalMainframeVolumeCapacity	long	Total capacity of the mainframe volumes and intermediate volumes (GB)
totalMainframeVolumeCapacityInKB	long	Total capacity of the mainframe volumes and intermediate volumes (KB)
totalVolumeCapacity	long	Total capacity of the open system volumes, mainframe volumes, and intermediate volumes (GB)
totalVolumeCapacityInKB	long	Total capacity of the open system volumes, mainframe volumes, and intermediate volumes (KB)

If you run this request with `parityGroupCapacity` specified for the query parameter `detailInfoType`, capacity information about parity groups is also obtained.

Attribute	Type	Description
totalAvailableParityGroupCapacity	long	Total free capacity of available parity groups and external volume groups (GB)
totalAvailableParityGroupCapacityInKB	long	Total free capacity of available parity groups and external volume groups (KB) If the information cannot be obtained, `-1` is output, indicating an invalid value.
largestAvailableParityGroupCapacity	long	Free capacity of the parity group that has the largest available capacity or of external volume groups (KB)

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/storage-
summaries/instance?detailInfoType=parityGroupCapacity
```

Getting a list of sessions

The following request gets a list of valid sessions on the REST API server. Only a user who belongs to the Administrator user group (built-in user group) can perform this operation.

Execution permission

Administrator user group (built-in user group)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/sessions
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "data": [
    {
      "sessionId": 8,
      "userId": "rest-user",
      "ipAddress": "192.0.2.100",
      "createdTime": "2015-09-14T01:02:24Z",
      "lastAccessedTime": "2015-09-14T01:02:24Z"
```

```
    },
    {
      "sessionId": 6,
      "userId": "api-user",
      "ipAddress": "192.0.2.100",
      "createdTime": "2015-09-14T00:59:58Z",
      "lastAccessedTime": "2015-09-14T00:59:58Z"
    },
    {
      "sessionId": 5,
      "userId": "admin-user",
      "ipAddress": "192.0.2.100",
      "createdTime": "2015-09-14T00:59:53Z",
      "lastAccessedTime": "2015-09-14T00:59:53Z"
    }
  ]
}
```


Attribute	Type	Description
sessionId	int	Session ID
userId	string	User ID that was used to generate the session
ipAddress	string	IP address of the REST API client that was used to generate the session If the REST API client accesses the REST API server via another server, a character string consisting of the concatenated IP addresses of the client and of the server used to access the REST API server (the content of the X-Forwarded-For header received by the REST API server) will be output.
createdTime	ISO8601string	Time the session was generated
lastAccessedTime	ISO8601string	Time the session was last used

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/sessions/
```

Getting information about a specific session

The following request gets information about a valid session on the REST API server by specifying a session ID. For the Authorization header of the request, specify the token of the session.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/sessions/object-ID
```

Request message

Object ID

Specify the value of `sessionId` that was obtained when the session was generated.

Attribute	Type	Description
sessionId	int	(Required) Session ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "token": "97c13b80-8244-4b36-bc21-03026205fa64",
  "sessionId": 9
}
```

Attribute	Type	Description
sessionId	int	Session ID
token	string	Token

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/sessions/9
```

Generating sessions

The following request generates sessions and manages the sessions on the REST API server. A maximum of 64 sessions can be generated for each storage system. When the number of sessions exceeds the maximum number of sessions, the HTTP status code 503 is returned. In this case, wait a while and then run the request again.

Note: For remote copy, specify at least 60 seconds for the `aliveTime` attribute of the sessions generated on the remote storage system. If you specify less than 60 seconds, the session on the remote storage system might time out, causing the execution of a request to fail.

Execution permission

Storage Administrator (View Only)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/sessions
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example specifies the time until a session timeout:

```
{
  "aliveTime": 5
}
```

Attribute	Type	Description
aliveTime	long	(Optional) Session timeout value (in seconds) Specify a value in the range from `1` to `300`#. If this attribute is omitted, `300` is assumed.
authenticationTimeout	long	(Optional) Timeout value for authentication processing (in seconds) Specify this value if an external authentication server is being used to authenticate users. You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. Change the value according to the external authentication settings of the storage system. Specify a value in the range from `1` to `900`. If this attribute is omitted, `120` is assumed.

#:

- There is a margin of error of between -20 seconds to +5 seconds before the session times out. If the execution of an API request fails with the KART40047-E error, which indicates an invalid session, generate a new session and then run the API request again.
- If either of the following conditions applies and you generate a session with less than 20 seconds specified for the `aliveTime` attribute, you might not be able to run API requests depending on the load on the system. Specify 20 seconds or more for the `aliveTime` attribute.
  - The storage system is aVSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, and the communication mode for the REST API server is fcConnectionMode.
  - The storage system is a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, and a link to the SVP is established in the configuration.

Response message

Body

```
{
  "token": "b74777a3-f9f0-4ea8-bd8f-09847fac48d3",
  "sessionId": 3
}
```

Attribute	Type	Description
sessionId	int	Session ID An ID that is used to manage sessions.
token	string	Token Information that is used to identify the source that issues requests as a specific user.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -u rest-test:rest-api -X POST https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/sessions/ -d ""
```

Discarding sessions

The following request discards the sessions that are no longer required. If a session is discarded, the lock obtained in that session is unlocked at the same time. For the Authorization header of the request, specify the token for a session to be discarded.

Execution permission

Storage Administrator (View Only)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/sessions/object-ID
```

Request message

Object ID

Specify the value of `sessionId` that was obtained when the session was generated. A user who belongs to the Administrator user group (built-in user group) can specify the value of `sessionId` that was obtained by the processing to get information about sessions.

Attribute	Type	Description
sessionId	int	(Required) Session ID

Query parameters

None.

Body

```
{
  "force": true
}
```

Attribute	Type	Description
force	boolean	Specify whether to force discarding of the session generated by other users, in addition to the session you generated. Only a user who belongs to the Administrator user group (built-in user group) can specify this attribute. ▪ `true`: Forces discarding of the session generated by other users, in addition to the session you generated. ▪ `false`: Forces discarding of only the session you generated. If you omit this value, `false` is used.

Response message

Body

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary
@./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/sessions/1
```

Getting a list of job information

The following request gets a list of information about jobs that were submitted by the user from the REST API. Only a user who belongs to a user group with the Storage Administrator (System Resource Management) role can get information about all the registered jobs. Job information can be used to check APIs that were issued and to identify the cause of a problem in the storage system.

Execution permission

No role is required to run this API request. Only the users authenticated by the storage system can issue this API request.

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/jobs
```

Request message

Object ID

None.

Query parameters

If no query parameters are specified, the request gets information about 100 jobs that can be referenced by the user and were submitted after the other jobs.

Parameter	Type	Filter Condition
startCreatedTime	ISO8601string	(Optional) Specify the submission start time of the jobs for which you want to get information. Specify the time in YYYY-MM-DDThh:mm:ssZ format. The request gets information about jobs that were submitted on and after the specified time.
endCreatedTime	ISO8601string	(Optional) Specify the submission end time of the jobs for which you want to get information. Specify the time in YYYY-MM-DDThh:mm:ssZ format. The request gets information about jobs that were submitted before the specified time.
count	int	(Optional) Specify a number from `1` to `100` for the number of jobs for which you want to get information. The specified number is the maximum number of jobs for which information will be obtained. If this is omitted, `100` is assumed.

Parameter	Type	Filter Condition
status	string	(Optional) Specify one of the following values for the status of the jobs for which information is to be obtained. ▪ `Initializing`: The jobs are being initialized. If you also need to specify a value for "state", you must specify `Queued` for "state". ▪ `Running`: The jobs are running. If you also need to specify a value for "state", you must specify `Started` for "state". ▪ `Completed`: The jobs have been completed. If you also need to specify a value for "state", you must specify `Succeeded`, `Failed`, or `Unknown` for "state".
state	string	(Optional) Specify one of the following values for the status (state) of the jobs for which information is to be obtained. ▪ `Queued`: The jobs have been queued. ▪ `Started`: The jobs have been started. ▪ `Succeeded`: The jobs finished successfully. ▪ `Failed`: The jobs failed. ▪ `Unknown`: The state of the jobs is unknown.

The following example gets information about a maximum of 30 jobs that ended normally and were submitted after other jobs during the period from "2015/05/01 08:00:00" to "2015/05/31 23:59:59".

```
?startCreatedTime=2015-05-01T08:00:00Z&endCreatedTime=2015-05-
31T23:59:59Z&count=30&state=Succeeded
```

Body

None.

Response message

Body

```
{
  "data": [
```

```
    {
      "jobId": 2,
      "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/2",
      "userId": "rest-test",
      "status": "Completed",
      "state": "Succeeded",
      "createdTime": "2015-09-14T02:08:13Z",
      "updatedTime": "2015-09-14T02:08:13Z",
      "completedTime": "2015-09-14T02:08:13Z",
      "request": {
        "requestUrl": "/ConfigurationManager/v1/836000123456/services/resource-
group-service/actions/lock/invoke",
        "requestMethod": "PUT",
        "requestBody": {
          "parameters": {
            "waitTime": null
          }
        }
      },
      "affectedResources": [
        "/ConfigurationManager/v1/objects/storages/836000123456/resource-
groups"
      ]
    },
    {
      "jobId": 1,
      "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/1",
      "userId": "rest-test",
      "status": "Completed",
      "state": "Failed",
      "createdTime": "2015-09-14T02:04:11Z",
      "updatedTime": "2015-09-14T02:04:12Z",
      "completedTime": "2015-09-14T02:04:12Z",
      "request": {
        "requestUrl": "/ConfigurationManager/v1/836000123456/services/resource-
group-service/actions/lock/invoke",
        "requestMethod": "PUT",
        "requestBody": {
          "parameters": {
            "waitTime": null
          }
        }
      },
      "error": {
        "errorSource": "/ConfigurationManager/v1/836000123456/services/
resource-group-service/actions/lock/invoke",
        "message": "An error occurred in the storage system. (message =
Access denied with Lock/Unlock)",
        "cause": "An error occurred during execution of a CCI command.",
```

```
        "solution": "See the manual of the CCI and remove the cause of the
error.",
        "messageId": "KART30000-E",
        "errorCode": {
          "errorCode": "EX_EACCES"
        }
      }
    }
  ]
}
```


Attribute	Type	Description
data	object[]	Job information (job objects) created by the user from the REST API. The maximum number of jobs for which you can get information at one time is 100.

For details on the job object schema, see the section explaining job objects.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/jobs
```

Getting job information

The following request gets, at a specific timing, information about a specified job that was submitted by the user from the asynchronous API. Only a user who belongs to a user group with the Storage Administrator (System Resource Management) role can also obtain information about jobs submitted by other users. The obtained information can be used to check the job status.

Execution permission

No role is required to run this API request. Only the users authenticated by the storage system can issue this API request.

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/jobs/object-ID
```

Request message

Object ID

Specify the `jobId` value obtained by getting information about the job list or the response message of the asynchronous API.

Attribute	Type	Description
jobId	long	(Required) Job object ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "jobId": 3,
  "self": "/ConfigurationManager/v1/objects/storages/836000123456/jobs/3",
  "userId": "rest-test",
  "status": "Completed",
  "state": "Succeeded",
  "createdTime": "2015-09-14T02:08:13Z",
  "updatedTime": "2015-09-14T02:08:13Z",
  "completedTime": "2015-09-14T02:08:13Z",
  "request": {
    "requestUrl": "/ConfigurationManager/v1/836000123456/services/resource-
group-service/actions/lock/invoke",
    "requestMethod": "PUT",
    "requestBody": {
      "parameters": {
        "waitTime": null
      }
    }
  },
  "affectedResources": [
    "/ConfigurationManager/v1/objects/storages/836000123456/resource-groups"
  ]
}
```

For details on the job object schema, see the description on job objects.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status codes	Message	Description
404	Not Found	▪ There is no information corresponding to the specified job ID. ▪ The user who issued the API request is not the user who submitted the job corresponding to the specified job ID.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/jobs/3
```

Locking a resource group

The following request locks resources of a resource group allocated to the user who runs API requests, preventing other users from performing operations on the resources. Exclusive control by locking is performed on a session basis. To run requests on the locked resources, specify as the Authorization header the token of the session that was specified when the resources were locked.

Execution permission

Storage Administrator (View Only)

Request line

```
PUT base-URL/v1/storage-device-ID/services/resource-group-service/actions/lock/invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "parameters": {
    "waitTime": 30
  }
}
```

Attribute	Type	Description
waitTime	int	The time that elapses before a lock timeout (in seconds) Specify a value from 0 to 7200 for the maximum wait time that elapses before a lock timeout occurs, for cases such as when the target resource is already locked by other sessions. If this value is omitted, 0 is specified.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the resource group that obtained a lock

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Status code	Message	Description
503	Service unavailable	The operation cannot be performed because an API operation that locks or unlocks resources is being run by using the same session.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/836000123456/
services/resource-group-service/actions/lock/invoke
```

Unlocking a resource group

The following request unlocks a resource group. For the Authorization header of the request for releasing the lock, specify the token of the session that got the lock.

Execution permission

Storage Administrator (View Only)

Request line

```
PUT base-URL/v1/storage-device-ID/services/resource-group-service/actions/unlock/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resource group that was unlocked

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Status code	Message	Description
503	Service unavailable	The operation cannot be performed because an API operation that locks or unlocks resources is being run by using the same session.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/836000123456/services/resource-group-
service/actions/unlock/invoke -d ""
```

Chapter 4: User management and access control

This chapter describes how to manage users and control access to storage system resources by using the REST API.

Overview of user management and access control

To perform operations on storage system resources, users must have the appropriate roles (execution permissions) and access permissions for the resources on which the operations are to be performed. Before using the REST API, users with the required roles and access permissions must be created.

For storage systems, resource groups and user groups are used to manage the roles and access permissions of users.

Resource group

Resource groups are used to classify and manage resources in the storage system. Only users who have access permissions for a resource group can perform operations on the resources (such as parity groups, LDEVs, and ports) that are added to that resource group.

User group

User groups are used to group users who have the same roles and access permissions for the resources in the storage system. To specify the operations that users in a user group can perform, assign a role to the user group. To specify the resources that the users in a user group can access, assign a resource group to the user group.

Role

Roles are execution permissions for resources. Roles are already set up, and the operations that users of each role can perform on resources are already defined. For details on the roles required to run a particular API request, see the description on that API request.

For storage systems where a password policy can be set, the user account operation methods follow the set policy. For details, see the section explaining password policies in the *System Administrator Guide* or the release note.

For storage systems where a password policy can be set, you can specify the settings so that the user is requested to change their password when they login for the first time after the user is created or changing the password. In this case, change the password at the first login from the maintenance utility or Hitachi Device Manager - Storage Navigator. You cannot use the REST API for changing a user's password to change the password at the first login.

The users, user groups, and resource groups created by using the REST API can also be used from Hitachi Device Manager - Storage Navigator. Note that the types of characters that can be used for user IDs and passwords differ between the REST API and Hitachi Device Manager - Storage Navigator. To use Hitachi Device Manager - Storage Navigator to create users who can use the REST API, specify a user ID and password in accordance with the rules for the REST API.

For the user group name and resource group name, you can use the same characters as those that can be used when creating groups in Hitachi Device Manager - Storage Navigator.

For details about user management and access control for storage systems, see the *System Administrator Guide*.

Note:

- If a user uses the REST API to lock the resources of a storage system, operations on the users, user groups, or resource groups will no longer be able to be performed. In such a case, unlock the resources before performing these operations.
- For the VSP 5000 series, it takes several minutes for the latest information to be applied to the cache after you create or delete a resource group or add or delete resources belonging to a resource group. For this reason, if you attempt to perform operations on user groups or users after performing any of these operations related to resource groups, the request might fail. If the request fails, wait for a while, and then run the request again.

User management and access control operations

The following table lists the user management and access control operations that can be performed from the REST API, as well as the storage systems for which each type of operation can be performed.

Operations for resource groups

Target storage system	Operation			
	Creating and deleting resource groups	Registering and deleting resources	Getting a list of resource groups	Getting information about a specific resource group
VSP One B20	Y	Y	Y	Y
VSP 5000 series	Y	Y	Y	Y
E series, Gx00 or Fx00	Y	Y	Y	Y
G1000, G1500, or F1500	Y	Y	Y	Y

Operations for user groups

Target storage system	Operation				
	Creating and deleting user groups	Changing user group settings (assigning roles, etc.)	Assigning and releasing resource groups	Getting a list of user groups	Getting information about a specific user group
VSP One B20	Y	Y	Y	Y	Y
VSP 5000 series	Y	Y	Y	Y	Y
E series, Gx00 or Fx00	Y	Y	Y	Y	Y
G1000, G1500, or F1500	N	N	N	Y	Y

Operations for users

Target storage system	Operation				
	Creating and deleting user accounts	Changing passwords	Registering and deleting user groups	Getting a list of users	Getting information about a specific user
VSP One B20	Y	Y	Y	Y	Y
VSP 5000 series	Y	Y	Y	Y	Y
E series, Gx00 or Fx00	Y	Y#	Y	Y	Y
G1000, G1500, or F1500	Y	Y	Y	Y	Y

(Legend)

Y: The operation can be performed from the REST API.

N: The operation cannot be performed from the REST API.

#: If either of the following conditions is met, you can simultaneously change the user password that is registered in the Storage Device list on the SVP:

- You are using a VSP G200, G400, G600, G800, VSP F400, F600, F800 storage system whose microcode version is 83-05-2*X*-*XX*/*XX* or later.
- You are using a VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system whose microcode version is 88-03-0*X*-*XX*/*XX* or later, and a link to the SVP is established in the configuration.
- You are using a VSP E series storage system, and a link to the SVP is established in the configuration.

For operations that cannot be performed from the REST API, use Hitachi Device Manager - Storage Navigator.

Changing passwords of user accounts of VSP E series, VSP Gx00 models or VSP Fx00 models

You can use the REST API to manage the passwords of the following user accounts:

1. The user accounts of the storage system

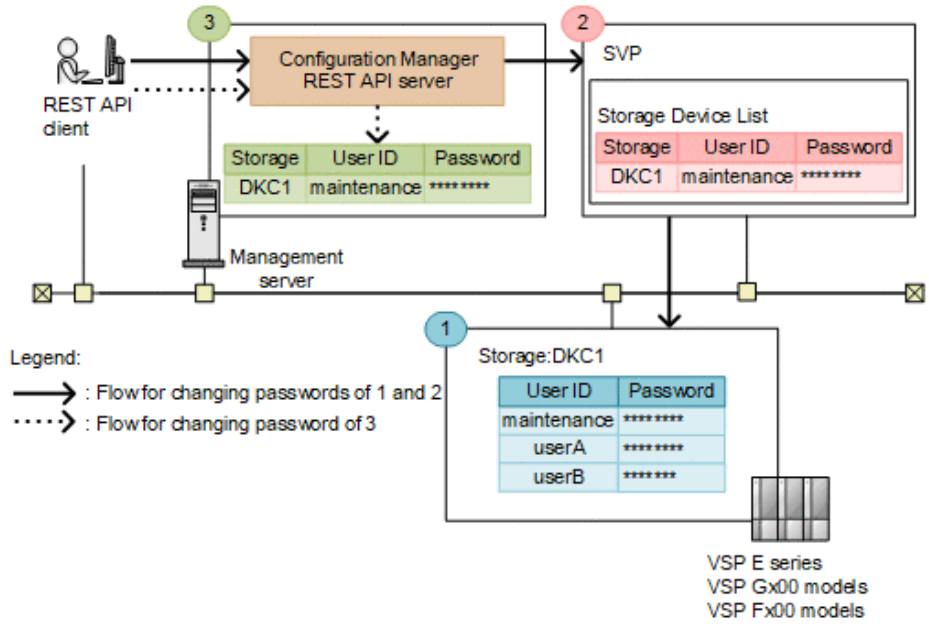
   These users perform operations on the storage system resources. Information about the users is stored on the storage system. These users are specified in the Authorization header of the REST API request.

2. The user account registered in the Storage Device List

   This user is registered in the Storage Device List during initial setup of the SVP. Information about the user is stored on the SVP.

3. The user accounts of the storage systems registered in the REST API server

   These users are specified in the Authorization header when a storage system is registered in the REST API server. Information about the users is stored on the REST API server.



If the same user account is registered in 1 and 2, you can change the password of the user account of 1 and 2 at the same time by using the API request for changing the password of the user. The request line of the API is as follows:

```
PUT base-URL/v1/objects/storages/storage-device-ID/users/object-ID
```

To change the password of a user account of 3, use the API request for changing information about a storage system. The request line of the API is as follows:

```
PUT base-URL/v1/objects/storages/storage-device-ID
```

If the user account of 1, 2, and 3 are the same, change the password of the user account of 1 and 2 first, and then change the password of the user account of 3.

If the user account registered in the Storage Device List is deleted by using the API request for deleting a user account, management software (such as the REST API and Storage Navigator) becomes unavailable.

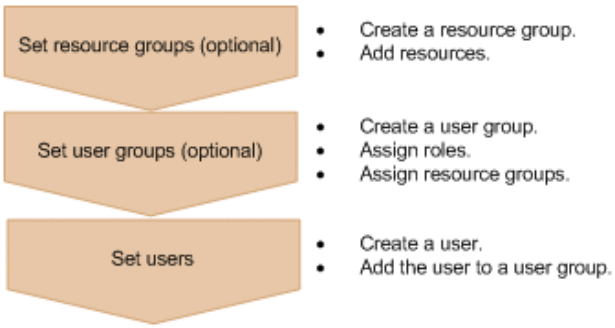
Therefore, when performing operations, be careful of the order in which passwords are changed and the information about users that is used within the system.

Workflow for user management and access control

This section describes the workflow for creating users who will perform operations on storage systems and for setting access permissions for the resources necessary for those operations.

When using the REST API to create a user, specify a user group to which the user will belong. Assign, in advance, resource groups and roles to the user group based on the types of resources on which the users in that user group can operate and the operation permissions of users in that user group.

The following figure shows the workflow for specifying user and access control settings. If you are using the meta_resource group or built-in user group, you do not need to configure the resource group or the user group.



Set resource groups

Create a resource group, and then add resources such as parity groups, LDEVs, and ports. Group resources by business or organization into units for controlling access.

Set user groups

Create a user group. Assign resource groups and roles based on the types of resources on which the users in that user group can operate and the operation permissions of users in that user group.

Set users

Create a user. Specify the user group to which the user will belong, and then add the user to that user group. The user then can use the resources in the resource groups assigned to the user group according to the assigned roles.

Input rules for user IDs and passwords

When creating users who will perform operations on storage systems from the REST API, specify user IDs and passwords consisting of the characters described in the following table.

If you want to include symbols in a request body, be sure to escape the symbols as required for JSON format.

Item	Number of characters	Specifiable characters
User ID	1 to 63 characters	You can use the following characters.# ▪ Alphanumeric characters ▪ The following symbols: `! # $ % & ' * + - . / = ? @ ^ _ ` { | } ~` • User IDs that contain forward slashes (`/`) cannot be used as object IDs. • User IDs that contain percent signs (`%`) or plus signs (`+`) cannot be used as object IDs for the following API requests: API request for adding users to user groups API request for removing users from user groups
Password	6 to 63 characters	You can use the following characters.# ▪ Alphanumeric characters ▪ ASCII symbols which can be keyed in except space: `! # $ % & ' ( ) * + , - . / : ; < = > ? @ [ \ ] ^ _ ` { | } ~`

#: For target storage systems whose microcode versions are earlier than those supported by Configuration Manager 8.6.2, if one of the following conditions is met, the specifiable characters might vary.

- The storage system model is VSP G1000, VSP G1500, or VSP F1500, and SSL communication is used for communication with the REST API server.
- The storage system model is VSP G200, G400, G600, G800, or VSP F400, F600, F800, and SSL communication (the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode) is used for communication with the REST API server.
- The storage system model is VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900.

In this case, you can use the following characters for User ID.

- Alphanumeric characters
- The following symbols:

  `- . / @ _`

In this case, you can use the following characters for Password.

- Alphanumeric characters
- The following symbols:

  , - . / @ _ \

Note:

- For storage systems where a password policy can be set, the number of characters and strings that can be used follow the set policy. For details, see the section explaining password policies in the *System Administrator Guide* or the release note.
- When creating a user account that will not be used for the REST API but will be used for other products, you can use the number of characters in the `userId` and `userPassword` attributes of the API function for creating a user account, and in the `userPassword` attribute of the API function for changing the password of the user.Specify the user ID and password according to input restrictions (specifiable characters and the required number of characters) of the software for which the user account will be used. Note that, if you create an account for which the user ID or password does not adhere to the input restrictions in the preceding table, you will not be able to use the account to run the REST API.
  - The `userId` attribute: 1 to 256 characters
  - The `userPassword` attribute: 6 to 256 characters
- If you use another product to create a user account whose password includes a double quotation mark ("), you can use that user account to run the REST API. However, you cannot use the REST API to create a user account whose password includes a double quotation mark or to change a password to one that includes a double quotation mark.

Getting a list of resource groups

The following request gets information about resource groups registered in the storage system. The obtained information can be used to check the lock status of each resource group, as well as the user ID or the name of the host that locked a resource group. You can also use a query parameter to get information about only certain resources of interest.

Important:

Note the following when executing this API request.

- For a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".
- If the storage system model is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, in a configuration in which no link is established to the SVP, when configuration information of a storage system is updated, this API request is run on the Platform REST API server. While this API request is running, it might affect the execution of API requests for which the number of concurrent executions is restricted.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/resource-groups
```

Request message

Object ID

None.

Query parameters

To filter execution results:

Parameter	Type	Filter condition
lockStatus	string	(Optional) Lock status of the resource group ▪ `Locked`: Gets information about the locked resource groups ▪ `Unlocked`: Gets information about the unlocked resource groups

To get information about only certain types of resources in resource groups:

You can reduce the request processing time by using the following query parameter to get information about only certain resources of interest.

Parameter	Type	Filter condition
attributes	string	(Optional) Type of resource for which information is to be obtained Information will be obtained about only resources corresponding to the specified attributes. To specify multiple attributes, separate the attributes by using commas. You can use this parameter in combination with the `lockStatus` parameter. This parameter cannot be specified at the same time as the `detailInfoType` parameter. ▪ `ldevIds`: LDEV numbers ▪ `parityGroupIds`: Parity group numbers ▪ `externalParityGroupIds`: External volume group numbers ▪ `portIds`: Port numbers ▪ `hostGroupIds`: Object IDs of host groups or iSCSI targets ▪ `nvmSubsystemIds`: NVM subsystem numbers This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H. If this parameter is omitted, information will be obtained about all of the attributes listed above, excluding the NVM subsystem number. Information about attributes other than those listed above will be obtained regardless of the specification of this parameter.

When getting information with NVM subsystem information added

Parameter	Type	Description
detailInfoType	string	(Optional) NVM subsystem information You can use this parameter in combination with the `lockStatus` parameter.

Parameter	Type	Description
		This parameter cannot be specified at the same time as the `attributes` parameter. ▪ `nvmSubsystemIds` Adds NVM subsystem information to all the information related to the resource group. This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H.

Note:

Specify either of the following query parameters when getting NVM subsystem storage information and the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H.

- To get only information related to NVM subsystems, specify `nvmSubsystemIds` in `attributes`.
- To get all information including NVM subsystem information, specify `nvmSubsystemIds` in `detailInfoType`.

The following are examples of how to specify these query parameters in various situations.

To get the LDEV numbers of locked resource groups:

```
?lockStatus=Locked&attributes=ldevIds
```

To get the port numbers, and the object IDs of host groups or iSCSI targets for all resource groups:

```
?attributes=portIds,hostGroupIds
```

Body

None.

Response message

Body


```
{
  "data": [
    {
      "resourceGroupId": 4,
      "resourceGroupName": "devResourceGroup",
      "lockStatus": "Locked",
      "lockOwner": "devUser",
      "lockHost": "host01",
      "virtualStorageId": 0,
      "ldevIds": [
        12,
        13
      ],
      "parityGroupIds": [
        "1-1",
        "1-2"
      ],
      "externalParityGroupIds": [
        "1-5",
        "1-6"
      ],
      "portIds": [
        "CL1-A",
        "CL1-B"
      ],
      "hostGroupIds": [
        "CL1-A,4",
        "CL1-A,5",
        "CL1-A,6"
      ]
    },
    {
      "resourceGroupId": 5,
      "resourceGroupName": "sales_group_resource",
      "lockStatus": "Unlocked",
      "virtualStorageId": 0,
      "ldevIds": [
        32,
        33
      ],
      "parityGroupIds": [
        "2-1",
        "2-2"
      ],
      "externalParityGroupIds": [
        "1-7",
```

```
        "1-8"
      ],
      "portIds": [
        "CL3-A"
      ],
      "hostGroupIds": [
        "CL3-A,1",
        "CL3-A,2"
      ]
    }
  ]
}
```

The following is an example of output when a request is run with the `attributes` query parameter specified, to get only information about port numbers and the object IDs of host groups or iSCSI targets:


```
{
  "data": [
    {
      "resourceGroupId": 4,
      "resourceGroupName": "devResourceGroup",
      "lockStatus": "Locked",
      "lockOwner": "devUser",
      "lockHost": "host01",
      "virtualStorageId": 0,
      "portIds": [
        "CL1-A",
        "CL1-B"
      ],
      "hostGroupIds": [
        "CL1-A,4",
        "CL1-A,5",
        "CL1-A,6"
      ]
    },
    {
      "resourceGroupId": 5,
      "resourceGroupName": "sales_group_resource",
      "lockStatus": "Unlocked",
      "virtualStorageId": 0,
      "portIds": [
        "CL3-A"
      ],
      "hostGroupIds": [
        "CL3-A,1",
        "CL3-A,2"
      ]
    }
  ]
}
```


The following shows an example of output when getting all information, including NVM subsystem information, by specifying `nvmSubsystemIds` in `detailInfoType` in the query parameter.


```
{
  "data": [
    {
      "resourceGroupId": 4,
      "resourceGroupName": "devResourceGroup",
      "lockStatus": "Locked",
```

```
    "lockOwner": "devUser",
    "lockHost": "host01",
    "virtualStorageId": 0,
    "ldevIds": [
      12,
      13
    ],
    "parityGroupIds": [
      "1-1",
      "1-2"
    ],
    "externalParityGroupIds": [
      "1-5",
      "1-6"
    ],
    "portIds": [
      "CL1-A",
      "CL1-B"
    ],
    "hostGroupIds": [
      "CL1-A,4",
      "CL1-A,5",
      "CL1-A,6"
    ],
    "nvmSubsystemIds": [
      3,
      4
    ]
  },
  {
    "resourceGroupId": 5,
    "resourceGroupName": "sales_group_resource",
    "lockStatus": "Unlocked",
    "virtualStorageId": 0,
    "ldevIds": [
      32,
      33
    ],
    "parityGroupIds": [
      "2-1",
      "2-2"
    ],
    "externalParityGroupIds": [
      "1-7",
      "1-8"
    ],
    "portIds": [
      "CL3-A"
    ],
```

```
      "hostGroupIds": [
        "CL3-A,1",
        "CL3-A,2"
      ],
      "nvmSubsystemIds": [
        7,
        8
      ]
    }
  ]
}
```

Attribute	Type	Description
resourceGroupName	string	Resource group name
resourceGroupId	int	Resource group ID
lockStatus	string	Lock status of the resource group ▪ `Locked`: The resource group is locked. ▪ `Unlocked`: The resource group is unlocked.
selfLock	boolean	Whether the session specified in the Authorization header locked the resource group ▪ `true`: The specified session locked the resource group ▪ `false`: Another session locked the resource group This attribute is output if the resource group is locked by a session that was generated by the same user who runs the API.
lockOwner	string	User ID that locked the resource group This attribute is not output if the resource group is unlocked.
lockHost	string	IP address or name of the host that locked the resource group

Attribute	Type	Description
		If the resource group has been locked by the REST API, IP address or host name of one of the following is output: ▪ SVP ▪ GUM/ESM ▪ Configuration Manager REST API server ▪ Relay server when the communication mode of the Configuration Manager REST API server is `proxyMode` This attribute is output only when the resource group is locked.
lockSessionId	int	Session ID that locked the resource group This attribute is output only when the resource group is locked and when a user who belongs to the Administrator user group (built-in user group) runs the API.
virtualStorageId	int	ID of the virtual storage machine that corresponds to the resource group
ldevIds	int[]	LDEV number
parityGroupIds	string[]	Parity group number
externalParityGroupIds	string[]	External volume group number
portIds	string[]	Port number
hostGroupIds	string[]	Object ID of the host group or iSCSI target
nvmSubsystemIds	int[]	NVM subsystem number

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-
groups
```

Getting information about a specific resource group

The following request gets information about the specified resource group. The obtained information can be used to check the lock status of a resource group, the user ID of the user who locked the resource group, or the name of the host that locked the resource group.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID
```

Request message

Object ID

Specify the value of `resourceGroupId` that was obtained by the processing to get information about resource groups.

Attribute	Type	Description
resourceGroupId	int	(Required) Resource group ID Specify a decimal (base 10) number in the range from `0` to `1023`.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) NVM subsystem information ▪ `nvmSubsystemIds` Adds NVM subsystem information to all the information related to the resource group. This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H.

Body

None.

Response message

Body


```
{
  "resourceGroupId": 4,
  "resourceGroupName": "devResourceGroup",
  "lockStatus": "Locked",
  "lockOwner": "devUser",
  "lockHost": "host01",
  "virtualStorageId": 0,
  "ldevIds": [
    12,
    13
  ],
  "parityGroupIds": [
    "1-1",
    "1-2"
  ],
  "externalParityGroupIds": [
    "1-5",
    "1-6"
  ],
  "portIds": [
    "CL1-A",
    "CL1-B"
  ],
  "hostGroupIds": [
    "CL1-A,4",
    "CL1-A,5",
    "CL1-A,6"
  ]
}
```


Attribute	Type	Description
resourceGroupName	string	Resource group name
resourceGroupId	int	Resource group ID
lockStatus	string	Lock status of the resource group ▪ `Locked`: The resource group is locked. ▪ `Unlocked`: The resource group is unlocked.

Attribute	Type	Description
selfLock	boolean	Whether the resource group was locked by the session specified in the Authorization header ▪ `true`: The specified session locked the resource group. ▪ `false`: Another session locked the resource group. This attribute is output when the resource group is locked by a session that was generated by the same user who runs the API.
lockOwner	string	User ID of the user who locked the resource group This attribute is output only when the resource group is locked.
lockHost	string	IP address or name of the host that locked the resource group If the resource group has been locked by the REST API, IP address or host name of one of the following is output: ▪ SVP ▪ GUM/ESM ▪ Configuration Manager REST API server ▪ Relay server when the communication mode of the Configuration Manager REST API server is `proxyMode` This attribute is output only when the resource group is locked.
lockSessionId	int	Session ID of the session that locked the resource group This attribute is output only when the resource group is locked and the API was run by one of the following users: the user who belongs to the Administrator user group (built-in user group).
virtualStorageId	int	ID of the virtual storage machine that corresponds to the resource group
ldevIds	int[]	LDEV number
parityGroupIds	string[]	Parity group number

Attribute	Type	Description
externalParityGroupIds	string[]	External volume group number
portIds	string[]	Port number
hostGroupIds	string[]	Object ID of the host group or iSCSI target
nvmSubsystemIds	int[]	NVM subsystem number

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-
groups/4
```

Creating a resource group

The following request creates resource groups. To add a resource group to a virtual storage machine, you must also specify the `virtualStorageDeviceId` attribute.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/resource-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "resourceGroupName":"devResourceGroup",
  "virtualStorageDeviceId":"900000050001"
}
```

Attribute	Type	Description
resourceGroupName	string	(Required) Resource group name Specify a name consisting of 1 to 32 characters.
virtualStorageDeviceId	string	(Optional) Storage device ID of the virtual storage machine This attribute cannot be specified at the same time as the `virtualStorageId` attribute. If this attribute is omitted, the default storage device ID (the same storage device ID as that of the target physical storage system) will be set.
virtualStorageId	int	(Optional) ID of the virtual storage machine that corresponds to the resource group This attribute cannot be specified at the same time as the `virtualStorageDeviceId` attribute. If this attribute is omitted, `0` will be set.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the created resource group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/resource-groups
```

Adding a resource to a resource group

The following request adding resources to resource groups.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID/actions/
add-resource/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `resourceGroupId` that was obtained by the processing to get information about resource groups.

Attribute	Type	Description
resourceGroupId	int	(Required) Resource group ID Specify a decimal (base 10) number in the range from `1` to `1023`.

Query parameters

None.

Body

The following coding example shows how to specify an LDEV number:

```
{
  "parameters": {
    "ldevIds": [
      2,
      3
    ],
    "parityGroupIds": [
      "1-1",
      "1-2"
    ],
    "externalParityGroupIds": [
      "1-5",
      "1-6"
    ],
    "portIds": [
      "CL1-A",
      "CL1-B"
    ],
    "hostGroupIds": [
      "CL1-A,4",
      "CL1-A,5",
      "CL1-A,6"
    ]
  }
}
```

The following coding example shows how to specify a range of LDEV numbers:

```
{
  "parameters": {
    "startLdevId": 2,
    "endLdevId": 5,
    "parityGroupIds": [
      "1-1",
      "1-2"
    ],
    "externalParityGroupIds": [
      "1-5",
      "1-6"
    ],
    "portIds": [
      "CL1-A",
      "CL1-B"
    ],
    "hostGroupIds": [
      "CL1-A,4",
```

```
      "CL1-A,5",
      "CL1-A,6"
    ]
  }
}
```

Attribute	Type	Description
parityGroupIds	string[]	(Optional) Parity group number
externalParityGroupIds	string[]	(Optional) External volume group number
portIds	string[]	(Optional) Port number
hostGroupIds	string[]	(Optional) Object ID of the host group or iSCSI target Specify the value of `hostGroupId` that was obtained by the processing to get information about host groups or iSCSI targets.
ldevIds	int[]	(Optional) LDEV number Specify a value in the range from `0` to `65279`. If you specify this attribute, you cannot specify the `startLdevId` attribute or the `endLdevId` attribute.
startLdevId	int	(Optional) First LDEV number When specifying a range of LDEVs, specify a value in the range from `0` to `65278`. If you specify this attribute, you must also specify the `endLdevId` attribute. If you specify the `ldevIds` attribute, you cannot specify this attribute.
endLdevId	int	(Optional) Last LDEV number When specifying a range of LDEVs, specify a value in the range from `1` to `65279`. If you specify this attribute, you must also specify the `startLdevId` attribute. If you specify the `ldevIds` attribute, you cannot specify this attribute.
nvmSubsystemIds	int[]	(Optional) NVM subsystem number Specify a value from 0 to 2047. You can use this attribute for VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Attribute	Type	Description
		If you want to register an NVM subsystem in a virtual storage machine created by a user, specify an unimplemented NVM subsystem.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the resource group to which resources are added

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID/actions/add-resource
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-groups/4/actions/add-resource
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-groups/4/actions/add-resource/invoke
```

Removing a resource from a resource group

The following request removes resources that are no longer necessary from resource groups.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID/actions/
remove-resource/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `resourceGroupId` that was obtained by the processing to get information about resource groups.

Attribute	Type	Description
resourceGroupId	int	(Required) Resource group ID Specify a decimal (base 10) number in the range from `1` to `1023`.

Query parameters

None.

Body

The following coding example shows how to specify an LDEV number:

```
{
  "parameters": {
    "ldevIds": [
      2,
      3
    ],
    "parityGroupIds": [
```

```
      "1-1",
      "1-2"
    ],
    "externalParityGroupIds": [
      "1-5",
      "1-6"
    ],
    "portIds": [
      "CL1-A",
      "CL1-B"
    ],
    "hostGroupIds": [
      "CL1-A,4",
      "CL1-A,5",
      "CL1-A,6"
    ]
  }
}
```

The following coding example shows how to specify a range of LDEV numbers:

```
{
  "parameters": {
    "startLdevId": 2,
    "endLdevId": 5,
    "parityGroupIds": [
      "1-1",
      "1-2"
    ],
    "externalParityGroupIds": [
      "1-7",
      "1-8"
    ],
    "portIds": [
      "CL1-A",
      "CL1-B"
    ],
    "hostGroupIds": [
      "CL1-A,4",
      "CL1-A,5",
      "CL1-A,6"
    ]
  }
}
```

Attribute	Type	Description
parityGroupIds	string[]	(Optional) Parity group number
externalParityGroupIds	string[]	(Optional) External volume group number
portIds	string[]	(Optional) Port number
hostGroupIds	string[]	(Optional) Object ID of the host group or iSCSI target Specify the value of `hostGroupId` that was obtained by the processing to get information about host groups or iSCSI targets.
ldevIds	int[]	(Optional) LDEV number Specify a value in the range from `0` to `65279`. If you specify this attribute, you cannot specify the `startLdevId` attribute or the `endLdevId` attribute.
startLdevId	int	(Optional) First LDEV number When specifying a range of LDEVs, specify a value in the range from `0` to `65278`. If you specify this attribute, you must also specify the `endLdevId` attribute. If you specify the `ldevIds` attribute, you cannot specify this attribute.
endLdevId	int	(Optional) Last LDEV number When specifying a range of LDEVs, specify a value in the range from `1` to `65279`. If you specify this attribute, you must also specify the `startLdevId` attribute. If you specify the `ldevIds` attribute, you cannot specify this attribute.
nvmSubsystemIds	int[]	(Optional) NVM subsystem number Specify a value from 0 to 2047. You can use this attribute for VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the resource group from which resources were removed

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID/actions/remove-resource
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-groups/4/actions/remove-resource
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-groups/4/actions/remove-resource/invoke
```

Deleting a resource group

The following request deletes unnecessary resource groups.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/resource-groups/object-ID
```

Request message

Object ID

Specify the value of `resourceGroupId` that was obtained by the processing to get information about resource groups.

Attribute	Type	Description
resourceGroupId	int	(Required) Resource group ID Specify a decimal (base 10) number in the range from `1` to `1023`.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the deleted resource group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/resource-
groups/4
```

Getting a list of user groups

The following request gets a list of user groups registered in the target storage system.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/user-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "userGroupObjectId": "devGroup",
      "userGroupId": "devGroup",
      "roleNames": [
        "Audit Log Administrator (View & Modify)"
      ],
      "resourceGroupIds": [
        1,
        2,
        3
      ],
      "isBuiltIn": false,
      "hasAllResourceGroup": false
    },
    {
      "userGroupObjectId": "adminGroup",
      "userGroupId": "adminGroup",
      "roleNames": [
        "Audit Log Administrator (View & Modify)",
```

```
        "Security Administrator (View & Modify)",
        "Storage Administrator (Initial Configuration)",
        "Storage Administrator (Local Copy)",
        "Storage Administrator (Performance Management)",
        "Storage Administrator (Provisioning)",
        "Storage Administrator (Remote Copy)",
        "Storage Administrator (System Resource Management)"
      ],
      "isBuiltIn": false,
      "hasAllResourceGroup": true
    }
  ]
}
```


Attribute	Type	Description
userGroupObjectId	string	The object ID for a user group ID An encoded character string is output if the user group ID includes reserved characters defined in RFC3986.
userGroupId	string	The user group ID
roleNames	string[]	The role name assigned to the user group
resourceGroupIds	int[]	The IDs of the resource groups assigned to the user group
isBuiltIn	boolean	Information about whether the user group is a built-in user group. ▪ `true`: A built-in user group. ▪ `false`: A user group created by a user.
hasAllResourceGroup	boolean	Information about whether all the resource groups are assigned to the target. ▪ `true`: All the resource groups are assigned. ▪ `false`: The specified resource groups are assigned.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups
```

Getting information about a specific user group

The following request gets information about the specified user group.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID
```

Request message

Object ID

Set the `userGroupObjectId` value obtained by getting the information about the user group.

Attribute	Type	Description
userGroupObjectId	string	(Required) The object ID for a user group ID The object ID is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "userGroupObjectId": "devGroup",
  "userGroupId": "devGroup",
  "roleNames":[
    "Security Administrator (View Only)"
  ],
```

```
  "resourceGroupIds": [
    1,
    2,
    3
  ],
  "isBuiltIn":false,
  "hasAllResourceGroup":false
}
```

Attribute	Type	Description
userGroupObjectId	string	The object ID for a user group ID An encoded character string is output if the user group ID includes reserved characters defined in RFC 3986.
userGroupId	string	The user group ID
roleNames	string[]	The role name assigned to the user group
resourceGroupIds	int[]	The IDs of the resource groups assigned to the user group
isBuiltIn	boolean	Information about whether the user group is a built-in user group. ▪ `true`: A built-in user group. ▪ `false`: A user group created by a user.
hasAllResourceGroup	boolean	Information about whether all the resource groups are assigned to the target. ▪ `true`: All the resource groups are assigned. ▪ `false`: The specified resource groups are assigned.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups/
devGroup
```

Creating a user group

The following request creates a user group and assigns an appropriate role and resource groups.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/user-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "userGroupId":"devGroup",
  "roleNames":[
    "Storage Administrator (Provisioning)"
  ],
  "resourceGroupIds": [
    8,
    9
  ],
  "hasAllResourceGroup":false
}
```

Attribute	Type	Description
userGroupId	string	(Required) The user group ID

Attribute	Type	Description
		Specify an ID consisting of 1 to 64 characters.
roleNames	string[]	(Required) The role name Specify one or more of the following role names. The role names are case sensitive. If you specify multiple role names, delimit the names by commas. You must specify `Storage Administrator (View Only)`. ▪ `Audit Log Administrator (View & Modify)`# ▪ `Audit Log Administrator (View Only)`# ▪ `Security Administrator (View & Modify)`# ▪ `Security Administrator (View Only)`# ▪ `Storage Administrator (Initial Configuration)` ▪ `Storage Administrator (Local Copy)` ▪ `Storage Administrator (Performance Management)` ▪ `Storage Administrator (Provisioning)` ▪ `Storage Administrator (Remote Copy)` ▪ `Storage Administrator (System Resource Management)` ▪ `Storage Administrator (View Only)` ▪ `Support Personnel`# ▪ `User Maintenance`# #: If you specify this role, be sure to specify `true` for `hasAllResourceGroup`.
resourceGroupIds	int[]	(Optional) The resource group IDs

Attribute	Type	Description
		Specify one or more decimal (base 10) numbers within the range of `0` to `1023`. If you specify multiple IDs, delimit the IDs by commas. This cannot be specified if the `hasAllResourceGroup` attribute is `true`.
hasAllResourceGroup	boolean	(Required) Information about whether all the resource groups are assigned to the target. If the roles specified for `roleNames` include any of the following roles, be sure to specify `true` for this attribute. ▪ `Audit Log Administrator (View & Modify)` ▪ `Audit Log Administrator (View Only)` ▪ `Security Administrator (View & Modify)` ▪ `Security Administrator (View Only)` ▪ `Support Personnel` ▪ `User Maintenance` If the roles specified for `roleNames` does not include any of these roles, be sure to specify `false` for this attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created user group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/user-groups
```

Changing the user group settings

The following request sets a user group ID and a role of the specified user group.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Set the `userGroupObjectId` value obtained by getting the information about the user group.

Attribute	Type	Description
userGroupObjectId	string	(Required) The object ID for a user group ID The object ID is case sensitive.

Query parameters

None.

Body

The following coding example shows how to change the user group ID:

```
{
  "userGroupId":"adminGroup"
}
```

The following coding example shows how to change a role:

```
{
  "roleNames":[
    "Storage Administrator (Provisioning)",
    "Storage Administrator (Local Copy)"
  ]
}
```

Only one attribute can be specified in one request.

Attribute	Type	Description
userGroupId	string	(Optional) The user group ID Specify an ID consisting of 1 to 64 characters.
hasAllResourceGroup	boolean	(Optional) Information about whether all the resource groups are assigned to the target. If the roles specified for `roleNames` include any of the following roles, be sure to specify `true` for this attribute. ▪ `Audit Log Administrator (View & Modify)` ▪ `Audit Log Administrator (View Only)` ▪ `Security Administrator (View & Modify)` ▪ `Security Administrator (View Only)` ▪ `Support Personnel` ▪ `User Maintenance` If the roles specified for `roleNames` does not include any of these roles, be sure to specify `false` for this attribute.
roleNames	string[]	(Optional) The role name

Attribute	Type	Description
		Specify one or more of the following role names. The role names are case sensitive. If you specify multiple role names, delimit the names by commas. You must specify `Storage Administrator (View Only)`. ▪ `Audit Log Administrator (View & Modify)`# ▪ `Audit Log Administrator (View Only)`# ▪ `Security Administrator (View & Modify)`# ▪ `Security Administrator (View Only)`# ▪ `Storage Administrator (Initial Configuration)` ▪ `Storage Administrator (Local Copy)` ▪ `Storage Administrator (Performance Management)` ▪ `Storage Administrator (Provisioning)` ▪ `Storage Administrator (Remote Copy)` ▪ `Storage Administrator (System Resource Management)` ▪ `Storage Administrator (View Only)` ▪ `Support Personnel`# ▪ `User Maintenance`# #: If you specify this role, be sure to specify `true` for `hasAllResourceGroup`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user group on which settings are changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups/
devGroup
```

Assigning resource groups to a user group

The following request assigns resource groups to a created user group.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID/actions/add-
resource-group/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Set the `userGroupObjectId` value obtained by getting the information about the user group.

Attribute	Type	Description
userGroupObjectId	string	(Required) The object ID for a user group ID The object ID is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "resourceGroupIds": [
      1,
      2
    ]
  }
}
```

Attribute	Type	Description
resourceGroupIds	int[]	(Required) The resource group IDs Specify one or more decimal (base 10) numbers within the range of `0` to `1023`. If you specify multiple IDs, delimit the IDs by commas.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user group to which resource groups are assigned

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID/actions/add-resource-group
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups/
devGroup/actions/add-resource-group
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./
InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/user-groups/devGroup/actions/add-resource-group/invoke
```

Releasing resource groups assigned to a user group

The following request releases resource groups assigned to a user group.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID/actions/
remove-resource-group/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Set the `userGroupObjectId` value obtained by getting information about the user group.

Attribute	Type	Description
userGroupObjectId	string	(Required) The object ID for a user group ID The object ID is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "resourceGroupIds": [
      1,
      2
    ]
  }
}
```

Attribute	Type	Description
resourceGroupIds	int[]	(Required) The resource group IDs Specify one or more decimal (base 10) numbers within the range of `0` to `1023`. If you specify multiple IDs, delimit the IDs by commas.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user group where assignment of resource groups is released

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID/actions/
remove-resource-group
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups/
devGroup/actions/remove-resource-group
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./
InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/user-groups/devGroup/actions/remove-resource-group/invoke
```

Deleting a user group

The following request deletes an unneeded user group. The request cannot delete a user group if the user group is assigned to a user.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/user-groups/object-ID
```

Request message

Object ID

Set the `userGroupObjectId` value obtained by getting the information about the user group.

Attribute	Type	Description
userGroupObjectId	string	(Required) The object ID for a user group ID The object ID is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted user group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/user-groups/
devGroup
```

Getting a list of users

The following request gets a list of user information registered on the target storage system.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/users
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "userObjectId": "devUser",
      "userId": "devUser",
      "authentication": "local",
      "userGroupNames": [
        "Audit Log Administrator (View Only) User Group",
        "Storage Administrator (View & Modify) User Group"
      ],
      "isBuiltIn": false,
      "isAccountStatus": true
    },
    {
      "userObjectId": "adminUser",
      "userId": "adminUser",
      "authentication": "local",
      "userGroupNames": [
        "Administrator User Group"
      ],
      "isBuiltIn": false,
      "isAccountStatus": true
    }
  ]
}
```


Attribute	Type	Description
userObjectId	string	Object ID of the user ID

Attribute	Type	Description
		If the user ID contains a reserved character defined in RFC 3986, the encoded character string is output.
userId	string	User ID
userGroupNames	string[]	User group name
isBuiltIn	boolean	Whether the user account is built-in ▪ `true`: Indicates a built-in user account ▪ `false`: Indicates that the account is created by the user
isAccountStatus	boolean	Status of the user account ▪ `true`: The user account is valid ▪ `false`: The user account is invalid
authentication	string	Set authentication ▪ `local`: Authorized by the storage system ▪ `external`: Authorized by the external authentication server

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users
```

Getting information about a specific user

The following request gets information about the specified user.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/users/object-ID
```

Request message

Object ID

Specify the `userObjectId` value obtained by getting information about the user.

Attribute	Type	Description
userObjectId	string	(Required) Object ID of the user ID The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "userObjectId": "devUser",
  "userId": "devUser",
  "authentication": "local",
  "userGroupNames": [
    "Audit Log Administrator (View Only) User Group",
    "Storage Administrator (View & Modify) User Group"
  ],
  "isBuiltIn": false,
  "isAccountStatus": true
}
```

Attribute	Type	Description
userObjectId	string	Object ID of the user ID If the user ID contains a reserved character defined in RFC 3986, the encoded character string is output.
userId	string	User ID

Attribute	Type	Description
userGroupNames	string[]	User group name
isBuiltIn	boolean	Whether the user account is built-in ▪ `true`: Indicates a built-in user account ▪ `false`: Indicates that the account is created by the user
isAccountStatus	boolean	Status of the user account ▪ `true`: The user account is valid ▪ `false`: The user account is invalid
authentication	string	Set authentication ▪ `local`: Authorized by the storage system ▪ `external`: Authorized by the external authentication server

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users/devUser
```

Creating a user account

The following request creates a user account and assigns the user to user groups where appropriate permissions are specified.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/users
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "userId": "devUser",
  "authentication": "local",
  "userPassword":"devPassword",
  "userGroupNames": [
    "Audit Log Administrator (View Only) User Group",
    "Storage Administrator (View & Modify) User Group"
  ]
}
```

Attribute	Type	Description
userId	string	(Required) User ID For details about the number of characters that can be specified for user IDs and the characters that can be used, see the description about input rules for user IDs and passwords.
userPassword	string	(Optional) Password The password cannot be specified if the `authentication` attribute is `external`. For details about the number of characters that can be specified for passwords and the characters that can be used, see the description about input rules for user IDs and passwords.
userGroupNames	string[]	(Required) User group name Specify a name consisting of 1 to 64 characters. You can specify up to 8 group names.

Attribute	Type	Description
authentication	string	(Required) Set authentication ▪ `local`: Authorized by the storage system ▪ `external`: Authorized by the external authentication server#

#: To authenticate users on an external authentication server, specify the settings on the SVP so that the external authentication server. For details, see the *System Administrator Guide*.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created user

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/users/
```

Changing the password of the user

The following request changes the password of a user account that performs operations on the storage system resources. The password cannot be changed for the user who is authorized by the external authentication server.

If either of the following conditions is met, and the specified user account is also registered in the storage information of the Storage Device List on the SVP, you can also change the password of the user account registered in the Storage Device List at the same time:

- You are using a VSP G200, G400, G600, G800, VSP F400, F600, F800 storage system whose microcode version is 83-05-2*X-XX*/*XX* or later.
- You are using a VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system whose microcode version is 88-03-0*X-XX*/*XX* or later, and a link to the SVP is established in the configuration.
- You are using a VSP E series storage system, and a link to the SVP is established in the configuration.

Important:

- If you change a password registered in the Storage Device List, the management software running on the SVP will restart. As a result, management software (such as the REST API and Storage Navigator) becomes temporarily unavailable. You can use the software again after the job is complete.
- When changing the password of a user account registered in the Storage Device List, we strongly recommend specifying `Completed` for the `Response-Job-Status` in the request header. If Completed is not specified and processing for the storage system fails, information about communication errors might not be correctly obtained.
- The user ID and password that were used to register a storage system to the REST API server are stored on the REST API server. To change such a password, in addition to executing the API request for changing the password of the user, you will also need to change the information stored on the REST API server by executing the API request for changing information about a storage system.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/users/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `userObjectId` value obtained by getting information about the user.

Attribute	Type	Description
userObjectId	string	(Required) Object ID of the user ID The name is case sensitive.

Query parameters

None.

Body

To change the password of a user account of a storage system:

```
{
  "userPassword":"userPass"
}
```

To simultaneously change the password of a user account of a storage system and the password of a user account registered in the Storage Device List:

(Example of using a VSP G200, G400, G600, G800, VSP F400, F600, F800 storage system)

```
{
  "userPassword":"userPass",
  "changesStorageDeviceListPassword":true,
  "mappWebServerHttpsPort":20443
}
```

To simultaneously change the password of a user account of a storage system and the password of a user account registered in the Storage Device List:

(Example of using a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system with link to the SVP established in the configuration)

```
{
  "userPassword":"userPass",
  "changesStorageDeviceListPassword":true
}
```

Attribute	Type	Description
userPassword	string	(Required) New password For details about the number of characters that can be specified for passwords and the characters that can be used, see the description about input rules for user IDs and passwords.

Attribute	Type	Description
		If `true` is specified for the attribute `changesStorageDeviceListPassword`, follow the rules for creating a user account that performs operations on storage systems from the REST API.
changesStorageDeviceListPassword	boolean	(Optional) Whether to change the password of a user account registered in the Storage Device List You can use this attribute when either of the following conditions is met: ▪ You are using a VSP G200, G400, G600, G800, VSP F400, F600, F800 storage system. ▪ You are using a VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, and link to the SVP is established in the configuration. ▪ You are using a VSP E series storage system, and link to the SVP is established in the configuration. If this attribute is specified, the password of a user account of the storage system and the password of a user account registered in the Storage Device List are simultaneously changed. ▪ `true`: Change the password in the Storage Device List ▪ `false`: Do not change the password in the Storage Device List If this attribute is omitted, `false` is assumed.
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication You can use this attribute for VSP G200, G400, G600, G800, VSP F400, F600, F800. Specify this attribute if `changesStorageDeviceListPassword` is `true` and if you are either using non-SSL communication or using SSL communication in DTLS encryption communication mode. If you are using non-SSL communication or DTLS encryption communication mode and you omit this attribute, `443` will be set.

Attribute	Type	Description
		If you are using SSL communication in DTLS SVP encrypted communication mode or SSL TLS encrypted communication mode between the REST API server and the storage system, you cannot specify this attribute, because this attribute requires the use of the port registered in the storage system.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user whose password was changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users/devUser
```

Adding users to user groups

To add a user to a user group, assign the user group to the user object.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/users/object-ID/actions/add-user-group/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `userObjectId` value obtained by getting information about the user.

Attribute	Type	Description
userObjectId	string	(Required) Object ID of the user ID The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "userGroupNames": [
      "System User Group"
    ]
  }
}
```

Attribute	Type	Description
userGroupNames	string[]	(Required) User group name Specify a name consisting of 1 to 64 characters.

Attribute	Type	Description
		The following are the maximum numbers of user groups to which one user can belong: ▪ For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900: 8 ▪ For VSP 5000 series, VSP G1000, VSP G1500, VSP F1500: 8 ▪ For VSP G200, G400, G600, G800, VSP F400, F600, F800: 1

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user who was added to the user group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/users/object-ID/actions/add-user-group
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users/devUser/actions/add-user-group
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./
```

```
InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/users/devUser/actions/add-user-group/invoke
```

Removing users from user groups

To remove a user from a user group, specify the user group that is associated with that user, and then release that user group from the user object. If only one user group is associated with a particular user, the user cannot be removed from that user group.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/users/object-ID/actions/remove-
user-group/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `userObjectId` value obtained by getting information about the user.

Attribute	Type	Description
userObjectId	string	(Required) Object ID of the user ID The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "userGroupNames": [
      "System User Group"
    ]
```

```
  }
}
```

Attribute	Type	Description
userGroupNames	string[]	(Required) User group name Specify a name consisting of 1 to 64 characters. The following are the maximum numbers of user groups to which one user can belong: ▪ For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900: 8 ▪ For VSP 5000 series, VSP G1000, VSP G1500, VSP F1500: 8 ▪ For VSP G200, G400, G600, G800, VSP F400, F600, F800: 1

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the user who was removed from the user group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/users/object-ID/actions/remove-user-group
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users/devUser/
actions/remove-user-group
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./
InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/users/devUser/actions/remove-user-group/invoke
```

Deleting a user account

The following request deletes unnecessary user accounts. Built-in user accounts of the storage system cannot be deleted.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/users/object-ID
```

Request message

Object ID

Specify the `userObjectId` value obtained by getting information about the user.

Attribute	Type	Description
userObjectId	string	(Required) Object ID of the user ID The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted user account

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/users/devUser
```

Chapter 5: Search function for storage systems

This chapter describes how to use the search function to search for storage system resources by using the REST API. You can use the search function for one storage system at a time.

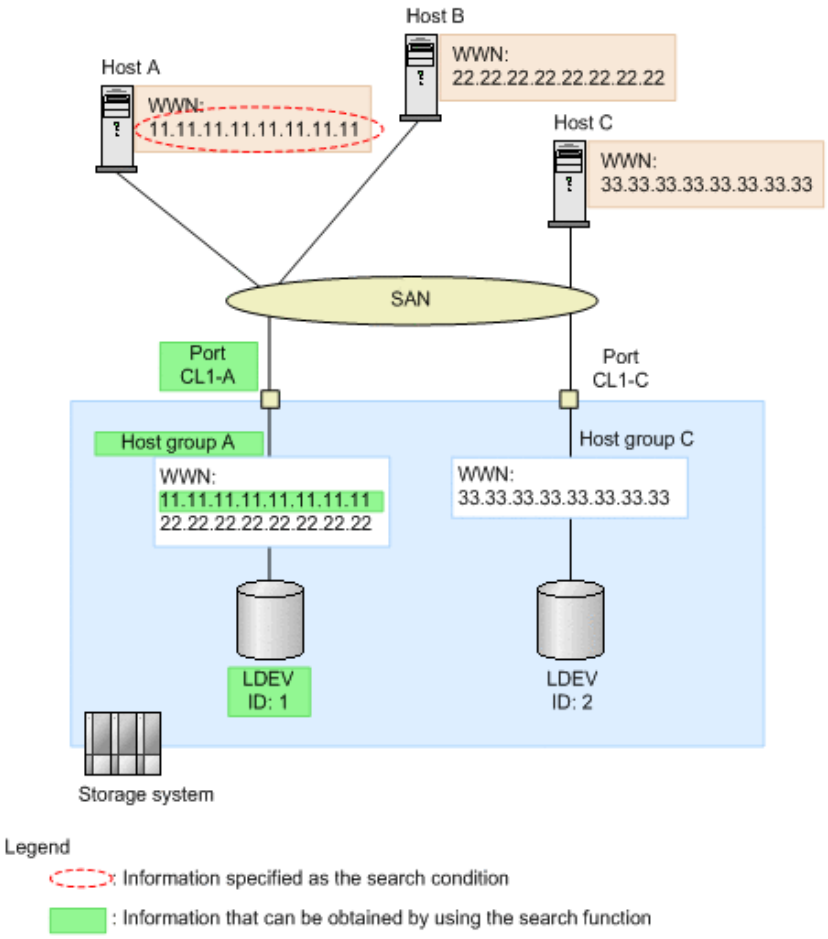
Overview of the search function for storage systems

The search function for storage systems obtains the storage system configuration information and resource statuses stored in the REST API server database. For such information, you can use multiple conditions to extract configuration information and obtain related configuration information between multiple resources such as volumes and host groups. You can also specify attributes to be output in order to filter the obtained resource information.

The following are examples of information that can be searched for from the API function for searching information:

- Host groups by using a WWN or iSCSI name as a filter condition
- Volumes allocated to a host group by using a WWN or iSCSI name as a filter condition
- Allocated volumes by using a port or host group as a filter condition
- Volumes by using a label or capacity as a filter condition

For example, when you need information related to volumes used by a host, if you run the API function for searching information by specifying the WWN of host A's HBA, you can obtain port and host group information about volumes allocated to host A at the same time.



For details on the information that can be searched for, see the section explaining what resource information can be obtained from storage systems by using the search function.

To obtain accurate search results, the storage system configuration information and resource statuses stored in the REST API server database must be updated to the latest state at the time the search is performed. See the section explaining methods for updating the REST API server database to its latest state, and check which method is appropriate for your storage systems.

Note:

When updating configuration information of the storage systems:

- For the following storage systems, in a configuration in which no link is established to the SVP, when configuration information of a storage system is updated, this API request is run on the Platform REST API server. While this API request is running, it might affect the execution of API requests for which the number of concurrent executions is restricted.
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- For the following storage systems, the processing to obtain configuration information is performed from the Platform REST API server of the applicable controller by using a single session. The user for this session is the user specified when the storage system was registered. The session is discarded after the configuration information of the storage system is refreshed.
  - VSP One B20
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 whose microcode version is 88-03-0*X*-*XX*/*XX* or later

Tip: If you are using a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, you can reduce the time required to update the configuration information of the storage system by establishing a link to the SVP.

Methods for updating the REST API server database to its latest state

You can use the following two methods to update the REST API server database to its latest state:

- Updating the database by using notifications of changes to storage system configurations

  For the following storage systems, you can use the function that sends notifications about changes to storage system configurations. When a storage system configuration is changed, a notification about changes to storage system configurations is sent from the storage system to the REST API server. Based on the notification that was sent, the REST API server database is automatically updated.

  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
  - VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
  - VSP G1500 or VSP F1500

  Check whether notifications of configuration changes to the target storage system can be received by obtaining the list of destinations for such notifications. If destinations for such notifications are not registered, run the API function for registering destinations for notifications of changes to storage system configurations.

  The microcode versions of storage systems whose latest information can be obtained by using a notification of changes to storage system configurations vary for each storage system resource. For details, see the descriptions of each storage system resource for which information can be obtained by using the search function.

- Updating the database by using the API function that refreshes the configuration information of storage systems

  If you run the API function that refreshes the configuration information of storage systems, you can get configuration information from the target storage system and then refresh the storage system configuration information stored on the REST API server.

  For storage systems for which a notification of changes to storage system configurations cannot be used, when a storage system configuration is changed by using functions other than those in the REST API, the configuration-change information is not applied to the database of the REST API server. Before running the API function for searching information, we recommend that you run the API function for updating the configuration information of storage systems, so that the configuration information of the storage system is up to date.

Note:

- When the configuration of storage systems is changed by maintenance personnel, the information about the configuration changes will not be applied to the REST API server database. Before running the API function for searching for information, be sure to run the API function for updating the configuration information of storage systems.
- Even when a notification of changes to storage system configurations is received, when you obtain resource status information such as the following, the information in the REST API server database might not match the latest information about the storage system. Before running an API function that searches for information, be sure to run the API function that refreshes the configuration information of storage systems.
  - Information such as the capacity and usage rate, whose values change depending on the usage status of the resource
  - Information such as the pool status, whose value automatically changes regardless of operations performed by the user

Note:

When a resource configuration of a storage system is changed by using the REST API, the configuration-change information is automatically applied to the database of the REST API server. However, performing the operations shown below does not automatically apply configuration changes to the database of the REST API server. Before running the API function for searching information, be sure to run the API function for updating the configuration information of storage systems.

- Operating copy pairs or snapshots
- Deleting volumes for which the capacity saving function is enabled
- Enabling or disabling the deduplication function for pools
- Deleting pools for which the deduplication function is enabled
- Operating parity groups
- Operating external volume groups
- Changing the iSCSI name or the iSCSI nickname of a host by editing the host from Storage Navigator

Refreshing the storage system configuration information

This section describes how to refresh the storage system configuration information stored in the REST API server database, and how to check the refresh status.

Getting the refresh status of storage system configuration information

The following request obtains the refresh status of the storage system configuration information stored on the REST API server. The result of collected `status` or `lastSucceededTime` attributes can be used to determine whether the configuration information needs to be refreshed.

Execution permission

No role is required to run this API request.

Request line

```
GET base-URL/v1/views/refresh-statuses
```

Request message

Query parameters

For details on the query parameters that can be specified, see the description on the query parameters used to search for information.

Body

None.

Response message

Body

```
{
  "data" : [ {
    "refreshStatus" : {
      "storageDeviceId" : "800000010051",
      "status" : "Succeeded",
      "lastSucceededTime" : "2017-12-25T01:21:03Z",
      "lastStartedTime" : "2017-12-25T01:18:00Z"
    }
  }, {
    "refreshStatus" : {
      "storageDeviceId" : "800000010057",
      "status" : "Succeeded",
      "lastSucceededTime" : "2017-12-25T01:24:48Z",
      "lastStartedTime" : "2017-12-25T01:22:32Z"
    }
  } ],
  "offset" : 0,
  "count" : 2,
  "totalCount" : 2
}
```

Attribute	Type	Description
refreshStatus	object	Information about the refresh status of the configuration information ▪ storageDeviceId (string) Storage device ID ▪ status (string) Status of the task to refresh configuration information • `Queued`: The processing to refresh the configuration information has been queued. • `Started`: The processing to refresh the configuration information has started. • `Succeeded`: The processing to refresh the configuration information finished successfully. • `Failed`: The processing to refresh the configuration information failed, or the configuration information needs to be refreshed.#1 • `PartiallyNotUpdated`: Part of the processing to refresh the configuration information failed.#2 ▪ lastSucceededTime (ISO8601string) Time when the processing to refresh the configuration information was last finished successfully.

Attribute	Type	Description
		▪ lastStartedTime (ISO8601string) Time when the processing to refresh the configuration information last started.#3 ▪ error (object) Object containing error information This information can be obtained when the value of the `status` attribute is `Failed` or `PartiallyNotUpdated`.

#1: If the REST API database was expanded as a result of an upgrade installation, you will need to refresh the storage system configuration information. Run the API request that refreshes the storage system configuration information.

#2: This information is output when the REST API server fails to refresh storage system configuration information. This might occur, for example, when the REST API server receives a notification of a change to the storage system configuration or when the storage system configuration is changed by using the REST API.

#3: The request is ignored if you are running the API function for refreshing storage system configuration information, on a storage system whose configuration information is already the process of being refreshed by the REST API server. In such cases, the value of the `lastStartedTime` attribute might be earlier than the execution time of the API function for refreshing the storage system configuration information.

Default sort key

The storageDeviceId attribute of refreshStatus

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/views/
refresh-statuses
```

Refreshing the configuration information of storage systems

The following request obtains configuration information from the target storage system and then refreshes the storage system configuration information stored on the REST API server.

Note:

In the following cases, use this API request to refresh the storage system configuration information.

- If the microcode was upgraded (In some cases, you might be able to obtain new configuration information.)
- If the REST API was upgraded (In this case, the REST API server is refreshed, so you might be able to obtain new configuration information.)

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/views/actions/refresh/invoke
```

You can run this API request in a POST method.

Request message

Query parameters

None.

Body

```
{
  "parameters": {
    "storageDeviceId": "800000010051"
  }
}
```

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID Specify the storage device ID of the target storage system.

Response message

Body

```
{
  "refreshStatus" : {
    "storageDeviceId" : "800000010051",
```

```
    "status" : "Started",
    "lastSucceededTime" : "2016-03-23T04:45:03Z",
    "lastStartedTime" : "2016-03-23T07:21:07Z"
  }

}
```

Attribute	Type	Description
refreshStatus	object	Information about the refresh status of the configuration information ▪ storageDeviceId (string) Storage device ID ▪ status (string) Refresh status of the configuration information • `Queued`: The processing to refresh the configuration information has been queued. • `Started`: The processing to refresh the configuration information has started. • `Succeeded`: The processing to refresh the configuration information finished successfully. • `Failed`: The processing to refresh the configuration information failed. • `PartiallyNotUpdated`: Part of the processing to refresh the configuration information failed.#1 ▪ lastSucceededTime (ISO8601string) Time when the processing to refresh the configuration information was last finished successfully

Attribute	Type	Description
		▪ lastStartedTime (ISO8601string) Time when the processing to refresh the configuration information last started#2 ▪ error (object) Object containing error information This information can be obtained when the value of the `status` attribute is `Failed` or `PartiallyNotUpdated`.

#1: This information is output when the REST API server fails to refresh storage system configuration information. This might occur, for example, when the REST API server receives a notification of a change to the storage system configuration or when the storage system configuration is changed by using the REST API.

#2: The request is ignored if you are running the API function for refreshing storage system configuration information, on a storage system whose configuration information is already the process of being refreshed by the REST API server. In such cases, the value of the `lastStartedTime` attribute might be earlier than the execution time of the API function for refreshing the storage system configuration information.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/views/actions/
refresh/invoke
```

Query parameters to be used for the search function

This section describes the query parameters to be used for the search function. To search for information, specify query parameters by using the views domain.

List of query parameters

The following table lists query parameters.

Parameter	Description
$query	Specify the condition for filtering data by the attribute value of a resource. To specify an attribute, specify a resource name and attribute name separated by a dot (`.`). You cannot specify attributes of the object type or the object[] type. For details on the syntax and operation of other filter conditions, see the description of the $query parameter. Specification example: `?$query=ldev.storageDeviceId eq '800000010051'`
$offset	Specify the starting point from which search results are to be obtained by using a decimal (base 10) number. You can specify a value from `0` to `2147483647`. Specification example: `?$offset=100&$count=100&$query=ldev.storageDeviceId eq '800000010051'` If this parameter is omitted, `0` is assumed.
$count	Specify the maximum number of search results to be obtained by using a decimal (base 10) number. You can specify a value from `1` to `16384`. Specification example: `?$offset=100&$count=100&$query=ldev.storageDeviceId eq '800000010051'` If this parameter is omitted, `100` is assumed.
$fields	Specify the resource or attributes to be obtained as search results. If you specify a resource, all attributes of the resource are obtained. To specify an attribute of a resource, specify a resource name and attribute name separated by a dot (`.`). You cannot specify attributes of the object type or the object[] type.

Parameter	Description
	You can specify multiple attribute values by delimiting them with commas (,). Specification example: `?$fields=ldev.ldevId,ldev.attributes&$query=ldev.storageDeviceId eq '800000010051'` If this parameter is omitted, all attributes are obtained.
$order-by	Specify the attributes by which to sort search results. To specify an attribute, specify a resource name and attribute name separated by a dot (.). Specify each attribute and its sorting order separated by a space. You cannot specify attributes of the object type or the object[] type. You can specify multiple attribute values by delimiting them with commas (,). Specify attributes in order of priority. You can specify the following sort orders: ▪ `ASC`: Ascending order ▪ `DESC`: Descending order Specification example: `?$order-by=ldev.poolId DESC,ldev.ldevId DESC&$query=ldev.storageDeviceId eq '800000010051'` If this parameter is omitted, the search results are sorted in ascending order of the default sort key. For details on the default sort key, see the description of each API function for obtaining information.

$query parameter

You can use the $query parameter to filter the obtained information by a resource attribute. This section describes the $query parameter.

For the $query parameter, specify one or more conditional expressions. You can use operators such as "eq", "startsWith", "in", and "and" in a conditional expression to compare attribute values or combine multiple expressions.

The following shows a basic example of how to specify the $query parameter:

```
?$query=ldev.storageDeviceId eq '800000010051'
```

The following describes the expressions specified by the $query parameter, supported data types, and the operators used.

Expressions specified by the $query parameter

Define the expressions to be specified in the $query parameter as follows:

```
expression ::= "(" expression ")" | binary-expression
               | expression space junction space expression
space ::= (" ")+
junction ::= ( "and" | "or" )
binary-expression ::= (compare-expression | tuple-expression)
compare-expression ::= name-expression space compare-operation
                        space value-expression
tuple-expression ::= name-expression space tuple-operation
                     space tuple-value-expression
tuple-value-expression ::= "[" value-expression
                           ("," value-expression)* "]"
name-expression ::= attribute-name ( "." attribute-name )*
                    | "[" attribute-name ("." attribute-name)* "]"
value-expression ::= ( string-expression | number-expression
                     | boolean-expression )
string-expression ::= "'" ( [^'] | ['']{2} )* "'"
number-expression:: = ( "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7"
                      | "8" | "9" )+
boolean-expression::= ("true" | "false")
compare-operation ::= ("eq" | "=" | "ne" | "<>" | "!=" | "gt" | ">"
                      |  "lt" | "<" | "ge" |">=" | "le" |"<="
                      | "startsWith" | "endsWith")
tuple-operation ::= ( "in" | "not in" | "contains")
```

- *attribute -name* indicates the attribute name defined by each API function.
- *attribute -name* and string-expression are case sensitive. Others are not case sensitive.
- When specifying a value for string-expression, enclose the value in single quotation marks (').

  To specify a character string containing a single quotation mark, specify it as follows:

  - Character string that you want to specify: I' m
  - Character string to be specified: 'I'' m'

- The value of string-expression is converted to a character string in UTF-8 format and then compared.

Supported data types

The following table shows the correspondence between the expressions used by the $query parameter and the data types supported by the REST API.

Expression	Data type supported by the REST API
boolean-expression	boolean
number-expression	int long
string-expression	string ISO8601String link

Supported operators

The following table describes the operators supported by the $query parameter. Smaller priority numbers have higher priority.

Operator	Description	Specifiable expressions	Priority
eq or =	Equal	boolean-expression number-expression string-expression	1
ne, <, >, or !=	Not equal	boolean-expression number-expression string-expression	1
gt or >	Greater than	number-expression string-expression	1
lt or <	Less than	number-expression string-expression	1
ge or >=	Greater than or equal to	number-expression string-expression	1
le or <=	Less than or equal to	number-expression string-expression	1
startsWith	Starts with the specified character string	string-expression ISO8601String is excluded.	1
endsWith	Ends with the specified character string	string-expression ISO8601String is excluded.	1
in	Includes	number-expression	1

Operator	Description	Specifiable expressions	Priority
		string-expression	
not in	Does not include	number-expression string-expression	1
contains	Contains any of the specified character strings	number-expression string-expression You can specify elements of the array type.	1
and	All conditions are true.	compare-expression tuple-expression	2
or	At least one of the conditions is true.	compare-expression tuple-expression	3

Examples of how to specify query parameters

The following are examples of how to specify query parameters and an example of the output execution results.

Examples of how to specify query parameters

The following examples show how to specify query parameters.

Example of specifying $query in the API function that obtains information about multiple resources (example of lun-paths)

```
?$query=hostGroup.portId eq 'CL1-A'&$query=ldev.storageDeviceId eq
'800000010051'
```

Example of specifying $order-by in the API function that obtains information about multiple resources (example of lun-paths)

```
?$order-by=hostGroup.portId DESC,ldev.ldevId DESC&$query=ldev.storageDeviceId
eq '800000010051'
```

Example of specifying a condition with parentheses for $query ($query = (<*conditional expression*>))

```
?$query=(ldev.storageDeviceId eq '800000010051')
```

Example of specifying multiple conditional expressions by concatenating them for $query (<*conditional expression*> and <*conditional expression*>)

```
?$query=ldev.isDefined eq true and ldev.storageDeviceId eq '800000010051'
```

Example of specification for boolean-type attributes for $query

```
?$query=ldev.isDefined eq false&$query=ldev.storageDeviceId eq '800000010051'
```

Example of specification for numeric-type attributes for $query (compare-expression)

```
?$query=ldev.poolId eq 1&$query=ldev.storageDeviceId eq '800000010051'
```

```
?$query=pool.virtualVolumeCapacityRate lt 0&$query=pool.storageDeviceId eq
'800000010051'
```

Example of specification for string-type attributes for $query (compare-expression)

```
?$query=ldev.storageDeviceId eq '800000010051'
```

Example of specification for numeric-type attributes for $query (tuple-expression)

```
?$query=hostGroup.hostModeOptions contains [1,2]&
$query=hostGroup.storageDeviceId eq '800000010051'
```

Example of specification for string-type attributes for $query (tuple-expression)

```
?$query=ldev.attributes contains ['CVS','POOL']&$query=ldev.storageDeviceId eq
'800000010051'
```

Example of specifying the "startsWith" operator for $query ($query=<*attribute name (non-array type)* > startsWith <*value*>)

```
?$query=ldev.emulationType startsWith 'OPEN-V'&$query=ldev.storageDeviceId eq
'800000010051'
```

Example of specifying the "contains" operator for $query ($query=<*attribute name (array type)* > contains [<*value 1*>,<*value 2*>...])

```
?$query=ldev.attributes contains ['CVS','POOL']&$query=ldev.storageDeviceId eq
'800000010051'
```

Example of specifying the "in" operator for $query ($query=<*attribute name (non-array type)* > in [<*value 1*>,<*value 2*>...])

```
?$query=ldev.emulationType in ['OPEN-V-CVS','OPEN-V-CVS-CM']&
$query=ldev.storageDeviceId eq '800000010051'
```

Example of the output execution results

The following is an example of the output that is generated when LU path information is collected.

Request URL

```
curl -v -H "Accept:application/json" -H "Authorization:Session b74777a3-f9f0-
4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/
ConfigurationManager/v1/views/lun-paths?$query=ldev.storageDeviceId%20eq
%20'800000010051'
```

Obtained results

```
{
  "data" : [ {
    "hostGroup" : {
      "hostGroupId" : "CL1-A,0",
      "portId" : "CL1-A",
      "hostGroupNumber" : 0,
      "hostGroupName" : "1A-G001",
      "hostMode" : "WIN",
      "storageDeviceId" : "800000010051"
    },
    "ldev" : {
      "ldevId" : 359,
      "clprId" : 0,
      "emulationType" : "OPEN-V-CVS",
      "byteFormatCapacity" : "1.00 G",
      "blockCapacity" : 2097152,
      "attributes" : [ "CVS" ],
      "status" : "NML",
      "mpBladeId" : 4,
      "poolId" : 11,
      "numOfUsedBlock" : 0,
      "isFullAllocationEnabled" : false,
      "storageDeviceId" : "800000010051",
      "isDefined" : true
    },
    "lun" : {
      "lunId" : "CL1-A,0,0",
      "storageDeviceId" : "800000010051"
    }
  }, {
    "hostGroup" : {
      ...
    },
    ...
  },
  ...
 ],
```

```
  "offset" : 0,
  "count" : 100,
  "totalCount" : 961
}
```

Searching for storage system information

This section describes how to search for storage system resource information by using the REST API.

Resource information obtainable from storage systems by the search function

This section describes the storage system resources for which information can be obtained by the search function.

Storage system resources for which information can be obtained by the search function

The search function obtains the following types of resource information from target storage systems:

- Information about parity groups (parityGroup)
- Information about external volume groups (externalParityGroup)
- Volume information (ldev)
- Information about host groups or iSCSI targets (hostGroup)
- Port information (port)
- LU path information (lun)
- Host WWN information (wwn)
- iSCSI names of hosts (iscsi)
- Information about the WWNs that are registered in host groups (hostWwn)
- Information about the iSCSI names that are registered in iSCSI targets (hostIscsi)
- Pool information (pool)

The following table shows the types of information that can be obtained and the storage system resources for which each type of information can be obtained.

Type of information to be obtained	Resource to be obtained
Information about parity groups	▪ parityGroup

Type of information to be obtained	Resource to be obtained
Information about parity groups and volumes	▪ parityGroup ▪ ldev
Information about parity groups and pools	▪ parityGroup ▪ ldev ▪ pool
Information about external volume groups	▪ externalParityGroup
Volume information	▪ ldev
Information about host groups or iSCSI targets	▪ hostGroup
Port information	▪ port
LU path information of volumes that belong to host groups or iSCSI targets	▪ hostGroup ▪ ldev ▪ lun
Information related to WWNs that are registered in host groups	▪ hostGroup ▪ hostWwn ▪ wwn
Information related to iSCSI names that are registered in iSCSI targets	▪ hostGroup ▪ hostIscsi ▪ iscsi
LU path information for WWNs that are registered in host groups	▪ hostGroup ▪ hostWwn ▪ ldev ▪ lun ▪ port ▪ wwn
LU path information for iSCSI names that are registered in iSCSI targets	▪ hostGroup ▪ hostIscsi ▪ ldev ▪ lun ▪ port ▪ iscsi

Type of information to be obtained	Resource to be obtained
Pool information	▪ pool

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Note:

Information about host groups that use external ports and initiator ports might include incorrect information. Do not refer to information for these types of host groups.

Searching for information about parity groups

The following request searches for information about parity groups based on specified search conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/parity-groups
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
parityGroup	object	Information about parity groups

Default sort key

The `parityGroupId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information about parity groups and volumes

The following request searches for information about parity groups and basic volumes based on specified search conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/views/parity-groups-ldevs
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
parityGroup	object	Information about parity groups
ldev	object	Information about basic volumes

Default sort key

The `parityGroupId` attribute of parityGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information about parity groups and pools

The following request searches for information about parity groups and pools based on specified search conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/views/parity-groups-ldevs-pools
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
parityGroup	object	Information about parity groups
ldev	object	Information about pool volumes
pool	object	Pool information

Default sort key

The `parityGroupId` attribute of parityGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information about external volume groups

The following request searches for information about external volume groups based on specified search conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/views/external-parity-groups
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
externalParityGroup	object	Information about external volume groups

Default sort key

The `externalParityGroupId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for volume information

The following request obtains LDEV information by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/ldevs
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
ldev	object	Volume information

Default sort key

The `ldevId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information about host groups or iSCSI targets

The following request obtains information about host groups and iSCSI targets by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter.

If you do not specify a value for `hostGroup.isDefined` in the $query parameter, `true` is assumed. To search for information about a host group or iSCSI target that has not yet been created, specify `false` for the `hostGroup.isDefined`.

For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Information about host groups or iSCSI targets

Default sort key

The `hostGroupId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for port information

The following request obtains port information by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/ports
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
port	object	Port information

Default sort key

The `portId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for the LU path information of volumes that belong to host groups or iSCSI targets

The following request obtains the LU path information of volumes that belong to host groups or iSCSI targets by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups-ldevs-luns
```

You can also specify a request line that uses an alias as follows:

```
GET base-URL/v1/views/lun-paths
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Information about the host group or iSCSI target
ldev	object	Volume information
lun	object	LU path information

Default sort key

The `hostGroupId` attribute of hostGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information related to the WWNs registered in host groups

The following request obtains information related to host groups and host WWNs by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups-host-wwns-wwns
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Host group information
hostWwn	object	WWN information registered in the host group
wwn	object	WWN information

Default sort key

The `hostGroupId` attribute of hostGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for information related to the iSCSI names registered in iSCSI targets

The following request obtains information related to the iSCSI targets and the iSCSI names of hosts by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups-host-iscsis-iscsis
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Host group (iSCSI target) information
hostIscsi	object	iSCSI name information registered in the iSCSI target
iscsi	object	iSCSI name of the host

Default sort key

The `hostGroupId` attribute of hostGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for the LU path information for host WWNs

The following request obtains path information for host WWNs that are registered in host groups by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups-host-wwns-ldevs-luns-ports-wwns
```

You can also specify a request line that uses an alias as follows:

```
GET base-URL/v1/views/host-wwn-paths
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Host group information
hostWwn	object	WWN information of hosts that belong to the host group
ldev	object	Volume information
lun	object	LU path information
port	object	Port information
wwn	object	WWN information

Default sort key

The `hostGroupId` attribute of hostGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for the LU path information for the iSCSI names of hosts

The following request obtains LU path information for the iSCSI names of hosts that are registered in iSCSI targets by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/host-groups-host-iscsis-iscsis-ldevs-luns-ports
```

You can also specify a request line that uses an alias as follows:

```
GET base-URL/v1/views/host-iscsi-paths
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
hostGroup	object	Host group (iSCSI target) information
hostIscsi	object	iSCSI name information registered in the iSCSI target
ldev	object	Volume information
lun	object	LU path information
port	object	Port information
iscsi	object	iSCSI name of the host

Default sort key

The `hostGroupId` attribute of hostGroup

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Searching for pool information

The following request obtains pool information by specifying filter conditions.

Execution permission

Security Administrator (View Only), Security Administrator (View & Modify), Audit Log Administrator (View Only), or Audit Log Administrator (View & Modify)

One of these roles is required, because permissions for All Resource Groups is required.

Request line

```
GET base-URL/v1/views/pools
```

Request message

Query parameters

Be sure to specify the storage device ID of the target storage system for the $query parameter. For details on the query parameters that can be specified, see the description of the query parameters that can be used for the search function.

Body

None.

Response message

Body

For details on the information that can be obtained, see the description on the storage system resources for which information can be obtained by the search function.

Attribute	Type	Description
pool	object	Pool information

Default sort key

The `poolId` attribute

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Storage system resources obtained by the search function

This section describes the storage system resources about which information can be obtained by the search function. To specify a resource attribute in a query parameter, connect the resource name and attribute name by a dot (`.`). For example, to specify the ldevId attribute of the resource "ldev":

```
ldev.ldevId
```

Parity groups (parityGroup)

You can use the search function to get information about the following attributes related to parity groups.

Resource name

parityGroup

List of resource attributes

Even if you have enabled the function for receiving notifications about changes made to the configuration of storage systems, you might not be able to get the newest parity group information by using the search function. We recommend that you run the API request to update information about the configuration of storage systems before using the search function.

Attribute	Type	Description
parityGroupId	string	Parity group number
groupType	string	Type of the parity group ▪ `PG`: Parity group ▪ `DDP`: Parity group for DDP This attribute is displayed for storage systems VSP One B20.
usedCapacityRate	int	Usage rate of the parity group (%)
availableVolumeCapacity	long	Available capacity (GB) The amount of free space is output. If the capacity is below 1 GB, the value is truncated and `0` is output.
raidLevel	string	RAID level
raidType	string	RAID type
clprId	int	CLPR number
driveType	string	Code indicating the drive type of the drive belonging to the parity group
driveTypeName	string	Drive type of the drive belonging to the parity group
driveSpeed	int	Rotation speed (rpm) of the drive belonging to the parity group
totalCapacity	long	Logical capacity of the parity group (GB)

Attribute	Type	Description
		If the accelerated compression setting is enabled, the expanded capacity is output.
physicalCapacity	long	Physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed. This attribute is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
isAcceleratedCompressionEnabled	boolean	Value of the accelerated compression of the parity group ▪ `true`: Accelerated compression for the parity group is enabled. ▪ `false`: Accelerated compression for the parity group is disabled.
storageDeviceId	string	Storage device ID

When the drive type of the parity group is `SSD(FMC)`, the following additional information is obtained.

Attribute	Type	Description
isExpandedSpaceUsed	boolean	Whether LDEVs in parity groups use the expanded area ▪ `true`: LDEVs use the expanded area ▪ `false`: LDEVs use the physical area or are not implemented
totalPhysicalCapacity	long	Physical capacity of the parity group (GB) Capacity reserved for writing data in the parity group. If the value of this attribute is less than 1 GB, `0` is displayed.

Attribute	Type	Description
		An invalid value is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.

External volume groups (externalParityGroup)

You can use the search function to get information about the following attributes related to external volume groups.

Resource name

externalParityGroup

List of resource attributes

Even if you have enabled the function for receiving notifications about changes made to the configuration of storage systems, you might not be able to get the newest external volume group information by using the search function. We recommend that you run the API request to update information about the configuration of storage systems before using the search function.

Attribute	Type	Description
externalParityGroupId	string	External volume group number
usedCapacityRate	int	Usage rate of the external volume group
availableVolumeCapacity	long	Available capacity (free space) If the capacity is below 1 GB, the value is ignored and `0` is assumed.
emulationType	string	Emulation type of the external volume group
clprId	int	Number of CLPR to which the external volume group belongs
storageDeviceId	string	Storage device ID

Volume (ldev)

This section describes the attributes that can be obtained by the search function with regard to volumes.

Resource name

ldev

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes (excluding the attributes marked with a hash mark (#)).

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, *XX*VSP F400, F600, F800

  83-05-24-/*XX* or later
- For VSP G1000, VSP G1500, VSP F1500

  80-06-6*X*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId#	int	Virtual LDEV number If the virtual LDEV number is not set, `65534` (FF:FE) is output. If the reserved attribute of the global-active device is set, `65535` (FF:FF) is output.
clprId#	int	CLPR number
emulationType#	string	The LDEV emulation type or the LDEV status information is output by using one of the following values: ▪ `NOT DEFINED`: The LDEV is not implemented. ▪ `DEFINING`: The LDEV is being created. ▪ `REMOVING`: The LDEV is being removed.
byteFormatCapacity	string	Capacity of the LDEV The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the LDEV

Attribute	Type	Description
composingPoolId	int	Pool ID of the pool that includes the LDEV
attributes#	string[]	LDEV attributes The following attributes are output: ▪ `CMD`: Command device (except for command devices for mainframes) ▪ `CLUN`: Cache LUN (DCR) ▪ `CVS`: CVS volume ▪ `ALUN`: Volume Migration volume ▪ `ELUN`: External volume ▪ `OLG`: OpenLDEV Guard volume ▪ `VVOL`: Virtual volume ▪ `HORC`: Pair volume (P-VOL or S-VOL) for remote copy (TrueCopy, TrueCopy for Mainframe, Universal Replicator, Universal Replicator for Mainframe) ▪ `MRCF`: ShadowImage volume (P-VOL or S-VOL) ▪ `HTI`: Thin Image volume (P-VOL or S-VOL) ▪ `JNL`: Journal volume ▪ `HDP`: HDP volume or Dynamic Provisioning for Mainframe volume ▪ `HDT`: HDT volume ▪ `POOL`: Pool volume ▪ `DRS`: Data reduction shared volume ▪ `QRD`: Quorum disk ▪ `ENCD`: Encrypted disk ▪ `SYSD`: System disk ▪ `TSE`: HDP volume used for FCSE ▪ `GAD`: global-active device volume ▪ `T10PI`: Volume for which the T10 PI attribute is enabled

Attribute	Type	Description
		▪ `DSD`: Deduplication system data volume (fingerprint) or deduplication system data volume ▪ `DS`: Deduplication system data volume (data store) ▪ `HNASS`: Volume used as the system LU of NAS Platform ▪ `HNASU`: Volume used as a user LU of NAS Platform ▪ `RCMD`: Remote command device ▪ `MG`: Volume used for data migration
raidLevel	string	RAID level
raidType	string	Drive configuration
parityGroupIds	string[]	Parity group to which the LDEV belongs
driveType	string	Code indicating the drive type of the drive belonging to the LDEV
driveByteFormatCapacity	string	Capacity of the HDD The value is output to the second decimal place.
driveBlockCapacity	long	Number of blocks of the HDD
label	string	LDEV nickname
status#	string	Status of the LDEV ▪ `NML`: The LDEV is in normal status. ▪ `BLK`: The LDEV is blocked. ▪ `BSY`: The LDEV status is being changed. ▪ `Unknown`: The LDEV status is unknown (not supported).
mpBladeId#	int	MP blade ID
resourceGroupId	int	ID of the resource group
quorumDiskId#	int	ID of the Quorum disk This attribute is output only if the external volume is a Quorum disk of the global-active device.

Attribute	Type	Description
quorumStorageSerialNumber#	string	Device number of the Quorum disk This attribute is output only if the external volume is a Quorum disk of the global-active device.
quorumStorageTypeId#	string	ID for identifying the Quorum disk device This attribute is output only if the external volume is a Quorum disk of the global-active device. `R8`: VSP G1000, VSP G1500, VSP F1500 `R9`: VSP 5000 series `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models
poolId#	int	ID of the pool with which the LDEV is associated. ▪ For DP volumes: ID of the associated DP pool ▪ For virtual volumes for Thin Image: ID of the pool in which the snapshot data was created
numOfUsedBlock	long	Number of blocks used in the pool. This attribute is output when the LDEV is a virtual volume. This includes the number of blocks whose pages are reserved by the Full Allocation functionality.
snapshotPoolId#	int	ID of the pool in which the snapshot data was created This attribute is output when the LDEV is both an S-VOL of a Thin Image pair and an HDP volume.
usedCapacityForSnapshot#	long	Capacity used for snapshots in a Thin Image P-VOL (in MB) This attribute is output when the LDEV is a virtual volume. The snapshot capacity that is allocated from the pool and used as data is obtained.
isRelocationEnabled#	boolean	Status of relocation

Attribute	Type	Description
		This attribute is output when the LDEV is a virtual volume. ▪ `true`: Relocation is enabled. ▪ `false`: Relocation is stopped.
tierLevel	string	Tiering policy used for relocation This attribute is output when the LDEV is a virtual volume. ▪ `all`: All tiers are used for relocation (level 0) ▪ `1` to `5`: Relocation is performed by following the tiering policy (levels 1 to 5) ▪ `6` to `31`: Relocation is performed by following the tiering policy (custom policy)
usedCapacityPerTierLevel1#	long	Capacity allocated to tier 1 (in MB) This attribute is output when the LDEV is a virtual volume.
usedCapacityPerTierLevel2#	long	Capacity allocated to tier 2 (in MB) This attribute is output when the LDEV is a virtual volume.
usedCapacityPerTierLevel3#	long	Capacity allocated to tier 3 (in MB) This attribute is output when the LDEV is a virtual volume.
tierLevelForNewPageAllocation	string	New page assignment tier This attribute is output when the LDEV is a virtual volume. ▪ `H`: The page is allocated to a higher-level tier (High) ▪ `M`: The page is allocated to a middle-level tier (Middle) ▪ `L`: The page is allocated to a lower-level tier (Low)
fullAllocationCapacity	long	Capacity for which pages are reserved by the Full Allocation functionality (in MB) This attribute is output when the LDEV is a virtual volume.

Attribute	Type	Description
isFullAllocationEnabled	boolean	Whether pages are reserved by the Full Allocation functionality This attribute is output when the LDEV is a virtual volume. ▪ `true`: The page reservation setting is enabled. ▪ `false`: The page reservation setting is disabled.
dataReductionMode	string	Setting of the capacity saving function ▪ `compression`: The capacity saving function (compression) is enabled. ▪ `compression_deduplication`: The capacity saving function (compression and deduplication) is enabled. ▪ `disabled`: The capacity saving function (compression and deduplication) is disabled.
dataReductionStatus#	string	Status of the capacity saving function ▪ `ENABLED`: The capacity saving function is enabled. ▪ `DISABLED`: The capacity saving function is disabled. ▪ `ENABLING`: The capacity saving function is being enabled. ▪ `REHYDRATING`: The capacity saving function is being disabled. ▪ `DELETING`: The volumes for which the capacity saving function is enabled are being deleted. ▪ `FAILED`: An attempt to enable the capacity saving function failed.
isDefined	boolean	Whether the LDEV is implemented ▪ `true`: Implemented ▪ `false`: Not implemented
storageDeviceId	string	Storage device ID

#: The latest information might not be acquired even if notifications of changes to the storage system configuration is received.

Host group or iSCSI target (hostGroup)

This section describes the attributes that can be obtained by the search function with regard to a host group or an iSCSI target.

Resource name

hostGroup

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes (excluding the attributes marked with a hash mark (#)).

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-23-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-05-29-*XX*/*XX* or later
- For VSP G1000, VSP G1500, VSP F1500

  80-06-65-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
hostGroupId	string	Object ID for the host group or iSCSI target
portId	string	Port number
hostGroupNumber	int	Host group number of the port (for the iSCSI target, target ID)
hostGroupName	string	Host group name (for the iSCSI target, target ID)
iscsiName	string	iSCSI name of the iSCSI target of the port This information is obtained only when the portId parameter is specified.
authenticationMode	string	Authentication mode for the iSCSI target

Attribute	Type	Description
		This information is obtained only when the portId parameter is specified. ▪ `CHAP`: CHAP-authentication mode ▪ `NONE`: No-authentication mode ▪ `BOTH`: Both CHAP-authentication mode and no-authentication mode
iscsiTargetDirection	string	Direction of CHAP authentication for the iSCSI target This information is obtained only when the portId parameter is specified. ▪ `S`: One-way (The iSCSI target authenticates the iSCSI initiator.) ▪ `D`: Mutual (The iSCSI target and the iSCSI initiator authenticate each other.)
hostMode	string	Host mode for setting the host adapter of the host group For details on the values to be obtained, see the description of the API function for changing the host group or iSCSI target settings.
hostModeOptions	int[]	Number of the host mode option set for the host group This is not output if a host mode option is not set. For details on the number to be obtained, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.
resourceGroupId#	int	Resource group ID of the host group or iSCSI target
isDefined	boolean	Whether the host group or iSCSI target has been created ▪ `true`: The host group or iSCSI target has been created. ▪ `false`: The host group or iSCSI target has not been created.

Attribute	Type	Description
		If you do not specify a value for `isDefined` in the $query parameter, `true` is assumed. To search for information about a host group or iSCSI target that has not yet been created, specify `false` for the `isDefined`.
storageDeviceId	string	Storage device ID

#: The latest information might not be acquired even if notifications of changes to the storage system configuration is received.

Port (port)

This section describes the attributes that can be obtained by the search function with regard to ports.

Resource name

port

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes (excluding the attributes marked with a hash mark (#)).

- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later
- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1500, VSP F350, F370, F700, F900, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
portId	string	Port number
staticMacAddress	string	Static MAC address of the port. This information is obtained in the case of an FCoE port.
vLanId	string	VLAN value (in hexadecimal number format)

Attribute	Type	Description
		This information is obtained in the case of an FCoE port.
dynamicMacAddress	string	Dynamic MAC address of the port. This information is obtained in the case of an FCoE port.
virtualPortStatus#	string	Status of the virtual port This information is obtained in the case of an FCoE port. ▪ `DWN`: Link down ▪ `LOT`: Link up (logoff) ▪ `LIN`: Link up (logon)
virtualPortId	string	Number of the virtual port This information is obtained in the case of an FCoE port. If not supported, 0x00 is output.
fcoeSwitchControlId	string	Management number of the FCoE switch This information is obtained in the case of an FCoE port. If not supported, 0x0000 is output.
tcpOption	object	The following attributes are output: This information is obtained in the case of an iSCSI port. ▪ ipv6Mode (boolean) IPv6 mode ▪ selectiveAckMode (boolean) Selective Ack mode ▪ delayedAckMode (boolean) Delayed Ack mode ▪ isnsService (boolean) iSNS service ▪ tagVLan (boolean) Tag VLAN
tcpMtu	int	Value of MTU for iSCSI communication

Attribute	Type	Description
		This information is obtained in the case of an iSCSI port.
iscsiWindowSize	string	Value of Window Size for iSCSI communication This information is obtained in the case of an iSCSI port.
keepAliveTimer	int	Value of Keep Alive Timer for iSCSI communication This information is obtained in the case of an iSCSI port.
tcpPort	string	TCP port number for iSCSI communication This information is obtained in the case of an iSCSI port.
ipv4Address	string	IPv4 address This information is obtained in the case of an iSCSI port.
ipv4Subnetmask	string	IPv4 subnet mask This information is obtained in the case of an iSCSI port.
ipv4GatewayAddress	string	IPv4 address of the gateway to be used for iSCSI communication This information is obtained in the case of an iSCSI port.
ipv6LinkLocalAddress[#]	object	This information is obtained in the case of an iSCSI port.

Attribute	Type	Description
		The following attributes are output: ▪ status (string)# One of the following values that indicate the status of the IPv6 link local address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 link local address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 link local address value
ipv6GlobalAddress#	object	This information is obtained in the case of an iSCSI port.

Attribute	Type	Description
		The following attributes are output: ▪ status (string)# One of the following values that indicate the status of the IPv6 global address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 global address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 global address value
ipv6GatewayGlobalAddress#	object	This information is obtained in the case of an iSCSI port.

Attribute	Type	Description
		The following attributes are output: ▪ status (string)# One of the following values that indicate the status of the IPv6 global address of the gateway to be used for iSCSI communication is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ address (string) IPv6 global address value of the gateway to be used for iSCSI communication ▪ currentAddress (string)# IPv6 global current address value of the gateway to be used for iSCSI communication
isnsPort	string	TCP port number of the iSNS server This information is obtained in the case of an iSCSI port.
isnsAddress	string	TCP port number of the iSNS server This information is obtained in the case of an iSCSI port.
portType#	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`,`NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, or `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port)

Attribute	Type	Description
		For a bidirectional port, all four attributes are output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number)
loopId	string	The value set for the port loop ID (AL_PA)
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set.
portConnection	string	Topology setting for the port ▪ `FCAL` ▪ `PtoP`
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set.
wwn	string	External WWN
storageDeviceId	string	Storage device ID

#: The latest information might not be acquired even if notifications of changes to the storage system configuration is received.

LUN (lun)

This section describes the attributes that can be obtained by the search function with regard to LUNs.

Resource name

lun

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes.

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later
- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G1500, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
lunId	string	Object ID for the LUN
lun	int	LUN between the host group and the mapped LDEV
storageDeviceId	string	Storage device ID

WWN (wwn)

This section describes the attributes that can be obtained by the search function with regard to WWNs.

Resource name

wwn

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes.

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later

- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G1500, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
wwn	string	WWN

iSCSI name (iscsi)

This section describes the attributes that can be obtained by the search function with regard to the iSCSI name.

Resource name

iscsi

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes.

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later
- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G1500, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
iscsiName	string	iSCSI name

WWNs registered in host groups (hostWwn)

This section describes the attributes that can be obtained by the search function with regard to the WWNs of hosts registered in a host group.

Resource name

hostWwn

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes.

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later
- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G1500, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
hostWwnId	string	Object ID for the WWN
wwnNickname	string	WWN nickname
storageDeviceId	string	Storage device ID

iSCSI registered in the iSCSI target (hostIscsi)

This section describes the attributes that can be obtained by the search function with regard to the iSCSI of a host registered in the iSCSI target.

Resource name

hostIscsi

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes.

- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-04-*XX*-*XX*/*XX* or later

- For VSP G1000

  80-05-*XX*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series, VSP G1500, VSP F1500

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
hostIscsiId	string	Object ID for the iSCSI name
iscsiNickname	string	iSCSI nickname
storageDeviceId	string	Storage device ID

Pool (pool)

This section describes the attributes that can be obtained by the search function with regard to pools.

Resource name

pool

List of resource attributes

If the microcode version of the storage system meets the following conditions, you can get the latest information by using a notification about configuration changes (excluding the attributes marked with a hash mark (#)).

- For VSP E990

  93-02-03-*XX*/*XX* or later
- For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  88-03-0*X*-*XX*/*XX* or later
- For VSP G200, G400, G600, G800, VSP F400, F600, F800

  83-05-24-*XX*/*XX* or later
- For VSP G1000, VSP G1500, VSP F1500

  80-06-6*X*-*XX*/*XX* or later
- For VSP One B20, VSP 5000 series, VSP E series (excluding VSP E990)

  Microcode versions that can be managed by REST API or later

  For details, see the description "Supported storage systems".

Attribute	Type	Description
poolId	int	Object ID for the pool
poolStatus#	string	One of the following is output as the pool status: ▪ `POLN`: Normal (Pool Normal) ▪ `POLF`: The pool is in the overflow status exceeding the threshold. (Pool Full) ▪ `POLS`: The pool is in the overflow status exceeding the threshold and is suspended. (Pool Suspend) ▪ `POLE`: The pool is suspended in the failure status. (Pool failure) If the pool status is `POLE`, pool information cannot be obtained.
usedCapacityRate#	int	Usage rate of the pool (%) The usage rate of logical capacity (%) is output. For VSP One B20, this indicates the usage rate of the effective capacity (%).
usedPhysicalCapacityRate#	int	Usage rate of physical capacity (%) This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
poolName	string	Pool name
availableVolumeCapacity#	long	The capacity that can be used for volume data (MB) The free logical capacity (MB) is output.
availablePhysicalVolumeCapacity#	long	Free physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
totalPoolCapacity#	long	Total capacity of the pool (MB) The total logical capacity (MB) is output.

Attribute	Type	Description
		For VSP One B20, part of the logical capacity might not be effective when you edit the parity group for DDP in storage management software such as CCI.
totalPhysicalCapacity#	long	Total physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
firstLdevId	int	The first LDEV number of the LDEVs in the pool (Not the first number in ascending order)
warningThreshold	int	The warning threshold set for the pool
depletionThreshold	int	The depletion threshold set for the pool
virtualVolumeCapacityRate#	int	The maximum subscription limit of a virtual volume relative to pool capacity If unlimited is set, `-1` is output. If the value of Thin Image pools, `-1` is output, indicating an invalid value. For the following storage system models, `-1` is output to indicate an invalid value: VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
isMainframe	boolean	Displays a pool for the mainframe or the open system ▪ `true`: Pool for the mainframe volume ▪ `false`: Pool for the open volume
isShrinking#	boolean	Whether the pool is shrinking or rebalancing is output. ▪ `true`: The pool is shrinking or rebalancing. ▪ `false`: The pool is not shrinking or rebalancing.
totalLocatedCapacity#	long	Total capacity of the DP volumes mapped to the pool (MB)

Attribute	Type	Description
		The value of this attribute does not include the control area.
blockingMode	string	Setting the protection function for a virtual volume When the DP pool is full or when the DP pool volume is blocked, whether the read and write operations can be performed for the DP volume that uses the target DP pool is output. ▪ `PF`: Pool Full If the DP pool is full, read and write operations are not possible. If the DP pool volume is blocked, read and write operations are possible. ▪ `PB`: Pool vol Blockade If the DP pool volume is blocked, read and write operations are not possible. If the DP pool is full, read and write operations are possible. ▪ `FB`: Full or Blockade If the DP pool is full or the DP pool volume is blocked, read and write operations are not possible. ▪ `NB`: No Blocking Even if the DP pool is full or the DP pool volume is blocked, read and write operations are possible for the target DP volume.
totalReservedCapacity#	long	Total capacity of the reserved page (MB) of the DP volume that is related to the DP pool If the Full Allocation functionality is not supported by the configuration, this attribute is not output.

Attribute	Type	Description
poolActionMode	string	Execution mode for the pool ▪ `DEF`: The mode in which the monitor is started or stopped by instructions from the REST API server, and the Tier range is specified by automatic calculation of the DKC. ▪ `AUT`: The mode in which the monitor is started or stopped at the specified time, and the Tier range is specified by automatic calculation of the DKC (specified by using Storage Navigator or other storage management software).
tierOperationStatus#	string	Operation status of performance monitoring and tier relocation is output. ▪ `STP`: Performance monitoring and tier relocation are both stopped. ▪ `RLC`: Performance monitoring is stopped and tier relocation is operating. ▪ `MON`: Performance monitoring is operating and tier relocation is stopped. ▪ `RLM`: Performance monitoring and tier relocation are both operating.
dat#	string	Status of monitor information ▪ `VAL`: Valid ▪ `INV`: Invalid ▪ `PND`: Pending calculation
poolType	string	Pool type ▪ `HDP`: HDP pool ▪ `HDT`: HDT pool ▪ `RT`: active flash pool ▪ `DM`: Data Direct Mapping HDP pool
monitoringMode	string	Performance monitoring execution mode (monitor mode) ▪ `PM`: Period mode ▪ `CM`: Continuous mode

Attribute	Type	Description
dataReductionAccelerateCompCapacity#	long	Size (in blocks) of data reduction through the capacity saving function or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionCapacity#	long	Size (in blocks) of data reduction through the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionBeforeCapacity#	long	Size (in blocks) of data before data reduction was performed by using the capacity saving function (compression and deduplication)
dataReductionAccelerateCompRate#	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
duplicationRate#	int	Percentage (%) of data on which data reduction has been performed by using the deduplication function
compressionRate#	int	Percentage (%) of data on which data reduction has been performed by using the compression function or the accelerated compression function
dataReductionRate#	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
snapshotUsedCapacity#	long	Total size of snapshot data mapped to the pool (MB)

Attribute	Type	Description
suspendSnapshot	boolean	Whether to suspend Thin Image pairs when the depletion threshold is exceeded ▪ `true`: Thin Image pairs are suspended when the depletion threshold is exceeded. ▪ `false`: Thin Image pairs are not suspended when the depletion threshold is exceeded.
tiers	object[]	The following attributes about HDT pool tiers are output for each tier. ▪ tierNumber (int) Tier number ▪ tierLevelRange (string)# Lower limit of the tier The value is output as the number of I/O operations per hour (IOPH). ▪ tierDeltaRange (string)# Delta value for the tier The value is output as the number of I/O operations per hour (IOPH). ▪ tierUsedPhysicalCapacity (long)# Physical capacity used by the tier (MB) ▪ tierTotalPhysicalCapacity (long)# Total physical capacity of the tier (MB) ▪ tierUsedCapacity (long)# Logical capacity used by the tier (MB) ▪ tierTotalCapacity (long)# Total logical capacity of the tier (MB) ▪ tablespaceRate (int)# Rate of free space to be used for new allocation ▪ performanceRate (int)# Performance utilization

Attribute	Type	Description
		▪ progressOfReplacing (int)# Relocation progress rate The progress rate of the following tier relocation operation is output as a value from `0` to `99`. • When the value of the `tierOperationStatus` attribute is `RLC` or `RLM`: Progress rate of relocation (being run). • When the value of the `tierOperationStatus` attribute is `STP` or `MON`: Progress rate of relocation (being suspended). When tier relocation is not run or tier relocation is complete, `100` is output. ▪ bufferRate (int)# Buffer area rate for relocation
dataReductionAccelerateCompIncludingSystemData	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) or the accelerated compression function are displayed.

Attribute	Type	Description
		These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean)# Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long)# Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean)# Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int)# Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.
dataReductionIncludingSystemData	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) are displayed.

Attribute	Type	Description
		These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean)# Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long)# Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean)# Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int)# Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.
capacitiesExcludingSystemData	object	Attributes related to the capacity saving achieved by using the capacity saving function are displayed. ▪ usedVirtualVolumeCapacity (long)# The capacity (in blocks) used by virtual volumes This does not include the capacity used by the system data volume for the dedupe function. ▪ compressedCapacity (long)# The size (in blocks) of data reduced by using compression This does not include the size of metadata and garbage data generated by the storage system.

Attribute	Type	Description
		▪ dedupedCapacity (long)# The size (in blocks) of data reduced by using deduplication This does not include the size of metadata and garbage data generated by the storage system. ▪ reclaimedCapacity (long)# The size (in blocks) of data reduced by reclaiming the specified data pattern This does not include the size of metadata and garbage data generated by the storage system. ▪ systemDataCapacity (long)# The size (in blocks) of system data reduced This includes the size of metadata and garbage data generated by the storage system. ▪ preUsedCapacity (long)# The size (in blocks) of the data before data reduction was performed ▪ preCompressedCapacity (long)# The size (in blocks) of the data before compression was performed ▪ preDedupredCapacity (long)# The size (in blocks) of the data before dedupe was performed
storageDeviceId	string	Storage device ID

#: The latest information might not be acquired even if notifications of changes to the storage system configuration is received.

When the drive type of the pool volumes that make up the pool is `SSD(FMC)`, the following additional information is obtained.

Attribute	Type	Description
usedPhysicalCapacityRate#	int	Usage rate of physical capacity (%) The percentage (%) that `usedPhysicalCapacity` occupies of `totalPhysicalCapacity` is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.
availablePhysicalVolumeCapacity#	long	Free physical capacity (MB) The capacity obtained by deducting `usedPhysicalCapacity` from `totalPhysicalCapacity` is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.
usedPhysicalCapacity#	long	Total physical capacity usage (MB) When the pool contains pool volumes for which the accelerated compression function is enabled, the compressed data is included in the total usage.
totalPhysicalCapacity#	long	Total physical capacity (MB) The total pool capacity reserved for writing is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.
availablePhysicalFMCPoolVolumesCapacity#	long	Total available physical capacity of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the total capacity reserved for writing in pool volumes that belong to a parity group and that support the accelerated compression function.
usedPhysicalFMCPoolVolumesCapacity#	long	Physical capacity usage of pool volumes that support the accelerated compression function (MB)

Attribute	Type	Description
		From among the volumes making up a pool, this outputs the used capacity after compression of the pool volumes that belong to a parity group and that support the accelerated compression function.
availableFMCPoolVolumesCapacity#	long	Total capacity of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the total capacity of the pool volumes that belong to a parity group and that support the accelerated compression function.
usedFMCPoolVolumesCapacity#	long	Capacity usage of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the used capacity of the pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacitySaving#	long	Amount of data reduction in the capacity of pool volumes and that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the capacity reduced by compression of data in pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacitySavingRate#	int	Rate of data reduction in the capacity of pool volumes that support the accelerated compression function (%) From among the volumes making up a pool, this outputs the percentage (%) that `fmcPoolVolumesCapacitySaving` occupies of `usedFMCPoolVolumesCapacity` with regard to pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacityExpansionRate#	int	Rate of capacity expansion of pool volumes that support the accelerated compression function (%)

Attribute	Type	Description
		This outputs the percentage (%) that `availableFMCPoolVolumesCapacity` occupies of `availablePhysicalFMCPoolVolumesCapacity`.
usedFMCLogicalPoolVolumesCapacity#	long	Logical capacity usage of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the used capacity before compression of the pool volumes that belong to a parity group and that support the accelerated compression function. This attribute is displayed for storage systems VSP 5000 series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

#: The latest information might not be acquired even if notifications of changes to the storage system configuration is received.

Enabling or disenabling the search function

This section describes how to enable or disable the search function by using the REST API. By default, the search function is enabled. You can disable the search function by running the `setProperty` command.

Enabling the search function

This section describes how to enable the search function by running the `setProperty` command. By default, this function is enabled.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Tip:

You can check the value that is currently set by checking the value of the `rest.view.enabled` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `rest.view.enabled` property, this indicates that the default value is set.

In a Windows OS:

REST-API-installation-destination\data\properties\StartupV.properties

In a Linux OS:

REST-API-installation-destination/data/properties/StartupV.properties

Procedure

1. Run the following command:

   In a Windows OS:

   REST-API-installation-destination\bin\setProperty.bat rest.view.enabled true

   In a Linux OS:

   REST-API-installation-destination/bin/setProperty.sh rest.view.enabled true

   After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

   When you run the `setProperty` command, the value of the `rest.view.enabled` property in the `StartupV.properties` file will be changed to `true`. If the file does not exist, it will be created.

   Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

Disabling the search function

This section describes how to disable the search function by running the `setProperty` command.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Tip:

You can check the value that is currently set by checking the value of the `rest.view.enabled` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `rest.view.enabled` property, this indicates that the default value is set.

In a Windows OS:

REST-API-installation-destination\data\properties\StartupV.properties

In a Linux OS:

REST-API-installation-destination/data/properties/StartupV.properties

Procedure

1. Run the following command:

   In a Windows OS:

   REST-API-installation-destination\bin\setProperty.bat rest.view.enabled false

   In a Linux OS:

   REST-API-installation-destination/bin/setProperty.sh rest.view.enabled false

   After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

   When you run the `setProperty` command, the value of the `rest.view.enabled` property in the `StartupV.properties` file will be changed to `false`. If the file does not exist, it will be created.

   Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

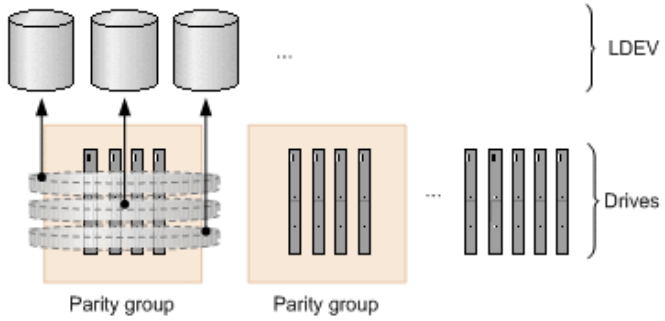
Chapter 6: Parity group management

This chapter describes how to manage parity groups by using the REST API.

Overview of a parity group

A parity group is a set of physical drives that configure a RAID in a storage system.

A logical storage area extracted from a parity group is used as an LDEV (basic volume). To create an LDEV to be used for operations such as volume allocation or pool creation, you need to create a parity group in advance.



Parity group operations performed by the REST API vary depending on the type of storage system.

For VSP One B20

You can use only parity groups for DDP (parity groups for which the value of `groupType` is `DDP`).

You cannot use the REST API to create parity groups for DDP. In addition, it is not possible to edit the parity group for DDP (for example, it is not possible to expand the parity group for DDP) or check the operation status. Use storage management software such as CCI.

For VSP E series

- Creating a parity group

  You can create a parity group when installing a new storage system or adding drives. You can configure a distributed parity group, or specify settings to encrypt a parity group or specify copy-back mode.

- Changing the drive settings

  You can assign a specified drive as a spare drive, or release the assignment. The spare drive is used when a failure occurs in a drive that configures a parity group.

- Formatting a parity group

  You can format all volumes created from a parity group. When you create multiple volumes at the time a new storage system is installed or drives are added, you can collectively format the volumes.

- Deleting a parity group

  You can delete a parity group. If the specified parity group is a parity group making up a distributed parity group, all concatenated parity groups are deleted.

For VSP Gx00 models or VSP Fx00 models

- Creating a parity group

  You can create a parity group when installing a new storage system or adding drives. You can configure a distributed parity group, or specify settings to encrypt a parity group or specify copy-back mode.

- Changing the drive settings

  You can assign a specified drive as a spare drive, or release the assignment. The spare drive is used when a failure occurs in a drive that configures a parity group.

- Changing the accelerated compression setting of a parity group

  You can enable or disable the accelerated compression setting for a parity group for which the accelerated compression function is supported.

- Formatting a parity group

  You can format all volumes created from a parity group. When you create multiple volumes at the time a new storage system is installed or drives are added, you can collectively format the volumes.

- Deleting a parity group

  You can delete a parity group. If the specified parity group is a parity group making up a distributed parity group, all concatenated parity groups are deleted.

For VSP 5000 series

- Changing the accelerated compression setting of a parity group

  You can enable or disable the accelerated compression setting for a parity group for which the accelerated compression function is supported.

- Formatting a parity group

  You can format all volumes created from a parity group. When you create multiple volumes at the time a new storage system is installed or drives are added, you can collectively format the volumes.

For VSP G1000, VSP G1500, or VSP F1500, the only operation you can perform is to change the accelerated compression setting for the parity group.

For details on parity groups, see the *Provisioning Guide*, or the *Provisioning Guide for Open Systems*.

Getting information about parity groups

The following request obtains information about all parity groups.

Note:

If you are using SCM drives, see the usage notes in the manual for the relevant storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/parity-groups
```

Request message

Object ID

None.

Query parameters

You can filter execution results by the specified condition and also collect additional detailed information about parity groups.

- When filtering execution results

Parameter	Type	Filtering condition
clprId	int	(Optional) CLPR number
driveTypeName	string	(Optional) Drive type For VSP One B20: ▪ SSD(QLC) ▪ SSD For VSP 5000 series: ▪ SAS ▪ SSD(MLC) ▪ SSD(FMC) ▪ SSD ▪ SCM

Parameter	Type	Filtering condition
		For VSP E series: ▪ `SAS` ▪ `SSD(MLC)` ▪ `SSD` For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900: ▪ `SAS` ▪ `SSD(MLC)` ▪ `SSD(FMC)` ▪ `SSD(RI)` For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500: ▪ `SAS` ▪ `SATA` ▪ `SSD(SLC)` ▪ `SSD(MLC)` ▪ `SSD(FMD)` ▪ `SSD(FMC)`
driveSpeed	int	(Optional) Drive rotation speed (rpm)

- When collecting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of information to be collected To specify multiple values, separate the values by using commas.

Parameter	Type	Description
		This parameter can be used together with the parameter for filtering execution results. ▪ `FMC` For the parity groups whose drive type is `SSD(FMC)`, add detailed information about accelerated compression. ▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. You can specify this item for VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900 model storage systems if the storage system is in a configuration that is linked to an SVP. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". ▪ `physicalCapacity` Specify this attribute to get additional information about the physical capacity. You can specify this item for the following storage systems: VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, and VSP F1500.

Body

None.

Response message

Body

```
{
  "data" : [
    {
```

```
    "parityGroupId" : "1-1",
    "numOfLdevs" : 267,
    "usedCapacityRate" : 96,
    "availableVolumeCapacity" : 24,
    "raidLevel" : "RAID5",
    "raidType" : "3D+1P",
    "clprId" : 0,
    "driveType" : "DKR5C-K300SS",
    "driveTypeName" : "SAS",
    "driveSpeed" : 15000,
    "totalCapacity" : 805,
    "physicalCapacity" : 805,
    "availablePhysicalCapacity" : 24,
    "isAcceleratedCompressionEnabled" : false,
    "availableVolumeCapacityInKB" : 26103552
  }, {
    "parityGroupId" : "1-2",
    "numOfLdevs" : 8,
    "usedCapacityRate" : 3,
    "availableVolumeCapacity" : 499,
    "raidLevel" : "RAID1",
    "raidType" : "2D+2D",
    "clprId" : 0,
    "driveType" : "DKR5C-K300SS",
    "driveTypeName" : "SAS",
    "driveSpeed" : 15000,
    "totalCapacity" : 518,
    "physicalCapacity" : 518,
    "availablePhysicalCapacity" : 499,
    "isAcceleratedCompressionEnabled" : false,
    "availableVolumeCapacityInKB" : 523737912
  }, {
    "parityGroupId" : "2-1",
    "numOfLdevs" : 90,
    "usedCapacityRate" : 88,
    "availableVolumeCapacity" : 191,
    "raidLevel" : "RAID6",
    "raidType" : "6D+2P",
    "clprId" : 0,
    "driveType" : "DKR5C-K300SS",
    "driveTypeName" : "SAS",
    "driveSpeed" : 15000,
    "totalCapacity" : 1610,
    "physicalCapacity" : 1610,
    "availablePhysicalCapacity" : 191,
    "isAcceleratedCompressionEnabled" : false,
    "availableVolumeCapacityInKB" : 201149952
  }
```

```
  ]
}
```

Attribute	Type	Description
parityGroupId	string	Parity group number
numOfLdevs	int	Number of assigned LDEVs
usedCapacityRate	int	Usage rate of the parity group
availableVolumeCapacity	long	Available capacity (GB) The amount of free space is output. If the capacity is below 1 GB, the value is ignored and `0` is assumed.
availableVolumeCapacityInKB	long	Available capacity (KB) The amount of free space is output. If the information cannot be obtained, `-1` is output, indicating an invalid value.
raidLevel	string	RAID level
raidType	string	RAID type
clprId	int	CLPR number
driveType	string	Code indicating the drive type of the drive belonging to the parity group
driveTypeName	string	Drive type of the drive belonging to the parity group
driveSpeed	int	Rotation speed (rpm) of the drive belonging to the parity group
totalCapacity	long	Logical capacity of the parity group (GB) If the accelerated compression setting is enabled, the expanded capacity is output.
physicalCapacity	long	Physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed.

Attribute	Type	Description
		This attribute is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
availablePhysicalCapacity	long	Total available physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed. This attribute is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
isAcceleratedCompressionEnabled	boolean	Value of the accelerated compression of the parity group ▪ `true`: Accelerated compression for the parity group is enabled. ▪ `false`: Accelerated compression for the parity group is disabled.
groupType	string	Type of the parity group ▪ `PG`: Parity group ▪ `DDP`: Parity group for DDP This attribute is displayed for storage systems VSP One B20.
numOfSpareDrives	long	The set number of times that backups can be made to spare area in the DDP This attribute is displayed if the `groupType` attribute is `DDP`.
numOfRemainingSpareDrives	long	The remaining number of times that backups can be made to spare area in the DDP This attribute is displayed if the `groupType` attribute is `DDP`.

If you obtained detailed information about accelerated compression

When the drive type of the parity group is `SSD(FMC)`, if you specify `FMC` for the `detailInfoType` query parameter and then run the request, the following additional information is obtained.

Attribute	Type	Description
totalPhysicalCapacity	long	Total capacity of the data drives belonging to the parity group (GB) If the value of this attribute is less than 1 GB, `0` is displayed. An invalid value is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
isExpandedSpaceUsed	boolean	Whether LDEVs in parity groups use the expanded area ▪ `true`: LDEVs use the expanded area ▪ `false`: LDEVs use the physical area or are not implemented

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
diskAdapterPairId	int	For VSP G1000, VSP G1500, VSP F1500 storage systems, the DKA pair number of the parity group is output. For VSP 5000 series storage systems, the DKB pair number of the parity group is output.
largestAvailableCapacity	long	Maximum capacity of the non-volume areas in the parity group (KB) The maximum capacity of the continuously free areas is output.
emulationType	string	Emulation type
totalOpenVolumeCapacity	long	Total LDEV capacity of the open volumes in the parity group (KB)

Attribute	Type	Description
unallocatedOpenVolumeCapacity	long	From among the open volumes in the parity group, the total capacity of volumes to which paths are not allocated (KB)
allocatedOpenVolumeCapacity	long	From among the open volumes in the parity group, the total capacity of volumes to which paths are allocated (KB)
allocatableOpenVolumeCapacity	long	From among the open volumes in the parity group, the total capacity of volumes to which paths can be allocated (KB) The total capacity of volumes that meet all of the following conditions is output. ▪ No path is allocated to the volume. ▪ The volume is not a pool volume. ▪ The volume is not a system disk.
reservedOpenVolumeCapacity	long	From among the open volumes in the parity group, the total capacity of volumes which are reserved (KB) The total capacity of volumes that meet all of the following conditions is output. ▪ No path is allocated to the volume. ▪ The volume is either a pool volume or a system disk.
totalUsablePhysicalCapacity	long	The capacity of the space that can be used for writing to the parity group or reading from the parity group (KB) This information is output if the accelerated compression function is supported for the parity group.

If you run the API request with `physicalCapacity` specified for `detailInfoType` in the query parameters, you can also get information about the physical capacity.

Attribute	Type	Description
physicalCapacity	long	Physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes.

Attribute	Type	Description
		If the value of this attribute is less than 1 GB, `0` is displayed.
availablePhysicalCapacity	long	Total available physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-groups
```

Getting information about a specific parity group

The following request gets information about a specific parity group by specifying the parity group number. You can get detailed information about individual parity groups.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID
```

Request message

Object ID

Specify the `parityGroupId` value obtained by getting information about the parity group.

Parameter	Type	Description
parityGroupId	string	(Required) Parity group number Specify concatenated parity groups in the same way as the above. If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `"parityGroupId": "1-3"`

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of information to be collected ▪ `physicalCapacity` Specify this attribute to get additional information about the physical capacity. You can specify this item for the following storage systems: VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, and VSP F1500.

Body

None.

Response message

Body

```
{
  "parityGroupId": "1-2",
  "numOfLdevs": 8,
  "usedCapacityRate": 3,
  "availableVolumeCapacity": 499,
  "raidLevel": "RAID1",
  "raidType": "2D+2D",
  "clprId": 0,
  "driveType": "DKR5C-K300SS",
  "driveTypeName": "SAS",
  "driveSpeed": 15000,
  "isCopyBackModeEnabled": true,
```

```
  "isEncryptionEnabled": false,
  "totalCapacity": 518,
  "physicalCapacity": 518,
  "availablePhysicalCapacity": 499,
  "isAcceleratedCompressionEnabled": false,
  "spaces": [
    {
      "partitionNumber": 0,
      "ldevId": 8672,
      "status": "NML",
      "lbaLocation": "0x000000000000",
      "lbaSize": "0x000000039180"
    }, {
      "partitionNumber": 1,
      "ldevId": 8673,
      "status": "NML",
      "lbaLocation": "0x000000039180",
      "lbaSize": "0x0000010a7000"
    },...
  ],
  "availableVolumeCapacityInKB": 523737912
}
```


Attribute	Type	Description
parityGroupId	string	Parity group number
numOfLdevs	int	Number of LDEVs in the parity group
usedCapacityRate	int	Usage rate of the parity group
availableVolumeCapacity	long	Available capacity (GB) The amount of free space is output. If the capacity is below 1 GB, the value is ignored and `0` is assumed.
availableVolumeCapacityInKB	long	Available capacity (KB) The amount of free space is output. If the information cannot be obtained, `-1` is output, indicating an invalid value.
raidLevel	string	RAID level
raidType	string	RAID type
clprId	int	CLPR number

Attribute	Type	Description
driveType	string	Code indicating the drive type of the drive belonging to the parity group is output.
driveTypeName	string	Drive type of the drive that belongs to the parity group
driveSpeed	int	Rotation speed (rpm) of the drive belonging to the parity group
isCopyBackModeEnabled	boolean	Value of the copy back mode setting of the parity group ▪ `true`: Copy back mode is enabled. ▪ `false`: Copy back mode is disabled.
isEncryptionEnabled	boolean	Value of the encryption setting of the parity group ▪ `true`: Encryption is enabled. ▪ `false`: Encryption is disabled.
totalCapacity	long	Logical capacity of the parity group (GB)
physicalCapacity	long	Physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed. This attribute is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
availablePhysicalCapacity	long	Total available physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed.

Attribute	Type	Description
		This attribute is displayed for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
isAcceleratedCompressionEnabled	boolean	Value of the accelerated compression setting of the parity group ▪ `true`: Accelerated compression for the parity group is enabled. ▪ `false`: Accelerated compression for the parity group is disabled.
spaces	object[]	The following attributes related to free space and the LDEV defined in the parity group are output: ▪ partitionNumber (long) Partition number of the partition created by partitioning the parity group ▪ ldevId (int) LDEV number ▪ status (string) LDEV status • `NML`: The LDEV is implemented, or the free space is determined. • `REG`: An LDEV is being created. • `DEL`: An LDEV is being deleted.

Attribute	Type	Description
		▪ lbaLocation (string) Starting location of the LBA of the partition in the parity group (in a multiple of 512 bytes) This information is not output if the `groupType` attribute is `DDP`. ▪ lbaSize (string) Size of the partition in the parity group (in a multiple of 512 bytes) If the `groupType` attribute is `DDP`, and an LDEV is not defined for the partition, `0x000000000000` is displayed.
groupType	string	Type of the parity group ▪ `PG`: Parity group ▪ `DDP`: Parity group for DDP This attribute is displayed for storage systems VSP One B20.
numOfSpareDrives	long	The set number of times that backups can be made to spare area in the DDP This attribute is displayed if the `groupType` attribute is `DDP`.
numOfRemainingSpareDrives	long	The remaining number of times that backups can be made to spare area in the DDP This attribute is displayed if the `groupType` attribute is `DDP`.

If you run the API request with `physicalCapacity` specified for `detailInfoType` in the query parameters, you can also get information about the physical capacity.

Attribute	Type	Description
physicalCapacity	long	Physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed.

Attribute	Type	Description
availablePhysicalCapacity	long	Total available physical capacity of the parity group (GB) For this attribute, 1 GB is equal to $1{,}024^3$ bytes. If the value of this attribute is less than 1 GB, `0` is displayed.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-
groups/1-1
```

Getting a list of drive information

The request below gets a list of drive information.

Note:

If you are using SCM drives, see the usage notes in the manual for the relevant storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/drives
```

Request message

Object ID

None.

Query parameters

You can filter the execution results by specifying conditions and obtain additional detailed information about the drive.

- To filter the execution results:

Parameter	Type	Filter condition
parityGroupId	string	(Optional) The parity group number of the parity group to which the drive belongs
usageType	string	(Optional) Purpose for which the drive is used You can specify the following values as filter conditions: ▪ `DATA`: Data drive ▪ `SPARE`: Spare drive ▪ `FREE`: Unused drive
driveTypeName	string	(Optional) Drive type You can specify the following values as filter conditions: ▪ `SAS` ▪ `SATA` ▪ `SSD(SLC)` ▪ `SSD(MLC)` ▪ `SSD(FMD)` ▪ `SSD(FMC)` ▪ `SSD(QLC)` ▪ `SSD` ▪ `SSD(RI)` ▪ `SCM`
driveSpeed	int	(Optional) Drive rotation speed (rpm)
totalCapacity	long	(Optional) Physical capacity of the drive (GB) For this attribute, 1 GB is equal to $1{,}000^3$ bytes.

- To obtain additional detailed information:

Attribute	Type	Description
detailInfoType	string	(Optional) Type of information to be collected To specify multiple drive types, delimit them by using commas.

Attribute	Type	Description
		You can use this parameter in combination with the query parameters that are used to filter the execution results. ▪ `usedEnduranceIndicator` If the drive type is `SSD(MLC)`, `SSD(FMC)`, `SSD(QLC)`, `SSD`, `SSD(RI)`, `SCM`, additional detailed information about the drive's life expectancy is collected. You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ `usageType` Additional detailed information about the usage of the drive is collected. ▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Body

None.

Response message

Body


```
{
  "data": [
    {
      "driveLocationId": "0-0",
      "driveTypeName": "SAS",
      "driveSpeed": 10000,
      "totalCapacity": 600,
      "driveType": "DKR5D-J600SS",
      "usageType": "DATA",
      "status": "NML",
      "parityGroupId": "1-6"
    },
    {
      "driveLocationId": "0-1",
      "driveTypeName": "SAS",
      "driveSpeed": 10000,
      "totalCapacity": 600,
      "driveType": "DKR5D-J600SS",
      "usageType": "DATA",
      "status": "NML",
      "parityGroupId": "1-6"
    },
    {
      "driveLocationId": "0-2",
      "driveTypeName": "SAS",
      "driveSpeed": 10000,
      "totalCapacity": 600,
      "driveType": "DKR5D-J600SS",
      "usageType": "DATA",
      "status": "NML",
      "parityGroupId": "1-6"
    },
    {
      "driveLocationId": "0-3",
      "driveTypeName": "SAS",
      "driveSpeed": 10000,
      "totalCapacity": 600,
      "driveType": "DKR5D-J600SS",
      "usageType": "DATA",
      "status": "NML",
      "parityGroupId": "1-6"
    }
  ]
}
```

Attribute	Type	Description
driveLocationId	string	Drive location (location of the drive box)
driveTypeName	string	Drive type
driveSpeed	int	Drive rotation speed (rpm)
totalCapacity	long	Drive capacity (GB) For this attribute, 1 GB is equal to $1{,}000^3$ bytes.
driveType	string	Drive type code
usageType	string	Purpose for which the drive is used ▪ `DATA`: Data drive ▪ `SPARE`: Spare drive ▪ `FREE`: Unused drive
status	string	Status of the drive ▪ `NML`: Normal ▪ `WAR`: Part of the drive is blocked ▪ `CPY`: Copying is in progress ▪ `CPI`: Copying is incomplete ▪ `RSV`: The spare drive cannot be used ▪ `FAI`: The drive is blocked because of a failure ▪ `BLK`: The drive is blocked because maintenance is being performed ▪ `Unknown` or `UNK`: The status is unknown
parityGroupId	string	Parity group number This item is hidden when the drive does not belong to any parity group.
serialNumber	string	Serial number of the drive This attribute is displayed for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

The following is an example of the detailed information that can be output about the drive's life expectancy.


```
{
    "data": [
        {
            "driveLocationId": "4-0",
            "driveTypeName": "SSD(FMC)",
            "totalCapacity": 1600,
            "driveType": "NFHAE-Q1R6SS",
            "usageType": "DATA",
            "status": "NML",
            "parityGroupId": "3-1",
            "serialNumber": "12345670",
            "usedEnduranceIndicator": 0,
            "usedEnduranceIndicatorThreshold": 99,
            "usedEnduranceIndicatorWarningSIM": 95
        },
        {
            "driveLocationId": "4-1",
            "driveTypeName": "SSD(FMC)",
            "totalCapacity": 1600,
            "driveType": "NFHAE-Q1R6SS",
            "usageType": "DATA",
            "status": "NML",
            "parityGroupId": "3-1",
            "serialNumber": "12345671",
            "usedEnduranceIndicator": 0,
            "usedEnduranceIndicatorThreshold": 99,
            "usedEnduranceIndicatorWarningSIM": 95
        },
        {
            "driveLocationId": "4-2",
            "driveTypeName": "SSD(FMC)",
            "totalCapacity": 1600,
            "driveType": "NFHAE-Q1R6SS",
            "usageType": "DATA",
            "status": "NML",
            "parityGroupId": "3-1",
            "serialNumber": "12345672",
            "usedEnduranceIndicator": 0,
            "usedEnduranceIndicatorThreshold": 99,
            "usedEnduranceIndicatorWarningSIM": 95
        }
    ]
}
```


To obtain detailed information about the drive's life expectancy:

If the drive type is `SSD(MLC)`, `SSD(FMC)`, `SSD(QLC)`, `SSD`, `SSD(RI)`, `SCM`, you can obtain the following information by executing the request with `usedEnduranceIndicator` specified for the `detailInfoType` query parameter.

Attribute	Type	Description
usedEnduranceIndicator	int	Life expectancy of the drive (%) A value in the range from `0` to `100` is displayed. A large value indicates that the drive is near the end of its life expectancy.
usedEnduranceIndicatorThreshold	int	Threshold value of the drive's life expectancy (%) If the value of the drive's life expectancy exceeds this value, data on the drive will be automatically copied to a spare drive (spare area).
usedEnduranceIndicatorWarningSIM	int	Threshold value of the warning SIM (%) If the value of the drive's life expectancy exceeds this value, error information (SIM) will be displayed.

The following is an example of the detailed information that can be output about the drive usage.


```
{
    "data": [
        {
            "driveLocationId": "0-0",
            "driveTypeName": "SAS",
            "driveSpeed": 10000,
            "totalCapacity": 600,
            "driveType": "DKS5H-J600SS",
            "usageType": "DATA",
            "detailUsageType": "DATA",
            "status": "NML",
            "parityGroupId": "1-1",
            "serialNumber": "12345670"
        },
        {
            "driveLocationId": "0-1",
            "driveTypeName": "SAS",
            "driveSpeed": 10000,
```

```
            "totalCapacity": 600,
            "driveType": "DKS5H-J600SS",
            "usageType": "DATA",
            "detailUsageType": "DATA",
            "status": "NML",
            "parityGroupId": "1-1",
            "serialNumber": "12345671"
        },
        {
            "driveLocationId": "0-2",
            "driveTypeName": "SAS",
            "driveSpeed": 10000,
            "totalCapacity": 600,
            "driveType": "DKS5H-J600SS",
            "usageType": "DATA",
            "detailUsageType": "DATA",
            "status": "NML",
            "parityGroupId": "1-1",
            "serialNumber": "12345671"
        },
        {
            "driveLocationId": "0-3",
            "driveTypeName": "SAS",
            "driveSpeed": 10000,
            "totalCapacity": 600,
            "driveType": "DKS5H-J600SS",
            "usageType": "DATA",
            "detailUsageType": "DATA",
            "status": "NML",
            "parityGroupId": "1-1",
            "serialNumber": "12345671"
        }
    ]
}
```


To obtain detailed information about the drive usage:

You can obtain the following information by specifying `usageType` for the `detailInfoType` query parameter.

Attribute	Type	Description
detailUsageType	string	Details about the usage of the drive ▪ `DATA`: Data drive ▪ `SPARE`: Spare drive

Attribute	Type	Description
		▪ `FREE`: Unused drive ▪ `SWAP`: the drive that is swapped a spare drive for a data drive ▪ `RESERVE`: the unused drive that is swapped a data drive for a spare drive

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
totalLogicalCapacity	long	Logical capacity of the drive (GB)
serialNumber	string	Serial number of the drive For VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems in a configuration that is linked to an SVP, this attribute is displayed even if `class` is not specified.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/drives
```

Getting information about a specific drive

The request below allows you to get information about a specific drive by specifying the drive location (the location of the drive box).

Note:

You can use this API function for VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models and VSP Fx00 models.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/drives/object-ID
```

Request message

Object ID

Specify the `driveLocationId` value obtained by getting information about the drive list.

Attribute	Type	Description
driveLocationId	string	(Required) Drive location (location of the drive box)

Query parameters

None.

Body

None.

Response message

Body

```
{
  "driveLocationId": "0-0",
  "driveTypeName": "SAS",
  "driveSpeed": 10000,
  "totalCapacity": 600,
  "driveType": "DKR5D-J600SS",
  "usageType": "DATA",
  "status": "NML",
  "parityGroupId": "1-6"
}
```

Attribute	Type	Description
driveLocationId	string	Drive location
driveTypeName	string	Drive type

Attribute	Type	Description
driveSpeed	int	Drive rotation speed (rpm)
totalCapacity	long	Drive capacity (GB) For this attribute, 1 GB is equal to $1{,}000^3$ bytes.
driveType	string	Drive type code
usageType	string	Purpose for which the drive is used ▪ `DATA`: Data drive ▪ `SPARE`: Spare drive ▪ `FREE`: Unused drive
status	string	Status of the drive ▪ `NML`: Normal ▪ `WAR`: Part of the drive is blocked ▪ `CPY`: Copying is in progress ▪ `CPI`: Copying is incomplete ▪ `RSV`: The spare drive cannot be used ▪ `FAI`: The drive is blocked because of a failure ▪ `BLK`: The drive is blocked because maintenance is being performed ▪ `Unknown` or `UNK`: The status is unknown
parityGroupId	string	The parity group number of the parity group to which the drive belongs This item is hidden when the drive does not belong to any parity group.
serialNumber	string	Serial number of the drive This attribute is displayed for VSP One B20, VSP 5000 series ,VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/drives/0-0
```

Creating a parity group

The request below creates a parity group.

Note:

You can use this API function for VSP E series, VSP Gx00 models and VSP Fx00 models.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/parity-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example creates a parity group:

```
{
  "parityGroupId": "2-10",
  "driveLocationIds": ["1-1","1-2","1-3","1-4"],
  "raidType": "3D+1P",
  "isEncryptionEnabled": false,
  "isCopyBackModeEnabled": true,
  "isAcceleratedCompressionEnabled": true,
  "clprId": 1
}
```

The following coding example creates a distributed parity group by concatenating two parity groups:

```
{
  "concatenatedParityGroupIds": ["2-9","2-10"],
  "driveLocationIds": ["1-1","1-2","1-3","1-4","1-5","1-6","1-7","1-8"],
  "raidType": "2D+2D",
  "isEncryptionEnabled": false,
  "isCopyBackModeEnabled": true,
  "isAcceleratedCompressionEnabled": true,
  "clprId": 1
}
```

Attribute	Type	Description
parityGroupId	string	(Optional) Parity group number Specify the number in *gno-sgno* format. Be sure to specify the `parityGroupId` attribute or the `concatenatedParityGroupIds` attribute.
concatenatedParityGroupIds	string[]	(Optional) To configure a distributed parity group, specify the parity group numbers of concatenated parity groups. The concatenated parity groups will be created in the order in which the `driveLocationIds` attribute is specified. Be sure to specify the `parityGroupId` attribute or the `concatenatedParityGroupIds` attribute.
driveLocationIds	string[]	(Required) Drive location Specify the locations of the drives to be used to create to the parity group.
raidType	string	(Required) RAID type Specify one of the following values: ▪ `2D+2D` ▪ `3D+1P` ▪ `4D+1P` ▪ `6D+1P`

Attribute	Type	Description
		▪ `7D+1P` ▪ `6D+2P` ▪ `12D+2P` ▪ `14D+2P`
isEncryptionEnabled	boolean	(Optional) Specify whether to enable the encryption function for the parity group. To specify `true` for this attribute, you must have the Security Administrator (View & Modify) execution permission. ▪ `true`: Enable the encryption function. ▪ `false`: Disable the encryption function. You cannot specify `true` if you specify `true` for the `isAcceleratedCompressionEnabled` attribute. If you omit this item, `false` will be set.
isCopyBackModeEnabled	boolean	(Optional) Specify whether to enable copy back mode for the parity group. ▪ `true`: Enable copy back mode. ▪ `false`: Disable copy back mode. If you omit this item, `true` will be set.
isAcceleratedCompressionEnabled	boolean	(Optional) Specify whether to enable accelerated compression for the parity group. ▪ `true`: Enable accelerated compression. ▪ `false`: Disable accelerated compression. You cannot specify `true` if you specify `true` for the `isEncryptionEnabled` attribute. If you omit this item, `false` will be set.
clprId	int	(Optional) CLPR number

Attribute	Type	Description
		Specify a CLPR number in the range from `0` to `31`. If you omit this item, `0` will be set.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created parity group

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status codes	Message	Description
409	Conflict	The parity group is already created with the specified parity group number or the concatenated parity group number.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/parity-groups
```

Changing the drive settings

The request below configures a drive. You can use this request to assign a specified drive as a spare drive and to release the assignment of a specified drive.

Note:

You can use this API function for VSP E series, VSP Gx00 models and VSP Fx00 models.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/drives/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `driveLocationId` value obtained by getting information about the drive list.

Attribute	Type	Description
driveLocationId	string	(Required) Drive location (location of the drive box)

Query parameters

None.

Body

```
{
  "isSpareEnabled": false
}
```

Attribute	Type	Description
isSpareEnabled	boolean	(Required) Spare drive setting ▪ `true`: Assigns the specified drive as a spare drive. ▪ `false`: Releases the assignment as a spare drive.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the drive whose setting was changed

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Action template

None.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/drives/0-0
```

Changing the accelerated compression setting of a parity group

The request below enables or disables accelerated compression for a parity group. You can use this API request for parity groups for which accelerated compression is supported.

Note:

You can use this API function for VSP 5000 series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, or VSP F1500.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `parityGroupId` value obtained by getting information about the parity group.

Attribute	Type	Description
parityGroupId	string	(Required) Parity group number Specify concatenated parity groups in the same way as the above. If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `"parityGroupId": "1-3"`

Query information

None.

