HITACHI
DATA SYSTEMS

HiCommand® Device Manager
Web Client User's Guide

MK-91HC001-21

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Preface

This document describes and provides instructions for using the HiCommand® Device Manager Web client software to manage storage on the Hitachi Freedom Storage. This document assumes that the user:

- has a background in data processing and understands peripheral storage device subsystems and their basic functions,
- has read and understands the user guide(s) for the subsystem and subsystem configuration functions,
- has read and understands the user guide(s) for the data management functions, and
- is familiar with the operating system which hosts the HiCommand Device Manager Web client software: Solaris operating system, Windows 2000 and XP operating system, or HP-UX.

Readme and Release Notes Contents

Readme and release notes files are included on the installation CD. These files contain requirements and notes for use of HiCommand Device Manager that may not be fully described in this manual. Review these files before installing HiCommand Device Manager.

Software Revision Level

This document revision applies to HiCommand Device Manager version 5.7 and higher.

Conventions for Storage Capacity Values

Storage capacity values for logical devices (LDEVs) on the Universal Storage Platform are calculated based on the following values:

- 1 KB (kilobyte) = 1,024 bytes
- 1 MB (megabyte) = $1,024^2$ bytes
- 1 GB (gigabyte) = $1,024^3$ bytes
- 1 TB (terabyte) = $1,024^4$ bytes

Referenced Documents

HiCommand documents:

- *HiCommand Device Manager Error Codes*, MK-92HC016
- *HiCommand Device Manager Server Installation and Configuration Guide*, MK-91HC002
- *HiCommand Device Manager Command Line Interface (CLI) User's Guide* , MK-91HC007
- *HiCommand Device Manager Agent Installation Guide*, MK-92HC019
- *HiCommand Protection Manager Console User's Guide*, MK-94HC071
- *HiCommand Tuning Manager Server Administration Guide*, MK-92HC021

Hitachi RAID subsystem documents:

- *Hitachi Command Control Interface (CCI) User and Reference Guide*, MK-95DF701
- *Hitachi Storage Navigator User's Guide*, MK 96RD621
- *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Account Authentication User's Guide*, MK-96DF797
- *Hitachi USP V Dynamic Provisioning User's Guide*, MK-96RD641
- *Hitachi Lightning 9900 TrueCopy User and Reference Guide*, MK-92RD108

Note: The term "9900V" refers to the entire Lightning 9900 V Series subsystem family, such 9980V, 9970V, unless otherwise noted. The term "9900" refers to the entire Lightning 9900 subsystem family, such as 9960, 9910, unless otherwise noted. The term "9500V" refers to the entire Thunder 9500 V Series subsystem family, such as 9570V, 9580V, unless otherwise noted.

Comments

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Chapter 1 Overview of HiCommand® Device Manager

This chapter provides an overview of HiCommand Device Manager:

- Overview (see section 1.1)
- Introducing the New Functions (see section 1.2)
- Reviewing the Related Software Products (see section 1.3)
- Reviewing the Device Manager Software Components (see section 1.4)
- Understanding Device Manager and Corresponding Subsystem Terms (see section 1.5)
- Understanding the Syntax Conventions (see section 1.6)

1.1 Overview

Device Manager, a core product for storage management, helps your organization to consolidate storage operations and management capability in a system that contains multiple Hitachi storage subsystems (such as Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, Thunder 9500V, Lightning 9900, and Thunder 9200).

Targeted for users managing multiple storage subsystems in open or shared environments, Device Manager quickly discovers the key configuration attributes of storage subsystems and allows users to begin proactively managing complex and heterogeneous storage environments quickly and effectively using an easy-to-use, browser-based GUI. Device Manager enables remote storage management over secure IP connections and does not have to be direct-attached to the storage subsystem. Device Manager is a component of the HiCommand family of software products, Hitachi Data Systems' storage management framework.

Device Manager gives storage administrators easier access to the existing array configuration, monitoring, and data management features and allows users to perform important operations such as adding/removing storage, configuring volume paths and Fibre Channel ports, creating custom-size volumes, managing LUN security, and copy pair operations. Device Manager also provides link-and-launch integration with HiCommand Suite products and management tools used exclusively for storage subsystems.

Device Manager provides a consistent, easy-to-use, and easy-to-configure set of interfaces for managing storage in a distributed environment. The Device Manager system includes the Device Manager server, the storage subsystem(s) connected to the server, the (optional) Device Manager agents, and the Device Manager clients. The Device Manager Web client provides a web-distributed client for real-time interaction with the storage subsystems being managed. The Device Manager Command Line Interface (CLI) is targeted for expert users who prefer a character-based interface to create their own automation scripts.

Device Manager enables management of storage by user-defined hierarchical groups. Device Manager displays detailed information on the configuration of the storage subsystems added to the Device Manager server and provides subsystem alert presentation. You can also configure Device Manager to monitor and display volume usage statistics using the Device Manager agent (optional). Device Manager's built-in report facility compiles and presents key information in preformatted reports (HTML) and as comma-separated values for export.

Device Manager provides several levels of access and utilities for users:

- Access Control: Access control using permissions (Admin, Modify, and View) and resource groups
- Storage Management: Storage configuration and manipulation
- System support: Web client support, user administration, Agent activity, and security

1.2 Introducing the New Functions

Device Manager 5.7 provides the following new functions:

- The Open-Reserved group, which displays the open volumes that cannot be assigned to a path, has been added to All Storage (My Storage) in Device Manager Web client.
- Device Manager Web client now supports the Hitachi Dynamic Provisioning (HDP) function of Universal Storage Platform V. For details about HDP, see section 11.2.3 of this manual, or refer to the *Hitachi USP V Dynamic Provisioning User's Guide*.
  - The HDP volume attribute and HDP pool volume attribute are now supported as identifiable volume attributes.
  - The consumed capacity on an HDP volume can now be displayed.
  - A path can now be assigned to an HDP volume.
  - Copy pair operations for HDP volumes are now supported.
- Detailed Array Reports, which output LDEV detailed information in CSV format, have been added to the reporting capability of Device Manager Web client. CSV-formatted files can be output to the location specified in the Device Manager server properties.
- Device Manager Web client can now display the actual amount of LDEV space in a storage subsystem.
- In the Device Manager server, by using the `hcmdssrv` command or performing an operation in the Windows Start menu, HiCommand Suite Common Component and all services of HiCommand Suite products can now be started and stopped at the same time.
- The `auto` option can now be specified in a command for operating a Device Manager server database. This option causes HiCommand Suite Common Component and all services of HiCommand Suite products to start or stop automatically before and after the database operation.
- In the Device Manager server, when installation or uninstallation is started , the services of HiCommand Suite products and HiCommand Suite Common Component are now stopped automatically if they are running (in a non-cluster configuration).
- In the Device Manager server, it is now possible to select whether the services of HiCommand Suite products and HiCommand Suite Common Component can now be started automatically after installation or uninstallation is completed (in a non-cluster configuration).
- When the Device Manager server detects an alert that has occurred in a storage subsystem, the Device Manager server can now email the contents of the alert to any user.
- The Device Manager VDS provider can now obtain configuration information for the specified resource only.

For details about the new functions provided by the Device Manager server and the Device Manager VDS provider, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

The following extensions are supported:

- Support for a new storage subsystem
  - Universal Storage Platform V is now supported.
- Support for new OSs
  - Device Manager Web client now supports Windows Server 2003 SP 2.
  - Device Manager Web client now supports Windows Server 2003 R2 SP 2.
  - Device Manager Web client now supports Windows Vista™.
  - Device Manager Web client now supports HP-UX 11i v3.
- Support for new browsers
  - Device Manager Web client now supports Internet Explorer 7.0.
  - In HP-UX 11i v3, Device Manager Web client now supports Mozilla 1.7.13.01.
- Device Manager Web client now supports JRE version 6.0.

1.3 Reviewing the Related Software Products

The following HiCommand software products are related to Device Manager:

- **Dynamic Link Manager**

  The Dynamic Link Manager (HDLM) software product is installed on the host and manages access paths to storage such as automatic failover, failback, and load balancing.

  The HDLM GUI can be displayed from the Web client (see section 2.5). For details on Dynamic Link Manager, refer to the applicable HDLM manuals.

- **Tuning Manager**

  The Tuning Manager software product monitors the performance of an entire storage network, including the SAN environment provided by the TagmaStore/Lightning/Thunder series storage subsystems.

  The Tuning Manager GUI can be displayed from the Web client (see section 2.5). For details, refer to the applicable Tuning Manager manuals.

- **Protection Manager**

  The HiCommand Protection Manager software product collectively control the storage subsystems, backup management products, database products, and application products to simplify the necessary procedure for data protection management. The Protection Manager GUI can be displayed from the Web client (see section 2.5). For details about Protection Manager, refer to the applicable Protection Manager manuals.

- **Provisioning Manager**

  The HiCommand Provisioning Manager product automates a series of operations required for allocating LDEVs to the server or expanding a file system. This reduces workload of administrative tasks for storage resources. The Provisioning Manager GUI can be displayed from the Web client (see section 2.5). For details about Provisioning Manager, refer to the applicable Provisioning Manager manuals.

- **Replication Monitor**

  The HiCommand Replication Monitor software product displays the configuration of copy pairs in the entire system from the aspects of configuration definitions of hosts, storage subsystems, and copy pairs so you can easily understand the configuration of copy pairs. By specifying monitoring settings, you can automatically notify users if an error occurs. The Replication Monitor GUI can be displayed from the Web client (see section 2.5). For details about Replication Monitor, refer to the applicable Replication Monitor manuals.

- **Tiered Storage Manager**

  The HiCommand Tiered Storage Manager software product provides a means to move data to the best-suited storage subsystem based on the characteristics of the data (severity level or access frequency). You can optimize the allocation of data in an environment containing integrated storage subsystems with Universal Storage Platform V or TagmaStore USP as the core storage subsystems. The Tiered Storage Manager GUI can be displayed from the Web client (see section 2.5). For details about Tiered Storage Manager, refer to the applicable Tiered Storage Manager manuals.

- **Global Link Availability Manager**

  The HiCommand Global Link Availability Manager software product provides centralized management of all paths when Dynamic Link Manager is installed on multiple hosts. This can reduce the administrator's workload in a large-scale system because path management does not have to be performed separately for each host. The Global Link Availability Manager GUI can be displayed from the Web client (see section 5.5.7). For details on Global Link Availability Manager, refer to the Global Link Availability Manager documentation.

- **HiCommand NAS Manager**

  HiCommand NAS Manager can manage the TagmaStore AMS/WMS series volumes in NAS environments. The HiCommand NAS Manager GUI can be displayed from the Web client (see section 2.5). For details on HiCommand NAS Manager, refer to the relevant HiCommand NAS Manager manual.

- **Mainframe Agent**

  The HiCommand Mainframe Agent provides volume information on the storage subsystems used by a mainframe host. This allows subsystems that could only be monitored on the mainframe host system to be monitored from a Device Manager client program, thereby facilitating centralized management of distributed resources. For details on Mainframe Agent, refer to the Mainframe Agent documentation. For information on setting the environment to link with Mainframe Agent, see the *HiCommand Device Manager Command Line Interface (CLI) User's Guide*.

- **Storage Services Manager**

  HiCommand Storage Services Manager acts as the main console for heterogeneous storage infrastructure management software, providing SAN visualization and reporting, asset management, performance and capacity monitoring and planning, and policy-driven event management. The Storage Services Manager GUI can be displayed from the Web client.

1.4 Reviewing the Device Manager Software Components

The Device Manager system consists of the following software components, as depicted in Figure 1.1, below.

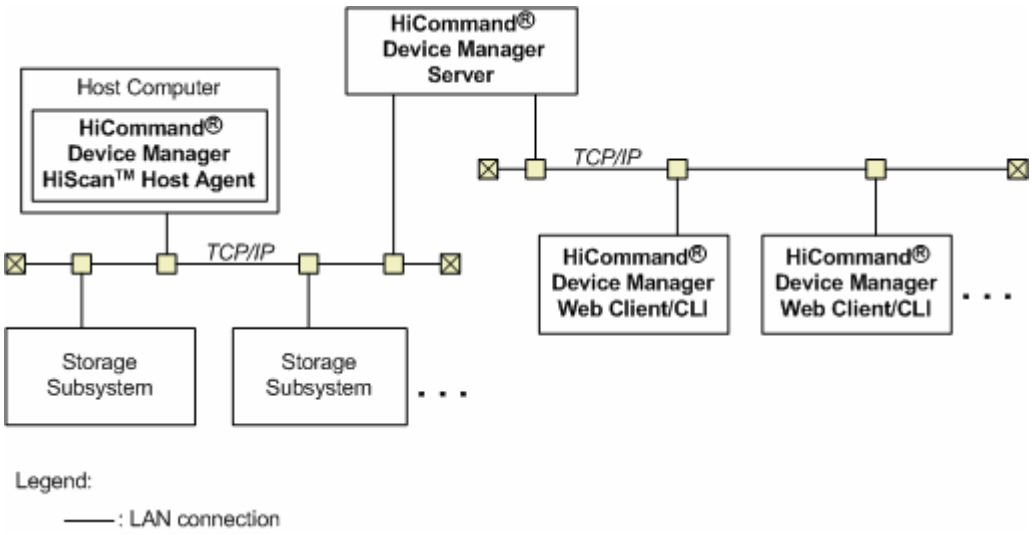


Figure 1.1 Device Manager System and Software Components

- **HiCommand Suite Common Component.** Device Manager supports integration with the HiCommand Suite Common Component, which provides features that are common to all HiCommand Suite products. Single Sign-On (SSO) user authentication and integrated event/error logging are provided for Device Manager and Tuning Manager. Each HiCommand product now includes HiCommand Suite Common Component.
  - **Single Sign-On.** Integrated Single Sign-On is used for link-and-launch operations (see section 2.5). The already authenticated user ID and password are available to the launched HiCommand software, so that users do not need to re-enter their user ID and password. User privileges are maintained across HiCommand Suite products.
  - **Common logging.** The HiCommand Suite Common Component integrated logging feature provides a common log repository for the various logs of the HiCommand suite products.
- **Server.** The Device Manager server is LAN-attached to the storage subsystems. It controls Device Manager operations based on requests from Device Manager clients (e.g., Web client, CLI, and third-party applications).

  Note: For further information on the Device Manager server, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.

- **Clients:**
  - **Web client.** The Device Manager Web client provides two types of user interfaces, an HTML GUI and a Java™ GUI, for Device Manager functions. The Web client communicates with and runs as a client of the Device Manager server.

    The HTML GUI is a browser-based application that can be accessed from Web browsers. This GUI provides the windows and dialog boxes for all features other than the storage subsystem and resource group management features.

    The Java GUI is a Java-based application. This GUI provides the windows and dialog boxes for the storage subsystem and resource group management features.

    This document describes how to install and configure the Java environment (see Chapter 3).
  - **Command Line Interface (CLI).** The Device Manager CLI allows you to perform Device Manager operations by issuing commands from the system command line prompt. The Device Manager CLI communicates with and runs as a client of the Device Manager server.

    Note: For further information on the Device Manager CLI, refer to the *HiCommand Device Manager Command Line Interface (CLI) User's Guide*.
  - **Third-party application.** Device Manager supports third-party applications by providing an application program interface (API) that developers can use to interface with the Device Manager server. For details, contact Hitachi Data Systems.
- **Agent (recommended, optional).** The Device Manager agent runs on a host server that is attached to one or more storage subsystems, collects data on the configuration and utilization of the attached storage, and sends this information to the Device Manager server. The Device Manager clients display this information for the user when it is available on the server. For more information, refer to the *HiCommand Device Manager Agent Installation Guide*.
- **VDS Provider (optional).** The HiCommand Device Manager VDS Provider software program provides information about storage subsystems, and changes the configuration of storage subsystems in response to requests from the Virtual Disk Service (VDS) provided by Windows Server 2003.

1.5 Understanding Device Manager and Corresponding Subsystem Terms

Table 1.1 Device Manager and Corresponding Terms for Universal Storage Platform V and TagmaStore USP

Device Manager	Universal Storage Platform V and TagmaStore USP
CVS	VLL Volume
HDP pool volume	Pool volume (pool-VOL)
LCP	LCP ports
Path	LU path
Port controller	CHA
Host storage domain	Host group
Array group	VDEV (an area that subdivides a parity group)
Quick Shadow/ Copy-on-Write Snapshot	Copy-on-Write Snapshot

Table 1.2 Device Manager and Corresponding Terms for other Storage Subsystems

Device Manager	Lightning 9900 V	Lightning 9900	TagmaStore AMS/ WMS Series	Thunder 9500 V	Thunder 9200
Port controller	CHA		Controller		
Host storage domain	Host group	Not applicable	Host group		Not applicable
Array group	VDEV (an area that subdivides a parity group)	Parity group	RAID group		
LDEV	LDEV		Logical unit (LU)		
Quick Shadow/ Copy-on-Write Snapshot	Not applicable		Copy-on-Write Snapshot	QuickShadow	Not applicable

1.6 Understanding the Syntax Conventions

Table 1.3 defines the syntax conventions that are used in this manual.

Table 1.3 Syntax Conventions

Example convention: **S**`tore`**D**`atabase [temp|perm] (`*database-name* `...)`	
Font or Symbol	**How Used**
`StoreDatabase`	The user should enter code-font characters exactly as shown.
database-name	In actual commands the user must replace the italics by suitable characters.
SD	Bold code-font characters indicate an abbreviation for a command.
perm	Underlined characters indicate a default value.
`[ ]`	An item or items enclosed in brackets are optional.
|	Only one of the options separated by a vertical bar can be used at one time.
`...`	Ellipses (...) indicate that the item or items enclosed in ( ) or [ ] and which immediately precede the ellipses can be repeated.
`()`	The items enclosed by the parentheses are in the range to which | or ... are applied.

Chapter 2 Reviewing the HiCommand Device Manager Operations

This chapter describes HiCommand Device Manager operations:

- Managing Users and Access Restrictions (see section 2.1)
- Managing Storage (see section 2.2)
- Configuring Storage Subsystems and Volumes (see section 2.3)
- Managing Data (see section 2.4)
- Linking-and-Launching Integration (see section 2.5)
- Generating Reports (see section 2.6)
- Using and Customizing System Security (see section 2.7)

2.1 Managing Users and Access Restrictions

HiCommand Device Manager uses the common user management function provided by the HiCommand Suite products to manage users. By handling combinations of resource groups and permissions set for each user, the common user management function provided by the HiCommand Suite products can be used to restrict resources and operations.

For details on permissions, see section 2.1.1, and for details on resource groups, see section 2.1.2.

For details on how to manage users and resource groups, see Chapter 6.

2.1.1 Permissions

The user management function that is common to all HiCommand Suite products enables you to set the following permissions for each user:

- The User Management permission common to all HiCommand Suite products
- Operation permissions for HiCommand Device Manager
- Permissions for HiCommand Suite products other than HiCommand Device Manager

  For details on the permissions for HiCommand Suite products other than HiCommand Device Manager, see the manual for the relevant product.

Permissions relating to users of HiCommand Device Manager are as follows:

- The User Management permission common to all HiCommand Suite products
- Operation permissions for HiCommand Device Manager

Table 2.1 lists the permissions relating to users of HiCommand Device Manager.

Table 2.1 List of Permissions

Classification	Permission	Description
Operation permissions for Device Manager	Admin	Allows the user to use the resource group management function with the available range of resources. When you set the Admin permission for a user, the Modify permission and View permission are set at the same time.
	Modify	Allows the user to operate the available range of resources. When you set the Modify permission for a user, the View permission is set at the same time.
	View	Allows the user to view the available range of resources.
	Peer	This permission is exclusively for use with HiCommand Device Manager agents. A user with Peer permission cannot log in from the Web client to HiCommand Device Manager. Furthermore, you cannot allocate a resource group to a user who has Peer permission. You cannot set this permission in combination with any other permission except the User Management permission.

Classification	Permission	Description
The User Management permission common to all HiCommand Suite products	User Management	Allows the users of HiCommand Suite products to use the user management function. You cannot allocate a resource group to a user who has User Management permission only. You can set this permission in combination with any of the HiCommand Device Manager operation permissions. ***Note***: To set the User Management permission common to all HiCommand Suite products, click **User Management**, and then set the **Admin** permission on the GUI of the product.

Note: There are two **Admin** permissions: The Admin operation permission, and the Admin User Management permission. To avoid confusion, this manual uses the following terms:

- *Admin permission* refers to the **Admin** operation permission for HiCommand Device Manager.
- *User Management permission* refers to the **Admin** User Management permission, which is common to all HiCommand Suite products.

About Account Authentication

When accessing the TagmaStore AMS/WMS series from Device Manager, certain permissions are required. The permissions (referred to as account authentication) are user management, user certification, and access control.

For information about account authentication roles relating to adding a storage subsystem, see Table 10.1 (section 10.3).

For complete details about account authentication, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Account Authentication User's Guide*.

2.1.2 Resource Groups

HiCommand Device Manager supports both the All Resources resource group and a user-defined resource group.

- All Resources

  This resource group is predefined in HiCommand Device Manager. The All Resources resource group includes all HiCommand Device Manager resources (logical groups, hosts, and LDEVs). A user who is assigned this resource group can access all HiCommand Device Manager resources.

- User-defined resource group

  The user can define which resources are to be held in the group. A user who is assigned to a user-defined resource group can access only the resources defined in the group. Therefore some functions are not available for the user. When a user who is assigned to a user-defined resource group logs in, the following menus are not displayed in the explorer menu:

  - **Resources** - **Subsystems** menu
  - **Alerts** menu
  - **Reports** menu

Only a user who has Admin permission can create a resource group or allocate a resource group to a user. For details on how to manage resource groups, see section 6.3.

Resource groups are closely related to logical groups. For example, suppose that there is a logical group B under logical group A. If logical group A is allocated to resource group A and logical group B is allocated to resource group B, resource group B will be lower in the hierarchy than resource group A. The users of resource group A can access the resources (logical group, hosts, and LDEVs) in both resource groups A and B.

2.1.3 Built-in Accounts

HiCommand Device Manager contains two predefined built-in accounts: The System account and HaUser account.

- The **System account** is a built-in account common to all HiCommand Suite products. With the System account, you can use all the functions provided by Device Manager and the other HiCommand Suite products and you can access all resources managed by HiCommand applications. When you first log in after installing Device Manager, log in with the System account and, if necessary, set up a user account that has the User Management permission and a user account that has the Admin permission for Device Manager. The default password for the System account is **manager**. To prevent unauthorized access, we recommend that you change the default password for the System account. You cannot delete the System account or change the permissions associated with the System account.
- The **HaUser account** is the default user for Device Manager agents. The Peer permission is set for the HaUser account. The default password for the HaUser account is `haset`. If you have changed the password for the HaUser account, you need to change the settings for the Device Manager agent. For details on how to change the settings for the Device Manager agent, see the *HiCommand Device Manager Agent Installation Guide*.

2.1.4 Security Enhancement at Login

In order to enhance security when a user logs in, HiCommand Device Manager enables the system administrator to set security options.

The security options at login are:

- Function for Locking User Accounts

  In HiCommand Device Manager, you can suppress the login operation of a particular user by manually locking the user account. You can also set up this function so that it automatically locks a user account if an incorrect password is entered repeatedly for that account. When a user account is locked, the user cannot log in to any of the HiCommand Suite products until the user account is unlocked.

  For details on how to lock or unlock a user account, see section 6.2.5. For details on how to set up automatic locking of user accounts, see section 6.4.2.

- Function for Setting Password Conditions

  To prevent users' passwords from being easily guessed by a third party, HiCommand Device Manager enables you to specify conditions for setting the minimum number of characters and the combination of characters that can be used for a password.

  For details on how to set the password conditions, see section 6.4.1.

- Function for Setting a Warning Banner message

  As a security measure at login, HiCommand Device Manager enables you to display a message on the login panel.

  For details on how to set the desired warning message, see section 6.4.3.

  Figure 2.1 shows an example of a warning banner message.



Figure 2.1 Example of a Warning Banner Message

2.2 Managing Storage

Device Manager enables you to perform storage management operations for storage on subsystems added to Device Manager.

- **Storage Groups.** Device Manager enables you to create and manage groups of LUNs (volume paths). The LUNs assigned to a storage group can be manipulated as a group. Storage groups must contain logical devices from the same storage subsystem. A storage group can contain only LUNs, not other groups.
- **Logical Groups.** Device Manager enables you to create and manage one or more storage groups under a logical group. A logical group can contain storage groups containing LUNs or other logical groups. This additional level of grouping creates a file-system approach to storage management and enables you to tailor your Device Manager system to your operational environment.
- **Resource Groups.** Device Manager enables you to create and manage one or more resource groups. Each resource group is associated with one or more logical groups, hosts, and LDEVs. When you create a new user and assign a user-defined resource group to the new user, this user will only be able to access the resources (logical groups, hosts, LDEVs) associated with that resource group.

2.3 Configuring Storage Subsystems and Volumes

Device Manager allows you to view and manage the configuration of Universal Storage Platform V, TagmaStore USP Lightning 9900 V Series (9900V), Lightning 9900, TagmaStore AMS/WMS series, Thunder 9500V, Thunder 9200 from a Web browser.

Device Manager provides the following functions for all supported storage subsystems:

- **Storage Subsystem Discovery.** When you add a storage subsystem to Device Manager, the Device Manager server discovers the storage subsystem on the Device Manager system network and determines its identity and configuration.
- **Configuration Display.** Device Manager displays detailed configuration information for each storage subsystem added, including: logical volume and physical disk drive information, array groups, RAID levels, ports, cache memory, microcode levels, and other storage subsystem-specific information, such as storage capacity for 9200, number and type of back-end array processors (ACPs) for Lightning 9900V and Lightning 9900.
- **LUN scan.** The LUN scan operation (see section 8.3) examines all LUNs on the storage subsystem. When you perform a LUN Scan, a logical group is created for each storage subsystem on which the LUN Scan is performed. This logical group is created in the LUN SCAN group of the **Logical Groups** object. A storage group is created for each port and host below the LUN Scan logical group, and all unregistered LUNs are placed in this storage group. The LUN scan also causes Device Manager to register unique hosts for all WWNs in the storage subsystem. The properties of the host registered by Device Manager are updated when the Device Manager agent reports information about the host.

  You must perform a LUN scan in the following sequence:

  1. During Device Manager initial setup you must register all hosts (host names and WWN) in the Device Manager server before performing the LUN Scan. Hosts are registered to the Device Manager server by manually entering them via the Web client or Device Manager's Command Line Interface (CLI), or by being notified from the Device Manager agent.
  2. When storage on an existing storage subsystem has been assigned to one or more new hosts not recognized by the Device Manager, make sure that the hosts are registered to the Device Manager server before performing a LUN scan operation.
  3. If there are no new hosts, you can perform a LUN scan operation immediately after a storage subsystem discovery and after a storage subsystem refresh operation.
- **Refresh.** The refresh operation (see section 10.5) rediscovers a storage subsystem. Perform a refresh operation when changes have been made to the storage subsystem other than through the Device Manager system.
- **Alert Presentation.** Device Manager displays SNMP traps, errors, and other conditions for each storage subsystem that has been added to the Device Manager server.
- **Path Assignment.** Device Manager enables you to add and delete volume paths for devices on the storage subsystems (see section 8.4 and 8.5).

2.3.1 Configuring the Universal Storage Platform V Storage Subsystem

Device Manager supports the following storage subsystem and volume configuration functions for the Universal Storage Platform V storage subsystem:

- **Configure ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports.
- **Configure adapters.** Enables you to configure the speed mode for the Fibre Channel adapters.
- **Create/Delete LDEVs.** Enables you to create new LDEVs and delete existing LDEVs.
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes on the Universal Storage Platform V storage subsystem. A LUSE volume is a combined LU which can be from 2 to 36 times larger than a standard OPEN-*x* LU. LUSE volumes are created from unallocated LDEVs.

  You can create a Universal Storage Platform V LUSE volume that does not have a volume path (see section 8.6). You can also create a Universal Storage Platform V LUSE volume when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete volume paths.** Enables you to add and delete volume paths (such as ports, host storage domains, or LUNs) for the LDEVs on connected Universal Storage Platform V storage subsystems.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.
- **Universal Volume Manager.** In a Universal Storage Platform V storage subsystem, volumes of another storage subsystem connected via a SAN can be handled as virtual Universal Storage Platform V volumes. This feature is called the Universal Volume Manager. For details about Universal Volume Manager, see section 4.5.
- **Cache logical partition function.** For details on the cache logical partition function, see section 4.6.1.
- **Storage logical partition function.** For details on the storage logical partition function, see section 4.6.2.
- **HDP function.** Enables you to check the consumed capacity of an HDP volume in order to check the usage status of the HDP volume. You can also create, change, or delete an HDP volume and HDP pool volume from Physical View of Universal Storage Platform V.

2.3.2 Configuring the TagmaStore USP Storage Subsystem

Device Manager supports the following storage subsystem and volume configuration functions for the TagmaStore USP storage subsystem:

- **Configure ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports on the TagmaStore USP storage subsystem.
- **Configure adapters.** Enables you to configure the speed mode for the Fibre Channel adapters.
- **Create/Delete LDEVs.** Enables you to create new LDEVs and delete existing LDEVs.
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes on the TagmaStore USP storage subsystem. A LUSE volume is a combined LU which can be from 2 to 36 times larger than a standard OPEN-*x* LU. LUSE volumes are created from unallocated LDEVs.

  You can create a TagmaStore USP LUSE volume that does not have a volume path (see section 8.6). You can also create a TagmaStore USP LUSE volume when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete volume paths.** Enables you to add and delete volume paths (such as ports, host storage domains, or LUNs) for the LDEVs on connected TagmaStore USP storage subsystems.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.
- **Universal Volume Manager.** In a TagmaStore USP storage subsystem, volumes of another storage subsystem connected via a SAN can be handled as virtual TagmaStore USP volumes. This feature is called the Universal Volume Manager. For details about Universal Volume Manager, see section 4.5.
- **Cache logical partition function.** For details on the cache logical partition function, see section 4.6.1.
- **Storage logical partition function.** For details on the storage logical partition function, see section 4.6.2.

2.3.3 Configuring the Lightning 9900V Series Subsystem

Device Manager supports the following subsystem and volume configuration functions for the Hitachi Lightning 9900V storage subsystem:

- **Configure Ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports (see section 11.3.1.1).
- **Configure Adapters.** Enables you to configure the speed mode for the Fibre Channel adapters (see section 11.3.1.4). Standard mode is the default mode. High-speed mode provides faster access speed by using more processors to handle data access. However, high-speed mode limits the number of available ports to one port on the channel adapter (CHA) board.
- **Create/Delete LDEVs.** Enables you to create new LDEVs and delete existing LDEVs (see section 11.3.3.1, and 11.3.3.3). You can create standard OPEN-*x* LDEVs or custom-size Virtual LVI/LUN devices which are smaller than standard LDEVs (minimum size = 36,000 KB for other than OPEN-V, 48,000 KB for OPEN-V).
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes. A LUSE volume is a combined LU which can be from 2 to 36 times larger than a standard OPEN-*x* LU. LUSE volumes are created from unallocated LDEVs.

  You can create a 9900V LUSE volume that does not have a volume path (see section 8.6). You can also create a 9900V LUSE volume when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete Volume Path.** Enables you to add and delete volume paths (such as ports, host storage domains, or LUNs) for the LDEVs on the connected 9900V storage subsystems.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.

2.3.4 Configuring the Lightning 9900 Series Storage Subsystem

Device Manager supports the following configuration functions for the Hitachi Lightning 9900 storage subsystem and its volumes:

- **Configure Ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports (see section 11.3.1.1).
- **Configure Adapters.** Enables you to configure the speed mode for the Fibre Channel adapters (see section 11.3.1.4). Standard mode is the default mode. High-speed mode provides faster access speed by using more processors to handle data access. However, high-speed mode limits the number of available ports to half of the ports on the channel adapter board.
- **Configure LUN and WWN Groups.** Enables you to configure the LUN groups and WWN groups, including creating, deleting, and modifying LUN groups and WWN groups (see section 11.3.1.2 and 11.3.1.3).
- **Create/Delete LDEVs.** Enables you to create new LDEVs and delete existing LDEVs (see section 11.3.3.1 and 11.3.3.3). You can create standard OPEN- ***x*** LDEVs or custom-size **Virtual LVI/LUN** devices which are smaller than standard LDEVs (minimum size is 36 MB).
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes on the Lightning 9900 storage subsystem. A LUSE volume is a combined LU which can be from 2 to 36 times larger than a standard OPEN- ***x*** LU. LUSE volumes are created from unallocated LDEVs.

  You can create a 9900 LUSE volume only when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2). You cannot create a 9900 LUSE volumes that does not have a volume path.
- **Add/Delete Volume Path.** Enables you to add and delete volume paths (such as port, LUN) for the LDEVs on the connected 9900 storage subsystems.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.

  For more information, refer to the *Hitachi Lightning 9900 LUN Manager User's Guide*.

2.3.5 Configuring the TagmaStore AMS/WMS Series Storage Subsystem

Device Manager supports the following configuration functions for the TagmaStore AMS/WMS storage subsystem and its volumes:

- **Configure ports.** Enables you to use the Storage Navigator Modular (for Web), which is started from the Physical View dialog box, to configure the host mode and fibre topology settings for the Fibre Channel ports.
- **Create/Delete Array Groups.** Enables you to use the Storage Navigator Modular (for Web), which is started from the Physical View dialog box, to create new array groups and delete existing array groups.
- **Create/Delete LDEVs.** Enables you to use the Storage Navigator Modular (for Web), which is started from the Physical View dialog box, to create new LDEVs (internal logical units) and delete existing LDEVs.
- **Configure Spare Drives.** Enables you to use the Storage Navigator Modular (for Web), which is started from the Physical View dialog box, to configure spare drives.
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-sized LUSE volumes. A LUSE volume is a logical unit that consists of multiple logical units, and is larger than the standard logical unit. A LUSE volume is created from logical devices that have no paths assigned.

  You can create a TagmaStore AMS/WMS series LUSE volume that does not have a volume path (see section 8.6). You can also create a TagmaStore AMS/WMS series LUSE volume when allocating a volume path to a logical device (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete volume paths.** Enables you to add and delete volume paths (ports, host storage domains, or LUNs) for LDEVs on a connected TagmaStore AMS/WMS series storage subsystem.

  Note on High Availability: Device Manager allows you to configure multiple paths to volumes as needed for path failover capability.
- **Cache logical partition function.** Device Manager allows you to specify a Cache Logical Partition (*CLPR*), that is, divide a cache that is normally shared in a storage subsystem into partitions that can be used as logical units.

  The cache logical partition function improves the independence of logical units allocated to each partition, so that they are not easily affected by the status of other logical units. For details about the cache logical partition function, see the storage subsystem Cache Partition Manager manual.

  Device Manager can display attributes of the cache logical partition function on the logical units. You can set up the cache logical partition function from the Physical View. For details about the Physical View, see section 11.1.5.

2.3.6 Configuring the Thunder 9500 V Series Storage Subsystem

Device Manager supports the following subsystem and volume configuration functions for the Hitachi Thunder 9500 V Series storage subsystem:

- **Configure Ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports (see section 11.3.1.1).
- **Create/Delete Array Groups.** Enables you to create new array groups and delete existing array groups (see section 11.3.2.1 and 11.3.2.2).
- **Create/Delete LDEVs.** Enables you to create new LDEVs (internal LUs) and delete existing LDEVs (see section 11.3.3.1 and 11.3.3.3).
- **Configure Spare Drives.** Enables you to configure the spare drives (see section 11.3.2.3).
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes. A LUSE volume is a combined LU which can be larger than a standard LU. LUSE volumes are created from unallocated LDEVs. This function corresponds to the LUN Expansion function (however, the size expansion of one LU is not supported). The LUN Expansion capability that increases the size of an LU without combining with other LDEVs is not supported.

  You can create a 9500V LUSE volume that does not have a volume path (see section 8.6). You can also create a 9500V LUSE volume when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete Volume Path.** Enables you to add and delete volume paths (such as port and LUN) for the LDEVs.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.

2.3.7 Configuring the Thunder 9200 Storage Subsystem

Device Manager supports the following storage subsystem and volume configuration functions for the Hitachi Thunder 9200 storage subsystem:

- **Configure Ports.** Enables you to configure the host mode and fibre topology settings for the Fibre Channel ports (see section 11.3.1.1).
- **Create/Delete Array Groups.** Enables you to create new array groups and delete existing array groups (see section 11.3.2.1 and 11.3.2.2).
- **Create/Delete LDEVs.** Enables you to create new LDEVs (internal LUs) and delete existing LDEVs (see section 11.3.3.1 and 11.3.3.3).

  WARNING: Make sure that only one Web client session is formatting LUs on the same 9200 storage subsystem. If multiple Web clients are formatting multiple LUs at the same time, this can cause the 9200 to become unavailable to the servers using it.
- **Configure Spare Drives.** Enables you to configure the spare drives (see section 11.3.2.3).
- **Configure LUN Expansion (LUSE) volumes.** Enables you to configure custom-size LUSE volumes. A LUSE volume is a combined LU which can be larger than a standard LU. LUSE volumes are created from unallocated LDEVs. This function corresponds to the integrated functions of LUs in the Thunder 9200. The LUN Expansion capability that increases the size of an LU without combining with other LDEVs is not supported.

  You can create a 9200 LUSE volume that does not have a volume path (see section 8.6). You can also create a 9200 LUSE volume when allocating a volume path to an LDEV (see section 8.4) or when adding storage to a storage group (see section 7.6.2).
- **Add/Delete Volume Path.** Enables you to add and delete volume paths (such as port, LUN) for the LDEVs on the connected 9200 storage subsystems.

  Note on High Availability: Device Manager enables you to configure multiple paths to volumes as needed for path failover capability.

2.4 Managing Data

Device Manager enables you to perform data management operations such as LUN security and data replication/backup (using, for example, TrueCopy and ShadowImage) on the storage subsystems which have been added to Device Manager.

Note: The data management function must be installed and available on the storage subsystem. If you need assistance, please contact the Hitachi Data Systems Support Center (see section 13.4).

2.4.1 Managing Data for Universal Storage Platform V Storage Subsystems

Device Manager helps you to manage data on the Universal Storage Platform V storage subsystem:

- **LUN Security.** Device Manager enables you to perform the following LUN security functions on the Universal Storage Platform V storage subsystem:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed (such as add host(s) to or remove host(s) from a host storage domain). After a LUN has been secured, only hosts with the specified WWNs are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations on the Universal Storage Platform V storage subsystem:
  - **Set/Cancel Command Device.** The command device is a logical unit used exclusively for communicating with CCI on the host to control copy operations.
  - **TrueCopy**. TrueCopy enables you to perform synchronous and asynchronous remote copy operations. For details about TrueCopy, refer to the *Hitachi TrueCopy User and Reference Guide*.
  - **ShadowImage.** ShadowImage enables you to perform local (subsystem-internal) copy operations that can provide a maximum of nine copies of a primary volume (P-VOL).
  - **Universal Replicator.** Universal Replicator enables you to perform asynchronous remote copying between different storage subsystems. Universal Replicator stores the updates in a journal volume.
  - **Copy-on-Write Snapshot.** Copy-on-Write Snapshot enables you to copy logical snapshot data on Universal Storage Platform V and create a maximum of 64 copies (V-VOLs) of a primary volume (P-VOL). Device Manager enables you to view pair information for Copy-on-Write Snapshot. You can also use Copy-on-Write Snapshot from the Physical View dialog box of a Universal Storage Platform V storage subsystem. For details on the Physical View dialog box of a Universal Storage Platform V storage subsystem, see section 11.1.1.

2.4.2 Managing Data for TagmaStore USP Storage Subsystems

Device Manager helps you to manage data on the TagmaStore USP storage subsystem:

- **LUN Security.** Device Manager enables you to perform the following LUN security function on the TagmaStore USP storage subsystem:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed (such as add host(s) to or remove host(s) from a host storage domain). After a LUN has been secured, only hosts with the specified WWNs are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations on the TagmaStore USP storage subsystem:
  - **Set/Cancel Command Device.** The command device is a logical unit used exclusively for communicating with CCI on the host to control copy operations.
  - **TrueCopy**. TrueCopy enables you to perform synchronous and asynchronous remote copy operations. For details about TrueCopy, refer to the *Hitachi TrueCopy User and Reference Guide*.
  - **ShadowImage.** ShadowImage enables you to perform local (subsystem-internal) copy operations that can provide a maximum of nine copies of a primary volume (P-VOL).
  - **Universal Replicator.** Universal Replicator enables you to perform asynchronous remote copying between different storage subsystems. Universal Replicator stores the updates in a journal volume.
  - **Copy-on-Write Snapshot.** Copy-on-Write Snapshot enables you to copy logical snapshot data on TagmaStore USP and create a maximum of 64 copies (V-VOLs) of a primary volume (P-VOL). Device Manager enables you to view pair information for Copy-on-Write Snapshot. You can also use Copy-on-Write Snapshot from the Physical View dialog box of a TagmaStore USP storage subsystem. For details on the Physical View dialog box of a TagmaStore USP storage subsystem, see section 11.1.2.

2.4.3 Managing Data for Lightning 9900 V Series Subsystems

Device Manager helps you to manage data on the Lightning 9900V storage subsystem:

- **LUN Security.** Enables you to perform the following LUN security function:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed (such as add host(s) to or remove host(s) from a host storage domain). After a LUN has been secured, only hosts with the specified WWNs are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations:
  - **Set/Cancel Command Device.** The command device is an LU used exclusively for communicating with CCI on the host to control copy operations.
  - **TrueCopy.** TrueCopy enables you to perform synchronous and asynchronous remote copy operations.
  - **ShadowImage.** ShadowImage enables you to perform local (subsystem-internal) copy operations that can provide up to nine copies of a primary volume (P-VOL).

2.4.4 Managing Data for Lightning 9900 Subsystems

Device Manager helps you to manage data on the Lightning 9900 storage subsystem:

- **LUN Security.** Enables you to perform the following LUN security (Hitachi SANtinel) functions:
  - **Configure LUN Groups.** Enables you to configure LUN groups, including creating, deleting, and modifying LUN groups.
  - **Configure WWN Groups.** Enables you to configure WWN groups, including creating, deleting, and modifying WWN groups. The WWNs assigned to a WWN group can be manipulated as a group.
  - **Secure/Unsecure Volumes.** Enables you to secure and unsecure volumes (LUNs) as needed. After a LUN has been secured, only hosts with the specified WWNs are permitted to access the LUN.
- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations:
  - **Set/Cancel Command Device.** The command device is an LU used exclusively for communicating with CCI on the host to control copy operations. For details about the command device, see the *Command Control Interface (CCI) User and Reference Guide*.
  - **TrueCopy.** TrueCopy enables you to perform synchronous and asynchronous remote copy operations. For more information, refer to the *Hitachi Lightning 9900 TrueCopy User and Reference Guide*.
  - **ShadowImage.** ShadowImage enables you to perform local (subsystem-internal) copy operations that can provide a maximum of nine copies of a primary volume (P-VOL). For more information, refer to the *Hitachi Lightning 9900 ShadowImage User's Guide*.

2.4.5 Managing Data for TagmaStore AMS/WMS Series Subsystems

Device Manager helps you to manage data on the TagmaStore AMS/WMS Series storage subsystem:

- **LUN Security.** Enables you to perform the following LUN security function:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed. After a LUN has been secured, only hosts with specified WWNs are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication and backup (copy) operations:
  - **Set/Cancel Command Device.** The command device is a logical unit used exclusively for communicating with the CCI software on the host, to control copy operations.
  - **TrueCopy.** Enables you to perform synchronous and asynchronous remote copy operations.
  - **ShadowImage.** Enables you to perform local (storage subsystem internal) copy operations. If the microcode is a version earlier than 0750/A, form a pair by setting one secondary volume (S-VOL) for a single primary volume (P-VOL). If the microcode is 0750/A or later, you can form a pair by setting up no more than three secondary volumes (S-VOLs) for a single primary volume (P-VOL).
  - **Copy-on-Write Snapshot.** Copy-on-Write Snapshot copies logical snapshot data inside a TagmaStore AMS/WMS series subsystem. If the microcode is a version earlier than 0750/A, you can create a maximum of 14 copies (V-VOLs) of a primary volume (P-VOL). If the microcode is 0750/A or later, you can create a maximum of 15 copies (V-VOLs) of a primary volume (P-VOL).

2.4.6 Managing Data for Thunder 9500 V Series Subsystems

Device Manager helps you to manage data on the Thunder 9500 V storage subsystem:

- **LUN Security.** Enables you to perform the following LUN security functions:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed. After a LUN has been secured, only the specified WWN(s) is/are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations:
  - **Set/Cancel Command Device.** The command device is an LU used exclusively for communicating with the CCI software on the host to control copy operations.
  - **TrueCopy.** TrueCopy enables you to perform synchronous remote copy operations.
  - **ShadowImage.** ShadowImage enables you to perform local (storage subsystem-internal) copy operations.
  - **QuickShadow.** QuickShadow enables you to perform logical snapshot data replication within the Thunder 9500 V storage subsystem to provide a maximum of 14 copies (V-VOLs) of each primary volume (P-VOL).

2.4.7 Managing Data for Thunder 9200 Subsystems

Device Manager helps you to manage data on the Thunder 9200 storage subsystem:

- **LUN Security.** Enables you to perform the following LUN security function:

  Secure/Unsecure Volumes. Enables you to secure and unsecure volumes (LUNs) as needed. After a LUN has been secured, only the specified WWN(s) is/are permitted to access the LUN.

- **Data Replication/Backup.** Enables you to perform the following data replication/backup (copy) operations on the 9200 storage subsystem:
  - **Set/Cancel Command Device.** The command device is an LU used exclusively for communicating with the CCI software on the host to control copy operations.
  - **TrueCopy.** TrueCopy enables you to perform synchronous remote copy operations.
  - **ShadowImage.** ShadowImage enables you to perform local (storage subsystem-internal) copy operations.

2.5 Linking-and-Launching Integration

The Device Manager link-and-launch feature enables administrators to easily move across storage management software for a full view of their storage resources. For information on the requirements for link-and-launch operations, see section 4.2.

Device Manager provides link-and-launch integration with the following software applications:

- Tuning Manager (see section 5.5.1)
- Dynamic Link Manager (HDLM) (see section 5.5.2)
- Protection Manager (see section 5.5.3)
- Provisioning Manager (see section 5.5.4)
- Replication Monitor (see section 5.5.5)
- Tiered Storage Manager (see section5.5.6)
- Global Link Availability Manager (see section 5.5.7)
- Storage Services Manager (see section 5.5.8)
- Storage Navigator (see section 5.5.9)
- NAS Manager (see section 5.5.10)
- HiCommand NAS Manager (see section 5.5.11)
- Disk Array Management Program3 (DAMP) (for Web) (see section 5.5.12)
- Storage Navigator Modular (for Web) (see section 5.5.12)
- Third-party applications (see section 5.5.13)

2.6 Generating Reports

Device Manager provides a built-in reporting function which enables the user to generate reports in HTML format and comma-separated value (CSV) format (see Chapter 12).

The Device Manager reports include:

- **Physical Configuration of Storage Subsystem** report: Physical configuration of the storage subsystems being managed by Device Manager
- **Storage Utilization by Host** report: Storage utilization organized and presented by host
- **Storage Utilization by Logical Group** report: Storage utilization organized and presented by logical group
- **Users and Resource Groups** report: Resource groups of Device Manager and users who are assigned to those resource groups
- **Detailed Array Reports**: Detailed information about the LDEVs managed by Device Manager.

2.7 Using and Customizing System Security

Device Manager can be deployed securely in a variety of operational environments, including private LAN, virtual private network (VPN), corporate intranet, and even public internet. The security features for Device Manager communications (between Web client and server, for example) can be customized for your operational environment.

Device Manager provides an end-to-end security context between the user and the Device Manager server which prevents message tampering and provides privacy, user authentication, and nonrepudiation. Messages between the Device Manager Web client and server are secured when the server is running in security mode 2 (SSL/TSL). For information about the server.properties setting, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*. The HiCommand Suite Common Component Single Sign-On feature (see section 1.4) maintains user authentication across HiCommand products.

The HiCommand Suite Common Component integrated logging feature provides a common log repository for the various logs of the HiCommand suite products.

For more information on Device Manager security operations, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

Chapter 3 Installing the Device Manager Web Client

This chapter describes the requirements for Web client operations, preparations for accessing the Web client, and the requirements and procedures for installing the Java environment.

- Requirements for Web Client Operations (see section 3.1)
- Preparing to Access the Web Client (see section 3.2)
- Installing the Java Software Environment (see section 3.3)
- Configuring Java software for Client/Server Operations (see section 3.4)
- Upgrading the Java GUI and Clearing Cache (see section 3.5)
- Setting up Secure Communication with Device Manager (see section 3.6)

3.1 Requirements for Web Client Operations

The requirements for Device Manager Web client operations are:

- **Device Manager server.** The Device Manager server must be installed, configured, and fully operational. Refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.
- **Platform for HiCommand Device Manager Web client.** Device Manager 5.7 supports the following operating systems for the Web client:
  - Microsoft Windows 2000 (Service Pack 3 or 4)
  - Microsoft Windows XP (with Service Pack 1 or 2)
  - Microsoft Windows Server 2003 (with no Service Pack or with Service Pack 1 or 2, x86 processor version only)
  - Windows Server 2003 R2 (with no Service Pack or with Service Pack 2, x86 processor version only)
  - Windows Vista™
  - Sun Solaris 8, 9, or 10 (SPARC platform only)
  - HP-UX 11i v1 (PA-RISC), HP-UX 11i v2, or HP-UX 11i v3 (PA-RISC)

  Supported monitor resolutions are XGA and higher.

  Notes:

  - If the OS is Windows Vista, the use of Storage Navigator or Storage Navigator Modular (for Web) is not supported.
  - If the OS is Solaris 10, the use of Storage Navigator for Lightning 9900V is not supported.
- **Web Browser for HTML GUI.** Device Manager 5.7 supports the following Web browsers for the Web client:
  - For Windows 2000: Internet Explorer 6.0
  - For Windows XP (with Service Pack 1): Internet Explorer 6.0
  - For Windows XP (with Service Pack 2): Internet Explorer 6.0 and Internet Explorer 7.0
  - For Windows Server 2003 (with no Service Pack): Internet Explorer 6.0
  - For Windows Server 2003 (with Service Pack 1 or 2): Internet Explorer 6.0 and Internet Explorer 7.0
  - For Windows Server 2003 R2 (with no Service Pack or with Service Pack 2): Internet Explorer 6.0
  - For Windows Vista: Internet Explorer 7.0
  - For Solaris 8: Mozilla 1.4
  - For Solaris 9: Mozilla 1.4 and Mozilla 1.7
  - For Solaris 10: Mozilla 1.7
  - For HP-UX 11i v1 or HP-UX 11i v2: Mozilla 1.7.8.00 and Mozilla 1.7.12.01
  - For HP-UX 11i v3: Mozilla 1.7.13.01

Environment variable setting for Web client in Solaris or HP-UX: When the Web client is used in Solaris or HP-UX, the **PATH** environment variable must contain the entry for the Mozilla installation directory to enable launching of the help and report functions and other applications.

Note: When the Web browser is set as noted below, characters might be displayed on top of each other (that is, two or more characters might appear in the same space on the screen) in the Web client.

- In Internet Explorer, the character size is set to **Largest**
- In Mozilla, the character size is set to a value greater than **120%**
- In Internet Explorer version 7.0, the enlargement level is a value other than **100%** (default)

- **Java execution environment.** HiCommand Device Manager Web client requires the following Java software environment. Java Web Start (JWS) is automatically installed when Java Runtime Environment (JRE) is installed:

  In Windows 2000 (with Service Pack 3), Windows XP (with Service Pack 1), Solaris 8 or Solaris 9 (see ***Note*** 1):

  - JRE 1.4.2_*xx* (*xx*: 04 or later) or version 5.0 (Update 7 or later)
  - JWS 1.4.2_*xx* (*xx*: 04 or later) or version 5.0 (Update 7 or later)

  In Windows 2000 (with Service Pack 4), Windows XP (with Service Pack 2), or Windows Server 2003 (see ***Note*** 1 and ***Note*** 2):

  - JRE version 1.4.2_xx (xx: 04 or later), version 5.0 (Update 7 or later), or version 6.0
  - JWS version 1.4.2_xx (xx: 04 or later), version 5.0 (Update 7 or later), or version 6.0

  In Windows Server 2003 R2 or Solaris 10 (see ***Note*** 1 and ***Note*** 2):

  - JRE 1.4.2_xx (xx: 12 or later), version 5.0 (Update 7 or later), or version 6.0
  - JWS 1.4.2_xx (xx: 12 or later), version 5.0 (Update 7 or later), or version 6.0

  In Windows Vista (see ***Note*** 2):

  - JRE version 6.0
  - JWS version 6.0

  In HP-UX (see ***Note*** 1):

  - JRE 1.4.2_*xx* (*xx*: 06 or later) or version 5.0.03 or later
  - JWS 1.4.2_*xx* (*xx*: 06 or later) or version 5.0.03 or later

  Note 1: For *xx*, we recommend that you use the latest version.