Body

```
{
  "isAcceleratedCompressionEnabled": true
}
```

Attribute	Type	Description
isAcceleratedCompressionEnabled	boolean	(Required) Specify whether to enable accelerated compression for the parity group. ▪ `true`: Enable accelerated compression. ▪ `false`: Disable accelerated compression.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the parity group whose setting was changed

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/parity-groups/1-7
```

Formatting a parity group

The request below formats all volumes created from a parity group. Before running this request, make sure that the status of each volume in the parity group is blocked (`BLK`).

Note:

You can use this API function for VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models and VSP Fx00 models.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID/actions/
format/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `parityGroupId` value obtained by getting information about the parity group.

Attribute	Type	Description
parityGroupId	string	(Required) Parity group number Specify concatenated parity groups in the same way as the above. If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `"parityGroupId": "1-3"`

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details, see the section explaining job objects. This API function does not display the `affectedResources` attribute. Formatting is performed when the `state` attribute of the job object is `Succeeded`. To check whether the formatting of each volume is complete, use the following URL. For *parity-group-number*, specify the parity group number that was specified for the object ID.

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs?parityGroupId=parity-group-number
```

If the status of each volume in the specified parity group is normal (`NML`), formatting is complete.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-
groups/1-7/actions/format/invoke -d ""
```

Deleting a parity group

The request below deletes a parity group. If the specified parity group is concatenated with other parity groups, all of the concatenated parity groups are deleted.

Note:

You can use this API function for VSP One B20, VSP E series, VSP Gx00 models and VSP Fx00 models.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID
```

Request message

Object ID

Specify the `parityGroupId` value obtained by getting information about the parity group.

Attribute	Type	Description
parityGroupId	string	(Required) Parity group number Specify concatenated parity groups in the same way as the above. If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `"parityGroupId": "1-3"`

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted parity group

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-
groups/1-1
```

Chapter 7: Volume allocation

This chapter describes how to allocate volumes to hosts by using the REST API.

Overview of volume allocation

Volume allocation means setting LU paths to allow the host to access volumes in the storage system.

In the REST API, allocate a volume by performing the following procedure:

1. Create a volume that meets the host requirements.

   You can either use a volume that meets the requirements from an existing LDEV or create an LDEV from the parity group or pool.

   When the host is connected to the external storage system by using Universal Volume Manager, you can create an external volume from an existing external volume group.

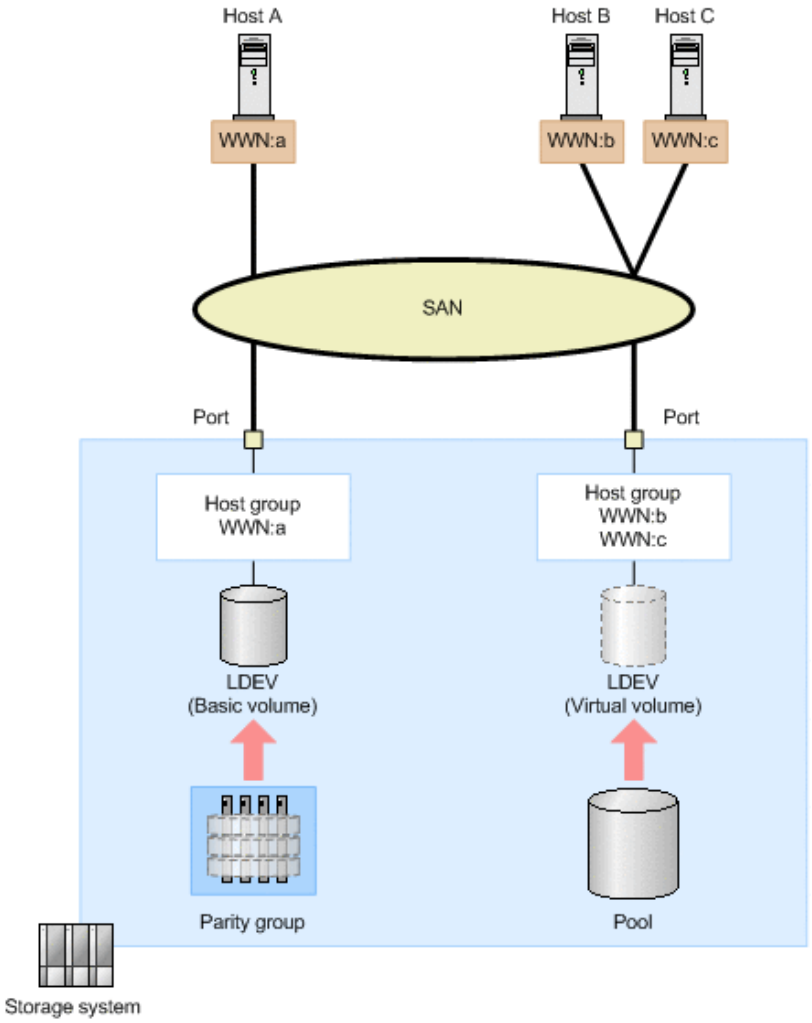
2. Configure a port.

   Configure a host group or an iSCSI target for the storage system port. Register information about the host that is to access the LDEV in the host group or the iSCSI target.

   Specify the host mode and host mode options according to the host type.

3. Set the LU path.

   Setting the LU path between the LDEV and the port's host group or iSCSI target enables access from the host to the LDEV.



In the preceding figure, an LDEV is created from the parity group, and the LU path is set for the host group in which the WWN of host A is registered. In addition, another LDEV is created from the DP pool, and the LU path is set for the host group in which the WWNs of host B and host C are registered. By registering the WWNs of multiple hosts in the host group, you can apply the same settings for accessing the LDEV to the hosts at the same time.

For details about the requirements for creating volumes and how to specify settings for host groups or iSCSI targets, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Note:

For VSP One B20, when using the REST API, it is not possible to create an LDEV (basic volume) from a parity group for DDP. Additionally, when creating virtual volumes from a pool, create them as data reduction shared volumes or volumes with the capacity-saving function enabled (capacity saving volumes using dedupe and compression). (However, this excludes DP volumes used as journals and DP volumes created from pools that have a data direct map attribute.)

Note:

For host groups that use external ports or initiator ports, do not run this request from the REST API.

Getting information about the capacity of a storage system

The following request gets information about the total capacity and the size of free space of all parity groups configured in the target storage system.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Important:

The size of free space (`freeSpace`) and the total capacity (`totalCapacity`) do not include the size of areas where, because of boundary limitations, volumes cannot be created. For this reason, after certain operations, such as those to create or delete volumes, the total capacity value might change. For details about volume capacity, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/total-capacities/instance
```

Request message

Object ID

Specify a value for `instance`. For objects that have only one instance, the value of `instance` is a fixed value (the object ID).

Query parameters

None.

Body

None.

Response message

Body

```
{
  "internal": {
    "freeSpace": 30405195264,
    "totalCapacity": 34921689272
  },
  "external": {
    "freeSpace": 0,
    "totalCapacity": 142606336
  },
  "total": {
    "freeSpace": 30405195264,
    "totalCapacity": 35064295608
  }
}
```

Attribute	Type	Description
internal	object	An attribute related to the capacity of internal volumes is output. ▪ freeSpace (long) The amount of free space in which users can create volumes (KB) ▪ totalCapacity (long) The sums of the total capacity and the size of free space of all volumes created by the user (KB)
external	object	An attribute related to the capacity of external volumes is output. If no external volumes are connected, the value `0` is output. ▪ freeSpace (long) The amount of free space in which users can create volumes (KB) ▪ totalCapacity (long) The sums of the total capacity and the size of free space of all volumes created by the user (KB)

Attribute	Type	Description
total	object	An attribute related to the total capacity of internal volumes and external volumes is output. ▪ freeSpace (long) The amount of free space in which users can create volumes (KB) ▪ totalCapacity (long) The sums of the total capacity and the size of free space of all volumes created by the user (KB)

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/total-
capacities/instance
```

Getting information about the total efficiency of a storage system

Obtain information about the saving efficiency for consumption of capacity (total efficiency) achieved by using the functions for increasing the usage efficiency of a storage system such as the capacity saving function, the accelerated compression function, the creation of backup data by using snapshots, and the virtualization of capacity by using Dynamic Provisioning.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/total-efficiencies/instance
```

Request message

Object ID

Specify `instance`. If an object has only one instance, the value for `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "isCalculated" : true,
  "totalRatio" : "8.46",
  "compressionRatio" : "1.18",
  "snapshotRatio" : "97.21",
  "provisioningRate" : "85",
  "calculationStartTime" : "2016-07-31T16:55:07Z",
  "calculationEndTime" : "2016-07-31T17:06:35Z",
  "dedupeAndCompression" : {
    "totalRatio" : "1.47",
    "compressionRatio" : "1.08",
    "dedupeRatio" : "1.35",
    "reclaimRatio" : "1.00"
  },
  "acceleratedCompression" : {
    "totalRatio" : "1.11",
    "compressionRatio" : "1.10",
    "reclaimRatio" : "1.00"
  }
}
```

Attribute	Type	Description
isCalculated	boolean	Calculation status of the total efficiency

Attribute	Type	Description
		This attribute indicates whether the total efficiency has been calculated. ▪ `true`: The values have been calculated. ▪ `false`: The values have not been calculated. Information about the other attributes will only be obtained if the value for this attribute is `true`.
calculationStartTime	ISO8601string	The date and time when the calculation of the total efficiency began (UTC) The local time of the storage system is displayed in YYYY-MM-DDThh:mm:ssZ format.
calculationEndTime	ISO8601string	The date and time when the calculation of the total efficiency ended (UTC) The local time of the storage system is displayed in YYYY-MM-DDThh:mm:ssZ format.
totalRatio	string	The total efficiency of the entire storage system# This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (`-`) indicating an invalid value is displayed. If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed. After a volume is created from a pool and before data is written to the volume, the maximum value (92233720368547758.07) is displayed.
compressionRatio	string	The efficiency of capacity saving performed by using the capacity saving function or accelerated compression# This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (`-`) indicating an invalid value is displayed.

Attribute	Type	Description
		If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed.
snapshotRatio	string	The efficiency of capacity saving performed by using snapshots to back up data[#] This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (-) indicating an invalid value is displayed. If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed.
provisioningRate	string	The percentage (%) of saving efficiency for consumption of capacity achieved by using Dynamic Provisioning to virtualize capacity This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (-) indicating an invalid value is displayed. If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed.
dedupeAndCompression	object	Attributes related to the efficiency of capacity saving performed by using the capacity saving function are displayed. This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (-) indicating an invalid value is displayed.

Attribute	Type	Description
		If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed. ▪ totalRatio (string) total efficiency of capacity saving performed by using the capacity saving function# ▪ compressionRatio (string) Efficiency of capacity saving performed by using compression# ▪ dedupeRatio (string) Efficiency of capacity saving performed by using deduplication# ▪ reclaimRatio (string) Efficiency of capacity saving performed by reclaiming the specified data pattern#
acceleratedCompression	object	Attributes related to the efficiency of capacity saving performed by using accelerated compression are displayed. This does not include the size of metadata, garbage data, and other similar data generated by the storage system. If the volume for which the calculation is to be performed does not exist, a hyphen (-) indicating an invalid value is displayed.

Attribute	Type	Description
		If the calculation cannot be performed for the volume because the volume is blocked or some other reason, the value from the previous calculation is displayed. ▪ totalRatio (string) Total efficiency of capacity saving performed by using accelerated compression# ▪ compressionRatio (string) Efficiency of capacity saving performed by using compression# ▪ reclaimRatio (string) Efficiency of capacity saving performed by reclaiming the specified data pattern#

#: This value represents the capacity before reduction as a ratio of the capacity after reduction, where the capacity after reduction is 1.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/total-
efficiencies/instance
```

Getting volume information

The following request obtains information about multiple LDEVs. You can get information about consecutive LDEVs by specifying the number of the first LDEV and the number of LDEVs. You can also get information filtered by LDEV conditions (attributes) or resource group.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs
```

Request message

Object ID

None.

Query parameters

You can filter the execution result by specifying conditions, or request additional detailed volume information.

- When filtering the execution result

  You can obtain information about 100 LDEVs by default, and information about 16,384 LDEVs by specifying the `count` parameter. If information about more than 16,384 LDEVs is obtained by specifying the `ldevOption` parameter or the `poolId` parameter, use the `headLdevId` parameter to obtain information about 16,385 or more LDEVs.

  Tip:

  Of the resources displayed by the filter, you can obtain information only about the resources for which you have been granted access permissions.

  For example, if you specify 10 for the `count` parameter and you have permission to access all LDEVs, information about 10 LDEVs will be obtained. If you have permission to access specific LDEVs only, information will be obtained only about LDEVs for which you have been granted access permissions.

  Important:

  For a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".

For details on query parameters that can be specified at the same time, see the following table showing the combinations of query parameters that can be specified.

Parameter	Type	Filter Condition
count	int	(Optional) Specify a value from `1` to `16384` for the number of LDEVs for which information is to be obtained.

Parameter	Type	Filter Condition
		If this parameter is omitted, information about 100 LDEVs will be obtained.
headLdevId	int	(Optional) Specify the number of the LDEV from which processing to get information is to start. The request gets information about the LDEVs in the ascending order of LDEV numbers, starting with the specified LDEV number. If this parameter is omitted, `0` is assumed.
ldevOption	string	(Optional) LDEV conditions for getting information You can specify the following conditions: ▪ `defined` Gets information about implemented LDEVs. ▪ `undefined` Gets information about LDEVs that are not implemented. ▪ `dpVolume` Gets information about DP volumes. ▪ `luMapped` Gets information about LDEVs for which LU paths are defined. ▪ `luUnmapped` Gets information about LDEVs for which LU paths are undefined. ▪ `externalVolume` Gets information about external volumes. ▪ `mappedNamespace` Gets information about the LDEV where the namespace is set. This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H. If this is omitted, information about all types of LDEVs will be obtained.
poolId	int	(Optional) Pool number

Parameter	Type	Filter Condition
		Gets information about the LDEVs that are associated with the specified pool. By using the `ldevOption` parameter when specifying conditions, the following information will be obtained: ▪ If `dpVolume` is specified for the `ldevOption` parameter: Gets information about the DP volumes that are associated with the specified pool. ▪ If `luMapped` is specified for the `ldevOption` parameter: Gets information about LDEVs that are associated with the specified pool and that have one or more LU paths defined. ▪ If `luUnmapped` is specified for the `ldevOption` parameter: Gets information about LDEVs that are associated with the specified pool and that do not have one or more LU paths defined. If you specify this parameter without specifying the `ldevOption` parameter, the processing gets information about the volumes that make up the pool (pool volumes). If `defined` or `undefined` is specified for the `ldevOption` parameter, you cannot specify this parameter.
resourceGroupId	int	(Optional) ID of the resource group to which LDEVs for which information is to be obtained belong
journalId	int	(Optional) ID of the journal to which LDEVs for which information is to be obtained belong
parityGroupId	string	(Optional) ID of the parity group to which LDEVs for which information is to be obtained belong Specify concatenated parity groups in the same way as the above.

Parameter	Type	Filter Condition
		If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `parityGroupId=1-3`

The following table shows the combinations of query parameters that can be specified.

Parameter	count	head LdevId	ldev Option	poolId	resourceGroupId	journalId	parityGroupId
count	--	Y	Y	Y	Y	Y	Y
head LdevId	Y	--	Y	N	N	N	N
ldev Option	Y	Y	--	Y#	Y	N	N
poolId	Y	N	Y#	--	Y	N	N
resourceGroupId	Y	N	Y	Y	--	Y	Y
journalId	Y	N	N	N	Y	--	N
parityGroupId	Y	N	N	N	Y	N	--

#: If `defined`, `undefined`, or `externalVolume` is specified as the value of the `ldevOption` parameter, you cannot specify this parameter.

- When requesting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained You can use this parameter together with parameters that filter the execution results.

Parameter	Type	Description
		The following values can be specified. To specify multiple values, separate the values by using commas. ▪ `FMC` Adds detailed information about accelerated compression for the LDEVs that belong to parity groups with drive type `SSD(FMC)`. ▪ `externalVolume` Adds detailed information about external volumes. ▪ `virtualSerialNumber` Adds detailed information about virtual storage machines. ▪ `savingInfo` Adds detailed information about the capacity saving function. You can specify this value if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900,VSP G1000, VSP G1500, VSP F350, F370, F700, F900 or VSP F1500. If the storage system model is VSP G1000, VSP G1500, or VSP F1500, the microcode version must be 80-06-40-*XX*/*XX* or later.

Parameter	Type	Description
		▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. You can specify this item for VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900 model storage systems if the storage system is in a configuration that is linked to an SVP. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". Immediately after you create an LDEV, if you specify `class` and at the same time specify `defined` in the query parameter `ldevOption` and then run the command, the volume status might be output as unimplemented. In such a case, wait a while and then run this request again. Alternatively, run the API request that updates the cache of storage system configuration information, and then run this request again. ▪ `qos` Adds information about QoS settings. You can specify this item for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ `nguId` Adds the NGUID (Namespace Globally Unique Identifier). You can specify this value for VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Query parameters can be specified as shown in the following examples.

- The following example retrieves information about 30 LDEVs from LDEV number 1234:

```
?headLdevId=1234&count=30
```

- The following example obtains information about 30 implemented LDEVs that belong to resource group number 5:

```
?ldevOption=defined&count=30&resourceGroupId=5
```

- The following example obtains information about 30 DP volumes that are associated with pool number 7, out of the LDEVs that belong to resource group number 5:

```
?ldevOption=dpVolume&pool=7&count=30&resourceGroupId=5
```

- The following example retrieves information about 30 LDEVs, for which detailed information about accelerated compression is added:

```
?detailInfoType=FMC&count=30
```

Body

None.

Response message

Body

For details on attributes to be obtained in the body of the response message, see the description of the API function for getting information about a specific volume.


```
{
  "data": [
    {
      "ldevId": 0,
      "clprId": 0,
      "emulationType": "OPEN-V-CVS",
      "byteFormatCapacity": "1.00 G",
      "blockCapacity": 2097152,
      "numOfPorts": 2,
      "ports": [
        {
          "portId": "CL1-A",
          "hostGroupNumber": 0,
          "hostGroupName": "1A-G00",
          "lun": 1
        },
        {
```

```
          "portId": "CL2-A",
          "hostGroupNumber": 0,
          "hostGroupName": "2A-G00",
          "lun": 1
        }
      ],
      "attributes": [
        "CVS",
        "HDP"
      ],
      "label": "JH-26216_DP",
      "status": "NML",
      "mpBladeId": 2,
      "ssid": "0012",
      "poolId": 63,
      "numOfUsedBlock": 86016,
      "isFullAllocationEnabled": false,
      "resourceGroupId": 0,
      "dataReductionStatus": "ENABLED",
      "dataReductionMode": "compression_deduplication",
      "dataReductionProcessMode" : "post_process",
      "isAluaEnabled": false
    },
    {
      "ldevId": 1,
      "clprId": 0,
      "emulationType": "OPEN-V-CVS",
      "byteFormatCapacity": "1.00 G",
      "blockCapacity": 2097152,
      "numOfPorts": 2,
      "ports": [
        {
          "portId": "CL1-A",
          "hostGroupNumber": 0,
          "hostGroupName": "1A-G00",
          "lun": 2
        },
        {
          "portId": "CL2-A",
          "hostGroupNumber": 0,
          "hostGroupName": "2A-G00",
          "lun": 2
        }
      ],
      "attributes": [
        "CVS",
        "HDP"
      ],
      "label": "JH-26216_DP",
```

```
      "status": "NML",
      "mpBladeId": 0,
      "ssid": "0012",
      "poolId": 63,
      "numOfUsedBlock": 0,
      "isFullAllocationEnabled": false,
      "resourceGroupId": 0,
      "dataReductionStatus": "DISABLED",
      "dataReductionMode": "disabled",
      "isAluaEnabled": false
    }
  ]
}
```


If the LDEV is not implemented:

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId	int	Virtual LDEV number If the virtual LDEV number is not set, `65534` (FF:FE) is output. If the reserved attribute of global-active device is set, `65535` (FF:FF) is output.
emulationType	string	`NOT DEFINED` (a value that indicates the LDEV is not implemented) is output.
ssid	string	SSID This attribute is output only if an SSID has been set.
resourceGroupId	int	ID of the resource group to which LDEVs for which information is to be obtained belong

If the volume is an internal volume:

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId	int	Virtual LDEV number If the virtual LDEV number is not set, `65534` (FF:FE) is output. If the reserved attribute of global-active device is set, `65535` (FF:FF) is output.

Attribute	Type	Description
clprId	int	CLPR number
emulationType	string	The LDEV emulation type or the LDEV status information is output by using one of the following values: ▪ `NOT DEFINED`: The LDEV is not implemented. ▪ `DEFINING`: The LDEV is being created. ▪ `REMOVING`: The LDEV is being removed.
byteFormatCapacity	string	Capacity of the LDEV The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the LDEV
numOfPorts	int	Number of ports for which a path to the LDEV is defined If a namespace is set for the LDEV, `0` is output.
ports	object[]	For ports for which a path to the LDEV is defined, the following attributes are output. If a namespace is set for the LDEV, this attribute is not output. ▪ portId (string) Port number ▪ hostGroupNumber (int) Host group number ▪ hostGroupName (string) Host group name This request can obtain host group names that are no more than 16 characters. To obtain a host group name that exceeds 16 characters, run the API function for getting information about the host group or the iSCSI target. ▪ lun (int) LUN
composingPoolId	int	Pool ID of the pool that includes the LDEV
attributes	string[]	LDEV attributes

Attribute	Type	Description
		The following attributes are output: ▪ `CMD`: Command device (except for command devices for mainframes) ▪ `CLUN`: Cache LUN (DCR) ▪ `CVS`: CVS volume ▪ `ALUN`: Volume Migration volume ▪ `ELUN`: External volume ▪ `OLG`: OpenLDEV Guard volume ▪ `VVOL`: Virtual volume ▪ `HORC`: Pair volume (P-VOL or S-VOL) for remote copy (TrueCopy,TrueCopy for Mainframe, Universal Replicator, Universal Replicator for Mainframe) ▪ `MRCF`: ShadowImage volume (P-VOL or S-VOL) ▪ `HTI`: Thin Image volume (P-VOL or S-VOL) ▪ `JNL`: Journal volume ▪ `HDP`: HDP volume or Dynamic Provisioning for Mainframe volume ▪ `HDT`: HDT volume ▪ `POOL`: Pool volume ▪ `QRD`: Quorum disk ▪ `ENCD`: Encrypted disk ▪ `SYSD`: System disk ▪ `TSE`: HDP volume used for FCSE ▪ `GAD`: global-active device volume ▪ `HNASS`: Volume used as the system LU of NAS Platform ▪ `HNASU`: Volume used as a user LU of NAS Platform ▪ `T10PI`: Volume for which the T10 PI attribute is enabled

Attribute	Type	Description
		▪ `RCMD`: Remote command device ▪ `ESE`: Virtual volume capable of page release by the User Directed Space Release function
raidLevel	string	RAID level
raidType	string	Drive configuration
numOfParityGroups	int	Number of parity groups to which the LDEV belongs
parityGroupIds	string[]	Parity group to which the LDEV belongs
driveType	string	Code indicating the drive type of the drive belonging to the LDEV
driveByteFormatCapacity	string	Capacity of the drive belonging to the LDEV The value is output to the second decimal place.
driveBlockCapacity	long	Number of blocks of the drive belonging to the LDEV
label	string	Label of the LDEV
status	string	Status of the LDEV ▪ `NML`: The LDEV is in normal status. ▪ `BLK`: The LDEV is blocked. ▪ `BSY`: The LDEV status is being changed. ▪ `Unknown`: The LDEV status is unknown (not supported).
operationType	string	The operation in progress: ▪ `FMT`: Formatting is in progress. ▪ `QFMT`: Quick formatting is in progress. ▪ `CCOPY`: Collection copying is in progress. ▪ `CACCS`: Collection access is in progress. ▪ `SHRD`: Shredding is in progress. ▪ `ZPD`: Pages are being released. ▪ `SHRPL`: Deletion from the pool is in progress. ▪ `RLC`: Pools are being reallocated. ▪ `RBL`: Pools are being rebalanced.

Attribute	Type	Description
preparingOperationProgressRate	int	Progress of formatting or shredding For cases other than above, `100` is output.
mpBladeId	int	MP blade ID
ssid	string	SSID This attribute is output only if an SSID has been set.
resourceGroupId	int	ID of the resource group
isAluaEnabled	boolean	Whether the ALUA (Asymmetric Logical Unit Access) attribute is enabled ▪ `true`: The ALUA attribute is enabled. ▪ `false`: The ALUA attribute is disabled.
namespaceId	string	Namespace ID This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and a namespace is set for the LDEV.
nvmSubsystemId	string	NVM subsystem ID This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and an NVM subsystem is set for the LDEV.

If the volume is an external volume:

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId	int	Virtual LDEV number If the virtual LDEV number is not set, `65534` (FF:FE) is output. If the reserved attribute of global-active device is set, `65535` (FF:FF) is output.
clprId	int	CLPR number

Attribute	Type	Description
emulationType	string	The LDEV emulation type or the LDEV status information is output by using one of the following values: ▪ `NOT DEFINED`: The LDEV is not implemented. ▪ `DEFINING`: The LDEV is being created. ▪ `REMOVING`: The LDEV is being removed.
byteFormatCapacity	string	Capacity of the LDEV The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the LDEV
numOfPorts	int	Number of ports for which a path to the LDEV is defined If a namespace is set for the LDEV, `0` is output.
ports	object[]	For ports for which a path to the LDEV is defined, the following attributes are output. If a namespace is set for the LDEV, this attribute is not output. ▪ portId (string) Port number ▪ hostGroupNumber (int) Host group number ▪ hostGroupName (string) Host group name This request can obtain host group names that are no more than 16 characters. To obtain a host group name that exceeds 16 characters, run the API function for getting information about the host group or the iSCSI target. ▪ lun (int) LUN
composingPoolId	int	Pool ID of the pool that includes the LDEV
attributes	string[]	LDEV attributes

Attribute	Type	Description
		The following attributes are output: ▪ `CMD`: Command device (except for command devices for mainframes) ▪ `CLUN`: Cache LUN (DCR) ▪ `CVS`: CVS volume ▪ `ALUN`: Volume Migration volumes ▪ `ELUN`: External volume ▪ `OLG`: OpenLDEV Guard volume ▪ `VVOL`: Virtual volume ▪ `HORC`: Pair volume (P-VOL or S-VOL) for remote copy (TrueCopy, TrueCopy for Mainframe, Universal Replicator, Universal Replicator for Mainframe) ▪ `MRCF`: ShadowImage volume (P-VOL or S-VOL) ▪ `HTI`: Thin Image volume (P-VOL or S-VOL) ▪ `JNL`: Journal volume ▪ `HDP`: HDP volume or Dynamic Provisioning for Mainframe volume ▪ `HDT`: HDT volume ▪ `POOL`: Pool volume ▪ `QRD`: Quorum disk ▪ `ENCD`: Encrypted disk ▪ `SYSD`: System disk ▪ `TSE`: HDP volume used for FCSE ▪ `GAD`: global-active device volume ▪ `HNASS`: Volume used as the system LU of NAS Platform ▪ `HNASU`: Volume used as a user LU of NAS Platform ▪ `MG`: Volume used for data migration ▪ `ESE`: Virtual volume capable of page release by the User Directed Space Release function
label	string	Label of the LDEV

Attribute	Type	Description
status	string	Status of the LDEV ▪ `NML`: The LDEV is in normal status. ▪ `BLK`: The LDEV is blocked. ▪ `BSY`: The LDEV status is being changed. ▪ `Unknown`: The LDEV status is unknown (not supported).
operationType	string	The operation in progress: ▪ `FMT`: Formatting is in progress. ▪ `QFMT`: Quick formatting is in progress. ▪ `CCOPY`: Collection copying is in progress. ▪ `CACCS`: Collection access is in progress. ▪ `SHRD`: Shredding is in progress. ▪ `ZPD`: Pages are being released. ▪ `SHRPL`: Deletion from the pool is in progress. ▪ `RLC`: Pools are being reallocated. ▪ `RBL`: Pools are being rebalanced.
preparingOperationProgressRate	int	Progress of formatting or shredding For cases other than above, `100` is output.
mpBladeId	int	MP blade ID
ssid	string	SSID This attribute is output only if an SSID has been set.
resourceGroupId	int	ID of the resource group
externalVendorId	string	Vendor information in SCSI information for the volume on the external storage system
externalProductId	string	Storage system that is connected using the external storage connection functionality of Universal Volume Manager
externalVolumeId	string	Device identification information in SCSI information for the volume on the external storage system (output in hexadecimal number format)

Attribute	Type	Description
externalVolumeIdString	string	Device identification information in SCSI information for the volume on the external storage system (output in ASCII format)
numOfExternalPorts	int	Number of alternate paths
externalPorts	object[]	For the defined alternate paths, the following attributes are output: ▪ portId (string) Port number ▪ hostGroupNumber (int) This attribute is currently not in use. `0` is always displayed for this attribute. ▪ lun (int) LUN ▪ wwn (string) WWN
quorumDiskId	int	ID of the Quorum disk This attribute is output only if the external volume is a Quorum disk of the global-active device.
quorumStorageSerialNumber	string	Device number of the Quorum disk This attribute is output only if the external volume is a Quorum disk of the global-active device.
quorumStorageTypeId	string	ID for identifying the Quorum disk device This attribute is output only if the external volume is a Quorum disk of the global-active device. `R8`: VSP G1000, VSP G1500, VSP F1500 `R9`: VSP 5000 series `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models
isAluaEnabled	boolean	Whether the ALUA attribute is enabled: ▪ `true`: The ALUA attribute is enabled. ▪ `false`: The ALUA attribute is disabled.
namespaceId	string	Namespace ID

Attribute	Type	Description
		This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and a namespace is set for the LDEV.
nvmSubsystemId	string	NVM subsystem ID This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and an NVM subsystem is set for the LDEV.

If the volume is a virtual volume:

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId	int	Virtual LDEV number If the virtual LDEV number is not set, `65534` (FF:FE) is output. If the reserved attribute of global-active device is set, `65535` (FF:FF) is output.
clprId	int	CLPR number
emulationType	string	The LDEV emulation type or the LDEV status information is output by using one of the following values: ▪ `NOT DEFINED`: The LDEV is not implemented. ▪ `DEFINING`: The LDEV is being created. ▪ `REMOVING`: The LDEV is being removed.
byteFormatCapacity	string	Capacity of the LDEV The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the LDEV
numOfPorts	int	Number of ports for which a path to the LDEV is defined If a namespace is set for the LDEV, `0` is output.
ports	object[]	For ports for which a path to the LDEV is defined, the following attributes are output.

Attribute	Type	Description
		If a namespace is set for the LDEV, this attribute is not output. ▪ portId (string) Port number ▪ hostGroupNumber (int) Host group number ▪ hostGroupName (string) Host group name This request can obtain host group names that are no more than 16 characters. To obtain a host group name that exceeds 16 characters, run the API function for getting information about the host group or the iSCSI target. ▪ lun (int) LUN
attributes	string[]	LDEV attributes The following attributes are output: ▪ `CMD`: Command device (except for command devices for mainframes) ▪ `CLUN`: Cache LUN (DCR) ▪ `CVS`: CVS volume ▪ `ALUN`: Volume Migration volume ▪ `ELUN`: External volume ▪ `OLG`: OpenLDEV Guard volume ▪ `VVOL`: Virtual volume ▪ `HORC`: Pair volume (P-VOL or S-VOL) for remote copy (TrueCopy, TrueCopy for Mainframe , Universal Replicator, Universal Replicator for Mainframe) ▪ `MRCF`: ShadowImage volume (P-VOL or S-VOL) ▪ `HTI`: Thin Image volume (P-VOL or S-VOL) ▪ `JNL`: Journal volume ▪ `HDP`: HDP volume or Dynamic Provisioning for Mainframe volume

Attribute	Type	Description
		▪ `HDT`: HDT volume ▪ `POOL`: Pool volume ▪ `DRS`: Data reduction shared volume ▪ `QRD`: Quorum disk ▪ `ENCD`: Encrypted disk ▪ `SYSD`: System disk ▪ `TSE`: HDP volume used for FCSE ▪ `GAD`: global-active device volume ▪ `HNASS`: Volume used as the system LU of NAS Platform ▪ `HNASU`: Volume used as a user LU of NAS Platform ▪ `DSD`: Deduplication system data volume (fingerprint) or deduplication system data volume ▪ `DS`: Deduplication system data volume (data store) ▪ `MG`: Volume used for data migration ▪ `ESE`: Virtual volume capable of page release by the User Directed Space Release function
label	string	Label of the LDEV
status	string	Status of the LDEV ▪ `NML`: The LDEV is in normal status. ▪ `BLK`: The LDEV is blocked. ▪ `BSY`: The LDEV status is being changed. ▪ `Unknown`: The LDEV status is unknown (not supported).
operationType	string	The operation in progress: ▪ `FMT`: Formatting is in progress. ▪ `QFMT`: Quick formatting is in progress. ▪ `CCOPY`: Collection copying is in progress. ▪ `CACCS`: Collection access is in progress. ▪ `SHRD`: Shredding is in progress.

Attribute	Type	Description
		▪ `ZPD`: Pages are being released. ▪ `SHRPL`: Deletion from the pool is in progress. ▪ `RLC`: Pools are being reallocated. ▪ `RBL`: Pools are being rebalanced.
preparingOperationProgressRate	int	Progress of formatting or shredding For cases other than above, `100` is output.
mpBladeId	int	MP blade ID
ssid	string	SSID This attribute is output only if an SSID has been set.
poolId	int	ID of the pool with which the LDEV is associated ▪ For DP volumes: ID of the associated DP pool ▪ For virtual volumes for Thin Image: ID of the pool in which the snapshot data was created
numOfUsedBlock	long	Number of blocks used in the pool. This includes the number of blocks whose pages are reserved by the Full Allocation functionality.
resourceGroupId	int	ID of the resource group
snapshotPoolId	int	ID of the pool in which the snapshot data was created This attribute is output when the LDEV is both an S-VOL of a Thin Image pair and an HDP volume.
isRelocationEnabled	boolean	Status of relocation ▪ `true`: Relocation is enabled. ▪ `false`: Relocation is stopped.
tierLevel	string	Tiering policy used for relocation ▪ `all`: All tiers are used for relocation (level 0) ▪ `1` to `5`: Relocation is performed by following the tiering policy (levels 1 to 5) ▪ `6` to `31`: Relocation is performed by following the tiering policy (custom policy)
usedCapacityPerTierLevel1	long	Capacity allocated to tier 1 (in MB)

Attribute	Type	Description
usedCapacityPerTierLevel2	long	Capacity allocated to tier 2 (in MB)
usedCapacityPerTierLevel3	long	Capacity allocated to tier 3 (in MB)
tierLevelForNewPageAllocation	string	New page assignment tier ▪ `H`: The page is allocated to a higher-level tier (High) ▪ `M`: The page is allocated to a middle-level tier (Middle) ▪ `L`: The page is allocated to a lower-level tier (Low)
tier1AllocationRateMin	int	Minimum capacity of tier 1 of the set tiering policy
tier1AllocationRateMax	int	Maximum capacity of tier 1 of the set tiering policy
tier3AllocationRateMin	int	Minimum capacity of tier 3 of the set tiering policy
tier3AllocationRateMax	int	Maximum capacity of tier 3 of the set tiering policy
fullAllocationCapacity	long	Capacity for which pages are reserved by the Full Allocation functionality (in MB)
isFullAllocationEnabled	boolean	Whether pages are reserved by the Full Allocation functionality ▪ `true`: The page reservation setting is enabled. ▪ `false`: The page reservation setting is disabled.
dataReductionMode	string	Setting of the capacity saving function ▪ `compression`: The capacity saving function (compression) is enabled. ▪ `compression_deduplication`: The capacity saving function (compression and deduplication) is enabled. ▪ `disabled`: The capacity saving function (compression and deduplication) is disabled.
dataReductionProcessMode	string	Capacity-saving mode ▪ `post_process`: Post-process mode ▪ `inline`: Inline mode

Attribute	Type	Description
		This attribute is displayed for volumes for which the capacity saving function is enabled.
isCompressionAccelerationEnabled	boolean	Whether the compression accelerator of the capacity saving function is enabled[#1] ▪ `true`: Enabled ▪ `false`: Disabled This attribute is displayed for volumes for which the capacity saving function is enabled and that are in a storage system for which a compression accelerator is enabled.
dataReductionStatus	string	Status of the capacity saving function ▪ `ENABLED`: The capacity saving function is enabled. ▪ `DISABLED`: The capacity saving function is disabled. ▪ `ENABLING`: The capacity saving function is being enabled. ▪ `REHYDRATING`: The capacity saving function is being disabled. ▪ `DELETING`: The volumes for which the capacity saving function is enabled are being deleted. ▪ `CONVERTING`: The capacity saving function that uses a compression accelerator is being enabled or disabled.[#1] ▪ `FAILED`: An attempt to enable the capacity saving function failed.
dataReductionProgressRate	int	Progress rate of the capacity saving function (%) This attribute is output when one of the following is output for the `dataReductionStatus` attribute. `ENABLING`, `REHYDRATING`, `DELETING`, `CONVERTING`[#1]

Attribute	Type	Description
compressionAccelerationStatus	string	Status of the capacity saving function that uses a compression accelerator[#1] ▪ `ENABLED`: The capacity saving function that uses a compression accelerator is enabled. ▪ `DISABLED`: The capacity saving function that uses a compression accelerator is disabled. ▪ `HYBRID`[#2]: The volume contains both data for which the capacity saving function that uses a compression accelerator is enabled and data for which the capacity saving function that uses a compression accelerator is disabled. `HYBRID` is displayed for the `dataReductionStatus` attribute even if the status is `CONVERTING`. This attribute is displayed for volumes for which the capacity saving function is enabled and that are in a storage system for which a compression accelerator is enabled.
isAluaEnabled	boolean	Whether the ALUA attribute is enabled: ▪ `true`: The ALUA attribute is enabled. ▪ `false`: The ALUA attribute is disabled.
namespaceId	string	Namespace ID This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and a namespace is set for the LDEV.
nvmSubsystemId	string	NVM subsystem ID This attribute is output if the storage system is a VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H storage system and an NVM subsystem is set for the LDEV.

#1 If you enabled the capacity saving function that uses a compression accelerator by running the API request to change volume settings, check whether the settings have been changed successfully based on the following attributes.

- The `dataReductionStatus` attribute: If the value is `CONVERTING`, the capacity saving function that uses a compression accelerator is being enabled or disabled.
- The `isCompressionAccelerationEnabled` attribute: If the value is `true`, the setting is being changed from disabled to enabled.

If the values of these attributes are as follows, this indicates that the capacity saving function that uses a compression accelerator has been enabled.

- `dataReductionStatus`: `ENABLED`
- `isCompressionAccelerationEnabled`: `true`

If the capacity saving function that uses a compression accelerator setting does not change, perform the following steps:

- If the value of the `dataReductionStatus` attribute does not change to `CONVERTING`, the relevant volume or hardware is not in a state where the setting can be changed. Check whether the volume or hardware is in a state where the setting can be changed by referring to the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.
- If the value of the `dataReductionStatus` attribute is `CONVERTING` and the value of the `dataReductionProgressRate` attribute (the progress rate) does not change, a compression accelerator might be blocked. Use the API request for acquiring a list of alert information to check whether a compression accelerator is blocked. If it is not blocked, refer to the troubleshooting section of the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

#2 Of the volumes in a pool, if the capacity saving function that uses a compression accelerator is enabled for even one volume for which deduplication is enabled, the capacity saving function that uses a compression accelerator will be enabled for the duplicate data in that pool. For this reason, for a volume for which the capacity saving function that uses a compression accelerator is disabled, the capacity saving function that uses a compression accelerator will be enabled for some data in the volume and disabled for other data in the volume, depending on whether the data is duplicated. As a result, the value of the `compressionAccelerationStatus` attribute is `HYBRID`.

If the volume is a Thin Image P-VOL:

In addition to the attributes output if the volume is an internal volume, the following attribute is obtained.

Attribute	Type	Description
usedCapacityForSnapshot	long	Capacity used for snapshots in a Thin Image P-VOL (in MB) The snapshot capacity that is allocated from the pool and used as data is output. For the root volume of a snapshot tree, the snapshot capacity of the root volume is output.
usedTotalCapacityForSnapshot	long	Capacity of all snapshots that are allocated from the pool used by the root volume (in MB) This attribute is output for VSP 5000 series. This attribute is output when a Thin Image root volume is used.

Attribute	Type	Description
		This value includes the volume of metadata and garbage data generated by the storage system.
garbageDataCapacityForSnapshot	long	Volume of snapshot garbage data (in MB) This attribute is output for VSP 5000 series. This attribute is output when a Thin Image root volume is used, if the processing to delete snapshot garbage data is not in progress. If the volume is less than 1 MB, this value is rounded up. This attribute is not output when a Thin Image Advanced root volume is used.
deletingGarbageDataStatusForSnapshot	string	Deletion status of snapshot garbage data This attribute is output for VSP 5000 series. This attribute is output when a Thin Image root volume is used. ▪ `PROCESSING`: The deletion processing is in progress ▪ `STOPPING`: The deletion process is stopped ▪ `NONE`: The deletion processing is not in progress This attribute is not output when a Thin Image Advanced root volume is used.
deletingGarbageDataProgressRateForSnapshot	int	Progress of the processing for deleting snapshot garbage data (%) This attribute is output for VSP 5000 series. This attribute is output when a Thin Image root volume is used, if snapshot garbage data is in the process of being deleted. This attribute is not output when a Thin Image Advanced root volume is used.

If the drive type of the parity group to which the volumes belong is `SSD(FMC)`:

Specify `FMC` for the `detailInfoType` query parameter, and then run the request to obtain additional detailed information for accelerated compression.

```
{
  "data": [
    {
```

```
      "ldevId": 280,
      ...
      ...
      "isExpandedSpaceUsed": true
    }
  ]
}
```

Attribute	Type	Description
isExpandedSpaceUsed	boolean	Indicates whether the LDEV uses the expanded area. ▪ `true`: The LDEV uses the expanded area. ▪ `false`:The LDEV uses the physical area.

If the volume is an external volume:

Specify `externalVolume` for the `detailInfoType` query parameter, and then run the request to obtain additional detailed information for the external volume.

Attribute	Type	Description
externalStorageSerialNumber	string	Serial number of the storage system that is connected using the external storage connection functionality of Universal Volume Manager

If you execute the request with `virtualSerialNumber` specified for the `detailInfoType` query parameter, the request also obtains detailed information about the virtual storage machines.

Attribute	Type	Description
virtualSerialNumber	string	Serial number of the virtual storage machine
virtualModel#	string	Model name of the virtual storage machine
virtualModelDetail#	string	Detailed model name of the virtual storage machine This attribute is output if the virtual storage machine is in the VSP 5000 series.

#: For virtual storage machines in the VSP 5000 series, the series name `VSP 5000 series AFA` or `VSP 5000 series hybrid` is output for the `virtualModel` attribute, and `VSP 5100, 5500`, `VSP 5200, 5600`, `VSP 5100H, 5500H`, or `VSP 5200H, 5600H` is output for the `virtualModelDetail` attribute.

If you run the request with `savingInfo` specified for the `detailInfoType` query parameter, the request also obtains detailed information about the capacity saving function for the volumes for which the capacity saving function is enabled.

In the case of a Thin Image Advanced pair, the request obtains detailed information of the snapshot tree root volume only.


```
{
  "data": [
    {
      "ldevId": 12,
      ...
      ...
      "dataReductionTotalSavingRatio": "2.44",
      "isDataReductionTotalSavingBlockAvailable": true,
      "dataReductionTotalSavingBlock": 13878844,
      "dataReductionSavingBlockCompression": 12134812,
      "dataReductionSavingBlockDeduplication": 808078,
      "dataReductionSavingBlockReclaim": 1076144,
      "dataReductionSystemBlock": 140190,
      "dataReductionPreUsedBlock": 23489911,
      "dataReductionPoolBlock": 9611067
    }
  ]
```


Attribute	Type	Description
dataReductionTotalSavingRatio	string	The ratio of volume capacity reduced by using the capacity reduction function The capacity before data reduction is displayed as a ratio of the capacity after data reduction, where the capacity after data reduction is assigned a value of 1.
isDataReductionTotalSavingBlockAvailable	boolean	Whether the size of the data can be reduced ▪ `true` : The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `dataReductionTotalSavingBlock` attribute. ▪ `false` : The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction).

Attribute	Type	Description
dataReductionTotalSavingBlock	long	Total number of blocks reduced by using the capacity saving function This value is displayed when the `isDataReductionTotalSavingBlockAvailable` attribute is set to `true`. This value includes the amount of zero data that was reduced and the volume of metadata and garbage data generated by the storage system.
dataReductionSavingBlockCompression	long	Number of blocks reduced by using the capacity saving function (compression) The value does not include the volume of metadata and garbage data generated by the storage system.
dataReductionSavingBlockDeduplication	long	Number of blocks reduced by using the capacity saving function (deduplication) The value does not include the volume of metadata and garbage data generated by the storage system.
dataReductionSavingBlockReclaim	long	Number of blocks reduced by using the capacity saving function (reclaiming of the specified data pattern) The value does not include the volume of metadata and garbage data generated by the storage system.
dataReductionSystemBlock	long	Total number of blocks of system data (metadata and garbage data) used by the capacity saving function The value does not include the volume of metadata and garbage data in the deduplication system data volumes.
dataReductionPreUsedBlock	long	Number of blocks before data reduction
dataReductionPoolBlock	long	Number of blocks in the pool volume used by the volume

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
isDataDirectMapping	boolean	Whether the data direct mapping attribute is enabled ▪ `true`: Enabled ▪ `false`: Disabled
dataDirectMappingLdevId	int	LDEV number of the volume mapped by using data direct mapping This information is output if a volume exists that is mapped by using data direct mapping. This information is output when the value of the `isDataDirectMapping` attribute is `true`. ▪ If the volume is an HDP volume: LDEV number of the pool volume ▪ If the volume is a pool volume: LDEV number of the HDP volume If no volume mapped by using data direct mapping exists, `-1` is output, indicating an invalid value.
slotSize	long	Slot size (KB)
cacheResidencyMode	string	Cache residency mode ▪ `Bind mode`: Bind mode ▪ `Priority mode`: Priority mode ▪ `Unknown`: Status unknown (unsupported) ▪ `None`: None `Unknown` is always output for storage systems other than VSP G1000, VSP G1500, VSP F1500.
readOnly	boolean	This attribute is currently not in use. `false` is always output.
usedCapacity	long	Used capacity of the DP volume (KB) This information is output if the volume is a DP volume. The used capacity that is output includes the capacity for which pages are reserved.
relocationPriority	string	Relocation priority

Attribute	Type	Description
		This information is output if the volume is an HDT volume. ▪ `Default`: No priority is set. ▪ `Prioritized`: Data is relocated preferentially when tier relocation is performed.
conglomerateLunDevice	string	Whether the volume is an ALU or an SLU ▪ `ALU` ▪ `SLU` ▪ `Unknown`: Status unknown (unsupported)
commandDevice	object	Attributes related to the command device This information is output when the volume is used as a command device. ▪ isSecurityEnabled (boolean) Whether the security setting for the command device is enabled • `true`: Enabled • `false`: Disabled ▪ isUserAuthenticationEnabled (boolean) Whether the user authentication setting for the command device is enabled • `true`: Enabled • `false`: Disabled ▪ isDeviceGroupDefinitionEnabled (boolean) Whether the device group information authentication setting for the command device is enabled • `true`: Enabled • `false`: Disabled
externalDriveTypeName	string	Drive type of the volume on the external storage system ▪ `SAS` ▪ `SATA` ▪ `BD`

Attribute	Type	Description
		▪ `SSD` ▪ `SCM` ▪ `Unknown`: Status unknown (unsupported) If the information cannot be obtained, `Unknown` is output.
guardStatuses	string[]	Attribute related to access to the volume ▪ `Read/Write`: The volume can be read and written to from all hosts. ▪ `Read Only`: The volume can be read, but cannot be written to, from all hosts. ▪ `Protect`: The volume cannot be read or written to from any host. ▪ `S-VOL Disable`: Access to the secondary volume is not permitted. ▪ `Invisible`: Invisible mode (Access via a SCSI command is not permitted.) ▪ `Zero Read Capacity`: Zero Read Capacity mode (0 is returned as the response to a SCSI command.) ▪ `Unknown`: Status unknown

If you run this request with `qos` specified for `detailInfoType` in the query parameters, information about QoS settings is also obtained.

Attribute	Type	Description
qos	object	Information about QoS settings If QoS settings are configured, the following information is output. ▪ upperIops (long) Upper limit on the IOPS ▪ upperTransferRate (int) Upper limit on the amount of data that can be transferred per second (in MB)

Attribute	Type	Description
		▪ upperAlertAllowableTime (int) Amount of time to wait before issuing an alert when the IOPS or the amount of data transferred per second exceeds the upper limit for a continuous period of time (in seconds) ▪ upperAlertTime (ISO8601string) Time when the last alert was issued because the IOPS or the amount of data transferred per second had exceeded the upper limit for a continuous period of time (UTC) This parameter is output in the format YYYY-MM-DDThh:mm:ssZ. ▪ lowerIops (long) Lower limit on the IOPS This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ lowerTransferRate (int) Lower limit on the amount of data that can be transferred per second (in MB) This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ lowerAlertAllowableTime (int) Amount of time to wait before issuing an alert when the IOPS or the amount of data transferred per second falls below the lower limit for a continuous period of time (in seconds) This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Attribute	Type	Description
		▪ lowerAlertTime (ISO8601string) Time when the last alert was issued because the IOPS or the amount of data transferred per second had fallen below the lower limit for a continuous period of time This parameter is output in the format YYYY-MM-DDThh:mm:ssZ. This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ responsePriority (int) Priority level of the I/O processing This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ targetResponseTime (int) Target response time (in milliseconds) based on the priority level (`responsePriority`) This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ responseAlertAllowableTime (int) Amount of time to wait before issuing an alert when the response time exceeds the target response time for a continuous period of time (in seconds) This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ responseAlertTime (ISO8601string) Time when the last alert was issued because the response time had exceeded the target response time for a continuous period of time (UTC) This parameter is output in the format YYYY-MM-DDThh:mm:ssZ. This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

If you run this request with `nguId` specified for `detailInfoType` in the query parameters, information about NGUID settings is also obtained.

Attribute	Type	Description
nguId	string	Namespace identifier information This attribute is not output if the namespace is not set. If the namespace is set but the NGUID cannot be obtained, `Unknown` is output.

Status codes

For details on the status codes for the request of this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs?
headLdevId=0&count=2"
```

Getting information about a specific volume

The following request gets information about a specific LDEV by specifying the LDEV number.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID
```

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "ldevId": 1,
  "clprId": 0,
  "emulationType": "OPEN-V-CVS",
  "byteFormatCapacity": "1.00 G",
  "blockCapacity": 2097152,
  "numOfPorts": 2,
  "ports": [
    {
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "1A-G00",
      "lun": 1
    },
    {
      "portId": "CL2-A",
      "hostGroupNumber": 0,
      "hostGroupName": "2A-G00",
      "lun": 1
    }
  ],
  "attributes": [
    "CVS",
    "HDP"
  ],
  "label": "JH-26216_DP",
  "status": "NML",
  "mpBladeId": 2,
  "ssid": "0012",
  "poolId": 63,
  "numOfUsedBlock": 86016,
  "isFullAllocationEnabled": false,
  "resourceGroupId": 0,
  "dataReductionStatus": "ENABLED",
  "dataReductionMode": "compression_deduplication",
  "dataReductionProcessMode" : "post_process",
  "isAluaEnabled": false
  "naaId": "60060e8006cf2e000000cf2e00000000"
}
```

The following attribute is output in addition to the attributes output from the API of getting volume information.

Attribute	Type	Description
naaId	string	The NAA ID of the volume whose LU path was specified is output.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1
```

Creating a volume

The following request creates a volume by using the specified parity groups or pools. Specify a parity group for creating a basic volume, an external volume group for creating the external volume, and a pool for creating a virtual volume (a DP volume or a virtual volume for Thin Image).

Note:

In the case of VSP One B20, you can create an external volume or a virtual volume.

Tip:

If you want to simultaneously execute multiple requests for creating DP volumes, we recommend that you execute the corresponding jobs in parallel by specifying `true` for the `isParallelExecutionEnabled` attribute. If you do not specify this setting, the jobs will be executed sequentially, which takes more time than parallel execution.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/ldevs
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example creates an LDEV (basic volume) by specifying the parity group:

```
{
  "ldevId": 0,
  "parityGroupId": "1-1",
  "byteFormatCapacity": "1G"
}
```

The following coding example creates an external volume by specifying an external volume group:

```
{
  "ldevId": 3,
  "externalParityGroupId": "1-1",
  "byteFormatCapacity": "1G"
}
```

The following coding example creates a DP volume for which the capacity saving function is enabled by specifying a pool:

```
{
  "ldevId": 1,
  "poolId": 0,
  "byteFormatCapacity": "1G",
  "dataReductionMode": "compression_deduplication"
}
```

Attribute	Type	Description
ldevId	int	(Optional) Specify an LDEV number that is not implemented with a decimal (base 10) number. This attribute cannot be specified at the same time as the `isParallelExecutionEnabled` attribute.

Attribute	Type	Description
		If this attribute is omitted, the minimum LDEV number that is not implemented is assumed.
isParallelExecutionEnabled	boolean	(Optional) If you want to execute multiple requests at the same time, specify whether to execute the corresponding jobs in parallel. You can specify this attribute only when you are creating DP volumes. ▪ `true`: Execute jobs in parallel. ▪ `false`: Do not execute jobs in parallel. (Execute jobs sequentially.) If this attribute is omitted, the value `false` is assumed. If you specify the `ldevId` attribute, `parityGroupId` attribute, or `externalParityGroupId` attribute, you cannot specify this attribute. If you specify this attribute, an unused LDEV number is automatically assigned to the created LDEV. If there are LDEV numbers that cannot be used, exclude those numbers by using the `startLdevId` and `endLdevId` attributes.
isDataReductionSharedVolumeEnabled	boolean	(Optional) Specify whether to create a data reduction shared volume. You can specify this attribute for VSP One B20, VSP 5000 series or VSP E series. If you want to create a volume for Thin Image Advanced, specify `true`. ▪ `true`: Creates a volume.[#1] ▪ `false`: Does not create a volume. If you specify `true`, you must also specify the `poolId` attribute. If this attribute is omitted, the value `false` is assumed.
startLdevId	int	(Optional) The first LDEV number in the range of LDEV numbers to be automatically assigned, if such a range is specified

Attribute	Type	Description
		You can specify this attribute if the `isParallelExecutionEnabled` attribute is set to `true`. If you specify this attribute, you must also specify the `endLdevId` attribute. The value of this attribute must be smaller than that of the `endLdevId` attribute.
endLdevId	int	(Optional) The last LDEV number in the range of LDEV numbers to be automatically assigned, if such a range is specified You can specify this attribute if the `isParallelExecutionEnabled` attribute is set to `true`. If you specify this attribute, you must also specify the `startLdevId` attribute. The value of this attribute must be greater than that of the `startLdevId` attribute.
parityGroupId	string	(Optional) Parity group number Be sure to specify this attribute when creating an LDEV (basic volume). Specify concatenated parity groups in the same way as the above. If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `"parityGroupId": "1-3"` If you specify the `isParallelExecutionEnabled` attribute, you cannot specify this attribute.
externalParityGroupId	string	(Optional) External volume group number Be sure to specify this attribute when creating an external volume. If you specify the `isParallelExecutionEnabled` attribute, you cannot specify this attribute.
poolId	int	(Optional) Pool number

Attribute	Type	Description
		Be sure to specify this item when creating a virtual volume from a pool. ▪ To create a DP volume: For the DP pool number, specify a decimal (base 10) number equal to or greater than 0. ▪ To create a virtual volume for Thin Image (excluding Thin Image Advanced): Specify `-1`. For the VSP One B20, VSP 5000 series or VSP E series, if you specify `true` for the `isDataReductionSharedVolumeEnabled` attribute, you must specify this attribute. In such cases, you can specify only the pool number of an HDP pool.#2
dataReductionMode	string	(Optional) Whether to enable the capacity saving function If you enable this attribute, a DP volume for which the capacity saving function (compression or deduplication) is enabled is created. The specifiable values are as follows: ▪ `compression`: Enable the capacity saving function (compression) ▪ `compression_deduplication`: Enable the capacity saving function (compression and deduplication) ▪ `disabled`: Disable the capacity saving function (compression and deduplication) If you specify `compression` or `compression_deduplication` and the storage system is one for which a compression accelerator can be used, the capacity saving function that uses a compression accelerator will be automatically enabled. The values are not case sensitive.

Attribute	Type	Description
		For VSP One B20, VSP 5000 series or VSP E series ▪ If this attribute is omitted when the `isDataReductionSharedVolumeEnabled` attribute is `false`, the value `disabled` is assumed. ▪ If this attribute is omitted when the `isDataReductionSharedVolumeEnabled` attribute is `true`, the value `compression_deduplication` is assumed. ▪ If the `isDataReductionSharedVolumeEnabled` attribute is `true`, you cannot specify `disabled`. For other storage systems If this attribute is omitted, `disabled` will be set.
isCompressionAccelerationEnabled	boolean	(Optional) Whether to enable the compression accelerator of the capacity saving function ▪ `true`: Enable ▪ `false`: Disable If you enable the capacity saving function and the storage system is one for which a compression accelerator can be used, the capacity saving function that uses a compression accelerator will be enabled even if you omit this attribute. If you specify this attribute and simultaneously execute multiple requests, the corresponding jobs will be executed in parallel.
byteFormatCapacity	string	(Optional) Capacity of the volume to be created, and the unit of the capacity. You must specify either this attribute or the `blockCapacity` attribute. The following units can be specified: ▪ `T` or `t` ▪ `G` or `g` ▪ `M` or `m` ▪ `K` or `k` To allocate all free space, specify "`all`".

Attribute	Type	Description
		The following is an example of specifying a capacity of 1 GB: `"byteFormatCapacity":"1G"`
blockCapacity	long	(Optional) Capacity of the volume to be created in blocks (1 block = 512 bytes). You must specify either this attribute or the `byteFormatCapacity` attribute. The following is an example of specifying a capacity of 1 GB: `"blockCapacity":2097152`

#1: An error might occur while a volume is being created internally on the storage system and the data reduction shared volume might not be able to be created. Get information about the volume to check the volume status. If the following conditions indicating a normal status are not met, delete the relevant volume.

Conditions for a normal status:

- The value of the `status` attribute is `NML` (normal status).
- The value of the `dataReductionStatus` attribute is `ENABLED` (the capacity saving function is enabled).
- If the compression accelerator is enabled, the value of the `isCompressionAccelerationEnabled` attribute is `true` (enabled).

#2: You cannot create a data reduction shared volume from pools other than an HDP pool. In addition, you can create a data reduction shared volume only when all of the volumes that make up an HDP pool are SSD-type volumes (volumes implemented in a parity group that uses an SSD drive).

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created volume

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs
```

Formatting a volume

The following request formats an LDEV (basic volume) or DP volume.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/format/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

```
{
  "parameters": {
    "operationType": "FMT"
```

```
  }
}
```

Attribute	Type	Description
operationType	string	(Required) Format type. The specifiable types are as follows: `FMT`: Normal formatting `QFMT`: Quick formatting For a DP volume for which the capacity saving function is enabled, you must specify `FMT`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the formatted volume

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/format
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot run because the volume meets one of the following conditions: ▪ The LDEV is used as a virtual volume of Thin Image. ▪ The LDEV is used as a Quorum disk. ▪ The LDEV is used as a system disk. ▪ The LDEV is used as a pool volume.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/format
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/1/actions/format/invoke
```

When forcibly formatting the DP volume for which the capacity saving function is enabled:

Note:

The formatting of deduplicated data might take time. Be sure to take this into account when planning when to format such data. For details about formatting DP volumes for which capacity saving function (compression or deduplication) is enabled, see the *Provisioning Guide* or the *Provisioning Guide for Open Systems*. In addition, use the status of the target resource rather than the status of the job to check whether the data has been formatted.

When format the DP volume for which the capacity saving function (compression or deduplication) is enabled, in the request body, specify `FMT` for the `operationType` attribute, and `true` for the `isDataReductionForceFormat` attribute.

The following coding example forcibly formats the DP volume for which the capacity saving function (compression or deduplication) is enabled:

```
{
  "parameters": {
    "operationType": "FMT",
```

```
    "isDataReductionForceFormat": true
  }
}
```

Attribute	Type	Description
isDataReductionForceFormat	boolean	(Optional) Specify whether to forcibly format the DP volume for which the capacity saving function (compression or deduplication) is enabled. ▪ `true`: Format forcibly ▪ `false`: Do not format forcibly When the attribute is omitted, `false` is assumed.

Expanding the capacity of a volume

The following request expands the capacity of a DP volume.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/expand/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

When specifying in bytes:

```
{
  "parameters": {
    "additionalByteFormatCapacity": "1G"
  }
}
```

When specifying in blocks:

```
{
  "parameters": {
    "additionalBlockCapacity": 2097152
  }
}
```

Attribute	Type	Description
additionalByteFormatCapacity	string	(Optional) The capacity to be added and its unit. You must specify either `additionalByteFormatCapacity` or `additionalBlockCapacity`. The specifiable units are as follows: ▪ `T` or `t` ▪ `G` or `g` ▪ `M` or `m` ▪ `K` or `k` The following is an example of specifying a capacity of 1 GB: `"additionalByteFormatCapacity":"1G"`
additionalBlockCapacity	long	(Optional) The capacity to be added in blocks (1 block = 512 bytes). You must specify either `additionalByteFormatCapacity` or `additionalBlockCapacity`.

Attribute	Type	Description
		The following is an example of specifying a capacity of 1 GB: `"additionalBlockCapacity":2097152`
enhancedExpansion	boolean	(Optional) Whether to expand volumes used by the copy pair or a data reduction shared volume. This attribute can be specified for the following storage system models: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900 and VSP F1500. ▪ `true`: Expand the volumes. ▪ `false`: Do not expand the volumes. If you do not specify a value, `false` is assumed. The capacity of volumes can be expanded if the status of the pair is PSUS or SSUS. For the VSP 5000 series, the volume capacity can be expanded even if the global-active device pair status is PAIR. For information on other prerequisite conditions and the workflow, see the manual of each software product. For example, if you want to expand volumes used by a Thin Image pair, see the *Hitachi Thin Image User Guide* or the *Hitachi Thin Image Advanced User Guide*.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the expanded volume

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/expand
```

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified LDEV is not a DP volume.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/expand
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/1/actions/expand/invoke
```

Changing the volume settings

The following request sets the label for the specified volume, tier relocation of HDT volumes, and whether page reservations are enabled for DP volumes.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following shows an example of code for changing the label for a volume:

```
{
  "label": "REST_API_10GVolume"
}
```

The following shows an example of code for setting tier relocation and the new page assignment tier:

```
{
  "isRelocationEnabled": true,
  "tierLevelForNewPageAllocation": "L"
}
```

The following shows an example of code for setting the tiering policy (already defined):

```
{
  "tieringPolicy": {
    "tierLevel": 2
  }
}
```

The following shows an example of code for setting the tiering policy (custom policy):

```
{
  "tieringPolicy": {
    "tierLevel": 23,
    "tier1AllocationRateMin": 20,
    "tier1AllocationRateMax": 40,
    "tier3AllocationRateMin": 10,
    "tier3AllocationRateMax": 40
```

```
  }
}
```

The following shows an example of code for enabling the page reservation setting:

```
{
  "isFullAllocationEnabled": true
}
```

The following shows an example of code for enabling the capacity saving function:

```
{
  "dataReductionMode": "compression_deduplication"
}
```

Attribute	Type	Description
label	string	(Optional) Label to be set for the volume Specify a label consisting of 0 to 32 characters. You can use the following characters.#1 ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' ( ) + , - . : = @ [ ] ^ _ ` { } ~ / \ You can specify a hyphen as the first character of the value. ▪ Spaces The label cannot start or end with a space.
dataReductionMode	string	(Optional) Specify whether to enable the capacity saving function If you enable this attribute, the capacity saving function (compression or deduplication) of the DP volume is enabled.

Attribute	Type	Description

		The specifiable values are as follows:
		▪ `compression`: Enable the capacity saving function (compression)
		▪ `compression_deduplication`: Enable the capacity saving function (compression and deduplication)
		▪ `disabled`: Disable the capacity saving function (compression and deduplication)#2
		The values are not case sensitive.
		You cannot change the value of this attribute from `compression_deduplication` to `compression`.
		If this attribute is changed from `disabled` to `compression` or `compression_deduplication`, the following applicable value is set by default for the `dataReductionProcessMode` attribute (the capacity-saving mode).
		▪ For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500 :
		`post_process`
		▪ For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 :
		`inline`
		If you change this attribute from `disabled` to `compression` or `compression_deduplication` and the storage system is one for which a compression accelerator can be used, the capacity saving function that uses a compression accelerator will be automatically enabled.

dataReductionProcessMode	string	(Optional) Specify the capacity-saving mode. ▪ `post_process`: Post-process mode ▪ `inline`: Inline mode

Attribute	Type	Description
		This attribute can be specified when the capacity saving function is enabled. This attribute cannot be specified at the same time as any other attribute.
isCompressionAccelerationEnabled	boolean	(Optional) Specify whether to enable the compression accelerator of the capacity saving function.[#3] ▪ `true`: Enable ▪ `false`: Disable This attribute can be specified when the capacity saving function is enabled. This attribute cannot be specified at the same time as any other attribute. If you specify this attribute and simultaneously execute multiple requests, the corresponding jobs will be executed in parallel.
isRelocationEnabled	boolean	(Optional) Specify whether to enable the tier relocation setting for the HDT volume. ▪ `true` : Enable the tier relocation. ▪ `false` : Disable the tier relocation.
tieringPolicy	object	Specify the tiering policy to be assigned to the HDT volume. Specifying this attribute automatically enables tier relocations for the HDT volume.

Attribute	Type	Description
		If you specify `false` for the `isRelocationEnabled` attribute, you cannot specify this attribute. ▪ (Optional) tierLevel (int) Level of the tiering policy If you specify the tiering policy, you must specify this setting. Specify a value from `0` to `31`. • `0`: All tiers are used for relocations. • `1` to `5`: Relocations are performed by following the tiering policy (levels 1 to 5). • `6` to `31`: Relocations are performed by following the tiering policy (custom policy). When an HDT volume is created, `0` is set. If you specify a custom policy of `6` to `31` for the `tierLevel` attribute, you can also specify the percentage of pages to be allocated to each tier.[#4] There are four attributes for specifying the percentage. If you specify these attributes, you must specify all of them. Specify a value from `1` to `100`.[#5] You can specify the following attributes: ▪ (Optional) tier1AllocationRateMin (int) From among the total capacity of the pages to be allocated when tier relocation is performed, the minimum rate (%) of the capacity to be relocated to tier 1 ▪ (Optional) tier1AllocationRateMax (int) From among the total capacity of the pages to be allocated when tier relocation is performed, the maximum rate (%) of the capacity to be relocated to tier 1

Attribute	Type	Description
		▪ (Optional) tier3AllocationRateMin (int) From among the total capacity of the pages to be allocated when tier relocation is performed, the minimum rate (%) of the capacity to be relocated to tier 3 ▪ (Optional) tier3AllocationRateMax (int) From among the total capacity of the pages to be allocated when tier relocation is performed, the maximum rate (%) of the capacity to be relocated to tier 3
tierLevelForNewPageAllocation	string	(Optional) Specify which tier of the HDT pool will be prioritized when a new page is allocated. The type is not case sensitive. ▪ `H`: Higher-level tier (High) ▪ `M`: Middle-level tier (Middle) ▪ `L`: Lower-level tier (Low) When an HDT volume is created, `M` is set.
isFullAllocationEnabled	boolean	(Optional) Specify whether to reserve pages of the pool associated with the DP volume by using the Full Allocation functionality. ▪ `true`: Enable the page reservation setting. ▪ `false`: Disable the page reservation setting. When a DP volume is created, `false` is set.
isAluaEnabled	boolean	(Optional) Specify whether to enable the ALUA attribute. You can specify this attribute for a volume used for a global-active device in a cross-path configuration (using a Fibre Channel connection). ▪ `true`: Enable the ALUA attribute. ▪ `false`: Disable the ALUA attribute.

#1: For target storage systems whose microcode versions are earlier than those supported by Configuration Manager 8.6.2, if one of the following conditions is met, the characters that can be specified in a label vary:

- The storage system model is VSP G1000, VSP G1500, or VSP F1500, and SSL communication is used for communication with the REST API server.
- The storage system model is VSP G200, G400, G600, G800, or VSP F400, F600, F800, and SSL communication (the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode) is used for communication with the REST API server.
- The storage system model is VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900.

In this case, you can specify the following characters in a label. The label must consist of 1 to 32 characters.

- Alphanumeric characters
- The following symbols:

  _ - . @ , :

  The label cannot start with a hyphen (-).

#2: If the data of the volume has been deduplicated, disabling the capacity saving function might take time. For details about the task to disable the capacity saving function, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*. In addition, use the status of the target resource rather than the status of the job to check whether the settings have been changed.

#3: After the settings of the compression accelerator of the capacity saving function are changed, data conversion processing is performed. This data conversion processing takes time. Thus, if you want to change the settings of the compression accelerator, we recommend that you do so in a planned manner. For details, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*. In addition, to check the progress of the data conversion processing of a volume, run the API for getting volume information, and then check the values of the `isCompressionAccelerationEnabled` and `dataReductionStatus` attributes.

#4: If you do not specify the percentage, the values stored in the storage system are set.

#5: If you specify the value of each attribute, make sure that the value meets the following conditions:

- The value of the tier1AllocationRateMin attribute is equal to or less than the value of the tier1AllocationRateMax attribute.
- The value of the tier3AllocationRateMin attribute is equal to or less than the value of the tier3AllocationRateMax attribute.
- The sum of the values of the tier1AllocationRateMin and tier3AllocationRateMin attributes is equal to or less than 100.
- The difference between the values of the tier1AllocationRateMax and tier1AllocationRateMin attributes is a multiple of 10.
- The difference between the values of the tier3AllocationRateMax and tier3AllocationRateMin attributes is a multiple of 10.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the volume whose settings were changed

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/100
```

Changing the volume status

The following request changes the status of a volume. The volume status can be changed to blocked before a volume is shredded or returned to the normal status after shredding is stopped.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/change-
status/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following is a coding example for changing the volume status to blocked:

```
{
  "parameters": {
    "status": "blk"
  }
}
```

Attribute	Type	Description
status	string	(Required) Volume status The specifiable values are as follows: `blk`: Change the status to blocked `nml`: Change the status to normal

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the volume whose status was changed

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/change-status
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot run because the volume meets one of the following conditions: ▪ The LDEV is used as a Quorum disk. ▪ The LDEV is used as a system disk. ▪ The LDEV is used as a pool volume. ▪ The LDEV is used as a Volume Migration volume. ▪ The LDEV is used as a pair volume of a global-active device. ▪ The LDEV is used as a pair volume of ShadowImage. ▪ The LDEV is used as a pair volume of TrueCopy or Universal Replicator. ▪ The LDEV is used as a pair volume of Thin Image.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/100/
actions/change-status
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/100/actions/change-status/invoke
```

Shredding a volume

The following request shreds an LDEV (basic volume) or DP volume. Overwrite the volume three times with dummy data. You can stop shredding before its completion. Change the status of the volume to be shredded to blocked. When shredding is complete, the status of the volume is automatically changed to normal. If you stopped shredding before completion, the status of the volume remains as blocked.

Notes when stopping shredding

If you make a request to stop shredding, all of the volumes that are currently being shredded are stopped.

Shredding might not stop even if you make a request to stop shredding. In such case, make the request according to the progress status of the shredding. The progress of the shredding can be checked from the value of the `preparingOperationProgressRate` attribute that is obtained from the information of the target volume.

- When the value of the attribute is `0`, shredding has not started.

  When the value is `0`, shredding is not stopped even if a request is made.

  Request the stopping of the shredding after the value is greater than or equal to `1`.

- When a request for stopping shredding is made but the value of the attribute does not change to `100`, shredding is not stopped.

  In such case, make a request to stop the shredding again.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/shred/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following is a coding example for performing shredding by specifying the dummy data pattern:

```
{
  "parameters": {
    "operationType": "start",
    "pattern": "F0F0F0"
  }
}
```

The following is a coding example for performing shredding without specifying the dummy data pattern:

```
{
  "parameters": {
    "operationType": "start"
  }
}
```

The following is a coding example for stopping shredding before completion:

```
{
  "parameters": {
    "operationType": "stop"
  }
}
```

Attribute	Type	Description
operationType	string	(Required) Run or stop shredding. The specifiable values are as follows: `start`: Run shredding `stop`: Stop shredding
pattern	string	(Optional) Dummy data pattern to be used for the second overwrite Specify a pattern consisting of 1 to 8 characters in a hexadecimal format. Specification example: `0F0F0F`

Attribute	Type	Description
		If the value is not specified, the default pattern `FFFFFFFF` will be used.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the shredded volume

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/shred
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot run because the volume meets one of the following conditions: ▪ The LDEV status is normal or the status is being changed. ▪ The LDEV is used as a Quorum disk. ▪ The LDEV is used as a system disk. ▪ The LDEV is used as a pool volume. ▪ The LDEV is used as a deduplication system data volume (fingerprint) or a deduplication system data volume. ▪ The LDEV is used as a journal volume. ▪ The LDEV is used as a pair volume of a global-active device. ▪ The LDEV is used as a pair volume of ShadowImage. ▪ The LDEV is used as a pair volume of TrueCopy or Universal Replicator. ▪ The LDEV is used as a pair volume of Thin Image.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/100/
actions/shred
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/100/actions/shred/invoke
```

Reclaiming zero pages of a DP volume

The following request reclaims zero pages of a DP volume to release the pages. By releasing pages, you can increase the free capacity of a pool.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/discard-zero-page/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

None.

Response message

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the volume for which zero pages were reclaimed

Action template

None.

Status codes

The following table explains the meanings of the status codes for this API. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot run because the volume meets one of the following conditions: ▪ The volume is not a DP volume. ▪ The volume is in the blocked status. ▪ The volume is used as a pair volume of one of the following copy types: • ShadowImage • TrueCopy • Universal Replicator ▪ The volume is used as a journal volume of Universal Replicator. ▪ The volume is used as a Volume Migration volume.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/discard-zero-page/invoke -d ""
```

Changing the MP blade assigned to a volume

The following request changes the MP blade assigned to a volume.

Note:

When changing the MP blade assigned to a volume, make sure to take into account the effect the change will have on I/O performance. For notes on changing the MP blade assigned to a volume, see the *Provisioning Guide for Open Systems* or the *Provisioning Guide* for the storage system.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/assign-mp-
blade/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting volume information.

Attribute	Type	Description
ldevId	int	(Required) LDEV number

Query parameters

None.

Body

```
{
    "parameters": {
        "mpBladeId": 1
    }
}
```

Attribute	Type	Description
mpBladeId	int	(Required) MP blade number of the MP blade to be assigned to the volume

Response message

Body

A job object is returned. For details about attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the volume for which the MP blade number was changed

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of the HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/99/actions/assign-mp-blade/invoke
```

Deleting a volume

The following request deletes an LDEV (basic volume) or a virtual volume (a DP volume or a virtual volume for Thin Image).

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID
```

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted volume

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/105
```

When forcibly deleting the DP volume for which the capacity saving function is enabled

Important: Deleting data on a DP volume for which the capacity saving function (compression or deduplication) is enabled might take time. Be sure to take this into account when planning when to delete such data. For details about how to delete DP volumes for which the capacity saving function (compression or deduplication) is enabled, see the *Provisioning Guide* or the *Provisioning Guide for Open Systems*. In addition, use the status of the target resource rather than the status of the job to check whether the volume has been deleted.

When deleting the DP volume for which the capacity saving function (compression or deduplication) is enabled, in the request body, specify `true` for the `isDataReductionDeleteForceExecute` attribute.

The following coding example forcibly deletes the DP volume for which the capacity saving function (compression or deduplication) is enabled:

```
{
  "isDataReductionDeleteForceExecute": true
}
```

Attribute	Type	Description
isDataReductionDeleteForceExecute	boolean	(Optional) Specify whether to forcibly delete the DP volume for which the capacity saving function (compression or deduplication) is enabled. ▪ `true`: Forcibly deletes ▪ `false`: Does not forcibly delete

Attribute	Type	Description
		When the attribute is omitted, `false` is assumed.

Getting port information

The following request obtains information about ports.

Important:

- If the storage system model is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, in a configuration in which no link is established to the SVP, if you execute this API request with `detailInfoType=logins` specified, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".
- Pay attention to the number of concurrent executions if this API request is run when the storage system is VSP E1090 or VSP E1090H, `detailInfoType=loginHostNqn` is specified in the query, and `portId` is not specified. For details, see "Implementing retry processing".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/ports
```

Request message

Object ID

None.

Query parameters

You can filter execution results by specifying conditions, or get additional detailed port information.

When filtering execution results:

Parameter	Type	Filter condition
portType	string	(Optional) Port type

Parameter	Type	Filter condition
		You can specify the following conditions: ▪ `FIBRE` ▪ `SCSI` ▪ `ISCSI` ▪ `NVME_TCP` ▪ `ENAS` ▪ `ESCON` ▪ `FICON` ▪ `FCoE` ▪ `HNASS` ▪ `HNASU` If this parameter is omitted, information about ports of all port types will be obtained. If you specify `portId`, you cannot specify this parameter.
portAttributes	string	(Optional) Port attribute You can specify the following conditions: ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) If this parameter is omitted, information about all port attributes will be obtained. Information about bidirectional ports will be obtained regardless of which value is specified for this parameter. If you specify `portId`, you cannot specify this parameter.
portId	string	(Optional) Port number If this parameter is omitted, information about all port numbers will be obtained. If you specify this parameter, be sure to specify `logins` or `loginHostNqn` for the `detailInfoType` parameter. Note that the `portType` parameter and the `portAttributes` parameter cannot be specified at the same time.

When collecting additional detailed information:

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained You can use this parameter together with parameters that filter the execution results. ▪ `logins`: Information about logins to a port corresponding to the WWN of an HBA or iSCSI name You can get this information if the port type is `FIBRE`, `FCoE`, or `ISCSI`. This value cannot be specified at the same time as `loginHostNqn`. ▪ `portMode`: Operating mode of the port ▪ `loginHostNqn`: Information about login to the host NQN port Information can be obtained if the port type is `FIBRE`, or `NVME_TCP`. This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H. This value cannot be specified at the same time as `logins`.

Body

None.

Response message

Body

The following is an example of the output when information obtained about all ports:

```
{
  "data": [
    {
      "portId": "CL1-A",
      "portType": "FIBRE",
      "portAttributes": [
        "TAR",
        "MCU",
        "RCU",
        "ELUN"
      ],
```

```
      "portSpeed": "AUT",
      "loopId": "EF",
      "fabricMode": true,
      "portConnection": "PtoP",
      "lunSecuritySetting": true,
      "wwn": "50060e80124e3b00"
    },
    {
      "portId": "CL1-B",
      "portType": "ISCSI",
      "portAttributes": [
        "TAR",
        "MCU",
        "RCU",
        "ELUN"
      ],
      "portSpeed": "10G",
      "loopId": "00",
      "fabricMode": false,
      "lunSecuritySetting": true
    }
  ]
}
```


The following is an example of the output when information is obtained about ports by specifying the port type:


```
{
  "data": [
    {
      "portId": "CL1-B",
      "portType": "ISCSI",
      "portAttributes": [
        "TAR",
        "MCU",
        "RCU",
        "ELUN"
      ],
      "portSpeed": "10G",
      "loopId": "00",
      "fabricMode": false,
      "lunSecuritySetting": true
    }
  ]
}
```

The following is an example of the output when information is obtained about ports by specifying the port attribute:

```
{
  "data": [
    {
      "portId": "CLB-C",
      "portType": "ISCSI",
      "portAttributes": [
        "ELUN"
      ],
      "portSpeed": "10G",
      "loopId": "00",
      "fabricMode": false,
      "lunSecuritySetting": false
    }
  ]
}
```

Attribute	Type	Description
portId	string	Port number
portType	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`, `NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) For a bidirectional port, all four attributes are output. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.

Attribute	Type	Description
loopId	string	The value set for the port loop ID (AL_PA) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portConnection	string	Topology setting for the port ▪ `FCAL` ▪ `PtoP` If the `portType` attribute is `ISCSI`, `NVME_TCP`, `HNASS`, or `HNASU`, this information is not output.
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
wwn	string	External WWN If the `portType` attribute is `ISCSI`, `NVME_TCP`, `HNASS` or `HNASU`, this information is not output.

The following is an example of the output when requesting additional detailed information:


```
{
  "data" : [
    {
      "portId" : "CL1-A",
      "portType" : "FIBRE",
      "portAttributes" : [ "TAR" ],
      "portSpeed" : "AUT",
      "loopId" : "EF",
      "fabricMode" : true,
      "portConnection" : "PtoP",
      "lunSecuritySetting" : true,
      "wwn" : "50060e8007274300",
```

```
      "logins" : [
        {
          "loginWwn" : "C0507603BFAA002C",
          "wwnNickName" : "-",
          "isLoggedIn" : false
        },
        {
          "loginWwn" : "C05076087D5A0012",
          "wwnNickName" : "ep22_10_0",
          "hostGroupId" : "CL1-A,9",
          "isLoggedIn" : true
        }
      ]
    },
    {
      "portId" : "CL1-B",
      "portType" : "ISCSI",
      "portAttributes" : [ "TAR" ],
      "portSpeed" : "10G",
      "loopId" : "00",
      "fabricMode" : false,
      "lunSecuritySetting" : true,
      "logins" : [
        {
          "loginIscsiName" : "iqn.1991-05.com.microsoft:hy0295",
          "iscsiNickName" : "hypoi0295",
          "hostGroupId" : "CL1-B,0",
          "iscsiTargetName" : "iqn.1994-
04.jp.co.hitachi:rsd.h8h.t.10011.1d000",
          "isLoggedIn" : false
        },
        {
          "loginIscsiName" : "iqn.1991-05.com.microsoft:hy0295",
          "iscsiNickName" : "hypoi0295",
          "hostGroupId" : "CL1-B,94",
          "iscsiTargetName" : "iqn.1994-
04.jp.co.hitachi:rsd.h8h.t.10011.1d05e",
          "isLoggedIn" : true
        }
      ]
    }
  ]
}
```


You can also get the following information by executing the request with `logins` specified for `detailInfoType` in the query parameters.

Attribute	Type	Description
logins	object[]	Information about logins to a storage system port corresponding to the WWN of an HBA or iSCSI name For the WWN: ▪ loginWwn (string) WWN of the HBA ▪ wwnNickName (string)# WWN nickname ▪ hostGroupId (string)# Object ID of the host group ▪ isLoggedIn (boolean) Login status of the host • `true`: Logged in • `false`: Not logged in For iSCSI name: ▪ loginIscsiName (string) iSCSI name of iSCSI initiator ▪ iscsiNickName (string)# iSCSI nickname ▪ hostGroupId (string)# Object ID of iSCSI target ▪ iscsiTargetName (string) iSCSI name of iSCSI target ▪ isLoggedIn (boolean) Login status of the host • `true`: Logged in • `false`: Not logged in

#: It might take some time (from about 30 seconds to a few minutes) after the values for these attributes are updated before you can obtain the updated information by using the REST API. Wait a while and then execute the request again. (This does not apply if you are using a VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 storage system in a configuration that is not linked to an SVP, and VSP One B20.)

You can also get the following information by executing the request with `portMode` specified for `detailInfoType` in the query parameters.

Attribute	Type	Description
portMode	string	Operating mode of the port ▪ `FC-NVMe`: NVMe over FC mode ▪ `FCP-SCSI`: SCSI mode ▪ `iSCSI`: iSCSI mode ▪ `NVMe over TCP`: NVMe/TCP mode ▪ `NOT SUPPORTED`: Output when the port does not support NVMe over FC, or when the port does not support NVMe/TCP.

You can also get the following information by executing the request with `loginHostNqn` specified for `detailInfoType` in the query parameters.

Attribute	Type	Description
hostNqnLogins	object[]	Information related to host NQN logins ▪ hostNqn (string) Host NQN ▪ isLoggedIn (boolean) Host NQN login information • `true`: Logged in • `false`: Not logged in

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To obtain information about all ports:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ports
```

To obtain information about ports by specifying the port type:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ports?
portType=ISCSI
```

To obtain information about ports by specifying the port attribute:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ports?
portAttributes=ELUN
```

To obtain information about ports by requesting additional detailed information:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session bc9179ae-8223-4da1-8140-e9ef3d65878f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/ports?
detailInfoType=logins
```

Getting information about a specific port

The following request gets information about a specific port by specifying the port number.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/ports/object-ID
```

Request message

Object ID

Specify the `portId` value obtained by getting information about the port.

Attribute	Type	Description
portId	string	(Required) Port number

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. You can specify this item for VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900 model storage systems if the storage system is in a configuration that is linked to an SVP. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". ▪ `portMode`: Operating mode of the port

Body

None.

Response message

Body

The following is an example of the output generated when getting Fibre Channel port information:

```
{
  "portId": "CL1-A",
  "portType": "FIBRE",
  "portAttributes": [
    "TAR"
  ],
  "portSpeed": "8G",
  "loopId": "EF",
```

```
  "fabricMode": true,
  "portConnection": "FCAL",
  "lunSecuritySetting": true,
  "wwn": "50060e8007274300",
  "logins": [
    {
      "loginWwn": "23880000871ad920",
      "wwnNickName": "-"
    },
    {
      "loginWwn": "23880000871ac910",
      "wwnNickName": "-"
    }
  ]
}
```


For a Fibre Channel port:

Attribute	Type	Description
portId	string	Port number
portType	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`, `NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) For a bidirectional port, all four attributes are output. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
loopId	string	The value set for the port loop ID (AL_PA)

Attribute	Type	Description
		If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portConnection	string	Topology setting for the port ▪ `FCAL` ▪ `PtoP` If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
wwn	string	External WWN If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
logins	object[]	If there is a currently-connected WWN, the following attributes are output: ▪ loginWwn (string) WWN of the host adapter that is logged in to the port If the `portType` attribute is `HNASS` or `HNASU`, this information is not output. ▪ wwnNickName (string) Reserved attribute The version of this API is always displayed as a hyphen (`-`). If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.

Attribute	Type	Description
		To get information about the WWN of the HBA that was previously logged in, use the API request for getting port information.

The following is an example of the output generated when getting FCoE port information without the currently connected WWN:


```
{
  "portId": "CL1-A",
  "portType": "FCoE",
  "portAttributes": [
    "TAR"
  ],
  "portSpeed": "10G",
  "loopId": "98",
  "fabricMode": true,
  "portConnection": "PtoP",
  "lunSecuritySetting": true,
  "wwn": "50060e8007274306",
  "staticMacAddress": "e3:00:00:e0:8b:02",
  "vLanId": "0x03fe",
  "dynamicMacAddress": "e2:00:00:e0:8b:02",
  "virtualPortStatus": "DWN",
  "virtualPortId": "0x00",
  "fcoeSwitchControlId": "0x0000"
}
```


For an FCoE port:

Attribute	Type	Description
portId	string	Port number
portType	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`, `NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, or `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port)

Attribute	Type	Description
		▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) For a bidirectional port, all four attributes are output. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
loopId	string	The value set for the port loop ID (AL_PA) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portConnection	string	Topology setting for the port ▪ `FCAL` ▪ `PtoP` If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
wwn	string	External WWN If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.

Attribute	Type	Description
logins	object[]	If there is a currently-connected WWN, the following attributes are output: ▪ loginWwn (string) WWN of the host adapter that is logged in to the port If the `portType` attribute is `HNASS` or `HNASU`, this information is not output. ▪ wwnNickName (string) Reserved attribute The version of this API is always displayed as a hyphen (`-`). If the `portType` attribute is `HNASS` or `HNASU`, this information is not output. To get information about the WWN of the HBA that was previously logged in, use the API request for getting port information.
staticMacAddress	string	Static MAC address of the port.
vLanId	string	VLAN value (in hexadecimal number format)
dynamicMacAddress	string	Dynamic MAC address of the port.
virtualPortStatus	string	Status of the virtual port ▪ `DWN`: Link down ▪ `LOT`: Link up (logoff) ▪ `LIN`: Link up (logon)
virtualPortId	string	Number of the virtual port If not supported, 0x00 is output.
fcoeSwitchControlId	string	Management number of the FCoE switch If not supported, 0x0000 is output.

The following is an example of the output generated when getting iSCSI port information.

```
{
  "portId": "CL1-D",
  "portType": "ISCSI",
```

```
  "portAttributes": [
    "TAR"
  ],
  "portSpeed": "10G",
  "loopId": "00",
  "fabricMode": false,
  "lunSecuritySetting": true,
  "logins": [
    {
      "loginIscsiName": "iqn.1996-04.de.suse:01:a0cada20917f"
    }
  ],
  "tcpOption": {
    "ipv6Mode": false,
    "selectiveAckMode": true,
    "delayedAckMode": true,
    "isnsService": false,
    "tagVLan": false
  },
  "tcpMtu": 1500,
  "iscsiWindowSize": "64KB",
  "keepAliveTimer": 60,
  "tcpPort": "3260",
  "ipv4Address": "192.168.116.19",
  "ipv4Subnetmask": "255.255.0.0",
  "ipv4GatewayAddress": "0.0.0.0",
  "ipv6LinkLocalAddress": {
    "status": "INV",
    "addressingMode": "AM",
    "address": "fe80::"
  },
  "ipv6GlobalAddress": {
    "status": "INV",
    "addressingMode": "AM",
    "address": "::"
  },
  "ipv6GatewayGlobalAddress": {
    "status": "INV",
    "address": "::",
    "currentAddress": "::"
  }
}
```


For an iSCSI port:

Attribute	Type	Description
portId	string	Port number

Attribute	Type	Description
portType	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`, `NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) For a bidirectional port, all four attributes are output. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
loopId	string	The value set for the port loop ID (AL_PA) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.

Attribute	Type	Description
logins	object[]	If there is a currently-connected iSCSI name, the following attributes are output: ▪ loginIscsiName (string) iSCSI name of the host adapter that is logged in to the port To get information about iSCSI name that was previously logged in, use the API request for getting port information.
vLanId	string	VLAN ID (in decimal number format)
tcpOption	object	The following attributes are output: ▪ ipv6Mode (boolean) IPv6 mode ▪ selectiveAckMode (boolean) Selective Ack mode ▪ delayedAckMode (boolean) Delayed Ack mode ▪ isnsService (boolean) iSNS service ▪ tagVLan (boolean) Tag VLAN
tcpMtu	int	Value of MTU for iSCSI communication
iscsiWindowSize	string	Value of Window Size for iSCSI communication
keepAliveTimer	int	Value of Keep Alive Timer for iSCSI communication
tcpPort	string	TCP port number for iSCSI communication
macAddress	string	MAC address of the port
ipv4Address	string	IPv4 address
ipv4Subnetmask	string	IPv4 subnet mask
ipv4GatewayAddress	string	IPv4 address of the gateway to be used for iSCSI communication

Attribute	Type	Description
ipv6LinkLocalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 link local address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 link local address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 link local address value

Attribute	Type	Description
ipv6GlobalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 global address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 global address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 global address value

Attribute	Type	Description
ipv6GatewayGlobalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 global address of the gateway to be used for iSCSI communication is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ address (string) IPv6 global address value of the gateway to be used for iSCSI communication ▪ currentAddress (string) IPv6 global current address value of the gateway to be used for iSCSI communication
isnsPort	string	TCP port number of the iSNS server
isnsAddress	string	Address of the iSNS server

The following is an example of the output generated when getting NVMe/TCP port information.

```
{
  "portId" : "CL2-D",
  "portType" : "NVME_TCP",
  "portAttributes" : [ "TAR" ],
  "portSpeed" : "100G",
  "loopId" : "00",
  "fabricMode" : false,
  "lunSecuritySetting" : false,
  "tcpOption" : {
    "ipv6Mode" : false,
    "selectiveAckMode" : true,
    "delayedAckMode" : true,
    "isnsService" : false,
    "tagVLan" : false
```

```
  },
  "tcpMtu" : 1500,
  "windowSize" : "1024KB",
  "tcpPortIoController" : "4420",
  "tcpPortDiscoveryController" : "8009",
  "macAddress" : "f8:48:97:47:ec:d6",
  "ipv4Address" : "192.168.0.102",
  "ipv4Subnetmask" : "255.255.255.0",
  "ipv4GatewayAddress" : "0.0.0.0",
  "ipv6LinkLocalAddress" : {
    "status" : "INV",
    "addressingMode" : "AM",
    "address" : "fe80::"
  },
  "ipv6GlobalAddress" : {
    "status" : "INV",
    "addressingMode" : "AM",
    "address" : "::"
  },
  "ipv6GatewayGlobalAddress" : {
    "status" : "INV",
    "address" : "::",
    "currentAddress" : "::"
  }
}
```


For an NVMe/TCP port:

Attribute	Type	Description
portId	string	Port number
portType	string	Port type One of the following values is output: `FIBRE`, `SCSI`, `ISCSI`, `NVME_TCP`, `ENAS`, `ESCON`, `FICON`, `FCoE`, `HNASS`, `HNASU`
portAttributes	string[]	The value set for the port attribute ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) For a bidirectional port, all four attributes are output.

Attribute	Type	Description
		If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
portSpeed	string	The value set for the transfer speed ▪ `AUT` (AUTO) ▪ *n*`G` (where *n* is a number) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
loopId	string	The value set for the port loop ID (AL_PA) If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
fabricMode	boolean	Fabric mode of the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
lunSecuritySetting	boolean	LUN security setting for the port ▪ `true`: Set. ▪ `false`: Not set. If the `portType` attribute is `HNASS` or `HNASU`, this information is not output.
vLanId	string	VLAN ID (in decimal number format)
tcpOption	object	The following attributes are output: ▪ ipv6Mode (boolean) IPv6 mode ▪ selectiveAckMode (boolean) Selective Ack mode ▪ delayedAckMode (boolean) Delayed Ack mode ▪ isnsService (boolean) iSNS service ▪ tagVLan (boolean) Tag VLAN

Attribute	Type	Description
tcpMtu	int	Value of MTU
windowSize	string	Value of Window Size
tcpPortIoController	string	TCP port number for the I/O controller
tcpPortDiscoveryController	string	TCP port number for the discovery controller
macAddress	string	MAC address of the port
ipv4Address	string	IPv4 address
ipv4Subnetmask	string	IPv4 subnet mask
ipv4GatewayAddress	string	IPv4 address of the gateway
ipv6LinkLocalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 link local address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 link local address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 link local address value

Attribute	Type	Description
ipv6GlobalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 global address is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ addressingMode (string) One of the following values that indicate the mode of the IPv6 global address is output: • `AM`: Auto mode • `MM`: Manual mode • `Unknown`: Undefined value ▪ address (string) IPv6 global address value

Attribute	Type	Description
ipv6GatewayGlobalAddress	object	The following attributes are output: ▪ status (string) One of the following values that indicate the status of the IPv6 global address of the gateway is output: • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value ▪ address (string) IPv6 global address value of the gateway ▪ currentAddress (string) IPv6 global current address value of the gateway

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
channelBoardId	int	ID of the channel board Replace "channel board" with "channel adapter" or "channel blade" depending on the storage system.
ipv6GlobalAddress2	object	Attributes related to IPv6 Global address2

Attribute	Type	Description
		This information is output for iSCSI ports. ▪ address (string) Address value for IPv6 Global address2 ▪ status (string) Status of IPv6 Global address2 • `INV`: Invalid • `VAL`: Valid • `ACQ`: Acquiring • `DUP`: Duplicated • `Unknown`: Undefined value This information is not output if `iscsiVirtualPortMode` is `true`.
ipv6SubnetPrefixLength	int	Length of the IPv6 subnet prefix This information is output for iSCSI ports. If the setting for IPv6 is invalid, `-1` is output. This information is not output if `iscsiVirtualPortMode` is `true`.
iscsiInitiatorName	string	iSCSI name of the storage system port This information is output for iSCSI ports.
t10piMode	string	Status of the T10 PI mode of the port ▪ `Enable`: Enabled ▪ `Disable`: Disabled ▪ `Unknown`: Status unknown (unsupported)
iscsiVirtualPortMode	boolean	Whether iSCSI virtual port mode is enabled This information is output for iSCSI ports. ▪ `true`: Enabled ▪ `false`: Disabled

You can also get the following information by executing the request with `portMode` specified for `detailInfoType` in the query parameters.

Attribute	Type	Description
portMode	string	Operating mode of the port ▪ `FC-NVMe`: NVMe over FC mode ▪ `FCP-SCSI`: SCSI mode ▪ `iSCSI`: iSCSI mode ▪ `NVMe over TCP`: NVMe/TCP mode ▪ `NOT SUPPORTED`: Output when the port does not support NVMe over FC, or when the port does not support NVMe/TCP.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ports/CL1-A
```

Changing the port settings

The request below changes the port setting.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ports/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attribute	Type	Description
portId	string	(Required) Port number

Query parameters

None.

Body

The following coding example shows how to change the port attribute:

```
{
  "portAttribute": "TAR"
}
```

Attribute	Type	Description
portAttribute	string	(Optional) Port attribute If you specify this attribute, you must have the Storage Administrator (System Resource Management) execution permission. You can specify the following values: ▪ `TAR`: Target port (Fibre Target port) ▪ `MCU`: Initiator port (MCU Initiator port) ▪ `RCU`: RCU target port (RCU Target port) ▪ `ELUN`: External port (External Initiator port) ▪ `ALL`: Bidirectional port This value can be specified only if the storage system belongs to the VSP 5000 series. If the port is operating in NVMe over FC mode and the storage system is a VSP 5000 series storage system, you must specify `TAR`. This item is not case sensitive. This attribute cannot be specified at the same time as any other attribute.
portMode	string	(Optional) Specify the operating mode of the port.

Attribute	Type	Description
		The specifiable values are as follows: ▪ `FC-NVMe`: NVMe over FC mode ▪ `FCP-SCSI`: SCSI mode You can use this attribute for VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H. This item is not case sensitive. This attribute cannot be specified at the same time as any other attribute.
portSpeed	string	(Optional) Specify the transfer speed of the port. The specifiable values are as follows: ▪ `AUT` ▪ *n*`G` (where *n* is a number) `G` can be omitted. For the specifiable the transfer speed, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* . This item is not case sensitive. This attribute cannot be specified at the same time as the `portAttribute` attribute or `portMode` attribute. If the target port meets the following conditions, even if you specify a valid value, you will not be able to change the transfer speed. ▪ The storage system is a VSP 5000 series storage system, and the port type is `ISCSI`. ▪ The storage system is a VSP One B20, VSP E series, VSP Gx00 models, or VSP Fx00 models storage system, and the channel board or channel adapter type of the port is `10G 2Port iSCSI (Optic)`.
fabricMode	boolean	(Optional) Fabric mode of the port ▪ `true`: Set ▪ `false`: Not set

Attribute	Type	Description
		When specifying this attribute, be sure to also specify the `portConnection` attribute. This attribute cannot be specified at the same time as the `portAttribute` attribute or `portMode` attribute.
portConnection	string	(Optional) Topology setting for the port The specifiable values are as follows: ▪ `FCAL` ▪ `PtoP` This item is case sensitive. When specifying this attribute, be sure to also specify the `fabricMode` attribute. This attribute cannot be specified at the same time as the `portAttribute` attribute or `portMode` attribute.
lunSecuritySetting	boolean	(Optional) Specify whether to enable the lun security setting for the port. ▪ `true`: Enable the lun security setting. ▪ `false`: Disable the lun security setting. This attribute cannot be specified at the same time as the `portAttribute` attribute or `portMode` attribute.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the changed port

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ports/CL1-A
```

Getting information about host groups or iSCSI targets

The following request gets information about host groups or iSCSI targets of the port.

Important:

If the storage system model is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, and if `portId` is not specified as a query parameter, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-groups
```

Request message

Object ID

None.

Query parameters

You can specify conditions to filter the execution results and get information about host groups at high speeds.

- To filter the execution results

Parameter	Type	Filter Condition
portId	string	(Optional) Port number

Parameter	Type	Filter Condition
		Only when this parameter is specified, the following attributes are also obtained: ▪ `iscsiName` ▪ `authenticationMode` ▪ `iscsiTargetDirection` ▪ `hostModeOptions` If this parameter is omitted, information about all ports is obtained.
isUndefined	boolean	(Optional) Specify whether to get information even about host group numbers for which no host group or iSCSI target has been created. ▪ `true`: Gets information about host group numbers for which no host group or iSCSI target has been created. ▪ `false`: Does not get information about host group numbers for which no host group or iSCSI target has been created. You cannot specify this parameter at the same time as the `hostGroupNumberList` parameter. If this parameter is omitted, `false` is assumed to be specified.

- When collecting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `resourceGroup` Gets information about resource groups of host groups or iSCSI targets. If you specify this parameter, also specify the `portId` parameter. The following parameter settings cannot be specified together with the `detailInfoType` parameter: `storageCache` specified for the `accessMode` parameter, or `true` specified for the `isSimpleMode` parameter.

- To get information about host groups at high speeds

Parameter	Type	Description
accessMode	string	(Optional) To get information about host groups at high speeds, specify the following value: ▪ `storageCache` You can specify this value if the storage system model is VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500. If you specify this parameter, information about host groups is obtained from the cache. For this reason, you can get information more quickly by specifying this parameter than without specifying this parameter. After you use the REST API or CCI to create a host group, it usually takes anywhere from a few minutes to an hour before the latest information is applied to the cache. If you specify `portId`, you cannot specify this parameter.

Parameter	Type	Description
		If you specify this parameter for VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, the parameter is ignored.

- To obtain only the attributes that fall under basic information

  You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

  You can obtain information more quickly than if you were to obtain all attributes.

Parameter	Type	Description
isSimpleMode	boolean	(Optional) Specify whether to obtain only the attributes that fall under basic information. ▪ `true`: Obtain only the attributes that fall under basic information. ▪ `false`: Obtain all attributes. If you specify the value `true` for this parameter, be sure to also specify the `portId` parameter. If this parameter is omitted, the value `false` is assumed.
hostGroupNumberList	string	(Optional) Target IDs of iSCSI targets Specify this parameter to get basic information about the specified iSCSI targets. If you specify this parameter, be sure to specify `true` for the `isSimpleMode` parameter. You cannot specify this parameter at the same time as the `isUndefined` parameter. To specify multiple IDs, delimit each ID by using a comma.

Body

None.

Response message

Body

The following coding example obtains only the attributes that fall under basic information:

```
{
  "data": [
    {
      "hostGroupId": "CL1-A,0",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "hostA"
    },
    {
      "hostGroupId": "CL1-B,0",
      "portId": "CL1-B",
      "hostGroupNumber": 0,
      "hostGroupName": "hostB"
    }
  ]
}
```

The following table describes the attributes that are obtained by a request that gets only attributes that fall under basic information:

Attribute	Type	Description
hostGroupId	string	Object ID for the host group or iSCSI target
portId	string	Port number
hostGroupNumber	int	Host group number of the port (for the iSCSI target, target ID)
hostGroupName	string	Host group name (for the iSCSI target, target ID) If you do not specify the `hostGroupNumberList` parameter, only the first 16 characters are obtained.
iscsiName	string	iSCSI name of the iSCSI target of the port This attribute is obtained only if you specify the `hostGroupNumberList` parameter.
authenticationMode	string	Authentication mode for the iSCSI target

Attribute	Type	Description
		This attribute is obtained only if you specify the `hostGroupNumberList` parameter. ▪ `CHAP`: CHAP-authentication mode ▪ `NONE`: No-authentication mode ▪ `BOTH`: Both CHAP-authentication mode and no-authentication mode
iscsiTargetDirection	string	Direction of CHAP authentication for the iSCSI target This attribute is obtained only if you specify the `hostGroupNumberList` parameter. ▪ `S`: One-way (The iSCSI target authenticates the iSCSI initiator.) ▪ `D`: Mutual (The iSCSI target and the iSCSI initiator authenticate each other.)

The following coding example obtains all attributes:

The following is an example of the output generated from the processing to get information about host groups or iSCSI targets of all ports:

```
{
  "data": [
    {
      "hostGroupId": "CL1-A,0",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "hostA",
      "hostMode": "WIN",
      "hostModeOptions": [
        1,
        2
      ]
    },
    {
      "hostGroupId": "CL1-B,0",
      "portId": "CL1-B",
      "hostGroupNumber": 0,
      "hostGroupName": "hostB",
      "hostMode": "LINUX/IRIX"
    }
  ]
}
```

The following is an output example when information about the host group or the iSCSI target created for the specified port number is obtained:


```
{
  "data": [
    {
      "hostGroupId": "CL1-A,0",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "hostA",
      "hostMode": "WIN",
      "hostModeOptions": [
        1,
        2
      ]
    },
    {
      "hostGroupId": "CL1-A,1",
      "portId": "CL1-A",
      "hostGroupNumber": 1,
      "hostGroupName": "hostB",
      "hostMode": "LINUX/IRIX"
    }
  ]
}
```


The following is an example of the output generated when information about resource groups is obtained:

In this example, information is also obtained about host group numbers for which no host group or iSCSI target has been created.


```
{
  "data": [
    {
      "hostGroupId": "CL1-A,0",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "hostA",
      "hostMode": "WIN",
      "hostModeOptions": [
        1,
        2
      ],
      "resourceGroupId": 1,
      "isDefined": true
    },
    {
      "hostGroupId": "CL1-A,1",
```

```
      "portId": "CL1-A",
      "hostGroupNumber": 1,
      "hostGroupName": "-",
      "resourceGroupId": 2,
      "isDefined": false
    }
  ]
}
```


The following table describes the attributes that are obtained by a request that gets all attributes:

Attribute	Type	Description
hostGroupId	string	Object ID for the host group or iSCSI target
portId	string	Port number
hostGroupNumber	int	Host group number of the port (for the iSCSI target, target ID)
hostGroupName	string	Host group name (for the iSCSI target, target ID)
iscsiName	string	iSCSI name of the iSCSI target of the port This information is obtained only when the `portId` parameter is specified.
authenticationMode	string	Authentication mode for the iSCSI target This information is obtained only when the `portId` parameter is specified. ▪ `CHAP`: CHAP-authentication mode ▪ `NONE`: No-authentication mode ▪ `BOTH`: Both CHAP-authentication mode and no-authentication mode
iscsiTargetDirection	string	Direction of CHAP authentication for the iSCSI target This information is obtained only when the `portId` parameter is specified. ▪ `S`: One-way (The iSCSI target authenticates the iSCSI initiator.) ▪ `D`: Mutual (The iSCSI target and the iSCSI initiator authenticate each other.)

Attribute	Type	Description
hostMode	string	Host mode for setting the host adapter of the host group This attribute is obtained if the host group name is defined. For details on the values to be obtained, see the description of the API function for changing the host group or iSCSI target settings.
hostModeOptions	int[]	Number of the host mode option set for the host group This is not output if a host mode option is not set. This information is obtained only when the `portId` parameter is specified. For details on the number to be obtained, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide* .
resourceGroupId	int	ID of the resource group to which the host group or iSCSI target belongs This information is obtained only when `detailInfoType=resourceGroup` is specified for the query.
isDefined	boolean	Whether the host group or iSCSI target has been created This information is obtained only when `detailInfoType=resourceGroup` is specified for the query. ▪ `true`: The host group or iSCSI target has been created. ▪ `false`: The host group or iSCSI target has not been created.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

When getting information about host groups or iSCSI targets of all ports:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-groups
```

When information about the host group or the iSCSI target created for the specified port number is obtained:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-groups?
portId=CL1-A
```

When obtaining information about resource groups:

In this example, information is also obtained about host group numbers for which no host group or iSCSI target has been created.

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/host-groups?
portId=CL1-A&isUndefined=true&detailInfoType=resourceGroup
```

Getting information about a specific host group or iSCSI target

The following request gets information by specifying the host group number of the port or the target ID of the iSCSI target.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-groups/object-ID
```

Request message

Object ID

Specify the `hostGroupId` value obtained by getting information about the host groups or iSCSI targets. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number of the port (for the iSCSI target, target ID)

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output generated when getting information by specifying the port number and the host group number:

```
{
  "hostGroupId": "CL1-A,0",
  "portId": "CL1-A",
  "hostGroupNumber": 0,
  "hostGroupName": "hostA",
  "hostMode": "WIN",
  "hostModeOptions": [
    1,
    2
  ]
}
```

For an iSCSI target, the following is an example of the output generated when getting information by specifying the port number and the target ID:

```
{
  "hostGroupId": "CL1-A,0",
  "portId": "CL1-A",
  "hostGroupNumber": 0,
  "hostGroupName": "hostA",
  "iscsiName": "iqn.rest.example.of.iqn.host",
  "authenticationMode": "CHAP",
  "iscsiTargetDirection": "S",
  "hostMode": "WIN",
  "hostModeOptions": [
    1,
```

```
    2
  ]
}
```

Attribute	Type	Description
hostGroupId	string	Object ID for the host group or iSCSI target
portId	string	Port number
hostGroupNumber	int	Host group number of the port (for the iSCSI target, target ID)
hostGroupName	string	Host group name (for the iSCSI target, target ID)
iscsiName	string	iSCSI name of the iSCSI target of the port This information is obtained in the case of an iSCSI port.
authenticationMode	string	Authentication mode for the iSCSI target This information is obtained in the case of an iSCSI port. ▪ `CHAP`: CHAP-authentication mode ▪ `NONE`: No-authentication mode ▪ `BOTH`: Both CHAP-authentication mode and no-authentication mode
iscsiTargetDirection	string	Direction of CHAP authentication for the iSCSI target This information is obtained in the case of an iSCSI port. ▪ `S`: One-way (The iSCSI target authenticates the iSCSI initiator.) ▪ `D`: Mutual (The iSCSI target and the iSCSI initiator authenticate each other.)
hostMode	string	Host mode for setting the host adapter of the host group For details on the values to be obtained, see the description of the API function for changing the host group or iSCSI target settings.
hostModeOptions	int[]	Number of the host mode option set for the host group This is not output if a host mode option is not set.

Attribute	Type	Description
		For details on the number to be obtained, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* .

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/host-groups/
CL1-A,0
```

Getting a list of host modes and host mode options

The following request acquires a list of host modes and host mode options used for the storage system.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/supported-host-modes/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "hostModes": [
    {
      "hostModeId": 0,
      "hostModeName": "Standard",
      "hostModeDisplay": "LINUX/IRIX"
    },
    {
      "hostModeId": 1,
      "hostModeName": "(Deprecated) VMware",
      "hostModeDisplay": "VMWARE"
    }
  ],
  "hostModeOptions": [
    {
      "hostModeOptionId": 2,
      "hostModeOptionDescription": "VERITAS Database Edition/Advanced Cluster"
    },
    {
      "hostModeOptionId": 6,
      "hostModeOptionDescription": "TPRLO"
    }
  ]
}
```


Attribute	Type	Description
hostModes	object[]	The following attributes related to the host mode are output: ▪ hostModeId (int) Host mode number ▪ hostModeName (string) Identification name of the host mode ▪ hostModeDisplay (string) Host mode value Value to be used to specify the host mode

Attribute	Type	Description
hostModeOptions	object[]	The following attributes related to the host mode option are output: ▪ hostModeOptionId (int) Host mode option number ▪ hostModeOptionDescription (string) Description of the host mode option

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/supported-
host-modes/instance
```

Creating a host group or an iSCSI target

The following request creates a host group for the port. For an iSCSI port, this request creates the iSCSI target and the iSCSI name. The host mode and the host mode option can also be specified at the same time when the host group and the iSCSI target are created.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/host-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example creates a host group:

```
{
  "portId": "CL1-A",
  "hostGroupName": "My_REST_API_HOST",
  "hostModeOptions": [12,33],
  "hostMode": "AIX"
}
```

The following coding example creates an iSCSI target:

```
{
  "portId": "CL1-A",
  "hostGroupName": "My_REST_API_HOST",
  "iscsiName": "iqn.20150908iscsi"
}
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Optional) Host group number Specify a decimal (base 10) number in the range from `0` to `254`. If this attribute is omitted, a value is automatically set. For iSCSI ports, this number is called target ID.
hostGroupName	string	(Required) Host group name or iSCSI target name ▪ To create a host group Specify a host group name consisting of 1 to 64 characters. ▪ To create an iSCSI target Specify the iSCSI target name consisting of 1 to 32 characters. For the iSCSI target, you cannot specify the default name of the iSCSI target whose ID is 0. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: . @ _ : - The label cannot start with a hyphen (-).

Attribute	Type	Description
		You cannot create host groups or iSCSI targets that have the same name for a single port.
iscsiName	string	(Optional) iSCSI name Specify this item when creating an iSCSI target. If this attribute is omitted, a value is automatically set. Specify this item in the iqn or eui format. ▪ iqn format Specify a value in the range from 5 to 223. You can use the following characters: alphanumeric characters (lowercase), periods (`.`), hyphens (`-`), and colons (`:`) Specification example: `iqn.rest.example.of.iqn.form` ▪ eui format After "eui.", specify a hexadecimal number. Specify a value consisting of 20 characters. Specification example: `eui.0900ABDC32598D26`
hostMode	string	(Optional) Host mode The specifiable values are as follows: For the supported host modes, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*. `HP-UX`, `SOLARIS`, `AIX`, `WIN`, `LINUX/IRIX`, `TRU64`, `OVMS`, `NETWARE`, `VMWARE`, `VMWARE_EX`, `WIN_EX` If this attribute is omitted, `LINUX/IRIX` is set.
hostModeOptions	int[]	(Optional) Number of options for setting host mode options For the specifiable numbers, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* . When specifying more than one attribute, use a comma to separate the values. When specifying this attribute, make sure to also specify the `hostMode` attribute.

Attribute	Type	Description
isQuickCreating	boolean	(Optional) When creating a host group by specifying `hostGroupNumber`, if you want to omit the process of checking whether the host group is created, specify `true`. If you specify `true` and a host group or iSCSI target already exists for the specified `hostGroupNumber`, the setting is overwritten. ▪ `true`: Does not check whether the host group has been created. ▪ `false`: Checks whether the host group has been created. If this attribute is omitted, `false` is assumed. If `hostGroupNumber` is not specified, this attribute is ignored.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created host group or iSCSI target

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
409	Conflict	A host group already exists for the specified host group number.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-groups
```

Changing the host group or iSCSI target settings

The following request sets the host mode or host mode option for a host group or an iSCSI target. For iSCSI targets, settings related to CHAP authentication can also be specified.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/host-groups/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `hostGroupId` value obtained by getting information about the host group or the iSCSI target. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)

Query parameters

None.

Body

When setting the host mode option of the host group:

```
{
  "hostMode": "WIN",
  "hostModeOptions": [12,33]
}
```

When resetting the host mode option of the host group:

```
{
  "hostMode": "HP-UX",
  "hostModeOptions": [-1]
}
```

When setting the CHAP authentication mode and CHAP authentication direction for the iSCSI target:

```
{
  "hostMode": "WIN",
  "authenticationMode": "CHAP",
  "iscsiTargetDirection": "D"
}
```

Attribute	Type	Description
hostMode	string	(Required) Host mode The specifiable types are as follows: For the supported host modes, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*. `HP-UX`, `SOLARIS`, `AIX`, `WIN`, `LINUX/IRIX`, `TRU64`, `OVMS`, `NETWARE`, `VMWARE`, `VMWARE_EX`, or `WIN_EX`
hostModeOptions	int[]	(Optional) Number of options for setting host mode options The values are updated (overwritten) by the specified values. When specifying values, specify all the numbers for the host mode options that you want to set. For details on the specifiable numbers, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* . To specify multiple option values, separate the values by commas. If you set `-1`, the set host mode option will be reset.
authenticationMode	string	(Optional) CHAP authentication mode for the iSCSI target

Attribute	Type	Description
		The specifiable types are as follows: ▪ `CHAP`: CHAP-authentication mode ▪ `NONE`: No-authentication mode ▪ `BOTH`: Both CHAP-authentication mode and no-authentication mode
iscsiTargetDirection	string	(Optional) Direction of CHAP authentication for the iSCSI target The specifiable types are as follows: `S`: Unidirectional authentication mode (The iSCSI target authenticates the iSCSI initiator.) `D`: Bidirectional authentication mode (The iSCSI target and the iSCSI initiator authenticate each other.)

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the changed host group or iSCSI target

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-groups/CL1-A,0
```

Deleting a host group or the iSCSI target

The following request deletes the WWN and LUN settings of a host group or of a host registered in a host group. Alternatively, the request deletes the LUN setting and iSCSI name of an iSCSI target or of a host (iSCSI initiator) registered for the iSCSI target. If the host group number of the host group to be deleted (target ID for the iSCSI port) is 0, the settings for the host group or iSCSI target are returned to their default values.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/host-groups/object-ID
```

Request message

Object ID

Specify the `hostGroupId` value obtained by getting information about the host group or the iSCSI target. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted host group or iSCSI target

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-groups/
CL1-A,0
```

Getting WWN information

Specifying a port and host group, the following request gets the information about the WWN registered for the host group.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-wwns
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
portId	string	(Required) Port number
hostGroupNumber	int	(Optional) The host group number

Parameter	Type	Filter Condition
		You must specify one of the following parameters: this parameter, the `hostGroupName` parameter, or the `hostGroupNumberList` parameter.
hostGroupName	string	(Optional) The host group name You must specify one of the following parameters: this parameter, the `hostGroupNumber` parameter, or the `hostGroupNumberList` parameter.
hostGroupNumberList	string	(Optional) The host group number You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. You can obtain information quickly by specifying this parameter. To specify multiple IDs, delimit each ID by using a comma. You must specify one of the following parameters: this parameter, the `hostGroupNumber` parameter, or the `hostGroupName` parameter.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "hostWwnId": "CL1-A,0,000000102ceceec9",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
      "hostGroupName": "my@host999",
      "hostWwn": "000000102ceceec9",
      "wwnNickname": "Myhostwwnsecret"
    },
    {
      "hostWwnId": "CL1-A,0,1111111111111111",
      "portId": "CL1-A",
      "hostGroupNumber": 0,
```

```
      "hostGroupName": "my@host999",
      "hostWwn": "1111111111111111",
      "wwnNickname": "formyhost"
    }
  ]
}
```


Attribute	Type	Description
hostWwnId	string	Object ID for the WWN
portId	string	Port number
hostGroupNumber	int	Host group number of the port
hostGroupName	string	Host group name of the port
hostWwn	string	WWN of the host bus adapter registered for the host group
wwnNickname	string	WWN nickname

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-wwns?
portId=CL1-A&hostGroupNumber=0"
```

Getting information about a specific WWN

The following request gets information about the specified WWN.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-wwns/object-ID
```

Request message

Object ID

Specify the `hostWwnId` value obtained by getting information about the WWN. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,hostWwn
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) The host group number
hostWwn	string	(Required) The WWN of the host bus adapter Specify the attribute without using colons (:).

Query parameters

None.

Body

None.

Response message

Body

```
{
  "hostWwnId": "CL1-A,0,000000102ccecccc9",
  "portId": "CL1-A",
  "hostGroupNumber": 0,
  "hostGroupName": "my@host999",
  "hostWwn": "000000102ccecccc9",
  "wwnNickname": "Myhostwwnsecret"
}
```

Attribute	Type	Description
hostWwnId	string	Object ID for the WWN
portId	string	Port number
hostGroupNumber	int	Host group number of the port
hostGroupName	string	Host group name of the port
hostWwn	string	WWN of the host bus adapter registered for the host group
wwnNickname	string	WWN nickname

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-wwns/CL1-
A,0,000000102ceccc9
```

Registering a WWN for the host group

The following request registers the host bus adapter WWN for the host group of the specified port.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/host-wwns
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "hostWwn": "210003e08b0256f9",
  "portId": "CL1-A",
  "hostGroupNumber": 5
}
```

Attribute	Type	Description
hostWwn	string	(Required) The WWN of the host bus adapter Specify a hexadecimal number consisting of 16 characters. You can specify the number by using colons (:) as separators.
portId	string	(Required) Port number
hostGroupNumber	int	(Required) The host group number

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the registered WWN

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-wwns
```

Setting the nickname for a WWN

The following request sets the nickname for a WWN registered in the host group. You can also delete the nickname that is already set.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/host-wwns/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `hostWwnId` that was obtained by the processing to get information about the WWN. You can also specify the following attributes and connect them with commas:

`portId`,*`hostGroupNumber`*,*`hostWwn`*

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number of the port
hostWwn	string	(Required) WWN of the host bus adapter registered in the host group

Query parameters

None.

Body

When setting the nickname for the WWN:

```
{
  "wwnNickname": "REST_API_Created"
}
```

When deleting the nickname from the WWN:

```
{
  "wwnNickname": ""
}
```

Attribute	Type	Description
wwnNickname	string	(Required) Specify a WWN nickname consisting of 1 to 64 characters. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: . @ _ : , - The label cannot start with a hyphen (-). You cannot specify the nickname that is used for other WWN of the same port. To delete the nickname from the WWN, specify a null character string.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the WWN whose settings were changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-wwns/CL1-A,0,1212121212121212
```

Deleting the WWN from a host group

The following request deletes the WWN information registered for the host group of the specified port.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/host-wwns/object-ID
```

Request message

Object ID

Specify the `hostWwnId` value obtained by getting information about the WWN. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,hostWwn
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) The host group number
hostWwn	string	(Required) The WWN of the host bus adapter Specify the attribute without using colons (:).

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted WWN

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-wwns/CL1-
A,5,210003e08b0256f9
```

Getting iSCSI names

Specifying a port and iSCSI target, the following request gets the iSCSI name information registered for the iSCSI target.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-iscsis
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
portId	string	(Required) Port number
hostGroupNumber	int	(Optional) Target ID of the iSCSI target You must specify one of the following parameters: this parameter, the `hostGroupName` parameter, or the `hostGroupNumberList` parameter.
hostGroupName	string	(Optional) Name of the iSCSI target You must specify one of the following parameters: this parameter, the `hostGroupNumber` parameter, or the `hostGroupNumberList` parameter.
hostGroupNumberList	string	(Optional) Target IDs of iSCSI targets You can specify this value if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. You can obtain information quickly by specifying this parameter. To specify multiple IDs, delimit each ID by using a comma. You must specify one of the following parameters: this parameter, the `hostGroupNumber` parameter, or the `hostGroupName` parameter.
displayHostGroupName	boolean	(Optional) If you specify the `hostGroupNumberList` parameter, specify whether to get the names of the iSCSI targets (the values of the `hostGroupName` attribute). You can specify this value if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. If you specify `false`, the processing will take shorter than if you were to specify `true`. ▪ `true`: Obtain the names of the iSCSI targets. ▪ `false`: Do not obtain the names of the iSCSI targets. If you specify this parameter but do not specify the `hostGroupNumberList` parameter, this parameter will be ignored. If this parameter is omitted, the value `true` is assumed.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "hostIscsiId": "CL1-D,1,iqn.1994-05.com.redhat%3A496799ba93",
      "portId": "CL1-D",
      "hostGroupNumber": 1,
      "hostGroupName": "1D-G00",
      "iscsiName": "iqn.1994-05.com.redhat:496799ba93",
      "iscsiNickname": "a_a"
    },
    {
      "hostIscsiId": "CL1-D,1,iqn.1994-05.com.redhat%3Aa7526e46aac.target",
      "portId": "CL1-D",
      "hostGroupNumber": 1,
      "hostGroupName": "1D-G00",
      "iscsiName": "iqn.1994-05.com.redhat:a7526e46aac.target",
      "iscsiNickname": "a_a"
    }
  ]
}
```


Attribute	Type	Description
hostIscsiId	string	Object ID for the iSCSI name
portId	string	Port number
hostGroupNumber	int	Target ID of the iSCSI target
hostGroupName	string	Name of the iSCSI target This attribute will not be obtained if the `hostGroupNumberList` parameter is specified as a query parameter and `false` is specified for the `displayHostGroupName` parameter.
iscsiName	string	iSCSI name of the host bus adapter (iSCSI initiator) registered for the iSCSI target

Attribute	Type	Description
iscsiNickname	string	iSCSI nickname

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-iscsis?
portId=CL1-D&hostGroupNumber=1"
```

Getting information about a specific iSCSI name

If you specify a port, iSCSI target, and iSCSI name, the following request gets information about that specific iSCSI name.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-iscsis/object-ID
```

Request message

Object ID

Specify the `hostIscsiId` value obtained by getting the iSCSI name. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,iscsiName
```

Attribute	Type	Description
portId	string	(Required) Port number

Attribute	Type	Description
hostGroupNumber	int	(Required) Target ID of the iSCSI target
iscsiName	string	(Required) iSCSI name of the host bus adapter (iSCSI initiator)

Query parameters

None.

Body

None.

Response message

Body

```
{
  "hostIscsiId": "CL1-D,1,iqn.1994-05.com.redhat%3A496799ba93",
  "portId": "CL1-D",
  "hostGroupNumber": 1,
  "hostGroupName": "1D-G00",
  "iscsiName": "iqn.1994-05.com.redhat:496799ba93",
  "iscsiNickname": "a_a"
}
```

Attribute	Type	Description
hostIscsiId	string	Object ID for the iSCSI name
portId	string	Port number
hostGroupNumber	int	Target ID of the iSCSI target
hostGroupName	string	Name of the iSCSI target
iscsiName	string	iSCSI name of the host bus adapter (iSCSI initiator) registered for the iSCSI target
iscsiNickname	string	iSCSI nickname

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/host-iscsis/
CL1-D,1,iqn.1994-05.com.redhat%3A496799ba93
```

Registering the iSCSI name for the iSCSI target

For the iSCSI target of the specified port, the following request registers the iSCSI name of the host on the initiator side.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/host-iscsis
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "portId": "CL1-D",
  "hostGroupNumber": 1,
  "iscsiName": "iqn.myrestapiiscsi20150907"
}
```

Attribute	Type	Description
iscsiName	string	(Required) iSCSI name of the host bus adapter (iSCSI initiator)

Attribute	Type	Description
		Specify this item in the iqn or eui format. ▪ iqn format Specify a value in the range from 5 to 223. You can use the following characters: Alphanumeric characters (lowercase), periods (`.`), hyphens (`-`), and colons (`:`) Specification example: `iqn.2014-04.jp.co.hitachi:xxx.h70.i.62510.1a.ff` ▪ eui format After "eui.", specify a hexadecimal number. Specify a value consisting of 20 characters. Specification example: `eui.ABCDEF1234567890`
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the registered iSCSI name

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-iscsis
```

Setting the nickname for an iSCSI name

The following request sets the nickname for an iSCSI name registered for the iSCSI target. You can also delete the nickname that is already set.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/host-iscsis/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `hostIscsiId` that was obtained by the processing to get information about the iSCSI name. You can also specify the attributes and connect them with commas as follows:

portId,*hostGroupNumber*,*iscsiName*

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target
iscsiName	string	(Required) iSCSI name of the host bus adapter (iSCSI initiator) registered for the iSCSI target

Query parameters

None.

Body

When setting the nickname for the iSCSI name

```
{
  "iscsiNickname": "REST_API_Testing"
}
```

When deleting the nickname from the iSCSI name:

```
{
  "iscsiNickname": ""
}
```

Attribute	Type	Description
iscsiNickname	string	(Required) Specify a nickname consisting of 1 to 32 characters for the iSCSI name of the host bus adapter. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: . @ _ - The label cannot start with a hyphen (-). To delete the nickname from the iSCSI name, specify a null character string.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the iSCSI name whose settings were changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/host-iscsis/CL1-B,0,iqn.20150907
```

Deleting the iSCSI name from the iSCSI target

The following request deletes the iSCSI name of the host bus adapter (iSCSI initiator) from the iSCSI target of the specified port.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/host-iscsis/object-ID
```

Request message

Object ID

Specify the `hostIscsiId` value obtained by getting the iSCSI name. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,iscsiName
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target
iscsiName	string	(Required) iSCSI name of the host bus adapter (iSCSI initiator)

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted iSCSI name

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/host-iscsis/
CL1-D,1,iqn.myrestapiiscsi20150907
```

Getting information about CHAP users

Using the specified port and iSCSI target, the following request gets the CHAP user information that is specified for the iSCSI target. Note that if the iSCSI target name or CHAP user name contains a single-byte space, the CHAP user name cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/chap-users
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target

Body

None.

Response message

Body


```
{
  "data": [
    {
      "chapUserId": "CL1-D,0,INI,TESTing",
      "portId": "CL1-D",
      "hostGroupNumber": 0,
      "hostGroupName": "1D-G00",
      "chapUserName": "TESTing",
      "wayOfChapUser": "INI"
    },
    {
      "chapUserId": "CL1-D,0,TAR,mychap",
      "portId": "CL1-D",
      "hostGroupNumber": 0,
      "hostGroupName": "1D-G00",
      "chapUserName": "mychap",
      "wayOfChapUser": "TAR"
    }
  ]
}
```


Attribute	Type	Description
chapUserId	string	Object ID for the CHAP user
portId	string	Port number
hostGroupNumber	int	Target ID of the iSCSI target
hostGroupName	string	Name of the iSCSI target
chapUserName	string	CHAP user name
wayOfChapUser	string	Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/chap-users?
portId=CL1-D&hostGroupNumber=0"
```

Getting information about a specific CHAP user

The following request gets information about the specified CHAP user. Note that if the iSCSI target name or CHAP user name contains a space, the CHAP user name cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/chap-users/object-ID
```

Request message

Object ID

Specify the `chapUserId` value obtained by getting information about the CHAP user. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,wayOfChapUser,chapUserName
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target
wayOfChapUser	string	(Required) Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side

Attribute	Type	Description
chapUserName	string	(Required) The CHAP user name

Query parameters

None.

Body

None.

Response message

Body

```
{
  "chapUserId": "CL1-D,0,INI,mychap",
  "portId": "CL1-D",
  "hostGroupNumber": 0,
  "hostGroupName": "1D-G00",
  "chapUserName": "mychap",
  "wayOfChapUser": "INI"
}
```

Attribute	Type	Description
chapUserId	string	Object ID for the CHAP user
portId	string	Port number
hostGroupNumber	int	Target ID of the iSCSI target
hostGroupName	string	Name of the iSCSI target
chapUserName	string	CHAP user name
wayOfChapUser	string	Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/chap-users/
CL1-D,0,INI,mychap
```

Setting the CHAP user name for the iSCSI target

The following request sets the CHAP user name for the iSCSI target. Two types of CHAP user names can be set: the CHAP user name of the iSCSI target side and the CHAP user name of the host (iSCSI initiator) that connects to the iSCSI target.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/chap-users
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example sets the CHAP user name for the iSCSI target side:

```
{
  "chapUserName": "MyRESTChapUser",
  "portId": "CL1-D",
  "hostGroupNumber": 1,
  "wayOfChapUser": "TAR"
}
```

Attribute	Type	Description
chapUserName	string	(Required) Specify a CHAP user name consisting of 1 to 223 characters.
portId	string	(Required) Port number

Attribute	Type	Description
hostGroupNumber	int	(Required) Target ID of the iSCSI target
wayOfChapUser	string	(Required) Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created CHAP user name

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/chap-users
```

Setting a secret for the CHAP user

The following request sets a secret for the specified CHAP user. If a secret is already set for the specified CHAP user, the current secret is overwritten.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/chap-users/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `chapUserId` value obtained by getting information about the CHAP user. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,wayOfChapUser,chapUserName
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target
wayOfChapUser	string	(Required) Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side
chapUserName	string	(Required) The CHAP user name

Query parameters

None.

Body

When setting the secret password for the CHAP user:

```
{
  "chapPassword": "TopSecretForMyChap"
}
```

When resetting the secret password of the CHAP user:

```
{
  "chapPassword": ""
}
```

Attribute	Type	Description
chapPassword	string	Specify a secret consisting of 12 to 32 characters for the specified CHAP user. If you specify a null character, the password is reset.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the CHAP user name for which the secret was set

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/chap-users/CL1-D,1,TAR,MyRESTChapUser
```

Deleting the CHAP user from the iSCSI target

The following request deletes the CHAP user name specified for the iSCSI target.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/chap-users/object-ID
```

Request message

Object ID

Specify the `chapUserId` value obtained by getting information about the CHAP user. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,wayOfChapUser,chapUserName
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Target ID of the iSCSI target
wayOfChapUser	string	(Required) Type of the CHAP user name ▪ `TAR`: The CHAP user name of the iSCSI target side ▪ `INI`: The CHAP user name of the host bus adapter (iSCSI initiator) side
chapUserName	string	(Required) The CHAP user name

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted CHAP user name

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/chap-users/
CL1-D,1,TAR,MyRESTChapUser
```

Getting information about LU paths

The following request gets information about LU paths defined for the iSCSI target or the host group for the port.

Note:

In a configuration that uses namespaces, use CCI 01-64-03/*XX* or a later version. If you use an earlier version, the request might return information about paths related to LDEVs for which namespaces are set (information that is not actually used).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/luns
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (for an iSCSI target, this is the target ID) You must specify either this parameter or the `hostGroupNumberList` parameter.

Parameter	Type	Filter Condition
isBasicLunInformation	boolean	(Optional) Specify whether to get only basic information. ▪ `true`: Gets only basic information. (Does not get the host reservation status.) ▪ `false`: Gets all the items. If this parameter is omitted, `false` is assumed.
lunOption	string	(Optional) Specify the type of information you want to get. ▪ `ALUA`: Gets information about ALUA settings. If you specify both this parameter and the `hostGroupNumberList` parameter, this parameter will be ignored.
hostGroupNumberList	string	(Optional) Host group number (for an iSCSI target, this is the target ID) You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. You can obtain information quickly by specifying this parameter. If you specify this parameter, the value of the `hostModeOptions` attribute is not obtained. To specify multiple IDs, delimit each ID by using a comma. You must specify either this parameter or the `hostGroupNumber` parameter.

Body

None.

Response message

Body

The following is an example of the output when only basic information is obtained:

```
{
  "data": [
    {
      "lunId": "CL1-A,1,1",
```

```
      "portId": "CL1-A",
      "hostGroupNumber": 1,
      "hostMode": "LINUX/IRIX",
      "lun": 1,
      "ldevId": 1,
      "isCommandDevice": false
    },
    {
      "lunId": "CL1-A,1,2",
      "portId": "CL1-A",
      "hostGroupNumber": 1,
      "hostMode": "LINUX/IRIX",
      "lun": 2,
      "ldevId": 2,
      "isCommandDevice": false
    }
  ]
}
```


The following is an example of the output generated when getting information about all items:


```
{
  "data": [
    {
      "lunId": "CL1-A,1,1",
      "portId": "CL1-A",
      "hostGroupNumber": 1,
      "hostMode": "LINUX/IRIX",
      "lun": 1,
      "ldevId": 1,
      "isCommandDevice": false,
      "luHostReserve": {
        "openSystem": false,
        "persistent": false,
        "pgrKey": false,
        "mainframe": false,
        "acaReserve": false
      }
    }
  ]
}
```


Attribute	Type	Description
lunId	string	Object ID for the LUN
portId	string	Port number

Attribute	Type	Description
hostGroupNumber	int	Host group number of the port (for an iSCSI target, this is the target ID)
hostMode	string	Host mode for setting the host adapter of the host group For details on the values to be obtained, see the description of the API function for changing the host group or iSCSI target settings.
lun	int	LUN between the host group and the mapped LDEV
ldevId	int	LDEV number
isCommandDevice	boolean	Gets information about whether the device is a command device.
luHostReserve	object	Host reservation status of the LU When `false` is specified for isBasicLunInformation and the LU is in the reserved status, the following attributes are output: ▪ openSystem (boolean) Indicates whether the LU is reserved for open systems. ▪ persistent (boolean) Indicates whether the LU is in the persistent reservation status. ▪ pgrKey (boolean) Indicates whether the LU is reserved by a PGR key. ▪ mainframe (boolean) Indicates whether the LU is reserved for mainframes. ▪ acaReserve (boolean) Indicates whether the LU is in the ACA reservation status.
hostModeOptions	int[]	Number of the host mode option set for the host group This is not output if a host mode option is not set. This attribute is not output if `hostGroupNumberList` is specified as a query parameter. For details on the number to be obtained, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* .

Attribute	Type	Description
isAluaEnabled	boolean	Whether the ALUA attribute is enabled: This attribute is displayed only if you specified `ALUA` for `lunOption` in the query parameters. ▪ `true`: The ALUA attribute is enabled. ▪ `false`: The ALUA attribute is disabled.
asymmetricAccessState	string	Priority level of the ALUA path This attribute is displayed only if you specified `ALUA` for `lunOption` in the query parameters. ▪ `Active/Optimized`: Higher priority ▪ `Active/Non-Optimized`: Lower priority ▪ `Not Supported`: Not supported

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

When getting only basic information:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/luns?
portId=CL1-A&hostGroupNumber=1&isBasicLunInformation=true"
```

When getting information about all items:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/luns?
portId=CL1-A&hostGroupNumber=1"
```

Getting information about a specific LU path

The following request gets information about the specified LU path.

Note:

In a configuration that uses namespaces, use CCI 01-64-03/*XX* or a later version. If you use an earlier version, the request might return information about paths related to LDEVs for which namespaces are set (information that is not actually used).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/luns/object-ID
```

Request message

Object ID

Specify the `lunId` value obtained by getting information about the LU path. You can also specify the following attributes and connect them with commas:

portId,*hostGroupNumber*,*lun*

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)
lun	int	(Required) LUN

Query parameters

None.

Body

None.

Response message

Body

```
{
  "lunId": "CL1-A,1,1",
  "portId": "CL1-A",
  "hostGroupNumber": 1,
  "hostMode": "LINUX/IRIX",
  "lun": 1,
```

```
  "ldevId": 1,
  "isCommandDevice": false,
  "luHostReserve": {
    "openSystem": false,
    "persistent": false,
    "pgrKey": false,
    "mainframe": false,
    "acaReserve": false
  },
  "hostModeOptions": [
    2,
    6
  ]
}
```


Attribute	Type	Description
lunId	string	Object ID for the LUN
portId	string	Port number
hostGroupNumber	int	Host group number of the port (for an iSCSI target, this is the target ID)
hostMode	string	Host mode for setting the host adapter of the host group For details on the values to be obtained, see *Changing the host group or iSCSI target settings*.
lun	int	LUN between the host group and the mapped LDEV
ldevId	int	LDEV number
isCommandDevice	boolean	Information about whether the device is a command device is output.
luHostReserve	object	Host reservation status of the LU ▪ openSystem (boolean) Indicates whether the LU is reserved for open systems. ▪ persistent (boolean) Indicates whether the LU is in the persistent reservation status. ▪ pgrKey (boolean) Indicates whether the LU is reserved by a PGR key.

Attribute	Type	Description
		▪ mainframe (boolean) Indicates whether the LU is reserved for mainframes. ▪ acaReserve (boolean) Indicates whether the LU is in the ACA reservation status.
hostModeOptions	int[]	Number of the host mode option set for the host group This is not output if a host mode option is not set. For details on the number to be obtained, see the *Provisioning Guide for Open Systems* (for VSP 5000 series, VSP G1000, VSP G1500, VSP F1500), or the *Provisioning Guide* (for VSP Gx00 models, VSP Fx00 models).

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/luns/CL1-A,1,1
```

Sending the ping command to a specified host

The request below checks the connection status of a storage system and a host by sending the ping command from a specified iSCSI port or NVMe/TCP port on the storage system to the host.

Execution permission

Storage Administrator (View Only)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ports/object-ID/actions/ping/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `portId` value obtained by getting information about the port.

Attribute	Type	Description
portId	string	(Required) Port number

Query parameters

None.

Body

```
{
  "parameters" : {
    "ipAddress" : "192.168.0.100"
  }
}
```

Attribute	Type	Description
ipAddress	string	(Required) IP address of the target host You can specify an IPv4 address or IPv6 address.

Response message

Body

```
{
    "transmittedPackets": 5,
    "receivedPackets": 5
}
```

Attribute	Type	Description
transmittedPackets	int	Number of sent packets

Attribute	Type	Description
receivedPackets	int	Number of received packets

Action template

None.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
503	Service unavailable	The port on the storage system is busy.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ports/CL1-A/actions/ping/invoke
```

Setting the LU path

The following request sets the LU path by mapping the LDEV with the LUN in the host group or in the iSCSI target of the specified port.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/luns
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example sets an LU path by specifying the LUN:

```
{
  "portId": "CL1-A",
  "hostGroupNumber": 1,
  "ldevId": 64,
  "lun": 12
}
```

The following coding example sets an LU path without specifying the LUN:

```
{
  "portId": "CL1-A",
  "hostGroupNumber": 1,
  "ldevId": 64
}
```

Attribute	Type	Description
portId	string	(Optional) Port number Specify this attribute when setting the LU path for one port. For VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models or VSP Fx00 models, you can set an LU path for multiple ports at the same time. To do this, use the `portIds` attribute. This attribute cannot be specified at the same time as the `portIds` attribute. You must specify either the `portId` attribute or the `portIds` attribute.
portIds	string[]	(Optional) Port number Specify this attribute when setting the LU paths for multiple ports at the same time. You can specify up to 6 port numbers. You can use this attribute for VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models or VSP Fx00 models. For VSP G200, G400, G600, G800, VSP F400, F600, F800, the version of the microcode must be 83-05-2*X*-*XX*/*XX* or later.

Attribute	Type	Description
		This attribute cannot be specified at the same time as the `portId` attribute. You must specify either the `portId` attribute or the `portIds` attribute.
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)
lun	int	(Optional) LUN If this attribute is omitted, a value is automatically set. You cannot specify the same LUN for multiple LDEVs.
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number. An LDEV cannot be mapped to another LUN in the same host group.

For host groups for which host mode option 60 is enabled, if you specify `portId` but omit `lun`, automatic configuration of LUNs might fail. If this happens, try the operation again, but specify `portIds` instead of `portId`. If your storage system does not support the use of `portIds`, try the operation again, but specify `lun` in addition to `portId`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created LU path

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/luns
```

Setting the priority levels of ALUA paths

For a global-active device in a cross-path configuration (using a Fibre Channel connection), by enabling the ALUA attribute, you can set the priority levels of paths between a host and a storage system.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/storage-device-ID/services/lun-service/actions/change-asymmetric-
access-state/invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "parameters": {
    "portId" : "CL1-A",
    "hostGroupNumber" : 1,
    "asymmetricAccessState" : "Active/Optimized"
  }
}
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number

Attribute	Type	Description
asymmetricAccessState	string	(Required) Priority level of the ALUA path ▪ `Active/Optimized`: Higher priority ▪ `Active/Non-Optimized`: Lower priority

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for getting information about LU paths You can get information about the priority level of an ALUA path by specifying `lunOption=ALUA` in the query parameters of the API function for getting information about LU paths.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/800000012345/
services/lun-service/actions/change-asymmetric-access-state/invoke
```

Deleting a LU path

The following request deletes the LU path defined for the host group or iSCSI target of the specified port.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/luns/object-ID
```

Request message

Object ID

Specify the `lunId` value obtained by getting information about the LU path. You can also specify the following attributes and connect them with commas:

```
portId,hostGroupNumber,lun
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)
lun	int	(Required) LUN

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted LU path

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/luns/CL1-A,1,
64
```

Setting the command device

The following request sets and releases the command device specified for the LDEV. The request also changes the attributes of the command device.

Note:

If you do not specify the `isSecurityEnabled` attribute, the `isUserAuthenticationEnabled` attribute, or the `isDeviceGroupDefinitionEnabled` attribute, the settings will be disabled after execution, even if the settings were enabled before execution. If you change a command device attribute, specify this item to prevent the setting from being unexpectedly disabled.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/set-as-
command-device/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following coding example sets the command device:

```
{
  "parameters": {
    "isCommandDevice": true
  }
}
```

The following coding example sets the command device, security, user authentication, and device group information authentication:

```
{
  "parameters": {
    "isCommandDevice": true,
    "isSecurityEnabled": true,
    "isUserAuthenticationEnabled": true,
    "isDeviceGroupDefinitionEnabled": true
  }
}
```

Attribute	Type	Description
isCommandDevice	boolean	(Required) Specify whether to set the specified LDEV for the command device. ▪ `true`: Enables the settings for the command device. ▪ `false`: Disables the settings for the command device.
isSecurityEnabled	boolean	(Optional) Specify whether to enable the security settings for the command device. ▪ `true`: Enables the security settings. ▪ `false`: Disables the security settings. If this value is omitted, `false` is assumed. Specify this item to prevent the setting from being unexpectedly disabled.
isUserAuthenticationEnabled	boolean	(Optional) Specify whether to enable the user authentication setting for the command device. ▪ `true`: Enables the user authentication setting. ▪ `false`: Disables the user authentication setting.

Attribute	Type	Description
		If this value is omitted, `false` is assumed. Specify this item to prevent the setting from being unexpectedly disabled.
isDeviceGroupDefinitionEnabled	boolean	(Optional) Specify whether to enable the settings for device group information authentication for the command device. ▪ `true`: Enables the settings for device group information authentication. ▪ `false`: Disables the settings for device group information authentication. If this value is omitted, `false` is assumed. Specify this item to prevent the setting from being unexpectedly disabled.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the volume for which the command device attribute has been changed

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/set-as-command-device
```

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The LDEV status is inappropriate. The LDEV might be in one of the following statuses: ▪ The LDEV is used as a virtual volume of Thin Image. ▪ The LDEV is used as a Quorum disk. ▪ The LDEV is used as a system disk. ▪ The LDEV is used as a deduplication system data volume (fingerprint) or a deduplication system data volume. ▪ The LDEV is used as a pool volume. ▪ The LDEV is used as a Volume Migration volume.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/set-as-command-device
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/1/actions/set-as-command-device/invoke
```

Getting a list of MP information

The request below obtains a list of MP location information.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/mps
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
    "data": [
        {
            "mpId": 0,
            "mpLocationId": "MP10-00",
            "mpUnitId": "MPU-10",
            "ctl": "ctl1"
        },
        {
            "mpId": 1,
            "mpLocationId": "MP10-01",
            "mpUnitId": "MPU-10",
            "ctl": "ctl1"
        },
        {
            "mpId": 4,
            "mpLocationId": "MP20-00",
            "mpUnitId": "MPU-20",
            "ctl": "ctl2"
        },
        {
            "mpId": 5,
            "mpLocationId": "MP20-01",
            "mpUnitId": "MPU-20",
            "ctl": "ctl2"
        }
    ]
}
```

Attribute	Type	Description
mpId	int	MP ID
mpLocationId	string	MP location number
mpUnitId	string	MP unit ID
ctl	string	Controller location information
cbx	int	CBX number For the following storage system models, `-1` is output to indicate an invalid value: VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/mps
```

Releasing the host reservation status by specifying the LU path

The following request releases the host reservation status of the LU mapped to a specified LU path. Use this API in situations when the host reservation status on the LU could not be released when there is a failure due to a problem on the host side.

Note:

- If the storage system is VSP G200, VSP G400, VSP G600, VSP G800, VSP F400, VSP F600, VSP F800, the microcode version must be 83-05-22-*XX*/80 or later.
- If the storage system is VSP G1000, VSP G1500, VSP F1500, the microcode version must be 80-06-0*X*-*XX*/*XX* or later.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/luns/object-ID/actions/release-lu-host-reserve/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `lunId` value from the LU path information. You can also specify a combination of attribute values in the following format:

```
portId, hostGroupNumber, lun
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number (target ID for an iSCSI port)
lun	int	(Required) LUN

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the path of the LU whose host reservation status is to be released

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Content-type:application/json" -H "Accept:application/json" -H
"Authorization:Session 2164f2f0-22d9-4005-89dc-218a73a818d4" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/luns/CL1-A,1,
0/actions/release-lu-host-reserve/invoke -d ""
```

Releasing the host reservation status by specifying a host group

The following request releases the host reservation status for all LUs mapped to the specified host group or iSCSI target. Use this API in situations such as when the host reservation status on LUs could not be released because of some reason, such as a failure.

Note:

- If the storage system is VSP G200, VSP G400, VSP G600, VSP G800, VSP F400, VSP F600, VSP F800, the microcode version must be 83-05-22-*XX*/80 or later.
- If the storage system is VSP G1000, VSP G1500, VSP F1500, the microcode version must be 80-06-0*X*-*XX*/*XX* or later.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/host-groups/object-ID/actions/
release-lu-host-reserves/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `hostGroupId` value obtained by the processing to obtain information about host groups or about iSCSI targets. You can also specify a combination of attribute values in the following format:

```
portId,hostGroupNumber
```

Attribute	Type	Description
portId	string	(Required) Port number
hostGroupNumber	int	(Required) Host group number for the port (For an iSCSI target, this is the target ID.)

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To check whether the host reservation status has been released, use the following URL. For *port-number* and *host-group-number*, specify the port number and the host group number (or the target ID) specified for the object ID.

```
GET base-URL/v1/objects/storages/storage-device-ID/luns?portId=port-number&hostGroupNumber=host-group-number
```

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Content-type:application/json" -H "Accept:application/json" -H "Authorization:Session 2164f2f0-22d9-4005-89dc-218a73a818d4" -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/host-groups/CL1-A,1/actions/release-lu-host-reserves/invoke -d ""
```

Chapter 8: Volume Allocation (when an NVMe-oF connection is used)

This chapter describes the allocating of volumes to a host by running REST API requests (when an NVMe-oF connection is used).

Overview of volume allocation (NVMe-oF)

NVMe over Fabrics (NVMe-oF) is an extension protocol that allows communication over fabrics using NVMe (Non-Volatile Memory Express) communication technology. It is called NVMe over FC in fiber-channel environments and NVMe/TCP in Ethernet environments. In this manual, when there is no need to distinguish between NVMe over FC and NVMe/TCP, they are referred to as NVMe-oF. In an NVMe-oF connection, an NVM subsystem is created as a resource to manage system components. By setting port and volume information in the NVM subsystem, you enable access from a host to a volume.

In the REST API, allocate a volume by performing the following procedure:

1. Create a volume that meets the host requirements.#

   You can either use a volume that meets the requirements from an existing LDEV or create an LDEV from the parity group or pool.

2. Create an NVM subsystem.

   In the created NVM subsystem, set an NVM subsystem port, a host NQN, a namespace, and a host-namespace path.

3. Set an NVM subsystem port for the NVM subsystem.

   In the NVM subsystem, set a storage system port (whose operation mode is `FC-NVMe` or `NVMe over TCP`#) that connects to the host.

4. Register a host NQN.

   In the NVM subsystem, register the host NQN defined for the host.

5. Create a namespace in an NVM subsystem.

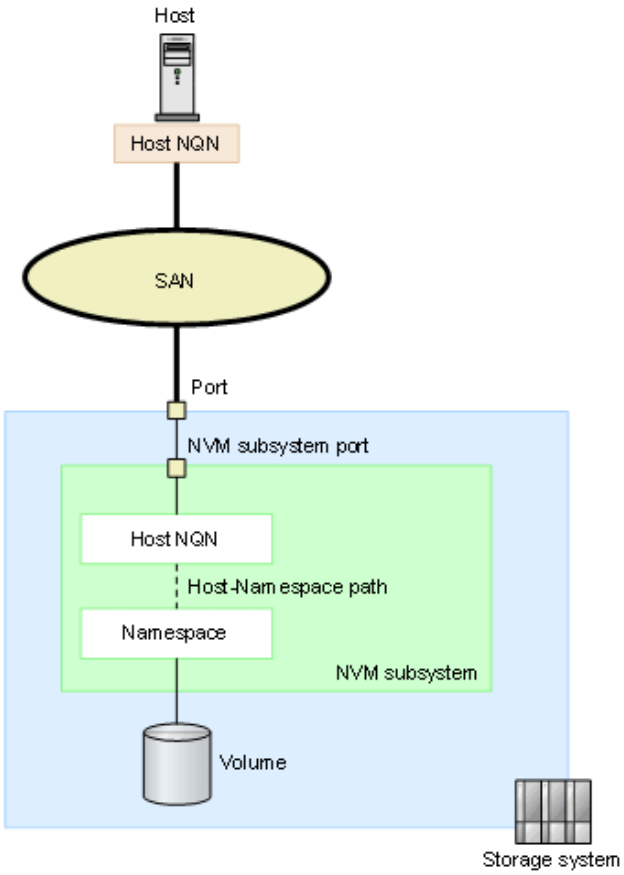
   Specify the volume to be allocated to the host, and then create a namespace in the NVM subsystem.

6. Set the host-namespace path.

   Set the permissions for accessing the namespace from the host NQN that was registered in the NVM subsystem.

#: Use the same API request as that for a non-NVMe-oF connection. For details, see the descriptions of the API request that creates volumes and the API request that sets the port operation mode.

For details on the requirements for creating a volume and details on settings when using NVMe over FC or NVMe/TCP, see the *Provisioning Guide for Open Systems* or the *Provisioning Guide*.



Note:

For an NVMe over FC connection, if the following conditions are met, you need to create a host group and specify WWN settings:

- You want to use the port's LUN security function to control the host (HBA WWN) that allows login to the port. (We recommend that you use the Fabric switch zoning functionality to manage access restrictions between storage target ports and host bus adapter ports in fabric connections. If you use FC switch zoning, NVMe over FC does not require configuring a host WWN for access restriction purposes.)
- You need to set the host mode option to respond to the connected hosts and HBA configuration.

For details, see the *Provisioning Guide for Open Systems* or the *Provisioning Guide*.

Getting NVM subsystem information

The following request gets NVM subsystem information.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/nvm-subsystems
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
nvmSubsystemInfo	string	(Optional) Type of information to be obtained The specifiable values are as follows: ▪ `basic` Gets basic information about the NVM subsystem. ▪ `nqn` Gets information about the subsystem NQN of the NVM subsystem. ▪ `namespace` Gets information about the namespace created in the NVM subsystem. ▪ `port` Gets information about the port registered in the NVM subsystem. Gets only information about the implemented NVM subsystem. If this parameter is omitted, the value `basic` is assumed.

Parameter	Type	Description
		You cannot specify this parameter at the same time as the `nvmSubsystemOption` parameter.
nvmSubsystemOption	string	(Optional) Condition of the NVM subsystem for which information is to be obtained The following value can be input as a condition. ▪ `undefined` Gets the NVM subsystem IDs of unimplemented NVM subsystems. You cannot specify this parameter at the same time as the `nvmSubsystemInfo` parameter.

Body

None.

Response message

Body

The following is an example of output when basic information is obtained by specifying `basic` in the query parameter `nvmSubsystemInfo`, or if the query parameter is not specified.

```
{
   "data": [
       {
          "nvmSubsystemId":1,
          "virtualNvmSubsystemId":1,
          "nvmSubsystemName":"rest_subsystem",
          "resourceGroupId":0,
          "namespaceSecuritySetting":"Enable",
          "t10piMode":"Disable",
          "hostMode":"LINUX/IRIX"
       },
       ...
   ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID

Attribute	Type	Description
virtualNvmSubsystemId	int	Virtual NVM subsystem ID This attribute is output if the storage system is a VSP 5000 series.
nvmSubsystemName	string	NVM subsystem name
resourceGroupId	int	Resource group ID of the resource group to which the NVM subsystem belongs
namespaceSecuritySetting	string	Namespace security settings ▪ `Enable`: Enabled ▪ `Disable`: Disabled ▪ `Unknown`: Status unknown (unsupported)
t10piMode	string	Status of the T10 PI mode of the port ▪ `Enable`: Enabled ▪ `Disable`: Disabled ▪ `Unknown`: Status unknown (unsupported)
hostMode	string	Host mode of the NVM subsystem This is not output if a host mode is not set.
hostModeOptions	int[]	Number of the host mode option set for the NVM subsystem This is not output if a host mode option is not set. For details on the number to be obtained, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

The following is an example of output when subsystem NQN information is obtained by specifying `nqn` in the query parameter `nvmSubsystemInfo`.

```
{
   "data": [
       {
          "nvmSubsystemId":1,
          "nvmSubsystemName":"rest_subsystem",
          "nvmSubsystemNqn":"nqn.2015-04.com.example:nvme:storage-subsystem-
sn.5-10088-nvmssid.00001"
       },
       ...
```

```
    ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID
nvmSubsystemName	string	NVM subsystem name
nvmSubsystemNqn	string	Subsystem NQN If the NVM subsystem is virtualized, the NQN of the virtualized NVM subsystem is output.

The following is an example of output when namespace information is obtained by specifying `namespace` in the query parameter `nvmSubsystemInfo`.

```
{
   "data": [
       {
           "nvmSubsystemId":1,
           "nvmSubsystemName":"rest_subsystem",
           "namespaces":[
               {
                "namespaceId":1,
                "ldevId:2000
               },
               {
                "namespaceId":2,
                "ldevId:2001
               },
               {
                "namespaceId":3,
                "ldevId:2002
               }
            ]
       },
       ...
   ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID

Attribute	Type	Description
nvmSubsystemName	string	NVM subsystem name
namespaces	object[]	Outputs the following attributes related to a namespace created in the NVM subsystem. ▪ namespaceId (int) Namespace ID ▪ ldevId (int) LDEV number

The following is an example of output when port information is obtained by specifying `port` in the query parameter `nvmSubsystemInfo`.

```
{
   "data": [
       {
         "nvmSubsystemId":1,
         "nvmSubsystemName":"rest_subsystem",
         "portIds":["CL1-A","CL1-B"]
       },
       ...
   ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID
nvmSubsystemName	string	NVM subsystem name
portIds	string[]	Port number

The following is an example of output when the NVM subsystem IDs of unimplemented NVM subsystems by specifying `undefined` in the query parameter `nvmSubsystemOption`.

```
{
   "data": [
       {
         "nvmSubsystemId":3
       },
```

```
        {
          "nvmSubsystemId":4
        },
        ...
    ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-
subsystems?nvmSubsystemInfo=basic
```

Getting information about a specific NVM subsystem

The following request gets information about a specific NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/nvm-subsystems/object-ID
```

Request message

Object ID

Specify the `nvmSubsystemId` value obtained by getting NVM subsystem information.

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID

Query parameters

None.

Body

None.

Response message

Body

```
{
      "nvmSubsystemId" : 1,
      "virtualNvmSubsystemId":1,
      "nvmSubsystemName" : "rest_subsystem",
      "resourceGroupId" : 0,
      "namespaceSecuritySetting" : "Enable",
      "t10piMode" : "Disable",
      "hostMode" : "LINUX/IRIX",
      "nvmSubsystemNqn" : "nqn.2015-04.com.example:nvme:storage-subsystem-sn.5-
10088-nvmssid.00001",
      "namespaces" : [
            {
              "namespaceId" : 1,
              "ldevId" : 2000
            },
            {
              "namespaceId" : 2,
              "ldevId" : 2001
            },
            {
              "namespaceId" : 3,
              "ldevId" : 2002
            }
        ],
      "portIds" : [ "CL1-A", "CL1-B" ]
}
```

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID

Attribute	Type	Description
virtualNvmSubsystemId	int	Virtual NVM subsystem ID This attribute is output if the storage system is a VSP 5000 series.
nvmSubsystemName	string	NVM subsystem name
resourceGroupId	int	Resource group ID of the resource group to which the NVM subsystem belongs
namespaceSecuritySetting	string	Namespace security settings ▪ `Enable`: Enabled ▪ `Disable`: Disabled ▪ `Unknown`: Status unknown (unsupported)
t10piMode	string	Status of the T10 PI mode of the port ▪ `Enable`: Enabled ▪ `Disable`: Disabled ▪ `Unknown`: Status unknown (unsupported)
hostMode	string	Host mode of the NVM subsystem This is not output if a host mode is not set.
hostModeOptions	int[]	Number of the host mode option set for the NVM subsystem This is not output if a host mode option is not set. For details on the number to be obtained, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.
nvmSubsystemNqn	string	Subsystem NQN If the NVM subsystem is virtualized, the NQN of the virtualized NVM subsystem is output.
namespaces	object[]	Outputs the following attributes related to a namespace created in an NVM subsystem. ▪ namespaceId (int) Namespace ID ▪ ldevId (int) LDEV number This is not output if no namespace is created.

Attribute	Type	Description
portIds	string[]	Port number This is not output if no port is registered.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-
subsystems/1
```

Creating an NVM subsystem

The following request creates an NVM subsystem as a resource for managing system configuration elements. By setting port and volume information in the NVM subsystem, you enable access from a host to a volume. When you create an NVM subsystem, you can also set the host mode and namespace security at the same time.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/nvm-subsystems
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "nvmSubsystemId": 1,
  "virtualNvmSubsystemId": 1,
  "nvmSubsystemName": "rest_subsystem",
  "hostMode": "LINUX/IRIX",
  "namespaceSecuritySetting": "Enable"
}
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
virtualNvmSubsystemId	int	(Optional) Virtual NVM subsystem ID Specify a value from `0` to `2047`. This attribute can be specified when the storage system is a VSP 5000 series. If this attribute is omitted, the same value as for the `nvmSubsystemId` attribute is set.
nvmSubsystemName	string	(Optional) Specify the NVM subsystem name consisting of 1 to 32 characters. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' ( ) + - . = @ _ [ ] ^ { } ~ The label cannot start with a hyphen (-). ▪ Spaces The label cannot start or end with a space. The following character string cannot be used for the label: ▪ A character string that starts with `nvmss_id_`, and ends with `(default_name)` If this attribute is omitted, a value is automatically set.
hostMode	string	(Optional) Host mode of the NVM subsystem The specifiable values are as follows: For the supported host modes, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Attribute	Type	Description
		`LINUX/IRIX`, `VMWARE`, `VMWARE_EX`, `AIX` If this attribute is omitted, `LINUX/IRIX` is set.
hostModeOptions	int[]	(Optional) Number of the host mode option set for the NVM subsystem For the specifiable numbers, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* . When specifying more than one attribute, use a comma to separate the values. When specifying this attribute, make sure to also specify the `hostMode` attribute.
namespaceSecuritySetting	string	(Optional) Namespace security settings ▪ `Enable`: Enabled ▪ `Disable`: Disabled If this attribute is omitted, the value `Enable` is assumed.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created NVM subsystem

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/nvm-subsystems
```

Changing the NVM subsystem settings

This request below changes the settings of the NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/nvm-subsystems/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `nvmSubsystemId` value obtained by getting NVM subsystem information.

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID

Query parameters

None.

Body

```
{
  "nvmSubsystemName":"rest_subsystem_01"
}
```

Attribute	Type	Description
nvmSubsystemName	string	(Optional) Specify the NVM subsystem name consisting of 1 to 32 characters.

Attribute	Type	Description
		You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' ( ) + - . = @ _ [ ] ^ { } ~ The label cannot start with a hyphen (-). ▪ Spaces The label cannot start or end with a space. The following character string cannot be used for the label: ▪ A character string that starts with `nvmss_id_`, and ends with `(default_name)` This attribute cannot be specified at the same time as any other attribute.
hostMode	string	(Optional) Host mode of the NVM subsystem The specifiable values are as follows: For the supported host modes, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*. `LINUX/IRIX`, `VMWARE`, `VMWARE_EX`, `AIX` If this attribute is omitted, `LINUX/IRIX` is set. This attribute cannot be specified at the same time as any other attribute.
hostModeOptions	int[]	(Optional) Number of the host mode option set for the NVM subsystem The values are updated (overwritten) by the specified values. When specifying values, specify all the numbers for the host mode options that you want to set. For details on the specifiable numbers, see the *Provisioning Guide for Open Systems* , or the *Provisioning Guide* . To specify multiple option values, separate the values by commas. If you set `-1`, the set host mode option will be reset. This attribute cannot be specified at the same time as any other attribute.

Attribute	Type	Description
namespaceSecuritySetting	string	(Optional) Namespace security settings ▪ `Enable`: Enabled ▪ `Disable`: Disabled This attribute cannot be specified at the same time as any other attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the NVM subsystem whose settings were changed

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/nvm-subsystems/1
```

Deleting an NVM subsystem

The following request deletes an NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/nvm-subsystems/object-ID
```

Request message

Object ID

Specify the `nvmSubsystemId` value obtained by getting NVM subsystem information.

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted NVM subsystem

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-
subsystems/1
```

Getting NVM subsystem port information

The following request gets NVM subsystem port information.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/nvm-subsystem-ports
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
nvmSubsystemId	int	(Optional) NVM subsystem ID Specify a value from `0` to `2047`. You cannot specify this parameter and the `portId` parameter at the same time. You must specify either this parameter or the `portId` parameter.
portId	string	(Optional) Port number You cannot specify this parameter and the `nvmSubsystemId` parameter at the same time. You must specify either this parameter or the `nvmSubsystemId` parameter.

Body

None.

Response message

Body

```
{
  "data": [
      {
          "nvmSubsystemPortId":"1,CL1-A",
          "nvmSubsystemId":1,
          "portId":"CL1-A"
      },
      {
          "nvmSubsystemPortId":"1,CL1-B",
          "nvmSubsystemId":1,
          "portId":"CL1-B"
      }
  ]
}
```

Attribute	Type	Description
nvmSubsystemPortId	string	Object ID of the NVM subsystem port The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `portId`
nvmSubsystemId	int	NVM subsystem ID
portId	string	Port number

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-subsystem-
ports?nvmSubsystemId=1
```

Getting information about a specific NVM subsystem port

The following request gets information about a specific NVM subsystem port.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/nvm-subsystem-ports/object-ID
```

Request message

Object ID

Specify the `nvmSubsystemPortId` value obtained by getting NVM subsystem port information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,portId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
portId	string	(Required) Port number

Query parameters

None.

Body

None.

Response message

Body

```
{
    "nvmSubsystemPortId":"1,CL1-A",
    "nvmSubsystemId":1,
    "portId":"CL1-A"
}
```

Attribute	Type	Description
nvmSubsystemPortId	string	Object ID of the NVM subsystem port The following attributes are output, separated by commas: ▪ nvmSubsystemId ▪ portId
nvmSubsystemId	int	NVM subsystem ID
portId	string	Port number

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-subsystem-
ports/1,CL1-A
```

Setting an NVM subsystem port for the NVM subsystem

The following request sets an NVM subsystem port for the NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/nvm-subsystem-ports
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
   "nvmSubsystemId": 1,
   "portId" : "CL3-D"
}
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
portId	string	(Required) Port number to be set as the NVM subsystem port Specify a port for which the operation mode is `FC-NVMe` or `NVMe over TCP`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created NVM subsystem port

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/nvm-subsystem-ports
```

Deleting an NVM subsystem port

The following request deletes the NVM subsystem port specified for the NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/nvm-subsystem-ports/object-ID
```

Request message

Object ID

Specify the `nvmSubsystemPortId` value obtained by getting NVM subsystem port information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,portId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
portId	string	(Required) Port number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted NVM subsystem port

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/nvm-subsystem-
ports/1,CL1-A
```

Getting host NQN information

The following request gets host NQN information.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-nqns
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.

Body

None.

Response message

Body

```
{
  "data": [
    {
        "hostNqnId":
"1,nqn.2014-08.org.example:uuid:4b73e622-ddc1-449a-99f7-412c0d3baa39",
        "hostNqn":
"nqn.2014-08.org.example:uuid:4b73e622-ddc1-449a-99f7-412c0d3baa39",
        "nvmSubsystemId":1,
        "hostNqnNickname":"myhost1"
    },
    {
        "hostNqnId":
"1,nqn.2014-08.org.example:uuid:f4d3488e-6986-4342-b693-9ecf5257e55d",
        "hostNqn":
"nqn.2014-08.org.example:uuid:f4d3488e-6986-4342-b693-9ecf5257e55d",
        "nvmSubsystemId":1,
        "hostNqnNickname":"myhost2"
    }
  ]
}
```

Attribute	Type	Description
hostNqnId	string	Object ID of the host NQN The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `hostNqn`
hostNqn	string	Host NQN
nvmSubsystemId	int	NVM subsystem ID
hostNqnNickname	string	Host NQN nickname If the host NQN nickname is not set, a hyphen (-) is output.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/host-nqns?
nvmSubsystemId=1
```

Getting information about a specific host NQN

The following request gets information about a specific host NQN.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/host-nqns/object-ID
```

Request message

Object ID

Specify the `hostNqnId` value obtained by getting host NQN information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,hostNqn
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
hostNqn	string	(Required) Host NQN

Query parameters

None.

Body

None.

Response message

Body

```
{
      "hostNqnId":
"1,nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-8345-a90afbb80d8b",
      "hostNqn":
"nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-8345-a90afbb80d8b",
      "nvmSubsystemId":1,
      "hostNqnNickname":"myhost1"
}
```

Attribute	Type	Description
hostNqnId	string	Object ID of the host NQN The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `hostNqn`
hostNqn	string	Host NQN
nvmSubsystemId	int	NVM subsystem ID
hostNqnNickname	string	Host NQN nickname If the host NQN nickname is not set, a hyphen (-) is output.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/host-nqns/1,
nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-8345-a90afbb80d8b
```

Registering a host NQN in an NVM subsystem

The following request registers a host NQN in an NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/host-nqns
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
      "nvmSubsystemId": 1,
      "hostNqn":
"nqn.2014-08.org.example:uuid:4b73e622-ddc1-449a-99f7-412c0d3baa39"
}
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
hostNqn	string	(Required) Host NQN Continuing from "nqn.", write the entire string by using no more than 233 characters. You can use the following characters: Alphanumeric characters (lowercase), hyphens (`-`), periods (`.`), and colons (`:`) Specification example: `nqn.example:1234567890-abcdef`

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created host NQN

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/host-nqns
```

Setting the nickname for a host NQN

This API request sets the nickname for the host NQN registered in the NVM subsystem. The request can also delete a set nickname. If the specified host NQN is registered in multiple NVM subsystems, the settings will be applied to all the NVM subsystems.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/host-nqns/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `hostNqnId` value obtained by getting host NQN information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,hostNqn
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
hostNqn	string	(Required) Host NQN

Query parameters

None.

Body

When setting the nickname for the host NQN:

```
{
  "hostNqnNickname":"myhost1"
}
```

When deleting the nickname from the host NQN:

```
{
  "hostNqnNickname":""
}
```

Attribute	Type	Description
hostNqnNickname	string	(Required) Specify the host NQN nickname consisting of 1 to 32 characters. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' ( ) + - . = @ _ [ ] ^ { } ~ The label cannot start with a hyphen (-). ▪ Spaces The label cannot start or end with a space.

Attribute	Type	Description
		To delete the nickname from the host NQN, specify a null character string.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the host NQN whose settings were changed

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/host-nqns/1,nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-
8345-a90afbb80d8b
```

Deleting the login information of the host NQN

This API request deletes the login information of the host NQN set for a specified port. However, you cannot delete information of a host NQN while you are logged in to the host.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ports/object-ID/actions/delete-login-host-nqn/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `portId` value obtained by getting port information.

Attribute	Type	Description
portId	string	(Required) Port number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the port for which the login information of the host NQN was deleted

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/ports/CL1-A/
actions/delete-login-host-nqn/invoke
```

Deleting a host NQN

The following request deletes the host NQN registered in an NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/host-nqns/object-ID
```

Request message

Object ID

Specify the `hostNqnId` value obtained by getting host NQN information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,hostNqn
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
hostNqn	string	(Required) Host NQN

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted host NQN

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/host-nqns/1,
nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-8345-a90afbb80d8b
```

Getting namespace information

The following request gets namespace information.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/namespaces
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID

Body

None.

Response message

Body


```
{
    "data":[
              {
                "namespaceObjectId":"1,1",
                "namespaceId":1,
                "namespaceNickname":"restns11",
                "nvmSubsystemId":1,
                "nvmSubsystemName":"rest_subsystem",
                "ldevId":2000,
                "byteFormatCapacity":"1.00 G",
                "blockCapacity":2097152
              },
              {
                "namespaceObjectId":"1,2",
                "namespaceId":2,
                "namespaceNickname":"restns12",
                "nvmSubsystemId":1,
                "nvmSubsystemName":"rest_subsystem",
                "ldevId":2001,
                "byteFormatCapacity":"1.00 G",
                "blockCapacity":2097152
              }
     ]
}
```


Attribute	Type	Description
namespaceObjectId	string	Object ID of the namespace The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `namespaceId`
namespaceId	int	Namespace ID
namespaceNickname	string	Namespace nickname If the namespace nickname is not set, a hyphen (-) is output.
nvmSubsystemId	int	NVM subsystem ID

Attribute	Type	Description
nvmSubsystemName	string	NVM subsystem name
ldevId	int	LDEV number LDEV number of the volume where the namespace is set
byteFormatCapacity	string	Capacity of the namespace
blockCapacity	long	Number of blocks of the namespace

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespaces?
nvmSubsystemId=1
```

Getting information about a specific namespace

The following request gets information about a specific namespace.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/namespaces/object-ID
```

Request message

Object ID

Specify the `namespaceObjectId` value obtained by getting namespace information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,namespaceId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
namespaceId	int	(Required) Namespace ID

Query parameters

None.

Body

None.

Response message

Body

```
{
        "namespaceObjectId":"1,1",
        "namespaceId":1,
        "namespaceNickname":"restns11",
        "nvmSubsystemId":1,
        "nvmSubsystemName":"rest_subsystem",
        "ldevId":2000,
        "byteFormatCapacity":"1.00 G",
        "blockCapacity":2097152
    }
```

Attribute	Type	Description
namespaceObjectId	string	Object ID of the namespace The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `namespaceId`
namespaceId	int	Namespace ID

Attribute	Type	Description
namespaceNickname	string	Namespace nickname If the namespace nickname is not set, a hyphen (-) is output.
nvmSubsystemId	int	NVM subsystem ID
nvmSubsystemName	string	NVM subsystem name
ldevId	int	LDEV number LDEV number of the volume where the namespace is set
byteFormatCapacity	string	Capacity of the namespace
blockCapacity	long	Number of blocks of the namespace

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespaces/1,1
```

Creating a namespace in an NVM subsystem

The following request creates a namespace in the NVM subsystem by using a specified LDEV number.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/namespaces
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
   "nvmSubsystemId": 1,
   "namespaceId" : 1,
   "ldevId": 10
}
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
namespaceId	int	(Optional) Namespace ID For the VSP 5000 series, specify a value from `1` to `4096`. For VSP One B20, VSP E1090 and VSP E1090H, specify a value from `1` to `2048`. If this attribute is omitted, a value is automatically set.
ldevId	int	(Required) LDEV number Specify a value from `0` to `65279`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created namespace

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/namespaces
```

Setting the nickname for a namespace

The following request sets the nickname for a namespace created in the NVM subsystem. You can also delete the nickname that is already set.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/namespaces/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `namespaceObjectId` value obtained by getting namespace information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,namespaceId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
namespaceId	int	(Required) Namespace ID

Query parameters

None.

Body

When setting the nickname for the namespace:

```
{
  "namespaceNickname":"restns11"
}
```

When deleting the nickname from the namespace:

```
{
  "namespaceNickname":""
}
```

Attribute	Type	Description
namespaceNickname	string	(Required) Specify the namespace nickname consisting of 1 to 32 characters. You can use the following characters. ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' ( ) + - . = @ _ [ ] ^ { } ~ The label cannot start with a hyphen (-). ▪ Spaces The label cannot start or end with a space. To delete the nickname from the namespace, specify a null character string.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the namespace whose settings were changed

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/namespaces/1,1
```

Deleting a namespace

The following request deletes the namespace in the NVM subsystem.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/namespaces/object-ID
```

Request message

Object ID

Specify the `namespaceObjectId` value obtained by getting namespace information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,namespaceId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
namespaceId	int	(Required) Namespace ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted namespace

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespaces/1,1
```

Getting host-namespace path information

The following request gets host-namespace path information (information related to the namespace and host NQN) by specifying the NVM subsystem.

Depending on the number of resources for which you are getting information, one API request might not be able to get all the information. To get the remaining information, see the explanations of the `hasNext` attribute and the `NextId` attribute.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/namespace-paths
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
namespaceId	int	(Optional) Namespace ID For the VSP 5000 series, specify a value from `1` to `4096`. For VSP One B20, VSP E1090 and VSP E1090H, specify a value from `1` to `2048`. You cannot specify this parameter at the same time as the `headId` parameter.
headId	string	(Optional) Namespace object ID Specify the object ID of the host-namespace path where the getting of the information starts. You cannot specify this parameter at the same time as the `namespaceId` parameter. If both this parameter and `namespaceId` parameter are omitted, the request gets information from the beginning of the information.

Body

None.

Response message

Body


```
{
    "data": [
        {
            "namespacePathId":"1,nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b,2",
            "nvmSubsystemId":1,
            "hostNqn":"nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b",
            "namespaceId":2,
            "ldevId":10
        },
```

```
        {
            "namespacePathId":"1,nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b,3",
            "nvmSubsystemId":1,
            "hostNqn":"nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b",
            "namespaceId":3,
            "ldevId":11
        },
        ...
    ],
    "hasNext":true
    "nextId":"1,nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b,42"
}
```

Attribute	Type	Description
namespacePathId	string	Object ID of the host-namespace path The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `hostNqn` ▪ `namespaceId`
nvmSubsystemId	int	NVM subsystem ID
hostNqn	string	Host NQN
namespaceId	int	Namespace ID
ldevId	int	LDEV number LDEV number of the volume where the namespace is set

This API request outputs the following attributes, in accordance with the data object.

Attribute	Type	Description
hasNext	boolean	Whether or not there is information that this API request could not get. ▪ `true`: There is information that this API request could not get. ▪ `false`: The request could get all the information.

Attribute	Type	Description
		For the VSP 5000 series, `false` is always output.
nextId	string	ID for getting continued information if there is information this API request could not get yet. If the API request could not get all the information at one time, by specifying this value in the query parameter `headId` and rerunning the API request, you can get the next information. This information is not output if the `hasNext` attribute is `false`.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespace-
paths?nvmSubsystemId=1
```

Getting information about a host-namespace path

The following request gets specific host-namespace path information (information related to the namespace and host NQN).

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/namespace-paths/object-ID
```

Request message

Object ID

Specify the `namespacePathId` value obtained by getting host-namespace path information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,hostNqn,namespaceId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
hostNqn	string	(Required) Host NQN
namespaceId	int	(Required) Namespace ID

Query parameters

None.

Body

None.

Response message

Body

```
{
          "namespacePathId":"1,nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b,2",
          "nvmSubsystemId":1,
          "hostNqn":"nqn.2014-08.org.example:uuid:
ff533865-1d0b-4043-8345-a90afbb80d8b",
          "namespaceId":2,
          "ldevId":10
}
```

Attribute	Type	Description
namespacePathId	string	Object ID of the host-namespace path The following attributes are output, separated by commas: ▪ `nvmSubsystemId` ▪ `hostNqn` ▪ `namespaceId`

Attribute	Type	Description
nvmSubsystemId	int	NVM subsystem ID
hostNqn	string	Host NQN
namespaceId	int	Namespace ID
ldevId	int	LDEV number LDEV number of the volume where the namespace is set

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespace-
paths/1,nqn.2014-08.org.example:uuid:ff533865-1d0b-4043-8345-a90afbb80d8b,2
```

Setting a host-namespace path

The following request sets the host-namespace path (information about the relation of the namespace and host NQN).

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/namespace-paths
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
      "nvmSubsystemId": 1,
      "hostNqn":
"nqn.2014-08.org.example:uuid:4b73e622-ddc1-449a-99f7-412c0d3baa39",
      "namespaceId": 1
}
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID Specify a value from `0` to `2047`.
hostNqn	string	(Required) Host NQN Continuing from "nqn.", write the entire string by using no more than 233 characters. You can use the following characters: Alphanumeric characters (lowercase), hyphens (`-`), periods (`.`), and colons (`:`) Specification example: `nqn.example:1234567890-abcdef`
namespaceId	int	(Required) Namespace ID For the VSP 5000 series, specify a value from `1` to `4096`. For VSP One B20, VSP E1090 and VSP E1090H, specify a value from `1` to `2048`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created host-namespace path

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/namespace-paths
```

Deleting a host-namespace path

The following request deletes a host-namespace path.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/namespace-paths/object-ID
```

Request message

Object ID

Specify the `namespacePathId` value obtained by getting host-namespace path information. You can also specify the following attributes and connect them with commas:

```
nvmSubsystemId,hostNqn,namespaceId
```

Attribute	Type	Description
nvmSubsystemId	int	(Required) NVM subsystem ID
hostNqn	string	(Required) Host NQN
namespaceId	int	(Required) Namespace ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted host-namespace path

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/namespace-
paths/1,nqn.2014-08.org.example:uuid:4b73e622-ddc1-449a-99f7-412c0d3baa39,1
```

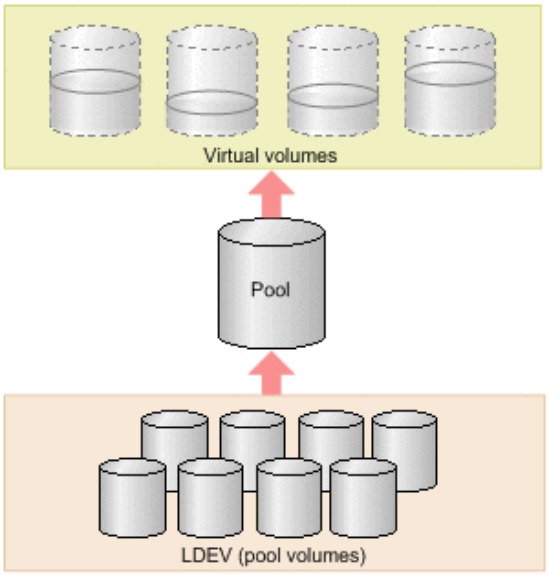
Chapter 9: Pool management

This chapter describes how to manage pools by using the REST API.

Overview of a pool

A pool is a virtual area created by integrating multiple LDEVs. You can create virtual volumes from a pool, and then allocate or pair the volumes.

You can create a virtual volume that has a capacity larger than that of the physical drive, and expand or reduce the size of a virtual volume as necessary. By doing so, you can effectively use the resources of a storage system and reduce the workload of adding and configuring drives. In addition, data is decentralized and stored on multiple drives by integrating multiple physical volumes, thereby improving drive operation efficiency.



HDP pools, HDT pools, and Thin Image pools (that not used for Thin Image Advanced) are created by the REST API. In this manual, HDP pools and HDT pools are referred to as DP pools when differentiation is unnecessary.

Note:

In the case of VSP One B20, you cannot use HDT pools, active flash pools, or Thin Image pools.

You cannot use the REST API to create pools from parity groups for DDP or to expand or shrink pools created from parity groups for DDP. Use storage management software such as CCI.

The following is a list of operations that can be performed for pools by using the REST API.

- Create pools

  Create DP pools or Thin Image pools by specifying LDEVs. You can also set a threshold value for the pool usage rate to be used for issuing a warning when that value is exceeded. Use DP pools to create virtual volumes, and use Thin Image pools to store snapshot data. For the following storage systems, you can also store snapshot data in HDP pools.

  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-05-0*X-XX*/*XX* or later
  - VSP G1000, VSP G1500, VSP F1500 whose microcode version is 80-06-0*X-XX*/*XX* or later

- Change pool settings

  Change the pool type from the HDP pool to the HDT pool, change the threshold usage rate of the DP pool or the Thin Image pool, or change the subscription of a virtual volume to DP pool capacity.

- Expand pools

  Expand capacity by adding LDEVs to DP pools or Thin Image pools.

- Shrink pools

  Reduce capacity by deleting the LDEVs that compose the DP pools or Thin Image pools.

- Perform performance monitoring of HDT pools

  Start or stop monitoring of HDT pools at a specific timing so that HDT pool data is appropriately located.

- Perform tier relocation for HDT pools

  Based on the performance monitoring information, relocate HDT pool data to an appropriate tier.

- Restore pools

  Unblock DP pools or Thin Image pools that have recovered from a failure or other problem.

- Delete pools

  Delete DP pools or Thin Image pools that are no longer necessary.

- Get information about pools

  Get information about DP pools or Thin Image pools.

You create pools during the procedure to allocate volumes or create Thin Image pairs. Perform other operations on pools according to the status of the pools.

For details on HDP (Dynamic Provisioning) and HDT (Dynamic Tiering), see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Getting pool information

The following request gets information items such as the pool status, the pool usage rate, and the pool threshold.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/pools
```

Request message

Object ID

None.

Query parameters

Query parameters can be specified to filter the execution results by the specified condition and also collect additional detailed information about pools.

- When filtering execution results

Parameter	Type	Filter Condition
poolType	string	(Optional) The type of pools about which information will be obtained. The specifiable types are as follows: ▪ `DP`: Information about DP pools is obtained. ▪ `HTI`: Information about Thin Image pools is obtained. If this parameter is omitted, information about all pools will be obtained.

- When collecting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained To specify multiple types, delimit the values by using commas. This parameter can be used in combination with the parameter to filter execution results. ▪ `FMC` Detailed accelerated compression information of pools that consist of pool volumes belonging to the parity group of `SSD(FMC)` type drives is added. ▪ `tierPhysicalCapacity` You can specify this parameter if the storage system model is VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. Additional detailed information about the physical capacity of the HDT pools in each tier is obtained. The obtained information is added to the `tiers` attribute in the response body that is displayed. ▪ `efficiency` You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900. Additional detailed information is obtained about the saving efficiency for consumption of capacity (total efficiency) achieved by using the functions for increasing the usage efficiency of a pool (namely, the capacity saving function, the accelerated compression function, the creation of backup data by using snapshots, and the virtualization of capacity by using Dynamic Provisioning). ▪ `formattedCapacity` You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. Additional detailed information is obtained about the size of the formatted capacity of the pool.

Parameter	Type	Description
		▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. You can specify this item for VSP E series, VSP G350, G370, G700, G900 and VSP F350, F370, F700, F900 model storage systems if the storage system is in a configuration that is linked to an SVP. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". ▪ `autoAddPoolVol` You can specify this parameter if the storage system model is VSP 5000 series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. Information is added on whether a pool volume is added automatically, depending on the compression rate of the parity group for which accelerated compression is enabled. ▪ `tierDiskType` You can specify this parameter if the storage system model is VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. The disk type is obtained for each tier. The obtained information is added to the `tiers` attribute in the response body that is displayed.

Body

None.

Response message

Body

The following is an example of the output generated when getting HDP pool information:


```
{
  "data": [ {
    "poolId": 5,
    "poolStatus": "POLN",
    "usedCapacityRate": 1,
    "usedPhysicalCapacityRate": 1,
    "snapshotCount": 0,
    "poolName": "Pool_5",
    "availableVolumeCapacity": 32042850,
    "availablePhysicalVolumeCapacity": 20006364,
    "effectiveCapacity": 32066496,
    "totalPoolCapacity": 32066496,
    "totalPhysicalCapacity": 20009724,
    "numOfLdevs": 11,
    "firstLdevId": 2304,
    "warningThreshold": 70,
    "depletionThreshold": 80,
    "virtualVolumeCapacityRate": -1,
    "isMainframe": false,
    "isShrinking": false,
    "locatedVolumeCount": 13,
    "totalLocatedCapacity": 79951368,
    "blockingMode": "NB",
    "totalReservedCapacity": 0,
    "reservedVolumeCount": 0,
    "poolType": "HDP",
    "duplicationLdevIds": [ 65269, 65268, 65267, 65266, 65265, 65264, 65263,
65262 ],
    "duplicationNumber": 8,
    "dataReductionAccelerateCompCapacity": 206783585,
    "dataReductionCapacity": 205901472,
    "dataReductionBeforeCapacity": 210117216,
    "dataReductionAccelerateCompRate": 87,
    "duplicationRate": 42,
    "compressionRate": 44,
    "dataReductionRate": 97,
    "dataReductionAccelerateCompIncludingSystemData": {
      "isReductionCapacityAvailable": true,
      "reductionCapacity": 228372480,
      "isReductionRateAvailable": true,
      "reductionRate": 97
    },
    "dataReductionIncludingSystemData": {
      "isReductionCapacityAvailable": true,
```

```
      "reductionCapacity": 186826752,
      "isReductionRateAvailable": true,
      "reductionRate": 79
    },
    "snapshotUsedCapacity": 0,
    "suspendSnapshot": true,
    "capacitiesExcludingSystemData": {
      "usedVirtualVolumeCapacity": 235253760,
      "compressedCapacity": 0,
      "dedupedCapacity": 101035296,
      "reclaimedCapacity": 129142560,
      "systemDataCapacity": 43351104,
      "preUsedCapacity": 234393600,
      "preCompressedCapacity": 0,
      "preDedupredCapacity": 105247408
    }
  } ]
}
```


For a DP pool:

Attribute	Type	Description
poolId	int	Object ID for the pool
poolName	string	Pool name
poolType	string	Pool type ▪ `HDP`: HDP pool ▪ `HDT`: HDT pool ▪ `RT`: active flash pool ▪ `DM`: Data Direct Mapping HDP pool
poolStatus	string	One of the following is output as the pool status: ▪ `POLN`: Normal (Pool Normal) ▪ `POLF`: The pool is in the overflow status exceeding the threshold. (Pool Full)

Attribute	Type	Description
		▪ `POLS`: The pool is in the overflow status exceeding the threshold and is suspended. (Pool Suspend) ▪ `POLE`: The pool is suspended in the failure status. (Pool failure) If the pool status is `POLE`, pool information cannot be obtained.
usedCapacityRate	int	Usage rate of the pool (%) The usage rate of logical capacity (%) is output. For VSP One B20, this indicates the usage rate of the effective capacity (%).
usedPhysicalCapacityRate	int	Usage rate of physical capacity (%) This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
availableVolumeCapacity	long	The capacity that can be used for volume data (MB) The free logical capacity (MB) is output.
availablePhysicalVolumeCapacity	long	Free physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
effectiveCapacity	long	Effective capacity of the pool (MB) The effective capacity of the logical capacity (MB) is output. This attribute is displayed for storage systems VSP One B20.
totalPoolCapacity	long	Total capacity of the pool (MB)

Attribute	Type	Description
		The total logical capacity (MB) is output. For VSP One B20, part of the logical capacity might not be effective when you edit the parity group for DDP in storage management software such as CCI. For information about the effective capacity of the logical capacity, see the value of the `effectiveCapacity` attribute.
totalPhysicalCapacity	long	Total physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
numOfLdevs	int	Number of LDEVs in the pool
firstLdevId	int	The first LDEV number of the LDEVs in the pool
warningThreshold	int	The warning threshold set for the pool
depletionThreshold	int	The depletion threshold set for the pool
suspendSnapshot	boolean	Whether to suspend Thin Image pairs when the depletion threshold is exceeded ▪ `true`: Thin Image pairs are suspended when the depletion threshold is exceeded. ▪ `false`: Thin Image pairs are not suspended when the depletion threshold is exceeded.
virtualVolumeCapacityRate	int	The maximum subscription limit of a virtual volume relative to pool capacity If unlimited is set, `-1` is output.

Attribute	Type	Description
		For the following storage system models, `-1` is output to indicate an invalid value: VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
isShrinking	boolean	Whether the pool is shrinking or rebalancing is output. ▪ `true`: The pool is shrinking or rebalancing. ▪ `false`: The pool is not shrinking or rebalancing.
locatedVolumeCount	int	Total number of DP volumes mapped to the pool
totalLocatedCapacity	long	Total capacity of the DP volumes mapped to the pool (MB) The value of this attribute does not include the control area.
snapshotCount	int	Total number of snapshot data items mapped to the pool
snapshotUsedCapacity	long	Total size of snapshot data mapped to the pool (MB)
blockingMode	string	Setting the protection function for a virtual volume

Attribute	Type	Description
		When the DP pool is full or when the DP pool volume is blocked, whether the read and write operations can be performed for the DP volume that uses the target DP pool is output. ▪ `PF`: Pool Full If the DP pool is full, read and write operations are not possible. If the DP pool volume is blocked, read and write operations are possible. ▪ `PB`: Pool vol Blockade If the DP pool volume is blocked, read and write operations are not possible. If the DP pool is full, read and write operations are possible. ▪ `FB`: Full or Blockade If the DP pool is full or the DP pool volume is blocked, read and write operations are not possible. ▪ `NB`: No Blocking Even if the DP pool is full or the DP pool volume is blocked, read and write operations are possible for the target DP volume.
totalReservedCapacity	long	Total capacity of the reserved page (MB) of the DP volume that is related to the DP pool If the Full Allocation functionality is not supported by the configuration, this attribute is not output.
reservedVolumeCount	int	Number of volumes associated with the DP pool for which the page reservation setting is enabled If the Full Allocation functionality is not supported by the configuration, this attribute is not output.

Attribute	Type	Description
poolActionMode	string	Execution mode for the pool ▪ `DEF`: The mode in which the monitor is started or stopped by instructions from the REST API server, and the Tier range is specified by automatic calculation of the DKC. ▪ `AUT`: The mode in which the monitor is started or stopped at the specified time, and the Tier range is specified by automatic calculation of the DKC (specified by using Storage Navigator or other storage management software).
monitoringMode	string	Performance monitoring execution mode (monitor mode) ▪ `PM`: Period mode ▪ `CM`: Continuous mode
tierOperationStatus	string	Operation status of performance monitoring and tier relocation is output. ▪ `STP`: Performance monitoring and tier relocation are both stopped. ▪ `RLC`: Performance monitoring is stopped and tier relocation is operating. ▪ `MON`: Performance monitoring is operating and tier relocation is stopped. ▪ `RLM`: Performance monitoring and tier relocation are both operating.
dat	string	Status of monitor information ▪ `VAL`: Valid ▪ `INV`: Invalid ▪ `PND`: Pending calculation

Attribute	Type	Description
tiers	object[]	The following attributes about HDT pool tiers are output for each tier. ▪ tierNumber (int) Tier number ▪ tierLevelRange (string) Lower limit of the tier The value is output as the number of I/O operations per hour (IOPH). ▪ tierDeltaRange (string) Delta value for the tier The value is output as the number of I/O operations per hour (IOPH). ▪ diskType (string) The disk type for each tier • `SCM` • `SSD` • `SAS_7200` • `SAS_10000` • `SAS_15000` • `SATA_7200` • `EXTERNAL_LOW` • `EXTERNAL_MIDDLE` • `EXTERNAL_HIGH` • `MIXED` This information is displayed if `tierDiskType` is specified for the `detailInfoType` query parameter when the request is executed.

Attribute	Type	Description
		▪ tierUsedPhysicalCapacity (long) Physical capacity used by the tier (MB) This information is displayed if `tierPhysicalCapacity` is specified for the `detailInfoType` query parameter when the request is executed. ▪ tierTotalPhysicalCapacity (long) Total physical capacity of the tier (MB) This information is displayed if `tierPhysicalCapacity` is specified for the `detailInfoType` query parameter when the request is executed. ▪ tierUsedCapacity (long) Logical capacity used by the tier (MB) ▪ tierTotalCapacity (long) Total logical capacity of the tier (MB) ▪ tablespaceRate (int) Rate of free space to be used for new allocation ▪ performanceRate (int) Performance utilization

Attribute	Type	Description
		▪ progressOfReplacing (int) Relocation progress rate The progress rate of the following tier relocation operation is output as a value from `0` to `99`. • When the value of the `tierOperationStatus` attribute is `RLC` or `RLM`: Progress rate of relocation (being run). • When the value of the `tierOperationStatus` attribute is `STP` or `MON`: Progress rate of relocation (being suspended). When tier relocation is not run or tier relocation is complete, `100` is output. ▪ bufferRate (int) Buffer area rate for relocation
duplicationLdevIds	int[]	LDEV numbers of the deduplication system data volumes
duplicationNumber	int	Number of deduplication system data volumes
dataReductionAccelerateCompCapacity	long	Size (in blocks) of data reduction through the capacity saving function or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionCapacity	long	Size (in blocks) of data reduction through the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.

Attribute	Type	Description
dataReductionBeforeCapacity	long	Size (in blocks) of data before data reduction was performed by using the capacity saving function (compression and deduplication)
dataReductionAccelerateCompRate	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionRate	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionAccelerateCompIncludingSystemData	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) or the accelerated compression function are displayed.

Attribute	Type	Description
		These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long) Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int) Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.
dataReductionIncludingSystemData	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) are displayed.

Attribute	Type	Description
		These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long) Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int) Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.

Attribute	Type	Description
capacitiesExcludingSystemData	object	Attributes related to the capacity saving achieved by using the capacity saving function are displayed. ▪ usedVirtualVolumeCapacity (long) The capacity (in blocks) used by virtual volumes This does not include the capacity used by the system data volume for the dedupe function. ▪ compressedCapacity (long) The size (in blocks) of data reduced by using compression This does not include the size of metadata and garbage data generated by the storage system. ▪ dedupedCapacity (long) The size (in blocks) of data reduced by using deduplication This does not include the size of metadata and garbage data generated by the storage system. ▪ reclaimedCapacity (long) The size (in blocks) of data reduced by reclaiming the specified data pattern This does not include the size of metadata and garbage data generated by the storage system. ▪ systemDataCapacity (long) The size (in blocks) of system data reduced This includes the size of metadata and garbage data generated by the storage system.

Attribute	Type	Description
		▪ preUsedCapacity (long) The size (in blocks) of the data before data reduction was performed ▪ preCompressedCapacity (long) The size (in blocks) of the data before compression was performed ▪ preDedupredCapacity (long) The size (in blocks) of the data before dedupe was performed
compressionRate	int	Percentage (%) of data on which data reduction has been performed by using the compression function or the accelerated compression function
duplicationRate	int	Percentage (%) of data on which data reduction has been performed by using the deduplication function
isMainframe	boolean	Displays a pool for the mainframe or the open system ▪ `true`: Pool for the mainframe volume ▪ `false`: Pool for the open volume

The following is an example of the output generated when getting Thin Image pool information:


```
{
  "data": [
    {
      "poolId": 6,
      "poolStatus": "POLN",
      "usedCapacityRate": 1,
      "snapshotCount": 1,
      "poolName": "pool_for_snapshot_data",
      "availableVolumeCapacity": 5922,
      "totalPoolCapacity": 6006,
      "numOfLdevs": 1,
```

```
      "firstLdevId": 35,
      "warningThreshold": 80,
      "virtualVolumeCapacityRate": -1,
      "isMainframe": false,
      "isShrinking": false,
      "poolType": "HTI"
    }
  ]
}
```


For a Thin Image pool:

Attribute	Type	Description
poolId	int	Object ID for the pool
poolName	string	Pool name
poolType	string	Pool type is output. `HTI`: Thin Image pool
poolStatus	string	One of the following is output as the pool status: ▪ `POLN`: Normal (Pool Normal) ▪ `POLF`: The pool is in the overflow status exceeding the threshold. (Pool Full) ▪ `POLS`: The pool is in the overflow status exceeding the threshold and is suspended. (Pool Suspend) ▪ `POLE`: The pool is suspended in the failure status. (Pool failure) If the pool status is `POLE`, pool information cannot be obtained.
usedCapacityRate	int	Usage rate of the pool (%) The usage rate of logical capacity (%) is output.
usedPhysicalCapacityRate	int	Usage rate of physical capacity (%) This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
snapshotCount	int	Number of volumes in the pool

Attribute	Type	Description
availableVolumeCapacity	long	The capacity that can be used for volume data (MB) The free logical capacity (MB) is output.
availablePhysicalVolumeCapacity	long	Free physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
totalPoolCapacity	long	Total capacity of the pool (MB) The total logical capacity (MB) is output.
totalPhysicalCapacity	long	Total physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
numOfLdevs	int	Number of LDEVs in the pool
firstLdevId	int	The first LDEV number of the LDEVs in the pool (Not the first number in ascending order)
warningThreshold	int	The warning threshold set for the pool
virtualVolumeCapacityRate	int	`-1` indicating the invalid value is output.
isShrinking	boolean	Whether the pool is shrinking or rebalancing is output. ▪ `true`: The pool is shrinking or rebalancing. ▪ `false`: The pool is not shrinking or rebalancing.

Attribute	Type	Description
isMainframe	boolean	Displays a pool for the mainframe or the open system ▪ `true`: Pool for the mainframe volume ▪ `false`: Pool for the open volume
capacitiesExcludingSystemData	object	Attributes related to the saving efficiency for consumption of capacity are displayed. ▪ usedVirtualVolumeCapacity (long) The capacity (in blocks) used by virtual volumes This does not include the capacity used by the system data volume used for the dedupe function.

The following example shows the output when the detailed information for accelerated compression is obtained:


```
{
  "data": [
    {
      "poolId": 6,
      "poolStatus": "POLN",
      "usedCapacityRate": 6,
      "usedPhysicalCapacityRate": 6,
      "poolName": "rest-test1",
      "availableVolumeCapacity": 91392,
      "availablePhysicalVolumeCapacity": 98196,
      "usedPhysicalCapacity": 6804,
      "totalPoolCapacity": 98196,
      "totalPhysicalCapacity": 91392,
      ...
      ...
      "availablePhysicalFMCPoolVolumesCapacity": 98196,
      "usedPhysicalFMCPoolVolumesCapacity": 6502,
      "availableFMCPoolVolumesCapacity": 98196,
      "usedFMCPoolVolumesCapacity": 6804,
      "fmcPoolVolumesCapacitySaving": 301,
      "fmcPoolVolumesCapacitySavingRate": 4,
      "fmcPoolVolumesCapacityExpansionRate": 100
    }
  ]
}
```

When the detailed information for accelerated compression is obtained:

When the drive type of the pool volumes that make up the pool is `SSD(FMC)`, if you specify `FMC` for the `detailInfoType` query parameter and then run the request, the following additional information is obtained.

Attribute	Type	Description
totalPhysicalCapacity	long	Total physical capacity (MB) The total pool capacity reserved for writing is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.
usedPhysicalCapacity	long	Total physical capacity usage (MB) When the pool contains pool volumes for which the accelerated compression function is enabled, the compressed data is included in the total usage.
usedPhysicalCapacityRate	int	Usage rate of physical capacity (%) The percentage (%) that `usedPhysicalCapacity` occupies of `totalPhysicalCapacity` is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.
availablePhysicalVolumeCapacity	long	Free physical capacity (MB) The capacity obtained by deducting `usedPhysicalCapacity` from `totalPhysicalCapacity` is output. This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500.

Attribute	Type	Description
availablePhysicalFMCPoolVolumesCapacity	long	Total available physical capacity of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the total capacity reserved for writing in pool volumes that belong to a parity group and that support the accelerated compression function.
usedPhysicalFMCPoolVolumesCapacity	long	Physical capacity usage of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the used capacity after compression of the pool volumes that belong to a parity group and that support the accelerated compression function.
usedFMCLogicalPoolVolumesCapacity	long	Logical capacity usage of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the used capacity before compression of the pool volumes that belong to a parity group and that support the accelerated compression function. This attribute is displayed for storage systems VSP 5000 series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
availableFMCPoolVolumesCapacity	long	Total capacity of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the total capacity of the pool volumes that belong to a parity group and that support the accelerated compression function.

Attribute	Type	Description
usedFMCPoolVolumesCapacity	long	Capacity usage of pool volumes that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the used capacity of the pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacitySaving	long	Amount of data reduction in the capacity of pool volumes and that support the accelerated compression function (MB) From among the volumes making up a pool, this outputs the capacity reduced by compression of data in pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacitySavingRate	int	Rate of data reduction in the capacity of pool volumes that support the accelerated compression function (%) From among the volumes making up a pool, this outputs the percentage (%) that `fmcPoolVolumesCapacitySaving` occupies of `usedFMCPoolVolumesCapacity` with regard to pool volumes that belong to a parity group and that support the accelerated compression function.
fmcPoolVolumesCapacityExpansionRate	int	Rate of capacity expansion of pool volumes that support the accelerated compression function (%)

Attribute	Type	Description
		This outputs the percentage (%) that `availableFMCPoolVolumesCapacity` occupies of `availablePhysicalFMCPoolVolumesCapacity`.

The following example shows the output when detailed information is obtained about the total efficiency.


```
{
  "data" : [ {
    "poolId" : 32,
    "poolStatus" : "POLN",
    "usedCapacityRate" : 49,
    "usedPhysicalCapacityRate" : 49,
    "snapshotCount" : 0,
    "poolName" : "pool_32",
    "availableVolumeCapacity" : 8190,
    "availablePhysicalVolumeCapacity" : 8190,
    "totalPoolCapacity" : 16254,
    "totalPhysicalCapacity" : 16254,
    "numOfLdevs" : 1,
    "firstLdevId" : 2229,
    "warningThreshold" : 70,
    "depletionThreshold" : 80,
    "virtualVolumeCapacityRate" : -1,
    "isMainframe" : false,
    "isShrinking" : false,
    "locatedVolumeCount" : 11,
    "totalLocatedCapacity" : 67173456,
    "blockingMode" : "NB",
    "totalReservedCapacity" : 0,
    "reservedVolumeCount" : 0,
    "poolType" : "HDP",
    "duplicationLdevIds" : [ 49098, 49097, 49096, 49095, 49094, 49093, 49092,
49091 ],
    "duplicationNumber" : 8,
    "dataReductionAccelerateCompCapacity" : 17174250,
    "dataReductionCapacity" : 17174250,
    "dataReductionBeforeCapacity" : 17175552,
    "dataReductionAccelerateCompRate" : 89,
    "duplicationRate" : 5,
    "compressionRate" : 84,
    "dataReductionRate" : 99,
    "dataReductionAccelerateCompIncludingSystemData" : {
      "isReductionCapacityAvailable" : true,
      "reductionCapacity" : 2580480,
      "isReductionRateAvailable" : true,
      "reductionRate" : 13
    },
    "dataReductionIncludingSystemData" : {
      "isReductionCapacityAvailable" : true,
      "reductionCapacity" : 2580480,
      "isReductionRateAvailable" : true,
      "reductionRate" : 14
```

```
    },
    "snapshotUsedCapacity" : 0,
    "suspendSnapshot" : true,
    "efficiency" : {
      "isCalculated" : true,
      "totalRatio" : "112.52",
      "compressionRatio" : "17.07",
      "snapshotRatio" : "-",
      "provisioningRate" : "84",
      "calculationStartTime" : "2016-07-31T20:32:47Z",
      "calculationEndTime" : "2016-07-31T20:41:09Z",
      "dedupeAndCompression" : {
        "totalRatio" : "18.47",
        "compressionRatio" : "8.61",
        "dedupeRatio" : "2.03",
        "reclaimRatio" : "1.05"
      },
      "acceleratedCompression" : {
        "totalRatio" : "1.00",
        "compressionRatio" : "1.00",
        "reclaimRatio" : "1.00"
      }
    },
    "capacitiesExcludingSystemData" : {
      "usedVirtualVolumeCapacity" : 19095552,
      "compressedCapacity" : 15975441,
      "dedupedCapacity" : 1064681,
      "reclaimedCapacity" : 1021936,
      "systemDataCapacity" : 15481578,
      "preUsedCapacity" : 18063360,
      "preCompressedCapacity" : 17041424,
      "preDedupredCapacity" : 1064982
    }
  } ]
}
```


When detailed information is obtained about the total efficiency

If you run the request with `efficiency` specified for the query parameter `detailInfoType`, the following information is obtained.

Attribute	Type	Description
efficiency	object	Attributes related to the total efficiency are displayed. Calculated results for the period from `calculationStartTime` to `calculationEndTime` are obtained.

Attribute	Type	Description
		Only When `true` is specified for the attribute `isCalculated`, other subordinate attributes are also obtained. If the pool volume for which the calculation is to be performed does not exist, a hyphen (`-`) indicating an invalid value is displayed for these attributes. If the calculation cannot be performed for the pool because the pool is blocked or some other reason, the value from the previous calculation is displayed. For the attributes that display the total efficiency or the efficiency of capacity saving, these results are displayed as a ratio of the size of data before reduction to the size of data after reduction, where the size of data after reduction is 1. ▪ isCalculated (boolean) Calculation status of the total efficiency This attribute indicates whether the total efficiency has been calculated. • `true`: The values have been calculated. • `false`: The values have not been calculated. ▪ calculationStartTime (ISO8601string) The date and time when the calculation of the total efficiency began (UTC) Displayed in the following format: YYYY-MM-DDThh:mm:ssZ ▪ calculationEndTime (ISO8601string) The date and time when the calculation of the total efficiency ended (UTC) Displayed in the following format: YYYY-MM-DDThh:mm:ssZ ▪ totalRatio (string) The total efficiency of the entire pool This does not include the size of metadata, garbage data, and other similar data generated by the storage system. After a volume is created from pool and before data is written to the volume, the maximum value (92233720368547758.07) is displayed.

Attribute	Type	Description
		▪ compressionRatio (string) The efficiency of capacity saving performed by using the capacity saving function or accelerated compression This does not include the size of metadata, garbage data, and other similar data generated by the storage system. ▪ snapshotRatio (string) The efficiency of capacity saving performed by using snapshots to back up data This does not include the size of metadata, garbage data, and other similar data generated by the storage system. ▪ provisioningRate (string) The percentage (%) of the saving efficiency for consumption of capacity achieved by using Dynamic Provisioning to virtualize capacity This does not include the size of metadata, garbage data, and other similar data generated by the storage system.

Attribute	Type	Description
		▪ dedupeAndCompression (object) Attributes related to the efficiency of capacity saving performed by using the capacity saving function are displayed. This does not include the size of metadata, garbage data, and other similar data generated by the storage system. • totalRatio (string) total efficiency of capacity saving performed by using the capacity saving function • compressionRatio (string) Efficiency of capacity saving performed by using compression • dedupeRatio (string) Efficiency of capacity saving performed by using deduplication • reclaimRatio (string) Efficiency of capacity saving performed by reclaiming the specified data pattern ▪ acceleratedCompression (object) Attributes related to the efficiency of capacity saving performed by using accelerated compression are displayed. This does not include the size of metadata, garbage data, and other similar data generated by the storage system. • totalRatio (string) total efficiency of capacity saving performed by using accelerated compression • compressionRatio (string) Efficiency of capacity saving performed by using compression • reclaimRatio (string) Efficiency of capacity saving performed by reclaiming the specified data pattern

When detailed information is obtained about the formatted capacity of the pool

If you run the request with `formattedCapacity` specified for the query parameter `detailInfoType`, the following information is obtained.

Attribute	Type	Description
formattedCapacity	long	The formatted capacity of the pool (MB) is displayed. If the information cannot be obtained, `-1` is displayed, indicating an invalid value.

When additional detailed information is obtained from the storage system's cache

If you run this request with `class` specified for `detailInfoType` in the query parameters, the following information is obtained.

Immediately after an HDT pool is created, the information under the `tiers` attribute (shown in the following table) might not be output. In this case, wait a while and then run this request again. Alternatively, run the API request that updating the cache of storage system configuration information, and then run this request again.

Attribute	Type	Description
usedPhysicalCapacity	long	Used physical capacity (MB) This information is output for DP pools.
totalPhysicalCapacity	long	Total physical capacity (MB) This information is output for DP pools. For DP pools made up of FMC pool volumes, the total pool capacity reserved for writing is output. For VSP 5000 series storage systems, or VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems in a configuration that is linked to an SVP, this attribute is displayed even if `class` is not specified.

Attribute	Type	Description
tiers	objec t[]	The following attributes related to the tiers of an HDT pool are output for each tier. ▪ raidLevel (string) RAID level • `RAID1` • `RAID5` • `RAID6` • `Unknown` `Unknown` is output if the RAID level is unknown or multiple RAID levels are being used. ▪ raidType (string) The combination of data drives and parity drives in a RAID configuration • `2D+2D` • `3D+1P` • `4D+1P` • `6D+1P` • `6D+2P` • `7D+1P` • `12D+2P` • `14D+2P` • `Unknown` If any of the following apply, `Unknown` is output. • The combination of data drives and parity drives is unknown. • Multiple combinations of data drives and parity drives are being used. • Multiple RAID levels are being used.

Attribute	Type	Description
		▪ driveSpeed (int) Drive speed (rpm) If any of the following apply, `-1` is output: • The combination of data drives and parity drives is unknown. • Multiple combinations of data drives and parity drives are being used. • Multiple RAID levels are being used. This information is not output if `driveTypeName` is `SSD` or SCM. ▪ driveTypeName (string) Drive types: • `SATA` • `SAS` • `SSD` • `SCM` • `Unknown` If any of the following apply, `Unknown` is output: • Multiple drive types are being used. • Multiple drives with different speeds are being used. ▪ substance (string) Types of volumes that make up a tier: • `Internal`: Internal volume • `External`: External volume • `Unknown`: Unknown or a combination of internal and external volumes
hasBlockedPoolVolume	boolean	Whether a blocked pool volume exists This information is output for DP pools, Thin Image pools. ▪ `true`: A blocked pool volume exists ▪ `false`: A blocked pool volume does not exist.

Attribute	Type	Description
usedLocatedCapacityRate	int	Subscription rate of virtual volumes relative to the pool capacity (%) This information is output for DP pools. The ratio of the sum of DP volume capacities to the DP pool capacity is output. The value is rounded down after the decimal point.
relocationInterval	int	Execution interval for performance monitoring and tier relocation This information is output for HDT pools. ▪ `0`: 30 minutes ▪ `1`: 1 hour ▪ `2`: 2 hours ▪ `4`: 4 hours ▪ `8`: 8 hours ▪ `24`: 24 hours
monitoringStartTime	string	Start time for performance monitoring This information is output for HDT pools. If `relocationInterval` is anything other than `24`, a hyphen (`-`) is output, indicating an invalid value.
monitoringEndTime	string	End time for performance monitoring This information is output for HDT pools. If `relocationInterval` is anything other than `24`, a hyphen (`-`) is output, indicating an invalid value.
isExternalMixCompatibleEnabled	boolean	Whether a pool can be configured by using a combination of internal volumes and external volumes This information is output for DP pools. ▪ `true`: The pool can be configured by using a combination of internal and external volumes. ▪ `false`: The pool cannot be configured by using a combination of internal and external volumes.

Attribute	Type	Description
lastMonitoringStartTime	string	Date and time when performance monitoring started This information is output for HDT pools. This information is output in the format `YYYY-MM-DDThh:mm:ss`. The local time of the storage system is output. If the value is invalid, a hyphen (`-`) is output.
lastMonitoringEndTime	string	Date and time when performance monitoring ended This information is output for HDT pools. This information is output in the format `YYYY-MM-DDThh:mm:ss`. The local time of the storage system is output. If the value is invalid, a hyphen (`-`) is output.
relocationSpeed	string	The speed at which tiers are relocated This information is output for HDT pools. ▪ `Slowest`: Slowest ▪ `Slow`: Slow ▪ `Normal`: Normal ▪ `Fast`: Fast ▪ `Fastest`: Fastest
protectsLocatedVolumeOnFullPool	boolean	Whether DP volumes are protected when I/O to a DP volume fails because the pool has been depleted This information is output for DP pools. This attribute is displayed for storage systems VSP 5000 series, VSP G1000, VSP G1500, VSP F1500. ▪ `true`: Protected ▪ `false`: Not protected
protectsLocatedVolumeOnBlockedPoolVolume	boolean	Whether DP volumes are protected when I/O to a DP volume fails because the pool is blocked This information is output for DP pools.

Attribute	Type	Description
		This attribute is displayed for storage systems VSP 5000 series, VSP G1000, VSP G1500, VSP F1500. ▪ `true`: Protected ▪ `false`: Not protected
isDeduplicationEnabled	boolean	Whether deduplication is enabled for the pool This information is output for DP pools. ▪ `true`: Enabled ▪ `false`: Disabled

When detailed information is obtained on whether a pool volume is added automatically:

If you run the request with `autoAddPoolVol` specified for the query parameter `detailInfoType`, the following information is obtained.

Attribute	Type	Description
autoAddPoolVol	string	Displays information on whether a pool volume is added automatically, depending on the compression rate of the parity group for which accelerated compression is enabled. ▪ `Enabled`: Added automatically ▪ `Disabled`: Not added automatically ▪ `Not Supported`: Not valid for this pool

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

When getting information about all pools:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools
```

When getting information about DP pools:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools?
poolType=DP
```

Getting information about a specific pool

The following request gets information about a specific pool by specifying the pool number.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/pools/object-ID
```

Request message

Object ID

Specify the `poolId` value obtained by getting information about the pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output generated when getting HDP pool information:

```
{
    "poolId": 5,
    "poolStatus": "POLN",
    "usedCapacityRate": 1,
    "usedPhysicalCapacityRate": 1,
```

```
    "snapshotCount": 0,
    "poolName": "Pool_5",
    "availableVolumeCapacity": 32042850,
    "availablePhysicalVolumeCapacity": 20006364,
    "effectiveCapacity": 32066496,
    "totalPoolCapacity": 32066496,
    "totalPhysicalCapacity": 20009724,
    "numOfLdevs": 11,
    "firstLdevId": 2304,
    "warningThreshold": 70,
    "depletionThreshold": 80,
    "virtualVolumeCapacityRate": -1,
    "isMainframe": false,
    "isShrinking": false,
    "locatedVolumeCount": 13,
    "totalLocatedCapacity": 79951368,
    "blockingMode": "NB",
    "totalReservedCapacity": 0,
    "reservedVolumeCount": 0,
    "poolType": "HDP",
    "duplicationLdevIds": [
        65269,
        65268,
        65267,
        65266,
        65265,
        65264,
        65263,
        65262
    ],
    "duplicationNumber": 8,
    "dataReductionAccelerateCompCapacity": 206783585,
    "dataReductionCapacity": 205901472,
    "dataReductionBeforeCapacity": 210117216,
    "dataReductionAccelerateCompRate": 87,
    "duplicationRate": 42,
    "compressionRate": 44,
    "dataReductionRate": 97,
    "dataReductionAccelerateCompIncludingSystemData": {
        "isReductionCapacityAvailable": true,
        "reductionCapacity": 228372480,
        "isReductionRateAvailable": true,
        "reductionRate": 97
    },
    "dataReductionIncludingSystemData": {
        "isReductionCapacityAvailable": true,
        "reductionCapacity": 186826752,
        "isReductionRateAvailable": true,
        "reductionRate": 79
```

```
    },
    "snapshotUsedCapacity": 0,
    "suspendSnapshot": true
}
```

For a DP pool:

Attribute	Type	Description
poolId	int	Pool number
poolName	string	Pool name
poolType	string	Pool type ▪ `HDP`: HDP pool ▪ `HDT`: HDT pool ▪ `RT`: active flash pool ▪ `DM`: Data Direct Mapping HDP pool
poolStatus	string	One of the following is output as the pool status: ▪ `POLN`: Normal (Pool Normal) ▪ `POLF`: The pool is in the overflow status exceeding the threshold. (Pool Full) ▪ `POLS`: The pool is in the overflow status exceeding the threshold and is suspended. (Pool Suspend) ▪ `POLE`: The pool is suspended in the failure status. (Pool failure) If the pool status is `POLE`, pool information cannot be obtained.
usedCapacityRate	int	Usage rate of the pool (%) The usage rate of logical capacity (%) is output. For VSP One B20, this indicates the usage rate of the effective capacity (%).
usedPhysicalCapacityRate	int	Usage rate of physical capacity (%)

Attribute	Type	Description
		This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
availableVolumeCapacity	long	The capacity that can be used for volume data (MB) The free logical capacity (MB) is output.
availablePhysicalVolumeCapacity	long	Free physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
effectiveCapacity	long	Effective capacity of the pool (MB) The effective capacity of the logical capacity (MB) is output. This attribute is displayed for storage systems VSP One B20.
totalPoolCapacity	long	Total capacity of the pool (MB) The total logical capacity (MB) is output. For VSP One B20, part of the logical capacity might not be effective when you edit the parity group for DDP in storage management software such as CCI. For information about the effective capacity of the logical capacity, see the value of the `effectiveCapacity` attribute.
totalPhysicalCapacity	long	Total physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes.

Attribute	Type	Description
		This attribute is displayed for storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
numOfLdevs	int	Number of LDEVs in the pool
firstLdevId	int	The first LDEV number of the LDEVs in the pool
warningThreshold	int	The warning threshold set for the pool
depletionThreshold	int	The depletion threshold set for the pool
suspendSnapshot#	boolean	Whether to suspend Thin Image pairs when the depletion threshold is exceeded ▪ `true`: Thin Image pairs are suspended when the depletion threshold is exceeded. ▪ `false`: Thin Image pairs are not suspended when the depletion threshold is exceeded.
virtualVolumeCapacityRate	int	The maximum subscription limit of a virtual volume relative to pool capacity If unlimited is set, `-1` is output. For the following storage system models, `-1` is output to indicate an invalid value: VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
isShrinking	boolean	Whether the pool is shrinking or rebalancing is output. ▪ `true`: The pool is shrinking or rebalancing. ▪ `false`: The pool is not shrinking or rebalancing.
locatedVolumeCount	int	Total number of DP volumes mapped to the pool

Attribute	Type	Description
totalLocatedCapacity	long	Total capacity of the DP volumes mapped to the pool (MB) The value of this attribute does not include the control area.
snapshotCount#	int	Total number of snapshot data items mapped to the pool
snapshotUsedCapacity#	long	Total size of snapshot data mapped to the pool (MB)
blockingMode	string	Setting the protection function for a virtual volume When the DP pool is full or when the DP pool volume is blocked, whether the read and write operations can be performed for the DP volume that uses the target DP pool is output. ▪ `PF`: Pool Full If the DP pool is full, read and write operations are not possible. If the DP pool volume is blocked, read and write operations are possible. ▪ `PB`: Pool vol Blockade If the DP pool volume is blocked, read and write operations are not possible. If the DP pool is full, read and write operations are possible.

Attribute	Type	Description
		▪ `FB`: Full or Blockade If the DP pool is full or the DP pool volume is blocked, read and write operations are not possible. ▪ `NB`: No Blocking Even if the DP pool is full or the DP pool volume is blocked, read and write operations are possible for the target DP volume.
totalReservedCapacity	long	Total capacity of the reserved page (MB) of the DP volume that is related to the DP pool If the Full Allocation functionality is not supported by the configuration, this attribute is not output.
reservedVolumeCount	int	Number of volumes associated with the DP pool for which the page reservation setting is enabled If the Full Allocation functionality is not supported by the configuration, this attribute is not output.
poolActionMode	string	Execution mode for the pool ▪ `DEF`: The mode in which the monitor is started or stopped by instructions from the REST API server, and the Tier range is specified by automatic calculation of the DKC. ▪ `AUT`: The mode in which the monitor is started or stopped at the specified time, and the Tier range is specified by automatic calculation of the DKC (specified by using Storage Navigator or other storage management software).

Attribute	Type	Description
monitoringMode	string	Performance monitoring execution mode (monitor mode) ▪ `PM`: Period mode ▪ `CM`: Continuous mode
tierOperationStatus	string	Operation status of performance monitoring and tier relocation is output. ▪ `STP`: Performance monitoring and tier relocation are both stopped. ▪ `RLC`: Performance monitoring is stopped and tier relocation is operating. ▪ `MON`: Performance monitoring is operating and tier relocation is stopped. ▪ `RLM`: Performance monitoring and tier relocation are both operating.
dat	string	Status of monitor information ▪ `VAL`: Valid ▪ `INV`: Invalid ▪ `PND`: Pending calculation
tiers	object[]	The following attributes about HDT pool tiers are output for each tier. ▪ tierNumber (int) Tier number ▪ tierLevelRange (string) Lower limit of the tier The value is output as the number of I/O operations per hour (IOPH).

Attribute	Type	Description
		▪ tierDeltaRange (string) Delta value for the tier The value is output as the number of I/O operations per hour (IOPH). ▪ tierUsedCapacity (long) Amount used by the tier (MB) ▪ tierTotalCapacity (long) Total capacity of the tier (MB) ▪ tablespaceRate (int) Rate of free space to be used for new allocation ▪ performanceRate (int) Performance utilization ▪ progressOfReplacing (int) Relocation progress rate The progress rate of the following tier relocation operation is output as a value from `0` to `99`. • When the value of the `tierOperationStatus` attribute is `RLC` or `RLM`: Progress rate of relocation (being run). • When the value of the `tierOperationStatus` attribute is `STP` or `MON`: Progress rate of relocation (being suspended). When tier relocation is not run or tier relocation is complete, `100` is output. ▪ bufferRate (int) Buffer area rate for relocation
duplicationLdevIds#	int[]	LDEV numbers of the deduplication system data volumes

Attribute	Type	Description
duplicationNumber#	int	Number of deduplication system data volumes
dataReductionAccelerateCompCapacity#	long	Size (in blocks) of data reduction through the capacity saving function or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionCapacity#	long	Size (in blocks) of data reduction through the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionBeforeCapacity#	long	Size (in blocks) of data before data reduction was performed by using the capacity saving function (compression and deduplication)
dataReductionAccelerateCompRate#	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) or the accelerated compression function The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.
dataReductionRate#	int	Percentage (%) of data on which data reduction has been performed by using the capacity saving function (compression and deduplication) The size of data after reduction does not include the size of metadata and garbage data generated by the storage system.

Attribute	Type	Description
dataReductionAccelerateCompIncludingSystemData#	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) or the accelerated compression function are displayed. These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long) Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int) Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.
dataReductionIncludingSystemData#	object	The attributes related to the size of data reduced by using the capacity saving function (compression and deduplication) are displayed.

Attribute	Type	Description
		These attributes are calculated based on the size of the data (which includes, in addition to user data, metadata and garbage data generated by the storage system) after data reduction is performed. ▪ isReductionCapacityAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the size of the data that has been reduced is displayed for the `reductionCapacity` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionCapacity (long) Size (in blocks) of the data that was reduced This attribute is displayed when the value of the `isReductionCapacityAvailable` attribute is `true`.

Attribute	Type	Description
		▪ isReductionRateAvailable (boolean) Whether the size of the data can be reduced • `true`: The size of the data can be reduced. If the value of this attribute is `true`, the percentage by which the size of the data has been reduced is displayed for the `reductionRate` attribute. • `false`: The size of the data cannot be reduced (for example, if the size of the data after data reduction is greater than the size of the data before data reduction). ▪ reductionRate (int) Percentage (%) by which the size of the data has been reduced This attribute is displayed when the value of the `isReductionRateAvailable` attribute is `true`.
compressionRate#	int	Percentage (%) of data on which data reduction has been performed by using the compression function or the accelerated compression function
duplicationRate#	int	Percentage (%) of data on which data reduction has been performed by using the deduplication function

Attribute	Type	Description
isMainframe	boolean	Displays a pool for the mainframe or the open system ▪ `true`: Pool for the mainframe volume ▪ `false`: Pool for the open volume

#: These attributes and those under objects are displayed when the pool type is HDP.

The following is an example of the output generated when getting Thin Image pool information:

```
{
  "poolId": 6,
  "poolStatus": "POLN",
  "usedCapacityRate": 1,
  "snapshotCount": 1,
  "poolName": "pool_for_snapshot_data",
  "availableVolumeCapacity": 5922,
  "totalPoolCapacity": 6006,
  "numOfLdevs": 1,
  "firstLdevId": 35,
  "warningThreshold": 80,
  "virtualVolumeCapacityRate": -1,
  "isMainframe": false,
  "isShrinking": false,
  "poolType": "HTI"
}
```

For a Thin Image pool:

Attribute	Type	Description
poolId	int	Pool number
poolName	string	Pool name
poolType	string	Pool type is output. `HTI`: Thin Image pool

Attribute	Type	Description
poolStatus	string	One of the following is output as the pool status: ▪ `POLN`: Normal (Pool Normal) ▪ `POLF`: The pool is in the overflow status exceeding the threshold. (Pool Full) ▪ `POLS`: The pool is in the overflow status exceeding the threshold and is suspended. (Pool Suspend) ▪ `POLE`: The pool is suspended in the failure status. (Pool failure) If the pool status is `POLE`, pool information cannot be obtained.
usedCapacityRate	int	Usage rate of the pool (%) The usage rate of logical capacity (%) is output.
usedPhysicalCapacityRate	int	Usage rate of physical capacity (%) This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
snapshotCount	int	Number of volumes in the pool
availableVolumeCapacity	long	The capacity in the pool that can be used for volume data (MB) The free logical capacity (MB) is output.
availablePhysicalVolumeCapacity	long	Free physical capacity (MB) For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
totalPoolCapacity	long	Total capacity of the pool (MB) The total logical capacity (MB) is output.
totalPhysicalCapacity	long	Total physical capacity (MB)

Attribute	Type	Description
		For this attribute, 1 MB is equal to $1{,}024^2$ bytes. This attribute is displayed for storage systems VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
numOfLdevs	int	Number of LDEVs in the pool
firstLdevId	int	The first LDEV number of the LDEVs in the pool (Not the first number in ascending order)
warningThreshold	int	The warning threshold set for the pool
virtualVolumeCapacityRate	int	`-1` indicating the invalid value is output.
isShrinking	boolean	Whether the pool is shrinking or rebalancing is output. ▪ `true`: The pool is shrinking or rebalancing. ▪ `false`: The pool is not shrinking or rebalancing.
isMainframe	boolean	Displays a pool for the mainframe or the open system ▪ `true`: Pool for the mainframe volume ▪ `false`: Pool for the open volume

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/pools/18
```

Creating a pool

The following request creates pools by specifying the LDEV. In the REST API, you can create DP pools and Thin Image pools (that not used for Thin Image Advanced). You can specify LDEVs by specifying LDEV numbers or a range of consecutive LDEV numbers.

Note:

In the case of VSP One B20, you cannot use this API request to create pools from a parity group for DDP.

Tip: If you want to store snapshot data in an HDP pool instead of a Thin Image pool, specify `HDP` for the `poolType` attribute when you create the pool.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/pools
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example creates an HDP pool by specifying the LDEV number:

```
{
  "poolId": 76,
  "poolName": "pool_for_email_server",
  "ldevIds": [405],
  "poolType": "HDP",
  "duplicationLdevIds": [406]
}
```

The following coding example creates an HDP pool by specifying a range of consecutive LDEV numbers:

```
{
  "poolId": 76,
  "poolName": "pool_for_email_server",
  "startLdevId": 101,
```

```
  "endLdevId": 105,
  "poolType": "HDP"
}
```

When creating a DP pool:

Attribute	Type	Description
poolId	int	(Required) Specify the pool number with a decimal (base 10) number.
poolName	string	(Required) Pool name Specify a character string consisting of 1 to 32 characters.
poolType	string	(Required) Pool type The specifiable values are as follows: ▪ `HDP`: HDP pools ▪ `HDT`: HDT pools
duplicationLdevIds	int[]	(Optional) Specify an unassigned LDEV number of the deduplication system data volume used for the deduplication function. Use a decimal (base 10) number. Specifying this attribute enables the deduplication function. You can specify only one value. You do not need to specify this attribute for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems.
ldevIds	int[]	(Optional) LDEV number Specify a decimal (base 10) number. Make sure to specify this attribute when specifying LDEV numbers. You can specify up to 64 digits. This attribute cannot be specified along with the `startLdevId` and `endLdevId` attribute.
startLdevId	int	(Optional) The first LDEV number in the range of consecutive LDEV numbers, if such a range is specified Make sure to specify this attribute when specifying a range of LDEV numbers.

Attribute	Type	Description
		If you specify this attribute, be sure to also specify the `endLdevId` attribute. The value of this attribute must be smaller than that of `endLdevId`. Specify a number such that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the `ldevIds` attribute.
endLdevId	int	(Optional) The last LDEV number in the range of consecutive LDEV numbers, if such a range is specified Make sure to specify this attribute when specifying a range of LDEV numbers. If you specify this attribute, be sure to also specify the `startLdevId` attribute. The value of this attribute must be greater than that of `startLdevId`. Specify a number such that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the `ldevIds` attribute.
warningThreshold	int	(Optional) Warning threshold (%) Specify a value in the range from `1` to `100`. Specify a value smaller than that of `depletionThreshold`. If this attribute is omitted, `70` is assumed.
depletionThreshold	int	(Optional) Depletion threshold (%) Specify a value in the range from `1` to `100`. Specify a value greater than the value of `warningThreshold`. If this attribute is omitted, `80` is assumed.
suspendSnapshot	boolean	(Optional) Specify whether to suspend Thin Image pairs when the depletion threshold is exceeded. You can specify this attribute if the pool to be created is an HDP pool for storing snapshot data. ▪ `true`: Suspend Thin Image pairs when the depletion threshold is exceeded. ▪ `false`: Do not suspend Thin Image pairs when the depletion threshold is exceeded.

Attribute	Type	Description
		If you specify `HDP` for the `poolType` attribute and omit this attribute, `true` is assumed.

The following coding example creates a Thin Image pool:

```
{
  "poolId":76,
  "poolName":"pool_for_snapshot_copy",
  "ldevIds":[405],
  "poolType": "HTI"
}
```

When creating a Thin Image pool:

Attribute	Type	Description
poolId	int	(Required) Specify the pool number with a decimal (base 10) number.
poolName	string	(Required) Pool name Specify a character string consisting of 1 to 32 characters.
poolType	string	(Required) Pool type `HTI`: Thin Image pools
ldevIds	int[]	(Optional) LDEV number Specify a decimal (base 10) number. Make sure to specify this attribute when specifying LDEV numbers. You can specify up to 64 digits. This attribute cannot be specified along with the `startLdevId` and `endLdevId` attribute.
startLdevId	int	(Optional) First LDEV number when specifying a range of consecutive LDEV numbers. Make sure to specify this attribute when specifying a range of LDEV numbers. If you specify this attribute, be sure to also specify the `endLdevId` attribute. The value of this attribute must be smaller than that of `endLdevId`.

Attribute	Type	Description
		Specify a number such that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the ldevIds attribute.
endLdevId	int	(Optional) Last LDEV number when specifying a range of consecutive LDEV numbers. Make sure to specify this attribute when specifying a range of LDEV numbers. If you specify this attribute, be sure to also specify the `startLdevId` attribute. The value of this attribute must be greater than that of `startLdevId`. Specify a number such that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the `ldevIds` attribute.
warningThreshold	int	(Optional) Warning threshold (%) Specify a value in the range from `20` to `95`. If this attribute is omitted, `80` is assumed.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created pool

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
409	Conflict	A pool of the specified pool number has already been created.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools
```

Changing pool settings

The following request changes the pool name, pool type, attributes related to an HDT pool tier, and other settings.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `poolId` that was obtained by the processing to get information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

The following coding example changes the warning threshold and depletion threshold of a DP pool, and the subscription limit for virtual volumes with respect to pool capacity:

```
{
  "warningThreshold": 75,
  "depletionThreshold": 85,
  "virtualVolumeCapacityRate": 600
}
```

The following coding example sets the attributes related to a specific tier of an HDT pool:

```
{
  "tier": {
    "tierNumber": 1,
    "tablespaceRate": 30,
    "bufferRate": 30
  }
}
```

The following coding example enables the deduplication function by specifying the LDEV number of a deduplication system data volume:

```
{
  "duplicationLdevIds": [406]
}
```

Attribute	Type	Description
poolName	string	(Optional) Pool name Specify the pool name by using 1 to 32 characters.
poolType	string	(Optional) Changes the pool type

Attribute	Type	Description
		You can specify the following values: ▪ `HDP`: Changes to an HDP pool You cannot specify this value for pools for active flash. ▪ `HDT`: Changes to an HDT pool You cannot specify this value for HDP pools for which Thin Image pairs have been created. ▪ `RT`: Changes to a pool for active flash You cannot specify this value for HDP pools. You cannot specify this attribute for Thin Image pools or for data direct mapping HDP pools.
duplicationLdevIds	int[]	(Optional) LDEV number of the deduplication system data volume You can use this attribute for VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500. ▪ To enable the deduplication function : Specify an unassigned LDEV number by using a decimal (base 10) number. You can specify only one value. ▪ To disable the deduplication function: Specify `-1`.
warningThreshold	int	(Optional) New warning threshold (%) Depending on the pool type, specify the following values: ▪ For DP pools: `1` to `100` Specify this attribute together with the `depletionThreshold` attribute. ▪ For Thin Image pools: `20` to `95` You cannot specify this value for data direct mapping HDP pools.
depletionThreshold	int	(Optional) New depletion threshold (%) Specify a value in the range from `1` to `100`. For DP pools, specify this attribute together with the `warningThreshold` attribute.

Attribute	Type	Description
		You cannot specify this value for Thin Image pools or for data direct mapping HDP pools.
suspendSnapshot	boolean	(Optional) Whether to suspend Thin Image pairs when the depletion threshold is exceeded. You can specify this attribute for HDP pools that contain snapshot data. ▪ `true`: Suspend Thin Image pairs when the depletion threshold is exceeded. ▪ `false`: Do not suspend Thin Image pairs when the depletion threshold is exceeded.
virtualVolumeCapacityRate	int	(Optional) The subscription limit of a virtual volume to pool capacity (%) You can use this attribute for VSP 5000 series, VSP E series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500. Specify a value in the range from `0` to `65534`. If you specify `-1`, the subscription limit is unlimited. You cannot specify this value for Thin Image pools.
blockingMode	string	(Optional) Setting the protection function for a virtual volume If a DP pool is full or a DP pool volume is blocked, specify whether it is possible to perform read and write operations for a DP volume that uses the target DP pool. ▪ `PF`: Pool Full If the DP pool is full, read and write operations are not possible. If the DP pool volume is blocked, read and write operations are possible. ▪ `PB`: Pool vol Blockade If the DP pool volume is blocked, read and write operations are not possible. If the DP pool is full, read and write operations are possible.

Attribute	Type	Description
		▪ `FB`: Full or Blockade If the DP pool is full or the DP pool volume is blocked, read and write operations are not possible. ▪ `NB`: No Blocking Even if the DP pool is full or the DP pool volume is blocked, read and write operations are possible for the target DP volume. You cannot specify this value for Thin Image pools.
tier	object	(Optional) HDT pool tier attribute ▪ tierNumber (int) Tier number Specify a number from `1` to `3`. This must be specified if you want to change the `tablespaceRate` attribute or the `bufferRate` attribute. ▪ tablespaceRate (int) Ratio of free space for new tiering (in percentage) Specify a value from `0` to `50`. If you specify this attribute, you must also specify the `tierNumber` attribute. ▪ bufferRate (int) Ratio of buffer areas for reallocation (in percentage) Specify a value from `2` to `40`. If you specify this attribute, you must also specify the `tierNumber` attribute.
monitoringMode	string	(Optional) Execution mode for performance monitoring (monitor mode) If the pool type is HDT, the following values can be specified: ▪ `PM`: Periodic mode (Period Mode) ▪ `CM`: Continuous mode (Continuous Mode)

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the pool whose settings were changed

Action template

None.

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
409	Conflict	The specified pool name already exists.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools/88
```

Expanding a pool

To expand the capacity of a pool, the following request adds LDEVs to the pool.

Note:

In the case of VSP One B20, you cannot use this API request to expand a pool created from a parity group for DDP.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/expand/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `poolId` value obtained by getting information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevIds": [101,102]
  }
}
```

Attribute	Type	Description
ldevIds	int[]	(Optional) Specify the LDEV number with a decimal (base 10) number. You can specify up to 64 numbers. This attribute cannot be specified along with the startLdevId and endLdevId attribute.
startLdevId	int	(Optional) First LDEV number when specifying a range of consecutive LDEV numbers. If you specify this attribute, be sure to also specify the endLdevId attribute. The value of this attribute must be smaller than that of endLdevId. Specify a number such that the range indicated by the startLdevId and endLdevId attributes consists of no more than 64 LDEVs.

Attribute	Type	Description
		This attribute cannot be specified along with the ldevIds attribute.
endLdevId	int	(Optional) Last LDEV number when specifying a range of consecutive LDEVs. If you specify this attribute, be sure to also specify the startLdevId attribute. The value of this attribute must be greater than that of startLdevId. Specify a number such that the range indicated by the startLdevId and endLdevId attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the ldevIds attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the expanded pool

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/expand
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3/
actions/expand
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools/3/actions/expand/invoke
```

Shrinking a pool

The following request removes an LDEV from a pool to decrease the pool capacity. Note that you cannot remove all LDEVs from the pool.

Note:

In the case of VSP One B20, you cannot use this API request to shrink a pool created from a parity group for DDP.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/shrink/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `poolId` that was obtained by the processing to get information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevIds": [101,102]
```

```
  }
}
```

Attribute	Type	Description
ldevIds	int[]	(Optional) Specify the LDEV number with a decimal (base 10) number. You can specify up to 64 numbers. This attribute cannot be specified along with the startLdevId and endLdevId attribute.
startLdevId	int	(Optional) First LDEV number when specifying a range of consecutive LDEV numbers. If you specify this attribute, be sure to also specify the endLdevId attribute. The value of this attribute must be smaller than that of endLdevId. Specify a number such that the range indicated by the startLdevId and endLdevId attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the ldevIds attribute.
endLdevId	int	(Optional) Last LDEV number when specifying a range of consecutive LDEVs. If you specify this attribute, be sure to also specify the startLdevId attribute. The value of this attribute must be greater than that of startLdevId. Specify a number such that the range indicated by the startLdevId and endLdevId attributes consists of no more than 64 LDEVs. This attribute cannot be specified along with the ldevIds attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the shrunk pool

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/shrink
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot be run on the specified pool because there is only one LDEV in the pool.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3/
actions/shrink
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools/3/actions/shrink/invoke
```

Performing performance monitoring of a pool

The following request starts or ends performance monitoring of an HDT pool. By performing performance monitoring, you can collect the I/O performance on each page of a pool as monitoring information to understand the characteristics of the I/O performance on each page allocated to an HDT volume. Perform performance monitoring before tier relocation.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/monitor/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `poolId` value obtained by getting information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

```
{
  "parameters": {
    "operationType": "start"
  }
}
```

Attribute	Type	Description
operationType	string	(Required) Specify the operation of performance monitoring. ▪ `start`: Start performance monitoring. ▪ `stop`: End performance monitoring.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the pool for which performance monitoring was started or ended

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/monitor
```

Status codes

The following table explains the meanings of the status codes for this API. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot be run because the pool meets either of the following conditions: ▪ The pool is not an HDT pool. ▪ The execution mode for the pool is auto (AUT).

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3/
actions/monitor
```

To run the API request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools/3/actions/monitor/invoke
```

Performing tier relocation

The following request relocates HDT pool data (in units of pages) to an appropriate tier, based on the monitoring information collected by performance monitoring. Before performing tier relocation, perform performance monitoring in advance.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/relocate/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `poolId` value obtained by getting information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

```
{
  "parameters": {
    "operationType": "start"
  }
}
```

Attribute	Type	Description
operationType	string	(Required) Specify the operation of tier relocation. ▪ `start`: Start tier relocation. ▪ `stop`: End tier relocation.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the pool for which tier relocation was started or ended

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/relocate
```

Status codes

The following table explains the meanings of the status codes for this API. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot be run because the pool meets either of the following conditions: ▪ The pool is not an HDT pool. ▪ The execution mode for the pool is auto (AUT).

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3/
actions/relocate
```

To run the API request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/pools/3/actions/relocate/invoke
```

Restoring a pool

The following request unblocks a pool after recovery from a failure or other problems.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/recover/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `poolId` value obtained by getting information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the recovered pool

Action template

None.

Status codes

The following table explains the meanings of the status codes for this API. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The specified action cannot be run because the pool meets either of the following conditions: ▪ The pool is not in the blocked status. ▪ The pool usage rate is 100%.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3/
actions/recover/invoke -d ""
```

Initializing the capacity saving function for a pool

The following request initializes, in a batch operation, the capacity saving function for specified pools for which the deduplication function is enabled. This request formats all deduplication system data volumes and volumes for which the capacity saving function (deduplication) is enabled.

Note:

- For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500, before running this API function, change the `status` attribute to the blocked status for all of the following volumes: the deduplication system data volume and the volumes for which the capacity saving function (deduplication) is enabled.
- After running this API function, if necessary, change the `status` attribute to the normal status for the volumes for which the capacity saving function (deduplication) is enabled.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/pools/object-ID/actions/data-reduction-initialize/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `poolId` value obtained by getting information about the pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the pool to which the initialized volumes belong

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/pools/3/
actions/data-reduction-initialize/invoke -d ""
```

Deleting a pool

The following request deletes a pool by specifying the pool number.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/pools/object-ID
```

Request message

Object ID

Specify the `poolId` value obtained by getting information about pools.

Attribute	Type	Description
poolId	int	(Required) Pool number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted pool

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/pools/3
```

Chapter 10: Optimizing I/O performance

This chapter describes how the REST API can be used to optimize I/O performance between the host and the storage system by using the functions of Virtual Partition Manager, QoS (Quality of Service), and Server Priority Manager, or by changing the assignment of MP blade servers. For more information about performance functions, see the *Performance Guide* for your storage system or the *Quality of Service User Guide*.

Overview of optimizing I/O performance

This section describes optimization of I/O performance between a host and a storage system.

To optimize I/O performance by using the REST API, use one the following methods:

- Use the Virtual Partition Manager function for dividing the cache to prevent a specific host from monopolizing use of too much cache capacity.
- Use the QoS (Quality of Service) function to restrict the I/O performance of hosts for each volume and thereby prevent the performance of one service from interfering with the performance of another service.
- Use the Server Priority Manager function to prioritize the I/O operations of hosts for which fast processing is required by restricting the I/O performance of lower-priority hosts.
- Assign specific MP blades to resources to distribute the workload of I/O operations.

Managing CLPRs

Use the Virtual Partition Manager function to divide the cache and allocate the resources that use the cache. By doing so, you can prevent a situation in which a specific host monopolizes use of too many cache memory areas and I/O performance deteriorates.

You can use the REST API to create or delete a CLPR, or assign resources.

For details about the CLPR function and notes on using CLPRs, see the manual for Virtual Partition Manager.

Note:

In the case of VSP One B20, you cannot manage CLPRs.

Performing QoS operations

Use the QoS function to restrict IOPS, the amount of transferred data, and other parameters for each volume. By doing so, you can ensure the appropriate I/O for each service, thereby maintaining the required performance and quality levels.

By using the REST API, you can set the upper and lower limits on IOPS and the amount of data transferred, as well as the amount of time to wait before issuing an alert. You can also get performance information about volumes for which QoS settings are configured. You can use the API for getting volume information to check the information that is set.

When the storage system is VSP 5000 series, you can get information related to QoS groups by using REST API requests that include simple in the request line. For details on how to get information related to QoS groups, see the descriptions on Operations on QoS groups.

When the storage system is VSP One B20, you can manage QoS groups by using the VSP One Block Administrator API. For details on operations related to QoS groups, see the *VSP One Block Administrator REST API Reference Guide*.

Using Server Priority Manager

To prevent performance degradation of high-priority hosts, you can use the Server Priority Manager function to restrict the number of times a lower-priority host can access a storage system and the amount of data a lower-priority host can transfer.

You can configure Server Priority Manager by specifying a port and the WWN of the HBA or by specifying a volume (LDEV) and the WWN or iSCSI name of the HBA. You cannot use both specification methods on the same storage system. If you are using the REST API, configure settings by specifying a volume and the WWN or iSCSI name of the HBA.

Use a product such as the Tuning Manager API to check the performance information of hosts for which Server Priority Manager information was set by specifying the volume and WWN or iSCSI name of the HBA in the REST API.

Note:

For storage systems for which the Server Priority Manager function is already being used from a product such as Storage Navigator, you cannot use the Server Priority Manager function from the REST API. To configure Server Priority Manager from the REST API, first delete all Server Priority Manager settings from products such as Storage Navigator.

Note:

For the following storage systems, you can use the functions of Server Priority Manager from the REST API:

- VSP 5000 series
- VSP E series
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- 83-03-2*X*-*XX* /*XX* or later (VSP G200, G400, G600, G800, VSP F400, F600, F800)
- VSP G1500 or VSP F1500
- 80-05-*XX*-*XX*/*XX* or later (VSP G1000)

Assigning MP blades

If you assign specific MP blades to each resource related to the input or output of data (resources such as LDEVs, external volume groups, and journals), those resources have exclusive use of the corresponding MP blades. In addition, if there are many write operations from hosts to a specific MP blade, you can distribute the I/O workload by assigning another MP blade to the resource that is placing a heavy load on the first MP blade.

You can use the REST API to change the MP blade assigned to an LDEV, an external volume group, or a journal. For details, see the descriptions of the API requests for changing the assignment of an MP blade in the following sections:

- For LDEVs: The section explaining the volume allocation
- For external volume groups: The section explaining the optimization of I/O performance
- For journals: The section explaining how to configure a remote copy environment

Getting information about CLPRs

Obtain a list of CLPRs. You can obtain information such as the cache capacity, cache usage rate, and resident cache capacity.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/clprs
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "data": [
    {
      "clprId": 0,
      "clprName": "CLPR0",
```

```
      "cacheMemoryCapacity": 432640,
      "cacheMemoryUsedCapacity": 112879,
      "writePendingDataCapacity": 185,
      "sideFilesCapacity": 0,
      "cacheUsageRate": 26,
      "writePendingDataRate": 1,
      "sideFilesUsageRate": 0,
      "residentCacheSize": 0,
      "numberOfResidentExtents": 16384
    },
    {
      "clprId": 1,
      "clprName": "CLPRDEV",
      "cacheMemoryCapacity": 12288,
      "cacheMemoryUsedCapacity": 0,
      "writePendingDataCapacity": 0,
      "sideFilesCapacity": 0,
      "cacheUsageRate": 0,
      "writePendingDataRate": 0,
      "sideFilesUsageRate": 0,
      "residentCacheSize": 0,
      "numberOfResidentExtents": 0
    },
    {
      "clprId": 2,
      "clprName": "CLPRGRP",
      "cacheMemoryCapacity": 24576,
      "cacheMemoryUsedCapacity": 0,
      "writePendingDataCapacity": 0,
      "sideFilesCapacity": 0,
      "cacheUsageRate": 0,
      "writePendingDataRate": 0,
      "sideFilesUsageRate": 0,
      "residentCacheSize": 0,
      "numberOfResidentExtents": 0
    }
  ]
}
```


Attribute	Type	Description
clprId	int	CLPR ID
clprName	string	CLPR name
cacheMemoryCapacity	long	Cache size (MB)

Attribute	Type	Description
cacheMemoryUsedCapacity	long	Used cache size (MB)
writePendingDataCapacity	long	Amount of data waiting to be written (MB)
sideFilesCapacity	long	Size of side files (MB)
cacheUsageRate	int	Cache usage rate (%)
writePendingDataRate	int	Rate of data waiting to be written (%)
sideFilesUsageRate	int	Side file usage rate (%)
residentCacheSize	long	Resident cache size (MB)
numberOfResidentExtents	int	Number of resident cache extents

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/clprs
```

Getting information about a specific CLPR

Obtain information about a specific CLPR by specifying the CLPR ID. You can obtain information such as the cache capacity, cache usage rate, and resident cache capacity.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/clprs/object-ID
```

Request message

Object ID

Specify the value of `clprId` that was obtained by the processing to get information about CLPRs.

Attribute	Type	Description
clprId	int	(Required) CLPR ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "clprId": 2,
  "clprName": "CLPRGRP",
  "cacheMemoryCapacity": 24576,
  "cacheMemoryUsedCapacity": 0,
  "writePendingDataCapacity": 0,
  "sideFilesCapacity": 0,
  "cacheUsageRate": 0,
  "writePendingDataRate": 0,
  "sideFilesUsageRate": 0,
  "residentCacheSize": 0,
  "numberOfResidentExtents": 0
}
```

Attribute	Type	Description
clprId	int	CLPR ID
clprName	string	CLPR name
cacheMemoryCapacity	long	Cache size (MB)
cacheMemoryUsedCapacity	long	Used cache size (MB)
writePendingDataCapacity	long	Amount of data waiting to be written (MB)

Attribute	Type	Description
sideFilesCapacity	long	Size of side files (MB)
cacheUsageRate	int	Cache usage rate (%)
writePendingDataRate	int	Rate of data waiting to be written (%)
sideFilesUsageRate	int	Side file usage rate (%)
residentCacheSize	long	Resident cache size (MB)
numberOfResidentExtents	int	Number of resident cache extents

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/clprs/2
```

Creating a CLPR

Create a CLPR.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/clprs
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "clprName" : "CLPRDEV",
  "cacheMemoryCapacity" : 12288,
  "residentCacheSize" : 4096,
  "numberOfResidentExtents" : 5
}
```

Attribute	Type	Description
clprName	string	(Required) CLPR name Specify a name consisting of 1 to 16 characters. Specify a name that is unique among the CLPRs on the target storage system.
cacheMemoryCapacity	long	(Required) Total cache size of the CLPR (MB) For VSP 5000 series, VSP G1000 , VSP G1500, or VSP F1500 storage systems, specify a multiple of `4096`. For other storage systems, specify a multiple of `2048`. For details on the size that can be specified for the cache, see the Virtual Partition Manager manual.
residentCacheSize	long	(Optional) Resident cache size (MB) Specify a multiple of `512`. For details on the size that can be specified for the cache, see the Virtual Partition Manager manual. If this attribute is omitted, `0` is set. You can specify this attribute if the storage system model is VSP G1000, VSP G1500, VSP F1500.
numberOfResidentExtents	int	(Optional) Number of resident cache extents Specify a value in the range from `0` to `16384`. If this attribute is omitted, `0` is set.

Attribute	Type	Description
		You can specify this attribute if the storage system model is VSP G1000, VSP G1500, VSP F1500.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the created CLPR

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/clprs
```

Changing the settings of a CLPR

Change the name, cache size, and other settings of a CLPR.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/clprs/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `clprId` that was obtained by the processing to get information about CLPRs.

Attribute	Type	Description
clprId	int	(Required) CLPR ID

Query parameters

None.

Body

The following is a coding example for changing the name of a CLPR:

```
{
  "clprName" : "CLPRGRP"
}
```

The following is a coding example for changing the total cache size of a CLPR:

```
{
  "cacheMemoryCapacity" : 24576
}
```

The following is a coding example for changing the resident cache size:

```
{
  "residentCacheSize" : 4096
}
```

The following is a coding example for changing the number of resident cache extents:

```
{
  "numberOfResidentExtents" : 5
}
```

The following is a coding example for changing the name of a CLPR, cache size of a CLPR, resident cache size, and number of resident cache extents:

```
{
  "clprName" : "CLPRGRP",
  "cacheMemoryCapacity" : 24576,
  "residentCacheSize" : 4096,
  "numberOfResidentExtents" : 5
}
```

Attribute	Type	Description
clprName	string	(Optional) CLPR name Specify a name consisting of 1 to 16 characters. Specify a name that is unique among the CLPRs on the target storage system.
cacheMemoryCapacity	long	(Optional) Total cache size of the CLPR (MB) For VSP 5000 series, VSP G1000, VSP G1500, or VSP F1500 storage systems, specify a multiple of `4096`. For other storage systems, specify a multiple of `2048`. For details on the size that can be specified for the cache, see the Virtual Partition Manager manual.
residentCacheSize	long	(Optional) Resident cache size (MB) Specify a multiple of `512`. For details on the size that can be specified for the cache, see the Virtual Partition Manager manual. You can specify this attribute if the storage system model is VSP G1000, VSP G1500, VSP F1500.
numberOfResidentExtents	int	(Optional) Number of resident cache extents Specify a value in the range from `0` to `16384`. You can specify this attribute if the storage system model is VSP G1000, VSP G1500, VSP F1500.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the CLPR whose settings were changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/clprs/2
```

Deleting a CLPR

Delete a CLPR. Before deleting a CLPR, move any resources that are currently allocated to the CLPR to be deleted to other CLPRs.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/clprs/object-ID
```

Request message

Object ID

Specify the value of `clprId` that was obtained by the processing to get information about CLPRs.

Attribute	Type	Description
clprId	int	(Required) CLPR ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the deleted CLPR

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary
@./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/clprs/3
```

Assigning LDEVs to a CLPR

The following request assigns LDEVs to a CLPR. You can use this API function to assign LDEVs to a created CLPR or to move an already assigned LDEV to a different CLPR.

Note:

If you want to assign external volumes to a CLPR, see the description of how to assign external volume groups to a CLPR.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/assign-clpr/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.

Query parameters

None.

Body

```
{
  "parameters": {
    "clprId": 2
  }
}
```

Attribute	Type	Description
clprId	int	(Required) CLPR ID of the CLPR to which the LDEV is to be assigned Specify a decimal (base 10) number in the range from `0` to `31`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the LDEV that was assigned to the CLPR

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/assign-clpr
```

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/100/
actions/assign-clpr
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/100/actions/assign-clpr/invoke
```

Assigning parity groups to a CLPR

The following request assigns parity groups to a CLPR. You can use this API function to assign parity groups to a created CLPR or to move an already assigned parity group to a different CLPR.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID/actions/
assign-clpr/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `parityGroupId` that was obtained by the processing to get information about parity groups.

Attribute	Type	Description
parityGroupId	string	(Required) Parity group number Specify concatenated parity groups in the same way. For 1-3-1, 1-3-2, and 1-3-3 concatenated parity groups, specify as follows: `"parityGroupId":"1-3"`

Query parameters

None.

Body

```
{
  "parameters": {
    "clprId": 2
  }
}
```

Attribute	Type	Description
clprId	int	(Required) CLPR ID of the CLPR to which the parity group is to be assigned Specify a decimal (base 10) number in the range from `0` to `31`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the parity group that was assigned to the CLPR

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/parity-groups/object-ID/actions/assign-clpr
```

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-groups/1-1/actions/assign-clpr
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/parity-groups/1-1/actions/assign-clpr/invoke
```

Getting information about external volume groups

The following request gets a list of information about external volume groups. You can get the information such as the number of LDEVs allocated to external volume groups and the usage rate of external volume groups.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-parity-groups
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Body

None.

Response message

Body


```
{
  "data": [
    {
      "externalParityGroupId": "1-1",
      "numOfLdevs": 1,
      "usedCapacityRate": 100,
      "availableVolumeCapacity": 0,
      "emulationType": "OPEN-V",
      "clprId": 0,
      "externalProductId": "OPEN-V",
      "availableVolumeCapacityInKB": 0
```

```
    },
    {
      "externalParityGroupId": "1-2",
      "numOfLdevs": 0,
      "usedCapacityRate": 0,
      "availableVolumeCapacity": 40,
      "emulationType": "OPEN-V",
      "clprId": 0,
      "externalProductId": "OPEN-V",
      "availableVolumeCapacityInKB": 41943040
    }
  ]
}
```


Attribute	Type	Description
externalParityGroupId	string	External volume group number
numOfLdevs	int	Number of LDEVs allocated to the external volume group
usedCapacityRate	int	Usage rate of the external volume group
availableVolumeCapacity	long	Available capacity (GB) The amount of free space is output. If the capacity is below 1 GB, the value is ignored and `0` is assumed.
availableVolumeCapacityInKB	long	Available capacity (KB) The amount of free space is output. If the information cannot be obtained, `-1` is output, indicating an invalid value.
emulationType	string	Emulation type of the external volume group
clprId	int	Number of CLPR to which the external volume group belongs
externalProductId	string	Storage system that is connected using the external storage connection functionality of Universal Volume Manager

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
largestAvailableCapacity	long	Maximum capacity of the non-volume areas in the external volume group (KB) The maximum capacity of the continuously free areas is output.
totalOpenVolumeCapacity	long	Total volume capacity of the open volumes in the external volume group (KB)
unallocatedOpenVolumeCapacity	long	From among the open volumes in the external volume group, the total capacity of volumes to which paths are not allocated (KB)
allocatedOpenVolumeCapacity	long	From among the open volumes in the external volume group, the total capacity of volumes to which paths are allocated (KB)
allocatableOpenVolumeCapacity	long	From among the open volumes in the external volume group, the total capacity of volumes to which paths can be allocated (KB) The total capacity of volumes that meet all of the following conditions is output. ▪ No path is allocated to the volume. ▪ The volume is not a pool volume. ▪ The volume is not a system disk.
reservedOpenVolumeCapacity	long	From among the open volumes in the external volume group, the total capacity of volumes which are reserved (KB) The total capacity of volumes that meet all of the following conditions is output. ▪ No path is allocated to the volume. ▪ The volume is either a pool volume or a system disk.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/external-
parity-groups
```

Getting information about a specific external volume group

The following request gets information about a specific external volume group by specifying the external volume group number.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID
```

Request message

Object ID

Specify the value of `externalParityGroupId` that was obtained by the processing to get information about the external volume group.

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number

Query parameters

None.

Body

None.

Response message

Body

```
{
  "externalParityGroupId": "1-2",
  "numOfLdevs": 1,
  "usedCapacityRate": 100,
  "availableVolumeCapacity": 0,
  "emulationType": "OPEN-V",
  "clprId": 0,
  "externalProductId": "OPEN-V",
  "spaces": [
```

```
    {
      "partitionNumber": 0,
      "ldevId": 49153,
      "status": "NML",
      "lbaLocation": "0x000000000000",
      "lbaSize": "0x000001e00000"
    }
  ],
  "availableVolumeCapacityInKB": 0
}
```


Attribute	Type	Description
externalParityGroupId	string	External volume group number
numOfLdevs	int	Number of LDEVs allocated to the external volume group
usedCapacityRate	int	Usage rate of the external volume group
availableVolumeCapacity	long	Available capacity (GB) The amount of free space is output. If the capacity is below 1 GB, the value is ignored and `0` is assumed.
availableVolumeCapacityInKB	long	Available capacity (KB) The amount of free space is output. If the information cannot be obtained, `-1` is output, indicating an invalid value.
emulationType	string	Emulation type of the external volume group
clprId	int	Number of CLPR to which the external volume group belongs
externalProductId	string	Storage system that is connected using the external storage connection functionality of Universal Volume Manager

Attribute	Type	Description
spaces	objects[ ]	For the free space and the LDEV defined in the specified external volume group, the following attributes are output: ▪ partitionNumber (long) Number of a partition created as a result of partitioning of an external volume group ▪ ldevId (int) LDEV number ▪ status (string) LDEV status • `NML`: The LDEV is implemented, or the free space is determined. • `REG`: The LDEV is being created. • `DEL`: The LDEV is being deleted. ▪ lbaLocation (string) Starting location of the LBA of the partition in the external volume group (in a multiple of 512 bytes) ▪ lbaSize (string) Size of the partition in the external volume group (in a multiple of 512 bytes)

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/external-
parity-groups/1-1
```

Assigning external volume groups to a CLPR

The following request assigns external volume groups to a CLPR. You can use this API function to assign external volume groups to a created CLPR or to move an already assigned external volume group to a different CLPR.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID/
actions/assign-clpr/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `externalParityGroupId` that was obtained by the processing to get information about external volume groups.

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number

Query parameters

None.

Body

```
{
  "parameters": {
    "clprId": 2
  }
}
```

Attribute	Type	Description
clprId	int	(Required) CLPR ID of the CLPR to which the external volume group is to be assigned Specify a decimal (base 10) number in the range from `0` to `31`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the external volume group that was assigned to the CLPR

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID/
actions/assign-clpr
```

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/external-
parity-groups/1-1/actions/assign-clpr
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/external-parity-groups/1-1/actions/assign-clpr/invoke
```

Changing the MP blade assigned to an external volume group

The following request changes the MP blade assigned to an external volume group.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID/
actions/assign-mp-blade/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `externalParityGroupId` value obtained by getting information about the external volume group.

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number

Query parameters

None.

Body

```
{
    "parameters": {
        "mpBladeId": 1
    }
}
```

Attribute	Type	Description
mpBladeId	int	(Required) The blade number of the MP blade to be assigned to the external volume group

Response message

Body

A job object is returned. For details about attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the external volume group for which the MP blade was changed To check changed setting values, execute the API request for getting information about the external path groups.

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of the HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/external-parity-groups/3-1/actions/assign-mp-blade/invoke
```

Configuring QoS settings for a volume

The following request configures the QoS settings (such as the upper and lower limits on IOPS and on the amount of data that can be transferred, and the amount of time to wait before issuing related alerts) for a specified volume.

Note:

- You can use QoS to control I/O between a host and the volumes of a storage system. You can configure QoS settings for volumes that are directly connected to the host.
- This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/set-qos/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `ldevId` that was obtained by the processing to get information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.

Query parameters

None.

Body

```
{
    "parameters": {
        "upperIops": 100
    }
}
```

You can specify only one attribute each time you run this API request.

Attribute	Type	Description
upperIops	long	(Optional) Upper limit on the IOPS Specify a value in the range from `100` to `2147483647`. If the `lowerIops` attribute is set, the value specified for this attribute must be greater than the value of the `lowerIops` attribute.

Attribute	Type	Description
		To disable this setting, specify `0`. If you disable both the `upperIops` attribute and the `upperTransferRate` attribute, the `upperAlertAllowableTime` attribute will also be disabled.
upperTransferRate	int	(Optional) Upper limit on the amount of data that can be transferred per second (in MB) Specify a value in the range from `1` to `2097151`. If the `lowerTransferRate` attribute is set, the value specified for this attribute must be greater than the value of the `lowerTransferRate` attribute. To disable this setting, specify `0`. If you disable both the `upperIops` attribute and the `upperTransferRate` attribute, the `upperAlertAllowableTime` attribute will also be disabled.
upperAlertAllowableTime	int	(Optional) Amount of time to wait before issuing an alert when the IOPS or the amount of data transferred per second exceeds the upper limit for a continuous period of time (in seconds) Specify a value in the range from `1` to `600`. You can specify this attribute only if one or both of the `upperIops` and `upperTransferRate` attributes are already set. To disable this setting, specify `0`.
lowerIops	long	(Optional) Lower limit on the IOPS Specify a value in the range from `10` to `2147483647`. If the `upperIops` attribute is set, the value specified for this attribute must be less than the value of the `upperIops` attribute. To disable this setting, specify `0`. If you disable both the `lowerIops` attribute and the `lowerTransferRate` attribute, the `lowerAlertAllowableTime` attribute will also be disabled.

Attribute	Type	Description
		You can specify this parameter if the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
lowerTransferRate	int	(Optional) Lower limit on the amount of data that can be transferred per second (in MB) Specify a value in the range from `1` to `2097151`. If the `upperTransferRate` attribute is set, the value specified for this attribute must be less than the value of the `upperTransferRate` attribute. To disable this setting, specify `0`. If you disable both the `lowerIops` attribute and the `lowerTransferRate` attribute, the `lowerAlertAllowableTime` attribute will also be disabled. You can specify this parameter if the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
lowerAlertAllowableTime	int	(Optional) Amount of time to wait before issuing an alert when the IOPS or the amount of data transferred per second falls below the lower limit for a continuous period of time (in seconds) Specify a value in the range from `1` to `600`. You can specify this attribute only if one or both of the `lowerIops` and `lowerTransferRate` attributes are already set. To disable this setting, specify `0`. You can specify this parameter if the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
responsePriority	int	(Optional) Priority level of the I/O processing Specify a value in the range from `1` to `3`. A larger value indicates a higher level of priority. If you specify this attribute, a target response time will be set, based on the priority level you set.

Attribute	Type	Description
		To disable this setting, specify `0`. If you disable the `responsePriority` attribute, the `responseAlertAllowableTime` attribute will also be disabled. You can specify this parameter if the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
responseAlertAllowableTime	int	(Optional) Amount of time to wait before issuing an alert when the response time exceeds the target response time for a continuous period of time (in seconds) Specify a value in the range from `1` to `600`. To disable this setting, specify `0`. You can specify this parameter if the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the LDEV for which QoS settings were configured

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of the HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/ldevs/100/actions/set-qos/invoke
```

Getting performance information for a volume on which QoS has been set up

This request specifies the LDEV number of a volume on which QoS has been set up, and gets performance information about that volume. You can check the average performance of the volume over the last second. Use this request to check the performance of volumes during operations or when an alert is issued. You can concurrently run multiple instances of this request, but we recommend running no more than five instances at one time.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/qos-monitor-ldevs/object-ID
```

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

None.

Response message

Body

```
{
    "ldevId": 200,
    "receivedCommands": 3840,
    "transferRateOfReceivedCommands": 15000,
    "iops": 2650,
    "transferRate": 10000,
    "responseTime": 5,
    "monitorTime": "2020-01-01T23:59:59Z"
}
```

Attribute	Type	Description
ldevId	int	LDEV number
receivedCommands	long	Number of commands received from hosts over the last second (IOPS)
transferRateOfReceivedCommands	long	Amount of transferred data received from hosts over the last second (KBps)
iops	long	Number of commands processed by the storage system over the last second (IOPS)
transferRate	long	Amount of transferred data processed by the storage system over the last one second (KBps)
responseTime	int	Average response time (μs)
monitorTime	ISO8601string	Time at which the performance information was collected (UTC) This parameter is output if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/qos-monitor-ldevs/1
```

Managing QoS groups

When the storage system is VSP 5000 series, you can get information related to QoS groups by using REST API requests that include simple in the request line. For details on how to get information related to QoS groups, see the descriptions on Operations on QoS groups.

When the storage system is VSP One B20, you can manage QoS groups by using the VSP One Block Administrator API. For details on operations related to QoS groups, see the *VSP One Block Administrator REST API Reference Guide*.

Getting a list of Server Priority Manager information

The following request gets a list of Server Priority Manager information for which operations can be performed by using the REST API. You can check the Server Priority Manager information of hosts for which the LDEV numbers of volumes and the WWNs or iSCSI names of the HBAs have been set.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/io-control-ldev-wwns-iscsis
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
ldevId	int	(Optional) Specify the LDEV number as a decimal (base 10) number.
hostWwn	string	(Optional) WWN of the HBA Specify a hexadecimal number consisting of 16 characters.
iscsiName	string	(Optional) iSCSI name of the HBA (iSCSI initiator)

Parameter	Type	Filter Condition
		Specify the name in iqn format or eui format. ▪ iqn format Specify a value consisting of 5 to 223 characters. You can use the following characters: Alphanumeric characters, hyphens (-), periods (.), and colons (:) Specification example: `iqn.rest.example.of.iqn.form` ▪ eui format Specify eui. followed by a hexadecimal number. The specified value must consist of a total of 20 characters. Specification example: `eui.0900ABDC32598D26`

Body

None.

Response message

Body


```
{
  "data" : [ {
    "ioControlLdevWwnIscsiId" : "0,210003e08b0256f9",
    "ldevId" : 0,
    "hostWwn" : "210003e08b0256f9",
    "priority" : "NonPrioritize",
    "upperLimitForIops" : 9999
  }, {
    "ioControlLdevWwnIscsiId" : "1,210003e08b0256f9",
    "ldevId" : 1,
    "hostWwn" : "210003e08b0256f9",
    "priority" : "NonPrioritize",
    "upperLimitForIops" : 9999
  }, {
    "ioControlLdevWwnIscsiId" : "2,iqn.myrestapiiscsi20150907",
    "ldevId" : 2,
    "iscsiName" : "iqn.myrestapiiscsi20150907",
    "priority" : "NonPrioritize",
    "upperLimitForTransferRate" : 30
  }, {
    "ioControlLdevWwnIscsiId" : "3,iqn.myrestapiiscsi20150907",
```

```
    "ldevId" : 3,
    "iscsiName" : "iqn.myrestapiiscsi20150907",
    "priority" : "NonPrioritize",
    "upperLimitForTransferRate" : 30
  } ]
}
```


Attribute	Type	Description
ioControlLdevWwnIscsiId	string	Object ID of the SPM information
ldevId	int	LDEV number
hostWwn	string	WWN of the HBA
iscsiName	string	iSCSI name of the HBA (iSCSI initiator)
priority	string	Prioritized or not prioritized The value of the SPM setting is output. ▪ `Prioritize`: Prioritized ▪ `NonPrioritize`: Not prioritized
upperLimitForIops	int	Upper limit on IOPS
upperLimitForTransferRate	int	Upper limit on the transfer rate (MBps)

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/io-control-
ldev-wwns-iscsis/
```

Getting Server Priority Manager information by specifying a volume and the WWN or iSCSI name of an HBA

The following request allows you to get Server Priority Manager information by specifying the LDEV number of a volume and the WWN or iSCSI name of an HBA.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/io-control-ldev-wwns-iscsis/object-ID
```

Request message

Object ID

Specify the value of `ioControlLdevWwnIscsiId` that was obtained by the processing to get the Server Priority Manager list. You can also specify the following attributes, delimited by commas:

For the WWN:

```
ldevId,hostWwn
```

For the iSCSI name:

```
ldevId,iscsiName
```

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.
hostWwn	string	(Optional) WWN of the HBA Specify a hexadecimal number consisting of 16 characters. You must specify either the `hostWwn` attribute or the `iscsiName` attribute.
iscsiName	string	(Optional) iSCSI name of the iSCSI initiator

Attribute	Type	Description
		Specify the name in iqn format or eui format. ▪ iqn format Specify a value consisting of 5 to 223 characters. You can use the following characters: Alphanumeric characters, hyphens (-), periods (.), and colons (:) Specification example: `iqn.rest.example.of.iqn.form` ▪ eui format Specify eui. followed by a hexadecimal number. The specified value must consist of a total of 20 characters. Specification example: `eui.0900ABDC32598D26` You must specify either the `hostWwn` attribute or the `iscsiName` attribute.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "ioControlLdevWwnIscsiId" : "0,210003e08b0256f9",
  "ldevId" : 0,
  "hostWwn" : "210003e08b0256f9",
  "priority" : "NonPrioritize",
  "upperLimitForTransferRate" : 30
}
```

Attribute	Type	Description
ioControlLdevWwnIscsiId	string	Object ID of the SPM information
ldevId	int	LDEV number
hostWwn	string	WWN of the HBA

Attribute	Type	Description
iscsiName	string	iSCSI name of the HBA (iSCSI initiator)
priority	string	Prioritized or not prioritized The value of the SPM setting is output. ▪ `Prioritize`: Prioritized ▪ `NonPrioritize`: Not prioritized
upperLimitForIops	int	Upper limit on IOPS
upperLimitForTransferRate	int	Upper limit on the transfer rate (MBps)

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/io-control-
ldev-wwns-iscsis/0,210003e08b0256f9
```

Setting Server Priority Manager information by specifying a volume and the WWN or iSCSI name of the HBA

The following request sets, in Server Priority Manager, the upper limit on the transfer rate or IOPS of a low-priority host by specifying the LDEV number of the volume and the WWN or iSCSI name of the HBA.

Note:

If the number of volumes for which Server Priority Manager has been configured exceeds 4,096, the hosts of volumes configured after the 4,096th volume will have lower I/O response be lower than the hosts of the first 4,096 volumes to be configured.

Make sure the number of volumes for which Server Priority Manager has been configured does not exceed 4,096.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/io-control-ldev-wwns-iscsis
```

Request message

Object ID

None.

Query parameters

None.

Body

The following coding example sets the upper limit on IOPS:

```
{
 "ldevId" : 0,
 "hostWwn" : "210003e08b0256f9",
 "upperLimitForIops" : 9999
}
```

The following coding example sets the upper limit on the transfer rate:

```
{
 "ldevId" : 0,
 "iscsiName" : "iqn.myrestapiiscsi20150907",
 "upperLimitForTransferRate" : 30
}
```

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.
hostWwn	string	(Optional) WWN of the HBA Specify a hexadecimal number consisting of 16 characters. You must specify either the `hostWwn` attribute or the `iscsiName` attribute.
iscsiName	string	(Optional) iSCSI name of the HBA (iSCSI initiator)

Attribute	Type	Description

		Specify the name in iqn format or eui format.
		▪ iqn format
		Specify a value consisting of 5 to 223 characters. You can use the following characters:
		Alphanumeric characters, hyphens (`-`), periods (`.`), and colons (`:`)
		Specification example:
		`iqn.rest.example.of.iqn.form`
		▪ eui format
		Specify eui. followed by a hexadecimal number. The specified value must consist of a total of 20 characters.
		Specification example:
		`eui.0900ABDC32598D26`
		You must specify either the `hostWwn` attribute or the `iscsiName` attribute.

upperLimitForIops	int	(Optional) Upper limit on the IOPS (IOPS) Specify a value in the range from `1` to `65535`. You must specify either the `upperLimitForIops` attribute or the `upperLimitForTransferRate` attribute.
upperLimitForTransferRate	int	(Optional) Upper limit on the transfer rate (MBps) Specify a value in the range from `1` to `31`. You must specify either the `upperLimitForIops` attribute or the `upperLimitForTransferRate` attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the specified SPM information

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/io-control-ldev-wwns-iscsis/
```

Changing the Server Priority Manager information

The following request changes the upper limit on the transfer rate or IOPS for hosts for which the LDEV number of a volume and the WWN or iSCSI name of the HBA are already specified in Server Priority Manager.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/io-control-ldev-wwns-iscsis/object-
ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `ioControlLdevWwnIscsiId` that was obtained by the processing to get the Server Priority Manager list. You can also specify the following attributes, delimited by commas:

For the WWN:

```
ldevId,hostWwn
```

For the iSCSI name:

```
ldevId,iscsiName
```

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.
hostWwn	string	(Optional) WWN of the HBA Specify a hexadecimal number consisting of 16 characters. You must specify either the `hostWwn` attribute or the `iscsiName` attribute.
iscsiName	string	(Optional) iSCSI name of the iSCSI initiator Specify the name in iqn format or eui format. ▪ iqn format Specify a value consisting of 5 to 223 characters. You can use the following characters: Alphanumeric characters, hyphens (`-`), periods (`.`), and colons (`:`) Specification example: `iqn.rest.example.of.iqn.form` ▪ eui format Specify eui. followed by a hexadecimal number. The specified value must consist of a total of 20 characters. Specification example: `eui.0900ABDC32598D26` You must specify either the `hostWwn` attribute or the `iscsiName` attribute.

Query parameters

None.

Body

The following coding example changes the upper limit on IOPS:

```
{
  "upperLimitForIops" : 9999
}
```

The following coding example changes the upper limit on the transfer rate:

```
{
  "upperLimitForTransferRate": 30
}
```

Attribute	Type	Description
upperLimitForIops	int	(Optional) Upper limit (IOPS) Specify a value in the range from `1` to `65535`. You must specify either the `upperLimitForIops` attribute or the `upperLimitForTransferRate` attribute.
upperLimitForTransferRate	int	(Optional) Upper limit (transfer rate in MBps) Specify a value in the range from `1` to `31`. You must specify either the `upperLimitForIops` attribute or the `upperLimitForTransferRate` attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the changed SPM information

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/io-control-ldev-wwns-iscsis/0,210003e08b0256f9
```

Deleting Server Priority Manager information

The following request allows you to remove the currently set upper limit on the transfer rate or IOPS of a host by specifying the LDEV number of a volume and the WWN or iSCSI name of the HBA, to remove the host from the management targets of Server Priority Manager.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/io-control-ldev-wwns-iscsis/
object-ID
```

Request message

Object ID

Specify the value of `ioControlLdevWwnIscsiId` that was obtained by the processing to get the Server Priority Manager list. You can also specify the following attributes, delimited by commas:

For the WWN:

```
ldevId,hostWwn
```

For the iSCSI name:

```
ldevId,iscsiName
```

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number as a decimal (base 10) number.
hostWwn	string	(Optional) WWN of the HBA Specify a hexadecimal number consisting of 16 characters. You must specify either the `hostWwn` attribute or the `iscsiName` attribute.
iscsiName	string	(Optional) iSCSI name of the HBA (iSCSI initiator)

Attribute	Type	Description
		Specify the name in iqn format or eui format. ▪ iqn format Specify a value consisting of 5 to 223 characters. You can use the following characters: Alphanumeric characters, hyphens (-), periods (.), and colons (:) Specification example: `iqn.rest.example.of.iqn.form` ▪ eui format Specify eui. followed by a hexadecimal number. The specified value must consist of a total of 20 characters. Specification example: `eui.0900ABDC32598D26` You must specify either the `hostWwn` attribute or the `iscsiName` attribute.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the deleted SPM information

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/io-control-
ldev-wwns-iscsis/0,210003e08b0256f9
```

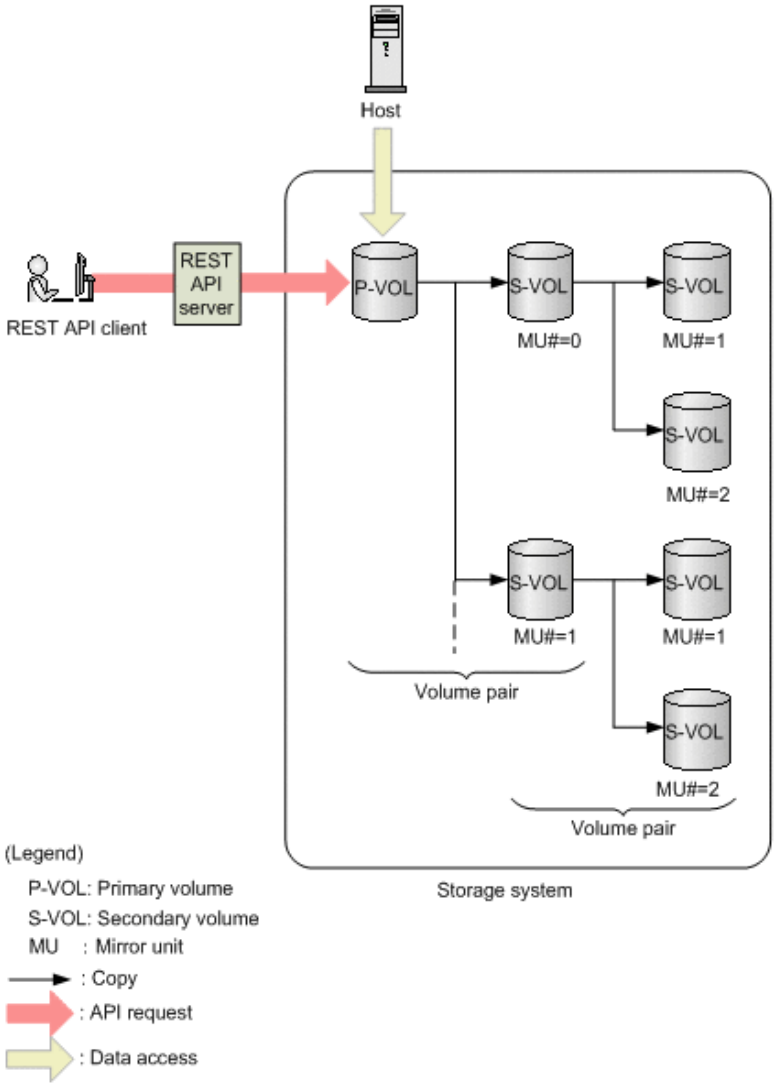
Chapter 11: Managing ShadowImage pairs

This chapter describes how to perform operations on ShadowImage pairs by using the REST API.

Overview of ShadowImage

ShadowImage creates a copy of a data volume in the same storage system as the copy source.

You can create a ShadowImage pair or manage the pair status by issuing an API from a REST API client. You can also operate ShadowImage pairs in units of copy groups. In addition, if you define a consistency group, the pair statuses of all pairs in the group are transited at the same time.



A ShadowImage pair consists of a primary volume (P-VOL) and a secondary volume (S-VOL). The primary volume can be paired with more than one secondary volume. Each secondary volume is managed according to the MU (mirror unit) number.

For details about ShadowImage, see the *Hitachi ShadowImage® User Guide*.

Notes when a ShadowImage pair was created by using software other than the REST API

If you want to use the REST API to manage a pair that was created by using software other than the REST API, see the description of device group definition methods in the *Command Control Interface User and Reference Guide*, and use the method of running a command to correctly set a copy group and a device group.

Device names described in the *Command Control Interface User and Reference Guide* correspond to copy pair names for the REST API.

Note that if you use the REST API to create a pair, these kinds of information will be set automatically. For this reason, if you want to use the REST API to manage pairs, we recommend that you use the REST API to create pairs.

Workflow for operating ShadowImage pairs

The following shows the ShadowImage functions that can be run by the REST API:

- Getting information about copy groups

  Obtains a list of copy groups registered in the target storage system. You can also obtain information about a specific copy group.

- Getting pair status and configuration information

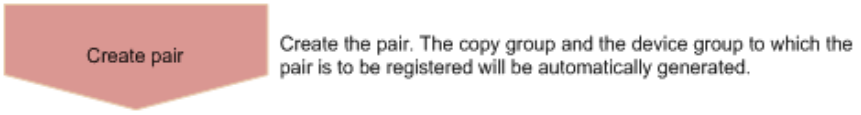
  Obtains a ShadowImage pair status and configuration information. You can check if a pair operation is complete. You can also obtain pair information in units of copy groups.

  If the copy group in which the target ShadowImage pair is registered contains a ShadowImage pair that was created or deleted by using another REST API server or software other than the REST API, correct information about that pair might not be obtained. In such a case, update the information about the pairs to the most recent information before you obtain information.

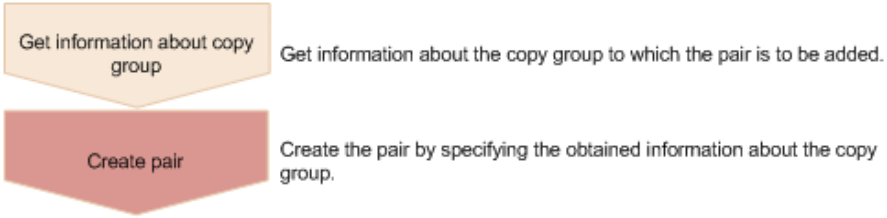
- Creating a pair

  Creates a new ShadowImage pair in a copy group of the target storage system. A copy group is a group made up of copy pairs. Each copy group consists of a device group made up of primary volumes, and a device group made up of secondary volumes. If the copy group is not already created, the copy group and its corresponding device groups are automatically created. You will be able to perform operations in units of copy groups by registering ShadowImage pairs in a copy group.

  To create a pair in a new copy group:

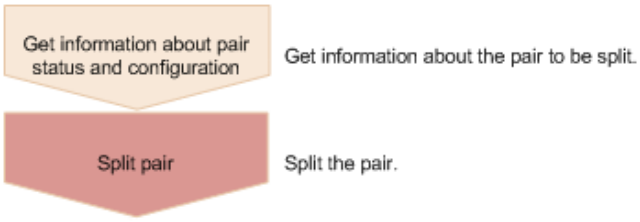
  

  To create a pair in an existing copy group:

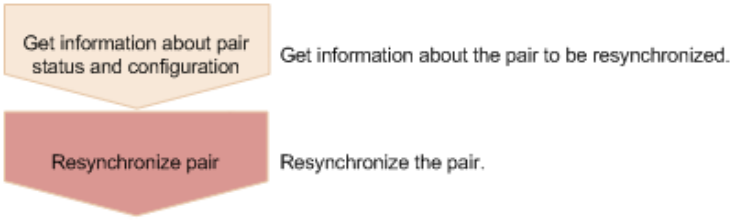
- Splitting a pair

  Splits a ShadowImage pair and enables read and write access for a secondary volume. You can also split pairs in units of copy groups.



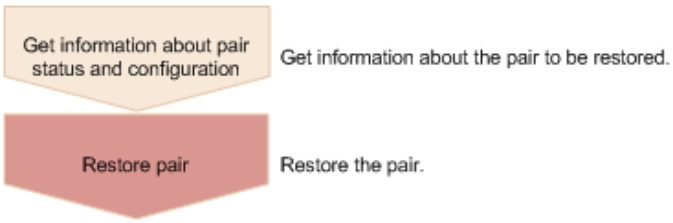
- Resynchronizing a pair

  Resynchronizes a split ShadowImage pair based on the primary volume. Even during resynchronization, you can access the P-VOL. You can also resynchronize pairs in units of copy groups.



- Resynchronizing a pair by a restore

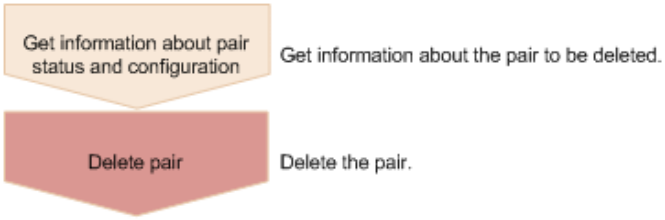
  Resynchronizes a split ShadowImage pair based on a secondary volume. During resynchronization by a restore, you cannot access the P-VOL. You can also perform a restore in units of copy groups.



- Deleting a pair

  Deletes a ShadowImage pair that is unnecessary. If you delete a pair, the pair is dissolved. The data in the primary volume and secondary volume remains unchanged. In addition, if you delete all the ShadowImage pairs in a copy group, the copy group and the device group included in the copy group are automatically deleted. You can also delete pairs in units of copy groups.

  You can delete a pair at any time regardless of the pair status. However, if you delete a pair while the pair status is being changed, the pair might be deleted before its status is changed, and the request to change the pair status might time out.



Migrating copy pair definitions

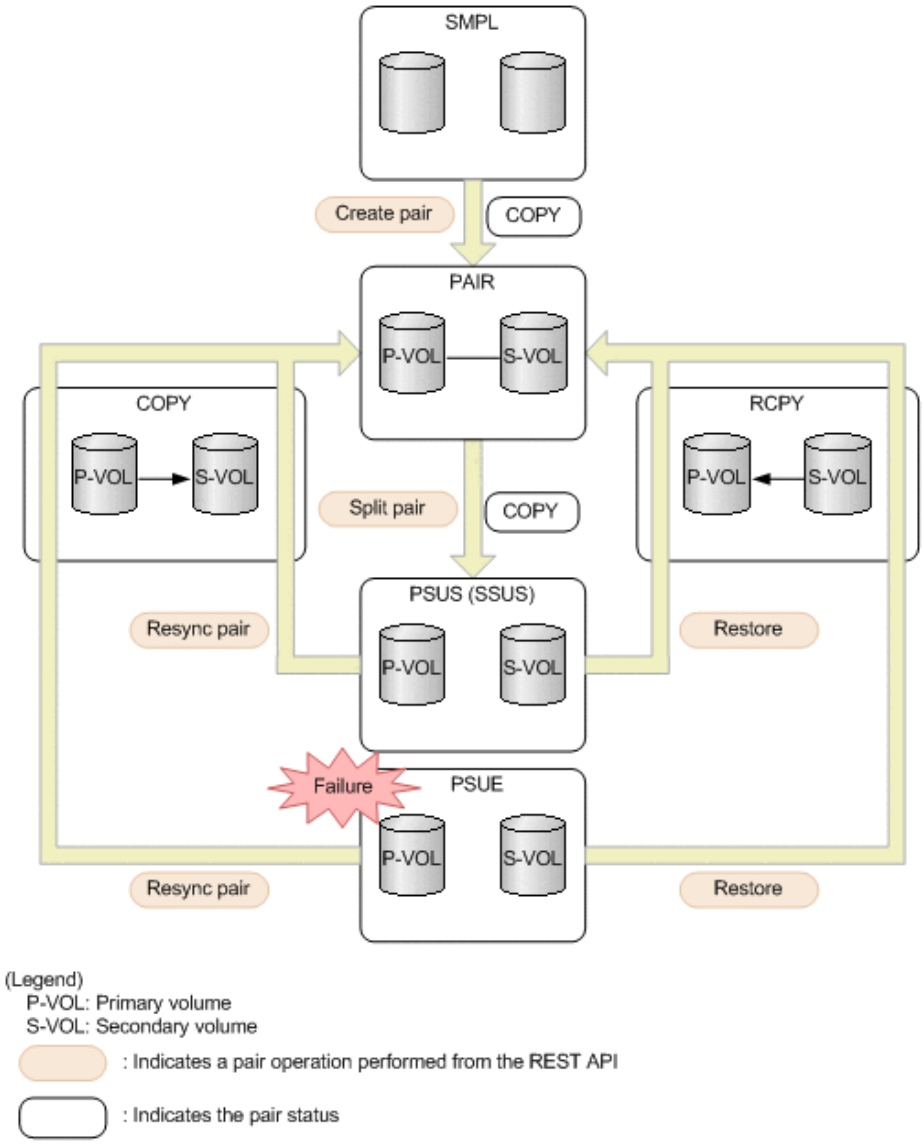
If you want to use the REST API to manage copy pairs that are currently managed by using the configuration definition file, you must change the copy pair definitions in the configuration definition file to device group definitions on the storage system. To do this, use the pair definition migration command (`PairCfgMigration`). For details about the pair definition migration command, see the *Hitachi Command Suite Administrator Guide* .

Specifying Job-Mode-Wait-Configuration-Change in the request header

During the creation, splitting, and resynchronizing of pairs, if multiple asynchronous processing requests are issued at the same time, jobs might get stuck and the job status might not change to `Completed` because data copying takes a long time. In such cases, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header so that the job status changes to `Completed` without waiting for data copying to finish, and the next job starts. At this time, data copying continues even after job execution ends. To check whether data copying has finished, check the pair status of the target resource instead of the job status. For details about the pair status, see the description of the pair status transitions.

Pair status (ShadowImage)

The following explains the operations and status transitions for pairs.



Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	-	-
COPY	The pair is being created. An initial copy or resynchronization is being performed.	R/W enabled	R enabled
PAIR	Paired volumes	R/W enabled	R enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
	The initial copy is complete. The update data of the P-VOL will be asynchronously copied to the S-VOL.		
PSUS	The pair is being split by operation. (This value is output for the P-VOL.)	R/W enabled	R/W enabled
SSUS	The pair is being split by operation. (This value is output for the S-VOL when the P-VOL is PSUS.)	R/W enabled	R/W enabled
PSUE	The pairing is suspended due to a failure. The P-VOL and the S-VOL are not synchronized.	R/W enabled	R enabled
RCPY	A restore operation is being performed. (Data is being copied from the S-VOL to the P-VOL.)	Not enabled	R enabled

If you delete a pair, the pair status changes to SMPL.

Note:

In the following cases, if you perform an operation on a pair, the request successfully returns a response, but the details specified in the request body are not actually applied:

- When you perform a pair splitting operation on a pair for which the status is PSUS or SSUS
- When you perform a pair resynchronization operation on a pair for which the status is COPY, PAIR, or RCPY

Getting a list of copy groups

The following request gets information about the copy groups containing ShadowImage pairs in the storage system.

Important:

If the copy group name or device group name contains spaces, the copy group information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `pair` Specify this parameter to get detailed information about the pairs in each copy group in addition to a list of copy groups. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Body

None.

Response message

Body

```
{
  "data": [
    {
      "copyGroupName": "localCopyGroup1",
      "pvolDeviceGroupName": "localCopyGroup1P_",
      "svolDeviceGroupName": "localCopyGroup1S_",
      "localCloneCopygroupId": "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_"
    },
```

```
    {
      "copyGroupName": "localCopyGroup2",
      "pvolDeviceGroupName": "localCopyGrouppvol",
      "svolDeviceGroupName": "localCopyGroupsvol",
      "localCloneCopygroupId": "localCopyGroup2,localCopyGrouppvol,
localCopyGroupsvol"
    }
  ]
}
```

Attribute	Type	Description
copyGroupName	string	Copy group name
pvolDeviceGroupName	string	Device group name for the P-VOL
svolDeviceGroupName	string	Device group name for the S-VOL
localCloneCopygroupId	string	Object ID of the copy group that contains a ShadowImage pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName`

If you run the request with `pair` specified for the query parameter `detailInfoType`, you can get the following information, in addition to a list of copy groups:

Attribute	Type	Description
copyPairs	object[]	The following attributes about the ShadowImage pairs included in the copy group: If information cannot be acquired, the attributes under the `copyPairs` object are not output. ▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name

Attribute	Type	Description
		▪ replicationType (string) Pair type Outputs `SI` (ShadowImage). ▪ copyMode (string)# Copy mode Outputs `NotSnapshot`. ▪ pvolLdevId (int) LDEV number of the P-VOL ▪ svolLdevId (int) LDEV number of the S-VOL ▪ pvolMuNumber (int) MU number of the P-VOL ▪ pvolStatus (string)# Pair volume status of the P-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained or if the status of the ShadowImage pair in transition is `Deleting`. ▪ svolStatus (string)# Pair volume status of the S-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained or if the status of the ShadowImage pair in transition is `Deleting`.

Attribute	Type	Description
		▪ consistencyGroupId (int) Consistency group ID If the storage system is VSP E series, VSP Gx00 models or VSP Fx00 models, `-1` is output. This attribute is not output if no consistency group consists. ▪ localCloneCopypairId (string) Object ID of the ShadowImage pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName` ▪ `copyPairName` ▪ transitionStatus (string) The status of the ShadowImage pair in transition • `None`: The pair is not in transition • `Deleting`: The pair is being deleted

#: Immediately after the ShadowImage pair is created, pair information might be output as follows:

- The `copyMode` attribute is `NotSynchronized`.
- The `pvolStatus` attribute is `SMPL`.
- The `svolStatus` attribute is `SMPL`.

If this occurs, either run the API again after execution of the API for updating the cache of the storage system configuration information is complete, or run the API for getting information about specific copy groups to get correct information.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups
```

Getting information about a specific copy group

The following request gets information about the specified copy group. This request also gets information about ShadowImage pairs included in the copy group. The request can be used to check the pair status or get configuration information about the pairs.

Important:

- If the target copy group contains a ShadowImage pair that was created or deleted by using another REST API server or software other than the REST API, correct information about that pair might not be obtained. To obtain the most recent information about such pairs, use the API for obtaining a list of ShadowImage pairs.
- If the copy group name, device group name, or copy pair name contains spaces, the information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID
```

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.

Attribute	Type	Description
pvolDeviceGroupName	string	(Required) Specifies the device group name for the P-VOL. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specifies the device group name for the S-VOL. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "localCloneCopygroupId" : "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_",
  "copyGroupName" : "localCopyGroup1",
  "pvolDeviceGroupName" : "localCopyGroup1P_",
  "svolDeviceGroupName" : "localCopyGroup1S_",
  "copyPairs" : [ {
    "localCloneCopypairId" : "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1",
    "copyGroupName" : "localCopyGroup1",
    "copyPairName" : "pair1",
    "replicationType" : "SI",
    "copyMode" : "NotSnapshot",
    "copyProgressRate" : 100,
    "pvolLdevId" : 10,
    "pvolStatus" : "PAIR",
    "svolLdevId" : 20,
    "svolStatus" : "PAIR",
    "pvolMuNumber" : 0,
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  }, {
    "localCloneCopypairId" : "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair2",
    "copyGroupName" : "localCopyGroup1",
    "copyPairName" : "pair2",
    "replicationType" : "SI",
```

```
    "copyMode" : "NotSnapshot",
    "copyProgressRate" : 100,
    "pvolLdevId" : 30,
    "pvolStatus" : "PAIR",
    "svolLdevId" : 40,
    "svolStatus" : "PAIR",
    "pvolMuNumber" : 0,
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  } ]
}
```


Attribute	Type	Description
copyGroupName	string	Copy group name
pvolDeviceGroupName	string	Device group name for the P-VOL
svolDeviceGroupName	string	Device group name for the S-VOL
localCloneCopygroupId	string	Object ID of the copy group that contains a ShadowImage pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName`
copyPairs	object[]	The following attributes about the ShadowImage pairs included in the copy group: ▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name ▪ replicationType (string) Pair type Outputs `SI` (ShadowImage).

Attribute	Type	Description
		▪ copyMode (string) Copy mode Outputs `NotSnapshot`. ▪ copyProgressRate (int) Copy progress rate (%) This attribute is not output if no information can be obtained. ▪ pvolLdevId (int) LDEV number of the P-VOL ▪ svolLdevId (int) LDEV number of the S-VOL ▪ pvolMuNumber (int) MU number of the P-VOL ▪ pvolStatus (string) Pair volume status of the P-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained. ▪ svolStatus (string) Pair volume status of the S-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained. ▪ consistencyGroupId (int) Consistency group ID This attribute is not output if no consistency group consists.

Attribute	Type	Description
		▪ localCloneCopypairId (string) Object ID of the ShadowImage pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName` ▪ `copyPairName` ▪ pvolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. The same value as that of `svolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. The same value as that of `pvolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
404	Not Found	No copy group can be obtained, or no pair was included in the copy group that was obtained.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,localCopyGroup1S_
```

Getting a list of ShadowImage pairs

The following request obtains information about the ShadowImage pairs in a copy group specified by using query parameters. You can also update the pair information when you obtain information about ShadowImage pairs.