  Note 2: In Windows, JRE version 6.0 is supported only when Internet Explorer 7.0 is used.

  Additional Notes:

  - When JRE version 6.0 is used, the use of Storage Navigator is not supported.
  - To use Storage Navigator Modular (for Web) or DAMP (for Web) in the Web client, use JRE version 1.4.2_*xx*. For details on the JRE versions supported by Storage Navigator Modular (for Web) or DAMP (for Web), see the manual for each management tool.

- If the system on which HP-UX operates uses a Dual-Core Intel Itanium 2 Processor for the CPU, use JRE version 1.4.2_*xx* (*xx*: 10 or later) or JRE version 5.0.03 or later, which comes with HP-UX (released in June 2006 or September 2006) that supports the processors.

- **Agent (recommended, optional).** The Device Manager agent is recommended but not required for Device Manager operations. If the Device Manager agent is installed, Device Manager will display usage and file system information for the storages assigned to the host, and statuses of the copy pairs managed by the host. For details on the Device Manager agent, refer to the *HiCommand Device Manager Agent Installation Guide*.
- **Storage subsystems.** Before adding a storage subsystem to Device Manager using the Web client (or another client), you must make sure that the storage subsystem is configured for Device Manager operations. For subsystem configuration requirements, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.

  Important: Device Manager displays, but does not allow you to set, mainframe volumes such as 3390-3.
- **Link-and-launch.** Device Manager Web client provides link-and-launch capability with several other software applications. See section 4.2 for requirements.

3.2 Preparing to Access the Web Client

Before accessing the Device Manager Web client software, you must complete the following tasks:

1. **Reading the Release Notes.** Always read the Device Manager Release Notes before starting.
2. **Installing the Server.** Ensure that the Device Manager server has been installed and configured properly as described in the *HiCommand Device Manager Server Installation and Configuration Guide*.

   Note: Device Manager server installation (version 2.3 and higher) includes installation of the HiCommand Suite Common Component.

   Copy pair operations: If you plan to perform copy pair operations (ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot, or Universal Replicator) using Device Manager, CCI must be installed on each host that manages copy pairs. For details on requirements, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
3. **Obtaining the Server address.** Write down the URL (IP address and/or host name) of the Device Manager server and the port specified in the server properties file (default = 23015). You will need this information to log in to the Device Manager server.

   Note: If you are not able to connect to the Device Manager server home page, see the troubleshooting information in Table 13.1.
4. **Installing Agents (optional).** The Device Manager agent is optional. If you will be using the Device Manager agent, install the agent on the applicable host(s). For details, refer to the *HiCommand Device Manager Agent Installation Guide*.
5. **Configuring a browser for which pop-up blocking is enabled.** When using Device Manager on a browser for which pop-up blocking is enabled, configure the browser so that pop-ups of the Device Manager server are not blocked.

   Example:

   When using Internet Explorer for Windows XP (SP2), configure either of the following settings:

   – Choose **Tools**, and then **Internet Options**. In the Internet Options dialog box, choose the **Security** tab, and then add the URL for Device Manager server to **Trusted Sites**. Enter the URL in the following format:

     The URL for communicating with the HBase Storage Mgmt Web Service of Device Manager server:

     `http://`*Device-Manager-server-address*`:`*port-number*`/DeviceManager/`

     Device-Manager-server-address = IP address or host name of the Device Manager server

     port-number = port number of the HBase Storage Mgmt Web Service

The URL for communicating with the Device Manager server:

`http://`*Device-Manager-server-address*`:`*port-number*`/`

Device-Manager-server-address = the IP address or host name of the Device Manager server

port-number = the port number of the Device Manager server

The following shows the example when specifying the default value for the port number.

For non-SSL:

`http://`*Device-Manager-server-address*`:23015/DeviceManager/`

`http://`*Device-Manager-server-address*`:2001/`

For SSL:

`https://`*Device-Manager-server-address*`:23016/DeviceManager/`

`https://`*Device-Manager-server-address*`:2443/`

6. **Configuring Internet Explorer security.** Make sure the following settings are configured on a browser that uses Web client.
   - **Run ActiveX controls and plug-ins** is set to **Enable**.
   - **Script ActiveX controls marked safe for scripting** is set to **Enable**.
   - **Active scripting** is set to **Enable**.
   - **Launching programs and files in an IFRAME** is set to **Prompt** or **Enable**.
   - **Submit non-encrypted form data** is set to **Prompt** or **Enable**.
   - For Internet Explorer 7.0, **Allow websites to prompt for information using scripted windows** is set to **Enable**.
7. **Configuring the Internet Explorer 7.0 browser**. When using Internet Explorer 7.0, you must select a radio button other than **Always open pop-ups in a new tab** in the area, **When a pop-up is encountered**. Otherwise, if **Always open pop-ups in a new tab** is selected, the window might be displayed behind another window.

3.3 Installing the Java Software Environment

Device Manager uses client-server architecture to support application distribution management. This Web-distribution framework is used to automatically update the Java GUI on a user's computer system.

Important: To host the Device Manager Web client, the Java 2 Runtime Environment (JRE) and Java Web Start (JWS) software products must be installed first.

The Java Web Start software enables you to launch Java-based applications like the Java GUI directly from the Web.

Note on upgrading: If the Java GUI is already installed and you have upgraded the Device Manager version, see section 3.5.1 for information on upgrading the Java GUI.

To install JRE and JWS:

1. If the necessary version of JRE comes with OS, use the supplied installer. If not supplied, download the platform-specific JRE installer.

   You can use the Device Manager Software Deployment dialog box to access the websites of vendors that provide a JRE. For details on the Device Manager Software Deployment dialog box, see section 5.6.

2. Read the installation instructions and release notes for JRE provided on the website.

3. Install the JRE software using the JRE installer. Make sure that you read the readme file for the JRE software.

   Note: Installing JRE automatically installs JWS.

Important: If the JRE version required for Web client is not installed, attempting to display a Java GUI on Web client starts the downloading of the latest JRE version. Install the latest version according to the displayed instructions. When installation is complete, the Java GUI appears. If JRE has been installed before the installation of the latest version, the settings of the newly installed JRE inherit the settings of the old JRE. However, you must configure Java Web Start (JWS) so that the appropriate version of JRE is used. For details about how to configure JWS, see section 3.4.3

Note: If you use the Java GUI in Windows, do not specify a directory name that contains an exclamation mark (!) for the JWS cache directory. If such a directory name is specified, an error will occur during initialization of the Device Manager Java GUI, and the Java GUI will not be able to start.

In the default settings for JWS, the cache directory includes the user's account name.

Therefore, if the account name you use to log in to Windows contains an exclamation mark, a directory name that contains an exclamation mark will be set for the JWS cache directory. In this case, you need to change the setting of the cache directory by using the JWS control panel.

3.4 Configuring Java Software for Client/Server Operations

You can configure a Java environment using Java Web Start (JWS).

You must configure the software as follows:

- Setting up the proxy (see section 3.4.1)
- Setting up the log output (see section 3.4.2)
- Setting up JWS when different JRE versions have been installed (see section 3.4.3)

3.4.1 Setting up the Proxy

You must set up the Java Web Start proxy in accordance with the method used to access the Device Manager server. The following methods are used to access the Device Manager server:

- Accessing the Device Manager server and other applications without a proxy
- Accessing the Device Manager server via a proxy
- Accessing the Device manager server without a proxy and accessing other applications via a proxy

The following subsections explain the proxy setup method for each version of JWS and the method used to access the Device Manager server.

3.4.1.1 For Java Web Start Version 1.4.2_xx

The proxy setup methods for Java Web Start version 1.4.2_xx are described below.

To access the Device Manager server and other applications without a proxy:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and select **Preferences**.
3. On the Java Web Start – Preferences panel, select the **General** tab.
4. Select **None**.
5. Select the **OK** button, and exit the Java Web Start application manager.

To access the Device Manager server via a proxy:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and select **Preferences**.
3. On the Java Web Start - Preferences panel, select the **General** tab.

4. Select the method to be used to set up the proxy.
   - If the proxy setting is enabled in the Web browser and it is also set to access the Device Manager server via a proxy:

     Select the **Use browser settings** radio button.
   - To set up a proxy manually:

     Select the **Manual** radio button, and then enter values in the following items:

     HTTP Proxy: IP address or name of the proxy server

     HTTP Port: Port number of the proxy server
5. Select the **OK** button, and exit the Java Web Start application manager.

To access the Device Manager server without a proxy and access other applications via a proxy:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and select **Preferences**.
3. On the Java Web Start - Preferences panel, select the **General** tab.
4. Select the method to be used to set up the proxy.
   - If the proxy setting is enabled in the Web browser and it is also set to access the Device Manager server without a proxy:

     Select the **Use Browser** radio button.
   - To set up a proxy manually:

     Select the **Manual** radio button, and then enter values in the following items.

     HTTP Proxy: IP address or name of the proxy server

     HTTP Port: Port number of the proxy server

     No Proxy Hosts: IP address or name of the Device Manager server
5. Select the **OK** button, and exit the Java Web Start application manager.

3.4.1.2 For Java Web Start Version 5.0 and 6.0

The proxy setup methods for Java Web Start version 5.0 or 6.0 are described below.

To access the Device Manager server and other applications without a proxy:

1. Start the Java Control Panel.
2. From the **General** tab, select the **Network Settings** button.

   The Network Settings window appears.
3. In the Network Settings window, select **Direct connection**.
4. In the Network Settings window, select the **OK** button.
5. In the Java Control Panel, select the **OK** button to exit the panel.

To access the Device Manager server via a proxy:

1. Start the Java Control Panel.
2. From the **General** tab, select the **Network Settings** button.

   The Network Settings window appears.
3. In the Network Settings window, select the method to be used to set up a proxy.
   - If the proxy setting is enabled in the Web browser and it is also set to access the Device Manager server via a proxy:

     Select the **Use browser settings** radio button.
   - To set up a proxy manually:

     Select the **Use proxy server** radio button, and then enter values in the following items:

     Address: IP address or name of the proxy server

     Port: Port number of the proxy server
   - If an automatic proxy configuration script is enabled in the Web browser and it is also set to access the Device Manager server via a proxy:

     Select the **Use automatic proxy configuration script** radio button, and then enter a value in the following item:

     Script location: Same script name and path as for the Web browser.
4. In the Network Settings window, select the **OK** button.
5. In the Java Control Panel, select the **OK** button and exit the panel.

To access the Device Manager server without a proxy and access other applications via a proxy:

1. Start the Java Control Panel.
2. From the **General** tab, select the **Network Settings** button.

   The Network Settings window appears.
3. In the Network Settings window, select the method to be used to set up the proxy.
   - If the proxy setting is enabled in the Web browser and it is also set to access the Device Manager server without a proxy:

     Select the **Use browser settings** radio button, and then proceed to step 7.
   - To set up a proxy manually:

     Select the **Use proxy server** radio button, enter values in the following items, and then proceed to step 4:

     Address: IP address or name of the proxy server

     Port: Port number of the proxy server
4. Select the **Advanced** button.

   The Advanced Network Settings window appears.

5. In the Advanced Network Settings window, in **Exceptions**, enter the IP address or the name of the Device Manager server.
6. In the Advanced Network Settings window, select the **OK** button.
7. In the Network Settings window, select the **OK** button.
8. In the Java Control Panel, select the **OK** button and exit the panel.

3.4.2 Setting up the Log Output

The Java Web Start version 1.4.2_xx has capability to output, to a log file, messages sent to the standard output. You can output the Java GUI's logs to a file using this function and setting properties for the client in the Device Manager server. For further information on property settings for clients in Device Manager, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.

If you launch Dynamic Link Manager from the Device Manager Web client (see section 2.5), Java Web Start collects these logs as well. To collect logs, you must set up the log output option in Java Web Start.

To set up the log output option in Java Web Start version 1.4.2_xx:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and select **Preferences**.
3. On the Java Web Start – Preferences panel, select the **Advanced** tab.
4. If desired, select the **Show Java Console** box to display the messages that are output to the log. This setting is optional.
5. In the **Output Options** box, select **Log Output**, and then enter the log file name in the **Log File Name** field. This setting is required.

   To enter the log file name, either type the desired file name in the **Log File Name** field, or select the **Choose Log File Name** button to select an existing log file name.
6. Select **OK** to save your changes, and exit the Java Web Start application manager.

3.4.3 Setting Up Java Web Start When Different JRE Versions are Installed

Java Web Start (JWS) uniquely manages the version of each installed JRE. All JREs are usable by default. Therefore, when there are multiple versions of JRE and some of these versions are the same as or higher than the version required for a Java application, JWS determines which version of JRE to use. The setup method depends on the JWS version. Because of this, you must set up JWS so that it uses the correct version of JRE to execute Java applications.

The following sections explain the setup methods for the JWS versions.

3.4.3.1 For Java Web Start Version 1.4.2_xx

To set up Java Web Start version 1.4.2_xx:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and select **Preferences**.
3. On the Java Web Start – Preferences panel, select the **Java** tab.
4. Select the **Find** button.
5. Select the **Next** button.
6. Specify the JRE installation directory, and then select the **Next** button. A dialog box displays, notifying you that the JRE is found.
7. Select the **Next** button. You return to the Preferences dialog box. Confirm that JRE is added in the **Java Runtime Versions** list.
8. In the **Java Runtime Versions** list, select the **Enabled** check box for JRE, and clear the check boxes for other versions.

   Important: For details about the version of JRE and JWS required for the Web client, see the explanation about the Java execution environment in section 3.1. To use Storage Navigator Modular (for Web) or DAMP (for Web) in the Web client, clear the JRE version 5.0 check box.
9. Select **OK** to save your changes, and exit the Java Web Start application manager.

3.4.3.2 For Java Web Start Version 5.0 and 6.0

To set up Java Web Start version 5.0 or 6.0:

1. Start the Java Control Panel.
2. In the **Java** tab window, in **Java Application Runtime Settings**, select the **View** button.

   The JNLP Runtime Settings dialog box appears.
3. In the JNLP Runtime Settings dialog box, select the **User** tab.
4. Select the **Find** button.
5. Select the **Next** button.
6. Specify the installation directory of the required version of JRE, and then select the **Next** button. A dialog box appears, notifying you that the JRE has been found.
7. Select the **Next** button. The JNLP Runtime Settings dialog box reappears.
8. Check that the required version has been added to the **Java Runtime Versions** list.
9. In the **Java Runtime Versions** list, select the **Enabled** check box for the required version, and clear the check boxes for other versions.

   Important: For details about the version of JRE and JWS required for the Web client, see the explanation about the Java execution environment in section 3.1. To use Storage Navigator Modular (for Web) or DAMP (for Web) in the Web client, clear the JRE version 5.0 check box.
10. Select the **OK** button to save your changes, and exit the Java Control Panel.

3.5 Upgrading the Java GUI and Clearing Cache

After upgrading the Device Manager server, you must complete the following tasks on the Device Manager Web client:

- Upgrade the Java GUI (see section 3.5.1)
- Clear the JWS cache (see section 3.5.2)
- Clear the browser cache (see section 3.5.3)

3.5.1 Upgrading the Java GUI

When you upgrade your Java GUI, check the required versions of the Java Runtime Environment (JRE) software and Java Web Start (JWS) software, and upgrade the JRE and JWS software according to the Device Manager version. For details on the required JRE and JWS versions for Device Manager Web client, see the explanation about the Java execution environment in section 3.1.

After upgrading the JRE and JWS software to the required version, you can start using the Java GUI. You do not need to manually update the Java GUI. Each time the Java GUI is invoked, the Java Web Start software checks to ensure that the locally cached application is the latest version available from the Device Manager server. If not, it downloads and invokes the newer version.

3.5.2 Clearing the Cache in Java Web Start

If a previous version of the Java GUI was installed, you may not be able to download the latest version of it, even when upgrading Device Manager. In such a case, you must clear the cache in Java Web Start in order to download the latest version of the Java GUI from the Device Manager server.

CAUTION: The following operation clears all resources downloaded by Java Web Start. To start applications using Java Web Start, you will need to download those resources again. The Java GUI will be downloaded automatically when you log in to the Device Manager server.

How the JWS cache is cleared depends on the JWS version. The following sections explain the procedures for the different JWS versions.

3.5.2.1 For JWS Version 1.4.2_xx

To clear the cache in JWS version 1.4.2_xx:

1. Start the Java Web Start application manager.
2. Select the **File** menu, and then select **Preferences**.
3. On the Java Web Start – Preferences panel, select the **Advanced** tab.
4. Select the **Clear Folder** button to open the Clear Applications Folder panel.
5. Select the **Yes** button.
6. Select **OK** to save your changes, and exit the Java Web Start application manager.

3.5.2.2 For Java Web Start Version 5.0

To clear the cache in Java Web Start version 5.0:

1. Start the Java Control Panel.
2. In the **General** tab, in **Temporary Internet Files**, select the **Delete Files** button.
   The Delete Temporary Files confirmation dialog box appears.
3. In the Delete Temporary Files confirmation dialog box, select the **OK** button.
   The Delete Temporary Files confirmation dialog box closes.
4. Select the **OK** button to save your changes, and exit the Java Control Panel.

3.5.3 Clearing the Browser's Cache

Even after you upgrade the Device Manager server, the browser may display the old version of Device Manager. If that happens, you must clear the cache in the browser.

To clear the cache for Internet Explorer:

1. In the menu bar, select `Tools` and then Internet `Options`.
2. In the Internet Options dialog box, select the `General` tab.
3. In `Temporary Internet` files, click the **Delete Files** button.
4. In the Delete Files dialog box, select the **Delete all offline content** check box, and then click the **OK** button.
5. In the Internet Options dialog box, click the **OK** button.

To clear the cache for Mozilla:

1. From the menu bar, select `Edit` and then `Preferences`.
2. For `Category` in the Preferences dialog box, select `Advanced` and then `Cache`.
3. Click the **Clear Memory Cache** button.
4. Click the **Clear Disk Cache** button.
5. Click the **OK** button.

3.6 Setting up Secure Communication with Device Manager

When setting up a Device Manager system, you need to perform security setup to ensure safe communication over the Internet or an intranet. With Device Manager, you can use secure sockets layer (SSL) and transport layer security (TLS) to encrypt network communications between Web client and either Device Manager server or HBase Storage Mgmt Web Service. For details about security for Device Manager server, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

When you use a TLS/SSL connection with Device Manager and the certificate or authority issuing the certificate is not trusted, a warning dialog box displays when you start the session.

This warning dialog box is displayed for Device Manager when HTML help is displayed from the following Java GUI dialog boxes:

- Resource Group Administration dialog box
- Resource Group Properties dialog box
- Resource Group Allocation dialog box
- Change Resource Group dialog box

To stop the warning dialog box from being displayed, you must import the certificate into your browser. To import the certificate into your browser, follow the instructions displayed in the appropriate dialog box.

Note: When you are using Internet Explorer as a Web browser and you specify the use of SSL on the Device Manager server, a Java GUI dialog box might not start because of an error occurring during the downloading of the Java GUI. If this problem occurs, in Internet Explorer, open the Internet Options dialog box, and then disable the **Do not save encrypted pages to disk** setting option. For details, see the Microsoft support Web site.

Note: If Web client is used on one of the following OSs, and is connected to a Device Manager server by using SSL, an attempt to start the Java GUI will display the dialog box used for saving the JNLP file, but the Java GUI cannot be started.

- Windows Server 2003, Standard Edition Service Pack 1
- Windows Server 2003, Enterprise Edition Service Pack 1
- Windows Server 2003, Datacenter Edition Service Pack 1
- Windows Server 2003 R2, Enterprise Edition Service Pack 1

In this case, save the JNLP file in the desired location in accordance with the message displayed in the dialog box, and then execute the saved file. You must perform this operation each time you start the Java GUI.

Chapter 4 Preparing for and Starting Operations

This chapter describes the preparation required before using Device Manager, and it provides instructions for starting subsystem management and other tasks:

- Preparing to start Device Manager Operations (see section 4.1)
- Link-and-Launch Requirements (see section 4.2)
- Copy Pair Requirements (see section 4.3)
- Starting Device Manager Operations (see section 4.4)
- Linking with Universal Volume Manager (see section 4.5)
- Using Virtual Partition Manager (see section 4.6)

4.1 Preparing to Start Device Manager Operations

This section provides information about using Device Manager to manage storage subsystems, and it explains the tasks that must be performed before you can start Device Manager operations.

4.1.1 Using Device Manager to Manage Storage Subsystems

The Device Manager server requires exclusive access to a storage subsystem. You must make sure that a single storage subsystem is always managed by a single Device Manager server. Do not build a system configuration where multiple Device Manager servers may be able to manage the same storage subsystem.

If Device Manager and another management tool (such as Storage Navigator from TagmaStore USP) modify the storage subsystem configuration at the same time, the operation(s) might not be performed correctly. Before using Device Manager Web client (or CLI) to modify the configuration of a storage subsystem, make sure that the storage subsystem is not being accessed by any other management tool. The service processor (SVP) from Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900 must be in the `View` mode (not in the `Modify` mode).

In an environment using the storage logical partition function, you can use different Device Manager servers to manage individual SLPRs, in addition to a Device Manager server that manages the entire storage subsystem. However, do not set up a system in a configuration in which multiple Device Manager servers manage the entire storage subsystem. A single Device Manager cannot manage multiple SLPRs of the same storage subsystem.

4.1.2 Performing tasks Before Using Device Manager

Before starting Device Manager operations, you need to perform the following tasks:

- **Install the Device Manager server.** Make sure that the Device Manager server is installed, configured, and fully operational. For more information, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*. Write down the IP address of the Device Manager server.

  Note: Make sure that you read the Release Notes for Device Manager.

- **Register the License Key.** You must register the license key of the storage subsystems you want to manage in Device Manager. Write down the license key or obtain the license key file.

- **Set up the Web Client Environment.** Make sure that the JRE and JWS software have been installed and configured properly on the Web client system as described in Chapter 1.

- **Configure Storage Subsystems.** Make sure that the storage subsystems are configured for Device Manager operations as specified in the *HiCommand Device Manager Server Installation and Configuration Guide*.

  Write down the IP address of each storage subsystem that you want to manage using Device Manager. You will need the IP address to add the storage subsystem to Device Manager.

- **Run the Device Manager Agent.** Hosts on which the Device Manager agent is installed are recognized automatically by the Web client. Make sure to run the Device Manager agent after installing the Device Manager server.

  For more information, refer to the *HiCommand Device Manager Agent Installation Guide*.

  Note: Device Manager recognizes NAS-attached hosts.

- **Write down the port WWN(s).** For each host that does not have the Device Manager agent installed, write down the port WWN(s). You will need the WWNs when you add the hosts manually to Device Manager. Note that you cannot add mainframe hosts from the Web client.

- **Configure settings for Hosts where Mainframe Agent is installed.** If you want to view the information about a mainframe volume (VOLSER and DEVN) from the Web client, Mainframe Agent must be installed on a mainframe host and the settings for linkage with Device Manager must be completed. For details on how to configure these settings, see the manual for Mainframe Agent.

  Note: You cannot perform operations for a mainframe host from the Web client. Although you can view the mainframe volume information that is acquired from Mainframe Agent, in the Web client, you cannot view information about a mainframe host.

4.2 Link-and-Launch Requirements

This section describes the requirements for performing link-and-launch operations for applications, and it explains how to specify the settings for using Mozilla as a Web browser.

4.2.1 Application-Specific Requirements

Before performing link-and-launch operations, verify that the requirements in Table 4.1 have been satisfied. For the latest information about OSs and browsers supported by an application started from a link-and- launch operation, see the manuals for the application.

Table 4.1 Link-and-Launch Requirements

Application	Requirements
Tuning Manager	For integration with Tuning Manager (Single Sign-On, common logging), Tuning Manager must be used in single sign-on mode. For details about the single sign-on settings in Tuning Manager, see the documentation for Tuning Manager.
Dynamic Link Manager (HDLM)	HDLM and the Device Manager agent must be installed on the management-target host of Device Manager. For details, see the *Hitachi Freedom Storage Hitachi Dynamic Link Manager (HDLM) User's Guide for Sun Solaris Systems*.
Protection Manager	Protection Manager and the Device Manager agent must be installed on the management-target host of Device Manager. Protection Manager Console must be installed in advance. For more information, refer to the *HiCommand Protection Manager Console User's Guide*.
Provisioning Manager	The Device Manager server (version 4.3 or later) and Provisioning Manager (version 4.3 or later) must be installed on the same server.
Replication Monitor	Device Manager Server and Replication Monitor must be installed on the same server.
Tiered Storage Manager	Device Manager Server and Tiered Storage Manager must be installed on the same server.
Global Link Availability Manager	The Device Manager server and Global Link Availability Manager must be installed on the same server. For details on how to set the Global Link Availability Manager, see the manual for Global Link Availability Manager.
Storage Services Manager	You must specify settings for the linkage with HiCommand Storage Services Manager. For details about the settings for linking with HiCommand Storage Services Manager, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
Storage Navigator	Storage Navigator must be installed on a Lightning 9900V that is being managed by Device Manager. Storage Navigator functions such as FlashAccess or TrueCopy must be installed and enabled on the storage subsystem. Device Manager only displays functions that are installed and enabled. ***CAUTION:*** When using Mozilla to start Storage Navigator in a Solaris or HP-UX environment, you need to set up the Java plug-in. For details on how to set up the Java plug-in, see section 4.2.2.
NAS Manager	The TagmaStore USP or Lightning 9900V managed by Device Manager must contain a NAS-CHA in which NAS Manager must be installed.
HiCommand NAS Manager	HiCommand NAS Manager must be installed, as a plug-in, on the management server on which the Device Manager server is installed.

Application	Requirements
Storage Navigator Modular (for Web)	You must specify settings for linking with Storage Navigator Modular (for Web) on the Device Manager server. For more information, see the *HiCommand Device Manager Server Installation and Configuration Guide*. ***Note:*** When using Mozilla to start Storage Navigator Modular (for Web) in a Solaris environment, you need to set up the Java plug-in. For details on how to set up the Java plug-in, see section.4.2.2
DAMP (for Web)	You must perform the necessary settings for linking the Device Manager server with DAMP (for Web). For details about the requirements and settings for linking with DAMP (for Web), see the *HiCommand Device Manager Server Installation and Configuration Guide*.
Third-Party Software Applications	If the third-party software applies to a specific array, Device Manager enables the link and launch of a URL from the Physical View dialog box or Show Properties - *subsystem-name* subwindow for each storage subsystem. For details, see the *HiCommand* Device Manager Command Line Interface (CLI) User's Guide. Specifically refer to the AddURLLink, GetURLLink, and DeleteURLLink API commands.

4.2.2 Settings for Using Mozilla

This section explains the settings for using Mozilla to start Storage Navigator or Storage Navigator Modular (for Web).

Specifying the Mozilla program that you want to use for Storage Navigator

To use Mozilla to start Storage Navigator, you must create a shell script that specifies the Mozilla program to be used:

1. Create a shell script named `netscapeforSN`, and code the following as appropriate for your environment:

   `#!/usr/bin/sh`

   LD_LIBRARY_PATH= *path-to-Mozilla-supported-by-Storage-Navigator* $*

   (Enter a single space after LD_LIBRARY_PATH=.)

2. Specify the execution permissions for the shell script `netscapeforSN`.
3. Modify the environment variable PATH so that the shell script `netscapeforSN` can be executed from the command line.

Setting up the Mozilla plug-in

To use Mozilla to start Storage Navigator or Storage Navigator Modular (for Web), you must create a symbolic link to the Java plug-in file in the Mozilla `plugins` directory.

The following is an example of using Mozilla in HP-UX:

`# cd` *path-to-Mozilla-supported-by-Storage-Navigator*`/plugins`

```
# ln -s /opt/java1.4/jre/plugin/PA_RISC/ns600/libjavaplugin_oji.sl .
```

After setup finishes, restart the browser.

For details on the Java plugin, see the Sun Microsystems web site.

4.3 Copy Pair Requirements

This section describes the requirements for creating a copy pair:

- P-VOL requirements (see section 4.3.1)
- S-VOL requirements (see section 4.3.2)
- RAID level requirements (see section 4.3.3)

4.3.1 Requirements for P-VOLs

Requirements for a logical device to be selectable as a primary volume (SP-VOL) for a copy pair differ depending on the storage subsystem or copy type.

Requirements for each storage subsystem have a higher priority than the requirements common to all storage subsystems.

P-VOL Requirements Common to All Systems

Table 4.2 shows the requirements common to all storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.2 Common Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL)

Copy Type	Requirements
Common conditions for paired volumes	■ The logical device must be identifiable to the Device Manager agent. You can confirm this by checking whether the date is updated to the last update time. However, if the host uses the central management method for pair management, the Device Manager agent does not need to identify the logical device. ■ The combination of the RAID levels must satisfy the conditions shown in Table 4.16 ■ The LUN security must be set up for the target host. ■ The logical device must be of an open system. ■ The logical device must belong to a storage subsystem for which a command device is set up. The command device must not be mounted. ■ The logical device must not be a command device or a remote command device. ■ If the host uses the central management method for pair management, the logical device must be a volume that belongs to the storage subsystem for the command device identified by the host that manages copy pairs.
Condition for TrueCopy	The primary volume must not have any secondary volumes.

P-VOL Requirements for Universal Storage Platform V

Table 4.3 shows the requirements specific to Universal Storage Platform V storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.3 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for Universal Storage Platform V

Copy Type	Requirements
Common condition for paired volumes	■ For an internal volume to which an external volume is mapped, the host I/O suppression mode must be disabled. ■ The logical device must not be an HDP pool volume.
Conditions for TrueCopy	■ The logical device must not be a primary or secondary volume for TrueCopy. ■ The logical device must not be a primary volume or secondary volume for Universal Replicator. For TrueCopy Sync, a Universal Replicator primary volume can be used as a primary volume for TrueCopy Sync. ■ The logical device must belong to the CU (MCU) for which the RCU is set up. ■ The logical device must not be a primary volume, V-volume or data pool for Copy-on-Write Snapshot. ■ The logical device must not be an HDP volume. ***Note***: To use a ShadowImage S-VOL as the P-VOL for a TrueCopy copy pair, the status of the ShadowImage copy pair must be Split.
Conditions for ShadowImage	■ The logical device must not be the secondary volume for a ShadowImage SP-volume. ■ If the selected logical device is a ShadowImage primary volume, the number of secondary volumes must be fewer than 3. ■ If the selected logical device is a ShadowImage SP-volume, the number of secondary volumes must be fewer than 2. ■ The logical device must not be a primary volume, V-volume or data pool for Copy-on-Write Snapshot.
Conditions for Universal Replicator	■ The emulation type must be OPEN-V. ■ The logical device must not be an HDP volume. ■ The logical device must not be a primary or secondary volume for TrueCopy Async. ■ If the selected LDEV is an S-VOL of ShadowImage, the copy status of the component pair must be Split. ■ The logical device must not be a V-volume or data pool for Copy-on-Write Snapshot. ■ The logical device must not be a P-VOL, S-VOL, or JNL-VOL of Universal Replicator.

P-VOL Requirements for TagmaStore USP

Table 4.4 shows the requirements specific to TagmaStore USP storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.4 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for TagmaStore USP

Copy Type	Requirements
Common condition for paired volumes	For an internal volume to which an external volume is mapped, the host I/O suppression mode must be disabled.
Conditions for TrueCopy	■ The logical device must not be a primary or secondary volume for TrueCopy. ■ The logical device must not be a primary volume or secondary volume for Universal Replicator. For TrueCopy Sync, a Universal Replicator primary volume can be used as a primary volume for TrueCopy Sync. ■ The logical device must belong to the CU (MCU) for which the RCU is set up. ■ The logical device must not be a primary volume, V-volume or data pool for Copy-on-Write Snapshot. ***Note***: To use a ShadowImage S-VOL as the P-VOL for a TrueCopy copy pair, the status of the ShadowImage copy pair must be Split.
Conditions for ShadowImage	■ The logical device must not be the secondary volume for a ShadowImage SP-volume. ■ If the selected logical device is a ShadowImage primary volume, the number of secondary volumes must be fewer than 3. ■ If the selected logical device is a ShadowImage SP-volume, the number of secondary volumes must be fewer than 2. ■ The logical device must not be a primary volume, V-volume or data pool for Copy-on-Write Snapshot.
Conditions for Universal Replicator	■ The emulation type must be OPEN-V. ■ The logical device must not be a primary or secondary volume for TrueCopy Async. ■ If the selected LDEV is an S-VOL of ShadowImage, the copy status of the component pair must be Split. ■ The logical device must not be a V-volume or data pool for Copy-on-Write Snapshot. ■ The logical device must not be a P-VOL, S-VOL, or JNL-VOL of Universal Replicator.

P-VOL Requirements for Lightning 9900V and Lightning 9900

Table 4.5 shows the requirements specific to Lightning 9900V and Lightning 9900 storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.5 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for Lightning 9900V and Lightning 9900

Copy Type	Requirements
Conditions for TrueCopy	■ The logical device must not be a primary or secondary volume for TrueCopy. ■ The logical device must belong to the CU (MCU) for which the RCU is set up.
Conditions for ShadowImage	■ The logical device must not be the secondary volume for a ShadowImage SP-volume. ■ If the selected logical device is a ShadowImage primary volume, the number of secondary volumes must be fewer than 3. ■ If the selected logical device is a ShadowImage SP-volume, the number of secondary volumes must be fewer than 2.

P-VOL Requirements for TagmaStore AMS/WMS Series

Table 4.6 shows the requirements specific to TagmaStore AMS/WMS series storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.6 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for TagmaStore AMS/WMS Series

Copy Type	Requirements
Conditions for TrueCopy Sync	■ The logical device must not be a Copy-on-Write Snapshot POOL. ■ There must be no Copy-on-Write Snapshot primary volumes that have a copy status of `Reverse-Copying`. ■ If the logical device is cascaded with a Copy-on-Write Snapshot V-volume, the V-volume for the Copy-on-Write Snapshot primary volume cannot be used as a TrueCopy primary volume. ■ The logical device must not be a TrueCopy primary or secondary volume. ■ A LUSE volume must consist of 16 or fewer logical units. ■ A TrueCopy path must be set up using Storage Navigator Modular.
Conditions for TrueCopy Extended Distance	■ The logical device must not be a ShadowImage primary or secondary volume. ■ The logical device must not be a TrueCopy primary or secondary volume. ■ The logical device must not be a secondary volume or V-volume for Copy-on-Write Snapshot. ■ The copy status of the Copy-on-Write Snapshot primary volume must not be `Restore`. ■ A LUSE volume must consist of 16 or fewer logical units. ■ All the logical devices in a LUSE volume must each have at least 1 GB capacity. ■ A TrueCopy path must be set up using Storage Navigator Modular.

Copy Type	Requirements
Conditions for ShadowImage	■ The logical device must not be a Copy-on-Write Snapshot primary volume, V-volume, or POOL. ■ The logical device must not be a TrueCopy Extended Distance primary or secondary volume. ■ The logical device must not be a ShadowImage secondary volume. ***Note***: Cascade is available on the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900. (Also, see ***Note*** 3.) ■ If the microcode is a version earlier than 0750/A, the logical device must not be a ShadowImage primary volume. ■ If the microcode is 0750/A or later and the selected logical device is a ShadowImage primary volume, the number of secondary volumes must be less than 3 and the copy status of the created pair must be **Simplex** or **Split**
Conditions for Copy-on-Write Snapshot	■ The logical device must be created, using Storage Navigator Modular, as a Copy-on-Write Snapshot primary volume, and the copy status must be `Simplex`. ■ If the microcode is a version earlier than 0750/A, the number of V-volumes must be less than 14. ■ If the microcode is 0750/A or later, the number of V-volumes must be less than 15. ■ The logical device must not be a ShadowImage primary or secondary volume.

P-VOL Requirements for Thunder 9500V

Table 4.7 shows the requirements specific to Thunder 9500V series storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.7 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for Thunder 9500V

Copy Type	Requirements
Conditions for TrueCopy Sync (see ***Note*** 1, 2)	■ The logical device must not be a QuickShadow POOL. ■ There must be no QuickShadow primary volumes that have a copy status of `Reverse-Copying`. (see ***Note*** 3) ■ If the logical device is cascaded with a QuickShadow V-volume, the V-volume for the QuickShadow primary volume cannot be used as a TrueCopy primary volume (see ***Note*** 3). ■ The logical device must not be a TrueCopy primary or secondary volume. ■ A LUSE volume must consist of 16 or fewer logical units (see ***Note*** 4). ■ A TrueCopy path must be set up using Storage Navigator Modular or DAMP.
Conditions for ShadowImage	■ The logical device must not be a QuickShadow primary volume, V-volume, or POOL. ■ The logical device must not be a ShadowImage primary or secondary volume (see ***Note*** 5).
Conditions for QuickShadow (see ***Note*** 6)	■ The logical device must be created, using Storage Navigator Modular or DAMP, as a QuickShadow primary volume, and the copy status must be `Simplex`. ■ The number of V-volumes must be fewer than 14. ■ The logical device must not be a ShadowImage primary or secondary volume.

Notes:

1: For Thunder 9500V and Thunder 9200, TrueCopy in asynchronous mode is not supported.

2: If the microcode is earlier than X656, a ShadowImage secondary volume cannot be a TrueCopy Sync primary volume (SP-volume).

3: If the microcode is earlier than X657/A, the QuickShadow cascade capability is not supported.

4: If the microcode is earlier than X657/A, a LUSE volume cannot be a TrueCopy Sync primary volume (SP-volume).

5: Cascade is available on the TagmaStore USP, Lightning 9900V, and Lightning 9900.

6: If the microcode is earlier than X657/A, a TrueCopy Sync primary volume (SP-volume) cannot be a QuickShadow primary volume.

P-VOL Requirements for Thunder 9200

Table 4.8 shows the requirements specific to Thunder 9200 series storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.8 Requirements for a Logical Device to be Selectable as a Primary Volume (SP-VOL) for Thunder 9200

Copy Type	Requirements
Conditions for TrueCopy Sync	■ The logical device must not be a TrueCopy primary or secondary volume. ■ The logical device must not be a ShadowImage secondary volume. ■ The logical device must not be a LUSE volume. ■ A TrueCopy path must be set up using Storage Navigator Modular or DAMP. ***Note***: For Thunder 9500V and Thunder 9200, TrueCopy in asynchronous mode is not supported.
Condition for ShadowImage	The logical device must not be a ShadowImage primary or secondary volume.

4.3.2 Requirements for S-VOLs

Requirements for a logical device to be selectable as a secondary volume for a copy pair differ depending on the storage subsystem or copy type.

Requirements for each storage subsystem have a higher priority than the requirements common to all storage subsystems.

S-VOL Requirements Common to All Systems

Table 4.9 shows the requirements common to all storage subsystems for a logical device to be selectable as a primary volume (SP-VOL).

Table 4.9 Common Requirements for a Logical Device to be Selectable as a Secondary Volume

Copy Type	Requirements
Common conditions for paired volumes	■ The logical device must be identifiable to the Device Manager agent, and must not be mounted. You can confirm this by checking whether the date is updated to the last update time. However, if the host uses the central management method for pair management, the Device Manager agent does not need to identify the logical device. ■ The combination of the RAID levels must satisfy the conditions shown in Table 4.16. ■ The logical device must not be a command device or a remote command device. ■ The LUN security must be set up for the selected host. ■ The logical device must not be selected as a primary volume. ■ The logical device must have the same capacity as that of the primary volume. ■ The logical device must not be mounted as a file system. ■ If the central management method is used for pair management, the logical device must be a volume that belongs to the storage subsystem for the command device identified by the host that manages the copy pairs. ■ The logical device must not be a primary volume or secondary volume for TrueCopy, or ShadowImage ***Note***: If you cascade with pairs other than QuickShadow/Copy-on-Write Snapshot pairs, first create the copy pair in the upper level. For example, suppose you use LDEV1, LDEV2, and LDEV3 to create the pairs of the P-VOL LDEV1 and the S-VOL LDEV2, and also the P-VOL LDEV2 and the S-VOL LDEV3, and then cascade them. In this case, first create the pair of the P-VOL LDEV1 and the S-VOL LDEV2.
Condition for ShadowImage	The logical device must be in the same storage subsystem as the selected primary volume.

S-VOL Requirements for Universal Storage Platform V

Table 4.10 shows the requirements specific to Universal Storage Platform V storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.10 Requirements for a Logical Device to be Selectable as a Secondary Volume for Universal Storage Platform V

Copy Type	Requirements
Common conditions for copy pairs	■ The logical device must be applicable to Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900. ■ The emulation type must be the same as that of the selected primary volume. ■ For a LUSE volume, the primary volume and secondary volume must have the same number of logical devices that make up the LUSE. ■ For an internal volume to which an external volume is mapped, the host I/O suppression mode must be disabled. ■ The logical device must not be an HDP pool volume.
Conditions for TrueCopy	■ The primary volume must belong to the MCU, and the secondary volume must belong to the RCU registered in that MCU. ■ The logical device must not be a primary volume or secondary volume for Universal Replicator. For TrueCopy Sync, a Universal Replicator primary volume can be used as a secondary volume for TrueCopy Sync. ■ The logical volume must not be a primary volume, V-volume, or data pool for Copy-on-Write Snapshot. ■ The logical device must not be an HDP volume.
Condition for ShadowImage	The logical volume must not be a primary volume, V-volume, or data pool for Copy-on-Write Snapshot. ***Note***: If a volume to be used for the primary volume of ShadowImage is not an HDP volume, we do not recommend that you use an HDP volume for the secondary volume.
Condition for Universal Replicator	■ The emulation type must be OPEN-V. ■ The primary volume must belong to the MCU, and the secondary volume must belong to the RCU registered in that MCU. ■ The logical device must not be an HDP volume. ■ The logical device must not be a secondary volume for ShadowImage. ■ The logical device must not be a primary or secondary volume for TrueCopy. ■ The logical device must not be a V-volume or data pool for Copy-on-Write Snapshot. ■ The logical device must not be a primary, secondary, or journal volume for Universal Replicator.

S-VOL Requirements for TagmaStore USP

Table 4.11 shows the requirements specific to TagmaStore USP storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.11 Requirements for a Logical Device to be Selectable as a Secondary Volume for TagmaStore USP

Copy Type	Requirements
Common conditions for copy pairs	■ The logical device must be applicable to TagmaStore USP, Lightning 9900V, and Lightning 9900. ■ The emulation type must be the same as that of the selected primary volume. ■ For a LUSE volume, the primary volume and secondary volume must have the same number of logical devices that make up the LUSE. ■ For an internal volume to which an external volume is mapped, the host I/O suppression mode must be disabled.
Conditions for TrueCopy	■ The primary volume must belong to the MCU, and the secondary volume must belong to the RCU registered in that MCU. ■ The logical device must not be a primary volume or secondary volume for Universal Replicator. For TrueCopy Sync, a Universal Replicator primary volume can be used as a secondary volume for TrueCopy Sync. ■ The logical volume must not be a primary volume, V-volume, or data pool for Copy-on-Write Snapshot.
Condition for ShadowImage	The logical volume must not be a primary volume, V-volume, or data pool for Copy-on-Write Snapshot.
Condition for Universal Replicator	■ The emulation type must be OPEN-V. ■ The primary volume must belong to the MCU, and the secondary volume must belong to the RCU registered in that MCU. ■ The logical device must not be a secondary volume for ShadowImage. ■ The logical device must not be a primary or secondary volume for TrueCopy. ■ The logical device must not be a V-volume or data pool for Copy-on-Write Snapshot. ■ The logical device must not be a primary, secondary, or journal volume for Universal Replicator. Note that, for Universal Replicator (Resync), a secondary volume for Universal Replicator can be used.

S-VOL Requirements for Lightning 9900V and Lightning 9900

Table 4.12 shows the requirements specific to Lightning 9900V and Lightning 9900 storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.12 Requirements for a Logical Device to be Selectable as a Secondary Volume for Lightning 9900V and Lightning 9900

Copy Type	Requirements
Common conditions for copy pairs	■ The logical device must be applicable to TagmaStore USP, Lightning 9900V, and Lightning 9900. ■ The emulation type must be the same as that of the selected primary volume. ■ For a LUSE volume, the primary volume and secondary volume must have the same number of logical devices that make up the LUSE.
Condition for TrueCopy	The primary volume must belong to the MCU, and the secondary volume must belong to the RCU registered in that MCU.

S-VOL Requirements for TagmaStore AMS/WMS Series

Table 4.13 shows the requirements specific to TagmaStore AMS/WMS series storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.13 Requirements for a Logical Device to be Selectable as a Secondary Volume for TagmaStore AMS/WMS Series

Copy Type	Requirements
Conditions for TrueCopy Sync	■ The logical device must belong to a different storage subsystem from that of the primary volume, and must be a TagmaStore AMS/WMS series logical device. ■ A TrueCopy path must be set up using Storage Navigator Modular. ■ A LUSE volume must consist of 16 or fewer logical units.
Conditions for TrueCopy Extended Distance	■ The logical device must belong to a different storage subsystem from that of the primary volume, and must be a TagmaStore AMS/WMS series logical device. ■ A TrueCopy path must be set up using Storage Navigator Modular. ■ A LUSE volume must consist of 16 or fewer logical units. ■ All the logical devices in a LUSE volume must each have at least 1 GB capacity. ■ The default controller of the logical device must match the current controller.
Conditions for ShadowImage	■ The logical device must not be a Copy-on-Write Snapshot primary volume, V-volume, or POOL. ■ The logical device must have the same default controller as that of the selected primary volume. ■ The logical volume must not be a TrueCopy Extended Distance primary volume or secondary volume.
Conditions for Copy-on-Write Snapshot	■ The logical device must be defined, using Storage Navigator Modular, as a Copy-on-Write Snapshot V-volume paired with the selected primary volume, and the copy status must be `Simplex`. ■ The logical device must not be a TrueCopy primary or a secondary volume.

S-VOL Requirements for Thunder 9500V

Table 4.14 shows the requirements specific to Thunder 9500V storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.14 Requirements for a Logical Device to be Selectable as a Secondary Volume for Thunder 9500V

Copy Type	Requirements
Conditions for TrueCopy Sync	■ The logical device must belong to a different storage subsystem from that of the primary volume, and must be a Thunder 9500V logical device. ■ The logical device must not be a V-volume or data pool for QuickShadow (see ***Note*** 1). ■ A LUSE volume must consist of 16 or fewer logical units (see ***Note*** 2). ■ A TrueCopy path must be set up using Storage Navigator Modular or DAMP.
Condition for ShadowImage	■ The logical device must not be a QuickShadow primary volume, V-volume, or POOL. ■ The logical device must have the same default controller as that of the selected primary volume.
Conditions for QuickShadow	The logical device must be defined, using Storage Navigator Modular or DAMP, as a QuickShadow V-volume paired with the selected primary volume, and the copy status must be `Simplex`.

Notes:

1: If the microcode is earlier than X657/A, the QuickShadow cascade capability is not supported.

2: If the microcode is earlier than X657/A, a LUSE volume cannot be a secondary volume.

S-VOL Requirements for Thunder 9200

Table 4.15 shows the requirements specific to Thunder 9200 storage subsystems for a logical device to be selectable as a secondary volume (SP-VOL).

Table 4.15 Requirements for a Logical Device to be Selectable as a Secondary Volume for Thunder 9200

Copy Type	Requirements
Conditions for TrueCopy Sync	■ The logical device must belong to a different storage subsystem from that of the primary volume, and must be a Thunder 9200 logical device. ■ A TrueCopy path must be set up using Storage Navigator Modular or DAMP. ■ The logical device must not be a LUSE volume.
Conditions for ShadowImage	■ The logical device must have the same default controller as that of the selected primary volume. ■ The logical device must not be in use as a copy pair for ShadowImage.

4.3.3 Requirements for RAID Levels

Requirements for the RAID level of copy pair volumes differ depending on the storage subsystem or copy type. Table 4.16 shows the combinations of the RAID levels of copy pair volumes.

Table 4.16 Combinations of RAID Levels of Copy Pair Volumes

Copy Type	Storage Subsystem			
	Universal Storage Platform V and TagmaStore USP	**Lightning 9900V and Lightning 9900**	**TagmaStore AMS/WMS Series**	**Thunder 9200 and Thunder 9500V**
QuickShadow/Copy-on-Write Snapshot	Not applicable	Not applicable	Any combination of RAID1, RAID5, RAID1+0, and RAID6	Combination of RAID1, RAID5, and RAID0+1 (Thunder 9200 does not support QuickShadow.)
TrueCopy	Any combination of RAID1, RAID5 and RAID6	Any combination of RAID1 and RAID5	Any combination of RAID1, RAID5, RAID1+0, and RAID6	Combination of RAID5 (2D+1P to 15D+1P). However, the number of data disks must be the same. For Thunder 9500V (for microcode X655 or later): Combination of the same RAID levels of RAID1, RAID5, or RAID0+1. However, the number of data disks must be the same.
ShadowImage	Any combination of RAID1, RAID5 and RAID6	Any combination of RAID1 and RAID5	Any combination of RAID0, RAID1, RAID5, RAID1+0, and RAID6	Any combination of RAID0, RAID1, RAID5, and RAID0+1. However, the number of data disks must be the same.
Universal Replicator	Any combination of RAID1, RAID5 and RAID6	Not Applicable		

4.4 Starting Device Manager Operations

After you have installed Device Manager, prepared for Device Manager operations, and logged in to the Device Manager server, you are ready to start using Device Manager. This section provides an overview of the tasks that are required to set up and use Device Manager.

To create an efficient Device Manager environment, perform the following tasks in the order in which they are listed.

To start Device Manager operations:

1. Log in to HiCommand Device Manager using the System account (see section 5.1.12).
2. Change the password for the System account from the default password to prevent unauthorized access (see section 6.2.4).
3. Create users who can perform all resource operations and user management operations provided by Device Manager (see section 6.2.1).

   After you have created the users, grant them the User Management and Admin permissions and assign the All Resources resource group to the users.
4. Create the logical group hierarchy (see section 7.3).
5. Create a user-defined resource group, and associate it with a logical group (see section 6.3.1).
6. Assign the created resource group to the users (see section 6.3.2).

   This enables specific users to access specific resources.
7. Add the connected storage subsystems to the Device Manager server. (see section 10.3). The volumes of the added subsystems are assigned to the All Resources resource group, and are placed on the **All Storage** object.

   Caution: The Device Manager server requires exclusive access to a storage subsystem. For details, see section 4.1.1.

   Important: In an environment where the storage logical partition function can be used, you can use different Device Manager servers to manage individual SLPRs, in addition to a Device Manager server that manages the entire storage subsystem.
8. Add each host (host name and WWN) that manages a storage to Device Manager by installing the Device Manager agent on each host and then executing the `HiScan` command, or by entering the host name using the Device Manager Web client or CLI

   CAUTION: You should add all hosts before performing a LUN scan operation. If you do not enter the hosts before performing a LUN scan, the LUN scan will automatically create a unique host name (HOST_0, HOST_1, etc.) for each WWN. This can create a significant number of hosts depending on the environment.
9. After completing steps 3 to 8, you are ready to perform storage operations (see section 7.6), such as adding and moving storage, adding and deleting volume paths, configuring LUN security, and managing copy pairs.

10. After storage operation is complete, update the host information by executing the `HiScan` command on the Device Manager agent or by refreshing the host on the Device Manager Web client.

11. Perform a LUN Scan operation on each storage subsystem if necessary.

    A LUN Scan operation detects any LUNs that have not been added to a storage group. Each detected LUN will be placed in one of the storage groups that are created for each security level under the LUN SCAN group created in the **Logical Groups** object.

    Important: If a LUN Scan operation detects a WWN that has not been added to Device Manager as a host, the WWN is automatically assigned a unique host name (such as `HOST_0` or `HOST_1`). After host names are automatically assigned through a LUN Scan operation, you can reassign more readable host names for the WWNs, assemble WWNs that are physically located on the same host to a single host, or delete unnecessary host names if necessary. To merge multiple WWNs into a single host, first remove any unnecessary hosts by executing the **Remove Host** operation in the method area. Then, in the Modify Properties - *host-name* dialog box, add the WWNs set for the deleted hosts to another host. For details, see section 9.6 and section 9.10.

12. When you are finished performing Device Manager operations, log out to prevent unauthorized access (see section 5.1.12 for instructions).

4.5 Linking with Universal Volume Manager

In a Universal Storage Platform V or TagmaStore USP subsystem, volumes of another storage subsystem connected via a SAN can be handled as virtual interval volumes. This feature is called the Universal Volume Manager.

Figure 4.1 shows an example of a system configuration using Universal Volume Manager.