Important:

- If the target copy group contains a ShadowImage pair that was created or deleted by using another REST API server or software other than the REST API, information about that pair might not be obtained. In this case, if you specify `refresh=true` as a query parameter and run the request, you might be able to get the most recent pair information. Note that such processing takes time because the information about the pairs in the specified copy group is updated, and then information is obtained.
- If the copy group name, device group name, or copy pair name contains spaces, the information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
localCloneCopyGroupId	string	(Required) Object ID of the copy group that contains a pair Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes separated by a comma: *`copyGroupName,pvolDeviceGroupName, svolDeviceGroupName`* ▪ copyGroupName (string) Copy group name Value should not exceed 31 characters. ▪ pvolDeviceGroupName (string) Device group name for the P-VOL Value should not exceed 31 characters. ▪ svolDeviceGroupName (string) Device group name for the S-VOL Value should not exceed 31 characters.
refresh	boolean	(Optional) Whether to update the pair information to the most recent: ▪ `true`: Pair information will be updated. ▪ `false`: Pair information will not be updated. If you specify `true`, processing takes time because the information about the pairs in the specified copy group is updated and then information is obtained. If this parameter is omitted, `false` is assumed.

Body

None.

Response message

Body

Information about the pairs in the specified copy group is obtained in a list. For details about the response body, see the section describing the API for obtaining information about specific ShadowImage pairs.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET "https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/local-clone-copypairs?localCloneCopyGroupId=localCopyGroup1,
localCopyGroup1P_,localCopyGroup1S_&refresh=true"
```

Getting information about a specific ShadowImage pair

The following request gets information about the specified ShadowImage pair. This request can confirm whether a pair operation is finished based on the pair status, and can get configuration information such as the consistency group ID used when adding a pair.

Important:

- If the target ShadowImage pair was created or deleted by using another REST API server or software other than the REST API, correct information about that pair might not be obtained. To obtain the most recent information about the pairs, use the API for obtaining a list of ShadowImage pairs.
- If the copy group name, device group name, or copy pair name contains spaces, information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID
```

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the ShadowImage pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the copy pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "localCloneCopypairId" : "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1",
  "copyGroupName" : "localCopyGroup1",
  "copyPairName" : "pair1",
  "replicationType" : "SI",
  "copyMode" : "NotSnapshot",
  "copyProgressRate" : 100,
  "pvolLdevId" : 10,
  "pvolStatus" : "PAIR",
  "svolLdevId" : 20,
```

```
  "svolStatus" : "PAIR",
  "pvolMuNumber" : 0,
  "pvolProcessingStatus": "N",
  "svolProcessingStatus": "N"
}
```

Attribute	Type	Description
copyGroupName	string	Copy group name
copyPairName	string	Copy pair name
replicationType	string	Pair type `SI`: ShadowImage
copyMode	string	Copy mode Outputs `NotSnapshot`.
copyProgressRate	int	Copy progress rate (%) This attribute is not output if no information can be obtained.
pvolLdevId	int	LDEV number of the P-VOL
svolLdevId	int	LDEV number of the S-VOL
pvolMuNumber	int	MU number of the P-VOL
pvolStatus	string	Pair volume status of the P-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained.
svolStatus	string	Pair volume status of the S-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained.
consistencyGroupId	int	Consistency group ID This attribute is not output if no consistency group consists.
localCloneCopypairId	string	Object ID of the ShadowImage pair

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName` ▪ `copyPairName`
pvolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. The same value as that of `svolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. The same value as that of `pvolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1
```

Getting information about all of ShadowImage pairs

The following request gets information about the ShadowImage pairs registered in the target storage system. You can obtain information about all such pairs from the cache of the storage system, regardless of whether they are managed by using copy groups.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, and VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can use this item.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-replications
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
startPvolLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the first LDEV in the range. The P-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be smaller than that of the `endPvolLdevId` parameter. If this attribute is omitted, `0` is set.
endPvolLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the last LDEV in the range.

Parameter	Type	Description
		The P-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be greater than that of the `startPvolLdevId` parameter. If this attribute is omitted, the maximum LDEV number in the storage system is set.

Body

None.

Response message

Body

```
{
    "data": [
        {
            "localReplicationId": "474,475",
            "replicationType": "SI",
            "copyMode": "NotSnapshot",
            "pvolLdevId": 474,
            "svolLdevId": 475,
            "pvolMuNumber": 0,
            "pvolStatus": "PAIR",
            "svolStatus": "PAIR",
            "consistencyGroupId": -1,
            "transitionStatus": "None"
        },
        {
            "localReplicationId": "476,487",
            "replicationType": "SI",
            "copyMode": "NotSnapshot",
            "pvolLdevId": 476,
            "svolLdevId": 487,
            "pvolMuNumber": 0,
            "pvolStatus": "PAIR",
            "svolStatus": "PAIR",
            "consistencyGroupId": -1,
            "transitionStatus": "None"
        }
```

```
    ]
}
```

Attribute	Type	Description
localReplicationId	string	Object ID of the copy pair The following attributes are output, separated by commas: ▪ `pvolLdevId` ▪ `svolLdevId`
replicationType	string	Pair type Outputs `SI` (ShadowImage).
copyMode	string	Copy mode For ShadowImage, `NotSnapshot` is output. If Volume Migration operations have already been performed for the pair, `VolumeMigration` is output.
pvolLdevId	int	LDEV number of the P-VOL
svolLdevId	int	LDEV number of the S-VOL
pvolMuNumber	int	MU number of the P-VOL
pvolStatus	string	Pair volume status of the P-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained or if the status of the ShadowImage pair in transition is `Deleting`.
svolStatus	string	Pair volume status of the S-VOL For details, see the section describing the pair status (ShadowImage). This attribute is not output if no information can be obtained or if the status of the ShadowImage pair in transition is `Deleting`.
consistencyGroupId	int	Consistency group ID If the storage system is VSP E series, VSP Gx00 models or VSP Fx00 models, `-1` is output.

Attribute	Type	Description
		This attribute is not output if no consistency group consists.
transitionStatus	string	The status of the ShadowImage pair in transition ▪ `None`: The pair is not in transition ▪ `Deleting`: The pair is being deleted

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/local-replications
```

Creating a ShadowImage pair

The following request creates a ShadowImage pair in the target storage system. The ShadowImage pair is either added to a newly created copy group or to an existing copy group.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "copyGroupName": "localCopyGroup1",
  "copyPairName": "pair1",
  "replicationType": "SI",
  "pvolLdevId": 10,
  "pvolMuNumber": 0,
  "svolLdevId": 20,
  "pvolDeviceGroupName": "localCopyGroup1P_",
  "svolDeviceGroupName": "localCopyGroup1S_",
  "isNewGroupCreation": true,
  "copyPace": 1,
  "isConsistencyGroup": true,
  "consistencyGroupId": 1,
  "quickMode": false,
  "autoSplit": false,
  "isDataReductionForceCopy": true
}
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 29 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the copy pair name. Value should not exceed 31 characters. The name is case sensitive.
replicationType	string	(Required) Specify `SI` (ShadowImage) as the pair type.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL with a decimal (base 10) number.
svolLdevId	int	(Required) Specify the LDEV number of the S-VOL with a decimal (base 10) number.
pvolDeviceGroupName	string	(Optional) Specify the device group name for the P-VOL. Value should not exceed 31 characters. The name is case sensitive. Specify a device group name that differs from the device group name for the S-VOL. In addition, to add a ShadowImage pair to an existing copy group, specify the device group name for an existing P-VOL. If this value is omitted, *copyGroupName*`P_` is assumed.

Attribute	Type	Description
svolDeviceGroupName	string	(Optional) Specify the device group name for the S-VOL. Value should not exceed 31 characters. The name is case sensitive. Specify a device group name that differs from the device group name for the P-VOL. To add a ShadowImage pair to an existing copy group, specify the device group name for an existing S-VOL. If this value is omitted, *copyGroupName*`S_` is assumed.
isNewGroupCreation	boolean	(Required) Depending on the value, this attribute specifies whether to add a ShadowImage pair to a newly created copy group or to an existing copy group. ▪ `true`: Adds the ShadowImage pair to a newly created copy group. ▪ `false`: Adds the ShadowImage pair to an existing copy group.
pvolMuNumber	int	(Optional) Specify the MU number of the P-VOL. If you specify `true` for the `isNewGroupCreation` attribute, make sure to specify this attribute. If you specify `false` for the `isNewGroupCreation` attribute, you cannot specify this attribute. ▪ If the S-VOL is in layer 1, specify a value in the range from `0` to `2`. ▪ If the S-VOL is in layer 2, specify `1` or `2`.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed. If this value is omitted, `3` is assumed.

Attribute	Type	Description
isConsistencyGroup	boolean	(Optional) Depending on the value, this attribute specifies whether to register the new pair in a consistency group. If a pair that is already registered in the consistency group exists in the copy group, you can register the new pair in the same consistency group. ▪ `true`: Registers the pair in a consistency group. ▪ `false`: Does not register the pair in a consistency group. When the value of the `autoSplit` attribute is `true`, you cannot specify `true` for this item. If this value is omitted, `false` is assumed.
consistencyGroupId	int	(Optional) To register the new pair in the consistency group, specify the consistency group ID (`0` to `127`). If a pair is already registered in a consistency group in a copy group, specify the ID of the consistency group to which the existing pair belongs. If you specify `true` for the `isConsistencyGroup` attribute and do not specify this attribute, a new consistency group ID is assigned.
autoSplit	boolean	(Optional) Depending on the value, this attribute specifies whether to split the pair automatically after the operation finishes. ▪ `true`: Splits the pair after the operation finishes ▪ `false`: Does not split the pair after the operation finishes When the value of the `isConsistencyGroup` attribute is `true`, you cannot specify `true` for this item. If this value is omitted, `false` is assumed.

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. You can specify `true` for this item only when the value of the `autoSplit` attribute is `true`. If this value is omitted, `false` is assumed.
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair# ▪ `false`: Do not forcibly create a pair When the attribute is omitted, `false` is assumed.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created ShadowImage pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs
```

Splitting ShadowImage pairs in units of copy groups

The following request splits the ShadowImage pairs included in the specified copy group. If the pair is split, data can be read from or written to the secondary volume.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Note: The `forceSplit` attribute in the action template is unnecessary. When using the action template, remove this attribute before creating a request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.

Attribute	Type	Description
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10,
    "forceSuspend": false
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed. If you specify `true` for the `forceSuspend` attribute, you cannot specify this attribute.
forceSuspend	boolean	(Optional) Specify whether to force splitting of the pair. ▪ `true`: Forces splitting of the pair. ▪ `false`: Does not force splitting of the pair. If this value is omitted, `false` is assumed. If you specify `true` for this attribute, you cannot specify the `copyPace` attribute.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the split copy group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/split
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/split
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/split/invoke
```

Splitting a ShadowImage pair

The following request splits the specified ShadowImage pair. If the pair is split, data can be read from or written to the secondary volume.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Note: The `forceSplit` attribute in the action template is unnecessary. When using the action template, remove this attribute before creating a request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the ShadowImage pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.

Attribute	Type	Description
copyPairName	string	(Required) Specify the name of the copy pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10,
    "forceSuspend": false
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed. If you specify `true` for the `forceSuspend` attribute, you cannot specify this attribute.
forceSuspend	boolean	(Optional) Specify whether to force splitting of the pair. ▪ `true`: Forces splitting of the pair. ▪ `false`: Does not force splitting of the pair. If this value is omitted, `false` is assumed. If you specify `true` for this attribute, you cannot specify the `copyPace` attribute.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the split ShadowImage pair

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/split
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/split
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/split/invoke
```

Resynchronizing ShadowImage pairs in units of copy groups

The following HTTP request resynchronizes ShadowImage pairs that were split in the specified copy group in the normal direction (from primary volumes to secondary volumes).

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resynchronized copy group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/resync
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/resync
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/resync/invoke
```

Resynchronizing a ShadowImage pair

The following HTTP request resynchronizes a split ShadowImage pair in the normal direction (from the primary volume to the secondary volume).

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the ShadowImage pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the copy pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resynchronized ShadowImage pair

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/resync
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/resync
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/resync/invoke
```

Restoring ShadowImage pairs in units of copy groups

The following HTTP request resynchronizes ShadowImage pairs that were split in the specified copy group in the reverse direction (from secondary volumes to the primary volumes).

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/actions/restore/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10
```

```
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the restored copy group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/restore
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/restore
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_/actions/restore/invoke
```

Restoring a ShadowImage pair

The following HTTP request resynchronizes a split ShadowImage pair in the reverse direction (from the secondary volume to the primary volume).

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/restore/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the ShadowImage pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the copy pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "quickMode": true,
    "copyPace": 10
  }
}
```

Attribute	Type	Description
quickMode	boolean	(Optional) Specify whether to run in quick mode. ▪ `true`: Performs execution in quick mode. ▪ `false`: Performs execution in normal mode. If this value is omitted, `false` is assumed.
copyPace	int	(Optional) Specify a value in the range from `1` to `15` to be the copy speed. The larger the value, the higher the speed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the restored ShadowImage pair

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/restore
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The action template cannot be obtained, because the object is incorrect.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/restore
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1/actions/restore/invoke
```

Deleting a copy group

The following request deletes ShadowImage pairs by using the specified copy group. When the pairs are all deleted, the device groups are also deleted.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID
```

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted copy group

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary
```

```
@./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_
```

When forcibly deleting a copy group

When a copy group cannot be deleted because the device group in a local storage system remains or because the configuration is not normal, you can forcibly delete the copy group by specifying the `forceDelete` attribute for the request body. The following shows a coding example of using the `forceDelete` attribute:

```
{
  "forceDelete" : true
}
```

Attribute	Type	Description
forceDelete	boolean	(Optional) Specify whether to delete the copy group forcibly. ▪ `true`: Forcibly delete the copy group. ▪ `false`: Do not forcibly delete the copy group. When the attribute is omitted, `false` is assumed.

Deleting a ShadowImage pair

The following request deletes the specified ShadowImage pair. If there is no ShadowImage pair in the copy group, the copy group and the device group that makes up of the copy group are also deleted.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID
```

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the ShadowImage pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the copy pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted ShadowImage pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X DELETE https://192.0.2.100:23451/ConfigurationManager/v1/
objects/storages/836000123456/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1
```

Chapter 12: Managing Thin Image pairs

This chapter describes how to perform operations on Thin Image pairs by using the REST API. In this manual, when it is not necessary to differentiate between Thin Image (CAW/CoW) and Thin Image Advanced, both are referred to as Thin Image. In the case of VSP One B20, you can use only the Thin Image Advanced function.

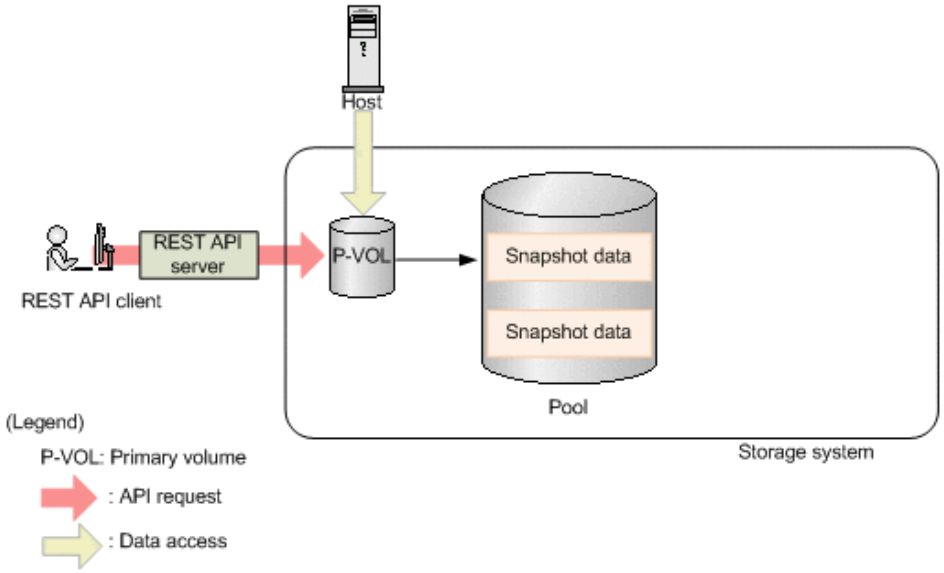
Overview of Thin Image

Thin Image creates a copy of a primary volume in a storage system by storing only the differential data for the primary volume.

When updating the primary volume, Thin Image stores the differential data in a Thin Image pool (that not used for Thin Image Advanced) or an HDP pool as snapshot data. If a failure occurs in the data in the storage system, the data can be restored by using the snapshot data. A REST API client issues an API to perform operations for Thin Image.

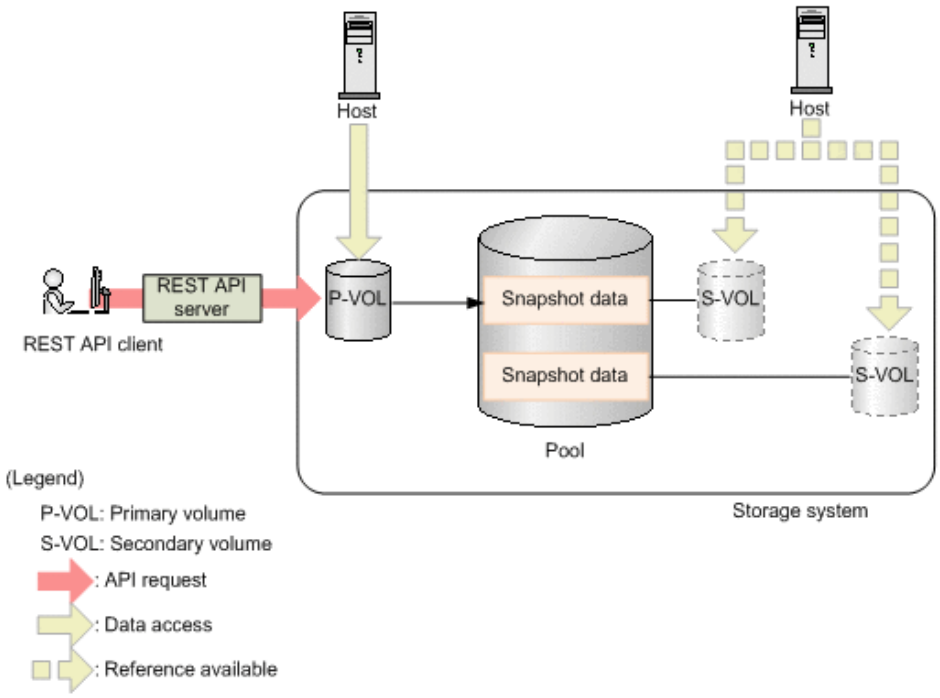
- When a Thin Image pair without a secondary volume is created:

  If a problem occurs in the primary volume data, the primary volume can be restored by using the snapshot data. A secondary volume can be allocated later to the snapshot data when the secondary volume becomes necessary.



- When a Thin Image pair with a secondary volume is created:

  The primary volume can be restored by using the snapshot data. In addition, a copy of the primary volume from when the snapshot data was stored can be viewed from the secondary volume. The following figure shows an example of obtaining a snapshot of a Thin Image pair.



To store snapshot data, create a Thin Image pair where an LDEV or a DP volume is used as a primary volume, and a virtual volume for Thin Image or a DP volume is used as a secondary volume. If the created pair is registered to a snapshot group or a consistency group, processing can be performed by group. If a consistency group is defined, the snapshot data from when the storage system received a request can be stored for all the primary volumes in that consistency group.

You can create a cascade configuration by creating a Thin Image pair for another Thin Image pair. You can also create a clone of a Thin Image pair (but you cannot create a clone for Thin Image Advanced) and use the created clone as DP volumes.

For details about Thin Image, see the *Hitachi Thin Image User Guide*, or the *Hitachi Thin Image Advanced User Guide*.

Workflow for operating Thin Image pairs

The following shows the Thin Image functions that can be run by the REST API:

- Getting information about snapshot groups

  Obtains a list of snapshot groups registered in the target storage system.

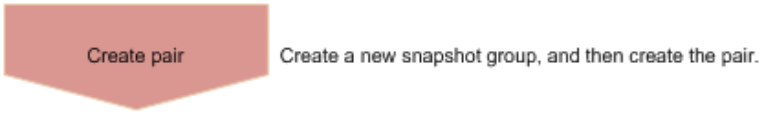
- Getting pair status and configuration information

  Obtains a Thin Image pair status and configuration information. You can check if a pair operation is complete. You can also obtain pair information in units of snapshot groups.

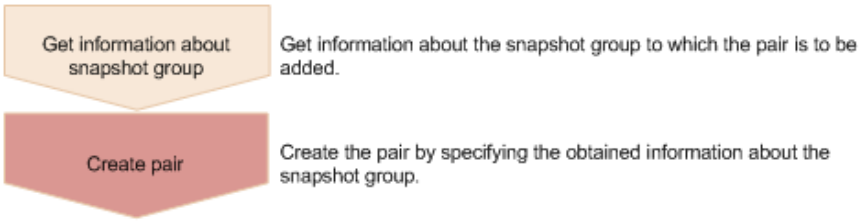
- Creating a pair

  Creates a new Thin Image pair in a snapshot group of the target storage system. If the snapshot group is not created, the snapshot group is automatically created. You will be able to perform operations in units of snapshot groups by creating Thin Image pairs in a snapshot group.

  To create a pair in a new snapshot group:

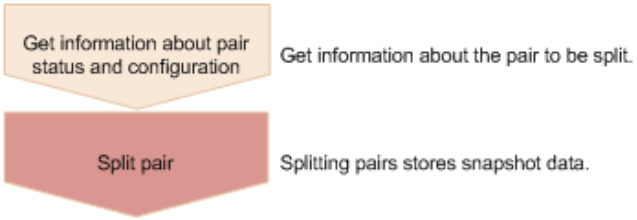
  To create a pair in an existing snapshot group:

  When creating a pair, you can specify whether the clone attribute can be set and whether a cascade configuration is possible.

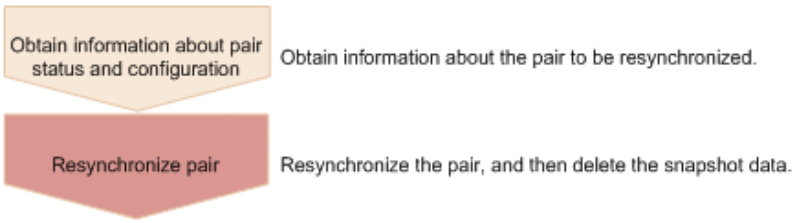
- Storing snapshot data

  Splits a Thin Image pair, and then stores snapshot data, after the primary volume is updated.

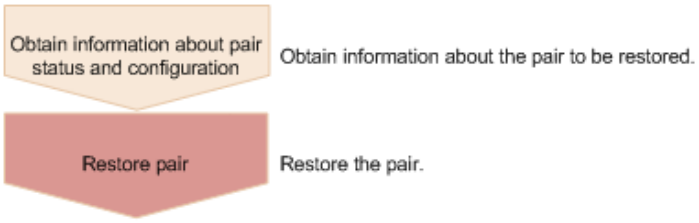
- Resynchronizing a pair

  Deletes old snapshot data by resynchronizing a pair. You can perform pair resynchronization if the pair status is PSUS. When pair resynchronization is complete, new snapshot data can be automatically stored again.



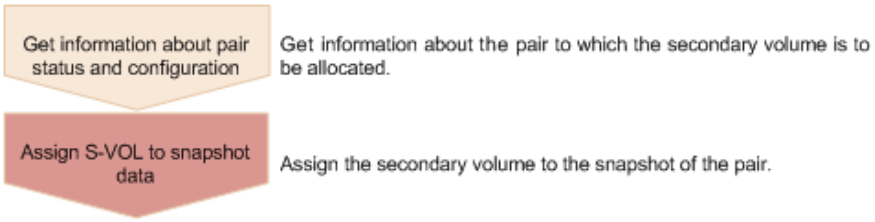
- Recovering a pair by a restore

  If you restore a split Thin Image pair, data of the primary volume is restored to the data from when the snapshot data was stored. You can also perform a restore in units of snapshot groups. You can perform a restore if the pair status is PSUS.



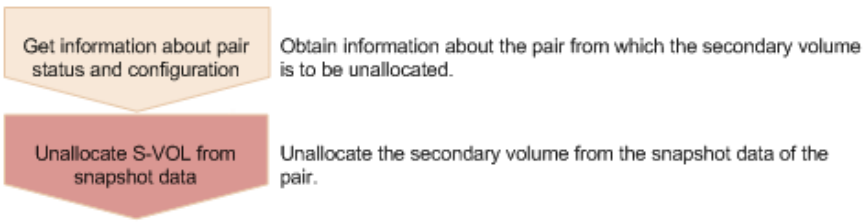
- Assigning a secondary volume to snapshot data

  Assigns a secondary volume to the snapshot data of the specified Thin Image pair. Create in advance a virtual volume for Thin Image to be used as the secondary volume. If you assign a secondary volume, you can view the snapshots.



- Unallocating the secondary volume for snapshot data

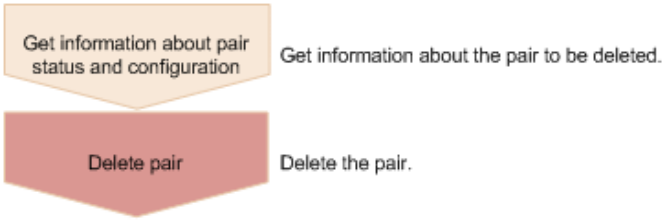
  Unallocates the secondary volume of the specified Thin Image pair.



- Deleting a pair

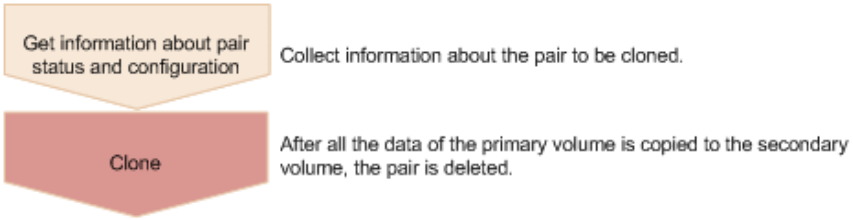
  Deletes a Thin Image pair that is unnecessary. If you delete a pair, the snapshot data is deleted from the Thin Image pool or the HDP pool. In addition, if the specified Thin Image pair is the last one in a snapshot group, the snapshot group is also deleted. You can also delete pairs in units of snapshot groups or snapshot trees.

  You can delete a pair at any time regardless of the pair status. However, if you delete a pair while the pair status is being changed, the pair might be deleted before its status is changed, and the request to change the pair status might time out.



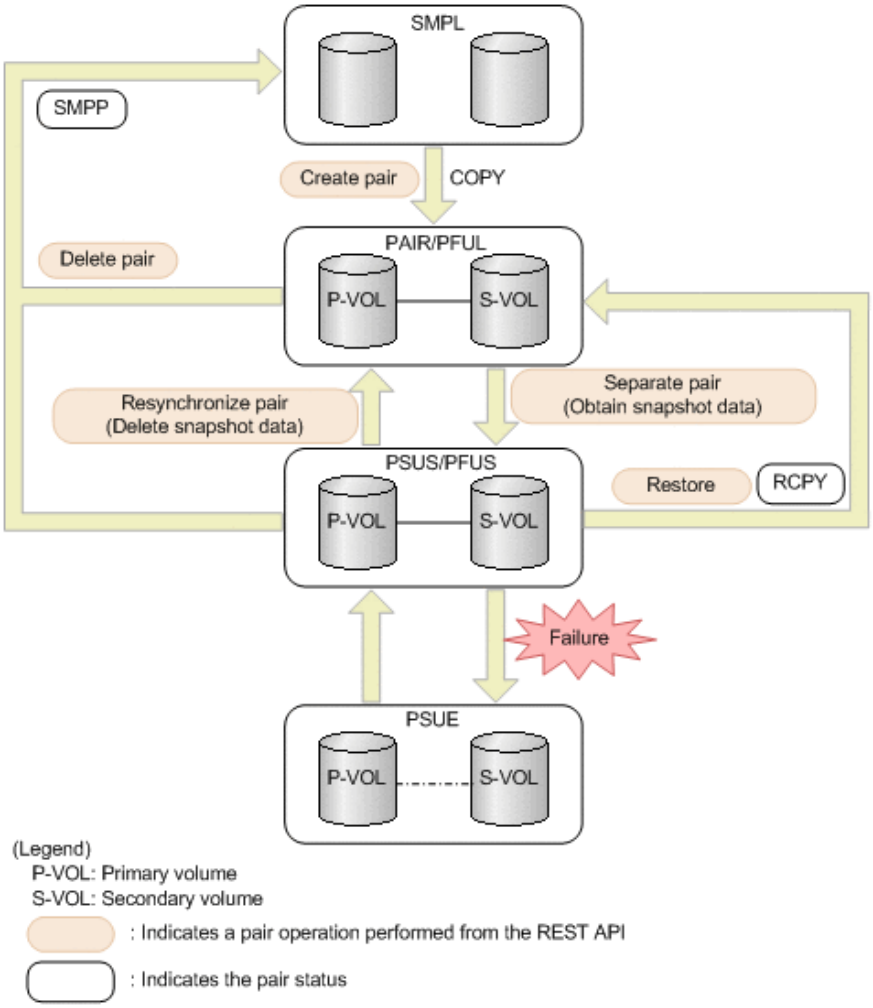
- Cloning (You cannot clone pairs for Thin Image Advanced.)

  After all the data of the primary volume of a Thin Image pair that has the clone attribute is copied to the secondary volume, the pair is deleted.



Pair status (Thin Image)

Pair status changes according to the pair operation.



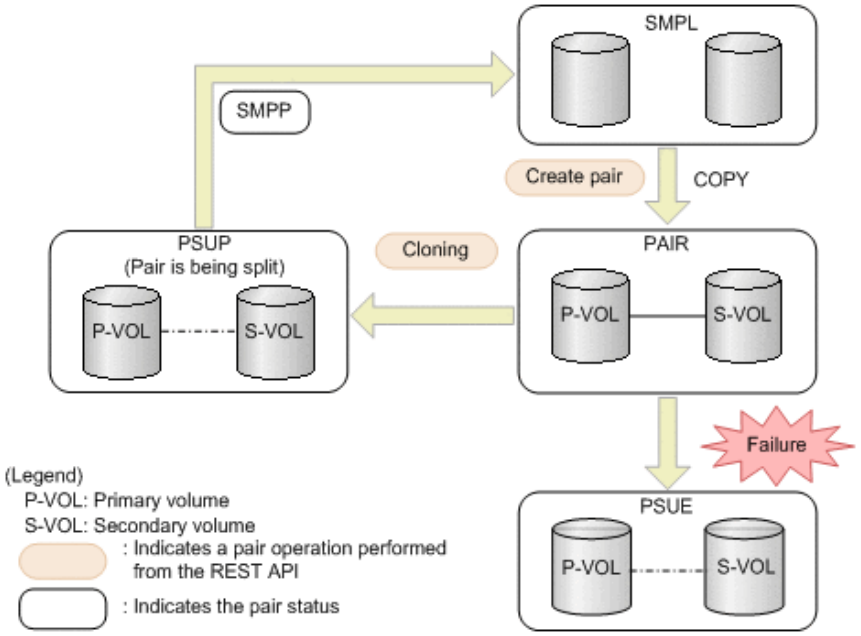
Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	-	-
SMPP	A pair was deleted and differential data is now being deleted#	R/W enabled	Not enabled
COPY	A pair is being created	R/W enabled	Not enabled
PAIR	Paired volumes	R/W enabled	Not enabled
PFUL	The volumes are paired, and the threshold of a Thin Image pool or an HDP pool is exceeded.	R/W enabled	Not enabled
PSUS	The pair has been split.	R/W enabled	R/W enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
PFUS	The pair is split and the threshold of a Thin Image pool or an HDP pool is exceeded.	R/W enabled	R/W enabled
RCPY	A restore operation is being performed. (Data is being copied from the S-VOL to the P-VOL.)	R/W enabled	Not enabled
PSUE	The pairing is suspended.	R/W enabled	Not enabled

#: When a pair is in the SMPP status, the volumes that made up the pair cannot be deleted.

When a Universal Replicator pair is made up of volumes with the SLU attribute, if a REST API request whose object type is `snapshot-groups` or `snapshots` is run on the pair, the CPYD status might be output. CPYD indicates the same status as PSUS, PSUP, and PFUS.

The following figure shows the pair status changes when cloning is performed.

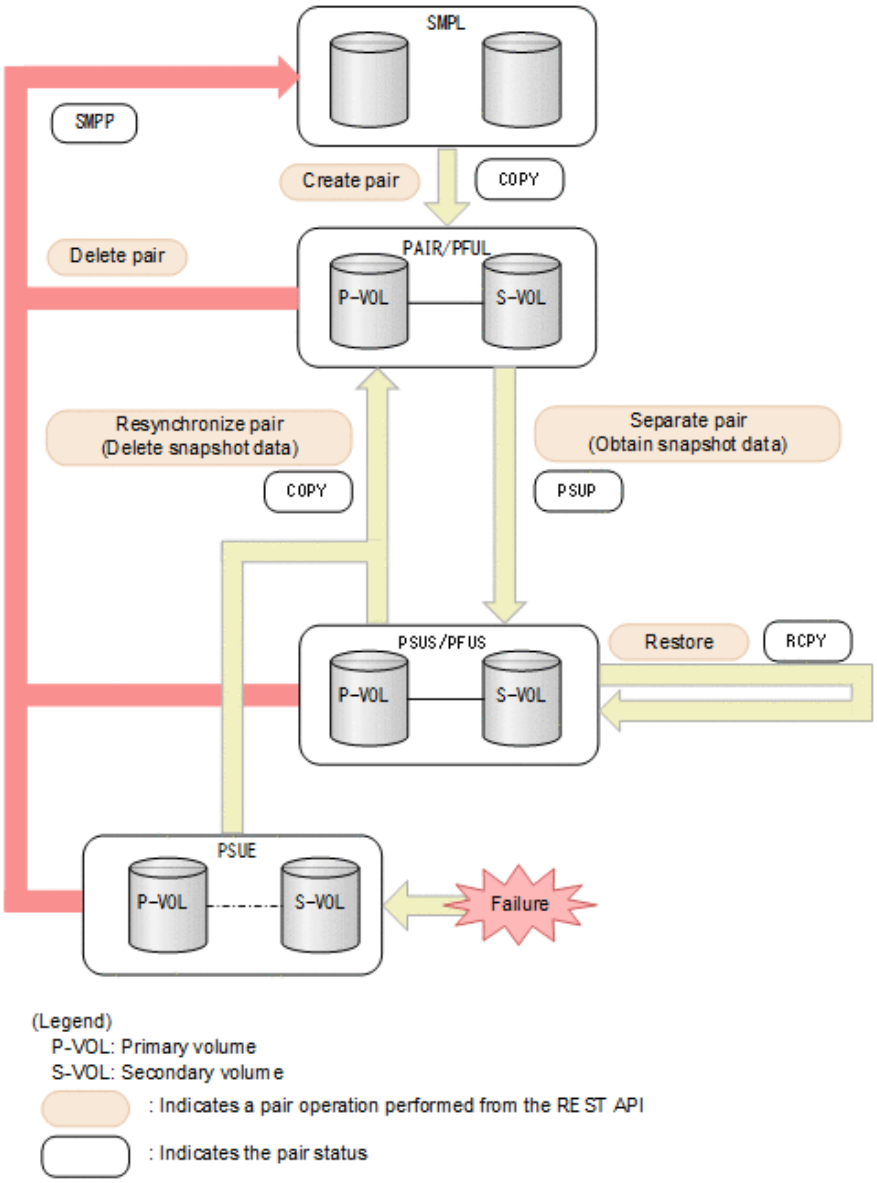


Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	-	-
SMPP	A pair was deleted and differential data is now being deleted#	R/W enabled	R/W enabled
COPY	A pair is being created	R/W enabled	Not enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
PAIR	Paired volumes	R/W enabled	Not enabled
PSUP	A pair is being split	R/W enabled	R/W enabled
PSUE	The pairing is suspended.	R/W enabled	Not enabled

#: When a pair is in the SMPP status, the volumes that made up the pair cannot be deleted.

For Thin Image Advanced



Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	-	-
SMPP	A pair was deleted and differential data is now being deleted#	R/W enabled	Not enabled
COPY	A pair is being created	R/W enabled	Not enabled
PAIR	Paired volumes	R/W enabled	Not enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
PFUL	The volumes are paired, and the threshold of an HDP pool is exceeded.	R/W enabled	Not enabled
PSUS	The pair has been split.	R/W enabled	R/W enabled
PFUS	The pair is split and the threshold of an HDP pool is exceeded.	R/W enabled	R/W enabled
PSUE	The pairing is suspended.	R/W enabled	Not enabled
PSUP	A pair is being split	R/W enabled	Not enabled
CPYP	A secondary volume is being assigned or unassigned	R/W enabled	Not enabled
RCPY	A restore operation is being performed.	Not enabled	Not enabled

#: When a pair is in the SMPP status, the volumes that made up the pair cannot be deleted.

Getting information about Thin Image pairs in units of snapshot groups

The following request gets a list of information about Thin Image pairs in units of snapshot groups. Use this information to check the information that is necessary for performing pair operations (for example, the pair status).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups
```

Request message

Object ID

None.

Query parameters

You can get a list of information about pairs in a snapshot group, as well as detailed information about a pair in a snapshot group.

Parameter	Type	Description
snapshotGroupName	string	(Optional) Specify the name of the snapshot group that contains the Thin Image pairs. Specify a character string consisting of 1 to 32 characters. Specify this parameter to get a list of information about pairs in the target snapshot group. If this parameter is omitted, this request gets a list of snapshot groups. If you specify `pair` for the `detailInfoType` parameter, you cannot specify this parameter. If you specify `retention` for the `detailInfoType` parameter, make sure to also specify this parameter.

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `pair` Gets detailed information about the pairs in each snapshot group in addition to a list of snapshot groups. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". This value cannot be specified at the same time as the `snapshotGroupName` parameter. ▪ `retention` Gets the remaining period for which the snapshot data for a pair in the snapshot group is retained. This value can be specified if the storage system is VSP One B20. If you specify this value, make sure to also specify the `snapshotGroupName` parameter.

Body

None.

Response message

Body

The following is an example of the output generated when getting a list of snapshot groups:

```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
```

```
      "snapshotGroupId": "snapshotGroup"
    },
    {
      "snapshotGroupName": "snapshotGroup2",
      "snapshotGroupId": "snapshotGroup2"
    }
  ]
}
```

Attribute	Type	Description
snapshotGroupName	string	Name of the snapshot group that contains the Thin Image pairs. If the name of the snapshot group contains spaces, information about that snapshot group is not output.
snapshotGroupId	string	Object ID of the snapshot group.

The following is an example of the output when the request for getting a list of information about pairs in a snapshot group is executed with `snapshotGroupName` specified as the query parameter. If multiple pairs exist, the information is output in ascending order of the LDEV number and MU number of the primary volume.

```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 3,
      "svolLdevId": 101,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,3",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    },
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
```

```
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 4,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,4",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    }
  ]
}
```


Attribute	Type	Description
snapshotGroupName	string	Name of the snapshot group that contains the Thin Image pairs. If the name of the snapshot group contains spaces, information about pairs is not output.
primaryOrSecondary	string	Attribute of the LDEV
status	string	Pair status For details, see the section explaining on pair status (Thin Image).
pvolLdevId	int	LDEV number of P-VOL
muNumber	int	MU number of the P-VOL
svolLdevId	int	LDEV number of S-VOL
snapshotPoolId	int	ID of the pool in which the snapshot data is created
isRedirectOnWrite	boolean	Returns whether the pair is a Thin Image Advanced pair. ▪ `true`: The pair is a Thin Image Advanced pair. ▪ `false`: The pair is not a Thin Image Advanced pair.
concordanceRate	int	Concordance rate for pairs

Attribute	Type	Description
		This attribute is output when either of the following conditions is met: ▪ The value of the `isClone` attribute is `false`, and the value of the `canCascade` attribute is also `false`. ▪ The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is not any of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`. This attribute is not output if the `isRedirectOnWrite` attribute is `true`.
progressRate	int	Progress of the processing This attribute is output when the following condition is met: The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is one of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`.
isConsistencyGroup	boolean	Returns whether the pair was created in the consistency group mode (CTG mode). ▪ `true`: The pair was created in the CTG mode. ▪ `false`: The pair was not created in the CTG mode.
isWrittenInSvol	boolean	Returns whether data was written to the S-VOL from the host when the pair status was `PSUS`/`PFUS`. ▪ `true`: Data was written to the S-VOL ▪ `false`: Data was not written to the S-VOL If the target pair is a Thin Image pair that does not have an S-VOL, `false` is displayed.
isClone	boolean	Returns whether the pair has the clone attribute. ▪ `true`: The pair has the clone attribute. ▪ `false`: The pair does not have the clone attribute.

Attribute	Type	Description
canCascade	boolean	Returns whether the pair can be a cascaded pair. ▪ `true`: The pair can be a cascaded pair. ▪ `false`: The pair cannot be a cascaded pair.
splitTime	string	Time when snapshot data was created The local time of the storage system is returned in YYYY-MM-DDThh:mm:ss format. For the following storage systems, if you asked maintenance personnel to configure settings to allow the use of an external authentication server or a key management server, the time zone settings for the storage system might be changed: VSP G1000, VSP G1500, or VSP F1500. In such cases, Greenwich Mean Time (GMT) is displayed.
snapshotId	string	Object ID of the Thin Image pair The following attributes are output, separated by commas: ▪ pvolLdevId ▪ muNumber
pvolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `P-VOL`.
svolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `S-VOL`.

Attribute	Type	Description
snapshotDataReadOnly	boolean	Returns whether the snapshot data is a pair that has the read-only attribute ▪ `true`: Read-only ▪ `false`: Not read-only This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

If you run the request with `pair` specified for the query parameter `detailInfoType`, you can get the following information, in addition to a list of snapshot groups. If multiple pairs exist, the information is output in ascending order of the LDEV number and MU number of the primary volume.

Attribute	Type	Description
snapshots	object[]	Outputs the following attributes related to Thin Image pairs contained in the snapshot group. ▪ snapshotGroupName (string) Name of the snapshot group ▪ status (string) Pair status For details, see the section explaining on pair status (Thin Image). ▪ pvolLdevId (int) LDEV number of P-VOL ▪ muNumber (int) MU number of the P-VOL ▪ svolLdevId (int) LDEV number of S-VOL This attribute is displayed if the target pair is a Thin Image pair that has an S-VOL. ▪ snapshotPoolId (int) ID of the pool in which the snapshot data is created

Attribute	Type	Description
		▪ isRedirectOnWrite (boolean) Returns whether the pair is a Thin Image Advanced pair. • `true`: The pair is a Thin Image Advanced pair. • `false`: The pair is not a Thin Image Advanced pair. ▪ concordanceRate (int) Concordance rate for pairs This attribute is displayed if the pair status is not `SMPL`. This attribute is not output if the `isRedirectOnWrite` attribute is `true`. ▪ isConsistencyGroup (boolean) Returns whether the pair was created in the consistency group mode (CTG mode). • `true`: The pair was created in the CTG mode. • `false`: The pair was not created in the CTG mode. ▪ isWrittenInSvol (boolean) Returns whether data was written to the S-VOL from the host when the pair status was `PSUS`/`PFUS`. • `true`: Data was written to the S-VOL • `false`: Data was not written to the S-VOL If the target pair is a Thin Image pair that does not have an S-VOL, `false` is displayed. ▪ isClone (boolean) Returns whether the pair has the clone attribute. • `true`: The pair has the clone attribute. • `false`: The pair does not have the clone attribute.

Attribute	Type	Description
		▪ canCascade (boolean) Returns whether the pair can be a cascaded pair. • `true`: The pair can be a cascaded pair. • `false`: The pair cannot be a cascaded pair. ▪ splitTime (string) Time when snapshot data was created This attribute is displayed if the pair status is `PSUS`, `PFUS`, or `PSUP`. The storage system time in Greenwich Mean Time (GMT) is displayed in the YYYY-MM-DDThh:mm:ss format. ▪ snapshotId (string) Object ID of the Thin Image pair The following attributes are output, separated by commas: • `pvolLdevId` • `muNumber`

If you run this request with `retention` specified for the query parameter `detailInfoType`, you can get the following information in addition to a list of pair information for the snapshot group. If multiple pairs exist, the information is output in ascending order of the LDEV number and MU number of the primary volume.

Attribute	Type	Description
retentionPeriod	int	The remaining period for which snapshot data is retained This value is output in units of hours. This value is not output for pairs for which no snapshot data retention period is set.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups
```

Getting information about Thin Image pairs in a specified snapshot group

The following request gets information about Thin Image pairs in units of snapshot groups. Use this information to check the information that is necessary for performing pair operations (for example, the pair status).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID
```

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group. Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `retention` Gets the remaining period for which snapshot data is retained. This value can be specified if the storage system is VSP One B20.

Body

None.

Response message

Body


```
{
  "snapshotGroupName" : "snapshotGroup",
  "snapshotGroupId" : "snapshotGroup",
  "snapshots" : [ {
    "snapshotGroupName": "snapshotGroup",
    "primaryOrSecondary": "P-VOL",
    "status": "PSUS",
    "pvolLdevId": 100,
    "muNumber": 3,
    "svolLdevId": 101,
    "snapshotPoolId": 10,
    "concordanceRate": 100,
    "isConsistencyGroup": true,
    "isWrittenInSvol": false,
    "isClone": false,
    "canCascade": false,
    "isRedirectOnWrite": false,
    "splitTime": "2015-03-20T09:27:35",
    "snapshotId": "100,3",
    "pvolProcessingStatus": "N",
    "snapshotDataReadOnly": false
  }, {
    "snapshotGroupName": "snapshotGroup",
    "primaryOrSecondary": "P-VOL",
    "status": "PSUS",
    "pvolLdevId": 100,
    "muNumber": 4,
    "snapshotPoolId": 10,
    "concordanceRate": 100,
    "isConsistencyGroup": true,
    "isWrittenInSvol": false,
    "isClone": false,
    "canCascade": false,
    "isRedirectOnWrite": false,
    "splitTime": "2015-03-20T09:27:35",
    "snapshotId": "100,4",
    "pvolProcessingStatus": "N",
    "snapshotDataReadOnly": false
  } ]
}
```

Attribute	Type	Description
snapshotGroupName	string	Name of the snapshot group that contains the Thin Image pairs. If the name of the snapshot group contains spaces, information about pairs is not output.
snapshotGroupId	string	Object ID of the snapshot group
snapshots	object[]	Outputs the following attributes related to Thin Image pairs contained in the snapshot group. ▪ snapshotGroupName (string) Name of the snapshot group ▪ primaryOrSecondary (string) Attribute of the LDEV ▪ status (string) Pair status For details, see the section explaining on pair status (Thin Image). ▪ pvolLdevId (int) LDEV number of P-VOL ▪ muNumber (int) MU number of the P-VOL ▪ svolLdevId (int) LDEV number of S-VOL ▪ snapshotPoolId (int) ID of the pool in which the snapshot data is created ▪ isRedirectOnWrite (boolean) Returns whether the pair is a Thin Image Advanced pair. • `true`: The pair is a Thin Image Advanced pair. • `false`: The pair is not a Thin Image Advanced pair.

Attribute	Type	Description
		▪ concordanceRate (int) Concordance rate for pairs This attribute is output when either of the following conditions is met: • The value of the `isClone` attribute is `false`, and the value of the `canCascade` attribute is also `false`. • The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is not any of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`. This attribute is not output if the `isRedirectOnWrite` attribute is `true`. ▪ progressRate (int) Progress of the processing This attribute is output when the following condition is met: The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is one of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`. ▪ isConsistencyGroup (boolean) Returns whether the pair was created in the consistency group mode (CTG mode). ▪ `true`: The pair was created in the CTG mode. ▪ `false`: The pair was not created in the CTG mode. ▪ isWrittenInSvol (boolean) Returns whether data was written to the S-VOL from the host when the pair status was `PSUS`/`PFUS`. ▪ `true`: Data was written to the S-VOL ▪ `false`: Data was not written to the S-VOL If the target pair is a Thin Image pair that does not have an S-VOL, `false` is displayed.

Attribute	Type	Description
		▪ isClone (boolean) Returns whether the pair has the clone attribute. ▪ `true`: The pair has the clone attribute. ▪ `false`: The pair does not have the clone attribute. ▪ canCascade (boolean) Returns whether the pair can be a cascaded pair. ▪ `true`: The pair can be a cascaded pair. ▪ `false`: The pair cannot be a cascaded pair. ▪ splitTime (string) Time when snapshot data was created The local time of the storage system is returned in YYYY-MM-DDThh:mm:ss format. For the following storage systems, if you asked maintenance personnel to configure settings to allow the use of an external authentication server or a key management server, the time zone settings for the storage system might be changed: VSP G1000, VSP G1500, VSP F1500. In such cases, Greenwich Mean Time (GMT) is displayed. ▪ snapshotId (string) Object ID of the Thin Image pair The following attributes are output, separated by commas: ▪ `pvolLdevId` ▪ `muNumber`

Attribute	Type	Description
		▪ pvolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `P-VOL`. ▪ svolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `S-VOL`. ▪ snapshotDataReadOnly (boolean) Returns whether the snapshot data is a pair that has the read-only attribute • `true`: Read-only • `false`: Not read-only This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ retentionPeriod (int) The remaining period for which snapshot data is retained This value is output in units of hours. This value is not output for pairs for which no snapshot data retention period is set.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json"  -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup
```

Getting information about Thin Image pairs

The following request gets a list of information about Thin Image pairs. Use this information to check the information that is necessary for performing pair operations (for example, the pair status).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots
```

Request message

Object ID

None.

Query parameters

You can use the specified conditions to filter the execution results and also to get detailed information about Thin Image pairs.

When filtering execution results

Parameter	Type	Filter Condition
snapshotGroupName	string	(Optional) Specify the name of the snapshot group that contains the Thin Image pairs. Specify a character string consisting of 1 to 32 characters.
pvolLdevId	int	(Optional) Specify the LDEV number of the P-VOL of the Thin Image pair. Specify a decimal (base 10) number equal to or greater than `0`.

Parameter	Type	Filter Condition
svolLdevId	int	(Optional) Specify the LDEV number of the S-VOL of the Thin Image pair. If the S-VOL exists, specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Optional) Specify the MU number of the P-VOL of the Thin Image pair. Specify a value in the range from `0` to `1023`.

The following shows how to specify parameters:

- The LDEV number of the P-VOL and the snapshot group name
- The LDEV number and the MU number of the P-VOL
- Only the LDEV number of the P-VOL
- If the secondary volume exists, only the LDEV number of the S-VOL

If no parameters are specified, an error occurs.

When collecting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained If you use this parameter, you also need to specify the parameter that filters the execution results. ▪ `retention` Gets the remaining period for which snapshot data is retained. This value can be specified if the storage system is VSP One B20.

Body

None.

Response message

Body

If information about multiple Thin Image pairs is obtained, the information is output in ascending order of the LDEV number and MU number of the primary volume.

The following is an output example of Thin Image pair information obtained by specifying the LDEV number of the primary volume and the snapshot group name:


```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 3,
      "svolLdevId": 101,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,3",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    },
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 4,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,4",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    }
  ]
}
```

The following is an output example of Thin Image pair information obtained by specifying the LDEV number and the MU number of the primary volume:


```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 3,
      "svolLdevId": 101,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,3",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    }
  ]
}
```


The following is an output example of Thin Image pair information obtained by specifying the LDEV number of the primary volume:


```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 3,
      "svolLdevId": 101,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,3",
      "pvolProcessingStatus": "N",
```

```
      "snapshotDataReadOnly": false
    },
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 4,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,4",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    }
  ]
}
```


The following is an output example of Thin Image pair information obtained by specifying the LDEV number of the secondary volume:


```
{
  "data": [
    {
      "snapshotGroupName": "snapshotGroup",
      "primaryOrSecondary": "P-VOL",
      "status": "PSUS",
      "pvolLdevId": 100,
      "muNumber": 3,
      "svolLdevId": 101,
      "snapshotPoolId": 10,
      "concordanceRate": 100,
      "isConsistencyGroup": true,
      "isWrittenInSvol": false,
      "isClone": false,
      "canCascade": false,
      "isRedirectOnWrite": false,
      "splitTime": "2015-03-20T09:27:35",
      "snapshotId": "100,3",
      "pvolProcessingStatus": "N",
      "snapshotDataReadOnly": false
    }
```

```
  ]
}
```

Attribute	Type	Description
snapshotGroupName	string	Name of the snapshot group that contains the Thin Image pairs. If the name of the snapshot group contains spaces, information about pairs is not output.
primaryOrSecondary	string	Attribute of the LDEV
status	string	Pair status For details, see the section explaining on pair status (Thin Image).
pvolLdevId	int	LDEV number of P-VOL
muNumber	int	MU number of the P-VOL
svolLdevId	int	LDEV number of S-VOL
snapshotPoolId	int	ID of the pool in which the snapshot data is created
isRedirectOnWrite	boolean	Returns whether the pair is a Thin Image Advanced pair. ▪ `true`: The pair is a Thin Image Advanced pair. ▪ `false`: The pair is not a Thin Image Advanced pair.
concordanceRate	int	Concordance rate for pairs This attribute is output when either of the following conditions is met: ▪ The value of the `isClone` attribute is `false`, and the value of the `canCascade` attribute is also `false`. ▪ The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is not any of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`. This attribute is not output if the `isRedirectOnWrite` attribute is `true`.
progressRate	int	Progress of the processing

Attribute	Type	Description
		This attribute is output when the following condition is met: The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is one of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`.
isConsistencyGroup	boolean	Returns whether the pair was created in the consistency group mode (CTG mode). ▪ `true`: The pair was created in the CTG mode. ▪ `false`: The pair was not created in the CTG mode.
isWrittenInSvol	boolean	Returns whether data was written to the S-VOL from the host when the pair status was `PSUS`/`PFUS`. ▪ `true`: Data was written to the S-VOL ▪ `false`: Data was not written to the S-VOL If the target pair is a Thin Image pair that does not have an S-VOL, `false` is displayed.
isClone	boolean	Returns whether the pair has the clone attribute. ▪ `true`: The pair has the clone attribute. ▪ `false`: The pair does not have the clone attribute.
canCascade	boolean	Returns whether the pair can be a cascaded pair. ▪ `true`: The pair can be a cascaded pair. ▪ `false`: The pair cannot be a cascaded pair.
splitTime	string	Time when snapshot data was created The local time of the storage system is returned in YYYY-MM-DDThh:mm:ss format. For the following storage systems, if you asked maintenance personnel to configure settings to allow the use of an external authentication server or a key management server, the time zone settings for the storage system might be changed: VSP G1000, VSP G1500, VSP F1500. In such cases, Greenwich Mean Time (GMT) is displayed.
snapshotId	string	Object ID of the Thin Image pair

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ pvolLdevId ▪ muNumber
pvolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `P-VOL`.
svolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `S-VOL`.
snapshotDataReadOnly	boolean	Returns whether the snapshot data is a pair that has the read-only attribute ▪ `true`: Read-only ▪ `false`: Not read-only This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

If you run the request with `retention` specified for the query parameter `detailInfoType`, the following information is obtained.

Attribute	Type	Description
retentionPeriod	int	The remaining period for which snapshot data is retained This value is output in units of hours.

Attribute	Type	Description
		This value is not output for pairs for which no snapshot data retention period is set.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

When the LDEV number of the P-VOL and the snapshot group name are specified:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET "https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots?pvolLdevId=100&snapshotGroupName=snapshotGroup"
```

When the LDEV number and the MU number of the P-VOL are specified:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET "https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots?pvolLdevId=100&muNumber=3"
```

When only the LDEV number of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots?pvolLdevId=100
```

If the secondary volume exists, when only the LDEV number of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots?svolLdevId=101
```

Getting information about a specific Thin Image pair

The following request gets information about the specified Thin Image pair. Use this information to check the information that is necessary for performing pair operations (for example, the pair status).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID
```

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL of the Thin Image pair. Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) Specify the MU number of the P-VOL of the Thin Image pair. Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "snapshotGroupName": "snapshotGroup",
  "primaryOrSecondary": "P-VOL",
  "status": "PSUS",
  "pvolLdevId": 100,
  "muNumber": 3,
  "svolLdevId": 101,
  "snapshotPoolId": 10,
  "concordanceRate": 100,
  "isConsistencyGroup": true,
  "isWrittenInSvol": false,
  "isClone": false,
  "canCascade": false,
  "isRedirectOnWrite": false,
```

```
  "splitTime": "2015-03-20T09:27:35",
  "snapshotId": "100,3",
  "pvolProcessingStatus": "N",
  "snapshotDataReadOnly": false
}
```

Attribute	Type	Description
snapshotGroupName	string	Name of the snapshot group that contains the Thin Image pairs. If the name of the snapshot group contains spaces, information about pairs is not output.
primaryOrSecondary	string	Attribute of the LDEV
status	string	Pair status For details, see the section explaining on pair status (Thin Image).
pvolLdevId	int	LDEV number of P-VOL
muNumber	int	MU number of the P-VOL
svolLdevId	int	LDEV number of S-VOL
snapshotPoolId	int	ID of the pool in which the snapshot data is created
isRedirectOnWrite	boolean	Returns whether the pair is a Thin Image Advanced pair. ▪ `true`: The pair is a Thin Image Advanced pair. ▪ `false`: The pair is not a Thin Image Advanced pair.
concordanceRate	int	Concordance rate for pairs This attribute is output when either of the following conditions is met: ▪ The value of the `isClone` attribute is `false`, and the value of the `canCascade` attribute is also `false`. ▪ The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is not any of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`.

Attribute	Type	Description
		This attribute is not output if the `isRedirectOnWrite` attribute is `true`.
progressRate	int	Progress of the processing This attribute is output when the following condition is met: The value of either the `isClone` attribute or the `canCascade` attribute is `true`, and the value of the `status` attribute is one of the following: `COPY`, `CPYP`, `RCPY`, `SMPP`, or `PSUP`.
isConsistencyGroup	boolean	Returns whether the pair was created in the consistency group mode (CTG mode). ▪ `true`: The pair was created in the CTG mode. ▪ `false`: The pair was not created in the CTG mode.
isWrittenInSvol	boolean	Returns whether data was written to the S-VOL from the host when the pair status was `PSUS`/`PFUS`. ▪ `true`: Data was written to the S-VOL ▪ `false`: Data was not written to the S-VOL If the target pair is a Thin Image pair that does not have an S-VOL, `false` is displayed.
isClone	boolean	Returns whether the pair has the clone attribute. ▪ `true`: The pair has the clone attribute. ▪ `false`: The pair does not have the clone attribute.
canCascade	boolean	Returns whether the pair can be a cascaded pair. ▪ `true`: The pair can be a cascaded pair. ▪ `false`: The pair cannot be a cascaded pair.
splitTime	string	Time when snapshot data was created The local time of the storage system is returned in YYYY-MM-DDThh:mm:ss format. For the following storage systems, if you asked maintenance personnel to configure settings to allow the use of an external authentication server or a key management server, the time zone settings for the storage system might be changed: VSP G1000, VSP G1500, VSP F1500. In such cases, Greenwich Mean Time (GMT) is displayed.

Attribute	Type	Description
snapshotId	string	Object ID of the Thin Image pair The following attributes are output, separated by commas: ▪ pvolLdevId ▪ muNumber
pvolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `P-VOL`.
svolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, and VSP F1500 when the value of the `primaryOrSecondary` attribute is `S-VOL`.
snapshotDataReadOnly	boolean	Returns whether the snapshot data is a pair that has the read-only attribute ▪ `true`: Read-only ▪ `false`: Not read-only This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
retentionPeriod	int	The remaining period for which snapshot data is retained This value is output in units of hours. This value is not output for pairs for which no snapshot data retention period is set.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snapshots/100,3
```

Getting information about all of Thin Image pairs

The following request gets information about the Thin Image pairs registered in the target storage system. You can obtain information about all such pairs from the cache of the storage system regardless of whether they are managed by using snapshot groups.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, and VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can use this API function.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-replications
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
startPvolLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the first LDEV in the range. The P-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be smaller than that of the `endPvolLdevId` parameter. If this attribute is omitted, `0` is set.
endPvolLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the last LDEV in the range. The P-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be greater than that of the `startPvolLdevId` parameter. If this attribute is omitted, the maximum LDEV number in the storage system is set.

Body

None.

Response message

Body


```
{
    "data": [
        {
            "snapshotReplicationId": "20900,3",
            "pvolLdevId": 20900,
            "svolLdevId": 20904,
            "snapshotPoolId": 103,
            "status": "PAIR",
            "concordanceRate": 100,
            "muNumber": 3,
            "isClone": false,
            "canCascade": false,
            "isRedirectOnWrite": false
```

```
        },
        {
            "snapshotReplicationId": "20912,3",
            "pvolLdevId": 20912,
            "svolLdevId": 20905,
            "snapshotPoolId": 104,
            "status": "PAIR",
            "concordanceRate": 90,
            "muNumber": 3,
            "isClone": false,
            "canCascade": false,
            "isRedirectOnWrite": false
        },
        {
            "snapshotReplicationId": "20912,4",
            "pvolLdevId": 20912,
            "svolLdevId": 20906,
            "snapshotPoolId": 104,
            "status": "PAIR",
            "concordanceRate": 80,
            "muNumber": 4,
            "isClone": false,
            "canCascade": false,
            "isRedirectOnWrite": false
        }
    ]
}
```


Attribute	Type	Description
snapshotReplicationId	string	Object ID of the Thin Image pair The following attributes are output, separated by commas: ▪ `pvolLdevId` ▪ `muNumber`
snapshotGroupName	string	Name of the snapshot group This attribute is output if the target pair belongs to a snapshot group.
pvolLdevId	int	LDEV number of P-VOL
snapshotPoolId	int	ID of the pool in which the snapshot data was created
svolLdevId	int	LDEV number of S-VOL

Attribute	Type	Description
		This attribute is displayed if the target pair is a Thin Image pair that has an S-VOL.
status	string	Pair status ▪ `SMPP` ▪ `COPY` ▪ `PAIR` ▪ `PSUS` ▪ `PFUL` ▪ `PSUE` ▪ `PFUS` ▪ `RCPY` ▪ `PSUP` ▪ `CPYP` ▪ `OTHER`
consistencyGroupId	int	Consistency group ID If no consistency group consists, information is not output.
isRedirectOnWrite	boolean	Returns whether the pair is a Thin Image Advanced pair. ▪ `true`: The pair is a Thin Image Advanced pair. ▪ `false`: The pair is not a Thin Image Advanced pair.
concordanceRate	int	Concordance rate for pairs This attribute is not output if the `isRedirectOnWrite` attribute is `true`.
muNumber	int	MU number of the P-VOL
splitTime	string	Time when snapshot data was created The local time of the storage system is returned in YYYY-MM-DDThh:mm:ss format. This attribute is output if the pair status is `PSUS` or `PSUP`.

Attribute	Type	Description
isClone	boolean	Returns whether the pair has the clone attribute. ▪ `true`: The pair has the clone attribute. ▪ `false`: The pair does not have the clone attribute.
canCascade	boolean	Returns whether the pair can be a cascaded pair. ▪ `true`: The pair that is or can be used in a cascade configuration. ▪ `false`: The pair cannot be a cascaded pair.

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/snapshot-replications
```

Creating a Thin Image pair

The following request creates a Thin Image pair in the specified snapshot group. After the pair is created, you can get snapshot data or clone the pair.

Note:

For VSP One B20, VSP 5000 series, VSP E series, you can store snapshot data for Thin Image pairs that belong to a snapshot group in the consistency group mode (CTG mode) in units of snapshot group only. To store snapshot data by pair, create a pair in a snapshot group that is not in the CTG mode.

Note:

You can create a Thin Image Advanced pair for the VSP One B20, VSP 5000 series, or VSP E series.

Execution permission

Storage Administrator (Local Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/snapshots
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is an example of coding used for creating a Thin Image pair.

If the secondary volume does not exist :

```
{
  "snapshotGroupName": "snapshotGroup",
  "snapshotPoolId": 13,
  "pvolLdevId": 100,
  "isConsistencyGroup": true,
  "autoSplit": true,
  "isDataReductionForceCopy": true
}
```

If the secondary volume exists:

```
{
  "snapshotGroupName": "snapshotGroup",
  "snapshotPoolId": 13,
  "pvolLdevId": 100,
  "svolLdevId": 101,
  "isConsistencyGroup": true,
  "autoSplit": true,
  "isDataReductionForceCopy": true
}
```

Attribute	Type	Description
snapshotGroupName	string	(Required) Specify the name of the snapshot group for which the Thin Image pair is to be created. Specify a character string consisting of 1 to 32 characters. The name is case sensitive. If you specify a new group name, a snapshot group is also created at the same time.

Attribute	Type	Description
snapshotPoolId	int	(Required) Specify the ID of the pool in which snapshot data is to be created. Specify the ID of a Thin Image pool or an HDP pool by using a decimal (base 10) number equal to or greater than `0`. You can specify the ID of an HDP pool for the following storage systems: ▪ VSP One B20 ▪ VSP 5000 series ▪ VSP E series ▪ VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 ▪ VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-05-0*X-XX*/*XX* or later ▪ VSP G1000, VSP G1500, and VSP F1500 whose microcode version is 80-06-0*X-XX*/*XX* or later When creating a Thin Image Advanced pair, specify the pool ID of the HDP pool to which the P-VOL belongs.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL of the Thin Image pair to be created. Specify a decimal (base 10) number equal to or greater than `0`. When creating a Thin Image Advanced pair, specify a data reduction shared volume for which the capacity saving function is in the `ENABLED` or `CONVERTING` status.
svolLdevId	int	(Optional) Specify the LDEV number of the S-VOL of the Thin Image pair to be created. This item is required when `true` is specified for the `isClone` attribute. If you specified `true` for the `isClone` attribute or the `canCascade` attribute, specify the LDEV number of the DP volume. Specify a decimal (base 10) number equal to or greater than `0`.

Attribute	Type	Description
		If you do not specify this item, a Thin Image pair that does not have the S-VOL will be created. When creating a Thin Image Advanced pair, specify a data reduction shared volume for which the capacity saving function is in the `ENABLED` status.
isConsistencyGroup	boolean	(Optional) Regarding the snapshot group for which the Thin Image pair is to be created, specify whether the snapshot group is to be created in the consistency group mode (CTG mode). ▪ `true`: Creates the snapshot group in the CTG mode. ▪ `false`: Does not create the snapshot group in the CTG mode. If you do not specify this item, `false` will be set.
autoSplit	boolean	(Optional) Specify whether the Thin Image pair is to be split after it is created. ▪ `true`: Splits the pair. ▪ `false`: Does not split the pair. If you specify `true`, the pair is split and snapshot data is stored. If you specify `true` for this attribute, you cannot specify `true` for the `isClone` attribute. If you do not specify this item, `false` will be set. When creating a pair that belongs to a snapshot group in the CTG mode for VSP One B20, VSP 5000 series, VSP E series, do not specify this attribute.
canCascade	boolean	(Optional) Specify whether the pair can be cascaded. ▪ `true`: The pair can be cascaded. ▪ `false`: The pair cannot be cascaded. If you specify `true` for the `isClone` attribute, also specify `true` for this attribute.

Attribute	Type	Description
		If you do not specify this item, the same value as for the `isClone` attribute will be set. For the `snapshotPoolId` attribute, if you specify the pool ID of the pool to which the data reduction shared volume belongs, you must specify `true` for this attribute. Thin Image (CAW/CoW) pairs and Thin Image Advanced pairs cannot coexist in the snapshot tree.
isClone	boolean	(Optional) Specify whether to create a pair that has the clone attribute specified. ▪ `true`: Creates a pair that has the clone attribute specified. ▪ `false`: Creates a pair that does not have the clone attribute specified. If you specify `true` for this attribute, do not specify the `autoSplit` attribute. If you specify `true` for this attribute, specify `true` for the `canCascade` attribute. If you do not specify this item, `false` will be set. When creating a Thin Image Advanced pair, you cannot specify `true`. Thin Image (CAW/CoW) pairs and Thin Image Advanced pairs cannot coexist in the snapshot tree.
clonesAutomation	boolean	(Optional) Specify whether the pair is to be cloned after the pair is created. You can specify this item when `true` is specified for the `isClone` attribute. ▪ `true`: Clones the pair. ▪ `false`: Does not clone the pair. If you do not specify this item, `false` will be set.
copySpeed	string	(Optional) Specify the copy speed at which the created pair is to be cloned.

Attribute	Type	Description
		You can specify this item when `true` is specified for both the `isClone` attribute and the `clonesAutomation` attribute. ▪ `slower`: Low speed ▪ `medium`: Medium speed ▪ `faster`: High speed This item is not case sensitive. If you do not specify this item, `medium` will be set.
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair for data reduplication volumes.# ▪ `false`: Do not forcibly create a pair for data reduplication volumes. If you do not specify this item, `false` will be set.
muNumber	int	(Optional) Specify the MU number of the P-VOL of the Thin Image pair to be created. Specify a value in the range from `0` to `1023`. You cannot specify a MU number that is already in use. If you do not specify this item, an available MU number will be assigned. You can specify this item for the following storage systems: VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
retentionPeriod	int	(Optional) The period for which snapshot data is to be retained You can specify this attribute only if the `autoSplit` attribute is set to `true`.

Attribute	Type	Description
		Specify a value in the range from `1` to `12288` in units of hours. This attribute can be used when the storage system is VSP One B20.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease. In addition, if `false` is specified for the `autoSplit` attribute, use the status of the target resource rather than the status of the job to check whether the pair has been created.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created Thin Image pair

For Thin Image Advanced pairs, if `true` is specified for the `autoSplit` attribute, to check whether the pair has been split after it was created, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots
```

Storing snapshot data in units of snapshot groups

The following request splits the Thin Image pairs in the specified snapshot group. You can split all pairs in that snapshot group and store snapshot data in a batch operation.

Note:

For Thin Image Advanced pairs, if both of the following conditions are met, operations in units of snapshot groups might fail. If the following conditions are met, perform operations on one pair at a time by using the API request for storing snapshot data.

- The snapshot group was not created in CTG mode.
- The snapshot group contains two or more pairs that have the same volume as the P-VOL.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs to be split belong. Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

Attribute	Type	Description
retentionPeriod	int	(Optional) The period for which snapshot data is to be retained Specify a value in the range from `1` to `12288` in units of hours.

Attribute	Type	Description
		This attribute can be used when the storage system is VSP One B20.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the split snapshot group

For Thin Image Advanced pairs, to check whether the pair has been split, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/split
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified when pairs are split in units of snapshot groups.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snapshot-groups/snapshotGroup/actions/split
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snapshot-groups/snapshotGroup/actions/split/invoke -d ""
```

Storing snapshot data

The following request splits the specified Thin Image pair. When the pair is split, snapshot data at the time of the split is stored.

Note:

For VSP One B20, VSP 5000 series, VSP E series, you cannot run this API request for a Thin Image pair that belongs to a snapshot group in the consistency group mode (CTG mode).

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL of the Thin Image pair to be split. Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) Specify the MU number of the P-VOL of the Thin Image pair to be split. Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

Attribute	Type	Description
retentionPeriod	int	(Optional) The period for which snapshot data is to be retained Specify a value in the range from `1` to `12288` in units of hours. This attribute can be used when the storage system is VSP One B20.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the split Thin Image pair

For Thin Image Advanced pairs, to check whether the pair has been split, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/split
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified when pairs are split.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/split
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/split/invoke -d ""
```

Resynchronizing Thin Image pair in units of snapshot groups and deleting snapshot data

The following request resynchronizes the Thin Image pairs in the specified snapshot group. When pairs are resynchronized, all snapshot data will be deleted. You can store new snapshot data by specifying the setting to split the resynchronized pair.

Note:

If the snapshot group includes at least one pair for which a snapshot data retention period (`retentionPeriod`) is set, you will not be able to resynchronize pairs in units of snapshot groups. In this case, wait until the snapshot data retention periods for all pairs end, and then perform the operation. Alternatively, individually resynchronize pairs for which no snapshot data retention period is set.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs to be resynchronized belong. Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "autoSplit": false
  }
}
```

Attribute	Type	Description
autoSplit	boolean	(Optional) After resynchronization of the Thin Image pairs is complete, specify whether to split the pairs. ▪ `true`: Splits the pair. ▪ `false`: Does not split the pair. If you specify `true`, the pairs are split in units of snapshot groups and snapshot data is stored. If you do not specify this item, `false` will be set.
retentionPeriod	int	(Optional) The period for which snapshot data is to be retained You can specify this attribute only if the `autoSplit` attribute is set to `true`. Specify a value in the range from `1` to `12288` in units of hours. This attribute can be used when the storage system is VSP One B20.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resynchronized snapshot group

For Thin Image Advanced pairs, if `true` is specified for the `autoSplit` attribute, to check whether the pair has been split after it was resynchronized, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
resync
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified during the resynchronization of pairs in units of snapshot groups.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup/actions/resync
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup/actions/resync/invoke
```

Resynchronizing a Thin Image pair and deleting snapshot data

The following request uses the specified snapshot data to resynchronize a Thin Image pair. When the pair is resynchronized, all snapshot data will be deleted. You can store new snapshot data by specifying the setting to split the resynchronized pair.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of the Thin Image pair to be resynchronized. Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) MU number of the P-VOL of the Thin Image pair to be resynchronized. Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

```
{
  "parameters": {
    "autoSplit": false
```

```
  }
}
```

Attribute	Type	Description
autoSplit	boolean	(Optional) After resynchronization of the Thin Image pairs is complete, specify whether to split the pairs. ▪ `true`: Splits the pair. ▪ `false`: Does not split the pair. If you specify `true`, the pair is split and snapshot data is stored. If you do not specify this item, `false` will be set. For VSP One B20, VSP 5000 series, VSP E series, do not specify this attribute for operations on pairs that belong to a snapshot group in the consistency group mode (CTG mode).
retentionPeriod	int	(Optional) The period for which snapshot data is to be retained You can specify this attribute only if the `autoSplit` attribute is set to `true`. Specify a value in the range from `1` to `12288` in units of hours. This attribute can be used when the storage system is VSP One B20.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resynchronized Thin Image pairs

For Thin Image Advanced pairs, if `true` is specified for the `autoSplit` attribute, to check whether the pair has been split after it was resynchronized, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/resync
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified during pair resynchronization.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/resync
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/resync/invoke
```

Restoring snapshot data in units of snapshot groups

The following request restores the Thin Image pairs contained in the specified snapshot group. When the pairs are restored, the snapshot data for the primary volume is overwritten in units of the specified snapshot group.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
restore/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs to be restored belong. Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "autoSplit": false
  }
}
```

Attribute	Type	Description
autoSplit	boolean	(Optional) After the restore of the Thin Image pairs is complete, specify whether to split the pairs. ▪ `true`: Splits the pair. ▪ `false`: Does not split the pair. If you specify `true`, the pairs are split in units of snapshot groups and snapshot data is stored. If you do not specify this item, `false` will be set. For Thin Image Advanced pairs, this attribute is ignored even if it is specified.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the restored snapshot group

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
restore
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified during a restore of pairs in units of snapshot groups.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup/actions/restore
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup/actions/restore/invoke
```

Restoring snapshot data

The following request restores a Thin Image pair by using the specified snapshot data. When the pair is restored, the data of the snapshot specified for the primary volume is overwritten.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/
restore/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of the Thin Image pair to be restored Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) MU number of the P-VOL of the Thin Image pair to be restored Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

```
{
  "parameters": {
    "autoSplit": false
  }
}
```

Attribute	Type	Description
autoSplit	boolean	(Optional) After a restore of the Thin Image pairs is complete, specify whether to split the pairs. ▪ `true`: Splits the pair. ▪ `false`: Does not split the pair. If you specify `true`, the pair is split and snapshot data is stored. If you do not specify this item, `false` will be set. For VSP One B20, VSP 5000 series, VSP E series, do not specify this attribute for operations on pairs that belong to a snapshot group in the consistency group mode (CTG mode). For Thin Image Advanced pairs, this attribute is ignored even if it is specified.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the restored Thin Image pair

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/restore
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified during a restore of pairs.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/restore
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/restore/invoke
```

Assigning a secondary volume to snapshot data

The following request assigns a secondary volume to snapshot data of a Thin Image pair.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/assign-volume/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of a Thin Image pair that has snapshot data Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) MU number of the P-VOL of a Thin Image pair that has snapshot data Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

```
{
  "parameters": {
    "svolLdevId": 101
  }
}
```

Attribute	Type	Description
svolLdevId	int	(Required) LDEV number of the S-VOL to be assigned to the snapshot data Specify a decimal (base 10) number equal to or greater than `0`. For the S-VOL, specify a virtual volume for Thin Image that was created beforehand.

Attribute	Type	Description
		If the pair specified by the object ID is a Thin Image Advanced pair, you must specify the LDEV number of a data reduction shared volume that belongs to the same pool as the volume specified for the `pvolLdevId` attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the Thin Image pair whose S-VOL was assigned

For Thin Image Advanced pairs, to check whether an S-VOL has been assigned, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/assign-volume
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified during S-VOL assignment.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snapshots/100,3/actions/assign-volume
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/assign-volume/invoke
```

Unassigning the secondary volume for snapshot data

The following request unassigns the secondary volume for the snapshot data of Thin Image pairs.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/
unassign-volume/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of a Thin Image pair that has snapshot data Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) MU number of the P-VOL of a Thin Image pair that has snapshot data Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the Thin Image pair whose S-VOL was unassigned

For Thin Image Advanced pairs, to check whether the S-VOL has been unassigned, obtain the status of the target pair instead of the status of the job. For details about the pair status, see the description of the pair status transitions.

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/
unassign-volume
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This object indicates that the following actions cannot run: actions specified when an S-VOL is unassigned.

Coding example

To get an action template:

You can check whether the secondary volume of a Thin Image pair that has a specified object ID can be unassigned.

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/unassign-volume
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/unassign-volume/invoke -d ""
```

Setting the retention period for obtained snapshot data in units of snapshot groups

The following request sets the snapshot data retention period for the snapshot data of all Thin Image pairs that belong to the specified snapshot group. You can also update (extend) a retention period that is already set.

Note:

- This API request can be used when the storage system is VSP One B20.
- You can run this request only when the pair status is `PSUS`.
- The same retention period is applied to all snapshot data in the snapshot group.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
set-retention/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs belong Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "retentionPeriod": 1
  }
}
```

Attribute	Type	Description
retentionPeriod	int	(Required) The period for which snapshot data is to be retained Specify a value in the range from `1` to `12288` in units of hours. You cannot specify a value smaller than the current value.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the snapshot group for which the snapshot data retention period was set

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshot-groups/snapshotGroup/actions/set-retention/invoke
```

Setting the retention period for obtained snapshot data

The following request sets the snapshot data retention period for the snapshot data of a Thin Image pair. You can also update (extend) a retention period that is already set.

Note:

- This API request can be used when the storage system is VSP One B20.
- You can run this request only when the pair status is `PSUS`.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/set-retention/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of the Thin Image pair
muNumber	int	(Required) MU number of the P-VOL of the Thin Image pair

Query parameters

None.

Body

```
{
  "parameters": {
    "retentionPeriod": 1
  }
}
```

Attribute	Type	Description
retentionPeriod	int	(Required) The period for which snapshot data is to be retained Specify a value in the range from `1` to `12288` in units of hours. You cannot specify a value smaller than the current value.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the Thin Image pair for which the snapshot data retention period was set

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snapshots/100,3/actions/set-retention/invoke
```

Deleting Thin Image pairs in units of snapshot groups

The following request deletes the Thin Image pairs contained in the specified snapshot group. When the pairs are deleted, all snapshot data is also deleted.

Note:

If the snapshot group includes at least one pair for which a snapshot data retention period (`retentionPeriod`) is set, you will not be able to delete pairs in units of snapshot groups. In this case, wait until the snapshot data retention periods for all pairs end, and then perform the operation. Alternatively, individually delete pairs for which no snapshot data retention period is set.

Execution permission

Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID
```

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs to be deleted belong. Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted snapshot group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snapshot-groups/snapshotGroup
```

Deleting a Thin Image pair

The following request deletes the specified Thin Image pair. When the pair is deleted, the snapshot data is also deleted.

Execution permission

Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID
```

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about a Thin Image pair. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL of the Thin Image pair to be deleted. Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) Specify the MU number of the P-VOL of the Thin Image pair to be deleted. Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted Thin Image pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X DELETE https://192.0.2.100:23451/ConfigurationManager/v1/
objects/storages/836000123456/snapshots/100,3
```

Deleting Thin Image pairs by snapshot tree

Forcibly delete all Thin Image pairs in the snapshot tree where the cascade attribute for the pair is enabled. When the pairs are deleted, the snapshot data will also be deleted. Before running this API, we recommend that you check information about the pairs within the snapshot tree to confirm that all pairs within the snapshot tree have been deleted.

Note:

For Thin Image Advanced, you cannot run this API request.

Tip:

If you use a configuration in which multiple snapshot trees are connected through pairs whose clone attribute is enabled, specify the root volume of the top snapshot tree first and run the API request. This action does not delete pairs in the snapshot trees under the secondary volumes of pairs whose clone attribute is enabled, but changes the statuses of pairs in those snapshot trees to `PSUE`.

Then, specify the root volume of the snapshot tree under the secondary volume, and run the API request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/storage-device-ID/services/snapshot-tree/actions/delete/invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevId": 1
  }
}
```

Attribute	Type	Description
ldevId	int	(Required) LDEV number of the root volume

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section that explains job objects.

Attribute	Description
affectedResources	URL of the root volume By referring to the `attributes` attribute value, confirm that this is no longer a Thin Image volume. To verify that all pairs within the snapshot tree have been deleted, obtain the pair statuses and volume attributes based on the pair information you confirmed in advance.

Action template

None.

Status codes

For details about the status codes issued in response to requests for this operation, see the description of HTTP status codes.

Code example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/836000123456/
services/snapshot-tree/actions/delete/invoke
```

Deleting garbage data of all Thin Image pairs in a snapshot tree

You can delete garbage data (defragment the snapshot data area) by specifying the root volume of a snapshot tree. You can stop the processing before the deletion processing is complete. Before running this API request, we recommend that you get volume information to check the usage status of snapshots and the volume of garbage data.

Note:

You can use this API request for VSP 5000 series storage systems.

Note:

For Thin Image Advanced, you cannot run this API request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/storage-device-ID/services/snapshot-tree/actions/delete-garbage-data/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevId": 66,
    "operationType": "start"
  }
}
```

Attribute	Type	Description
ldevId	int	(Required) LDEV number of the root volume
operationType	string	(Required) Starts or stops the deletion of garbage data. The following values can be specified: ▪ `start`: Starts the processing for deleting garbage data ▪ `stop`: Stops the processing for deleting garbage data

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section that explains job objects.

Attribute	Description
affectedResources	URL of the root volume To check whether garbage data has been deleted from a snapshot tree, do not check the job status. Instead, get the attributes of the volume to check the status of the processing for deleting the garbage data.

The processing to delete garbage data stops automatically when the remaining amount of garbage data is less than 1 GB.

In some cases, the processing to delete garbage data stops even if the remaining amount of garbage data is 1 GB or more. In such cases, rerun the processing to delete garbage data, so that the remaining amount of garbage data becomes less than 1 GB.

Action template

None.

Status codes

For details about the status codes issued in response to requests for this operation, see the description of HTTP status codes.

Code example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/900000012345/
services/snapshot-tree/actions/delete-garbage-data/invoke
```

Cloning pairs in a specified snapshot group

The following request clones the Thin Image pairs in a specified snapshot group. You can use this request to clone all of the pairs in a snapshot group in a batch operation.

Note:

For Thin Image Advanced, you cannot run this API request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/
clone/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotGroupId` value obtained by getting information about the snapshot groups.

Attribute	Type	Description
snapshotGroupId	string	(Required) Object ID of the snapshot group to which the Thin Image pairs to be cloned belong Specify a character string consisting of 1 to 32 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters": {
    "copySpeed": "medium"
  }
}
```

Attribute	Type	Description
copySpeed	string	(Optional) Specify the copy speed. You can specify the following values: ▪ `slower`: Low speed ▪ `medium`: Medium speed ▪ `faster`: High speed This item is not case sensitive. If you do not specify this item, `medium` will be set.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the snapshot group that was cloned

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID/actions/clone
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This indicates that the specified snapshot group cannot be cloned.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/snapshot-groups/snapshotGroup/actions/clone
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" --data-binary @./InputParameters.json -X PUT https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/snapshot-groups/snapshotGroup/actions/clone/invoke
```

Cloning a Thin Image pair

The following request clones the specified Thin Image pair.

Note:

For Thin Image Advanced, you cannot run this API request.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/clone/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `snapshotId` value obtained by getting information about Thin Image pairs. You can also specify the following attributes and connect them with commas:

```
pvolLdevId,muNumber
```

Attribute	Type	Description
pvolLdevId	int	(Required) LDEV number of the P-VOL of the Thin Image pair to be cloned Specify a decimal (base 10) number equal to or greater than `0`.
muNumber	int	(Required) MU number of the P-VOL of the Thin Image pair to be cloned Specify a value in the range from `0` to `1023`.

Query parameters

None.

Body

```
{
  "parameters": {
    "copySpeed": "medium"
  }
}
```

Attribute	Type	Description
copySpeed	string	(Optional) Specify the copy speed. You can specify the following values: ▪ `slower`: Low speed ▪ `medium`: Medium speed ▪ `faster`: High speed This item is not case sensitive. If you do not specify this item, `medium` will be set.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the Thin Image pair that was cloned

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/clone
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status codes	Message	Description
412	Precondition Failed	This indicates that the specified pair cannot be cloned.

Coding example

To get an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/snapshots/100,3/actions/clone
```

To run the request after getting an action template:

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" --data-binary @./InputParameters.json -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/snapshots/100,
3/actions/clone/invoke
```

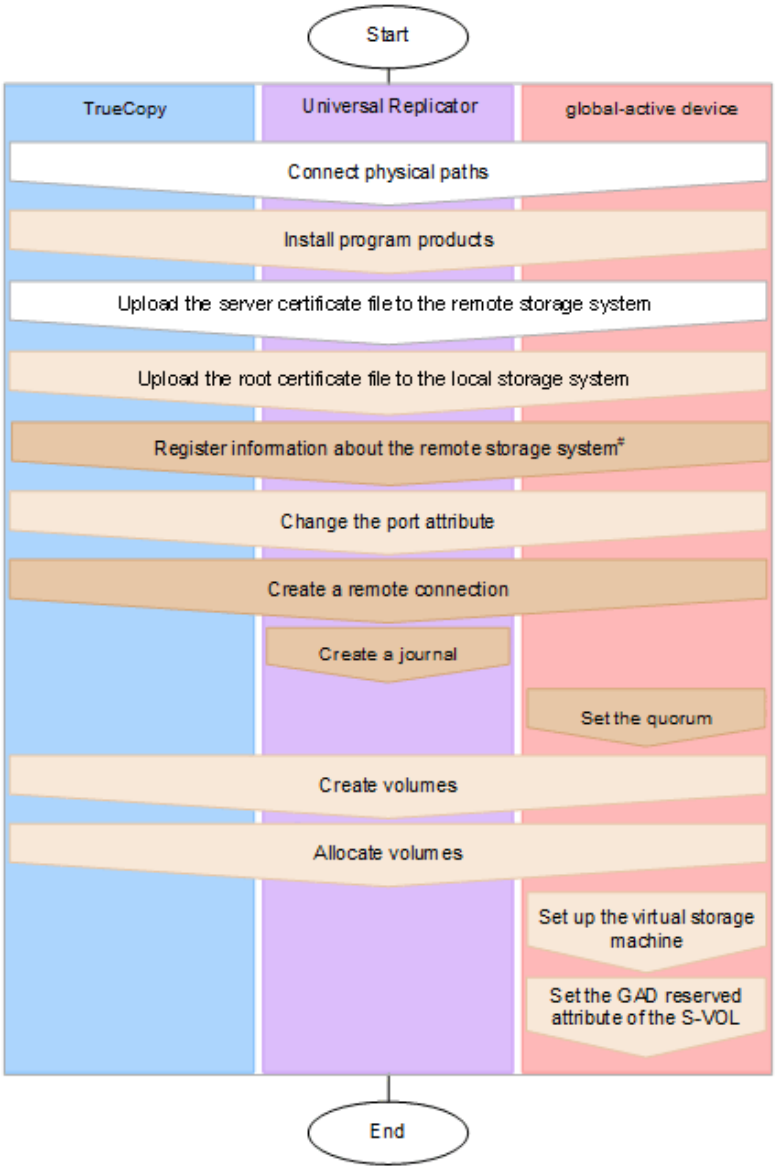
Chapter 13: Configuring a remote copy environment

This chapter describes how to configure a remote copy environment by using the REST API.

Workflow for configuring a remote copy environment

The following describes the workflow for configuring an environment required to use TrueCopy, Universal Replicator, or global-active device (GAD).

The following figure shows the workflow for configuring an environment.



#: The remote storage system must first be registered, as the local storage system, to the REST API server of the remote storage system. Note that, in a one-site configuration, the REST API server of the remote storage system serves as the REST API server of the local storage system.

Connecting physical paths

Use cables to connect between hardware objects according to the configuration required for the operation, such as between the host and the storage system, and between the primary site and the secondary site.

Installing software products

Install software products that are required for remote copy operations. If the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models or VSP Fx00 models, operations can be performed by using the REST API.

Uploading the server certificate file to the remote storage system

When the local storage system is VSP One B20, use the maintenance utility or Hitachi Device Manager - Storage Navigator to upload the server certificate to SVP/GUM/ESM on the remote storage system side. Refer to the local storage system manual *System Administrator Guide* to upload the server certificates that meet the certificate requirements. For details on how to upload a server certificate, see the *System Administrator Guide*.

Uploading the root certificate file to the local storage system

When the local storage system is VSP One B20, use the REST API to upload the root certificate of the server certificate, which has been uploaded to SVP/GUM/ESM on the remote storage system side, to the local storage system side.

Important:

When the local storage system is VSP One B20, during SSL communication between the local storage system and the remote storage system, the server certificate for HTTPS uploaded to SVP/GUM/ESM on the remote storage system side is verified by the REST API on the local storage system. For this reason, make sure to upload the server certificate to the remote storage system, and to upload the root certificate to the local storage system. If no certificate that meets the requirements has been uploaded, when you perform a remote copy (TrueCopy, Universal Replicator, global-active device) operation, SSL communication between the local and remote storage systems will fail due to server certificate verification. For details on certificate verification, see the descriptions in "Server certificate verification function (VSP One B20)".

Registering information about the remote storage system

Register information about the remote storage system on the REST API server of the local storage system. At the same time, information about the local storage system can be registered, as the remote storage system, to the REST API server of the remote storage system.

Note:

The remote storage system must first be registered, as the local storage system, to the REST API server of the remote storage system. Note that, in a one-site configuration, the REST API server of the remote storage system serves as the REST API server of the local storage system.

Changing the port attribute

Change the port attribute for VSP G1000, VSP G1500, VSP F1500 storage systems.

For VSP 5000 series storage systems, you will need to change target ports to bidirectional ports.

Creating a remote connection

Create a remote connection by specifying a remote path. If you use an iSCSI port, register in advance the information about the iSCSI port of the remote storage system for the iSCSI port of the local storage system.

Creating a journal

Create a journal by specifying a journal volume.

Setting the quorum

Specify settings related to the quorum.

When creating a global-active device pair, you must configure a quorum regardless of whether you are using configuration where volumes are set for quorum disks or not.

For configurations where volumes are set for quorum disks, first make sure that the following conditions have been met.

- The two storage systems on which the global-active device environment is to be built and the external storage system for the quorum disks are connected by a physical path.
- The volumes on the external storage system for the quorum disks are mapped to the two storage systems on which the global-active device environment is to be built.

Creating volumes

Create volumes to be used for a pair.

Allocating volumes

Set LU paths so that the host can access the volumes in the storage system.

Setting up the virtual storage machine

Create a virtual storage machine in the storage system, and then specify the required settings.

Setting the GAD reserved attribute of S-VOL

For the virtual LDEV number of S-VOL, set the GAD reserved attribute number.

For details on configuring a remote copy environment, see the manual of each software product or Hitachi Device Manager - Storage Navigator.

Migrating copy pair definitions

If you want to use the REST API to manage copy pairs that are currently managed by using the configuration definition file, you must change the copy pair definitions in the configuration definition file to device group definitions on the storage system. To do this, use the pair definition migration command (`PairCfgMigration`). For details about the pair definition migration command, see the *Hitachi Command Suite Administrator Guide* .

Registering and deleting information about remote storage systems

This section describes how to register and delete information about remote storage systems by using the REST API.

Overview of registering and deleting information about remote storage systems

For remote copy, by registering in advance the information about storage systems that are remotely connected to the REST API server, you no longer need to specify the remotely-connected storage system information when the remote copy operation is performed.

Register the following storage system information: model name of the remotely-connected storage system, and the controller IP address and communication mode. The information about the remote storage system will be registered to the REST API server of the local storage system while the information about the local storage system will be registered to the REST API server of the remote storage system.

You can use the following API commands for registering and deleting the information about remote storage systems:

- Registering information about remote storage systems to the REST API server
- Deleting information about remote storage systems from the REST API server
- Obtaining information about remote storage systems registered on the REST API server

Getting a list of remote storage systems

The following request gets a list of information about the storage systems registered on the REST API server.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-storages
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "storageDeviceId": "836000123456",
      "dkcType": "Local",
      "restServerIp": "192.0.2.100",
      "restServerPort": 443,
      "mappWebServerHttpsPort": 443,
      "model": "VSP G800",
      "serialNumber": 123456,
      "ctl1Ip": "192.0.10.10",
      "ctl2Ip": "192.0.10.11",
      "communicationModes": [
        {
          "communicationMode": "lanConnectionMode"
        }
      ]
    },
    {
      "storageDeviceId": "836000123457",
      "dkcType": "Remote",
      "restServerIp": "192.0.2.101",
      "restServerPort": 443,
      "mappWebServerHttpsPort": 443,
      "model": "VSP G800",
      "serialNumber": 123457,
      "ctl1Ip": "192.0.10.20",
      "ctl2Ip": "192.0.10.21",
      "communicationModes": [
        {
          "communicationMode": "proxyMode",
          "proxies": [
            {
              "proxyIp": "192.0.2.102",
              "proxyPort": 2010
            },
            {
              "proxyIp": "192.0.2.103",
              "proxyPort": 2011
            }
          ]
        },
        {
          "communicationMode": "lanConnectionMode"
        }
      ]
```

```
    }
  ]
}
```

Attribute	Type	Description
storageDeviceId	string	Storage device ID
dkcType	string	Type of storage system ▪ `Local`: Local storage system (The storage system where the REST API server that received the request exists.) ▪ `Remote`: Remote storage system (The storage system registered on the REST API server of the local storage system.)
restServerIp	string	IP address used by the REST API server of the remote storage system or a host name For the following storage systems, the IP address of the ESM of the remote storage system is displayed: VSP One B20 For the following storage systems, the IP address of the GUM of the remote storage system is displayed: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 For the following storage systems, the IP address of the SVP of the remote storage system is displayed: VSP 5000 series
restServerPort	int	Port number used for SSL communication by the REST API server of the remote storage system For the following storage systems, port number of the ESM of the remote storage system is displayed: VSP One B20 For the following storage systems, the port number of the GUM of the remote storage system is displayed: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 For the following storage systems, the port number of the SVP of the remote storage system is displayed: VSP 5000 series
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication

Attribute	Type	Description
		This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
ctl1Ip	string	IP address of controller board 1 This attribute is output for VSP E series, VSP Gx00 models or VSP Fx00 models.
ctl2Ip	string	IP address of controller board 2 This attribute is output for VSP E series, VSP Gx00 models or VSP Fx00 models.
communicationModes	object[]	The following attributes related to the communication mode between the REST API server and the storage system are output: If multiple communication modes are output, the mode that is output at the top will be prioritized in communication. ▪ communicationMode (string) Communication mode ▪ `proxyMode` ▪ `fcConnectionMode` ▪ `lanConnectionMode` ▪ proxies (object[]) The following attributes about the relay server are output: ▪ proxyIp (string) IP address ▪ proxyPort (int) Port number

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-storages
```

Getting information about a specific remote storage system

The following request gets information about a specific remote storage system registered on the REST API server.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-storages/object-ID
```

Request message

Object ID

Specify the `storageDeviceId` value obtained by getting information about the storage systems.

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "storageDeviceId": "836000123456",
  "dkcType": "Local",
  "restServerIp": "192.0.2.100",
  "restServerPort": 443,
  "mappWebServerHttpsPort": 443,
  "model": "VSP G800",
  "serialNumber": 123456,
```

```
  "ctl1Ip": "192.0.10.10",
  "ctl2Ip": "192.0.10.11",
  "communicationModes": [
    {
      "communicationMode": "proxyMode",
      "proxies": [
        {
          "proxyIp": "192.0.2.102",
          "proxyPort": 2010
        },
        {
          "proxyIp": "192.0.2.103",
          "proxyPort": 2011
        }
      ]
    },
    {
      "communicationMode": "lanConnectionMode"
    }
  ]
}
```


Attribute	Type	Description
storageDeviceId	string	Storage device ID
dkcType	string	Type of storage system ▪ `Local`: Local storage system (The storage system where the REST API server that received the request exists.) ▪ `Remote`: Remote storage system (The storage system registered on the REST API server of the local storage system.)
restServerIp	string	IP address used by the REST API server of the remote storage system or a host name For the following storage systems, the IP address of the ESM of the remote storage system is displayed: VSP One B20 For the following storage systems,the IP address of the GUM of the remote storage system is displayed: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 For the following storage systems, the IP address of the SVP of the remote storage system is displayed: VSP 5000 series

Attribute	Type	Description
restServerPort	int	Port number used for SSL communication by the REST API server of the remote storage system For the following storage systems, port number of the ESM of the remote storage system is displayed: VSP One B20 For the following storage systems, the port number of the GUM of the remote storage system is displayed: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 For the following storage systems, the port number of the SVP of the remote storage system is displayed: VSP 5000 series
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication This attribute is displayed for storage systems VSP G200, G400, G600, G800, VSP F400, F600, F800.
model	string	Model name of the storage system
serialNumber	int	Serial number of the storage system
ctl1Ip	string	IP address of controller board 1 This attribute is output for VSP E series, VSP Gx00 models or VSP Fx00 models.
ctl2Ip	string	IP address of controller board 2 This attribute is output for VSP E series, VSP Gx00 models or VSP Fx00 models.
communicationModes	object[]	The following attributes related to the communication mode between the REST API server and the storage system are output:

Attribute	Type	Description
		If multiple communication modes are output, the mode that is output at the top will be prioritized in communication. ▪ communicationMode (string) Communication mode ▪ `proxyMode` ▪ `fcConnectionMode` ▪ `lanConnectionMode` ▪ proxies (object[]) The following attributes about the relay server are output: ▪ proxyIp (string) IP address ▪ proxyPort (int) Port number

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-storages/836000123456
```

Registering information about remote storage systems

The following request registers information about the remote storage system on the REST API server of the local storage system. At the same time, information about the local storage system can be registered, as the remote storage system, to the REST API server of the remote storage system.

Note:

The remote storage system must first be registered, as the local storage system, to the REST API server of the remote storage system. Note that, in a one-site configuration, the REST API server of the remote storage system serves as the REST API server of the local storage system.

Important:

When the local storage system is VSP One B20, during SSL communication between the local storage system and the remote storage system, the server certificate for HTTPS uploaded to SVP/GUM/ESM on the remote storage system side is verified by the REST API on the local storage system. For this reason, make sure to upload the server certificate to the remote storage system, and to upload the root certificate to the local storage system. If no certificate that meets the requirements has been uploaded, when you perform a remote copy (TrueCopy, Universal Replicator, global-active device) operation, SSL communication between the local and remote storage systems will fail due to server certificate verification. For details on certificate verification, see the descriptions in "Server certificate verification function (VSP One B20)".

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/remote-storages
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "storageDeviceId": "836000123457",
  "restServerIp": "192.0.2.101",
  "restServerPort": 23451,
  "isMutualDiscovery": true
}
```

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID of the remote storage system
restServerIp	string	(Required) IP address used by the REST API server of the remote storage system You can specify an IPv4 address, IPv6 address, or a host name. For VSP One B20, specify the IP address of the ESM of the remote storage system. For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, specify the IP address of the GUM of the remote storage system. Specify the IP address of the GUM on the controller for which the REST API of the remote storage system performs operations. For VSP 5000 series, specify the IP address of the SVP of the remote storage system.
restServerPort	int	(Required) Port number used for SSL communication by the REST API server of the remote storage system For VSP One B20, specify the port number of the ESM of the remote storage system. For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, specify the port number of the GUM of the remote storage system. Specify the port number of the GUM on the controller for which the REST API of the remote storage system performs operations. For VSP 5000 series, specify the port number of the SVP of the remote storage system.
isMutualDiscovery	boolean	(Optional) Specify whether to perform a mutual registration operation. You can specify whether to register information about the local storage system on the REST API server of the remote storage system. ▪ `true`: Perform a mutual registration operation. ▪ `false`: Do not perform a mutual registration operation. If this value is omitted, `true` is specified.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the registered remote storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-storages
```

Deleting information about remote storage systems

The following request deletes information about the remote storage system that is registered on the REST API server of the local storage system and information about the local storage system that is registered on the REST API server of the remote storage system. Alternatively, you can delete the information that is registered in the local storage system only. To change information about storage systems registered on the REST API server, delete the information about the storage systems, and then register information again.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-storages/object-ID
```

Request message

Object ID

Specify the `storageDeviceId` value obtained by getting information about the storage systems.

Attribute	Type	Description
storageDeviceId	string	(Required) Storage device ID

Query parameters

None.

Body

```
{
  "isMutualDeletion": true
}
```

Attribute	Type	Description
isMutualDeletion	boolean	(Optional) Specify whether to perform a mutual deletion operation. You can specify whether to delete information about the local storage system registered on the REST API server of the remote storage system. ▪ `true`: Perform a mutual deletion operation. ▪ `false`: Do not perform a mutual deletion operation. If this value is omitted, `true` is specified.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H "Remote-
Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-storages/836000123457
```

Setting remote connections

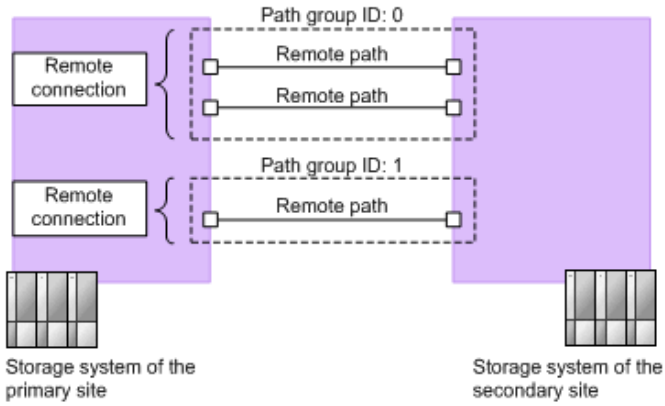
This section describes how to specify settings of remote connections used for remote copy operations by using the REST API.

Overview of the remote connection settings

Remote connections are used to connect storage systems used in remote copy operations for TrueCopy, Universal Replicator, and global-active device.

In this manual, the storage system that receives requests from the REST API clients is called a local storage system, and the storage system that is remotely connected to the local storage system is called a remote storage system.

The following figure shows an example of a remote connection:



Remote path

A logical path that connects storage systems on the primary site and the secondary site is called a remote path.

A combination of port numbers that a logical path consists of is defined as a remote path.

Remote connections

A remote connection consists of a group of remote paths that connect the storage system on the primary site (MCU) and the storage system on the secondary site (RCU).

A remote connection consists of one or more remote paths, and a unique path group ID is assigned to each remote connection for management.

To set a remote connection by using the copy direction from the remote storage system to the local storage system, specify settings from a REST API client of the remote storage system.

The following is a list of operations that can be performed for remote connections by using the REST API.

- Create remote connections
- Change remote connection settings
- Add remote paths to remote connections
- Delete remote paths from remote connections
- Delete remote connections
- Get information about remote connections

To create a remote path for an iSCSI port, register in advance information about the iSCSI port of the remote storage system to the iSCSI port of the local storage system.

The following is a list of operations that can be performed for iSCSI ports by using the REST API.

- Register iSCSI ports
- Delete iSCSI ports
- Get information about iSCSI ports

Getting a list of remote connections

The following request gets a list of remote connections.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remotepath-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about the remote storage system is not registered on the REST API server:


```
{
  "data": [
    {
      "remotepathGroupId": "492015,M8,0",
      "remoteSerialNumber": "492015",
      "remoteStorageTypeId": "M8",
      "pathGroupId": 0,
      "cuType": "REMOTE",
      "portType": "FIBRE",
      "cuStatus": "NML",
      "minNumOfPaths": 1,
      "numOfPaths": 1,
      "timeoutValueForRemoteIOInSeconds": 15,
      "roundTripTimeInMilliSeconds": 1
    }
  ]
}
```


The following is an example of the output when information about the remote storage system is registered on the REST API server:


```
{
  "data": [
    {
      "remotepathGroupId": "492015,M8,0",
      "remoteStorageDeviceId": "834000492015",
      "remoteSerialNumber": "492015",
      "remoteStorageModel": "VSP G400",
      "remoteStorageTypeId": "M8",
      "pathGroupId": 0,
      "cuType": "REMOTE",
      "portType": "FIBRE",
```

```
      "cuStatus": "NML",
      "minNumOfPaths": 1,
      "numOfPaths": 1,
      "timeoutValueForRemoteIOInSeconds": 15,
      "roundTripTimeInMilliSeconds": 1
    }
  ]
}
```


Attribute	Type	Description
remotepathGroupId	string	Object ID for the remote connection
remoteStorageDeviceId	string	Storage device ID of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageModel	string	Model type of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteStorageTypeId	string	ID that indicates the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	Path group ID If the connection setting for the remote path is CU specific, this information is not output.
localCuNumber	string	CU number of the local storage system (MCU) This item is hidden when the value of the connection setting of the remote path is CU Free or when the value of the `cuType` attribute is `LOCAL`.

Attribute	Type	Description
remoteCuNumber	string	CU number of the remote storage system (RCU) This item is hidden when the value of the connection setting of the remote path is CU Free or when the value of the `cuType` attribute is `LOCAL`.
portType	string	Port type of the remote path ▪ `FIBRE`: All the ports are Fibre Channel ports ▪ `ESCON`: All the ports are ESCON ports ▪ `ISCSI`: All the ports are iSCSI ports ▪ `MIXED`: Multiple port types from among these three types This item is hidden when the value of the `cuType` attribute is `LOCAL`.
cuType	string	CU type ▪ `REMOTE`: If a remote path is set from the local storage system to the remote storage system ▪ `LOCAL`: If a remote path is set from the remote storage system to the local storage system
cuStatus	string	CU status ▪ `NML`: Normal ▪ `WAR`: Warning ▪ `ERR`: Failing ▪ `Unknown`: Unknown. This is output if the `cuType` attribute is `LOCAL`.
minNumOfPaths	int	Minimum number of paths If the `cuType` attribute is `LOCAL`, this information is not output.
numOfPaths	int	Number of set remote paths If the `cuType` attribute is `LOCAL`, this information is not output.

Attribute	Type	Description
incidentMode	string	Incident mode for sending incidents to the RCU host ▪ `MR`: Incidents are sent to the MCU host and the RCU host. ▪ `RO`: Incidents are sent to the RCU host only. This item is hidden when the value of the connection setting of the remote path is CU Free or when the value of the `cuType` attribute is `LOCAL`.
isFreezeOptionEnabled	boolean	Value of the FREEZE option ▪ `false`: The FREEZE option is disabled. ▪ `true`: The FREEZE option is enabled. This item is hidden when the value of the connection setting of the remote path is CU Free or when the value of the `cuType` attribute is `LOCAL`.
timeoutValueForRemoteIOInSeconds	int	RIO timeout value (in seconds) for RIO (Remote IO) setting between the local storage system and the remote storage system If the `cuType` attribute is `LOCAL`, this information is not output.
roundTripTimeInMilliSeconds	int	The round-trip time value (in milliseconds) between the local storage system and the remote storage system If the `cuType` attribute is `LOCAL`, this information is not output.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remotepath-
groups
```

Getting information about a specific remote connection

The following request gets information about a specific remote connection. You can get information about a remote connection when the value of the connection setting of the remote path is CU Free.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID
```

Request message

Object ID

Specify the value of `remotepathGroupId` that was obtained by the processing to get information about the remote connection. You can also specify the attributes and connect them with commas as follows:

```
remoteSerialNumber,remoteStorageTypeId,pathGroupId
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about the remote storage system is not registered on the REST API server:

```
{
  "remotepathGroupId": "492015,M8,255",
  "remoteSerialNumber": "492015",
  "remoteStorageTypeId": "M8",
  "pathGroupId": 255,
  "remotePaths": [
    {
      "cuType": "REMOTE",
      "portType": "ISCSI",
      "pathNumber": 0,
      "localPortId": "CL3-B",
      "remotePortId": "CL2-C",
      "pathStatus": "ERR_03"
    }
  ]
}
```

The following is an example of the output when information about the remote storage system is registered on the REST API server:

```
{
  "remotepathGroupId": "492015,M8,255",
  "remoteStorageDeviceId": "834000492015",
  "remoteSerialNumber": "492015",
  "remoteStorageModel": "VSP G400",
  "remoteStorageTypeId": "M8",
  "pathGroupId": 255,
  "remotePaths": [
    {
      "cuType": "REMOTE",
      "portType": "ISCSI",
      "pathNumber": 0,
      "localPortId": "CL3-B",
      "remotePortId": "CL2-C",
      "pathStatus": "ERR_03"
    }
  ]
}
```

Attribute	Type	Description
remotepathGroupId	string	Object ID for the remote connection
remoteStorageDeviceId	string	Storage device ID of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageModel	string	Model type of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteStorageTypeId	string	ID that indicates the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	Path group ID
remotePaths	objects[]	The following attributes are output for each remote path: ▪ cuType (string) CU type • `REMOTE`: If a remote path is set from the local storage system to the remote storage system • `LOCAL`: If a remote path is set from the remote storage system to the local storage system ▪ portType (string) Port type of the remote path • `FIBRE`: Fibre Channel port • `ESCON`: ESCON port • `ISCSI`: iSCSI port

Attribute	Type	Description
		▪ pathNumber (int) Path number ▪ localPortId (string) Port number of the local storage system (MCU) ▪ remotePortId (string) Port number of the remote storage system (RCU) ▪ pathStatus (string) The path status • `NML_01`: Normal • `ERR_02`: Initialization Failed • `ERR_03`: Communication Time Out • `ERR_04`: Path Blockade • `ERR_05`: Port Rejected • `ERR_06`: Serial Number Mismatch • `ERR_10`: Invalid Port Mode • `ERR_80`: Pair-Port Number Mismatch • `ERR_81`: Pair-Port Type Mismatch • `ERR_82`: Communication Failed • `IN_PRG`: The path is being created or deleted.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remotepath-
groups/492015,M8,255
```

Creating a remote connection

The following request creates a remote connection, and then adds a remote path. By using this request, you can create a CU Free remote connection. You can specify the serial number and the series name of the remote storage system to create a remote connection. Alternatively, you can specify the storage device ID of the remote storage system to create a remote connection. To add a remote path for an iSCSI port, register in advance the iSCSI port of the remote storage system to the iSCSI port of the local storage system.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/remotepath-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for creating a remote connection by specifying the serial number and the series name of the remote storage system:

```
{
  "remoteSerialNumber": "492015",
  "remoteStorageTypeId": "M8",
  "pathGroupId": 255,
  "localPortId": "CL3-B",
  "remotePortId": "CL2-C"
}
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system

Attribute	Type	Description
		You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID Specify a decimal (base 10) number in the range from `0` to `255`.
localPortId	string	(Required) Port number of the local storage system
remotePortId	string	(Required) Port number of the remote storage system

The following is a coding example for creating a remote connection by specifying the storage device ID of the remote storage system:

```
{
  "remoteStorageDeviceId": "836000410011",
  "pathGroupId": 255,
  "localPortId": "CL3-B",
  "remotePortId": "CL2-C"
}
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
pathGroupId	int	(Required) Path group ID Specify a decimal (base 10) number in the range from `0` to `255`.
localPortId	string	(Required) Port number of the local storage system
remotePortId	string	(Required) Port number of the remote storage system

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the registered remote connection

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
409	Conflict	A remote connection has already been created with the specified path group ID.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remotepath-groups
```

Changing the remote connection settings

The following request changes the remote connection settings such as the minimum number of paths, communication timeout value, and the return response time. You can change the remote connection settings when the value of the connection setting of the remote path is CU Free.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `remotepathGroupId` that was obtained by the processing to get information about the remote connection. You can also specify the attributes and connect them with commas as follows:

```
remoteSerialNumber,remoteStorageTypeId,pathGroupId
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID

Query parameters

None.

Body

```
{
  "minNumOfPaths": 1,
  "timeoutValueForRemoteIOInSeconds": 15,
  "roundTripTimeInMilliSeconds": 1
}
```

Attribute	Type	Description
minNumOfPaths	int	Minimum number of remote paths Specify a value in the range from `1` to `8`. This value is set to `1` by default when a remote connection is created.

Attribute	Type	Description
		Specify a value that is no more than the number of remote paths registered in the remote connection.
timeoutValueForRemoteIOInSeconds	int	RIO timeout value (in seconds) for RIO (Remote IO) setting between the local storage system and the remote storage system Specify a value in the range from `10` to `100`. This value is set to `15` by default when a remote connection is created.
roundTripTimeInMilliSeconds	int	The round-trip time value (in milliseconds) between the local storage system and the remote storage system Specify a value in the range from `1` to `500`. Default: `1` This value is set to `1` by default when a remote connection is created.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the changed remote connection

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
400	Bad Request	Values smaller or greater than the specifiable values exist in the specified values.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remotepath-groups/492015,M8,255
```

Adding remote paths to a remote connection

The following request adds a remote path to the existing remote connection. You can add a remote path when the value of the connection setting of the remote path is CU Free. To add a remote path for an iSCSI port, register in advance the iSCSI port of the remote storage system to the iSCSI port of the local storage system.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID/
actions/add-remotepath/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remotepathGroupId` that was obtained by the processing to get information about the remote connection. You can also specify the attributes and connect them with commas as follows:

```
remoteSerialNumber,remoteStorageTypeId,pathGroupId
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system

Attribute	Type	Description
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID

Query parameters

None.

Body

```
{
  "parameters": {
    "localPortId": "CL1-A",
    "remotePortId": "CL2-B"
  }
}
```

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remotePortId	string	(Required) Port number of the remote storage system

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the remote path that was added to the remote connection

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID/
actions/add-remotepath
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The number of the remote paths already registered to the target remote connection is eight, which is the maximum number of remote paths that can be registered.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remotepath-
groups/492015,M8,255/actions/add-remotepath
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remotepath-groups/492015,M8,255/actions/add-remotepath/invoke
```

Deleting a remote path from a remote connection

The following request deletes a specified remote path from a remote connection. You can delete a remote path when the value of the connection setting of the remote path is CU Free. If the specified path is an iSCSI remote path and is not registered to other remote connections, the remote storage system's iSCSI port information that is registered to the iSCSI port on the local storage system is deleted at the same time the iSCSI remote path is deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID/
actions/remove-remotepath/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remotepathGroupId` that was obtained by the processing to get information about the remote connection. You can also specify the attributes and connect them with commas as follows:

```
remoteSerialNumber,remoteStorageTypeId,pathGroupId
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID

Query parameters

None.

Body

```
{
  "parameters": {
    "localPortId": "CL1-A",
    "remotePortId": "CL2-B"
```

```
  }
}
```

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remotePortId	string	(Required) Port number of the remote storage system

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the remote path removed from the remote connection

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID/
actions/remove-remotepath
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	Only one remote path or the minimum number of remote paths is set for the target remote connection.

Coding example

To get an action template

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remotepath-
groups/492015,M8,255/actions/remove-remotepath
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remotepath-groups/492015,M8,255/actions/remove-remotepath/invoke
```

Deleting a remote connection

The following request deletes a specified remote connection. You can delete a remote connection when the value of the connection setting of the remote path is CU Free. When a remote connection is deleted, all remote paths registered to the remote connection to be deleted will also be deleted. If an iSCSI remote path is included in the remote connection to be deleted and is not registered to other remote connections, the remote storage system's iSCSI port information that is registered to the iSCSI port on the local storage system is deleted at the same time the iSCSI remote path is deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remotepath-groups/object-ID
```

Request message

Object ID

Specify the value of `remotepathGroupId` that was obtained by the processing to get information about the remote connection. You can also specify the attributes and connect them with commas as follows:

```
remoteSerialNumber,remoteStorageTypeId,pathGroupId
```

Attribute	Type	Description
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system

Attribute	Type	Description
		You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
pathGroupId	int	(Required) Path group ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted remote connection

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remotepath-
groups/492015,M8,255
```

Getting information about iSCSI ports

The following request gets information about iSCSI ports of the registered remote storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-iscsi-ports
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about the remote storage system is not registered on the REST API server:


```
{
  "data": [
    {
      "remoteIscsiPortId": "CL1-B,410012,M8,CL2-D",
      "localPortId": "CL1-B",
      "remoteSerialNumber": "410012",
      "remoteStorageTypeId": "M8",
      "remotePortId": "CL2-D",
      "remoteIpAddress": "192.168.116.29",
      "remoteTcpPort": 3260
    },
    {
      "remoteIscsiPortId": "CL3-B,410012,M8,CL2-D",
      "localPortId": "CL3-B",
      "remoteSerialNumber": "410012",
      "remoteStorageTypeId": "M8",
      "remotePortId": "CL2-D",
      "remoteIpAddress": "192.168.116.29",
      "remoteTcpPort": 3260
    }
  ]
}
```

The following is an example of the output when information about the remote storage system is registered on the REST API server:


```
{
  "data": [
    {
      "remoteIscsiPortId": "CL1-B,410012,M8,CL2-D",
      "localPortId": "CL1-B",
      "remoteStorageDeviceId": "834000410012",
      "remoteSerialNumber": "410012",
      "remoteStorageModel": "VSP G400",
      "remoteStorageTypeId": "M8",
      "remotePortId": "CL2-D",
      "remoteIpAddress": "192.168.116.29",
      "remoteTcpPort": 3260
    },
    {
      "remoteIscsiPortId": "CL3-B,410012,M8,CL2-D",
      "localPortId": "CL3-B",
      "remoteStorageDeviceId": "834000410012",
      "remoteSerialNumber": "410012",
      "remoteStorageModel": "VSP G400",
      "remoteStorageTypeId": "M8",
      "remotePortId": "CL2-D",
      "remoteIpAddress": "192.168.116.29",
      "remoteTcpPort": 3260
    }
  ]
}
```


Attribute	Type	Description
remoteIscsiPortId	string	Object ID for the iSCSI port
localPortId	string	Port number of the local storage system
remoteStorageDeviceId	string	Storage device ID of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageModel	string	Model type of the remote storage system

Attribute	Type	Description
		This attribute is output when information about the remote storage system is registered on the REST API server.
remoteStorageTypeId	string	ID that indicates the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remotePortId	string	Port number of the remote storage system
remoteIpAddress	string	IP address of the remote storage system
remoteTcpPort	int	TCP port number of the remote storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-iscsi-
ports
```

Getting information about a specific iSCSI port

If you specify a port, the following request gets information about that iSCSI port of the remote storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-iscsi-ports/object-ID
```

Request message

Object ID

Specify the value of `remoteIscsiPortId` that was obtained by the processing to get information about the port. You can also specify the attributes and connect them with commas as follows:

```
localPortId,remoteSerialNumber,remoteStorageTypeId,remotePortId
```

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remotePortId	string	(Required) Port number of the remote storage system

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about the remote storage system is not registered on the REST API server:

```
{
  "remoteIscsiPortId": "CL1-B,410012,M8,CL2-D",
  "localPortId": "CL1-B",
  "remoteSerialNumber": "410012",
  "remoteStorageTypeId": "M8",
```

```
  "remotePortId": "CL2-D",
  "remoteIpAddress": "192.168.116.29",
  "remoteTcpPort": 3260
}
```

The following is an example of the output when information about the remote storage system is registered on the REST API server:

```
{
  "remoteIscsiPortId": "CL1-B,410012,M8,CL2-D",
  "localPortId": "CL1-B",
  "remoteStorageDeviceId": "834000410012",
  "remoteSerialNumber": "410012",
  "remoteStorageModel": "VSP G400",
  "remoteStorageTypeId": "M8",
  "remotePortId": "CL2-D",
  "remoteIpAddress": "192.168.116.29",
  "remoteTcpPort": 3260
}
```

Attribute	Type	Description
remoteIscsiPortId	string	Object ID for the iSCSI port
localPortId	string	Port number of the local storage system
remoteStorageDeviceId	string	Storage device ID of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageModel	string	Model type of the remote storage system This attribute is output when information about the remote storage system is registered on the REST API server.

Attribute	Type	Description
remoteStorageTypeId	string	ID that indicates the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remotePortId	string	Port number of the remote storage system
remoteIpAddress	string	IP address of the remote storage system
remoteTcpPort	int	TCP port number of the remote storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456/remote-iscsi-
ports/CL1-B,410012,M8,CL2-D
```

Registering an iSCSI port

The following request registers the iSCSI port of the remote storage system to the iSCSI port of the local storage system. You can specify the serial number and the series name of the remote storage system to register an iSCSI port. Alternatively, you can specify the storage device ID of the remote storage system to register an iSCSI port. Perform this operation before adding a remote path to a remote connection.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/remote-iscsi-ports
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for registering an iSCSI port by specifying the serial number, series name, and the TCP port number of the remote storage system:

```
{
  "localPortId": "CL1-B",
  "remoteSerialNumber": "492015",
  "remoteStorageTypeId": "M8",
  "remotePortId": "CL2-D",
  "remoteIpAddress": "192.168.116.29",
  "remoteTcpPort": 3260
}
```

The following is a coding example for registering an iSCSI port by specifying the serial number and the series name of the remote storage system, without specifying the TCP port number:

```
{
  "localPortId": "CL1-B",
  "remoteSerialNumber": "492015",
  "remoteStorageTypeId": "M8",
  "remotePortId": "CL2-D",
  "remoteIpAddress": "192.168.116.29"
}
```

When registering an iSCSI port by specifying the serial number and the series name of the remote storage system:

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system

Attribute	Type	Description
		You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remotePortId	string	(Required) Port number of the remote storage system
remoteIpAddress	string	(Required) IP address of the remote storage system You can specify an IPv4 or IPv6 address.
remoteTcpPort	int	(Optional) TCP port number If this attribute is not specified, the TCP port number for the iSCSI target of the local storage system will be set to the TCP port number of the remote storage system.

The following is a coding example for registering an iSCSI port by specifying the storage device ID and the TCP port number of the remote storage system:

```
{
  "localPortId": "CL1-B",
  "remoteStorageDeviceId": "834000492015",
  "remotePortId": "CL2-D",
  "remoteIpAddress": "192.168.116.29"
}
```

When registering the iSCSI port by specifying the storage device ID of the remote storage system:

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
remotePortId	string	(Required) Port number of the remote storage system
remoteIpAddress	string	(Required) IP address of the remote storage system

Attribute	Type	Description
		You can specify an IPv4 or IPv6 address.
remoteTcpPort	int	(Optional) TCP port number If this attribute is not specified, the TCP port number for the iSCSI target of the local storage system will be set to the TCP port number of the remote storage system.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the iSCSI port of the remote storage system that was registered to the iSCSI port of the local storage system

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-iscsi-ports
```

Removing the registration of an iSCSI port

The following request deletes information about the iSCSI port of the remote storage system that is registered to the iSCSI port of the local storage system. If this iSCSI port is registered in a remote connection, you cannot delete the information.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-iscsi-ports/object-ID
```

Request message

Object ID

Specify the value of `remoteIscsiPortId` that was obtained by the processing to get information about the port. You can also specify the attributes and connect them with commas as follows:

```
localPortId,remoteSerialNumber,remoteStorageTypeId,remotePortId
```

Attribute	Type	Description
localPortId	string	(Required) Port number of the local storage system
remoteSerialNumber	string	(Required) Serial number of the remote storage system
remoteStorageTypeId	string	(Required) ID that indicates the model of the remote storage system You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One SDS Block, VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remotePortId	string	(Required) Port number of the remote storage system

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted iSCSI port

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-iscsi-
ports/CL1-B,410012,M8,CL2-D
```

Setting journals

This section describes how to specify settings of journals to be used in Universal Replicator by using the REST API.

Getting journal information

The following request gets a list of information about a journal.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/journals
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
journalInfo	string	(Required) Type of information to be obtained The specifiable values are as follows: ▪ `basic`: Basic journal information ▪ `timer`: Journal time information ▪ `detail`: Detailed journal information

Body

None.

Response message

Body

The following is an example of the output when basic journal information is obtained:

```
{
  "data": [
    {
      "journalId": 0,
      "muNumber": 1,
      "consistencyGroupId": 5,
      "journalStatus": "PJSF",
      "numOfActivePaths": 1,
      "usageRate": 0,
      "qMarker": "575cc653",
      "qCount": 0,
      "byteFormatCapacity": "1.88 G",
      "blockCapacity": 3956736,
      "numOfLdevs": 1,
      "firstLdevId": 513
    }
  ]
}
```

Attribute	Type	Description
journalId	int	Journal ID
muNumber	int	MU (mirror unit) number

Attribute	Type	Description
consistencyGroupId	int	Consistency group identifier
journalStatus	string	Journal volume status For details, see the section explaining the mirror journal statuses.
numOfActivePaths	int	Number of active link paths
usageRate	int	Usage rate of the journal volume
qMarker	string	If the obtained journal is the master journal, the last sequential number (Q-marker) when the journal volume received the write data is output. If the obtained journal is the restore journal, the last sequential number (Q-marker) that is written in the cache is output.
qCount	long	Number of `qMarker` remaining in the master journal volume
byteFormatCapacity	string	Capacity of the journal volume The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the journal volume
numOfLdevs	int	Number of LDEVs configuring the journal volume
firstLdevId	int	LDEV number of the first LDEV assigned to the journal

The following is an example of the output when journal time information is obtained:


```
{
  "data": [
    {
      "journalId": 0,
      "muNumber": 1,
      "consistencyGroupId": 5,
      "journalStatus": "PJSF",
      "numOfActivePaths": 1,
      "usageRate": 0,
      "qMarker": "575cc653",
      "qCount": 0,
      "byteFormatCapacity": "1.88 G",
      "blockCapacity": 3956736,
      "dataOverflowWatchInSeconds": 60,
      "pathBlockadeWatchInMinutes": 5,
      "activePathWatchTimerSettingInSeconds": 40
```

```
    }
  ]
}
```

Attribute	Type	Description
journalId	int	Journal ID
muNumber	int	MU (mirror unit) number
consistencyGroupId	int	Consistency group identifier
journalStatus	string	Journal volume status For details, see the section explaining the mirror journal statuses.
numOfActivePaths	int	Number of active link paths
usageRate	int	Usage rate of the journal volume
qMarker	string	If the obtained journal is the master journal, the last sequential number (Q-marker) when the journal volume received the write data is output. If the obtained journal is the restore journal, the last sequential number (Q-marker) that is written in the cache is output.
qCount	long	Number of `qMarker` remaining in the master journal volume
byteFormatCapacity	string	Capacity of the journal volume The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the journal volume
dataOverflowWatchInSeconds	int	Data Overflow Watch timer setting (in seconds) per the Journal
pathBlockadeWatchInMinutes	int	Path Blockade Watch timer setting (in minutes) per the Journal
activePathWatchTimerSettingInSeconds	int	Active Path Watch timer setting (in seconds) to detect any link failures

The following is an example of the output when detailed journal information is obtained:


```
{
  "data": [
    {
      "journalId": 0,
      "isMainframe": false,
      "isCacheModeEnabled": true,
      "isInflowControlEnabled": true,
      "dataOverflowWatchInSeconds": 60,
      "copySpeed": 256,
      "isDataCopying": true,
      "mpBladeId": 0,
      "mirrorUnits": [
        {
          "muNumber": 0,
          "consistencyGroupId": 0,
          "journalStatus": "SMPL",
          "pathBlockadeWatchInMinutes": 5,
          "copyPace": "L"
          "copySpeed": 256,
          "isDataCopying": true,
        },
          ...
          ...
        {
          "muNumber": 3,
          "consistencyGroupId": 0,
          "journalStatus": "SMPL",
          "pathBlockadeWatchInMinutes": 5,
          "copyPace": "L"
          "copySpeed": 256,
          "isDataCopying": true,
        }
      ]
    }
  ]
}
```


Attribute	Type	Description
journalId	int	Journal ID

Attribute	Type	Description
isMainframe	boolean	Indicates whether the journal is used for mainframe systems or open systems ▪ `true`: The journal is used for mainframe systems ▪ `false`: The journal is used for open systems
mfTimerType	string	Timer type for mainframe systems ▪ `LOCAL`: A local timer is used. ▪ `SYSTEM`: A system timer is used. ▪ `none`: A system timer is used (when the copy direction is the reverse).
isCacheModeEnabled	boolean	Indicates whether the cache mode setting is enabled ▪ `true`: The cache mode setting is enabled. ▪ `false`: The cache mode setting is disabled.
isInflowControlEnabled	boolean	Indicates whether an inflow of update I/O to the journal volume is limited ▪ `true`: Inflow is limited. ▪ `false`: Inflow is unlimited.
dataOverflowWatchInSeconds	int	Data Overflow Watch timer setting (in seconds) per the Journal
copySpeed	int	Transfer speed (in Mbps) The value set for the object whose MU (mirror unit) number is 3 is output. For details about the value for each mirror, see the description of the `copySpeed` attribute of the `mirrorUnits` object.
isDataCopying	boolean	Copy mode "true" or "false" under failure of the delta resync: ▪ `true`: copying ALL data ▪ `false`: No copying

Attribute	Type	Description
		The value set for the object whose MU (mirror unit) number is 3 is output. For details about the value for each mirror, see the description of the `isDataCopying` attribute of the `mirrorUnits` object.
mpBladeId	int	MP blade ID
mirrorUnits	object[]	The following attributes are output for each mirror: ▪ muNumber (int) MU (mirror unit) number ▪ consistencyGroupId (int) Consistency group ID ▪ journalStatus (string) The journal status For details, see the section explaining the mirror journal statuses. ▪ pathBlockadeWatchInMinutes (int) Path Blockade Watch timer setting (in minutes) per the Journal ▪ copyPace (string) Copy speed • `L`: Low speed • `M`: Medium speed • `H`: High speed ▪ copySpeed (int) Transfer speed (in Mbps) ▪ isDataCopying (boolean) Copy mode "true" or "false" under failure of the delta resync: • `true`: copying ALL data • `false`: No copying

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

To get basic journal information:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals?
journalInfo=basic
```

To get journal time information:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals?
journalInfo=timer
```

To get detailed journal information:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals?
journalInfo=detail
```

Getting information about a specific journal

The following request gets basic information about the specified journal. To get journal time information or detailed journal information, run the API function for getting a list of journals.

Note: If the specified journal is used in a 3DC configuration and multiple MUs are set for the journal, information about only one MU can be acquired for the API. In this situation, run the API function for getting a list of journals to get the information about the target journal ID.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/journals/object-ID
```

Request message

Object ID

Specify the `journalId` value obtained by getting information about the journal.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "journalId": 0,
  "muNumber": 1,
  "consistencyGroupId": 5,
  "journalStatus": "PJSF",
  "numOfActivePaths": 1,
  "usageRate": 0,
  "qMarker": "575cc653",
  "qCount": 0,
  "byteFormatCapacity": "1.88 G",
  "blockCapacity": 3956736,
  "numOfLdevs": 1,
  "firstLdevId": 513
}
```

Attribute	Type	Description
journalId	int	Journal ID
muNumber	int	MU (mirror unit) number
consistencyGroupId	int	Consistency group identifier
journalStatus	string	Journal volume status For details, see the section explaining the mirror journal statuses.
numOfActivePaths	int	Number of active link paths
usageRate	int	Usage rate of the journal volume

Attribute	Type	Description
qMarker	string	If the obtained journal is the master journal, the last sequential number (Q-marker) when the journal volume received the write data is output. If the obtained journal is the restore journal, the last sequential number (Q-marker) that is written in the cache is output.
qCount	long	Number of `qMarker` remaining in the master journal volume
byteFormatCapacity	string	Capacity of the journal volume The value is output to the second decimal place.
blockCapacity	long	Number of blocks of the journal volume
numOfLdevs	int	Number of LDEVs configuring the journal volume
firstLdevId	int	LDEV number of the first LDEV assigned to the journal

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals/0
```

Creating a journal

The following request creates a journal and then adds a journal volume. Specify a DP volume for a journal volume to be added.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/journals
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for creating a journal by specifying the LDEV number:

```
{
  "journalId": 33,
  "ldevIds": [101,102]
}
```

When creating a journal by specifying the LDEV number

Attribute	Type	Description
journalId	int	(Required) Specify the journal ID. Specify a decimal (base 10) number in the range from `0` to `255`.
ldevIds	int[]	(Required) Specify the LDEV number with a decimal (base 10) number. You can specify up to 2 numbers.

The following is a coding example for creating a journal by specifying a range of consecutive LDEV numbers:

```
{
  "journalId": 33,
  "startLdevId": 101,
  "endLdevId": 102
}
```

When creating a journal by specifying a range of consecutive LDEV numbers

Attribute	Type	Description
journalId	int	(Required) Specify the journal ID with a decimal (base 10) number.
startLdevId	int	(Required) Specify the first LDEV number by using a decimal (base 10) number. The value of this attribute must be smaller than that of `endLdevId`.
endLdevId	int	(Required) Specify the last LDEV number by using a decimal (base 10) number.

Attribute	Type	Description
		The value of this attribute must be greater than that of `startLdevId`. Specify a number such that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 2 LDEVs.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the created journal

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
409	Conflict	A journal that has the specified journal ID already exists.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/journals
```

The mirror journal status

The following table describes the mirror journal statuses for Universal Replicator.

Status	Description
SMPL	The mirror is not used.
P(S)JNN	The master journal (restore journal) is normal.
P(S)JSN	The master journal (restore journal) is in normal split status.
P(S)JNF	The master journal (restore journal) is full.
P(S)JSF	The master journal (restore journal) is full and split.
P(S)JSE	The master journal (restore journal) is split due to an error (including link errors).
P(S)JNS	The master journal (restore journal) is in normal split status (for the 3DC multi-target configuration that uses delta resync).
P(S)JES	The master journal (restore journal) is split due to an error (for the 3DC multi-target configuration that uses delta resync).

Changing journal settings

The following request changes the journal settings, such as Data Overflow Watch and the transfer speed.

Note:

If a user uses the REST API to lock the resources of a target storage system, any request that includes a change to the transfer speed (the `copySpeed` attribute) cannot run. In such a case, unlock the resources before performing the operation.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/journals/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the value of `journalId` that was obtained by the processing to get information about journals.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

The following is a coding example for changing the following settings: Data Overflow Watch, cache mode, and transfer speed:

```
{
  "dataOverflowWatchInSeconds": 60,
  "isCacheModeEnabled": true,
  "copySpeed": 100
}
```

The following is a coding example for changing the following settings: mirror copy speed and Path Blockade Watch Time for the mirror:

```
{
  "mirrorUnit": {
    "muNumber": 0,
    "copyPace": "M",
    "pathBlockadeWatchInMinutes": 10
  }
}
```

The following is a coding example for changing the following settings: Data Overflow Watch, cache mode, transfer speed, copy speed per mirror, and Path Blockade Watch Time for the mirror:

```
{
  "dataOverflowWatchInSeconds": 60,
  "isCacheModeEnabled": true,
  "copySpeed": 100,
  "mirrorUnit": {
    "muNumber": 0,
    "copyPace": "M",
    "pathBlockadeWatchInMinutes": 10
```

```
  }
}
```

Attribute	Type	Description
dataOverflowWatchInSeconds	int	(Optional) Data Overflow Watch (in seconds) This value is set to `60` by default when a journal is created. If `0` is specified, control on inflow of update I/O to the journal volume will be disabled.
isCacheModeEnabled	boolean	(Optional) Specify whether to enable the cache mode setting. ▪ `true`: The cache mode setting is enabled. ▪ `false`: Disable the cache mode setting. This value is set to `true` by default when a journal is created.
copySpeed	int	(Optional) Transfer speed (in Mbps) Specify the transfer speed for data transfer. You can specify one of the following values: `3`, `10`, `100`, or `256` This value is set to `256` by default when a journal is created.

Attribute	Type	Description
mirrorUnit	object	Specify the following attributes for each mirror: ▪ (Optional) muNumber (int) MU (mirror unit) number Specify this attribute together with either the `copyPace` attribute or the `pathBlockadeWatchInMinutes` attribute. ▪ (Optional) copyPace (string) Copy speed The type is not case sensitive. • `L`: Low speed • `M`: Medium speed • `H`: High speed This value is set to `L` by default when a journal is created. ▪ (Optional) pathBlockadeWatchInMinutes (int) Path Blockade Watch Time (in minutes) Specify a value in the range from `0` to `60`. This value is set to `5` by default when a journal is created. If `0` is specified, the Path Blockade Watch Time is not changed, and the function that transfers the Path Blockade Watch Time to the secondary site of the mirror (the RCU) is disabled. If a value other than `0` is specified, the specified value is set as the value for the Path Blockade Watch Time, and the function that transfers the Path Blockade Watch Time to the secondary site of the mirror (the RCU) is enabled.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the changed journal You can use detailed journal information to check changed setting values. You can obtain detailed information by specifying `journalInfo=detail` for the query parameter of the API for getting a list of journals.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/journals/100
```

Adding a journal volume

The following request adds a journal volume to a journal to expand the journal. Specify a DP volume for a journal volume to be added.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/journals/object-ID/actions/expand/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `journalId` that was obtained by the processing to get information about journals.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevIds": [101]
  }
}
```

Attribute	Type	Description
ldevIds	int[]	(Required) Specify the LDEV number with a decimal (base 10) number. You can specify only one LDEV.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the journal to which a volume was added

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/journals/object-ID/actions/expand
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The number of journal volumes that are registered to the target volume is already at the maximum.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals/3/
actions/expand
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/journals/3/actions/expand/invoke
```

Deleting a journal volume from a journal

The following request deletes the specified journal volume from a journal to shrink the journal.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/journals/object-ID/actions/shrink/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `journalId` that was obtained by the processing to get information about journals.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

```
{
  "parameters": {
    "ldevIds": [101]
  }
}
```

Attribute	Type	Description
ldevIds	int[]	(Required) Specify the LDEV number with a decimal (base 10) number. You can specify only one LDEV.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the journal from which a volume was deleted

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/journals/object-ID/actions/shrink
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	Only one journal volume exists in the target journal, or pairs are created and the status of the journal volume is normal.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals/3/
actions/shrink
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/journals/3/actions/shrink/invoke
```

Changing the MP blade assigned to a journal

The following request changes the MP blade assigned to a journal.

Execution permission

Storage Administrator (System Resource Management)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/journals/object-ID/actions/assign-
mp-blade/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `journalId` value obtained by getting journal information.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

```
{
    "parameters": {
        "mpBladeId": 1
    }
}
```

Attribute	Type	Description
mpBladeId	int	(Required) The blade number of the MP blade to be assigned to the journal

Response message

Body

A job object is returned. For details about attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the journal for which the MP blade was changed You can use detailed journal information to check changed setting values. You can obtain detailed information by specifying `journalInfo=detail` for the query parameter of the API for getting a list of journals.

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of the HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/journals/3/actions/assign-mp-blade/invoke
```

Deleting a journal

The following request deletes a journal. A DP volume registered as a journal volume is not deleted. However, the DP volume can no longer be used as a journal.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/journals/object-ID
```

Request message

Object ID

Specify the value of `journalId` that was obtained by the processing to get information about journals.

Attribute	Type	Description
journalId	int	(Required) Journal ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description on job objects.

Attribute	Description
affectedResources	URL of the deleted journal

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/journals/30
```

Setting quorum

This section describes how to use the REST API to configure the settings of the quorum to be used in a global-active device.

Getting information about quorum disks

The following request gets a list of information about quorum disks.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/quorum-disks
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "data": [
    {

      "quorumDiskId" : 1,
      "remoteSerialNumber" : "39304",
      "remoteStorageTypeId" : "R9",
      "readResponseGuaranteedTime" : 40
    },
    {
      "quorumDiskId" : 31,
      "remoteSerialNumber" : "39304",
      "remoteStorageTypeId" : "R9",
      "ldevId" : 11432,
      "readResponseGuaranteedTime" : 40,
      "status" : "NORMAL"
    }
  ]
}
```

Attribute	Type	Description
quorumDiskId	int	ID of the Quorum disk
remoteSerialNumber	string	Serial number of the remote storage system with which the quorum disk is shared
remoteStorageTypeId	string	Model ID of the remote storage system with which the quorum disk is shared ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
ldevId	int	LDEV number that is set for the quorum disk This attribute is not output for configurations where no volumes are set for quorum disks.
readResponseGuaranteedTime	int	Guaranteed read-response time (in seconds) set for the quorum disk when quorum monitoring is stopped

Attribute	Type	Description
status	string	Status of the quorum disk ▪ NORMAL: The disk is in a normal state. ▪ TRANSITIONING: The disk is transitioning. ▪ BLOCKED: The disk is blocked. ▪ REPLACING: The disk is being replaced. ▪ FAILED: The disk is in an abnormal state. This attribute is not output for configurations where no volumes are set for quorum disks.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/quorum-disks
```

Getting information about a specific quorum disk

The following request gets information about the specified quorum disk.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/quorum-disks/object-ID
```

Request message

Object ID

Specify the value of quorumDiskId obtained by the request that gets information about quorum disks.

Attribute	Type	Description
quorumDiskId	int	(Required) ID of the Quorum disk Specify a decimal (base 10) number in the range from `0` to `31`.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "quorumDiskId": 31,
  "remoteSerialNumber": "39304",
  "remoteStorageTypeId": "R9",
  "ldevId": 1,
  "readResponseGuaranteedTime": 5,
  "status": "NORMAL"
}
```

Attribute	Type	Description
quorumDiskId	int	ID of the Quorum disk
remoteSerialNumber	string	Serial number of the remote storage system with which the quorum disk is shared
remoteStorageTypeId	string	Model ID of the remote storage system with which the quorum disk is shared ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
ldevId	int	LDEV number that is set for the quorum disk This attribute is not output for configurations where no volumes are set for quorum disks.

Attribute	Type	Description
readResponseGuaranteedTime	int	Guaranteed read-response time (in seconds) set for the quorum disk when quorum monitoring is stopped
status	string	Status of the quorum disk ▪ `NORMAL`: The disk is in a normal state. ▪ `TRANSITIONING`: The disk is transitioning. ▪ `BLOCKED`: The disk is blocked. ▪ `REPLACING`: The disk is being replaced. ▪ `FAILED`: The disk is in an abnormal state. This attribute is not output for configurations where no volumes are set for quorum disks.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/quorum-
disks/31
```

Registering information about a quorum disk

In the storage system, you can register information about the quorum disk to use for global-active device.

Note:

You need to specify the same quorum disk ID for the local storage system and for the remote storage system. For each storage system, run the API request that gets information about quorum disks and check for unused quorum disk IDs.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/quorum-disks
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "quorumDiskId": 1,
  "remoteSerialNumber": "39304",
  "remoteStorageTypeId": "R9",
  "ldevId": 10
}
```

Attribute	Type	Description
quorumDiskId	int	(Required) ID of the Quorum disk Specify a decimal (base 10) number in the range from `0` to `31`. Specify an unused quorum disk ID.
remoteSerialNumber	string	(Required) Serial number of the remote storage system with which the quorum disk is shared
remoteStorageTypeId	string	(Required) Model ID of the remote storage system with which the quorum disk is shared You can specify the following values: ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
ldevId	int	(Optional) LDEV number to be set for the quorum disk Specify a decimal (base 10) number in the range from `0` to `65279`.

Attribute	Type	Description
		If you want to register information about a quorum disk with an external volume configured, you must specify this attribute. If you do not specify this attribute, information about the quorum disk will be registered with no external volume configured.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the registered quorum disk information

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/quorum-disks
```

Deleting information about a quorum disk

You can delete information about a quorum disk from the storage system by specifying the Quorum disk ID.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/quorum-disks/object-ID
```

Request message

Object ID

Set the `quorumDiskId` value obtained by getting the information about the quorum disks.

Attribute	Type	Description
quorumDiskId	int	(Required) ID of the Quorum disk Specify a decimal (base 10) number in the range from `0` to `31`.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted quorum disk information

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/quorum-
disks/31
```

Chapter 14: Managing TrueCopy pairs or Universal Replicator pairs

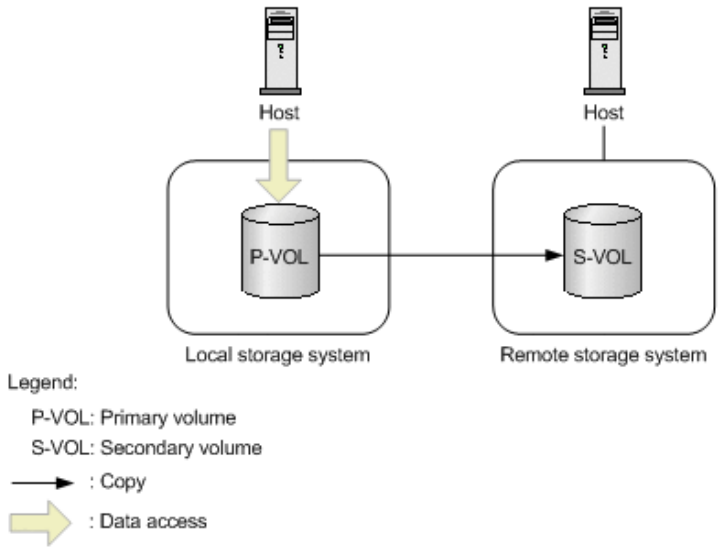
This chapter describes how to perform operations on TrueCopy pairs or Universal Replicator pairs by using the REST API.

Overview of TrueCopy and Universal Replicator

TrueCopy and Universal Replicator create a copy of a data volume between storage systems. You can create a pair or manage the pair status by issuing an API operation from a REST API client.

TrueCopy

By synchronizing with the data of the local storage system, TrueCopy copies the data to the remote storage system. Therefore, if the volumes of the local storage system (primary volumes) and the volumes of the remote storage system (secondary volumes) are in the PAIR status, the data is consistent.

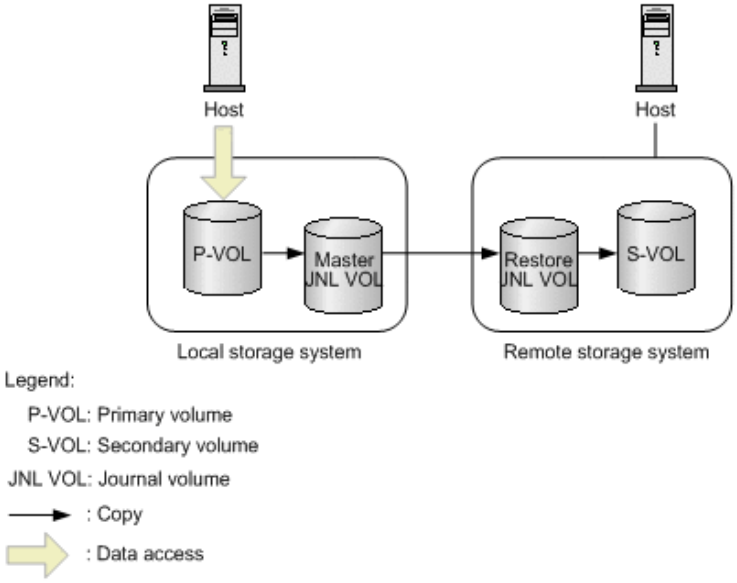


A pair consists of a primary volume and a secondary volume. You can perform operations on pairs in units of copy groups. A copy group is a group made up of copy pairs. Each copy group consists of a device group made up of primary volumes, and a device group made up of secondary volumes.

For details on TrueCopy, see the *Hitachi TrueCopy® User Guide*.

Universal Replicator

Universal Replicator asynchronously copies the data of the local storage system to the data of the remote storage system. The updated data (journal data) is stored in the master journal volume, and is copied to the data of the secondary volumes via the restore journal volume.



For Universal Replicator, the primary volumes and the master journal volume are called the master journal, and the secondary volumes and the restore journal volume are called the restore journal. Perform operations on pairs in units of mirrors (copy groups) that are the correspondence relationship between the master journal and the restore journal. A mirror (copy group) is a group made up of copy pairs. Each mirror (copy group) consists of a device group made up of primary volumes, and a device group made up of secondary volumes.

For details on Universal Replicator, see the *Hitachi Universal Replicator User Guide*.

Notes when a TrueCopy pair or Universal Replicator pair was created by using software other than the REST API

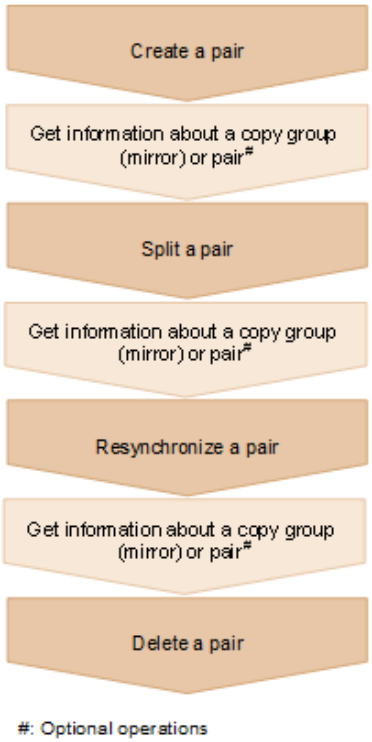
If you want to use the REST API to manage a pair that was created by using software other than the REST API, see the description of device group definition methods in the *Command Control Interface User and Reference Guide*, and use the method of running a command to correctly set a copy group and a device group.

Device names described in the *Command Control Interface User and Reference Guide* correspond to copy pair names for the REST API.

Note that if you use the REST API to create a pair, these kinds of information will be set automatically. For this reason, if you want to use the REST API to manage pairs, we recommend that you use the REST API to create pairs.

Workflow for operating TrueCopy pairs or Universal Replicator pairs

The following figure shows the workflow for performing TrueCopy or Universal Replicator operations.



Important:

If you perform operations on or get information about TrueCopy or Universal Replicator pairs, specify Remote-Authorization for the request header.

Creating a pair

Create a pair, and then copy all of the data in the P-VOL to the S-VOL. The pair is synchronized. Create a pair in a new copy pair (mirror), or add a pair to an existing copy group.

Getting information about a copy group (mirror) or pair

For TrueCopy, you can perform operations on the pair in units of copy groups or pairs. For Universal Replicator, perform operations on the pair in units of copy groups (mirrors).

Splitting a pair

Split the pair to suspend data copy.

Resynchronizing a pair

Copy the differential data to resynchronize the pair.

Note: Resynchronization can be performed in units of copy groups or pairs. For TrueCopy, if you want to register pairs to a consistency group during resynchronization, perform resynchronization in units of copy groups. Do not perform resynchronization in units of pairs.

Deleting a pair

Dissolve the pair status of the volumes.

Specifying Job-Mode-Wait-Configuration-Change in the request header

During the creation, splitting, and resynchronizing of pairs, if multiple asynchronous processing requests are issued at the same time, jobs might get stuck and the job status might not change to `Completed` because data copying takes a long time. In such cases, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header so that the job status changes to `Completed` without waiting for data copying to finish, and the next job starts. At this time, data copying continues even after job execution ends. To check whether data copying has finished, check the pair status of the target resource instead of the job status. For details about the pair status, see the description of the pair status transitions.

Flow of recovery operations to be performed when a failure occurs at the primary site of a Universal Replicator pair

If a failure occurs at the primary site of a Universal Replicator pair, you can use the REST API to perform a failover to the secondary site, in order to ensure continuous operation. After the recovery of the primary site is complete, you can return the pair to the state it was in before the failure occurred by switching operations back to the primary site from the secondary site.

The operations for recovering the Universal Replicator pair can be divided into three general phases:

1. Perform a failover to switch operations over to the secondary site.
2. Copy data from the secondary site to the primary site.
3. Return the pair relationship between the primary site and the secondary site to the state it was in before the failure occurred.

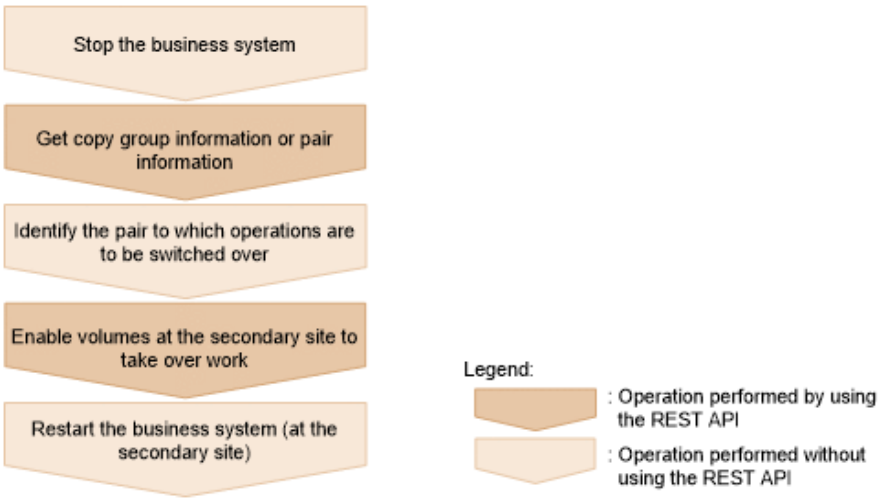
The following explains the flow of operations in each phase.

Performing a failover to switch over business operations to the secondary site

After a failure is detected at the primary site, switch the roles of the primary volume and the secondary volume of the Universal Replicator pair, so that data can be written to the secondary volume, and business operations can continue at the secondary site.

Note: If a failure has occurred at the primary site, pair information of the primary site cannot be obtained. Therefore, to identify the volume at the secondary site to which business operations are to be switched over, you need to know in advance which storage system makes up a pair together with the primary volume of the Universal Replicator pair at the primary site.

The following figure shows the flow of operations:



Stop the business system

When a failure is detected at the primary site, stop the business system, and make sure that there is no I/O to or from the hosts.

Get copy group information or pair information

Get a list of the copy groups on the storage system of the secondary site. Then, based on this information, get copy pair information for the secondary site. When executing these API requests, you need to specify remote storage system information for the query parameter or object ID. In this situation, specify NotSpecified.

Identify the pair to which business operations are to be switched over

Based on the pair information for the secondary site, identify the pair to which business operations are to be switched over.

Switch over business operations to a volume at the secondary site

Specify the pair or copy group, and then switch the roles of the primary volume and the secondary volume. Data can now be written to the secondary volume.

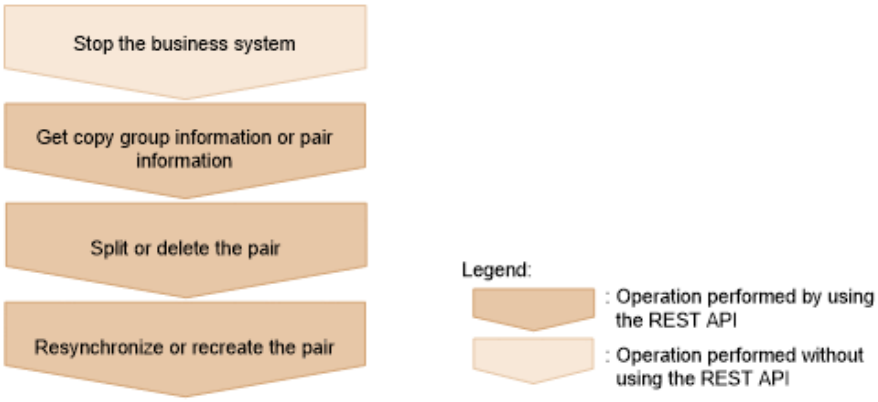
Note: When `auto` is specified as the takeover execution mode, the storage systems at the secondary site automatically try to resynchronize with the storage systems at the primary site. If the resynchronization succeeds, you do not need to split and then resynchronize the pair by performing the following flow of operations (the flow of operations for copying data from the secondary site to the primary site). To check whether the resynchronization was successful, get pair information.

Restart the business system (at the secondary site)

Restart the operations of the business system at the secondary site.

Copying data from the secondary site to the primary site

After recovery is complete for the primary site, apply the data that was written to the secondary site during the failure to the primary site. The following figure shows the flow of operations:



Stop the business system

Stop the business system, and make sure that there is no I/O to or from the hosts.

Get copy group information or pair information

Get copy pair information based on the copy group information, and then check the pair status.

Split or delete the pair

Perform one of the following operations if necessary, according to the pair status:

- If the pair status of the S-VOL is SSWS, split the pair.
- If the pair status of the P-VOL or the S-VOL is SMPL, delete the pair.

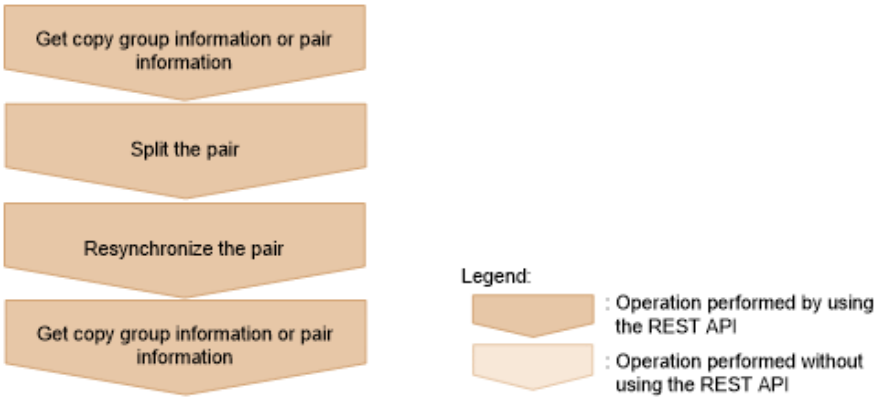
Resynchronize or re-create the pair

Perform one of the following operations if necessary, according to the pair status:

- If the pair status of the S-VOL is SSWS, resynchronize the pair at the secondary site (the S-VOL). At this time, specify `true` for `doSwapSvol`.
- If the pair status of both the primary site and the secondary site is SMPL, create a pair by specifying the P-VOL for the secondary site.

Returning the pair relationship between the primary site and the secondary site to the state it was in before the failure

When all pair statuses are PAIR and all data on the secondary site is applied to the primary site, normal operation can be restarted at the primary site. The following figure shows the flow of operations:



Get copy group information or pair information

Get pair information based on copy group information, and make sure that the status of the target pair is `PAIR`.

Split the pair

Split the pair.

Resynchronize the pair

Resynchronize the pair at the primary site (P-VOL). Specify `true` for `doSwapSvol`.

Get copy group information or pair information

Get pair information based on copy group information, and make sure that the status of the target pair is `PAIR`.

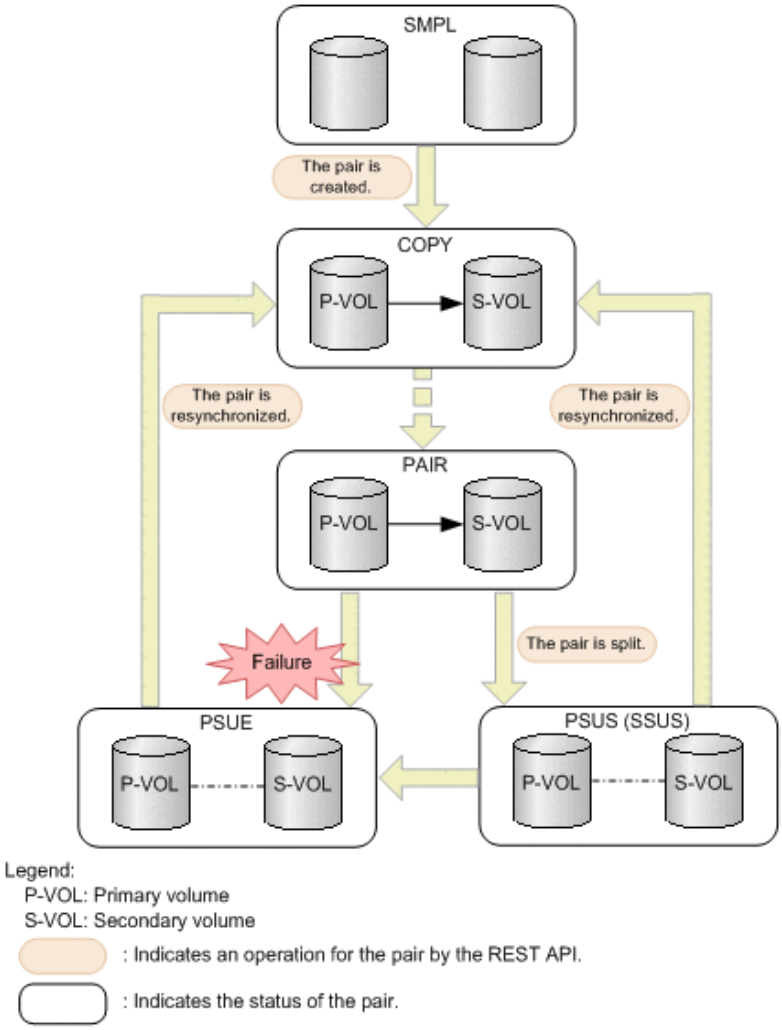
The pair relationship between the primary site and the secondary site and the copy direction are returned to the state they were in before the failure, and the business system can now be restarted.

Pair status (TrueCopy and Universal Replicator)

This section explains the operations and status transition for TrueCopy pairs and Universal Replicator pairs.

Pair status for TrueCopy pairs

The following explains the operations and status transitions for TrueCopy pairs.



Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	--	--
COPY	A pair is being created. An initial copy or resynchronization is being performed.	R/W enabled	R enabled
PAIR	Paired volumes The initial copy finished, and the pair volumes are synchronized.	R/W enabled	R enabled
PSUS	The pair is split by operation, or deleted from the storage system on the secondary site. (This value is output for the P-VOL.)	R/W enabled	R/W enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
			#1
SSUS	The pair is split by operation, or deleted from the storage system on the secondary site. (This value is output for the S-VOL.)	R/W enabled	R/W enabled #1
PSUE	The pair is split due to a failure.	R/W enabled #2	R enabled
SSWS	The P-VOL and S-VOL are switched, and the S-VOL is writable.	R enabled	R/W enabled

#1: When you split a pair, you can specify whether to permit read-write or read-only.

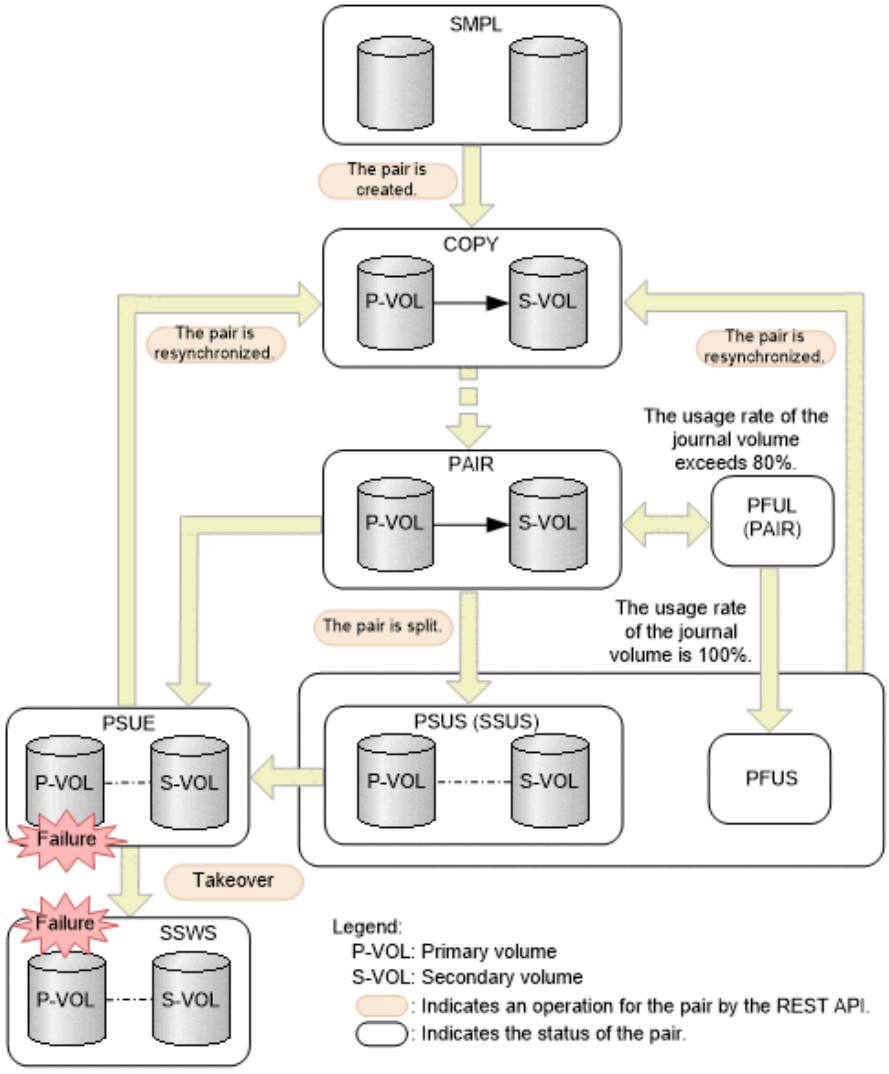
#2: When the fence level of the P-VOL is DATA (S-VOL data), read-only is permitted.

If you delete a pair, the pair status changes to SMPL.

Pair status for Universal Replicator pairs

The following explains the operations and status transitions for Universal Replicator pairs.

Universal Replicator pairs have specific pair statuses because Universal Replicator pairs use the journal volume to asynchronously copy data.



Pair status	Description	Access to the P-VOL	Access to the S-VOL
SMPL	Unpaired volumes	--	--
COPY	A pair is being created. An initial copy or resynchronization is being performed.	R/W enabled	R enabled
PAIR	Paired volumes The initial copy is finished, and the pair volumes are synchronized.	R/W enabled	R enabled
PSUS	The pair is split by operation, or deleted from the storage system on the secondary site. (This value is output for the P-VOL.)	R/W enabled	R/W enabled

Pair status	Description	Access to the P-VOL	Access to the S-VOL
			#
SSUS	The pair is split by operation, or deleted from the storage system on the secondary site. (This value is output for the S-VOL.)	R/W enabled	R/W enabled #
PSUE	The pair is split due to a failure.	R/W enabled	R enabled
SSWS	The P-VOL and S-VOL are switched, and the S-VOL is writable.	R enabled	R/W enabled
PFUL	The amount of the data in the journal volume exceeds the threshold (80%). The pair is not split, and data continues to be copied.	R/W enabled	R enabled
PFUS	The amount of the data in the journal volume reaches 100%, and the pair is split. You must review the configurations of remote paths and the journal volume.	R/W enabled	R enabled #

#: This is determined by the secondary volume's access mode that is specified to split the pair. (Default: Read is enabled.)

If you delete a pair, the pair status changes to SMPL.

Note:

In the following cases, if you perform an operation on a pair, the request successfully returns a response, but the details specified in the request body are not actually applied:

- When you perform a pair splitting operation on a pair for which the status is PSUS or SSUS
- When you perform a pair resynchronization operation on a pair for which the status is COPY or PAIR

Getting a list of remote copy groups

The following request gets a list of all the remote copy groups in which the remote copy pairs (TrueCopy, Universal Replicator, and global-active device) of the target storage system are registered. If the device group name or copy group name contains spaces, copy group information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups
```

Request message

Object ID

None.

Query parameters

You can get only a list of remote copy groups, or you can get detailed information about remote copy pairs in addition to a list of remote copy groups.

- To get a list of remote copy groups only:

Parameter	Type	Filter condition
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system If a failure occurs in a remote storage system and you then specify `NotSpecified`, only the information about the local storage system is obtained. In this situation (when a failure occurs and you specify `NotSpecified`), you do not need to specify the `Remote-Authorization` header.

Parameter	Type	Filter condition
		If you specify `NotSpecified` for this parameter, you cannot specify the `detailInfoType` parameter.

- To obtain additional detailed information:

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `pair` Gets additional detailed information[#1#2] about remote copy pairs. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Parameter	Type	Description
		If you specify `NotSpecified` for the `remoteStorageDeviceId` parameter, you cannot specify this parameter.

#1: If the remote storage system is a VSP One B20, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 model storage system, you might not be able to get some of the information about the remote storage system.

If either of the following conditions is met for other storage systems, you might not be able to get some of the information about the remote storage system.

- The REST API server that manages the remote storage system is using a version of Configuration Manager earlier than 10.0.0.
- The remote storage system's microcode version is earlier than the microcode versions that support Configuration Manager 10.0.0.

  For the storage system microcode versions that support Configuration Manager 10.0.0, see the table listing the compatible versions of Configuration Manager.

#2: If you are getting information for many pairs, you might not be able to get information from the remote storage system for the attribute `pvolStatus`, `pvolIOMode`, `copyPace`, `svolStatus`, or `svolIOMode`.

If that happens, on each of the REST API servers for the local storage system and the remote storage system, run the API request that gets a list of remote copy groups, with `pair` specified for `detailInfoType` in the query parameters. Then, merge the information about remote copy pairs that was acquired from each API request.

This issue occurs when there is a large amount of data communication from the local storage system to the remote storage system. The number of pairs affected by this issue depends on the amount of information in the remote copy groups and pairs, but when there are multiple pairs in a single remote copy group, the issue might occur with approximately 1,200 pairs.

Body

None.

Response message

Body


```
{
  "data" : [ {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup1,
remoteCopyGroup1S_,remoteCopyGroup1P_",
    "copyGroupName" : "remoteCopyGroup1",
```

```
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup1S_",
    "remoteDeviceGroupName" : "remoteCopyGroup1P_"
  }, {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_",
    "copyGroupName" : "remoteCopyGroup2",
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup2P_",
    "remoteDeviceGroupName" : "remoteCopyGroup2S_"
  }, {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_",
    "copyGroupName" : "remoteCopyGroup3",
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup3P_",
    "remoteDeviceGroupName" : "remoteCopyGroup3S_"
  } ]
}
```


Attribute	Type	Description
remoteStorageDeviceId	string	Storage device ID of the remote storage system If you specify `NotSpecified` for remoteStorageDeviceId, `NotSpecified` is output.
copyGroupName	string	Copy group name
localDeviceGroupName	string	Device group name in the local storage system
remoteDeviceGroupName	string	Device group name in the remote storage system If you specify `NotSpecified` for remoteStorageDeviceId, `NotSpecified` is output.
muNumber	int	MU (mirror unit) number If the MU number cannot be obtained, information is not output.
remoteMirrorCopyGroupId	string	Object ID of the remote copy group

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName`

If you run the request with `pair` specified for the query parameter `detailInfoType`, you can get the following information, in addition to information about remote copy groups:

Attribute	Type	Description
copyPairs	objec t[]	Detailed information about the remote copy pair is output.

Attribute	Type	Description
		If information cannot be acquired, the attributes under the `copyPairs` object are not output.

Attribute	Type	Description
		▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name ▪ replicationType (string) Pair type • `TC`: TrueCopy • `UR`: Universal Replicator • `GAD`: global-active device If the pair status is `SMPL`, information is not output. ▪ pvolLdevId (int) LDEV number of P-VOL ▪ svolLdevId (int) LDEV number of S-VOL ▪ fenceLevel (string) Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output. ▪ pvolJournalId (int) Journal ID of the P-VOL A value from `0` to `255` is output only in the case of Universal Replicator. This information is not output if the pair type cannot be obtained. ▪ svolJournalId (int) Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator. This information

Attribute	Type	Description
		is not output if the pair type cannot be obtained. ▪ quorumDiskId (int) ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. This information is not output if the pair type cannot be obtained. ▪ pvolStatus (string) Pair status of the P-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output. ▪ svolStatus (string) Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output. ▪ consistencyGroupId (int) Consistency group ID If no consistency group consists, information is not output. ▪ pvolIOMode (string) I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local

Attribute	Type	Description
		▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ svolIOMode (string) I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ pvolStorageDeviceId (string) Storage device ID of the storage system on the P-VOL ▪ svolStorageDeviceId (string) Storage device ID of the storage system on the S-VOL ▪ remoteMirrorCopyPairId (string) Object ID of the remote copy pair The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName` ▪ transitionStatus (string) The transition status of a pair is output for a Universal Replicator pair. • `None`: The pair is not in transition. • `Suspending`: The pair is being split. • `Deleting`: The pair is being deleted.

Attribute	Type	Description
		This is not output if the copy pair is not a Universal Replicator pair. ▪ copyPace (int) Copy speed This is not output if copy pair is Universal Replicator. ▪ pathGroupId (int) ID of the RCU path group This is not output if CU is specified for the remote path connection setting. This is not output if the pair status of the P-VOL or the S-VOL is `SMPL`. ▪ deltaStatus (string) Status of the 3DC multi-target configuration that uses delta resync This is output if the pair type is Universal Replicator and the 3DC multi-target configuration that uses delta resync is used. • `HOLD`: Universal Replicator delta resync pair (normal) • `HLDE`: Universal Replicator delta resync pair (failed) • `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups?remoteStorageDeviceId=836000123789
```

Getting information about a specific remote copy group

The following request gets information about the specified copy group. This request also gets information about the pairs (TrueCopy, Universal Replicator, or global-active device) included in the copy group. If the copy group name or copy pair name contains spaces, pair information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system#
copyGroupName	string	(Required) Copy group name Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system# Specify a character string consisting of 1 to 31 characters. The name is case sensitive.

#: If you specify `NotSpecified` in cases such as when a failure occurs in a remote storage system, only information about the local storage system can be acquired. If you specify `NotSpecified`, copy pair information about attributes of volumes that belong to the remote storage system will not be output. In this case, you do not need to specify the `Remote-Authorization` header.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `class` Adds additional information#1#2 from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

#1: If the remote storage system is a VSP One B20, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 model storage system, you might not be able to get some of the information about the remote storage system.

If either of the following conditions is met for other storage systems, you might not be able to get some of the information about the remote storage system.

- The REST API server that manages the remote storage system is using a version of Configuration Manager earlier than 10.0.0.
- The remote storage system's microcode version is earlier than the microcode versions that support Configuration Manager 10.0.0.

  For the storage system microcode versions that support Configuration Manager 10.0.0, see the table listing the compatible versions of Configuration Manager.

#2: If you are getting information for many pairs, you might not be able to get information from the remote storage system for the attribute `pvolStatus`, `pvolIOMode`, `copyPace`, `svolStatus`, or `svolIOMode`.

If that happens, on each of the REST API servers for the local storage system and the remote storage system, run the API request that gets the information for a specific copy group, with `class` specified for `detailInfoType` in the query parameters. Then, merge the information about remote copy pairs that was acquired from each API request.

This issue occurs when there is a large amount of data communication from the local storage system to the remote storage system. The number of pairs affected by this issue depends on the amount of information in the remote copy groups and pairs, but when there are multiple pairs, the issue might occur with approximately 1,200 pairs.

Body

None.

Response message

Body

The following is an example of the output when information about TrueCopy pairs is obtained:


```
{
  "remoteMirrorCopyGroupId" : "886000123789,remoteCopyGroup1,
remoteCopyGroup1P_,remoteCopyGroup1S_",
  "copyGroupName" : "remoteCopyGroup1",
  "copyPairs" : [ {
    "copyGroupName" : "remoteCopyGroup1",
    "copyPairName" : "pair1",
    "replicationType" : "TC",
    "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup1,
remoteCopyGroup1P_,remoteCopyGroup1S_,pair1",
    "pvolLdevId" : 2108,
    "svolLdevId" : 1581,
    "fenceLevel" : "DATA",
    "pvolStatus" : "PAIR",
    "svolStatus" : "PAIR",
    "consistencyGroupId": 5,
    "pvolStorageDeviceId" : "886000123456",
    "svolStorageDeviceId" : "886000123789",
    "pvolDifferenceDataManagement": "S",
    "svolDifferenceDataManagement": "S",
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  }, {
    "copyGroupName" : "remoteCopyGroup1",
    "copyPairName" : "pair2",
    "replicationType" : "TC",
    "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup1,
remoteCopyGroup1P_,remoteCopyGroup1S_,pair2",
    "pvolLdevId" : 2109,
```

```
    "svolLdevId" : 1582,
    "fenceLevel" : "DATA",
    "pvolStatus" : "PSUS",
    "svolStatus" : "SMPL",
    "consistencyGroupId": 5,
    "pvolStorageDeviceId" : "886000123456",
    "svolStorageDeviceId" : "886000123789",
    "pvolDifferenceDataManagement": "S",
    "svolDifferenceDataManagement": "S",
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  } ],
  "remoteStorageDeviceId" : "886000123789",
  "localDeviceGroupName" : "remoteCopyGroup1P_",
  "remoteDeviceGroupName" : "remoteCopyGroup1S_"
}
```


The following is an example of the output when information about Universal Replicator pairs is obtained:


```
{
  "remoteMirrorCopyGroupId" : "886000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_",
  "copyGroupName" : "remoteCopyGroup2",
  "copyPairs" : [ {
    "copyGroupName" : "remoteCopyGroup2",
    "copyPairName" : "pair1",
    "replicationType" : "UR",
    "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_,pair1",
    "consistencyGroupId" : 10,
    "pvolLdevId" : 1569,
    "pvolJournalId" : 13,
    "svolLdevId" : 2835,
    "svolJournalId" : 36,
    "fenceLevel" : "ASYNC",
    "pvolStatus" : "PAIR",
    "svolStatus" : "PAIR",
    "pvolStorageDeviceId" : "886000123456",
    "svolStorageDeviceId" : "886000123789",
    "pvolDifferenceDataManagement": "S",
    "svolDifferenceDataManagement": "S",
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  } ],
  "remoteStorageDeviceId" : "886000123789",
  "localDeviceGroupName" : "remoteCopyGroup2P_",
```

```
  "remoteDeviceGroupName" : "remoteCopyGroup2S_"
}
```

To see an output example for global-active device, see Getting information about a specific remote copy group (on page 1111) in Managing global-active device pairs (on page 1093).

Attribute	Type	Description
remoteStorageDeviceId	string	Storage device ID of the remote storage system If you specify a value that includes `NotSpecified` for the object ID, `NotSpecified` is output.
copyGroupName	string	Copy group name
localDeviceGroupName	string	Device group name in the local storage system
remoteDeviceGroupName	string	Device group name in the remote storage system If you specify a value that includes `NotSpecified` for the object ID, `NotSpecified` is output.
remoteMirrorCopyGroupId	string	Object ID of the remote copy group

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName`
copyPairs	object[]	The detailed information about the copy pair is output.

Attribute	Type	Description
		▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name ▪ replicationType (string) Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device If the pair status is `SMPL`, information is not output. ▪ pvolLdevId (int) LDEV number of P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolLdevId (int) LDEV number of S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ fenceLevel (string) Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output. ▪ pvolJournalId (int) Journal ID of the P-VOL

Attribute	Type	Description
		A value from `0` to `255` is output only in the case of Universal Replicator. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolJournalId (int) Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ quorumDiskId (int) ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ pvolStatus (string) Pair status of the P-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolStatus (string) Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device).

Attribute	Type	Description
		If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ consistencyGroupId (int) Consistency group ID If no consistency group consists, information is not output. ▪ pvolIOMode (string) I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolIOMode (string) I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ pvolStorageDeviceId (string) Storage device ID of the storage system on the P-VOL

Attribute	Type	Description
		If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolStorageDeviceId (string) Storage device ID of the storage system on the S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ copyProgressRate (int) Copy progress rate Information is output only when the pair status of the P-VOL is `COPY` (a pair is being created or resynchronized). This attribute is not output if you specify a value that includes `NotSpecified` for the object ID. ▪ remoteMirrorCopyPairId (string) Object ID of the remote copy pair# The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName` ▪ pvolDifferenceDataManagement (string) Method for managing difference data about the P-VOL • `S`: Difference data based on the shared memory • `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370,

Attribute	Type	Description
		G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolDifferenceDataManagement (string) Method for managing difference data about the S-VOL • `S`: Difference data based on the shared memory • `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ pvolProcessingStatus (string) Processing status of the pair of P-VOLs • `E`: Processing to expand the P-VOLs is being performed • `N`: Processing to expand the P-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolProcessingStatus (string) Processing status of the pair of S-VOLs • `E`: Processing to expand the S-VOLs is being performed • `N`: Processing to expand the S-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

#: We recommend that you save the object ID information you obtain in case a failure occurs. When you need to perform a takeover to recover the system, you can use the saved information to identify the pair that you need to work on, even if you cannot get information about the failed storage system.

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
copyPairs	object[]	Attributes related to the detailed information about the copy pair ▪ transitionStatus (string) The transition status of a pair is output for a Universal Replicator pair. • `None`: The pair is not in transition. • `Suspending`: The pair is being split. • `Deleting`: The pair is being deleted. This is not output if the copy pair is not a Universal Replicator pair. ▪ copyPace (int) Copy speed This is not output for a Universal Replicator pair.

Attribute	Type	Description
		▪ pathGroupId (int) ID of the RCU path group This is not output if CU is specified for the remote path connection setting. This is not output if the pair volume status of the P-VOL or S-VOL (the value of the `pvolStatus` attribute of the `svolStatus` attribute) is `SMPL`. ▪ deltaStatus (string) Status of the 3DC multi-target configuration that uses delta resync This is output if the value of replicationType for the `copyPairs` attribute of the `replicationType` attribute, which is the pair type for the detailed information about the remote copy pairs, is Universal Replicator, and if you are using a 3DC multi-target configuration that uses delta resync. • `HOLD`: Universal Replicator delta resync pair (normal) • `HLDE`: Universal Replicator delta resync pair (failed) • `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

For TrueCopy:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup1,
remoteCopyGroup1P_,remoteCopyGroup1S_
```

For Universal Replicator:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_
```

To see an coding example for global-active device, see Getting information about a specific remote copy group (on page 1111) in Managing global-active device pairs (on page 1093).

Getting information about a specific remote copy pair

The following request gets information about the specified copy pair (TrueCopy, Universal Replicator, or global-active device). Use this information to get the information that is necessary for performing pair operations (for example, the pair status). If the copy group name or copy pair name contains spaces, pair information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system #
copyGroupName	string	(Required) Copy group name Specify a character string consisting of 1 to 31 characters. The name is case sensitive.

Attribute	Type	Description
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system # Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

#: If you specify `NotSpecified` in cases such as when a failure occurs in a remote storage system, only information about the local storage system can be acquired. If you specify `NotSpecified`, copy pair information about attributes of volumes that belong to the remote storage system will not be output. In this case, you do not need to specify the `Remote-Authorization` header.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about TrueCopy pairs is obtained:

```
{
  "copyGroupName" : "remoteCopyGroup1",
  "copyPairName" : "pair1",
  "replicationType" : "TC",
  "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup1,remoteCopyGroup1P_,
remoteCopyGroup1S_,pair1",
  "pvolLdevId" : 2108,
  "svolLdevId" : 1581,
  "fenceLevel" : "DATA",
  "pvolStatus" : "PAIR",
  "svolStatus" : "PAIR",
  "pvolStorageDeviceId" : "886000123456",
```

```
  "svolStorageDeviceId" : "886000123789",
  "pvolDifferenceDataManagement": "S",
  "svolDifferenceDataManagement": "S",
  "pvolProcessingStatus": "N",
  "svolProcessingStatus": "N"
}
```

The following is an example of the output when information about Universal Replicator pairs is obtained:

```
{
  "copyGroupName" : "remoteCopyGroup2",
  "copyPairName" : "pair1",
  "replicationType" : "UR",
  "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup2,remoteCopyGroup2P_,
remoteCopyGroup2S_,pair1",
  "consistencyGroupId" : 10,
  "pvolLdevId" : 1569,
  "pvolJournalId" : 13,
  "svolLdevId" : 2835,
  "svolJournalId" : 36,
  "fenceLevel" : "ASYNC",
  "pvolStatus" : "PAIR",
  "svolStatus" : "PAIR",
  "pvolStorageDeviceId" : "886000123456",
  "svolStorageDeviceId" : "886000123789",
  "pvolDifferenceDataManagement": "S",
  "svolDifferenceDataManagement": "S",
  "pvolProcessingStatus": "N",
  "svolProcessingStatus": "N"
}
```

To see an output example for global-active device, see Getting information about a specific remote copy pair (on page 1127) in Managing global-active device pairs (on page 1093).

Attribute	Type	Description
copyGroupName	string	Copy group name
copyPairName	string	Copy pair name
replicationType	string	Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device

Attribute	Type	Description
		If the pair status is `SMPL`, information is not output.
pvolLdevId	int	LDEV number of P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolLdevId	int	LDEV number of S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
fenceLevel	string	Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output.
pvolJournalId	int	Journal ID of the P-VOL A value from `0` to `255` is output only in the case of UR. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolJournalId	int	Journal ID of the S-VOL A value from `0` to `255` is output only in the case of UR. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
quorumDiskId	int	ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. If the pair status is `SMPL`, information is not output.
pvolStatus	string	Pair status of the P-VOL

Attribute	Type	Description
		For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolStatus	string	Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
consistencyGroupId	int	Consistency group ID If no consistency group consists, information is not output.
pvolIOMode	string	I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolIOMode	string	I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block

Attribute	Type	Description
		Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
pvolStorageDeviceId	string	Storage device ID of the storage system on the P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolStorageDeviceId	string	Storage device ID of the storage system on the S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
copyProgressRate	int	Copy progress rate Information is output only when the pair status of the P-VOL is `COPY` (a pair is being created or resynchronized). This attribute is not output if you specify a value that includes `NotSpecified` for the object ID.
remoteMirrorCopyPairId	string	Object ID of the remote copy pair[#] The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName`
pvolDifferenceDataManagement	string	Method for managing difference data about the P-VOL ▪ `S`: Difference data based on the shared memory ▪ `D`: Hierarchical difference data (difference data based on drives)

Attribute	Type	Description
		This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolDifferenceDataManagement	string	Method for managing difference data about the S-VOL ▪ `S`: Difference data based on the shared memory ▪ `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
pvolProcessingStatus	string	Processing status of the pair of P-VOLs ▪ `E`: Processing to expand the P-VOLs is being performed ▪ `N`: Processing to expand the P-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolProcessingStatus	string	Processing status of the pair of S-VOLs ▪ `E`: Processing to expand the S-VOLs is being performed ▪ `N`: Processing to expand the S-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

#: We recommend that you save the object ID information you obtain in case a failure occurs. When you need to perform a takeover to recover the system, you can use the saved information to identify the pair that you need to work on, even if you cannot get information about the failed storage system.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

For TrueCopy:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup1,
remoteCopyGroup1P_,remoteCopyGroup1S_,pair1
```

For Universal Replicator:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_,pair1
```

To see an coding example for global-active device, see Getting information about a specific remote copy pair (on page 1127) in Managing global-active device pairs (on page 1093).

Getting TrueCopy or Universal Replicator pair information

You can obtain a list of volume and storage system information regarding the P-VOL and S-VOL composing a TrueCopy or Universal Replicator pair. You can obtain the pair information without specifying information about the remote storage system in the request message.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Important:

If you do not specify the `headLdevId` and `count` query parameters, the API request gets information about 500 pairs, from LDEV number 0. If you want to get information about other pairs, use `headLdevId` or `count`.

Execution permission

Administrator user group (built-in user group)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-copypairs
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
replicationType	string	(Required) Specify the pair type. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
headLdevId	int	(Optional) Specify, as a decimal (base 10) number, the number of the first LDEV for which you want to acquire information about the pair. Specify a value in the range from `0` to `65279`. If this attribute is omitted, `0` is set.
count	int	(Optional) Specify the number of LDEVs about which information is to be obtained. Specify this by a decimal (base 10) number. Specify a value in the range from `0` to `500`. If this attribute is omitted, `500` is set.

Body

None.

Response message

Body

```
{
  "data" : [ {
    "replicationType" : "TC",
    "ldevId" : 49153,
    "remoteSerialNumber" : "10088",
    "remoteStorageTypeId" : "R9",
    "remoteLdevId" : 51712,
    "primaryOrSecondary" : "P-VOL",
```

```
    "muNumber" : 0,
    "status" : "PSUS",
    "serialNumber" : "10011",
    "storageTypeId" : "R9",
    "isMainframe" : false
  } ]
}
```

Attribute	Type	Description
replicationType	string	Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
ldevId	int	LDEV number of the volume on the local storage system.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageTypeId	string	ID corresponding to the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remoteLdevId	int	LDEV number of the volume on the remote storage system
primaryOrSecondary	string	Attribute of the volume on the local storage system ▪ `P-VOL` ▪ `S-VOL`
muNumber	int	MU number
status	string	Pair status of the volume on the local storage system For details, see the section about pair status transition (TrueCopy and Universal Replicator).
serialNumber	string	Serial number of the local storage system

Attribute	Type	Description
storageTypeId	string	ID indicating the model of the local storage system ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
isMainframe	boolean	Whether the pair is for mainframe use ▪ `true`: Pair for mainframe use ▪ `false`: Not a pair for mainframe use

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/remote-
copypairs?replicationType=TC
```

Getting information about all of remote copy pairs

The following request gets a list of information about the remote copy pairs (TrueCopy, Universal Replicator, or global-active device) registered in the target storage system. You can obtain information about all such pairs from the cache of the storage system, regardless of whether they are managed by using copy groups. You do not need to specify the information about the remote storage system in the request message.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, and VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can use this API function.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-replications
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
startLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the first LDEV in the range. The P-VOLs and S-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be smaller than that of the `endLdevId` parameter. If this attribute is omitted, `0` is set.
endLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the last LDEV in the range. The P-VOLs and S-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be greater than that of the `startLdevId` parameter. If this attribute is omitted, the maximum LDEV number in the storage system is set.
replicationType	string	(Optional) Specify the pair type of the pairs about which information is to be obtained. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device

Body

None.

Response message

Body


```
{
    "data": [
        {
            "remoteReplicationId": "R8,51304,375,R8,51305,969",
            "muNumber": 2,
            "replicationType": "UR",
            "pvolLdevId": 375,
            "svolLdevId": 969,
            "fenceLevel": "ASYNC",
            "pvolJournalId": 10,
            "svolJournalId": 0,
            "pvolStatus": "PAIR",
            "consistencyGroupId": 17,
            "pvolStorageType": "R8",
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "transitionStatus": "None",
            "pathGroupId": 0
        },
        {
            "remoteReplicationId": "R8,51304,378,R8,51305,765",
            "replicationType": "TC",
            "pvolLdevId": 378,
            "svolLdevId": 765,
            "fenceLevel": "DATA",
            "pvolStatus": "PAIR",
            "pvolStorageType": "R8",
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "copyPace": 3,
            "pathGroupId": 0
        },
        {
            "remoteReplicationId": "R8,51304,400,R8,51305,567",
            "muNumber": 0,
            "replicationType": "GAD",
            "pvolLdevId": 400,
            "svolLdevId": 567,
            "fenceLevel": "NEVER",
            "quorumDiskId": 4,
```

```
            "pvolStatus": "PAIR",
            "consistencyGroupId": 11,
            "pvolIOMode": "L/M",
            "pvolStorageType": "R8",
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "copyPace": 7,
            "pathGroupId": 0
        }
    ]
}
```


Attribute	Type	Description
remoteReplicationId	string	Object ID of the remote copy pair The following attributes are output, separated by commas: ▪ `pvolStorageType` ▪ `pvolStorageSerial` ▪ `pvolLdevId` ▪ `svolStorageType` ▪ `svolStorageSerial` ▪ `svolLdevId` If the value of `remoteReplicationId` includes `Unknown` or `-1`, the pair might not be in a normal state. Check the status of the storage system.
muNumber	int	MU (mirror unit) number
replicationType	string	Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device
pvolLdevId	int	LDEV number of P-VOL
svolLdevId	int	LDEV number of S-VOL

Attribute	Type	Description
fenceLevel	string	Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output.
pvolJournalId	int	Journal ID of the P-VOL A value from `0` to `255` is output only in the case of Universal Replicator.
svolJournalId	int	Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator.
quorumDiskId	int	ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device.
pvolStatus	string	Pair volume status of the P-VOL This attribute is output only if the specified storage system contains the P-VOL. For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output.
svolStatus	string	Pair volume status of the S-VOL This attribute is output only if the specified storage system contains the S-VOL. For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device).

Attribute	Type	Description
		In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output.
consistencyGroupId	int	Consistency group ID This attribute is not output if no consistency group consists.
pvolIOMode	string	I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block This is output only if the volume is a global-active device and the specified storage system is on the P-VOL.
svolIOMode	string	I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block This is output only if the volume is a global-active device and the specified storage system is on the S-VOL.
pvolStorageType	string	ID indicating the model of the storage system on the P-VOL ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models ▪ `UNKNOWN`: Unknown
pvolStorageSerial	string	Serial number of the storage system on the P-VOL
svolStorageType	string	ID indicating the model of the storage system on the S-VOL ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series

Attribute	Type	Description
		▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models ▪ `UNKNOWN`: Unknown
svolStorageSerial	string	Serial number of the storage system on the S-VOL
transitionStatus	string	The transition status of a pair is output for a Universal Replicator pair. ▪ `None`: The pair is not in transition. ▪ `Suspending`: The pair is being split. ▪ `Deleting`: The pair is being deleted. This is not output if the copy pair is not a Universal Replicator pair.
copyPace	int	Copy speed If the pair type is TrueCopy, this attribute is output only if the specified storage system contains the P-VOL. If the pair type is global-active device, this attribute is output regardless of whether the specified storage system contains the P-VOL or contains the S-VOL. This is not output if the pair type is Universal Replicator.
pathGroupId	int	Path group ID of the RCU This is not output if CU is specified for the remote path connection setting.
deltaStatus	string	Status of the 3DC multi-target configuration that uses delta resync This is output if the pair type is Universal Replicator and the 3DC multi-target configuration that uses delta resync is used. ▪ `HOLD`: Universal Replicator delta resync pair (normal) ▪ `HLDE`: Universal Replicator delta resync pair (failed) ▪ `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/remote-replications
```

Creating a TrueCopy pair or Universal Replicator pair

The following request creates a TrueCopy pair or a Universal Replicator pair in the storage systems of the primary and secondary sites. The TrueCopy pair or the Universal Replicator pair is either added to a new copy group or to an existing copy group. If you create a copy group, also create a device group. First create a pair in the storage system of the primary site. Before creating a pair, lock the resources or make sure that the resources have not been locked by another user.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs
```

Request message

Object ID

None.

Query parameters

None.

Body

The following are coding examples for creating a TrueCopy pair.

When creating a new copy group and adding a pair to the copy group:

```
{
  "copyGroupName": "remoteCopyGroup1",
  "copyPairName": "pair1",
```

```
  "replicationType": "TC",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 2108,
  "svolLdevId": 1581,
  "localDeviceGroupName": "remoteCopyGroup1P_",
  "remoteDeviceGroupName": "remoteCopyGroup1S_",
  "isNewGroupCreation": true,
  "fenceLevel": "DATA",
  "isConsistencyGroup": true,
  "consistencyGroupId": 5,
  "copyPace": 10,
  "pathGroupId": 3,
  "doInitialCopy": true,
  "isDataReductionForceCopy": true
}
```

When adding a pair to an existing copy group:

```
{
  "copyGroupName": "remoteCopyGroup1",
  "copyPairName": "pair2",
  "replicationType": "TC",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 2109,
  "svolLdevId": 1582,
  "localDeviceGroupName": "remoteCopyGroup1P_",
  "remoteDeviceGroupName": "remoteCopyGroup1S_",
  "isNewGroupCreation": false,
  "fenceLevel": "DATA",
  "isConsistencyGroup": true,
  "consistencyGroupId": 5,
  "copyPace": 10,
  "doInitialCopy": true,
  "isDataReductionForceCopy": false
}
```

The following table describes attributes for a TrueCopy pair.

Attribute	Type	Description
copyGroupName	string	(Required) Specify a copy group name consisting of 1 to 29 characters. The name is case sensitive. Set a unique name that is the same for the storage systems on both the local and remote sides.

Attribute	Type	Description
copyPairName	string	(Required) Specify a copy pair name consisting of 1 to 31 characters. The name is case sensitive. Set a unique name that is the same for the storage systems in the copy group.
replicationType	string	(Required) Specify the pair type. `TC`: TrueCopy
remoteStorageDeviceId	string	(Required) Specify the storage device ID of the remote storage system in which the pair is to be created.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL with a decimal (base 10) number.
svolLdevId	int	(Required) Specify the LDEV number of the S-VOL with a decimal (base 10) number.
pathGroupId	int	(Optional) Specify the path group ID by using a decimal (base 10) number in the range from `0` to `255`. If you omit this value or specify `0`, the lowest path group ID in the specified path group is used.
localDeviceGroupName	string	(Optional) Specify the device group name in the local storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing local storage system. If this value is omitted, *copyGroupName*P_ is set. The name needs to be unique in the local storage system.
remoteDeviceGroupName	string	(Optional) Specify the device group name in the remote storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing remote storage system. If this value is omitted, *copyGroupName*S_ is set. The name needs to be unique in the remote storage system.

Attribute	Type	Description
isNewGroupCreation	boolean	(Required) Depending on the value, this attribute specifies whether to add the pair to a newly created copy group or to an existing copy group. ▪ `true`: Adds the pair to a newly created copy group. ▪ `false`: Adds the pair to an existing copy group.
isConsistencyGroup	boolean	(Optional) Depending on the value, this attribute specifies whether to register the new pair in a consistency group. ▪ `true`: Registers the pair in a consistency group. ▪ `false`: Does not register the pair in a consistency group. If you add the pair to an existing copy group, specify the same value as that of the existing copy pair. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If this value is omitted, `false` is set.
consistencyGroupId	int	(Optional) Specify the consistency group ID by using a decimal (base 10) number in the range from `0` to `255`. If you omit this value when registering the new pair in a consistency group, the value of the consistency group ID is automatically assigned. If you add the pair to an existing copy group, specify the same value as that of the existing copy pair. If a copy group includes a pair whose consistency group ID differs, pair operations by consistency group cannot be correctly performed. When specifying this attribute, make sure to specify `true` for the `isConsistencyGroup` attribute.
fenceLevel	string	(Required) Fence level

Attribute	Type	Description
		The specifiable values are as follows: ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None
copyPace	int	(Optional) Copy speed Specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed. If this value is omitted, `3` is assumed.
doInitialCopy	boolean	(Optional) Specify whether to perform initial copy when creating a pair. ▪ `true`: Performs initial copy. ▪ `false`: Does not perform initial copy. If this value is omitted, `true` is assumed.
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair # ▪ `false`: Do not forcibly create a pair When the attribute is omitted, `false` is assumed.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease.

The following are coding examples for creating a Universal Replicator pair.

When creating a new copy group and adding a pair to the copy group:

```
{
  "copyGroupName": "remoteCopyGroup2",
  "copyPairName": "pair1",
```

```
  "replicationType": "UR",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 1569,
  "svolLdevId": 2835,
  "pvolJournalId": 13,
  "svolJournalId": 36,
  "localDeviceGroupName": "remoteCopyGroup2P_",
  "remoteDeviceGroupName": "remoteCopyGroup2S_",
  "isNewGroupCreation": true,
  "fenceLevel": "ASYNC",
  "muNumber": 0,
  "consistencyGroupId": 10,
  "doInitialCopy": true,
  "doDeltaResyncSuspend": false,
  "isDataReductionForceCopy": true
}
```

When adding a pair to an existing copy group:

```
{
  "copyGroupName": "remoteCopyGroup2",
  "copyPairName": "pair2",
  "replicationType": "UR",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 1570,
  "svolLdevId": 2836,
  "localDeviceGroupName": "remoteCopyGroup2P_",
  "remoteDeviceGroupName": "remoteCopyGroup2S_",
  "isNewGroupCreation": false,
  "fenceLevel": "ASYNC",
  "consistencyGroupId": 10,
  "doInitialCopy": true,
  "doDeltaResyncSuspend": false,
  "isDataReductionForceCopy": false
}
```

The following table describes attributes for a Universal Replicator pair.

Attribute	Type	Description
copyGroupName	string	(Required) Specify a copy group name consisting of 1 to 29 characters. The name is case sensitive. Set a unique name that is the same for the storage systems on both the local and remote sides.

Attribute	Type	Description
copyPairName	string	(Required) Specify a copy pair name consisting of 1 to 31 characters. The name is case sensitive. Set a unique name that is the same for the storage systems in the copy group.
replicationType	string	(Required) Specify the pair type. `UR`: Universal Replicator
remoteStorageDeviceId	string	(Required) Specify the storage device ID of the remote storage system in which the pair is to be created.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL with a decimal (base 10) number.
svolLdevId	int	(Required) Specify the LDEV number of the S-VOL with a decimal (base 10) number.
pathGroupId	int	(Optional) Specify the path group ID by using a decimal (base 10) number in the range from `0` to `255`. If you omit this value or specify `0`, the lowest path group ID in the specified path group is used.
localDeviceGroupName	string	(Optional) Specify the device group name of the local storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing local storage system. If this value is omitted, *copyGroupName*P_ is set. The name needs to be unique in the local storage system.
remoteDeviceGroupName	string	(Optional) Specify the device group name of the remote storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing remote storage system. If this value is omitted, *copyGroupName*S_ is set. The name needs to be unique in the remote storage system.

Attribute	Type	Description
isNewGroupCreation	boolean	(Required) Depending on the value, this attribute specifies whether to add the pair to a newly created copy group or to an existing copy group. ▪ `true`: Adds the pair to a newly created copy group. ▪ `false`: Adds the pair to an existing copy group.
muNumber	int	(Required) Specify the MU (mirror unit) number by using a number from `0` to `3`. This value is used by the P-VOL and the S-VOL. You can specify this attribute only if you add the pair to a newly created copy group.
pvolJournalId	int	(Required) Specify the journal ID of the P-VOL by using a decimal (base 10) number in the range from `0` to `255`. Make sure to specify this attribute if you add the pair to a newly created copy group.
svolJournalId	int	(Required) Specify the journal ID of the S-VOL by using a decimal (base 10) number in the range from `0` to `255`. Make sure to specify this attribute if you add the pair to a newly created copy group.
consistencyGroupId	int	(Optional) Specify the consistency group ID by using a decimal (base 10) number in the range from `0` to `255`. If you omit this value when adding the pair to a newly created copy group, the value of the consistency group ID is automatically assigned. If you add the pair to an existing copy group, specify the same value as that of the existing copy pair. If a copy group includes a pair whose consistency group ID differs, pair operations by consistency group cannot be correctly performed.
fenceLevel	string	(Optional) Fence level `ASYNC` is automatically set.

Attribute	Type	Description
doInitialCopy	boolean	(Optional) Specify whether to perform initial copy when creating a pair. ▪ `true`: Performs initial copy. ▪ `false`: Does not perform initial copy. If this value is omitted, `true` is assumed.
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair # ▪ `false`: Do not forcibly create a pair When the attribute is omitted, `false` is assumed.
doDeltaResyncSuspend	boolean	(Optional) For the 3DC multi-target configuration, specify whether to use delta resync between the storage systems of the secondary sites. ▪ `true`: Uses delta resync. ▪ `false`: Does not use delta resync. If `true` is specified, a journal volume of the Universal Replicator pair to be used for delta resync will be created in the initial status without initial copy performed. If this value is omitted, `false` is set.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created TrueCopy pairs or Universal Replicator pairs

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-mirror-copypairs
```

Splitting TrueCopy pairs or Universal Replicator pairs in units of copy groups

The following request splits TrueCopy pairs or Universal Replicator pairs by using the specified copy group. If the pairs are split, data copy from the primary volume to the secondary volume will be suspended. Do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair split operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply splitting pairs:

```
{
  "parameters": {
    "replicationType": "TC"
  }
}
```

The following is a coding example for splitting pairs by specifying the S-VOL, and forcibly changing the status of the pairs of the S-VOL to SSWS:

```
{
  "parameters": {
```

```
    "replicationType": "UR",
    "svolOperationMode": "SSWS"
  }
}
```

The following is a TrueCopy coding example for splitting pairs and prohibiting write operations for the P-VOL:

```
{
  "parameters": {
    "replicationType": "TC",
    "doPvolWriteProtect": true
  }
}
```

The following is a Universal Replicator coding example for splitting pairs and forcibly stopping operations on a journal volume:

```
{
  "parameters": {
    "replicationType": "UR",
    "doDataSuspend": true
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
svolAccessMode	string	(Optional) Specify the access mode for the S-VOL after pairs are split. ▪ `r`: Read only ▪ `rw`: Read and write If the value is not specified, `r` will be set. If you specify this attribute, you cannot specify the `svolOperationMode` attribute. In the case of TC, you cannot specify `true` for the `doPvolWriteProtect` attribute. In the case of UR, you cannot specify `true` for the `doDataSuspend` attribute.

Attribute	Type	Description
svolOperationMode	string	(Optional) Specify this attribute to forcibly change the status of the pairs of the S-VOL in cases such as if a failure occurs in the storage system of the primary site. Issue a request from the storage system of the secondary site. ▪ `SSWS`: Change to SSWS mode. ▪ `PSUS`: Change to PSUS (PSUE or PSUS) mode. If you specify this attribute, you cannot specify the `svolAccessMode` attribute. In the case of TC, you cannot specify `true` for the `doPvolWriteProtect` attribute. In the case of UR, you cannot specify `true` for the `doDataSuspend` attribute.
doPvolWriteProtect	boolean	(Optional) In the case of TC, specify whether to forcibly disable write operations for the P-VOL. Issue a request from the storage system of the secondary site. ▪ `true`: Disable write operations for P-VOL. ▪ `false`: Do not disable write operations for P-VOL. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify the `svolAccessMode` and `svolOperationMode` attributes.
doDataSuspend	boolean	(Optional) In the case of UR, specify whether to forcibly stop operations on a journal when the amount of access to the journal increases. Issue a request from the storage system of the primary site. ▪ `true`: Forcibly stop operations on the journal. Data is not copied to the group on the S-VOL. The data of the master journal volume and the restore journal volume is deleted. ▪ `false`: Do not forcibly stop operations on the journal. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify the `svolOperationMode` attribute. However, you can specify only `rw` for the `svolAccessMode` attribute.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the split TrueCopy pairs or Universal Replicator pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/split
```

This action template returns only the specifiable attributes, depending on the following: the type of the pairs of the copy group specified for the object ID, and whether the volume in the copy group of the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This status code indicates that operations on the pairs of the specified copy group cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_/actions/split
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
```

```
storages/836000123789/remote-mirror-copygroups/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_/actions/split
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_/actions/split/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copygroups/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_/actions/split/invoke
```

Splitting a TrueCopy pair or Universal Replicator pair

The following request splits the specified TrueCopy pair or Universal Replicator pair. If the pairs are split, data copy from the primary volume to the secondary volume will be suspended. Do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair split operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name of the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply splitting pairs:

```
{
  "parameters": {
    "replicationType": "UR"
  }
}
```

The following is a coding example for splitting a pair and permitting write operations for the S-VOL:

```
{
  "parameters": {
    "replicationType": "TC",
    "svolAccessMode": "rw"
  }
}
```

The following is a coding example for splitting a pair by specifying the S-VOL, and forcibly changing the status of the pair of the S-VOL:

```
{
  "parameters": {
    "replicationType": "TC",
    "svolOperationMode": "PSUS"
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
svolAccessMode	string	(Optional) Specify the access mode for the S-VOL after pairs are split. ▪ `r`: Read only ▪ `rw`: Read and write If the value is not specified, `r` will be set. If you specify this attribute, you cannot specify the `svolOperationMode` attribute. In the case of TC, you cannot specify `true` for the `doPvolWriteProtect` attribute. In the case of UR, you cannot specify `true` for the `doDataSuspend` attribute.
svolOperationMode	string	(Optional) Specify this attribute to forcibly change the status of the pairs of the S-VOL in cases such as if a failure occurs in the storage system of the primary site. Issue a request from the storage system of the secondary site. ▪ `SSWS`: Change to SSWS mode. ▪ `PSUS`: Change to PSUS (PSUE or PSUS) mode.

Attribute	Type	Description
		If you specify this attribute, you cannot specify the `svolAccessMode` attribute. In the case of TC, you cannot specify `true` for the `doPvolWriteProtect` attribute. In the case of UR, you cannot specify `true` for the `doDataSuspend` attribute.
doPvolWriteProtect	boolean	(Optional) In the case of TC, specify whether to forcibly disable write operations for the P-VOL. Issue a request from the storage system of the secondary site. ▪ `true`: Disable write operations for P-VOL. ▪ `false`: Do not disable write operations for P-VOL. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify the `svolAccessMode` and `svolOperationMode` attributes.
doDataSuspend	boolean	(Optional) In the case of UR, specify whether to forcibly stop operations on a journal when the amount of access to the journal increases. Issue a request from the storage system of the primary site. ▪ `true`: Forcibly stop operations on the journal. Data is not copied to the S-VOL. The data of the master journal volume and the restore journal volume is deleted. ▪ `false`: Do not forcibly stop operations on the journal. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify the `svolOperationMode` attribute. However, you can specify only `rw` for the `svolAccessMode` attribute.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the split TrueCopy pairs or Universal Replicator pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/split
```

This action template returns only the specifiable attributes, depending on the following: the type of the pair specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This status code indicates that operations on the specified pair cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_,pair1/actions/split
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
```

```
storages/836000123789/remote-mirror-copypairs/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_,pair1/actions/split
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1/actions/split/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copypairs/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_,pair1/actions/split/invoke
```

Resynchronizing TrueCopy pairs or Universal Replicator pairs in units of copy groups

The following request resynchronizes TrueCopy pairs or Universal Replicator pairs by using the specified copy group. If the pairs are resynchronized, the differential data that was accumulated after the pairs were split is copied, by copy group, from the primary volume to the secondary volume, so that the data is consistent between the two volumes. Do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair resynchronization operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Note:

If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, to register TrueCopy pairs in a consistency group when performing a TrueCopy pair resynchronization operation, the number of pairs in the target copy group must be 1,000 or less. If the number of pairs exceeds 1,000, delete all pairs in the copy group, and then register pairs in a consistency group when you re-create the pairs. Alternatively, delete some pairs so that the number of pairs decreases to 1,000 or less, perform a pair resynchronization operation, and then register the pairs in a consistency group when you re-create the pairs that you deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply resynchronizing pairs:

```
{
  "parameters": {
    "replicationType": "TC"
  }
}
```

The following is a coding example for resynchronizing pairs by specifying the MU (mirror unit) number of the copy group to be failed back:

```
{
  "parameters": {
    "replicationType": "UR",
    "doFailback": true,
    "failbackMuNumber": 1
  }
}
```

The following is a coding example for reversing and resynchronizing pairs by specifying the P-VOL:

```
{
  "parameters": {
    "replicationType": "UR",
    "doSwapPvol": true
  }
}
```

The following is a TrueCopy coding example for newly registering the specified copy group in a consistency group and resynchronizing pairs:

```
{
  "parameters": {
    "replicationType": "TC",
    "fenceLevel": "STATUS",
    "isConsistencyGroup": true,
    "consistencyGroupId": 123
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
doFailback	boolean	(Optional) Specify whether to perform a failback if a failure occurs in a 3DC cascade configuration. ▪ `true`: A failback is performed. ▪ `false`: A failback is not performed. If the value is omitted, `false` is assumed. If you specify `true` for this attribute, you cannot specify `true` for the `doSwapSvol` and `doSwapPvol` attributes. In the case of TC, you cannot specify the `fenceLevel` attribute.
failbackMuNumber	int	(Optional) Specify the MU (mirror unit) number of the volume to be failed back. You can specify this attribute only if the `doFailback` attribute is set to `true`.
doSwapSvol	boolean	(Optional) Specify the resynchronization method if the pairs on the specified S-VOL are split. Issue a request from the storage system of the secondary site. ▪ `true`: Resynchronize pairs by specifying the S-VOL (swap resync). Reverse the P-VOL and the S-VOL. Copy the data of the new P-VOL to the S-VOL to resynchronize the pairs. ▪ `false`: Resynchronize pairs by specifying the P-VOL. Copy the data of the P-VOL to the S-VOL to resynchronize the pairs. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify `true` for the `doSwapPvol` and `doFailback` attributes. In the case of TC, you also cannot specify the `fenceLevel` attribute.

Attribute	Type	Description
doSwapPvol	boolean	(Optional) Specify the resynchronization method if the pairs in the specified P-VOL are split. Issue a request from the storage system of the primary site. ▪ `true`: Resynchronize pairs by specifying the P-VOL (swap resync). Reverse the P-VOL and the S-VOL. Copy the data of the new P-VOL to the S-VOL to resynchronize the pairs. ▪ `false`: Resynchronize pairs by specifying the P-VOL. Copy the data of the P-VOL to the S-VOL to resynchronize the pairs. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify `true` for the `doSwapSvol` and `doFailback` attributes. In the case of TC, you also cannot specify the `fenceLevel` attribute.
isConsistencyGroup	boolean	(Optional) In the case of TC, specify the value as follows according to whether the copy group is registered in a consistency group: ▪ If the copy group is not registered in a consistency group • `true`: Registers the copy group in a consistency group. # • `false`: Leaves the copy group as it is without registering it in a consistency group. ▪ If the copy group is registered in a consistency group • `true`: Leaves the copy group registered in a consistency group. • `false`: Cancels the registration of the copy group in a consistency group, and places it in an unregistered state.

Attribute	Type	Description
		If the value is not specified, `false` will be set. To leave the pair registered in a consistency group, be sure to specify `true` for this attribute. To cancel registration in a consistency group, specify `false` for this attribute and, at the same time, specify the `fenceLevel` attribute. Make sure that each copy group contains either only pairs that are registered to a consistency group or only pairs that are not registered to a consistency group. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If you specify `true` for this attribute, make sure to also specify the `fenceLevel` attribute.
consistencyGroupId	int	(Optional) In the case of TC, specify the consistency group ID by using a decimal (base 10) number in the range from `0` to `255`. Use this attribute when registering the specified copy group in a consistency group. You cannot specify this attribute if the specified copy group is already registered in a consistency group. When specifying this attribute, make sure to specify `true` for the `isConsistencyGroup` attribute.
fenceLevel	string	(Required) In the case of TC, specify the fence level. ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None If you specify `true` for the `isConsistencyGroup` attribute, or if you cancel the registration by specifying `false` for `isConsistencyGroup`, be sure to specify this attribute. When you specify this attribute, if there is no change in the fence level, specify the value of the existing fence level. To change the fence level, specify the new value.

Attribute	Type	Description
		If you specify this attribute, you cannot specify `true` for the `doFailback`, `doSwapSvol`, and `doSwapPvol` attributes.
copyPace	int	(Optional) In the case of TC, specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed.

#: If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, this value can be specified only if the number of pairs in the copy group is 1,000 or less.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the resynchronized TrueCopy pairs or Universal Replicator pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/actions/resync
```

This action template returns only the specifiable attributes depending on the following: the type of the pairs of the copy group specified for the object ID, and whether the volume in the copy group of the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This status code indicates that operations on the pairs of the specified copy group cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_/actions/resync
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123789/remote-mirror-copygroups/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_/actions/resync
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_/actions/resync/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copygroups/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_/actions/resync/invoke
```

Resynchronizing a TrueCopy pair or Universal Replicator pair

The following request resynchronizes the specified TrueCopy pair or Universal Replicator pair. If the pair is resynchronized, the differential data that was accumulated after the pair was split is copied from the primary volume to the secondary volume, so that the data is consistent between the two volumes. Do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair resynchronization operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for pairs.

Note:

If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, to register TrueCopy pairs in a consistency group when performing a TrueCopy pair resynchronization operation, the number of pairs in the target copy group must be 1,000 or less. If the number of pairs exceeds 1,000, delete all pairs in the copy group, and then register pairs in a consistency group when you re-create the pairs. Alternatively, delete some pairs so that the number of pairs decreases to 1,000 or less, perform a pair resynchronization operation, and then register the pairs in a consistency group when you re-create the pairs that you deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Attribute	Type	Description
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply resynchronizing pairs:

```
{
  "parameters": {
    "replicationType": "UR"
  }
}
```

The following is a coding example for resynchronizing a pair to be failed back by specifying the MU (mirror unit) number of the pair:

```
{
  "parameters": {
    "replicationType": "TC",
    "doFailback": true,
    "failbackMuNumber": 1
  }
}
```

The following is a coding example for reversing and resynchronizing a pair by specifying the S-VOL:

```
{
  "parameters": {
```

```
    "replicationType": "TC",
    "doSwapSvol": true
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator
doFailback	boolean	(Optional) Specify whether to perform a failback if a failure occurs in a 3DC cascade configuration. ▪ `true`: A failback is performed. ▪ `false`: A failback is not performed. If the value is omitted, `false` is assumed. If you specify `true` for this attribute, you cannot specify `true` for the `doSwapSvol` and `doSwapPvol` attributes. In the case of TC, you cannot specify the `fenceLevel` attribute.
failbackMuNumber	int	(Optional) Specify the MU (mirror unit) number of the volume to be failed back. You can specify this attribute only if the `doFailback` attribute is set to `true`.
doSwapSvol	boolean	(Optional) Specify the resynchronization method if the pairs on the specified S-VOL are split. Issue a request from the storage system of the secondary site. ▪ `true`: Resynchronize pairs by specifying the S-VOL (swap resync). Reverse the P-VOL and the S-VOL. Copy the data of the new P-VOL to the S-VOL to resynchronize the pairs. ▪ `false`: Resynchronize pairs by specifying the P-VOL. Copy the data of the P-VOL to the S-VOL to resynchronize the pairs. If the value is not specified, `false` will be set.

Attribute	Type	Description
		If you specify `true` for this attribute, you cannot specify `true` for the `doSwapPvol` and `doFailback` attributes. In the case of TC, you also cannot specify the `fenceLevel` attribute.
doSwapPvol	boolean	(Optional) Specify the resynchronization method if the pairs in the specified P-VOL are split. Issue a request from the storage system of the primary site. ▪ `true`: Resynchronize pairs by specifying the P-VOL (swap resync). Reverse the P-VOL and the S-VOL. Copy the data of the new P-VOL to the S-VOL to resynchronize the pairs. ▪ `false`: Resynchronize pairs by specifying the P-VOL. Copy the data of the P-VOL to the S-VOL to resynchronize the pairs. If the value is not specified, `false` will be set. If you specify `true` for this attribute, you cannot specify `true` for the `doSwapSvol` and `doFailback` attributes. In the case of TC, you also cannot specify the `fenceLevel` attribute.
isConsistencyGroup	boolean	(Optional) In the case of TC, specify the value as follows according to whether the pair is registered in a consistency group: ▪ If the pair is not registered in a consistency group • `true`: Registers the pair in a consistency group. # • `false`: Leaves the pair as it is without registering it in a consistency group. ▪ If the pair is registered in a consistency group • `true`: Leaves the pair registered in a consistency group. • `false`: Cancels the registration of the pair in a consistency group, and places it in an unregistered state.

Attribute	Type	Description
		If the value is not specified, `false` will be set. To leave the pair registered in a consistency group, be sure to specify `true` for this attribute. To cancel registration in a consistency group, specify `false` for this attribute and, at the same time, specify the `fenceLevel` attribute. Make sure that each copy group contains either only pairs that are registered to a consistency group or only pairs that are not registered to a consistency group. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If you specify `true` for this attribute, make sure to also specify the `fenceLevel` attribute.
consistencyGroupId	int	(Optional) In the case of TC, specify the consistency group ID by using a decimal (base 10) number in the range from `0` to `255`. Use this attribute when registering the specified copy group in a consistency group. You cannot specify this attribute if the specified pair is already registered in a consistency group. Unify the consistency group ID within the copy group. If a copy group includes a pair whose consistency group ID differs, pair operations by consistency group cannot be correctly performed. When specifying this attribute, make sure to specify `true` for the `isConsistencyGroup` attribute.
fenceLevel	string	(Required) In the case of TC, specify the fence level. ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None

Attribute	Type	Description
		If you specify `true` for the `isConsistencyGroup` attribute, or if you cancel the registration by specifying `false` for `isConsistencyGroup`, be sure to specify this attribute. When you specify this attribute, if there is no change in the fence level, specify the value of the existing fence level. To change the fence level, specify the new value. If you specify this attribute, you cannot specify `true` for the `doFailback`, `doSwapSvol`, and `doSwapPvol` attributes.
copyPace	int	(Optional) In the case of TC, specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed.

#: If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, this value can be specified only if the number of pairs in the copy group is 1,000 or less.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the resynchronized TrueCopy pairs or Universal Replicator pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/actions/resync
```

This action template returns only the specifiable attributes depending on the following: the type of the pair specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This status code indicates that operations on the specified pair cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_,pair1/actions/resync
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123789/remote-mirror-copypairs/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_,pair1/actions/resync
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1/actions/resync/invoke
```

When the storage system of the S-VOL is specified:

```
 curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copypairs/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_,pair1/actions/resync/invoke
```

Deleting TrueCopy pairs or Universal Replicator pairs in units of copy groups

The following request deletes TrueCopy pairs or Universal Replicator pairs by using the specified copy group. When the pairs are all deleted, the device groups are also deleted. Before deleting a pair, lock the resources or make sure the resources have not been locked by another user.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the deleted TrueCopy pairs or Universal Replicator pairs

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,remoteCopyGroupS_
```

Deleting a TrueCopy pair or Universal Replicator pair

The following request deletes the specified TrueCopy pair or Universal Replicator pair. As a result of deleting a pair, if there is no pair in the copy group, the copy group and the device group are also deleted. Before deleting a pair, lock the resources or make sure that the resources have not been locked by another user.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted TrueCopy pairs or Universal Replicator pairs

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1
```

Enabling volumes at the secondary site to take over work in units of copy groups

If a failure occurs at the primary site, the following request switches the roles between the primary volumes and the secondary volumes of Universal Replicator pairs (in units of copy groups) to enable data to be written in the secondary volumes so that work can be taken over and continued at the secondary site. This API request runs on the storage system of the secondary site.

Note:

- Valid targets are Universal Replicator pairs that are not in a cascade configuration.
- When running this API request, you do not need to specify `Remote-Authorization` for the request header.
- If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, specify `forceSplit` for `mode` in the request body. When these are specified, the value specified for `timeout` is ignored.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/takeover/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `remoteMirrorCopyGroupId` value obtained by getting information about the remote copy group. You can also specify the attributes separated by commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system For this API request, specify `NotSpecified`.
copyGroupName	string	(Required) Copy group name Specify a character string of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name at the local storage system Specify a character string of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name at the remote storage system For this API request, specify `NotSpecified`.

Query parameters

None.

Body

```
{
    "parameters": {
        "mode": "auto"
    }
}
```

Attribute	Type	Description
mode	string	(Required) Execution mode at takeover After the P-VOL and the S-VOL are switched, the pair is in a split status (SSWS) and writable. For the subsequent transition of the pair status, specify one of the following values: ▪ `forceSplit`: Does not change from the status in which the pair is split (SSWS). ▪ `auto`: Resynchronize the pair if possible according to the status of the storage system. If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, specify `forceSplit`.
timeout	int	(Optional) Timeout period for waiting for completion of synchronization of differential data (seconds) Specify the timeout time for the processing that synchronizes the differential data with the S-VOL if the journal contains differential data. Specify a value in the range from `1` to `10000`. If you do not specify a value, `7200` is assumed. If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, the value specified for this attribute is ignored. If the synchronization of the pairs does not finish within the specified time, the REST API job fails. However, on the storage system, the synchronization processing and the splitting processing after the synchronization is completed continue to be performed. To check whether the synchronization of the pairs has finished, obtain the information about the target pairs.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the Universal Replicator pairs that were switched

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-type: application/json" -H
"Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/remote-mirror-copygroups/NotSpecified,copyGroup,
localDeviceGroup,NotSpecified/actions/takeover/invoke
```

Enabling volumes at the secondary site to take over work in units of copy pairs

If a failure occurs at the primary site, you can continue your work at the secondary site by switching the roles of the primary volume and the secondary volume of the Universal Replicator pair (in units of copy pairs), to enable writing to the secondary volume (takeover). This API is executed on the storage system of the secondary site.

Note:

- Valid targets are Universal Replicator pairs that are not in a cascade configuration.
- When running this API request, you do not need to specify `Remote-Authorization` for the request header.
- If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, specify `forceSplit` for `mode` in the request body. When these are specified, the value specified for `timeout` is ignored.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/takeover/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system For this API request, specify `NotSpecified`.
copyGroupName	string	(Required) Copy group name Specify a character string of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name at the local storage system Specify a character string of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name at the remote storage system For this API request, specify `NotSpecified`.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
    "parameters": {
        "mode": "auto"
    }
}
```

Attribute	Type	Description
mode	string	(Required) Execution mode at takeover After the P-VOL and the S-VOL are switched, the pair is in a split status (SSWS) and writable. For the subsequent transition of the pair status, specify one of the following values: ▪ `forceSplit`: Does not change from the status in which the pair is split (SSWS). ▪ `auto`: Resynchronize the pair if possible according to the status of the storage system. If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, specify `forceSplit`.
timeout	int	(Optional) Timeout period for waiting for completion of synchronization of differential data (seconds) Specify the timeout time for the processing that synchronizes the differential data with the S-VOL if the journal contains differential data. Specify a value in the range from `1` to `10000`. If you do not specify a value, `7200` is assumed. If you specify `Job-Mode-Wait-Configuration-Change:NoWait` for the request header, the value specified for this attribute is ignored.

Attribute	Type	Description
		If the synchronization of the pairs does not finish within the specified time, the REST API job fails. However, on the storage system, the synchronization processing and the splitting processing after the synchronization is completed continue to be performed. To check whether the synchronization of the pairs has finished, obtain the information about the target pairs.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the Universal Replicator pairs that were switched

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

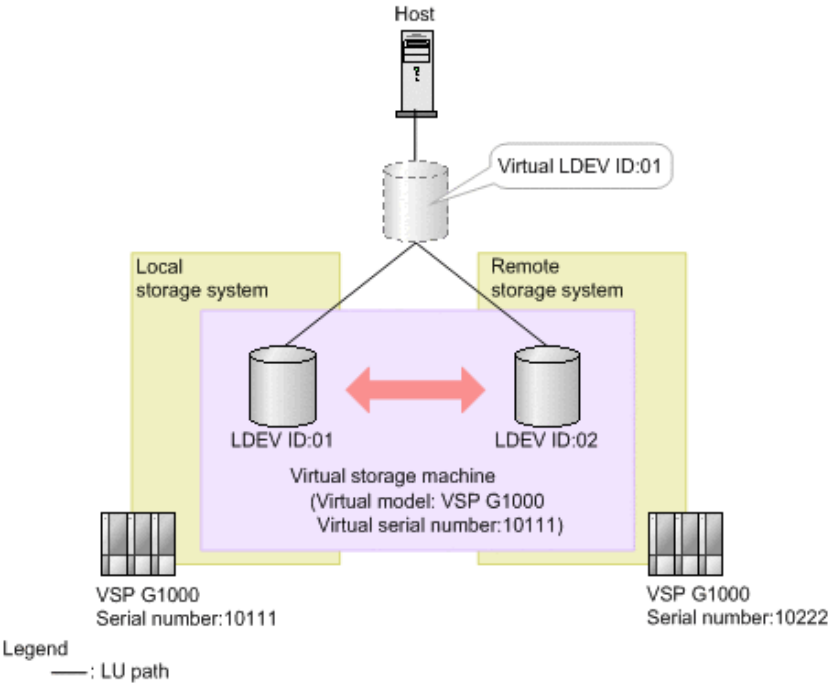
```
curl -v -H "Accept: application/json" -H "Content-type: application/json" -H
"Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/remote-mirror-copypairs/NotSpecified,copyGroup,localDeviceGroup,
NotSpecified,pair/actions/takeover/invoke
```

Chapter 15: Managing global-active device pairs

This chapter describes how to perform operations on global-active device pairs by using the REST API.

Overview of global-active device

Global-active device enables you to duplicate volumes between two storage systems to improve availability of the storage systems. If you register resources of each storage system in the same virtual storage machine and specify the same virtual LDEV ID for the volumes to be paired, the host can handle the volumes as a volume of a storage system. I/O from the host can be received by both storage systems. If data is written in one volume, the data is automatically synchronized with another volume.



If you issue an API request from a REST API client, you can create a global-active device pair, or perform operations on pairs when stopping either storage system for maintenance.

To perform operations on global-active device pairs, you must set up a quorum in advance. If a path or a storage system fails, the quorum disk determines the storage system on which I/O operations from the server will continue.

For a global-active device in a cross-path configuration (using a Fibre Channel connection), you can change the volume settings to enable the ALUA attribute or to set the priority levels of ALUA paths.

For details on global-active device, see the *Global-Active Device User Guide*.

Notes when a global-active device pair was created by using software other than the REST API

If you want to use the REST API to manage a pair that was created by using software other than the REST API, see the description of device group definition methods in the *Command Control Interface User and Reference Guide*, and use the method of running a command to correctly set a copy group and a device group.

Device names described in the *Command Control Interface User and Reference Guide* correspond to copy pair names for the REST API.

Note that if you use the REST API to create a pair, these kinds of information will be set automatically. For this reason, if you want to use the REST API to manage pairs, we recommend that you use the REST API to create pairs.

Workflow for operating global-active device pairs

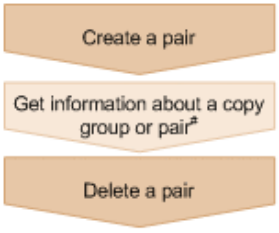
The global-active device pair operation, which is performed in an environment that uses the REST API, is divided into normal operation and maintenance operation.

Important:

If you perform operations on or get information about global-active device pairs, specify Remote-Authorization for the request header.

Normal operation

The following figure shows the workflow for the normal operation.



#: Optional operation

Creating a pair

Create a pair, and then copy all of the data in the P-VOL to the S-VOL. The pair is duplicated. Create a pair in a new copy group (mirror), or add a pair to an existing copy group (mirror). A copy group is a group made up of copy pairs. Each copy group consists of a device group made up of P-VOLs, and a device group made up of S-VOLs.

Getting information about a copy group or pair

You can perform operations on the pair in units of copy groups or pairs.

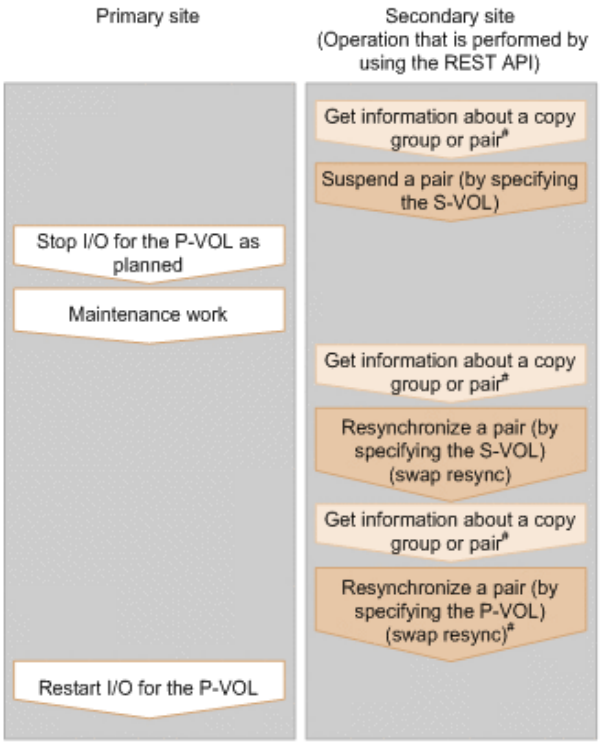
Deleting a pair

Suspend the pair in advance, and then dissolve the pair status of the volumes.

Maintenance operation

You can use the REST API to stop the storage systems used by global-active device as planned and to perform maintenance work.

The following figure shows the workflow for performing maintenance work of the primary site.



#: Optional operation

Suspending a pair (by specifying the S-VOL)

Suspend the status of a pair that is duplicated. I/O is switched to the secondary site.

Stopping I/O for the P-VOL as planned

Stop I/O for the P-VOL.

Maintenance work

At the primary site, upgrade the micro version or perform other maintenance work.

Resynchronizing a pair (by specifying the S-VOL) (swap resync)

After the maintenance work, resynchronize the differential data generated during stop of the P-VOL. Switch the P-VOL and the S-VOL, and then copy the data of the switched P-VOL to the S-VOL to resynchronize the pair.

> **Note:**
>
> Resynchronization can be performed in units of copy groups or pairs. If you want to register pairs to a consistency group during resynchronization, perform resynchronization in units of copy groups. Do not perform resynchronization in units of pairs.

Resynchronizing a pair (by specifying the P-VOL) (swap resync)

If necessary, switch the switched P-VOL and S-VOL.

Restarting I/O for the P-VOL

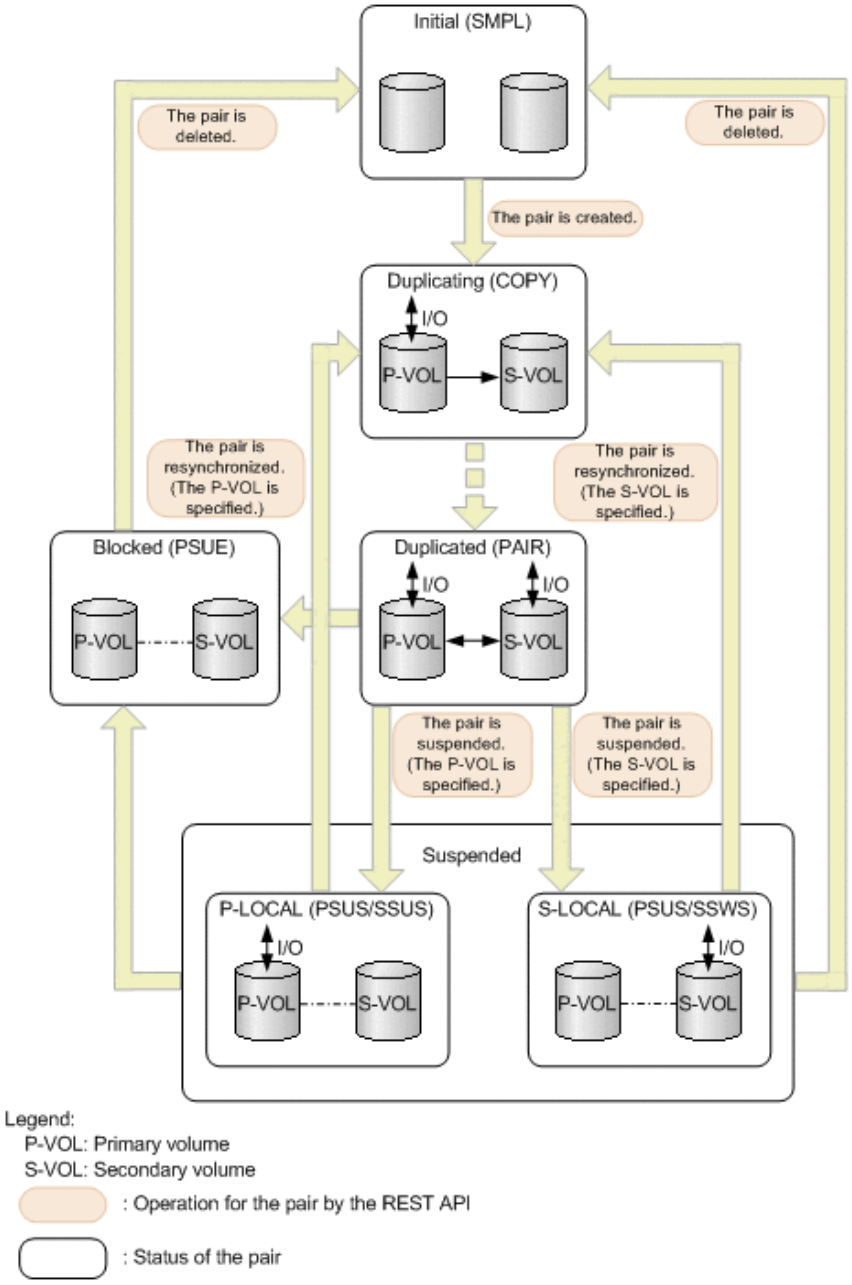
Restart I/O for the P-VOL.

Specifying Job-Mode-Wait-Configuration-Change in the request header

During the creation, splitting, and resynchronizing of pairs, if multiple asynchronous processing requests are issued at the same time, jobs might get stuck and the job status might not change to `Completed` because data copying takes a long time. In such cases, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header so that the job status changes to `Completed` without waiting for data copying to finish, and the next job starts. At this time, data copying continues even after job execution ends. To check whether data copying has finished, check the pair status of the target resource instead of the job status. For details about the pair status, see the description of the pair status transitions.

Pair status (global-active device)

The following explains the operations and status transitions for global-active device pairs.



Management of the status for global-active device pairs

Global-active device pairs are managed based on the following statuses and mode:

- GAD status

  Status of a global-active device pair. The value is determined by the combination of the pair status and I/O mode, and is not output anywhere.

- Pair status

  Pair statuses for the primary volume and the secondary volume

- I/O mode

  I/O modes for the primary volume and the secondary volume

The following table shows GAD status values.

GAD status	Description
Simplex	Status before creating a pair
Mirroring	The status is being changed to the mirrored status. This status indicates either of the following cases: ▪ A Quorum disk is being prepared. ▪ Data in the P-VOL is being copied to the S-VOL.
Mirrored	The pair is running normally. Data is duplicated.
Suspended	The pair is suspended by operation or due to a failure. The latest data is stored in either the P-VOL or the S-VOL. I/O from the host targets only the volume that contains the latest data.
Blocked	Multiple failures occurred at the same time, and neither the P-VOL nor the S-VOL accepts I/O from the host. This status indicates either of the following cases: ▪ The latest data is stored in both the P-VOL and the S-VOL, and one of the volumes can accept I/O from the host if the pair is forcibly deleted. However, the REST API cannot be used to forcibly delete the pair. ▪ A failure occurred on the local storage system or the remote storage system, and the volume on the other storage system also blocks I/O from the host.

The following table shows pair status values. The primary volume and the secondary volume each have the pair status.

Pair status	Description
SMPL	Unpaired volumes
COPY	A pair is being created. An initial copy or resynchronization is being performed.
PAIR	Paired volumes The initial copy is completed, and data is duplicated.
PSUS	The pair is suspended by operation.

Pair status	Description
	(This value is output for the P-VOL.)
SSUS	The pair is suspended by operation, and the S-VOL is not updated. (This value is output for the S-VOL.)
PSUE	The pair is suspended and blocked due to a failure.
SSWS	The pair is suspended by operation or due to a failure, and the P-VOL is not updated. (This value is output for the S-VOL.)

The following table shows I/O mode values. I/O mode indicates the I/O operations for the primary and secondary volumes that make up a global-active device pair.

I/O mode	Status	Read processing	Write processing
L/M	Mirror (RL)	Data in the volume on the local storage system is sent to the host.	Data is written to the volumes on the local storage system and the remote storage system, in this order.
L/L	Local	Data in the volume on the local storage system is sent to the host.	Data is written to the volume on the local storage system only.
B/B	Block	Denied. (An illegal request is returned.)	Denied. (An illegal request is returned.)

"L" indicates "local". "M" indicates "Mirror". "B" indicates "Block".

The following table shows the relationships of the GAD status, pair status, and I/O mode.

GAD status	Trigger of suspension	P-VOL		S-VOL		Volume that contains the latest data
		Pair status	I/O mode	Pair status	I/O mode	
Simplex	--	SMPL	--	SMPL	--	--
Mirroring	--	COPY	L/M	COPY	B/B	P-VOL
Mirrored	--	PAIR	L/M	PAIR	L/M	P-VOL

GAD status	Trigger of suspension	P-VOL		S-VOL		Volume that contains the latest data
		Pair status	I/O mode	Pair status	I/O mode	
						S-VOL
Suspended (P-LOCAL)	Operation for the pair	PSUS	L/L	SSUS	B/B	P-VOL
	Failure	PSUE	L/L	PSUE	B/B	
				SMPL	--	
				N	N	
Suspended (S-LOCAL)	Operation for the pair	PSUS	B/B	SSWS	L/L	S-VOL
	Failure	PSUE	B/B	SSWS	L/L	
		SMPL	--			
		N	N			
Blocked	--	PSUE	B/B	PSUE	B/B	P-VOL
				N	N	S-VOL
		N	N	PSUE	B/B	

(Legend)

--: Not applied.

N: The I/O mode and pair status cannot be confirmed due to a storage system failure.

Note:

In the following cases, if you perform an operation on a pair, the request successfully returns a response, but the details specified in the request body are not actually applied:

- When you perform a pair suspending operation on a pair for which the status is PSUS or SSUS
- When you perform a pair resynchronization operation on a pair for which the status is COPY or PAIR

Getting a list of remote copy groups

The following request gets a list of all the remote copy groups in which the remote copy pairs (TrueCopy, Universal Replicator, and global-active device) of the target storage system are registered. If the device group name or copy group name contains single-byte spaces, copy group information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups
```

Request message

Object ID

None.

Query parameters

You can get only a list of remote copy groups, or you can get detailed information about remote copy pairs in addition to a list of remote copy groups.

- To get a list of remote copy groups only:

Parameter	Type	Filter condition
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system If a failure occurs in a remote storage system and you then specify `NotSpecified`, only the information about the local storage system is obtained. In this situation (when a failure occurs and you specify `NotSpecified`), you do not need to specify the `Remote-Authorization` header.

Parameter	Type	Filter condition
		If you specify `NotSpecified` for this parameter, you cannot specify the `detailInfoType` parameter.

- To obtain additional detailed information:

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `pair` Gets additional detailed information[#1#2] about remote copy pairs. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Parameter	Type	Description
		If you specify `NotSpecified` for the `remoteStorageDeviceId` parameter, you cannot specify this parameter.

#1: If the remote storage system is a VSP One B20, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 model storage system, you might not be able to get some of the information about the remote storage system.

If either of the following conditions is met for other storage systems, you might not be able to get some of the information about the remote storage system.

- The REST API server that manages the remote storage system is using a version of Configuration Manager earlier than 10.0.0.
- The remote storage system's microcode version is earlier than the microcode versions that support Configuration Manager 10.0.0.

  For the storage system microcode versions that support Configuration Manager 10.0.0, see the table listing the compatible versions of Configuration Manager.

#2: If you are getting information for many pairs, you might not be able to get information from the remote storage system for the attribute `pvolStatus`, `pvolIOMode`, `copyPace`, `svolStatus`, or `svolIOMode`.

If that happens, on each of the REST API servers for the local storage system and the remote storage system, run the API request that gets a list of remote copy groups, with `pair` specified for `detailInfoType` in the query parameters. Then, merge the information about remote copy pairs that was acquired from each API request.

This issue occurs when there is a large amount of data communication from the local storage system to the remote storage system. The number of pairs affected by this issue depends on the amount of information in the remote copy groups and pairs, but when there are multiple pairs in a single remote copy group, the issue might occur with approximately 1,200 pairs.

Body

None.

Response message

Body

```
{
  "data" : [ {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup1,
remoteCopyGroup1S_,remoteCopyGroup1P_",
    "copyGroupName" : "remoteCopyGroup1",
```

```
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup1S_",
    "remoteDeviceGroupName" : "remoteCopyGroup1P_"
  }, {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup2,
remoteCopyGroup2P_,remoteCopyGroup2S_",
    "copyGroupName" : "remoteCopyGroup2",
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup2P_",
    "remoteDeviceGroupName" : "remoteCopyGroup2S_"
  }, {
    "remoteMirrorCopyGroupId" : "836000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_",
    "copyGroupName" : "remoteCopyGroup3",
    "muNumber" : 0,
    "remoteStorageDeviceId" : "836000123789",
    "localDeviceGroupName" : "remoteCopyGroup3P_",
    "remoteDeviceGroupName" : "remoteCopyGroup3S_"
  } ]
}
```


Attribute	Type	Description
remoteStorageDeviceId	string	Storage device ID of the remote storage system If you specify `NotSpecified` for remoteStorageDeviceId, `NotSpecified` is output.
copyGroupName	string	Copy group name
localDeviceGroupName	string	Device group name in the local storage system
remoteDeviceGroupName	string	Device group name in the remote storage system If you specify `NotSpecified` for remoteStorageDeviceId, `NotSpecified` is output.
muNumber	int	MU (mirror unit) number If the MU number cannot be obtained, information is not output.
remoteMirrorCopyGroupId	string	Object ID of the remote copy group

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName`

If you run the request with `pair` specified for the query parameter `detailInfoType`, you can get the following information, in addition to information about remote copy groups:

Attribute	Type	Description
copyPairs	objec t[]	Detailed information about the remote copy pair is output.

Attribute	Type	Description
		If information cannot be acquired, the attributes under the `copyPairs` object are not output.

Attribute	Type	Description
		▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name ▪ replicationType (string) Pair type • `TC`: TrueCopy • `UR`: Universal Replicator • `GAD`: global-active device If the pair status is `SMPL`, information is not output. ▪ pvolLdevId (int) LDEV number of P-VOL ▪ svolLdevId (int) LDEV number of S-VOL ▪ fenceLevel (string) Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output. ▪ pvolJournalId (int) Journal ID of the P-VOL A value from `0` to `255` is output only in the case of Universal Replicator. This information is not output if the pair type cannot be obtained. ▪ svolJournalId (int) Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator. This information

Attribute	Type	Description
		is not output if the pair type cannot be obtained. ▪ quorumDiskId (int) ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. This information is not output if the pair type cannot be obtained. ▪ pvolStatus (string) Pair status of the P-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output. ▪ svolStatus (string) Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output. ▪ consistencyGroupId (int) Consistency group ID If no consistency group consists, information is not output. ▪ pvolIOMode (string) I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local

Attribute	Type	Description
		▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ svolIOMode (string) I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ pvolStorageDeviceId (string) Storage device ID of the storage system on the P-VOL ▪ svolStorageDeviceId (string) Storage device ID of the storage system on the S-VOL ▪ remoteMirrorCopyPairId (string) Object ID of the remote copy pair The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName` ▪ transitionStatus (string) The transition status of a pair is output for a Universal Replicator pair. • `None`: The pair is not in transition. • `Suspending`: The pair is being split. • `Deleting`: The pair is being deleted.

Attribute	Type	Description
		This is not output if the copy pair is not a Universal Replicator pair. ▪ copyPace (int) Copy speed This is not output if copy pair is Universal Replicator. ▪ pathGroupId (int) ID of the RCU path group This is not output if CU is specified for the remote path connection setting. This is not output if the pair status of the P-VOL or the S-VOL is `SMPL`. ▪ deltaStatus (string) Status of the 3DC multi-target configuration that uses delta resync This is output if the pair type is Universal Replicator and the 3DC multi-target configuration that uses delta resync is used. • `HOLD`: Universal Replicator delta resync pair (normal) • `HLDE`: Universal Replicator delta resync pair (failed) • `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups?remoteStorageDeviceId=836000123789
```

Getting information about a specific remote copy group

The following request gets information about the specified copy group. This request also gets information about the pairs (TrueCopy, Universal Replicator, or global-active device) included in the copy group. If the copy group name or copy pair name contains single-byte spaces, pair information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system#
copyGroupName	string	(Required) Copy group name Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system# Specify a character string consisting of 1 to 31 characters. The name is case sensitive.

#: If you specify `NotSpecified` in cases such as when a failure occurs in a remote storage system, only information about the local storage system can be acquired. If you specify `NotSpecified`, copy pair information about attributes of volumes that belong to the remote storage system will not be output. In this case, you do not need to specify the `Remote-Authorization` header.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `class` Adds additional information#1#2 from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

#1: If the remote storage system is a VSP One B20, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900 model storage system, you might not be able to get some of the information about the remote storage system.

If either of the following conditions is met for other storage systems, you might not be able to get some of the information about the remote storage system.

- The REST API server that manages the remote storage system is using a version of Configuration Manager earlier than 10.0.0.
- The remote storage system's microcode version is earlier than the microcode versions that support Configuration Manager 10.0.0.

  For the storage system microcode versions that support Configuration Manager 10.0.0, see the table listing the compatible versions of Configuration Manager.

#2: If you are getting information for many pairs, you might not be able to get information from the remote storage system for the attribute `pvolStatus`, `pvolIOMode`, `copyPace`, `svolStatus`, or `svolIOMode`.

If that happens, on each of the REST API servers for the local storage system and the remote storage system, run the API request that gets the information for a specific copy group, with `class` specified for `detailInfoType` in the query parameters. Then, merge the information about remote copy pairs that was acquired from each API request.

This issue occurs when there is a large amount of data communication from the local storage system to the remote storage system. The number of pairs affected by this issue depends on the amount of information in the remote copy groups and pairs, but when there are multiple pairs, the issue might occur with approximately 1,200 pairs.

Body

None.

Response message

Body

The following is an example of the output when information about global-active device pairs is obtained:


```
{
  "remoteMirrorCopyGroupId" : "886000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_",
  "copyGroupName" : "remoteCopyGroup3",
  "copyPairs" : [ {
    "copyGroupName" : "remoteCopyGroup3",
    "copyPairName" : "pair1",
    "replicationType" : "GAD",
    "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_,pair1",
    "quorumDiskId" : 14,
    "pvolLdevId" : 1580,
    "svolLdevId" : 2128,
    "fenceLevel" : "NEVER",
    "pvolStatus" : "PAIR",
    "svolStatus" : "PAIR",
    "pvolIOMode" : "L/M",
    "svolIOMode" : "L/M",
    "pvolStorageDeviceId" : "886000123456",
    "svolStorageDeviceId" : "886000123789",
    "pvolDifferenceDataManagement": "S",
    "svolDifferenceDataManagement": "S",
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  } ],
  "remoteStorageDeviceId" : "886000123789",
  "localDeviceGroupName" : "remoteCopyGroup3P_",
  "remoteDeviceGroupName" : "remoteCopyGroup3S_"
}
```

To see an output example for TrueCopy or Universal Replicator, see Getting information about a specific remote copy group (on page 1019) in Managing TrueCopy pairs or Universal Replicator pairs (on page 998).

Attribute	Type	Description
remoteStorageDeviceId	string	Storage device ID of the remote storage system If you specify a value that includes `NotSpecified` for the object ID, `NotSpecified` is output.
copyGroupName	string	Copy group name
localDeviceGroupName	string	Device group name in the local storage system
remoteDeviceGroupName	string	Device group name in the remote storage system If you specify a value that includes `NotSpecified` for the object ID, `NotSpecified` is output.
remoteMirrorCopyGroupId	string	Object ID of the remote copy group

Attribute	Type	Description
		The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName`
copyPairs	object[]	The detailed information about the copy pair is output.

Attribute	Type	Description
		▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Copy pair name ▪ replicationType (string) Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device If the pair status is `SMPL`, information is not output. ▪ pvolLdevId (int) LDEV number of P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolLdevId (int) LDEV number of S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ fenceLevel (string) Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output. ▪ pvolJournalId (int) Journal ID of the P-VOL

Attribute	Type	Description
		A value from `0` to `255` is output only in the case of Universal Replicator. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolJournalId (int) Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ quorumDiskId (int) ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. ▪ pvolStatus (string) Pair status of the P-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolStatus (string) Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device).

Attribute	Type	Description
		If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ consistencyGroupId (int) Consistency group ID If no consistency group consists, information is not output. ▪ pvolIOMode (string) I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolIOMode (string) I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ pvolStorageDeviceId (string) Storage device ID of the storage system on the P-VOL

Attribute	Type	Description
		If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system. ▪ svolStorageDeviceId (string) Storage device ID of the storage system on the S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system. ▪ copyProgressRate (int) Copy progress rate Information is output only when the pair status of the P-VOL is `COPY` (a pair is being created or resynchronized). This attribute is not output if you specify a value that includes `NotSpecified` for the object ID. ▪ remoteMirrorCopyPairId (string) Object ID of the remote copy pair# The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName` ▪ pvolDifferenceDataManagement (string) Method for managing difference data about the P-VOL • `S`: Difference data based on the shared memory • `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370,

Attribute	Type	Description
		G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolDifferenceDataManagement (string) Method for managing difference data about the S-VOL • `S`: Difference data based on the shared memory • `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ pvolProcessingStatus (string) Processing status of the pair of P-VOLs • `E`: Processing to expand the P-VOLs is being performed • `N`: Processing to expand the P-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolProcessingStatus (string) Processing status of the pair of S-VOLs • `E`: Processing to expand the S-VOLs is being performed • `N`: Processing to expand the S-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

#: We recommend that you save the object ID information you obtain in case a failure occurs. When you need to perform a takeover to recover the system, you can use the saved information to identify the pair that you need to work on, even if you cannot get information about the failed storage system.

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
copyPairs	object[]	Attributes related to the detailed information about the copy pair ▪ transitionStatus (string) The transition status of a pair is output for a Universal Replicator pair. • `None`: The pair is not in transition. • `Suspending`: The pair is being split. • `Deleting`: The pair is being deleted. This is not output if the copy pair is not a Universal Replicator pair. ▪ copyPace (int) Copy speed This is not output for a Universal Replicator pair.

Attribute	Type	Description
		▪ pathGroupId (int) ID of the RCU path group This is not output if CU is specified for the remote path connection setting. This is not output if the pair volume status of the P-VOL or S-VOL (the value of the `pvolStatus` attribute of the `svolStatus` attribute) is `SMPL`. ▪ deltaStatus (string) Status of the 3DC multi-target configuration that uses delta resync This is output if the value of replicationType for the `copyPairs` attribute of the `replicationType` attribute, which is the pair type for the detailed information about the remote copy pairs, is Universal Replicator, and if you are using a 3DC multi-target configuration that uses delta resync. • `HOLD`: Universal Replicator delta resync pair (normal) • `HLDE`: Universal Replicator delta resync pair (failed) • `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

For global-active device:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_
```

To see an coding example for TrueCopy or Universal Replicator, see Getting information about a specific remote copy group (on page 1019) in Managing TrueCopy pairs or Universal Replicator pairs (on page 998).

Getting information about global-active device pairs

The following request acquires a list of volume information and storage system information about the P-VOLs and S-VOLs that make up a global-active device pair. You can get information about a pair without specifying information about the remote storage system in the request message.

Note:

This API request can be used when the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Important:

If you do not specify the `startLdevId` and `endLdevId` query parameters, the API request gets information about pairs from LDEV number 0 to LDEV number 2047. If you want to get information about other pairs, use `startLdevId` and `endLdevId`.

Important:

For a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".

Execution permission

Administrator user group (built-in user group)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-copypairs
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
replicationType	string	(Required) Specify the pair type. `GAD`: global-active device
startLdevId	int	(Optional) Specify, as a decimal (base 10) number, the number of the first LDEV for which you want to acquire information about the pair. Specify a value in the range from `0` to `65279`. If you specify this attribute, be sure to also specify the `endLdevId` attribute. The value of this attribute must be equal to or less than the value of `endLdevId`. If this attribute is omitted, `0` is set.
endLdevId	int	(Optional) Specify, as a decimal (base 10) number, the number of the last LDEV for which you want to acquire information about the pair. Specify a value in the range from `0` to `65279`. If you specify this attribute, be sure to also specify the `startLdevId` attribute. The value of this attribute must be equal to or greater than the value of `startLdevId`. Specify these values so that the range indicated by the `startLdevId` and `endLdevId` attributes consists of no more than 2048 LDEVs. If this attribute is omitted, `2047` will be set.

Body

None.

Response message

Body

```
{
  "data" : [ {
    "replicationType" : "GAD",
    "ldevId" : 8,
    "remoteSerialNumber" : "415008",
    "remoteStorageTypeId" : "M8",
    "remoteLdevId" : 22,
    "primaryOrSecondary" : "P-VOL",
```

```
    "muNumber" : 0,
    "status" : "PSUE",
    "isSSWS" : false,
    "createdLocalTime" : "2017-09-29T16:26:07",
    "quorumDiskId" : 1,
    "suspendedMode" : "BLOCK"
  }, {
    "replicationType" : "GAD",
    "ldevId" : 9,
    "remoteSerialNumber" : "415008",
    "remoteStorageTypeId" : "M8",
    "remoteLdevId" : 23,
    "primaryOrSecondary" : "P-VOL",
    "muNumber" : 2,
    "status" : "PSUS",
    "isSSWS" : false,
    "createdLocalTime" : "2017-10-02T09:46:36",
    "quorumDiskId" : 1,
    "suspendedMode" : "BLOCK"
  }, {
    "replicationType" : "GAD",
    "ldevId" : 73,
    "remoteSerialNumber" : "415008",
    "remoteStorageTypeId" : "M8",
    "remoteLdevId" : 2171,
    "primaryOrSecondary" : "P-VOL",
    "muNumber" : 0,
    "status" : "PAIR",
    "isSSWS" : false,
    "createdLocalTime" : "2018-11-04T01:12:39",
    "quorumDiskId" : 1,
    "suspendedMode" : "BLOCK"
  }, {
    "replicationType" : "GAD",
    "ldevId" : 93,
    "remoteSerialNumber" : "415008",
    "remoteStorageTypeId" : "M8",
    "remoteLdevId" : 25,
    "primaryOrSecondary" : "P-VOL",
    "muNumber" : 0,
    "status" : "PSUE",
    "isSSWS" : false,
    "createdLocalTime" : "2017-10-27T17:42:33",
    "quorumDiskId" : 1,
    "suspendedMode" : "BLOCK"
  }, {
    "replicationType" : "GAD",
    "ldevId" : 99,
    "remoteSerialNumber" : "415008",
```

```
    "remoteStorageTypeId" : "M8",
    "remoteLdevId" : 2163,
    "primaryOrSecondary" : "P-VOL",
    "muNumber" : 0,
    "status" : "PAIR",
    "isSSWS" : false,
    "createdLocalTime" : "2018-03-11T03:10:22",
    "quorumDiskId" : 1,
    "suspendedMode" : "BLOCK"
  } ]
}
```


Attribute	Type	Description
replicationType	string	Pair type `GAD`: global-active device
ldevId	int	LDEV number of the volume on the local storage system.
remoteSerialNumber	string	Serial number of the remote storage system
remoteStorageTypeId	string	ID corresponding to the model of the remote storage system ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models
remoteLdevId	int	LDEV number of the volume on the remote storage system
primaryOrSecondary	string	Attribute of the volume on the local storage system ▪ `P-VOL` ▪ `S-VOL`
muNumber	int	MU number
status	string	Pair status of the volume on the local storage system For details, see the section about pair status transition (global-active device).

Attribute	Type	Description
isSSWS	boolean	Indicates whether the state of the volume on the local storage system is `SSWS`. ▪ `true`: The state of the volume is `SSWS`. ▪ `false`: The state of the volume is not `SSWS`.
createdLocalTime	string	Time at which the pair was created. The local time of the storage system is displayed in YYYY-MM-DDThh:mm:ss format.
quorumDiskId	int	Quorum disk ID
suspendedMode	string	Block or Remote instructions when a pair is suspended ▪ `BLOCK_IO`: Block with I/O check ▪ `BLOCK`: Block without I/O check ▪ `REMOTE`: Remote

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/remote-
copypairs?replicationType=GAD
```

Getting information about a specific remote copy pair

The following request gets information about the specified copy pair (TrueCopy, Universal Replicator, or global-active device). Use this information to get the information that is necessary for performing pair operations (for example, the pair status). If the copy group name or copy pair name contains single-byte spaces, pair information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system #
copyGroupName	string	(Required) Copy group name Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system # Specify a character string consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

#: If you specify `NotSpecified` in cases such as when a failure occurs in a remote storage system, only information about the local storage system can be acquired. If you specify `NotSpecified`, copy pair information about attributes of volumes that belong to the remote storage system will not be output. In this case, you do not need to specify the `Remote-Authorization` header.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of the output when information about global-active device pairs is obtained:

```
{
  "copyGroupName" : "remoteCopyGroup3",
  "copyPairName" : "pair1",
  "replicationType" : "GAD",
  "remoteMirrorCopyPairId" : "886000123789,remoteCopyGroup3,remoteCopyGroup3P_,
remoteCopyGroup3S_,pair1",
  "quorumDiskId" : 14,
  "pvolLdevId" : 1580,
  "svolLdevId" : 2128,
  "fenceLevel" : "NEVER",
  "pvolStatus" : "PAIR",
  "svolStatus" : "PAIR",
  "pvolIOMode" : "L/M",
  "svolIOMode" : "L/M",
  "pvolStorageDeviceId" : "886000123456",
  "svolStorageDeviceId" : "886000123789",
  "pvolDifferenceDataManagement": "S",
  "svolDifferenceDataManagement": "S",
  "pvolProcessingStatus": "N",
  "svolProcessingStatus": "N"
}
```

To see an output example for TrueCopy or Universal Replicator, see Getting information about a specific remote copy pair (on page 1032) in Managing TrueCopy pairs or Universal Replicator pairs (on page 998).

Attribute	Type	Description
copyGroupName	string	Copy group name
copyPairName	string	Copy pair name
replicationType	string	Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device

Attribute	Type	Description
		If the pair status is `SMPL`, information is not output.
pvolLdevId	int	LDEV number of P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolLdevId	int	LDEV number of S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
fenceLevel	string	Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous If the fence level cannot be obtained, information is not output.
pvolJournalId	int	Journal ID of the P-VOL A value from `0` to `255` is output only in the case of UR. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolJournalId	int	Journal ID of the S-VOL A value from `0` to `255` is output only in the case of UR. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
quorumDiskId	int	ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device. If the pair status is `SMPL`, information is not output.
pvolStatus	string	Pair status of the P-VOL

Attribute	Type	Description
		For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolStatus	string	Pair status of the S-VOL For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). If the pair status cannot be obtained, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
consistencyGroupId	int	Consistency group ID If no consistency group consists, information is not output.
pvolIOMode	string	I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolIOMode	string	I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block

Attribute	Type	Description
		Information is output only in the case of global-active device. If the pair status is `SMPL`, information is not output. If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
pvolStorageDeviceId	string	Storage device ID of the storage system on the P-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the P-VOL is a volume in the local storage system.
svolStorageDeviceId	string	Storage device ID of the storage system on the S-VOL If you specify a value that includes `NotSpecified` for the object ID, this attribute is output only if the S-VOL is a volume in the local storage system.
copyProgressRate	int	Copy progress rate Information is output only when the pair status of the P-VOL is `COPY` (a pair is being created or resynchronized). This attribute is not output if you specify a value that includes `NotSpecified` for the object ID.
remoteMirrorCopyPairId	string	Object ID of the remote copy pair[#] The following attributes are output, separated by commas: ▪ `remoteStorageDeviceId` ▪ `copyGroupName` ▪ `localDeviceGroupName` ▪ `remoteDeviceGroupName` ▪ `copyPairName`
pvolDifferenceDataManagement	string	Method for managing difference data about the P-VOL ▪ `S`: Difference data based on the shared memory ▪ `D`: Hierarchical difference data (difference data based on drives)

Attribute	Type	Description
		This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolDifferenceDataManagement	string	Method for managing difference data about the S-VOL ▪ `S`: Difference data based on the shared memory ▪ `D`: Hierarchical difference data (difference data based on drives) This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
pvolProcessingStatus	string	Processing status of the pair of P-VOLs ▪ `E`: Processing to expand the P-VOLs is being performed ▪ `N`: Processing to expand the P-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolProcessingStatus	string	Processing status of the pair of S-VOLs ▪ `E`: Processing to expand the S-VOLs is being performed ▪ `N`: Processing to expand the S-VOLs is not being performed This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

#: We recommend that you save the object ID information you obtain in case a failure occurs. When you need to perform a takeover to recover the system, you can use the saved information to identify the pair that you need to work on, even if you cannot get information about the failed storage system.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

For global-active device:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup3,
remoteCopyGroup3P_,remoteCopyGroup3S_,pair1
```

To see an coding example for TrueCopy or Universal Replicator, see Getting information about a specific remote copy pair (on page 1032) in Managing TrueCopy pairs or Universal Replicator pairs (on page 998).

Getting information about all of remote copy pairs

The following request gets a list of information about the remote copy pairs (TrueCopy, Universal Replicator, or global-active device) registered in the target storage system. You can obtain information about all such pairs from the cache of the storage system, regardless of whether they are managed by using copy groups. You do not need to specify the information about the remote storage system in the request message.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, and VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can use this API function.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-replications
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
startLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the first LDEV in the range. The P-VOLs and S-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be smaller than that of the `endLdevId` parameter. If this attribute is omitted, `0` is set.
endLdevId	int	(Optional) To specify a range of LDEVs, specify the LDEV number of the last LDEV in the range. The P-VOLs and S-VOLs in the specified range of LDEVs are searched, and information about the relevant pairs is obtained. Specify a value in the range from `0` to `65279`. The value of this parameter must be greater than that of the `startLdevId` parameter. If this attribute is omitted, the maximum LDEV number in the storage system is set.
replicationType	string	(Optional) Specify the pair type of the pairs about which information is to be obtained. ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device

Body

None.

Response message

Body


```
{
    "data": [
        {
            "remoteReplicationId": "R8,51304,375,R8,51305,969",
            "muNumber": 2,
            "replicationType": "UR",
            "pvolLdevId": 375,
            "svolLdevId": 969,
            "fenceLevel": "ASYNC",
            "pvolJournalId": 10,
            "svolJournalId": 0,
            "pvolStatus": "PAIR",
            "consistencyGroupId": 17,
            "pvolStorageType": "R8",
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "transitionStatus": "None",
            "pathGroupId": 0
        },
        {
            "remoteReplicationId": "R8,51304,378,R8,51305,765",
            "replicationType": "TC",
            "pvolLdevId": 378,
            "svolLdevId": 765,
            "fenceLevel": "DATA",
            "pvolStatus": "PAIR",
            "pvolStorageType": "R8",
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "copyPace": 3,
            "pathGroupId": 0
        },
        {
            "remoteReplicationId": "R8,51304,400,R8,51305,567",
            "muNumber": 0,
            "replicationType": "GAD",
            "pvolLdevId": 400,
            "svolLdevId": 567,
            "fenceLevel": "NEVER",
            "quorumDiskId": 4,
            "pvolStatus": "PAIR",
            "consistencyGroupId": 11,
            "pvolIOMode": "L/M",
            "pvolStorageType": "R8",
```

```
            "pvolStorageSerial": "51304",
            "svolStorageType": "R8",
            "svolStorageSerial": "51305",
            "copyPace": 7,
            "pathGroupId": 0
        }
    ]
}
```

Attribute	Type	Description
remoteReplicationId	string	Object ID of the remote copy pair The following attributes are output, separated by commas: ▪ `pvolStorageType` ▪ `pvolStorageSerial` ▪ `pvolLdevId` ▪ `svolStorageType` ▪ `svolStorageSerial` ▪ `svolLdevId` If the value of `remoteReplicationId` includes `Unknown` or `-1`, the pair might not be in a normal state. Check the status of the storage system.
muNumber	int	MU (mirror unit) number
replicationType	string	Pair type ▪ `TC`: TrueCopy ▪ `UR`: Universal Replicator ▪ `GAD`: global-active device
pvolLdevId	int	LDEV number of P-VOL
svolLdevId	int	LDEV number of S-VOL
fenceLevel	string	Fence level ▪ `DATA`: S-VOL data ▪ `STATUS`: S-VOL status ▪ `NEVER`: None ▪ `ASYNC`: Asynchronous

Attribute	Type	Description
		If the fence level cannot be obtained, information is not output.
pvolJournalId	int	Journal ID of the P-VOL A value from `0` to `255` is output only in the case of Universal Replicator.
svolJournalId	int	Journal ID of the S-VOL A value from `0` to `255` is output only in the case of Universal Replicator.
quorumDiskId	int	ID of the Quorum disk A value from `0` to `31` is output only in the case of global-active device.
pvolStatus	string	Pair volume status of the P-VOL This attribute is output only if the specified storage system contains the P-VOL. For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output.
svolStatus	string	Pair volume status of the S-VOL This attribute is output only if the specified storage system contains the S-VOL. For details, see the section explaining on pair status (TrueCopy and Universal Replicator) or pair status (global-active device). In the case of Universal Replicator, if the transition status of the Universal Replicator pair is `Suspending` or `Deleting`, information is not output.
consistencyGroupId	int	Consistency group ID This attribute is not output if no consistency group consists.

Attribute	Type	Description
pvolIOMode	string	I/O mode of the P-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block This is output only if the volume is a global-active device and the specified storage system is on the P-VOL.
svolIOMode	string	I/O mode of the S-VOL ▪ `L/M`: Mirror (RL) ▪ `L/L`: Local ▪ `B/B`: Block This is output only if the volume is a global-active device and the specified storage system is on the S-VOL.
pvolStorageType	string	ID indicating the model of the storage system on the P-VOL ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models ▪ `UNKNOWN`: Unknown
pvolStorageSerial	string	Serial number of the storage system on the P-VOL
svolStorageType	string	ID indicating the model of the storage system on the S-VOL ▪ `R8`: VSP G1000, VSP G1500, or VSP F1500 ▪ `R9`: VSP 5000 series ▪ `M8`: VSP One B20, VSP E series, VSP Gx00 models, VSP Fx00 models ▪ `UNKNOWN`: Unknown
svolStorageSerial	string	Serial number of the storage system on the S-VOL

Attribute	Type	Description
transitionStatus	string	The transition status of a pair is output for a Universal Replicator pair. ▪ `None`: The pair is not in transition. ▪ `Suspending`: The pair is being split. ▪ `Deleting`: The pair is being deleted. This is not output if the copy pair is not a Universal Replicator pair.
copyPace	int	Copy speed If the pair type is TrueCopy, this attribute is output only if the specified storage system contains the P-VOL. If the pair type is global-active device, this attribute is output regardless of whether the specified storage system contains the P-VOL or contains the S-VOL. This is not output if the pair type is Universal Replicator.
pathGroupId	int	Path group ID of the RCU This is not output if CU is specified for the remote path connection setting.
deltaStatus	string	Status of the 3DC multi-target configuration that uses delta resync This is output if the pair type is Universal Replicator and the 3DC multi-target configuration that uses delta resync is used. ▪ `HOLD`: Universal Replicator delta resync pair (normal) ▪ `HLDE`: Universal Replicator delta resync pair (failed) ▪ `HOLDING`: In the process of being changed to a Universal Replicator delta resync pair

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/800000012345/remote-replications
```

Creating a global-active device pair

The following request creates a global-active device pair in the storage systems of the primary and secondary sites. The global-active device pair is either added to a new copy group or to an existing copy group. If you create a copy group, a device group is also created. Before creating a pair, lock the resources or make sure that the resources have not been locked by another user.

Tip:

- Before creating the pair, set the reserved attribute of global-active device for the secondary volume by using the API that sets a virtual LDEV number.
- We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.
- For data migration that uses global-active device pairs, one volume is paired with two different volumes to form one pair for migration from the global-active device pair that is in use, and to form one migration destination pair from one pair for migration. In this case, the pair statuses of the pair for migration and the migration destination pair might not change even after the copying processing finishes. For this reason, when performing operations on a pair for migration or a migration destination pair, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of the API function. For details, see the description of the flow of operations for the pairs. For details on data migration that uses global-active device pairs, see the *Global-Active Device User Guide*.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for creating a new copy group and adding a pair to the copy group:

```
{
  "copyGroupName": "remoteCopyGroup3",
  "copyPairName": "pair1",
  "replicationType": "GAD",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 1580,
  "svolLdevId": 2128,
  "localDeviceGroupName": "remoteCopyGroup3P_",
  "remoteDeviceGroupName": "remoteCopyGroup3S_",
  "muNumber": 0,
  "quorumDiskId": 14,
  "isNewGroupCreation": true,
  "fenceLevel": "NEVER",
  "copyPace": 10,
  "doInitialCopy": true,
  "isDataReductionForceCopy": true
}
```

The following is a coding example for adding a pair to an existing copy group:

```
{
  "copyGroupName": "remoteCopyGroup3",
  "copyPairName": "pair2",
  "replicationType": "GAD",
  "remoteStorageDeviceId": "836000123789",
  "pvolLdevId": 1581,
  "svolLdevId": 2129,
  "localDeviceGroupName": "remoteCopyGroup3P_",
  "remoteDeviceGroupName": "remoteCopyGroup3S_",
  "quorumDiskId": 14,
  "isNewGroupCreation": false,
  "fenceLevel": "NEVER",
  "copyPace": 10,
  "doInitialCopy": true,
  "isDataReductionForceCopy": false
}
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify a copy group name consisting of 1 to 29 characters. The name is case sensitive.

Attribute	Type	Description
		Set a unique name that is the same for the storage systems on both the local and remote sides.
copyPairName	string	(Required) Specify a copy pair name consisting of 1 to 31 characters. The name is case sensitive. Set a unique name that is the same for the storage systems in the copy group.
replicationType	string	(Required) Specify the pair type. `GAD`: global-active device
remoteStorageDeviceId	string	(Required) Specify the storage device ID of the remote storage system in which the pair is to be created.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL with a decimal (base 10) number.
svolLdevId	int	(Required) Specify the LDEV number of the S-VOL for which the reserved attribute of global-active device is set. Specify it with a decimal (base 10) number. Specify the reserved attribute of global-active device by using the API that sets a virtual LDEV number.
pathGroupId	int	(Optional) Specify the path group ID by using a decimal (base 10) number in the range from `0` to `255`. If you omit this value or specify `0`, the lowest path group ID in the specified path group is used.
localDeviceGroupName	string	(Optional) Specify the device group name in the local storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing local storage system. The name needs to be unique in the local storage system. If this value is omitted, *copyGroupName*P_ is assumed.

Attribute	Type	Description
remoteDeviceGroupName	string	(Optional) Specify the device group name in the remote storage system by using 1 to 31 characters. The name is case sensitive. If you add the pair to an existing copy group, specify the same device group name as that of the existing remote storage system. The name needs to be unique in the remote storage system. If this value is omitted, *copyGroupName*S_ is assumed.
isNewGroupCreation	boolean	(Required) Depending on the value, this attribute specifies whether to add the pair to a new copy group or to an existing copy group. ▪ `true`: Adds the pair to a new copy group. ▪ `false`: Adds the pair to an existing copy group.
muNumber	int	(Required) Specify the MU (mirror unit) number by using a number from `0` to `3`. This value is used by the P-VOL and the S-VOL. You can specify this attribute only if you add the pair to a new copy group.
quorumDiskId	int	(Required) Specify the quorum disk ID by using a decimal (base 10) number in the range from `0` to `31`.
isConsistencyGroup	boolean	(Optional) Depending on the value, this attribute specifies whether to register the new pair in a consistency group. ▪ `true`: Registers the pair in a consistency group. ▪ `false`: Does not register the pair in a consistency group. If you add the pair to an existing copy group, specify the same value as that of the existing copy pair. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If this value is omitted, `false` is assumed.

Attribute	Type	Description
consistencyGroupId	int	(Optional) Specify the consistency group ID by using a decimal (base 10) number. If you omit this value when registering the new pair in a consistency group, the value is automatically assigned. If you add the pair to an existing copy group, specify the same value as that of the existing copy pair. If a copy group includes a pair whose consistency group ID differs, pair operations by consistency group cannot be correctly performed. When specifying this attribute, make sure to specify `true` for the `isConsistencyGroup` attribute.
fenceLevel	string	(Optional) Fence level `NEVER` is automatically set.
copyPace	int	(Optional) Copy speed Specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed. If this value is omitted, `3` is assumed.
doInitialCopy	boolean	(Optional) Specify whether to perform initial copy when creating a pair. ▪ `true`: Performs initial copy. ▪ `false`: Does not perform initial copy. If this value is omitted, `true` is assumed.
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair # ▪ `false`: Do not forcibly create a pair

Attribute	Type	Description
		When the attribute is omitted, `false` is assumed.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for accessing the created global-active device pair

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-mirror-copypairs
```

Deleting global-active device pairs in units of copy groups

The following request deletes global-active device pairs by using the specified copy group. When the pairs are all deleted, the device groups are also deleted. You can specify a copy group on the primary volume side to delete pairs. Alternatively, you can specify a copy group on the secondary volume side to delete pairs. Before deleting pairs, specify the copy group to suspend the pairs, and then change the statuses of the pairs to suspension. If a copy group includes the primary volume and the secondary volume, you cannot specify a copy group to delete pairs. Before deleting a pair, lock the resources or make sure that the resources have not been locked by another user.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example of continuing to use the S-VOL after a suspended (S-LOCAL) pair is deleted:

```
{
  "isSvolToKeepUsing" : true
}
```

Attribute	Type	Description
isSvolToKeepUsing	boolean	(Optional) Specify the volume that continues I/O after pairs are deleted. ▪ `true`: Deletes the pairs by specifying the S-VOL. The S-VOL continues I/O, and the reserved attribute of global-active device is set for the P-VOL. If you set `true`, you must suspend pairs in advance by specifying the S-VOL. ▪ `false`: Deletes the pairs by specifying the P-VOL. The P-VOL continues I/O, and the reserved attribute of global-active device is set for the S-VOL. If you set `false`, you must suspend pairs in advance by specifying the P-VOL. If this value is omitted, `false` is set.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the deleted global-active device pairs

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_
```

Deleting a global-active device pair

The following request deletes the specified global-active device pair. As a result of deleting a pair, if there is no pair in the copy group, the copy group and the device group are also deleted. You can specify the primary volume to delete a pair. Alternatively, you can specify the secondary volume to delete a pair. Before deleting a pair, suspend the pair, and then change the status of the pair to suspension. Before deleting a pair, lock the resources or make sure that the resources have not been locked by another user.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Remote Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-
ID
```

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Attribute	Type	Description
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example of continuing to use the S-VOL after a suspended (S-LOCAL) pair is deleted:

```
{
  "isSvolToKeepUsing" : true
}
```

Attribute	Type	Description
isSvolToKeepUsing	boolean	(Optional) Specify the volume that continues I/O after the pair is deleted. ▪ `true`: Deletes the pair by specifying the S-VOL. The S-VOL continues I/O, and the reserved attribute of global-active device is set for the P-VOL. If you set `true`, you must suspend pairs in advance by specifying the S-VOL. ▪ `false`: Deletes the pair by specifying the P-VOL. The P-VOL continues I/O, and the reserved attribute of global-active device is set for the S-VOL. If you set `false`, you must suspend pairs in advance by specifying the P-VOL. If this value is omitted, `false` is set.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted global-active device pair

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1
```

Suspending global-active device pairs in units of copy groups

The following request suspends global-active device pairs by using the specified copy group. You can specify a copy group on the primary volume side to suspend pairs. Alternatively, you can specify a copy group on the secondary volume side to suspend pairs. If a copy group includes the primary volume and the secondary volume, you cannot specify the copy group to suspend pairs. Also, when suspending pairs by copy group, do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair suspending operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following coding example is for simply suspending pairs. After pairs are suspended, I/O is continued on the P-VOL.

```
{
  "parameters": {
    "replicationType": "GAD"
  }
}
```

The following coding example is for suspending pairs by specifying the S-VOL. After pairs are suspended, I/O is continued on the S-VOL.

```
{
  "parameters": {
    "replicationType": "GAD",
    "svolOperationMode": "SSWS"
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. `GAD`: global-active device
svolOperationMode	string	(Optional) Specify the volume that continues I/O after pairs are suspended. Specify the following value. ▪ `SSWS`: The S-VOL continues I/O. Specify the S-VOL to suspend a pair. If this attribute is omitted, the P-VOL continues I/O. In this case, specify the P-VOL to suspend a pair.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group of the suspended global-active device pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/split
```

This action template returns only the specifiable attributes, depending on the following: the type of the pairs of the copy group specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This object indicates that operations on the pairs of the specified copy group cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_/actions/split
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123789/remote-mirror-copygroups/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_/actions/split
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_/actions/split/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copygroups/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_/actions/split/invoke
```

Suspending a global-active device pair

The following request suspends the specified global-active device pair. You can specify the primary volume to suspend a pair. Alternatively, you can specify the secondary volume to suspend a pair. Also, when suspending a pair, do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair suspending operation is performed.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Attribute	Type	Description
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following coding example is for simply suspending pairs. After pairs are suspended, I/O is continued on the P-VOL.

```
{
  "parameters": {
    "replicationType": "GAD"
  }
}
```

The following coding example is for suspending pairs by specifying the S-VOL. After pairs are suspended, I/O is continued on the S-VOL.

```
{
  "parameters": {
    "replicationType": "GAD",
    "svolOperationMode": "SSWS"
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. `GAD`: global-active device

Attribute	Type	Description
svolOperationMode	string	(Optional) Specify the volume that continues I/O after pairs are suspended. Specify the following value. ▪ `SSWS`: The S-VOL continues I/O. Specify the S-VOL to suspend a pair. If this attribute is omitted, the P-VOL continues I/O. In this case, specify the P-VOL to suspend a pair.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the suspended global-active device pair

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/actions/split
```

This action template returns only the specifiable attributes, depending on the following: the type of the copy pair specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This object indicates that operations on the specified pair cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_,pair1/actions/split
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123789/remote-mirror-copypairs/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_,pair1/actions/split
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1/actions/split/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copypairs/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_,pair1/actions/split/invoke
```

Resynchronizing global-active device pairs in units of copy groups

The following request resynchronizes global-active device pairs by using the specified copy groups. You can specify a copy group on the primary volume side to resynchronize pairs. Alternatively, you can specify a copy group on the secondary volume side to resynchronize pairs. If a copy group includes the primary volume and the secondary volume, you cannot specify the copy group to resynchronize pairs. Also, when resynchronizing pairs by copy group, do not simultaneously perform other operations on the copy group or the pairs in that copy group on which a pair resynchronization operation is performed.

Tip:

- We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.
- For data migration that uses global-active device pairs, one volume is paired with two different volumes to form one pair for migration from the global-active device pair that is in use, and to form one migration destination pair from one pair for migration. In this case, the pair statuses of the pair for migration and the migration destination pair might not change even after the copying processing finishes. For this reason, when performing operations on a pair for migration or a migration destination pair, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of the API function. For details, see the description of the flow of operations for the pairs. For details on data migration that uses global-active device pairs, see the *Global-Active Device User Guide*.

Note:

If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, to register pairs in a consistency group when performing a pair resynchronization operation, the number of pairs in the target copy group must be 1,000 or less. If the number of pairs exceeds 1,000, delete all pairs in the copy group, and then register pairs in a consistency group when you re-create the pairs. Alternatively, delete some pairs so that the number of pairs decreases to 1,000 or less, perform a pair resynchronization operation, and then register the pairs in a consistency group when you re-create the pairs that you deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyGroupId` that was obtained by the processing to get information about the remote copy group. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply resynchronizing pairs:

```
{
  "parameters": {
    "replicationType": "GAD"
  }
}
```

The following is a coding example for reversing and resynchronizing pairs by specifying the S-VOL:

```
{
  "parameters": {
    "replicationType": "GAD",
    "doSwapSvol": true
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type.

Attribute	Type	Description
		`GAD`: global-active device
doSwapSvol	boolean	(Optional) Specify the copy group to be used for a pair resynchronization operation. Use this attribute when the S-VOL side is used as the local storage system. ▪ `true`: Resynchronize pairs by specifying the copy group on the S-VOL side (swap resync). You can use this value if the pairs in the specified copy group on the S-VOL side are suspended. Reverse the P-VOL and the S-VOL, and then copy data of the new P-VOL to the new S-VOL. ▪ `false`: Resynchronize pairs by specifying the copy group on the P-VOL side. If the value is not specified, `false` will be set. If this attribute is set to `true`, you cannot specify `true` for the `doSwapPvol` and `isConsistencyGroup` attributes.
doSwapPvol	boolean	(Optional) Specify the copy group to be used for a pair resynchronization operation. Use this attribute when the P-VOL side is used as the local storage system. ▪ `true`: Resynchronize pairs by specifying the copy group on the P-VOL side (swap resync). You can use this value if the pairs in the specified copy group on the P-VOL side are suspended. Reverse the P-VOL and the S-VOL, and then copy data of the new P-VOL to the new S-VOL. ▪ `false`: Resynchronize pairs by specifying the copy group on the P-VOL side. If the value is not specified, `false` will be set. If this attribute is set to `true`, you cannot specify `true` for the `doSwapSvol` and `isConsistencyGroup` attributes.
isConsistencyGroup	boolean	(Optional) If the pair is not registered in a consistency group, you can specify the value as follows: ▪ `true`: Registers the copy group in a consistency group.# ▪ `false`: Leaves the copy group as it is without registering it in a consistency group.

Attribute	Type	Description
		If the pair is already registered in a consistency group, you do not need to specify this attribute to maintain the registered state, regardless of the value specified for this attribute. Note that, if `false` is specified, registration of the consistency group cannot be canceled. To register the copy group in a consistency group, you must also specify the `consistencyGroupId` attribute. Make sure that each copy group contains either only pairs that are registered to a consistency group or only pairs that are not registered to a consistency group. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If you specify `true` for this attribute, you cannot specify the `doSwapSvol` and `doSwapPvol` attributes.
consistencyGroupId	int	(Optional) Specify the consistency group ID by using a decimal (base 10) number. Be sure to specify this attribute when registering the copy group in a consistency group.
fenceLevel	string	(Optional) Specify `NEVER` for the fence level. If you specify `true` for the `isConsistencyGroup` attribute, `NEVER` is automatically set.
copyPace	int	(Optional) Copy speed Specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed.

#: If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, this value can be specified only if the number of pairs in the copy group is 1,000 or less.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the description on job objects.

Attribute	Description
affectedResources	URL of the copy group of the resynchronized global-active device pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copygroups/object-ID/actions/resync
```

This action template returns only the specifiable attributes, depending on the following: the type of the pairs of the copy group specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This object indicates that operations on the specified pair cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,remoteCopyGroupS_/actions/resync
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
```

```
storages/836000123789/remote-mirror-copygroups/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_/actions/resync
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copygroups/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_/actions/resync/invoke
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copygroups/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_/actions/resync/invoke
```

Resynchronizing a global-active device pair

The following request resynchronizes the specified global-active device pair. You can specify the primary volume to resynchronize pairs. Alternatively, you can specify the secondary volume to resynchronize pairs. Also, when resynchronizing pairs, do not simultaneously perform other operations on the copy group or pairs on which a pair resynchronization operation is performed.

Tip:

- We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the flow of operations for the pairs.
- For data migration that uses global-active device pairs, one volume is paired with two different volumes to form one pair for migration from the global-active device pair that is in use, and to form one migration destination pair from one pair for migration. In this case, the pair statuses of the pair for migration and the migration destination pair might not change even after the copying processing finishes. For this reason, when performing operations on a pair for migration or a migration destination pair, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of the API function. For details, see the description of the flow of operations for the pairs. For details on data migration that uses global-active device pairs, see the *Global-Active Device User Guide*.

Note:

If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, to register pairs in a consistency group when performing a pair resynchronization operation, the number of pairs in the target copy group must be 1,000 or less. If the number of pairs exceeds 1,000, delete all pairs in the copy group, and then register pairs in a consistency group when you re-create the pairs. Alternatively, delete some pairs so that the number of pairs decreases to 1,000 or less, perform a pair resynchronization operation, and then register the pairs in a consistency group when you re-create the pairs that you deleted.

Execution permission

Storage Administrator (Remote Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/resync/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `remoteMirrorCopyPairId` that was obtained by the processing to get information about the remote copy pair. You can also specify the attributes and connect them with commas as follows:

```
remoteStorageDeviceId,copyGroupName,localDeviceGroupName,remoteDeviceGroupName,
copyPairName
```

Attribute	Type	Description
remoteStorageDeviceId	string	(Required) Storage device ID of the remote storage system
copyGroupName	string	(Required) Copy group name Specify a name consisting of 1 to 31 characters. The name is case sensitive.
localDeviceGroupName	string	(Required) Device group name in the local storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Attribute	Type	Description
remoteDeviceGroupName	string	(Required) Device group name in the remote storage system Specify a name consisting of 1 to 31 characters. The name is case sensitive.
copyPairName	string	(Required) Copy pair name Specify a name consisting of 1 to 31 characters. The name is case sensitive.

Query parameters

None.

Body

The following is a coding example for simply resynchronizing pairs:

```
{
  "parameters": {
    "replicationType": "GAD"
  }
}
```

The following is a coding example for reversing and resynchronizing pairs by specifying the P-VOL:

```
{
  "parameters": {
    "replicationType": "GAD",
    "doSwapPvol": true
  }
}
```

Attribute	Type	Description
replicationType	string	(Required) Specify the pair type. `GAD`: global-active device

Attribute	Type	Description
doSwapSvol	boolean	(Optional) Specify the volume to be specified for a pair resynchronization operation. Use this attribute when the S-VOL side is used as the local storage system. ▪ `true`: Resynchronize pairs by specifying the S-VOL (swap resync). You can use this value if the pairs in the specified S-VOL are suspended. Reverse the P-VOL and the S-VOL, and then copy data of the new P-VOL to the new S-VOL. ▪ `false`: Resynchronize pairs by specifying the P-VOL. If the value is not specified, `false` will be set. If this attribute is set to `true`, you cannot specify `true` for the `doSwapPvol` and `isConsistencyGroup` attributes.
doSwapPvol	boolean	(Optional) Specify the volume to be specified for a pair resynchronization operation. Use this attribute when the P-VOL side is used as the local storage system. ▪ `true`: Resynchronize pairs by specifying the P-VOL (swap resync). You can use this value if the pairs in the specified P-VOL are suspended. Reverse the P-VOL and the S-VOL, and then copy data of the new P-VOL to the new S-VOL. ▪ `false`: Resynchronize pairs by specifying the P-VOL. If the value is not specified, `false` will be set. If this attribute is set to `true`, you cannot specify `true` for the `doSwapSvol` and `isConsistencyGroup` attributes.
isConsistencyGroup	boolean	(Optional) If the pair is not registered in a consistency group, you can specify the value as follows: ▪ `true`: Registers the pair in a consistency group. # ▪ `false`: Leaves the pair as it is without registering it in a consistency group.

Attribute	Type	Description
		If the pair is already registered in a consistency group, you do not need to specify this attribute to maintain the registered state, regardless of the value specified for this attribute. Note that, if `false` is specified, registration of the consistency group cannot be canceled. To register the pair in a consistency group, you must also specify the `consistencyGroupId` attribute. Make sure that each copy group contains either only pairs that are registered to a consistency group or only pairs that are not registered to a consistency group. If a copy group includes both pairs that are registered in a consistency group and pairs that are not registered in a consistency group, pair operations by consistency group cannot be correctly performed. If you specify `true` for this attribute, you cannot specify the `doSwapSvol` and `doSwapPvol` attributes.
consistencyGroupId	int	(Optional) Specify the consistency group ID by using a decimal (base 10) number. Be sure to specify this attribute when registering the pair in a consistency group. Unify the consistency group ID within the copy group. If a copy group includes a pair whose consistency group ID differs, pair operations by consistency group cannot be correctly performed.
fenceLevel	string	(Optional) Specify `NEVER` for the fence level. If you specify `true` for the `isConsistencyGroup` attribute, `NEVER` is automatically set.
copyPace	int	(Optional) Copy speed Specify a decimal (base 10) number in the range from `1` to `15` for the size of tracks to be copied. The larger the value you specify, the faster the copy speed.

#: If the model of either or both of the storage systems is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, this value can be specified only if the number of pairs in the copy group is 1,000 or less.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the description on job objects.

Attribute	Description
affectedResources	URL of the resynchronized global-active device pairs

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/remote-mirror-copypairs/object-ID/
actions/resync
```

This action template returns only the specifiable attributes, depending on the following: the type of the copy pair specified for the object ID, and whether the volume in the local storage system is the primary volume or the secondary volume.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This object indicates that operations on the specified pair cannot be performed.

Coding example

To get an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/remote-mirror-copypairs/836000123789,remoteCopyGroup,
remoteCopyGroupP_,remoteCopyGroupS_,pair1/actions/resync
```

When the storage system of the S-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Authorization:Session b74777a3-f9f0-4ea8-bd8f-
09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
```

```
storages/836000123789/remote-mirror-copypairs/836000123456,remoteCopyGroup,
remoteCopyGroupS_,remoteCopyGroupP_,pair1/actions/resync
```

To run the request after getting an action template:

When the storage system of the P-VOL is specified:

```
curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/
remote-mirror-copypairs/836000123789,remoteCopyGroup,remoteCopyGroupP_,
remoteCopyGroupS_,pair1/actions/resync/invoke
```

When the storage system of the S-VOL is specified:

```
 curl -v -H "Accept: application/json" -H "Remote-Authorization:Session 10399a1f-fce3-
489b-9c3a-823017462396" -H "Content-Type: application/json" -H "Authorization:Session
b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./InputParameters.json
https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123789/
remote-mirror-copypairs/836000123456,remoteCopyGroup,remoteCopyGroupS_,
remoteCopyGroupP_,pair1/actions/resync/invoke
```

Chapter 16: Performing Volume Migration operations

This chapter describes how to use the REST API to perform Volume Migration operations.

Overview of Volume Migration

Volume Migration is used to move data on a volume to another volume within the storage system (including a volume on an external storage system). Moving data to another volume is called migration.

Use Volume Migration to perform migration in situations such as the following:

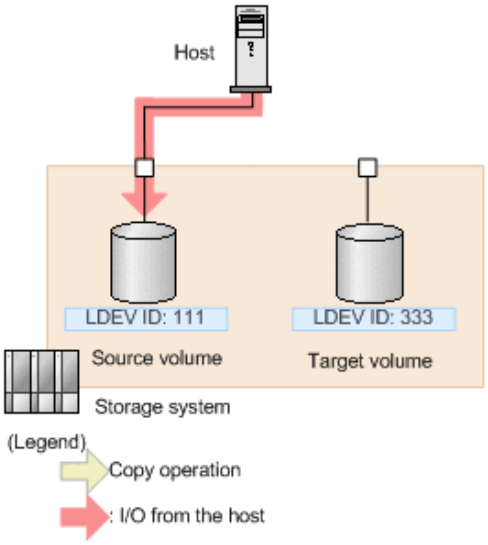
- When you want to migrate data from the old storage system when a new storage system is installed
- When you want to migrate data with a low frequency of I/O operations to an external storage system
- When you want to relocate data with a high frequency of I/O operations to a volume on a drive with a low usage rate or to a volume on a drive with high performance

The host can access data during migration. When migration is complete, the LDEV ID and the host I/O of the migration source volume are automatically swapped with those of the migration target volume. For this reason, the host can continue to access data after the migration by using the same path settings.

The following figures show the flow of data when migration is performed by using Volume Migration.

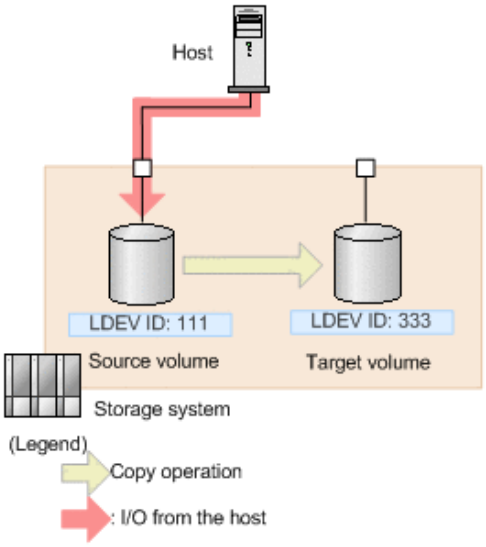
Before migration

I/O from the host is directed to the migration source volume. From the source volume and the target volume (the volume that was created for the purpose of migration), create a pair to be used for Volume Migration.



During migration

When migration is performed, data is copied from the source volume to the target volume. During migration, the host can read and write data online. If a write I/O operation from the host is performed while the data is being copied, only the differential data is copied to the target volume. Copy operations continue to be performed until all differential data has been copied.

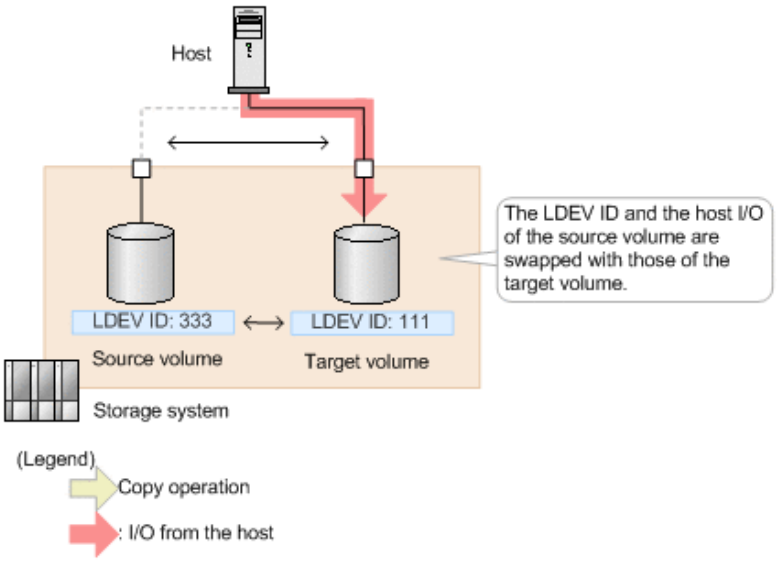


Note:

There is an upper limit to the number of copy operations that can be performed, and the upper limit varies depending on the capacity of the source volume. If differential data still exists after the upper limit for the number of copy operations is exceeded, migration will fail. In this case, reduce the load from the host, and then perform migration again. Use a value of 50 IOPS or less as a reference value for the update I/O operations from the host.