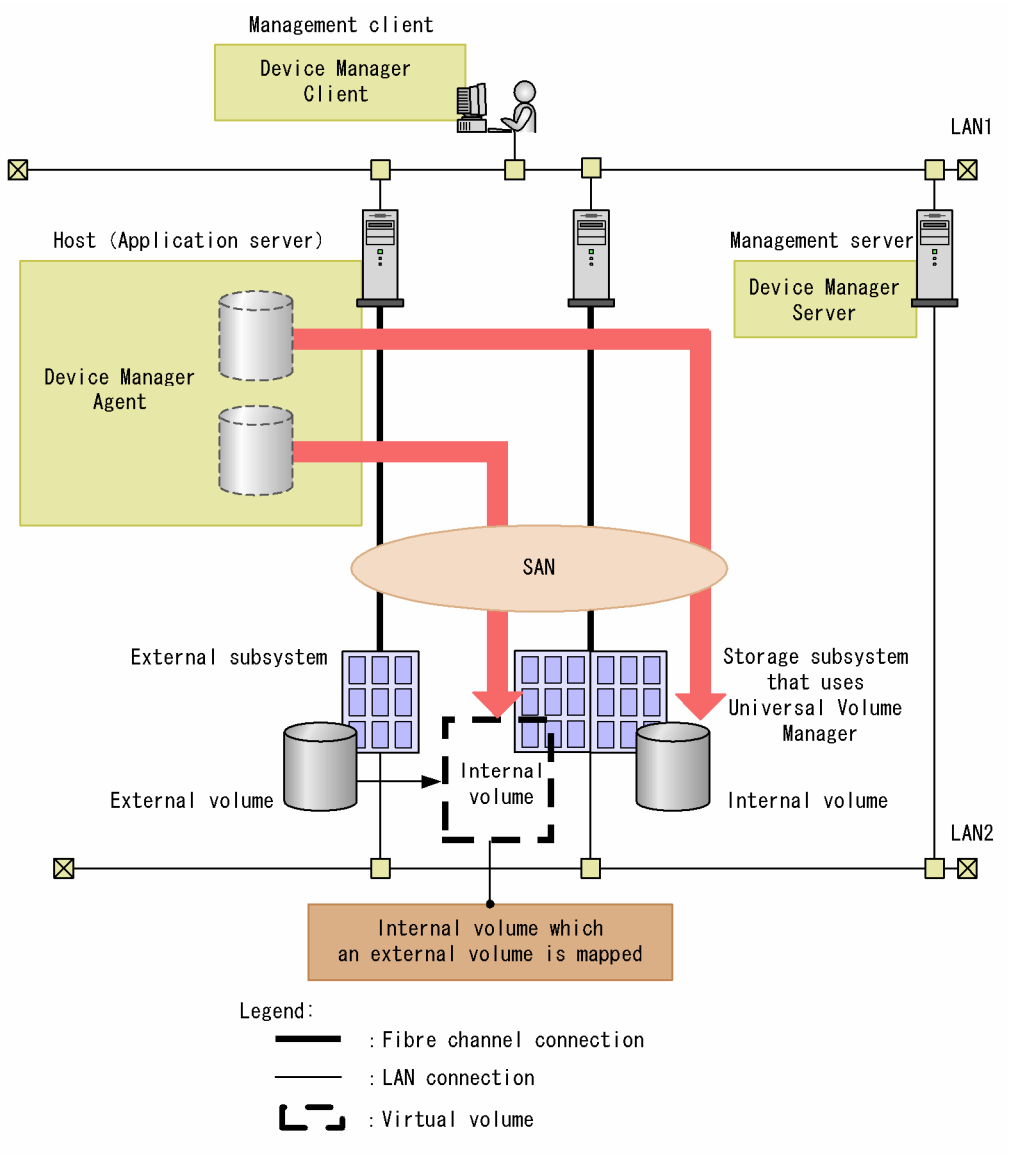


Figure 4.1 System Configuration Using Universal Volume Manager

A storage subsystem connected to a storage subsystem that uses Universal Volume Manager is called an *external subsystem*. Of the volumes that the external subsystem manages, those volumes mapped to the storage subsystem that use Universal Volume Manager are called *external volumes*.

A storage subsystem that uses Universal Volume Manager can manage external volumes as virtual internal volumes by mapping the external volumes to internal volumes of the storage subsystem.

For details on Universal Volume Manager, refer to the *Universal Volume Manager User's Guide*.

4.5.1 Advantages of Linking with Device Manager

In a storage subsystem that uses Universal Volume Manager, Device Manager distinguishes between internal volumes and external volumes, and displays them separately. Thus, for example, if you want to allocate reliable storage to a host, you can select a volume from the internal volumes. If you want to allocate lower bit-cost storage for use as S-VOL of the copy pair capability, you can select a volume from the external volumes.

So, if you remove the LUN settings or LUN security settings for an external volume in an external subsystem management window, the storage subsystem that uses Universal Volume Manager can no longer use the external volume. To avoid the problem, Device Manager provides the Detailed Information - LDEV-number dialog box, which displays whether the volume is used as an external volume. To display whether a volume in an external subsystem is an external volume, verify that Device Manager has already found both the storage subsystem that uses Universal Volume Manager and the external subsystem.

4.5.2 Required Tasks for Universal Volume Manager

In order to use the Universal Volume Manager, complete the following tasks:

1. Use Device Manager to find a storage subsystem that uses Universal Volume Manager and find storage subsystems that can be used for external subsystems.
2. In a storage subsystem that uses Universal Volume Manager, set the port that you want to use for the external connection as an external port.

   Device Manager manages the external port as a special host. For details on how to use Physical View to set a port as an external port, see the Universal Volume Manager documentation.
3. Specify an external subsystem port to be connected to the external port. For details, refer to the *Universal Volume Manager User's Guide*.
4. Specify an external volume in the external subsystem.

   Select the port specified in step 3 and add storage.

   For LUN security, select the external port that you set in step 2. The port will be treated as a host. For details on how to add storage, see section 7.6.2.

   When external volumes are assigned to an external port this way, Device Manager can manage those volumes because the external port is treated as a special host.
5. Use Physical View of the storage subsystem that uses Universal Volume Manager to map the external volumes to internal volumes.

   For details on mapping a volume, refer to the *Universal Volume Manager User's Guide*.

Once the settings are configured, you can use the external volumes set in the external subsystem as well as LUs contained in Universal Storage Platform V and TagmaStore USP.

4.6 Using Virtual Partition Manager

In a Universal Storage Platform V or TagmaStore USP storage subsystem, you can use Virtual Partition Manager to logically divide the resources in the storage subsystem. Virtual Partition Manager provides two functions, a cache logical partition function and a storage logical partition function.

4.6.1 Cache logical partition function

The cache logical partition function logically divides a cache shared in a storage subsystem into partitions. A partition of the cache is called a CLPR (Cache Logical PaRtition). By allocating a separate virtual cache to each host, you can prevent the I/O processing on a specific host from degrading the performance of other hosts. For details on the cache logical partition function, see the storage subsystem Virtual Partition Manager documentation.

Device Manager can display the number of the CLPR to which the volume belongs as an LDEV attribute. You can set up the cache logical partition function from Physical View.

4.6.2 Storage logical partition function

The storage logical partition function of Virtual Partition Manager logically divides the storage subsystem resources (such as ports, CLPRs, and LDEVs) into partitions. A partition of the resources is called an SLPR (Storage Logical PaRtition). The partitions that are called SLPR can be managed individually.

An environment using the storage logical partition function has an administrator for the entire storage subsystem as well as administrators for individual SLPRs. An administrator for an SLPR is called a partitioned storage administrator. Figure 4.2 shows an example of managing the partitioned resources using the storage logical partition function.

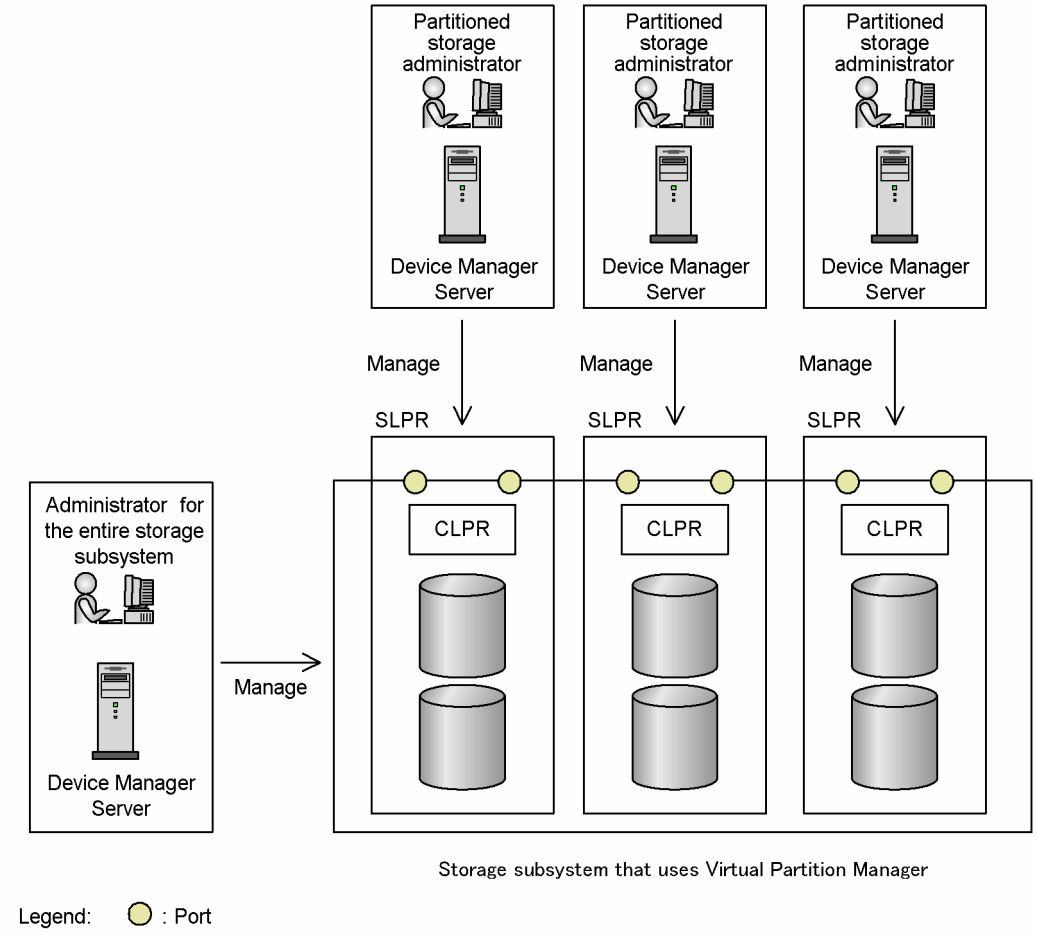


Figure 4.2 Using the Storage Logical Partition Function

For details on the storage logical partition function, see the storage subsystem Virtual Partition Manager documentation.

If you set a partitioned storage administrator's user ID when you add a storage subsystem, only the resources that belong to the SLPR that the partitioned storage administrator is managing can be accessed from Device Manager.

Device Manager can display the number of the SLPR to which the volume belongs as an LDEV attribute. The storage logical partition function can be set up from Physical View.

Note: For a storage subsystem that has been added by a user ID that has partitioned storage administrator permission, operations for managing copy pairs cannot be performed. Also, copy pair information will not be displayed for the LDEV attribute.

Chapter 5 Performing Device Manager System Operations

This chapter describes HiCommand Device Manager system operations. The tasks include:

- Using the Device Manager Main Window (see section 5.1)
- Logging In and Out of Device Manager (see section 5.1.12)
- Viewing and Installing License Information (see section 5.2)
- Managing Alerts (see section 5.3)
- Viewing the Task List (see section 5.4)
- Launching Other Applications (see section 5.5)
- Downloading Device Manager Software (see section 5.6)

5.1 Using the Device Manager Main Window

The Device Manager main window, depicted below, allows you to access all Device Manager functions. To open the main window, open the web browser, and log in to Device Manager.

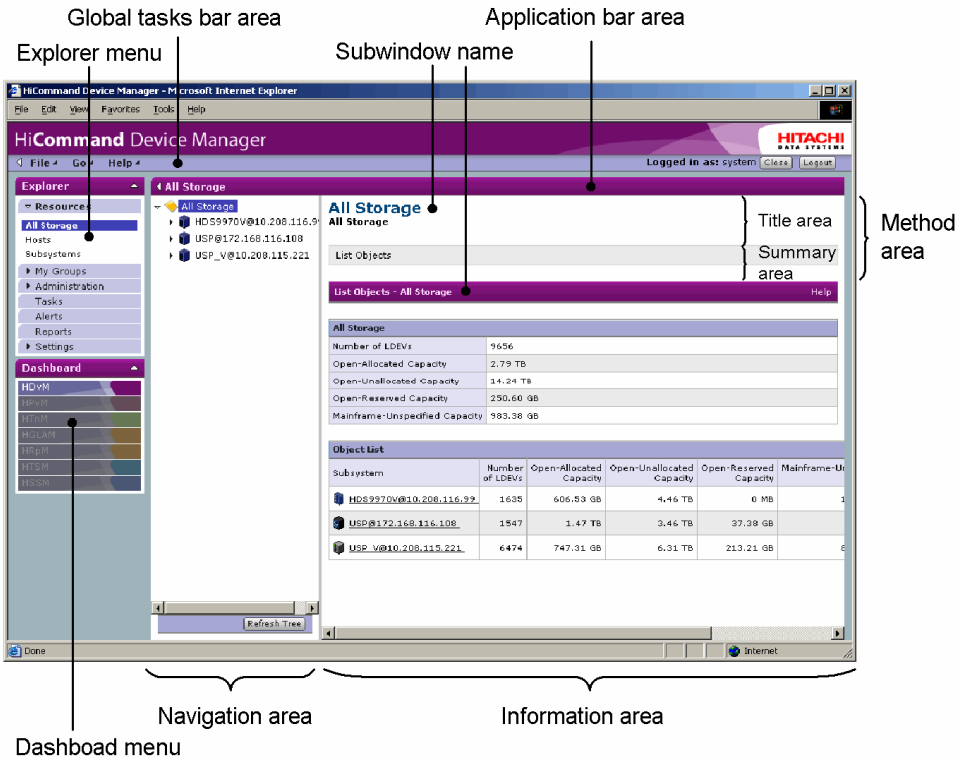


Figure 5.1 Device Manager Main Window Components

The main window has the following components:

- **Global tasks bar area**
- **Explorer menu**
- **Dashboard menu**
- **Navigation area**
- **Application bar area**
- **Method area**
- **Information area**
- **Dialog box**

Note: For usage precautions pertaining to the main window, see section 5.1.11.

5.1.1 Global Tasks Bar Area

The global tasks bar area on the HiCommand Device Manager main window enables the logged-in user to perform global operations such as logging out and displaying the version information. This area also displays information about the user who is currently logged in.

The following describes the functions available in the global tasks bar area and the information displayed in the area:

- **File** menu
  - **Close**: Closes the Web browser.
  - **Logout**: Enables you to log out of HiCommand Device Manager and other active HiCommand Suite products, and closes the Web browser.
- **Go** menu
  - **Download**: Displays the Device Manager software deployment dialog box.
  - **Links**: Displays the link dialog box, from which user-registered applications can be launched. If an application has not been registered, this submenu is not displayed.
- **Help** menu
  - **Online Manual**: Displays the GUI help for HiCommand Device Manager, which describes the items displayed on the Device Manager windows.
  - **About**: Displays the HiCommand Device Manager version and license information, and enables you to enter your license key when required.
- **Logged in as:**

  Displays the full name of the user who is currently logged in. When the full name has been omitted, the user ID is displayed.
- **Close**

  Closes the Web browser.
- **Logout**

  Enables you to log out of HiCommand Device Manager and other active HiCommand Suite products, and closes the Web browser.

5.1.2 Explorer Menu

The **Explorer** menu on the HiCommand Device Manager main window enables the logged-in user to select an operation available in Device Manager. When you choose a menu item, information in the application bar area, navigation area, method area, and information area changes accordingly.

You can switch whether the area, which contains the **Explorer** menu and **Dashboard** menu, is shown or hidden by clicking the leftmost button in the global tasks bar area.

The **Explorer** menu displays the following items:

- **Resources**

  A submenu for accessing and operating Device Manager resources.

  - **All Storage** or **My Storage**: If a user assigned the All Resources resource group is logged in, **All Storage** is displayed. If a user who is assigned to a user-defined resource group is logged in, **My Storage** is displayed.

    The **All Storage** or **My Storage** menu items enables users to manage storage to which they have access.
  - **Hosts**: Enables operations related to host management to be performed.
  - **Subsystems**: Enables operations for storage subsystems managed by Device Manager to be performed. This menu item is displayed to users who are assigned to the All Resources resource group.
  - **NAS**: Enables the user to start HiCommand NAS Manager. This menu item is displayed only when a user who is been assigned the All Resources resource group and been granted the Modify permission is logged in, and HiCommand NAS Manager has been installed as a plug-in on the management server.

- **My Groups**

  A submenu for accessing and operating logical groups that are available to you.

  - **Logical Groups**: Enables operations for logical group management to be performed.

- **Administration**

  A submenu for accessing and operating user accounts and resource groups.

  - **Users and Permissions**: Enables operations for user account management to be performed. This menu item is displayed to users who have user management permissions.
  - **Resource Groups**: Enables operations for resource group management to be performed. This menu item is displayed to users who have administrative permissions.
  - **Security**: Enables operations for security options setup to be performed. This menu item is displayed only when a user having *User Management* permission is logged in.

- **Tasks**

  Enables viewing of task information.

- **Alerts**

  Enables operations for alert management to be performed. This menu item is displayed only when a user assigned the All Resources resource group is logged in.

- **Reports**

  Enables operations for reports. This menu item is displayed to users who are assigned to the All Resources resource group.

- **Settings**
  - **User Profile**: Enables viewing and editing of the profile of the logged-in user.
  - **License Info**: Enables viewing of version and license information. License information can be set using this menu item.

5.1.3 Dashboard Menu

The dashboard menu in the HiCommand Device Manager main window displays a list of HiCommand Suite products, regardless of whether the product has been installed. Products that have not been installed are disabled (and appear dimmed) while the products that have been installed are enabled. Click **GO**. **GO** is not displayed for a product that has already started.

You can switch whether the area, which contains the **Explorer** menu and **Dashboard** menu, is shown or hidden by clicking the leftmost button in the global tasks bar area.

5.1.4 Navigation Area

The navigation area in the HiCommand Device Manager main window displays the object tree appropriate for the item selected in the **Explorer** menu. You can select the target object using this tree. When an object is selected in the navigation area, the method area and information area display information for the selected object. The navigation area is displayed only when the selected operation target is in a tree structure.

You can determine whether the navigation area is shown or hidden by clicking the leftmost button in the application bar area. When you click the **Refresh Tree** button in the navigation area, all information displayed in the navigation area, method area, and the information area in the main window is refreshed.

Important: The information on the Device Manager main window is not automatically updated. After you perform a Device Manager operation, click the **Refresh Tree** button to display the latest information.

Note: When using Mozilla 1.4, if you attempt to display another window while updating information, the result of the update will not be applied to the object tree in the navigation area. For example, if you display a list of storage subsystems while a host is being added, the added host will not be displayed in the tree for hosts in the navigation area. In this case, click the **Refresh Tree** button to display the latest information.

5.1.5 Application Bar Area

Displays the menu item selected in the **Explorer** menu. If there are operations that can be performed for the object selected in the navigation area, the buttons for the operations are also displayed.

5.1.6 Method Area

The method area on the HiCommand Device Manager main window displays methods that can be executed on the object selected in the navigation area. When a method is selected in the method area, the method execution dialog box is displayed, or the execution results of the method are displayed in the information area. The method area is displayed only when there are methods that can be executed for the selected object.

The display area in the method area is called a subwindow. The subwindow name is displayed at the top of the method area.

When an object is selected in the navigation area, the method area also displays the location of the object in the object tree managed by Device Manager. The location is displayed using greater-than signs (>) to separate the objects from the menu item selected in the **Explorer** menu down to the selected object. For example, when **host_0** is selected in the navigation area, the location displayed in the method area is as follows:

```
Hosts > host_0
```

When you click an object in the displayed location, the appropriate information for the object you clicked is displayed in the method area and the information area.

5.1.7 Information Area

The information area in the HiCommand Device Manager main window displays details about the object selected in the navigation area, the buttons for operating the object, or the execution results of the method selected in the method area. When object details are displayed, the information area is called a subwindow and is named *information-area-title-name*. The display area in the information area is called a subwindow. The subwindow name is displayed at the top of the information area.

A Help link exists on the right of the subwindow's name. Click the link to access GUI Help about the subwindow's contents. GUI Help explains items displayed on the Device Manager windows.

Data size indication rules: Unless otherwise noted, the following rules apply to the calculation method and the format of displayed data sizes:

- The data size is calculated in KB.
- The unit of the data size to be displayed changes depending on the size. If the size is smaller than 1 GB, the size is displayed in MB. If the size is 1 GB or larger but less than 1 TB, the size is displayed in GB. If the size is 1 TB or larger, the size is displayed in TB.
- When the size is displayed in MB, only the integer part is displayed. When the size is displayed in GB or TB, the size is truncated to two decimal places.

5.1.8 Dialog Box

A dialog box is a pop-up window displayed when a method is selected in the method area or when an operation button is clicked in the information area. A dialog box displays the details of the selected operation, allowing you to set necessary conditions for the operation and to perform the operation.

The following items are displayed in all dialog boxes:

- **Title**: Indicates the name of the dialog box.
- **Help:** When selected, displays GUI Help, which describes the items displayed in the dialog box.

5.1.9 Sortable Table

A sortable table is used to list objects in the information area or a dialog box. For a sortable table, the Paging function, Sort function, Select All function, and the Selecting a Range function can be used (see Figure 5.2). The functions that can be used by a sortable table differ depending on the information area or dialog box.

A sortable table can be used in the following information areas and dialog box:

- List Objects - Open-Allocated subwindow
- List Objects - Open-Unallocated subwindow
- List Objects - Open-Reserved subwindow
- List Objects - Mainframe-Unspecified subwindow
- Show Properties - *host-name* subwindow
- Show Properties - *external-port-name* subwindow
- List Objects - *logical-group-name* subwindow (when a storage group has been selected)
- Add Storage (Step: Allocate Storage - Allocatable LDEVs) dialog box
- List Objects - *host* subwindow (see section 9.3)

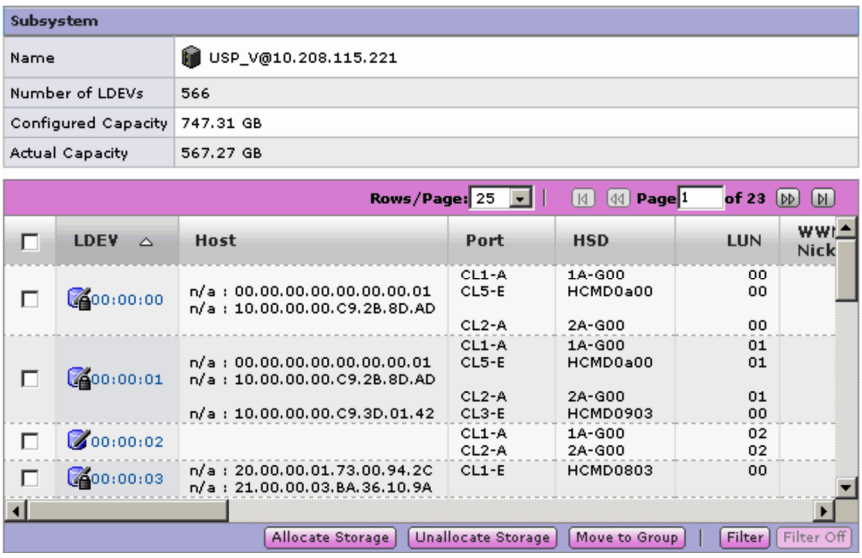


Figure 5.2 Sortable Table

Note: If any of the following conditions exist, sortable table operations might take time because many array groups are created in a storage subsystem.

- There are many externally connected LDEVs.
- There are many V-VOLs of QuickShadow/Copy-on-Write Snapshot.
- There are many DP-VOLs of Universal Storage Platform V.

In the above cases, the following problems might occur depending on the browser you are using.

- When using Internet Explorer:

  Switching pages or changing the number of lines to be displayed might take time.

- When using Mozilla:

  When displaying a sortable table, a message might be displayed that indicates the processing is taking a long time.

5.1.9.1 Paging Function

The paging function is used to list objects on a page basis. You can select the number of lines on one page. You can perform the following operations by using the paging function:

- Select the number of lines to be displayed on one page

  You can select, from a drop-down list, the number of lines to be displayed on one page. You can also set the line count options in the Server properties file. The defaults options are 25 and 300 (lines). When a sortable table is displayed for the first time or redisplayed, the smaller value is applied as the number of lines to be displayed on one page, regardless of which option you had previously chosen. Therefore, if you change the value of the options in the Server properties file, specify as the smaller value the number of lines that you want to initially display on one page.

  The maximum number of lines that can be displayed in a sortable table depends on the Web browser and the environment. The maximum value that can be set as the number of display lines is indicated below for each Web browser:

  - Internet Explorer 7.0 and Internet Explorer 6.0: 1,000 (lines)
  - Mozilla 1.4: 2,000 (lines)
  - Mozilla 1.7: 300 (lines)

  For details on how to set the line count options, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

- Navigate pages. You can navigate to the first page, the previous page, the next page, or the last page.
- Display the current page number. You can display the total number of pages and the current page number.
- Jump to a page. You can jump to a page by entering the page number in a text box and pressing the Enter key.

When you execute the sort function, the display always returns to the first page.

5.1.9.2 Sort Function

When you click a column title of a sortable table, the table is sorted on the column whose title you clicked. When the table has been sorted, an icon indicating whether the sorting is in ascending or descending order appears to the right of the column title used as the sort key.

5.1.9.3 Select All Function

If you select the check box in the title line, the check boxes for all items on the displayed page are selected. Alternatively, if you select the check boxes for all items on the displayed page, the check box in the title line is selected. Clearing the check boxes of the title line and the items on the displayed page works in the same way.

5.1.9.4 Selecting a Range Function

You can select multiple rows together in a sortable table. To select a range of rows together, select the check box of the row that is to be the start of the range, hold down the **Shift** key, and select the check box of the row that is to be the end of the range. The check boxes of the rows between the start and end rows of the range are automatically selected.

5.1.10 Filtering Function

The filtering function enables you to extract the objects that match the specified conditions from the list of objects displayed in the sortable table. You can use the filtering function in the following information areas and dialog box:

- List Objects - Open-Allocated subwindow
- List Objects - Open-Unallocated subwindow
- List Objects - Open-Reserved subwindow
- List Objects - Mainframe-Unspecified subwindow
- Show Properties - *host-name* subwindow
- Show Properties - *external-port-name* subwindow
- List Objects - *logical-group-name* subwindow (when a storage group has been selected)
- Add Storage (Step: Allocate Storage - Allocatable LDEVs) dialog box

When the filtering function is available in the sortable table, the **Filter** and **Filter Off** buttons are displayed.

When you click the **Filter** button, the Filter - *object-name* dialog box appears (see Figure 5.3). You can use this dialog box to specify filtering conditions and perform filtering.

Different filtering methods are used depending on the items selected for the filtering conditions, as described below:

- Range specification: Objects within the specified range are extracted. Use the >, <, >=, and <= operators to specify a condition range.
- Perfect match specification: Only objects that exactly match the specified condition are extracted. Select either of the operators `is` or = to specify the condition.
- Partial match specification: Objects that include the specified text character string are extracted. Select `contains` as the condition operator.

When you specify conditions for multiple items, filtering is performed using the AND condition. If no objects matching the conditions are found, only the title line is displayed.

The filtering function can be used in conjunction with the sort function.

To perform filtering:

1. In the sortable table in the information area, click the **Filter** button. The Filter - *object-name* dialog box appears.
2. Specify the filtering conditions.
   - **Attribute**: From the drop-down list, select the item you want to set as a filtering condition.
   - The drop-down list for operators contains the operator corresponding to the item selected in **Attribute**.
   - **Value**: In the text box, directly enter a filtering condition appropriate for the item selected from the **Attribute** drop-down list. Alternatively, select the filtering condition from the drop-down list.

   Table 5.1 shows the combinations of attributes and operators that can be specified as filtering conditions and the values that can be set.

Table 5.1 Filtering Conditions

Attribute	Operator	Value	Number of Conditions
LDEV	<=, >=	Specify a condition in the same format as the format displayed in the LDEV list. If the list contains LDEVs in different formats, only the LDEVs in the specified format are extracted. You cannot specify LDEVs in different display formats at the same time. If the upper limit is omitted, the maximum value is assumed; if the lower limit value is omitted, the minimum value is assumed.	If different operators are used, no more than two conditions can be specified.
Type	`contains`	Select from the drop-down list.	One condition can be specified.
ArrayGroup	`is`	Select from the drop-down list.	
Port	`is`	Select from the drop-down list.	
Host	`contains`	Specify the character string included in the host name (which is not case sensitive). If you enter `n/a` or nothing, data whose host name is `n/a` or no data is extracted. WWN is not subject to filtering.	
EMU Type	`is`	Select from the drop-down list. If you select `(blank)`, blank columns are extracted. The number of LDEVs displayed for the LUSE volume is not subject to filtering.	
Capacity (see ***Note***)	<, >, <=, >=, =	Select the units from the drop-down list, and then enter the capacity by using single-byte numeric characters. You can enter a maximum of 9 digits for the capacity. If nothing is entered, an error occurs. If you omit the upper limit value when using a range to specify a condition, the maximum value is assumed; if the lower limit value is omitted, the minimum value is assumed.	Multiple conditions can be specified.

Attribute	Operator	Value	Number of Conditions
Consumed Capacity (see ***Note***)	<, >, <=, >=, =	Use either of the following methods to perform filtering: ▪ Select the units from the drop-down list, and then enter the capacity by using single-byte numeric characters. You can enter a maximum of 9 digits for the capacity. If you omit the upper limit value when using a range to specify a condition, the maximum value is assumed; if the lower limit value is omitted, the minimum value is assumed. ▪ Enter the character string `n/a` to perform filtering as a perfect match specification. The entered character string is not case sensitive. If nothing is entered, an error occurs.	Multiple conditions can be specified.
Default Controller	`is`	Select from a drop-down list.	One condition can be specified.
Subsystem	`is`	Select from the drop-down list.	
Logical Group	`is`	Select from the drop-down list.	
Volume Attr	`contains`	Select from the drop-down list.	
Copy Type	`contains`	Select from the drop-down list.	
Copy Role	`contains`	Select from the drop-down list.	
Copy Status	`contains`	Select from the drop-down list.	
External Subsystem	`is`	Select from the drop-down list. If you select `(blank)`, blank columns are extracted.	

Note: **Capacity** values are rounded down and displayed. As a result, the value that is shown might be less than the actual capacity. When filtering is executed, the actual value is used as the extraction condition. Therefore, even though the displayed value matches the condition, it might not be extracted. For example, a volume of 1.001GB is displayed as **1.00GB**. If you specify `=1 GB` as the filtering condition, 1.001 GB would not be extracted. For details about displaying capacity, see section 5.1.7.

3. To specify multiple conditions, click the **+** (plus) button to add a new condition entry line. To delete an unnecessary condition, click the **-** (minus) button on the right of the condition line. When you click the **Reset** button, the changes to the conditions are discarded and the settings are reset to those in effect when the Filter - *object-name* dialog box was opened.

4. Click the **Apply** or **OK** button to perform filtering. When you click the **Apply** button, the Filter - *object-name* dialog box is displayed again after performing filtering so that you can continuously set filtering conditions. The set filtering conditions are enabled until one of the following operations is performed:
   - Clicking the **Filter Off** button for the sortable table.
   - Moving from the subwindow using the sortable table to another subwindow.
   - Closing the dialog box using the sortable table.

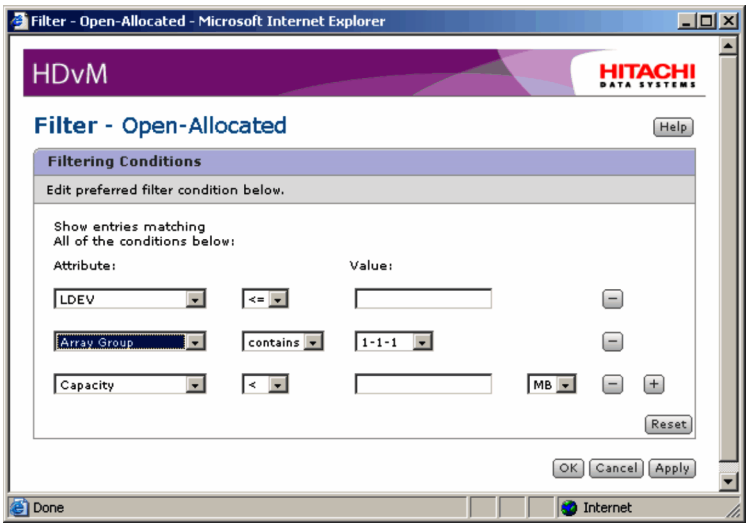


Figure 5.3 Filter Dialog Box

5.1.11 Reviewing Main Window Usage Precautions

CAUTION:

- An operation might be possible while reloading a window, depending on the number of window items or network status. In such a case, make sure that reloading of the window has finished before performing the operation. If the operation is performed during the reload, an error might occur.
- If you click the **Esc** key during Device Manager operations, you cannot use Device Manager. If this occurs, click **Refresh** in the navigation frame or press the **F5** key to refresh the screen. If a pop-up window is open, close it and re-open it.

Notes:

- The Main Window is locked after 60 minutes if you open a dialog box but take no further action. If this occurs, close and re-open the dialog box, and then perform the operation again from the beginning.

- Use the links and buttons provided in the HiCommand Device Manager main window to perform GUI operations. Do not use Web browser functions, such as **Reload** or **Back**, as these functions may display an inappropriate window. For example, if you are using Internet Explorer as your Web browser, right-clicking a link in the Device Manager's information area and choosing **Open** in the pop-up window will produce a blank window. If you have been using browser functions, click **Refresh Tree** in the navigation area, or press the **F5** key to refresh the screen. If a dialog box is open, close and re-open it.
- For information on the Device Manager warning messages, see section 13.2.
- If you change the language environment of the Web browser while using the Web client, click the **Refresh Tree** button in the navigation area before performing the next operation.
- If you are using JRE version 6.0 in Solaris 10, the Main Window is displayed in front of the Java GUI after operations executed on the Java GUI have been completed.

5.1.12 Logging In and Out of Device Manager

5.1.13 Logging in to Device Manager

To use Device Manager, you must have one or more Device Manager permissions and be assigned to a resource that Device Manager manages.

When you log in to HiCommand Device Manager for the first time, use the System account common to HiCommand Suite products. For details about the System account, see section 2.1.3.

Note: When the OS is Windows XP (Service Pack 2) or Windows Vista in which the Classic Start Menu is enabled, if you use Web client running Internet Explorer 7.0, start Internet Explorer 7.0 from the Start menu. If you start Internet Explorer 7.0 from the desktop icon, you cannot use the Java GUI to start an application that uses the Web browser.

To log in to Device Manager:

1. Launch the web browser, and enter the URL for the Device Manager server: http://*Device-Manager-server-address*:*port-number*/DeviceManager/

   Device-Manager-server-address = IP address or host name of Device Manager server such as "localhost"

   port-number = enter the port number of the HBase Storage Mgmt Web Service of the HiCommand series (default = 23015)

   The Device Manager Login panel appears.

   Note: Use `https` and port 23016 (default) for SSL. For details on port numbers, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

   The values in *Device-Manager-server-address* and *port-number* are the values that were specified during the installation. For details, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.

2. If you are accessing Device Manager for the first time after installation, a message asking you to enter the license key appears. In this case, install the Device Manager license key, and then log in. For details on registering the license key, see section 5.2.

   Important: If necessary, you can set a warning banner message for display in the Login panel. For details on how to configure the setting, see section 6.4.3.

3. On the Device Manager Login panel, enter your **User ID** and **Password**, and then select **Login**. The password is case sensitive.

4. The Device Manager main window displays (see section 5.1). This window provides access to all Device Manager functions. See section 4.4 for instructions on starting Device Manager operations.

Important: A user account might be locked after repeated failures to log in. If the user account is locked, ask a user who has the User Management permission to unlock the user account. You cannot log in to Device Manager until the user account is unlocked.

For Device Manager to work properly, the Device Manager server must be the same version as the Java GUI. Check the versions by performing the following procedures:

- To check the Device Manager server version, select **Help** and then **About** in the global tasks bar area on the HiCommand Device Manager main window.
- To check the Java GUI version in the Web client, select **About** in the menu bar on the Physical View, or click the **About** button in the resource group administration window.

If the Java GUI is an earlier version than the Device Manager server, clear the Java Web Start (JWS) cache (see section 3.5.2), and then re-install the Java GUI.

5.1.14 Logging out of Device Manager

Each Device Manager user must log out of Device Manager after completing operations to prevent any unauthorized usage. Device Manager maintains an audit log of all user actions for the verification and traceability of Device Manager operations.

WARNING: When you log out of Device Manager, you also log out of other HiCommand Suite products and the Java GUI (the dialog box for browsing and setting detailed information about the storage subsystem, and for creating and assigning resource groups). If you log out of Device Manager before the tasks you executed in the Java GUI are complete, the processing may be canceled and inconsistencies may occur in the system. Finish all tasks before logging out.

To log out of Device Manager:

1. In the global tasks bar area on the HiCommand Device Manager main window, select **File** and then **Logout**, or click the **Logout** button.
2. When the confirmation panel appears, select **OK** to log out, or select **Cancel** to cancel your request to log out of HiCommand Device Manager.

5.2 Viewing and Installing License Information

The dialog box for license information of HiCommand Device Manager (see Figure 5.4) displays the following information:

- Device Manager version information
- License type information

  The license types are **Permanent**, **Temporary**, **Emergency**, and **Unregistered**.
- Plug-in information

  Displays the product name and version of the plug-in. This item is displayed only when a plug-in has been installed on the management server.
- Serial of the storage subsystem associated with the license key
- Licensed capacity

Important: When a temporary license is used, the serial number of the storage subsystem and the license capacity that correspond to the license key are not displayed.

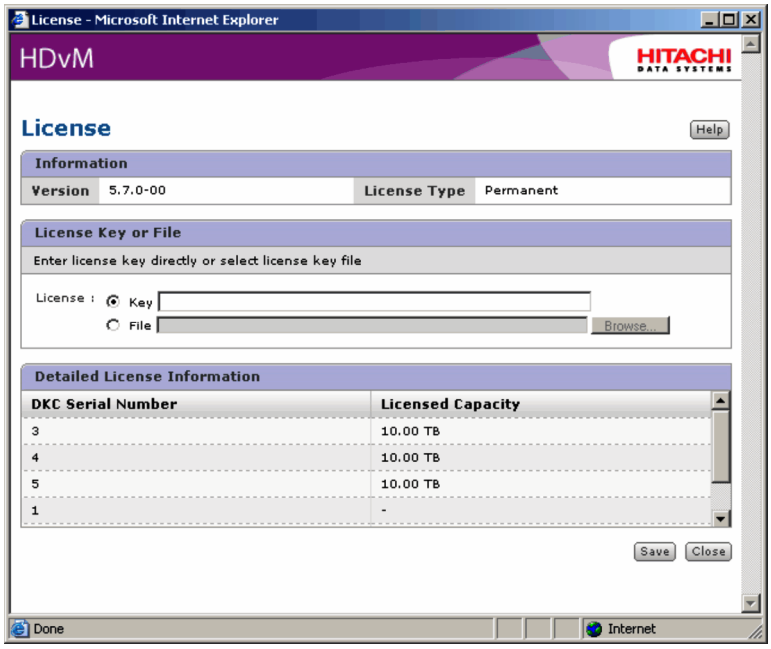


Figure 5.4 License Information Dialog Box When a License Key has been Registered

In the dialog box for HiCommand Device Manager license information, you can install your HiCommand Device Manager license key.

Note: You cannot install the license key of a different HiCommand Suite product in the dialog box for HiCommand Device Manager license information. To install the license key of a different HiCommand Suite product, install the license key in the dialog box for that product's license information.

If you start a HiCommand Suite product whose license key has not been installed from the **Dashboard menu**, that product's user login dialog box will be displayed.

To view HiCommand Device Manager license information or install a license key:

1. Open the dialog box for HiCommand Device Manager license information.

   Perform one of the following procedures:

   - Before logging in to Device Manager, click the **License** button on the HiCommand Device Manager Login panel.
   - After logging in to Device Manager, in the global tasks bar area, select **Help** and then **About**.
   - After logging in to Device Manager, in the **Explorer** menu, select **Settings** and then **License Info**. To install a license key, in the License Info subwindow, click the **Edit License** button.

   If you only want to view license information, go to step 4.

2. Enter the license key.

   To enter the license key directly, select the **Key** radio button, and then enter the license key.

   To use a license key file, select the **File** radio button, and use the **Browse** button to select a license key file.

3. To install the license key entered in step 2, click the **Save** button.

   A message states that the license key has been installed.

4. Click the **Close** button.

5.3 Managing Alerts

Users who are assigned to the All Resources resource group can manage alerts for storage subsystems by:

- Viewing alerts (see section 5.3.1)
- Monitoring alerts (see section 5.3.2)
- Deleting alerts (see section 5.3.3)

The **Alerts** item in the **Explorer** menu provides access to the alert operations. When you select the Alerts option, the method area displays the **List Objects** and **Monitor Alerts** methods, and the information area displays the List Objects - Alerts subwindow (see Figure 5.5).

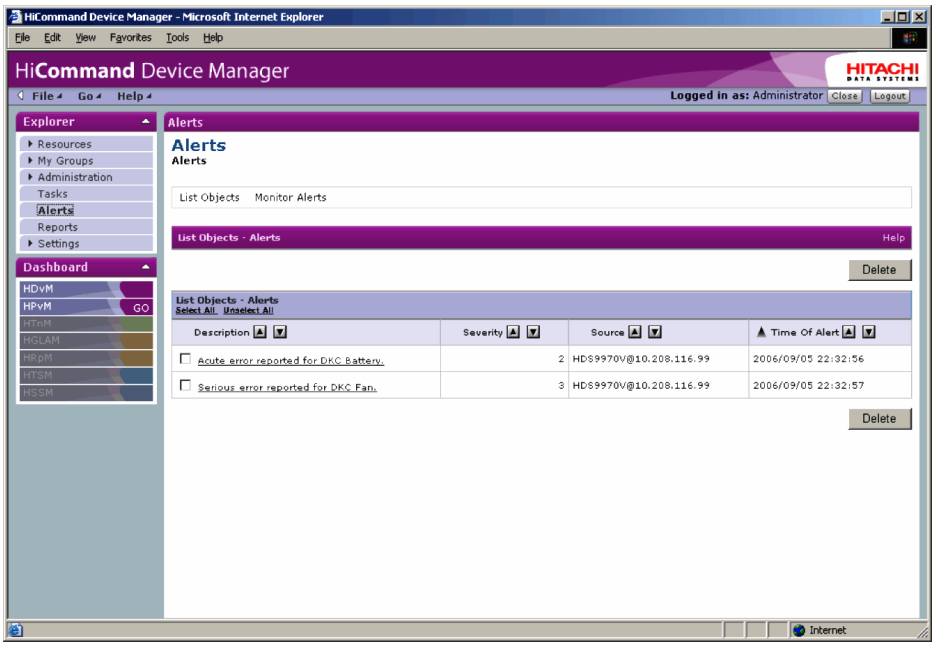


Figure 5.5 Alerts

5.3.1 Viewing Alerts

You can view a list of all alerts for all storage subsystems or a selected storage subsystem, and detailed information about a specific alert. These functions can be executed only by users who are assigned to **All Resources** as a resource group. Note that these functions are not accessible to users who are assigned to a user-defined resource group.

5.3.1.1 Viewing all alerts for all storage subsystems

To view alerts for all storage subsystems and the detailed information about a specific alert:

1. In the **Explorer** menu, select **Alerts**.

   The List Objects - Alerts subwindow is displayed in the information area (see Figure 5.5). The subwindow lists a maximum of 100 alerts for all storage subsystems in reverse chronological order.

2. In the List Objects - Alerts subwindow, click the description link for an alert for which you want to view more detailed information.

   The Detailed Information - Alert dialog box (see Figure 5.6) displays the following information for the selected alert:

   - **Number:** serial number assigned to the alert by the Device Manager server
   - **Type:** type of alert: `Server` (alert detected by server polling), or `Trap` (alert reported from the device)
   - **Source:** name and IP address (*subsystem-name@IP-address*) of the storage subsystem where the alert originated.
   - **Severity:** code defining the severity of the alert.

     The following shows the codes displayed and their meanings:

Table 5.2 Alert Severity Codes

Code	Meaning
0	The severity of the error is unclear.
1	No error has occurred.
2	The storage subsystem has completely stopped.
3	The part where an error has occurred is not working.
4	A partial error has occurred.
5	A slight error has occurred.

- **Component:** component where the alert is located
- **Description:** details about what triggered the alert
- **Action To Take:** recommendation for how to handle the alert
- **Data:** data used to analyze the aler

  If the alert type is `Server`, a message that shows the contents of the alert is displayed. If the alert type is `Trap`, the SIM data is displayed.
- **Time Of Alert:** date (yyyy/mm/dd) and time (hh:mm:ss) when the alert occurred

CAUTION: If you remove a storage subsystem for which an alert has occurred and then attempt to display the alert information for the removed storage subsystem, `ARRAY.`*storage-subsystem-type* (for example, `ARRAY.HDS9980V`) is displayed in **Source**. If this happens, either delete the alert information if it is not needed, or add the storage subsystem to Device Manager again.

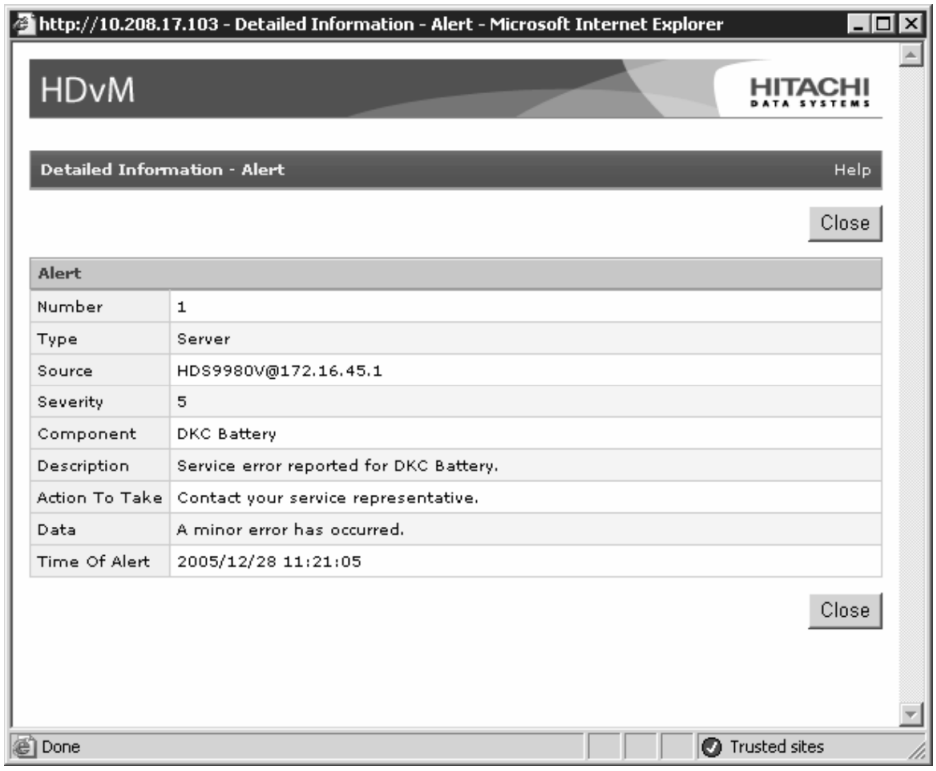


Figure 5.6 Detailed Information – Alert Dialog Box

5.3.1.2 Viewing alerts for a selected storage subsystem

To view a list of alerts for a selected storage subsystem and detailed information about a specific alert:

1. Display the storage subsystem properties (see section 10.4).

   The Show Properties - *subsystem-name* subwindow is displayed in the information area.

   If there are alerts for the selected storage subsystem, according to the number of alerts, red lines will be displayed in the **Alerts** indicator of the subwindow.

2. Click the **Alerts** indicator.

   The List Objects - Alerts dialog box, which displays a list of alerts occurring in the storage subsystem, appears.

3. In the List Objects - Alerts dialog box, click the description link for an alert for which you want to view more detailed information.

   The Detailed Information - Alert dialog box (see Figure 5.6) appears and displays the detailed information about the selected alert. For details on the displayed information, see section 5.3.1.1.

5.3.1.3 Calculating the location of the disk on which an error has occurred

For the TagmaStore AMS/WMS series and Thunder 9500V, when an alert for a hard disk error is detected, the number of the disk drive where the error occurred is displayed in the alert explanation. This disk drive number does not indicate the physical location of the hard disk. You need to calculate the physical location of the hard disk by using the displayed disk drive number.

The variable and functions used for the calculation are as follows:

- *n*: Indicates the disk drive number displayed in the alert description.
- `INT`: Truncates (the digits after the decimal point) the fractional portion of the calculation result to obtain an integer.
- `MOD`: Obtains the remainder after division.

The following shows how to calculate the locations of the hard disk unit and HDU:

- For the TagmaStore AMS/WMS series

  location-of-unit = INT (*n* / 15)

  location-of-HDU = *n* MOD 15

  Example:

  When *n* is 17:

  location-of-unit = INT (17 /15) = 1

  location-of-HDU = 17 MOD 15 = 2

- For Thunder 9500V

  When *n* is less than or equal to 13:

  location-of-unit = 0

  location-of-HDU = *n*

  When *n* is greater than 13:

  location-of-unit = INT ((*n* + 1) / 15)

  location-of-HDU = (*n* + 1) MOD 15

  Example:

  When *n* is 12:

  location-of-unit = 0

  location-of-HDU = 12

  When *n* is 17:

  location-of-unit = INT((17 + 1) / 15) = 1

  location-of-HDU = (17 + 1) MOD 15 = 3

5.3.2 Monitoring Alerts

A user who is assigned to the All Resources resource group can monitor storage subsystem alerts and view information about alerts in real-time.

To monitor alerts and view information about them as they occur:

1. In the **Explorer** menu, select **Alerts** in the navigation frame (see Figure 5.5).
2. Select the **Monitor Alerts** command in the method area to open the Monitor – Alerts window. The **Close** button stops monitoring and closes this panel.

   When an alert occurs, the Monitor – Alerts panel notifies you and displays the time of the alert. Select the **Confirm** button to acknowledge the alert and continue monitoring.

   When you want to stop monitoring alerts, select the **Close** button.

   Note: When the List Objects - Alerts subwindow or Show Properties - *subsystem-name* subwindow is displayed in the information area, the alert information displayed in those subwindows is not automatically updated when an alert occurs during monitoring. Click the **Refresh Tree** button in the navigation area to update the information in the information area.

5.3.3 Deleting Alerts

A user who has been assigned to the All Resources resource group and has the Modify permission can delete alerts from the Device Manager server.

To delete one or more alerts from the Device Manager server:

1. In the **Explorer** menu, select **Alerts** (see Figure 5.5) to display the list of alerts in the information area.
2. Select the check box for each alert that you want to delete. To select all check boxes, click **Select All** button.
3. Click the **Delete** button.

   A window appears asking you to confirm that you want to delete the selected alert(s).
4. Click the **OK** button to delete the selected alert(s), or the **Cancel** button to cancel the deletion.

   The selected alert(s) are deleted from the Device Manager server.

5.4 Viewing the Task List

Device Manager enables the logged-in user to view task information within the user's permitted access range.

To view the Device Manager Task List, in the **Explorer** menu, select **Tasks** to open the List Objects - Tasks subwindow in the information area. The following information is shown for each item in the list:

- **Operation:** name of the operation performed by the user
- **Subsystem:** name of the storage subsystem involved in the operation
- **Logical Group:** name of the logical group(s) involved in the operation
- **Start Time:** date and time that the operation was started

Note: When operations are performed on a storage subsystem from Physical View, no task information is displayed in the List Objects - Tasks subwindow. If a task is being executed from Physical View, `Busy` is displayed in Physical View. You can perform the next operation when the `Busy` indication disappears.

5.5 Launching Other Applications from Device Manager

Device Manager provides link-and-launch capability for the following applications:

- HiCommand Tuning Manager (see section 5.5.1)
- Dynamic Link Manager (HDLM) (see section 5.5.2)
- HiCommand Protection Manager (see section 5.5.3)
- HiCommand Provisioning Manager (see section 5.5.4)
- HiCommand Replication Monitor (see section 5.5.5)
- HiCommand Tiered Storage Manager (see section 5.5.6)
- HiCommand Global Link Availability Manager (see section 5.5.7)
- HiCommand Storage Services Manager (see section 5.5.8)
- Storage Navigator (see section 5.5.9)
- NAS Manager (see section 5.5.10)
- HiCommand NAS Manager (see section 5.5.11)
- Storage Navigator Modular (for Web) or DAMP for Web (see section 5.5.12)
- Registered third-party applications (see section 5.5.13)

Note: If you log out from the global tasks bar area of another HiCommand Suite product that you launched by using the link-and-launch function, you will also be logged out from Device Manager and will not be able to operate Device Manager. If you launched more than one HiCommand Suite of products, make sure that no operations are in progress before logging out.

5.5.1 Launching HiCommand Tuning Manager

Tuning Manager collects information on the performance and capacity of the servers, databases, and storage subsystems connected in a SAN environment. It centrally controls the performance of the entire storage network.

HiCommand Tuning Manager can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

For details on working with Tuning Manager, see the *HiCommand Tuning Manager Server Administration Guide*.

5.5.2 Launching Dynamic Link Manager

Dynamic Link Manager (HDLM) manages access paths to storage subsystems. HDLM provides functions for distributing workload across paths and switching to an alternate path if a failure occurs on the path in use. Networks dedicated to data transfer, such as storage area networks (SANs), can use HDLM to provide enhanced access to storage.

When a Device Manager agent and HDLM are installed on a management-target host of Device Manager in Device Manager a **Dynamic Link Manager** button displays in the Show Properties – *host-name* subwindow for the host. For instructions on displaying the Show Properties – *host-name* subwindow for a host, see section 9.5. To launch the Dynamic Link Manager GUI, select **Dynamic Link Manager**.

To launch HDLM so that it launches displaying a specific volume path, select the desired volume path in the Show Properties – *host-name* subwindow, and then select **Dynamic Link Manager**. You can select only one volume path. For details about the selectable volume types, refer to the part describing the devices that HDLM can manage in the HDLM user documentation.

5.5.3 Launching Protection Manager

Protection Manager controls backup and recovery of databases that use the volume replication features (such as ShadowImage and TrueCopy) provided by storage subsystems. By providing integrated control of storage subsystems, backup products, database products and other applications, Protection Manager simplifies procedures related to data integrity.

When a Device Manager agent and Protection Manager are installed on a management-target host of Device Manager, a **Protection Manager** button displays in the Show Properties - *host-name* subwindow of Device Manager for the host running Protection Manager. For details on displaying a host's Show Properties - *host-name* subwindow, see section 9.5. Clicking the **Protection Manager** button launches the GUI for Protection Manager.

5.5.4 Launching Provisioning Manager

Provisioning Manager allows you to manage a group of disks in a storage subsystem as a single large data storage pool. Provisioning Manager can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

5.5.5 Launching Replication Monitor

Replication Monitor provides capabilities for monitoring the configuration and operating status of complex copy pairs. Replication Monitor displays the configuration and operating status of copy pairs in an easy-to-understand manner and automatically notifies users if an error occurs.

Replication Monitor can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

5.5.6 Launching Tiered Storage Monitor

Tiered Storage Manager allocates data to the best-suited storage based on the data characteristics (value of data and access frequency) in a hierarchical storage environment with Universal Storage Platform V or TagmaStore USP as the core.

Tiered Storage Manager can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

5.5.7 Launching HiCommand Global Link Availability Manager

HiCommand Global Link Availability Manager enables centralized management of multiple host paths, by using the path management function of Dynamic Link Manager.

HiCommand Global Link Availability Manager can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

5.5.8 Launching HiCommand Storage Services Manager

HiCommand Storage Services Manager acts as the main console for heterogeneous storage infrastructure management software, providing SAN visualization and reporting, asset management, performance and capacity monitoring and planning, and policy-driven event management. HiCommand Storage Services Manager can be launched from the dashboard menu. For details on dashboard menu operations, see section 5.1.3.

5.5.9 Launching Lightning 9900V Storage Navigator

When Storage Navigator is installed on a Lightning 9900V that has been registered in Device Manager, you can start Storage Navigator from Web client. This capability is accessible only if you have been assigned the All Resources resource group.

CAUTIONS:

- When using Mozilla in a Solaris or HP-UX environment, you must configure the browsers and Java plug-ins you use to start Storage Navigator. For details on how to configure browsers and Java plug-ins, see section 4.2.2.
- To start Storage Navigator, the Java heap size must be set to 256 MB. For details on how to set the Java heap size for Storage Navigator, see the Storage Navigator manual.

You can start Storage Navigator from the following places:

- The Physical View dialog box. For Lightning 9900V, the **Storage Navigator** drop-down list appears in the Physical View dialog box. For details on the Physical View dialog box, see section 11.1.3.

  If you have been granted the Modify permission, the licensed functions of the functions in the Storage Navigator are displayed in a drop-down list. Select the function you want to use from the drop-down list.

  If you have been granted only the View permission, only **Login** appears in the drop-down list. When you choose **Login**, the login window for Storage Navigator appears.
- Show Properties - *subsystem-name* subwindow. For Lightning 9900V, the **Storage Navigator** button appears in the Show Properties - *subsystem-name* subwindow. For details on the Show Properties - *subsystem-name* subwindow, see section 10.4.

  If you have been granted the Modify permission, the main window of Storage Navigator appears, allowing you to use the licensed features. If you have been granted only the View permission, the login window for Storage Navigator appears.

5.5.10 Launching NAS Blade Manager (TagmaStore USP and 9900V)

When a NAS-CHA running NAS Manager resides on a TagmaStore USP or Lightning 9900V subsystem managed by Device Manager, you can launch NAS Manager from the Web client (if you have been assigned the All Resources resource group and have the Modify permission).

NAS Manager launches from one of two windows, depending on the storage subsystem:

- Physical View dialog box for Lightning 9900V. In the Physical View dialog box for Lightning 9900V, select **NAS-CHA** from the **NAS/Management** drop-down list. This launches NAS Manager. For details on how to open the Physical View dialog box, see section 11.1.3.
- Show Properties - s*ubsystem-name* subwindow for TagmaStore USP or Lightning 9900V. In the Show Properties - s*ubsystem-name* subwindow for TagmaStore USP or Lightning 9900V, click the **NAS/Management** button. The Select Nas/Management Port Controller dialog box displays and the list of selectable NAS-CHAs is sorted and then displayed. Select **NAS-CHA**, and then click **OK** to launch NAS Manager. For details on how to open the Show Properties - s*ubsystem-name* subwindow, see section 10.4.

5.5.11 Launching NAS Manager (TagmaStore AMS/WMS Series)

If HiCommand NAS Manager is installed as a plug-in on the management server on which the Device Manager server is installed, you can start HiCommand NAS Manager from the Web client. A user who is assigned the All Resources resource group, and is granted the Modify permission can access this function.

You can start HiCommand NAS Manager from the Explorer menu. For details about the menu items displayed in the Explorer menu, see section 5.1.2.

5.5.12 Launching Storage Navigator Modular (for Web) or DAMP (for Web) (Thunder 9500V and Thunder 9200)

When a Thunder 9500V or Thunder 9200 subsystem is being managed by Device Manager, a user assigned the All Resources resource group can launch Storage Navigator Modular (for Web) or DAMP (for Web) from the Web client. A **Storage Navigator Modular** or **DISK ARRAY MANAGEMENT PROGRAM** button appears in the Thunder 9500V or Thunder 9200 Physical View dialog box. Click **Storage Navigator Modular** button to launch Storage Navigator Modular (for Web). Click **DISK ARRAY MANAGEMENT PROGRAM** button to launch DAMP (for Web). If you have the Modify permission, Storage Navigator Modular (for Web) or DAMP (for Web) starts in management mode. If you have only the View permission, Storage Navigator Modular (for Web) or DAMP (for Web) starts in standard mode. For details on how to open the Physical View dialog box, see section Chapter 11.

Notes:

- To start Storage Navigator Modular (for Web) from the Web client, you must specify settings related to Device Manager linkage on the Device Manager server. For details on how to set up see the *HiCommand Device Manager Server Installation and Configuration Guide*.
- If Mozilla is used on Solaris, you must set up the Java plug-in to start Storage Navigator Modular (for Web). For details on how to set up the Java plug-in, see section 4.2.2.
- Device Manager's URLLink feature is used to launch Storage Navigator Modular (for Web) and DAMP (for Web). If you set up the linkage with Storage Navigator Modular (for Web) and DAMP (for Web) on the Device Manager server and then add a Thunder 9500V or Thunder 9200 subsystem to the Device Manager, URLLink's link destination is set automatically to DAMP Storage Navigator Modular (for Web) and DAMP (for Web). If you execute a command to change this URLLink, Web client can no longer start Storage Navigator Modular (for Web) and DAMP (for Web) because only one application can be set as URLLink's link destination. For details on the URLLink feature, see section 5.5.13. If DAMP Storage Navigator Modular (for Web) and DAMP (for Web) cannot start because the URLLink was changed by the command, refresh information about the Thunder 9500V or Thunder 9200 for which URLLink was set. The URLLink will be reset to the previous settings, enabling Storage Navigator Modular (for Web) and DAMP (for Web) to be started.
- With Storage Navigator Modular (for Web), if the Device Manager Server's properties are set to enable the automatic refresh function, the storage subsystem is refreshed automatically when Storage Navigator Modular (for Web) is terminated after it has been started and information about the storage subsystem has been referenced or changed.

  Note: If Storage Navigator Modular (for Web) or DAMP (for Web) do not access the Web server in a set period of time, they are automatically logged off the Web server. For details on the automatic logoff, see the manual for Storage Navigator Modular (for Web) or DAMP (for Web).
- If Storage Navigator Modular (for Web) or DAMP (for Web) are automatically logged off from a storage subsystem for which the password protection option is enabled, they remain logged in to the storage subsystem. When this occurs, Device Manager cannot perform operations such as changing the configuration of, and perform a refresh for, the storage subsystem. In this case, start Storage Navigator Modular (for Web) or DAMP (for Web) again, and then manually close the window.
- Storage Navigator Modular (for Web) and DAMP (for Web) cannot be used at the same time on the same subsystem.

5.5.13 Launching a Third-Party Application

When third-party software applies to a specific array, Device Manager provides a URLLink that allows you to link and launch from the Physical View dialog box and Show Properties - *subsystem-name* subwindow to a URL specific to the storage subsystem. Only a user who has been assigned the All Resources resource group and been granted the Modify permission can use URLLink. For details, see the *HiCommand Device Manager Command Line Interface (CLI) User's Guide*. Specifically refer to the `AddURLLink`, `GetURLLink`, and `DeleteURLLink` API commands to obtain a better understanding of this function.

Note: If you execute a command to set URLLink for a TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200 on which a Web client is enabled to start Storage Navigator Modular (for Web) or DAMP (for Web), refreshing the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200 for which URLLink has been set changes the URLLink settings back to Storage Navigator Modular (for Web) or DAMP (for Web).

To specify another application as a link destination:

1. In the Device Manager Server, release the settings for linkage with Storage Navigator Modular (for Web) or DAMP (for Web). For more information on modifying the settings, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
2. Restart the Device Manager server.
3. Refresh the storage subsystem for which you cleared the settings.
4. Execute the command that sets up URLLink.

Notes:

- URLs that you set using URLLink are displayed in the HTML source code.
- If you set URLLink for a TagmaStore AMS/WMS series subsystem, you cannot use the TagmaStore AMS/WMS series Physical View dialog box.

5.6 Downloading Device Manager Software

The Web client enables you to download Device Manager-related software from Device Manager Server to the local environment. You can download the following software:

- Device Manager agent
- Device Manager Command Line Interface (CLI)

You can also download the JRE required for the execution environment of the selected software.

Software is provided in a compressed file for each type of platform. For Windows, software is in the `exe` format (self-extracting). For UNIX, software is in the `tar` format. Expand the desired software from a file that is suited to your platform and then install it. Download the software suited to your platform, extract the downloaded software to the machine on which you want to install the software, and then install it.

To download and install software:

1. In the global tasks bar area, choose **Go** and then **Download**. The Device Manager Software Deployment dialog box appears. For each platform of the provided software, the **Download** link and the **ReadMe** link are displayed. By choosing the **ReadMe** link, you can reference how to install the software. Also, the links for the websites of vendors that provide a JRE are also displayed. A JRE is required for an environment to execute the software. To download a JRE, choose the website of a vendor suited to your platform.
2. In the method frame, choose the **Download** method. The Device Manager Software Deployment dialog box (see Figure 5.7) appears. For each platform of the provided software, the **Download** link and the **ReadMe** link are displayed. By choosing the **ReadMe** link, you can reference how to install the software. Also, the links for the websites of vendors that provide a JRE are also displayed. A JRE is required for an environment to execute the software. To download a JRE, choose the website of a vendor suited to your platform.
3. Choose the **Download** link suited to your platform for the software you want to download. A dialog box for downloading the file appears.
4. Check the message in the downloaded dialog box and choose **Save**. The Save As dialog box appears.
5. In the Save As dialog box, specify the desired storage destination and save the file.

Install the software. For the installation procedure, please refer to the following manuals:

- Device Manager agent: *HiCommand Device Manager Agent Installation Guide*
- Device Manager Command Line Interface (CLI): *HiCommand Device Manager Command Line Interface (CLI) User's Guide*

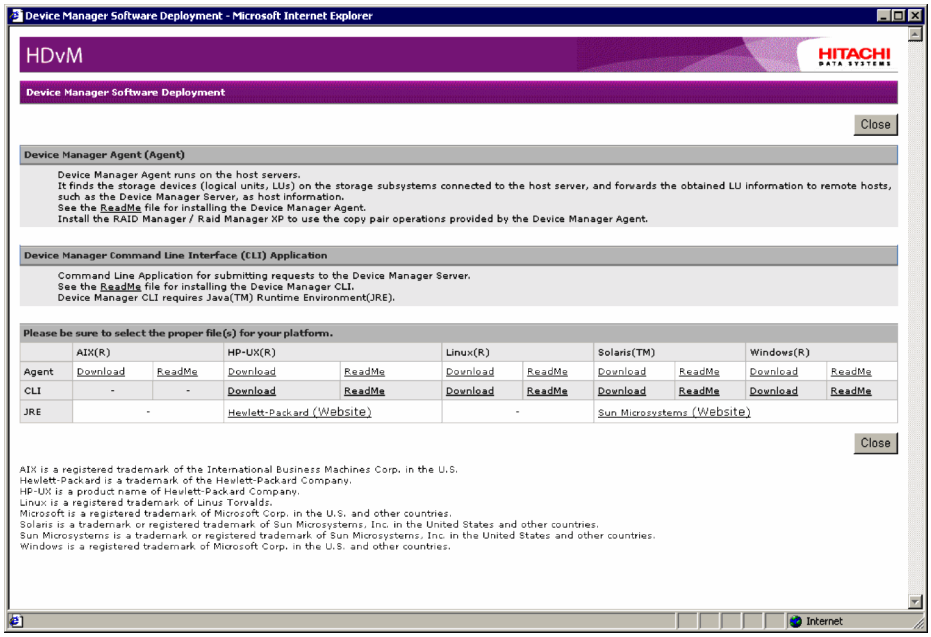


Figure 5.7 Device Manager Software Deployment Dialog Box

Chapter 6 Managing Users

This chapter describes Device Manager user management tasks.

- Overview (see section 6.1)
- Managing User Account Information (see section 6.2)
- Managing Resource Groups (see section 6.3)
- Setting Security Options at Login (see section 6.4)
- Migrating User Data from an Earlier Version (see section 6.5)

6.1 Overview

In Device Manager, you can set user permissions to restrict operations performed by individual users. You can also restrict the resources accessed by users by assigning resource groups to each user. For details about permissions, see section 2.1.1. For details about resource groups, see section 2.1.2.

Device Manager supports functions that enhance the security when a user logs in. For details, see section 6.4.

The **Administration** menu is available when you log in with the User Management permission or Admin permission. To manage users and operate resource groups, in the **Explorer** menu choose **Administration**.

To create a new user:

1. Create a new user.
2. Set permissions for the new user.
3. Create a resource group.

   You can also create a resource group before creating a new user in step 1.
4. Assign the resource group to the new user.

6.2 Managing User Account Information

With the User Management permission, you can perform operations on any user account. Without the User Management permission, you can only modify your own profile (full name, e-mail address, and description) and your password.

User account management tasks include:

- Creating a user
- Viewing and changing user permissions
- Viewing and editing user profiles
- Changing your password
- Changing the lock status of a user account
- Deleting a user

6.2.1 Adding a User

With the User Management permission, you can create a user account common to the HiCommand Suite products.

To create a new user account:

1. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**. In the navigation area, select **Users**. The Users subwindow appears. The **User List** appears in the Users subwindow.
2. Click the **Add User** button in the Users subwindow. The Add User dialog box displays (see Figure 6.1).

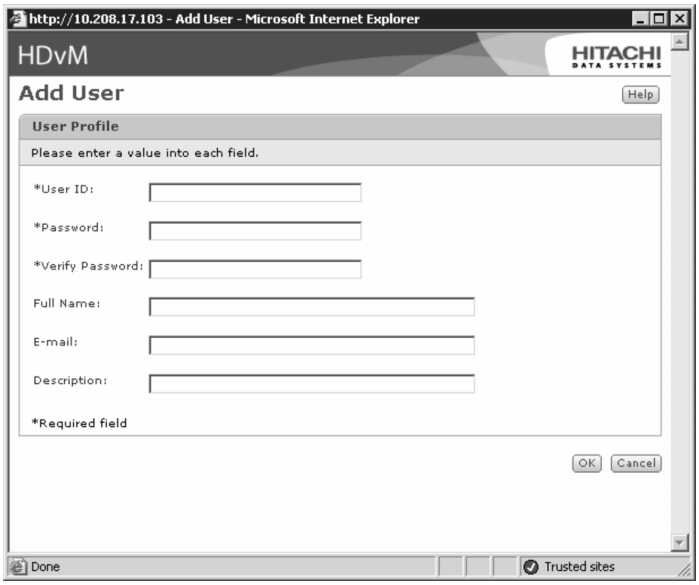


Figure 6.1 Add User Dialog Box

3. Enter the following information about the new user:
   - **User ID**. The user ID (login name) must be 1 to 256 bytes in length and is not case-sensitive. You can use the following characters:

     A - Z a - z 0 - 9 # + - _ . @

     Note: On HiCommand Suite products earlier than version 5.5, the number of characters that can be set for a user ID is between 4 bytes and 25 bytes. For environments that contain HiCommand Suite products of version 5.5 or later, together with products earlier than version 5.5, set a user ID using between 4 bytes and 25 bytes.
   - **Password** and **Verify Password**. The password is case-sensitive and must be a maximum of 256 bytes. You can use the following characters:

     A - Z a - z 0 - 9 ! # $ % & ' ( ) * + - . = @ \ ^ _ |

     Set conditions might apply to the minimum number of characters or combination of characters that can be set as a password. Passwords that do not meet these conditions cannot be set. For information on the set conditions, contact your system administrator.

     Note: On HiCommand Suite products earlier than version 5.5, the number of characters that can be set for a password is between 4 bytes and 25 bytes. For environments that contain HiCommand Suite products of version 5.5 or later, together with products earlier than version 5.5, set a password using between 4 bytes and 25 bytes.
   - **Full Name** (optional). Enter no more than 80 Basic Latin characters. Basic Latin characters are the following characters (Unicode 0020 to 007E): A-Z a-z 0-9 ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ` { | } ~ (space)

     Note: You cannot use two or more dollar signs ($) consecutively (for example, $$ or $$$)

     Important: The full name is displayed in the global tasks bar area after a user logs in. If this item is omitted, the user ID will be displayed in the global tasks bar area.
   - **E-mail** (optional). Enter no more than 255 alphanumeric characters.
   - **Description** (optional) (e.g., job title). Enter no more than 80 characters, using the character set allowed for the full name.
4. Click the **OK** button to save the settings. The user account is created and you are returned to the Users subwindow. The new user account appears in **User List**.

Note: The new user cannot access Device Manager yet because he or she does not have any permissions or a resource group. To enable the new user to access Device Manager, you must set permissions and assign a resource group to the user. For details about setting permissions, see section 6.2.2. For details about assigning resource groups, see section 6.3.2.

6.2.2 Setting Permissions for a User

With the User Management permission, you can set permissions for users other than yourself to access Device Manager and other HiCommand Suite products.

Notes:

- You cannot change the permissions associated with the System account.
- Do not change the permissions for the HaUser account. This account is the default user for the Device Manager agent.
- The User Management permission does not allow you to change your own permissions. To change your own permissions, you must log in to Device Manager using the System account or the user ID of another user who has the User Management permission.

To set permissions for a user:

1. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**.
2. In the navigation area, expand the **Users** object tree and select the user ID for which to set permissions. The *user-ID* subwindow appears in the information area (see Figure 6.2). Here you can view the user's existing permissions.

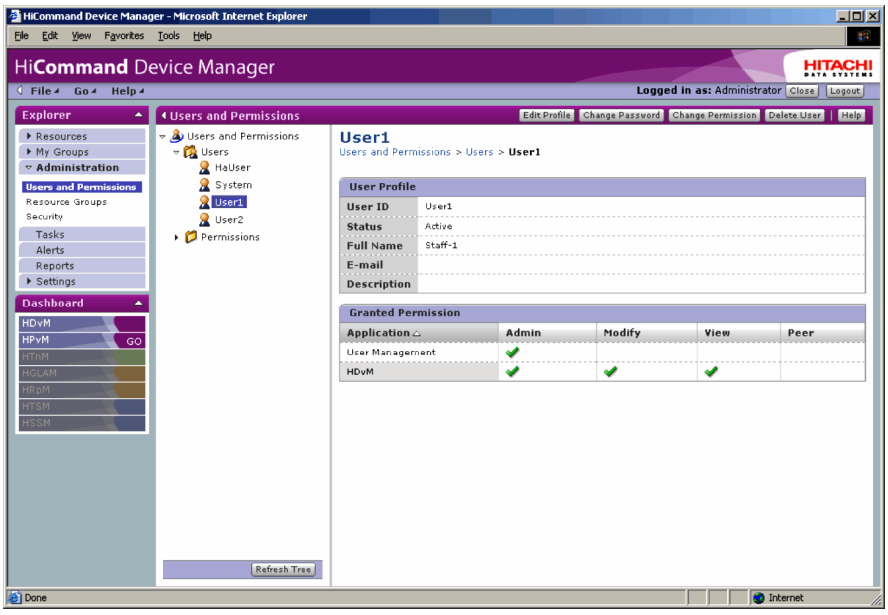


Figure 6.2 ***user-ID*** **Subwindow**

3. To change the permissions, click the **Change Permission** button. The Change Permission - *user-ID* dialog box appears (see Figure 6.3).

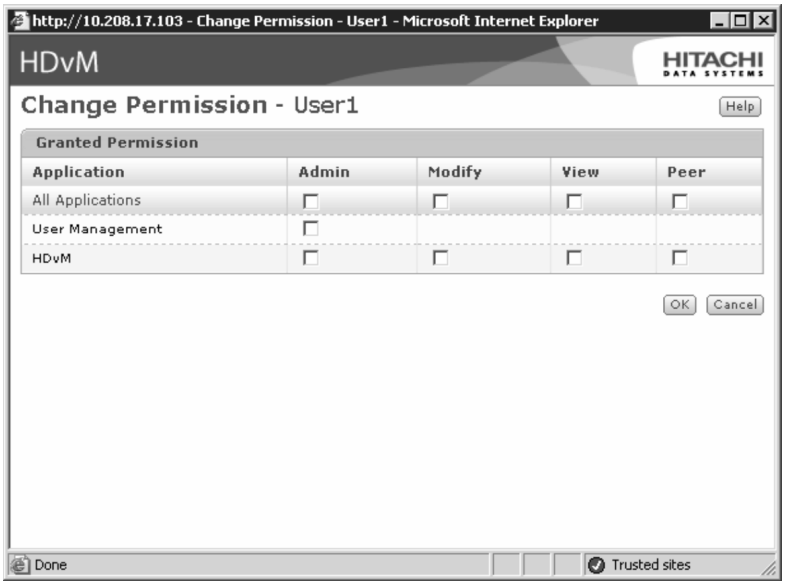


Figure 6.3 Change Permission - *user-ID* Dialog Box

4. For each application, select the permissions you want to set for the user, and then click the **OK** button to save the settings. For the combinations of permissions you can set, see section 2.1.1.

Important: Resource groups assigned to users remain in effect until the assignment is cleared. If you clear the permission to access Device Manager from a user, and then specify the permission for the same user again, resource groups assigned to the user from the beginning remain in effect.

6.2.3 Viewing and Editing User Profiles

With the User Management permission, you can view and edit the profile of any user. Without the User Management permission, you can view and edit only your own profile.

To view or edit another user's profile:

1. Log in to Device Manager with an account that has the User Management permission.
2. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**.
3. In the navigation area, expand the Users object tree and select the user ID whose profile you want to view or edit. The *user-ID* subwindow appears in the information area (see Figure 6.2). Here you can view the user's profile and permissions.
4. To edit the profile, click the **Edit Profile** button. The Edit Profile - *user-ID* dialog box appears (see Figure 6.4). In this dialog box, you can edit the **Full Name**, **E-mail**, and **Description** settings.
5. Click the **OK** button to save the edited settings. The user's profile information is updated in the *user-ID* subwindow.

To view or edit your own profile:

1. Log in to Device Manager with any user ID.
2. In the **Explorer** menu, choose **Settings** and then **User Profile**. The User Profile subwindow appears in the information area. Here you can view the profile and permissions of the user account you logged in with.
3. To edit the profile, click the **Edit Profile** button. The Edit Profile - *user-ID* dialog box appears. To change your profile, edit the **Full Name**, **E-mail**, and **Description** settings.
4. Click the **OK** button to save the edited settings. The edited information is reflected in the User Profile subwindow.

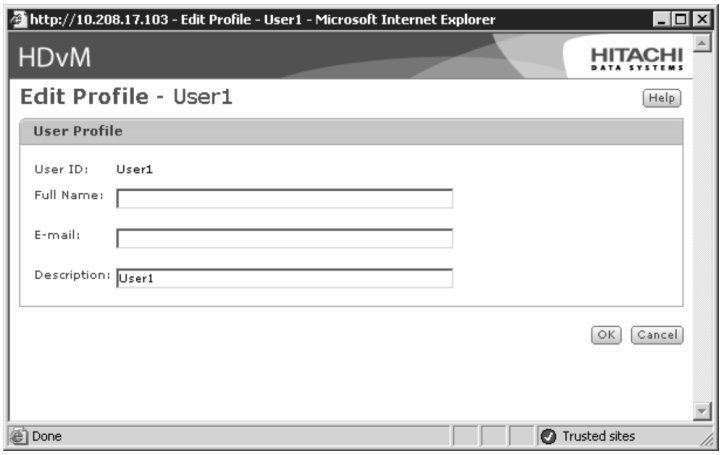


Figure 6.4 Editing a Profile

6.2.4 Changing Passwords

With the User Management permission, you can change the password of any user. Without the User Management permission, you can change only your own password.

CAUTION: When the Device Manager server is running in a cluster environment, if you change the password for the System account, specify the same settings on all nodes that make up the cluster. For details about cluster environments, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

6.2.4.1 Changing Another User's Password

To change another user's password:

1. Log in to Device Manager with a user account that has the User Management permission.
2. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**.
3. In the navigation area, expand the **Users** object tree and select the user ID whose password you want to change. The *user-ID* subwindow appears in the information area.
4. Click the **Change Password** button. The Change Password - *user-ID* dialog box appears (see Figure 6.5).

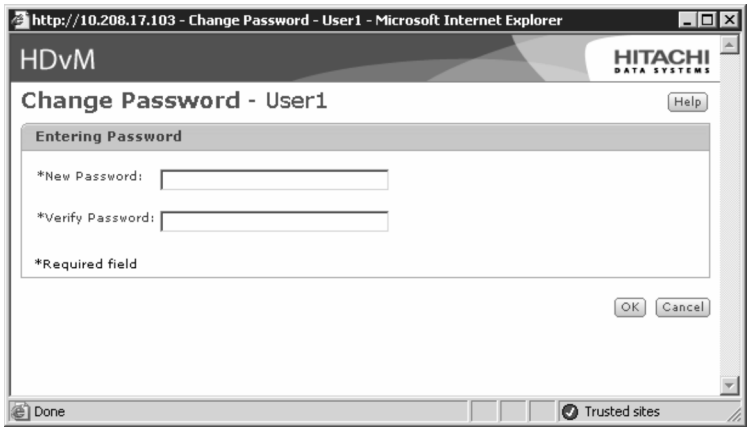


Figure 6.5 Changing Another User's Password

5. Type the new password in the **New Password** and **Verify Password** text boxes, and then click the **OK** button.

   The password is case sensitive and must be a maximum of 256 bytes. You can use the following characters:

   A – Z a – z 0 – 9 ! # $ % & ' ( ) * + – . = @ \ ^ _ |

   Set conditions might apply to the minimum number of characters or combination of characters that can be set as a password. Passwords that do not meet these conditions cannot be set. For information on the set conditions, contact your system administrator.

   Note: On HiCommand Suite products earlier than version 5.5, the number of characters that can be set for a password is between 4 bytes and 25 bytes. For environments that contain HiCommand Suite products of version 5.5 or later, together with products earlier than version 5.5, set a password using between 4 bytes and 25 bytes.

6.2.4.2 Changing Your Own Password

To change your own password:

1. Log in to Device Manager using any user account.
2. In the **Explorer** menu, choose **Settings** and then **User Profile**. The User Profile subwindow appears in the information area.
3. Click the **Change Password** button. The Change Password - *user-ID* dialog box appears (see Figure 6.6).

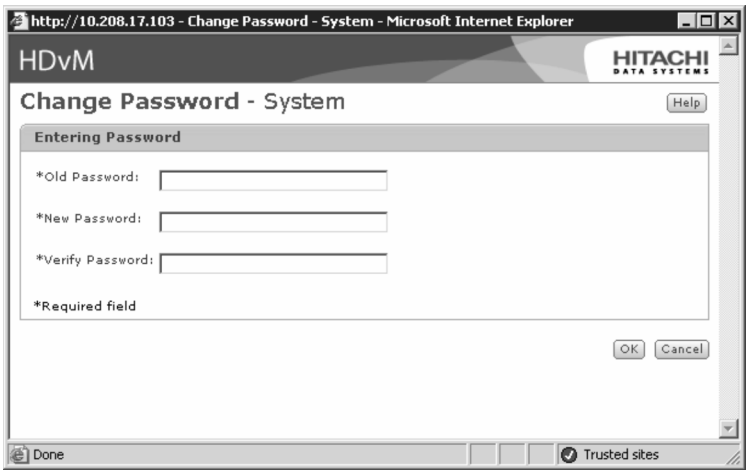


Figure 6.6 Changing Your Own Password

4. Type your current password in the **Old Password** text box. Type your new password in the **New Password** and **Verify Password** text boxes, and then click the **OK** button.

   The password is case sensitive and must be a maximum of 256 bytes. You can use the following characters:

   A - Z a - z 0 - 9 ! # $ % & ' ( ) * + - . = @ \ ^ _ |

   Set conditions might apply to the minimum number of characters or combination of characters that can be set as a password. Passwords that do not meet these conditions cannot be set. For information on the set conditions, contact your system administrator.

   Note: On HiCommand Suite products earlier than version 5.5, the number of characters that can be set for a password is between 4 bytes and 25 bytes. For environments that contain HiCommand Suite products of version 5.5 or later, together with products earlier than version 5.5, set a password using between 4 bytes and 25 bytes.

6.2.5 Changing the Lock Status of a User Account

Users who have the User Management permission can manually lock and unlock user accounts. When a user account is locked, the user cannot log in to any products in the HiCommand Suite until the user account is unlocked.

Users who have the User Management permission can also unlock user accounts that were locked automatically because of repeated login failures. For details on how to lock a user account automatically, see section 6.4.2.

The System account cannot be locked.

Notes:

- Users with the User Management permission cannot lock their own user account.
- If you lock the user account of a user who is currently logged in, the user will not be able to perform any operations. Before locking a user account, make sure the user is not logged in to Device Manager.

To change the lock status of a user account:

1. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**. Then select a user in the navigation area.

   The Users subwindow appears. The **User List** appears in the Users subwindow.

2. In **User List**, select the check box of the user whose account lock status you want to change, and then click the **Lock Users** or **Unlock Users** button.

   To change the lock status of all user accounts, click the check box in the title bar.

3. A window appears for confirming that you want to change the lock status for the user account. Click the **OK** button to change the account status, or the **Cancel** button to cancel the change.

   You are returned to the Users subwindow. If you changed the lock status, the **Status** field is updated in the **User List**.

6.2.6 Deleting Users

With the User Management permission, you can delete a user account common to the HiCommand Suite products.

You cannot delete the System account.

Notes:

- The HaUser account must not be deleted. This account is the default user for logging in to the Device Manager agent. If you delete this account, the Device Manager agent cannot transmit information to the Device Manager server.
- If you delete a user who is currently logged in, that user will be unable to continue operations. Before deleting any account, make sure the user is not logged in to Device Manager.

To delete a user from the Device Manager server:

1. In the **Explorer** menu, choose **Administration** and then **Users and Permissions**. In the navigation area, select **Users**. The Users subwindow appears with the **User List** in the Users subwindow.
2. In **User List**, select the check box of the user that you want to delete, and then click the **Delete Users** button.

   To delete all listed user accounts, click the check box in the title bar.

   The Delete User - Confirmation dialog box appears.

   Important: To delete a user after viewing the user's profile, select the required user ID in **User List** and open the *user-ID* subwindow. In the *user-ID* subwindow, you can click the **Delete User** button to delete that account.
3. Click the **OK** button to delete the account, or the **Cancel** button to cancel deletion.

6.3 Managing Resource Groups

With the Admin permission, you can manage resource groups. By creating and assigning resource groups to users, you can control the Device Manager resources to which users are allowed access.

The HiCommand Device Manager resource group operations include:

- Creating a Resource Group (see section 6.3.1)
- Assigning a Resource Group to a User (see section 6.3.2)
- Viewing and Changing Resource Group Properties (see section 6.3.3)
- Deleting a Resource Group (see section 6.3.4)

6.3.1 Creating a Resource Group

With the Admin permission, you can create resource groups as required. If the All Resources resource group has been assigned as your resource group, you can create a resource group allowing access to all Device Manager resources. If you were assigned to a user-defined resource group, you can create a new resource group under your assigned resource group.

When you create a resource group, the logical group, hosts, and LDEVs that the user can access are allocated to the resource group. Note that the following logical groups are not associated with a resource group:

- A logical group allocated to another resource group
- A logical group that has a lower-level logical group allocated to another resource group
- A storage group

Notes:

- Before you create a new resource group, make sure that the logical group to be associated with the resource group has been created in Device Manager.
- You cannot change the associated logical group after creating a resource group.

To create a Device Manager resource group:

1. In the **Explorer** menu, choose **Administration** and then **Resource Groups**. In the information area, select **Resource Group Administration**. The Resource Group Administration dialog box appears (see Figure 6.7).
2. Click the **CREATE** button to open the Resource Group Properties dialog box (see Figure 6.8).

3. Complete the **Group Name** and **Description** text boxes for the new resource group you are creating.
   - **Group Name.** The resource group name can be no more than 25 bytes in length. You can use the following characters:

     `A - Z a - z 0 - 9 , - . = \ _ ``

     You cannot use spaces in the resource group name. This item is mandatory.
   - **Description.** The description can be no more than 255 bytes in length and can contain Basic Latin characters. You can also use spaces. This item is optional.
4. Click the **Logical Group** tab and select a logical group to be allocated to the new resource group. Users assigned this resource group will be able to access all LUNs in this logical group and any logical groups below this logical group.
5. Click the **Host** tab and select the hosts to be allocated to the new resource group.

   The hosts allocated to the LUNs in the logical group selected in step 4 are automatically displayed in **Accessible hosts** of the **Host** tab. You cannot delete these hosts from **Accessible hosts**. To add another host, select the host you want to add from **Inaccessible hosts**, and then click the **Add** button.

   Notes:
   - To allow copy pair operations to be performed by the users to whom this user-defined resource group is assigned, make sure that you allocate (to the resource group) a host that meets the requirements for such operations and a command device recognized by that host.
   - If you are using Universal Volume Manager from a storage subsystem, and the storage subsystem has been incorrectly added to Device Manager, the external port might appear as a host under **Inaccessible hosts** or **Accessible hosts**. You must not allocate an external port to a resource group. To determine whether a host listed under **Inaccessible hosts** or **Accessible hosts** is an external port, from the **Explorer** menu, choose **Resources** and then **Hosts** to display the Host Management window. If the host you are interested in is displayed under the **External Array Nodes** object, it is an external port. If you refresh a storage subsystem that uses Universal Volume Manager when an external port is allocated to a resource group, the external port disappears from the **Inaccessible hosts** or **Accessible hosts** list and is unallocated from the resource group.
6. Click the **LDEV** tab and select the LDEVs to be allocated to the resource group.

   The LDEVs corresponding to the path in the logical group selected in step 4 are automatically displayed in **Accessible LDEVs** of the **LDEV** tab. You cannot delete these LDEVs from **Accessible LDEVs**. To add another LDEV, select a storage subsystem from **Select subsystem**, select the LDEV you want to add from the LDEVs displayed in **Inaccessible LDEVs**, and then click the **Add** button.

7. Make sure that the logical group, host, and LDEV information is correct. Then click the **SAVE** button to save your changes. Device Manager creates the new resource group and returns you to the Resource Group Administration dialog box where the new resource group is now listed.

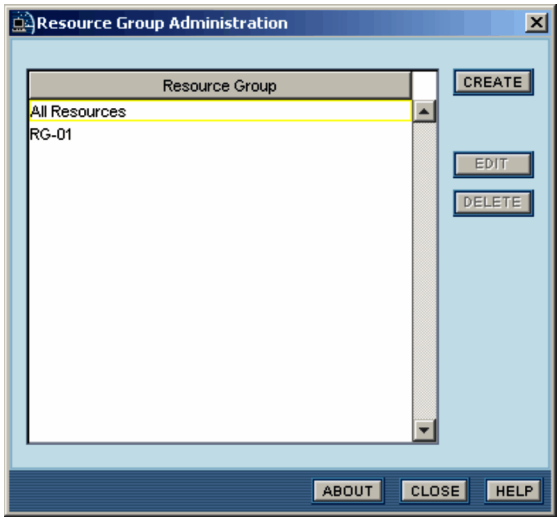


Figure 6.7 Resource Group Administration Dialog Box

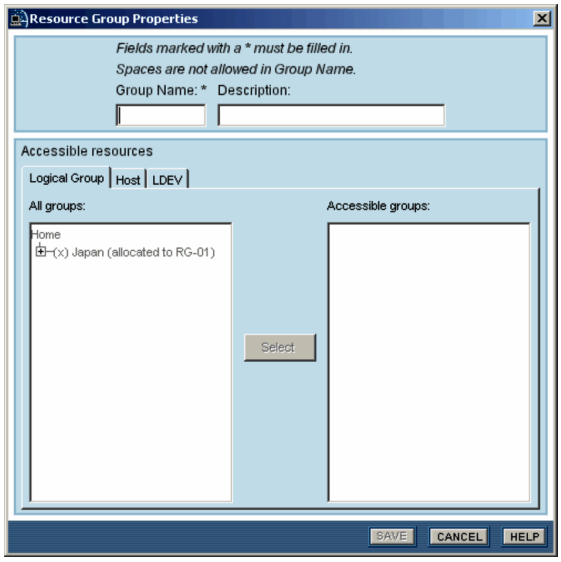


Figure 6.8 Creating a Resource Group

6.3.2 Assigning a Resource Group to a User

With the Admin permission, you can assign All Resources or a user-defined resource group to a user. To assign a user-defined resource group to a user, you must create a resource group in advance. For details about creating resource groups, see section 6.3.1.

Notes:

- You cannot change the resource group associated with the System account.
- You cannot assign a resource group to a user who has the Peer permission.

To assign a resource group to a user:

1. In the **Explorer** menu, choose **Administration** and then **Resource Groups**. In the information area, select **Resource Group Allocation**. The Resource Group Allocation dialog box appears (see Figure 6.9). You can view the resource group allocated to each user.

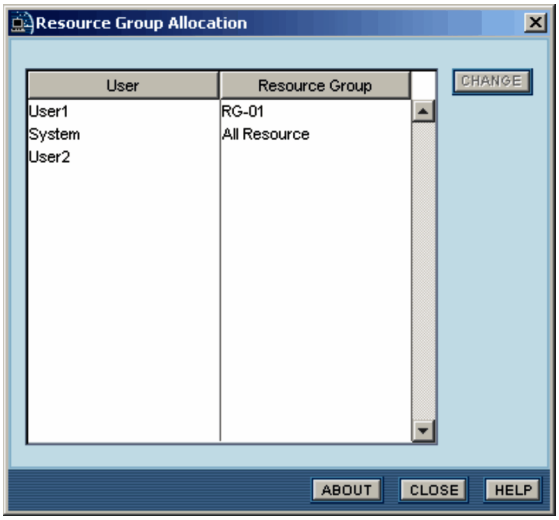


Figure 6.9 Resource Group Allocation Dialog Box

2. Select the user account to which you want to assign a resource group or whose assigned resource group you want to change. Then click the **CHANGE** button. The Change Resource Group dialog box appears (see Figure 6.10).

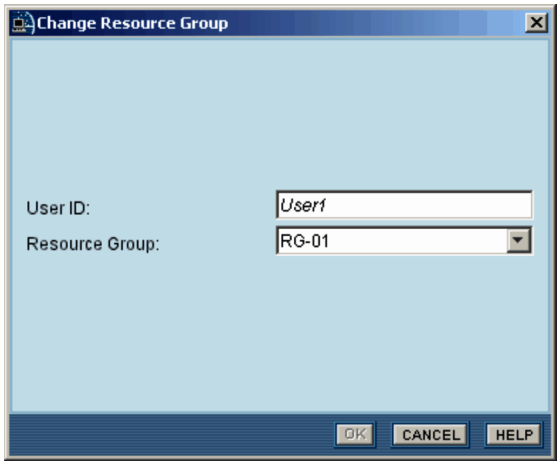


Figure 6.10 Change Resource Group Dialog Box

3. From the **Resource Group** drop-down list, select a resource group to be assigned to the user. From the drop-down list, you can select the following:
   - User-defined resource groups. If you are logged in with an account to which All Resources is assigned, all resource groups are listed. If you are logged in with an account to which a user-defined resource group is assigned, only the resource groups that you can access are shown.
   - **All Resources.** Select **All Resources** to allow the user to access all Device Manager resources.
   - **No Group.** Select **<No Group>** to clear the resource group allocated to the user. The user will be unable to log in to Device Manager without User Management permission.
4. Click the **OK** button to allocate the resource group. The information in the Resource Group Allocation dialog box is updated.

6.3.3 Viewing or Editing Resource Group Properties

With the Admin permission, you can edit the properties of user-defined resource groups. You cannot change the properties of All Resources.

The following describes the resource groups whose properties can be edited.

- If All Resources has been assigned as your resource group, you can edit the properties of any user-defined resource group.
- If you have been assigned to a user-defined resource group, you can edit the properties of your assigned resource group and of any lower-level resource groups.

To view and edit the properties of a Device Manager resource group:

1. In the **Explorer** menu, choose **Administration** and then **Resource Groups**. In the information area, select **Resource Group Administration** to open the Resource Group Administration dialog box (see Figure 6.7).
2. Select a resource group, then click the **EDIT** button to open the Resource Group Properties dialog box (see Figure 6.11).

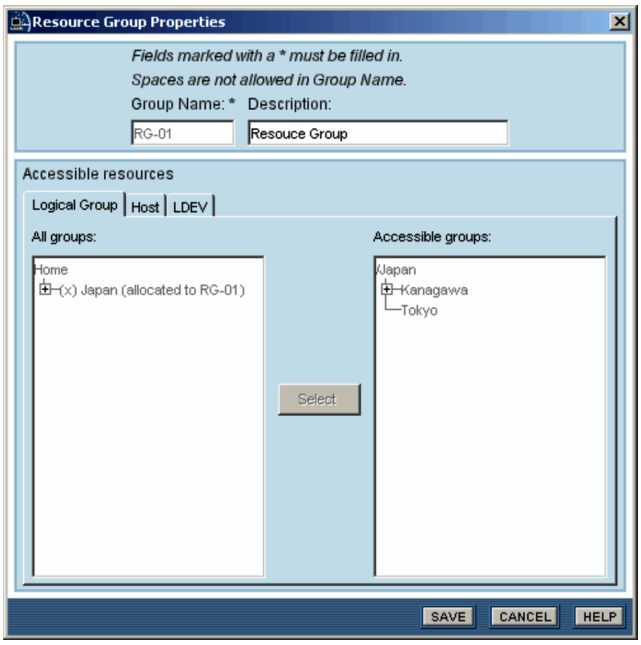


Figure 6.11 Changing Resource Group Properties

In this dialog box, you can view the resource group properties and the resources allocated to the resource group.

3. Change the settings in the Resource Group Properties dialog box as required. You can edit the information on the **Description**, **Host**, and **LDEV** tabs. You cannot change the resource group name or the logical group allocated to the resource group.

   Note: If you are using Universal Volume Manager from a storage subsystem, take care when performing host allocation.

4. Click the **SAVE** button to save your changes and update the resource group properties.

6.3.4 Deleting a Resource Group

With the Admin permission, you can delete a user-defined resource group. You cannot delete All Resources.

The following describes the resource groups that can be deleted.

- If All Resources has been assigned as your resource group, you can delete any user-defined resource group.
- If you were assigned to a user-defined resource group, you can only delete resource groups under your assigned resource group.

Notes:

- If you delete a resource group assigned to a user who does not have the User Management permission, that user will be unable to log in to Device Manager.
- If you delete a resource group assigned to a user who has logged in to Device Manager, an error occurs the next time that user performs an operation. Before deleting a resource group, make sure that the user to whom the resource group is assigned has not logged in to Device Manager.
- If the resource group you are deleting has any lower-level resource groups, they will also be deleted.

To delete a resource group from the HiCommand Device Manager server:

1. In the **Explorer** menu, choose **Administration** and then **Resource Groups**. In the information area, select **Resource Group Administration** to open the Resource Group Administration dialog box (see Figure 6.7).
2. Select the resource group you want to delete, and then click the **DELETE** button. A confirmation message appears (see Figure 6.12).
3. Click the **YES** button to delete the selected resource group, or the **NO** button to cancel deletion.

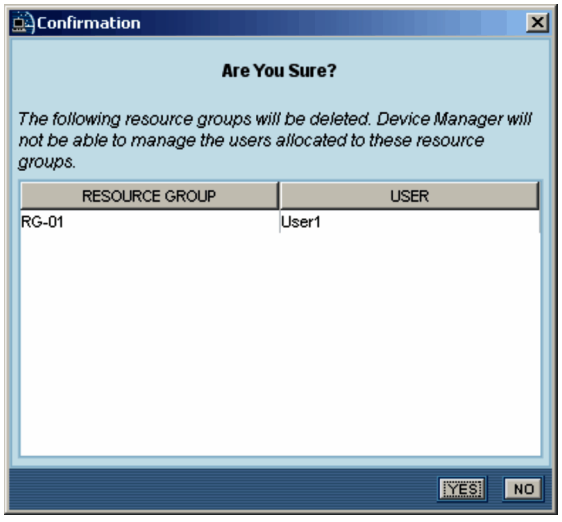


Figure 6.12 Delete Resource Group – Confirmation

6.4 Setting Security Options at Login

To enhance security when a user logs in, users who have the User Management permission can apply the following security options:

- Password conditions (see section 6.4.1)
- Automatic locking of user accounts (see section 6.4.2)
- Warning Banner message (see section 6.4.3)

Notes:

- If you run the Device Manager server in a cluster environment, set the security options on the server. For details on how to set the security options, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
- Whenever you use the Web client to change the password conditions setting or the setting for automatically locking user accounts, the security options settings file is overwritten. If you intend to manually edit the settings file, we recommend that you back up the file beforehand. For details on how to edit the settings file manually, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

6.4.1 Setting Password Conditions

Users who have the User Management permission can set password conditions.

To prevent users' passwords from being guessed by a third party, HiCommand Device Manager enables password conditions (the minimum number of characters and the combination of characters that can be used) to be specified.

The password conditions apply when a user account is added or a password is changed, and are not applied to passwords of existing user accounts.

To set password conditions:

1. In the **Explorer** menu, choose **Administration**, and then **Security**. In the navigation area, select **Password**.

   The Password subwindow appears in the Information area. The Password subwindow displays the set password conditions.

2. To change the password conditions, click the **Edit Settings** button.

   The Password dialog box appears (see Figure 6.13).

3. Enter the following information to set the password conditions.
   - **Minimum length**

     Specify the minimum number of characters that can be set as a password. The available range is 1 to 256 characters. The default is **4** (characters).
   - **Minimum number of characters**

     Specify the minimum number of characters for uppercase, lowercase, numeric, and symbolic characters that must be included in a password. You must specify the values so that the total number of uppercase, lowercase, numeric, and symbolic characters does not exceed the minimum length that can be specified for a password.

     The specifiable range for each value is 0 to 256 characters. The default is **0** (characters).
   - **Allow password to be the same as the User ID**

     If you select **No**, a user cannot use his or her user ID as a password. The default is **Yes**.
4. To change the password conditions, click the **OK** button. To cancel modification of the password conditions, click the **Cancel** button.

   You are returned to the Password subwindow. The password conditions are updated to reflect the new settings.

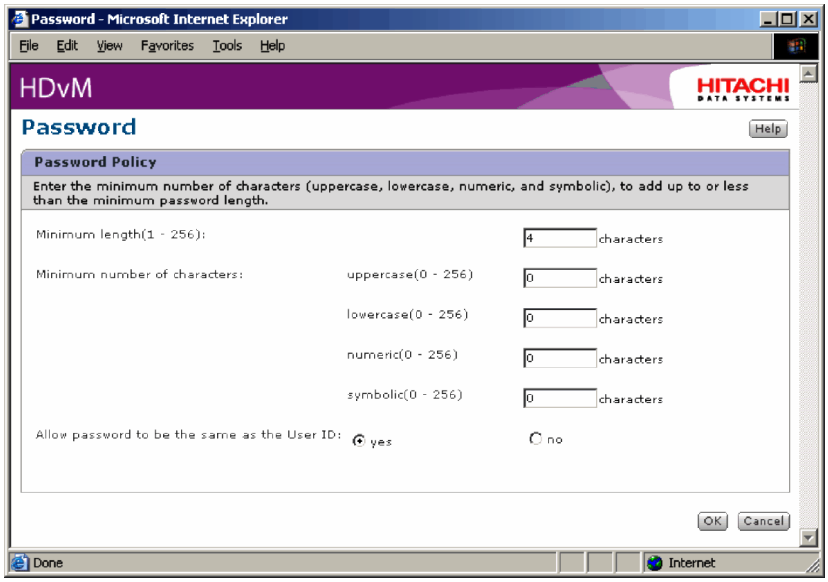


Figure 6.13 Setting Password Conditions

6.4.2 Setting Automatic Locking of User Accounts

Users who have the User Management permission can set automatic locking of user accounts.

When automatic locking has been set for a user account, operations by a user can be automatically locked if an invalid password is entered repeatedly for that user account. When enabling automatic locking of a user account, you can specify the number of login failures allowed before the user account is automatically locked.

Unsuccessful attempts to log in to other products in the HiCommand Suite that use the Single Sign-On feature count towards the number of unsuccessful login attempts. For example, if the number of unsuccessful attempts is set to **3**, and a user fails to log in to Device Manager once, fails to log in to Provisioning Manager once, and then fails to log in to Global Link Availability Manager once, the user account will be automatically locked.

Changing the number of unsuccessful login attempts does not affect users who have already registered a number of unsuccessful attempts or whose user account is locked. For example, if you change the number of unsuccessful login attempts from **5** to **2**, the user account of a user who has already made three unsuccessful login attempts will remain active. If that user fails the next login attempt, the user account for that user will be locked.

When a user account is locked, the user cannot log in to any products in the HiCommand Suite until the user account is unlocked. For details on how to unlock a user account, see section 6.2.5.

Note: Even when automatic locking has been set, the System account is not locked.

To set automatic locking of a user account:

1. In the **Explorer** menu, choose **Administration**, and then **Security**. In the navigation area, select **Account Lock**.

   The Account Lock subwindow appears in the Information area. When automatic locking of a user account has been set in the Account Lock subwindow, the number of allowable consecutive login failures is displayed. If automatic locking has not been set, the Account Lock subwindow indicates **unlimited**.

2. To change the automatic lock setting, click the **Edit Settings** button.

   The Account Lock dialog box appears (see Figure 6.14).

3. In the Account Lock dialog box, change the automatic lock setting for the user account.

   To enable automatic locking of the user account, select **Lockout a user account after number of failed attempts**, and then enter a value in **Maximum number of login attempts**. In **Maximum number of login attempts**, specify a value between 1 and 10.

4. To enable the change to the automatic lock setting for the user account, click the **OK** button. To cancel modification of the automatic lock setting, click the **Cancel** button.

   You are returned to the Account Lock subwindow. The automatic lock setting for the user account is updated.