When migration is complete

After the data is copied and the data on the source volume and the data on the target volume are fully synchronized, the LDEV ID and the host I/O of the source volume are swapped with those of the target volume. From the host, the volume and the path settings are the same as before the migration. The actual data, however, has been migrated to the volume that was prepared for migration.



Notes when a pair for Volume Migration was created by using software other than the REST API

If you want to use the REST API to manage a pair that was created by using software other than the REST API, see the description of device group definition methods in the *Command Control Interface User and Reference Guide*, and use the method of running a command to correctly set a copy group and a device group.

Device names described in the *Command Control Interface User and Reference Guide* correspond to copy pair names for the REST API.

Note that if you use the REST API to create a pair, these kinds of information will be set automatically. For this reason, if you want to use the REST API to manage pairs, we recommend that you use the REST API to create pairs.

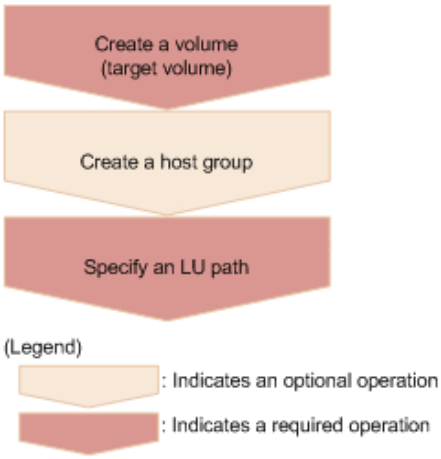
Workflow for performing Volume Migration

The following explains how to perform migrations by using Volume Migration, which is executed by the REST API.

Preparing for migration

Before starting migration, prepare a volume as the migration destination (target volume). You must set an LU path for the target volume.

The following figure shows the workflow.



Creating volumes (target volumes)

Create target volumes to which data is to be migrated.

Creating a host group

Create a host group so that LU paths can be set for the target volumes. The host group does not need to be allocated to the host. You can use an existing host group, but it must not include the volumes to be migrated (source volumes).

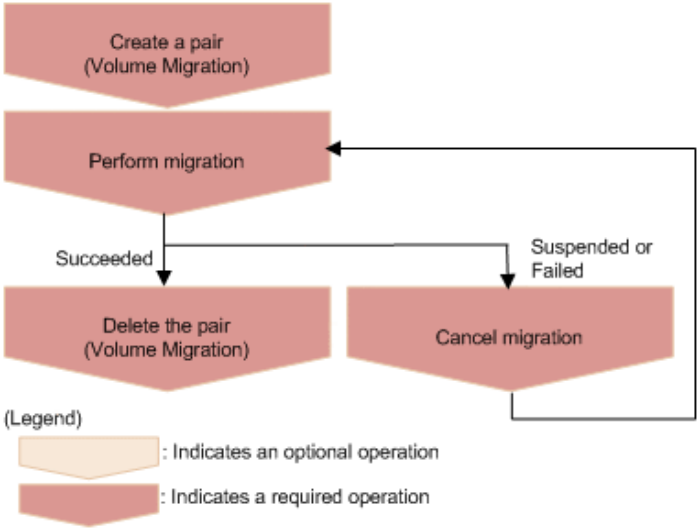
Setting LU paths

Specify the host group that you created for the target volumes, and then set LU paths.

Migrating data

Create Volume Migration pairs by specifying the source volumes as the P-VOLs and the target volumes as the S-VOLs, and then copy the data. You can perform operations on copy pairs in units of copy groups. A copy group is a group made up of copy pairs. Each copy group consists of a device group that is made up of P-VOLs and a device group made up of S-VOLs.

The following figure shows the workflow.



Creating pairs (Volume Migration)

Use the source volumes and the target volumes to create Volume Migration pairs. When a Volume Migration pair is created, the pair status is SMPL. Data is not copied until migration is performed.

Migrating data

Copy data from the source volumes to the target volumes in units of pairs or copy groups. When data copying is complete, the LDEV IDs and the path settings of the source volumes and the target volumes are switched, and the I/O from the host switches to the target volumes.

Deleting pairs (Volume Migration)

After the migration job is complete, if migration was successful, delete the pairs for migration.

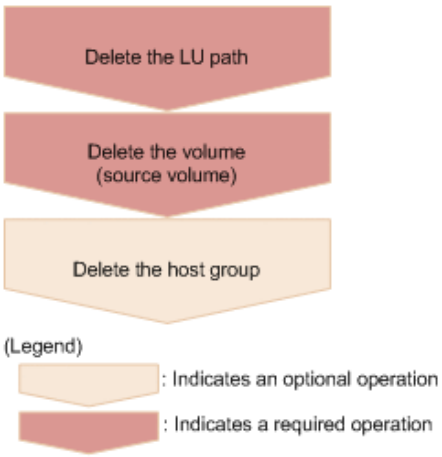
Canceling migration

Cancel migration to stop the migration processing or if a migration job fails. When the migration of a pair is canceled, the pair status changes to SMPL, and you can then perform migration again.

Performing post-migration tasks

Delete the volumes and the host group that were created for migration.

The following figure shows the workflow.



Deleting LU paths

Delete the LU paths that were set for the source volumes. Note that the path settings of source volumes and target volumes are switched when migration finishes. For this reason, be sure to delete the paths set for the host group that was created for volume migration (the host group that is not allocated to the host).

Deleting volumes (source volumes)

Delete the source volumes. Note that the LDEV IDs are switched when migration finishes. For this reason, when specifying the LDEV IDs of the volumes to be deleted, be sure to specify the LDEV IDs of the volumes that were created as the target volumes (volumes that do not receive I/O from the host).

Deleting the host group

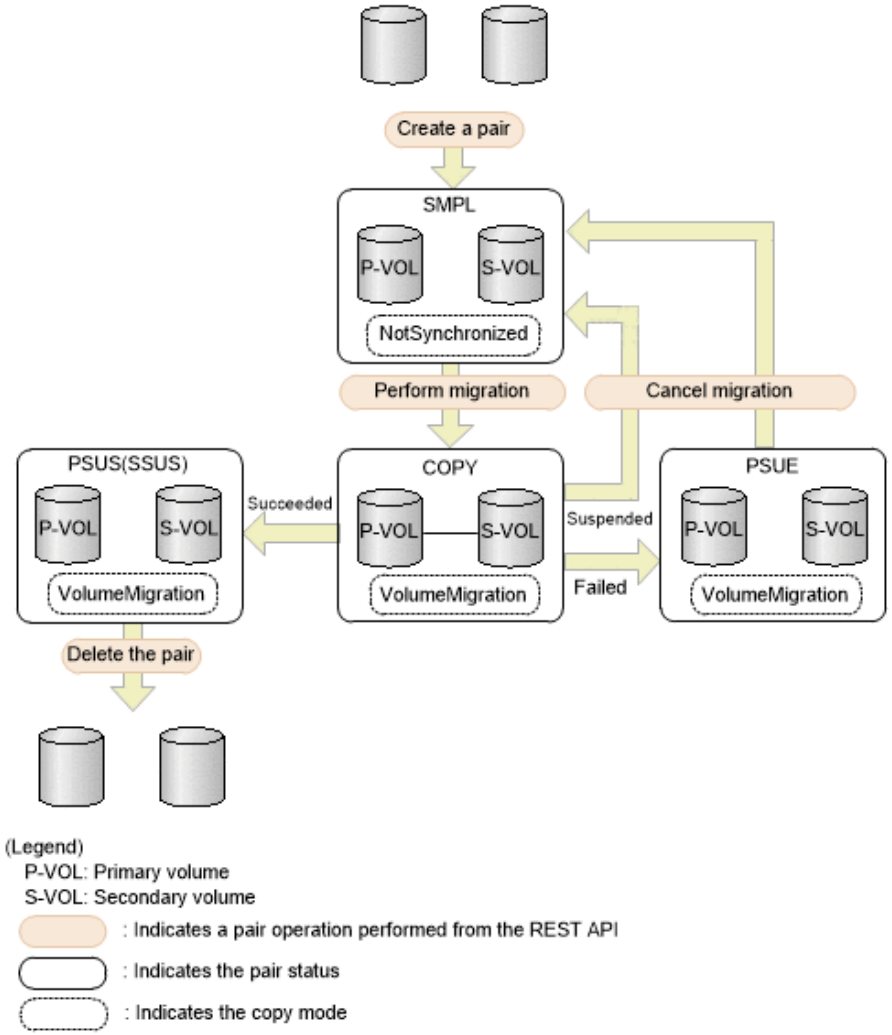
If the host group to which the source volumes belong is no longer necessary, delete the host group.

Specifying Job-Mode-Wait-Configuration-Change in the request header

With respect to operations to perform or cancel migration, data copying might take a long time. As a result, the job status might not change to `Completed` and other jobs might become delayed if you execute multiple asynchronous processes at the same time. In such cases, specify `Job-Mode-Wait-Configuration-Change:NoWait` in the request header, so that the job status changes to `Completed` without waiting for data copying to finish, and the next job starts. In other words, data copying will continue even after the job execution ends. To check whether data copying has finished, check the status of the applicable pair, instead of checking the job status. For details about pair statuses, see the description of pair status transitions.

Pair status transitions (Volume Migration)

The following figure shows how pair statuses transition when certain pair operations are performed.



Pair status	Copy mode	Description	Access to the P-VOL	Access to the S-VOL
SMPL	NotSynchronized	Volume Migration can be performed.	R/W enabled	R/W enabled
COPY	VolumeMigration	The pair status is being migrated.	R/W enabled	-
PSUS	VolumeMigration	Migration is complete. (This value is output for the P-VOL.)	R/W enabled	R/W enabled
SSUS	VolumeMigration	Migration is complete. (This value is output for the S-VOL.)	R/W enabled	R/W enabled
PSUE	VolumeMigration	Migration was interrupted, or migration failed.	R/W enabled	R enabled

Creating a pair to be used for Volume Migration

To perform migration by using the REST API, create a pair of volumes from the source volume (P-VOL) and the target volume (S-VOL). When the pair is created, the status of the pair is SMPL.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "copyGroupName": "vm-cg",
  "pvolDeviceGroupName": "dgp",
  "svolDeviceGroupName": "dgs",
  "copyPairName": "pair",
  "svolLdevId": 40970,
  "pvolLdevId": 40960,
  "replicationType": "SI",
  "copyMode": "NotSynchronized",
  "isNewGroupCreation": true
}
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 29 characters. The name is case sensitive.
isNewGroupCreation	boolean	(Required) Depending on the value, this attribute specifies whether to add a pair to a newly created copy group or to an existing copy group.

Attribute	Type	Description
		Make sure that the Volume Migration pair is not added to a copy group that includes ShadowImage pairs. ▪ `true`: Adds the pair to a newly created copy group. ▪ `false`: Adds the pair to an existing copy group.
copyPairName	string	(Required) Specify the pair name. Value should not exceed 31 characters. The name is case sensitive.
copyMode	string	(Required) Copy mode Specify `NotSynchronized`.
replicationType	string	(Required) Specify `SI`.
pvolLdevId	int	(Required) Specify the LDEV number of the P-VOL (source volume) with a decimal (base 10) number.
svolLdevId	int	(Required) Specify the LDEV number of the S-VOL (target volume) with a decimal (base 10) number.
pvolDeviceGroupName	string	(Optional) Specify the device group name for the P-VOL. Value should not exceed 31 characters. The name is case sensitive. Specify a device group name that differs from the device group name for the S-VOL. In addition, to add a pair to an existing copy group, specify the device group name for an existing P-VOL. If this value is omitted, *copyGroupName*`P_` is assumed.
svolDeviceGroupName	string	(Optional) Specify the device group name for the S-VOL. Value should not exceed 31 characters. The name is case sensitive. Specify a device group name that differs from the device group name for the P-VOL. To add a pair to an existing copy group, specify the device group name for an existing S-VOL. If this value is omitted, *copyGroupName*`S_` is assumed.

Attribute	Type	Description
isDataReductionForceCopy	boolean	(Optional) Specify whether to forcibly create a pair for a volume for which the capacity saving function is enabled. When creating a pair for a volume for which the capacity saving function is enabled, always specify `true`. ▪ `true`: Forcibly create a pair# ▪ `false`: Do not forcibly create a pair When the attribute is omitted, `false` is assumed.

#: If you create a pair by using volumes for which the capacity saving function (compression or deduplication) is enabled, data that has been compressed or deduplicated will be copied and, as a result, the performance of the copying processing or the I/O performance of the host might decrease.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the created pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copypairs
```

Performing migration for an entire copy group

The following request performs migration to copy the data in the source volume (P-VOL) to the target volume (S-VOL) for the entire specified copy group. When the copy operation is complete, the host switches from accessing the target volume to accessing the source volume.

Note:

After copying the data by successfully executing the API request for performing migration, execute the API request for deleting a pair to change the pair status of the source volume and the target volume to SMPL.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the workflow for performing Volume Migration.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/migrate/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.

Attribute	Type	Description
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To check whether the migration was successful, execute the API request for obtaining information about a copy group. The possible pair statuses are as follows:

- If the migration was successful: `PSUS`
- If the migration failed: `PSUE`

Action template

None.

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT -d "" https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/local-clone-
copygroups/vm-cg,dgp,dgs/actions/migrate/invoke
```

Performing migration

The following request performs migration to copy the data of the source volume (P-VOL) to the target volume (S-VOL). When the copy operation is complete, the host switches from accessing the target volume to accessing the source volume.

Note:

After copying the data by successfully executing the API request for performing migration, execute the API request for deleting a pair to change the pair status of the source volume and the target volume to SMPL.

Tip: We recommend specifying `Job-Mode-Wait-Configuration-Change:NoWait` in the request header of this API function. For details, see the description of the workflow for performing Volume Migration.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/migrate/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To check whether the migration was successful, execute the API request for obtaining information about a pair. The possible pair statuses are as follows:

- If the migration was successful: `PSUS`
- If the migration failed: `PSUE`

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT -d "" https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/local-clone-
copypairs/vm-cg,dgp,dgs,p1/actions/migrate/invoke
```

Getting a list of copy groups (Volume Migration)

The following request gets information about the copy groups containing pairs in the storage system.

Important:

If the copy group name or device group name contains spaces, the copy group information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `pair` Specify this parameter to get detailed information about the pairs in each copy group in addition to a list of copy groups. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Body

None.

Response message

Body

```
{
  "data": [
    {
      "copyGroupName": "localCopyGroup1",
```

```
      "pvolDeviceGroupName": "localCopyGroup1P_",
      "svolDeviceGroupName": "localCopyGroup1S_",
      "localCloneCopygroupId": "localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_"
    },
    {
      "copyGroupName": "localCopyGroup2",
      "pvolDeviceGroupName": "localCopyGrouppvol",
      "svolDeviceGroupName": "localCopyGroupsvol",
      "localCloneCopygroupId": "localCopyGroup2,localCopyGrouppvol,
localCopyGroupsvol"
    }
  ]
}
```


Attribute	Type	Description
copyGroupName	string	Copy group name
pvolDeviceGroupName	string	Device group name for the P-VOL (source volume)
svolDeviceGroupName	string	Device group name for the S-VOL (target volume)
localCloneCopygroupId	string	Object ID of the copy group that contains a pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName`

If you run the request with `pair` specified for the query parameter `detailInfoType`, you can get the following information, in addition to a list of copy groups:

Attribute	Type	Description
copyPairs	object[]	The following attributes about the pairs included in the copy group:

Attribute	Type	Description
		If information cannot be acquired, the attributes under the `copyPairs` object are not output. ▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Pair name ▪ replicationType (string) Pair type Outputs `SI` . ▪ copyMode (string) Copy mode ▪ `NotSynchronized`: Pairs created for the purpose of performing migration ▪ `VolumeMigration`: Pairs for which migration is in progress or for which migration is complete Other values are displayed for pairs that do not meet either of the preceding conditions. ▪ pvolLdevId (int) LDEV number of the P-VOL ▪ svolLdevId (int) LDEV number of the S-VOL ▪ pvolStatus (string) Pair volume status of the P-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained.

Attribute	Type	Description
		▪ svolStatus (string) Pair volume status of the S-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained. ▪ localCloneCopypairId (string) Object ID of the pair ▪ pvolMuNumber (int) MU number of the P-VOL

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copygroups
```

Getting information about a specific copy group (Volume Migration)

The following request acquires information about the specified copy group and about the pairs within that copy group that are to be used for Volume Migration. This operation allows you to check the status of the pairs and to acquire their pair configuration information.

Important:

- If the target copy group contains a pair that was created or deleted by using another REST API server or software other than the REST API, correct information about that pair might not be obtained. To obtain the most recent information about such pairs, use the API for obtaining a list of pairs.
- If the copy group name, device group name, or copy pair name contains spaces, the information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID
```

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specifies the device group name for the P-VOL (source volume). Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specifies the device group name for the S-VOL (target volume). Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "localCloneCopygroupId" : "vm-cg,dgp,dgs",
  "copyGroupName" : "vm-cg",
  "pvolDeviceGroupName" : "dgp",
  "svolDeviceGroupName" : "dgs",
  "copyPairs" : [ {
    "localCloneCopypairId" : "vm-cg,dgp,dgs,p0",
    "copyGroupName" : "vm-cg",
```

```
    "copyPairName" : "p0",
    "replicationType" : "SI",
    "copyMode" : "NotSynchronized",
    "pvolLdevId" : 40970,
    "pvolStatus" : "SMPL",
    "svolLdevId" : 40960,
    "svolStatus" : "SMPL",
    "pvolMuNumber" : 0,
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  }, {
    "localCloneCopypairId" : "vm-cg,dgp,dgs,p1",
    "copyGroupName" : "vm-cg",
    "copyPairName" : "p1",
    "replicationType" : "SI",
    "copyMode" : "NotSynchronized",
    "pvolLdevId" : 40971,
    "pvolStatus" : "SMPL",
    "svolLdevId" : 40961,
    "svolStatus" : "SMPL",
    "pvolMuNumber" : 0,
    "pvolProcessingStatus": "N",
    "svolProcessingStatus": "N"
  } ]
}
```


Attribute	Type	Description
copyGroupName	string	Copy group name
pvolDeviceGroupName	string	Device group name for the P-VOL
svolDeviceGroupName	string	Device group name for the S-VOL
localCloneCopygroupId	string	Object ID of the copy group that contains a pair The following attributes are output, separated by commas: ▪ `copyGroupName` ▪ `pvolDeviceGroupName` ▪ `svolDeviceGroupName`

Attribute	Type	Description
copyPairs	object[]	The following attributes about the pairs included in the copy group: ▪ copyGroupName (string) Copy group name ▪ copyPairName (string) Pair name ▪ replicationType (string) Pair type Outputs `SI` . ▪ copyMode (string) Copy mode ▪ `NotSynchronized`: Pairs created for the purpose of performing migration ▪ `VolumeMigration`: Pairs for which migration is in progress or for which migration is complete Other values are displayed for pairs that do not meet either of the preceding conditions. ▪ copyProgressRate (int) Copy progress rate (%) This attribute is not output if no information can be obtained. ▪ pvolLdevId (int) LDEV number of the P-VOL ▪ svolLdevId (int) LDEV number of the S-VOL ▪ pvolStatus (string) Pair volume status of the P-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained.

Attribute	Type	Description
		▪ svolStatus (string) Pair volume status of the S-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained. ▪ localCloneCopypairId (string) Object ID of the pair ▪ pvolMuNumber (int) MU number of the P-VOL ▪ pvolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. The same value as that of `svolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500. ▪ svolProcessingStatus (string) Processing status of the pair • `E`: The expansion processing is in progress. • `N`: The expansion processing is not in progress. The same value as that of `pvolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the section explaining HTTP status codes.

Status code	Message	Description
404	Not Found	No copy group can be obtained, or no pair was included in the copy group that was obtained.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/local-clone-
copypairs?localCloneCopyGroupId=vm-cg,dgp,dgs
```

Getting a list of pairs (Volume Migration)

The following request obtains information about the pairs in a copy group specified by using query parameters. You can also update the pair information when you obtain information about pairs.

Important:

- If the target copy group contains a pair that was created or deleted by using another REST API server or software other than the REST API, information about that pair might not be obtained. In this case, if you specify `refresh=true` as a query parameter and run the request, you might be able to get the most recent pair information. Note that such processing takes time because the information about the pairs in the specified copy group is updated, and then information is obtained.
- If the copy group name, device group name, or copy pair name contains spaces, the information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
localCloneCopyGroupId	string	(Required) Object ID of the copy group that contains a pair Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes, separated by a comma: *`copyGroupName,pvolDeviceGroupName, svolDeviceGroupName`* ▪ copyGroupName (string) Copy group name Value should not exceed 31 characters. ▪ pvolDeviceGroupName (string) Device group name for the P-VOL (source volume) Value should not exceed 31 characters. ▪ svolDeviceGroupName (string) Device group name for the S-VOL (target volume) Value should not exceed 31 characters.
refresh	boolean	(Optional) Whether to update the pair information to the most recent: ▪ `true`: Pair information will be updated. ▪ `false`: Pair information will not be updated. If you specify `true`, processing takes time because the information about the pairs in the specified copy group is updated and then information is obtained. If this parameter is omitted, `false` is assumed.

Body

None.

Response message

Body

Information about the pairs in the specified copy group is obtained in a list. For details about the response body, see the section describing the API for obtaining information about a specific pair.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X GET "https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copypairs?localCloneCopyGroupId=localCopyGroup1,
localCopyGroup1P_,localCopyGroup1S_&refresh=true"
```

Getting information about a specific pair (Volume Migration)

The following request gets information about specific pairs to be used for Volume Migration. This operation allows you to obtain information about the status and the configuration information of the pairs.

Important:

- If the target pair was created or deleted by using another REST API server or software other than the REST API, correct information about that pair might not be obtained. To obtain the most recent information about the pairs, use the API for obtaining a list of pairs.
- If the copy group name, device group name, or pair name contains spaces, information cannot be obtained.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID
```

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "localCloneCopypairId" : "vm-cg,dgp,dgs,p1",
  "copyGroupName" : "vm-cg",
  "copyPairName" : "p1",
  "replicationType" : "SI",
  "copyMode" : "NotSynchronized",
  "pvolLdevId" : 40971,
  "pvolStatus" : "SMPL",
  "svolLdevId" : 40961,
  "svolStatus" : "SMPL",
  "pvolMuNumber" : 0,
  "pvolProcessingStatus": "N",
```

```
  "svolProcessingStatus": "N"
}
```

Attribute	Type	Description
copyGroupName	string	Copy group name
copyPairName	string	Pair name
replicationType	string	Pair type Outputs `SI`
copyMode	string	Copy mode ▪ `NotSynchronized`: Pairs created to be used for migration ▪ `VolumeMigration`: Pairs for which migration is being performed or complete Other values are displayed for pairs other than the above.
copyProgressRate	int	Copy progress rate (%) This attribute is not output if no information can be obtained.
pvolLdevId	int	LDEV number of the P-VOL
svolLdevId	int	LDEV number of the S-VOL
pvolStatus	string	Pair volume status of the P-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained.
svolStatus	string	Pair volume status of the S-VOL For details, see the section describing the pair status (Volume Migration). This attribute is not output if no information can be obtained.
localCloneCopypairId	string	Object ID of the pair
pvolMuNumber	int	MU number of the P-VOL

Attribute	Type	Description
pvolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. The same value as that of `svolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.
svolProcessingStatus	string	Processing status of the pair ▪ `E`: The expansion processing is in progress. ▪ `N`: The expansion processing is not in progress. The same value as that of `pvolProcessingStatus` is output. This attribute is output for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP G1000, VSP G1500, VSP F350, F370, F700, F900, VSP F1500.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/local-clone-
copypairs/vm-cg,dgp,dgs,p1
```

Deleting a pair (Volume Migration)

The following request deletes the specified pair. If there is no pair in the copy group, the copy group and the device group that make up the copy group are also deleted.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID
```

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted pair

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Authorization:Session b74777a3-f9f0-4ea8-
bd8f-09847fac48d3" -X DELETE https://192.0.2.100:23451/ConfigurationManager/v1/
objects/storages/886000123457/local-clone-copypairs/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_,pair1
```

Deleting a copy group (Volume Migration)

The following request deletes pairs by using the specified copy group. When the pairs are all deleted, the device groups are also deleted.

Execution permission

Storage Administrator (Provisioning) and Storage Administrator (Local Copy)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID
```

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the deleted copy group

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE --data-binary
@./InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copygroups/localCopyGroup1,localCopyGroup1P_,
localCopyGroup1S_
```

When forcibly deleting a copy group

When a copy group cannot be deleted because the device group in a local storage system remains or because the configuration is not normal, you can forcibly delete the copy group by specifying the `forceDelete` attribute for the request body. The following shows a coding example of using the `forceDelete` attribute:

```
{
  "forceDelete" : true
}
```

Attribute	Type	Description
forceDelete	boolean	(Optional) Specify whether to delete the copy group forcibly. ▪ `true`: Forcibly delete the copy group. ▪ `false`: Do not forcibly delete the copy group. When the attribute is omitted, `false` is assumed.

Canceling migration for an entire copy group

The following request cancels migration of the pairs in a specified copy group. You can use this request if you want to cancel a migration that is in progress, or if an attempted migration fails. If migration is canceled, the status of the pairs included in the target copy group reverts to SMPL.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copygroups/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopygroupId` value obtained by getting the list of copy groups. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters":{
    "forceSplit": true
  }
}
```

Attribute	Type	Description
forceSplit	boolean	(Optional) Specify whether to cancel migration. ▪ `true`: Cancel migration. ▪ `false`: Do not cancel migration. If this attribute is omitted, `false` is assumed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the copy group for which migration was canceled

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copygroups/vm-cg,dgp,dgs/actions/split/invoke
```

Canceling migration

The following request cancels migration of the specified pair. You can use this request if you want to cancel a migration that is in progress, or if an attempted migration fails. If migration is canceled, the status of the pair reverts to SMPL.

Execution permission

Storage Administrator (Local Copy)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/local-clone-copypairs/object-ID/
actions/split/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `localCloneCopypairId` value obtained by getting the pair information. You can also specify the following attributes and connect them with commas:

```
copyGroupName,pvolDeviceGroupName,svolDeviceGroupName,copyPairName
```

Attribute	Type	Description
copyGroupName	string	(Required) Specify the copy group name. Value should not exceed 31 characters. The name is case sensitive.
pvolDeviceGroupName	string	(Required) Specify the P-VOL (source volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
svolDeviceGroupName	string	(Required) Specify the S-VOL (target volume) device group name. Value should not exceed 31 characters. The name is case sensitive.
copyPairName	string	(Required) Specify the name of the pair. Value should not exceed 31 characters. The name is case sensitive.

Query parameters

None.

Body

```
{
  "parameters":{
    "forceSplit": true
  }
}
```

Attribute	Type	Description
forceSplit	boolean	(Optional) Specify whether to cancel migration. ▪ `true`: Cancel migration. ▪ `false`: Do not cancel migration. If this attribute is omitted, `false` is assumed.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the pair for which migration was canceled

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type: application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/local-clone-copypairs/vm-cg,dgp,dgs,p1/actions/split/invoke
```

Chapter 17: Performing Universal Volume Manager operations

This chapter describes how to use the REST API to perform Universal Volume Manager operations.

Overview of Universal Volume Manager

Universal Volume Manager is a function that virtualizes storage devices and enables different models of storage systems to be used as one storage system.

To use volumes on an external storage system as external volumes, use a cable to connect the external connection port of the local storage system and the port of the external storage system, and then allocate (map) the volumes of the external storage system to the local storage system.

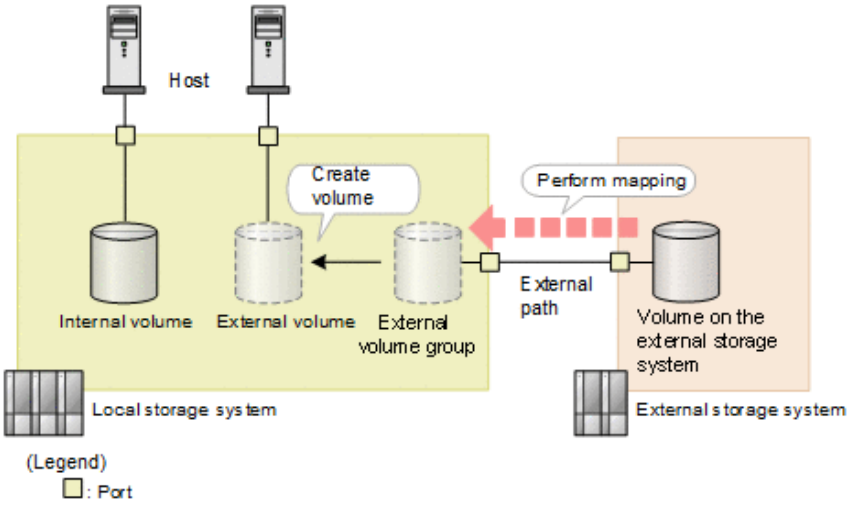
External volumes are used in situations such as the following:

- When you want to back up data in the volumes on the local storage system to the external storage system
- When you want to allocate an external volume to a host when the host issues a request for a volume to be used for storing data
- When you want to migrate data from the old storage system (external storage system) when a new storage system is installed

To discontinue the use of an external storage system that has become unnecessary, unmap the volumes of the unnecessary external storage system.

For details about the functions of Universal Volume Manager and related notes, see the *Hitachi Universal Volume Manager User Guide*.

The following figure shows the system configuration for using Universal Volume Manager, and the components of that configuration.



Local storage system

The local storage system receives requests from the REST API client.

External storage system

The external storage system is connected to the local storage system via external paths.

External path

An external path is a route by which the external connection port of the local storage system and the port of the external storage system are connected. You can set multiple routes as external paths. A group consisting of multiple external volumes that use the same external path is called an external path group.

External volume group

An external volume group is used to manage external volumes on the local storage system. Although an external volume group does not include parity information, it is managed in the same way as a parity group is managed. By registering volumes on the external storage system in the external volume group, you can use the external volume from the local storage system. For some storage systems, external volume groups are referred to as external parity groups.

External volume

You can enable volumes on an external storage system to be used from the host by creating external volumes from the external volume group. You can use the external volumes in the same way as other volumes on the local storage system.

Important:

If you are using the REST API, Storage Advisor Embedded, or CCI, attempts to perform multiple, concurrent executions of the following operations might fail or produce incorrect results.

- Getting a list of ports on an external storage system
- Getting a list of the LUs of ports on an external storage system
- Getting information about the iSCSI targets of ports on an external storage system
- Performing a test to log in to an iSCSI target of an external storage system registered to the port of the local storage system

We recommend that you do not perform multiple, concurrent executions of these operations. For details about the problems that might occur if you perform multiple, concurrent executions of these operations and how to resolve these problems, see the note on the number of concurrent executions of operations in the *Hitachi Universal Volume Manager User Guide*.

Workflow for Universal Volume Manager

This section describes the workflow in the REST API for using Universal Volume Manager to virtualize and use external storage system resources.

Note: For the REST API, if the virtual port mode of the local storage system is enabled, the virtual port ID is assumed to be 0. If the virtual port mode is enabled, use CCI to perform operations on ports.

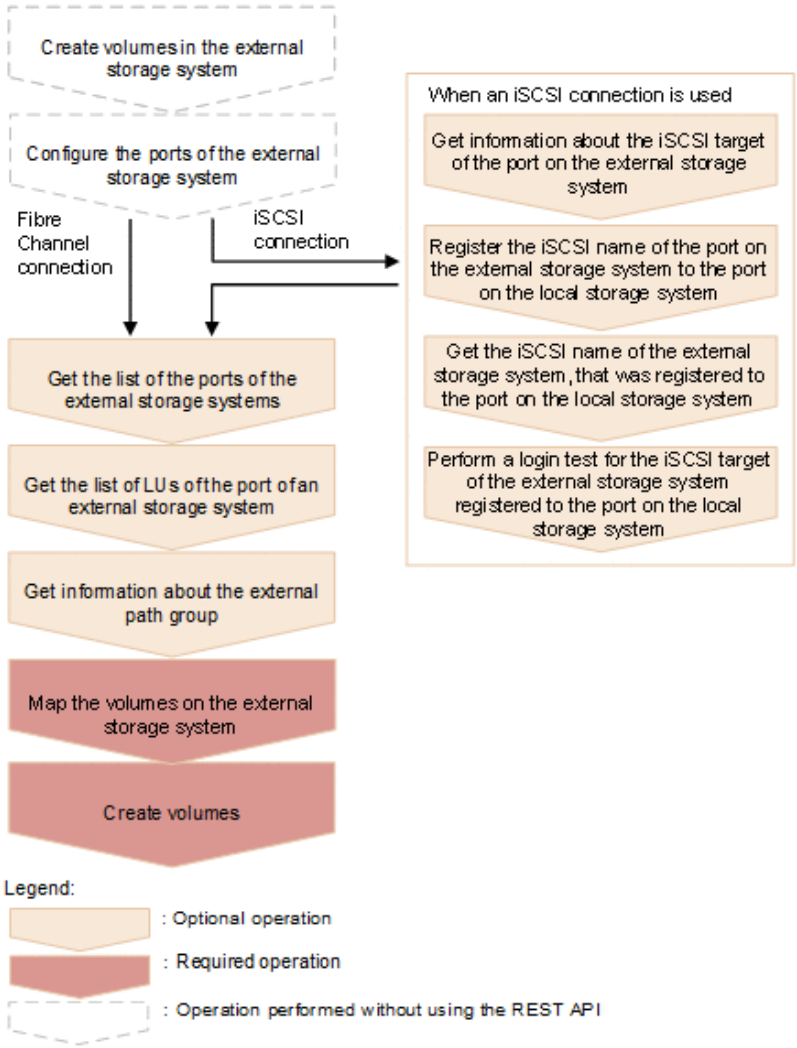
Using external volumes

Create external volumes by mapping volumes of the external storage system that is connected to the port of the local storage system.

Important:

- For storage systems of the VSP 5000 series, if the port on the local storage system is a target port, you need to change that port on the local storage system to a bidirectional port.
- If you are using VSP G1000, VSP G1500, VSP F1500, you need to change the port on the local storage system to an external port.

The workflow is shown in the following diagram.



Create volumes in the external storage system

Create volumes in the external storage system. If the external storage system supports the REST API, you can use the REST API on the external storage system to create volumes.

Configure the ports of the external storage system

Configure the ports of the external storage system and the system options. For details on how to configure the ports and options, see the manual for the external storage system that you are using.

(for iSCSI) Get information about the iSCSI target of the port on the external storage system

If the external storage system is connected via an iSCSI connection, retrieve information about the iSCSI target of the port on the external storage system.

(for iSCSI) Register the iSCSI name of the port on the external storage system to the port on the local storage system

If the external storage system is connected via an iSCSI connection, register the retrieved iSCSI name of the port on the external storage system to the port on the local storage system.

After registering the iSCSI name, use the API request for performing a login test make sure that you can successfully log in.

(for iSCSI) Get the iSCSI name of the external storage system, that was registered to the port on the local storage system

If the external storage system is connected via an iSCSI connection, get the iSCSI name of the port on the external storage system, that was registered to the port on the local storage system.

(for iSCSI) Perform a login test for the iSCSI target of the external storage system, that was registered to the port of the local storage system

If the external storage system is connected via an iSCSI connection, test whether you can log in to the iSCSI target of the external storage system by using the retrieved iSCSI name.

If you cannot log in, revise the settings so that you can log in, or delete the iSCSI target. If you do not delete iSCSI targets that cannot be used to log in, when you retrieve information about iSCSI targets of the port on the external storage system, there will be an increased load on the network or external storage system and information might not be retrieved successfully.

Get the list of the ports of the external storage systems

Get information about the ports of the external storage systems that are connected. The obtained information will be used to map volumes on the external storage system.

Get the list of LUs defined for the port on the external storage system

Get information about the LUs that are defined for the ports of the connected external storage system. The obtained information will be used to map volumes on the external storage system.

Get information about the external path group

To use an existing external path group to perform mapping, get information about the external path group and check the path group ID.

When an iSCSI connection is used and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

Map the volumes on the external storage system

Create external volume groups, and register information about the volumes on the external storage system that you want to map. Check the registered mapping information with the API function for getting information about the external path group to which the external volume groups that you created belong.

When an iSCSI connection is used and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

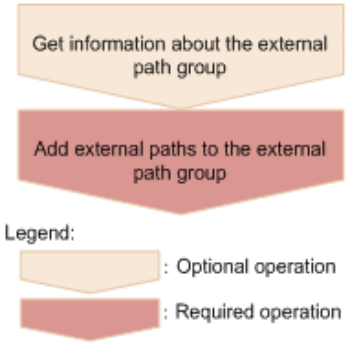
Create volumes

Create external volumes from the external volume groups that have been created in the local storage system. The created external volumes can be allocated to the host or used as pool volumes (this is the same as other volumes in the local storage system).

Making the external paths redundant

You can make the access routes to the volumes on the external storage system redundant by setting multiple external paths between the local storage system and the external storage system. To set multiple external paths, add the paths to the external path group. The external path group is created automatically when volumes on the external storage system are mapped.

The workflow is shown in the following diagram.



Get information about the external path group

Get information about the target external path group to check the path group ID.

When an iSCSI connection is used and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

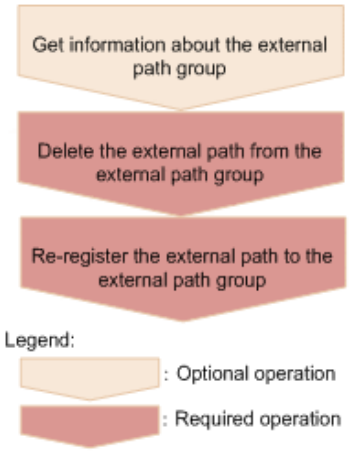
Add external paths to the external path group

Add external paths by specifying the external path group.

Changing priorities of external paths

The priorities of external paths depend on the order that the paths are registered to the external path group. To change the priority of a path in the REST API, delete the paths that are registered before the path for which you want to increase the priority, and then re-register the paths.

The workflow for external paths is shown in the following diagram.



Get information about the external path group

Get information about the target external path group, and check the priorities of the external paths and the path group ID.

When an iSCSI connection is used and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

Delete the external path from the external path group

From the external path group, delete the external path whose priority you want to reduce.

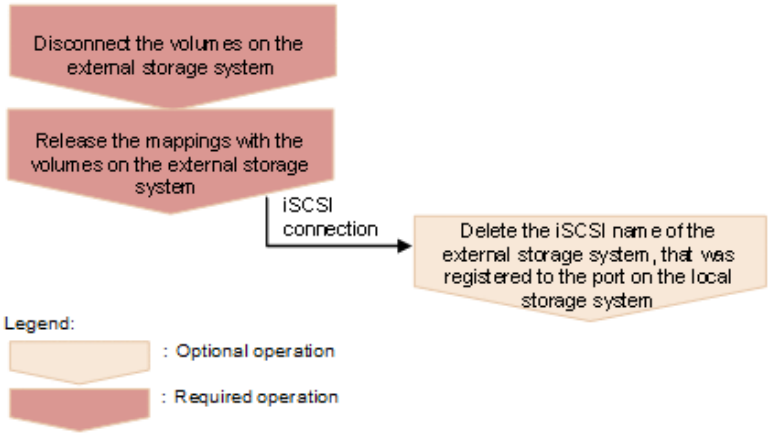
Re-register the external path to the external path group

Re-register the deleted external path in the external path group. To add more than one path, re-register the paths starting from the path with a higher priority.

Abolishing the use of volumes on the external storage system

To dispose of an external storage system, disconnect the volumes on the external storage system to release the mappings, and abolish the use of the volumes on the external storage system.

The workflow is shown in the following diagram.



Disconnect the volumes on the external storage system

Disconnect the volumes on the external storage system. Input operations to and output operations from the mapped volumes on the external storage system are stopped, and the data stored in the cache memory is written (destaged) to the volumes on the external storage system.

Release the mappings with the volumes on the external storage system

Delete the external volume groups to release the mappings with the volumes on the external storage system. Data that has been written to the volumes on the external storage system site is not deleted after mappings are released. When the last external volume groups in the external path group is deleted, the path group is automatically deleted.

(for iSCSI) Delete the iSCSI name of the external storage system, that was registered to the port on the local storage system

If the connection to the iSCSI target is no longer necessary, delete the iSCSI name of the external storage system, that was registered to the port on the local storage system.

Getting information about an iSCSI target of a port on an external storage system

This request gets information by searching for an iSCSI target (on an external storage system) that is connected to the local storage system.

Note:

- `0` is assumed for the virtual port ID if virtual port mode is enabled for the local storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/iscsi-ports/object-ID/actions/
discover/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attributes	Type	Description
portId	string	(Required) Port number of the local storage system

Query parameters

None.

Body

```
{
    "parameters": {
        "iscsiIpAddress": "192.168.0.100",
        "tcpPort": 3260
    }
}
```

Attribute	Type	Description
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system Specify an IPv4 or IPv6 IP address.
tcpPort	int	(Optional) TCP port number of the iSCSI target on the external storage system If this attribute is omitted, the TCP port number of the port on the local storage system is assumed.

Response message

Body

```
{
    "portId": "CL1-A",
    "externalIscsiTargets": [
        {
            "iscsiIpAddress": "192.168.0.100",
            "tcpPort": 3260,
            "iscsiName": "iqn.rest.example.of.iscsi1",
            "virtualPortId": 0,
            "isRegistered": true
        },
        {
            "iscsiIpAddress": "192.168.0.101",
            "tcpPort": 3260,
            "iscsiName": "iqn.rest.example.of.iscsi2",
            "virtualPortId": 0,
            "isRegistered": false
        }
    ]
}
```

Attribute	Type	Description
portId	string	Port number of the local storage system
externalIscsiTargets	object[]	The following attributes related to the iSCSI target of the external storage system are output: ▪ tcpPort (int) TCP port number ▪ iscsiIpAddress (string) IP address of the iSCSI target ▪ iscsiName (string) iSCSI name of the iSCSI target

Attribute	Type	Description
		▪ virtualPortId (int) ID of the virtual port by which the local storage system is connected to the external storage system This attribute is output if the virtual port mode is enabled. ▪ isRegistered (boolean) Indicates whether this iSCSI target is registered to the iSCSI port of the local storage system ▪ `true`: The iSCSI target is registered to the iSCSI port of the local storage system. ▪ `false`: The iSCSI target is not registered to the iSCSI port of the local storage system.

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X PUT "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/iscsi-ports/
CL1-A/actions/discover/invoke"
```

Registering an iSCSI name of an external storage system to a port on the local storage system

This request registers an iSCSI name of an external storage system to a port on the local storage system.

After registering the iSCSI name, run the API request that performs a login test to verify that you can log in. If the attempt to log in fails, revise the settings so that you can log in, or delete that iSCSI target. If iSCSI targets remain to which you cannot log in, attempts to obtain information might fail because a heavy load might be placed on the network or external storage system when you search for an iSCSI target of a port on the external storage system.

Note:

- `0` is assumed for the virtual port ID if virtual port mode is enabled for the local storage system.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/iscsi-ports/object-ID/actions/
register/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attribute	Type	Description
portId	string	(Required) Port number of the local storage system

Query parameters

None.

Body

```
{
    "parameters": {
        "iscsiIpAddress": "192.168.0.100",
        "iscsiName": "iqn.rest.example.of.iscsi1",
        "tcpPort" : 3260
    }
}
```

Attribute	Type	Description
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system Specify an IPv4 or IPv6 IP address.

Attribute	Type	Description
iscsiName	string	(Required) iSCSI name of the iSCSI target on the external storage system Specify the name in iqn or eui format. This attribute is case sensitive.
tcpPort	int	(Optional) TCP port number of the iSCSI target on the external storage system If this attribute is omitted, the TCP port number of the port on the local storage system is assumed. If the iSCSI name and IP address to be specified are already registered to a port of the local storage system, set the same value as that port or omit this attribute. If you omit this attribute in this situation, the following settings are applied: ▪ If the iSCSI name and IP address are already registered to the same port as the port specified for object-ID, the registered `tcpPort` value is not changed. ▪ If the iSCSI name and IP address are registered to a port different from the port specified for object-ID, the same value as the value that was set for `tcpPort` when the iSCSI name and IP address were registered to that port is set for the port specified for object-ID.

Response message

A job object is returned. For details about attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the port (on the local storage system) to which information about the iSCSI name of the external storage system is registered

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X PUT "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/iscsi-ports/
CL1-A/actions/register/invoke"
```

Getting the iSCSI name of an external storage system that is registered to a port on the local storage system

The following request gets information about the iSCSI name of an iSCSI target of a port on an external storage system that is registered to a port on the specified local storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/iscsi-ports/object-ID
```

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attribute	Type	Description
portId	string	(Required) Port number of the local storage system

Query parameters

None.

Body

None.

Response message

Body

```
{
    "portId": "CL1-A",
    "externalIscsiTargets": [
        {
```

```
            "iscsiIpAddress": "192.168.0.100",
            "tcpPort": 3260,
            "iscsiName": "iqn.rest.example.of.iscsi1",
            "authenticationMode": "CHAP",
            "iscsiTargetDirection" "D",
            "chapUserName": "Win_SQL_EX",
            "isSecretSet": true,
            "virtualPortId": 0
        },
        {
            "iscsiIpAddress": "192.168.0.101",
            "tcpPort": 3260,
            "iscsiName": "iqn.rest.example.of.iscsi2",
            "authenticationMode": "NONE",
            "iscsiTargetDirection" "S",
            "chapUserName": "-",
            "isSecretSet": false,
            "virtualPortId": 0
        }
    ]
}
```


Attribute	Type	Description
portId	string	Port number of the local storage system
externalIscsiTargets	object[]	The attributes related to the iSCSI target on the external storage system are output. An empty array is output if the port on the external storage system is a Fibre Channel port. ▪ iscsiIpAddress (string) IP address of the iSCSI target ▪ tcpPort (int) TCP port number ▪ iscsiName (string) iSCSI name ▪ authenticationMode (string) CHAP-authentication mode • `CHAP`: CHAP-authentication mode • `NONE`: No authentication mode

Attribute	Type	Description
		▪ iscsiTargetDirection (string) Direction of the iSCSI target CHAP-authentication • `D`: Bidirectional authentication (The iSCSI target and the iSCSI initiator authenticate each other.) • `S`: Unidirectional authentication (The iSCSI target authenticates the iSCSI initiator.) ▪ chapUserName (string) CHAP user name The following user name is output: the user name used when the direction of CHAP-authentication is bidirectional. This also appears if CHAP-authentication mode is `NONE`. A hyphen (`-`) appears if the CHAP user name is omitted.# ▪ isSecretSet (boolean) Indicates whether a secret password is set for the CHAP authentication • `true`: A password is set. • `false`: A password is not set. ▪ virtualPortId (int) ID of the virtual port by which the local storage system is connected to the external storage system This attribute is output if virtual port mode is enabled.

#: A hyphen (`-`) is output if `-` is specified for the CHAP user name.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X GET "https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/iscsi-ports/
CL1-A"
```

Performing a login test on an iSCSI target of an external storage system that is registered to a port on the local storage system

The following request gets a login result by logging in to an iSCSI target on an external storage system that is registered to a port on the local storage system.

If an attempt to log in fails, revise the settings so that you can log in to the iSCSI target, or delete that iSCSI target. If iSCSI targets remain to which you cannot log in, attempts to obtain information might fail because a heavy load might be placed on the network or external storage system when you search for an iSCSI target of a port on the external storage system.

Note:

- `0` is assumed for the virtual port ID if virtual port mode is enabled for the local storage system.

Execution permission

Storage Administrator (View Only)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/iscsi-ports/object-ID/actions/
check/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attribute	Type	Description
portId	string	(Required) Port number of the local storage system

Query parameters

None.

Body

```
{
    "parameters": {
        "iscsiIpAddress": "192.168.0.100",
        "iscsiName": "iqn.rest.example.of.iscsi1"
    }
}
```

Attribute	Type	Description
iscsiIpAddress	string	(Required) IP address of the iSCSI target of the external storage system Specify an IPv4 or IPv6 IP address.
iscsiName	string	(Required) iSCSI name of the iSCSI target of the external storage system Specify the name in iqn or eui format. This attribute is case sensitive.

Response message

Body

```
{
    "portId": "CL1-A",
    "externalIscsiTargets": [
        {
            "iscsiIpAddress": "192.168.0.100",
            "iscsiName": "iqn.rest.example.of.iscsi1",
            "isLoginSucceeded": true
        }
    ]
}
```

Attribute	Type	Description
portId	string	Port number of the local storage system

Attribute	Type	Description
externalIscsiTargets	object[]	The following attributes related to the iSCSI target of the external storage system are output: ▪ iscsiIpAddress (string) IP address of the iSCSI target ▪ iscsiName (string) iSCSI name of the iSCSI target ▪ isLoginSucceeded (boolean) Result of logging in to the iSCSI target ▪ `true`: The login attempt succeeded. ▪ `false`: The login attempt failed.

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X PUT "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/iscsi-ports/
CL1-A/actions/check/invoke"
```

Getting a list of ports on an external storage system

The following request acquires a list of ports for an external storage system that is connected to the local storage system.

Note:

- In the case of an iSCSI port, if an iSCSI target that cannot connect to the target iSCSI port is registered, attempts to obtain information might fail because a heavy load might be placed on the network or external storage system. After registering the iSCSI name, perform a login test to verify that you can log in.
- If the local storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, or VSP Fx00 models storage system and you use a port for external connections as the endpoint of an I/O path from an external storage system to the local storage system, the I/O path might become disconnected. Use a route that can be used as an external path. For details about external paths, see the *Hitachi Universal Volume Manager User Guide*.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-storage-ports
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
portId	string	(Required) Number of the port on the local storage system

Body

None.

Response message

Body

The following is a coding example when a Fibre Channel port is used:

```
{
  "data" : [ {
    "externalWwn" : "50060e80222fd141",
    "portId" : "CL7-A",
    "externalSerialNumber" : "477777",
```

```
    "externalStorageInfo" : "HITACHI VSP Gx00",
    "externalPathMode" : "Multi",
    "externalIsUsed" : false
  } ]
}
```

The following is a coding example when an iSCSI port is used:

```
{
  "data" : [ {
    "portId" : "CL2-D",
    "externalSerialNumber" : "477777",
    "externalStorageInfo" : "HITACHI VSP Gx00",
    "externalPathMode" : "Multi",
    "externalIsUsed" : true,
    "iscsiIpAddress" : "192.0.1.100",
    "iscsiName" : "iqn.rest.example.of.iscsi1",
    "virtualPortId" : 0
  } ]
}
```

Attribute	Type	Description
portId	string	Number of the port on the local storage system
externalWwn	string	WWN of the port on the external storage system This attribute is displayed when a Fibre Channel port is used.
iscsiIpAddress	string	IP address of the iSCSI target on the external storage system This attribute is displayed when an iSCSI port is used.
iscsiName	string	Name of the iSCSI target on the external storage system This attribute is displayed when an iSCSI port is used.
virtualPortId	int	Virtual port ID This attribute is displayed when an iSCSI port is used and virtual port mode is enabled.
externalSerialNumber	string	Serial number of the external storage system

Attribute	Type	Description
externalStorageInfo	string	The vendor information and product ID of the external storage system This information is obtained in a format in which the vendor information and product ID are concatenated by a space.
externalPathMode	string	Path mode for the external path of the port on the external storage system ▪ `Multi`: Multi mode ▪ `Single`: Single mode ▪ `APLB`: APLB mode
externalIsUsed	boolean	Whether the port of the external storage system that is externally connected to the local storage system is being used to map volumes on the external storage system ▪ `true`: Used ▪ `false`: Not used

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-
storage-ports?portId=CL7-A
```

Getting a list of LUs defined for a port on an external storage system

The following request acquires a list of the LUs that are defined for the port on an external storage system that is externally connected to the local storage system.

Note:

If the local storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, or VSP Fx00 models storage system and you use a port for external connections as the endpoint of an I/O path from an external storage system to the local storage system, the I/O path might become disconnected. Use a route that can be used as an external path. For details about external paths, see the *Hitachi Universal Volume Manager User Guide*.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-storage-luns
```

Request message

Object ID

None.

Query parameters

When a Fibre Channel port is used:

Parameter	Type	Filter Condition
portId	string	(Required) Number of the port on the local storage system
externalWwn	string	(Required) WWN of the port on the external storage system

When an iSCSI port is used:

Parameter	Type	Filter Condition
portId	string	(Required) Port number on the local storage system
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system
iscsiName	string	(Required) iSCSI name of the iSCSI target on the external storage system Specify this parameter in iqn or eui format.

Body

None.

Response message

Body

The following is a coding example when a Fibre Channel port is used:

```
{
  "data" : [ {
    "externalLun" : 0,
    "portId" : "CL7-A",
    "externalWwn" : "50060e80222fd141",
    "externalVolumeCapacity" : 62914560,
    "externalVolumeInfo" : "OPEN-V HITACHI 50412FD100CC"
  } ]
}
```

The following is a coding example when an iSCSI port is used:

```
{
  "data" : [ {
    "externalLun" : 0,
    "portId" : "CL7-A",
    "externalVolumeCapacity" : 62914560,
    "externalVolumeInfo" : "OPEN-V HITACHI 50412FD100CC",
    "iscsiIpAddress" : "192.168.0.100",
    "iscsiName" : "iqn.rest.example.of.iscsi1",
    "virtualPortId" : 0
  } ]
}
```

Attribute	Type	Description
portId	string	Number of the port on the local storage system
externalWwn	string	WWN of the port on the external storage system This attribute is displayed when a Fibre Channel port is used.
iscsiIpAddress	string	IP address of the iSCSI target on the external storage system This attribute is displayed when an iSCSI port is used.

Attribute	Type	Description
iscsiName	string	Name of the iSCSI target on the external storage system This attribute is displayed when an iSCSI port is used.
virtualPortId	int	Virtual port ID This attribute is displayed when an iSCSI port is used and virtual port mode is enabled.
externalLun	int	LUN that can be referenced from the port on the external storage system
externalVolumeCapacity	long	Capacity of the volume on the external storage system (1 block = 512 bytes)
externalVolumeInfo	string	The product ID and the device identification (output in ASCII format) in the SCSI information for the volume on the external storage system This information is obtained in a format in which the product ID and the device identification are concatenated by a space. If the LU cannot be used as an external volume group, `OTHER` is output for the product ID.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-
storage-luns?portId=CL7-A&externalWwn=50060e80222fd141"
```

Mapping a volume on the external storage system

The following request creates an external volume group on the local storage system, and then registers (maps) volumes on an external storage system to the created external volume

group. When a volume is mapped, the external path group and the external path are also created.

Important:

The API request for mapping a volume on the external storage system can be used only when Fibre Channel ports are used. The request cannot be used when iSCSI ports are used.

If you are using an iSCSI port and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

Note:

If the local storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, or VSP Fx00 models storage system and you use a port for external connections as the endpoint of an I/O path from an external storage system to the local storage system, the I/O path might become disconnected. Use a route that can be used as an external path. For details about external paths, see the *Hitachi Universal Volume Manager User Guide*.

Execution permission

Storage Administrator (Provisioning)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/external-parity-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{   "externalParityGroupId":"1-1",
    "externalPathGroupId":1,
    "portId":"CL7-A",
    "externalWwn":"50060e80222fd141",
    "lunId":0,
    "emulationType":"OPEN-V",
```

```
    "clprId":0
}
```

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number Specify the number in *gno-sgno* format.
externalPathGroupId	int	(Required) External path group ID If the specified path group ID does not exist, a new path group ID will be created.
portId	string	(Required) Number of the port on the local storage system
externalWwn	string	(Required) WWN of the external storage system
lunId	int	(Required) LUN of the port on the external storage system
emulationType	string	(Optional) Emulation type Specifiable values are as follows: `OPEN-3` , `OPEN-8` , `OPEN-9` , `OPEN-E` , `OPEN-K` , `OPEN-L` , `OPEN-V` , `3380-3` , `3380-3A` , `3380-3B` , `3380-3C` , `3390-1` , `3390-2` , `3390-3` , `3390-A` , `3390-3A` , `3390-3B` , `3390-3C` , `3390-3R` , `3390-9` , `3390-9A` , `3390-9B` , `3390-9C` , `3390-L` , `3390-LA` , `3390-LB` , `3390-LC` , `3390-M` , `3390-MA` , `3390-MB` , `3390-MC` , `3390-V` , `6586-G` , `6586-J` , `6586-K` , `6586-KA` , `6586-KB` , `6586-KC` , `6588-1` , `6588-3` , `6588-9` , `6588-A` , `6588-3A` , `6588-3B` , `6588-3C` , `6588-9A` , `6588-9B` , `6588-9C` , `6588-L` , `6588-LA` , `6588-LB` , `6588-LC` If this attribute is omitted, `OPEN-V` is set.
clprId	int	(Optional) CLPR number to be used by the external volume group

Attribute	Type	Description
		Specify a decimal (base 10) number in the range from `0` to `31`. If this attribute is omitted, `0` is set.
isExternalAttributeMigration	boolean	(Optional) Whether to set the nondisruptive migration attribute for the external volume group ▪ `true`: Set the attribute. ▪ `false`: Do not set the attribute If this attribute is omitted, `false` is set.
commandDeviceLdevId	int	(Optional) LDEV number of the remote command device Specify this attribute if you want to map the command device of the external storage system. The specified LDEV number is assigned to the remote command device. You can specify this parameter if the storage system model is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects. To check whether the execution results of this API request have been correctly applied, execute the API request for getting information about the external paths.

Attribute	Description
affectedResources	URL of the mapped external volume group

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/external-parity-groups
```

Getting a list of external path groups

The following request obtains a list of information about external path groups. It also obtains information about the related external volume groups and external paths.

Depending on the number of resources for which information is to be obtained, you might have to run this API request more than once to obtain information about all of those resources. In such cases, each time you run the request, if information was not obtained for one or more external path groups, the attribute `nextPageHeadPathGroupId` in the response body indicates the ID of the first external path group for which information was not obtained. To obtain information about the remaining external path groups, run the API request with the path group ID indicated by `nextPageHeadPathGroupId` specified for the parameter `headPathGroupId` in the query. If information was obtained for all target resources, the attribute `nextPageHeadPathGroupId` returns the value `-1`.

Important:

The API request for getting a list of external path groups can be used only when Fibre Channel ports are used. The request cannot be used when iSCSI ports are used.

If you are using an iSCSI port and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-path-groups
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
externalParityGroupId	string	(Optional) External volume group number Specify the number in *gno-sgno* format. You cannot specify this parameter and the `ldevId` parameter at the same time.
ldevId	int	(Optional) LDEV number You cannot specify this parameter and the `externalParityGroupId` parameter at the same time.
headPathGroupId	int	(Optional) ID of the first external path group of the external path groups for which information is to be obtained If you want to specify a range of external path groups for which to information is to be obtained, specify the ID of the first external path group in the target range.

Body

None.

Response message

Body


```
{
    "data": [
         {
            "externalPathGroupId": 24,
            "externalSerialNumber": "487538",
            "externalProductId": "VSP Gx00",
            "externalParityGroups": [
                {
                    "externalParityGroupId": "1-28",
                    "externalParityGroupStatus": "NML",
                    "cacheMode": "D",
                    "isInflowControlEnabled": false,
                    "mpBladeId": 3,
                    "loadBalanceMode": "N",
                    "pathMode": "M",
                    "isDataDirectMapping": false,
                    "externalLuns": [
                        {
```

```
                        "portId": "CL4-B",
                        "externalWwn": "50060e802255f230",
                        "priority": 1,
                        "externalLun": 0,
                        "pathStatus": "NML"
                    }
                ]
            }
        ],
        "externalPaths": [
            {
                "portId": "CL4-B",
                "externalWwn": "50060e802255f230",
                "qDepth": 8,
                "ioTimeOut": 15,
                "blockedPathMonitoring": 10
            }
        ],
        "nextPageHeadPathGroupId": -1
    },
    {
        "externalPathGroupId": 25,
        "externalSerialNumber": "417660",
        "externalProductId": "VSP E series",
        "externalParityGroups": [
            {
                "externalParityGroupId": "1-29",
                "externalParityGroupStatus": "BLK",
                "cacheMode": "E",
                "isInflowControlEnabled": false,
                "mpBladeId": 0,
                "loadBalanceMode": "N",
                "pathMode": "M",
                "isDataDirectMapping": false,
                "externalLuns": [
                    {
                        "portId": "CL4-B",
                        "externalWwn": "50060e801244fc40",
                        "priority": 1,
                        "externalLun": 0,
                        "pathStatus": "BLK"
                    }
                ]
            }
        ],
        "externalPaths": [
            {
                "portId": "CL4-B",
                "externalWwn": "50060e801244fc40",
```

```
                    "qDepth": 8,
                    "ioTimeOut": 15,
                    "blockedPathMonitoring": 10
                }
            ],
            "nextPageHeadPathGroupId": -1
        },
        {
            "externalPathGroupId": 27,
            "externalSerialNumber": "39303",
            "externalProductId": "VSP 5000 series",
            "externalParityGroups": [
                {
                    "externalParityGroupId": "1-31",
                    "externalParityGroupStatus": "NML",
                    "cacheMode": "E",
                    "isInflowControlEnabled": false,
                    "mpBladeId": 2,
                    "loadBalanceMode": "N",
                    "pathMode": "M",
                    "isDataDirectMapping": false,
                    "externalLuns": [
                        {
                            "portId": "CL3-A",
                            "externalWwn": "50060e8008998720",
                            "priority": 1,
                            "externalLun": 1,
                            "pathStatus": "NML"
                        }
                    ]
                },
                {
                    "externalParityGroupId": "1-32",
                    "externalParityGroupStatus": "NML",
                    "cacheMode": "D",
                    "isInflowControlEnabled": false,
                    "mpBladeId": 3,
                    "loadBalanceMode": "N",
                    "pathMode": "M",
                    "isDataDirectMapping": false,
                    "externalLuns": [
                        {
                            "portId": "CL3-A",
                            "externalWwn": "50060e8008998720",
                            "priority": 1,
                            "externalLun": 6,
                            "pathStatus": "NML"
                        }
                    ]
```

```
                }
            ],
            "externalPaths": [
                {
                    "portId": "CL3-A",
                    "externalWwn": "50060e8008998720",
                    "qDepth": 8,
                    "ioTimeOut": 15,
                    "blockedPathMonitoring": 10
                }
            ],
            "nextPageHeadPathGroupId": -1
        }
    ]
}
```


Attribute	Type	Description
externalPathGroupId	int	External path group number
externalSerialNumber	string	Serial number of the external storage system
externalProductId	string	Product ID of the external storage system

Attribute	Type	Description
externalParityGroups	object[]	The following attributes are output for each external volume group: ▪ externalParityGroupId (string) External volume group number ▪ externalParityGroupStatus (string) Status of the external volume group ▪ `NML`: Normal ▪ `CHK`: The mapping path status is being checked ▪ `SYN`: Data in the cache is being written to the volume ▪ `DSC`: The parity group is disconnected from the external storage system or the volumes on the external storage system ▪ `BLK`: The mapping path is blocked ▪ `WAR`: The status of the mapping path is not normal ▪ `Unknown`: Unknown ▪ cacheMode (string) Cache mode ▪ `E`: Enabled ▪ `D`: Disabled For an external volume group that has the nondisruptive migration attribute, the following values are output: ▪ `EM`: Enabled ▪ `DM`: Disabled ▪ `TM`: Through ▪ `SM`: Synchronized writing

Attribute	Type	Description
		▪ isInflowControlEnabled (boolean) Inflow cache control ▪ `true`: Enabled ▪ `false`: Disabled ▪ mpBladeId (int) MP blade ID ▪ loadBalanceMode (string) The load balancing method for I/O operations for the external storage system ▪ `N`: Standard round-robin method ▪ `E`: Expanded round-robin method ▪ `D`: I/O is performed over a single path, and load balancing is not used ▪ pathMode (string) Path mode of the external storage system ▪ `M`: Multi mode ▪ `S`: Single mode ▪ `A`: APLB mode ▪ `AL`: ALUA mode ▪ `MA`: Multi mode (in a state in which the mode can be changed to the ALUA mode) ▪ `SA`: Single mode (in a state in which the mode can be changed to the ALUA mode)

Attribute	Type	Description
		▪ isDataDirectMapping (boolean) Whether the data direct mapping attribute is enabled ▪ `true`: Enabled ▪ `false`: Disabled ▪ externalLuns (object[]) The following attributes are output for each LU on the external storage system: • portId (string) Port number • externalWwn (string) WWN of the external storage system • priority (int) Priority within the external path group • externalLun (int) LUN within the ports of the external storage system • pathStatus (string) Status of the external path `NML`: Normal `CHK`: Temporarily blocked (The status of the external path is being checked.) `BLK`: Blocked `DSC`: Disconnected `Unknown`: Unknown
externalPaths	object[]	The following attributes are output for each external path: ▪ portId (string) Port number ▪ externalWwn (string) WWN of the external storage system

Attribute	Type	Description
		▪ qDepth (int) Number of Read/Write commands that can be queued to the external volume group This information is obtained only when the `qDepth` attribute is set. ▪ ioTimeOut (int) The value (in seconds) set for the I/O time over for the external volume group This information is obtained only when the `ioTimeOut` attribute is set. ▪ blockedPathMonitoring (int) The time (in seconds) until the external volume group is blocked after all paths to the external volume group are disconnected This information is obtained only when the `blockedPathMonitoring` attribute is set.
nextPageHeadPathGroupId	int	ID of the first external path group for which information was not obtained If you were not able to obtain information about all target external path groups by a single execution of the request, you can obtain information about the remaining external path groups by running the request again, with this value specified for the parameter `headPathGroupId` in the query. If information was obtained about all target external path groups, the value `-1` is output.

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-path-
groups
```

Getting information about a specific external path group

The following request acquires information about a specified external path group and the external volume groups and external paths that are related to the specified external path group.

Important:

The API request for getting information about a specific external path group can be used only when Fibre Channel ports are used. The request cannot be used when iSCSI ports are used.

If you are using an iSCSI port and the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. For VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. For storage systems of other models, use storage management software such as CCI.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/external-path-groups/object-ID
```

Request message

Object ID

Specify the value of `externalPathGroupId` that was obtained by the request to get information about the external path group.

Attribute	Type	Description
externalPathGroupId	int	(Required) External path group number

Query parameters

None.

Body

None.

Response message

Body


```
{
    "externalPathGroupId": 24,
    "externalSerialNumber": "487538",
    "externalProductId": "VSP Gx00",
    "externalParityGroups": [
        {
            "externalParityGroupId": "1-28",
            "externalParityGroupStatus": "NML",
            "cacheMode": "D",
            "mpBladeId": 3,
            "loadBalanceMode": "N",
            "pathMode": "M",
            "externalLuns": [
                {
                    "portId": "CL4-B",
                    "externalWwn": "50060e802255f230",
                    "priority": 1,
                    "externalLun": 0,
                    "pathStatus": "NML"
                }
            ],
            "isInflowControlEnabled": false,
            "isDataDirectMapping": false
        },
        {
            "externalParityGroupId": "1-29",
            "externalParityGroupStatus": "BLK",
            "cacheMode": "E",
            "mpBladeId": 0,
            "loadBalanceMode": "N",
            "pathMode": "M",
            "externalLuns": [
                {
                    "portId": "CL4-B",
                    "externalWwn": "50060e801244fc40",
                    "priority": 1,
                    "externalLun": 0,
                    "pathStatus": "BLK"
                }
            ],
            "isInflowControlEnabled": false,
            "isDataDirectMapping": false
        }
    ],
    "externalPaths": [
        {
```

```
            "portId": "CL4-B",
            "externalWwn": "50060e801244fc40"
        }
    ]
}
```


Attribute	Type	Description
externalPathGroupId	int	External path group number
externalSerialNumber	string	Serial number of the external storage system
externalProductId	string	Product ID of the external storage system
externalParityGroups	object[]	The following attributes are output for each external volume group: ▪ externalParityGroupId (string) External volume group number ▪ externalParityGroupStatus (string) Status of the external volume group ▪ `NML`: Normal ▪ `CHK`: The mapping path status is being checked ▪ `SYN`: Data in the cache is being written to the volume ▪ `DSC`: The external volume group is disconnected from the external storage system or the volumes on the external storage system ▪ `BLK`: The mapping path is blocked ▪ `WAR`: The status of the mapping path is not normal ▪ `Unknown`: Unknown

Attribute	Type	Description
		▪ cacheMode (string) Cache mode ▪ `E`: Enabled ▪ `D`: Disabled For an external volume group that has the nondisruptive migration attribute, the following values are output: ▪ `EM`: Enabled ▪ `DM`: Disabled ▪ `TM`: Through ▪ `SM`: Synchronized writing ▪ isInflowControlEnabled (boolean) Inflow cache control ▪ `true`: Enabled ▪ `false`: Disabled ▪ mpBladeId (int) MP blade ID ▪ loadBalanceMode (string) The load balancing method for I/O operations for the external storage system ▪ `N`: Standard round-robin method ▪ `E`: Expanded round-robin method ▪ `D`: I/O is performed over a single path, and load balancing is not used

Attribute	Type	Description
		▪ pathMode (string) Path mode of the external storage system ▪ `M`: Multi mode ▪ `S`: Single mode ▪ `A`: APLB mode ▪ `AL`: ALUA mode ▪ `MA`: Multi mode (E) ▪ `SA`: Single mode (in a state in which the mode can be changed to the ALUA mode)

Attribute	Type	Description
		▪ isDataDirectMapping (boolean) Whether the data direct mapping attribute is enabled ▪ `true`: Enabled ▪ `false`: Disabled ▪ externalLuns (object[]) The following attributes are output for each LU on the external storage system: • portId (string) Port number • externalWwn (string) WWN of the external storage system • priority (int) Priority within the external path group • externalLun (int) LUN within the ports of the external storage system • pathStatus (string) Status of the external path `NML`: Normal `CHK`: Temporarily blocked (The status of the external path is being checked.) `BLK`: Blocked `DSC`: Disconnected `Unknown`: Unknown
externalPaths	object[]	The following attributes are displayed for each external path: ▪ portId (string) Port number ▪ externalWwn (string) WWN of the external storage system

Attribute	Type	Description
		▪ qDepth (int) Number of Read/Write commands that can be queued to the external volume group This information is obtained only when the `qDepth` attribute is set. ▪ ioTimeOut (int) The value (in seconds) set for the I/O time over for the external volume group This information is obtained only when the `ioTimeOut` attribute is set. ▪ blockedPathMonitoring (int) The time (in seconds) until the external volume group is blocked after all paths to the external volume group are disconnected This information is obtained only when the `blockedPathMonitoring` attribute is set.

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-path-
groups/1
```

Adding an external path to an external path group

The following request adds external path information to an existing external path group. The priority of the path is set in ascending order, according to the order in which the path was added.

Note:

If the local storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, or VSP Fx00 models storage system and you use a port for external connections as the endpoint of an I/O path from an external storage system to the local storage system, the I/O path might become disconnected. Use a route that can be used as an external path. For details about external paths, see the *Hitachi Universal Volume Manager User Guide*.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-path-groups/object-ID/
actions/add-path/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `externalPathGroupId` that was obtained by the request to get information about the external path group.

Attribute	Type	Description
externalPathGroupId	int	(Required) External path group number

Query parameters

None.

Body

The following is a coding example when a Fibre Channel port is used:

```
{
"parameters": {
    "portId":"CL7-A",
    "externalWwn":"50060E801033C2F0"
}
}
```

When a Fibre Channel port is used:

Attribute	Type	Description
portId	string	(Required) Number of the port on the local storage system
externalWwn	string	(Required) WWN of the external storage system

The following is a coding example when an iSCSI port is used:

```
{
  "parameters": {
    "portId":"CL1-C",
    "iscsiIpAddress": "192.168.0.100",
    "iscsiName": "iqn.rest.example.of.iscsi1"
  }
}
```

When an iSCSI port is used:

Attribute	Type	Description
portId	string	(Required) Port number on the local storage system
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system Specify an IPv4 or IPv6 address.
iscsiName	string	(Required) iSCSI name of the iSCSI target on the external storage system Specify this attribute in iqn or eui format.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	▪ When a Fibre Channel port is used: The URL of the external path group to which the external path was added is returned. ▪ When an iSCSI port is used: `affectedResources` is not displayed for this API. To check whether the external path was added to the external path group, use one of the following methods: ▪ If the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. ▪ If the local storage system is VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. ▪ For storage systems of other models, use storage management software such as CCI.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/external-path-groups/1/actions/add-path/invoke
```

Removing an external path from an external path group

The following request removes external path information from an external path group.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-path-groups/object-ID/
actions/remove-path/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `externalPathGroupId` that was obtained by the request to get information about the external path group.

Attribute	Type	Description
externalPathGroupId	int	(Required) External path group number

Query parameters

None.

Body

The following is a coding example when a Fibre Channel port is used:

```
{
"parameters": {
    "portId":"CL7-A",
    "externalWwn":"50060E801033C2F0"
}
}
```

When a Fibre Channel port is used:

Attribute	Type	Description
portId	string	(Required) Number of the port on the local storage system
externalWwn	string	(Required) WWN of the external storage system

The following is a coding example when an iSCSI port is used:

```
{
```

```
  "parameters": {
    "portId":"CL1-C",
    "iscsiIpAddress": "192.168.0.100",
    "iscsiName": "iqn.rest.example.of.iscsi1"
  }
}
```

When an iSCSI port is used:

Attribute	Type	Description
portId	string	(Required) Port number on the local storage system
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system Specify an IPv4 or IPv6 address.
iscsiName	string	(Required) iSCSI name of the iSCSI target on the external storage system Specify this attribute in iqn or eui format.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	▪ When a Fibre Channel port is used: The URL of the external path group from which the external path was removed is returned. ▪ When an iSCSI port is used: `affectedResources` is not displayed for this API. To check whether the external path was removed from the external path group, use one of the following methods: ▪ If the model of the local storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, use the API requests described in Running the REST APIs that respond quickly for the storage systems. ▪ If the local storage system is VSP One B20, use the API requests described in Running VSP One Block Administrator REST API requests for VSP One B20 storage systems. ▪ For storage systems of other models, use storage management software such as CCI.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/external-path-groups/1/actions/remove-path/invoke
```

Unmapping a volume on the external storage system

The following request unmaps a volume on the external storage system by deleting the external volume group. If the last external volume group is deleted, the external path group itself is also deleted.

Execution permission

Storage Administrator (Provisioning)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID
```

Request message

Object ID

Specify the value of `externalParityGroupId` that was obtained by the processing to get information about the external path group.

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number

Query parameters

None.

Body

```
{
  "force": true
}
```

Attribute	Type	Description
force	boolean	(Optional) Specify whether to forcibly unmap the external volume without destaging it. You can specify this attribute for VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, VSP Fx00 models. Specify `true` to unmap the volume on the external storage system without destaging it. ▪ `true`: Forcibly unmap the external volume. ▪ `false`: Unmap the volume on the external storage system only if the external volume has been destaged. If this attribute is omitted, `false` is set.

Attribute	Type	Description
		If you specify `false`, first execute the API function to disconnect the volume on the external storage system.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To check whether the unmapping was successful, execute the API request for getting information about an external path group.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-
parity-groups/1-1
```

Disconnecting from a volume on the external storage system

The following request disconnects a volume on the external storage system from the local storage system. The volume on the external storage system is not unmapped.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID/
actions/disconnect/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `externalParityGroupId` that was obtained by the processing to get information about the external path group.

Attribute	Type	Description
externalParityGroupId	string	(Required) External volume group number

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API function. To check whether the disconnection was successful, check the status of the external path by executing the API function for getting information about an external path group.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/external-
parity-groups/1-1/actions/disconnect/invoke -d ""
```

Deleting an iSCSI name of an external storage system that is registered to a port on the local storage system

This request deletes information about an iSCSI name (on the external storage system) that is registered to the local storage system.

Note:

- `0` is assumed for the virtual port ID if virtual port mode is enabled for the local storage system.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/iscsi-ports/object-ID/actions/remove/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the value of `portId` that was obtained by the processing to get information about ports.

Attribute	Type	Description
portId	string	(Required) Port number of the local storage system

Query parameters

None.

Body

```
{
    "parameters": {
        "iscsiIpAddress": "192.168.0.100",
        "iscsiName": "iqn.rest.example.of.iscsi1"
    }
}
```

Attribute	Type	Description
iscsiIpAddress	string	(Required) IP address of the iSCSI target on the external storage system Specify an IPv4 or IPv6 IP address.
iscsiName	string	(Required) iSCSI name of the iSCSI target on the external storage system Specify the name in iqn or eui format. This attribute is case sensitive.

Response message

A job object is returned. For details about attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the port (on the local storage system) whose iSCSI name information about the external storage system has been deleted

Action template

None.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X PUT "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/iscsi-ports/
CL1-A/actions/remove/invoke"
```

Chapter 18: Initial settings for a storage system

This chapter describes the initial settings for a storage system that are performed by using the REST API.

Overview of the initial settings of a storage system

This section describes the operations that can be performed by using the REST API, related to the initial settings of a storage system.

For VSP One B20

- Setting the system date and time for a storage system

  Set the system date and time for a storage system.

- Setting the transfer destinations for audit log files

  Specify settings related to the transfer of audit log files from a storage system to the syslog servers. You can also upload to the storage system the certificate files that are required when SSL communication is used to transfer audit log files between a storage system and the syslog servers.

- Setting the SNMP notification destinations

  Specify settings related to reporting error information (SIM) of a storage system by using SNMP.

- Setting error notification emails

  Specify settings related to reporting error information (SIM) of a storage system by using emails.

- License management

  Set software licenses.

- Changing the user information used in searches of the external authentication server

  Change the DN (Distinguished Name) and password of the user used in searches of the external authentication server set for the storage system.

- Uploading the certificate files (for external server verification)

  Upload the root certificate files used to verify external servers via the REST API server.

For VSP 5000 series

- Setting the transfer destinations for audit log files

  Specify settings related to the transfer of audit log files from a storage system to the syslog servers. You can also upload to the storage system the certificate files that are required when SSL communication is used to transfer audit log files between a storage system and the syslog servers.

- Setting the SNMP notification destinations

  Specify settings related to reporting error information (SIM) of a storage system by using SNMP. To perform a test transmission of the SNMP trap, use Hitachi Device Manager - Storage Navigator.

- License management

  Set software licenses.

- Changing the user information used in searches of the external authentication server

  Change the DN (Distinguished Name) and password of the user used in searches of the external authentication server set for the storage system.

For VSP E series, VSP Gx00 models or VSP Fx00 models

- Setting the system date and time for a storage system

  Set the system date and time for a storage system.

- Setting the transfer destinations for audit log files

  Specify settings related to the transfer of audit log files from a storage system to the syslog servers. You can also upload to the storage system the certificate files that are required when SSL communication is used to transfer audit log files between a storage system and the syslog servers.

- Setting the SNMP notification destinations

  Specify settings related to reporting error information (SIM) of a storage system by using SNMP.

- Setting error notification emails

  Specify settings related to reporting error information (SIM) of a storage system by using emails.

- License management

  Set software licenses.

- Changing the user information used in searches of the external authentication server

  Change the DN (Distinguished Name) and password of the user used in searches of the external authentication server set for the storage system.

For VSP G1000, VSP G1500, or VSP F1500

- Setting the SNMP notification destinations

  Specify settings related to reporting error information (SIM) of a storage system by using SNMP. To perform a test transmission of the SNMP trap, use Hitachi Device Manager - Storage Navigator.

- License management

  You can obtain software license information. To configure licenses, use Hitachi Device Manager - Storage Navigator.

- Changing the user information used in searches of the external authentication server

  Change the DN (Distinguished Name) and password of the user used in searches of the external authentication server set for the storage system.

Related manuals

For details about the initial settings of the storage system, see the following manuals.

- *System Administrator Guide*
- *Hitachi Alert Notification Guide* (VSP 5000 series)
- *Hitachi SNMP Agent User Guide* (Storage systems other than the VSP 5000 series or the VSP One B20)

Getting the system date and time of a storage system

The following request gets the system date and time of a storage system.

Note:

You can use this API request for the following storage systems:

- VSP One B20
- VSP E series
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-03-2*X*-*XX*/*XX* or later

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/date-times/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "isNtpEnabled": true,
  "ntpServerNames": [
    "192.0.2.200"
  ],
  "timeZoneId": "America/Los_Angeles",
  "systemTime": "2016-07-20T17:02:12Z",
  "synchronizingLocalTime": "22:00",
  "adjustsDaylightSavingTime": true
}
```

Attribute	Type	Description
isNtpEnabled	boolean	Whether to synchronize the time with the NTP server ▪ `true`: Synchronize the time with the NTP server ▪ `false`: Do not synchronize the time with the NTP server
ntpServerNames	string[]	The IP address or host name of the NTP server This attribute is displayed if the time is synchronized with the NTP server.
timeZoneId	string	Time zone ID
systemTime	ISO8601string	System date and time (UTC)

Attribute	Type	Description
synchronizingLocalTime	string	Synchronization time with the NTP server (local time) This attribute is displayed if the time is synchronized with the NTP server.
adjustsDaylightSavingTime	boolean	Whether to automatically adjust for daylight saving time This attribute is displayed if the time zone supports daylight saving time. ▪ `true`: Adjust for daylight saving time ▪ `false`: Do not adjust for daylight saving time

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/date-times/
instance
```

Getting a list of time zones that can be used in a storage system

The following request checks the time zones that can be used when you set the system date and time of a storage system or other information.

Note:

You can use this API request for the following storage systems:

- VSP One B20
- VSP E series
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-03-2*X-XX*/*XX* or later

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/time-zones
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "timeZoneId": "Etc/GMT+12",
      "timeZone": "(UTC-12:00)",
      "displayName": "International Date Line West",
      "observesDaylightSavingTime": false
    },
    {
      "timeZoneId": "Etc/GMT+11",
      "timeZone": "(UTC-11:00)",
      "displayName": "Coordinated Universal Time-11",
      "observesDaylightSavingTime": false
    },
    {
      "timeZoneId": "Pacific/Honolulu",
```

```
      "timeZone": "(UTC-10:00)",
      "displayName": "Hawaii",
      "observesDaylightSavingTime": false
    }
  ]
}
```


Attribute	Type	Description
timeZoneId	string	Time zone ID
timeZone	string	Time zone
displayName	string	Displays the name of the time zone
observesDaylightSavingTime	boolean	Whether daylight saving time is supported ▪ `true`: Daylight saving time is supported. ▪ `false`: Daylight saving time is not supported.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/time-zones
```

Setting the system date and time of a storage system

The following request sets the system date and time of a storage system.

Note:

- You can use this API request for the following storage systems:
  - VSP One B20
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-03-2*X-XX*/*XX* or later
- If you changed the system date and time of a storage system, you need to change the date and time of the SVP. For details on how to change the date and time of the SVP, see the OS manual.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/date-times/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
  "isNtpEnabled": true,
  "ntpServerNames": [
    "192.0.2.200",
    "192.0.2.300"
  ],
  "timeZoneId": "America/Los_Angeles",
  "systemTime": "2016-07-20T17:02:12Z",
  "synchronizingLocalTime": "22:00",
```

```
  "adjustsDaylightSavingTime": true,
  "synchronizesNow": true
}
```

Attribute	Type	Description
isNtpEnabled	boolean	(Required) Whether to synchronize the time with the NTP server ▪ `true`: Synchronize the time with the NTP server ▪ `false`: Do not synchronize the time with the NTP server
ntpServerNames	string[]	(Optional) The IP address or host name of the NTP server You can specify this attribute only if `true` is specified for the `isNtpEnabled` attribute. If `true` is specified for the `isNtpEnabled` attribute, you must specify this attribute. If you specify multiple NTP servers, use commas to delimit the names. You can set a maximum of 5 NTP servers.
timeZoneId	string	(Required) Time zone ID Specify a time zone ID that you obtained by using the API function that obtains a list of available time zones for the storage system.
systemTime	ISO8601string	(Required) System date and time (UTC) Specify a date between January 1, 2000 and December 31, 2037 in YYYY-MM-DDThh:mm:ssZ format. If the time zone specified for the `timeZoneId` attribute uses daylight saving time and the `adjustsDaylightSavingTime` attribute is set to `true`, you cannot set a time that is within the transition period of standard time to daylight saving time or the transition period of daylight saving time to standard time.

Attribute	Type	Description
		The specified system date and time might be different from the date and time actually set on the storage system by several seconds. To set an accurate date and time, we recommend that you synchronize the date and time with the NTP server.
synchronizingLocalTime	string	(Optional) Synchronization time with the NTP server (local time) You can specify this attribute only if `true` is specified for the `isNtpEnabled` attribute. Specify a time between `00:00` and `23:59` in "hh:mm" format. If this attribute is omitted, `00:00` is assumed to be set.
adjustsDaylightSavingTime	boolean	(Optional) Whether to automatically switch to daylight saving time You can specify this attribute only if the time zone specified for the `timeZoneId` attribute supports daylight saving time. You cannot specify this attribute if the specified time zone does not support daylight saving time. To check whether the time zone supports daylight saving time, you can use the API function that obtains a list of available time zones for the storage system. ▪ `true`: Switch to daylight saving time ▪ `false`: Do not switch to daylight saving time If this attribute is omitted, `true` is assumed to be set.
synchronizesNow	boolean	(Optional) Whether to immediately synchronize with the NTP server

Attribute	Type	Description
		You can specify this attribute only when `true` is specified for the `isNtpEnabled` attribute. ▪ `true`: Immediately synchronize with the NTP server ▪ `false`: Do not synchronize with the NTP server until the synchronization time If you specify `false` for this attribute, the time will be set as the time specified for the `systemTime` attribute until the time specified for the synchronization time of the `synchronizingLocalTime` attribute. If this attribute is omitted, `true` is assumed to be set.

Response message

Body

```
{
  "isNtpEnabled": true,
  "ntpServerNames": [
    "192.0.2.200",
    "192.0.2.300"
  ],
  "timeZoneId": "America/Los_Angeles",
  "systemTime": "2016-07-20T17:02:12Z",
  "synchronizingLocalTime": "22:00",
  "adjustsDaylightSavingTime": true
}
```

Attribute	Type	Description
isNtpEnabled	boolean	Whether to synchronize the time with the NTP server ▪ `true`: Synchronize the time with the NTP server ▪ `false`: Do not synchronize the time with the NTP server
ntpServerNames	string[]	The IP address or host name of the NTP server
timeZoneId	string	Time zone ID
systemTime	ISO8601string	System date and time (UTC)
synchronizingLocalTime	string	Synchronization time with the NTP server (local time)
adjustsDaylightSavingTime	boolean	Whether to automatically switch to daylight saving time ▪ `true`: Switch to daylight saving time ▪ `false`: Do not switch to daylight saving time

Action template

None.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/date-times/instance
```

Uploading the files required to set the transfer destination of audit log files

The following request uploads the files required to set the transfer destination of audit log files. The files are uploaded from a REST API client to the storage system via the REST API server. In the request header of this API function, specify `multipart/form-data` for Content-Type.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

If SSL communication is used between the storage system and the syslog server, run this API function to upload the required certificate file to the storage system in advance. After that, run the API function for setting the transfer destinations of the audit log. When you do so, the storage system will be set to use the uploaded certificate file for communication.

Important:

- Only one file can be uploaded in one request.
- If files with the same `fileType` attribute are already uploaded, the currently uploaded file will be overwritten by the file to be uploaded.

Execution permission

Audit Log Administrator (View & Modify)

Request header

In this API, the request body is sent in the format of multipart/form-data. Specify `multipart/form-data` for the Content-Type of the request header.

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/actions/file-upload/invoke
```

Request message

Object ID

None.

Query parameters

None.

Body

Attribute	Type	Description
fileType	string	(Required) File type of the file to be uploaded The specifiable values are as follows: ▪ `AuditSyslogPrimaryClientCertFile`: Client certificate file of the syslog server to which audit log files are to be transferred (for the primary server) ▪ `AuditSyslogPrimaryRootCertFile`: Root certificate file of the syslog server to which audit log files are to be transferred (for the primary server) ▪ `AuditSyslogSecondaryClientCertFile`: Client certificate file of the syslog server to which audit log files are to be transferred (for the secondary server) ▪ `AuditSyslogSecondaryRootCertFile`: Root certificate file of the syslog server to which audit log files are to be transferred (for the secondary server)
file	file	(Required) File to be uploaded You can use the following characters: ▪ Spaces ▪ Alphanumeric characters ▪ The following symbols: `! " # $ % & ' ( ) * + , - . : ; < = > ? @ [ \ ] ^ _ ` { | } ~`

Response message

Body

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

If HTTP status code 502 is returned, make sure the file is correctly specified, and then run the API request again.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type: multipart/form-data" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST -F
"file=@C:\certfile.crt" -F "fileType=AuditSyslogPrimaryClientCertFile" https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/actions/file-upload/invoke
```

If you run a request in which `multipart/form-data` is specified for Content-Type, `Expect: 100-continue` might be automatically assigned to the header, depending on the specifications of the client software. For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems, depending on the specifications of the web server, this header might not be accepted. If the header is not accepted, a 417 error occurs, and the request fails. In the following coding example, `-H "Expect:"` is specified for the Expect header to overwrite the automatically assigned header, thereby preventing this error.

```
curl -v -H "Accept:application/json" -H "Content-Type: multipart/form-data" -H "Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -H "Expect:" -X POST -F "file=@C:\certfile.crt" -F "fileType=AuditSyslogPrimaryClientCertFile" https://192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/actions/file-upload/invoke
```

Getting information about the transfer destinations of audit log files

The following request gets information, specified for a storage system, about the settings related to the transfer of audit log files to the syslog servers.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Audit Log Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/auditlog-syslog-servers/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "transferProtocol": "TLS",
  "locationName": "836000123456",
  "retries": true,
  "retryInterval": 30,
  "isDetailed": true,
  "primarySyslogServer": {
    "isEnabled": true,
    "ipAddress": "192.0.1.100",
    "port": 12345
  },
  "secondarySyslogServer": {
    "isEnabled": true,
    "ipAddress": "192.0.1.200",
    "port": 12345
  }
}
```

Attribute	Type	Description
transferProtocol	string	Protocol to be used when transferring audit log files to the syslog servers ▪ `TLS`: TLS1.2/RFC5424 ▪ `UDP`: UDP/RFC3164 If the transfer destination of audit log files has not been set, `undefined` will be output for VSP 5000 series storage systems, but `UDP` will be output for VSP One B20, VSP E series, VSP Gx00 models and VSP Fx00 models storage systems.
locationName	string	Name of the storage system from which audit log files are to be transferred
retries	boolean	Specifies whether to try again if communication with a syslog server fails This attribute is displayed if the `transferProtocol` attribute is `TLS`. ▪ `true`: Tries again ▪ `false`: Does not try again
retryInterval	int	Retry interval (in seconds) when communication with a syslog server fails

Attribute	Type	Description
		This attribute is displayed if the `retries` attribute is `true`.
isDetailed	boolean	Specifies whether to transfer detailed information about audit log files to the syslog servers ▪ `true`: Transfers detailed information ▪ `false`: Does not transfer detailed information
primarySyslogServer	object	Settings of the primary-site syslog server The following information about the primary-site syslog server is displayed: ▪ isEnabled (boolean) Whether audit log files are transferred to the syslog server ▪ `true`: Audit log files are transferred to the syslog server ▪ `false`: Audit log files are not transferred to the syslog server ▪ ipAddress (string) IP address or host name of the server This is displayed when the value of the `isEnabled` attribute is `true`. ▪ port (int) Port number This is displayed when the value of the `isEnabled` attribute is `true`.
secondarySyslogServer	object	Settings of the secondary-site syslog server

Attribute	Type	Description
		The following information about the secondary-site syslog server is displayed: ▪ isEnabled (boolean) Whether audit log files are transferred to the syslog server ▪ `true`: Audit log files are transferred to the syslog server ▪ `false`: Audit log files are not transferred to the syslog server ▪ ipAddress (string) IP address or host name of the server This is displayed when the value of the `isEnabled` attribute is `true`. ▪ port (int) Port number This is displayed when the value of the `isEnabled` attribute is `true`.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/auditlog-
syslog-servers/instance
```

Specifying the transfer destinations of audit log files

The following request specifies settings related to the transfer of audit log files from a storage system to the syslog servers. Run this API function with `https` specified as the protocol to be used.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

- If SSL communication is to be used to transfer audit log files between syslog servers, upload the necessary certificate files to the storage system before specifying the transfer destinations of audit log files.
- If you locked the resources of the target storage system by using the REST API, you will not be able to use the API function for specifying the transfer destinations of audit log files. In such cases, unlock the resources before running the API function.
- When specifying the transfer destinations of audit log files for VSP 5000 series, number of the retry and the timeout value are set as 1 and 120 sec.

Execution permission

Audit Log Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/auditlog-syslog-servers/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
  "transferProtocol": "TLS",
  "locationName": "836000123456",
  "retries": true,
  "retryInterval": 30,
  "isDetailed": true,
  "primarySyslogServer": {
    "isEnabled": true,
    "ipAddress": "192.0.1.100",
    "port": 12345,
    "clientCertFileName": "primaryClientCert.crt",
    "clientCertFilePassword": "123456",
    "rootCertFileName": "primaryRootCert.crt"
  },
```

```
  "secondarySyslogServer": {
    "isEnabled": true,
    "ipAddress": "192.0.1.200",
    "port": 12345,
    "clientCertFileName": "secondaryClientCert.crt",
    "clientCertFilePassword": "123456",
    "rootCertFileName": "secondaryRootCert.crt"
  }
}
```

Attribute	Type	Description
transferProtocol	string	(Required) Protocol used when transferring audit log files to syslog servers Specify one of the following values: ▪ `TLS`: TLS1.2/RFC5424 ▪ `UDP`: UDP/RFC3164
locationName	string	(Required) Name of the storage system from which audit log files are to be transferred Specify a character string consisting of 1 to 32 characters. You can use the following characters: ▪ Alphanumeric characters ▪ The following symbols: `! " # $ % & ' ( ) * + - . / : ; < = > ? @ [ \ ] ^ _ ` { | } ~`
retries	boolean	(Optional) Specify whether to try again if communication with a syslog server fails. If the `transferProtocol` attribute is `TLS`, specify either of the following values: ▪ `true`: Try again. ▪ `false`: Do not try again. If you omit this item, `true` is assumed.
retryInterval	int	(Optional) Retry interval (in seconds) if communication with a syslog server fails If the `retries` attribute is `true`, specify a value in the range from `1` to `60`. If you omit this item, `1` will be set.

Attribute	Type	Description
isDetailed	boolean	(Optional) Specify whether to transfer detailed information about audit log files to the syslog servers. Specify one of the following values: ▪ `true`: Transfer detailed information. ▪ `false`: Do not transfer detailed information. If you omit this item, `true` is assumed.
primarySyslogServer	object	(Required) Settings of the primary-site syslog server

Attribute	Type	Description
		Specify values for the following attributes of the primary-site syslog server: ▪ isEnabled (boolean) (Required) Specify whether audit log files are to be transferred to the syslog server. ▪ `true`: Transfer audit log files. ▪ `false`: Do not transfer audit log files. ▪ ipAddress (string) (Optional) IP address or host name of the server You must specify this attribute if `true` is specified for `isEnabled`. You can specify an IPv4 address, an IPv6 address, or a host name. Specify a name consisting of 1 to 255 characters. You can use the following characters in the host name: • Alphanumeric characters • The following symbols: `! $ % - . @ _ ` ~` ▪ port (int) (Optional) Port number You must specify this attribute if `true` is specified for `isEnabled`. ▪ clientCertFileName (string) (Optional) Name of the client certificate file You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. If you specify this attribute, the certificate file that was uploaded to the storage system will be set to be used. (The system will not check whether the file name of the certificate matches the file name specified for this attribute.) If a null character string is specified for this attribute, the certificate file that

Attribute	Type	Description
		is already set for the storage system will be used. ▪ clientCertFilePassword (string) (Optional) Password for client certificate You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. ▪ rootCertFileName (string) (Optional) File name for root certificate You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. If you specify this attribute, the certificate file that was uploaded to the storage system will be set to be used. (The system will not check whether the file name of the certificate matches the file name specified for this attribute.) If a null character string is specified for this attribute, the certificate file that is already set for the storage system will be used.
secondarySyslogServer	object	(Required) Settings of the secondary-site syslog server

Attribute	Type	Description
		Specify values for the following attributes of the secondary-site syslog server: ▪ isEnabled (boolean) (Required) Specify whether audit log files are to be transferred to the syslog server. ▪ `true`: Transfer audit log files. ▪ `false`: Do not transfer audit log files. ▪ ipAddress (string) (Optional) IP address or host name of the server You must specify this attribute if `true` is specified for `isEnabled`. You can specify an IPv4 address, an IPv6 address, or a host name. Specify a name consisting of 1 to 255 characters. You can use the following characters in the host name: • Alphanumeric characters • The following symbols: `! $ % - . @ _ ` ~` ▪ port (int) (Optional) Port number You must specify this attribute if `true` is specified for `isEnabled`. ▪ clientCertFileName (string) (Optional) Name of the client certificate file You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. If you specify this attribute, the certificate file that was uploaded to the storage system will be set to be used. (The system will not check whether the file name of the certificate matches the file name specified for this attribute.) If a null character string is specified for this attribute, the certificate file that

Attribute	Type	Description
		is already set for the storage system will be used. ▪ clientCertFilePassword (string) (Optional) Password for client certificate You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. ▪ rootCertFileName (string) (Optional) File name for root certificate You must specify this attribute if `true` is specified for `isEnabled` and `TLS` is specified for `transferProtocol`. If you specify this attribute, the certificate file that was uploaded to the storage system will be set to be used. (The system will not check whether the file name of the certificate matches the file name specified for this attribute.) If a null character string is specified for this attribute, the certificate file that is already set for the storage system will be used.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the transfer destinations set for the audit log files of the storage system

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/auditlog-syslog-servers/instance
```

Sending test messages to the transfer destinations of audit log files

The following request sends test messages to the syslog servers to verify that the settings related to the transfer destinations of audit log files are correctly specified.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

If you locked the resources of the target storage system by using the REST API, you will not be able to use the API function for sending test messages. In such cases, unlock the resources before running the API function.

Execution permission

Audit Log Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/auditlog-syslog-servers/instance/
actions/send-test/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the schema of job objects, see the description of job objects.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/auditlog-
syslog-servers/instance/actions/send-test/invoke -d ""
```

Getting SNMP settings

The following request explains how to obtain the SNMP settings for a storage system.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/snmp-settings/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of output when the SNMP version is SNMP v1:


```
{
  "isSNMPAgentEnabled": true,
  "snmpVersion": "v1",
  "sendingTrapSetting": {
    "snmpv1v2cSettings": [
      {
        "community": "MyRestSNMPCommunity1",
        "sendTrapTo": [
          "192.0.2.100",
          "192.0.2.200"
        ]
      }
    ]
  },
  "requestAuthenticationSetting": {
    "snmpv1v2cSettings": [
      {
        "community": "MyRestSNMPCommunity2",
        "requestsPermitted": [
          "192.0.3.100"
        ]
      }
    ]
  },
  "systemGroupInformation": {
    "storageSystemName": "VSP_G600",
    "contact": "confmanager.@example.com",
    "location": "Data Center 1F"
  },
  "snmpEngineID": "0x800000740463613366633530 61"
}
```


The following is an example of output when the SNMP version is SNMP v3:


```
{
  "isSNMPAgentEnabled": true,
  "snmpVersion": "v3",
  "sendingTrapSetting": {
    "snmpv3Settings": [
      {
        "userName": "MyRestSNMPUser1",
        "sendTrapTo": "192.0.2.100",
        "authentication": {
          "protocol": "SHA",
```

```
          "password": "",
          "encryption": {
            "protocol": "AES",
            "key": ""
          }
        }
      },
      {
        "userName": "MyRestSNMPUser2",
        "sendTrapTo": "192.0.2.200"
      }
    ]
  },
  "requestAuthenticationSetting": {
    "snmpv3Settings": [
      {
        "userName": "MyRestSNMPUser3",
        "authentication": {
          "protocol": "MD5",
          "password": "",
          "encryption": {
            "protocol": "DES",
            "key": ""
          }
        }
      }
    ]
  },
  "systemGroupInformation": {
    "storageSystemName": "VSP_G600",
    "contact": "confmanager.@example.com",
    "location": "Data Center 1F"
  },
  "snmpEngineID": "0x800000740463613366663353061"
}
```


Attribute	Type	Description
isSNMPAgentEnabled	boolean	Whether the SNMP Agent is enabled ▪ `true`: Enabled ▪ `false`: Disabled If this attribute is `true`, error information (SIM) is reported by SNMP traps. Also, SNMP operation requests (GET REQUEST, GETNEXT REQUEST, and GETBULK REQUEST) are received.

Attribute	Type	Description
snmpVersion	string	SNMP version Outputs the SNMP version that is being used. ▪ `v1` : SNMP v1 ▪ `v2c` : SNMP v2c ▪ `v3` : SNMP v3 If this attribute is not set, `Unestablished` is output.

Attribute	Type	Description
sendingTrapSetting	object	SNMP trap destinations ▪ snmpv1v2cSettings (object[]) Array of settings for SNMP trap destinations This is output when there is a setting for which the SNMP version is SNMPv1 or SNMPv2c. • community (string) Community name used for SNMP trap reports • sendTrapTo (string[]) Array of IP addresses to which SNMP traps are sent The addresses are output in IPv4 or IPv6 IP. ▪ snmpv3Settings (object[]) Array of the settings for SNMP trap destinations This is output when there is a setting for which the SNMP protocol version is SNMP v3. • userName (string) User name that is used for SNMP trap reports • sendTrapTo (string) The IP address to which an SNMP trap is sent This is output in IPv4 or IPv6 format. • authentication (object) Authentication information This is output when password-based authentication is enabled. For details on the output attributes, see the table of the attributes output to the `authentication` attribute.
requestAuthenticationSetting	object	Settings for permitted requests.

Attribute	Type	Description
		Settings for the permitted requests (GET REQUEST, GETNEXT REQUEST, and GETBULK REQUEST) of SNMP operations are output. ▪ snmpv1v2cSettings (object[]) Array of the settings for permitted requests This is output when there is a setting for which the SNMP protocol version is SNMPv1 or SNMPv2c. • community (string) Name of the community that receives requests • requestsPermitted (string[]) Array of the IP addresses of the SNMP Managers that receive requests This is output in IPv4 or IPv6 format. If the array is empty, requests of all SNMP Managers are received. ▪ snmpv3Settings (object[]) Array of the settings for permitted requests This is output when there is a setting for which the SNMP version is SNMP v3. • userName (string) Name of the user who receives requests • authentication (object) Authentication information This is output when password-based authentication is enabled. For details on the output attributes, see the table of the attributes output to the `authentication` attribute.

Attribute	Type	Description
systemGroupInformation	object	Information of the system group ▪ storageSystemName (string) Name of the storage system ▪ contact (string) Contact information or name of the administrator ▪ location (string) Location of the storage system
snmpEngineID	string	ID identifying the SNMP engine

The following table shows the attributes output to the `authentication` attribute.

Attribute	Type	Description
protocol	string	Authentication method The following values are output: ▪ `SHA` ▪ `MD5`
password	string	Password An empty character string is output even if a password has been set.
encryption	object	Encryption information This is output when encryption is enabled. ▪ protocol (string) Encryption method The following values are output: ▪ `AES` ▪ `DES` ▪ key (string) Encryption key An empty character string is output even if an encryption key has been set.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snmp-settings/
instance
```

Specifying the SNMP error notification destinations

The following request specifies settings related to reporting error information (SIM) of a storage system by using SNMP. Run this API function with `https` specified as the protocol to be used.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Notes on creating the request body

Before running this API function, obtain the current settings by using the API function that obtains SNMP information. The response body you have obtained is to be used as the request body for this API function. Values other than the SNMP-version value specified in the `snmpVersion` attribute might also be output in the obtained settings information. Change only the values of the attributes that you want to change.

For the VSP 5000 series, VSP G1000, VSP G1500, and VSP F1500, this API only updates the values of settings supported by the SNMP version that is specified by the `snmpVersion` attribute. For example, if `v1` is set for the `snmpVersion` attribute, this API updates only the values of the items that are supported by version SNMP v1 and specified under the `sendingTrapSetting` attribute. For details, see the descriptions about the attributes of the request body.

For the VSP One B20, VSP E series, VSP Gx00 models and VSP Fx00 models, this API updates all settings by overwriting the existing values, including the settings of versions other than the version specified by the `snmpVersion` attribute. When you delete the information of the acquired response body, those setting contents are deleted.

Note:

- Null character values are output to the acquired response body for the `password` attribute and `key` attribute. Change the values only when you want to change the setting.
- You cannot change the setting for the `snmpEngineID` attribute. The value is ignored even if it is specified.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snmp-settings/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

The following is a coding example when the SNMP version is SNMP v1:

```
{
  "isSNMPAgentEnabled": true,
  "snmpVersion": "v1",
  "sendingTrapSetting": {
    "snmpv1v2cSettings": [
      {
        "community": "MyRestSNMPCommunity1",
        "sendTrapTo": [
          "192.0.2.100",
          "192.0.2.200"
        ]
      }
    ]
```

```
  },
  "requestAuthenticationSetting": {
    "snmpv1v2cSettings": [
      {
        "community": "MyRestSNMPCommunity2",
        "requestsPermitted": [
          "192.0.3.100"
        ]
      }
    ]
  },
  "systemGroupInformation": {
    "storageSystemName": "VSP_G600",
    "contact": "confmanager.@example.com",
    "location": "Data Center 1F"
  }
}
```

The following is a coding example when the SNMP version is SNMP v3:

```
{
  "isSNMPAgentEnabled": true,
  "snmpVersion": "v3",
  "sendingTrapSetting": {
    "snmpv3Settings": [
      {
        "userName": "MyRestSNMPUser1",
        "sendTrapTo": "192.0.2.100",
        "authentication": {
          "protocol": "SHA",
          "password": "TopSecretForMySNMP1",
          "encryption": {
            "protocol": "AES",
            "key": "KeyForMySNMP1"
          }
        }
      },
      {
        "userName": "MyRestSNMPUser2",
        "sendTrapTo": "192.0.2.200"
      }
    ]
  },
  "requestAuthenticationSetting": {
    "snmpv3Settings": [
      {
        "userName": "MyRestSNMPUser3",
        "authentication": {
          "protocol": "MD5",
```

```
          "password": "",
          "encryption": {
            "protocol": "DES",
            "key": ""
          }
        }
      }
    ]
  },
  "systemGroupInformation": {
    "storageSystemName": "VSP_G600",
    "contact": "confmanager.@example.com",
    "location": "Data Center 1F"
  }
}
```

Attribute	Type	Description
isSNMPAgentEnabled	boolean	(Required) Whether SNMP Agent is enabled ▪ `true`: Enabled ▪ `false`: Disabled If this attribute is `true`, error information (SIM) is sent by using SNMP traps. Also, SNMP operation requests (GET REQUEST, GET NEXT REQUEST, and GET BULK REQUEST) are received.
snmpVersion	string	(Required) SNMP version Specify the SNMP version that is used. The specifiable values are as follows: ▪ `v1`: SNMP v1 ▪ `v2c`: SNMP v2c ▪ `v3`: SNMP v3
sendingTrapSetting	object	(Optional) SNMP trap destinations

Attribute	Type	Description
		Specifiable attributes vary depending on the SNMP version. ▪ snmpv1v2cSettings (object[]) (Optional) Array of the settings for SNMP trap destinations (for SNMP v1 or SNMP v2c) You can specify up to 32 destinations. If you specify more than one destination, you must specify a unique `community` attribute. If you specify `snmpv1v2cSettings` attribute, you must also specify both the `community` attribute and the `sendTrapTo` attribute. • community (string) Community name used to report an SNMP trap[#] Specify a character string that consists of 1 to 180 characters. • sendTrapTo (string[]) Array of the IP addresses to which SNMP traps are sent. Specify these in IPv4 or IPv6 format. You can specify up to 32 IP addresses.

Attribute	Type	Description
		▪ snmpv3Settings (object[]) (Optional) Array of the settings for SNMP trap destinations (for SNMP v3) You can specify up to 8 destinations. If you specify more than one destination, you must specify a unique `sendTrapTo` attribute. If you specify `snmpv3Settings` attribute, you must also specify both the `userName` attribute and the `sendTrapTo` attribute. • userName (string) User name that is used for SNMP trap reports# Specify a character string that consists of 1 to 32 characters. • sendTrapTo (string) Specify the IP address to which SNMP traps are sent. Specify these in IPv4 or IPv6 format. • authentication (object) (Optional) Authentication information Specify this attribute when password-based authentication is enabled. For details on the specifiable attributes, see the table of the attributes that can be specified for the `authentication` attribute.
requestAuthenticationSetting	object	(Optional) Settings for the permitted requests

Attribute	Type	Description
		Specify the settings for the permitted requests (GET REQUEST, GETNEXT REQUEST, and GETBULK REQUEST) of SNMP operations. Specifiable attributes vary depending on the SNMP version. ▪ snmpv1v2cSettings (object[]) (Optional) Array of the settings for permitted requests (for SNMP v1 or SNMP v2c) You can specify up to 32 requests. If you specify more than one request, you must specify a unique `community` attribute. If you specify `snmpv1v2cSettings` attribute, you must also specify both the `community` attribute and the `requestsPermitted` attribute. • community (string) Name of the community that receives requests# Specify a character string that consists of 1 to 180 characters. • requestsPermitted (string[]) Array of the IP addresses of the SNMP Managers that receive requests Specify this in IPv4 or IPv6 format. You can specify up to 32 IP addresses. If you specify an empty array, requests of all SNMP Managers are received.

Attribute	Type	Description
		▪ snmpv3Settings (object[]) (Optional) Array of the settings for permitted requests (for SNMP v3) You can specify up to 8 requests. If you specify more than one request, you must specify a unique `userName` attribute. If you specify `snmpv3Settings` attribute, you must also specify the `userName` attribute. • userName (string) Name of the user who receives requests# Specify a character string that consists of 1 to 32 characters. This attribute is case sensitive. • authentication (object) (Optional) Authentication information Specify this attribute when password-based authentication is enabled. For details on the specifiable attributes, see the table of the attributes that can be specified for the `authentication` attribute.

Attribute	Type	Description
systemGroupInformation	object	(Required) Information of the system group ▪ storageSystemName (string) (Required) Name of the storage system# This is output as the sysName of the MIB of SNMP Agent. Specify a character string that consists of 1 to 180 characters. ▪ contact (string) (Required) Contact information or name of the administrator# This is output as the sysContact of the MIB of SNMP Agent. Specify a character string that consists of 0 to 180 characters. ▪ location (string) (Required) Location of the storage system# This is output as the sysLocation of the MIB of SNMP Agent. Specify a character string that consists of 0 to 180 characters.

The following table shows the attributes that can be specified for the `authentication` attribute. If you specify `authentication` attribute, you must also specify both the `protocol` attribute and the `password` attribute.

Attribute	Type	Description
protocol	string	Authentication method You can specify the following values: ▪ `SHA` ▪ `MD5`
password	string	Password# For a VSP 5000 series, VSP G1000, VSP G1500, or VSP F1500 storage system, specify a character string consisting of no fewer than 8 and no more than 180 characters. For a VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models storage system, specify a character string consisting of no fewer than 8 and no more than 64 characters.

Attribute	Type	Description
		If you do not want to change the password, specify an empty character string.
encryption	object	(Optional) Encryption information Specify this item to enable encryption. If you specify this attribute, you must also specify both the `protocol` attribute and the `key` attribute. ▪ protocol (string) Encryption method You can specify the following values: ▪ `AES` ▪ `DES` ▪ key (string) Encryption key# For a VSP 5000 series, VSP G1000, VSP G1500, or VSP F1500 storage system, specify a character string consisting of no fewer than 8 and no more than 180 characters. For a VSP One B20, VSP E series, VSP Gx00 models or VSP Fx00 models storage system, specify a character string consisting of no fewer than 8 and no more than 64 characters. If you do not want to change the encryption key, specify an empty character string.

#: You can use the following characters:

- Alphanumeric characters
- The following symbols:

  ```
  ! # $ ' ( ) + - . = @ [ ] _ ` { } ~
  ```

  The following symbols can be used for the `community` attribute.

  ```
  ! # $ ( ) + - . = @ [ ] _ ` { } ~
  ```

- Spaces (except at the beginning or end of a character string)

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the SNMP settings

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/snmp-settings/instance
```

Sending a test SNMP trap

The following request sends a test SNMP trap to make sure that the settings for reporting error information (SIM) to the SNMP manager are correctly specified.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/snmp-settings/instance/actions/
send-trap-test/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the schema of job objects, see the description of job objects.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/snmp-settings/
instance/actions/send-trap-test/invoke -d ""
```

Getting information about the error notification email settings

The following request gets information about settings related to the sending of email notifications for the service information messages (SIMs) of storage systems.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/alert-email-settings/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "isEmailNotificationEnabled" : true,
  "mailServer" : {
    "serverName" : "server1",
    "smtpAuth" : {
      "isSmtpAuthEnabled" : false,
      "account" : "user1",
      "password" : "****"
    }
  },
  "fromAddress" : "from@example.com",
  "replyToAddress" : "replyTo@example.com",
  "toAddresses" : [
   {
    "attribute" : "to",
    "address" : "to@example.com"
   }
  ],
  "description" : "description"
}
```

Attribute	Type	Description
isEmailNotificationEnabled	boolean	Whether notification by error notification emails is enabled ▪ `true`: Enabled ▪ `false`: Disabled
mailServer	object	Settings related to the server that sends the error notification emails

Attribute	Type	Description
		The IP address or host name of the server is displayed, along with the following SMTP authentication settings. ▪ serverName (string) IP address or host name of the server ▪ smtpAuth (object) SMTP authentication settings for the server ▫ isSmtpAuthEnabled (boolean) Whether SMTP authentication is enabled `true`: Enabled `false`: Disabled ▫ account (string) Account (user name) for SMTP authentication ▫ password (string) Password for SMTP authentication If a password is set, four asterisks (`****`) are displayed. If no password is set, an empty character string is displayed.
fromAddress	string	Source (from) email address from which error notification emails are sent
replyToAddress	string	Reply-destination (reply-to) email address to which replies to error notification emails are sent
toAddresses	object[]	Array of destination addresses for error notification emails

Attribute	Type	Description
		If destination addresses for error notification emails are set, the following information is output: ▪ attribute (string) An attribute of a destination address for error notification emails. Either `to`, `cc`, or `bcc` is output. ▪ address (string) A destination address for error notification emails.
description	string	Information displayed at the beginning of an error notification email Additional notification information that is displayed at the beginning of an error notification email is output.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/alert-email-
settings/instance
```

Specifying settings for error notification emails

The following request specifies settings related to the sending of email notifications for the service information messages (SIMs) of storage systems. You can specify, in a batch operation, the server that sends the error notification emails, additional information to be included in each email, and the destination addresses.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/alert-email-settings/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
  "isEmailNotificationEnabled": true,
  "mailServer": {
        "serverName": "server1",
        "smtpAuth" : {
          "account": "user1",
          "password": "userPass"
        }
  },
  "fromAddress" : "from@example.com",
  "replyToAddress" : "reply@example.com",
  "toAddresses" : [
    {
       "attribute" :"to",
       "address" :"to@example.com"
    },
    {
       "attribute" :"cc",
       "address" :"cc@example.com"
    },
    {
```

```
        "attribute" :"bcc",
        "address" :"bcc@example.com"
      }
  ],
  "description" : "description"
}
```

Attribute	Type	Description
isEmailNotificationEnabled	boolean	(Optional) Whether to enable the sending of error notification emails ▪ `true`: Enabled ▪ `false`: Disabled If you specify `true`, be sure to specify at least one source (from) address and one destination address.

Attribute	Type	Description
mailServer	object	(Optional) Settings related to the server that sends the error notification emails ▪ serverName (string) (Optional) IP address or host name of the server If you want to enable sending error notification emails, be sure to specify the `serverName` attribute of the `mailServer` object. You can specify an IPv4 address, an IPv6 address, or a host name. Specify a name consisting of 1 to 255 characters. You can use the following characters in the host name: ▪ Alphanumeric characters ▪ The following symbols: `! $ % - . @ _ ` ~` You cannot use spaces. To delete the IP address or host name of the server for sending emails, specify `false` for the `isEmailNotificationEnabled` attribute, and then specify an empty character string for this attribute.

Attribute	Type	Description
		▪ smtpAuth (object) (Optional) SMTP authentication settings for the server ▪ isSmtpAuthEnabled (boolean) (Optional) Whether to use SMTP authentication `true`: Use `false`: Do not use ▪ account (string) (Optional) Account (user name) for SMTP authentication You must specify this attribute if `true` is specified for the `isSmtpAuthEnabled` attribute. Specify a name consisting of 1 to 255 characters. You can use the following characters: Alphanumeric characters The following symbols: `! $ % ( ) - . @ _ ` ~` You cannot use spaces. To delete the account (user name) for SMTP authentication, specify `false` for the `isSmtpAuthEnabled` attribute, and specify an empty character string for this attribute. ▪ password (string) (Optional) Password for SMTP authentication You must specify this attribute if `true` is specified for the `isSmtpAuthEnabled` attribute. Specify a password consisting of 1 to 255 characters. You can use the following characters:

Attribute	Type	Description
		Alphanumeric characters The following symbols: `! $ % ( ) - . @ _ ` ~` You cannot use spaces. To delete the SMTP authentication password, specify `false` for the `isSmtpAuthEnabled` attribute, and specify an empty character string for this attribute.
fromAddress	string	(Optional) Source (from) email address from which error notification emails are sent# In `fromAddress`, specify a value consisting of 1 to 255 characters. To delete a source (from) email address from which error notification emails are sent, specify `false` for the `isEmailNotificationEnabled` attribute, and then specify an empty character string for this attribute.
replyToAddress	string	(Optional) Reply-destination (reply-to) email address to which replies to error notification emails are to be sent# In `replyToAddress`, specify a value consisting of 1 to 255 characters. To delete the reply-destination (reply-to) address, specify an empty character string.
toAddresses	object[]	(Optional) Array of destination addresses for error notification emails

Attribute	Type	Description
		You can specify up to 32 destination addresses to which error notification emails are to be sent. If you specify this attribute, all destination addresses that are currently registered will be overwritten. ▪ attribute (string) An attribute of a destination address for error notification emails. You must specify this attribute if you specify the `toAddresses` attribute. • `to` • `cc` • `bcc` ▪ address (string) A destination address for error notification emails.# You must specify this attribute if you specify the `toAddresses` attribute. Specify an address consisting of 1 to 255 characters. To delete all registered destination addresses for error notification emails, specify `false` for the `isEmailNotificationEnabled` attribute, and then specify an empty array for this attribute.
description	string	(Optional) Information displayed at the beginning of an error notification email Specify additional notification information to be displayed at the beginning of an error notification email. You can use between 1 and 511 characters.

Attribute	Type	Description

		You can use the following characters:
		▪ Alphanumeric characters
		▪ The following symbols:
		`! " # $ % & ' ( ) * + ,`
		`- . / : ; < = > ? @ [ \ ] ^ _ ` { | } ~`
		▪ Spaces
		▪ Newlines
		A newline character is counted as two characters.
		To delete the information displayed at the beginning of an error notification email, specify an empty character string.

#: You can use the following characters for the source (from) address, reply-destination (reply-to) address, and destination address:

- Alphanumeric characters
- The following symbols:

  `! # $ % & ' * + - . = ? @ ^ _ ` { | } ~`

You cannot use spaces.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL for acquiring settings information about an error notification email

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/alert-email-settings/instance
```

Adding a destination address for error notification emails

You can add a destination address for error notification emails. These notification emails are used to report service information messages (SIMs) of storage systems. This API allows you to add one destination address for error notification emails at a time.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/alert-email-settings/instance/
actions/add-recipient-address/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
     "parameters": {
        "attribute" : "to",
```

```
        "address"   : "to@example.com"
    }
}
```

Attribute	Type	Description
attribute	string	(Required) An attribute of a destination address for error notification emails that you want to add. ▪ `to` ▪ `cc` ▪ `bcc`
address	string	(Required) A destination address for error notification emails that you want to add. Specify a name consisting of 1 to 255 characters. You can use the following characters: ▪ Alphanumeric characters ▪ The following symbols: `! # $ % & ' * + - . = ? @ ^ _ ` { | } ~` You cannot use spaces.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL for acquiring settings information about an error notification email

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/alert-email-settings/instance/actions/add-recipient-address/
invoke
```

Deleting a destination address for error notification emails

You can delete a destination address for error notification emails. These notification emails are used to report service information messages (SIMs) of storage systems. This API allows you to delete one destination address at a time.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

- To delete all destination addresses at once, disable the setting for sending error notification emails.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/alert-email-settings/instance/
actions/remove-recipient-address/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
     "parameters": {
         "address"   : "to@example.com"
     }
}
```

Attribute	Type	Description
address	string	(Required) A destination address for error notification emails that you want to delete. Specify a name consisting of 1 to 255 characters. You can use the following characters: ▪ Alphanumeric characters ▪ The following symbols: ! # $ % & ' * + - . = ? @ ^ _ ` { | } ~ You cannot use spaces.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL for acquiring settings information about an error notification email

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/alert-email-settings/instance/actions/remove-recipient-address/
invoke
```

Sending a test error notification email

The following request sends a test error notification email to verify that the settings related to the sending of email notifications for the service information messages (SIMs) of storage systems are correctly specified.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/alert-email-settings/instance/
actions/send-email-test/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects. `affectedResources` is not displayed for this API. To verify that the email was successfully sent, check whether the test email was received by the specified recipients (destination addresses).

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	If the setting for sending error notification emails is disabled, test emails cannot be sent.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/alert-email-
settings/instance/actions/send-email-test/invoke -d ""
```

Getting a list of license information

The following request obtains a list of software license information. You can also obtain the list by specifying the software name or installation status of the software.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

For storage systems VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, if you execute this API request immediately after updating the license, the request might not be processed correctly if the system does not recognize the updated license. If this happens, wait a while, and then execute the request again.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/licenses
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
programProductName	string	(Optional) Software name You cannot specify this parameter and the `status` parameter at the same time.
status	string	(Optional) Installation status of the software You can specify the following values: ▪ `Installed` ▪ `Installed (Disabled)` ▪ `Not Installed` ▪ `Not Enough License` ▪ `Grace Period` ▪ `Expired` You cannot specify this parameter and the `programProductName` parameter at the same time.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "licenseId": 32775,
      "programProductName": "Dynamic Provisioning",
      "status": "Installed",
      "keyType": "Permanent",
      "capacityLimitStatus": "Unlimited",
      "usedCapacityInGB": 24379
    },
    {
      "licenseId": 32835,
      "programProductName": "Dynamic Tiering",
```

```
      "status": "Installed",
      "keyType": "Permanent",
      "capacityLimitStatus": "Unlimited",
      "usedCapacityInGB": 14682
    },
    {
      "licenseId": 32880,
      "programProductName": "Thin Image",
      "status": "Installed",
      "keyType": "Permanent",
      "capacityLimitStatus": "Unlimited",
      "usedCapacityInGB": 940
    },
    {
      "licenseId": 32884,
      "programProductName": "global-active device",
      "status": "Installed",
      "keyType": "Permanent",
      "capacityLimitStatus": "Unlimited",
      "usedCapacityInGB": 161
    }
  ]
}
```


The following is an example of output generated when the query parameters are specified:


```
{
  "data": [
    {
      "licenseId": 32775,
      "programProductName": "Dynamic Provisioning",
      "status": "Installed",
      "keyType": "Permanent",
      "capacityLimitStatus": "Unlimited",
      "usedCapacityInGB": 24379
    }
  ]
}
```


The following table lists the license information that you can obtain. For details about license information, see the *System Administrator Guide*.

Attribute	Type	Description
licenseId	int	License ID

Attribute	Type	Description
programProductName	string	Software name
status	string	Installation status of the software ▪ `Installed`: Installed ▪ `Installed (Disabled)`: Installed (License is disabled) ▪ `Not Installed`: Not installed ▪ `Not Enough License`: Installed (Not enough license capacity) ▪ `Grace Period`: Not enough license capacity because of additional LDEVs or pool volumes, or creation of pairs ▪ `Expired`: Expired Output when the `keyType` attribute is `Temporary`.
keyType	string	License key type ▪ `Permanent`: For purchase (no limit on effective term) ▪ `Term`: For purchase (effective term specified) ▪ `Temporary`: For trial use before purchase ▪ `Emergency`: For emergency use
capacityLimitStatus	string	Specified if the permitted license capacity has a limit ▪ `Limited`: Limited ▪ `Unlimited`: Unlimited
permittedCapacityInTB	long	Permitted license capacity (TB)
usedCapacityInGB	long	Volume capacity used by the software (GB)
remainingDays	int	Remaining days before expiration ▪ If the `keyType` attribute is `Term`, `Temporary`, or `Emergency`: Remaining days before expiration ▪ If a license for which the `keyType` attribute is `Temporary` is expired: Remaining days after the expiration date until re-installation of the software becomes available

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/licenses
```

Getting information about a specific license

The following request obtains license information by specifying a software license ID.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/licenses/object-ID
```

Request message

Object ID

Specify the `licenseId` value obtained by getting information about the licenses.

Attribute	Type	Description
licenseId	int	(Required) License ID

Query parameters

None.

Body

None.

Response message

Body

```
{
  "licenseId": 32775,
  "programProductName": "Dynamic Provisioning",
  "status": "Installed",
  "keyType": "Permanent",
  "capacityLimitStatus": "Unlimited",
  "usedCapacityInGB": 24379
}
```

The following table lists the license information that you can obtain. For details about license information, see the *System Administrator Guide*.

Attribute	Type	Description
licenseId	int	License ID
programProductName	string	Software name
status	string	Installation status of the software ▪ `Installed`: Installed ▪ `Installed (Disabled)`: Installed (License is disabled) ▪ `Not Installed`: Not installed ▪ `Not Enough License`: Installed (Not enough license capacity) ▪ `Grace Period`: Not enough license capacity because of additional LDEVs or pool volumes, or creation of pairs ▪ `Expired`: Expired Output when the `keyType` attribute is `Temporary`.
keyType	string	License key type ▪ `Permanent`: For purchase (no limit on effective term) ▪ `Term`: For purchase (effective term specified) ▪ `Temporary`: For trial use before purchase ▪ `Emergency`: For emergency use

Attribute	Type	Description
capacityLimitStatus	string	Specified if the permitted license capacity has a limit ▪ `Limited`: Limited ▪ `Unlimited`: Unlimited
permittedCapacityInTB	long	Permitted license capacity (TB)
usedCapacityInGB	long	Volume capacity used by the software (GB)
remainingDays	int	Remaining days before expiration ▪ If the `keyType` attribute is `Term`, `Temporary`, or `Emergency`: Remaining days before expiration ▪ If a license for which the `keyType` attribute is `Temporary` is expired: Remaining days after the expiration date until re-installation of the software becomes available

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/800000012345/licenses/32775
```

Installing software

The following request installs software by registering a license key code.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/licenses
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "keyCode":
"ABCDEFGHIJKLMNOPQRSTUVWXYZ12345678901234567890123456789OABCDEFGHIJKLMNOPQRS"
}
```

Attribute	Type	Description
keyCode	string	(Required) License key code

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the list of software license information

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/licenses
```

Enabling or disabling a license

You can enable or disable a software license by specifying the software license ID.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/licenses/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `licenseId` value obtained by getting information about the licenses.

Attribute	Type	Description
licenseId	int	(Required) License ID

Query parameters

None.

Body

```
{
  "isEnabled": true
}
```

Attribute	Type	Description
isEnabled	boolean	(Required) Whether to enable a license or not ▪ `true`: Enables a license ▪ `false`: Disables a license

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of information about the license for which the setting was changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/licenses/34055
```

Removing software

The following request shows how to remove software by specifying the license ID.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/licenses/object-ID
```

Request message

Object ID

Specify the `licenseId` value obtained by getting information about the licenses.

Attribute	Type	Description
licenseId	int	(Required) License ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the license information of the removed program product

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/licenses/34055
```

Changing the user information used in searches of the external authentication server set for a storage system

If the DN (Distinguished Name) or password of a user used in searches of the external authentication server (LDAP server) set for a storage system is changed on the LDAP server side, change the settings on the storage system side.

For a list of storage systems that support this API, see Overview of the initial settings of a storage system (on page 1261).

Note:

- Note that you cannot use the REST API to specify the initial settings for linkage with the external authentication server. For details about the initial settings, see the manual of the storage system that you are using.
- To run this API request for a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system that is managed by using an SVP, the storage system must be in a configuration that is linked with the SVP.
- If one SVP is linked with multiple storage systems, run this API request for each storage system that is linked.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/external-authentication-server-settings/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query information

None.

Body

```
{
  "ldap" : {
    "searchUserDN":"CN=search_user,DC=example,DC=com",
    "searchUserPassword":"search_password"
  }
}
```

Attribute	Type	Description
ldap	object	(Required) Setting when an LDAP server is used for the external authentication server ▪ searchUserDN (string) (Optional) DN of the user used for searches Specify a name consisting of 1 to 255 characters. You can use the following characters: • Alphanumeric characters • The following symbols: `! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [ \ ] ^ _ ` { | } ~` • Spaces ▪ searchUserPassword (string) (Required) Password of the user used for searches Specify a name consisting of 1 to 256 characters. You can use the following characters: • Alphanumeric characters • The following symbols: For VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 `! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [ \ ] ^ _ ` { | } ~` For other storage systems `! # $ % & ' ( ) * + - . = @ \ ^ _ |` • Spaces You can use this character for VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication

Attribute	Type	Description
		Specify this attribute if you are using non-SSL communication or using SSL communication in the DTLS encrypted communication mode for a VSP G200, G400, G600, G800 or VSP F400, F600, F800 storage system. If you omit this item, the value of `mappWebServerHttpsPort` that was specified when the storage system was registered is assumed.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API request. To check whether a change has been applied, as a user authenticated by the external authentication server, run the API request for generating a session and confirm that authentication is successful.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/900000012345/external-authentication-server-settings/instance
```

Getting information about certificate files (for external server verification)

The following request gets a list of information about the root certificate files used to verify external servers.

Note:

- This API request can be used when the storage system is VSP One B20.
- You cannot run the following API requests simultaneously:
  - Getting information about certificate files (for external server verification)
  - Getting information about a specific certificate file (for external server verification)
  - Uploading the certificate files (for external server verification)
  - Deleting a certificate file (for external server verification)

Execution permission

Security Administrator (View Only)

Request header

```
GET base-URL/v1/objects/storages/storage-device-ID/server-verification-certificates
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained ▪ `certificate` Gets detailed certificate information.

Body

None.

Response message

Body

```
{
  "data": [
    {
      "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-
412c0d3baa39",
      "nickname": "cert1"
```

```
    },
    {
      "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-
412c0d3baa40",
      "nickname": "cert2"
    }
  ]
}
```


Attribute	Type	Description
serverVerification CertificateId	string	ID of the certificate used to verify external servers
nickname	string	Nickname of the certificate

If you run the query with `certificate` specified for `detailInfoType` in the query parameters, detailed certificate information is also obtained.


```
{
  "data": [
    {
      "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-
412c0d3baa39",
      "nickname": "cert1",
      "serialNumber": "ABCDEF1234567890",
      "issuer": "CN=example.com",
      "owner": "CN=example.com",
      "startOfValidityPeriod": "2024-01-23T04:56:07Z",
      "endOfValidityPeriod": "2030-01-23T04:56:07Z"
    },
    {
      "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-
412c0d3baa40",
      "nickname": "cert2",
      "serialNumber": "ABCDEF1234567890",
      "issuer": "CN=example.com",
      "owner": "CN=example.com",
      "startOfValidityPeriod": "2024-01-23T04:56:07Z",
      "endOfValidityPeriod": "2030-01-23T04:56:07Z"
    }
  ]
}
```

Attribute	Type	Description
serialNumber	string	Serial number of the certificate
issuer	string	Issuer of the certificate
owner	string	Owner of the certificate
startOfValidityPeriod	ISO8601string	Validity period of the certificate (start) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
endOfValidityPeriod	ISO8601string	Validity period of the certificate (end) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/server-
verification-certificates
```

Getting information about a specific certificate file (for external server verification)

The following request gets information about the root certificate file used to verify external servers.

Note:

- This API request can be used when the storage system is VSP One B20.
- You cannot run the following API requests simultaneously:
  - Getting information about certificate files (for external server verification)
  - Getting information about a specific certificate file (for external server verification)
  - Uploading the certificate files (for external server verification)
  - Deleting a certificate file (for external server verification)

Execution permission

Security Administrator (View Only)

Request header

```
GET base-URL/v1/objects/storages/storage-device-ID/server-verification-certificates/
object-ID
```

Request message

Object ID

Specify the value of `serverVerificationCertificateId` obtained by using the API request described in "Getting information about certificate files (for external server verification)".

Attribute	Type	Description
serverVerificationCertificateId	string	(Required) ID of the certificate used to verify external servers

Query parameters

None.

Body

None.

Response message

Body

```
{
  "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
  "nickname": "cert1",
  "serialNumber": "ABCDEF1234567890",
```

```
  "issuer": "CN=example.com",
  "owner": "CN=example.com",
  "startOfValidityPeriod": "2024-01-23T04:56:07Z",
  "endOfValidityPeriod": "2030-01-23T04:56:07Z"
}
```

Attribute	Type	Description
serverVerificationCertificateId	string	ID of the certificate used to verify external servers
nickname	string	Nickname of the certificate
serialNumber	string	Serial number of the certificate
issuer	string	Issuer of the certificate
owner	string	Owner of the certificate
startOfValidityPeriod	ISO8601string	Validity period of the certificate (start) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
endOfValidityPeriod	ISO8601string	Validity period of the certificate (end) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/server-
verification-certificates/4b73e622-ddc1-449a-99f7-412c0d3baa39
```

Uploading the certificate files (for external server verification)

The following request uploads the root certificate files used to verify external servers via the REST API server.

The request uploads the root certificate of the server certificate, which has been uploaded to SVP/GUM/ESM on the remote storage system side, to the local storage system side.

Enabling the certificate verification function

The certificate verification function is enabled the first time you upload the root certificate by using this API request. Once enabled, the certificate verification function cannot be disabled. If you use multiple communication destination servers, uploading the root certificate of any one of those servers enables the certificate verification function for all communication destination servers. If the destination server cannot be verified, communication will fail. Before performing this operation, make sure that you thoroughly understand the certificate verification function by referring to "Server certificate verification function (VSP One B20)" and the *System Administrator Guide*.

Notes when downgrading the firmware version

When downgrading the firmware from A3-04-01-*XX* or a later version to a version earlier than A3-04-01-*XX*, you need to delete all root certificates that have been uploaded to the local storage system side.

Even if you downgrade the firmware version, the certificate verification function that was enabled once will not be disabled. If you downgraded the firmware from A3-04-01-*XX* or a later version to a version earlier than A3-04-01-*XX*, and then want to update the firmware to A3-04-01-*XX* or a later version, you will need to upload the root certificate again.

Important:

- The certificate files will be uploaded to the truststore. This upload is not to the keystore. Do not upload private keys for external servers.
- You can also upload chained certificates for external server verification. In this case, only the topmost certificate in the chain is registered.

In the request header of this API function, specify `multipart/form-data` for Content-Type.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.
- Only one file can be uploaded in one request.
- A maximum of 150 files can be uploaded.
- You cannot run the following API requests simultaneously:
  - Getting information about certificate files (for external server verification)
  - Getting information about a specific certificate file (for external server verification)
  - Uploading the certificate files (for external server verification)
  - Deleting a certificate file (for external server verification)

Execution permission

Security Administrator (View & Modify)

Request header

In this API, the request body is sent in the format of multipart/form-data. Specify `multipart/form-data` for the Content-Type of the request header.

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/server-verification-certificates
```

Request message

Object ID

None.

Query parameters

None.

Body

Attribute	Type	Description

file	string	(Required) File to be uploaded (up to 200KB)
		You can use server certificate files in either X509v3 DER format or X509v3 PEM format.
		You can use the following characters:
		▪ Spaces
		▪ Alphanumeric characters
		▪ The following symbols:
		`! " # $ % & ' ( ) * + , - . : ;`
		`< = > ? @ [ \ ] ^ _ ` { | } ~`

nickname	string	(Optional) Specify the certificate nickname consisting of 1 to 255 characters. You can use the following characters. ▪ Alphanumeric characters You cannot specify the same name as a certificate that is already uploaded. If you do not specify the `nickname` attribute, a name will be assigned by the REST API according to the following. ServerVerificationCertYYYYMMDDhhmmss

Response message

Body

```
{
  "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
  "nickname": "cert1",
  "serialNumber": "ABCDEF1234567890",
  "issuer": "CN=example.com",
  "owner": "CN=example.com",
  "startOfValidityPeriod": "2024-01-23T04:56:07Z",
  "endOfValidityPeriod": "2030-01-23T04:56:07Z"
}
```

Attribute	Type	Description
serverVerificationCertificateId	string	ID of the certificate used to verify external servers
nickname	string	Nickname of the certificate
serialNumber	string	Serial number of the certificate
issuer	string	Issuer of the certificate
owner	string	Owner of the certificate
startOfValidityPeriod	ISO8601string	Validity period of the certificate (start) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
endOfValidityPeriod	ISO8601string	Validity period of the certificate (end) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type: multipart/form-data" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -H "Expect:" -X POST -F
"file=@C:\certfile.der" https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/A34000123457/server-verification-certificates
```

If you run a request in which `multipart/form-data` is specified for Content-Type, `Expect: 100-continue` might be automatically assigned to the header, depending on the specifications of the client software. Depending on the specifications of the web server, this header might not be accepted. If the header is not accepted, a 417 error occurs, and the request fails. In this coding example, the Expect header is specified to overwrite the automatically assigned header, thereby preventing this error.

Deleting a certificate file (for external server verification)

The following request deletes the root certificate file used to verify external servers.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.
- You cannot run the following API requests simultaneously:
  - Getting information about certificate files (for external server verification)
  - Getting information about a specific certificate file (for external server verification)
  - Uploading the certificate files (for external server verification)
  - Deleting a certificate file (for external server verification)

Execution permission

Security Administrator (View & Modify)

Request header

```
DELETE base-URL/v1/objects/storages/storage-device-ID/server-verification-certificates/object-ID
```

Request message

Object ID

Specify the value of `serverVerificationCertificateId` obtained by using the API request described in "Getting information about certificate files (for external server verification)".

Attribute	Type	Description
serverVerificationCertificateId	string	(Required) ID of the certificate used to verify external servers

Query parameters

None.

Body

None.

Response message

Body

```
{
  "serverVerificationCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39"
}
```

Attribute	Type	Description
serverVerification CertificateId	string	ID of the deleted certificate

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/server-
verification-certificates/4b73e622-ddc1-449a-99f7-412c0d3baa39
```

Chapter 19: Encrypting data

You can use REST API to perform operations related to data encryption that utilizes Encryption License Key. The data encryption function is an optional function and is sold only in select countries or regions.

Overview of data encryption

You can use the Encryption License Key functionality to encrypt data stored in a volume of the storage system. If you encrypt data, you can prevent information leakage when drives in the storage system are replaced or the drives are stolen. Even if you encrypt data, the processing time or waiting time during I/O will not increase and the existing applications and infrastructure will not be affected.

With the REST API, you can use the Encryption License Key functionality if the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

The operations for data encryption to be performed by using the REST API are as follows:

- Setting an encryption environment

  You can use the REST API to change the encryption environment settings for the storage system or initialize the encryption environment.

- Encrypting data to be stored in a volume

  If you enable data encryption when creating a parity group and create a volume from the parity group, data to be stored in that volume is encrypted. In addition, if you migrate exiting volumes to the volume, the data stored in these existing volumes can also be encrypted.

- Managing encryption keys

  You can use the REST API to manage encryption keys used to encrypt and decrypt data. Encryption keys are automatically created when an encryption environment is enabled for the first time. You can create a new key if unassigned keys become insufficient due to replacement of a drive, or delete unnecessary unassigned keys. In addition, you can back up encryption keys to a REST API client and restore them if needed. For VSP One B20, you can back up encryption keys to a key management server and restore them if needed.

- Setting a key management server

  For VSP One B20, you can use the REST API to configure or change settings to link with the key management server.

Note:

In the case of VSP One B20, you cannot use the REST API to create parity group for DDP. Use storage management software such as CCI to create parity group for DDP.

Note:

If the settings are specified so that an encryption environment for the storage system links with the key management server, you cannot use the REST API to perform the following operations for VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900:

- Change or get the encryption environment settings
- Create or delete encryption keys
- Back up or restore encryption keys

For details on the Encryption License Key functionality such as the encryption specifications and system requirements, see the *Encryption License Key User Guide*.

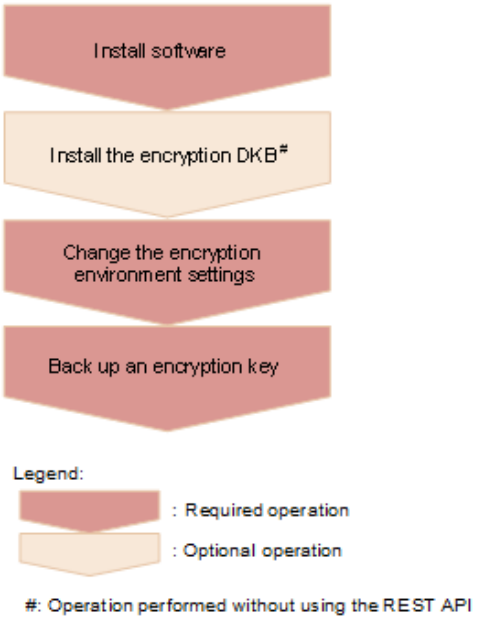
Workflow for operations related to data encryption

The workflow for using the REST API to perform operations to encrypt and use data stored in a volume of a storage system is as follows.

Specifying encryption environment settings (when there is no link to a key management server)

Specify settings for an environment used to encrypt data stored in a volume.

The following figure shows the workflow.



Installing software

Install the license key for the Encryption License Key software.

Installing the encryption disk board (DKB)

If necessary, install the encryption DKB.

Changing the encryption environment settings

Enable the encryption environment settings.

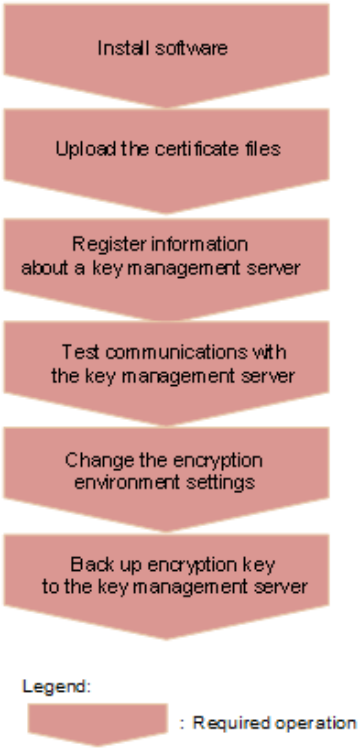
Backing up an encryption key

When you enable the encryption environment settings and create an encryption key, you need to back up the encryption key.

Specifying encryption environment settings (when there is a link to a key management server)

Specify settings for an environment used to encrypt data stored in a volume.

The following figure shows the workflow.



Installing software

Install the license key for the Encryption License Key software.

Uploading the certificate files

Upload the certificate files required for communications with the key management server. To do this, upload them from the REST API client to the storage system via the REST API server.

Registering information about a key management server

In the storage system, register information about the key management server.

Testing communications with the key management server

Test whether communications with the key management server are possible.

Changing the encryption environment settings

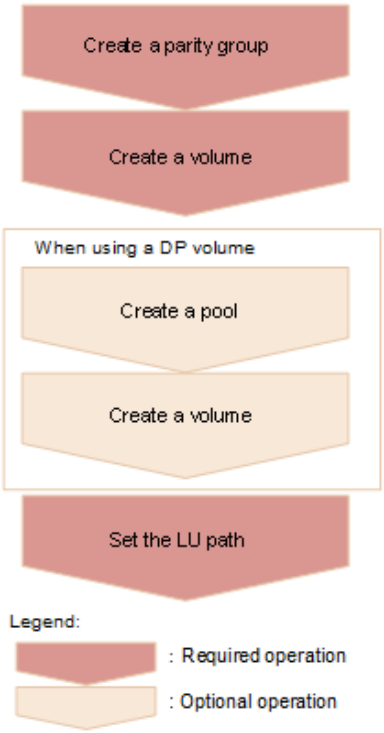
Enable the encryption environment settings and configure them to use the key management server.

Backing up encryption keys to the key management server

When you enable the encryption environment settings and create an encryption key, you need to back up the encryption key.

Encrypting new data

The following describes how to create a volume, and then encrypt data to be newly written to the volume.



Creating a parity group

Create a parity group for which data encryption is enabled (specify `true` for the attribute `isEncryptionEnabled`).

In the case of VSP One B20, you cannot use the REST API to create parity group for DDP. Use storage management software such as CCI.

Creating a volume

Create a volume by specifying the parity group for which data encryption is enabled.

In the case of VSP One B20, perform the operations described in When using a DP volume.

When using a DP volume

Creating a pool

Create a pool by specifying volumes whose data is encrypted.

In the case of VSP One B20, you cannot use the REST API to create pools from a parity group for DDP. Use storage management software such as CCI.

Creating a volume

Create a DP volume by specifying a pool consisting only of volumes whose data is encrypted.

Setting the LU path

Specify the LU path from the host to the volume.

Encrypting existing data

To encrypt existing data in a non-encrypted volume, create an encrypted volume and then migrate the data from the existing volume.

Create a Volume Migration pair with the volume containing the non-encrypted data specified as the source volume (P-VOL) and the volume for which encryption is enabled specified as the target volume (S-VOL), and then perform migration.

To encrypt existing data in a non-encrypted volume without changing the drive structure, perform migration twice as described in the following procedure.

1. Create a Volume Migration pair with the volume containing the non-encrypted data specified as the source volume (P-VOL) and the volume to which the data is to be backed up specified as the target volume (S-VOL), and then perform migration.
2. Confirm that the data has been backed up, and then delete the existing parity group.
3. Create a parity group and volumes for which encryption is enabled.
4. Create a Volume Migration pair with the volume to which data was backed up specified as the source volume (P-VOL) and the volume for which encryption is enabled specified as the target volume (S-VOL), and then perform migration.

Note:

Use the following method to check whether the data in a volume is encrypted.

- To check a basic volume:

  Get information about the volume by running the API request for getting information about a specific volume.

  If `ENCD` is output for the `attributes` attribute, this indicates that the data in the volume is encrypted.

- To check a DP volume:

  Get information about a list of volumes that make up a pool, by running the API request for getting volume information with the pool number specified for the query parameter `poolId`.

  If `ENCD` is output for the `attributes` attribute of each pool volume that makes up the pool, this indicates that the data in the DP volume is encrypted.

Getting information about the encryption environment settings

The following request gets information about the encryption environment settings.