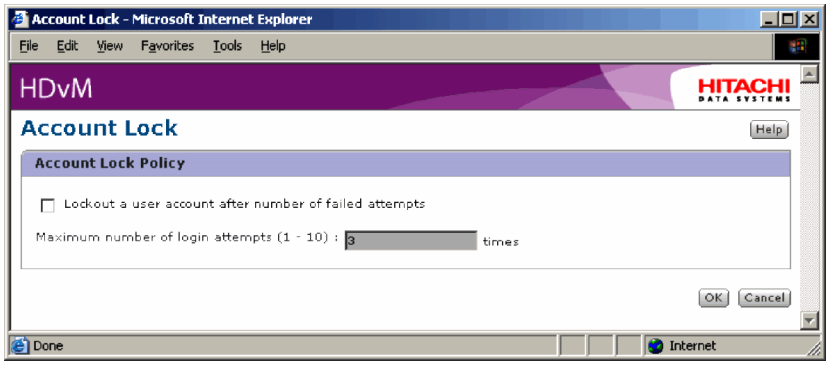


Figure 6.14 Setting Automatic Account Locking

6.4.3 Setting a Warning Banner Message

Users who have the User Management permission can set a warning banner message.

As a security measure at login, HiCommand Device Manager enables you to set any message in the Login panel.

Notes:

- You can also use the `hcmdsbanner` command to set a warning banner message. When you set a message using the `hcmdsbanner` command, there are no restrictions on the HTML tags that you can use. You can even set different messages for different locales. For details on how to set a warning banner message using the `hcmdsbanner` command, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
- On the Web client, you can edit only the warning banner message displayed as the default. However, you cannot edit a message set using the `hcmdsbanner` command if that message contains HTML tags that cannot be used on the Web client.

To edit the warning banner message:

1. In the **Explorer** menu, choose **Administration**, and then **Security**. In the navigation area, select **Warning Banner**.

   The Warning Message subwindow appears in the Information area. The set message appears in the Warning Banner subwindow. When no message has been set, the Warning Banner subwindow indicates **No Message**.

2. Click the **Edit Message** button. The Edit Message dialog box appears.
3. In the **Message** text box, edit the message. To delete the set message, click the **Delete** button.

Edit the message in HTML format. The maximum number of characters that you can use, including HTML tags, is 1,000. When editing the message on the Web client, you can use the following number of HTML tags:

```
<b> </b> <i> </i> <center> </center> <br>
<div dir="ltr"> <div dir="rtl"> <div style="direction:rtl">
<div style="direction:ltr"> </div>
```

HTML tags are not case sensitive.

- To display characters used as HTML tags in the message, use the HTML escape sequence.
- To insert a line feed into the message to be displayed, use the HTML tag `<br>` at the desired position. Line feed characters that you entered when editing the message are ignored at registration.

4. To check the edited message, click the **Preview** button.

   If the message has been edited correctly, the HTML image of the message appears in **Preview** (see

   Figure 6.15). If you have used tags that cannot be used or if there is a problem in the HTML syntax, an error message appears and **Preview** is blank.

5. Once you have confirmed that the message is displayed correctly, click the **OK** button to save the editing changes. To cancel editing of the message, click the **Cancel** button.

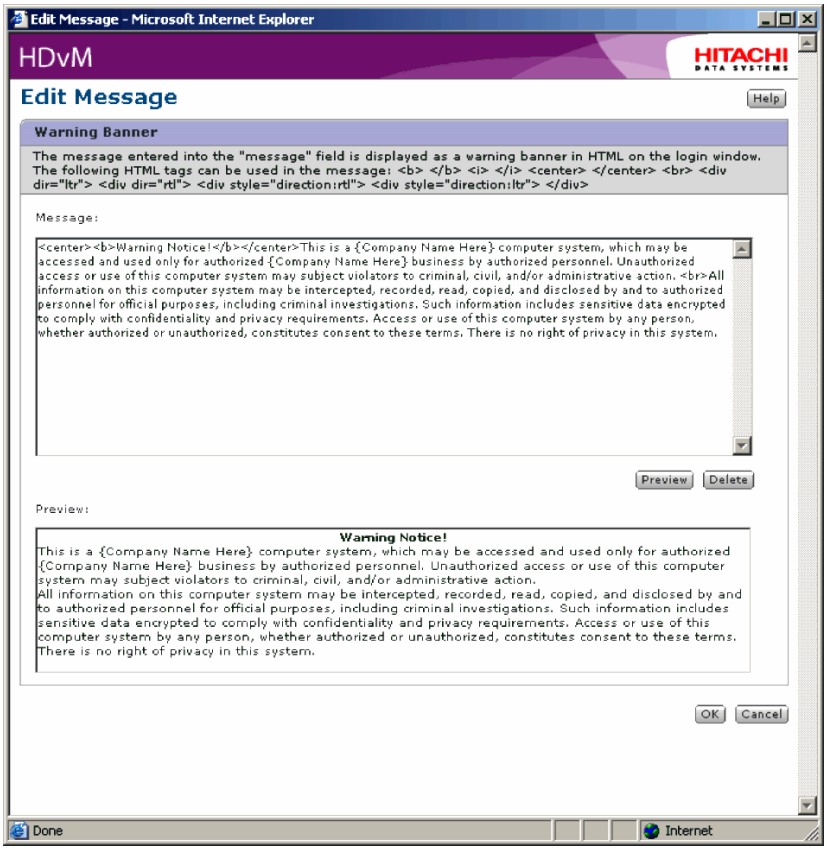


Figure 6.15 When the Message was Edited Correctly

6.5 Migrating User Data from an Earlier Version

When you upgrade to Device Manager version 5.0 or later from version 4.3 or earlier, the user roles, user groups, and properties set for users in the earlier version are migrated to the version 5.0 or later format.

Important: For details about migrating the user ID and password associated with the upgrade, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

6.5.1 Migrating User Roles

User roles in an earlier version are migrated to the permissions for version 5.0 or later. A combination of version 5.0 permissions that correspond to the particular user role are set for each user. Table 6.1 describes the migration of user roles and indicates which permissions are available (Yes) or not available (No) for the user.

Table 6.1 Migration of User Roles

User Role in Earlier Version	User Management	Device Manager Permissions			
		Admin	Modify	View	Peer
System Administrator Local System Administrator (see ***Note***)	Yes	Yes	Yes	Yes	No
Storage Administrator Local Storage Administrator	No	No	Yes	Yes	No
Guest Local Guest	No	No	No	Yes	No
Peer	No	No	No	No	Yes

Note: When the Local System Administrator account is migrated to version 5.0 or later from an earlier version, users who have that role can exercise the User Management permission on all users (not just users belonging to the same resource group as the user or its subordinate resource groups). As with earlier versions however, you can only manage resource groups that belong to your resource group.

6.5.2 Migrating User Groups

When the Local System Administrator, Local Storage Administrator, and Local Guest accounts are migrated to version 5.0 or later from an earlier version, the user groups assigned to the users become user-defined resource groups.

When the System Administrator, Storage Administrator, and Guest accounts are migrated to the 5.0 environment, **All Resources** is assigned as their resource group.

6.5.3 Migrating User Properties

Table 6.2 describes the migration of properties set in an earlier version.

Table 6.2 Migration of User Properties

Version 4.3 or Earlier	Version 5.0 or Later	Migration
First name and last name	Full name	Converted to a full name in the format <*first-name*> <*last-name*>
Description	Description	Unchanged

Note: After the migration, if the number of the characters in **Full Name** or **Description** exceeds the maximum, you must edit the user profile so that the number of specified characters does not exceed the maximum.

Chapter 7 Performing Logical Group Operations

This chapter describes logical group operations:

- Overview of Logical Groups (see section 7.1)
- Viewing the List of Logical Groups (see section 7.2)
- Creating a Logical Group (see section 7.3)
- Viewing and Editing the Logical Group Properties (see section 7.4)
- Deleting a Logical Group (see section 7.5)
- Storage Group Operations (see section 7.6)

7.1 Overview

You can access logical groups as follows: From the **Explorer** menu, choose **My Groups** and then **Logical Groups** to display the **Logical Groups** object tree in the navigation area. The **Logical Groups** object in the navigation area (see Figure 7.1), provides access to logical group operations.

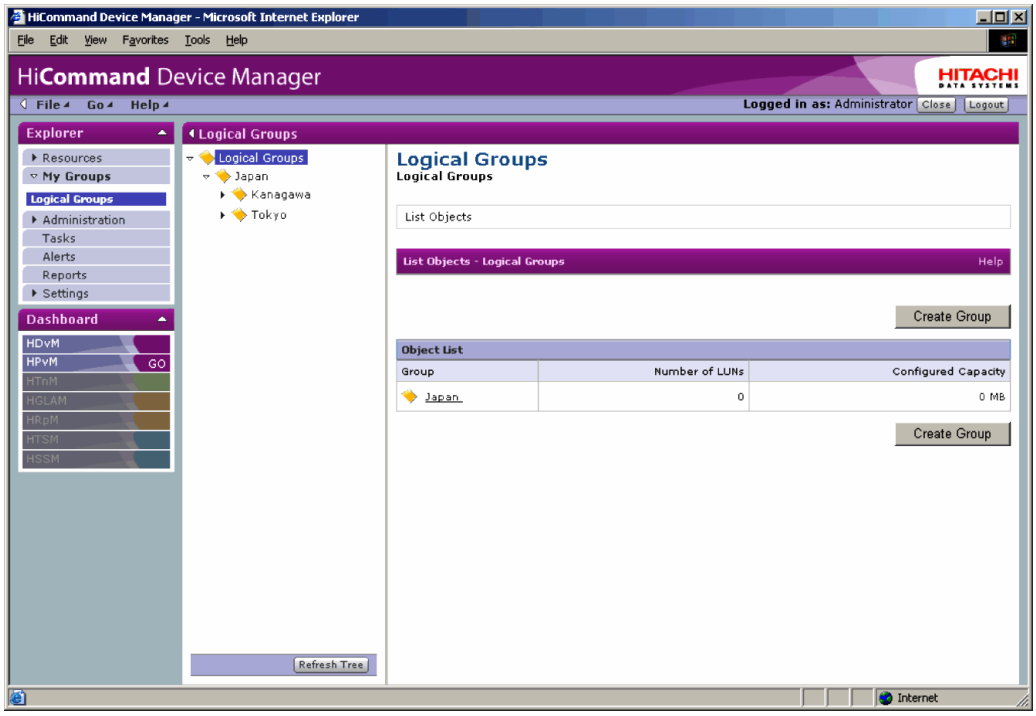


Figure 7.1 Logical Groups

Logical groups can be classified as follows:

- **Parent or child group:** When logical groups are arranged in a hierarchical structure, a higher-level logical group in the hierarchy can be called a parent group, and a lower-level logical group in the hierarchy can be called a child group. A parent group is always a logical group, whereas a child group can be either a logical group (such as mid-level) or a storage group.
- **Storage group:** A logical group for which paths to storage have been set is called a storage group. A storage group is a collection of any user-specified LUNs (access paths). Storage groups are placed under logical groups. However, logical groups cannot be placed under storage groups.
- **Empty group:** A logical group that has no contents is called an empty group. An empty group can be converted to a storage group by assigning a logical group to it.

HiCommand Device Manager enables you to create a hierarchy of logical groups and assign storage to empty groups or storage groups. One or more logical groups and/or one or more storage groups can be placed in a logical group.

The **All Storage** or **My Storage** object contains all LDEVs that can be accessed by the logged-in user. The **All Storage** object appears when a user assigned the All Resources resource group has logged in. The **My Storage** object appears when a user who is assigned to a user-defined resource group has logged in. The **All Storage** or **My Storage** object has a group for each storage subsystem, and each storage subsystem group contains an **Open-Allocated** group, an **Open-Unallocated** group, and an **Open-Reserved** group. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, each storage subsystem group also contains a **Mainframe-Unspecified** group.

- **Open-Allocated group:** Displays the LUs/LDEVs in the specified storage subsystem that are available to the logged-in user and that have one or more paths assigned to them on open volumes in the specified storage subsystem. When you add a new storage subsystem or perform a Refresh on an existing storage subsystem (see section 10.5), the LUs or LDEVs that have paths assigned to open volumes are placed in the **Open-Allocated** group.
- **Open-Unallocated group:** Displays the LUs/LDEVs that are available to the logged-in user and do not have any paths assigned to them on open volumes in the specified storage subsystem. When you add a new storage subsystem or perform a Refresh on an existing storage subsystem (see section 10.5), the LUs or LDEVs that do not have any paths assigned to open volumes are placed by HiCommand Device Manager into the **Open-Unallocated** group.
- **Open-Reserved** group: Displays the LUs/LDEVs that are available to the logged-in user, and that cannot be assigned any paths, on open volumes in the specified storage subsystem. When you add a new storage subsystem or perform a Refresh on an existing storage subsystem (see section 10.5), the LUs or LDEVs that cannot be assigned any paths to open volumes are placed by HiCommand Device Manager into the **Open-Reserved** group.
- **Mainframe-Unspecified** group: Displays the mainframe volumes that are available to the logged-on user in the specified storage subsystem. When you add a new storage subsystem or perform a Refresh on an existing storage subsystem (see section 10.5), mainframe volumes are placed in the **Mainframe-Unspecified** group. The **Mainframe-Unspecified** group is displayed for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900 storage subsystems that support mainframe volumes.

The LUN SCAN logical group is created under the **Logical Groups** object when you perform the first LUN scan operation. Logical groups for each storage subsystem on which a LUN Scan operation has been performed are created in the LUN SCAN group. Storage groups for each port and each host are created underneath, and all unregistered LUNs are placed in the storage groups. Logical groups in the LUN SCAN group can be renamed or deleted in the same way as user-defined logical groups.

7.2 Viewing the List of Logical Groups

All Device Manager users can view the list of logical groups for which they have access permission. To view the list of logical groups, in the **Explorer** menu choose **My Groups** and then **Logical Groups**, and then select the **Logical Groups** object in the navigation area. You can expand the tree hierarchy as needed to display the child group(s) and/or storage group(s) contained within the parent group(s).

When the **Logical Groups** object is selected in the navigation area, the method area displays the **List Objects** operation, and the information area displays the list of objects (logical groups and/or storage groups) at the top level of the logical group hierarchy.

When a logical group is selected in the navigation area, the method area displays the **Delete Group**, **List Objects**, and **Modify Properties** operations, and the information area displays the following subwindows:

- **Logical Group:** Displays the properties of the selected logical group:
  - **Name:** name of the logical group
  - **Parent group:** name of the parent group(s) with nested child groups separated by a slash (/) character (for example, **/Enterprise/MIS Dept/E-Mail**)
  - **Number of LUNs:** total number of LUNs in the logical group, including the LUNs in all child groups
  - **Configured Capacity:** total capacity of the storage in the logical group, including the storage in all child groups
  - **Subsystem:** subsystem name for storage that is allocated to a storage group. This item is displayed only for storage groups
- A list of child groups or storage: Displays a list of objects contained within the selected logical group. If a parent group is selected in the navigation area, **Object List** is displayed as the item name, and this subwindow displays the child groups (logical groups and/or storage groups) contained within the selected logical group. If a storage group is selected in the navigation area, this subwindow displays a list of LUNs contained in the storage group.

Note on Display of Capacity: The rules for calculating the capacity and the display format are as follows, unless otherwise specified in the description of items.

- The capacity is calculated in kilobytes.
- The unit of display changes according to the capacity. If the capacity is less than 1 GB, the capacity is displayed in MB. If the capacity exceeds 1 GB, the MB display changes to the GB display. If the capacity exceeds 1 TB, the GB display changes to the TB display.
- For the MB display, the fractional portion of the value is truncated. For the GB and TB displays, the value is truncated to two decimal places.

7.3 Creating a Logical Group

Logical groups can contain one or more logical groups and/or storage groups. Users with the Modify permission can create logical groups.

Notes:

- In the Web client, increasing the amount of data that is displayed in the window increases the amount of memory that is used. To avoid a memory shortage, we recommend that you do not create more than 1,000 logical groups.
- Logical groups created on the 32nd level or higher are not displayed in the navigation area. We recommend that you create no more than 31 levels for a logical group hierarchy.

To create a logical group to Device Manager:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**.
2. Expand the tree in the navigation area as necessary, and then in the navigation area, select the parent group for the logical group that you want to create.
3. To create a logical group at the top level, select the **Logical Groups** object.

   Select the **Create Group** button in the information area to open the Create Group panel or dialog box, as shown in Figure 7.2.
4. The parent group selected in the navigation area is displayed in **Parent Group**.

   If you select the **Logical Groups** object in the navigation area, **None** is displayed.

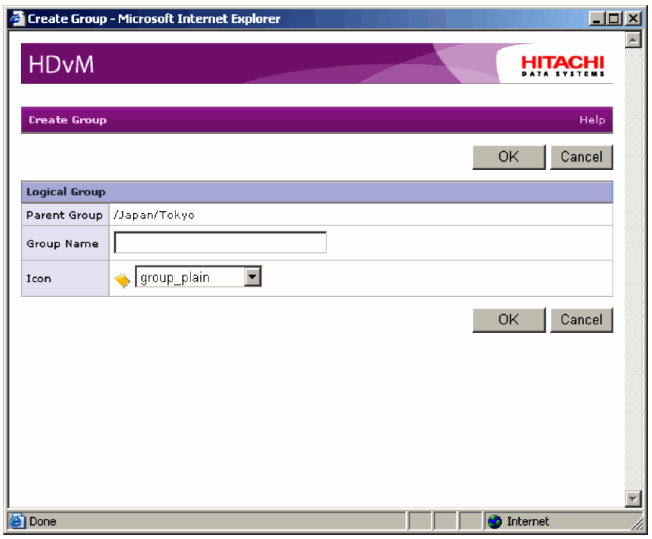


Figure 7.2 Creating a Logical Group

5. In the **Parent Group** field on the Create Group panel, select the desired parent group for the new logical group, if not already selected. Select **None** to create a new group at the top level.
6. In the **Group Name** field in the Create Group panel, enter the desired parent group. You cannot create a group with the same name as another logical group on the same level, and you cannot use LUN SCAN as a group name. The group name can contain spaces and is not case-sensitive. The group name can be a maximum of 50 bytes. You can use the following characters:

   ```
   A - Z a - z 0 - 9 - _ . @
   ```

   The group name may include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded.
7. In the **Icon** field on the Create Group panel, select the desired icon for the new group.
8. If the information displayed on the Create Group panel is correct, select **OK** to create the specified new group (or select **Cancel** to cancel your request).

7.4 Viewing and Editing Logical Group Properties

Users with the Modify permission can edit the logical group properties.

To view and edit the logical group properties:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, expand the tree in the navigation area as necessary. In the navigation area, select the logical group for which you want to view or edit the properties.
2. In the method area, select the **Modify Properties** operation to open the Modify Properties panel (see Figure 7.3). The Modify Properties panel enables you to change the parent group, group name, and icon for the selected group.

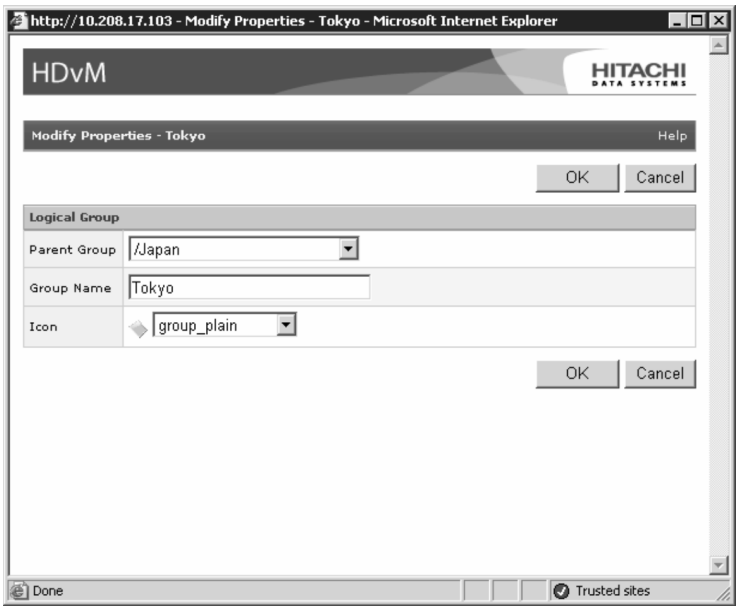


Figure 7.3 Modifying Properties

3. Edit the properties of the logical group (parent group, group name, icon) as needed.

   Note on changing the name: You cannot use LUN SCAN as a group name, and you cannot have two groups with the same name on the same level. The group name may include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded. The group name can be a maximum of 50 bytes and is not case-sensitive. You can use the following characters: `A - Z a - z 0 - 9 - _ . @`

   Note on changing the parent group: If you move a logical group to within another logical group by changing the parent group, the following changes will be applied:

   - When a logical group above the group being moved is assigned to a resource group, the logical group being moved and the logical groups within are removed from the resource group to which the logical group above it is assigned.
   - When a move destination logical group is assigned to a resource group, the logical group being moved and the logical groups within are added to the resource group to which the move destination logical group is assigned.

4. Select **OK** to save any changes and close the panel, or select **Cancel** to close the panel without saving changes.

7.5 Deleting a Logical Group

Users with the Modify permission can delete a logical group.

Notes:

- For instructions on deleting a storage group (containing LUNs) or a parent group which contains one or more storage groups, see section 7.6.6.
- You cannot delete a logical group that is assigned to a resource group. To delete such a logical group, you must first delete the corresponding resource group.

To delete a logical group from Device Manager:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, expand the tree in the navigation area as necessary, and then in the navigation area, select the group that you want to delete.
2. In the method area, select the **Delete Group** operation.

   Device Manager displays your request to remove a logical group, and asks you to confirm it.

   If the group you are deleting contains subgroups, Device Manager lists them and asks you to confirm your request.
3. Select **OK** to delete the logical group and its subgroups or **Cancel** to cancel your request.

7.6 Storage Group Operations

Users with the Modify permission can manage storage groups. Users with the View permission can only view the storage group information.

A Device Manager storage group is a user-defined set of LUNs that can be manipulated as a group. When you view the contents of a storage group, you can view property information on the selected storage group and information on the LDEVs managed under that storage group. You can add, remove, and move storage in a storage group, and you can change the security properties of a storage group.

Device Manager storage group operations include:

- Viewing the contents of storage groups (see section 7.6.1)
- Adding storage to a storage group (see section 7.6.2)
- Moving storage from one logical group to another (see section 7.6.3)
- Modifying LUN security for a group (see section 7.6.4)
- Removing storage from a group (see section 7.6.5)
- Deleting a storage group (see section 7.6.6)

Notes:

- For instructions on creating storage groups, see section 7.3.
- When an error occurs during a storage group operation, Device Manager might ask you to perform the **Refresh** operation. If you do not have Refresh privileges, ask a user with the Modify permission, who is assigned the All Resources resource group, to perform the **Refresh** operation.

Note on Display of Capacity: The rules for calculating the capacity and the display format are as follows, unless otherwise specified in the description of items.

- The capacity is calculated in kilobytes.
- The unit of display changes according to the capacity. If the capacity is less than 1 GB, the capacity is displayed in MB. If the capacity exceeds 1 GB, the MB display changes to the GB display. If the capacity exceeds 1 TB, the GB display changes to the TB display.
- For the MB display, the fractional portion of the value is truncated. For the GB and TB displays, the value is truncated to two decimal places.

7.6.1 Viewing the Contents of a Storage Group

When you view the contents of a storage group, you can view property information on the selected storage group and information on the LDEVs managed under that storage group.

To view the contents of a storage group:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, and expand the tree in the navigation area as necessary.
2. In the navigation area, select the desired storage group as shown in Figure 7.4.

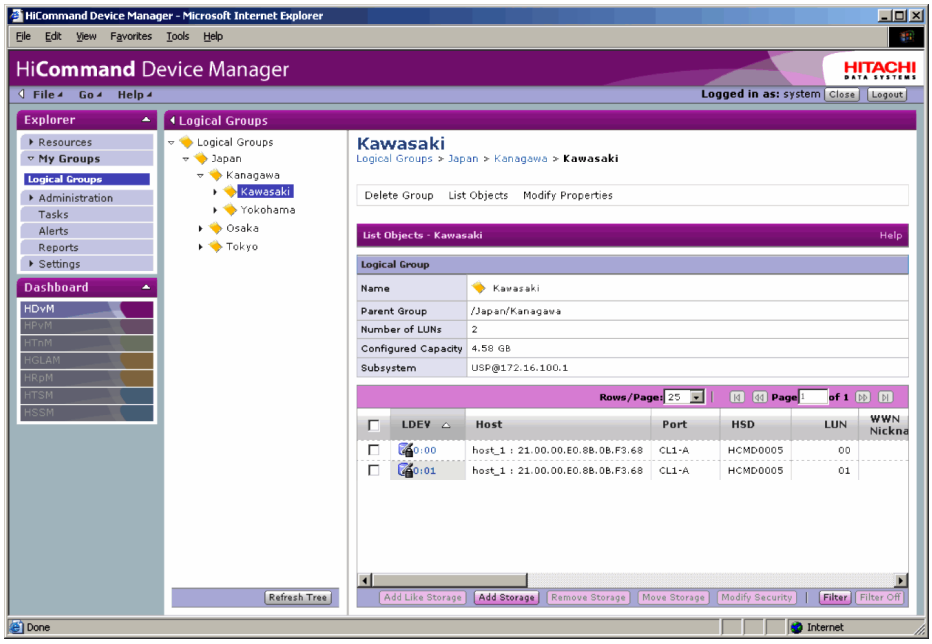


Figure 7.4 Viewing the Contents of a Storage Group

The method area displays the operations that can be performed on the selected group:

- **Modify Properties** (see section 7.4)
- **Delete Group** (see section 7.6.6)

The information area displays the following information and operations for the storage in the selected group:

- Logical group information: name and icon, parent group, number of LUNs, configured capacity, storage subsystem, and list of LDEVs in the storage group (see step 3)
- **Add Like Storage** (see section 7.6.2)
- **Add Storage** (see section 7.6.2)
- **Remove Storage** (see section 7.6.5)
- **Move Storage** (see section 7.6.3)
- **Modify Security** (see section 7.6.4)

3. To view detailed information for an LDEV in the storage group, select the LDEV to open the **Detailed Information - LDEV-number** panel shown in Figure 7.5.

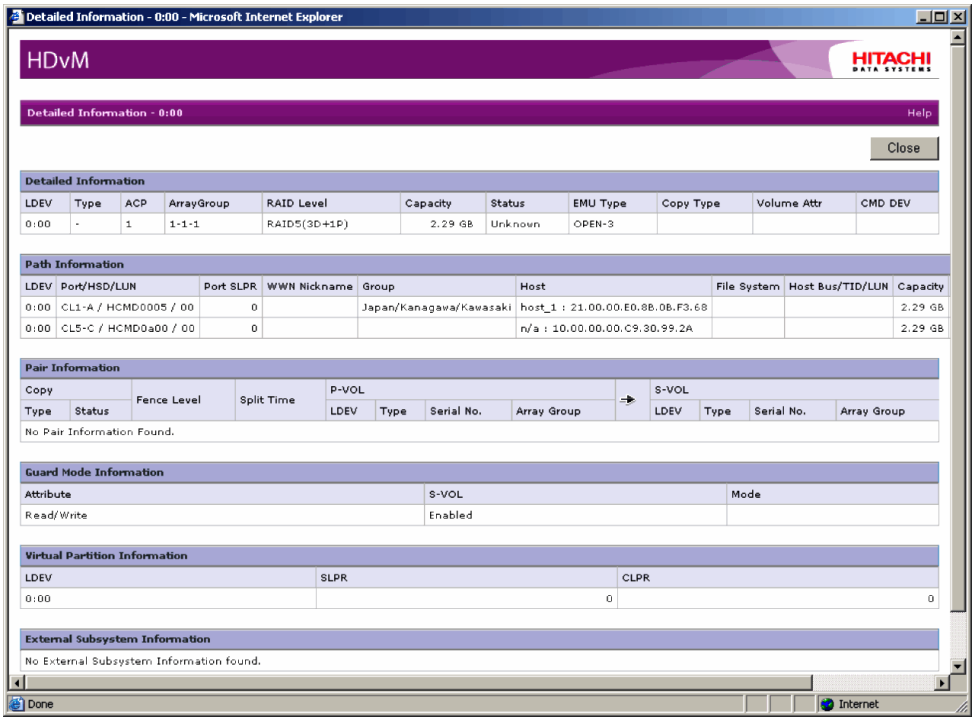


Figure 7.5 Detailed Information – LDEV-Number Panel

Table 7.1 lists and describes the information displayed on the Detailed Information – *LDEV-number* panel.

Table 7.1 LDEV-Number Panel Detailed Information

Item		Description
Detailed Information	**LDEV**	Displays the logical device number. For the LUSE volume, the LDEV numbers of logical devices that make up the LUSE volume are displayed in the dropdown list.
	Type	Displays the LDEV type. This item is displayed only for Universal Storage Platform V, TagmaStore USP, the TagmaStore AMS/WMS series, and Thunder 9500V.
	Default Controller	Displays the default for the host controller. This item is displayed only for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200.
	ACP	Displays the array control processor.
	Array Group	Displays the array group number.
	RAID Level	Displays the RAID level.
	Capacity	Displays the logical device capacity.
	Consumed Capacity	Displays the LDEV capacity information. When the volume attribute of the LDEV is DP-VOL, the amount of space that has been consumed is displayed. When the volume attribute of the LDEV is not DP-VOL, the same value as **Capacity** is displayed. This item is displayed only for Universal Storage Platform V.
	Status	Displays the status of the LDEV. For a LUSE volume, the statuses of all the LDEVs that make up the volume are displayed. This item is displayed only for Universal Storage Platform V and TagmaStore USP.

Item		Description
	EMU Type	Displays the emulation type (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900 only, *emulation-type x number-of-LDEVs* is shown for a LUSE volume). No value is displayed for the TagmaStore AMS/WMS Series, Thunder 9500V or 9200.
	Stripe Size	Displays the LDEV stripe size, in KB. This item is displayed only for the TagmaStore AMS/WMS series.
	Copy Type	Displays the copy type: ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot, or Universal Replicator.
	Volume Attr	Displays the volume attribute.
	CMD DEV	Displays the command device status.
Mainframe Volume Information	Displays information about mainframe volumes. This item is displayed only for a mainframe volume.	
	VOLSER	Displays the volume serial number of the logical device. A blank appears if the serial number cannot be obtained.
	DEVN	Displays all the device numbers set for the logical device. A blank appears if the device numbers cannot be obtained.
Path Information	**LDEV**	Displays the logical device number.
	Port/HSD/LUN	Displays the port (cluster+port number), host storage domain (HSD) nickname, and logical unit number. These items are displayed only for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode).
	Port/LUN	Displays the port (cluster+port number) and logical unit number. These items are not displayed for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode).
	Port SLPR	Displays the SLPR number of the port. This item is displayed only for a storage subsystem that can use Virtual Partition Manager.
	Group	Displays the name of the storage group to which the path belongs.
	Host	Displays host-name: World-Wide-Name.
	File System	Displays the mount point on the host. The value is displayed only when a Device Manager agent is installed on the host. A maximum of 378 bytes is used to display the mount point.
	Host Bus/TID/LUN	Displays SCSI information recognized by the host.
	Capacity	Displays the volume capacity.
	% Used	Displays the percentage of volume usage. The unit is %. For details about how to calculate the percentage and details about the conditions that prevent this item from being displayed, see the description of **% Used** in section 8.2.1. When multiple paths are assigned to a volume, the following information is displayed: ▪ When paths are assigned to multiple hosts The percentage of volume usage on a host to which the Device Manager agent last sent the data is displayed. If the percentage of volume usage cannot be calculated on that host, −− appears even if the volume is being used by another host. ▪ Multiple paths are assigned to a single host The largest value is displayed as the percentage of storage usage.

Item		Description	
	Last Updated	Displays the date and time when Device Manager agent performed the last update. If multiple paths are assigned to the volume, the date and time when information was last updated on a host to which Device Manager agent last sent the data is displayed.	
Pair Information	Displays pair information. This item is not displayed if the volume attribute of the LDEV is POOL.		
	Copy Type	Displays the copy type: ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot, or Universal Replicator.	
	Copy Status	Displays the copy status when volumes are paired.	
	Fence Level	Displays the recovery settings used when a failure occurs during execution of TrueCopy.	
	Split Time	Displays the time when a snapshot is obtained if Copy Type is QuickShadow/Copy-on-Write Snapshot. A blank is displayed if Copy Type is not QuickShadow/Copy-on-Write Snapshot. This item is displayed only for Universal Storage Platform V, TagmaStore USP, TagmaStore AMS/WMS series and Thunder 9500V.	
	P-VOL	Displays P-VOL information.	
		LDEV	Displays the logical device number of the primary volume.
		Journal Group	For Universal Replicator, displays the number of the journal group to which the primary volume belongs. In all other cases, this item is blank. This item is displayed when the displayed pair contains a Universal Replicator pair.
		Type	Displays the model name of the storage subsystem to which the primary volume belongs.
		Serial No.	Displays the serial number of the storage subsystem to which the primary volume belongs.
		Array Group	Displays the number of the array group to which the primary volume belongs.
	S-VOL	Displays S-VOL information.	
		LDEV	Displays the logical device number of the secondary volume.
		Journal Group	For Universal Replicator, displays the number of the journal group to which the secondary volume belongs. In all other cases, this item is blank. This item is displayed when the displayed pair contains a Universal Replicator pair.
		Type	Displays the model name of the storage subsystem to which the secondary volume belongs.
		Serial No.	Displays the serial number of the storage subsystem to which the secondary volume belongs.
		Array Group	Displays the number of the array group to which the secondary volume belongs.
POOL Information	Displays POOL information. This item is displayed only if the attribute of the LDEV is POOL.		
	POOL ID		Displays the POOL ID.

Item		Description	
Guard Mode Information	For Universal Storage Platform V, TagmaStore USP and TagmaStore AMS/WMS series, displays Data Retention information. For Lightning 9900V and Thunder 9500V, displays OPEN LDEV Guard information. This item is not displayed for mainframe volumes.		
	Attribute	Displays the attribute of the logical device.	
	S-VOL	Displays the S-VOL Disable attribute.	
	Mode	Displays the INH bit attribute.	
Virtual Partition Information	Displays information about the SLPR and CLPR. This item is only displayed for a storage subsystem that can use Virtual Partition Manager.		
	LDEV	Displays the LDEV number.	
	SLPR	Displays the SLPR number.	
	CLPR	Displays the CLPR number.	
Cache Partition Information	Displays information about CLPR. This item is displayed only for TagmaStore AMS/WMS series.		
	LDEV	Displays the LDEV number.	
	CLPR	Displays the CLPR number. A blank is displayed if the LDEV is a Copy-on-Write Snapshot V-VOL.	
External Subsystem Information	If an internal volume of a storage subsystem that uses Universal Volume Manager is selected, this item displays the information about the external volume mapped to that internal volume. If an external volume is selected, this item displays information on the internal volume to which the external volume is mapped. If neither case applies, the message `No External Storage Information found` displays.		
	External Volume(s) comprising this volume	Displays information on the external volume mapped to that internal volume. This information is displayed only if an internal volume of a storage subsystem that uses Universal Volume Manager is selected. For a LUSE, multiple lines will be displayed.	
		LDEV	Displays the LDEV number.
		External Subsystem	Displays the name of the external subsystem.
		External LDEV	Displays the LDEV number of the external subsystem.
		External Subsystem Vendor	Displays the name of the external subsystem vendor.
	Assigned Volume(s) using this volume	Displays information on the internal volume to which the external volume is mapped. This information is displayed only if an external volume is selected. If the internal volume to which an external volume is mapped is sliced (CVS), multiple lines will be displayed.	
		Assigned Subsystem	Displays the storage subsystem name of the internal volume to which an external volume is mapped.
		Assigned LDEV	Displays the LDEV numbers of the internal volume to which an external volume is mapped.

7.6.2 Adding Storage to a Storage Group

Users with the Modify permission can assign a path to a logical device, and add storage to an empty group or storage group.

When you add storage, you add one or more LUNs (access paths) to an empty group or a storage group. You can add storage to an open-allocated group, an open-unallocated group, or both. During this process you can optionally create LUSE volume(s) and secure the LUNs to host WWNs.

Notes:

- The maximum number of LUNs that can be assigned in one operation is 100. If you attempt to assign more than 100 LUNs at one time, an error message appears. To assign more than 100 LUNs, add storage in multiple operations, adding no more than 100 LUNs in each operation.
- In the Web client, increasing the amount of data that is displayed in the window increases the amount of memory that is used. To avoid a memory shortage, we recommend that you do not add more than 1,000 LUNs (access paths) to a storage group.
- If an error occurs when you attempt to add storage, depending on the state of the storage, you may no longer be able to recognize the storage. If this happens, perform a refresh and a LUN Scan, and move the affected storage to an appropriate storage group. If you do not have permissions to perform a refresh and a LUN Scan, ask a user with the Modify permission, who is assigned the All Resources resource group, to perform a refresh and a LUN Scan.
- A path cannot be assigned to an LDEV whose volume attribute is POOL, DM-LU, OnDemand, Migration-reserved, JNL-VOL, or DP-Pool.

Important: You can also assign a path to an LDEV from an All Storage (or My Storage) object. In addition, you can also add storage to an empty group or storage group from the **Hosts** object.

To assign a path to a logical device, or to add storage to an empty group or storage group:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, and expand the tree in the navigation area as necessary.
2. In the navigation area, select the empty group or storage group to which you want to add storage (see Figure 7.6). The List Objects - *logical-group-name* subwindow is displayed in the information area.

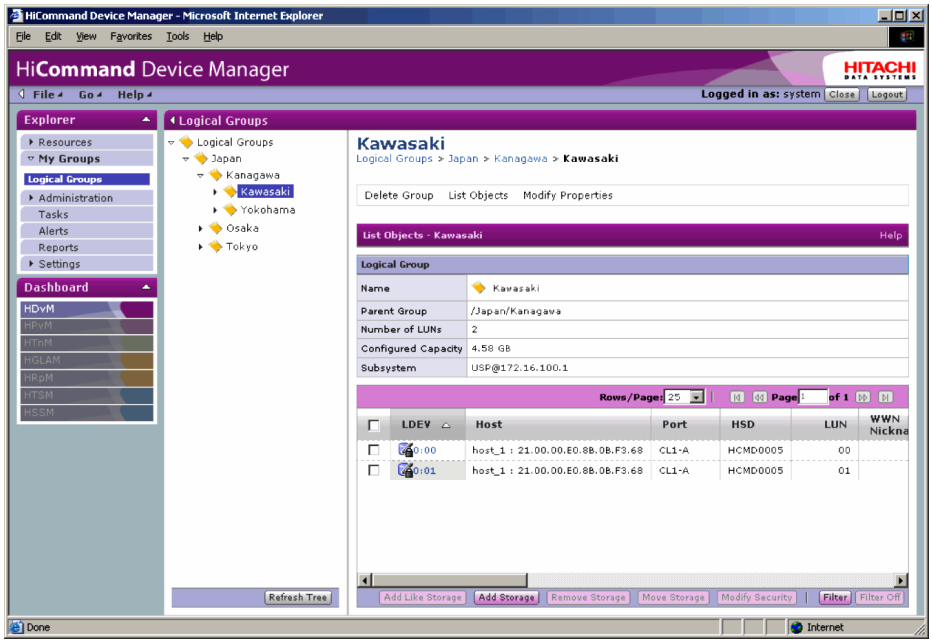


Figure 7.6 Add Storage - Selecting the Logical Group

3. In the information area, perform either of the following operations:
   - To add a path that has the same port and LUN security settings as the path set for a storage subsystem:

     In the sortable table, select storage of which you want to inherit the port and LUN security settings, and then click the **Add Like Storage** button. The Add Storage (STEP: Allocate Storage) dialog box appears. Perform steps 8, 9, 11, and 12.
   - To add storage with a new path for the LDEV:

     Click the **Add Storage** button. If the storage group you select for the additional storage is empty or if the paths in the storage group have different LUN security settings, the Add Storage (STEP: Define Host/Port Connections) dialog box appears. Perform steps 6 to 12.

   If all the paths in the selected storage group have the same LUN security settings and all the LDEVs are set with paths to the same port the Add Storage - *logical-group-name* dialog box appears (see Figure 7.7). Proceed to step 4.
4. In the Add Storage - *logical-group-name* dialog box, select a method for adding the storage and then click the **OK** button.

   The available methods for adding storage are as follows:
   - **Storage is added with the same port and the same security. (Only LDEV and LUN are specified):** When adding storage using the same ports and LUN security settings, you simply inherit the existing settings for the ports and LUN security settings, and assign only the LDEVs and LUNs. Select this method when you want to increase capacity while creating logical groups on a per-host basis without changing the ports and LUN security settings. Perform steps 8, 9, 11, and 12.

– **Storage is added to another port with the same LDEV and the same security (only a port and LUN are specified):** To add storage to other ports using the same LDEVs and LUN security settings, you simply assign ports and LUNs to the same LDEVs. Select this method when you want to configure switchover paths for existing LUNs. Perform steps 5, 7, 11, and 12.

  Notes: When you select this method for Lightning 9900, you cannot select a LUN Group in the Assign LUN(s) panel (see Figure 7.17).

– **The usual storage addition (all parameters are specified):** Select this method when you wish to add storage using the normal procedure. You will perform steps 6, 7, 8, 9, 10, 11, and 12.

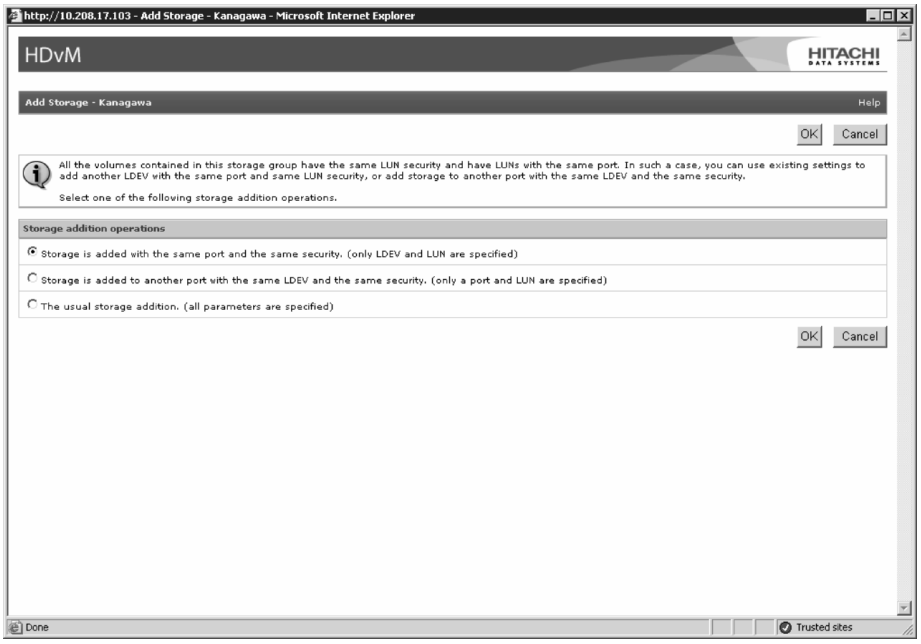


Figure 7.7 Add Storage - Selecting the Storage Addition Operation

5. Select ports in the Select Ports panel. The panel (see Figure 7.8) enables you to select the desired port(s) for the storage to be added. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode), the following buttons are displayed:

   – **Detail** button: Clicking this button displays security information for the ports (see Figure 7.10).

   – **Edit New HSD** button: This button appears when a port for which the WWN that is set to the storage group path for security does not exist in the host storage domain. Clicking this button displays the Host Storage Domain Info dialog box.

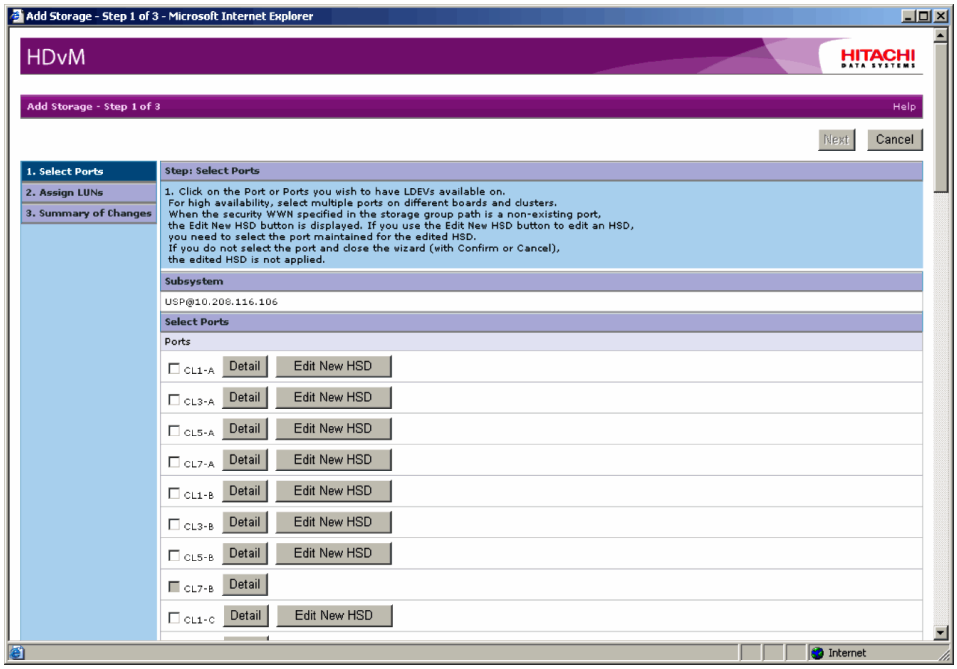


Figure 7.8 Add Storage - Select Ports (STEP: Select Ports)

To edit the host storage domain information, click the **Edit New HSD** button, and then go to step 7. If you do not want to edit it, click **Next** and go to step 11.

Notes:

- When the port is recognized as an initiator port or an external port, the **Port** check box appears inactive and cannot be selected. For details about initiator ports, see the TrueCopy documentation for the desired storage subsystem.
- In a storage subsystem that is using Virtual Partition Manager, ports that are recognized as an Initiator port, external port, or RCU Target port belong to SLPR0. These ports are displayed even if the storage subsystem has been added by using a user ID other than the user ID of the partitioned storage administrator for SLPR0. In such a case, however, an attempt to set a path to RCU Target fails, and the path cannot be set.
- For Lightning 9900V, the following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.
- For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode), if security is set for the storage group, you can select only a port to which a host storage domain with the same WWN that is set for security belongs, or a port for which the WWN that is set for security is not used in any of the host storage domains. When security is not set, you can select ports that have not been set for a storage group.
- Check boxes for ports other than Fibre Channel ports become inactive and cannot be selected.

6. Define host/port connections The Define Host/Port Connections panel (see Figure 7.10) enables you to define the port(s) or the combination of port(s) and host WWN(s). If you opened the Define Host/Port Connections panel from the **Logical Groups** object or **All Storage** (or **My Storage**) object, all the hosts and their WWNs that are recognized by Device Manager are displayed. If you have started the panel from the **Hosts** object, the hosts and their WWNs that were selected in the navigation area are displayed. When adding storage to an empty group, you can select the desired storage subsystem.

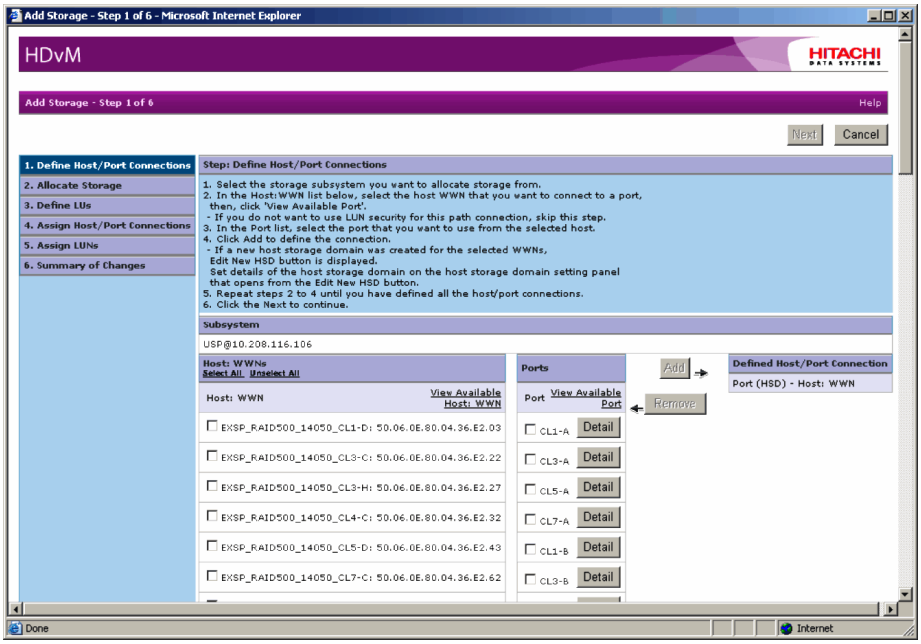


Figure 7.9 Add Storage - Define Host/Port Connections (STEP: Define Host/Port Connections)

After you choose the hosts (WWN) and the ports, and then click the **Add** button, the combination of the hosts and ports are added to the **Defined Host/Port Connections** section. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode), the following buttons are displayed:

- **Detail** button: Clicking this button displays security information for the ports (see Figure 7.10).
- **Edit New HSD** button: If the selected WWNs do not exist in the host storage domains for the selected port and the **Add** button is clicked, new host storage domain information is created. In this case, the **Edit New HSD** button appears in the column of the port for which the host storage domain information is newly created, in the **Defined Host/Port Connections** section. Clicking this button displays the Host Storage Domain Info dialog box (see Figure 7.11).

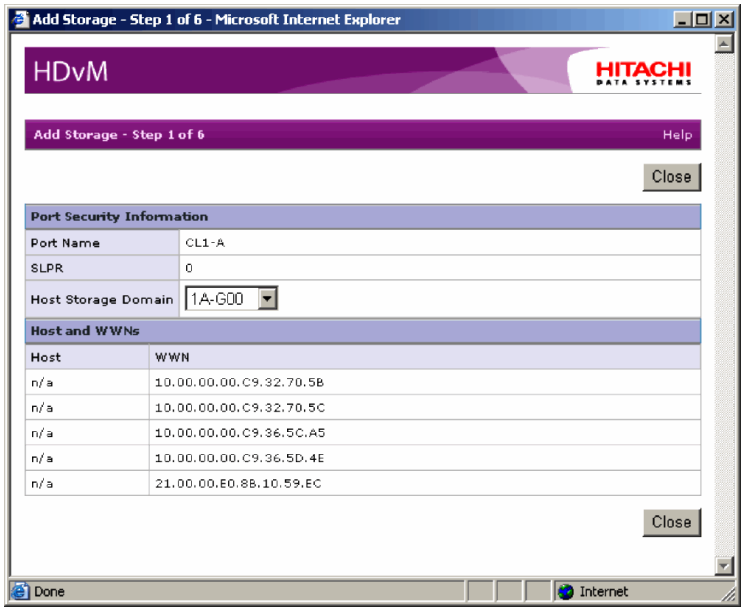


Figure 7.10 Add Storage - Displaying Port Security Information

To edit the host storage domain information, click the **Edit New HSD** button, and then go to step 7. If you do not want to edit it, click **Next** and go to step 8.

Notes:

- You will be able to assign each LUN to different host/port connections, so make sure to define all desired host/port connections.
- Each Universal Storage Platform V, TagmaStore USP, Lightning 9900V, TagmaStore AMS/WMS series, and Thunder 9500V (LUN Management mode) port has its own host storage domains with LUN security settings. The same WWN can only be assigned to one host storage domain on each port.
- When the port is recognized as an initiator port or an external port, the **Port** check box appears inactive and cannot be selected. For details about initiator ports, refer to the TrueCopy manual for the appropriate storage subsystem.
- In a storage subsystem that is using Virtual Partition Manager, ports that are recognized as an Initiator port, external port, or RCU Target port belong to SLPR0. These ports are displayed even if the storage subsystem has been added by using a user ID other than the user ID of the partitioned storage administrator for SLPR0. In such a case, however, an attempt to set a path to RCU Target fails, and the path cannot be set.
- For Lightning 9900V, the following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.
- Check boxes for ports other than Fibre Channel ports become inactive and cannot be selected.

For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, Lightning 9900, TagmaStore AMS/WMS series, and Thunder 9500V (LUN Management mode), if security was initially selected from **Host: WWN**, then in **Port**, click **View Available Port**. Only the available ports are displayed for activation, so select the desired port. If port was initially selected from **Port**, then in **Host: WWN** click **View Available Host: WWN**. Only the available securities are displayed for activation, so select the desired security. Note that for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, TagmaStore AMS/WMS series, and Thunder 9500V (LUN Management mode), if more than one port is initially selected, an unusable port might appear available even after clicking **View Available Host: WWN** in **Host: WWN**. In such a case, select security so that each selected port satisfies one of the following conditions. If a port does not satisfy either of the conditions regarding the selected security, when the **Add** button is selected an error occurs.

- There is a host storage domain whose security settings completely match to those of all the selected WWNs.
- The host storage domain that belongs to the corresponding port does not contain any of the selected WWNs.

7. In the Host Storage Domain Info dialog box (see Figure 7.11), you can edit information about host storage domains. If you edit the host storage domain information and then click the **OK** button, the edited information is saved and you will return to the parent window. If you click the **Cancel** button, the edited information is discarded. After you return to the parent window, click **Next** to go to the next step. If the parent window is the Define Host/Port Connections window, go to step 8. If the parent window is the Select Ports window, go to step 11.

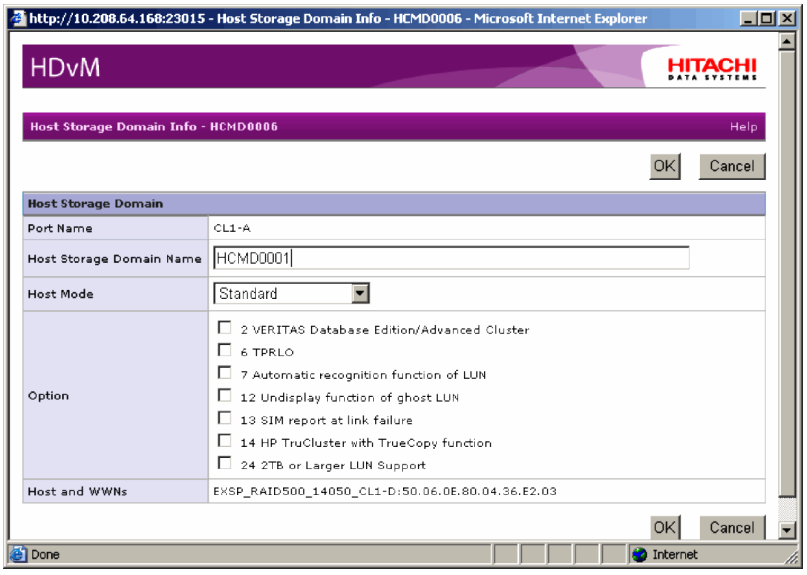


Figure 7.11 Host Storage Domain Info

If you start the Host Storage Domain Info dialog box from the Define Host/Port Connections window, edit the host storage domain information, and click the **OK** button to return to the parent window, the host storage domain name displayed in the **Defined Host/Port Connections** section has changed to reflect your edits. Changes made to host mode and option information are reflected also.

Note: The newly created information about the host storage domain is determined as a host storage domain after the operation for adding storage finishes. Thus, when you click the **Detail** button in the Define Host/Port Connections window or Select Ports window to display the port security information, the newly created information about the host storage domain is not displayed.

8. Allocate storage in the Allocate Storage panel. (This step is not displayed if storage is allocated from the **Open-Allocated** or **Open-Unallocated** groups in the **All Storage** object.)

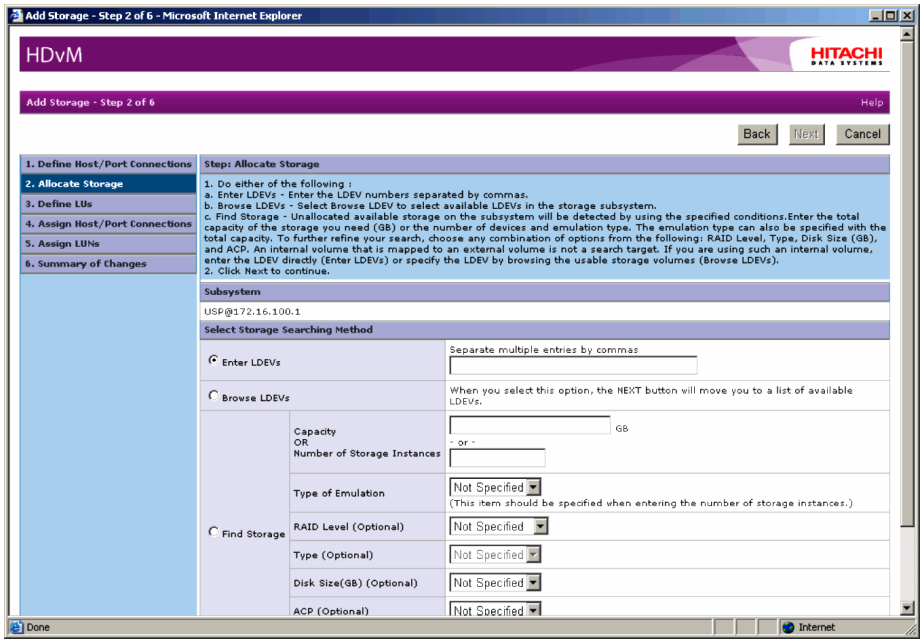


Figure 7.12 Add Storage - Allocate Storage

The panel (see Figure 7.12) enables you to enter the ID(s) of the LDEV(s) that you want to add in any of the following three ways.

- **Enter LDEVs**: Enter the desired LDEV(s), and select **Next**. To specify multiple LDEVs, use a comma as the delimiter between LDEVs.
- **Browse LDEVs**: A list of LDEVs in the selected storage subsystem is displayed (see Figure 7.13).

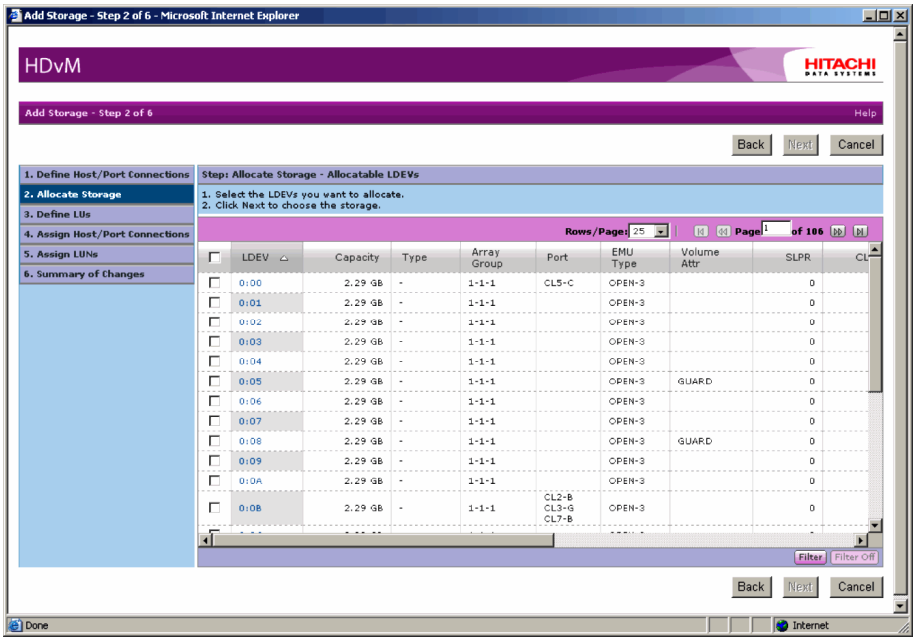


Figure 7.13 Add Storage - Browsing for LDEVs

For the Thunder 9500V in the LUN Security mode, Lightning 9900, and Thunder 9200, the LDEVs whose paths are assigned to all the ports in the device are not displayed. For the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, TagmaStore AMS/WMS series, and Thunder 9500V in the LUN management mode, all LDEVs are displayed. Clicking the link of an LDEV number displays the detailed information for each LDEV.

– **Find Storage:** Specify a condition, and then find the storage. You must specify one of the following: total capacity or the storage count. If you specify total capacity, you can omit the emulation type. If necessary, you can also specify the RAID level, LDEV type, disk size (GB), ACP number, and Stripe Size.

  If you specify a condition in **Find Storage**, and then click **Next**, the Storage Found dialog box appears. This dialog box displays a maximum of 300 storage devices that have been found (see Figure 7.14). The displayed list does not include volumes to which paths have been assigned or internal volumes to which external volumes are mapped. To allocate such volumes, select **Enter LDEVs** or **Browse LDEVs**.

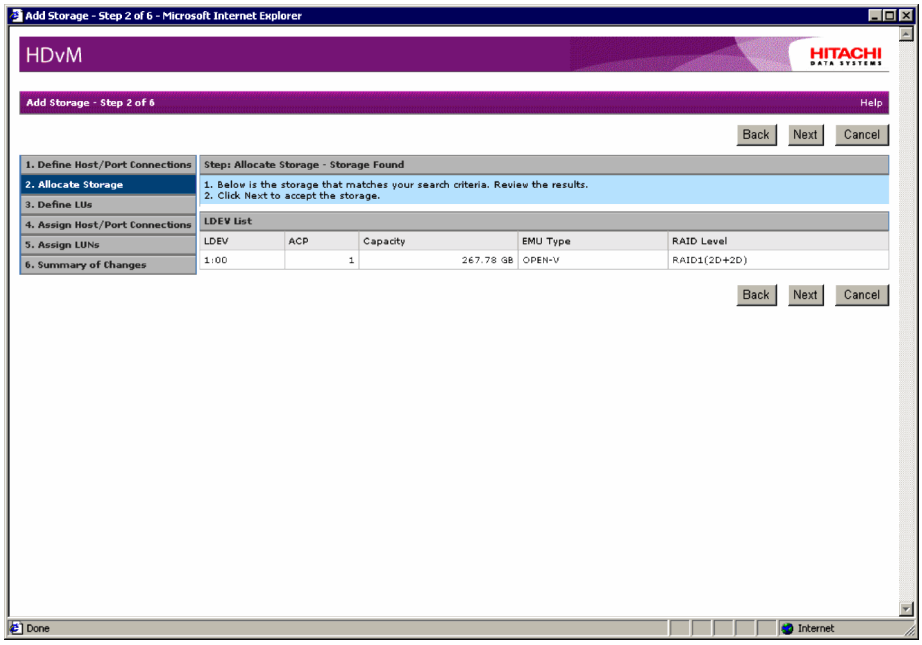


Figure 7.14 Add Storage - Storage Found

Select **Next** to continue, or select **Back** to go back to the Allocate Storage panel.

9. Define LUs (optional) in the Define LUs panel. (see Figure 7.15) enables you to create LUSE volumes. If you do not want to create LUSE volumes, select **Next** to continue.

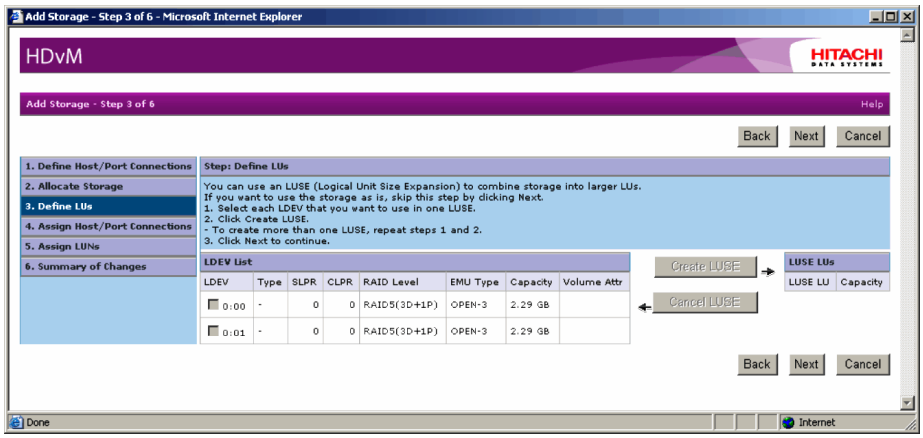


Figure 7.15 Add Storage - Define LUs (STEP: Define LUs)

To optionally create LUSE volumes from unallocated LDEVs, select the desired LDEVs for each LUSE volume, and select the **Create LUSE** button. See section 8.6 for LUSE volume requirements. When the LUSE information is correct, select **Next** to continue. This step is not displayed in the following cases:

- When storage is allocated from the **Open-Allocated** group in the **All Storage** object
- When only one LDEV is selected in the above **Allocate Storage** step

To create LUSE volumes from unallocated LDEVs, select the desired LDEVs for each LUSE volume, and select the **Create LUSE** button.

Note on representative LDEV number for a LUSE volume: For the TagmaStore AMS/WMS series, Thunder 9500V and 9200, specify the LDEV number of the representative LDEV. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, the smallest number among the LDEVs used to configure the LUSE volume is selected automatically as the representative LDEV for the new LUSE volume.

Note: For a storage subsystem that is using Virtual Partition Manager, do not create LUSE volumes by using LDEVs with different SLPRs and CLPRs. If SLPRs differ, the partitioned storage administrator cannot manage the storage subsystem. If CLPRs differ, the effect of cache partitioning might decrease.

10. Assign host/port connections in the Assign Host/Port Connections. The panel enables you to set the association between the volume path and an LDEV (see Figure 7.16).

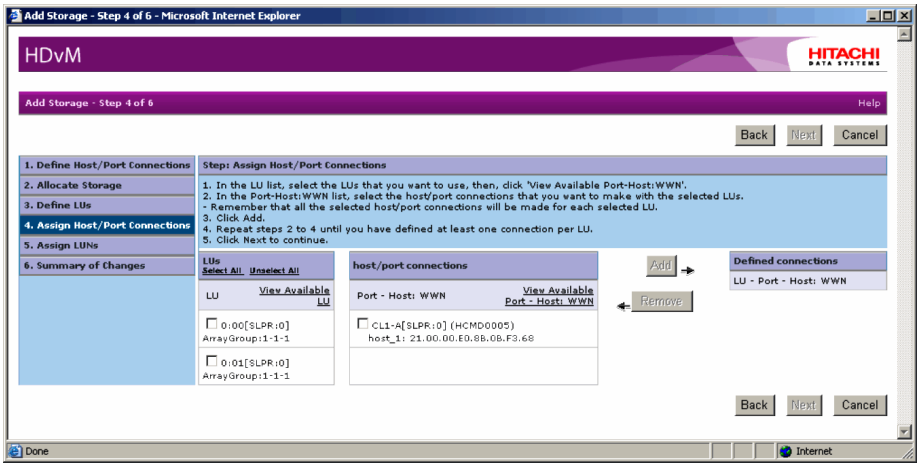


Figure 7.16 Add Storage - Assigning Host/Port Connection

The host/port connection(s) that you selected on the Define Host/Port Connection panel are displayed. Select the desired LDEV/LU(s) and host/port connection(s). When you select **LU** first, click the **View Available Port-Host: WWN** link to display the available ports and WWNs, and then select **Port-Host: WWN**. When you select **Port-Host: WWN** first, click the **View Available LU** link to display the available LUs, and then select **LU**. When these selections are completed, click **Add**. Repeat as needed. When you are finished assigning connections, select **Next** to continue.

Note: For a storage subsystem that is using Virtual Partition Manager, do not associate LDEVs and ports that belong to different SLPRs. If SLPRs differ, the partitioned storage administrator can no longer manage the storage subsystem.

11. Assign LUNs in the Assign LUN(s) panel. The panel (see Figure 7.17) enables you to select the desired LUNs for the storage being added.

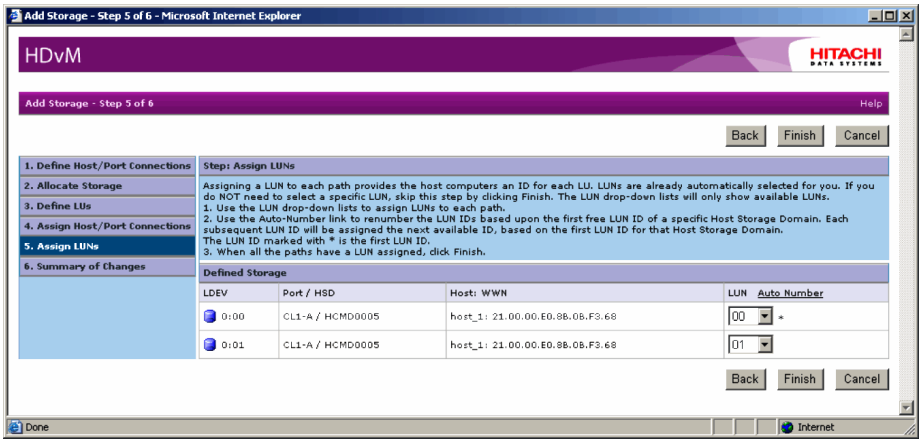


Figure 7.17 Add Storage - Assign LUNs (STEP: Assign LUNs)

The LDEVs/LUs and host/port connections that you selected on the Assign Host/Port Connections panel are displayed. Use one of the following methods to assign LUNs to LDEVs:

- Assigning pre-selected LUNs

  By default, the LUNS that can be selected are assigned in ascending order beginning with the smallest LUN.

- Assigning desired LUNs

  From the drop-down list, select the LUN of the LDEV (the smallest numbered LDEV) flagged with an asterisk (*) as the start number. Clicking **Auto Number** assigns LUNs in ascending order beginning with this start number.

- Assigning LUNs individually

  From the drop-down list, assign the desired LUNs.

When you are done assigning LUNs, select **Finish**. If any of the following conditions apply, **Finish** is inactive:

- A LUN is already assigned to a path for the same port or host storage domain.
- The number of LUNs assigned to the same port or host storage domain exceeds the maximum number.
- If LUNs are assigned in ascending order using the desired LUN as the start number, the total number of LUNs whose numbers are greater than the start number is less than the number of LDEVs.

Note for Lightning 9900: If you set only ports in the Define Host/Port Connections panel (Define Host/Port Connections Step), you can register the LUN into a LUN group at the same time you assign the LUN. To register a LUN into a LUN group, select the target LUN group. Select **Unregistered** if you do not want to register the LUN into a LUN group.

12. The Summary of Changes panel (see Figure 7.18) displays the requested add storage operations and asks you to confirm the requested operations. Select **Confirm** to add the storage as specified, or select **Cancel** to cancel your request to add storage. If you need to make any changes, select **Back** to return to the previous panel(s).

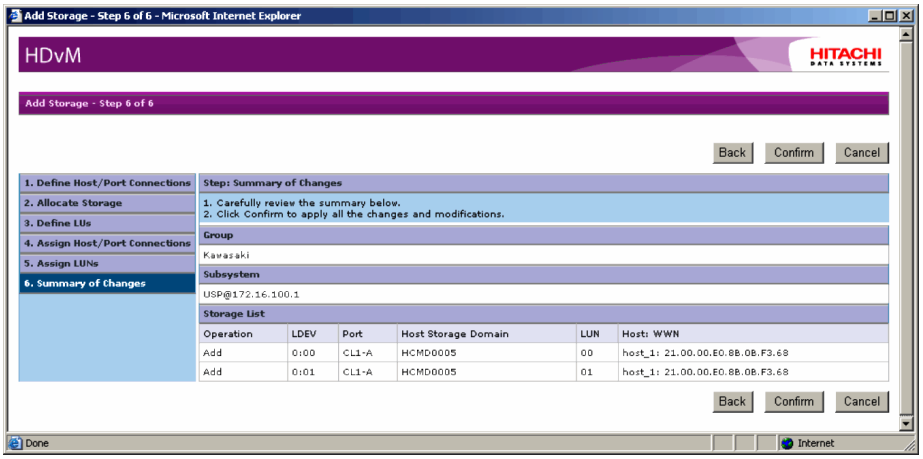


Figure 7.18 Add Storage - Confirmation (STEP: Summary of Changes)

For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V (LUN management mode), if both of the following conditions are satisfied when you click the **Confirm** button, a new host storage domain is created:

- Host storage domain information has been newly created in the Define Host/Port Connections window or Select Ports window.
- A port for which host storage domain information was newly created is selected in the Assign Host/Port Connections window.

If a host storage domain with the same security settings has already been created for the port, an error message appears and you cannot add storage.

Note: For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200 storage subsystems, a storage subsystem-specific management tool (such as Storage Navigator Modular or DAMP) can be used to preset (reserve) LUN security for a LUN that does not actually exist. If a LUN with this security specified is used when Device Manager adds storage, LUN security that the Device Manager user does not intend to set may be configured on the storage subsystem. If you are using Device Manager, make sure that you do not use this function.

7.6.3 Moving Storage from One Group to Another

Users with the Modify permission can move storage (LUNs) from one storage group to another.

When you move storage, the selected LUN (path) is moved to another storage group or an empty group. When moving storage to another storage group, the target must be a storage group that is assigned to a LUN within the same storage subsystem as the selected LUN.

Note: For instructions on creating a new logical group, see section 7.3.

To move one or more LUNs (paths) from one storage group to another:

1. Select an object to move storage from. You can move storage from any of the following:
   - To move storage from the **Logical Groups** object:

     In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, expand the **Logical Groups** object tree in the navigation area, and then select a storage group that contains the LUN that you want to move. The List Objects - *logical-group-name* subwindow is displayed in the information area.
   - To move storage from the **Hosts** object:

     In the **Explorer** menu, choose **Resources** and then **Hosts**, expand the **Hosts** object tree in the navigation area, and then select the host associated with the storage group that contains the LUN that you want to move. The Show Properties - *logical-group-name* subwindow is displayed in the information area.
   - To move storage from the **All Storage** or **My Storage** object:

     In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**, expand the object tree in the navigation area, and then select an **Open-Allocated** group in the storage subsystem that contains the LUN that you want to move. The List Objects - *host-name* subwindow is displayed in the information area. When moving storage from the **Open-Allocated** group, you can also register a LUN that is not assigned to a storage group to a logical group.
2. Select LDEVs that contains the LUN that you want to move in the information area.

   You can select a maximum of 100 LDEVs in one operation. If you want to operate more than 100 LDEVs, operate them in multiple operations, selecting no more than 100 LDEVs in each operation.
3. Select the **Move Storage** button when moving storage from the List Objects - *logical-group-name* subwindow or the Show Properties - *host-name* subwindow. Select the **Move to Group** button when moving storage from the List Objects - Open-Allocated subwindow.

   Note: When moving a LUN from the Show Properties - *host-name* subwindow, you cannot simultaneously select LUNs from different storage subsystems.
4. If you select an LDEV that has multiple volume paths, the Select Paths window is displayed (see Figure 7.19). Select the desired path(s) to be registered to the target storage group, and then select **OK**.

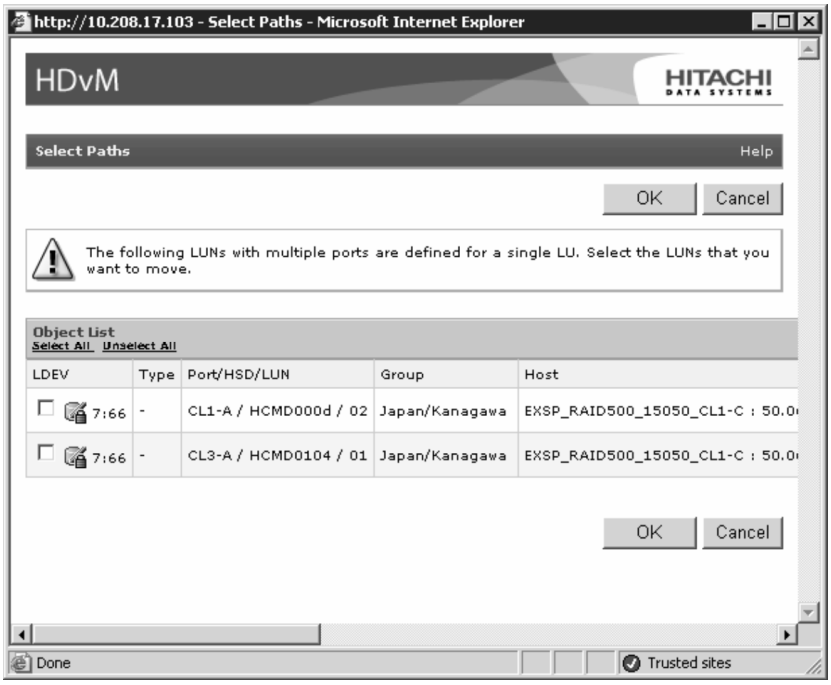


Figure 7.19 Move Storage - Selecting the Path(s)

5. On the Select Logical Group panel (see Figure 7.20), select the desired target storage group, and select **OK** to continue. An empty group, or a storage group that is assigned to a LUN that is in the same storage subsystem as the selected LUN, can be specified.

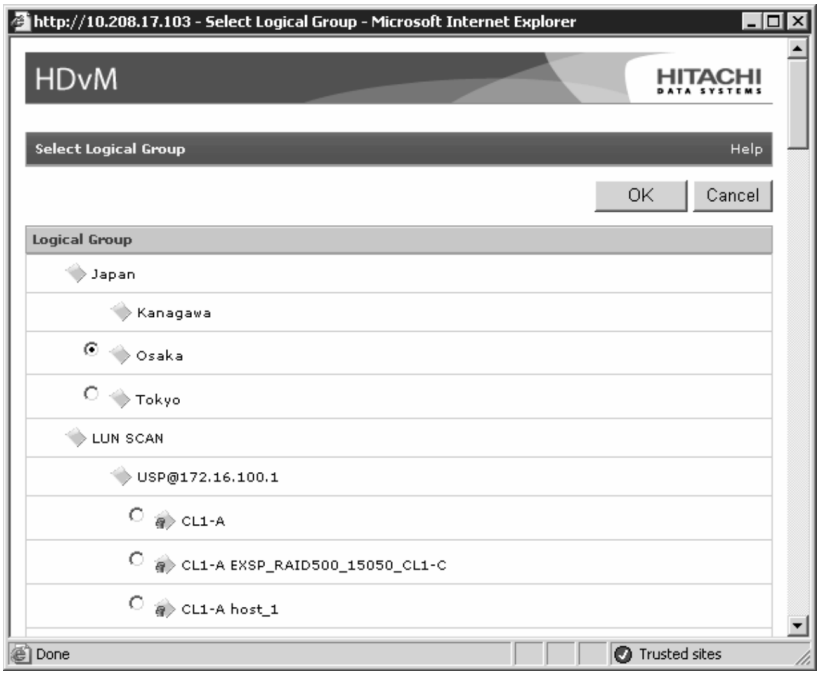


Figure 7.20 Move Storage - Selecting the Target Storage Group

6. When the confirmation panel displays, select **OK** to move the LUN(s) as specified, or select **Cancel** to cancel your request to move the LUN(s). If you move storage from **Logical Groups** or **Hosts** objects, the Move Storage - Confirmation window displays. If you move storage from the **Open-Allocated** group, the Move to Group - Confirmation window displays.

WARNING: If an error occurs while you are moving storage (a LUN) to another storage group, the same LUN may exist in both the source and target storage groups at the same time. In this case, delete the duplicate LUN from the source storage group. Do not release the LUN when you delete it.

7.6.4 Modifying LUN Security for a Group

Users with the Modify permission can modify the LUN security of the LUN(s) in a storage group.

When you add a host WWN to a LUN, you secure that LUN to that WWN. When you remove a host WWN from a LUN, you unsecure that LUN from that WWN. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V in the LUN Management mode, host WWNs that are set as security for LUNs in a storage group make up a host group (host storage domain) on a storage subsystem port. When you reach the maximum number of host groups on a port, you must use another port for securing storage. Universal Storage Platform V, TagmaStore USP 100, TagmaStore USP 600, and TagmaStore USP 1100 support a maximum of 255 host groups per port, and 57,344 host groups for the entire storage subsystem. TagmaStore NSC55 supports a maximum of 255 host groups per port, and 12,240 host groups for the entire storage subsystem. Lightning 9900V supports a maximum of 128 host groups per port and 8,192 host groups for the entire storage subsystem. The TagmaStore AMS/WMS series supports a maximum of 128 host groups per port and 512 host groups for the entire storage subsystem. The Thunder 9500V supports a maximum of 128 host groups per port and 1,024 host groups for the entire storage subsystem.

To modify the LUN security, the following storage subsystem features must be enabled.

- For Universal Storage Platform V, TagmaStore USP and the TagmaStore AMS/WMS series: LUN Manager feature
- For Lightning 9900V: LUN Management feature
- For Lightning 9900: Hitachi SANtinel feature
- For Thunder 9500V: LUN Security or LUN Management feature
- For Thunder 9200: LUN Security feature

To modify the LUN security of one or more LUN(s):

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, and expand the tree in the navigation area as necessary.
2. In the navigation area, select the storage group for which you want to modify LUN security (see Figure 7.6).
3. In the information area, select the desired LUN(s), and then select the **Modify Security** button to start the Modify Security wizard.

   You can select a maximum of 100 LUNs in one operation. If you want to operate more than 100 LUNs, operate them in multiple operations, selecting no more than 100 LUNs in each operation.
4. The Select Hosts panel (see Figure 7.21) displays the hosts whose security can be set. Check box es are pre-selected on the hosts that have already been granted access permissions for the selected LUN. Select the check box es for the hosts that you want to grant access permissions for the LUN. If you clear a check box, access permissions to the LUN for that host are revoked. After you select the hosts to grant access permissions, click **Next** to go to the next step.

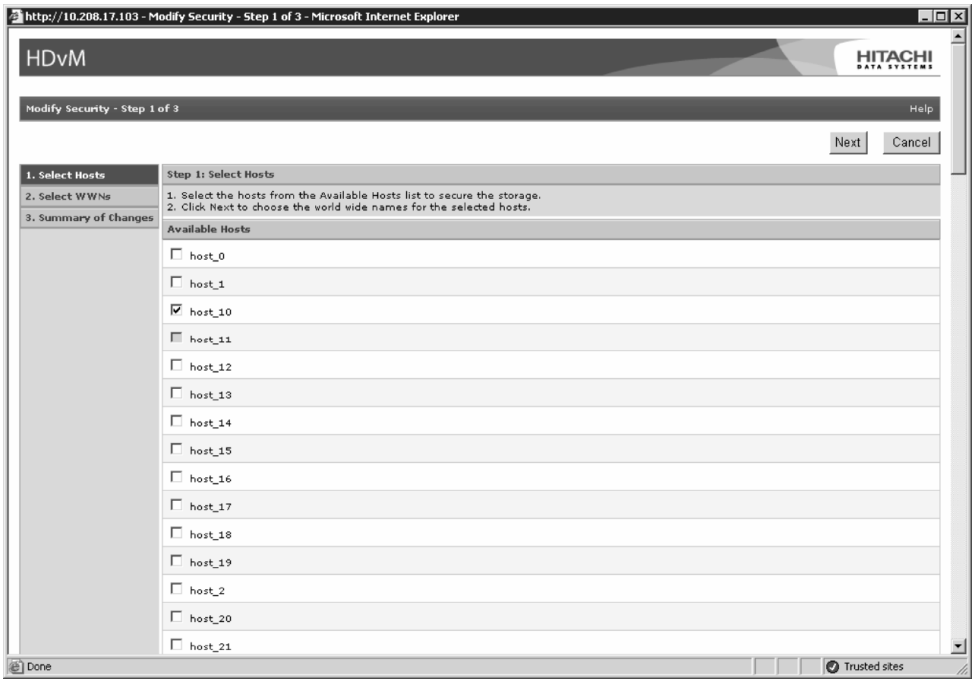


Figure 7.21 Modify Security - Select Hosts (STEP 1: Select Hosts)

5. **Select WWNs Step.** The Select WWNs panel (see Figure 7.22) displays the WWN(s) for the selected host(s) and enables you to select the WWN(s) that you want to secure to the LUN(s). After selecting the desired WWN(s), select **Next** to continue.

   The security property that can be set depends on the selected paths and the status of the WWNs.

   – If the selected WWNs are not assigned to all of the selected paths, the security properties that can be set are as follows:

     Not assigned (Current Status)

     Assign this security to all selected paths

   – If the selected WWNs are assigned to all of the selected paths, the security properties that can be set are as follows:

     Assigned to all paths (Current Status)

     Delete this security from all selected paths

   – If the selected WWNs are assigned to only some of the selected paths, the security properties that can be set are as follows:

     Assigned to some paths (Current Status)

     Assign this security to all selected paths

     Delete this security from all selected paths

   – If the selected WWNs belong to the host storage domains assigned to one of the selected paths or belong to the host storage domains that do not contain the selected paths, you cannot set security. In this case, **Not assigned (Current Status)** displays with the inactive status.

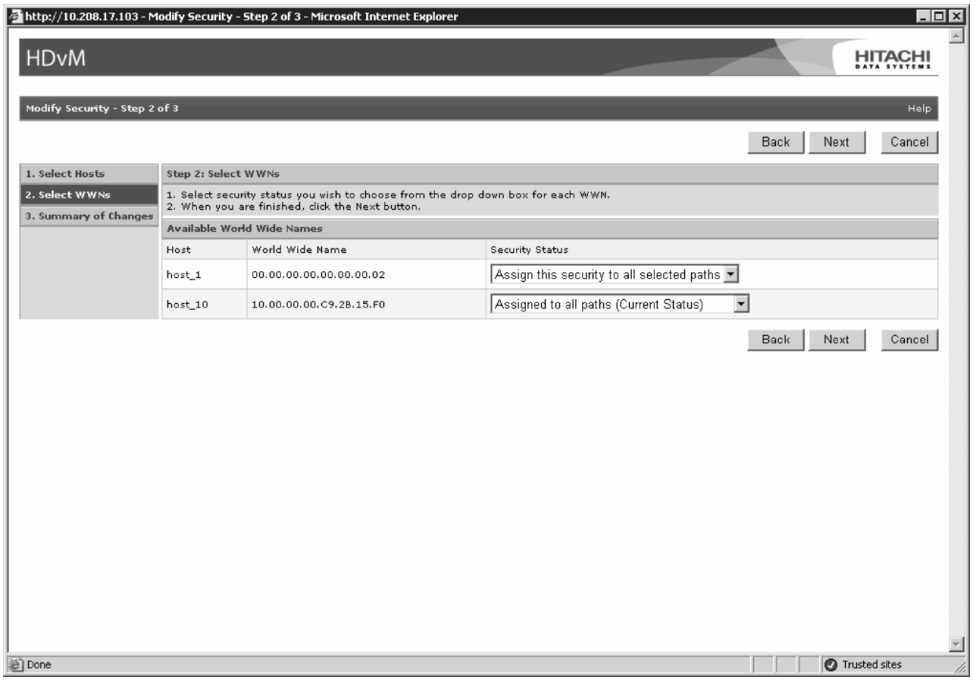


Figure 7.22 Modify Security - Select WWNs (STEP 2: Select WWNs)

6. ***Warning for HSD (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V in LUN management mode).*** If you modify the security for storage that belongs to a host storage domain, the security of all storage belonging to that host storage domain changes. For this reason, Device Manager lists all LDEVs that will be affected by your requested LUN security change (see Figure 7.23).

7. Select **Next** to continue, or select **Back** to return to the previous panel(s).

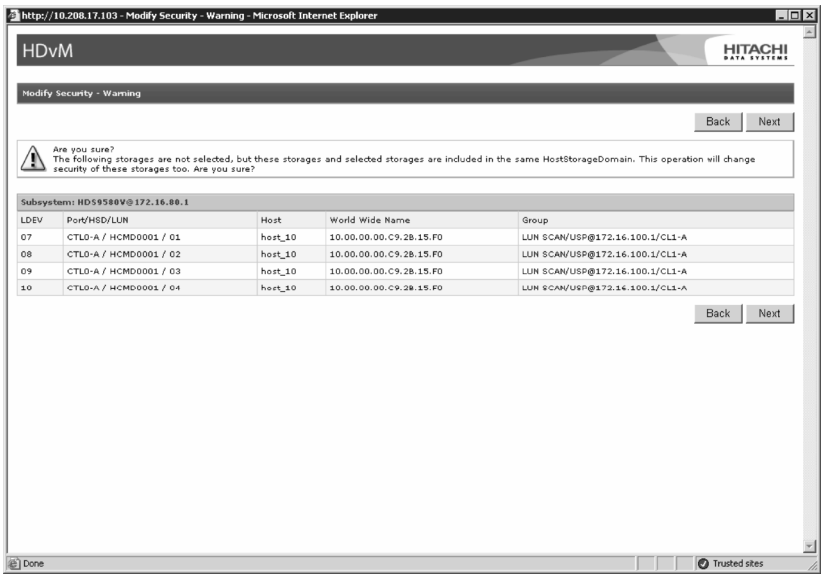


Figure 7.23 Modify Security - Warning

8. **Summary of Changes Step.** The Summary of Changes panel (see Figure 7.24) displays the requested LUN security changes and asks you to confirm the requested operations. Select **Confirm** to modify the LUN security as specified, or select **Cancel** to cancel your request. If you need to make any changes, select **Back** to return to the previous panel(s).

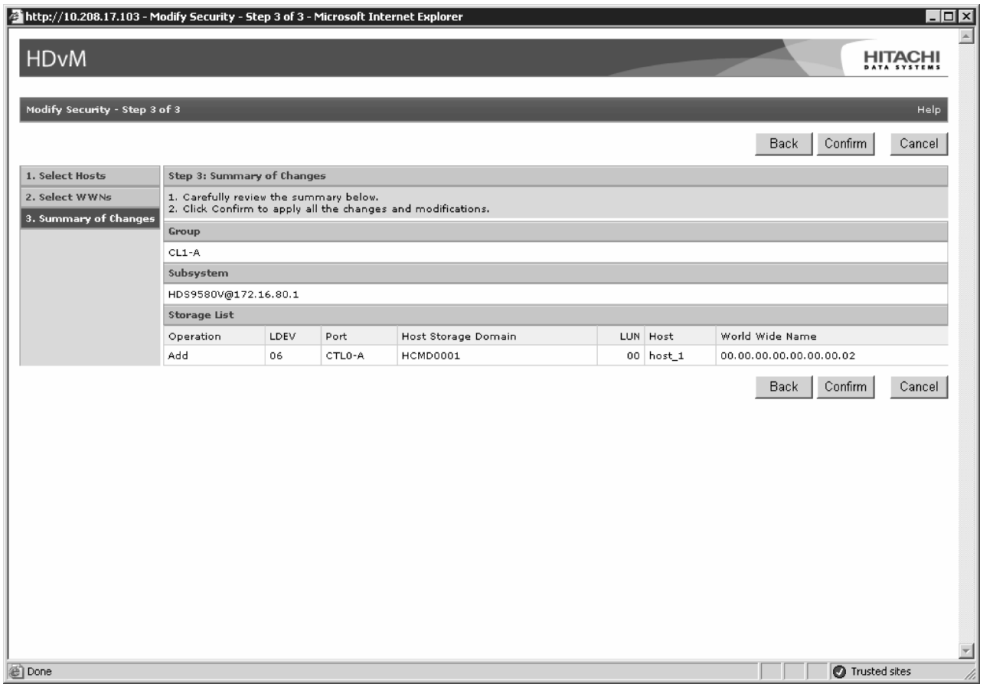


Figure 7.24 Modify Security - Confirmation (STEP 3: Summary of Changes)

WARNING: If you change or remove the LUN security set for an external volume, the internal volume to which that external volume is mapped might become unavailable. In this case, a warning message is displayed. For details on messages, see section 13.2.9

7.6.5 Removing Storage from a Group

Users with the Modify permission can remove storage (LUNs) from an existing storage group.

When you remove storage, you remove the selected LUN(s) from the storage group. During the remove storage operation, you can choose to keep or delete the LUN(s) (access paths) themselves.

Note: To remove paths from LDEVs, use the unallocate operation (see section 8.5).

CAUTION: Before deleting a LUN, make sure that no access is underway from a host. When a LUN is deleted, all I/Os being executed between a host and that LUN are canceled.

Caution concerning the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200: When a LUN is deleted, all the storage subsystem ports (or host storage domains for the TagmaStore AMS/WMS series and Thunder 9500V in the LUN management mode) to which that LUN belongs might be reset. This will cancel all I/Os being executed between a host and any LUN via such a port or host storage domain. Before deleting a LUN, make sure that there is no access from a host via a port or host storage domain to which the LUN belongs.

Note for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900: Even if a LUN is deleted, the storage subsystem port or host storage domain to which that LUN belongs is not reset.

Note for Lightning 9900 LUN group: When you remove storage belonging to a LUN group, you must select all storage in that LUN group. If you wish to remove only a portion of such storage, you must first remove the desired LUNs from the LUN group, and then remove the storage.

To remove storage (LUNs) from a storage group:

1. You can start the remove storage operation from either the **Logical Groups** object or the **Hosts** object in the navigation frame:
   - In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, expand the **Logical Groups** object tree in the navigation area, and then select the storage group that contains the LUN(s) you want to delete.
   - In the **Explorer** menu, choose **Resources** and then **Hosts**, expand the **Hosts** object tree in the navigation area, and then select the host associated with the storage group containing the LUN(s) you want to delete.
2. In the information area, select the LUN(s) to be deleted, and select **Remove Storage**. If you select an unremovable LUN, an error is displayed in the pop-up window.

   Restrictions on deleting LUNs:
   - You can delete a maximum of 100 LUNs in one operation. If you want to delete more than 100 LUNs, delete them in multiple operations, selecting no more than 100 LUNs in each operation.
   - For Universal Storage Platform V, TagmaStore USP, and Lightning 9900, you cannot delete the last volume path of the logical device specified as a copy pair volume.
   - For Lightning 9900, you cannot delete the last volume path of the logical device set as a command device or the logical device specified as a copy pair volume.
   - For Thunder 9500V (only for microcode before X655) and Thunder 9200, you cannot delete any volume path from the logical device that is set as a command device, or logical devices that are specified as copy pair volumes.

   The Remove Storage – Confirmation panel displays, with a list of LUNs you are deleting, as shown in Figure 7.25.

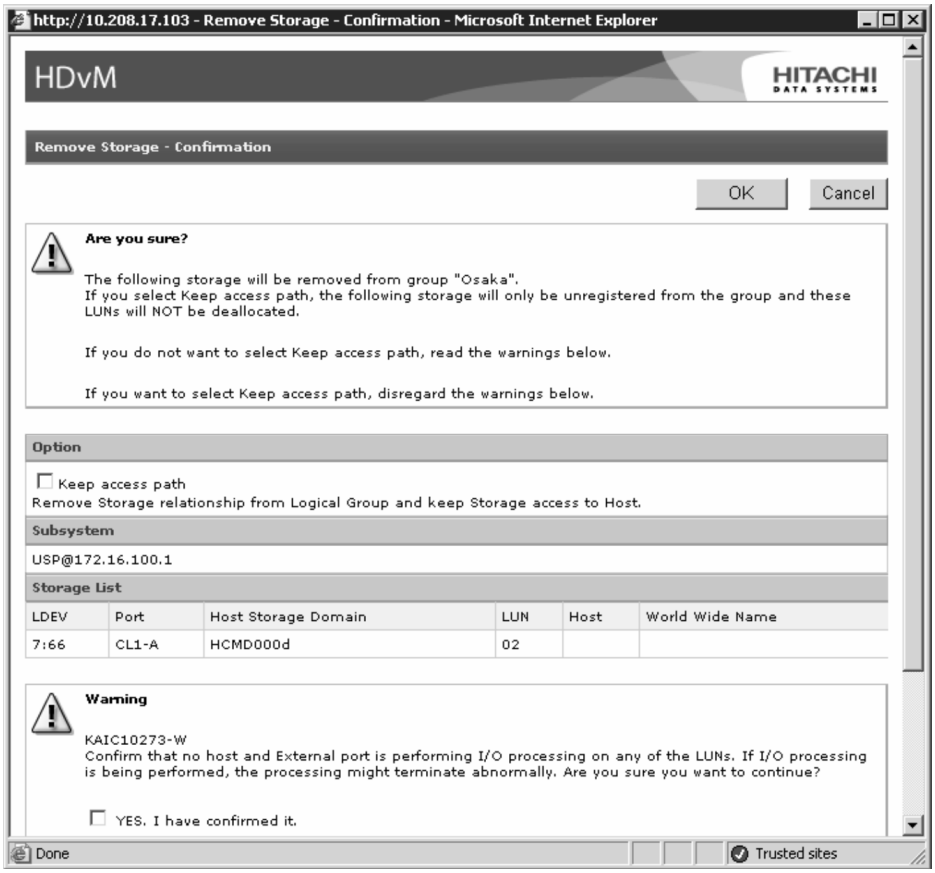


Figure 7.25 Remove Storage - Confirmation

3. Do one of the following to either keep or delete the access paths to the LDEVs:

   When you select **Keep access path**, the path is released from the storage group, but the path itself remains allocated to the LDEV and the target LDEV remains in the **Open-Allocated** group.

   If you do not select **Keep access path**, the path is released from the storage group and from the LDEV, and the LDEV to which the path was set is moved to the **Open-Unallocated** group.

   CAUTION: Before deleting a path, make sure that the path is no longer in use.

   Note for LUSE: If the LDEVs and paths to be deleted are in a LUSE volume and all paths of the LUSE volume will be deleted, Device Manager enables you to delete the LUSE volume if desired. In this case, if you choose **OK** without selecting **Keep access path** in the Remove Storage - Confirmation panel, the Confirmation - LUSE panel displays. To delete the LUSE volume, select the Delete LUSE button. To retain the LUSE volume, select the Keep LUSE button.

   Restrictions for deleting access paths: For the Lightning 9900, storage (LDEVs) defined for ShadowImage or TrueCopy may not have a port or LUN assigned. Device Manager cannot be used to remove storage that is incorrectly configured (lacking ports or LUNs, for example). Use the SVP console to remove such storage.

4. If you chose to delete the access paths, read the warning (under `Storage List` in the Remove Storage - Confirmation panel) about stopping I/O processing from all hosts to the specified LUN(s).

5. Select **YES I have confirmed it** to confirm deletion of the specified path(s).
6. Select **OK** to delete the specified LUN(s) from the specified storage group and, if applicable, to remove the specified path(s) from the LDEVs/LUs. Select **Cancel** to cancel your request to remove the storage.

   When an access path is deleted, the target LDEV or LU is moved to the **Open-Unallocated** group of the storage subsystem. The **Open-Unallocated** group is displayed under the **All Storage** or **My Storage** object in the navigation area.

7.6.6 Deleting a Storage Group

Users with the Modify permission can delete storage groups. When a storage group is deleted, both the volume paths and the data are deleted from the storage group that is being deleted. During the remove storage groups operation, you can choose to keep or delete the LUN(s) (access paths) themselves.

WARNING: Data is lost if the LUN is released. The data saved on the LDEVs in the storage group is lost. Before deleting a storage group, you should back up the data that is stored on the LDEVs in the storage group. In addition, you should check that you will no longer have any need to use the storage in that storage group.

CAUTION: Before deleting a LUN, make sure that no access is underway from a host. When a LUN is deleted, all I/Os being executed between a host and that LUN are canceled.

CAUTION for TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200: When a LUN is deleted, all the storage subsystem ports (or host storage domains for the TagmaStore AMS/WMS series and Thunder 9500V in the LUN management mode) to which that LUN belongs are reset. This cancels all I/Os being executed between a host and any LUN via such a port or host storage domain. Before deleting a LUN, make sure there is no access from a host via a port or host storage domain to which the LUN belongs.

Note for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900: Even when a LUN is deleted, the storage subsystem port or host storage domain to which that LUN belongs is not reset.

To delete a storage group or a logical group that contains a storage group:

1. In the **Explorer** menu, choose **My Groups** and then **Logical Groups**, and expand the tree in the navigation area as necessary.
2. In the navigation area, select the storage group that you want to delete (see Figure 7.6).
3. Select the **Delete Group** operation in the method frame.

   Note: If the selected group does not contain any storage, see section 7.5 for details on deleting a logical group.
4. The Delete Logical Group – Confirmation panel displays a list of LUNs in the group you are deleting, as shown in Figure 7.26.

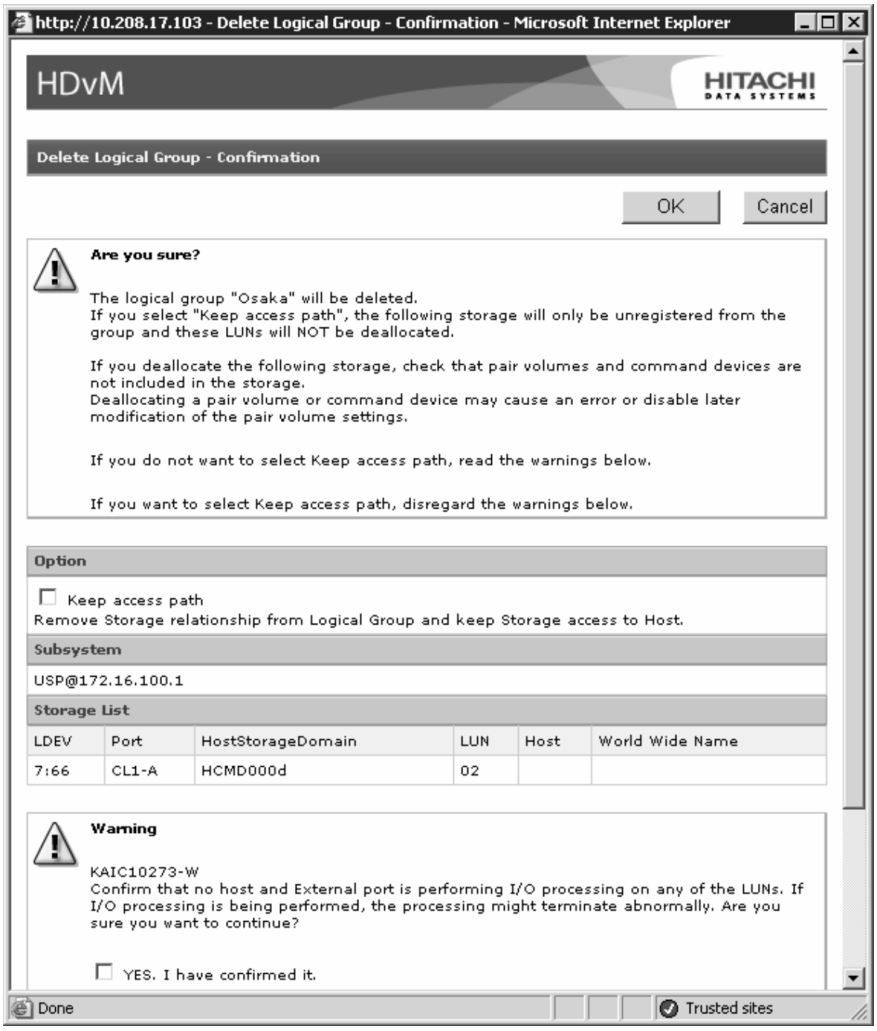


Figure 7.26 Deleting a Logical Group – Confirmation

Do one of the following to either keep or delete the access paths to the LDEVs:

- When you select **Keep access path**, the storage group is deleted, but the path itself remains allocated to the LDEV and the LDEV that was contained in the deleted storage group remains in the **Open-Allocated** group.
- If you do not select **Keep access path**, the paths are removed from all LDEVs in the group, and the LDEVs are moved to the **Open-Unallocated** group.

CAUTION: Before deleting a path, make sure that the path is no longer in use.

Note for LUSE: If all paths of the LUSE volume will be deleted, Device Manager enables you to delete or keep the LUSE volume if desired. To delete a LUSE volume, in the Delete Logical Group - Confirmation panel, choose **OK** without selecting **Keep access path.** In the Confirmation - LUSE panel, choose the **Delete LUSE** button. To retain the LUSE volume, select the **Keep LUSE** button, except for the Lightning 9900. For Lightning 9900, the LUSE is deleted at the same time that the path is deleted. You cannot cancel the LUSE deletion for Lightning 9900.

Restrictions for deleting access paths:

- For Universal Storage Platform V, TagmaStore USP, and For Lightning 9900V, you cannot delete the last volume path of a logical device specified as a copy pair volume.
- For Lightning 9900V, you cannot delete the last volume path of a logical device specified as a copy pair volume.
- For Thunder 9500V (microcode before X655 only) and Thunder 9200, you cannot delete any volume path of a logical device set to a command device or a logical device specified as a copy pair volume.
- For Lightning 9900, storage (LDEVs) defined for ShadowImage or TrueCopy may not have a port or LUN assigned. Device Manager cannot be used to remove storage that is incorrectly configured, such as storage without ports or LUNs. The SVP console must be used to delete such storage.

5. If you chose to delete the access paths, read the warning (under `Storage List` in the Delete Logical Group - Confirmation panel) about stopping I/O processing from all hosts to the specified LUN(s). Select **YES I have confirmed it** to confirm deletion of the specified path(s).

   WARNING: The delete LUSE operation is destructive. Read and observe the important warning carefully, and select **OK** only if it is acceptable to lose the data on the LUSE.

6. Select **OK** to delete the specified group and, if applicable, to remove the specified path(s) from the LDEVs/LUs. Select **Cancel** to cancel your request to delete the group.

   You are notified when the delete group operation is complete. When an access path is deleted, the target LDEV or LU is moved to the **Open-Unallocated** group of the storage subsystem.

Chapter 8 Performing All Storage / My Storage Operations

This chapter describes All Storage / My Storage logical group operations:

- Overview (see section 8.1)
- Viewing the All Storage / My Storage Group (see section 8.2)
- Scanning LUNs (see section 8.3)
- Allocating Storage (see section 8.4)
- Unallocating Storage (see section 8.5)
- Creating LUSE Volumes (see section 8.6)
- Deleting LUSE Volumes (see section 8.7)

8.1 Overview

Under **Resources** in the **Explorer** menu, **All Storage** or **My Storage** is displayed so that only storage within the access range of the logged-in user can be operated. **All Storage** appears when a user assigned the All Resources resource group has logged in. **My Storage** appears when a user who is assigned to a user-defined resource group has logged in. **All Storage/My Storage** includes all LDEVs that the logged-in user can manage, and is organized into a group for each storage subsystem.