Execution permission

Security Administrator (View & Modify)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-settings/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
    "isEnabled": true,
    "detectsError": false
}
```

Attribute	Type	Description
isEnabled	boolean	Whether the encryption environment is enabled ▪ `true`: The encryption environment is enabled ▪ `false`: The encryption environment is disabled
detectsError	boolean	Whether an error occurred while the encryption environment settings were being changed ▪ `true`: An error occurred. ▪ `false`: No error occurred. If this value is `true`, data encryption cannot be performed. Disable (initialize) the encryption environment settings by running the API request that changes the encryption environment settings, and then enable the encryption environment settings again.
usesKms	boolean	Whether a key management server is used This attribute is output for VSP One B20. ▪ `true`: Used ▪ `false`: Not used
prohibitsLocalKeyGeneration	boolean	Whether local key generation is prohibited This attribute is output for VSP One B20. ▪ `true`: Local key generation is prohibited ▪ `false`: Local key generation is not prohibited

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/encryption-
settings/instance
```

Changing the encryption environment settings

You can change the encryption environment settings. If you change the settings to enable the encryption environment, encryption is applied. If you change the settings to disable the encryption environment, the encryption environment settings are initialized.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/encryption-settings/instance
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

```
{
      "isEnabled": true
}
```

Attribute	Type	Description
isEnabled	boolean	For VSP One B20: (Optional) Specify whether to enable the encryption environment. For other storage systems: (Required) Specify whether to enable the encryption environment. ▪ `true`: Enables the encryption environment ▪ `false`: Disables (initialize) the encryption environment If you are using VSP One B20 to link with a key management server, when you set this attribute to `false`, you must set the `usesKms` attribute to `false`.
usesKms	boolean	(Optional) Specify whether to use a key management server. You can specify this attribute for VSP One B20. ▪ `true`: Use ▪ `false`: Do not use You can specify `true` only if one or more key management servers are registered and the `isEnabled` attribute is `true`.
prohibitsLocalKeyGeneration	boolean	(Optional) Specify whether to prohibit local key generation. You can specify this attribute for VSP One B20. ▪ `true`: Prohibit local key generation ▪ `false`: Do not prohibit local key generation

Attribute	Type	Description
		You can specify `true` only if one or more key management servers are registered and the `usesKms` attribute is `true`. If you specify `true`, the encryption key is created on the key management server and cannot be created in the storage system. Once this attribute is set to `true`, you cannot change it to `false`. Make sure that you can set this attribute to `true`.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the encryption environment settings specified for the storage system

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/encryption-settings/instance
```

Getting information about the module used for encryption

The following request gets information about the module used for encryption.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-modules/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "name": "Storage_Encryption_Module_20",
  "version": {
      "newVersion": "A0-99-00-00",
      "oldVersion": "A0-01-00-00",
      "isMixed": true
  }
}
```

Attribute	Type	Description
name	string	Name of the module used for encryption
version	object	Information about the version of the module used for encryption

Attribute	Type	Description
		The version of the module used for encryption is unique, so the values of the `newVersion` and `oldVersion` attributes should be the same. If a firmware update is in progress or has failed, the values of the `newVersion` and `oldVersion` attributes will not match and the version information will be mixed. ▪ newVersion (string) Information on the latest version of the module used for encryption ▪ oldVersion (string) Information on the oldest version of the module used for encryption ▪ isMixed (boolean) Whether the versions of the module used for encryption are different • `true`: The versions are different • `false`: The versions are the same If this value is `true`, a firmware update might be in progress or might have failed. If a firmware update is in progress, wait for it to finish and then check again. In other cases, contact your system administrator.

Status codes

For details about the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/encryption-
modules/instance
```

Getting the number of encryption keys

This request obtains the number of encryption keys.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-key-counts/instance
```

Request message

Object ID

Specify `instance`.

If an object has only one instance, the `instance` is the fixed value that specifies the object ID.

Query parameters

None.

Body

None.

Response message

Body

```
{
    "cek": 4,
    "dek": 12,
    "free": 1003
}
```

Attribute	Type	Description
cek	int	The number of certificate encryption keys (CEKs)
dek	int	The number of data encryption keys (DEKs)
free	int	The number of unused keys

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This operation is not supported for the microcode version of the storage system.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/encryption-
key-counts/instance
```

Getting information about a list of encryption keys

You can get information about a list of encryption keys.

Important:

If you specify `DEK`, `FREE`, or `DEKANDFREE` for the query parameter `keyType` but do not specify `startKeyId` and `count`, the API request gets information about 1024 key IDs, from key ID 0. If you want to get information about other keys, use `startKeyId` or `count`.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-keys
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter condition
keyType	string	(Required) Type of keys for which information is to be obtained ▪ `DEK` ▪ `CEK`

Parameter	Type	Filter condition
		▪ `KEK` ▪ `FREE` ▪ `DEKANDFREE` (DEK and FREE) If you specify `DEK`, `FREE`, or `DEKANDFREE` for this parameter, you can specify other optional parameters.
startKeyId	int	(Optional) ID of the key from which to start getting information Specify a value in the range from `0` to `4095`. This parameter is valid only if you specify `DEK`, `FREE`, or `DEKANDFREE` for the `keyType` parameter. If this parameter is omitted, `0` is assumed.
count	int	(Optional) Number of keys for which information is to be obtained Specify a value in the range from `1` to `1024`. This parameter is valid only if you specify `DEK`, `FREE`, or `DEKANDFREE` for the `keyType` parameter. If this parameter is omitted, `1024` is assumed.
startCreatedTime	ISO8601string	(Optional) Information is obtained about keys that were created on or after the specified date and time. Specify a value in YYYY-MM-DDThh:mm:ssZ format. If you also specify the `endCreatedTime` parameter, specify a date and time that is earlier than the date and time specified for the `endCreatedTime` parameter. This parameter is valid only if you specify `DEK`, `FREE`, or `DEKANDFREE` for the `keyType` parameter.
endCreatedTime	ISO8601string	(Optional) Information is obtained about keys that were created on or before the specified date and time.

Parameter	Type	Filter condition
		Specify a value in YYYY-MM-DDThh:mm:ssZ format. If you also specify the `startCreatedTime` parameter, specify a date and time that is later than the date and time specified for the `startCreatedTime` parameter. This parameter is valid only if you specify `DEK`, `FREE`, or `DEKANDFREE` for the `keyType` parameter.

Body

None.

Response message

Body

```
{
    "data": [
        {
            "keyId": "6",
            "createdTime": "2018-10-29T04:32:26Z",
            "keyType": "DEK",
            "uuid": "-",
            "targetDeviceLocation": "HDD00-08",
            "keyGeneratedLocation": "DKC",
            "numOfBackups": 4
        },
        {
            "keyId": "7",
            "createdTime": "2018-10-29T04:32:26Z",
            "keyType": "DEK",
            "uuid": "-",
            "targetDeviceLocation": "HDD00-09",
            "keyGeneratedLocation": "DKC",
            "numOfBackups": 4
        }
    ]
}
```

Attribute	Type	Description
keyId	string	ID of the key

Attribute	Type	Description
		If the value of the `keyType` attribute is `CEK` or `KEK`, a hyphen (`-`) is output.
createdTime	ISO8601string	Date and time when the key was created If the value of the `keyType` attribute is `KEK` and the value of the `keyGeneratedLocation` attribute is `DKC`, a hyphen (`-`) is output for VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900.
keyType	string	Type of the key ▪ `DEK`: Encryption key The key is used to encrypt stored data. ▪ `CEK`: Key for authentication This key is used to encrypt a certificate. It is also used when a DEK is stored in a DKB. ▪ `KEK`: Key for encrypting keys This key is used to encrypt a CEK, a DEK, or a FREE key. Only one KEK exists for each storage system. ▪ `FREE`: Unused key that has not been assigned an encryption key
uuid	string	UUID of the key If the value of the `keyType` attribute is not `KEK`, or if the value of the `keyType` attribute is `KEK` but no key management server is linked, a hyphen (`-`) is output.
targetDeviceLocation	string	Device to which the key is assigned ▪ Location number of the drive (if the key type is DEK) ▪ Location number of the controller (if the key type is CEK) ▪ A hyphen (`-`) (if the key type is KEK or FREE)

Attribute	Type	Description
keyGeneratedLocation	string	Location where the key was created ▪ `DKC`: Storage system ▪ `KMS`: Key management server
numOfBackups	int	Number of times the key was backed up Even if the key backup fails, the value may increase. If the value of the `keyType` attribute is `KEK`, `-1` is output, indicating an invalid value.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	This operation is not supported for the microcode version of the storage system.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/encryption-
keys?keyType=DEK
```

Getting a specific encryption key

You can get information about a specific encryption key by specifying the ID of the key. You can use this API request to get information about a key whose type is DEK or FREE. To get information about a key whose type is CEK or KEK, use the API request that gets information about a list of encryption keys.

Execution permission

Security Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-keys/object-ID
```

Request message

Object ID

Specify the value for `keyId` that you acquired by running the API request to obtain a list of encryption keys.

Attribute	Type	Description
keyId	string	(Required) ID of the key

Query parameters

None.

Body

None.

Response message

Body

```
{
    "keyId": "7",
    "createdTime": "2018-10-29T04:32:26Z",
    "keyType": "DEK",
    "uuid": "-",
    "targetDeviceLocation": "HDD00-09",
    "keyGeneratedLocation": "DKC",
    "numOfBackups": 4
}
```

Attribute	Type	Description
keyId	string	ID of the key
createdTime	ISO8601string	Date and time when the key was created
keyType	string	Type of the key ▪ `DEK`: Encryption key The key is used to encrypt stored data. ▪ `FREE`: Unused key that has not been assigned an encryption key
uuid	string	UUID of the key

Attribute	Type	Description
		A hyphen (-) is always output.
targetDeviceLocation	string	Device to which the key is assigned ▪ Location number of the drive (if the key type is DEK) ▪ A hyphen (-) (if the key type is FREE)
keyGeneratedLocation	string	Location where the key was created ▪ `DKC`: Storage system ▪ `KMS`: Key management server
numOfBackups	int	Number of times the key was backed up Even if the key backup fails, the value may increase.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/encryption-
keys/7
```

Creating encryption keys

You can create encryption keys by specifying the number of encryption keys you want to create. After creating an encryption key, be sure to back it up.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/encryption-keys
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
    "count": 10
}
```

Attribute	Type	Description
count	int	(Required) The number of encryption keys to be created Specify a value equal to or greater than 1. If the sum of the value specified for the `count` attribute and the number of existing keys exceeds the maximum number of keys that can be created, no keys are created, and an error occurs.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To confirm that the encryption keys have been created, run the API request for obtaining the number of encryption keys or the API request for obtaining a list of encryption keys.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/encryption-keys
```

Deleting one or more encryption keys at one time

You can delete unused (FREE) keys by specifying the ID of the key you want to delete. Keys whose type is CEK or DEK cannot be deleted. You can delete from 1 to 4096 encryption keys.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/storage-device-ID/services/encryption-key-service/actions/delete/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "parameters": {
    "keyIds": [
      "0",
      "1"
    ]
  }
}
```

Attribute	Type	Description
keyIds	string[]	(Required) The key ID Specify a value in the range from 0 to 4095. If you specify multiple IDs, delimit the IDs by commas.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To confirm that the encryption keys have been deleted, run the API request for obtaining the number of encryption keys or the API request for obtaining a list of encryption keys.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/A34000123457/
services/encryption-key-service/actions/delete/invoke
```

Deleting an encryption key

You can delete unused (FREE) keys by specifying the ID of the key you want to delete. Keys whose type is CEK or DEK cannot be deleted.

Note:

For VSP One B20, we recommend that you use the API request "Deleting one or more encryption keys at one time".

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/encryption-keys/object-ID
```

Request message

Object ID

Specify the value for `keyId` that you acquired by running the API request to obtain a list of encryption keys.

Attribute	Type	Description
keyId	string	(Required) The key ID

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	The URL of the key that was deleted

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/encryption-
keys/4
```

Backing up encryption keys on the REST API client

You can back up encryption keys to a file on the REST API client. In the request header of this API function, specify `application/octet-stream` for Accept.

Note:

- When you create an encryption key, be sure to back it up. We also recommend that you periodically back up encryption keys.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request header

This API request downloads an encryption key file to the REST API client. Specify `application/octet-stream` for the Accept of the request header.

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/encryption-keys/file/actions/backup/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify a value for `file`.

When backing up encryption keys to a file or restoring encryption keys from a file, the value of `file` is a fixed value (the object ID).

Query parameters

None.

Body

```
{
    "parameters": {
        "password": "backuppassword"
    }
}
```

Attribute	Type	Description
password	string	(Required) Password. For the VSP One B20, specify a character string consisting of 12 to 255 characters. Specify a character string consisting of 6 to 255 characters for other storage systems. You can use the following characters: ▪ Alphanumeric characters ▪ ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ` { | } ~ You will need this password when you restore the encryption key.

Response header

This API request returns the following response header.

Header	Description
Content-Disposition	`attachment`
Content-Length	The size of the backup data (in bytes)
Content-type	`application/octet-stream`

Response message

Body

None.

Action template

None.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/octet-stream" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000123457/encryption-keys/file/actions/backup/invoke -o "backupfile.ekf"
```

Restoring encryption keys on the REST API client

You can restore encryption key file that was previously backed up. In the request header of this API function, specify `multipart/form-data` for Content-Type.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request header

In this API, the request body is sent in the format of multipart/form-data. Specify `multipart/form-data` for the Content-Type of the request header.

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/encryption-keys/file/actions/restore/invoke
```

Request message

Object ID

Specify a value for `file`.

When backing up encryption keys to a file or restoring encryption keys from a file, the value of `file` is a fixed value (the object ID).

Query parameters

None.

Body

Attribute	Type	Description
password	string	(Required) The password that was specified when the encryption key was backed up.
file	file	(Required) The backed-up encryption key file. Specify the most recent backup file. Encryption keys that are not up to date (for example, encryption keys that were changed after the file was backed up) cannot be restored.

Response message

Body

A job object is returned. For details on the schema of job objects, see the description of job objects. Note, however, that this API function does not display the `affectedResources` attribute.

Action template

None.

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description of HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type: multipart/form-data" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -H "Expect:" -X POST -F
"file=@C:\backupfile.ekf" -F "password=backuppassword" https://192.0.2.100:23451/
ConfigurationManager/v1/objects/storages/886000123457/encryption-keys/file/actions/
restore/invoke
```

Getting information about certificate files

The following request gets information about all the certificates required for communications with the key management server.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View & Modify)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/kms-certificates
```

Request message

Object ID

None.

Query parameters

Parameter	Type	Filter Condition
fileType	string	(Optional) The type of certificate file for which to get information

Parameter	Type	Filter Condition
		The following values can be specified. ▪ `ClientCertFile`: Client certificate file ▪ `RootCertFile`: Root certificate file If this parameter is omitted, information will be obtained about all certificate file types.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "fileType": "ClientCertFile",
      "nickname": "clientFileName",
      "kmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
      "serialNumber": "232074948215794841672223798212900118786",
      "issuer": "C=JP, CN=localhost",
      "owner": "C=JP, CN=localhost",
      "startOfValidityPeriod": "2000-01-23T04:56:07Z",
      "endOfValidityPeriod": "2001-01-23T04:56:07Z",
      "isUsed": true
    },
    {
      "fileType": "RootCertFile",
      "nickname": "rootFileName",
      "kmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
      "serialNumber": "23fb2ff750768c468ab0c85c0127a545",
      "issuer": "C=JP, CN=localhost",
      "owner": "C=JP, CN=localhost",
      "startOfValidityPeriod": "2000-01-23T04:56:07Z",
      "endOfValidityPeriod": "2001-01-23T04:56:07Z",
      "isUsed": true
    }
  ]
}
```

Attribute	Type	Description
fileType	string	Type of the certificate file ▪ `ClientCertFile`: Client certificate file ▪ `RootCertFile`: Root certificate file If a valid value cannot be obtained, a hyphen (`-`) is output, indicating an invalid value.
nickname	string	Nickname of the certificate
kmsCertificateId	string	Certificate ID required for communications with the key management server If the information cannot be obtained, a hyphen (`-`) is output, indicating an invalid value.
serialNumber	string	Serial number of the certificate
issuer	string	Issuer of the certificate
owner	string	Owner of the certificate
startOfValidityPeriod	ISO8601string	Validity period of the certificate (start) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
endOfValidityPeriod	ISO8601string	Validity period of the certificate (end) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
isUsed	boolean	Whether the certificate is used for communications with the key management server ▪ `true`: Used ▪ `false`: Not used

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-
certificates?fileType=ClientCertFile
```

Getting information about a specific certificate file

The following request gets information about a certificate required for communications with the key management server.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View & Modify)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/kms-certificates/object-ID
```

Request message

Object ID

Specify the `kmsCertificateId` value obtained by getting information about certificate files.

Attribute	Type	Description
kmsCertificateId	string	(Required) ID of the certificate required for communications with the key management server

Query parameters

None.

Body

None.

Response message

Body

```
{
  "fileType": "ClientCertFile",
  "nickname": "clientFileName",
  "kmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
  "serialNumber": "232074948215794841672223798212900118786",
  "issuer": "C=JP, CN=localhost",
  "owner": "C=JP, CN=localhost",
  "startOfValidityPeriod": "2000-01-23T04:56:07Z",
  "endOfValidityPeriod": "2001-01-23T04:56:07Z",
  "isUsed": true
}
```

Attribute	Type	Description
fileType	string	Type of the certificate file ▪ `ClientCertFile`: Client certificate file ▪ `RootCertFile`: Root certificate file If a valid value cannot be obtained, a hyphen (-) is output, indicating an invalid value.
nickname	string	Nickname of the certificate
kmsCertificateId	string	Certificate ID required for communications with the key management server If the information cannot be obtained, a hyphen (-) is output, indicating an invalid value.
serialNumber	string	Serial number of the certificate
issuer	string	Issuer of the certificate
owner	string	Owner of the certificate
startOfValidityPeriod	ISO8601string	Validity period of the certificate (start) If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
endOfValidityPeriod	ISO8601string	Validity period of the certificate (end)

Attribute	Type	Description
		If the information cannot be obtained, `0000-00-00T00:00:00Z` is output, indicating an invalid value.
isUsed	boolean	Whether the certificate is used for communications with the key management server ▪ `true`: Used ▪ `false`: Not used

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-
certificates/4b73e622-ddc1-449a-99f7-412c0d3baa39
```

Uploading the certificate files

The following request uploads the files required for communications with the key management server. The files are uploaded from a REST API client to the storage system via the REST API server. In the request header of this API function, specify `multipart/form-data` for Content-Type.

Important:

- Only one file can be uploaded in one request.
- A maximum of eight files of various types can be uploaded.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request header

In this API, the request body is sent in the format of multipart/form-data. Specify `multipart/form-data` for the Content-Type of the request header.

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/kms-certificates
```

Request message

Object ID

None.

Query parameters

None.

Body

Attribute	Type	Description

file	string	(Required) File to be uploaded (up to 200KB)
		You can use the following characters:
		▪ Spaces
		▪ Alphanumeric characters
		▪ The following symbols:
		`! " # $ % & ' ( ) * + , - . : ;`
		`< = > ? @ [ \ ] ^ _ ` { | } ~`

fileType	string	(Required) File type of the file to be uploaded

Attribute	Type	Description
		The specifiable values are as follows: ▪ `ClientCertFile`: Client certificate file (in PKCS#12 format) ▪ `RootCertFile`: Root certificate file (in X509 DER format or X509 PEM format)
nickname	string	(Optional) Specify the certificate nickname consisting of 1 to 255 characters. You can use the following characters. ▪ Alphanumeric characters If the `fileType` is the same, you cannot specify the same name of a certificate that is already uploaded. If you do not specify the `nickname` attribute, a name will be assigned by the REST API according to the following. ▪ If the `fileType` is for a `ClientCertFile`: ClientCertYYYYMMDDhhmmss ▪ If the `fileType` is for a `RootCertFile`: RootCertYYYYMMDDhhmmss
filePassword	string	(Optional) Password for the client certificate If the `fileType` is `ClientCertFile` and the certificate is password protected, you must specify the password. If this attribute is not specified, the certificate is not considered as being password protected. If you specify the incorrect password, the upload will fail. If the `fileType` is `RootCertFile`, the password cannot be specified.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for accessing the certificates required for communications with the key management server

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type: multipart/form-data" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -H "Expect:" -X POST -F
"file=@C:\certfile.crt" -F "fileType=RootCertFile" https://192.0.2.100:23451/
ConfigurationManager/v1/objects/storages/A34000123457/kms-certificates
```

If you run a request in which `multipart/form-data` is specified for Content-Type, `Expect: 100-continue` might be automatically assigned to the header, depending on the specifications of the client software. Depending on the specifications of the web server, this header might not be accepted. If the header is not accepted, a 417 error occurs, and the request fails. In this coding example, the Expect header is specified to overwrite the automatically assigned header, thereby preventing this error.

Deleting a certificate file

The following request deletes the certificate by specifying the ID of the certificate.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/kms-certificates/object-ID
```

Request message

Object ID

Specify the `kmsCertificateId` value obtained by getting information about certificate files.

Attribute	Type	Description
kmsCertificateId	string	(Required) ID of the certificate required for communications with the key management server

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the deleted certificate file

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-
certificates/4b73e622-ddc1-449a-99f7-412c0d3baa39
```

Getting key management server information

The following request gets information about settings for the key management servers.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View & Modify)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/kms-settings
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "kmsId": "0",
      "intraClassPriority": 1,
      "serverName": "192.0.2.200",
      "serverPort": 5696,
      "numOfRetries": 3,
      "retryInterval": 1,
      "timeout": 60,
      "clientKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
      "rootKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa3a"
    },
    {
      "kmsId": "1",
      "intraClassPriority": 2,
      "serverName": "192.0.2.300",
      "serverPort": 5696,
      "numOfRetries": 3,
      "retryInterval": 1,
      "timeout": 60,
      "clientKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa3b",
```

```
      "rootKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa3c"
    }
  ]
}
```

Attribute	Type	Description
kmsId	string	Number of the key management server
intraClassPriority	int	The priority within the cluster If the information cannot be obtained, `-1` is output, indicating an invalid value.
serverName	string	The IP address or host name for the key management server
serverPort	int	The port number of the key management server If the information cannot be obtained, `-1` is output, indicating an invalid value.
numOfRetries	int	The number of retries to perform when communications with the key management server fail If the information cannot be obtained, `-1` is output, indicating an invalid value.
retryInterval	int	The time interval between retries when communications with the key management server fail (in seconds) If the information cannot be obtained, `-1` is output, indicating an invalid value.
timeout	int	The time until the connection to the key management server times out (in seconds) If the information cannot be obtained, `-1` is output, indicating an invalid value.
clientKmsCertificateId	string	ID of the client certificate file If the information cannot be obtained, a hyphen (`-`) is output, indicating an invalid value.
rootKmsCertificateId	string	ID of the root certificate file

Attribute	Type	Description
		If the information cannot be obtained, a hyphen (-) is output, indicating an invalid value.

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-settings
```

Getting information about a specific key management server

The following request gets information about the settings for a specific key management server by specifying the number of the key management server.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View & Modify)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/kms-settings/object-ID
```

Request message

Object ID

Specify the `kmsId` value obtained by getting key management server information.

Attribute	Type	Description
kmsId	string	(Required) Number of the key management server

Query parameters

None.

Body

None.

Response message

Body

```
{
  "kmsId": "1",
  "intraClassPriority": 1,
  "serverName": "192.0.2.200",
  "serverPort": 5696,
  "numOfRetries": 3,
  "retryInterval": 1,
  "timeout": 60,
  "clientKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa39",
  "rootKmsCertificateId": "4b73e622-ddc1-449a-99f7-412c0d3baa3a"
}
```

Attribute	Type	Description
kmsId	string	Number of the key management server
intraClassPriority	int	The priority within the cluster If the information cannot be obtained, `-1` is output, indicating an invalid value.
serverName	string	The IP address or host name for the key management server
serverPort	int	The port number of the key management server If the information cannot be obtained, `-1` is output, indicating an invalid value.
numOfRetries	int	The number of retries to perform when communications with the key management server fail

Attribute	Type	Description
		If the information cannot be obtained, `-1` is output, indicating an invalid value.
retryInterval	int	The time interval between retries when communications with the key management server fail (in seconds) If the information cannot be obtained, `-1` is output, indicating an invalid value.
timeout	int	The time until the connection to the key management server times out (in seconds) If the information cannot be obtained, `-1` is output, indicating an invalid value.
clientKmsCertificateId	string	ID of the client certificate file If the information cannot be obtained, a hyphen (`-`) is output, indicating an invalid value.
rootKmsCertificateId	string	ID of the root certificate file If the information cannot be obtained, a hyphen (`-`) is output, indicating an invalid value.

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The microcode version of the storage system does not support this operation.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-settings/1
```

Registering information about a key management server

The following request registers the key management server information on the storage system.

Important:

When specifying the number of retries, the retry interval, and the timeout period, specify the values so that the value calculated by the following formula is 9120 seconds (152 minutes) or less.

```
Timeout-period (seconds) + (retry-interval (seconds) + timeout-period
(seconds)) * number-of-retries
```

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/kms-settings
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "kmsId": "1",
  "intraClassPriority": 1,
  "serverName": "192.0.2.200",
  "serverPort": 5696,
  "numOfRetries": 3,
  "retryInterval": 1,
  "timeout": 60,
  "clientKmsCertificateId": "111a8193-08e8-436a-a87c-051528b8c2aa",
```

```
  "rootKmsCertificateId": "6134f2ab-9f0b-4802-87cd-4a68077a1b17"
}
```

Attribute	Type	Description
kmsId	string	(Required) Number of the key management server Specify a value in the range from `0` to `1`.
intraClassPriority	int	(Required) The priority within the cluster Specify a value in the range from `1` to `2`.
serverName	string	(Required) The IP address or host name for the key management server Specify an IPv4 address, IPv6 address, or a host name. Specify a name consisting of 1 to 255 characters. You can use the following characters in the host name: alphanumeric characters, hyphens (`-`),periods (`.`)
serverPort	int	(Optional) The port number of the key management server If this attribute is omitted, `5696` is assumed.
numOfRetries	int	(Optional) The number of retries to perform when communications with the key management server fail Specify a value in the range from `1` to `50`. If this attribute is omitted, `3` is assumed.
retryInterval	int	(Optional) The time interval between retries when communications with the key management server fail (in seconds) Specify a value in the range from `1` to `60`. If this attribute is omitted, `1` is assumed.
timeout	int	(Optional) The time until the connection to the key management server times out (in seconds) Specify a value in the range from `10` to `999`.

Attribute	Type	Description
		If this attribute is omitted, `60` is assumed.
clientKmsCertificateId	string	(Required) ID of the client certificate file
rootKmsCertificateId	string	(Required) ID of the root certificate file

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the information on the registered key management server

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
409	Conflict	A key management server has already been created with the specified key management server number or with the priority in the cluster.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/A34000123457/kms-settings
```

Testing communications with the key management server

The following request tests whether communications with the key management server are possible. You must upload the certificate files to the storage system beforehand.

Note:

This API request can be used when the storage system is VSP One B20.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/kms-settings/object-ID/actions/
test-connectivity/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `kmsId` value obtained by getting key management server information.

Attribute	Type	Description
kmsId	string	(Required) Number of the key management server

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the schema of job objects, see the description of job objects. Note, however, that this API function does not display the `affectedResources` attribute. Check the status (state) of the job to verify whether the test was successful.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-
settings/1/actions/test-connectivity/invoke -d ""
```

Changing the key management server settings

The following request changes the key management server settings by specifying the number of the key management server.

Notes on creating the request body

Before running this API function, obtain the current settings by using the API function that obtains key management server information. The response body you have obtained is to be used as the request body for this API function. Change only the values of the attributes that you want to change. All settings are overwritten with the values specified in the request body, including attributes that do not change.

Important:

When specifying the number of retries, the retry interval, and the timeout period, specify the values so that the value calculated by the following formula is 9120 seconds (152 minutes) or less.

```
Timeout-period (seconds) + (retry-interval (seconds) + timeout-period
(seconds)) * number-of-retries
```

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/kms-settings/object-ID
```

You can run this API request in a PATCH method.

Request message

Object ID

Specify the `kmsId` value obtained by getting key management server information.

Attribute	Type	Description
kmsId	string	(Required) Number of the key management server

Query parameters

None.

Body

```
{
  "serverName": "192.0.2.200",
  "serverPort": 5696,
  "numOfRetries": 3,
  "retryInterval": 1,
  "timeout": 60,
  "clientKmsCertificateId": "111a8193-08e8-436a-a87c-051528b8c2aa",
  "rootKmsCertificateId": "6134f2ab-9f0b-4802-87cd-4a68077a1b17",
  "isMigration": false
}
```

Attribute	Type	Description
serverName	string	(Required) The IP address or host name for the key management server Specify an IPv4 address, IPv6 address, or a host name. Specify a name consisting of 1 to 255 characters. You can use the following characters in the host name: alphanumeric characters, hyphens (-),periods (.)
serverPort	int	(Required) The port number of the key management server
numOfRetries	int	(Required) The number of retries to perform when communications with the key management server fail Specify a value in the range from 1 to 50.

Attribute	Type	Description
retryInterval	int	(Required) The time interval between retries when communications with the key management server fail (in seconds) Specify a value in the range from `1` to `60`.
timeout	int	(Required) The time until the connection to the key management server times out (in seconds) Specify a value in the range from `10` to `999`.
clientKmsCertificateId	string	(Required) ID of the client certificate file
rootKmsCertificateId	string	(Required) ID of the root certificate file
isMigration	boolean	(Optional) Whether to perform a migration of the key management server ▪ `true`: Perform ▪ `false`: Do not perform If this attribute is omitted, `false` is assumed.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the information about the settings for the key management server

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
```

```
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/A34000123457/kms-settings/1
```

Changing the priority of key management servers within a cluster

The following request changes the priority of key management servers within a cluster.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/storage-device-ID/services/kms-setting-service/actions/change-
priority/invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

The following is an example of coding that switches the priorities of key management server number 0 (priority 1 in the cluster) and key management server number 1 (priority 2 in the cluster).

```
{
  "parameters": {
    "kmsPriorities": [
      {
        "kmsId": "0",
        "intraClassPriority": 2
      },
```

```
      {
        "kmsId": "1",
        "intraClassPriority": 1
      }
    ]
  }
}
```

Attribute	Type	Description
kmsPriorities	object[]	(Required) An array that holds the priority of the key management server information ▪ kmsId (string) (Required) Number of the key management server ▪ intraClassPriority (int) (Required) The priority within the cluster

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the information on the key management server whose priority has been changed As many URLs as the number of key management servers whose priority has been changed are returned.

Status codes

The following table describes the meanings of the status codes of the request for this operation. For details on the other status codes, see the description about HTTP status codes.

Status code	Message	Description
409	Conflict	A key management server has already been specified with the priority in the cluster.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/A34000123457/
services/kms-setting-service/actions/change-priority/invoke
```

Deleting information about a key management server

The following request deletes the information about the key management server by specifying the number of the key management server. If the encryption environment is configured to link with a key management server, the number of registered key management servers cannot be reduced to 0.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/kms-settings/object-ID
```

Request message

Object ID

Specify the `kmsId` value obtained by getting key management server information.

Attribute	Type	Description
kmsId	string	(Required) Number of the key management server

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the deleted information on the key management server

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/kms-settings/1
```

Backing up encryption keys to the key management server

The following request backs up encryption keys to the key management server.

Note:

- This API request can be used when the storage system is VSP One B20.
- When you create an encryption key, be sure to back it up. We also recommend that you periodically back up encryption keys.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/encryption-keys/kms/actions/backup/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify a value for `kms`.

`kms` is the fixed value to be specified as the object ID when you back up encryption keys to a key management server or when you restore encryption keys backed up to a key management server.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the schema of job objects, see the description of job objects. Note, however, that this API function does not display the `affectedResources` attribute.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/encryption-
keys/kms/actions/backup/invoke -d ""
```

Restoring encryption keys backed up to a key management server

The following request restores data on encryption keys backed up to a key management server.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/encryption-keys/kms/actions/
restore/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify a value for `kms`.

`kms` is the fixed value to be specified as the object ID when you back up encryption keys to a key management server or when you restore encryption keys backed up to a key management server.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on the attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL for the list of information about the encryption keys

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/encryption-
keys/kms/actions/restore/invoke -d ""
```

Rekeying the key encryption key

If no key management server is linked, the following request updates the key encryption key (KEK) on the storage system. If a key management server is linked, the following request updates the key encryption key (KEK) on the key management server. Be sure to back up the encryption keys immediately after rekeying the key encryption key.

Note:

- This API request can be used when the storage system is VSP One B20.
- If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/encryption-keys/kek/actions/rekey/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify a value for `kek`.

`kek` is a fixed value that is specified as the object ID when rekeying the key encryption key.

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. See the description for the job object. `affectedResources` is not displayed for this API. To check whether the KEK was rekeyed, use the following URL.

```
GET base-URL/v1/objects/storages/storage-device-ID/encryption-keys?keyType=KEK
```

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/A34000123457/encryption-
keys/kek/actions/rekey/invoke -d ""
```

Chapter 20: Monitoring storage systems

You can monitor the status of storage systems by getting alerts (SIMs) generated on each storage system, as well as information about the hardware installed in each storage system.

Getting a list of alert information

The following request gets a list of alerts related to the error information (SIM) of a storage system.

Note:

This API request can be used when the storage system is VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Important:

If you do not specify the `start` and `count` query parameters, the API request lists the 10 alerts from the most recent alert. If you want to get information about other alerts, use `start` or `count`.

Execution permission

Support Personnel or User Maintenance

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/alerts
```

Request message

Object ID

None.

Query parameters

Attribute	Type	Filter Condition
type	string	(Required) Specify the location where the alerts you want to obtain are retained.

Attribute	Type	Filter Condition
		Specifiable values are as follows: ▪ `DKC`: Alerts retained by the DKC ▪ `CTL1`: Alerts retained by the controller 1 ▪ `CTL2`: Alerts retained by the controller 2
start	int	(Optional) Specify the number of the alert from which you want to start obtaining information. Alerts are sorted by date and time in descending order. If you specified `DKC` for the `type` parameter, specify a value in the range from `1` to `10240`. If you specified `CTL1` or `CTL2` for the `type` parameter, specify a value in the range from `1` to `256`. If this parameter is omitted, alert information will be obtained starting from the first alert.
count	int	(Optional) Specify the number of alerts to be obtained. If you specified `DKC` for the `type` parameter, specify a value in the range from `1` to `10240`. If you specified `CTL1` or `CTL2` for the `type` parameter, specify a value in the range from `1` to `256`. If this parameter is omitted, 10 alerts will be obtained.

Body

None.

Response message

Body

```
{
    "data" : [
        {
            "alertIndex" : "133ed620e449-0f0c9-7d0700",
            "alertId" : 61641,
            "occurenceTime" : "2018-03-22T16:14:01",
            "referenceCode" : 8193792,
            "errorLevel" : "Moderate",
            "errorSection" : "GUM detection error",
            "errorDetail" : "GUM security error detected",
```

```
            "location" : "CTL1",
            "actionCodes" : [
                {
                    "actionCode" : 1492123648,
                    "possibleFailureParts" : "TSC CALL",
                    "accLocation" : "-"
                }
            ]
        },
        {
            "alertIndex" : "133ed620a156-0f0c6-7d0700",
            "alertId" : 61638,
            "occurenceTime" : "2018-03-22T11:28:22",
            "referenceCode" : 8193792,
            "errorLevel" : "Moderate",
            "errorSection" : "GUM detection error",
            "errorDetail" : "GUM security error detected",
            "location" : "CTL1",
            "actionCodes" : [
                {
                    "actionCode" : 1492123648,
                    "possibleFailureParts" : "TSC CALL",
                    "accLocation" : "-"
                }
            ]
        },
        {
            "alertIndex" : "133ed6011907-0f0c3-7d0700",
            "alertId" : 61635,
            "occurenceTime" : "2018-03-20T19:59:03",
            "referenceCode" : 8193792,
            "errorLevel" : "Moderate",
            "errorSection" : "GUM detection error",
            "errorDetail" : "GUM security error detected",
            "location" : "CTL1",
            "actionCodes" : [
                {
                    "actionCode" : 1492123648,
                    "possibleFailureParts" : "TSC CALL",
                    "accLocation" : "-"
                }
            ]
        },
        {
            "alertIndex" : "133ed601164f-0f0bd-7d0700",
            "alertId" : 61629,
            "occurenceTime" : "2018-03-20T19:47:27",
            "referenceCode" : 8193792,
            "errorLevel" : "Moderate",
```

```
            "errorSection" : "GUM detection error",
            "errorDetail" : "GUM security error detected",
            "location" : "CTL1",
            "actionCodes" : [
                {
                    "actionCode" : 1492123648,
                    "possibleFailureParts" : "TSC CALL",
                    "accLocation" : "-"
                }
            ]
        }
    ]
}
```


Attribute	Type	Description
alertIndex	string	Character string that uniquely identifies an alert
alertID	int	Alert ID The log number of the SIM is displayed.
occurenceTime	string	Date and time when the alert occurred The local time of the storage system is displayed in YYYY-MM-DDThh:mm:ss format.
referenceCode	int	SIM reference code (in decimal number format) For details about SIM reference codes, see the *SIM Reference Guide* or the *System Administrator Guide*. When you refer to these manuals, convert the reference code you obtained from the REST API into a hexadecimal number.
errorLevel	string	One of the following values is displayed as the error level: ▪ `Service`: Service ▪ `Moderate`: Warning (Moderate) ▪ `Serious`: Error (Serious) ▪ `Acute`: Acute
errorSection	string	Information about where the alert occurred
errorDetail	string	Details of the alert

Attribute	Type	Description
location	string	The location of the component or part for which the error occurred
actionCodes	object[]	The following information related to the action code of the alert is displayed: ▪ `actionCode` (long) Action code ▪ `possibleFailureParts` (string) The part that might have been the cause of the error The name of the part that is assumed to be the cause of the error is displayed. ▪ `accLocation` (string) Location The location of the component in which the error occurred is displayed.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session f76884c29fff4dfaa664aa6981087b71" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/alerts?
type=CTL1&start=2&count=4"
```

Getting information about the hardware installed in a storage system

The following request gets information about the hardware installed in a storage system, including information about the controller's temperature and the battery status.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/components/instance
```

Request message

Object ID

Specify `instance`. If an object has only one instance, the value for `instance` is the fixed value that specifies the object ID.

Query parameters

Parameter	Type	Description
componentOption	string	For VSP G1000, VSP G1500, VSP F1500 (Required) Type of detailed information to be obtained For VSP 5000 series, VSP E series, VSP Gx00 models, VSP Fx00 models (Optional) Type of detailed information to be obtained

Parameter	Type	Description
		The following values can be specified for this parameter. ▪ `class` You can get information about hardware installed on a storage system from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. You must specify this item for the following storage systems: VSP G1000, VSP G1500, VSP F1500. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". If you specify `class` for `componentOption` in a query parameter, only detailed information is obtained.

Body

None.

Response message

Body

For VSP One B20:

```
{
  "system" : {
    "powerConsumption" : 812
  },
  "dkcs" : [ {
    "led" : "ON",
```

```
    "location" : "DKC0",
    "type" : "RH20K-MH2",
    "ctls" : [ {
      "location" : "CTL01",
      "status" : "Normal",
      "temperature" : 29,
      "temperatureStatus" : "Normal",
      "charge" : 50,
      "type" : "Controller Board"
    }, {
      "location" : "CTL02",
      "status" : "Normal",
      "temperature" : 29,
      "temperatureStatus" : "Normal",
      "charge" : 50,
      "type" : "Controller Board"
    } ],
    "cacheMemories" : [ {
      "location" : "CTL01 CMG0",
      "status" : "Normal",
      "cacheSize" : 64
    }, {
      "location" : "CTL01 CMG1",
      "status" : "Normal",
      "cacheSize" : 64
    },...
}
```


Note:

- If a failure occurs on the storage system, a question mark (`?`) might be output for some attributes.
- If there is no hardware and information cannot be obtained, the attributes under the object are not output.

Attribute	Type	Description
system	object	The following attribute related to the storage system information is output: ▪ powerConsumption (int) Power consumption of the storage system (Watt) A value is output indicating the average amount of power consumed by the controller and the drive box per minute. If a valid value cannot be obtained, `-1` is output.

Attribute	Type	Description
dkcs	object[]	The following attributes related to the DKC information are output: ▪ led (string) This attribute is currently not in use. ▪ location (string) Location of the DKC ▪ type (string) Type of the DKC

Attribute	Type	Description

		▪ ctls (object[])
		The following attributes related to the controller information are output:
		• location (string)
		Location of the controller
		• status (string)
		Status of the controller
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		• temperature (int)
		Temperature of the controller (°C)
		A value in the range from `-55` to `125` is output.
		If a value outside of this range is obtained, `-274` is output.
		If the value of the `status` attribute is `Blocked`, the value that was obtained immediately before the controller was blocked is output.
		A similar value might also be output if the value of the `status` attribute is `Failed`.
		• temperatureStatus (string)
		Status indicating the temperature of the controller
		`Normal`
		`Warning`
		`Failed`
		• charge (int)
		Charge status of the battery (%)
		A value in the range from `0` to `100` is output.
		If a value outside of this range is obtained, `-1` is output.
		• type (string)

Attribute	Type	Description

		Type of the controller
		If a valid value cannot be obtained, `-` is output.
		
		▪ cacheMemories (object[])
		The following attributes related to the cache memory are output:
		• location (string)
		Location of the cache memory
		• status (string)
		Status of the cache memory
		`Normal`
		`Warning`
		`Blocked`
		• cacheSize (int)
		Size (GB) of the cache memory
		If a valid value cannot be obtained, `-1` is output.
		
		▪ cacheFlashMemories (object[])
		The following attributes related to the cache flash memory are output:
		• location (string)
		Location of the cache flash memory
		• status (string)
		Status of the cache flash memory
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		• type (string)
		Type of the cache flash memory

Attribute	Type	Description

		▪ dkbs (object[])
		The following attributes related to the disk board are output:
		• location (string)
		Location of the disk board
		• status (string)
		Status of the disk board
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		• type (string)
		Type of the disk board

Attribute	Type	Description

		▪ chbs (object[])
		The following attributes related to the channel board are output:
		• location (string)
		Location of the channel board
		• status (string)
		Status of the channel board
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		• type (string)
		Type of the channel board
		• ports (object[])
		The following attributes related to the port of the channel board are output:
		portId (string)
		Port number of the channel board

Attribute	Type	Description

		▪ sfps (object[])
		The following attributes related to the SFP (Small Form Factor Pluggable) information are output:
		• portId (string)
		Port number of the SFP
		• status (string)
		Status of the SFP
		`Not fix`
		`Normal`
		`Warning`
		• type (string)
		Type of the SFP
		If no port is used, an empty character string is output.
		• speed (string)
		SFP Speed
		n`Gbps` (where *n* is a number)
		If no speed is set, an empty character string is output.
		• portCondition (string)
		Condition of the SFP port
		`Not Available`
		`Available (Connected)`
		`Available (Not Connected)`
		If the value of the attribute is anything other than the above, a hyphen (`-`) is output.

Attribute	Type	Description

		▪ bkmfs (object[])
		The following attributes related to the backup module are output:
		• location (string)
		Location of the backup module
		• type (string)
		Type of the backup module
		• status (string)
		Status of the backup module
		`Normal`
		`Warning`
		`Warning (FAN)`
		`Blocked`
		`Failed`
		If the value of the attribute is anything other than the above, a hyphen (`-`) is output.
		• batteries (object[])
		The following attributes related to the battery are output:
		location (string)
		Location of the battery
		status (string)
		Status of the battery
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		life (int)
		Life expectancy of the battery
		A value in the range from `0` to `100` is output.
		If a value outside of this range is obtained, `-1` is output.

Attribute	Type	Description

		▪ fans (object[])
		The following attributes related to fans are output:
		• location (string)
		Location of the fans
		• status (string)
		Status of the fans
		`Normal`
		`Warning`
		`Failed`
		▪ hies (object[])
		The following attributes related to the HIES information are output:
		• location (string)
		Location of the HIES
		• status (string)
		Status of the HIES
		`Normal`
		`Warning`
		`Failed`
		▪ dkcpss (object[])
		The following attributes related to the DKCPS information are output:
		• location (string)
		Location of the DKCPS
		• status (string)
		Status of the DKCPS
		`Normal`
		`Warning`
		`Failed`
		`Blocked`

Attribute	Type	Description
		▪ upsMode (string) UPS mode ▪ encryptionPolicy (int) Encryption policy
smFunctions	object[]	The following attributes related to the SMFunctions information are output: ▪ value (int) Base Extension number of the SMFunctions • `0`: Base • `1`: Extension1 • `2`: Extension2 • `3`: Extension3 ▪ install (string) Installation status of the SMFunctions • `Installed` • `Not Installed` ▪ status (string) Status of the SMFunctions • `Normal` • `Warning`
driveBoxes	object[]	The following attributes related to the drive box are output: ▪ location (string) Location of the drive box ▪ type (string) Type of the drive box ▪ led (string) Status of the LED • `ON` • `OFF`

Attribute	Type	Description

		▪ drives (object[])
		The following attributes related to drives are output:
		• location (string)
		Location of the drives
		• modelCode (string)
		Drive type code
		• status (string)
		Status of the drives
		`Normal`
		`Warning`
		`Warning (Port 0 failed)`
		`Warning (Port 1 failed)`
		`Blocked`
		`Failed`
		`Copying` *n* `%` `(***)`
		`Pending (***)`
		`Copy incomplete`
		`Reserved`
		Details are output to the location indicated by `(***)`.
		If multiple copy statuses exist, all of them are output.
		• usage (string)
		Drive usage
		`DATA`
		`Spare`
		`Free`

Attribute	Type	Description

		▪ encs (object[])
		The following attributes related to the ENC information are output:
		• location (string)
		Location of the ENC
		• status (string)
		Status of the ENC
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		`Not Installed`
		▪ dbps (object[])
		The following attributes related to the power supply for drive boxes are output:
		• location (string)
		Location of the power supply for drive boxes
		• status (string)
		Status of the power supply for drive boxes
		`Normal`
		`Warning`
		`Failed`
		`Not Installed`

Attribute	Type	Description
hsnbxs	object[]	The following attributes related to the HSNBX information are output: ▪ led (string) Status of the LED • `ON` • `OFF` ▪ location (string) Location of the HSNBX

Attribute	Type	Description

		▪ isws (object[])
		The following attributes related to the ISW information are output:
		• location (string)
		Location of the ISW
		• status (string)
		Status of the ISW
		`Normal`
		`Warning`
		• iswFans (object[])
		The following attributes related to the ISWFAN information are output:
		location (string)
		Location of the ISWFAN
		status (string)
		Status of the ISWFAN
		`Normal`
		`Warning`
		▪ iswpss (object[])
		The following attributes related to the ISWPS information are output:
		• location (string)
		Location of the ISWPS
		• status (string)
		Status of the ISWPS
		`Normal`
		`Warning`

Attribute	Type	Description

xPaths	object[]	The following attributes related to the X-path information are output:
		▪ location (string)
		Location of the X-path
		▪ status (string)
		Status of the X-path
		`Normal`
		`Warning`

For other storage systems:


```
{
    "system": {
        "powerConsumption": 283
    },
    "ctls": [
        {
            "location": "CTL1",
            "status": "Normal",
            "temperature": 29,
            "temperatureStatus": "Normal",
            "charge": 100,
            "type": "Controller Board"
        },
        {
            "location": "CTL2",
            "status": "Normal",
            "temperature": 29,
            "temperatureStatus": "Normal",
            "charge": 100,
            "type": "Controller Board"
        }
    ],
    "cacheMemories": [
        {
            "location": "CTL1 CMG0",
            "status": "Normal",
            "cacheSize": 16
        },
        {
            "location": "CTL2 CMG0",
```

```
            "status": "Normal",
            "cacheSize": 16
        }
    ],
    "chbs": [
        {
            "location": "CHB-1A",
            "status": "Normal",
            "type": "10G 2Port iSCSI (Optic)"
        },
        {
            "location": "CHB-2A",
            "status": "Normal",
            "type": "10G 2Port iSCSI (Optic)"
        }
    ],
    "cacheFlashMemories": [
        {
            "location": "CFM-1",
            "status": "Normal",
            "type": "BM05"
        },
        {
            "location": "CFM-2",
            "status": "Normal",
            "type": "BM05"
        }
    ],
    "dkbs": [],
    "lanbs": [],...
}
```


For attributes indicated by a hash mark (#), if there is no hardware and information cannot be obtained, the attributes under the object are not output.

Attribute	Type	Description
system	object	The following attribute related to the storage system information is output: ▪ powerConsumption (int) Power consumption of the storage system (Watt) A value is output indicating the average amount of power consumed by the controller and the drive box per minute. If a valid value cannot be obtained, `-1` is output.

Attribute	Type	Description
ctls	object[]	The following attributes related to the controller information are output: ▪ location (string) Location of the controller ▪ status (string) Status of the controller • `Normal` • `Warning` • `Blocked` • `Failed` ▪ temperature (int) Temperature of the controller (°C) A value in the range from `-55` to `125` is output. If a value outside of this range is obtained, `-274` is output. If the value of the `status` attribute is `Blocked`, the value that was obtained immediately before the controller was blocked is output. A similar value might also be output if the value of the `status` attribute is `Failed`. ▪ temperatureStatus (string) Status indicating the temperature of the controller • `Normal` • `Warning` • `Failed` This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models.

Attribute	Type	Description
		▪ charge (int) Charge status of the battery (%) A value in the range from `0` to `100` is output. If a value outside of this range is obtained, `-1` is output. This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ type (string) Type of the controller • `Encryption Controller Board`: Encryption is enabled. • `Encryption Controller Board for NVMe`: Encryption is enabled. • `Controller Board`: Encryption is disabled. • `Controller Board for NVMe`: Encryption is disabled. If a valid value cannot be obtained, `-` is output. This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models.
cacheMemories[#]	object[]	The following attributes related to the cache memory are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the cache memory ▪ status (string) Status of the cache memory • `Normal` • `Warning` • `Blocked` ▪ cacheSize (int) Size (GB) of the cache memory If a valid value cannot be obtained, `-1` is output.

Attribute	Type	Description
chbs#	object[]	The following attributes related to the channel board are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the channel board ▪ status (string) Status of the channel board • `Normal` • `Warning` • `Blocked` • `Failed` ▪ type (string) Type of the channel board • `8G 4Port FC` • `16G 2Port FC` • `32G Ready 4Port FC` • `25G 2Port iSCSI (Optic)` • `10G 2Port iSCSI (Copper)`
cacheFlashMemories#	object[]	The following attributes related to the cache flash memory are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the cache flash memory ▪ status (string) Status of the cache flash memory • `Normal` • `Warning` • `Blocked` • `Failed` ▪ type (string) Type of the cache flash memory Example : `BM30`
dkbs#	object[]	The following attributes related to the disk board are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the disk board ▪ status (string) Status of the disk board • `Normal` • `Warning` • `Blocked` • `Failed` ▪ type (string) Type of the disk board Example : `Disk Board`
lanbs#	object[]	The following attributes related to the LAN board are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the LAN board ▪ status (string) Status of the LAN board • `Normal` • `Warning`
sfps#	object[]	The following attributes related to the SFP (Small Form Factor Pluggable) information are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ portId (string) Port number of the SFP ▪ status (string) Status of the SFP • `Not fix` • `Normal` • `Warning` ▪ type (string) Type of the SFP • `Short Wave` • `Long Wave` • `Copper Cable` If no port is used, an empty character string is output.

Attribute	Type	Description
		▪ speed (string) SFP Speed • `16Gbps` • `32Gbps` If no speed is set, an empty character string is output. ▪ portCondition (string) Condition of the SFP port • `Not Available` • `Available (Connected)` • `Available (Not Connected)` If the value of the attribute is anything other than the above, a hyphen (-) is output. This attribute is output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.
bkmfs#	object[]	The following attributes related to the backup module are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the backup module ▪ type (string) Type of the backup module • `Backup Module` • `Accelerator Module` If the value of the attribute is anything other than the above, a hyphen (-) is output. This attribute is output for VSP E series.

Attribute	Type	Description

		▪ status (string)
		Status of the backup module
		• `Normal`
		• `Warning`
		• `Warning (FAN)`
		• `Blocked`
		• `Failed`
		If the value of the attribute is anything other than the above, a hyphen (`-`) is output.
		▪ batteries (object[])
		The following attributes related to the battery are output:
		• location(string)
		Location of the battery
		• status (string)
		Status of the battery
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		• life (int)
		Life expectancy of the battery
		A value in the range from `0` to `100` is output.
		If a value outside of this range is obtained, `-1` is output.

dkcpss#	object[]	The following attributes related to the DKCPS information are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the DKCPS ▪ status (string) Status of the DKCPS • `Normal` • `Warning` • `Failed` • `Blocked`
driveBoxes#	object[]	The following attributes related to the drive box are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the drive box ▪ type (string) Type of the drive box • `DBS` • `DBL` • `DB60` • `DBF` • `DBF2_A` • `DBF2_B` • `DBN` • `DBS2_A` • `DBS2_B` ▪ led (string) Status of the LED • `ON` • `OFF`

Attribute	Type	Description

		▪ drives (object[])
		The following attributes related to drives are output:
		• location (string)
		Location of the drives
		• modelCode (string)
		Drive type code
		• status (string)
		Status of the drives
		`Normal`
		`Warning`
		`Warning (Port 0 failed)`
		`Warning (Port 1 failed)`
		`Blocked`
		`Failed`
		`Copying n % (xxx to xxx)`
		`Copying n % (xxx from xxx)`
		`Pending (xxx to xxx)`
		`Pending (xxx from xxx)`
		`Copy incomplete`
		`Reserved`
		If multiple copy statuses exist, all of them are output.
		• usage (string)
		Drive usage
		`DATA`
		`Spare`
		`Free`
		• recomendReplacement (int)
		Whether the replacement of the drive is recommended
		`0`: PDEV replacement is not recommended.
		`1`: PDEV replacement is recommended.

Attribute	Type	Description

		▪ encs (object[])
		The following attributes related to the ENC information are output:
		• location (string)
		Location of the ENC
		• status (string)
		Status of the ENC
		`Normal`
		`Warning`
		`Blocked`
		`Failed`
		`Not Installed`
		▪ dbps (object[])
		The following attributes related to the power supply for drive boxes are output:
		• location (string)
		Location of the power supply for drive boxes
		• status (string)
		Status of the power supply for drive boxes
		`Normal`
		`Warning`
		`Failed`
		`Not Installed`

fans#	object[]	The following attributes related to fans are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the fans ▪ status (string) Status of the fans • `Normal` • `Warning` • `Failed`
upsMode	string	UPS mode This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ `UPS Interlock Mode 1` ▪ `UPS Interlock Mode 2` ▪ `UPS Interlock Mode 3` ▪ `Standard Mode`
pecbs#	object[]	The following attributes related to the PCIe channel board are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the PCIe channel board ▪ status (string) Status of the PCIe channel board • `Normal` • `Warning` • `Blocked` ▪ connectionMode (string) Connection mode of the PCIe channel board • `Channel Board Box` • `Server Chassis` If the value of the attribute is anything other than the above, a hyphen (`-`) is output.
chbb#	object	The following attributes related to the channel board box are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the channel board box ▪ expansionMode (string) Expansion mode of the channel board box • `1-vSW` • `2-vSW` If the value of the attribute is anything other than the above, a hyphen (`-`) is output.
pcps#	object[]	The following attributes related to the PCIe channel package are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the PCIe channel package ▪ status (string) Status of the PCIe channel package • `Normal` • `Warning` • `Blocked`
swpks#	object[]	The following attributes related to the switch package are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the switch package ▪ status (string) Status of the switch package • `Normal` • `Warning` • `Blocked`
chbbfans#	object[]	The following attributes related to the fan for the channel board box are output: This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the fan for the channel board box ▪ status (string) Status of the fan for the channel board box • `Normal` • `Warning`
chbbps#	object[]	The following attributes related to the power supply for the channel board box are output:

Attribute	Type	Description
		This attribute is output for the VSP E series, VSP Gx00 models or the VSP Fx00 models. ▪ location (string) Location of the power supply for the channel board box ▪ status (string) Status of the power supply for the channel board box • `Normal` • `Warning`

If you run this request with `class` specified for the `componentOption` query parameter, only information from the storage system's cache will be obtained.

Attribute	Type	Description
cacheMemorySummary	object	The attribute related to summary information about the cache memory ▪ status (string) Status of the cache memory • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.

Attribute	Type	Description
sharedMemorySummary	object	The attribute related to summary information about the shared memory ▪ status (string) Status of the shared memory • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` For the following storage systems, incorrect information might be output for this attribute: VSP E series, VSP Gx00 models, and VSP Fx00 models. Do not use this information. If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
lanbSummary	object	The attribute related to summary information about the LAN board ▪ status (string) Status of the LAN board • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` For the following storage systems, incorrect information might be output for this attribute: VSP 5000 series, VSP G350, G370, VSP F350, F370, VSP G200, VSP G1000, VSP G1500, VSP F1500. Do not use this information.

Attribute	Type	Description
		If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
bkmfSummary	object	The attribute related to summary information about the backup module ▪ fanStatus (string) Status of the fan • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
dkcpsSummary	object	The attribute related to summary information about the DKCPS ▪ status (string) Status of the DKCPS • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
driveBoxSummary	object	Attributes related to summary information about the drive box

Attribute	Type	Description
		Replace "drive box" with "drive chassis" depending on the storage system. ▪ powerSupplyStatus (string) Status of the drive box power supply • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required. ▪ fanStatus (string) This attribute is currently not in use.

Attribute	Type	Description
		▪ environmentStatus (string) Status of the drive box environment • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` For the following storage systems, incorrect information might be output for this attribute: VSP G1000, VSP G1500, VSP F1500. Do not use this information. If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required. ▪ driveStatus (string) Status of the drive • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` For the following storage systems, incorrect information might be output for this attribute: VSP E series, VSP G700, G900, VSP F700, F900, VSP G400, G600, G800, VSP F400, F600, F800. Do not use this information. If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.

Attribute	Type	Description
processorSummary	object	The attribute related to summary information about the processor ▪ status (string) Status of the processor • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
batterySummary	object	The attribute related to summary information about the battery ▪ status (string) Status of the battery • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.
xPathSummary	object	The attribute related to summary information about the X-path

Attribute	Type	Description
		This attribute is output for VSP G1000, VSP G1500, VSP F1500, and VSP 5000 series storage systems. For VSP G1000, VSP G1500, and VSP F1500 storage systems, if the microcode version is earlier than 80-06-66-00/00-01, `Normal` is always output. However, `Normal` indicates an invalid value. For VSP 5000 series storage systems, information about the X-path and the interconnection switch is output as the value of the `xPathSummary` attribute. ▪ status (string) Status of the X-path • `Normal` • `Service` • `Moderate` • `Serious` • `Acute` • `Unknown` If the value of the attribute is `Service`, `Moderate`, `Serious`, or `Acute`, this indicates that an SIM has been issued and maintenance is required.

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/components/
instance
```

Getting information about channel boards

This request gets information about all channel boards.

Note:

- You can use this API function for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this API function.
- In the following descriptions, replace "channel board" with "channel adapter" depending on the storage system.
- To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information".

Tip:

If the storage system is VSP G200, G400, G600, G800, VSP F400, F600, F800, or the storage system is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 in a configuration that is linked to an SVP, you can also get channel board information by using the API request for getting information about the hardware installed in a storage system.

```
GET base-URL/v1/objects/storages/storage-device-ID/components/instance
```

When using the above API request to get channel board information, you do not need to specify the query parameter for getting additional information.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/channel-boards
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "data" : [ {
    "channelBoardId" : 3,
    "location" : "CHB-01F",
    "clusterNumber" : 1,
    "channelBoardNumber" : 3,
    "channelBoardType" : "FIBRE",
    "numOfPorts" : "4Port",
    "maxPortSpeed" : "32G",
    "cableMaterial" : "-"
  }, {
    "channelBoardId" : 7,
    "location" : "CHB-02F",
    "clusterNumber" : 2,
    "channelBoardNumber" : 3,
    "channelBoardType" : "FIBRE",
    "numOfPorts" : "4Port",
    "maxPortSpeed" : "32G",
    "cableMaterial" : "-"
  } ]
}
```

Attribute	Type	Description
channelBoardId	int	ID of the channel board
location	string	Location of the channel board
clusterNumber	int	Cluster number of the channel board
channelBoardNumber	int	Number of the channel board Each channel board in a cluster is assigned a unique number.
channelBoardType	string	Type of ports that are installed on the channel board ▪ `FICON` ▪ `FIBRE` ▪ `FCoE` ▪ `ISCSI` ▪ `NAS`

Attribute	Type	Description
numOfPorts	string	Number of ports that are installed on the channel board ▪ `2Port` ▪ `4Port` ▪ `8Port` ▪ `-` If this information cannot be obtained, a hyphen (`-`) is output.
maxPortSpeed	string	Data transmission speed of the ports installed on the channel board ▪ `8G` ▪ `10G` ▪ `16G` ▪ `25G` ▪ `32G` ▪ `-` If this information cannot be obtained, a hyphen (`-`) is output.
cableMaterial	string	Type of cable materials that can be used with the ports that are installed on the channel board ▪ `Optical` ▪ `Copper` ▪ `-` If no information about the type of cable materials exists, a hyphen (`-`) is output.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/900000012345/channel-boards
```

Chapter 21: Managing resources by using virtual storage machines

This chapter explains how to manage resources on virtual storage machines by using the REST API.

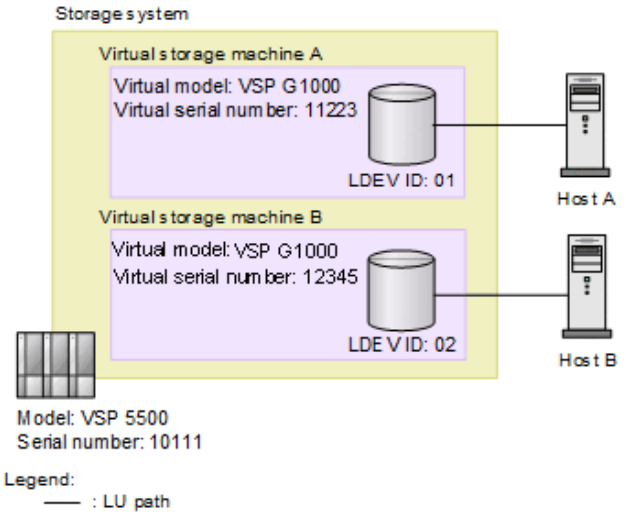
Overview of managing resources by using virtual storage machines

A "virtual storage machine" is a virtual storage system created on a storage system by using the global storage virtualization function. You can set virtual information, such as models and serial numbers, for virtual storage machines.

A virtual storage machine can be used as a global-active device or for nondisruptive migration. By registering resources in virtual storage machines, you can collectively manage resources of multiple physical storage systems on a single virtual storage machine, or divide resources of a single physical storage system into multiple virtual storage machines and manage the resources separately.

Examples of virtual storage machine configurations

The following figure shows examples of virtual storage machine configurations:



In this figure, a virtual storage machine of the virtual model VSP G1000 (virtual serial number: 11223) and a virtual storage machine of the virtual model VSP G1000 (virtual serial number: 12345) are created in a VSP 5500 storage system (serial number: 10111), and the resources registered in the virtual storage machines are allocated to the hosts. When the configuration is set up like this, from the virtual point of view it seems as if host A is accessing VSP G1000 (virtual serial number: 11223), and host B is accessing VSP G1000 (virtual serial number: 12345).

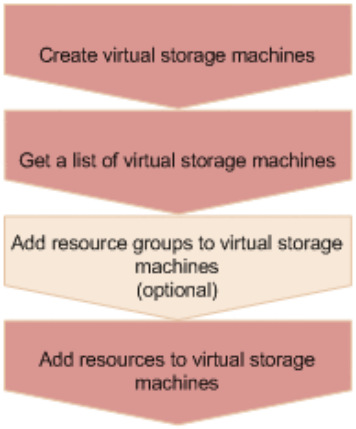
For details on how to manage resources by using virtual storage machines, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

Workflow for managing resources by using virtual storage machines

The following explains how to manage resources on virtual storage machines by using the REST API.

Workflow for creating a virtual storage machine and registering resources

Create a virtual storage machine, and then register the required resources. Allocate the registered resources to the hosts in the same way as allocating resources of a physical storage system, or use the registered resources in the volumes of a global-active device pair.



Create a virtual storage machine

Create a virtual storage machine, and then specify the model name and serial number. A resource group to be used on the virtual storage machine is also created at the same time.

Get a list of the virtual storage machines

Get information such as the storage device IDs of the created virtual storage machines, and the IDs of resource groups on the virtual storage machines.

Add resource groups on a virtual storage machine (optional)

If necessary, add resource groups to the virtual storage machine. Perform this operation by executing the API request for creating resource groups.

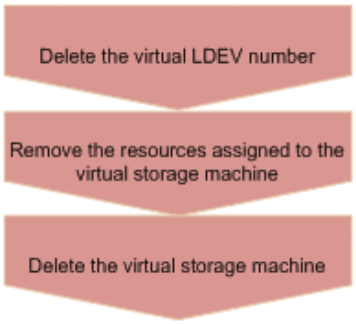
Add resources to the virtual storage machines

In the resource groups of the virtual storage machine, add resources such as host numbers, host group numbers, and LDEV numbers. Perform this operation by executing the API request for adding a resource to a resource group.

- To add an LDEV number, first delete the set virtual LDEV number, and then add the LDEV number. After adding the LDEV number in the virtual storage machine, set the virtual LDEV number.
- To add a host group number or iSCSI target number, add an undefined host group or iSCSI target.

Workflow for deleting an unnecessary virtual storage machine

Delete the resources on a virtual storage machine before you delete the virtual storage machine.



Delete the virtual LDEV number

Delete the virtual LDEV number that was set for the virtual LDEV on the virtual storage machine.

Remove the resources in the virtual storage machine

Delete the LDEVs, parity groups, host numbers, and all other resources that are added in the resource group in the virtual storage machine. Perform this operation by executing the API request for removing resources from resource groups.

Delete the virtual storage machine

Delete the virtual storage machine. Note that when all of the resource groups are deleted from the virtual storage machine, the virtual storage machine is automatically deleted.

Getting a list of virtual storage machines

The following request obtains a list of virtual storage machines. You can get information such as serial numbers, model names, and resource group IDs.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/virtual-storages
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

```
{
  "data": [
    {
      "virtualStorageDeviceId" : "882000410000",
      "virtualSerialNumber": "410000",
      "virtualModel": "VSP G350",
      "resourceGroupIds": [
        0,
        1
      ],
      "virtualStorageTypeId" : "M850S1"
    },
    {
      "virtualStorageDeviceId" : "886000422222",
      "virtualSerialNumber": "422222",
      "virtualModel": "VSP G700",
      "resourceGroupIds": [
        2
      ],
      "virtualStorageTypeId" : "M850M3"
    }
  ]
}
```

Attribute	Type	Description
virtualStorageDeviceId	string	Storage device ID of the virtual storage machine
virtualSerialNumber	string	Serial number of the virtual storage machine
virtualModel#	string	Model name of the virtual storage machine
virtualModelDetail#	string	Detailed model name of the virtual storage machine This parameter is output if the virtual storage machine is in the VSP 5000 series.
resourceGroupIds	int[]	Resource group ID
virtualStorageTypeId	string	Storage system type ID of the virtual storage machine If storage system is not be determined, `Unknown` is output. This parameter is output if the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

#: For virtual storage machines in the VSP 5000 series, the series name `VSP 5000 series AFA` or `VSP 5000 series hybrid` is output for the `virtualModel` attribute, and `VSP 5100, 5500`, `VSP 5200, 5600`, `VSP 5100H, 5500H`, or `VSP 5200H, 5600H` is output for the `virtualModelDetail` attribute.

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/886000123457/virtual-
storages
```

Getting information about a specific virtual storage machine

The following request gets information about the specified virtual storage machine. You can get information such as serial numbers, model names, and resource group IDs.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/virtual-storages/object-ID
```

Request message

Object ID

Specify the `virtualStorageDeviceId` value obtained by getting information about the virtual storage machine.

Attribute	Type	Description
virtualStorageDeviceId	string	(Required) Storage device ID of the virtual storage machine

Query parameters

None.

Body

None.

Response message

Body

```
{
  "virtualStorageDeviceId" : "882000400002",
  "virtualSerialNumber" : "400002",
  "virtualModel" : "VSP G350",
  "resourceGroupIds" : [
    0,
    2,
    4
  ],
  "virtualStorageTypeId" : "M850S1"
}
```

Attribute	Type	Description
virtualStorageDeviceId	string	Storage device ID of the virtual storage machine

Attribute	Type	Description
virtualSerialNumber	string	Serial number of the virtual storage machine
virtualModel#	string	Model name of the virtual storage machine
virtualModelDetail#	string	Detailed model name of the virtual storage machine This parameter is output if the virtual storage machine is in the VSP 5000 series.
resourceGroupIds	int[]	Resource group ID
virtualStorageTypeId	string	Storage system type ID of the virtual storage machine If storage system is not be determined, `Unknown` is output. This parameter is output if the storage system is VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

#: For virtual storage machines in the VSP 5000 series, the series name `VSP 5000 series AFA` or `VSP 5000 series hybrid` is output for the `virtualModel` attribute, and `VSP 5100, 5500`, `VSP 5200, 5600`, `VSP 5100H, 5500H`, or `VSP 5200H, 5600H` is output for the `virtualModelDetail` attribute.

Status codes

For details on the status codes for the request that performs this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/virtual-
storages/836000400002
```

Creating a virtual storage machine

The following request creates a virtual storage machine. A resource group is also created at the same time.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/virtual-storages
```

Request message

Object ID

None.

Query parameters

None.

Body

```
{
  "virtualSerialNumber": "422222",
  "virtualModel": "VSP G700",
  "resourceGroupName": "DevGroup"
}
```

Attribute	Type	Description
virtualSerialNumber	string	(Required) Serial number of the virtual storage machine
virtualModel	string	(Required) Model name of the virtual storage machine Specifiable values are as follows: ▪ `VSP One B28` ▪ `VSP One B26` ▪ `VSP One B24` ▪ `VSP E1090` ▪ `VSP E990`

Attribute	Type	Description
		▪ VSP E790 ▪ VSP E590 ▪ VSP E1090H ▪ VSP E790H ▪ VSP E590H ▪ VSP F900 ▪ VSP F700 ▪ VSP F370 ▪ VSP F350 ▪ VSP G900 ▪ VSP G700 ▪ VSP G370 ▪ VSP G350 ▪ VSP G800 and VSP F800[#1] ▪ VSP G400/G600 and VSP F400/F600[#1] ▪ VSP G200 ▪ HUS VM ▪ VSP 5100, 5500[#2] ▪ VSP 5200, 5600[#2] ▪ VSP 5100H, 5500H[#2] ▪ VSP 5200H, 5600H[#2] ▪ VSP G1000/G1500 and VSP F1500 ▪ VSP

Attribute	Type	Description
resourceGroupName	string	(Required) Name of the resource group to be created when the virtual storage machine is created Specify a name consisting of 1 to 32 characters.

#1: If the storage system model is VSP N400 or VSP N600, specify `VSP G400/G600 and VSP F400/F600`. If the storage system model is VSP N800, specify `VSP G800 and VSP F800`.

#2: If the storage system is in the VSP 5000 series, note the following.

- To maintain compatibility, you can specify `VSP 5000 series AFA` instead of `VSP 5100, 5500`. In this case, the request is run in the same way as if `VSP 5100, 5500` were specified.
- To maintain compatibility, you can also specify `VSP 5000 series hybrid` instead of `VSP 5100H, 5500H`. In this case, the request is run in the same way as if `VSP 5100H, 5500H` were specified.
- If you run the API request that gets information about a virtual storage machine with `VSP 5100, 5500`, `VSP 5200, 5600`, `VSP 5100H, 5500H`, or `VSP 5200H, 5600H` specified for the `virtualModel` attribute, the series name (`VSP 5000 series AFA` or `VSP 5000 series hybrid`) will be output for the `virtualModel` attribute, and the value you specified will be output for the `virtualModelDetail` attribute.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the created virtual storage machine

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session d7b673af189048468c5af9bcf3bbbb6f" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/886000012345/virtual-storages/
```

Deleting a virtual storage machine

The following request deletes a virtual storage machine. Remove all of the resources included in the virtual storage machine before running this request.

Note:

If you locked any resources of the target storage system by using the REST API, you will not be able to use this API function. In such cases, unlock the resources before running the API function.

Execution permission

Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/virtual-storages/object-ID
```

Request message

Object ID

Specify the `virtualStorageDeviceId` value obtained by getting information about the virtual storage machine.

Attribute	Type	Description
virtualStorageDeviceId	string	(Required) Storage device ID of the virtual storage machine

Query parameters

None.

Body

None.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the description of job objects.

Attribute	Description
affectedResources	URL of the deleted virtual storage machine

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/virtual-
storages/409900010000
```

Getting information about virtual LDEVs

The following request gets information about the virtual LDEVs (LDEVs to which virtual LDEV numbers have been assigned) on a virtual storage machine. If no virtual LDEVs exist in the specified range, an empty list will be returned. To get information about virtual LDEVs, use multiple query parameters so that virtual LDEVs are included.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs
```

Request message

Object ID

None.

Query parameters

You can filter the execution result by specifying conditions, or request additional detailed information about virtual LDEVs. To get information about virtual LDEVs, specify the target virtual storage machine by using the `virtualSerialNumber` parameter.

- When filtering the execution result

  By default, information about a maximum of 100 virtual LDEVs is obtained. You can get information about a maximum of 16,384 virtual LDEVs by specifying the `count` parameter. When the `ldevOption` parameter or the `poolId` parameter is specified, if the number of virtual LDEVs for which information is to be obtained exceeds 16,384, use the `headVirtualLdevId` parameter and specify a value so that the virtual LDEV numbers whose information is to be obtained are included in the range. The information that can be obtained is only about the number of virtual LDEVs that are included in the range specified by the combination of the `headVirtualLdevId` parameter and the `count` parameter.

  Tip:

  Of the resources displayed by the filter, you can obtain information only about the resources for which you have been granted access permissions.

  For example, if you specify 10 for the `count` parameter and you have permission to access all virtual LDEVs, information about 10 virtual LDEVs will be obtained. If you have permission to access specific virtual LDEVs only, information will be obtained only about virtual LDEVs for which you have been granted access permissions.

  Important:

  For a VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage system, pay attention to the number of concurrent executions of this API request. For details, see "Implementing retry processing".

For query parameters that can be specified at the same time, see the following table that lists the combinations of query parameters that can be specified.

Parameter	Type	Filter Condition
virtualSerialNumber	string	(Required) Specify the serial number of a virtual storage machine. Information about virtual LDEVs on the virtual storage machine is obtained in the ascending order of virtual LDEV numbers.
headVirtualLdevId	int	(Optional) Specify the virtual LDEV number (a decimal) from which the processing to get information is to start.

Parameter	Type	Filter Condition
		Information about the LDEVs is obtained in the ascending order of virtual LDEV numbers, starting with the specified virtual LDEV number. If this parameter is omitted, `0` is assumed. When specifying this parameter, be sure to also specify the `virtualSerialNumber` parameter.
count	int	(Optional) Specify the number of virtual LDEVs about which you want to obtain information. Specify a value in the range from `1` to `16384`. If this parameter is omitted, `100` is assumed.
ldevOption	string	(Optional) Virtual LDEV conditions for getting information You can specify the following conditions: ▪ `defined` Get information about virtual LDEVs that have been implemented. ▪ `undefined` Get information about virtual LDEVs that are not implemented. ▪ `dpVolume` Obtaining DP volume information ▪ `luMapped` Get information about virtual LDEVs for which LU paths are defined. ▪ `luUnmapped` Get information about virtual LDEVs for which LU paths have not been defined. ▪ `externalVolume` Get information about external volumes. ▪ `mappedNamespace` Gets information about the virtual LDEV where the namespace is set. This value can be specified if the storage system is VSP One B20, VSP 5000 series, VSP E1090, or VSP E1090H.

Parameter	Type	Filter Condition
		If this is omitted, information about all types of virtual LDEVs will be obtained.
poolId	int	(Optional) Pool number Get information about the virtual LDEVs that are associated with the specified pool. By using the ldevOption parameter when specifying conditions, the following information can be obtained: ▪ If `dpVolume` is specified for the `ldevOption` parameter: Gets information about the DP volumes that are associated with the specified pool. ▪ If `luMapped` is specified for the `ldevOption` parameter: Gets information about virtual LDEVs for which LU paths associated with the specified pool are defined. ▪ If `luUnmapped` is specified for the `ldevOption` parameter: Gets information about virtual LDEVs for which LU paths associated with the specified pool have not been defined. If you specify this parameter without specifying the `ldevOption` parameter, the API gets information about the volumes that make up the pool (pool volumes).
resourceGroupId	int	(Optional) ID of the resource group to which virtual LDEVs for which information is to be obtained belong
journalId	int	(Optional) ID of the journal to which virtual LDEVs for which information is to be obtained belong
parityGroupId	string	(Optional) Number of the parity group to which LDEVs for which information is to be obtained belong Specify concatenated parity groups in the same way as the above.

Parameter	Type	Filter Condition
		If the concatenated parity groups are 1-3-1, 1-3-2, or 1-3-3, specify as follows: `parityGroupId=1-3`

The following table shows the combinations of query parameters that can be specified.

Parameter	virtualSerialNumber	headVirtualLdevId	count	ldevOption	poolId	resourceGroupId	journalId	parityGroupId
virtualSerialNumber	--	Y	Y	Y	Y	Y	Y	Y
headVirtualLdevId	Y	--	Y	Y	N	N	N	N
count	Y	Y	--	Y	Y	Y	Y	Y
ldevOption	Y	Y	Y	--	Y#	Y	N	N
poolId	Y	N	Y	Y#	--	Y	N	N
resourceGroupId	Y	N	Y	Y	Y	--	Y	Y
journalId	Y	N	Y	N	N	Y	--	N
parityGroupId	Y	N	Y	N	N	Y	N	--

#: If `defined`, `undefined`, or `externalVolume` is specified as the value of the `ldevOption` parameter, you cannot specify this combination of parameters.

- When requesting additional detailed information

Parameter	Type	Description
detailInfoType	string	(Optional) Type of detailed information to be obtained You can use this parameter together with parameters that filter the execution results.

Parameter	Type	Description
		The following values can be specified. To specify multiple values, separate the values by using commas. ▪ `FMC` Adds detailed information about accelerated compression for the virtual LDEVs that belong to parity groups with drive type `SSD(FMC)`. ▪ `virtualSerialNumber` Adds detailed information about virtual storage machines. ▪ `class` Adds additional information from the storage system's cache. You can specify this item for the following storage systems: VSP 5000 series, VSP E series, VSP Gx00 models, VSP G1000, VSP G1500, VSP Fx00 models, VSP F1500. If the storage system is VSP E series, VSP G350, G370, G700, G900, or VSP F350, F370, F700, F900, in a configuration that is linked to an SVP, you can specify this item. To get up-to-date information, you must run the API request that refreshes the storage system's cache before running this request. For details, see "Updating the cache of storage system configuration information". Immediately after you create an LDEV, if you specify `class` and at the same time specify `defined` in the query parameter `ldevOption` and then run the command, the volume status might be output as unimplemented. In such a case, wait a while and then run this request again. Alternatively, run the API request that updates the cache of storage system configuration information, and then run this request again.

Parameter	Type	Description
		▪ `qos` Adds information about QoS settings. You can specify this item for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900. ▪ `nguId` Adds the NGUID (Namespace Globally Unique Identifier). You can specify this value for VSP One B20, VSP 5000 series, VSP E1090, VSP E1090H.

Body

None.

Response message

Body


```
{
  "data": [
    {
      "ldevId": 0,
      "virtualLdevId": 0,
      "virtualSerialNumber": "410012",
      "clprId": 0,
      "emulationType": "OPEN-V-CVS",
      "byteFormatCapacity": "1.00 G",
      "blockCapacity": 2097152,
      "numOfPorts": 1,
      "ports": [
        {
          "portId": "CL3-B",
          "hostGroupNumber": 25,
          "hostGroupName": "bs10300-7",
          "lun": 19
        }
      ],
      "attributes": [
        "CVS",
        "HDP",
        "GAD"
      ],
```

```
      "status": "NML",
      "mpBladeId": 2,
      "ssid": "0004",
      "poolId": 4,
      "numOfUsedBlock": 0,
      "isFullAllocationEnabled": false,
      "resourceGroupId": 6,
      "dataReductionStatus": "DISABLED",
      "dataReductionMode": "disabled",
      "isAluaEnabled": false
    },
    {
      "ldevId": 1,
      "virtualLdevId": 1,
      "virtualSerialNumber": "410012",
      "clprId": 0,
      "emulationType": "OPEN-V-CVS",
      "byteFormatCapacity": "1.00 G",
      "blockCapacity": 2097152,
      "numOfPorts": 1,
      "ports": [
        {
          "portId": "CL3-B",
          "hostGroupNumber": 25,
          "hostGroupName": "bs10300-7",
          "lun": 21
        }
      ],
      "attributes": [
        "CVS",
        "HDP",
        "GAD"
      ],
      "label": "ldev_label_1",
      "status": "NML",
      "mpBladeId": 0,
      "ssid": "0004",
      "poolId": 10,
      "numOfUsedBlock": 0,
      "isFullAllocationEnabled": false,
      "resourceGroupId": 6,
      "dataReductionStatus": "DISABLED",
      "dataReductionMode": "disabled",
      "isAluaEnabled": false
    }
  ]
}
```

The following table describes the attributes to be obtained in the body of the response message. For details on attributes to be obtained, see the description of the API function for getting volume information.

Attribute	Type	Description
ldevId	int	LDEV number
virtualLdevId	int	Virtual LDEV number
virtualSerialNumber	string	Serial number of the virtual storage machine

If you execute the request with `virtualSerialNumber` specified for the `detailInfoType` query parameter, the request also obtains detailed information about the virtual storage machines.

Attribute	Type	Description
virtualModel#	string	Model name of the virtual storage machine
virtualModelDetail#	string	Detailed model name of the virtual storage machine This parameter is output if the virtual storage machine is in the VSP 5000 series.

#: For virtual storage machines in the VSP 5000 series, the series name `VSP 5000 series AFA` or `VSP 5000 series hybrid` is output for the `virtualModel` attribute, and `VSP 5100, 5500`, `VSP 5200, 5600`, `VSP 5100H, 5500H`, or `VSP 5200H, 5600H` is output for the `virtualModelDetail` attribute.

If you run this request with `class` specified for `detailInfoType` in the query parameters, additional information from the storage system's cache is also obtained.

Attribute	Type	Description
virtualEmulationType	string	Virtual emulation type of the virtual LDEV
virtualSsId	int	Virtual SSID of the virtual LDEV
isVirtualCvs	boolean	Whether a virtual CVS is set for the virtual LDEV ▪ `true`: Set ▪ `false`: Not set

Status codes

For details on the status codes of the request for this operation, see the section explaining HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET "https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs?
count=2&virtualSerialNumber=410012"
```

Setting a virtual LDEV number

The following request sets a virtual LDEV number for an LDEV.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/assign-
virtual-ldevid/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting information about volumes.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following coding example sets the virtual LDEV number `405` for a LDEV:

```
{
  "parameters": {
```

```
    "virtualLdevId": 405
  }
}
```

Attribute	Type	Description
virtualLdevId	int	(Required) Specify the virtual LDEV number with a decimal (base 10) number. If you specify `65535`, the reserved attribute of global-active device will be set.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the LDEV for which the virtual LDEV number is set

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/assign-virtual-ldevid
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The virtual LDEV number is already set for the target LDEV.

Coding example

To get an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/assign-virtual-ldevid
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/1/actions/assign-virtual-ldevid/invoke
```

Deleting a virtual LDEV number

The following request deletes the virtual LDEV number set for an LDEV.

Execution permission

Storage Administrator (Provisioning)

Request line

```
PUT base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/unassign-
virtual-ldevid/invoke
```

You can run this API request in a POST method.

Request message

Object ID

Specify the `ldevId` value obtained by getting information about the virtual LDEV number.

Attribute	Type	Description
ldevId	int	(Required) Specify the LDEV number with a decimal (base 10) number.

Query parameters

None.

Body

The following coding example deletes virtual LDEV number 405:

```
{
  "parameters": {
```

```
    "virtualLdevId": 405
  }
}
```

Attribute	Type	Description
virtualLdevId	int	(Required) Specify the virtual LDEV number with a decimal (base 10) number. If you specify `65535`, the reserved attribute of global-active device is canceled.

Response message

Body

A job object is returned. For details on attributes other than affectedResources, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the LDEV for which the virtual LDEV number is deleted

Action template

```
GET base-URL/v1/objects/storages/storage-device-ID/ldevs/object-ID/actions/unassign-virtual-ldevid
```

Status codes

The following table describes the meaning of the status code of the request for this operation. For details on other status codes, see the description on HTTP status codes.

Status code	Message	Description
412	Precondition Failed	The virtual LDEV number is not set for the target LDEV.

Coding example

To get an action template:

```
 curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
```

```
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/836000123456/ldevs/1/
actions/unassign-virtual-ldevid
```

To run the request after getting an action template:

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/836000123456/ldevs/1/actions/unassign-virtual-ldevid/invoke
```

Chapter 22: Sample coding

This chapter explains the sample coding.

Overview of sample coding

This section provides sample client coding written in Python, as reference information for calling and using the REST API. The sample client coding includes basic code constructs required for client programs, including those for getting information about, creating, and changing the attributes of objects. Each sample of client coding shows an operation example such as allocating a volume or creating a copy pair. You can apply the code constructs included in the sample client coding to other use cases.

Code constructs of sample coding

The following operations are performed by the sample coding:

- Register storage system information

  In one of the samples, information about the target storage system is registered to the REST API server, to enable use of the REST API to perform operations on the storage system resources.

  The parameters that are required when you register information about a storage system vary depending on the storage system. Revise the values of the parameters defined in the following files based on the storage system to be registered:

  - `block_storage_api.py`
  - `storage_param.py`

  For details, see the description of the sample coding for registering information about a storage system and the description of the functions used in the sample coding.

- Allocate a volume

  In one of the samples, an HDP volume is created from an HDP pool that has already been created, and the volume is made accessible by allocating it to a host.

- Operate a ShadowImage pair

  In one of the samples, volumes that have already been created are used to create a ShadowImage pair. After the pair is split, the status of the pair is verified.

- Register remote storage system information

  In one of the code samples, information about the remote storage systems is registered to the REST API server of the local storage system. This is a prerequisite operation for a remote copy operation.

- Operate a TrueCopy pair

  In one of the code samples, a TrueCopy pair is created by using volumes that have already been created, and the pair status is checked. A resource group is locked while the pair is being created.

- Upload files (specify the transfer destinations of audit log files)

  Specify settings so that the audit log files of storage systems are transferred to the syslog server. This sample coding includes the procedure for uploading the client certificates to a storage system.The supported storage systems for this sample coding are VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, VSP Fx00 models.

- Download a file (back up encryption keys)

  Back up the encryption keys by using a REST API client. This sample coding includes the procedure for downloading an encryption backup file to a client. The supported storage systems for this sample coding are VSP One B20, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

- Re-create a parity group (encrypt data)

  Delete an existing parity group, and then create a parity group for which encryption is enabled. This operation is performed as part of the procedure for encrypting existing data without changing the drive configuration. For details on the entire procedure, see the description of the flow of data encryption operations. The supported storage systems for this sample coding are VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Code constructs such as the following are included in the previously listed operations:

1. Processing that is run before the REST API is called
   - Generating request bodies in JSON format
   - Creating form data
   - Specifying request headers (for the default HTTP headers or for the custom HTTP headers)
   - Setting user authentication information (for authentication by using a user ID and a password, or for authentication by using session-based authentication)
   - Getting the URLs of the resources (when object IDs are not specified or when object IDs that are obtained from the operation results are specified, or when fixed object IDs such as those for single instances are specified)
2. Processing to call the REST API
   - Getting information about the version of the REST API by performing a GET operation
   - Getting an object by performing a GET operation (when getting a specific object)
   - Getting an object by performing a GET operation (when getting an object by using the search function)
   - Getting the action template by performing a GET operation
   - Changing object attributes by performing a PUT operation
   - Running actions that use the action template by performing a PUT operation

- Running actions for objects by using the PUT operation
- Running actions for services by performing a PUT operation
- Creating objects by performing a POST operation
- Running actions for objects by using the POST operation
- Operations that require sessions to be generated on multiple devices (remote copy operation)
- Deleting objects by performing a DELETE operation

3. Processing that is run after the REST API is called
   - Outputting obtained information
   - Getting job execution results
   - Getting the URLs of the resources to which the operation results have been applied
   - Getting error codes
   - Outputting error messages

The following table shows an example of using each code construct included in the samples. For details about each code, see the description of each sample coding.

Code constructs	Example of using sample coding	Corresponding sample coding
Generating a request body in JSON format	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Volume allocation Operate a ShadowImage pair
	Create an HDP volume.	Volume allocation
	Create a ShadowImage pair.	Operate a ShadowImage pair
Creating form data	Upload the root certificate of the syslog server to which audit log files are to be transferred. Upload the client certificate of the syslog server to which audit log files are to be transferred.	Upload files (specify the transfer destinations of audit log files)
Specifying request headers (for the default HTTP headers)	Define headers.	Volume allocation Operate a ShadowImage pair Register remote storage system information

Code constructs	Example of using sample coding	Corresponding sample coding
		Operate a TrueCopy pair
Specifying request headers (for the custom HTTP headers)	Define headers.	Operate a ShadowImage pair
Setting user authentication information (for authentication by using a user ID and a password)	Generate a session.	Volume allocation Operate a ShadowImage pair Register remote storage system information Operate a TrueCopy pair
Setting user authentication information (for authentication by using session-based authentication)	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Volume allocation Operate a ShadowImage pair
	Create an HDP volume.	Volume allocation
	Split a ShadowImage pair.	Operate a ShadowImage pair
Getting the URLs of the resources (when object IDs are not specified)	Create an HDP volume. (BlockStorageAPI.ldevs)	Volume allocation
	Create a host group. (BlockStorageAPI.host_groups)	Volume allocation
	Create a ShadowImage pair. (BlockStorageAPI.local_copy_pairs)	Operate a ShadowImage pair
Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified)	Create a host group. (BlockStorageAPI.affected_resource)	Volume allocation
	Create a ShadowImage pair. (BlockStorageAPI.affected_resource)	Operate a ShadowImage pair
Getting the URLs of the resources (when fixed object IDs such as those for single instances are specified)	Specify the syslog server to which audit log files are to be transferred. (BlockStorageAPI.auditlog_syslog)	Upload files (specify the transfer destinations of audit log files)

Code constructs	Example of using sample coding	Corresponding sample coding
	Send a test message to the syslog server to which audit log files are to be transferred. (BlockStorageAPI.auditlog_syslog_send_test)	
	Download the encryption key backup file. (BlockStorageAPI.encryption_key_file_backup)	Download a file (back up encryption keys)
Getting information about the version of the REST API by performing the GET operation	Check the version of the REST API. (BlockStorageAPI.api_version)	Volume allocation Operate a ShadowImage pair Register remote storage system information Operate a TrueCopy pair
Getting an object by performing the GET operation (when getting a specific object)	Get HDP volume information. (BlockStorageAPI.ldev)	Volume allocation
	Get information about a ShadowImage pair.	Operate a ShadowImage pair
Getting an object by performing a GET operation (when getting an object by using the search function)	Create an HDP volume (BlockStorageAPI.views_undefined_ldev)	Volume allocation
Getting the action template by performing the GET operation	Split a ShadowImage pair. (BlockStorageAPI.split_local_copy _pair_template)	Operate a ShadowImage pair
Getting information about the job status by performing the GET operation	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Volume allocation Operate a ShadowImage pair Register remote storage system information
	Define the function for getting status changes for asynchronous processing.	Operate a TrueCopy pair

Code constructs	Example of using sample coding	Corresponding sample coding
Changing the object attribute by performing the PUT operation	Change the host mode.	Volume allocation
Running actions that use the action template by performing a PUT operation	Split a ShadowImage pair. (BlockStorageAPI.split_local_copy_pair)	Operate a ShadowImage pair
Running actions for objects by using the PUT operation	Send a test message to the syslog server to which audit log files are to be transferred.	Upload files (specify the transfer destinations of audit log files)
Running actions for services by performing a PUT operation	Lock resources. Unlock resources.	Operate a TrueCopy pair
Creating objects by performing a POST operation	Create an HDP volume. (BlockStorageAPI.ldevs) Register the WWN of the host. (BlockStorageAPI.host_wwns) Create a host group. (BlockStorageAPI.host_groups) Set an LU path. (BlockStorageAPI.luns)	Volume allocation
	Create a ShadowImage pair. (BlockStorageAPI.local_copy_pairs)	Operate a ShadowImage pair
Running actions for objects by using the POST operation	Upload the root certificate of the syslog server to which audit log files are to be transferred. Upload the client certificate of the syslog server to which audit log files are to be transferred.	Upload files (specify the transfer destinations of audit log files)
Operations that require sessions to be generated on multiple devices (remote copy operation)	Create a TrueCopy pair.	Operate a TrueCopy pair

Code constructs	Example of using sample coding	Corresponding sample coding
Deleting objects by performing a DELETE operation	Discard the session.	Volume allocation Operate a ShadowImage pair Register remote storage system information Operate a TrueCopy pair
Outputting the obtained information	Get HDP volume information.	Volume allocation
	Get information about a ShadowImage pair.	Operate a ShadowImage pair
Getting the job execution results	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing. (BlockStorageAPI.job)	Volume allocation Operate a ShadowImage pair Register remote storage system information
	Define the function for getting status changes for asynchronous processing.	Operate a TrueCopy pair
Getting the URLs of the resources to which the operation results have been applied	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Volume allocation Operate a ShadowImage pair Register remote storage system information
	Define the function for getting status changes for asynchronous processing.	Operate a TrueCopy pair
Getting error codes	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Volume allocation Operate a ShadowImage pair Register remote storage system information
	Define the function for getting status changes for asynchronous processing.	Operate a TrueCopy pair
Outputting error messages	Output error messages.	Volume allocation

Code constructs	Example of using sample coding	Corresponding sample coding
		Operate a ShadowImage pair Register remote storage system information Operate a TrueCopy pair

Structure of sample coding

The following operations are shared by the samples. These operations are implemented as functions, which are called and executed by the main operation. For details on each function, see the section explaining the functions used in the sample coding.

- Generating a URL (BlockStorageAPI class)

  Creates a URL to issue an HTTP request to the storage system.

- Issuing an HTTP request and verify the status of the asynchronous processing (invoke_async_command)

  Issues an HTTP request, verifies whether the execution results of the asynchronous processing have been applied, and then returns the result.

- Getting status changes for asynchronous processing (wait_until_jobstatus_is_changed)

  Verifies that jobs have moved to the status specified in the parameter, and then returns the result.

Sample coding files

The following describes files that are provided as sample coding and their content:

- `register_storage.py`

  This file contains sample coding for registering storage system information.

- `provisioning.py`

  This file contains sample coding for volume allocation.

- `local_copy.py`

  This file contains sample coding for ShadowImage pair operations.

- `register_remote_storage.py`

  This file contains sample coding for registering remote storage system information.

- `synchronous_remote_copy.py`

  This file contains sample coding for TrueCopy pair operations.

- `auditlog_syslog_server_setting.py`

  This file contains sample coding for uploading files (specifying the transfer destinations of audit log files).

- `backup_encryption_keys.py`

  This file contains sample coding for downloading a file (backing up encryption keys).

- `recreate_parity_group.py`

  This file contains sample coding for re-creating a parity group (encrypting data).

- `block_storage_api.py`

  This file defines the BlockStorageAPI class.

- `rest_server_param.py`

  This file defines information about the server where the REST API server is installed.

- `storage_param.py`

  This file defines information about the local storage system.

- `remote_copy_param.py`

  This file defines information about the remote and the local storage systems.

The sample coding file is stored in the following location of the installation media:

In a Windows OS:

DVD-ROM-drive:\Windows\samplecode.zip

In a Linux OS:

mount-directory-of-DVD-ROM/Linux/samplecode.tar

Operation environment for sample coding

The samples are coded in the script language Python. Python code has excellent readability. Python is a versatile programming language widely used by Web service developers. Please download Python from the official Python website (https://www.python.org/) and configure the operation environment.

The code samples provided in this chapter use the standard library (json, sys, http.client, time, and traceback). Along with the standard library, you are also going to use the Requests library, which is a third-party library. Please download it from the web page for downloading the Requests library.

Note that the operations of the code samples described in this chapter have been checked in an environment of Python 3.7.5 and Requests 2.31.0.

Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies that verification of the server certificate is skipped when a request is issued.

Sample coding for registering storage system information

This section explains the sample coding (`register_storage.py`) for registering storage system information.

Sample coding operation flow for registering storage system information

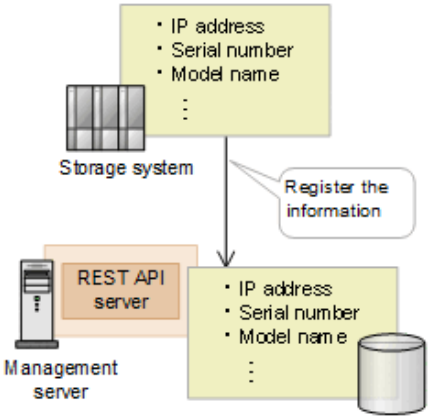
The following table shows the sample coding operation flow for registering storage system information and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
4	Register information about storage systems.	Getting the URLs of the resources (when object IDs are not specified) Generating a request body in JSON format Creating objects by performing a POST operation
5	Get information about storage systems.	Getting an object by performing a GET operation (when getting a specific object)

Step	Sample coding operation flow	Code constructs
		Outputting the obtained information
6	Output error messages.	Outputting error messages

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1", "pass1")`	This is the authentication information to be used for authentication in storage systems. The coding sample shows a setting example when the user ID is `user1`, and the password is `pass1`. This user must have the Security Administrator (View Only) role or the Security Administrator (View & Modify) role.
IS_SECURE	`"true"`	Enables or disables SSL communication between the REST API server and the storage system. The sample coding is an example of how to enable SSL communication.

If you want to use the information about the local storage system as common variables in coding samples, use the parameters and values defined in the `storage_param.py` file. Determine which parameters to use, according to the storage system to be registered. Comment out the lines of the parameters that you do not want to use.

For VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500, set the following parameters:

Parameter	Value	Description
SVP_IP_ADDR	`192.0.2.100`	The IP address of the SVP
STORAGE_MODEL	`VSP G800`	The model name of the storage system
SERIAL_NUMBER	`410000`	The serial number of the storage system

For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, set the following parameters:

Parameter	Value	Description
GUM1_IP_ADDR#	`192.0.3.100`	IP address of controller 1 of the storage system
GUM2_IP_ADDR#	`192.0.3.200`	IP address of controller 2 of the storage system
STORAGE_MODEL#	`VSP G900`	The model name of the storage system
SERIAL_NUMBER#	`420000`	The serial number of the storage system

For VSP One B20, set the following parameters:

Parameter	Value	Description
SERVICE_IP_ADDR#	`192.0.2.20`	IP address (service IP) used to communicate with the storage system
STORAGE_MODEL#	`VSP One B28`	The model name of the storage system
SERIAL_NUMBER#	`800556`	The serial number of the storage system

#: By default, the line corresponding to this parameter is commented out.

In addition, based on the storage system you are using, revise in advance the value of the STORAGE_MODEL_DICT parameter in the file (`block_storage_api.py`) in which the BlockStorageAPI class is defined.

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

Before starting the processing to register information about the storage system, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
register_storage

This program requires API version 1.9.1 or newer.
"""

import traceback
import requests
import json
import sys
import http.client
import storage_param
import rest_server_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################## #
# Change the following parameters to fit your environment

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

# Enable cipher mode
IS_SECURE = "true"

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 9
REQUIRED_REVISION_VERSION = 1

############################################################
```

3. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
        required_minor_version, required_revision_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    revision_version = int(version[2])
    version_error = False
    if major_version == required_major_version:
        if minor_version == required_minor_version:
            if revision_version < required_revision_version:
                version_error = True
        elif minor_version < required_minor_version:
            version_error = True
    elif major_version < required_major_version:
        version_error = True

    if version_error == True:
        sys.exit(
            "This program requires API Version " +
            str(required_major_version) +
            "." +
            str(required_minor_version) +
```

```
            "." +
            str(required_revision_version) +
            " or newer.\n")
```

```
try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    check_api_version(
        r.json()["apiVersion"],
        REQUIRED_MAJOR_VERSION,
        REQUIRED_MINOR_VERSION,
        REQUIRED_REVISION_VERSION)
```

4. Register information about storage systems

Register information about the storage systems to be monitored on the REST API server. In this sample coding, the content of the request body has been changed according to the storage system to be registered.

```
    # step2 Register a storage
    print("Register a storage")
    url = block_storage_api.local_storages()
    if storage_param.SERVICE_IP_ADDR is not None:
        body = {
            "ip": storage_param.SERVICE_IP_ADDR,
            "serialNumber": storage_param.SERIAL_NUMBER,
            "model": storage_param.STORAGE_MODEL,
            "isSecure" : IS_SECURE
        }

    elif storage_param.SVP_IP_ADDR is not None:
        body = {
            "svpIp": storage_param.SVP_IP_ADDR,
            "serialNumber": storage_param.SERIAL_NUMBER,
            "model": storage_param.STORAGE_MODEL,
            "isSecure" : IS_SECURE
        }
    else:
        body = {
            "ctl1Ip": storage_param.GUM1_IP_ADDR,
            "ctl2Ip": storage_param.GUM2_IP_ADDR,
            "serialNumber": storage_param.SERIAL_NUMBER,
            "model": storage_param.STORAGE_MODEL
        }
    r = requests.post(url, headers=headers,
                      data=json.dumps(body),
                      auth=USER_CREDENTIAL, verify=False)
```

```
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
```

5. Get information about the storage systems.

To confirm that information about the storage systems is correctly registered, get information about the registered storage systems by specifying the storage device ID. In this sample coding, the content to be obtained and output has been changed according to the storage system that was registered.

```
# step3 Get the storage
print("Get the storage")
url = block_storage_api.local_storage(
                    str(r.json()["storageDeviceId"]))
r = requests.get(url, headers=headers,
                 auth=USER_CREDENTIAL, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)

if storage_param.SERVICE_IP_ADDR is not None:
    print("STORAGE DEVICE ID : " +
          str(r.json()["storageDeviceId"]))
    print("MODEL : " + r.json()["model"])
    print("SERIAL NUMBER : " + str(r.json()["serialNumber"]))
    print("IP : " + r.json()["ip"])
    print("DKC MICRO VERSION : " +
           r.json()["dkcMicroVersion"])
    print("COMMUNICATION MODES : " + str(r.json()["communicationModes"]))
    print("IS SECURE : " + str(r.json()["isSecure"]))
    print("CTR LOCATION : " + r.json()["ctlLocation"])
    print()
elif storage_param.SVP_IP_ADDR is not None:
    print("STORAGE DEVICE ID : " +
          str(r.json()["storageDeviceId"]))
    print("MODEL : " + r.json()["model"])
    print("SERIAL NUMBER : " + str(r.json()["serialNumber"]))
    print("SVP IP ADDRESS : " + r.json()["svpIp"])
    print("RMI PORT : " + str(r.json()["rmiPort"]))
    print("DKC MICRO VERSION : " +
           r.json()["dkcMicroVersion"])
    print()
else:
    print("STORAGE DEVICE ID : " +
           str(r.json()["storageDeviceId"]))
    print("MODEL : " + r.json()["model"])
    print("SERIAL NUMBER : " + str(r.json()["serialNumber"]))
    print("CTL1 IP ADDRESS : " + r.json()["ctl1Ip"])
    print("CTL2 IP ADDRESS : " + r.json()["ctl2Ip"])
    print("TARGET CONTROLLER : " + str(r.json()["targetCtl"]))
    print("DKC MICRO VERSION : " + r.json()["dkcMicroVersion"])
```

```
        print()
```

6. Output error messages.

   In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
finally:
    print("Operation was completed.")
    sys.exit()
```

Sample coding for volume allocation

This section explains the sample coding for volume allocation.

Sample coding operation flow for volume allocation

The following table shows the sample coding operation flow for volume allocation and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication)

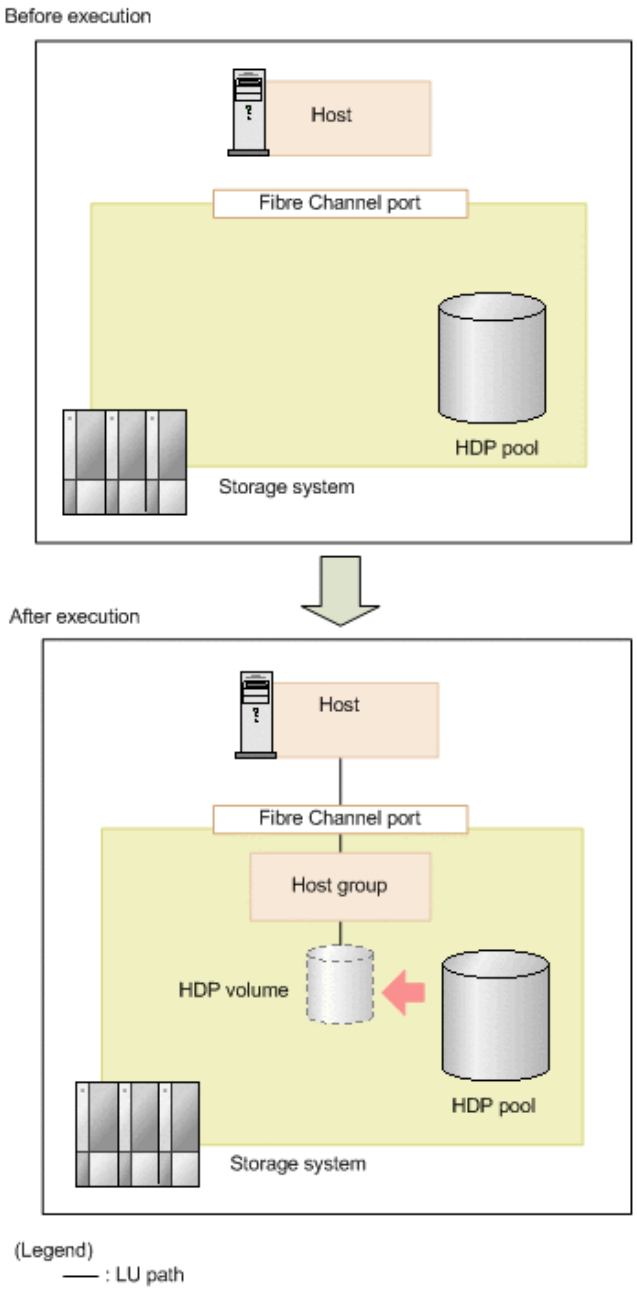
Step	Sample coding operation flow	Code constructs
		Generating a request body in JSON format Getting the job execution results Getting the URLs of the resources to which the operation results have been applied Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password) Creating objects by performing a POST operation
6	Create an HDP volume.	Getting the URLs of the resources (when object IDs are not specified) Getting an object by performing a GET operation (when getting an object by using the search function)# Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Creating objects by performing a POST operation
7	Create a host group.	Getting the URLs of the resources (when object IDs are not specified) Generating a request body in JSON format Creating objects by performing a POST operation Getting the URLs of the resources (when object IDs that are automatically obtained from the operation results are specified)
8	Change the host mode.	Generating a request body in JSON format Changing the object attribute by performing a PUT operation
9	Register the WWN of the host.	Getting the URLs of the resources (when object IDs are not specified) Generating a request body in JSON format

Step	Sample coding operation flow	Code constructs
		Creating objects by performing a POST operation
10	Set an LU path.	Getting the URLs of the resources (when object IDs are not specified) Generating a request body in JSON format Creating objects by performing a POST operation
11	Get HDP volume information.	Getting an object by performing the GET operation (when getting a specific object) Setting user authentication information (for authentication by using session-based authentication) Outputting the obtained information
12	Output error messages.	Outputting error messages
13	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Deleting objects by performing a DELETE operation

#: We recommend that you refresh the storage system configuration information in advance to make sure that the resource information stored on the REST API server is the latest.

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1", "pass1")`	This is the authentication information to be used for authentication in the storage system. The coding sample shows a setting example when the user ID is `user1`, and the password is `pass1`. The user needs the Storage Administrator (Provisioning) role.

Parameter	Value	Description
POOL_ID	`8`	ID of the created HDP pool which will be used to create the HDP volume
BYTE_CAPACITY	`1T`	Capacity of the HDP volume to be created
PORT_ID	`CL1-A`	The name of the Fibre Channel port that is used for I/O with the host
HOST_GRP_NAME	`WindowsHost`	The host group name to be created in order to associate the host and the port
HOST_MODE	`WIN`	The host mode to be specified for the host group
HOST_WWN	`aaaabbbbcccc0123`	The WWN of the host
FIRST_WAIT_TIME	`1`	The first interval (seconds) for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	`6`	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

   Before starting the volume allocation processing, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
provisioning

This program requires API version 1.3.x or newer.
"""

import requests
import json
import sys
import http.client
import time
import traceback
import rest_server_param
import storage_param
```

```
from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# ##################Initialize parameters################## #
# Change the following parameters to fit your environment

# A POOL ID for creating a volume
POOL_ID = 8

# The DP volume capacity to create
BYTE_CAPACITY = "1T"

# A port name to add a LUN path
PORT_ID = "CL1-A"

# A host group name to create
# You can assign any host group name
HOST_GRP_NAME = "WindowsHost"

# A Host mode for the created host group
# Please refer to the manual and set an appropriate mode
HOST_MODE = "WIN"

# A World Wide Name of the host (HBA) to allocate the volume
HOST_WWN = "aaaabbbbcccc0123"


# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 6

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
```

```
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 3

session_id = 0

############################################################
```

3. Define the function for issuing an HTTP request and for verifying the status of asynchronous processing (the invoke_async_command function).

Define the function that issues an HTTP request and verifies the status of asynchronous processing. Call and use this function from the main volume allocation operation. For details on this function, see the section explaining the functions used in the sample coding.

Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies `verify=False` in the request message to skip verification of the server certificate.

```
"""
Check whether the asynchronous command was finished.
@param job_id the job ID to identify
       the asynchronous command
@return r the response data
"""


def check_update(job_id):
    url = block_storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r
```

```
"""
Execute the HTTP request (POST or PUT)
@param method_type HTTP request method (POST or PUT)
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(method_type, url, body):
    if method_type == "put":
        r = requests.put(url, headers=headers,
                         data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
```

```
    status = "Initializing"
```

```
    job_result = None
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != "Completed":
        if retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(r.json()["jobId"])
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
```

```
    print("Async job was succeeded. affected resource : " +
          job_result.json()["affectedResources"][0])
    return job_result.json()["affectedResources"][0]
```

4. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit("This program requires API Version " +
                 str(required_major_version) + "." +
                 str(required_minor_version) +
                 "." + "x or newer.\n")

try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    check_api_version(
        r.json()["apiVersion"],
```

```
    REQUIRED_MAJOR_VERSION,
    REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate sessions by using the REST API server.

```
# step2 Generate a session #
print("Generate a session")
url = block_storage_api.generate_session()
r = requests.post(url, headers=headers, auth=USER_CREDENTIAL,
                  verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
token = r.json()["token"]
auth = "Session " + token
session_id = r.json()["sessionId"]
```

When a session is generated, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Create an HDP volume.

First, collect an LDEV number to be used by the HDP volume that you are creating. Because you must specify an unused LDEV number when creating an HDP volume, generate a URL by searching with the condition "Undefined LDEVs", and then get information about the LDEVs that meet the condition. The block_storage_api function is used to generate the URL.

```
# step3 Search for an unused LDEV ID #
print("Search for an unused LDEV ID")

url = block_storage_api.views_undefined_ldev()
headers["Authorization"] = auth
r = requests.get(url, headers=headers, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
```

Obtain an undefined LDEV number from the returned LDEV information.

```
# Get an unused LDEV ID (smallest value)
if len(r.json()["data"]) is 0:
    raise Exception("Free LDEV ID does not exist")
undefined_ldev = r.json()["data"][0]["ldev"]
ldev_id = undefined_ldev["ldevId"]

print("Free LDEV ID:", ldev_id)
```

Next, specify the undefined LDEV number that you obtained, the pool ID, and the volume capacity, and then create the HDP volume.

```
# step4 Add an LDEV #
print("Add an LDEV")
url = block_storage_api.ldevs()
body = {
    "ldevId": ldev_id,
    "poolId": POOL_ID,
    "byteFormatCapacity": BYTE_CAPACITY
}
invoke_async_command("post", url, body)
```

The invoke_async_command function issues the request to create the HDP volume, checks the execution status of the jobs that were run asynchronously, and then returns the URL of the created HDP volume as the execution result.

7. Create a host group.

To allocate the created HDP volume to the host, create a host group. The sample coding only specifies the port number to be used by the host group and the host group name. Specification of the host group number is omitted. In this case, a host group number is automatically assigned.

```
# step5 Add a host group #
print("Add a host group")
url = block_storage_api.host_groups()
body = {
    "portId": PORT_ID,
    "hostGroupName": HOST_GRP_NAME
}
affected_resource_path = invoke_async_command("post",
                                              url, body)
```

Get the URL of the created host group and the assigned host group number.

```
url = block_storage_api.affected_resource(
    affected_resource_path)

r = requests.get(url, headers=headers, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)

host_group_number = r.json()["hostGroupNumber"]
```

8. Change the host mode.

Change the host mode of the created host group according to the platform of the host to which the volume will be allocated. To issue a request to change the host mode, use the URL of the host group that was obtained in the step when the host group was created.

```
# step6 Modify the host group #
print("Modify the host group")
body = {
    "hostMode": HOST_MODE
}
invoke_async_command("put", url, body)
```

9. Register the WWN of the host.

Register the host to which the HDP volume will be allocated in the host group that you created. Specify the WWN of the HBA of the host to be registered, the port number of the host group, and the assigned host group number. Use the host group number that was obtained when the host group was created.

```
# step7 Add an HBA WWN #
print("Add an HBA WWN")
url = block_storage_api.host_wwns()
body = {
    "hostWwn": HOST_WWN,
    "portId": PORT_ID,
    "hostGroupNumber": host_group_number
}
invoke_async_command("post", url, body)
```

10. Set an LU path.

Set the LU path by associating the created volume with the host group. The sample coding specifies the LDEV number of the created HDP volume, the port number to be used by the host group, and the host group number. Specification of the LUN is omitted. In this case, a LUN is automatically assigned.

```
# step8 Add a LUN path #
print("Add a LUN path")
url = block_storage_api.luns()
body = {
    "ldevId": ldev_id,
    "portId": PORT_ID,
    "hostGroupNumber": host_group_number
}
invoke_async_command("post", url, body)
```

The LU path is set, and the HDP volume is now accessible from the host.

11. Get HDP volume information.

To check whether the operations up to this step have been correctly applied to the resource, specify the LDEV number that was obtained when the HDP volume was created, and then obtain HDP volume information. From the collected information, the sample coding outputs the LDEV number, the ID of the pool from which the volume was created, the capacity of the HDP volume, and the assigned port.

```
    # step9 Print the LDEV #
    print("Print the LDEV")
    url = block_storage_api.ldev(ldev_id)
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    print("LDEV ID : " + str(r.json()["ldevId"]))
    print("POOL ID : " + str(r.json()["poolId"]))
    print("CAPACITY : " +
          str(r.json()["byteFormatCapacity"]))
    print("PORT : " + str(r.json()["ports"]))
    print()
```

12. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

13. Discard the session.

After a set of operations is completed, discard the session. Specify the session ID that was obtained when the session was generated. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # ----step10 Discard the session----#
    print("Discard the session")
    url = block_storage_api.discard_session(session_id)
    r = requests.delete(url, headers=headers, verify=False)
    try:
        if r.status_code != http.client.OK:
            raise requests.HTTPError(r)
    except requests.HTTPError as he:
        sys.stderr.write("HTTP Error! status code : ")
        sys.stderr.write(str(he.args[0].status_code) + "\n")
        sys.stderr.write(he.args[0].text + "\n")

    print("Operation was completed.")
    sys.exit()
```

Sample coding for ShadowImage pair operations

This section explains the sample coding for the ShadowImage pair operations.

Sample coding operation flow for ShadowImage pair operations

The following table shows the sample coding operation flow for ShadowImage pair operations and the corresponding code constructs.

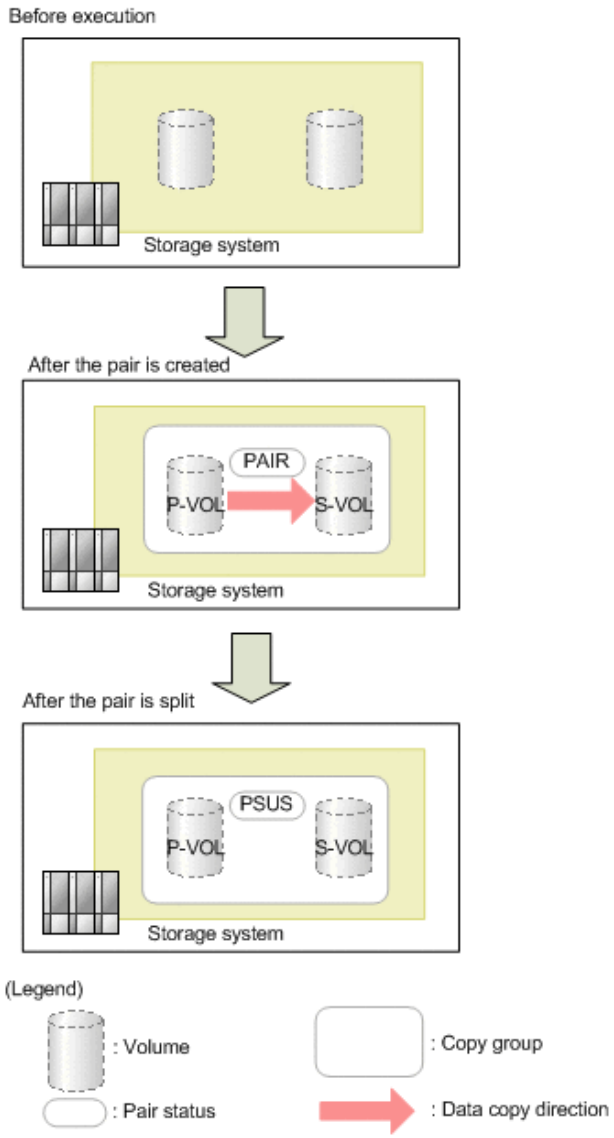
Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers) Specifying request headers (for the custom HTTP headers)
3	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format

Step	Sample coding operation flow	Code constructs
		Getting the job execution results Getting the URLs of the resources to which the operation results have been applied Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password) Creating objects by performing a POST operation
6	Create a ShadowImage pair.	Getting the URLs of the resources (when object IDs are not specified) Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Generating a request body in JSON format Creating objects by performing a POST operation
7	Split a ShadowImage pair.	Getting the action template by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Running actions that use the action template by using a PUT operation
8	Get information about a ShadowImage pair.	Getting an object by performing a GET operation (when getting a specific object) Setting user authentication information (for authentication by using session-based authentication) Outputting the obtained information
9	Output error messages.	Outputting error messages
10	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified)

Step	Sample coding operation flow	Code constructs
		Deleting objects by performing a DELETE operation

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1", "pass1")`	This is the authentication information to be used for authentication in the storage system. The coding sample shows a setting example when the user ID is `user1`, and the password is `pass1`. The user needs the Storage Administrator (Provisioning) role and the Storage Administrator (Local Copy) role.
COPY_GROUP_NAME	`SI_347`	The copy group name to be used for creating a ShadowImage pair. In the sample coding, a new copy group is created when creating a pair.
COPY_PAIR_NAME	`p_347-348`	The copy pair name of the ShadowImage pair to be created
PVOL_LDEV_ID	`347`	The LDEV number of the already created volume to be used as the primary volume
SVOL_LDEV_ID	`348`	The LDEV number of the already created volume to be used as the secondary volume
FIRST_WAIT_TIME	`1`	The first interval for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	`10`	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

Before performing operations for the ShadowImage pair, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
local_copy

This program requires API version 1.2.x or newer.
"""

import traceback
import requests
import json
import sys
import http.client
import time
import rest_server_param
import storage_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################## #
# Change the following parameters to fit your environment

# A copy group name
COPY_GROUP_NAME = "SI_347"

# A copy pair name
COPY_PAIR_NAME = "p_347-348"

# A primary volume ID
# Specify already created and allocated volume ID by decimal
PVOL_LDEV_ID = 347

# A secondary volume ID which has the exactly same size
# as the primary volume
# Specify already created and allocated volume ID by decimal
SVOL_LDEV_ID = 348


# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 10

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format. In addition, for asynchronous processing, the sample coding specifies the settings of the Response-Job-Status header so that responses are returned after waiting for the completion of the jobs.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json",
           "Response-Job-Status": "Completed"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 2

session_id = 0

############################################################
```

3. Define the function for issuing an HTTP request and for verifying the status of asynchronous processing (the invoke_async_command function).

Define the function that issues an HTTP request and verifies the status of asynchronous processing. Call and use this function from the main ShadowImage pair operation. For details on this function, see the section explaining the of functions used in the sample coding.

Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies `verify=False` in the request message to skip verification of the server certificate.

```
"""
Check whether the asynchronous command was finished.
@param job_id The job ID to identify
             the asynchronous command
@return r.json() The JSON data that contains response data

"""


def check_update(job_id):
    url = block_storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r


"""
Execute the HTTP request (POST or PUT)
@param method_type HTTP request method (POST or PUT)
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(method_type, url, body):
    if method_type == "put":
        r = requests.put(url, headers=headers,
                         data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
    status = "Initializing"
```

```
    job_result = None
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != "Completed":
        if retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(r.json()["jobId"])
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
    print("Async job was succeeded. affected resource : " +
          job_result.json()["affectedResources"][0])
    return job_result.json()["affectedResources"][0]
```

4. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit(
            "This program requires API Version " +
            str(required_major_version) +
            "." +
            str(required_minor_version) +
            "." +
            "x or newer.\n")

try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
```

```
    raise requests.HTTPError(r)
check_api_version(
    r.json()["apiVersion"],
    REQUIRED_MAJOR_VERSION,
    REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate sessions by using the REST API server.

```
# step2 Generate a session #
print("Generate a session")
url = block_storage_api.generate_session()
r = requests.post(url, headers=headers,
                  auth=USER_CREDENTIAL, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
token = r.json()["token"]
auth = "Session " + token
session_id = r.json()["sessionId"]
```

When a session is generated, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Create a ShadowImage pair.

Use the already created volumes to create a ShadowImage pair. Also create a new copy group. Specify the copy group name, copy pair name, and the LDEV number of the volume to be used that are defined in advance in the parameters. In addition, specify the copy pair type, MU number, and whether to create a copy group, and then issue a request to create a ShadowImage pair. The block_storage_api function is used to generate the URL.

```
# step3 Create a local copy pair #
print("Create a local copy pair")
url = block_storage_api.local_copy_pairs()
body = {
    "copyGroupName": COPY_GROUP_NAME,
    "copyPairName": COPY_PAIR_NAME,
    "replicationType": "SI",
    "pvolLdevId": PVOL_LDEV_ID,
    "pvolMuNumber": 0,
    "svolLdevId": SVOL_LDEV_ID,
    "isNewGroupCreation": True,
}
headers["Authorization"] = auth
affected_resource = invoke_async_command("post",
                                         url, body)
pair_url = block_storage_api.affected_resource(
    affected_resource)
```

The invoke_async_command function issues the request to create a ShadowImage pair under the specified conditions, checks the execution status of the jobs that were run asynchronously, and then returns the URL of the created pair as the execution result.

7. Split the ShadowImage pair.

In the sample coding, a ShadowImage pair is split by using the action template. First, get the action template for splitting a ShadowImage pair by using the URL of the pair that was obtained when the ShadowImage pair was created.

```
# step4 Split the local copy pair #
print("Split the local copy pair")
url = block_storage_api.split_local_copy_pair_template(
    pair_url)
r = requests.get(url, headers=headers, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
print("Action template(split):")
print(r.text)
```

Set values in the obtained template, and then issue a request to split the created ShadowImage pair.

```
body = r.json()
body["parameters"]["copyPace"] = 3
split_url = block_storage_api.split_local_copy_pair(
    pair_url)
invoke_async_command("put", split_url, body)
```

8. Get information about the ShadowImage pair.

Get information about the pair by using the URL of the pair that was obtained when the ShadowImage pair was created. In the sample coding, the following items are output: the copy group name, copy pair name, LDEV number and pair volume status for the P-VOL, and the LDEV number and pair volume status for the S-VOL.

```
# step5 Print the pair status #
print("Print the pair status")
r = requests.get(pair_url,
                 headers=headers, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)

print("COPY GROUP NAME : " + r.json()["copyGroupName"])
print("COPY PAIR NAME : " + r.json()["copyPairName"])
print("P-VOL LDEV ID : " + str(r.json()["pvolLdevId"]))
print("S-VOL LDEV ID : " + str(r.json()["svolLdevId"]))
print("P-VOL STATUS : " + r.json()["pvolStatus"])
print("S-VOL STATUS : " + r.json()["svolStatus"])
print("LOCAL CLONE COPY PAIR ID : " +
      r.json()["localCloneCopypairId"])
print()
```

9. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

10. Discard the session.

After a set of operations is completed, discard the session. Specify the session ID that was obtained when the session was generated. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # step6 Discard the session #
    print("Discard the session")
    url = block_storage_api.discard_session(session_id)
    r = requests.delete(url, headers=headers, verify=False)
    try:
        if r.status_code != http.client.OK:
            raise requests.HTTPError(r)
    except requests.HTTPError as he:
        sys.stderr.write("HTTP Error! status code : ")
        sys.stderr.write(str(he.args[0].status_code) + "\n")
        sys.stderr.write(he.args[0].text + "\n")

    print("Operation was completed.")
    sys.exit()
```

Sample coding for registering remote storage system information

This section explains the sample coding for registering remote storage system information.

Sample coding operation flow for registering remote storage system information

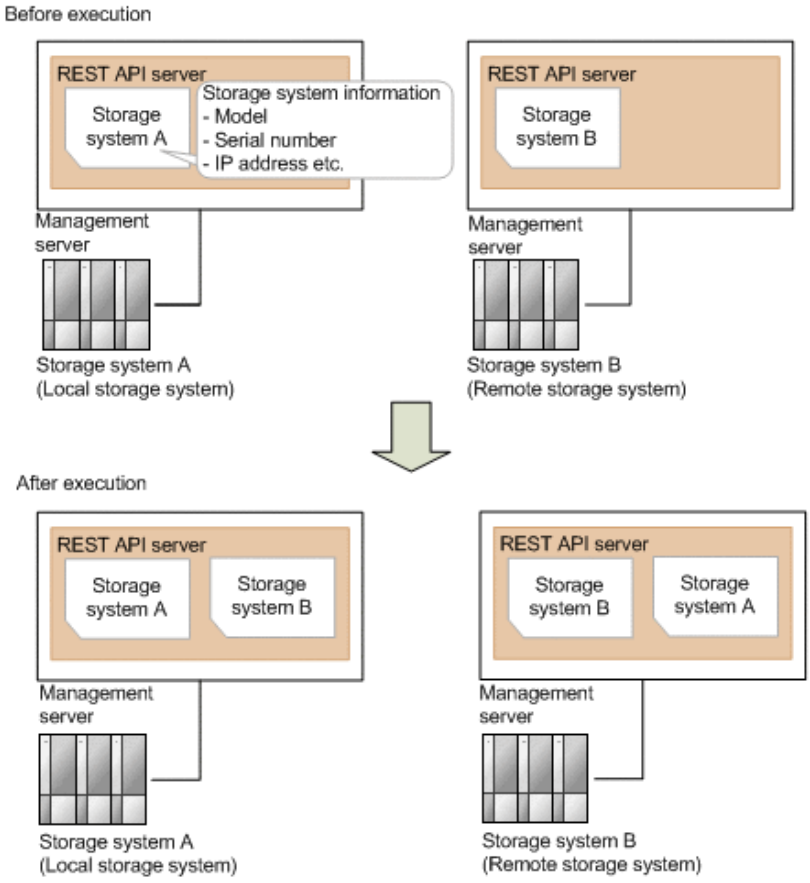
The following table shows the sample coding operation flow for registering remote storage system information and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Getting the job execution results Getting the URLs of the resources to which the operation results have been applied Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password) Creating objects by performing a POST operation
6	Register information about storage systems.	Getting the URLs of the resources (when object IDs are not specified) Generating a request body in JSON format Operations that require sessions to be generated on multiple devices (remote copy operation) Creating objects by performing a POST operation
7	Get information about storage systems.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Setting user authentication information (for authentication by using session-based authentication)

Step	Sample coding operation flow	Code constructs
		Getting an object by performing a GET operation (when getting a specific object) Outputting the obtained information
8	Output error messages.	Outputting error messages
9	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Deleting objects by performing a DELETE operation

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
LOCAL_USER_CREDENTIAL	`("local_user", "local_pass")`	This is the authentication information to be used for authentication in the local storage system. The coding sample shows a setting example when the user ID is `local_user`, and the password is `local_pass`. The user needs the Storage Administrator (Initial Configuration) role.
REMOTE_USER_CREDENTIAL	`("remote_user", "remote_pass")`	This is the authentication information to be used for authentication in the remote storage system. The coding sample shows a setting example when the user ID is `remote_user`, and the password is `remote_pass`. The user needs the Storage Administrator (Initial Configuration) role.
FIRST_WAIT_TIME	`1`	The first interval for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	`10`	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

The following table shows the parameters and values defined in the remote_copy_param.py file, which can be used in coding samples as common variables for the information about the local and the remote storage systems. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
LOCAL_REST_SERVER_IP_ADDR	`192.0.2.100`	The IP address of the REST API server of the local storage system
LOCAL_PORT	`23451`	The SSL communication port for the REST API server of the local storage system
LOCAL_STORAGE_MODEL	`VSP G800`	The model name of the local storage system
LOCAL_SERIAL_NUMBER	`410000`	The serial number of the local storage system
REMOTE_REST_SERVER_IP_ADDR	`192.0.2.200`	The IP address of the REST API server of the remote storage system
REMOTE_PORT	`23451`	The SSL communication port for the REST API server of the remote storage system

Parameter	Value	Description
REMOTE_STORAGE_MODEL	`VSP G200`	The model name of the remote storage system
REMOTE_SERIAL_NUMBER	`420000`	The serial number of the remote storage system

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

   Before starting the registration processing of remote storage system information, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
register_remote_storage

This program requires API version 1.3.x or newer.
"""

import traceback
import requests
import json
import sys
import http.client
import time
import remote_copy_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################# #
# Change the following parameters to fit your environment

# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 10

# An user id and password of the local storage
LOCAL_USER_CREDENTIAL = ("local_user", "local_pass")

# An user id and password of the remote storage
REMOTE_USER_CREDENTIAL = ("remote_user", "remote_pass")

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format.

```
# ###You don't have to change the following parameters### #
local_storage_api = BlockStorageAPI(
    remote_copy_param.LOCAL_REST_SERVER_IP_ADDR,
    remote_copy_param.LOCAL_PORT,
    remote_copy_param.LOCAL_STORAGE_MODEL,
    remote_copy_param.LOCAL_SERIAL_NUMBER)

remote_storage_api = BlockStorageAPI(
    remote_copy_param.REMOTE_REST_SERVER_IP_ADDR,
    remote_copy_param.REMOTE_PORT,
    remote_copy_param.REMOTE_STORAGE_MODEL,
    remote_copy_param.REMOTE_SERIAL_NUMBER)

local_headers = {"content-type": "application/json",
                 "accept": "application/json",
                 "Response-Job-Status": "Completed"}

remote_headers = {"content-type": "application/json",
                  "accept": "application/json",
                  "Response-Job-Status": "Completed"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 3

local_session_id = 0
remote_session_id = 0

############################################################
```

3. Define the function for issuing an HTTP request and for verifying the status of asynchronous processing (the invoke_async_command function).

   Define the function that issues an HTTP request and verifies the status of asynchronous processing. Call and use this function from the main registration operation of the remote storage system information. For details on this function, see the section explaining the functions used in the sample coding.

   Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies `verify=False` in the request message to skip verification of the server certificate.

```
"""
Check whether the asynchronous command was finished.

@param storage_api storage_api
@param job_id the job ID to identify
```

```
the asynchronous command
@param headers the array of the http headers
@return r the response data
"""


def check_update(storage_api, job_id, headers):
    url = storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r

"""
Execute the HTTP request (POST or PUT)

@param storage_api storage_api
@param method_type HTTP request method (POST or PUT)
@param headers the array of the http headers
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(storage_api, method_type, headers,
                         url, body):
    if method_type == "put":
        r = requests.put(url, headers=headers,
                         data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
    status = "Initializing"
    job_result = None
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != "Completed":
        if retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(storage_api,
                                  r.json()["jobId"], headers)
        status = job_result.json()["status"]
```

```
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
    print("Async job was succeeded. affected resource : " +
          job_result.json()["affectedResources"][0])
    return job_result.json()["affectedResources"][0]
```

4. Check the version of the REST API.

Get information about the version of the REST API for both the local and the remote storage systems by using the REST API server of each system to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api version api_version of this REST Server
@param required_major_version the lowest number of
the major version that this program requires
@param required_minor_version the lowest number of
the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit("This program requires API Version " +
                 str(required_major_version) + "." +
                 str(required_minor_version) +
                 "." + "x or newer.\n")

try:
    # step1 Check the API version of the local REST API #
    print("Check the API version of the local REST API")
    url = local_storage_api.api_version()
    r = requests.get(url, headers=local_headers,
                     verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    check_api_version(r.json()["apiVersion"],
                      REQUIRED_MAJOR_VERSION,
                      REQUIRED_MINOR_VERSION)
```

```
# step1 Check the API version of the remote REST API #
print("Check the API version of the remote REST API")
url = remote_storage_api.api_version()
r = requests.get(url, headers=remote_headers,
                 verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
check_api_version(r.json()["apiVersion"],
                  REQUIRED_MAJOR_VERSION,
                  REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate a session in both the local and the remote storage systems by using the REST API server of each system.

```
# step2 Generate a local session #
print("Generate a local session")
url = local_storage_api.generate_session()
r = requests.post(
    url,
    headers=local_headers,
    auth=LOCAL_USER_CREDENTIAL,
    verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
local_token = r.json()["token"]
local_auth = "Session " + local_token
local_session_id = r.json()["sessionId"]

# step2 Generate a remote session #
print("Generate a remote session")
url = remote_storage_api.generate_session()
r = requests.post(url, headers=remote_headers,
                  auth=REMOTE_USER_CREDENTIAL,
                  verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
remote_token = r.json()["token"]
remote_auth = "Session " + remote_token
remote_session_id = r.json()["sessionId"]
remote_headers["Authorization"] = remote_auth
```

When a session is generated, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Register information about the remote storage system

Register information about the remote storage system on the REST API server of the local storage system. For the request body, specify information about the remote storage system.

```
# step3 Register a remote storage device #
print("Register a remote storage device")
url = local_storage_api.remote_storage()
body = {
    "storageDeviceId": remote_storage_api.
    get_storage_id(),
    "restServerIp": remote_copy_param.REMOTE_REST_SERVER_IP_ADDR,
    "restServerPort": remote_copy_param.REMOTE_PORT
}
local_headers["Authorization"] = local_auth
local_headers["Remote-Authorization"] = remote_auth
affected_resource_path = invoke_async_command(
    local_storage_api, "post",
    local_headers, url, body)
```

The invoke_async_command function issues a request for registering information about the remote storage system, verifies the execution status of the jobs that were run asynchronously, and then returns the URL of the registered storage system as the execution result.

7. Get information about the registered remote storage system.

To confirm that information about the remote storage system is correctly registered, get the registered storage information by using the REST API server of the local storage system.

```
# step4 Print the remote storage device #
print("Print the remote storage device")
url = local_storage_api.affected_resource(
    affected_resource_path)
r = requests.get(url, headers=local_headers,
                 verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
print("STORAGE DEVICE ID : " +
      str(r.json()["storageDeviceId"]))
print("DKC TYPE : " + str(r.json()["dkcType"]))
print("REST SERVER IP : " + str(r.json()["restServerIp"]))
print("REST SERVER PORT : " + str(r.json()["restServerPort"]))
print("MODEL : " + str(r.json()["model"]))
print("SERIAL NUMBER : " +
      str(r.json()["serialNumber"]))
```

In the sample coding, the following items are obtained and output: storage device ID, storage system type, IP address of the REST API server for the remote storage system, port number of the REST API server for the remote storage system, model name, and serial number.

8. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

9. Discard the session.

After a set of operations is completed, discard the session by using the REST API server of both the local and the remote storage systems. Specify the session ID that was obtained when the session was created. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # step5 Discard the local session #
    print("Discard the local session")
    url = local_storage_api.discard_session(
        local_session_id)
    r = requests.delete(url, headers=local_headers,
                        verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    # step5 Discard the remote session #
    print("Discard the remote session")
    url = remote_storage_api.discard_session(
        remote_session_id)
    r = requests.delete(url, headers=remote_headers,
                        verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    print("Operation was completed.")
    sys.exit()
```

Sample coding for TrueCopy pair operations

This section explains the sample coding for the TrueCopy pair operations.

Sample coding operation flow for TrueCopy pair operations

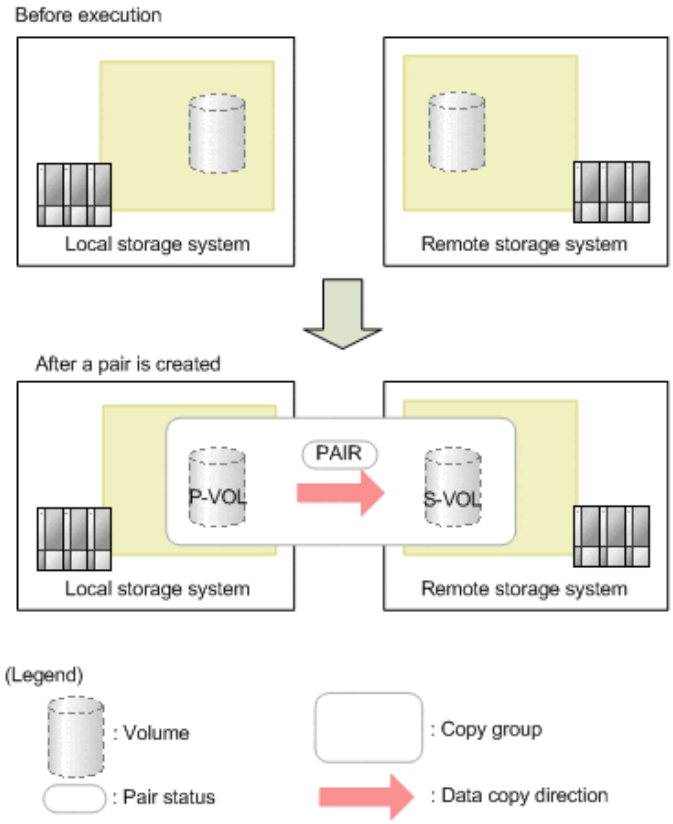
The following table shows the sample coding operation flow for TrueCopy pair operations and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Define the function for getting status changes for asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Getting the job execution results Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password) Creating objects by performing a POST operation
6	Lock resources.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using session-based authentication) Running actions for services by performing a PUT operation
7	Create a TrueCopy pair.	Getting the URLs of the resources (when object IDs are not specified)

Step	Sample coding operation flow	Code constructs
		Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Operations that require sessions to be generated on multiple devices (remote copy operation) Creating objects by performing a POST operation
8	Unlock resources.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using session-based authentication) Running actions for services by performing a PUT operation
9	Confirm that the pair has been created.	-
10	Get information about a TrueCopy pair.	Getting an object by performing a GET operation (when getting a specific object) Setting user authentication information (for authentication by using session-based authentication) Getting the URLs of the resources to which the operation results have been applied Getting error codes
11	Output error messages.	Outputting error messages
12	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Setting user authentication information (for authentication by using session-based authentication) Deleting objects by performing a DELETE operation

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
LOCAL_USER_CREDENTIAL	`("local_copy_user", "local_copy_pass")`	This is the authentication information to be used for authentication in the local storage system. The coding sample shows a setting example when the user ID is `local_copy_user`, and the password is `local_copy_pass`. The user needs the Storage Administrator (Provisioning) role and the Storage Administrator (Remote Copy) role.
REMOTE_USER_CREDENTIAL	`("remote_copy_user", "remote_copy_pass")`	This is the authentication information to be used for authentication in the remote storage system. The coding sample shows a setting example when the user ID is `remote_copy_user`, and the password is `remote_copy_pass`. The user needs the Storage Administrator (Provisioning) role and the Storage Administrator (Remote Copy) role.

Parameter	Value	Description
COPY_GROUP_NAME	"TC_GROUP"	The copy group name for a TrueCopy pair to be created
COPY_PAIR_NAME	"p_347-348"	The copy pair name for a TrueCopy pair to be created
PVOL_LDEV_ID	347	The number of the already created LDEV to be used for the primary volume
SVOL_LDEV_ID	348	The number of the already created LDEV to be used for the secondary volume
FIRST_WAIT_TIME	1	The first interval for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	10	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

The following table shows the parameters and values defined in the remote_copy_param.py file, which can be used in coding samples as common variables for the information about the local and the remote storage systems. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
LOCAL_REST_SERVER_IP_ADDR	192.0.2.100	The IP address of the REST API server of the local storage system
LOCAL_PORT	23451	The SSL communication port for the REST API server of the local storage system
LOCAL_STORAGE_MODEL	VSP G800	The model name of the local storage system
LOCAL_SERIAL_NUMBER	410000	The serial number of the local storage system
REMOTE_REST_SERVER_IP_ADDR	192.0.2.200	The IP address of the REST API server of the remote storage system
REMOTE_PORT	23451	The SSL communication port for the REST API server of the remote storage system
REMOTE_STORAGE_MODEL	VSP G200	The model name of the remote storage system

Parameter	Value	Description
REMOTE_SERIAL_NUMBER	420000	The serial number of the remote storage system

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

   Before starting operations for the TrueCopy pair, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
synchronous_remote_copy

This program requires API version 1.3.x or newer.
"""

import traceback
import requests
import json
import sys
import http.client
import time
import remote_copy_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################# #
# Change the following parameters to fit your environment

# A copy group name
COPY_GROUP_NAME = "TC_GROUP"

# A copy pair name
COPY_PAIR_NAME = "p_347-348"

# A primary volume ID
# Specify already created and allocated volume ID by decimal
PVOL_LDEV_ID = 347

# A secondary volume ID which has the exactly same size
# as the primary volume
# Specify already created and allocated volume ID by decimal
SVOL_LDEV_ID = 348

# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 10

# An user id and password of the local storage
LOCAL_USER_CREDENTIAL = ("local_copy_user",
                         "local_copy_pass")

# An user id and password of the remote storage
REMOTE_USER_CREDENTIAL = ("remote_copy_user",
                          "remote_copy_pass")

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format.

```
# ###You don't have to change the following parameters### #
local_storage_api = BlockStorageAPI(
    remote_copy_param.LOCAL_REST_SERVER_IP_ADDR,
    remote_copy_param.LOCAL_PORT,
    remote_copy_param.LOCAL_STORAGE_MODEL,
    remote_copy_param.LOCAL_SERIAL_NUMBER)

remote_storage_api = BlockStorageAPI(
    remote_copy_param.REMOTE_REST_SERVER_IP_ADDR,
    remote_copy_param.REMOTE_PORT,
    remote_copy_param.REMOTE_STORAGE_MODEL,
    remote_copy_param.REMOTE_SERIAL_NUMBER)

local_headers = {"content-type": "application/json",
                 "accept": "application/json",
                 "Response-Job-Status": "Completed"}

remote_headers = {"content-type": "application/json",
                  "accept": "application/json",
                  "Response-Job-Status": "Completed"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 3

local_session_id = 0
remote_session_id = 0

############################################################
```

3. Define the function for getting status changes for asynchronous processing. (wait_until_jobstatus_is_changed function)

   Define the function for getting status changes for asynchronous processing. Call and use this function from the main TrueCopy pair operation. For details on this function, see the description of functions used in the sample coding.

Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies `verify=False` in the request message to skip verification of the server certificate.

```
"""
Check whether the asynchronous command was finished.

@param storage_api storage_api
@param job_id the job ID to identify
      the asynchronous command
@param headers the array of the http headers
@return r the response data
"""


def check_update(storage_api, job_id, headers):
    url = storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r
```

```
"""
Wait until the job status is changed

@param storage_api storage_api
@param headers the array of the http headers
@param job_id the job ID to identify
       the asynchronous command
@param changed_status job status after waiting
@param is_retry_count_enabled if true, wait
       until MAX_RETRY_COUNT. if false, wait forever
       until job status is changed.
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def wait_until_jobstatus_is_changed(
        storage_api,
        headers,
        job_id,
        changed_status,
        is_retry_count_enabled):
    status = "Initializing"
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != changed_status:
        if status == "Completed":
            print("Status was already changed" +
```

```
                "to Completed.")
            break
        if is_retry_count_enabled and \
                retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(storage_api,
                                  job_id, headers)
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
    print("Async job was succeeded. affected resource : " +
          job_result.json()["affectedResources"][0])
    return job_result.json()["affectedResources"][0]
```

4. Check the version of the REST API.

   Get information about the version of the REST API for both the local and the remote storage systems by using the REST API server of each system to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit(
            "This program requires API Version " +
            str(required_major_version) +
            "." +
            str(required_minor_version) +
            "." +
            "x or newer.\n")

try:
    # step1 Check the API version of the local REST API #
    print("Check the API version of the local REST API")
    url = local_storage_api.api_version()
    r = requests.get(url, headers=local_headers,
                     verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
```

```
check_api_version(r.json()["apiVersion"],
                  REQUIRED_MAJOR_VERSION,
                  REQUIRED_MINOR_VERSION)

# step1 Check the API version of the remote REST API #
print("Check the API version of the remote REST API")
url = remote_storage_api.api_version()
r = requests.get(url, headers=remote_headers,
                 verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
check_api_version(r.json()["apiVersion"],
                  REQUIRED_MAJOR_VERSION,
                  REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate a session in both the local and the remote storage systems by using the REST API server of each system.

```
# step2 Generate a local session #
print("Generate a local session")
url = local_storage_api.generate_session()
r = requests.post(
    url,
    headers=local_headers,
    auth=LOCAL_USER_CREDENTIAL,
    verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
local_token = r.json()["token"]
local_auth = "Session " + local_token
local_session_id = r.json()["sessionId"]

# step2 Generate a remote session #
print("Generate a remote session")
url = remote_storage_api.generate_session()
r = requests.post(
    url,
    headers=remote_headers,
    auth=REMOTE_USER_CREDENTIAL,
    verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
remote_token = r.json()["token"]
remote_auth = "Session " + remote_token
remote_session_id = r.json()["sessionId"]
```

When a session is generated, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Lock resources.

Obtain a lock to prevent other users from performing operations on the target volume. For the local storage system, lock the resource group to which the LDEV for the primary volume belongs. For the remote storage system, lock the resource group to which the LDEV for the secondary volume belongs.

```
try:
      # step3 Lock the local resource group #
      print("Lock the local resource group")
      url = local_storage_api.lock()
      local_headers["Authorization"] = local_auth
      r = requests.put(url, headers=local_headers,
                       verify=False)
      if r.status_code != http.client.ACCEPTED:
          raise requests.HTTPError(r)
      print("Request was accepted. JOB URL : " +
            r.json()["self"])
      wait_until_jobstatus_is_changed(
          local_storage_api,
          local_headers,
          r.json()["jobId"],
          "Completed",
          True)

      # step3 Lock the remote resource group #
      print("Lock the remote resource group")
      remote_headers["Authorization"] = remote_auth
      url = remote_storage_api.lock()
      r = requests.put(url, headers=remote_headers,
                       verify=False)
      if r.status_code != http.client.ACCEPTED:
          raise requests.HTTPError(r)
      print("Request was accepted. JOB URL : " +
            r.json()["self"])
      wait_until_jobstatus_is_changed(
          remote_storage_api,
          remote_headers,
          r.json()["jobId"],
          "Completed",
          True)
```

The wait_until_jobstatus_is_changed function checks the execution status of the jobs that were run asynchronously, and waits until the job status changes to the specified status. In the sample coding, the job execution status is confirmed to have changed to "Completed" and to have been locked.

7. Create a TrueCopy pair.

Use the already created LDEV to create a TrueCopy pair. Also create a new copy group. Specify the copy group name, copy pair name, and the LDEV number of the volume to be used, which are defined in advance in the parameters. In addition, specify items such as the copy pair type, whether to create a copy group, and the fence level, and then issue a request for creating a TrueCopy pair. The block_storage_api function is used to generate the URL.

```
# step4 Create a remote copy pair #
  print("Create a remote copy pair")
  url = local_storage_api.remote_copy_pairs()
  body = {
      "copyGroupName": COPY_GROUP_NAME,
      "copyPairName": COPY_PAIR_NAME,
      "replicationType": "TC",
      "remoteStorageDeviceId": remote_storage_api.
      get_storage_id(),
      "pvolLdevId": PVOL_LDEV_ID,
      "svolLdevId": SVOL_LDEV_ID,
      "isNewGroupCreation": "true",
      "fenceLevel": "data",
  }
  local_headers["Remote-Authorization"] = remote_auth
  r = requests.post(
      url,
      headers=local_headers,
      data=json.dumps(body),
      verify=False)
  if r.status_code != http.client.ACCEPTED:
      raise requests.HTTPError(r)
  print("Create remote copy pair request " +
        "was accepted. JOB URL : " + r.json()["self"])
  wait_until_jobstatus_is_changed(
      local_storage_api,
      local_headers,
      r.json()["jobId"],
      "StorageAccepted",
      False)
  jobid = r.json()["jobId"]

  print("Status changed to StorageAccepted")
```

The wait_until_jobstatus_is_changed function checks the execution status of the jobs that were run asynchronously, and waits until the job status changes to the specified status. In the sample coding, it is confirmed that the job execution status has changed to "StorageAccepted" and the request for creating a TrueCopy pair has been received by the storage system.