The Open-Allocated, Open-Unallocated, and Open-Reserved groups are automatically created in each storage subsystem group by Device Manager, and the Mainframe-Unspecified group is also added for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900. If you add a new storage subsystem, Device Manager distributes the volumes in the storage subsystem into groups as follows:

- Open-Allocated group: Open volumes that are already assigned paths will belong to this group.
- Open-Unallocated group: Open volumes that have not been assigned paths will belong to this group.
- Open-Reserved group: Open volumes that cannot be assigned paths will belong to this group.
- Mainframe-Unspecified group: Mainframe volumes will belong to this group.

The All Storage/My Storage group and its subgroups cannot be deleted.

The All Storage/My Storage group displays the storage subsystems and storage that can be accessed by the logged-in user and provides detailed information on their properties. Paths can be set for the LDEVs in the Open-Allocated group and Open-Unallocated group.

8.2 Viewing the All Storage/My Storage Group

The **All Storage**/**My Storage** group is created automatically by Device Manager and includes all LDEVs that the logged-in user is permitted to manage. The **Explorer** menu displays **All Storage** for users who are assigned to the All Resources resource group, or **My Storage** for users who are assigned to a user-defined resource group.

When the **All Storage** or **My Storage** object is selected in the navigation area, the information area displays the following information for the **All Storage** or **My Storage** group, as shown in Figure 8.1.

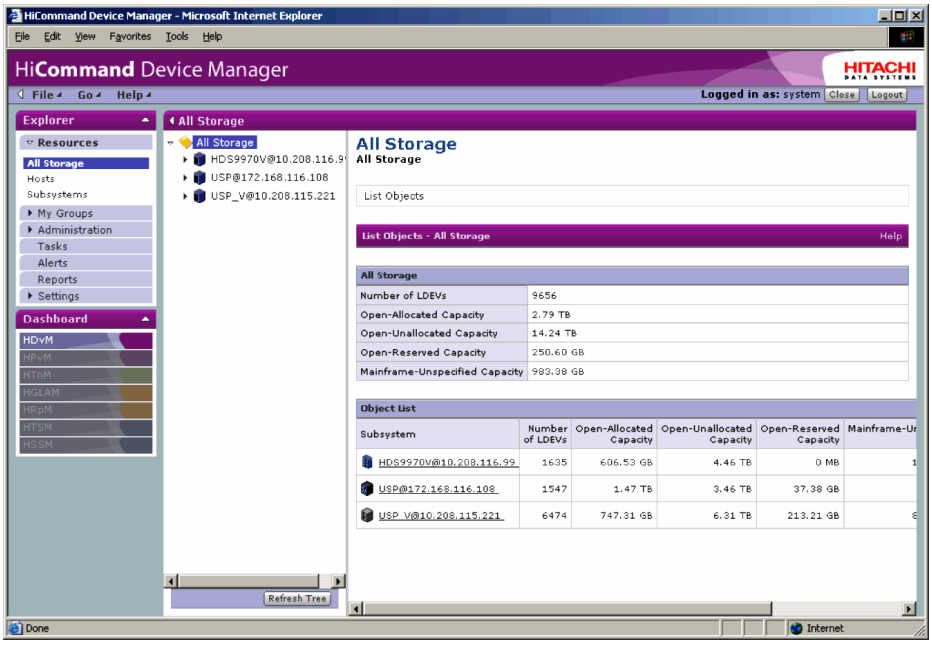


Figure 8.1 All Storage or My Storage

- **Number of LDEVs** = total number of LDEVs in the **All Storage** or **My Storage** group (including all storage subsystems)
- **Open-Allocated capacity** (see ***Note***) = total capacity of the LDEVs in the **All Storage/My Storage** group that are assigned paths on open volumes
- **Open-Unallocated capacity** (see ***Note***) = total capacity of the LDEVs in the **All Storage/My Storage** group that are not assigned paths on open volumes
- **Open-Reserved Capacity** (see ***Note***) = total capacity of the LDEVs in the **All Storage/My Storage** group that cannot be assigned paths on open volumes
- **Mainframe-Unspecified Capacity** (see ***Note***) = total capacity of the mainframe volume in the **All Storage/My Storage** group. This is displayed when Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900 is managed by Device Manager.
- **Object List** = list of storage subsystems in the **All Storage/My Storage** group. The list shows the name of each storage subsystem, the number of LDEVs contained, the capacity of the volumes contained in each group, and the last time the storage subsystem was refreshed.

When the **All Storage** (**My Storage**) object tree is expanded in the navigation area, Device Manager displays a group for each storage subsystem available to the logged-in user. When *storage-subsystem* is selected in the navigation area, the information area displays the following information for the storage subsystem:

- **Name** = name of the storage subsystem
- **Number of LDEVs** = total number of LDEVs/LUs in the storage subsystem
- **Configured capacity** (see ***Note***) = total capacity of the LDEVs/LUs in the storage subsystem
- **Actual Capacity** (see ***Note***) = actual capacity of the LDEVs/LUs in the storage subsystem
- **Last Refreshed** = the last time the storage subsystem was refreshed or added to Device Manager
- **Object List** = a list showing the number of LDEVs, the total capacity, and the actual capacity for each of the **Open-Allocated**, **Open-Unallocated**, and **Open-Reserved** groups in the storage subsystem. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900 that supports mainframe volumes, information is also displayed for the **Mainframe-Unspecified** group.

Note: The GB and TB capacity values are rounded down to two decimal places. The MB capacity values are rounded down to whole numbers. As a result, the capacity shown on the Device Manager window may be less than the actual capacity available.

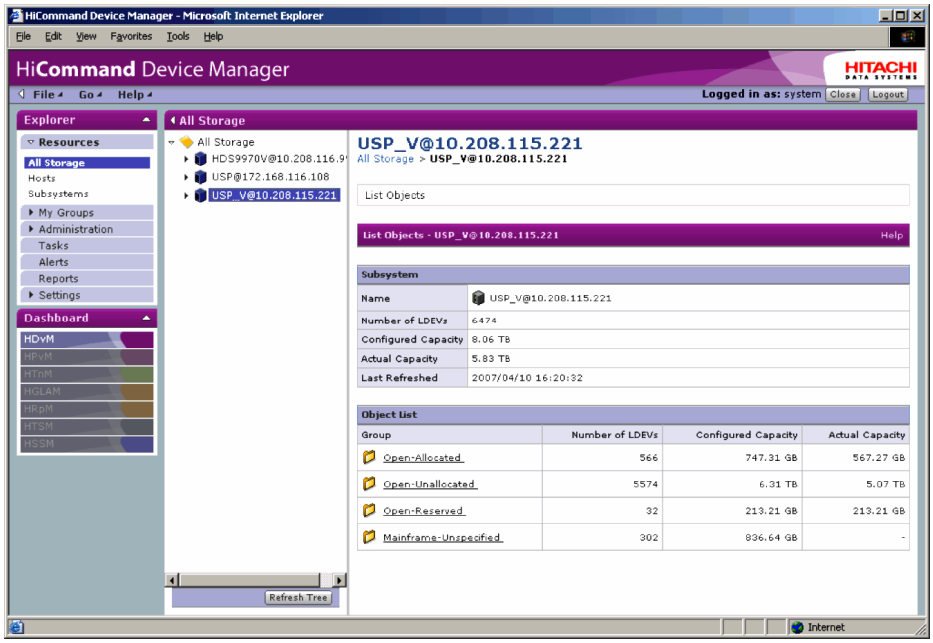


Figure 8.2 Viewing a Storage Subsystem Group in All Storage/My Storage

When you select and expand a storage subsystem group in the **All Storage/My Storage** group, Device Manager displays the **Open-Allocated** group (see section 8.2.1) and **Open-Unallocated** group (see section 8.2.2) and **Open-Reserved** group (see section 8.2.3) for the selected storage subsystem. The **Mainframe-Unspecified** group (see section 8.2.4) is also displayed for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900.

8.2.1 Viewing the Open-Allocated Group for a Subsystem

When the **Open-Allocated** group for a storage subsystem is selected, the method area displays the method for executing the **LUN Scan** operation on the selected storage subsystem. When the **Open-Allocated** group for a storage subsystem is selected, the information area displays the following information:

- **Name:** Name of the storage subsystem
- **Number of LDEVs:** Number of LDEVs/LUs for which paths are allocated, for open volumes in the storage subsystem
- **Configured Capacity** (see ***Note***): Total capacity of the allocated LDEVs/LUs for which paths are allocated, for open volumes in the storage subsystem.
- **Actual Capacity** (see ***Note***)**:** Actual capacity of LDEVs/LUs for which paths are allocated, for open volumes in the storage subsystem

Note: The GB and TB capacity values are rounded down to two decimal places. The MB capacity values are rounded down to whole numbers. As a result, the capacity shown on the Device Manager window may be less than the actual capacity available.

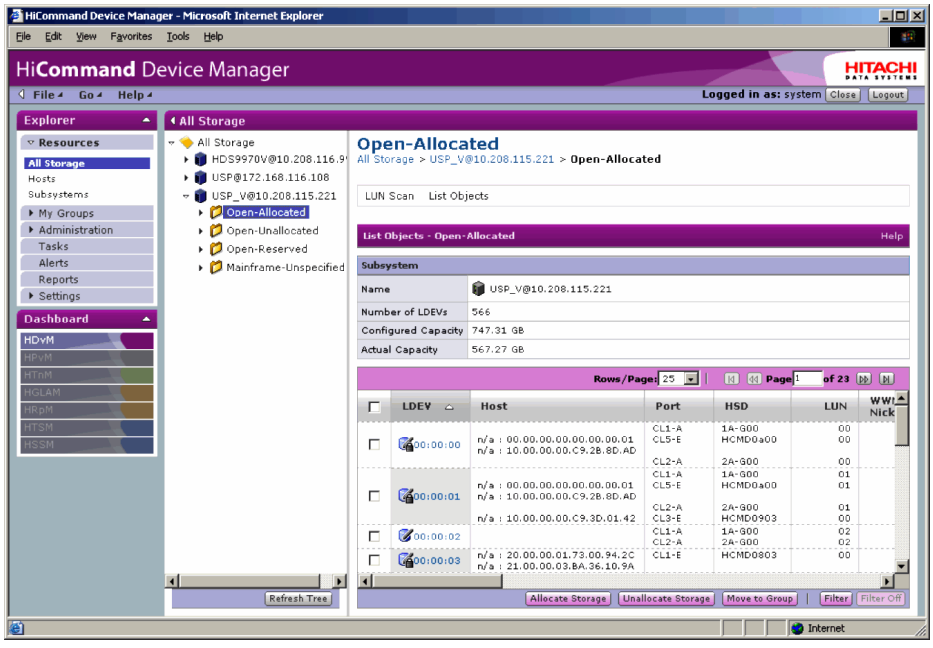


Figure 8.3 Viewing the Open-Allocated Group for a Storage Subsystem

Select:

- **Allocate Storage** to add paths to the selected LDEV(s) (see section 8.4).
- **Unallocate Storage** to remove paths from the selected LDEV(s) (see section 8.5).
- **Move to Group** to assign the selected LDEV(s) to a storage group. The operations are the same as the operations for moving storage.

Sortable table lists the LDEVs/LUs in the **Open-Allocated** group for the storage subsystem and displays detailed information for each LDEV/LU (see Table 8.1). To view the detailed information for a specific LDEV, select the desired LDEV to open the Detailed Information panel. For details on the items displayed in the LDEV Detailed Information panel, see Table 7.1.

Table 8.1 Information for the Open-Allocated Group under All Storage/My Storage

Item	Description
LDEV	LDEV number. For LUN expansion or LUSE, only a representative LDEV number is displayed. Select the link to display the Detailed Information panel for the LDEV. This item can be used for filtering by specifying a range.
Host	Displays the host number and WWN recognized by Device Manager. If the host name cannot be acquired, **n/a** is displayed. If there are multiple paths, multiple hosts and WWNs are displayed. This item can be used for filtering. You can use a partial match specification as a condition for filtering.
Port	Displays the port name (cluster + port number). This item can be used for filtering.
HSD	Displays the host storage domain. This item is displayed only for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V in LUN Management mode.
LUN Group	LUN group name for Lightning 9900. Not shown for any other storage subsystems.
LUN	Displays the LUN.
WWN Nickname	Displays the nickname corresponding to the WWN displayed in **Host**. If a nickname has not been set for the WWN, a blank is displayed. This item is displayed only for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, Lightning 9900, TagmaStore AMS/WMS series, and Thunder 9500V (LUN Management mode).

Item	Description
Type	Displays the LDEV type. This item is displayed for Universal Storage Platform V, TagmaStore USP, the TagmaStore AMS/WMS series, and Thunder 9500V only. ▪ For Universal Storage Platform V, TagmaStore USP: #AT = Internal volume to which an external volume is mapped, and the external volume consists of SATA drives #BD = Internal volume to which an external volume is mapped, and the external volume consists of BD drives #– = Internal volume to which an external volume is mapped, and the drive type of the external volume is not identified – = LDEVs other than those above ▪ For the TagmaStore AMS/WMS series and Thunder 9500V: AT = LDEV that consists of SATA drives FC = LDEV that consists of FC drives BD = LDEV that consists of BD drives – = LDEV connected to an unidentified type of drive, or a storage subsystem that does not have a function for identifying FC and SATA. This item can be used for filtering by using a partial match specification as a condition for filtering.
ArrayGroup	Displays information about the array group. For Universal Storage Platform V, TagmaStore USP, and Lightning 9900V, the value displayed is the virtual device number in the parity group. For Lightning 9900, the value displayed is the parity group number. For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, the value displayed is the RAID group number. If the array group is unknown, **n/a** is displayed. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
SLPR	Displays the SLPR number. This item is displayed only for a storage subsystem that can use Virtual Partition Manager. If no SLPR is set, **0** is displayed. **Inconsistent** is displayed in either of the following cases: ▪ If a LUSE is used, when different SLPRs are set for the LDEVs comprising the LUSE ▪ When the SLPR of the LDEV or the LUSE differs from the SLPR of the assigned port
CLPR	Displays the CLPR number. This item is displayed only for the TagmaStore AMS/WMS series and a storage subsystem that can use Virtual Partition Manager. If no CLPR is set, **0** is displayed. If a LUSE is used, **Inconsistent** is displayed in either of the following cases: ▪ When different SLPRs are set for the LDEVs comprising the LUSE ▪ When different CLPRs are set for the LDEVs comprising the LUSE A blank is displayed if the LDEV is a Copy-on-Write Snapshot V-VOL for the TagmaStore AMS/WMS series.
Group	Name of the storage group to which the volume path (LUN) belongs.
EMU Type	Emulation type for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900. For LUSE, displays emulation type and number of LDEVs in the LUSE. This column is blank for the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
Capacity	Displays LDEV capacity. Values in GB and TB are rounded down to two decimal places. Values in MB are rounded down to whole numbers. So, the value shown here might be less than the actual capacity. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, this field also displays the size of intermediate HRX volumes. For more information on HRX intermediate volumes, refer to the documentation for the storage subsystem you use. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.

Item	Description
Consumed Capacity	Displays LDEV capacity. This column is displayed only for Universal Storage Platform V. When the volume attribute of the LDEV is DP-VOL, the amount of space that has been consumed is displayed. When the volume attribute of the LDEV is not DP-VOL, the same value as **Capacity** is displayed. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.
Volume Attr	Displays the volume attribute. ▪ `LUSE` = LUSE volume ▪ `CVS` = Volume created with the Virtual LVI/LUN (or CVS) function ▪ `LUSE (CVS)` = LUSE volume consisting of CVS volumes ▪ `DP-VOL` = HDP volume ▪ `V-VOL` = V-volume used in QuickShadow/Copy-on-Write Snapshot ▪ `GUARD` = Data Retention or Open LDEV Guard volume ▪ `External` = External volume ▪ `IO Suppression` = Volume to which an external volume is mapped, and for which the host I/O suppression mode is enabled ▪ `CacheEnable` = Volume to which an external volume is mapped, and for which the I/O cache mode is enabled ▪ None = Ordinary volume This item can be used for filtering. You can use a partial match specification as a condition for filtering.
External Subsystem	Displays the external subsystem name. This column is displayed only for Universal Storage Platform V and TagmaStore USP. This item can be used for filtering. You can use a perfect match specification as a condition for filtering. *external-subsystem-name* = Displayed when all the following conditions are met (see ***Note*** 1): - The volume is an internal volume to which an external volume is mapped. - Device Manager manages the external subsystem. - The external volume is allocated to the logged-in user. *external-system-model*#*external-subsystem-serial-number* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager does not manage the external subsystem. - The model is such that Universal Volume Manager can acquire its serial number. *external-system-model* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager has not managed the external subsystem. - The model is such that Universal Volume Manager cannot acquire its serial number. `Unknown` = Displayed when all of the following conditions are satisfied: - The volume must be an internal volume to which an external volume is mapped. - A user assigned to a user-defined resource group is logged in. - No external volumes are assigned to the logged-in user. Blank = Displayed when the volume is a volume other than an internal volume to which an external volume is mapped.
CMD DEV	Displays whether the LDEV is a command device (**CMD DEV**, **Remote** or blank).

Item	Description
Copy Type	Displays copy type. For P-VOLs paired with multiple S-VOLs, the copy type of each pair is displayed: ▪ `SI` = ShadowImage ▪ `TC (Sync)` = TrueCopy Synchronous ▪ `TC(Async) / TCE` = TrueCopy Asynchronous ▪ `TC` = TrueCopy with unidentifiable synchronous mode (see ***Note*** 2) ▪ `QS/COW` = QuickShadow/Copy-on-Write Snapshot ▪ `UR` = Universal Replicator ▪ `Unpaired` = unpaired ▪ Blank = pair status unknown This item can be used for filtering. You can use a partial match specification as a condition for filtering.
Copy Role	Copy role: **P-VOL**, **S-VOL**, or Blank = ordinary volume For P-VOLs paired with multiple S-VOLs, the copy role of each pair is displayed. Use this item for filtering. You can use a partial match specification as a condition for filtering.
Copy Status	Copy status: ▪ `Simplex` = SMPL status ▪ `Pair` = PAIR status ▪ `Copying` = COPY (PD), COPY (RS), COPY (SP), or COPY status ▪ `Reverse-Copying` = COPY (RS-R) copy status ▪ `Split` = PSUS or PSUS (SP) copy status ▪ `Suspended` = PSUE copy status ▪ `Error in LUSE` = PDUB copy status ▪ `Suspending` = Suspending status ▪ `Deleting` = Deleting status ▪ Blank = copy status is unknown. For each P-VOL paired with multiple S-VOLs, the copy status of each pair is displayed. Use this item for filtering. You can use a partial match specification as a condition for filtering.
File System	Mount point (e.g., `D:\` for Windows, `/mnt/RAID` for Solaris). When a volume is mounted on multiple mount points, all mount points are displayed, separated by commas. A maximum of 378 bytes is used to display the mount point. If the Device Manager agent is not running on the host, this field is blank.

Item	Description
% Used	Displays the volume usage (units: %). This item is updated when the Device Manager agent sends the volume usage to the Device Manager server. If the Device Manager agent is not running on the host, this field is blank. The Device Manager agent may not be installed or may be installed but not started. If multiple paths are assigned to a single volume, information is displayed for the number of times LUN security is configured to the paths, in the List Objects - Open-Allocated subwindow. Use the following formula to obtain the storage usage: `((`*used-capacity-of-the-file-system-built-on-the-target-storage*`) / (`*storage-capacity*`)) x 100 (%)` The usage cannot be calculated if the values required for calculation cannot be obtained correctly. In this case, -- appears. The conditions that enable % used to be displayed are as follows: ▪ When Windows is the platform of the host using the storage: - A drive letter is assigned to the LU. - The LU is mounted on a directory. - The LU has multiple partitions and, among the disks in the LU, drive letters are assigned to all partitioned disks and that LU is mounted on a directory. - The LU or all of the LU that has multiple partitions is not under a dynamic disk configuration and is not incorporated into a volume manager (VxVM). If the version of the Device Manager agent is earlier than 3.5, the displayed usage rate might be incorrect. ▪ When Solaris is the platform of the host using the storage: - The target LU is not incorporated into a volume manager (VxVM, SVM, or SDS). - The LU is mounted. ▪ When Linux is the platform of the host using the storage: - The target LU is not incorporated into a volume manager (LVM, LVM2). - The LU has multiple partitions and no partitioned disk is incorporated into a volume manager (LVM, LVM2). - The LU or all of the LU that has multiple partitions is mounted. ▪ When HP-UX or AIX is the platform of the host using the storage, % used is not displayed.
Last Updated	Time of the last agent update. If multiple paths are assigned to the volume, information is displayed for the number of times LUN security is configured to the paths. If the Device Manager agent is not running on the host, this field is blank.

Notes:

1: Even if all the conditions are met, if the microcode of a storage subsystem that uses Universal Volume Manager is not supported in the connection-destination subsystem, that external subsystem name will not be displayed. In this case, if a user assigned to the All Resources resource group is logged in, external-system-model#external-subsystem-serial-number is displayed. If a user assigned to a user-defined resource group is logged in, Unknown is displayed.

2: Displayed when the storage subsystem containing the TrueCopy P-VOL has not been registered in Device Manager. Since Device Manager is able to obtain information about the synchronization mode, if the target storage subsystem (S-VOL) is a Universal Storage Platform V, TagmaStore USP or Lightning 9900V, `TC (Sync)` or `TC (Async)` / `TCE` displays in this column.

8.2.2 Viewing the Open-Unallocated Group for a Subsystem

When you select the Open-**Unallocated** storage group for a storage subsystem, the information area displays the following information (as shown in Figure 8.4):

- **Name**. Name of the storage subsystem.
- **Number of LDEVs**. Number of unallocated open volumes in the storage subsystem.
- **Configured Capacity** (see ***Note***). Total capacity of LDEVs/LUs for which paths are not allocated, for open volumes in the storage subsystem.
- **Actual Capacity** (see ***Note***). Actual capacity of LDEVs/LUs for which paths are not allocated, for open volumes in the storage subsystem

Note: The GB and TB capacity values are rounded down to two decimal places. The MB capacity values are rounded down to whole numbers. As a result, the capacity shown on the Device Manager window may be less than the actual capacity available.

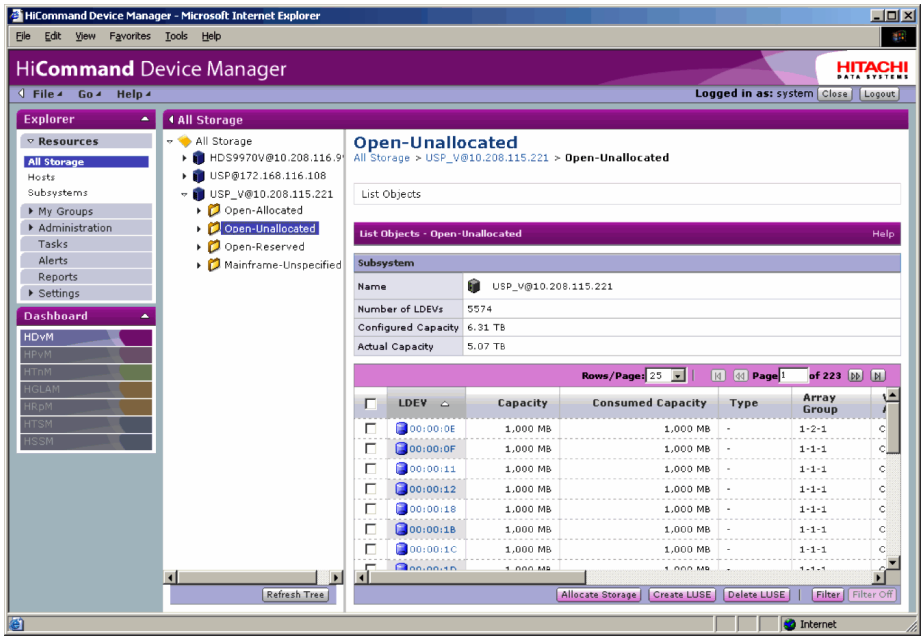


Figure 8.4 Viewing the Open-Unallocated Group for a Storage Subsystem

Select:

- **Allocate Storage** to add paths to the selected LDEV(s) (see section 8.4).
- **Create LUSE** to create LUSE volumes (see section 8.6).
- **Delete LUSE** to delete LUSE volumes (see section 8.7).

Sortable table lists the LDEVs/LUs in the **Open-Unallocated** group for the storage subsystem and displays detailed information for each LDEV/LU (see Table 8.2). To view the detailed information for a specific LDEV, select the desired LDEV to open the Detailed Information panel. For details on the items displayed in the LDEV Detailed Information panel, see Table 7.1.

The **Object List** lists the LDEVs/LUs in the unallocated group for the storage subsystem and displays detailed information for each LDEV/LU (see Table 8.2).

Table 8.2 Open-Unallocated Group Information under All Storage/My Storage

Column	Description
LDEV	LDEV number. For LUSE, only a representative LDEV number is displayed. Select the link to display the Detailed Information panel for the LDEV. You can use this item for filtering by specifying a range.
Capacity	Displays LDEV capacity. Values in GB and TB are rounded down to two decimal places. Values in MB are rounded down to whole numbers. So, the value shown here might be less than the actual capacity. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, this field also displays the size of HRX intermediate volumes. For more information on the HRX intermediate volume, see the documentation for the storage subsystem that you are using. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.
Consumed Capacity	Displays LDEV capacity. This column is displayed only for Universal Storage Platform V. When the volume attribute of the LDEV is DP-VOL, the amount of space that has been consumed is displayed. When the volume attribute of the LDEV is not DP-VOL, the same value as **Capacity** is displayed. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.
Type	Displays the LDEV type. This item displays only for Universal Storage Platform V, TagmaStore USP, the TagmaStore AMS/WMS series, and Thunder 9500V. ▪ For Universal Storage Platform V and TagmaStore USP: #AT = Internal volume to which an external volume is mapped, and the external volume consists of SATA drives #BD = Internal volume to which an external volume is mapped, and the external volume consists of BD drives #– = Internal volume to which an external volume is mapped, and the drive type of the external volume is not identified – = LDEVs other than those above ▪ For the TagmaStore AMS/WMS series and Thunder 9500V: AT = LDEV that consists of SATA drives FC = LDEV that consists of FC drives BD = LDEV that consists of BD drives – = LDEV connected to an unidentified type of drive, or a storage subsystem that does not have a function for identifying FC and SATA. Use this item for filtering. You can use a partial match specification as a condition for filtering.
ArrayGroup	Displays information about the array group. For Universal Storage Platform V, TagmaStore USP, and Lightning 9900V, the value displayed is the virtual device number in the parity group. For Lightning 9900, the value displayed is the parity group number. For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, the value displayed is the RAID group number. If the array group is unknown, **n/a** is displayed. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.

Column	Description
Default Controller	Displays default port controller. This item is displayed only for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
Volume Attr	Displays volume attributes. ▪ `LUSE` = LUN Expansion or LUSE volume ▪ `CVS` = Volume created with the Virtual LVI/LUN (or CVS) function ▪ `LUSE (CVS)` = LUSE volume consisting of CVS volumes ▪ `DP-VOL` = HDP volume ▪ `V-VOL` = V-volume used in QuickShadow/Copy-on-Write Snapshot ▪ `GUARD` = Data Retention or Open LDEV Guard volume ▪ `External` = External volume ▪ `IO Suppression` = Volume to which an external volume is mapped, and for which the host I/O suppression mode is enabled ▪ `CacheEnable` = Volume to which an external volume is mapped, and for which the I/O cache mode is enabled ▪ None = Ordinary volume This item can be used for filtering. You can use a partial match specification as a condition for filtering.
SLPR	Displays the SLPR number. This item is displayed only for a storage subsystem that can use Virtual Partition Manager. If no SLPR is set, **0** is displayed. If a LUSE is used and different SLPRs are set for the LDEVs comprising the LUSE, **Inconsistent** is displayed.
CLPR	Displays the CLPR number. This item is displayed only for the TagmaStore AMS/WMS series and a storage subsystem that can use Virtual Partition Manager. If no CLPR is set, **0** is displayed. If a LUSE is used, **Inconsistent** is displayed in either of the following cases: ■ When different SLPRs are set for the LDEVs comprising the LUSE ■ When different CLPRs are set for the LDEVs comprising the LUSE If the LDEV is a Copy-on-Write Snapshot V-VOL, a blank is displayed for the TagmaStore AMS/WMS series.
EMU Type	Emulation type for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900. For LUSE, this item indicates the emulation type and the number of LDEVs in the LUSE. This column is blank for the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
Stripe Size	Displays the LDEV stripe size in KB. This item is displayed for the TagmaStore AMS/WMS series only.

Column	Description
External Subsystem	Displays the external subsystem name. This item is displayed only for Universal Storage Platform V and TagmaStore USP. This item can be used for filtering. You can use a perfect match specification as a condition for filtering. *external-subsystem-name* = Displayed when all the following conditions are met (see ***Note*** 1): - The volume is an internal volume to which an external volume is mapped. - Device Manager manages the external subsystem. - The external volume is allocated to the logged-in user. *external-system-model*#*external-subsystem-serial-number* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager has not managed the external subsystem. - The model is such that Universal Volume Manager can acquire its serial number. *external-system-model* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager has not managed the external subsystem. - The model is such that Universal Volume Manager cannot acquire its serial number. `Unknown` = Displayed when all of the following conditions are satisfied: - The volume must be an internal volume to which an external volume is mapped. - A user assigned to a user-defined resource group is logged in. - No external volumes are assigned to the logged-in user. Blank = Displayed when the volume is a volume other than an internal volume to which an external volume is mapped.
CMD DEV	Displays whether the LDEV is a command device (**CMD DEV**, **Remote** or blank).
Copy Type	Displays copy type. For each P-VOL paired with multiple S-VOLs, the copy type of each pair is displayed. ▪ `SI` = ShadowImage ▪ `TC (Sync)` = TrueCopy Synchronous ▪ `TC (Async) / TCE` = TrueCopy Asynchronous ▪ `TC` = TrueCopy with unidentifiable synchronous mode (see ***Note*** 2) ▪ `QS/COW` = QuickShadow/Copy-on-Write Snapshot ▪ `UR` = Universal Replicator ▪ `Unpaired` = unpaired ▪ None = pair status unknown This item can be used for filtering. You can use a partial match specification as a condition for filtering.
Copy Role	Copy role: P-VOL, S-VOL, or Blank = ordinary volume For each P-VOL paired with multiple S-VOLs, the copy role of each pair is displayed. This item can be used for filtering. You can use a partial match specification as a condition for filtering.

Column	Description
Copy Status	Copy status: ▪ `Simplex` = SMPL status ▪ `Pair` = PAIR status ▪ `Copying` = COPY (PD), COPY (RS), COPY (SP), or COPY status ▪ `Reverse-Copying` = COPY (RS-R) copy status ▪ `Split` = PSUS or PSUS (SP) copy status ▪ `Suspended` = PSUE copy status ▪ `Error in LUSE` = PDUB copy status ▪ `Suspending` = Suspending status ▪ `Deleting` = Deleting status ▪ None = copy status is unknown. For each P-VOL paired with multiple S-VOLs, the copy status of each pair is displayed. Use this item for filtering. You can use a partial match specification as a condition for filtering.

Notes:

1: Even if all the conditions are met, if the microcode of a storage subsystem that uses Universal Volume Manager is not supported in the connection-destination subsystem, that external subsystem name will not be displayed. In this case, if a user assigned to the All Resources resource group is logged in, external-system-model#external-subsystem-serial-number is displayed. If a user assigned to a user-defined resource group is logged in, Unknown is displayed.

2*:* This item is displayed when the storage subsystem containing the TrueCopy P-VOL has not been registered in Device Manager. Since Device Manager is able to obtain information about the synchronization mode, if the target storage subsystem (S-VOL) is a Universal Storage Platform V, TagmaStore USP or Lightning 9900V, `TC (Sync)` or `TC (Async)` / `TCE` appears in this column.

8.2.3 Viewing the Open-Reserved Group for a Subsystem

For the **Open-Reserved** group, information about the open volumes that cannot be assigned paths is displayed. The volumes that cannot be assigned paths are as follows:

- HDP pool volume
- QuickShadow/Copy-on-Write Snapshot data pool volume
- Universal Replicator journal volume
- DM-LU volume containing the differential information during a copy operation
- On-demand volume
- Reserve volume used in Volume Migration (Universal Storage Platform V and TagmaStore USP), CruiseControl (Lightning 9900V), or HIHSM (Lightning 9900)

When the **Open-Reserved** group for a storage subsystem is selected (see Figure 8.5), the information area displays the following information:

- **Name** = storage subsystem name
- **Number of LDEVs** = total number of LDEVs/LUs for which paths cannot be allocated, for open volumes in the storage subsystem
- **Configured Capacity** (see ***Note***) = total capacity of LDEVs/LUs for which paths cannot be allocated, for open volumes in the storage subsystem
- **Actual Capacity** (see ***Note***) = actual capacity of LDEVs/LUs for which paths cannot be allocated, for open volumes in the storage subsystem

Note: The GB and TB capacity values are rounded down to two decimal places, and the MB capacity values are rounded down to whole numbers. Thus, the capacity shown on the Device Manager window might be less than the actual capacity available.

Sortable table lists the LDEVs/LUs in the **Open-Reserved** group for the storage subsystem and displays detailed information for each LDEV/LU (see Table 8.3). To view the detailed information for a specific LDEV, select the desired LDEV to open the Detailed Information panel. For details on the items displayed in the LDEV Detailed Information panel, see Table 7.1.

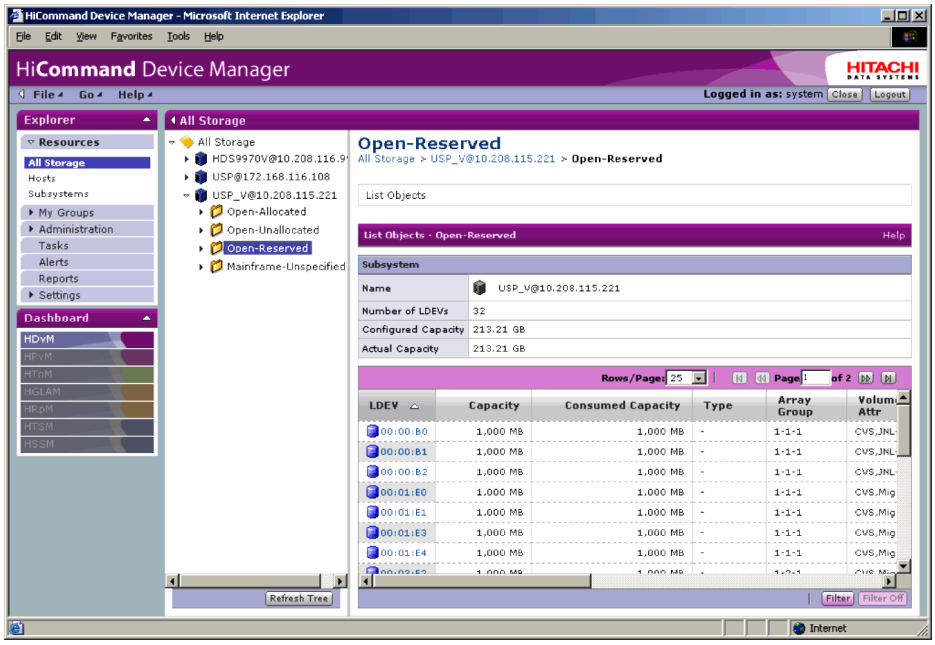


Figure 8.5 Viewing the Open-Reserved Group for a Storage Subsystem

Table 8.3 Information for the Open-Reserved Group under All Storage/My Storage

Item	Description
LDEV	LDEV number. For LUSE, only a representative LDEV number is displayed. Select the link to display the Detailed Information panel for the LDEV. This item can be used for filtering. You can set conditions for filtering by specifying a range.
Capacity	Displays LDEV capacity. Values in GB and TB are rounded down to two decimal places. Values in MB are rounded down to whole numbers. So, the value shown here might be less than the actual capacity. For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, this field also displays the size of HRX intermediate volumes. For more information on the HRX intermediate volume, see the documentation for the storage subsystem that you are using. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.
Consumed Capacity	Displays LDEV capacity. This column is displayed only for Universal Storage Platform V. When the volume attribute of the LDEV is DP-VOL, the amount of space that has been consumed is displayed. When the volume attribute of the LDEV is not DP-VOL, the same value as **Capacity** is displayed. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.
Type	Displays the LDEV type. This item is displayed for Universal Storage Platform V, TagmaStore USP, the TagmaStore AMS/WMS series, and Thunder 9500V only. ▪ For Universal Storage Platform V and TagmaStore USP: #AT = Internal volume to which an external volume is mapped, and the external volume consists of SATA drives #BD = Internal volume to which an external volume is mapped, and the external volume consists of BD drives #– = Internal volume to which an external volume is mapped, and the drive type of the external volume is not identified – = LDEVs other than those given above ▪ For the TagmaStore AMS/WMS series and Thunder 9500V: AT = LDEV that consists of SATA drives FC = LDEV that consists of FC drives BD = LDEV that consists of BD drives – = LDEV connected to an unidentified type of drive, or a storage subsystem that does not have a function for identifying FC and SATA. This item can be used for filtering. You can use a partial match specification as a condition for filtering.
ArrayGroup	Displays information about the array group. For Universal Storage Platform V, TagmaStore USP, and Lightning 9900V, the value displayed is the virtual device number in the parity group. For Lightning 9900, the value displayed is the parity group number. For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, the value displayed is the RAID group number. If the array group is unknown, **n/a** is displayed. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.

Item	Description
Default Controller	Displays default port controller. This item is displayed only for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
Volume Attr	Displays volume attributes. ▪ LUSE = LUN Expansion or LUSE volume ▪ CVS = Volume created with the Virtual LVI/LUN (or CVS) function ▪ LUSE (CVS) = LUSE volume consisting of CVS volumes ▪ DP-VOL = HDP volume ▪ DP-Pool = HDP pool volume ▪ V-VOL = V-volume used in QuickShadow/Copy-on-Write Snapshot ▪ POOL = QuickShadow/Copy-on-Write Snapshot data pool volume ▪ JNL-VOL = Universal Replicator journal volume ▪ GUARD = Data Retention or Open LDEV Guard volume ▪ External = External volume ▪ IO Suppression = Volume to which an external volume is mapped, and for which the host I/O suppression mode is enabled ▪ CacheEnable = Volume to which an external volume is mapped, and for which the I/O cache mode is enabled ▪ DM-LU = Volume containing the differential information during a copy operation ▪ OnDemand = On-demand volume ▪ Migration-reserved = Reserve volume used in Volume Migration (Universal Storage Platform V and TagmaStore USP), CruiseControl (Lightning 9900V), or HIHSM (Lightning 9900) ▪ None = Ordinary volume This item can be used for filtering. You can use a partial match specification as a condition for filtering.
SLPR	Displays the SLPR number. This item is displayed only for the TagmaStore AMS/WMS series and a storage subsystem that can use Virtual Partition Manager. If no SLPR is set, **0** is displayed. If a LUSE is used and different SLPRs are set for the LDEVs comprising the LUSE, **Inconsistent** is displayed.
CLPR	Displays the CLPR number. This item is displayed only for the TagmaStore AMS/WMS series, a TagmaStore USP that can use Virtual Partition Manager. If no CLPR is set, **0** is displayed. If a LUSE is used, **Inconsistent** is displayed in either of the following cases: ▪ When different SLPRs are set for the LDEVs comprising the LUSE ▪ When different CLPRs are set for the LDEVs comprising the LUSE Note that a blank is displayed if the LDEV is a Copy-on-Write Snapshot V-VOL for the TagmaStore AMS/WMS series.
EMU Type	Emulation type for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900. For LUSE, this item indicates the emulation type and the number of LDEVs in the LUSE. This column is blank for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.
Stripe Size	Displays the LDEV stripe size in KB. This item is displayed for the TagmaStore AMS/WMS series only.

Item	Description
External Subsystem	Displays the external subsystem name. This item is displayed only for Universal Storage Platform V and TagmaStore USP. This item can be used for filtering. You can use a perfect match specification as a condition for filtering. *external-subsystem-name* = Displayed when all the following conditions are satisfied (see ***Note*** 1): - The volume is an internal volume to which an external volume is mapped. - Device Manager manages the external subsystem. - The external volume is allocated to the logged-in user. *external-system-model*#*external-subsystem-serial-number* = Displayed when all the following conditions are satisfied: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager has not managed the external subsystem. - The model is such that Universal Volume Manager can acquire its serial number. *external-system-model* = Displayed when all the following conditions are satisfied: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager has not managed the external subsystem. - The model is such that Universal Volume Manager cannot acquire its serial number. `Unknown` = Displayed when all of the following conditions are satisfied: - The volume must be an internal volume to which an external volume is mapped. - A user assigned to a user-defined resource group is logged in. - No external volumes are assigned to the logged-in user. Blank = Displayed when the volume is a volume other than an internal volume to which an external volume is mapped.
CMD DEV	Displays whether the LDEV is a command device (**CMD DEV**, **Remote**, or blank).
Copy Type	Displays copy type. For each P-VOL paired with multiple S-VOLs, the copy type of each pair is displayed. ▪ `SI` = ShadowImage ▪ `TC(Sync)` = TrueCopy Synchronous ▪ `TC(Async / TCE)` = TrueCopy Asynchronous ▪ `TC` = TrueCopy with unidentifiable synchronous mode (see ***Note*** 2) ▪ `QS / COW` = QuickShadow/Copy-on-Write Snapshot ▪ `UR` = Universal Replicator ▪ `Unpaired` = unpaired ▪ None = pair status unknown This item can be used for filtering. You can use a partial match specification as a condition for filtering.
Copy Role	Copy role: `P-VOL`, `S-VOL`, or Blank = ordinary volume For each P-VOL paired with multiple S-VOLs, the copy role of each pair is displayed. This item can be used for filtering. You can use a partial match specification as a condition for filtering.

Item	Description
Copy Status	Copy status: ▪ `Simplex` = SMPL status ▪ `Pair` = PAIR status ▪ `Copying` = COPY (PD), COPY (RS), COPY (SP), or COPY status ▪ `Reverse-Copying` = COPY (RS-R) copy status ▪ `Split` = PSUS or PSUS (SP) copy status ▪ `Suspended` = PSUE copy status ▪ `Error in LUSE` = PDUB copy status ▪ `Suspending` = Suspending status ▪ `Deleting` = Deleting status ▪ None = copy status is unknown. For each P-VOL paired with multiple S-VOLs, the copy status of each pair is displayed. This item can be used for filtering. You can use a partial match specification as a condition for filtering.

Notes:

1: Even if all the conditions are met, if the microcode of a storage subsystem that uses Universal Volume Manager is not supported in the connection-destination subsystem, that external subsystem name will not be displayed. In this case, if a user assigned to the All Resources resource group is logged in, *external-system-model*#*external-subsystem-serial-number* is displayed. If a user assigned to a user-defined resource group is logged in, `Unknown` is displayed.

2: Displayed when the storage subsystem containing the TrueCopy P-VOL has not been registered in Device Manager. Since Device Manager is able to obtain information about the synchronization mode, if the target storage subsystem (S-VOL) is a Universal Storage Platform V, TagmaStore USP or Lightning 9900V, `TC (Sync)` or `TC (Async)` / `TCE` appears in this column.

8.2.4 Viewing the Mainframe-Unspecified Group

When the **Mainframe-Unspecified** group in a storage subsystem that supports mainframe volumes is selected (see Figure 8.6), the information area displays the following information:

- **Name**: storage subsystem name
- **Number of LDEVs**: total number of mainframe volumes in the storage subsystem
- **Mainframe-Unspecified Capacity**: Total capacity of mainframe volumes in the storage subsystem. The GB and TB capacity values are rounded down to two decimal places, and the MB capacity values are rounded down to whole numbers. Thus, the capacity shown on the Device Manager window might be less than the actual capacity available.

Sortable table lists the LDEVs/LUs in the **Mainframe-Unspecified** group for the storage subsystem and displays detailed information for each LDEV/LU (see Table 8.4). To view detailed information for a specific LDEV, select the desired LDEV to open the Detailed Information panel. For details on the items displayed in the LDEV Detailed Information panel, see Table 7.1.

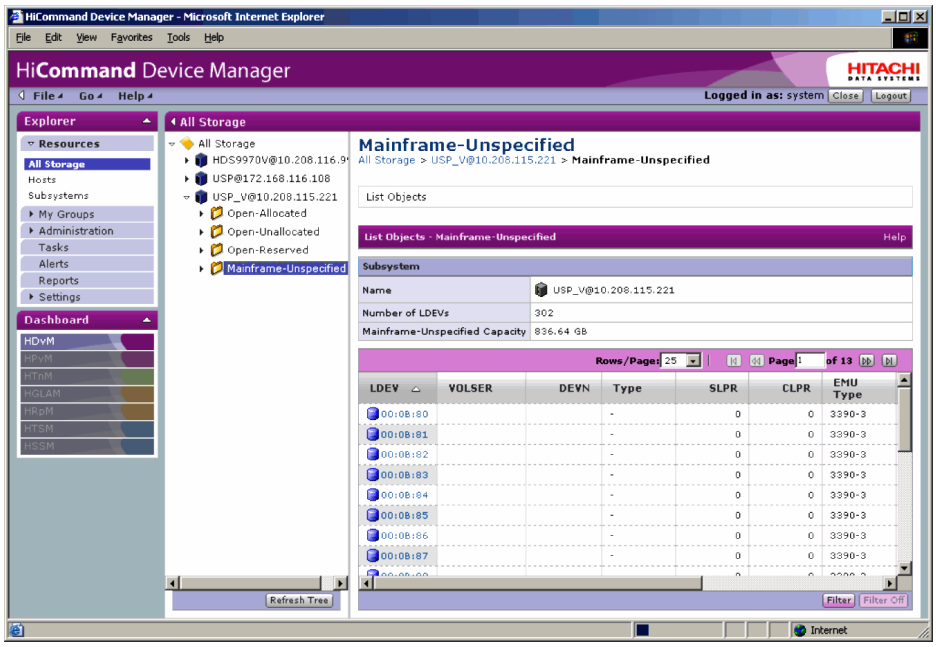


Figure 8.6 Viewing the Mainframe-Unspecified Group for a Storage Subsystem

Table 8.4 Information for the Mainframe-Unspecified Group under All Storage/My Storage

Item	Description
LDEV	Displays the LDEV number. For LUSE, only a representative LDEV number is displayed. Select the link to display the Detailed Information panel for the LDEV. This item can be used for filtering. You can set conditions for filtering by specifying a range.
VOLSER	Displays the serial number of the LDEV volume. A blank appears if the serial number cannot be obtained.
DEVN	Displays all the device numbers set for the LDEV. A blank appears if the device numbers cannot be obtained.
Type	Displays the LDEV type. This column is displayed for Universal Storage Platform V and TagmaStore USP only. ▪ #AT = Internal volume to which an external volume is mapped, and the external volume consists of SATA drives ▪ #BD = Internal volume to which an external volume is mapped, and the external volume consists of BD drives ▪ #– = Internal volume to which an external volume is mapped, and the drive type of the external volume is not identified ▪ – = LDEVs other than those given above
SLPR	Displays the SLPR number. This item is displayed only for a storage subsystem that can use Virtual Partition Manager. If no SLPR is set, **0** is displayed. If a LUSE is used and different SLPRs are set for the LDEVs comprising the LUSE, **Inconsistent** is displayed.
CLPR	Displays the CLPR number. This item is displayed only for a storage subsystem that can use Virtual Partition Manager. If no CLPR is set, **0** is displayed. If a LUSE is used, **Inconsistent** is displayed in either of the following cases: ■ When different SLPRs are set for the LDEVs comprising the LUSE ■ When different CLPRs are set for the LDEVs comprising the LUSE
EMU Type	Displays the emulation type. For LUSE, this item indicates the emulation type and the number of LDEVs in the LUSE. This item can be used for filtering. You can use a perfect match specification as a condition for filtering.

Item	Description
Volume Attr	Displays the volume attribute. ▪ `LUSE` = LUN Expansion or LUSE volume ▪ `CVS` = Volume created with the Virtual LVI/LUN (or CVS) function ▪ `LUSE (CVS)` = LUSE volume consisting of CVS volumes ▪ `DP-VOL` = HDP volume ▪ `DP-Pool` = HDP pool volume ▪ `V-VOL` = V-volume used in QuickShadow/Copy-on-Write Snapshot ▪ `POOL` = QuickShadow/Copy-on-Write Snapshot data pool volume ▪ `JNL-VOL` = Universal Replicator journal volume ▪ `GUARD` = Data Retention or Open LDEV Guard volume ▪ `External` = External volume ▪ `IO Suppression` = Volume to which an external volume is mapped, and for which the host I/O suppression mode is enabled ▪ `CacheEnable` = Volume to which an external volume is mapped, and for which the I/O cache mode is enabled ▪ `Migration-reserved` = Reserve volume used in Volume Migration (Universal Storage Platform V and TagmaStore USP), CruiseControl (Lightning 9900V), or HIHSM (Lightning 9900) ▪ None = Ordinary volume This item can be used for filtering. You can use a partial match specification as a condition for filtering.
Capacity	Displays the LDEV capacity. The unit is **Cyl**. This item is subject to filtering. You can set filtering conditions using either the partial match or the perfect match specification.

Item	Description
External Subsystem	Displays the external subsystem name. This column is displayed only for Universal Storage Platform V and TagmaStore USP. This item can be used for filtering. You can use a perfect match specification as a condition for filtering. *External subsystem name* = Displayed when all the following conditions are met (see ***Note***): - The volume is an internal volume to which an external volume is mapped. - Device Manager manages the external subsystem. - The external volume is allocated to the logged-in user *external -system-model# external -subsystem-serial-number* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager does not manage the external subsystem. - The model is such that Universal Volume Manager can acquire its serial number. *external I system model* = Displayed when all the following conditions are met: - A user assigned the All Resources resource group is logged in. - The volume is an internal volume to which an external volume is mapped. - Device Manager does not manage the external subsystem. - The model is such that Universal Volume Manager cannot acquire its serial number. `Unknown` = Displayed when all of the following conditions are satisfied: - The volume must be an internal volume to which an external volume is mapped. - A user assigned to a user-defined resource group is logged in. - No external volumes are assigned to the logged-in user. Blank = Displayed when the volume is a volume other than an internal volume to which an external volume is mapped.

Note: Even if all the conditions are met, if the microcode of a storage subsystem that uses Universal Volume Manager is not supported in the connection-destination subsystem, that external subsystem name will not be displayed. In this case, if a user assigned to the All Resources resource group is logged in, external-system-model#external-subsystem-serial-number is displayed. If a user assigned to a user-defined resource group is logged in, Unknown is displayed.

8.3 Scanning LUNs

Users with the Modify permission who are assigned to the All Resources resource group can perform LUN Scan operations.

After a new storage subsystem is detected, none of the LUNs defined in the storage subsystem are associated with a (user-defined) storage group. When you perform a LUN scan after adding a storage subsystem and its associated hosts, Device Manager creates a hierarchy of logical groups and storage groups to contain all of the existing LUNs in the storage subsystem. The LUN Scan operation creates the LUN SCAN group immediately under the **Logical Groups** object. Logical groups for each storage subsystem are created within the LUN SCAN group, and LUNs are placed in storage groups organized by ports and security. The LUNs in the LUN SCAN group can be moved to new or existing storage groups as desired.

The LUN scan also causes Device Manager to register the hosts that have WWNs associated with the LUNs. The properties of the host registered by Device Manager are updated when the Device Manager agent sends information about the host.

When you execute a LUN scan on the Lightning 9900, Device Manager places LUNs that belong to the same LUN group in the same storage group, and creates a temporary host for each WWN in the WWN group and registers the WWN in the host.

Note: If you display the contents of the LUN SCAN group while LUN scan is being executed and before the operation is completed, the value displayed for the number of LUNs may be less than the actual number. To display the correct LUN count, display the contents of the LUN SCAN group again after the LUN scan ends.

To perform a LUN scan operation:

1. Before performing the LUN Scan operation, make sure that all hosts and their WWNs are registered and that the name of the storage subsystem on which you are performing a LUN Scan operation is correct.

   Logical groups and storage groups containing the storage subsystems are created when the LUN Scan operation is performed. To use a specific name, change the storage subsystem name before performing the LUN Scan operation (see section 10.4).

   Device Manager automatically creates a host for one WWN in the storage subsystem during the LUN Scan. Device Manager also automatically determines the host names. Before performing a LUN Scan, make sure that all hosts and their WWNs are registered.

   Note: If you change a storage subsystem name after performing a LUN scan, the logical group name in the LUN scan group will not match the changed storage subsystem name. If you perform a LUN Scan under these circumstances, a logical group whose name corresponds to the changed storage subsystem name is created in the LUN scan group. Thus, a LUN that has already been detected and a LUN that is newly detected are placed in different groups, even though they have the same path.

2. In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**.

3. Expand the **All Storage** (**My Storage**) object tree in the navigation area to display the groups for each storage subsystem available to the logged-in user. Select the desired storage subsystem for which to perform a LUN Scan, and then select the **Open-Allocated** group (see Figure 8.3).