8. Unlock resources.

After having confirmed that the storage system received processing for creating the pair, cancel the obtained lock. The "finally" statement in the sample coding makes sure that the lock will be canceled even if an error occurs while the API is running.

```
finally:
     # step5 Unlock the local resource group #
     print("Unlock the local resource group")
     url = local_storage_api.unlock()
     r = requests.put(url, headers=local_headers,
                      verify=False)
     if r.status_code != http.client.ACCEPTED:
         raise requests.HTTPError(r)
     print("Request was accepted. JOB URL : " +
           r.json()["self"])
     wait_until_jobstatus_is_changed(
         local_storage_api, local_headers,
         r.json()["jobId"], "Completed", True)

     # step5 Unlock the remote resource group #
     print("Unlock the remote resource group")
     url = remote_storage_api.unlock()
     r = requests.put(url, headers=remote_headers,
                      verify=False)
     if r.status_code != http.client.ACCEPTED:
         raise requests.HTTPError(r)
     print("Request was accepted. JOB URL : " +
           r.json()["self"])
     wait_until_jobstatus_is_changed(
         remote_storage_api,
         remote_headers,
         r.json()["jobId"],
         "Completed",
         True)
```

9. Confirm that the pair has been created.

Confirm that processing for creating the pair is completed in the storage system. Use the wait_until_jobstatus_is_changed function to confirm that the job execution status has changed to "Completed".

```
 # step6 Wait until the operation is complete #
 affected_resource_path = wait_until_jobstatus_is_changed(
     local_storage_api, local_headers,
     jobid, "Completed", False)
```

10. Get information about a TrueCopy pair.

To confirm that the pair has been correctly created, get information about the pair by using the URL of the pair that was obtained when the TrueCopy pair was created. In the sample coding, the following items are output: the copy group name, copy pair name, pair type, LDEV numbers for the P-VOL and S-VOL, pair volume status, and the storage device ID.

```
    # step7 Print the remote copy pair #
    print("Print the remote copy pair")
    url = local_storage_api.affected_resource(
        affected_resource_path)
    r = requests.get(url, headers=local_headers,
                     verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    print("COPY GROUP NAME : " +
          str(r.json()["copyGroupName"]))
    print("COPY PAIR NAME : " +
          str(r.json()["copyPairName"]))
    print("REPLICATION TYPE : " +
          str(r.json()["replicationType"]))
    print("PVOL LDEV ID : " + str(r.json()["pvolLdevId"]))
    print("SVOL LDEV ID : " + str(r.json()["svolLdevId"]))
    print("PVOL STATUS : " + str(r.json()["pvolStatus"]))
    print("SVOL STATUS : " + str(r.json()["svolStatus"]))
    print("PVOL STORAGE DEVICE ID : "
          + str(r.json()["pvolStorageDeviceId"]))
    print("SVOL STORAGE DEVICE ID : "
          + str(r.json()["svolStorageDeviceId"]))
    print("REMOTE MIRROR COPY PAIR ID : "
          + str(r.json()["remoteMirrorCopyPairId"]))
    print()
```

11. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

12. Discard the session.

After a set of operations is completed, discard the session by using the REST API server of both the local and the remote storage systems. Specify the session ID that was obtained when the session was created. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # step8 Discard the local session #
    print("Discard the local session")
    url = local_storage_api. \
        discard_session(local_session_id)
    r = requests.delete(url, headers=local_headers,
                        verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    # step8 Discard the remote session #
    print("Discard the remote session")
    url = remote_storage_api.discard_session(
        remote_session_id)
    r = requests.delete(url,
                        headers=remote_headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    print("Operation was completed.")
    sys.exit()
```

Sample coding for uploading files (specifying the transfer destinations of audit log files)

This section provides sample code for specifying the transfer destinations of the audit log files of storage systems. This sample coding includes the procedure for uploading the client certificates to a storage system. The supported storage systems for the provided sample code are VSP One B20, VSP 5000 series, VSP E series, VSP Gx00 models, VSP Fx00 models.

Operation flow of the sample code for specifying the transfer destinations of the audit log files of storage systems

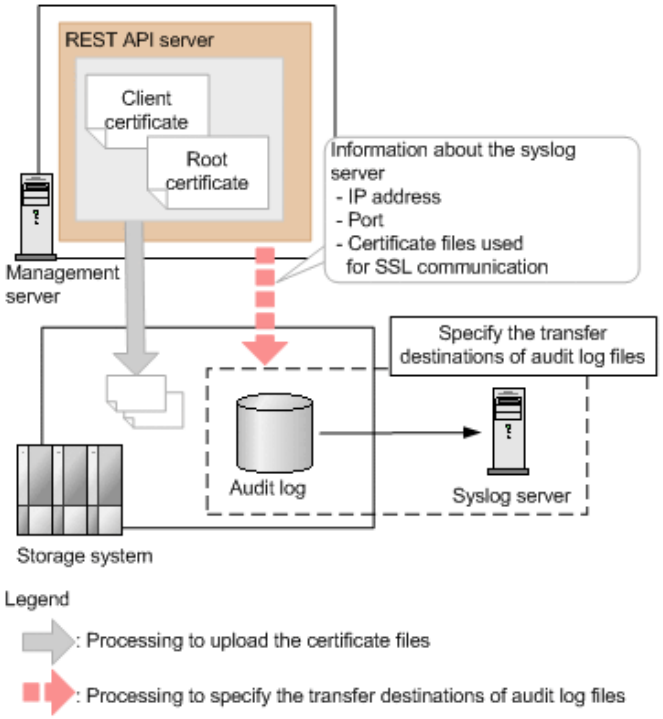
The following is the operation flow of the sample code for specifying the transfer destinations of the audit log files of storage systems and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Getting the job execution results Getting the URLs of the resources to which the operation results have been applied Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password) Creating objects by performing a POST operation
6	Upload the root certificate of the syslog server to which audit log files are to be transferred.	Getting the URLs of the resources (when object IDs are not specified) Creating form data Running actions for objects by using the POST operation
7	Upload the client certificate of the syslog server to which audit log files are to be transferred.	Getting the URLs of the resources (when object IDs are not specified) Creating form data Running actions for objects by using the POST operation

Step	Sample coding operation flow	Code constructs
8	Specify the syslog server to which audit log files are to be transferred.	Getting the URLs of the resources (when fixed object IDs such as those for single instances are specified) Generating a request body in JSON format Changing the attribute of an object by using the PUT operation
9	Send a test message to the syslog server to which audit log files are to be transferred.	Getting the URLs of the resources (when fixed object IDs such as those for single instances are specified) Running actions for objects by using the PUT operation
10	Obtain the configuration information of the transfer destinations of audit log files	Getting the URLs of the resources (when fixed object IDs such as those for single instances are specified) Obtaining an object by using the GET operation (when obtaining a specific object) Outputting obtained information
11	Output error messages.	Outputting error messages
12	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Deleting objects by performing a DELETE operation

Expected system configuration

The sample code assumes the system configuration in the following figure. Note that the transfer destination is a single syslog server.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1", "pass1")`	Authentication information used for authentication by the storage system. In the sample code, the user ID is `user1` and the password is `pass1`. The user must have the Audit Log Administrator (View & Modify) role.
ROOT_CERT_FILE_PATH	`"D:\\cert\\"`	The path where the root certificate file of the syslog server (the file to be uploaded to the storage system) is stored. The sample code specifies for SSL communication to be used between the storage system and the syslog server. Prepare the root certificate of the syslog server in advance.
ROOT_CERT_FILE_NAME	`"root.crt"`	The name of the root certificate file of the syslog server (the file to be uploaded to the storage system).
CLIENT_CERT_FILE_PATH	`"D:\\cert\\"`	The path where the client certificate file of the syslog server (the file to be uploaded to the storage system) is stored.

Parameter	Value	Description
		The sample code specifies for SSL communication to be used between the storage system and the syslog server. Prepare the client certificate of the syslog server in advance.
CLIENT_CERT_FILE_NAME	`"client.pfx"`	The name of the client certificate file of the syslog server (the file to be uploaded to the storage system).
TRANSFER_PROTOCOL	`"TLS"`	The protocol to be used when transferring the audit logs to the syslog server.
LOCATION_NAME	`"STORAGE_SYSTEM_1"`	The name that identifies the storage system from which the audit logs are to be transferred.
RETRY_INTERVAL	`5`	The interval (in seconds) between retries when communication with the syslog server fails.
PRIMARY_SYSLOG_SERVER_IP_ADDR	`"192.0.1.101"`	The IP address of the syslog server.
PRIMARY_SYSLOG_SERVER_PORT	`"12345"`	The port number used by the syslog server.
CLIENT_CERT_FILE_PASSWORD	`"certFilePass"`	The password for the client certificate file.
FIRST_WAIT_TIME	`1`	The first interval (in seconds) for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	`6`	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

Before starting the volume allocation processing, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
auditlog_syslog_server setting

This program requires API version 1.4.x or newer.
"""

import requests
import json
import sys
import http.client
import time
import traceback
import rest_server_param
import storage_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################# #
# Change the following parameters to fit your environment

# A path of root certificate
ROOT_CERT_FILE_PATH = "D:\\cert\\"

# A root certificate name
ROOT_CERT_FILE_NAME = "root.crt"

# A path of client certificate
CLIENT_CERT_FILE_PATH = "D:\\cert\\"

# A client certificate name
CLIENT_CERT_FILE_NAME = "client.pfx"

# A transfer protocol
TRANSFER_PROTOCOL = "TLS"

# A location name
LOCATION_NAME = "STORAGE_SYSTEM_1"

# A retry interval
RETRY_INTERVAL = 5

# A primary syslog server IP address
PRIMARY_SYSLOG_SERVER_IP_ADDR = "192.0.1.101"

# A primary syslog server port number
PRIMARY_SYSLOG_SERVER_PORT = "12345"

# A password of the client certificate
CLIENT_CERT_FILE_PASSWORD = "certFilePass"

# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 6

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

############################################################
```

2. Define headers.

Define the HTTP request header. In addition to the JSON format, which is the standard format for the REST API, define the header information so that the form data format, which used in by the API function for uploading the file, can also be handled.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json"}
file_upload_headers = {"accept": "application/json"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 4

session_id = 0

############################################################
```

3. Define the function for issuing an HTTP request and for verifying the status of asynchronous processing (the invoke_async_command function).

   Define the function that issues an HTTP request and verifies the status of asynchronous processing. Call and use this function from the main volume allocation operation. For details on this function, see the section explaining the functions used in the sample coding.

Tip: To prevent errors that occur when the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding specifies `verify=False` in the request message to skip verification of the server certificate.

```
"""
Check whether the asynchronous command was finished.
@param job_id the job ID to identify
       the asynchronous command
@return r the response data
"""


def check_update(job_id):
    url = block_storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r
```

```
"""
Execute the HTTP request (POST or PUT)
@param method_type HTTP request method (POST or PUT)
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(method_type, url, body):
    if method_type == "put":
        if body is None:
            r = requests.put(url, headers=headers, verify=False)
        else:
            r = requests.put(url, headers=headers,
                             data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
```

```
    status = "Initializing"
    job_result = None
```

```
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != "Completed":
        if retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(r.json()["jobId"])
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
```

```
    if "affectedResources" in job_result.json():
        print("Async job was succeeded. affected resource : " +
              job_result.json()["affectedResources"][0])
        return job_result.json()["affectedResources"][0]
    else:
        print("Async job was succeeded.")
        return None
```

4. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

If the following apply, check the version of the microcode of the storage system to make sure that the version is compatible.

- SSL communication is enabled between the REST API server and the storage system.
- The storage system is a VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit("This program requires API Version " +
                 str(required_major_version) + "." +
                 str(required_minor_version) +
                 "." + "x or newer.\n")

try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    check_api_version(
        r.json()["apiVersion"],
```

```
    REQUIRED_MAJOR_VERSION,
    REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate sessions by using the REST API server.

```
# step2 Generate a session #
print("Generate a session")
url = block_storage_api.generate_session()
r = requests.post(url, headers=headers, auth=USER_CREDENTIAL,
                  verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
token = r.json()["token"]
auth = "Session " + token
session_id = r.json()["sessionId"]
headers["Authorization"] = auth
file_upload_headers["Authorization"] = auth
```

When a session is generated, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Upload the root certificate of the syslog server to which the audit log files are to be transferred.

As preparation for transferring the audit log files to the syslog server by using SSL communication, upload the root certificate of the syslog server to the storage system.

```
# step3 Upload a root certificate #
print("Upload a root certificate")
url = block_storage_api.file_upload()
files = {"file": (ROOT_CERT_FILE_NAME,
    open(ROOT_CERT_FILE_PATH + ROOT_CERT_FILE_NAME, "rb"),
    "application/octet-stream")}
r = requests.post(url, headers=file_upload_headers,
    data={"fileType": "AuditSyslogPrimaryRootCertFile"},
                  files=files, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
```

7. Upload the client certificate of the syslog server to which audit log files are to be transferred.

As preparation for transferring the audit log files to the syslog server by using SSL communication, upload the client certificate of the syslog server to the storage system.

```
# step4 Upload a client certificate #
print("Upload a client certificate")
files = {"file": (CLIENT_CERT_FILE_NAME,
    open(CLIENT_CERT_FILE_PATH + CLIENT_CERT_FILE_NAME, "rb"),
    "application/octet-stream")}
r = requests.post(url, headers=file_upload_headers,
    data={"fileType": "AuditSyslogPrimaryClientCertFile"},
    files=files, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
```

8. Specify the syslog server to which audit log files are to be transferred.

Specify the settings for transferring audit log files to the syslog server. Because the sample code specifies for SSL communication to be used for communication with the syslog server, in addition to information about the syslog server to which audit log files are to be transferred, the sample code also specifies information about the certificate for SSL communication.

```
# step5 Modify the syslog server #
print("Modify the syslog server")
url = block_storage_api.auditlog_syslog()
body = {
    "transferProtocol": TRANSFER_PROTOCOL,
    "locationName": LOCATION_NAME,
    "retries": True,
    "retryInterval": RETRY_INTERVAL,
    "primarySyslogServer": {
        "isEnabled": True,
        "ipAddress": PRIMARY_SYSLOG_SERVER_IP_ADDR,
        "port": PRIMARY_SYSLOG_SERVER_PORT,
        "clientCertFileName": CLIENT_CERT_FILE_NAME,
        "clientCertFilePassword": CLIENT_CERT_FILE_PASSWORD,
        "rootCertFileName": ROOT_CERT_FILE_NAME
    },
    "secondarySyslogServer": {
        "isEnabled": False
    }
}
invoke_async_command("put", url, body)
```

The invoke_async_command function issues a request to specify the transfer destination of audit log files and checks the execution status of jobs that are executed asynchronously. The function then returns, as the execution result, the URL of information about the transfer destination of audit log files that is specified for the storage system.

9. Send a test message to the syslog server to which audit log files are to be transferred.

Send a test message to check whether the syslog server that is set as the transfer destination of audit log files can correctly receive audit log data.

```
# step6 Send a test message to the syslog server #
print("Send a test message to the syslog server")
url = block_storage_api.auditlog_syslog_send_test()
invoke_async_command("put", url, None)
```

10. Obtain the configuration information of the transfer destinations of audit log files.

To make sure that the operations in the previous steps (operations to set information on the storage system) have been successful, obtain and output the configuration information of the transfer destinations of audit logs. The sample code obtains and outputs the following information: the protocol to be used, the identifier of the storage system from which audit log files are to be transferred, retry settings and the interval for retries when communication fails, and the IP address and port number of the syslog server.

```
# step7 Get the syslog server #
print("get the syslog server")
url = block_storage_api.auditlog_syslog()
r = requests.get(url, headers=headers, verify=False)
if r.status_code != http.client.OK:
    raise requests.HTTPError(r)
print("TRANSFER PROTOCOL : " + str(r.json()["transferProtocol"]))
print("LOCATION NAME : " + str(r.json()["locationName"]))
print("RETRIES : " + str(r.json()["retries"]))
print("RETRY INTERVAL : " + str(r.json()["retryInterval"]))
print("PRIMARY SYSLOG SERVER")
print("IP ADDRESS : " +
    str(r.json()["primarySyslogServer"]["ipAddress"]))
print("PORT : " + str(r.json()["primarySyslogServer"]["port"]))
```

11. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

12. Discard the session.

After a set of operations is completed, discard the session. Specify the session ID that was obtained when the session was generated. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # step8 Discard the session #
    print("Discard the session")
    url = block_storage_api.discard_session(session_id)
    r = requests.delete(url, headers=headers, verify=False)
    try:
        if r.status_code != http.client.OK:
            raise requests.HTTPError(r)
    except requests.HTTPError as he:
        sys.stderr.write("HTTP Error! status code : ")
        sys.stderr.write(str(he.args[0].status_code) + "\n")
        sys.stderr.write(he.args[0].text + "\n")

    print("Operation was completed.")
    sys.exit()
```

Sample coding for downloading a file (backing up encryption keys)

This section provides the sample coding for backing up encryption keys. This sample coding includes the procedure for downloading an encryption key backup file to a client.

Sample coding operation flow for backing up encryption keys

The following table shows the sample coding operation flow for backing up encryption keys and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
4	Download the encryption key backup file.	Getting the URLs of the resources (when fixed object IDs such as those for single instances are specified)

Step	Sample coding operation flow	Code constructs
		Running actions for objects by using the PUT operation
5	Output error messages.	Outputting error messages

Values to be specified for the parameters in the sample coding

The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1","pass1")`	This information is used for authentication by the storage system. In the sample coding, the user ID is `user1`, and the password is `pass1`. The user must have the Security Administrator (View & Modify) role.
BACKUP_PASSWORD	`backuppassword`	The password for the encryption key backup file
ENCRYPTION_KEY_BACKUP_FILE_PATH	`D:\encryption\\`	The path where the encryption key backup file is stored
ENCRYPTION_KEY_BACKUP_FILE_NAME	`backupfile.ekf`	The name of the encryption key backup file

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

   Before starting the volume allocation processing, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
backup_encryption_keys

This program requires API version 1.12.0 or newer.
"""

import requests
```

```
import json
import sys
import http.client
import traceback
import rest_server_param
import storage_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################# #
# Change the following parameters to fit your environment

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

# A backup password
BACKUP_PASSWORD = "backuppassword"

# A path of encryption key backup file
ENCRYPTION_KEY_BACKUP_FILE_PATH = "D:\encryption\\"

# A encryption key backup file name
ENCRYPTION_KEY_BACKUP_FILE_NAME = "backupfile.ekf"

############################################################
```

2. Define headers.

Define the HTTP request header. In addition to the JSON format, which is the standard format for the REST API, define the header information so that the stream data format, which is used in the API function for file downloading, can also be handled.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json"}

file_download_headers = {"content-type": "application/json",
                         "accept": "application/octet-stream"}

REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 12

############################################################
```

3. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

In the following cases, you will also need to make sure that the microcode version of the storage system is supported:

- If SSL communication is used between the REST API server and the storage system
- If the storage system model is VSP One B20, VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit("This program requires API Version " +
                 str(required_major_version) + "." +
                 str(required_minor_version) +
                 "." + "x or newer.\n")

try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
```

```
    check_api_version(
        r.json()["apiVersion"],
        REQUIRED_MAJOR_VERSION,
        REQUIRED_MINOR_VERSION)
```

4. Download the encryption key backup file.

Download the encryption key backup file to a specified path.

```
    # step2 Get the encryption keys backup #
    print("Get the encryption keys backup")
    url = block_storage_api.encryption_key_file_backup()
    body = {
        "parameters": {
            "password": BACKUP_PASSWORD
        }
    }
    r = requests.post(url, headers=file_download_headers,
                      auth=USER_CREDENTIAL, data=json.dumps(body),
                      verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    with open(ENCRYPTION_KEY_BACKUP_FILE_PATH + ENCRYPTION_KEY_BACKUP_FILE_NAME,
'wb') as saveFile:
        saveFile.write(r.content)
```

5. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
finally:
    print("Operation was completed.")
    sys.exit()
```

Sample coding for re-creating a parity group (data encryption)

This section provides the sample coding for re-creating a parity group (encrypting data).

Note:

This operation is performed as part of the procedure for encrypting existing data without changing the drive configuration. For details on the entire procedure, see the description of the flow of data encryption operations.

Before deleting a parity group, be sure to back up the data in the parity group to a volume in another parity group.

Sample coding operation flow for re-creating a parity group

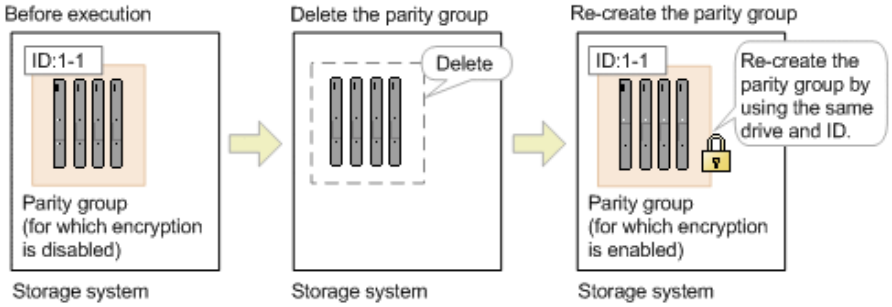
The following table shows the sample coding operation flow for re-creating a parity group and the corresponding code constructs.

Step	Sample coding operation flow	Code constructs
1	Import necessary libraries and set parameters.	-
2	Define headers.	Specifying request headers (for the default HTTP headers)
3	Define functions for issuing an HTTP request and for verifying the status of asynchronous processing.	Getting information about the job status by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Getting the job execution results Getting the URLs of the resources to which the operation results have been applied Getting error codes
4	Check the version of the REST API.	Getting information about the version of the REST API by performing a GET operation
5	Generate a session.	Getting the URLs of the resources (when object IDs are not specified) Setting user authentication information (for authentication by using a user ID and a password)

Step	Sample coding operation flow	Code constructs
		Creating objects by performing a POST operation
6	Get information about the parity group.	Getting objects by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Outputting the acquired information
7	Get information about drives.	Getting objects by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Outputting the acquired information
8	Delete the parity group.	Getting the URLs of the resources (when no object ID is specified) Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Deleting objects by performing a DELETE operation
9	Create a parity group.	Getting the URLs of the resources (when no object ID is specified) Setting user authentication information (for authentication by using session-based authentication) Generating a request body in JSON format Creating objects by performing a POST operation
10	Get information about the parity group.	Getting objects by performing a GET operation Setting user authentication information (for authentication by using session-based authentication) Outputting the acquired information
11	Output error messages.	Outputting error messages
12	Discard the session.	Getting the URLs of the resources (when object IDs that are obtained from the operation results are specified) Deleting objects by performing a DELETE operation

Expected system configuration

This sample coding assumes the system configuration is as shown in the following figure.



The following table shows the values specified for the parameters in the sample coding. If necessary, change the settings to match the system environment and requirements.

Parameter	Value	Description
USER_CREDENTIAL	`("user1", "pass1")`	This is the authentication information to be used for authentication in the storage system. The coding sample shows a setting example when the user ID is `user1`, and the password is `pass1`. The user needs the Storage Administrator (Provisioning) role.
PARITY_GROUP_ID	`1-1`	The ID of the parity group to be recreated
FIRST_WAIT_TIME	`1`	The first interval (seconds) for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.
MAX_RETRY_COUNT	`6`	The maximum number of retries for collecting the execution result of asynchronous processing. Normally, you do not need to change this value.

Contents of the sample coding

This subsection explains the sample coding.

1. Import necessary libraries and set parameters.

   Before starting the volume allocation processing, the sample coding imports the required libraries or classes. In addition to the common libraries, the sample coding also imports the BlockStorageAPI class that defines the function that generates URLs.

```
# coding:utf-8

"""
recreate_parity_group

This program requires API version 1.12.0 or newer.
```

```
"""

import requests
import json
import sys
import http.client
import time
import traceback
import rest_server_param
import storage_param

from block_storage_api import BlockStorageAPI
```

Set parameters to be used in the sample coding.

```
# #################Initialize parameters################# #
# Change the following parameters to fit your environment

# This parameter defines the first interval to access
# an asynchronous job. (Unit: Second)
FIRST_WAIT_TIME = 1

# This parameter defines the maximum retry time
# to confirm job status.
MAX_RETRY_COUNT = 6

# An user id and password of the target storage
USER_CREDENTIAL = ("user1", "pass1")

# A parity group id
PARITY_GROUP_ID = "1-1"

############################################################
```

2. Define headers.

Define the HTTP request header. Because the REST API only supports JSON format data, the sample coding defines header information so that data is handled in JSON format.

```
# ###You don't have to change the following parameters### #
block_storage_api = BlockStorageAPI(
    rest_server_param.REST_SERVER_IP_ADDR,
    rest_server_param.REST_SERVER_PORT,
    storage_param.STORAGE_MODEL,
    storage_param.SERIAL_NUMBER)

headers = {"content-type": "application/json",
           "accept": "application/json",
           "Response-Job-Status": "Completed"}
```

```
REQUIRED_MAJOR_VERSION = 1
REQUIRED_MINOR_VERSION = 12

############################################################
```

3. Define the function for issuing an HTTP request and for verifying the status of asynchronous processing (the invoke_async_command function).

   Define the function that issues an HTTP request and verifies the status of asynchronous processing. Call and use this function from the main volume allocation operation. For details on this function, see the section explaining the functions used in the sample coding.

   Tip: To prevent errors that occur if the server certificate used for SSL communication between the REST API client and the storage system is a self-signed certificate, the sample coding skips the verification of the server certificate by specifying `verify=False` when a request is issued.

```
"""
Check whether the asynchronous command was finished.
@param job_id the job ID to identify
       the asynchronous command
@return r the response data
"""


def check_update(job_id):
    url = block_storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r


"""
Execute the HTTP request (POST, PUT or DELETE)
@param method_type HTTP request method (POST, PUT or DELETE)
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(method_type, url, body):
    if method_type == "put":
        if body is None:
            r = requests.put(url, headers=headers, verify=False)
        else:
            r = requests.put(url, headers=headers,
                             data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
```

```
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    elif method_type == "delete":
        r = requests.delete(
            url,
            headers=headers,
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
    status = "Initializing"
    job_result = None
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
    while status != "Completed":
        if retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(r.json()["jobId"])
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
    if "affectedResources" in job_result.json():
        print("Async job was succeeded. affected resource : " +
              job_result.json()["affectedResources"][0])
        return job_result.json()["affectedResources"][0]
    else:
        print("Async job was succeeded.")
        return None
```

4. Check the version of the REST API.

Get information about the version of the REST API to make sure that the version is supported.

Tip:

In the following cases, you will also need to make sure that the microcode version of the storage system is supported:

- If SSL communication is used between the REST API server and the storage system
- If the storage system model is VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900

For information about the storage system microcode version that are compatible with each REST API version, see the table listing the compatible versions of Configuration Manager.

```
"""
Check whether this API version allows the REST
 Server to execute this program

@param api_version api version of this REST Server
@param required_major_version the lowest number of
       the major version that this program requires
@param required_minor_version the lowest number of
       the minor version that this program requires

"""


def check_api_version(api_version, required_major_version,
                      required_minor_version):
    version = api_version.split(".")
    major_version = int(version[0])
    minor_version = int(version[1])
    if not ((major_version == required_major_version and
             minor_version >= required_minor_version) or
            major_version >= required_major_version + 1):
        sys.exit("This program requires API Version " +
                 str(required_major_version) + "." +
                 str(required_minor_version) +
                 "." + "x or newer.\n")

try:
    # step1 Check the API version #
    print("Check the API version")
    url = block_storage_api.api_version()
    r = requests.get(url, headers=headers, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    check_api_version(
        r.json()["apiVersion"],
```

```
        REQUIRED_MAJOR_VERSION,
        REQUIRED_MINOR_VERSION)
```

5. Generate a session.

Generate sessions by using the REST API server.

```
    # step2 Generate a session #
    print("Generate a session")
    url = block_storage_api.generate_session()
    r = requests.post(url, headers=headers,
                      auth=USER_CREDENTIAL, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)
    token = r.json()["token"]
    auth = "Session " + token
    session_id = r.json()["sessionId"]
    headers["Authorization"] = auth
```

When you generate a session, a session ID and a token are returned. When running the API, specify the token for the Authentication header as the required authentication information for the subsequent operations. Use the session ID to discard the session after a set of operations is completed.

6. Get information about the parity group.

Get information about the parity group by specifying its parity group number. From the acquired information, the sample coding outputs the following information: number of LDEVs in the parity group, usage rate of the parity group, available capacity, RAID level, RAID type, CLPR number, code indicating the drive type of the drives belonging to the parity group, drive type of the drives that belong to the parity group, rotation speed of the drives belonging to the parity group, value of the encryption setting of the parity group, total logical capacity of the parity group, total physical capacity of the parity group, and value of the accelerated compression setting of the parity group.

```
    # step3 Get the parity group #
    print("Get the parity group")
    url = block_storage_api.parity_group(PARITY_GROUP_ID)
    r = requests.get(url, headers=headers,
                     auth=USER_CREDENTIAL, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    raidType = r.json()["raidType"]
    isCopyBackModeEnabled = r.json()["isEncryptionEnabled"]
    isAcceleratedCompressionEnabled = r.json()["isAcceleratedCompressionEnabled"]
    clprId = r.json()["clprId"]
    print("NUM OF LDEVS : " + str(r.json()["numOfLdevs"]))
    print("USED CAPACITY RATE : " + str(r.json()["usedCapacityRate"]))
    print("AVAILABLE VOLUME CAPACITY : " + str(r.json()
["availableVolumeCapacity"]))
    print("RAID LEVEL : " + str(r.json()["raidLevel"]))
```

```
    print("RAID TYPE : " + str(r.json()["raidType"]))
    print("CLPR ID : " + str(r.json()["clprId"]))
    print("DRIVE TYPE : " + r.json()["driveType"])
    print("DRIVE TYPE NAME : " + str(r.json()["driveTypeName"]))
    print("DRIVE SPEED : " + str(r.json()["driveSpeed"]))
    print("IS ENCRYPTION ENABLED : " + str(r.json()["isEncryptionEnabled"]))
    print("TOTAL CAPACITY : " + str(r.json()["totalCapacity"]))
    print("PHYSICAL TOTAL CAPACITY : " + str(r.json()["physicalCapacity"]))
    print("IS ACCELERATED COMPRESSION ENABLED : " + str(r.json()
["isAcceleratedCompressionEnabled"]))
    print()
```

7. Get information about drives.

Get information about drives that belong to a parity group by specifying its parity group number.

```
    # step4 Get drives #
    print("Get drives")
    url = block_storage_api.drives_parity_group(PARITY_GROUP_ID)
    r = requests.get(url, headers=headers,
                     auth=USER_CREDENTIAL, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    drive_ids = []
    for d in r.json()["data"]:
        drive_ids.append(d["driveLocationId"])
        print("DRIVE LOCATION ID : " + str(d["driveLocationId"]))
    print()
```

8. Delete the parity group.

Delete the parity group by specifying its parity group number.

```
    # step5 Delete the parity group #
    print("Delete the parity group")
    url = block_storage_api.parity_group(PARITY_GROUP_ID)
    invoke_async_command("delete", url, None)
```

The `invoke_async_command` function issues a request to delete the parity group, checks the execution statuses of the jobs that were executed asynchronously, and then returns the URL of the deleted parity group as the execution result.

9. Create a parity group.

Create a parity group by specifying a parity group number and drive IDs.

```
    # step6 Create the parity group #
    print("Create the parity group")
    url = block_storage_api.parity_groups()
    body = {
        "parityGroupId": PARITY_GROUP_ID,
```

```
        "driveLocationIds": drive_ids,
        "raidType": raidType,
        "isEncryptionEnabled": True,
        "isCopyBackModeEnabled": isCopyBackModeEnabled,
        "isAcceleratedCompressionEnabled": isAcceleratedCompressionEnabled,
        "clprId": clprId
    }
    invoke_async_command("post", url, body)
```

The `invoke_async_command` function issues a request to create a parity group, checks the execution statuses of jobs that were executed asynchronously, and then returns the URL of the created parity group as the execution result.

10. Get information about the parity group.

To check whether the operations up to this step have been correctly applied to the resource, get information about the parity group by specifying the parity group number you acquired when you created the parity group. From the acquired information, the sample coding outputs the following information: number of LDEVs in the parity group, usage rate of the parity group, available capacity, RAID level, RAID type, CLPR number, code indicating the drive type of the drives belonging to the parity group, drive type of the drives that belong to the parity group, rotation speed of the drives belonging to the parity group, value of the encryption setting of the parity group, total logical capacity of the parity group, total physical capacity of the parity group, and value of the accelerated compression setting of the parity group.

```
    # step7 Get the parity group #
    print("Get the parity group")
    url = block_storage_api.parity_group(PARITY_GROUP_ID)
    r = requests.get(url, headers=headers,
                     auth=USER_CREDENTIAL, verify=False)
    if r.status_code != http.client.OK:
        raise requests.HTTPError(r)

    print("NUM OF LDEVS : " + str(r.json()["numOfLdevs"]))
    print("USED CAPACITY RATE : " + str(r.json()["usedCapacityRate"]))
    print("AVAILABLE VOLUME CAPACITY : " + str(r.json()
["availableVolumeCapacity"]))
    print("RAID LEVEL : " + str(r.json()["raidLevel"]))
    print("RAID TYPE : " + str(r.json()["raidType"]))
    print("CLPR ID : " + str(r.json()["clprId"]))
    print("DRIVE TYPE : " + r.json()["driveType"])
    print("DRIVE TYPE NAME : " + str(r.json()["driveTypeName"]))
    print("DRIVE SPEED : " + str(r.json()["driveSpeed"]))
    print("IS ENCRYPTION ENABLED : " + str(r.json()["isEncryptionEnabled"]))
    print("TOTAL CAPACITY : " + str(r.json()["totalCapacity"]))
    print("PHYSICAL TOTAL CAPACITY : " + str(r.json()["physicalCapacity"]))
    print("IS ACCELERATED COMPRESSION ENABLED : " + str(r.json()
["isAcceleratedCompressionEnabled"]))
    print()
```

11. Output error messages.

In the sample coding, processing for communication errors, HTTP request errors, and job execution errors is described. If a communication error occurs, an error message is output. If an HTTP request error occurs, the error code, the error message, and the response body are output. If a job execution error occurs, all of the contents included in the job execution result are output.

```
except requests.ConnectionError:
    sys.stderr.write("Connection Error!\n")
    sys.stderr.write(traceback.format_exc())
except requests.HTTPError as he:
    sys.stderr.write("HTTP Error! status code : ")
    sys.stderr.write(str(he.args[0].status_code) + "\n")
    sys.stderr.write(he.args[0].text + "\n")
except Exception as e:
    sys.stderr.write(traceback.format_exc())
    for msg in e.args:
        sys.stderr.write(str(msg) + "\n")
```

12. Discard the session.

After a set of operations is completed, discard the session. Specify the session ID that was obtained when the session was generated. The "finally" statement in the sample coding makes sure that the session will be discarded even if an error occurs while the API is running. After the session is discarded, the processing ends.

```
finally:
    # step8 Discard the session #
    print("Discard the session")
    url = block_storage_api.discard_session(session_id)
    r = requests.delete(url, headers=headers, verify=False)
    try:
        if r.status_code != http.client.OK:
            raise requests.HTTPError(r)
    except requests.HTTPError as he:
        sys.stderr.write("HTTP Error! status code : ")
        sys.stderr.write(str(he.args[0].status_code) + "\n")
        sys.stderr.write(he.args[0].text + "\n")

    print("Operation was completed.")
    sys.exit()
```

Functions used in the sample coding

This section explains the functions used in the sample coding.

Generating a URL

In the sample coding, the functions that generate the URL to be used in the HTTP request are defined in the BlockStorageAPI class, and are called from the main processing when needed. If you specify the required parameters for each target resource or the method to use, these functions generate and return the corresponding URL. The following explains the sample coding for BlockStorageAPI.

In this sample coding, the storage device ID to be used in the URL is generated from the model name and serial number of the storage system specified by the parameters. The storage device ID is generated by replacing the model name specified by the STORAGE_MODEL_DICT parameter with the fixed value of the type of the storage system. If necessary, change the value to match the system environment and requirements.

```
# coding:utf-8
"""
This class creates a URL for the REST API
to manage block storage
"""

STORAGE_MODEL_DICT = {
                      "VSP One B28": "A34000",
                      "VSP E990": "936000",
                      "VSP 5500H": "900000",
                      "VSP G900": "886000",
                      "VSP G800": "836000",
                      "VSP G1500":"800000"}

class BlockStorageAPI():
    # storage IP address
    storage_ip_addr = None
    # port number
    port = None
    # storage URL
    base_url = None
    # object URL
    object_url = None
    # service URL
    service_url = None
    # storage device ID
    storage_id = None
```

Generate the common part, in the following format, of the requests in the URL:

For the objects domain:

```
protocol://host-name:port-number/ConfigurationManager/version/objects/storages/
storage-device-ID
```

For the services domain:

```
protocol://host-name:port-number/ConfigurationManager/version/storage-device-ID/services
```

```
def __init__(self, storage_ip_addr, port, storage_model,
             serial_number):
    self.storage_ip_addr = storage_ip_addr
    self.port = port
    self.storage_id = STORAGE_MODEL_DICT[storage_model]\
        + serial_number
    self.base_url = "https://" + \
        self.storage_ip_addr + ":" + self.port + \
        "/ConfigurationManager/v1"
    self.object_url = "/objects/storages/" + self.storage_id
    self.service_url = "/" + self.storage_id + "/services"
```

Next, define the functions according to the target resource and the operation. For example, the URL for creating a volume is generated by the `block_storage_api.ldevs` that corresponds to `ldevs`.

```
def __init__(self, storage_ip_addr, port, storage_model,
             serial_number):
    self.storage_ip_addr = storage_ip_addr
    self.port = port
    self.storage_id = STORAGE_MODEL_DICT[storage_model]\
        + serial_number
    self.base_url = "https://" + \
        self.storage_ip_addr + ":" + self.port + \
        "/ConfigurationManager/v1"
    self.object_url = "/objects/storages/" + self.storage_id
    self.service_url = "/" + self.storage_id + "/services"

def get_storage_id(self):
    return self.storage_id

def ldevs(self):
    url = self.base_url + self.object_url + "/ldevs"
    return url

def undefined_ldev(self):
    url = self.ldevs() + \
        "?ldevOption=undefined&count=1"
    return url

def ldev(self, object_id):
    url = self.ldevs() + "/" + str(object_id)
    return url
```

```
    def views_ldevs(self):
        url = self.base_url + "/views/ldevs?$query=ldev.storageDeviceId eq '" + \
              self.storage_id + "'"
        return url

    def views_undefined_ldev(self):
        url = self.views_ldevs() + \
            "&$query=ldev.isDefined eq false&$count=1"
        return url

    def host_groups(self):
        url = self.base_url + self.object_url + "/host-groups"
        return url

    def host_wwns(self):
        url = self.base_url + self.object_url + "/host-wwns"
        return url

    def luns(self):
        url = self.base_url + self.object_url + "/luns"
        return url

    def local_copy_pairs(self):
        url = self.base_url + self.object_url + "/local-clone-copypairs"
        return url

    def split_local_copy_pair_template(self, pair_url):
        url = pair_url + "/actions/split"
        return url

    def split_local_copy_pair(self, pair_url):
        url = pair_url + "/actions/split/invoke"
        return url

    def generate_session(self):
        url = self.base_url + self.object_url + "/sessions"
        return url

    def discard_session(self, object_id):
        url = self.base_url + self.object_url + "/sessions/" + \
            str(object_id)
        return url

    def lock(self):
        url = self.base_url + self.service_url + \
            "/resource-group-service/" + \
            "actions/lock/invoke"
        return url

    def unlock(self):
        url = self.base_url + self.service_url + \
```

```
            "/resource-group-service/" + \
            "actions/unlock/invoke"
        return url

    def remote_storage(self):
        url = self.base_url + self.object_url + "/remote-storages"
        return url

    def remote_copy_pairs(self):
        url = self.base_url + self.object_url +\
            "/remote-mirror-copypairs"
        return url

    def job(self, object_id):
        url = self.base_url + self.object_url + "/jobs/" + \
            str(object_id)
        return url

    def affected_resource(self, affected_resource):
        url = "https://" + self.storage_ip_addr + ":" + \
              self.port \
              + affected_resource
        return url

    def api_version(self):
        url = "https://" + self.storage_ip_addr + ":" + \
              self.port \
            + "/ConfigurationManager/configuration/version"
        return url

    def local_storages(self):
        url = self.base_url + "/objects/storages"
        return url

    def local_storage(self, object_id):
        url = self.local_storages() + "/" + str(object_id)
        return url

    def file_upload(self):
        url = self.base_url + self.object_url + "/actions/file-upload/invoke"
        return url

    def auditlog_syslog(self):
        url = self.base_url + self.object_url + "/auditlog-syslog-servers" + \
                "/instance"
        return url

    def auditlog_syslog_send_test(self):
        url = self.auditlog_syslog() + "/actions/send-test/invoke"
        return url
```

```
    def drives(self):
        url = self.base_url + self.object_url + "/drives"
        return url

    def drives_parity_group(self, parity_group_id):
        url = self.drives() + "?parityGroupId=" + str(parity_group_id)
        return url

    def parity_groups(self):
        url = self.base_url + self.object_url + "/parity-groups"
        return url

    def parity_group(self, object_id):
        url = self.parity_groups() + "/" + str(object_id)
        return url

    def encryption_keys(self):
        url = self.base_url + self.object_url + "/encryption-keys"
        return url

    def encryption_key(self, object_id):
        url = self.encryption_keys() + "/" + str(object_id)
        return url

    def encryption_key_file(self):
        url = self.encryption_key("file")
        return url

    def encryption_key_file_backup(self):
        url = self.encryption_key_file() + "/actions/backup/invoke"
        return url

    def encryption_key_file_restore(self):
        url = self.encryption_key_file() + "/actions/restore/invoke"
        return url
```

Issuing an HTTP request and verifying the status of asynchronous processing

In the REST API, operations such as creating an object or changing its attributes are registered as jobs and run asynchronously. For asynchronous processing, you must confirm that the jobs are complete before obtaining the resource to which the request execution result is applied. In the sample coding, the invoke_async_command function is used to issue the request and to perform the processing for waiting for the completion of the jobs. After the method type, URL, and request body are specified, the invoke_async_command function issues the request according to the specified method, waits for the completion of the job, and then returns the resource information.

The invoke_async_command function is defined in the coding samples for volume allocation, ShadowImage pair operation, and registration of remote storage system information. The following examples show the contents of coding samples for the invoke_async_command function.

First, define the function that gets the job status. This function is called by using the invoke_async_command function.

```
"""
Check whether the asynchronous command was finished.
@param job_id the job ID to identify
       the asynchronous command
@return r the response data
"""


def check_update(job_id):
    url = block_storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r
```

Next, define the invoke_async_command function. Specify the settings so that when a request is generated, the request body is generated in JSON format. Specify the authentication information by using the token obtained when a session was generated.

```
"""
Execute the HTTP request (POST or PUT)
@param method_type HTTP request method (POST or PUT)
@param url URL to execute HTTP method
@param body The information of a resource
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def invoke_async_command(method_type, url, body):
    if method_type == "put":
        r = requests.put(url, headers=headers,
                         data=json.dumps(body), verify=False)
    elif method_type == "post":
        r = requests.post(
            url,
            headers=headers,
            data=json.dumps(body),
            verify=False)
    if r.status_code != http.client.ACCEPTED:
        raise requests.HTTPError(r)
    print("Request was accepted. JOB URL : " +
          r.json()["self"])
```

After the request is issued, the job status is repeatedly obtained until the job status changes to `Completed`. If the job does not finish before the maximum number of retries specified in

the parameter is reached, the processing ends. In addition, if an error occurs for the job, the error code is obtained and the processing ends.

```
status = "Initializing"
job_result = None
retry_count = 1
wait_time = FIRST_WAIT_TIME
while status != "Completed":
    if retry_count > MAX_RETRY_COUNT:
        raise Exception("Timeout Error! "
                        "Operation was not completed.")
    time.sleep(wait_time)
    job_result = check_update(r.json()["jobId"])
    status = job_result.json()["status"]
    double_time = wait_time * 2
    if double_time < 120:
        wait_time = double_time
    else:
        wait_time = 120
    retry_count += 1
if job_result.json()["state"] == "Failed":
    error_obj = job_result.json()["error"]
    if "errorCode" in error_obj:
        if "SSB1" in error_obj["errorCode"]:
            print("Error! SSB code : ",
                  error_obj["errorCode"]["SSB1"],
                  ", ", error_obj["errorCode"]["SSB2"])
        elif "errorCode" in error_obj["errorCode"]:
            print("Error! error code : ",
                  error_obj["errorCode"]["errorCode"])
    raise Exception("Job Error!", job_result.text)
```

After the job is complete and the status changes to `Completed`, the URL of the resource to which the job execution result is applied is obtained. The first result is obtained because only one result is returned to affectedResources.

```
print("Async job was succeeded. affected resource : " +
      job_result.json()["affectedResources"][0])
return job_result.json()["affectedResources"][0]
```

Getting status changes for asynchronous processing

The wait_until_jobstatus_is_changed function gets the status of the jobs that were asynchronously run by the REST API, waits until the job status changes to the specified execution status, and then returns the resource information. The wait_until_jobstatus_is_changed function is defined in the coding samples for a TrueCopy pair operation. The following example shows the contents of coding samples for the wait_until_jobstatus_is_changed function.

First, define the function that gets the job status. This function is called by using the wait_until_jobstatus_is_changed function.

```
"""
Check whether the asynchronous command was finished.

@param storage_api storage_api
@param job_id the job ID to identify
      the asynchronous command
@param headers the array of the http headers
@return r the response data
"""


def check_update(storage_api, job_id, headers):
    url = storage_api.job(str(job_id))
    r = requests.get(url, headers=headers, verify=False)
    return r
```

Next, define the wait_until_jobstatus_is_changed function. For changed_status, specify the job status that needs to be detected when a job status has changed to that status. If `True` is specified for is_retry_count_enabled, after processing is tried again for the number of times specified in the MAX_RETRY_COUNT parameter, a timeout error will be returned. If `False` is specified, processing will wait until a job moves to the specified status.

```
"""
Wait until the job status is changed

@param storage_api storage_api
@param headers the array of the http headers
@param job_id the job ID to identify
       the asynchronous command
@param changed_status job status after waiting
@param is_retry_count_enabled if true, wait
       until MAX_RETRY_COUNT. if false, wait forever
       until job status is changed.
@return job_result.json()["affectedResources"][0]
         URL of an affected resource
"""


def wait_until_jobstatus_is_changed(
        storage_api,
        headers,
        job_id,
        changed_status,
        is_retry_count_enabled):
    status = "Initializing"
    retry_count = 1
    wait_time = FIRST_WAIT_TIME
```

```
    while status != changed_status:
        if status == "Completed":
            print("Status was already changed" +
                  "to Completed.")
            break
        if is_retry_count_enabled and \
                retry_count > MAX_RETRY_COUNT:
            raise Exception("Timeout Error! "
                            "Operation was not completed.")
        time.sleep(wait_time)
        job_result = check_update(storage_api,
                                  job_id, headers)
        status = job_result.json()["status"]
        double_time = wait_time * 2
        if double_time < 120:
            wait_time = double_time
        else:
            wait_time = 120
        retry_count += 1
    if job_result.json()["state"] == "Failed":
        error_obj = job_result.json()["error"]
        if "errorCode" in error_obj:
            if "SSB1" in error_obj["errorCode"]:
                print("Error! SSB code : ",
                      error_obj["errorCode"]["SSB1"],
                      ", ", error_obj["errorCode"]["SSB2"])
            elif "errorCode" in error_obj["errorCode"]:
                print("Error! error code : ",
                      error_obj["errorCode"]["errorCode"])
        raise Exception("Job Error!", job_result.text)
    print("Async job was succeeded. affected resource : " +
          job_result.json()["affectedResources"][0])
    return job_result.json()["affectedResources"][0]
```

Appendix A: Changing the communication mode of the REST API server

Processing speed of the REST API depends on how the REST API server is connected to storage systems. This section describes how to improve the processing speed of the REST API by changing the method for connecting the REST API server and storage systems, and then changing the communication mode of the REST API server.

Overview of changing the communication mode for the REST API server

The processing speed can be improved by changing the connection method between the REST API server and the storage system. To change the connection method, you must change the communication mode in the REST API. The following explains the communication mode supported by the REST API.

When the operation of the REST API is started, the Management server where the REST API server is allocated and the storage system are connected by a LAN. The communication mode for this default connection method is called lanConnectionMode.

If you want to improve the processing performance, change the communication method so that the API function is run from the server that is directly connected to the storage system by using a Fibre Channel or iSCSI connection. This method is called the In-Band method. To run the REST API function by using the In-Band method, you must change the communication mode for the REST API server. You can change the communication mode to either of the following two methods:

- fcConnectionMode

  Communication mode for connecting the management server where the REST API server is allocated and the storage system by using a Fibre Channel or iSCSI connection

- proxyMode

  Communication mode for connecting the REST API server to the storage system via another server that uses a Fibre Channel or iSCSI connection

Each communication mode can be combined and used in operation.

To change the communication mode, you must specify the required settings on the storage system or the server, and then run the API to change the communication method.

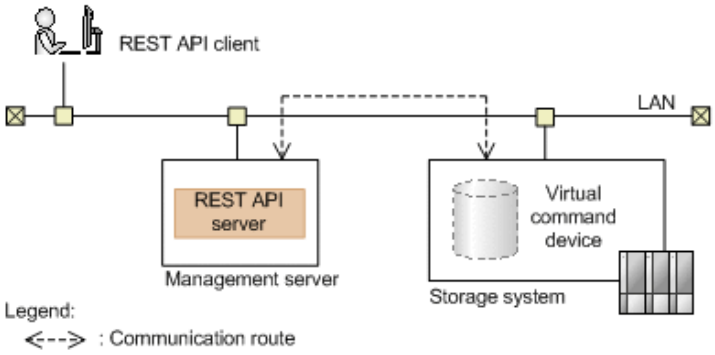
Note:

- You cannot change the communication mode to proxyMode when SSL communication is enabled between the REST API server and the storage system.
- You cannot change the communication mode to proxyMode for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems.

The following explains each communication mode:

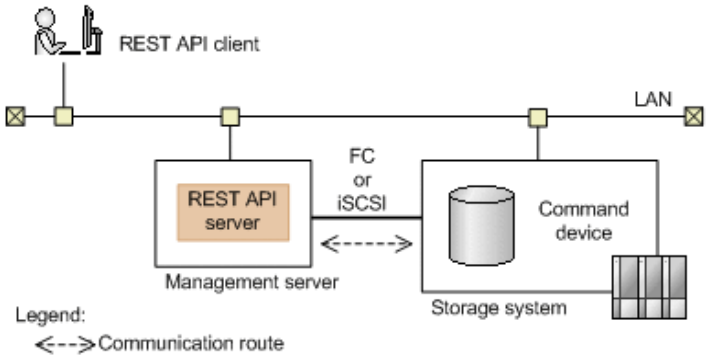
lanConnectionMode

This is the default communication mode. Orders issued from the REST API server are run via the virtual command device on the storage system. The following shows an example of the communication route in lanConnectionMode.



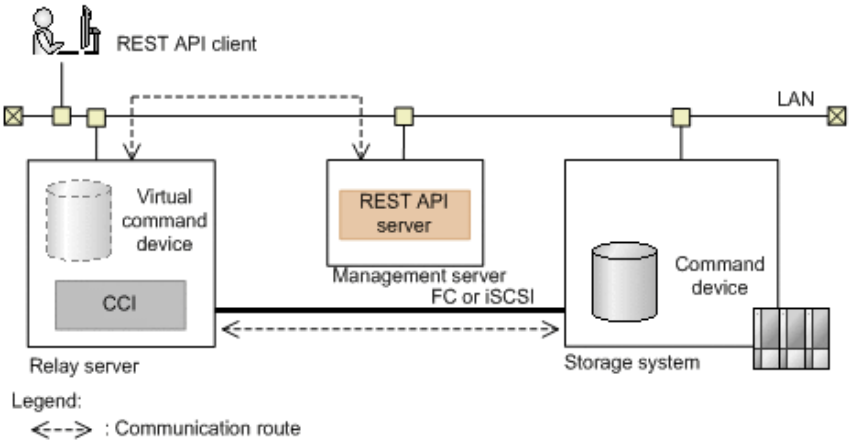
fcConnectionMode

This is a communication mode for connecting the management server (where the REST API server is allocated) and the storage system by using a Fibre Channel or iSCSI connection. The following shows an example of the communication route in fcConnectionMode.



proxyMode

This is a communication mode for connecting the REST API server to the storage system via another server that uses a Fibre Channel or iSCSI connection. You can also configure a redundant configuration by setting multiple relay servers. A maximum of three relay servers can be set. The following shows an example of the communication route in proxyMode.



Tip: In an environment such as Replication Manager where the copy pairs are managed by using the pair management server, the pair management server can be used as a relay server.

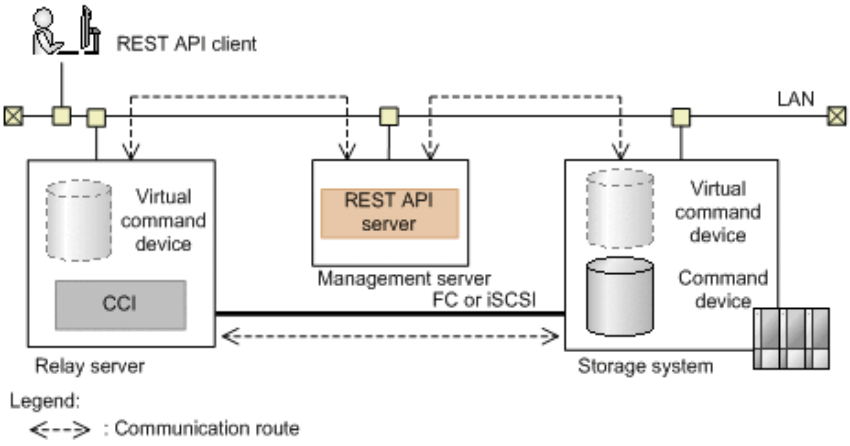
When combining different communication modes

Two communication modes can be combined and used for a storage system to make the communication route redundant.

Note:

You cannot combine two communication modes for VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems.

The following figure is an example of combining lanConnectionMode and proxyMode.



You can specify the priority for communication modes to be used. If you specify a combination of lanConnectionMode and proxyMode as shown in the preceding figure, when you specify the highest priority for proxyMode with a fast communication speed, proxyMode with a fast communication speed is usually used, and the communication mode is switched to lanConnectionMode to continue the communication when a failure occurs in proxyMode.

Settings required to change the communication mode of the REST API server

This section describes the required settings to change the communication mode of the REST API server.

Settings required to change the communication mode to fcConnectionMode:

Connect the management server and the storage system via Fibre Channel or iSCSI, and then perform the following procedure to create a command device on the storage system and assign it to the management server.

1. Create a command device by specifying the following conditions.

   If the following conditions are not met, REST API operations might not provide the expected results.

   - User authentication setting: Enabled
   - Security settings: Disabled
   - Resource group: meta_resource
   - Settings for device group information authentication: Disabled

   When multiple command devices are assigned to the management server on which the REST API is installed, if you do not configure the required settings for all of those command devices, you might not be able to run API requests by using fcConnectionMode.

2. Assign the path to the management server to the created command device.

   For details about how to assign a path to a command device, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

3. For an iSCSI connection, set up the iSCSI initiator in the management server.

4. In the management server, confirm that the command device is assigned.

If you change the settings of the command device after it was assigned, restart the services of the REST API.

Settings required to change the communication mode to proxyMode:

To use the proxyMode, you need a relay server to which the storage system is connected via Fibre Channel or iSCSI. CCI must be installed on the relay server. For details about the system requirements for a relay server or how to install CCI, see the *Command Control Interface Installation and Configuration Guide*.

Connect the relay server and the storage system via Fibre Channel or iSCSI, create a command device on the storage system, and then assign the command device to the relay server. Create a configuration definition file on the relay server, and then create a virtual command device. The procedure is as follows:

1. Create a command device by specifying the following conditions.

If the following conditions are not met, REST API operations might not provide the expected results.

- User authentication setting: Enabled
- Security settings: Disabled
- Resource group: meta_resource
- Settings for device group information authentication: Disabled

For details about how to create a command device, see the *Command Control Interface Installation and Configuration Guide*.

2. Assign the path to the relay server to the created command device.

   For details about how to assign a path to a command device, see the *Provisioning Guide for Open Systems*, or the *Provisioning Guide*.

3. For an iSCSI connection, set an iSCSI initiator on the relay server.
4. On the relay server, confirm that the command device is assigned.
5. Create a configuration definition file on the relay server by referring to the following examples.

   For details about how to set a configuration definition file, see the *Command Control Interface Installation and Configuration Guide*. For details about how to set HORCM_CMD, see the description on configuring the In-Band method.

   - HORCM_MON (example)

     ```
     IP-address-of-the-relay-server port-number 1000 3000
     ```

     For the port number, specify any number from the numbers available for a relay server, which can be used to uniquely identify the storage system from the Management server.

   - HORCM_CMD (example in Windows)

     ```
     \\.\CMD-serial-number-of-the-storage-system
     ```

6. Specify the firewall settings for the relay server so that communication that uses the port specified in the configuration definition file can be allowed.
7. On the relay server, start the instance by selecting the created configuration definition file.

Changing the communication mode of the REST API server

The following request changes the communication mode of the REST API server after the necessary settings are specified for the storage systems and servers.

Execution permission

Storage Administrator (Initial Configuration)

Request line

```
PUT base-URL/v1/storage-device-ID/services/communication-mode/actions/change/invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for changing the communication mode to proxyMode, and then specifying multiple relay servers:

```
{
  "parameters": {
    "communicationModes": [
      {
        "communicationMode": "proxyMode",
        "proxies": [
          {
            "proxyIp": "192.0.2.101",
            "proxyPort": 1110
          },
          {
            "proxyIp": "192.0.2.102",
            "proxyPort": 1110
          }
        ]
      }
    ]
  }
}
```

The following is a coding example for specifying multiple communication modes:

```
{
  "parameters": {
    "communicationModes": [
      {
        "communicationMode": "proxyMode",
```

```
        "proxies": [
          {
            "proxyIp": "192.0.2.101",
            "proxyPort": 2010
          }
        ]
      },
      {
        "communicationMode": "lanConnectionMode"
      }
    ]
  }
}
```

Attribute	Type	Description
communicationModes	object[]	(Required) Array of communication modes

Attribute	Type	Description
		You can specify a maximum of two communication modes. If you specify multiple communication modes, communication is performed by preferentially using the communication mode from the first element of the array. For VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems, enter one of either `fcConnectionMode` or `lanConnectionMode` for `communicationMode`. Specify the following attribute for each communication mode. ▪ communicationMode (string) (Required) Communication mode Specify one of the following: `fcConnectionMode`, `proxyMode`, or `lanConnectionMode`. You cannot specify `proxyMode` when SSL communication is enabled between the REST API server and the storage system. ▪ proxies(object[]) (Optional) Array of relay servers Make sure to specify this attribute when specifying `proxyMode` for communicationMode. You can specify a maximum of three relay servers. If you specify multiple relay servers, communication is performed by preferentially using the relay server from the first element of the array. ▫ proxyIp (string) IP address of the relay server Make sure to specify this attribute when specifying `proxyMode` for communicationMode. You can specify the address in both the IPv4 format and IPv6 format. ▫ proxyPort (int) Port number specified in the configuration definition file Make sure to specify this attribute when specifying `proxyMode` for communicationMode.

Response message

Body

A job object is returned. For details on attributes other than `affectedResources`, see the section explaining job objects.

Attribute	Description
affectedResources	URL of the storage system whose communication mode was changed

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept: application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/836000123456/
services/communication-mode/actions/change/invoke
```

Appendix B: Backup and restore

This chapter describes how to back up or restore the REST API database and the environment settings file.

Backing up the REST API database and the environment settings file

This section describes how to back up the REST API database and the environment settings file.

If a disk failure occurs, you can continue the same operation as the REST API server at backup by restoring the backed up database and environment settings file. Periodically back up the database and the environment settings file.

Note: Backing up and recovering using Ops Center Protector

You can schedule automatic backups for your Ops Center products by using Ops Center Protector. For information about how to use Protector to back up and restore, see the *Hitachi Ops Center Installation and Configuration Guide*.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Manually copy the following files to a storage destination for backup.

Files to back up	File storage location
REST API database (if the REST API server is in a non-cluster configuration)[#]	**In a Windows OS:** Files under the folder *REST-API-installation-destination*\data\db ▪ restapi.sqlite.db ▪ search.sqlite.db **In a Linux OS:** Files under the directory *REST-API-installation-destination*/data/db ▪ restapi.sqlite.db ▪ search.sqlite.db
REST API database (if the REST API server is in a cluster configuration)[#]	**In a Windows OS:** Files under the folder *path-of-the-shared-folder*\db ▪ restapi.sqlite.db ▪ search.sqlite.db
Property file[#]	**In a Windows OS:** *REST-API-installation-destination*\data\properties\StartupV.properties **In a Linux OS:** *REST-API-installation-destination*/data/properties/StartupV.properties
Settings file of the port for internal communication	**In a Windows OS:** *REST-API-installation-destination*\data\usercnf\user-api-port.ini **In a Linux OS:** *REST-API-installation-destination*/data/usercnf/user-api-port.ini

Files to back up	File storage location
Settings file of the port for HTTP or HTTPS communication Settings file of the private key and server certificate Settings file of the port for internal communication	**In a Windows OS:** Files under the folder *REST-API-installation-destination*\oss\apache\conf\userextra ▪ user-httpd-port.conf ▪ user-httpd-ssl.conf ▪ user-httpsd-certificate.conf ▪ user-proxy-path.conf **In a Linux OS:** Files under the directory *REST-API-installation-destination*/oss/apache/conf/userextra ▪ user-httpd-port.conf ▪ user-httpd-ssl.conf ▪ user-httpsd-certificate.conf ▪ user-proxy-path.conf
Private key file and server certificate file that were created and obtained by the user	A directory in which the user stored the files
Settings file for the Web server	**In a Windows OS:** *REST-API-installation-destination*\oss\apache\conf\httpd.conf **In a Linux OS:** *REST-API-installation-destination*/oss/apache/conf/httpd.conf
Settings file for receiving notifications about changes made to the storage system configuration	**In a Windows OS:** Files under the folder *REST-API-installation-destination*\oss\rabbitmq\etc\rabbitmq ▪ rabbitmq-env-conf.bat ▪ advanced.config ▪ .erlang.cookie

Files to back up	File storage location
	In a Linux OS: Files under the directory *REST-API-installation-destination*/oss/rabbitmq/etc/rabbitmq ▪ rabbitmq-env.conf ▪ advanced.config ▪ .erlang.cookie

#: If the file does not exist, you do not need to back it up

3. Start the REST API services.

Restoring the REST API database and environment settings file

This section explains how to restore the database and the environment settings file for the REST API.

Before you begin

- The database (when a database file exists) and the environment settings file for the REST API must be backed up.
- The host name, IP address, and OS of the original and the restore destination must be the same.
- The version of the REST API of the original and the restore destination must be the same.
- Log in to the management server as any one of the following user types:
  - A user with Administrator permissions (in Windows)
  - Root user (if the REST API was installed by the root user in Linux)
  - A non-root user who installed the REST API

Procedure

1. Stop the REST API services.
2. Overwrite the backed up file to the restore destination.

   If you want to change the location of the private key file and the server certificate to be stored at a restore, also change the paths for the private key file and the server certificate described in the `user-httpsd-certificate.conf` file.
3. If you want to use notifications about changes made to storage system configurations, run the following command, specifying a character string of your choice to be used in notifications about changes made to storage system configurations:

In a Windows OS:

```
REST-API-installation-destination\bin
\setChangeNotificationSecret.bat character-string-of-your-
choice
```

In a Linux OS:

```
REST-API-installation-destination/bin/
setChangeNotificationSecret.sh character-string-of-your-
choice
```

Specify a character string of no more than 32 characters and using only alphanumerical characters and the following symbols:

- _

If you are performing restoration in a cluster environment, run the command on both the active node and the standby node and specify the same character string for both nodes.

4. Start the REST API services.
5. If you want to use notifications about changes made to storage system configurations, update the registered information about notification destinations by deleting the currently registered destination to which notifications about changes made to storage system configurations are to be sent, and then register a destination again.

   If no notification destination is registered, register the REST API server to be restored as a destination for sending notifications about changes made to storage system configurations.

Appendix C: Troubleshooting

This section describes the actions to take if an error occurs on the REST API server. Check the messages or log files to determine the cause of the error, and take action accordingly.

Information to be collected when an error occurs

If you cannot determine the cause of the error or resolve the error, collect the following information, and then contact maintenance personnel.

- Maintenance information for the REST API (required)

  To collect this information, run the `RestTI` command.

- Log file for the REST API interface on the storage system

  In the following cases, collect a dump file of the storage system:

  - The version of Configuration Manager is 8.5.1 or later, and the REST API is used to manage VSP G1000, VSP G1500, or VSP F1500 whose microcode version is 80-05-2*X*-*XX*/*XX* or later and for which SSL communication is enabled
  - The version of Configuration Manager is 8.5.2-03 or later, and the REST API is used to manage VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-43-*XX*/*XX* or later and for which SSL communication is enabled

    In this case, you will need to collect a dump file only when if you are using the DTLS SVP encrypted communication mode or the SSL TLS encrypted communication mode.
  - The version of Configuration Manager is 8.5.3 or later, and the REST API was installed in a Linux environment by a non-root user
  - The REST API is used to manage VSP One B20, VSP 5000 series, VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

  For details on how to collect a dump file of the storage system, see the *System Administrator Guide* for the corresponding storage system.

- Log file for the cluster management application in Windows

  Collect this log file if you are using a cluster environment in Windows.

  To collect the log file (`Cluster.log`) for the cluster management application, use Windows Power Shell to run the `Get-ClusterLog` command on the active node or the standby node. The log file is output to both the active node and the standby node.

Collecting maintenance information about the REST API

Run the `RestTI` command to collect maintenance information about the management server and the REST API.

> **Caution:**
>
> Do not close the dialog box that is displayed while the maintenance information is being collected.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Procedure

1. Run the following command:

   In a Windows OS:

   ```
   REST-API-installation-destination\SupportTools\CollectTool
   \RestTI.bat -dir maintenance-information-storage-destination
   ```

   In a Linux OS:

   ```
   REST-API-installation-destination/SupportTools/CollectTool/
   RestTI.sh -dir maintenance-information-storage-destination
   ```

   Options

   `dir`

   Specify the absolute path to the directory for storing the collected maintenance information.

   For the path, you can specify any printable ASCII character excluding certain special characters. You cannot specify the following special characters. In a Linux OS, you cannot specify a space character in the path.

   ```
   \ / : , ; * ? " < > | $ % & ' `
   ```

   However, you can specify, as a path delimiter, backslashes (`\`), colons (`:`), and forward slashes (`/`) in a Windows OS, and forward slashes (`/`) in a Linux OS.

Result

The collected maintenance information is output to the `ConfManager_log.jar` file.

Appendix D: Sending notifications about changes to storage system configurations

This chapter describes an overview of the function for sending notifications about changes to storage system configurations, and information on how to use the function to update the REST API database.

Notifications of changes to storage system configurations

This section describes the mechanism for sending notifications of changes to storage system configurations and how to use these notifications to automatically update the Configuration Manager REST API database.

Overview of notifications of configuration changes

When a REST API request or other storage management software changes the configuration of a storage system, the functionality for sending notifications of changes to storage system configurations sends a notification that the configuration changed from the storage system to the management server.

If you register a management server that has the Configuration Manager REST API server installed, to a storage system as a configuration-change notification destination, the REST API server will be able to receive notifications regarding configuration changes. Based on the received change notifications, the REST API server obtains target resource information from the storage system and automatically updates the REST API database used for the search function. The Configuration Manager REST API database is kept up to date without users having to manually run API requests to refresh the configuration information for the storage system.

You can use the function for sending notifications of changes to storage system configurations when using the following storage systems:

- VSP One B20
- VSP 5000 series
- VSP E series
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
- VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
- VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
- VSP G1500 or VSP F1500

Settings for receiving notifications of configuration changes

To receive notifications of configuration changes, the management server must be registered in the storage system as a configuration-change notification destination.

You can register configuration-change notification destinations when you register the storage system. You can also register configuration-change notification destinations at a later time.

Configuration-change notification destinations

Information about configuration-change notification destinations is registered in the following locations:

For VSP One B20
: The information is registered on the ESM via the service IP. You can register a maximum of 4 notification destinations.

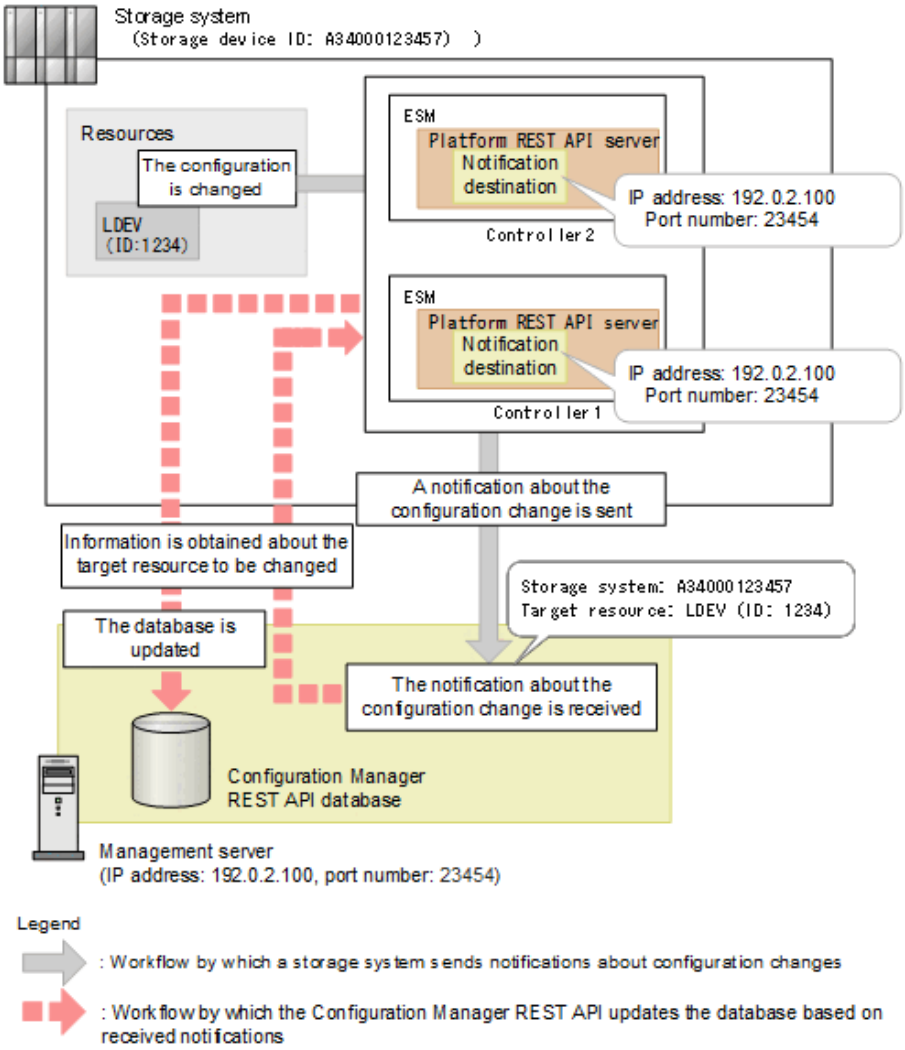
For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
: The information is simultaneously registered in the GUM on controller 1 and 2. A maximum of four notification destinations can be registered for each controller.

For VSP 5000 series, VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500
: The information is registered in the SVP. You can register a maximum of 100 notification destinations.

Workflow for handling notifications of configuration changes (VSP One B20)

This section describes the workflow for updating the Configuration Manager REST API database after receiving notifications of changes to storage system configurations.

The following example shows the workflow for handling notifications of configuration changes.



For VSP One B20, information about the destinations of notifications of changes to the storage system configuration is registered in the ESM. Based on the received change notifications, the Configuration Manager REST API server obtains target resource information from the Platform REST API server and automatically updates the Configuration Manager REST API database used for the search function.

Registering configuration-change notification destinations

To receive notifications of changes to storage system configurations, notification destinations must be registered in the storage system. If you run API requests for registering storage systems, configuration-change notification destinations will be also registered at the same time.

Tip:

After you register the configuration-change notification destinations, if the IP address or port number of the Configuration Manager REST API server changes, re-register the registered notification destinations.

Deleting configuration-change notification destinations

If you no longer require notifications of changes to storage system configurations, delete the configuration-change notification destinations that were registered in the storage system. After you do this, notifications will no longer be sent from the storage system.

Running API requests for deleting information about storage systems also deletes the configuration-change notification destinations at the same time. Therefore, you do not have to run subsequent API requests for deleting the destinations.

Note:

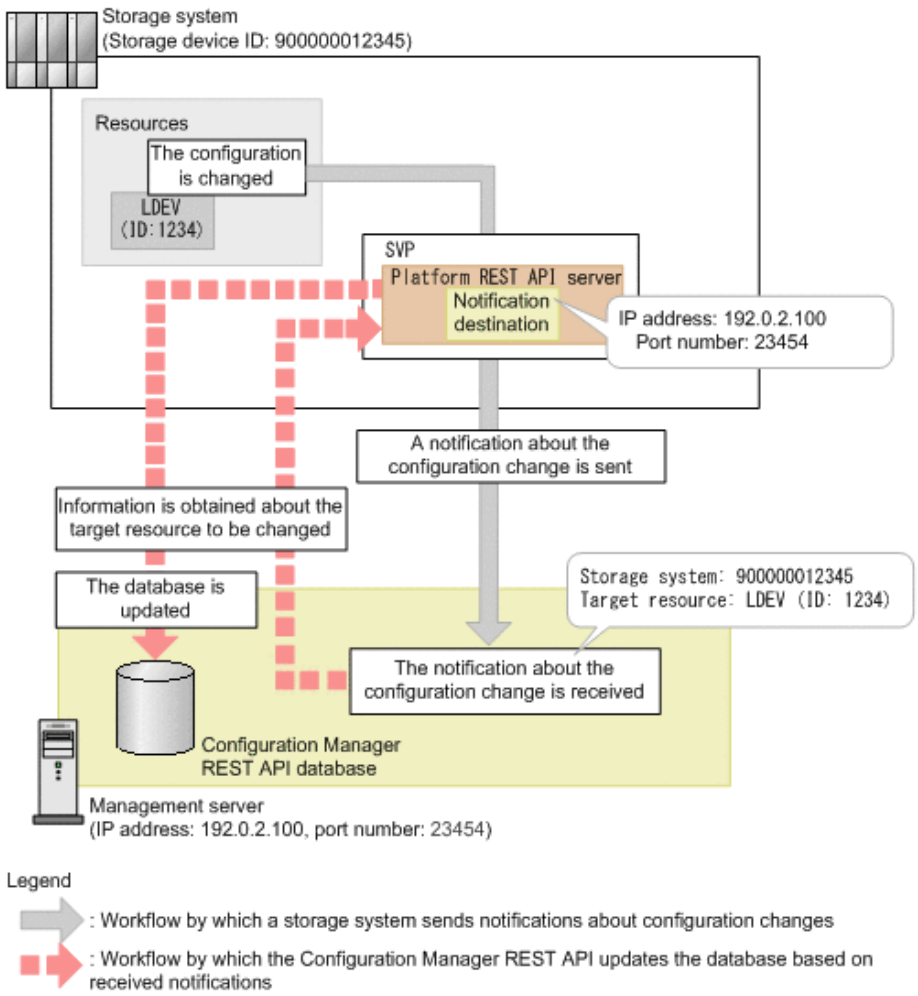
If you perform the operations shown below without running API requests for deleting information about storage systems, information about the Configuration Manager REST API server that is registered as a notification destination in the storage system will not be deleted. In that case, you need to run API requests for deleting the destinations.

- Changing the settings for, or removing storage systems
- Removing the Configuration Manager REST API

Workflow for handling notifications of configuration changes (VSP 5000 series)

This section describes the workflow for updating the Configuration Manager REST API database after receiving notifications of changes to storage system configurations.

The following example shows the workflow for handling notifications of configuration changes.



For VSP 5000 series, information about the destinations of notifications of changes to the storage system configuration is registered in the SVP. Based on the received change notifications, the Configuration Manager REST API server obtains target resource information from the Platform REST API server and automatically updates the Configuration Manager REST API database used for the search function.

Registering configuration-change notification destinations

To receive notifications of changes to storage system configurations, notification destinations must be registered in the storage system. If you run API requests for registering storage systems, configuration-change notification destinations will be also registered at the same time.

Tip:

After you register the configuration-change notification destinations, if the IP address or port number of the Configuration Manager REST API server changes, re-register the registered notification destinations.

Deleting configuration-change notification destinations

If you no longer require notifications of changes to storage system configurations, delete the configuration-change notification destinations that were registered in the storage system. After you do this, notifications will no longer be sent from the storage system.

Running API requests for deleting information about storage systems also deletes the configuration-change notification destinations at the same time. Therefore, you do not have to run subsequent API requests for deleting the destinations.

Note:

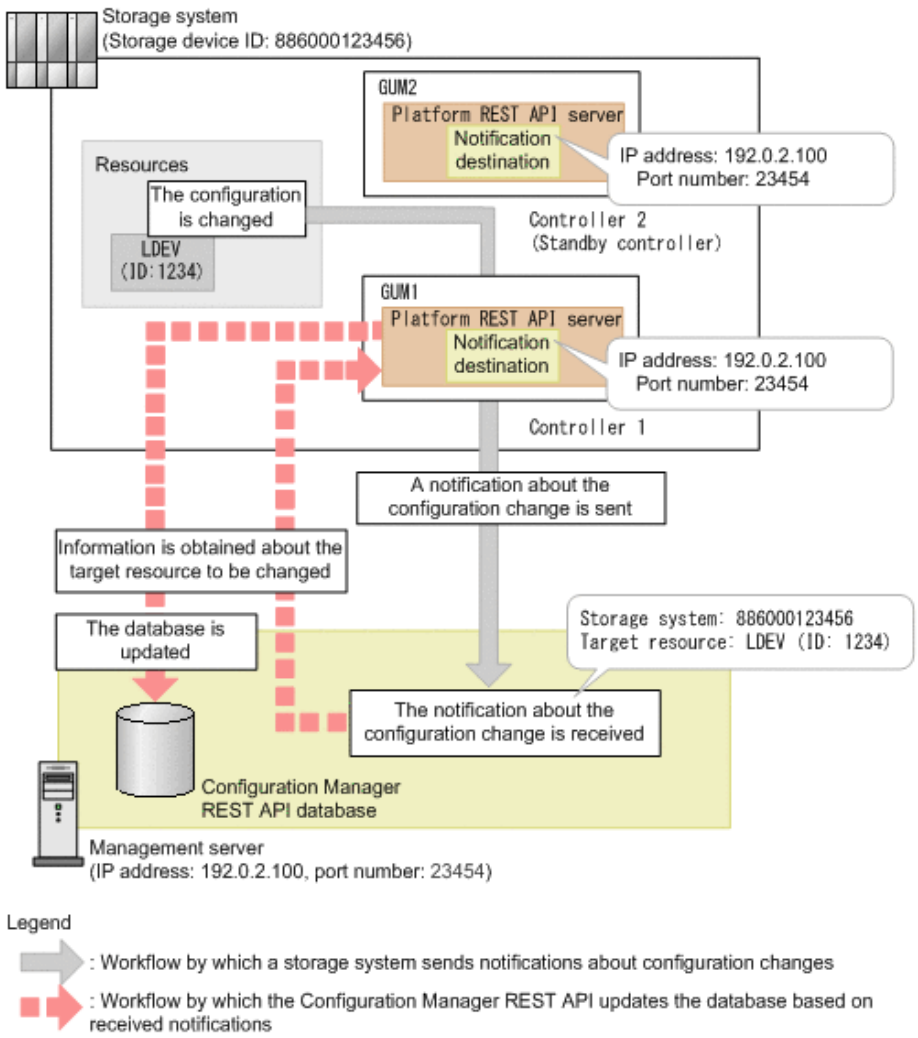
If you perform the operations shown below without running API requests for deleting information about storage systems, information about the Configuration Manager REST API server that is registered as a notification destination in the storage system will not be deleted. In that case, you need to run API requests for deleting the destinations.

- Changing the settings for, or removing storage systems
- Removing the Configuration Manager REST API

Workflow for handling notifications of configuration changes (VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900)

This section describes the workflow for updating the Configuration Manager REST API database after receiving notifications of changes to storage system configurations.

The following example shows the workflow for handling notifications of configuration changes.



For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, information about configuration-change notification destinations is registered on both the controller 1 side and on the controller 2 side. Notifications of changes to the storage system configuration are sent either from the controller 1 side or from the controller 2 side. In the example in the figure above, notification of a configuration change is sent from the controller 1 side. Based on the received change notifications, the Configuration Manager REST API server obtains target resource information from the Platform REST API server and automatically updates the Configuration Manager REST API database used for the search function.

Note:

If information about only notification destinations on the controller 1 side or only those on the controller 2 side is registered in the storage system, the Configuration Manager REST API cannot correctly receive notifications of configuration changes.

Registering configuration-change notification destinations

To receive notifications of changes to storage system configurations, notification destinations on both the controller 1 side and on the controller 2 side must be registered in the storage system. If you execute the API request for registering storage systems or the API request for registering the destinations to which notifications of changes to storage system configurations are to be sent, the configuration-change notification destinations on the controller 1 side and those on the controller 2 side will be registered with different object IDs at the same time.

Tip:

After you register the configuration-change notification destinations, if the IP address or port number of the Configuration Manager REST API server changes, re-register the registered notification destinations.

Deleting configuration-change notification destinations

If you no longer require notifications of changes to storage system configurations, delete the configuration-change notification destinations that were registered in the storage system. After you do this, notifications will no longer be sent from the storage system.

Running API requests for deleting information about storage systems also deletes the configuration-change notification destinations on both the controller 1 side and the controller 2 side at the same time. Therefore, you do not have to run subsequent API requests for deleting the destinations.

To use an API request to delete a configuration-change notification destination, you must run the API request separately for the controller 1 side and for the controller 2 side.

Note:

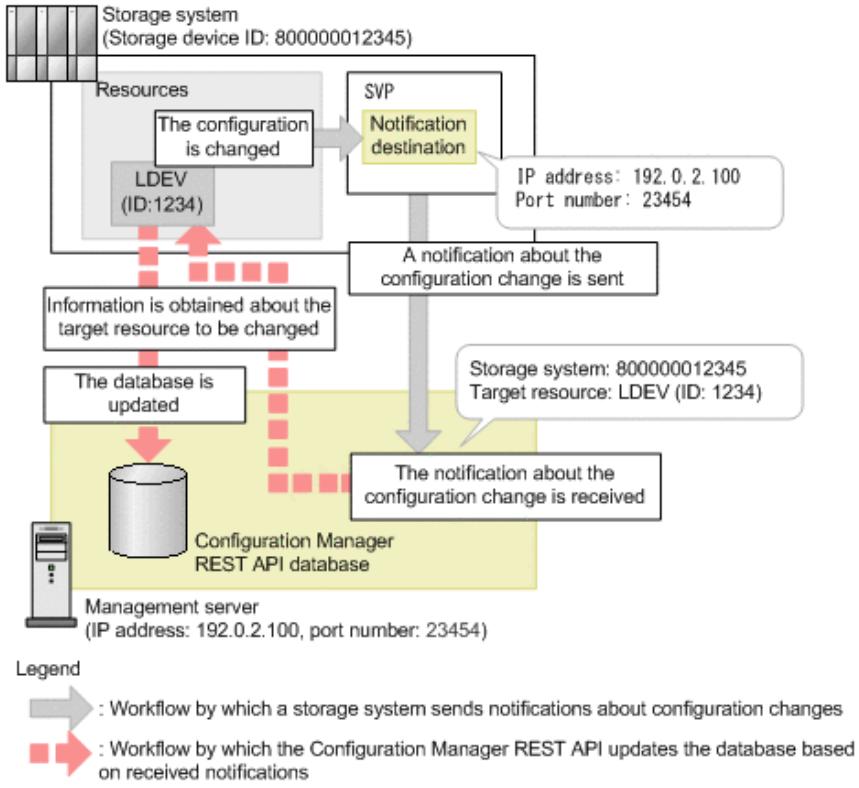
If you perform the operations shown below without running API requests for deleting information about storage systems, information about the REST API server that is registered as a notification destination in the storage system will not be deleted. In that case, you need to run API requests for deleting the destinations. If you run the API request for deleting notification destinations, be sure to delete those on the controller 1 side as well as those on the controller 2 side.

- Changing the settings for, or removing storage systems
- Removing the Configuration Manager REST API

Workflow for handling notifications of configuration changes (VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, VSP F1500)

This section describes the workflow for updating the Configuration Manager REST API database after receiving notifications of changes to storage system configurations.

The following example shows the workflow for handling notifications of configuration changes.



For VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500, information about the destinations of notifications of changes to the storage system configuration is registered in the SVP. Based on the received change notifications, the Configuration Manager REST API server obtains target resource information from the storage system and automatically updates the Configuration Manager REST API database used for the search function.

Registering configuration-change notification destinations

To receive notifications of changes to storage system configurations, destinations must be registered in the storage system. The method of registering destinations depends on the version of the Configuration Manager REST API that is used when registering storage systems.

- For storage systems registered by using version 8.5.0 or later of the Configuration Manager REST API:

  If you run API requests for registering storage systems, configuration-change notification destinations will be also registered at the same time.

- For storage systems registered by using a version earlier than 8.5.0 of the Configuration Manager REST API:

  First, upgrade the Configuration Manager REST API to version 8.5.0 or later, and then run API requests for registering configuration-change notification destinations.

Tip:

After you register the configuration-change notification destinations, if the IP address or port number of the Configuration Manager REST API server changes, re-register the registered notification destinations.

After you register the configuration-change notification destinations, if the port number used by the SVP for HTTPS communication changes, perform the following operations:

1. Forcibly delete information about the storage system registered in the Configuration Manager REST API server.
2. Specify the new port number, and then re-register information about the storage system.
3. Get a list of the configuration-change notification destinations.
4. Delete any old configuration-change notification destinations that remain.

Deleting configuration-change notification destinations

If you no longer require notifications of changes to storage system configurations, delete the configuration-change notification destinations that were registered in the storage system. After you do this, notifications will no longer be sent from the storage system.

Running API requests for deleting information about storage systems also deletes the configuration-change notification destinations at the same time. Therefore, you do not have to run subsequent API requests for deleting the destinations.

If you perform the operations shown below without running API requests for deleting information about storage systems, information about the Configuration Manager REST API server that is registered as a notification destination in the storage system will not be deleted. In that case, you need to run API requests for deleting the destinations.

- Changing the settings for, or removing storage systems
- Removing the Configuration Manager REST API

Getting a list of destinations for sending notifications about changes to storage system configurations

The following request gets a list of configuration-change notification destinations registered in a storage system. The request allows you to check whether the Configuration Manager REST API being used is registered as a notification destination by using an IP address and port number.

Note:

- You can use this API request for the following storage systems:
  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
  - VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
  - VSP G1500 or VSP F1500
- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, you can get information about configuration-change notification destinations on the controller 1 side and on the controller 2 side.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/change-notification-settings
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

The following is an example of output for VSP G200, G400, G600, G800, VSP F400, F600, F800:

```
{
  "data":[
    {
      "receiverId": "changeNotification-ffbac078-8cf0-483f-817d-184a5e812611",
      "receiverIp": "192.0.2.100",
```

```
      "receiverPort":23454,
      "mappWebServerHttpsPort": 443
    },
    {
      "receiverId": "changeNotification-ffbac078-8cf0-483f-817d-184a5e812612",
      "receiverIp": "192.0.2.101",
      "receiverPort": 23454,
      "mappWebServerHttpsPort": 443
    }
  ]
}
```


The following is an example of output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:


```
{
  "data" : [ {
    "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812621",
    "receiverIp" : "192.0.2.100",
    "receiverPort" : 23454,
    "ctl" : "CTL1"
  }, {
    "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812623",
    "receiverIp" : "192.0.2.101",
    "receiverPort" : 23454,
    "ctl" : "CTL1"
  }, {
    "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812622",
    "receiverIp" : "192.0.2.100",
    "receiverPort" : 23454,
    "ctl" : "CTL2"
  }, {
    "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812624",
    "receiverIp" : "192.0.2.101",
    "receiverPort" : 23454,
    "ctl" : "CTL2"
  } ]
}
```


Attribute	Type	Description
receiverId	string	Object ID of information about the configuration-change notification destination
receiverIp	string	IP address of the configuration-change notification destination

Attribute	Type	Description
receiverPort	int	Port number of the configuration-change notification destination
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication This attribute is output for VSP G200, G400, G600, G800, VSP F400, F600, F800.
ctl	string	The controller to which configuration-change notification destinations are registered ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2 This attribute is output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456/change-
notification-settings
```

Getting specific destinations for sending notifications about changes to storage system configurations

The following request gets information about a configuration-change notification destination registered in a storage system by specifying the object ID of the notification destination. The request allows you to check whether the notification destination for the specified object ID exists.

Note:

- You can use this API request for the following storage systems:
  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
  - VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
  - VSP G1500 or VSP F1500
- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, you will need to use different requests to get information about configuration-change notification destinations on either controller 1 or controller 2.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/v1/objects/storages/storage-device-ID/change-notification-settings/
object-ID
```

Request message

Object ID

Specify the value of `receiverId` that was obtained by the processing to get the list of configuration-change notification destinations for storage systems.

Attribute	Type	Description
receiverId	string	(Required) Object ID of information about the configuration-change notification destination

Query parameters

None.

Body

None.

Response message

Body

The following is an example of output for VSP G200, G400, G600, G800, VSP F400, F600, F800:

```
{
  "receiverId": "changeNotification-ffbac078-8cf0-483f-817d-184a5e812615",
  "receiverIp": "192.0.2.100",
  "receiverPort": 23454,
  "mappWebServerHttpsPort": 443
}
```

The following is an example of output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:

```
{
  "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812621",
  "receiverIp" : "192.0.2.100",
  "receiverPort" : 23454,
  "ctl" : "CTL1"
}
```

Attribute	Type	Description
receiverId	string	Object ID of information about the configuration-change notification destination
receiverIp	string	IP address of the configuration-change notification destination
receiverPort	int	Port number of the configuration-change notification destination
mappWebServerHttpsPort	int	Port number used by the SVP for HTTPS communication This attribute is output for VSP G200, G400, G600, G800, VSP F400, F600, F800.
ctl	string	The controller to which configuration-change notification destinations are registered ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2 This attribute is output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456/change-
notification-settings/changeNotification-ffbac078-8cf0-483f-817d-184a5e812615
```

Registering destinations for sending notifications about changes to storage system configurations

The following request registers a configuration-change notification destination in the storage system that is registered in the Configuration Manager REST API server.

Note:

- You can use this API request for the following storage systems:
  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
  - VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
  - VSP G1500 or VSP F1500
- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, information about configuration-change notification destinations on controller 1 and 2 is simultaneously registered by using different object IDs.

Tip:

If notification destinations have already been registered and the IP address or port number of the Configuration Manager REST API server changes, re-register the registered notification destination.

If notification destinations have already been registered and the port number used by the SVP for HTTPS communication changes, perform the following operations:

1. Forcibly delete information about the storage system registered in the Configuration Manager REST API server.
2. Specify the new port number, and then re-register information about the storage system.
3. Get a list of the configuration-change notification destinations.
4. Delete any old configuration-change notification destinations that remain.

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
POST base-URL/v1/objects/storages/storage-device-ID/change-notification-settings
```

Request message

Object ID

None.

Query parameters

None.

Body

The following is a coding example for specifying the port number to be used by the SVP for HTTPS communication:

```
{
  "mappWebServerHttpsPort": 445
}
```

Attribute	Type	Description
mappWebServerHttpsPort	int	(Optional) Port number used by the SVP for HTTPS communication For VSP G200, G400, G600, G800, VSP F400, F600, F800, if the port number has been changed from the default value `443`, specify the new value.

Attribute	Type	Description
		If this attribute is omitted, `443` will be set. If the microcode version of VSP G200, G400, G600, G800, VSP F400, F600, F800 is 83-04-44-*XX*/*XX* or later, and this value is changed, make sure that you specify the same value for the `mappWebServerHttpsPort` attribute that is set when SSL communication is used between the REST API server and the storage system.

Response message

Body

The following is an example of output for VSP G200, G400, G600, G800, VSP G1000, VSP G1500, VSP F400, F600, F800, or VSP F1500:

```
{
  "receiverId": "changeNotification-ffbac078-8cf0-483f-817d-184a5e812613"
}
```

The following is an example of output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900:

```
{
  "receiverId" : "changeNotification-ffbac078-8cf0-483f-817d-184a5e812621",
  "standbyReceiverId" : "changeNotification-ffbac078-8cf0-483f-817d-
184a5e812622",
  "ctl" : "CTL1"
}
```

Attribute	Type	Description
receiverId	string	Object ID of information about the configuration-change notification destination
standbyReceiverId	string	Object ID of information about the configuration-change notification destination (the standby-controller side) This attribute is output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Attribute	Type	Description
ctl	string	Indicates that the value of the `receiverId` attribute belongs to either controller 1 or controller 2. ▪ `CTL1`: Controller 1 ▪ `CTL2`: Controller 2 This attribute is output for VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X POST --data-binary @./
InputParameters.json https://192.0.2.100:23451/ConfigurationManager/v1/objects/
storages/834000123456/change-notification-settings
```

Deleting destinations for sending notifications about changes to storage system configurations

The following request deletes configuration-change notification destinations registered in a storage system.

Note:

- You can use this API request for the following storage systems:
  - VSP One B20
  - VSP 5000 series
  - VSP E series
  - VSP G350, G370, G700, G900, VSP F350, F370, F700, F900
  - VSP G200, G400, G600, G800, VSP F400, F600, F800 whose microcode version is 83-04-*XX*-*XX*/*XX* or later
  - VSP G1000 whose microcode version is 80-05-*XX*-*XX*/*XX* or later
  - VSP G1500 or VSP F1500
- For VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, you will need to use different requests to delete configuration-change notification destinations on the controller 1 side or on the controller 2.

Execution permission

Security Administrator (View Only) or Security Administrator (View & Modify)

Request line

```
DELETE base-URL/v1/objects/storages/storage-device-ID/change-notification-settings/
object-ID
```

Request message

Object ID

Specify the value of `receiverId` that was obtained by the processing to get the list of configuration-change notification destinations for storage systems.

Attribute	Type	Description
receiverId	string	(Required) Object ID of information about the configuration-change notification destination

Query parameters

None.

Body

None.

Response message

Body

```
{
  "receiverId": "changeNotification-ffbac078-8cf0-483f-817d-184a5e812616"
}
```

Attribute	Type	Description
receiverId	string	Object ID of the information about the notification destination that was deleted

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X DELETE https://
192.0.2.100:23451/ConfigurationManager/v1/objects/storages/834000123456/change-
notification-settings/changeNotification-ffbac078-8cf0-483f-817d-184a5e812615
```

Appendix E: Getting configuration information (including additional information) from the SVP

You can get and update configuration information (including additional information) from the storage system cache on the SVP.

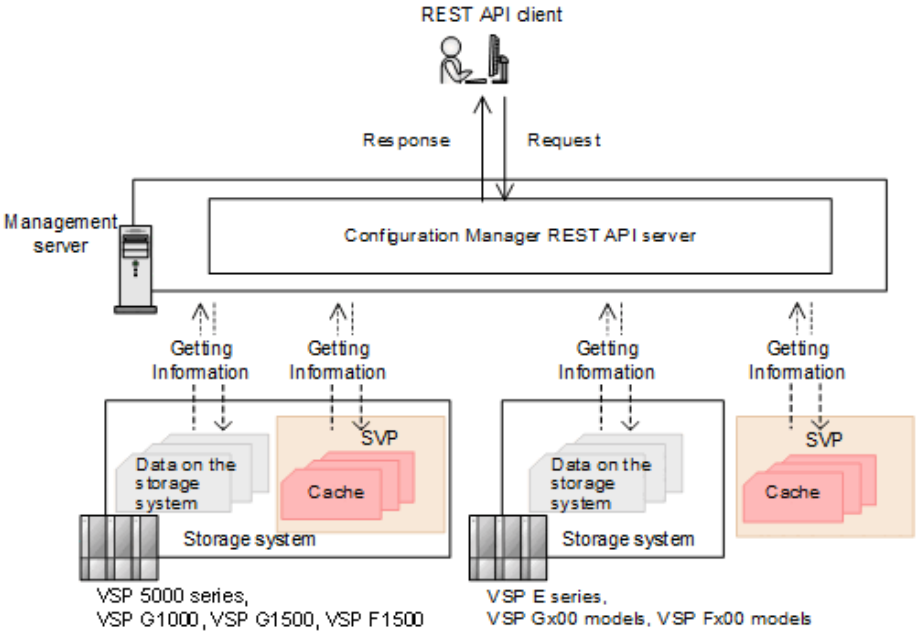
About getting additional information from the SVP

This section describes how to get configuration information, including additional information, from the storage system cache on the SVP after you perform an operation such as changing the configuration.

You can get this information from the following storage systems:

- VSP 5000 series
- VSP E series in a configuration that links to an SVP
- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 in a configuration that links to an SVP
- VSP G200, G400, G600, G800, VSP F400, F600, F800
- VSP G1000, VSP G1500, VSP F1500

The following figure shows an implementation in which configuration information, including additional information, is obtained from the storage system cache on the SVP.



For details on the storage system configuration for VSP E series, VSP G350, G370, G700, G900, and VSP F350, F370, F700, F900 that links with the SVP, see the description of the VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 configurations in which a link to the SVP is established (on page 1630).

API requests for getting information from the SVP

The API requests that get information from the SVP storage system cache can get configuration information (including additional information) and copy pair information.

- The following API requests can get configuration information, including additional information:
  - Summary information about storage systems

    API: Getting summary information about storage systems (on page 223)
  - Channel board information

    API: Getting information about channel boards (on page 1445)

- The following API requests can get configuration information, including additional information, by specifying a query parameter:
  - Information about parity groups

    API: Getting information about parity groups (on page 386)

    Query parameter: `detailInfoType=class`
  - Information about external volume group

    API: Getting information about external volume groups (on page 755)

    Query parameter: `detailInfoType=class`
  - Information about drives[#1]

    API: Getting a list of drive information (on page 400)

    Query parameter: `detailInfoType=class`
  - Information about volumes

    API: Getting volume information (on page 431)

    Query parameter: `detailInfoType=class`

    API: Getting information about virtual LDEVs (on page 1460)

    Query parameter: `detailInfoType=class`
  - Information about ports

    API: Getting information about a specific port (on page 510)

    Query parameter: `detailInfoType=class`
  - Information about pools

    API: Getting pool information (on page 660)

    Query parameter: `detailInfoType=class`
  - Information about remote copy groups

    API: Getting information about a specific remote copy group (on page 1019)

    Query parameter: `detailInfoType=class`

    API: Getting information about a specific remote copy group (on page 1111)

    Query parameter: `detailInfoType=class`
  - Information about hardware installed on a storage system[#2]

    API: Getting information about the hardware installed in a storage system (on page 1407)

    Query parameter: `componentOption=class`

- The following API requests can get information about copy pairs:
  - Getting information about all of ShadowImage pairs

    API: Getting information about all of ShadowImage pairs (on page 808)
  - Getting information about all of Thin Image pairs

    API: Getting information about all of Thin Image pairs (on page 875)
  - Getting information about all of remote copy pairs (TrueCopy/Universal Replicator)

    API: Getting information about all of remote copy pairs (on page 1042)
  - Getting information about all of remote copy pairs (global-active device)

    API: Getting information about all of remote copy pairs (on page 1134)
- The following API requests can add and get detailed information about copy pairs, by specifying a query parameter:
  - Getting a list of copy groups (ShadowImage)

    API: Getting a list of copy groups (on page 792)

    Query parameter: `detailInfoType=pair`
  - Getting information about Thin Image pairs in units of snapshot groups

    API: Getting information about Thin Image pairs in units of snapshot groups (on page 846)

    Query parameter: `detailInfoType=pair`
  - Getting a list of remote copy groups (TrueCopy/Universal Replicator)

    API: Getting a list of remote copy groups (on page 1008)

    Query parameter: `detailInfoType=pair`
  - Getting a list of remote copy groups (global-active device)

    API: Getting a list of remote copy groups (on page 1101)

    Query parameter: `detailInfoType=pair`
  - Getting a list of copy groups (Volume Migration)

    API: Getting a list of copy groups (Volume Migration) (on page 1184)

    Query parameter: `detailInfoType=pair`

#1: If the storage system is VSP G1000,VSP G1500, and VSP F1500, all information (not only additional information) is obtained from the storage system cache.

#2: For the information about the hardware installed in the storage system, only additional information is obtained from the storage system cache.

It usually takes from one to five minutes (but can take as long as an hour) before the latest information is applied to the cache. To obtain the latest information, run the API request that updates the cache of storage system configuration information to refresh the cache data, and then run the API request for getting information.

Updating the cache of storage system configuration information

The following API request updates the cache of storage system configuration information.

The procedure for obtaining information about resources after performing operations such as changing the configuration of resources is as follows.

1. Run the API request that changes the configuration of resources described in the explanation about API requests for getting information from the SVP.
2. Run the API request that updates the cache of storage system configuration information.

   It takes about 10 seconds or longer to update the cache information. Depending on the storage system usage status, it might take as long as 20 minutes to receive a response for this API request. Also, if multiple operations for changing the configuration are running concurrently, it might take a long time to receive a response for this API request.

   We recommend that you lock the target resources before running this API request.

   Note:

   This API request might fail depending on the number of configuration change operations and the number of resources such as LDEVs. If such a failure occurs, the HTTP status code 503 will be returned. In such a case, wait a while, and then run the request again.
3. Run the API request that obtains information about the resources whose configuration has been changed.

Execution permission

Storage Administrator (View)

Request line

```
PUT base-URL/v1/storage-device-ID/services/storage-cache-service/actions/refresh/
invoke
```

You can run this API request in a POST method.

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body

None.

Action template

None.

Status codes

For details on the status codes of the request for this operation, see the description of HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X PUT https://
192.0.2.100:23451/ConfigurationManager/v1/900000012345/services/storage-cache-service/
actions/refresh/invoke -d ""
```

Appendix F: Specifying settings to link the REST API to Ops Center Analyzer detail view

If you want to link the REST API to Ops Center Analyzer detail view, you will need to specify certain settings.

Changing the Java heap size when the REST API is to be linked to Ops Center Analyzer detail view

If you want to link the REST API to Ops Center Analyzer detail view, change the size of the Java heap used by the REST API server to 6,144 MB.

Before you begin

Log in to the management server as any one of the following user types:

- A user with Administrator permissions (in Windows)
- Root user (if the REST API was installed by the root user in Linux)
- A non-root user who installed the REST API

Tip:

You can check the value that is currently set by checking the value of the `rest.java.heapMemory.size` property in the `StartupV.properties` file, which is stored in the following location. If the file does not exist or the file does not contain the `rest.java.heapMemory.size` property, this indicates that the default value is set.

In a Windows OS:

REST-API-installation-destination\data\properties\StartupV.properties

In a Linux OS:

REST-API-installation-destination/data/properties/StartupV.properties

Procedure

1. Run the following command:

In a Windows OS:

REST-API-installation-destination\bin\setProperty.bat rest.java.heapMemory.size 6144

In a Linux OS:

REST-API-installation-destination/bin/setProperty.sh rest.java.heapMemory.size 6144

After the command is run, the REST API server restarts. If you specify `-noRestart` at the end of the command line, command execution will end without restarting the REST API server.

When you run the `setProperty` command, the value of the `rest.java.heapMemory.size` property in the `StartupV.properties` file will be changed to 6144. If the file does not exist, it will be created.

Each time the command is run, the current `StartupV.properties` file is backed up. The backup file is created in the same directory and the name of the backup file will include the date and time of creation (for example, `StartupV_20200220-093320.properties`).

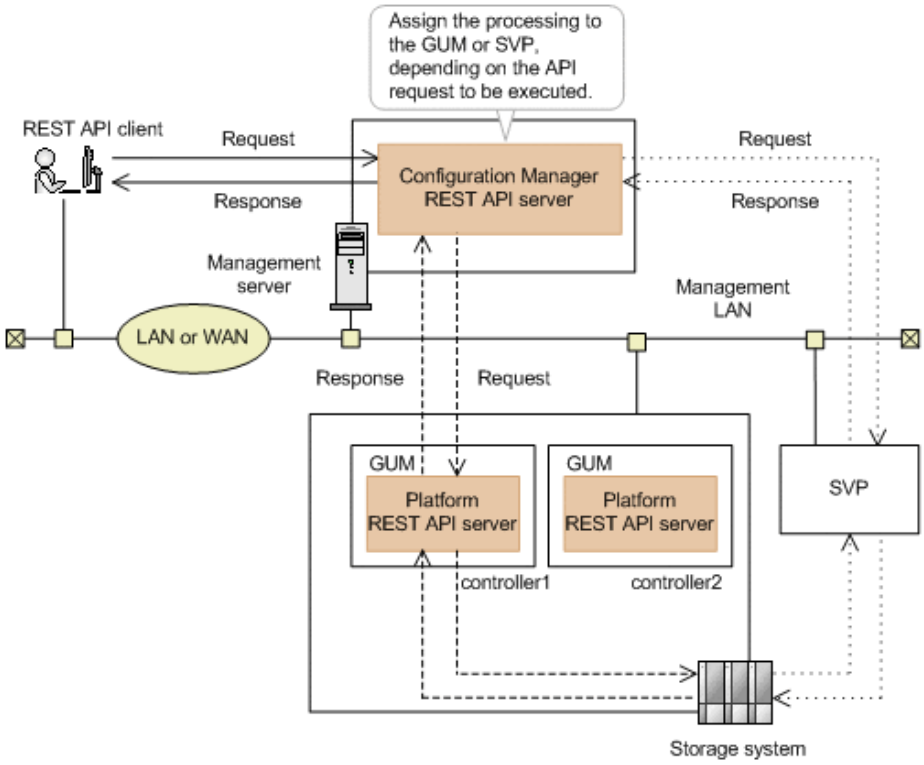
Appendix G: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 configurations in which a link to the SVP is established

You can use VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 storage systems in a configuration in which a link to the SVP is established.

Configuration in which a link to the SVP is established

If you are using a storage system of one of the following models, you can take advantage of additional functions if a link to the SVP is established: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

The figure below shows a REST API configuration in which a link to the SVP is established. To set up this configuration, enable link to the SVP by using the API request for registering a storage system.



The paths used to send requests and responses between the Configuration Manager REST API server and the storage system vary depending on the API requests to be executed.

For the port numbers used for the communication paths in this configuration, see the description on setting the port numbers to be used by the REST API.

If a link to the SVP is established, you can take advantage of the following additional functions.

- API requests that can get configuration information, including additional information:

  The following API request gets configuration information, including additional information, from the storage system cache.

  - Summary information about storage systems
  - Channel board information

- API requests that can get configuration information, including additional information, by specifying a query parameter:

  The following API request gets configuration information, including additional information, from the storage system cache by specifying a query parameter.

  - Information about parity groups
  - Information about external volume group
  - Information about drives
  - Information about volumes
  - Information about ports
  - Information about pools
  - Information about remote copy groups
  - Information about hardware installed on a storage system#

  #: Of the information about the hardware installed in the storage system, only additional information is obtained from the storage system cache.

- API requests that can get information about copy pairs
  - Getting information about all of ShadowImage pairs
  - Getting information about all of Thin Image pairs
  - Getting information about all of remote copy pairs (TrueCopy/Universal Replicator)
  - Getting information about all of remote copy pairs (global-active device)
- The API requests for adding and getting copy pair detailed information, by specifying a query parameter
  - Getting a list of copy groups (ShadowImage)
  - Getting information about Thin Image pairs in units of snapshot groups
  - Getting a list of remote copy groups (TrueCopy/Universal Replicator)
  - Getting a list of remote copy groups (global-active device)
  - Getting a list of copy groups (Volume Migration)

If you run these API requests in a configuration that is not linked to an SVP, the HTTP status code 412 will be returned.

- The API request for changing the password of the user (if `true` is specified for the `changesStorageDeviceListPassword` attribute)

  ```
  PUT base-URL/v1/objects/storages/storage-device-ID/users/object-ID
  ```

  You can change the user password for the Storage Device List.

- The time required to update the configuration information of a storage system can be reduced.

In this configuration, the following API request links with the SVP to get information.

- The API request for getting port information (if `logins` is specified for the `detailInfoType` query parameter)

  ```
  GET base-URL/v1/objects/storages/storage-device-ID/ports
  ```

Appendix H: SSL communication using VSP G1000, VSP G1500, VSP F1500 storage systems with a microcode version earlier than 80-05-2*X-XX*/*XX*

The following communication routes and ports are used when you establish SSL communication by using VSP G1000, VSP G1500, VSP F1500 storage systems whose microcode version is earlier than 80-05-2*X-XX*/*XX*.

About VSP G1000, VSP G1500, VSP F1500 storage systems with a microcode version earlier than 80-05-2*X-XX*/*XX*

If you perform a remote copy operation in an environment where SSL communication between the Configuration Manager REST API server and the storage system is enabled, different communication routes between the primary site and the secondary site are used for microcode versions earlier than 80-05-2*X-XX*/*XX* and for microcode version 80-05-2*X-XX*/*XX* or later.

The following ports and SSL communication routes are used for remote copy operations if the microcode version of the storage system is earlier than 80-05-2*X-XX*/*XX*.

For details on the ports and SSL communication routes that are used if remote copy operations are not performed, see the description of the ports used by the REST API and the description of the SSL communication routes between the Configuration Manager REST API server and the storage system.

Important:

For the storage system, we recommend using microcode version 80-05-2*X-XX*/*XX* or later.

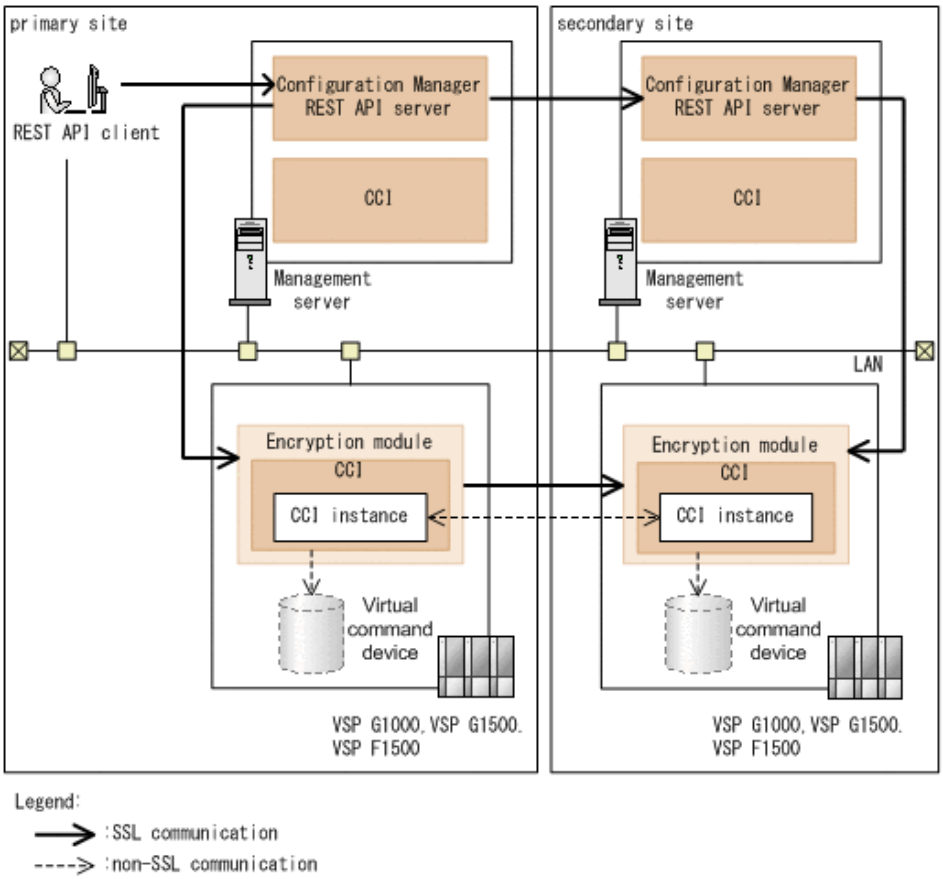
We do not recommend using SSL communication for storage systems for which the microcode version is 80-04-2*X-XX*/*XX* or later, but 80-05-2*X-XX*/*XX* or earlier, for the following reasons:

- If the same storage system is managed by multiple Configuration Manager REST API servers, the SSL communication settings cannot be enabled simultaneously for multiple Configuration Manager REST API servers.
- The resource lock function cannot be used when the SSL communication settings are enabled.

SSL communication routes and ports used when remote copy operations are performed

The following is an example of performing a remote copy operation by using VSP G1000, VSP G1500, VSP F1500 storage systems at the primary site and the secondary site.

SSL communication routes



In this configuration, SSL communication is used for the following routes:

- Between the REST API clients and the Configuration Manager REST API server of the primary site
- Between the Configuration Manager REST API server of the primary site and the encryption module in the SVP of the primary site
- Between the encryption module in the SVP of the primary site and the encryption module in the SVP of the secondary site
- Between the Configuration Manager REST API server of the primary site and the Configuration Manager REST API server of the secondary site
- Between the Configuration Manager REST API server of the secondary site and the encryption module in the SVP of the secondary site

Ports used for communication among the REST API clients, management servers, and storage systems

The ports used for communication among the REST API clients, management servers, and storage systems are the same as the ports used for VSP G1000, VSP G1500, VSP F1500 storage systems whose microcode version is 80-05-2*X-XX*/*XX* or later. For details, see the description of the ports used by the REST API.

Ports used for communication between the primary site and the secondary site

The ports used for VSP G1000, VSP G1500, VSP F1500 storage systems whose microcode version is earlier than 80-05-2*X-XX*/*XX* are as follows:

Primary site		Secondary site		
Machine	**Port number**	**Machine**	**Port number**	**Description**
Originator: Management server	any/tcp	Destination: Management server#	23451/tcp	Used for communication between the REST API server. This is the same port that is used for HTTPS communication from the REST API client to the REST API server. You can change the port number of the communication destination.
Originator: Storage system (SVP)		Destination: Storage system (SVP)	443/tcp	Used for communication between the encryption modules.
Originator: Storage system (SVP)	35049 to 36048/udp	Destination: Storage system (SVP)	37001 to 38000/udp	Used for communication between CCI.

#: In a one-site configuration, this is the same as the originator.

Appendix I: Configuration Manager version compatibility

This section describes the compatibility between the product versions, REST API versions, and the microcode versions of the storage system.

Compatible versions of Configuration Manager

The following table lists combinations of the product version and REST API version together with the storage system microcode versions required to use all the functions supported by the product. If your microcode version is earlier than those listed in the table, you will be unable to use some of the REST API functions.

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 11.0.4	1.57.0	**For VSP One B20** A3-04-01-*XX*/*XX* **For VSP 5000 series** 90-09-26-*XX*/*XX* **For VSP E series** 93-07-25-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-98-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-53-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-25-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-15-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 11.0.3	1.54.0	**For VSP One B20** A3-03-01-*XX*/*XX* **For VSP 5000 series** 90-09-25-*XX*/*XX* **For VSP E series** 93-07-24-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-97-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-52-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-24-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-14-*XX*/*XX*
Configuration Manager 11.0.2	1.43.0	**For VSP One B20** A3-02-21-*XX*/*XX* **For VSP 5000 series** 90-09-24-*XX*/*XX* **For VSP E series** 93-07-23-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-96-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-51-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-23-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-13-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 11.0.1	1.42.0	**For VSP 5000 series** 90-09-24-*XX*/*XX* **For VSP E series** 93-07-23-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-96-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-51-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-23-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-13-*XX*/*XX*
Configuration Manager 11.0.0	1.40.0	**For VSP 5000 series** 90-09-23-*XX*/*XX* **For VSP E series** 93-07-22-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-95-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-50-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-22-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-12-*XX*/*XX*
Configuration Manager 10.9.3	1.38.0	**For VSP 5000 series** 90-09-21-*XX*/*XX* **For VSP E series** 93-07-21-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP G1000, VSP G1500 or VSP F1500 80-06-94-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-49-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-21-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-11-*XX*/*XX*
Configuration Manager 10.9.2	1.36.0	**For VSP 5000 series** 90-09-01-*XX*/*XX* **For VSP E series** 93-07-01-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-93-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-48-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-20-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-10-*XX*/*XX*
Configuration Manager 10.9.1	1.34.0	**For VSP 5000 series** 90-08-81-*XX*/*XX* **For VSP E series** 93-06-81-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-92-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-47-*XX*/*XX*[#2]

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP N400, N600, N800 83-06-19-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-09-*XX*/*XX*
Configuration Manager 10.9.0	1.33.0	**For VSP 5000 series** 90-08-61-*XX*/*XX* **For VSP E series** 93-06-61-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-91-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-46-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-18-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-08-*XX*/*XX*
Configuration Manager 10.8.3	1.32.1	**For VSP 5000 series** 90-08-42-*XX*/*XX* **For VSP E series** 93-06-42-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-90-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-45-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-17-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-07-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 10.8.2	1.31.0	**For VSP 5000 series** 90-08-41-*XX*/*XX* **For VSP E series** 93-06-41-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-89-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-44-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-16-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-06-*XX*/*XX*
Configuration Manager 10.8.1	1.30.0	**For VSP 5000 series** 90-08-21-*XX*/*XX* **For VSP E series** 93-06-21-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-89-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-44-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-16-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-05-*XX*/*XX*
Configuration Manager 10.8.0	1.28.0	**For VSP 5000 series** 90-08-01-*XX*/*XX* **For VSP E series** 93-05-02-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP G1000, VSP G1500 or VSP F1500 80-06-87-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-42-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-15-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-03-*XX*/*XX*
Configuration Manager 10.7.0	1.27.0	**For VSP 5000 series** 90-07-01-*XX*/*XX* **For VSP E series** 93-05-02-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-87-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-42-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-14-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-03-*XX*/*XX*
Configuration Manager 10.6.1	1.26.0	**For VSP 5000 series** 90-06-21-*XX*/*XX* **For VSP E series** 93-04-02-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-86-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-41-*XX*/*XX*[#2]

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP N400, N600, N800 83-06-13-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-02-*XX*/*XX*
Configuration Manager 10.6.0	1.24.0	**For VSP 5000 series** 90-06-01-*XX*/*XX* **For VSP E series** 93-04-01-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-84-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-40-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-12-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-08-01-*XX*/*XX*
Configuration Manager 10.5.1	1.23.0	**For VSP 5000 series** 90-05-02-*XX*/*XX* **For VSP E series** 93-03-22-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-83-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-39-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-11-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-07-02-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 10.5.0	1.22.0	**For VSP 5000 series** 90-05-01-*XX*/*XX* **For VSP E990** 93-03-01-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-82-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-38-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-10-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-07-01-*XX*/*XX*
Configuration Manager 10.3.0 Configuration Manager 10.3.1	1.20.0 1.21.0	**For VSP 5000 series** 90-04-04-*XX*/*XX* **For VSP E990** 93-02-03-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-80-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-37-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-09-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-06-02-*XX*/*XX*
Configuration Manager 10.2.0	1.19.0	**For VSP 5000 series** 90-04-01-*XX*/*XX* **For VSP E990** 93-02-01-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP G1000, VSP G1500 or VSP F1500 80-06-77-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-36-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-08-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-06-01-*XX*/*XX*
Configuration Manager 10.1.0 Configuration Manager 10.1.1	1.18.0	**For VSP 5000 series** 90-03-01-*XX*/*XX* **For VSP E990** 93-01-01-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-74-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-35-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-07-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-05-01-*XX*/*XX*
Configuration Manager 10.0.1-01	1.17.1	**For VSP 5000 series** 90-02-01-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-73-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-34-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-06-*XX*/*XX*[#2]

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
		For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 88-04-03-*XX*/*XX*
Configuration Manager 10.0	1.15.2	**For VSP 5000 series** 90-01-42-*XX*/*XX* **For VSP G1000, VSP G1500 or VSP F1500** 80-06-71-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-33-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-05-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-04-01-*XX*/*XX*
Configuration Manager 8.6.5	1.14.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-68-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-31-*XX*/*XX*[#2] **For VSP N400, N600, N800** 83-06-03-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-03-25-*XX*/*XX*
Configuration Manager 8.6.4	1.12.3	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-65-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-29-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-03-23-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 8.6.3	1.12.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-64-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-28-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-03-2*X*-*XX*/*XX*
Configuration Manager 8.6.2	1.11.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-6*X*-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-24-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-03-0*X*-*XX*/*XX*
Configuration Manager 8.6.1	1.10.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-22-*XX*/80 or 80-06-40-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-22-*XX*/80[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-02-0*X*-*XX*/*XX*
Configuration Manager 8.6.0	1.9.1	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-2*X*-*XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-2*X*-*XX*/*XX*[#2] **For VSP G350, G370, G700, G900, VSP F350, F370, F700, F900** 88-01-0*X*-*XX*/*XX*

Product version	Configuration Manager REST API version[#1]	Microcode version of the storage system
Configuration Manager 8.5.4	1.8.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-06-0*X-XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-05-0*X-XX*/*XX*[#2]
Configuration Manager 8.5.3	1.7.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-05-6*X-XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-04-6*X-XX*/*XX*
Configuration Manager 8.5.2	1.6.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-05-4*X-XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-04-4*X-XX*/*XX*
Configuration Manager 8.5.1	1.5.0	**For VSP G1000, VSP G1500 or VSP F1500** 80-05-2*X-XX*/*XX*[#2] **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-04-2*X-XX*/*XX*
Hitachi Command Suite 8.5.0	1.4.0	**For VSP G1000, VSP G1500, and VSP F1500** 80-05-0*X-XX*/*XX* **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-04-0*X-XX*/*XX*
Hitachi Command Suite 8.4.1	1.3.0	**For VSP G1000** 80-04-2*X-XX*/*XX* **For VSP G200, G400, G600, G800, VSP F400, F600, F800** 83-03-2*X-XX*/*XX*

#1: To check the version of the REST API, run the API for getting the version information.

#2: In an environment where SSL communication is used between the REST API server and the storage system, if you want to use all of the REST API functions, the microcode version of the storage system must be of a version supported by the applicable version of Configuration Manager.

If Configuration Manager does not support the microcode version of the storage system, one or more the REST API functions might not work. In such cases, check the REST API manual for the Configuration Manager version corresponding to the microcode version of the storage system, to see which API functions are supported.

Notes regarding environments where a storage system's microcode version has been downgraded

The following describes points to note when a storage system's microcode version is downgraded, as well as methods for handling related issues.

Note:

These notes apply to the following storage system models: VSP 5000 series, VSP G1000, VSP G1500, VSP F1500, VSP G200, G400, G600, G800, VSP F400, F600, F800.

If the maintenance personnel downgrades the microcode version on the storage system, you will no longer be able to use the Configuration Manager REST API managed by that storage system to view the following information.

- Job information

  Past API execution histories cannot be viewed.

- Remote storage system information

  Because remote storage system information can no longer be viewed, remote copy operations cannot be performed.

If you want to run remote copy operations in an environment where the microcode version has been downgraded, perform the following procedure.

1. Get list information about remote storage systems.

   Check whether you can get information about remote storage systems that were registered before the microcode version was downgraded.

2. If you cannot get information about these remote storage systems, register the remote storage system information again.

Appendix J: Implementing retry processing

This section describes points to consider when you implement retry processing in scripts that use the REST API.

Implementing retry processing

When you use the REST API to create a client program, implement the retry processing properly so that the program is executed as intended. After executing the retry processing, we recommend that you verify the client program in a system configuration similar to the production environment.

Retry conditions

Sometimes a REST API request cannot be executed, because for example, the network or server is temporarily busy or resources of the storage system are locked. In such cases, you might be able to resume processing of the request by implementing processing to retry failed requests. To determine whether an error can be handled by retrying the request, check the response information, such as HTTP status codes and error codes. The following describes the conditions under which errors can be handled by retrying the failed request.

A request can be retried when one of the following conditions is met:

- The returned HTTP status code is 503 (Service unavailable).
- When a job cannot be executed, RETRY is returned for solutionType of the error object.
- When REST API is used for a long period, the following response is returned (VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900).

  1. The HTTP status code is 500, and a response body is returned in HTML format for a several minutes.
  2. When executing the API except discarding the sessions API, a blank response body is returned with the status code 200.

     After that, the symptom described in 1. occurs.

  In this case, execute the API again until an HTML format response is not returned with the status code 500.

- A specific message ID or an error code of the storage system is returned to the error object.

  Whether the error can be handled by retrying the request depends on the error object. You can get the error object from either of the following:

  - Response returned when the API request is issued
  - Response from the API request that gets job information

Error object	Message ID	Error codes from the storage system		
		SSB1	SSB2	errorCode
Response returned when the API request is issued	KART00003-E KART00006-E KART30003-E KART30090-E KART30095-E KART30096-E KART30097-E KART40042-E KART40049-E KART40051-E KART40052-E	--	--	--
Response from the API request that gets job information	KART30000-E	2E11	2205	--
	KART30008-E KART30072-E	--	--	--

(Legend)

--: Not applicable

- When the API request is for locking a resource group, a specific message ID or error code is returned to the error object.

  The following table describes the retry conditions for the API request that locks a resource group.

Error object	Message ID	Error codes from the storage system		
		SSB1	SSB2	errorCode
Response returned when the API request is issued	--	--	--	--
Response from the API request that gets job information	KART40050-E KART40052-E	--	--	--
	KART30000-E	--	--	EX_EACCES

(Legend)

--: Not applicable

Verifying client programs

Verify client programs in a system configuration similar to the production environment.

Verify them from the following viewpoints:

- Whether client programs in which retry conditions are implemented are executable
- Whether client programs end within the expected execution time

If the verification result is not as expected, check and, if necessary, revise the programs from the following viewpoints:

- Adjust the retry count and retry time of clients' API requests.
- Reduce the number of API requests to be executed at the same time, and reduce the retry frequency of clients' API requests.

  You need to pay attention to the maximum number of concurrent executions for the following API requests. See the estimated maximum number.

  For VSP One B20, VSP 5000 series:

API requests for which the number of concurrent executions is limited	Maximum number of requests that can be executed at the same time
API request for getting a list of resource groups	2
API request for getting global-active device pair information	2

  For VSP E series, VSP G350, G370, G700, G900 or VSP F350, F370, F700, F900:

API requests for which the number of concurrent executions is limited	Maximum number of requests that can be executed at the same time
API request for getting a list of resource groups	2
API request for getting volume information (the number of volumes to be obtained: 2,049 or more)	2
API request for getting port information (when executed with `detailInfoType=logins` specified in the query, in a configuration that is not linked to an SVP)	2 (number of ports: 8) 1 (number of ports: 40)
API request for getting port information (when run with `detailInfoType=loginHostNqn` specified in the query and `portId` not specified, on VSP E1090 or VSP E1090H)	11 (number of Fibre Channel ports: 8)

API requests for which the number of concurrent executions is limited	Maximum number of requests that can be executed at the same time
	3 (number of Fibre Channel ports: 40)
API request for getting information about host groups or iSCSI targets (when executed without specifying `portId` as a query parameter)	13 (number of ports: 32) 6 (number of ports: 80)
API request for getting global-active device pair information	2
API request for getting information about virtual LDEVs (the number of virtual LDEVs to be obtained is 2,049 or more)	2

Note:

If the storage system model is VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900, in a configuration in which no link is established to the SVP, when configuration information of a storage system is updated, this API request is run on the Platform REST API server. While this API request is running, it might affect the execution of API requests for which the number of concurrent executions is restricted.

Sample coding for implementing retry processing

The following explains sample code for implementing retry processing when an API request is executed.

Example of implementing retry processing

If the API request (function_xxx) fails, the system determines whether the retry conditions are met based on the status code or error message returned by the error object. This sample code is written so that retry processing is performed if the returned HTTP status code is 503 (Service unavailable) and if the message ID returned by the error object meets the retry conditions. If the retry conditions are met, the system retries the request at the specified interval for the specified maximum number of times.

```
retry_error_list = ["KART30095-E", "KART30096-E", "KART30003-E", "KART30090-E", ...]
retry_count = 1

from requests.structures import CaseInsensitiveDict

while True:
    url = block_storage_api.function_xxx()
```

```
    r = requests.post(url, headers=headers, auth=USER_CREDENTIAL,
                      verify=False)
    if r.status_code == http.client.OK or r.status_code == http.client.ACCEPTED:
        # Succeeded #
        print("Succeeded")
        break
    else:
        # failed #
        error_code = CaseInsensitiveDict(r.json())["messageId"]
        if r.status_code == http.client.SERVICE_UNAVAILABLE or error_code in
retry_error_list:
            if retry_count > MAX_RETRY_COUNT:
                raise Exception("Timeout Error! "
                                "Operation was not completed.")
            print("Retry API")
            time.sleep(WAIT_TIME)
            retry_count += 1
        else:
            raise requests.HTTPError(r)
```

Succeeded

Processing for when the API request succeeds

This sample code defines status code 200 (http.client.OK) and status code 202 (http.client.ACCEPTED). When implementing a process, define it in accordance with the processing method (synchronous or asynchronous) for the API request.

Failed

Retry processing for when an API request fails

If the status code is 503 (http.client.SERVICE_UNAVAILABLE) or the error message matches the message ID defined for the retry_error_list, the system retries the API request at the specified interval (WAIT_TIME) for specified maximum number of times (MAX_RETRY_COUNT). Specify an appropriate maximum number of times and interval according to your system design and operations.

Appendix K: Running the REST APIs that respond quickly for the storage systems VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900

The following explains the REST APIs that, for the following storage systems, get information in a simple format, and respond quickly when managing and performing operations for storage systems: VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900.

Running the REST APIs

The storage systems VSP E series, VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 have REST APIs that can get information in simple format, and respond quickly when managing and performing operations for storage systems. The request lines for these REST APIs include `simple`, and differ from the request lines of APIs without `simple`.

The following table lists the REST APIs that respond quickly.

For details about how to use the REST APIs in this table, see the *Hitachi Storage Advisor Embedded Guide*. In addition, carefully read the explanations of the common specifications and the APIs to make sure that you fully understand the content before running the APIs. For details about the authentication information to be specified in the Authorization header, see the section describing user authentication.

Note:

Specify the base URL in following formats:

```
protocol://host-name:port-number/ConfigurationManager
```

- For the protocol, specify `https` or `http`. We recommend specifying `https` for security.
- For the host name, specify the IP address of the management server or a host name that can be resolved.
- For the port number, specify the port number to be used for communications with the REST API server. The default port number is `23451` for SSL communications, and `23450` for non-SSL communications.

Common operations in the REST API

Operation	Request line	Processing method
Getting status information about an API function that performs asynchronous processing	`GET base-URL/simple/v1/objects/storages/storage-device-ID/command-status/object-ID`	Synchronous
Deleting status information about an API function that performs asynchronous processing	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/command-status/object-ID`	Synchronous

Note:

If an API function that performs asynchronous processing is run, a job object that gets information about the API progress status or execution results will not be returned.

Run an API for getting the status information of API functions that perform asynchronous processing, and then get the `commandStatus` object for getting the API progress status or execution results.

For details, see the description of the API for getting status information about API functions that perform asynchronous processing in the *Hitachi Storage Advisor Embedded Guide*.

Operations on an entire storage system

Operation	Request line	Processing method
Getting information about a storage system	`GET base-URL/simple/v1/objects/storages/storage-device-ID/storage`	Synchronous
Getting the operating status of snapshots and pools	`GET base-URL/simple/v1/objects/storages/storage-device-ID/health-status`	Synchronous

Drive management

Operation	Request line	Processing method
Getting drive information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/drives`	Synchronous
Getting information about a specific drive	`GET base-URL/simple/v1/objects/storages/storage-device-ID/drives/object-ID`	Synchronous
Setting up a spare drives	`POST base-URL/simple/v1/objects/storages/storage-device-ID/drives/actions/set-spare/invoke`	Asynchronous
Releasing the spare drive setting	`POST base-URL/simple/v1/objects/storages/storage-device-ID/drives/actions/release-spare/invoke`	Asynchronous

Pool management

Operation	Request line	Processing method
Getting pool information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/pools`	Synchronous
Getting information about a specific pool	`GET base-URL/simple/v1/objects/storages/storage-device-ID/pools/object-ID`	Synchronous
Creating a pool	`POST base-URL/simple/v1/objects/storages/storage-device-ID/pools`	Asynchronous
Changing pool settings	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/pools/object-ID`	Synchronous
Deleting a pool	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/pools/object-ID`	Asynchronous

Operation	Request line	Processing method
Expanding the capacity of a pool	`POST base-URL/simple/v1/objects/storages/storage-device-ID/pools/object-ID/actions/expand/invoke`	Asynchronous

Port management

Operation	Request line	Processing method
Getting port information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/ports`	Synchronous
Getting information about a specific port	`GET base-URL/simple/v1/objects/storages/storage-device-ID/ports/object-ID`	Synchronous
Changing port settings	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/ports/object-ID`	Synchronous

Server management

Note:

You can use the API functions for server management if both of the following conditions are met:

- VSP G350, G370, G700, G900, VSP F350, F370, F700, F900 (The microcode version is 88-03-0*X-XX*/*XX* or later).
- The servers that use the storage system are managed in Storage Advisor Embedded.

Operation	Request line	Processing method
Getting server information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers`	Synchronous

Operation	Request line	Processing method
Getting information about a specific server	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID`	Synchronous
Registering a server	`POST base-URL/simple/v1/objects/storages/storage-device-ID/servers`	Asynchronous
Changing server settings	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID`	Asynchronous
Deleting a server	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID`	Asynchronous
Adding host groups (iSCSI target) to a server	`POST base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/actions/add-host-groups/invoke`	Asynchronous
Synchronizing a host group name (iSCSI target name) with a server nickname	`POST base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/actions/sync-host-group-names/invoke`	Asynchronous
Getting information about the WWN of an HBA (iSCSI name)	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/hbas`	Synchronous
Getting information about the WWN of an HBA (iSCSI name) of a specific server	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/hbas/object-ID`	Synchronous
Adding information about the WWN of an HBA (iSCSI name)	`POST base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/hbas`	Asynchronous
Deleting information about the WWN of an HBA (iSCSI name) from a server	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/hbas/object-ID`	Asynchronous

Operation	Request line	Processing method
Getting a list of server path information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/paths`	Synchronous
Getting information about the paths between a server and a specific port	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/paths/object-ID`	Synchronous
Adding path information to a server	`POST base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/paths`	Asynchronous
Deleting path information from a server	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/paths/object-ID`	Asynchronous
Getting information about iSCSI targets	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/target-iscsi-ports`	Synchronous
Getting information about a specific iSCSI target	`GET base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/target-iscsi-ports/object-ID`	Synchronous
Changing the settings of an iSCSI target	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/servers/object-ID/target-iscsi-ports/object-ID`	Asynchronous

Volume management

Operation	Request line	Processing method
Getting volume information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/volumes`	Synchronous
Getting information about a specific volume	`GET base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID`	Synchronous

Operation	Request line	Processing method
Creating a volume	`POST base-URL/simple/v1/objects/storages/storage-device-ID/volumes`	Asynchronous
Changing the volume settings	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID`	▪ Synchronous ▪ Asynchronous
Expanding the capacity of a volume	`POST base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID/actions/expand/invoke`	Synchronous
Deleting a volume	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID`	Asynchronous
Getting information about the QoS settings of a specific volume	`GET base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID/qos-setting`	Synchronous
Changing the QoS settings of a volume	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/volumes/object-ID/qos-setting`	Asynchronous
Getting information about the connections between volumes and servers	`GET base-URL/simple/v1/objects/storages/storage-device-ID/volume-server-connections`	Synchronous
Getting information about the connection between a volume and a specific server	`GET base-URL/simple/v1/objects/storages/storage-device-ID/volume-server-connections/object-ID`	Synchronous
Attaching a volume to a server	`POST base-URL/simple/v1/objects/storages/storage-device-ID/volume-server-connections`	Asynchronous
Detaching a volume from a specific server	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/volume-server-connections/object-ID`	Asynchronous

Snapshot operations

Operation	Request line	Processing method
Getting a list of snapshot group names	`GET base-URL/simple/v1/objects/storages/storage-device-ID/snapshot-groups`	Synchronous
Getting information about a specific snapshot group	`GET base-URL/simple/v1/objects/storages/storage-device-ID/snapshot-groups/object-ID`	Synchronous
Getting snapshot information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/snapshots`	Synchronous
Getting information about a specific snapshot	`GET base-URL/simple/v1/objects/storages/storage-device-ID/snapshots/object-ID`	Synchronous
Creating a snapshot	`POST base-URL/simple/v1/objects/storages/storage-device-ID/snapshots`	Asynchronous
Mapping a snapshot	`POST base-URL/simple/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/map/invoke`	Asynchronous
Restoring a snapshot	`POST base-URL/simple/v1/objects/storages/storage-device-ID/snapshots/object-ID/actions/restore/invoke`	Asynchronous
Deleting a snapshot group	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/snapshot-groups`	Asynchronous
Deleting a snapshot	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/snapshots/object-ID`	Asynchronous

Configuring a global-active device environment

Operation	Request line	Processing method
Getting external volume information	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-volumes`	Synchronous
Getting information about a specific external volume	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-volumes/object-ID`	Synchronous
Creating an external volume	`POST base-URL/simple/v1/objects/storages/storage-device-ID/external-volumes`	Asynchronous
Changing the nickname of an external volume	`PATCH base-URL/simple/v1/objects/storages/storage-device-ID/external-volumes/object-ID`	Synchronous
Getting information about external parity groups	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-parity-groups`	Synchronous
Getting information about a specific external parity group	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-parity-groups/object-ID`	Synchronous
Getting information about external path groups	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-path-groups`	Synchronous
Getting information about a specific external path group	`GET base-URL/simple/v1/objects/storages/storage-device-ID/external-path-groups/object-ID`	Synchronous
Getting information about quorum disks	`GET base-URL/simple/v1/objects/storages/storage-device-ID/quorum-disks`	Synchronous
Getting information about a specific quorum disk	`GET base-URL/simple/v1/objects/storages/storage-device-ID/quorum-disks/object-ID`	Synchronous
Registering information about a quorum disk	`POST base-URL/simple/v1/objects/storages/storage-device-ID/quorum-disks`	Asynchronous

Operation	Request line	Processing method
Deleting information about a quorum disk	`DELETE base-URL/simple/v1/objects/storages/storage-device-ID/quorum-disks/object-ID`	Asynchronous

Appendix L: Running VSP One Block Administrator REST API requests for VSP One B20 storage systems

The following describes the VSP One Block Administrator REST API requests that can be run for VSP One B20 storage systems.

Running VSP One Block Administrator REST API requests

The VSP One Block Administrator REST API is available for VSP One B20 storage systems. The request lines for this REST API include the word `simple`.

If you specify the following base URL, you can use the Configuration Manager REST API to run VSP One Block Administrator REST API requests:

```
protocol://host-name:port-number/ConfigurationManager
```

- For the protocol, specify `https` or `http`. We recommend specifying `https` for security.
- For the host name, specify the IP address of the management server or a host name that can be resolved.
- For the port number, specify the port number to be used for communications with the REST API server. The default port number is `23451` for SSL communications, and `23450` for non-SSL communications.

For details on how to use the VSP One Block Administrator REST API, see the description of each REST API request in the *VSP One Block Administrator REST API Reference Guide*. Make sure that you read and thoroughly understand the description of the common specifications of the VSP One Block Administrator REST API before you run an API request. For details on the authentication information to be specified in the Authorization header, see the description of user authentication.

Note:

The following VSP One Block Administrator REST API requests cannot be used:

- Getting setting information for server management
- Changing setting information for server management

Appendix M: Operations performed on QoS groups by using REST API requests that include simple in the request line

The following describes operations performed on QoS groups by using REST API requests that include simple in the request line. These operations can be performed for VSP 5000 series storage systems. For details on common specifications (how to specify resources, the information required to run an API request, and information that can be checked by running the API request) for running REST API requests that include simple in the request line, see the description of REST API requests that include simple in the request line in the *REST API Reference Guide*.

Operations on QoS groups

Gain an understanding about operations on QoS groups performed by using REST API requests that include simple in the request line.

Important: For details on common specifications (how to specify resources, the information required to run an API request, and information that can be checked by running the API request) for running REST API requests that include simple in the request line, see the description of REST API requests that include simple in the request line in the *REST API Reference Guide*.

Getting a list of QoS groups

This request gets a list of QoS group information.

Note:

This API request can be used when the storage system is VSP 5000 series.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/simple/v1/objects/storages/storage-device-ID/qos-groups
```

Request message

Object ID

None.

Query parameters

None.

Body

None.

Response message

Body


```
{
    "data": [
        {
            "id": 10,
            "threshold": {
                "isUpperIopsEnabled": false,
                "isUpperTransferRateEnabled": false
            },
            "alertSetting": {
                "isUpperAlertEnabled": false
            },
            "alertTime": {}
        },
        {
            "id": 200,
            "threshold": {
                "isUpperIopsEnabled": true,
                "upperIops": 2000,
                "isUpperTransferRateEnabled": true,
                "upperTransferRate": 20000
            },
            "alertSetting": {
                "isUpperAlertEnabled": true,
                "upperAlertAllowableTime": 10
            },
            "alertTime": {
                "upperAlertTime": "2020-10-21T07:10:17Z"
            }
        }
    ],
    "count": 2
}
```

Attribute	Type	Description
id	int	ID of the QoS group
threshold	object	Information about the QoS settings of the QoS group ▪ `isUpperIopsEnabled` (boolean) Whether the upper limit on the IOPS is enabled • `true`: Enabled • `false`: Disabled ▪ `upperIops` (int) Upper limit on the IOPS This information is not output if `isUpperIopsEnabled` is `false`. ▪ `isUpperTransferRateEnabled` (boolean) Whether the upper limit on the amount of data that can be transferred is enabled • `true`: Enabled • `false`: Disabled ▪ `upperTransferRate` (int) Upper limit on the amount of data that can be transferred per second (MBps) This information is not output if `isUpperTransferRateEnabled` is `false`.
alertSetting	object	Information about the alert settings of the QoS group ▪ `isUpperAlertEnabled` (boolean) Whether alerts are output if the IOPS or the amount of data transferred not achieve the upper limit for a continuous period of time • `true`: Output • `false`: Not output ▪ `upperAlertAllowableTime` (int) Amount of time to wait before issuing an alert when an upper limit is exceeded for a continuous period of time (in seconds) This information is not output if `isUpperAlertEnabled` is `false`.

Attribute	Type	Description
alertTime	object	The time# when an alert was issued for the QoS group ▪ `upperAlertTime` (ISO8601string) Time when the last alert was issued because the IOPS or the amount of data transferred per second had exceeded the upper limit for a continuous period of time (UTC)

#: If you change the time zone of the storage system, the times displayed for alerts that were issued before the change will be invalid.

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/simple/v1/objects/storages/900000012345/qos-
groups
```

Getting information for a specific QoS group

This request gets information about QoS group.

Note:
This API request can be used when the storage system is VSP 5000 series.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/simple/v1/objects/storages/storage-device-ID/qos-groups/object-ID
```

Request message

Object ID

Specify the value of `id` that is obtained when you get information about the QoS group.

Attribute	Type	Description
id	int	(Required) ID of the QoS group

Query parameters

Parameter	Type	Description
withVolumeIds	boolean	(Optional) Specify whether to get information about the LDEV numbers that belong to the QoS group. ▪ `true`: Obtain the LDEV numbers. ▪ `false`: Do not obtain the LDEV numbers. If this value is omitted, `false` is assumed.

Body

None.

Response message

Body

```
{
    "id": 200,
    "threshold": {
        "isUpperIopsEnabled": true,
        "upperIops": 2000,
        "isUpperTransferRateEnabled": true,
        "upperTransferRate": 20000
    },
    "alertSetting": {
        "isUpperAlertEnabled":  true,
        "upperAlertAllowableTime": 10
    },
    "alertTime": {
        "upperAlertTime": "2020-10-21T07:10:17Z"
    },
    "volumeIds": [
        10000,
        10001
    ]
}
```

Attribute	Type	Description
id	int	ID of the QoS group
threshold	object	Information about the QoS settings of the QoS group ▪ `isUpperIopsEnabled` (boolean) Whether the upper limit on the IOPS is enabled: • `true`: Enabled • `false`: Disabled ▪ `upperIops` (int) Upper limit on the IOPS This information is not output if `isUpperIopsEnabled` is `false`. ▪ `isUpperTransferRateEnabled` (boolean) Whether the upper limit on the amount of data that can be transferred is enabled: • `true`: Enabled • `false`: Disabled ▪ `upperTransferRate` (int) Upper limit on the amount of data that can be transferred per second (MBps) This information is not output if `isUpperTransferRateEnabled` is `false`.
alertSetting	object	Information about the alert settings of the QoS group ▪ `isUpperAlertEnabled` (boolean) Whether alerts are output if the IOPS or the amount of data transferred not achieve the upper limit for a continuous period of time: • `true`: Output • `false`: Not output ▪ `upperAlertAllowableTime` (int) Amount of time to wait before issuing an alert when an upper limit is exceeded for a continuous period of time (in seconds) This information is not output if `isUpperAlertEnabled` is `false`.

Attribute	Type	Description
alertTime	object	The time# when an alert was issued for the QoS group ▪ `upperAlertTime` (ISO8601string) Time when the last alert was issued because the IOPS or the amount of data transferred per second had exceeded the upper limit for a continuous period of time (UTC)
volumeIds	int[]	The LDEV numbers that belong to the QoS group This attribute is displayed only if you specified `true` for `withVolumeIds` in the query parameters.

#: If you change the time zone of the storage system, the times displayed for alerts that were issued before the change will be invalid.

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/simple/v1/objects/storages/900000012345/qos-
groups/200?withVolumeIds=true
```

Getting performance information for a specific QoS group

The following request gets performance information about a QoS group for the specified QoS group ID.

Note:

This API request can be used when the storage system is VSP 5000 series.

Execution permission

Storage Administrator (View Only)

Request line

```
GET base-URL/simple/v1/objects/storages/storage-device-ID/performances/qos-groups/
object-ID
```

Request message

Object ID

Specify the value of `id` that is obtained when you get information about the QoS group.

Attribute	Type	Description
id	int	(Required) ID of the QoS group

Query parameters

None.

Body

None.

Response message

Body

```
{
  "id": 10,
  "receivedCommands": 0,
  "transferRateOfReceivedCommands": 0,
  "iops": 0,
  "transferRate": 0,
  "responseTime": 0,
  "monitorTime": "2020-10-08T05:54:07Z"
}
```

Attribute	Type	Description
id	int	ID of the QoS group
receivedCommands	int	Number of commands received from hosts (IOPS)
transferRateOfReceivedCommands	int	Amount of data transferred by commands received from hosts (KBps)
iops	int	Number of commands processed by the storage system (IOPS)
transferRate	int	Amount of transferred data processed by the storage system (KBps)
responseTime	long	Response time (microseconds)

Attribute	Type	Description
monitorTime	ISO8601string	Time at which the performance information was obtained (UTC)

Status codes

For details on the status codes of the API, see the description on HTTP status codes.

Coding example

```
curl -v -H "Accept:application/json" -H "Content-Type:application/json" -H
"Authorization:Session b74777a3-f9f0-4ea8-bd8f-09847fac48d3" -X GET https://
192.0.2.100:23451/ConfigurationManager/simple/v1/objects/storages/900000012345/
performances/qos-groups/10
```

Appendix N: About the Data in Place upgrade of VSP 5000 series storage systems

For VSP 5000 series storage systems, you can perform a Data in Place upgrade to upgrade from VSP 5100, 5500, 5100H, 5500H to VSP 5200, 5600, 5200H, 5600H. The following describes the operations to be performed after a Data in Place upgrade.

Re-registering a storage system after a Data in Place upgrade

If you perform a Data in Place upgrade while a VSP 5100, 5500, 5100H, 5500H storage system is registered as the local storage system or remote storage system, perform the following operations after the upgrade.

For the local storage system:

1. Deleting information about a storage system

   Delete information about the upgraded storage system.

2. Registering a storage system

   Register the storage system by using the name of the model to which you upgraded (VSP 5200, 5600, 5200H, 5600H).

For the remote storage system:

1. Getting information about the local storage system

   Use the API request for getting information about a specific storage system to verify that the microcode version of the local storage system is one that can be used in a pair with a VSP 5200, 5600, 5200H, 5600H storage system.

2. Deleting information about remote storage systems

   Delete information about the upgraded remote storage system.

3. Registering information about remote storage systems

   Register information about the upgraded remote storage system.

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