   A LUN Scan can be performed from the **Subsystems** object. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then in the navigation area, select and expand the **Subsystems** object. Then, select the storage subsystem for which the LUN Scan is to be performed.

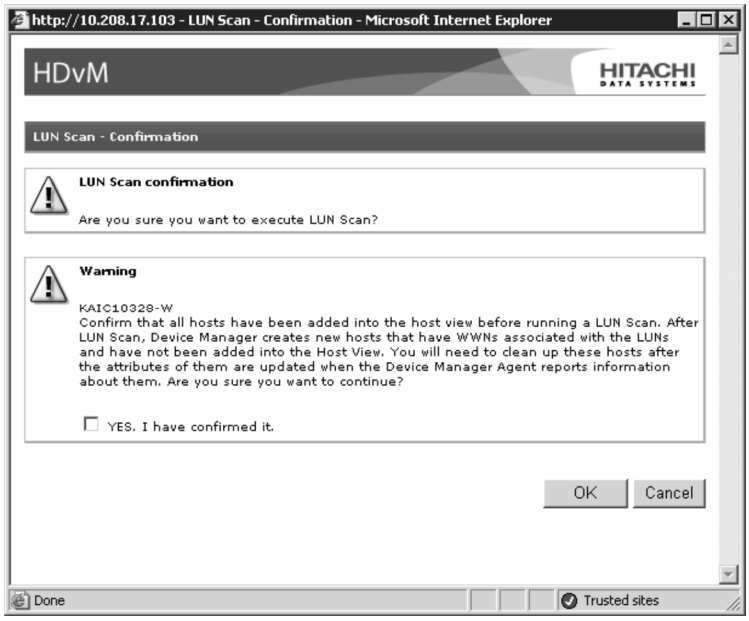


Figure 8.7 Performing a LUN Scan – Confirmation

4. In the method area, select the **LUN Scan** operation.
5. Select **OK** to perform the LUN scan operation or **Cancel** to cancel your request. Device Manager scans the selected subsystem for LUNs not assigned to a storage group and places these LUNs into the LUN scan group. It also updates LUN information for the **Open-Allocated** group using the information that was detected by the LUN scan.
6. When the LUN SCAN operation is complete, you can view the updated list of LUNs in the LUN scan storage groups for the storage subsystem (under **Logical Groups**, see section 7.6.1) or in the **Open-Allocated** storage group for the storage subsystem (under **All Storage**/**My Storage**) (see section 8.2.1).

After the LUN scan operation, you can leave the LUNs in the LUN SCAN storage groups and manage the storage there, or you can create your own logical groups and move the LUNs from the LUN SCAN group into your customized logical groups. To move LUNs to another logical group, select the desired LUNs in the LUN SCAN group, and then select **Move Storage** (see section 7.6.3 for instructions).

8.4 Allocating Storage

Users with the Modify permission can assign a path to storage.

When you allocate storage, you assign one or more access paths (port/LUN) to LDEV(s), and you can optionally secure the new LUN(s) to host WWN(s). You can allocate LDEVs that are unallocated or already allocated.

Note: You can also assign a volume path when you add storage to a storage group (see section 7.6.2).

To allocate storage:

1. In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**.
2. Expand the **All Storage** (**My Storage**) object tree in the navigation area, and then select the storage subsystem and group (**Open-Allocated** or **Open-Unallocated**) that contains the LDEV(s) you want to allocate.
3. Select the LDEV(s) to which you want to assign a volume path, and then click the **Allocate Storage** button.

   The Add Storage (STEP: Define Host/Port Connections) dialog box appears.

   You can select a maximum of 100 LDEVs in one operation. If you want to operate more than 100 LDEVs, operate them in multiple operations, selecting no more than 100 LDEVs in each operation.
4. For the operations you perform in this dialog box and subsequent tasks, see step 6 onward in section 7.6.2.

8.5 Unallocating Storage

Users with the Modify permission can unallocate storage.

When you unallocate storage, you remove one or more access paths from an LDEV. When you unallocate a LUSE volume, you can also optionally delete the LUSE volume to make the individual LDEVs available for use.

CAUTION:

- Before deleting a path, make sure that the path is no longer in use.
- Before deleting a LUN, make sure that no access is underway from a host. When a LUN is deleted, all I/Os that are being executed between a host and that LUN are canceled.

Note for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200: If a LUN is deleted, all the ports to which that LUN belongs in the storage subsystem (or host storage domains in the case of the TagmaStore AMS/WMS series or Thunder 9500V in the LUN Management mode) may be reset. This reset will cancel all I/Os being executed between a host and any LUN via such a port or host storage domain. Before deleting a LUN, make sure that there is no access from a host via a port or host storage domain to which the LUN belongs.

Note for Universal Storage Platform V, TagmaStore USP, Lightning 9900V , and Lightning 9900: Even if a LUN is deleted, the storage subsystem port or host storage domain to which that LUN belongs is not reset.

Notes for command device and copy pair volumes:

For Universal Storage Platform V, TagmaStore USP and Lightning 9900V, you cannot unallocate the last volume path from a logical device that is specified as a copy pair volume.

For the Lightning 9900, you cannot unallocate the last volume path from a logical device that is specified as a command device or as a copy pair volume.

For the Thunder 9500V (microcode before X655) and 9200, you cannot unallocate any volume paths from a logical device that is specified as a command device or as a copy pair volume.

To unallocate storage:

1. In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**.
2. Expand the **All Storage** (**My Storage**) object tree in the navigation area, select the storage subsystem that contains the LDEV(s) that you want to unallocate, and then select the **Open-Allocated** group.
3. Select the desired LDEV(s), and select the **Unallocate Storage** button. You can select a maximum of 100 LDEVs in one operation. If you want to operate more than 100 LDEVs, operate them in multiple operations, selecting no more than 100 LDEVs in each operation.

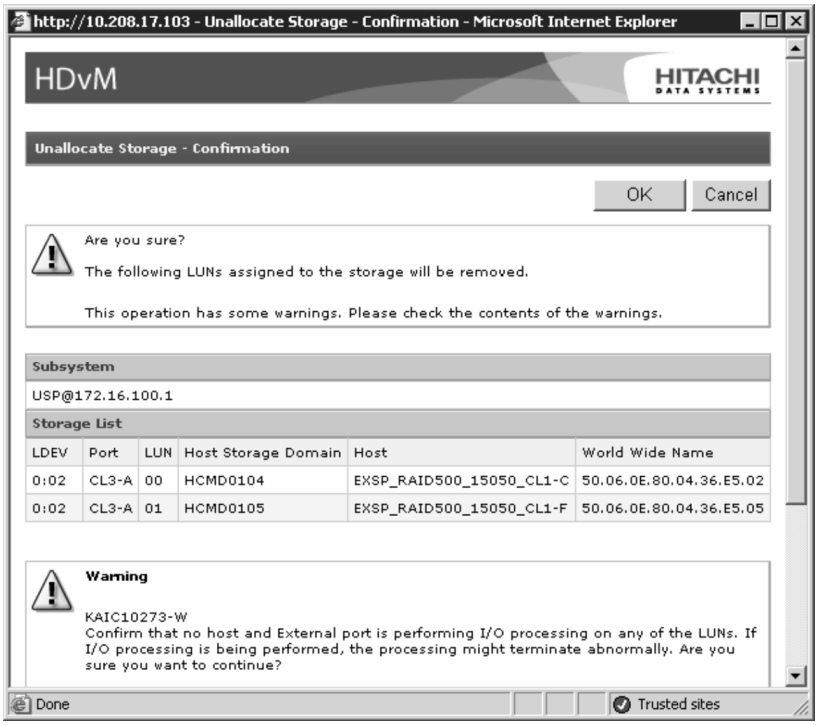


Figure 8.8 Unallocate Storage-Confirmation

4. When the confirmation panel appears (see Figure 8.8), read and observe the important warning. Select **OK** to delete the specified path(s), or select **Cancel** to cancel your request to unallocate storage. If you selected a volume with more than one path, Device Manager displays the paths and asks you to select the path(s) to be deleted (see Figure 8.9).

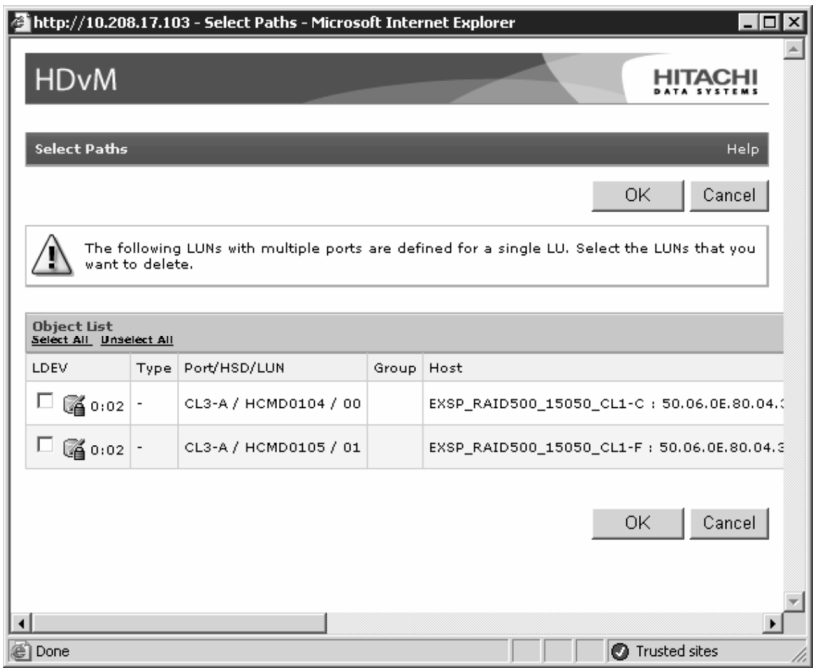


Figure 8.9 Unallocating Storage – Selecting the Path(s)

5. Select the desired path(s), and select **OK** to continue, or select **Cancel** to cancel your request to unallocate storage.

   If all paths of a LUSE volume are being deleted, Device Manager displays a confirmation message asking if you want to keep or delete the LUSE volume, as shown in Figure 8.10. For the 9900, LUSE is always deleted.

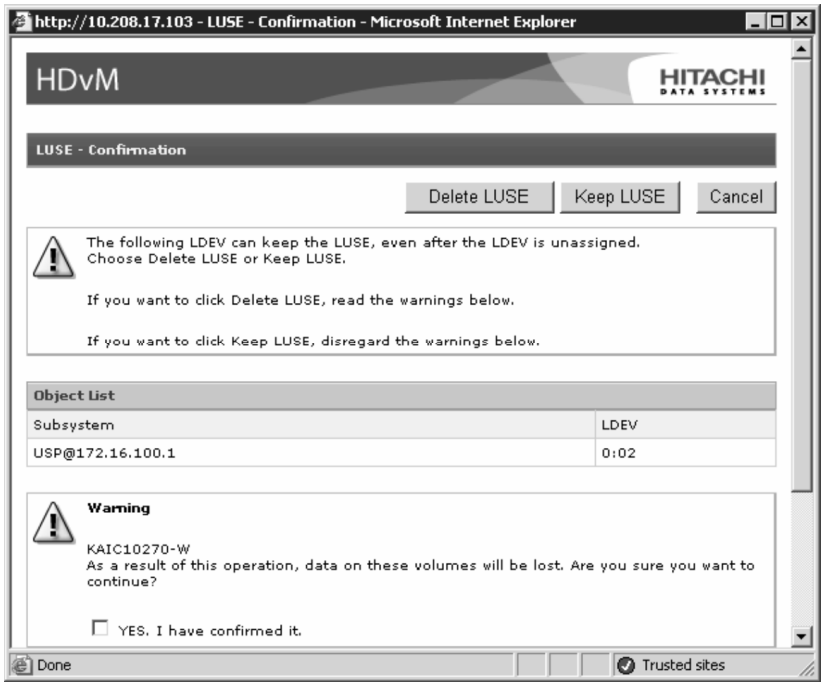


Figure 8.10 Unallocate Storage LUSE Confirmation

WARNING: The delete LUSE operation is destructive. Read and observe the important warning on the LUSE Confirmation panel.

- To delete a LUSE volume, select the **Yes, I have confirmed it** check box, and then select the Delete LUSE button only if it is acceptable to lose the data on the LUSE volume.
- To retain the LUSE volume, select **Keep LUSE**, except for the Lightning 9900. For the 9900, LUSE is deleted when the path is deleted. You cannot cancel the LUSE deletion for the 9900.

You are notified when the unallocate storage operation is complete. When a path allocated to an LDEV or LU is released, the LDEV or LU is moved to the **Open-Unallocated** group of the storage subsystem.

8.6 Creating LUSE Volumes

WARNING: The create LUSE volume operation is destructive. Data stored on the LDEVs/LUs combined to make the LUSE volume will be lost. You should back up the data before creating LUSE volumes.

Users with the Modify permission can create LUSE volumes on the storage subsystems.

Note: For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, if you use a storage subsystem-specific management tool (such as Storage Navigator Modular or DAMP) to create a LUSE volume from multiple LUs that have allocated LUNs, or if you allocate LUNs to LUs other than the main LU after you create a LUSE volume, Device Manager displays the LUNs that have been allocated to LUs other than the main LU. For these LUNs, the size is not displayed, and you cannot delete or perform other operations on them. In this case, use these management tools to delete the LUNs that can no longer be used, and refresh the storage subsystem from Device Manager.

LUSE volumes are created from unallocated LDEVs. Device Manager enables you to create LUSE volumes in several ways:

- For the Lightning 9900, you can create a LUSE volume when allocating a volume path to an LDEV in the **Open-Unallocated** group (see section 8.4) and when adding storage to a storage group (see section 7.6.2). You cannot create a 9900 LUSE volume that does not have an allocated volume path.
- For the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, you can create a LUSE volume that is not added to a storage group and does not have an allocated volume path (see instructions in this section). The Lightning 9900 does not allow this. You can also create a LUSE volume when allocating a volume path to an LDEV in the **Open-Unallocated** group (see section 8.4) or when adding storage to a storage group (see section 7.6.2).

Table 8.5 shows the requirements of LDEVs that make up a LUSE volume.

Table 8.5 Requirements of LDEVs That Make Up a LUSE Volume

Requirements	Universal Storage Platform V	TagmaStore USP	Lightning 9900V	Lightning 9900	TagmaStore AMS/WMS series	Thunder 9500V	Thunder 9200
No path must be allocated.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Must not be a command device or a remote command device.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Must not make up a copy pair (see ***Note*** 1).	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Must not be registered as an external volume.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Must not be a LUSE.	-	-	-	Yes	-	-	-
Must be the same emulation type (see ***Note*** 2).	Yes	Yes	Yes	Yes	-	-	-
Must have the same RAID level.	Yes	Yes	Yes	Yes	-	-	-
Must not be a reserved volume for Volume Migration (Universal Storage Platform V and TagmaStore USP), CruiseControl (Lightning 9900V), or HIHSM (Lightning 9900).	Yes	Yes	Yes	Yes	-	-	-
The external volumes must not coexist with internal volumes to which external volumes are mapped.	Yes	Yes	-	-	-	-	-
The internal volumes to which external volumes are mapped must have the same host I/O suppression mode.	Yes	Yes	-	-	-	-	-
The internal volumes to which external volumes are mapped must have the same I/O cache mode.	Yes	Yes	-	-	-	-	-
Must not be an HDP volume.	Yes	-	-	-	-	-	-

Requirements	Universal Storage Platform V	TagmaStore USP	Lightning 9900V	Lightning 9900	TagmaStore AMS/WMS series	Thunder 9500V	Thunder 9200
Must be located in the same control unit.	-	-	Yes	Yes	-	-	-
The CVS volumes must not coexist with normal volumes.	-	-	Yes	Yes	-	-	-
Must be the same size.	-	-	Yes	Yes	-	-	-
The default controller must be the same.	-	-	-	-	Yes	Yes	Yes
Must not be a RAID 0.	-	-	-	-	Yes	Yes	Yes
The maximum LUSE volume size is 2 TB.	-	-	-	-	Yes	Yes	Yes
Must not be blocked or unformatted.	-	-	-	-	Yes	Yes	Yes
Must belong to the same CLPR.	-	-	-	-	Yes	-	-
The maximum number of LDEVs is 128.	-	-	-	-	Yes	-	-
The stripe size must be the same.	-	-	-	-	Yes	-	-
When LDEV #0 is used as the sub-LDEV, the microcode must be X55E or later.	-	-	-	-	-	Yes	Yes

Notes:

1: For Universal Storage Platform V and TagmaStore USP, a QuickShadow/Copy-on-Write Snapshot V-VOL can make up a LUSE with another QuickShadow/Copy-on-Write Snapshot V-VOL.

2: You can only use the LDEVs of the following emulation types: OPEN-3, OPEN-8, OPEN-9, OPEN-K, OPEN-E, OPEN-L, OPEN-M, and OPEN-V

To create a LUSE volume in the **Open-Unallocated** group (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200):

1. In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**.
2. Expand the **All Storage** (**My Storage**) object tree in the navigation area, select the storage subsystem for which you want to create LUSE volumes, and then select the **Open-Unallocated** group.
3. Select the desired LDEVs for the LUSE volumes, and select the **Create LUSE** button.

   You can select a maximum of 128 LDEVs in one operation. If you want to operate more than 128 LDEVs, operate them in multiple operations, selecting no more than 128 LDEVs in each operation.
4. On the Create LUSE panel, select the devices, and use the **Create LUSE** button to create the desired LUSE volume(s), as shown in Figure 8.11. Use the **Cancel LUSE** button as needed to remove LUSE LUs and re-enable the LDEVs/LUs in the **LDEV** list.

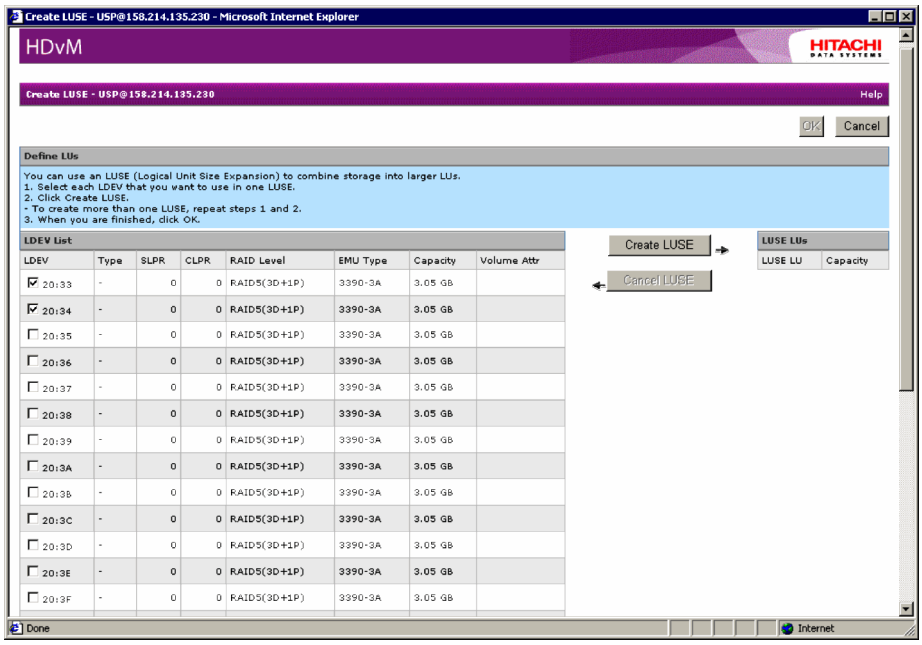


Figure 8.11 Creating LUSE – Selecting LDEVs

For the TagmaStore AMS/WMS series, Thunder 9500V and Thunder 9200, specify the LDEV number of the representative LDEV for the LUSE volume. For Universal Storage Platform V, TagmaStore USP and Lightning 9900V, the smallest LDEV number in the LUSE volume automatically becomes the representative LDEV number of a new LUSE volume.

Notes:

- You cannot delete/reconstruct existing LUSE volumes during this procedure. You must delete a LUSE volume first in order to use the individual LDEVs.
- For an LDEV that is being used as an external volume, the check box appears inactive and cannot be selected.

- For a storage subsystem that is using Virtual Partition Manager, do not create a LUSE volume by using LDEVs with different SLPRs and CLPRs. If the SLPRs differ, the partitioned storage administrator cannot manage the storage subsystem. If the CLPRs differ, the effectiveness of the cache partitioning may decrease.

5. When the information on the Create LUSE panel is correct, select **OK** or select **Cancel** to cancel your request. The confirmation panel displays, as shown in Figure 8.12.

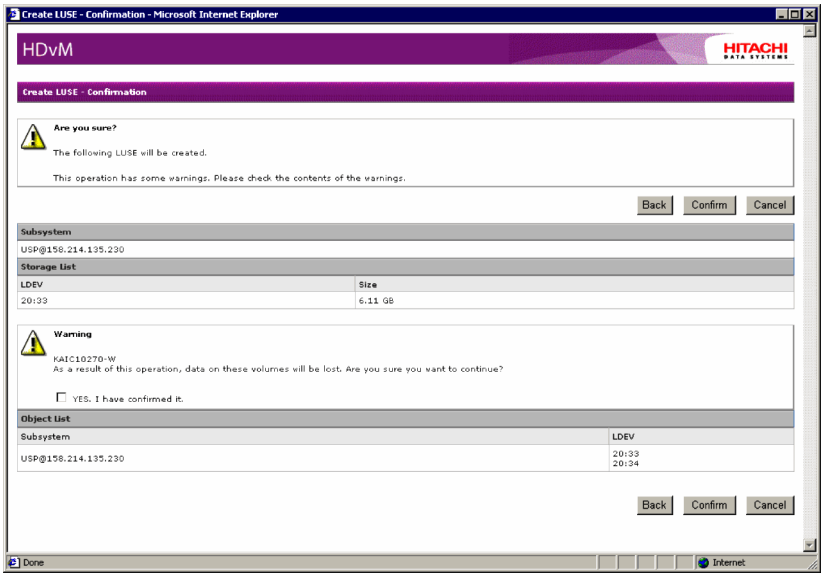


Figure 8.12 Create LUSE Confirmation and Warning

6. Review the warning information and select the **Yes, I have confirmed it** check box if you want to create the LUSE volumes and lose the data on the related LDEVs/LUs.

7. Select **Confirm** to create the LUSE volumes or **Cancel** to cancel your request.

8.7 Deleting LUSE Volumes

WARNING: The delete LUSE volume operation is destructive. Data stored on the LUSE volume will be lost. We strongly recommend that you back up data before deleting LUSE volumes.

Users with the Modify permission can delete LUSE volumes on the storage subsystems.

For the Universal Storage Platform V, TagmaStore USP, 9900V, the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200 storage subsystems, you can also delete LUSE volumes when you unallocate storage (see section 8.5).

Note: This operation cannot be performed on the Lightning 9900. A 9900 LUSE volume is automatically deleted when the last access path is removed (see section 8.5).

To delete one or more LUSE volumes:

1. In the **Explorer** menu, choose **Resources** and then **All Storage** or **My Storage**.
2. Expand the **All Storage** (**My Storage**) object tree in the navigation area, select the storage subsystem for which you want to delete LUSE volumes, and then select the **Open-Unallocated** group.
3. Select the desired LUSE volume(s), and then select the **Delete LUSE** button. You can select a maximum of 100 LUSE volumes in one operation. If you want to operate more than 100 LUSE volumes, operate them in multiple operations, selecting no more than 100 LUSE volumes in each operation. The Delete LUSE – Confirmation panel displays, as shown in Figure 8.13.

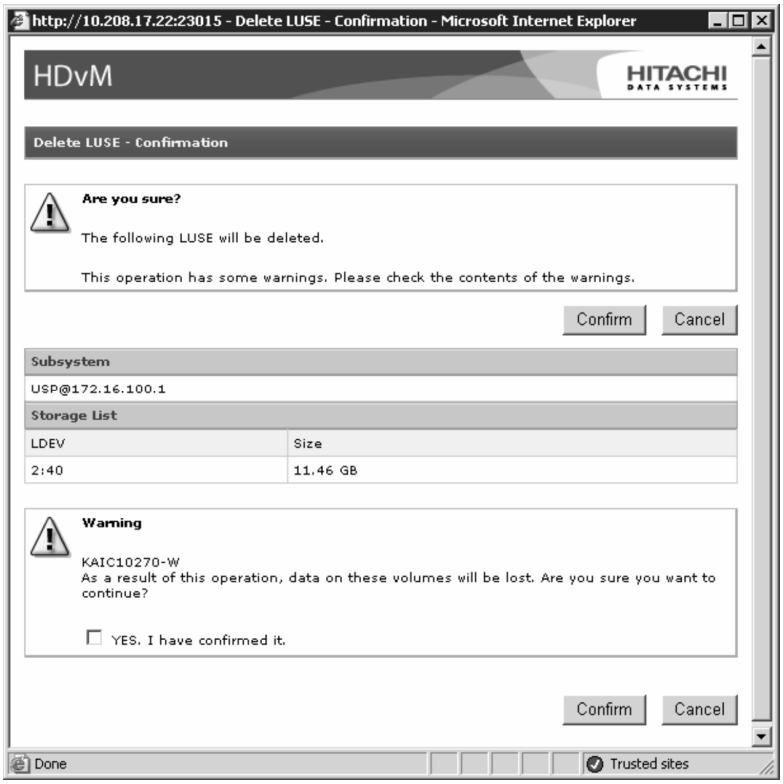


Figure 8.13 Delete LUSE Confirmation and Warning

4. Review the warning information and select the **Yes, I have confirmed it** check box to delete the LUSE volumes and lose the data on the related devices.
5. Select **Confirm** to delete the LUSE volumes or **Cancel** to cancel your request.

Chapter 9 Performing Host Operations

This chapter describes HiCommand Device Manager host operations:

- Overview (see section 9.1)
- Acquiring Information from the Device Manager Agent (see section 9.2)
- Viewing the List of Hosts (see section 9.3)
- Adding a Host (see section 9.4)
- Viewing Host Properties and Volume Information (see section 9.5)
- Modifying Host Properties (see section 9.6)
- Adding Storage from Host Management (see section 9.7)
- Refreshing Host Information (see section 9.8)
- Managing Copy Pairs (see section 9.9)
- Removing a Host (see section 9.10)
- Processing When Replacing Host Bus Adapters (see section 9.11)

9.1 Overview

A computer system that uses storage on a subsystem is referred to as a host. The Device Manager agents installed on these hosts periodically send information about the hosts and the storage used by the hosts to the Device Manager server. This enables monitoring of how the hosts use the storage in the storage subsystems managed by Device Manager.

In Device Manager, a world wide name (WWN) or a group of world wide names can be handled as a host. If you have not installed the Device Manager agent on a host, you can set a Device Manager host on the basis of the configuration of a physical host. Also, you can set a Device Manager host on the basis of a group of WWNs that access a specific storage in a storage subsystem managed by Device Manager.

For external volumes that are managed by the external storage subsystem, the external port used in Universal Volume Manager operates in the same manner as a host. Therefore, Device Manager manages the external port as a host.

In the **Explorer** menu, choosing **Resources** and then **Hosts** displays the **Hosts** object tree in the navigation area. Select **Hosts** in the navigation area to access host operations, as shown in Figure 9.1.

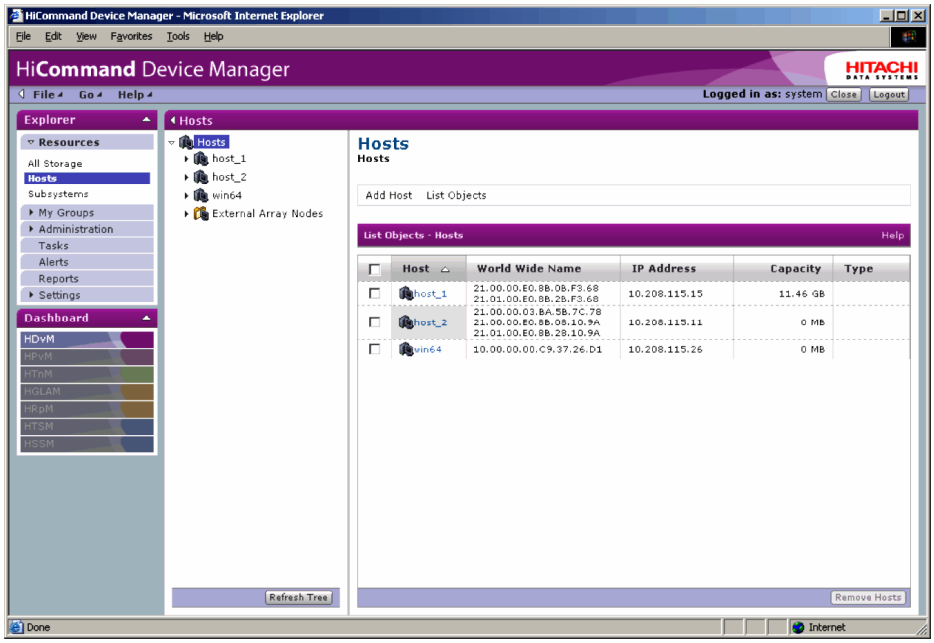


Figure 9.1 Hosts Object

9.2 Acquiring Information from the Device Manager Agent

When a Device Manager agent is installed on a host, the Web client acquires the WWN information of the host and the LDEV information related to the host, from the Device Manager agent running on that host.

The following information is acquired from the Device Manager agent:

- **World Wide Names** in the Show Properties - *host-name* subwindow
- Host name

Note: For a host on which a Device Manager agent is not installed, the WWNs and host name that were specified when Device Manager was added to the host are displayed. For details about adding a host, see section 9.4.

The following LDEV attributes are sent from the Device Manager agent running on a host:

- File System
- % Used
- Copy Type
- Copy Role
- Copy Status
- Last Updated

Note: Information of copy type, copy role, or copy status can also be acquired from a storage subsystem.

Information that can be acquired from the Device Manager agent differs, depending on the host configuration. The following sections describe the information displayed in the Web client for each host configuration.

- When a host has a single path configuration (see section 9.2.1)
- When a host has a multi-path configuration (see section 9.2.2)
- When a host has no path assigned (see section 9.2.3)

9.2.1 When a Host Has a Single Path Configuration

When a host has a single path configuration, the Web client displays the information about LDEVs assigned to the host. The information about all WWNs registered in the host, the host name, and LDEVs is sent from the Device Manager agent, and then is displayed in the Web client.

9.2.2 When a Host Has a Multi-path Configuration

When a host has a multi-path configuration, the following information is displayed in **World Wide Names** in the Show Properties - *host-name* subwindow and for the LDEV information. The information to be displayed differs depending on the host OS, whether HBA API libraries are installed, and whether path management software is installed.

Table 9.1 Information Displayed in a Multi-path Configuration

Host Configuration			**Displayed Information**	
OS	**Path Management Software** (see ***Note*** 1)	**HBA API**	**World Wide Names**	**LDEV Information** (see ***Note*** 2)
Windows Solaris	Installed	Installed	All WWNs registered in the host	Only for active paths
		Not installed	Only WWNs assigned to active paths	Only for active paths
	Not installed	—	All WWNs registered in the host	For all paths
Linux AIX HP-UX	—	—	All WWNs registered in the host	For all paths

Legend: —: Whether it is installed does not affect the display.

Notes:

1: The information to be displayed differs, depending on whether the following path management software is installed: Dynamic Link Manager (in Windows), or Dynamic Link Manager or SUN StorEdge Traffic Manager (in Solaris).

2: The LDEV information (**% Used**, **File System**, **Copy Type**, **Copy Role**, **Copy Status**, and **Last Updated**) to be acquired from the Device Manager agent.

For details on the required HBA API libraries for each host OS, see the *HiCommand Device Manager Agent Installation Guide*.

9.2.3 When a Host Has No Path Assigned

When a host has no path assigned, the information displayed in **World Wide Names** in the Show Properties - *host-name* subwindow differs depending on the host OS and whether the HBA API libraries are installed.

Table 9.2 Information Displayed When a Host has No Path Assigned

Host Configuration		Displayed Information
OS	**HBA API**	**World Wide Names**
Windows Solaris Linux	Installed	All WWNs registered in the host
	Not installed	WWNs are not displayed.
AIX HP-UX	—	All WWNs registered in the host

Legend: —: Whether it is installed does not affect the display.

For details on the required HBA API libraries for each host OS, see the *HiCommand Device Manager Agent Installation Guide*.

9.3 Viewing the List of Hosts

All Device Manager users can view the list of hosts for which they have access permission. To view the list of hosts in the information area, from the **Explorer** menu choose **Resources** then **Hosts** (see Figure 9.1).

When the **Hosts** object is selected in the navigation area, the method area displays the following methods:

- **Add Host** (see section 9.4)
- **List Objects.** When **List Objects** is selected, the information area displays the list of hosts. The list of hosts in the information area displays the name, IP address, storage capacity, and host type for each host.

  A **Remove Hosts** button is also displayed for deleting selected hosts.

  When a user logs in (for whom **All Resources** is assigned as a resource group), the **External Array Nodes** object is displayed next to the regular hosts under the **Hosts** object in the navigation area. The external port is displayed under the **External Array Nodes** object. Device Manager handles the external port as a host.

  When you select an object from the **External Array Nodes** object in the navigation area, the method area displays the methods that can be executed and the information area displays host attributes, just as when you select a host from the **Hosts** object. However, because you cannot add or delete an external port, the **Add Host** method and **Remove Host** button are not displayed; the IP address is not displayed either.

  When you select a host that you want to view in the navigation area or information area, the method area displays the methods that can be executed for the selected host. The information area displays information and operations for the host (see Figure 9.1).

9.4 Adding a Host

There are two ways to add hosts to your system:

- By scanning LUNs (see section 9.4.1)
- By adding hosts manually (see section 9.4.2)

Note: When a host is installed by using the Device Manager agent, information on the host is sent to the Device Manager server. This function automatically adds new hosts to Device Manager. For details on the Device Manager agent, see the *HiCommand Device Manager Agent Installation Guide*.

9.4.1 Adding Hosts by Scanning LUNs

When you execute a LUN scan operation on a storage subsystem, Device Manager detects the WWNs and automatically registers a temporary host per WWN. The names of the temporary hosts are host_*serial-number* (such as host_1) except for the WWNs in a WWN group.

For the WWNs in a Lightning 9900 WWN group, Device Manager uses a naming convention that indicates the WWN group name: *WWN-group-name_serial-number*. For example, the WWNs in the WWN group called Finance would be named Finance_1, Finance_2, Finance_3.

If the Device Manager agent is installed on a host and the `HiScan` command is executed on that host, the Device Manager agent sends detailed information about the host to the Device Manager server, and the Device Manager server registers the new host according to the information received from the Device Manager agent. If the new host contains a WWN that was detected during a LUN scan, Device Manager moves the WWN from the temporary host created during the LUN scan (such as host_1 or Finance_1) to the new registered host. After the WWN has moved, the temporary host becomes empty and should be removed. For details on removing a host, see section 9.10.

You can rename the hosts created during LUN scan to more easily identify them, combine WWNs that are on a single physical host, and remove the extraneous hosts as needed.

9.4.2 Adding Hosts Manually

Users with the Modify permission can add hosts to HiCommand Device Manager.

When adding a host manually, specify the host name and WWNs to be registered in the host. You can then use this information to secure LUNs using the WWNs of this host.

Note: You cannot add multiple hosts at the same time. Add each host individually.

To add a host to Device Manager:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**.
2. Choose **Add Host** in the method area to open the Add Host panel.

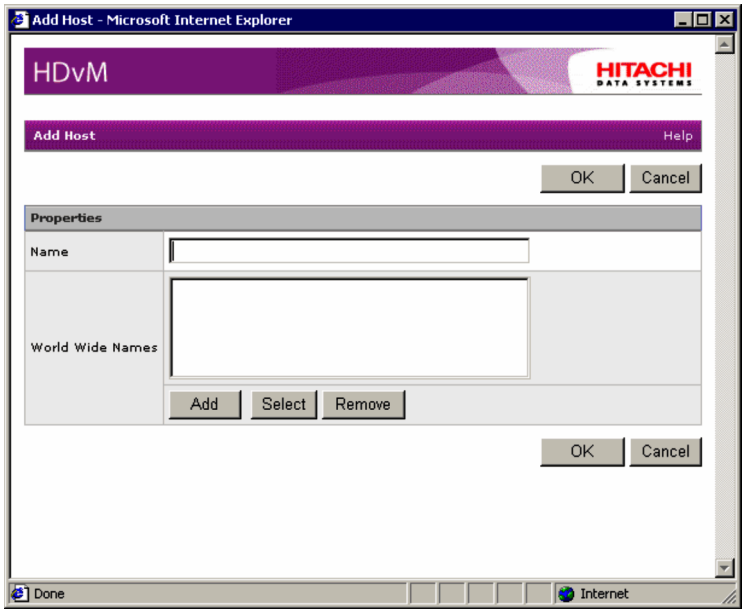


Figure 9.2 Adding a Host – Entering the Name

3. Enter the name for the new host using a maximum of 50 bytes. The host name is not case-sensitive. The host name may include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded. You can use the following characters:

   `A - Z a - z 0 - 9 - _ . @`

   Note: You cannot use the same host name as that of a mainframe host that is registered to Device Manager. Confirm the name of mainframe hosts by using the Device Manager CLI. For details on how to check a mainframe host name, see the *HiCommand Device Manager Command Line Interface (CLI) User's Guide*.

4. Register one or more WWNs for the new host by either of the following methods:
   - Click the **Add** button. In the displayed dialog box, type the WWN and then click the **OK** button (see Figure 9.3). Repeat this operation for each WWN you want to register.



Figure 9.3 Adding a Host – Entering a New WWN

When entering a WWN, use the following format. You can omit periods.

XX.*XX*.*XX*.*XX*.*XX*.*XX*.*XX*.*XX* (*XX*: two hexadecimal digits)

– Click the **Select** button. A dialog box for selecting WWNs appears. A list of WWNs that are used as LUN security and not registered for any host is displayed in the dialog box (see Figure 9.4). From the list, select the WWNs you want to register for the host you are adding, and then click the **OK** button.

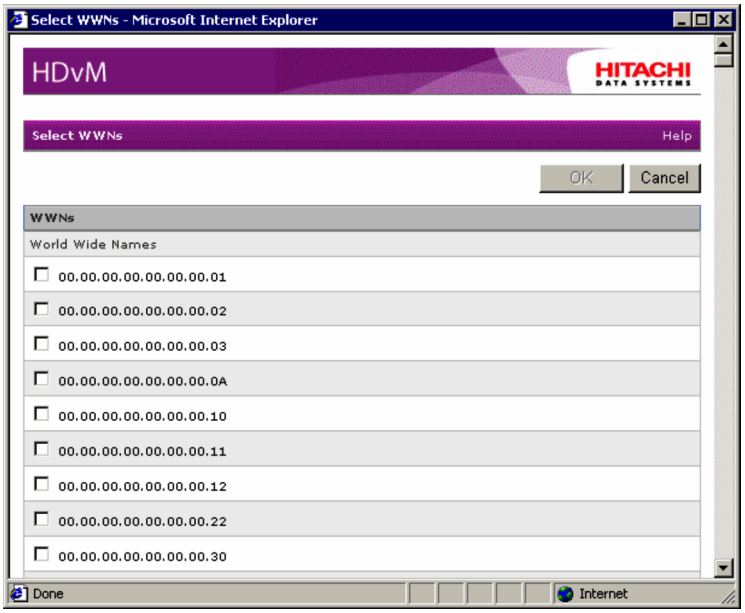


Figure 9.4 Add Host - Select WWNs

If the WWNs you are registering are used as LUN security, the LUN security can be inherited. You do not need to set LUN security again.

5. When you are finished adding WWNs, review the information on the Add Host panel.
6. Select **OK** to add the host or **Cancel** to cancel your request.

9.5 Viewing Host Properties and Volume Information

All Device Manager users can view host properties and the detailed information for the volumes (storage) allocated to each host.

To view the host properties and detailed information for the volumes allocated to that host:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. In the navigation area, select the host for which you want to view information.

   The information for the selected host is displayed in the method area and the information area.

   The method area provides the **Add Storage** (see section 9.7), **Modify Properties** (see section 9.6), and **Remove Host** (see section 9.10).

   The Show Properties - *host-name* subwindow in the information area displays the following properties for the selected host (see Figure 9.5): **Name**, **IP address**, **Capacity** (total capacity of storage (volumes) allocated to the host), **WWNs** assigned to the host, and **Type** (host type).

   Important: If you select an external port displayed under the **External Array Nodes** object tree in the navigation area, the **Remove Host** method and **IP address** are not displayed.

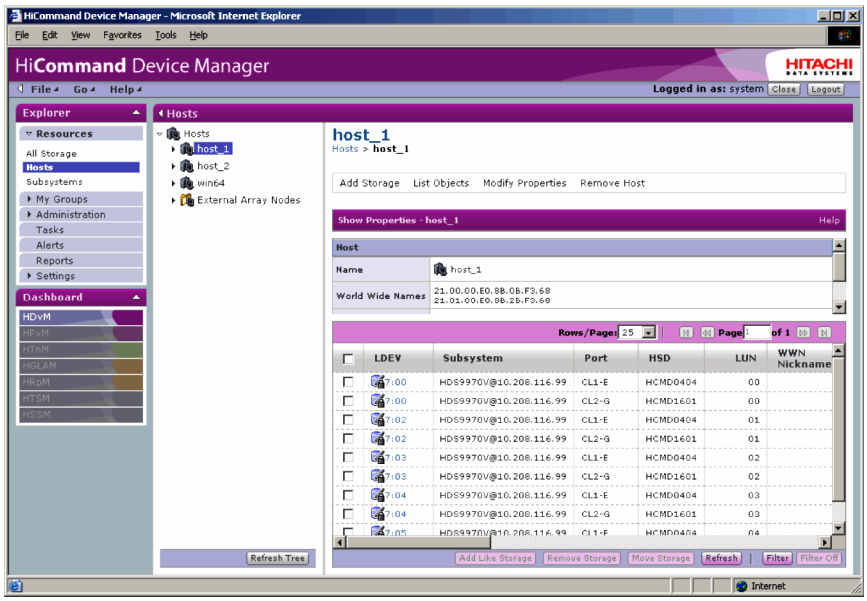


Figure 9.5 Viewing Host Properties

Note: For a host that uses Fibre Channel for the interface of the internal hard disk, the internal interface WWNs are displayed in addition to the WWNs of the host bus adapter used for the external connection.

The Show Properties - *host-name* subwindow displays the following information for the host you selected: **Name**, **IP address**, **Capacity** (total capacity of storage (volumes) allocated to the host), **Type** (host type), and **WWNs** assigned to the host.

You can select the following operations: **Add Like Storage** (see section 9.7), **Remove Storage** (see section 7.6.5), **Move Storage** (see section 7.6.3), **Refresh** (see section 9.8). **Add Like Storage, Remove Storage** and **Move Storage** are displayed when storage (volumes) is allocated to the selected host. **Refresh** is displayed when Device Manager agent (version 2.3 or later) is installed in the selected host.

If storage is allocated to the selected host, the information area lists the volumes that the host can use. The information area lists the volumes accessible to the volume.

Notes:

- For Universal Storage Platform V, a value in the range from 0 to 2047 can be set for a LUN. For TagmaStore USP, a value in the range from 0 to 1023 can be set for a LUN. However, since the range of LUNs that the host can recognize varies depending on the OS, the host might not recognize the LUN set in Universal Storage Platform V or TagmaStore USP.
- When LDEVs of multiple storage subsystems are allocated to the selected host, if you sort the list of volumes by LDEV, the LDEVs will be sorted for each storage subsystem.

The information area also displays buttons for operating copy pairs and starting other applications.

- **If copy pairs are managed together as batches:** The **Replication Management Console** drop-down list shows the hosts that centrally manage copy pairs and meet the requirements. Also, you can manage copy pairs from the information area by using the buttons for operating copy pairs (the **Create Pair**, **Modify Pair**, **Delete Pair**, and **View Pair** buttons).

  Note: The **Create Pair**, **Modify Pair**, and **Delete Pair** buttons do not appear when you have logged in to HiCommand Device Manager as a user with only the View permission.

- **If copy pairs are not managed together as batches:** When the selected host meets the copy pair requirements and you are managing one or more copy pairs, you can manage copy pairs by using the buttons for managing copy pairs (the **Create Pair**, **Modify Pair**, **Delete Pair**, and **View Pair** buttons).

  Note: The **Create Pair**, **Modify Pair**, and **Delete Pair** buttons do not appear when you have logged in to HiCommand Device Manager as a user with only the View permission.

- **If HDLM is installed on the selected host.** When the Device Manager agent and HDLM are installed on the selected host, the information area displays the **Dynamic Link Manager** button for launching HDLM. For details on launching HDLM, see section 4.2 and 5.5.2, and refer to the HDLM user documentation.

Note: To launch HDLM so that it launches displaying a specific volume path, select the desired volume path in the Show Properties - *host-name* subwindow, and then select the **Dynamic Link Manager** button. You can select only one volume path. For details about the selectable volume types, see the part describing the devices that HDLM can manage in the HDLM user documentation.

– **If Protection Manager has been installed on the selected host.** When the Device Manager agent and HDLM are installed on the selected host, the information area displays the Protection Manager button for launching Protection Manager. For details on launching Protection Manager, see section 4.2 and 5.5.3, as well as the documentation for Protection Manager.

Note: If a volume you know is allocated to the selected host does not display on the updated View Host Properties window, it could be because Device Manager agents on more than one host recognize the volume, or because the last updated Device Manager agent is not on the current host. If this is the case, click the link on the LDEV column to open the Detailed Information panel.

3. To view detailed information for a specific volume allocated to the selected host, select the desired LDEV to open the Detailed Information – *LDEV-number* dialog box, as shown in Figure 9.6. For details on the information displayed on this dialog box, see section 7.6.1.

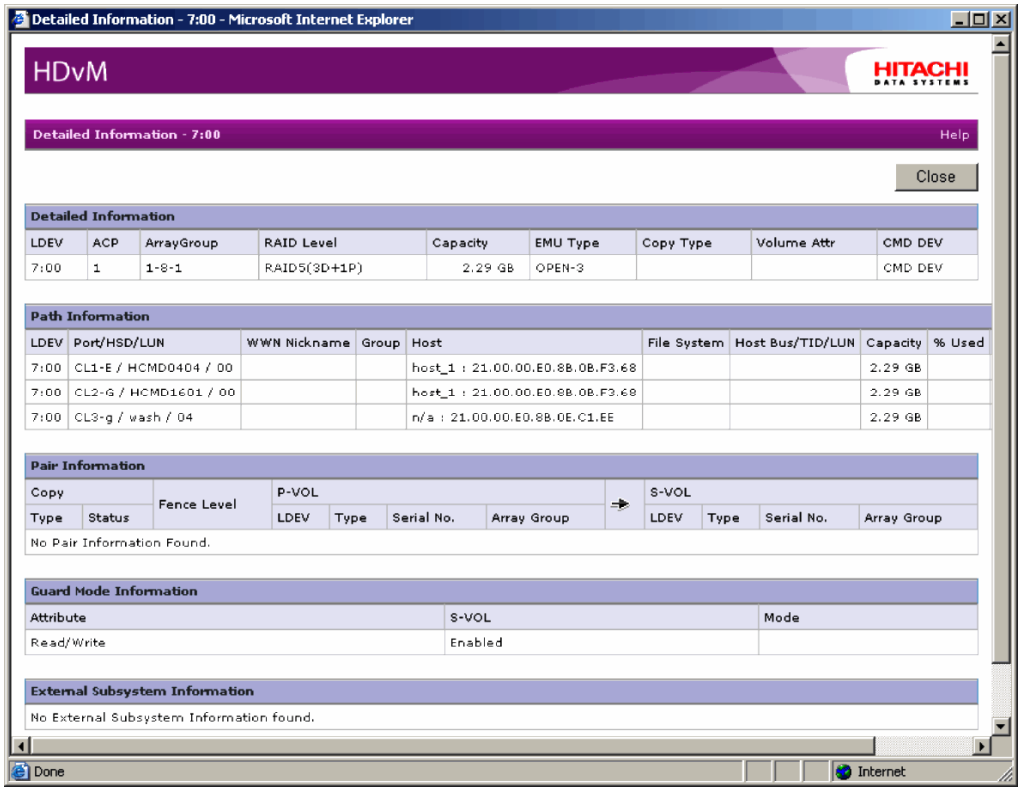


Figure 9.6 Detailed Information – LDEV-Number Panel

9.6 Modifying Host Properties

Users with the Modify permission can modify (edit) the existing host properties as needed.

To modify the properties of a Device Manager host:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. In the navigation area, select the host for which you want to modify (edit) the properties.
3. Select **Modify Properties** in the method area to open the Modify Properties panel for the host you selected, as shown in Figure 9.7.

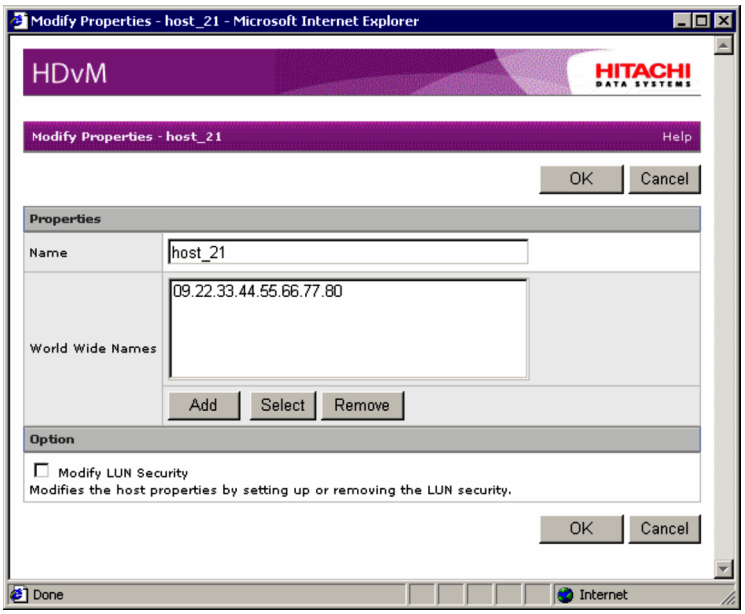


Figure 9.7 Modify Host Properties

4. Modify the host properties as needed on the Modify Properties panel. You cannot remove or register a WWN when an external port is selected.
   - To rename the host, edit the name in the **Name** field. The host name can be a maximum of 50 bytes, and can include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded. Additionally, the host name is not case sensitive. For example, if `HOST1` is already registered, a new host name cannot be `host1`. You can use the following characters:

     `A - Z a - z 0 - 9 - _ . @`

     Note: You cannot use the same host name as that of a mainframe host that is registered to Device Manager. Confirm the name of mainframe hosts by using the Device Manager CLI. For details on how to check a mainframe host name, see the *HiCommand Device Manager Command Line Interface (CLI) User's Guide*.

- To remove WWNs, select the WWNs and then click the **Remove** button. If only one WWN is set for the host, you cannot use the Modify Properties – *host-name* panel to remove the WWN. To remove the last WWN, you must remove the host (see section 9.10). If the WWNs you are removing are used as LUN security, select the **Modify LUN Security** option to clear the LUN security setting of the storage assigned to the host via the WWNs you are removing. If you do not select the option, the WWNs are disassociated from the host, but the LUN security still applies.
- To register WWNs for the host, perform either of the following operations:

  Click the **Add** button. In the displayed dialog box, type the WWN and then click the **OK** button (see Figure 9.3). Repeat this operation for each WWN you want to register.

  When entering a WWN, use the following format. You can omit periods.

  XX.*XX*.*XX*.*XX*.*XX*.*XX*.*XX*.*XX* (*XX*: two hexadecimal digits, 16 digits total)
  (You can omit periods).

  Click the **Select** button. A dialog box for selecting WWNs appears. A list of WWNs that are used as LUN security and not registered for any host is displayed in the dialog box (see Figure 9.4). From the list, select the WWNs you want to register for the host, and then click the **OK** button.

  If the WWNs you are registering are used as LUN security, the LUN security can be inherited. You do not need to set LUN security again.

  If you want to register WWNs for the host to which storage is assigned, select the **Modify LUN Security** option so that LUN security setting of the storage that is assigned to the host can be changed.

5. When you are finished editing the host properties, check the information set in the Modify Properties - *host-name* window. If the entered information is correct, click the **OK** button to save your changes, or click the **Cancel** button to cancel your request to modify the host properties.

   The following shows the windows displayed depending on the properties modified in the Modify Properties - *host-name* window and which options are selected.

   When the **Modify LUN Security** option is selected:

   - When you register a WWN to a host for which storage is assigned

     The Modify Properties - *host-name* dialog box (LUN List) is displayed, and then go to step 6.
   - When a WWN to be deleted is used as a LUN security.

     The Modify Properties - Confirmation dialog box appears. The LUN security used for a WWN that is to be deleted will be released. In the dialog box, a list of storages whose LUN security is to be released is displayed. Next, go to step 7.
   - For other cases

     The Modify Properties - Confirmation dialog box appears. The LUN security for a path assigned to the host will not be changed, and then go to step 7.

– When the **Modify LUN Security** option is not selected

  The Modify Properties - Confirmation dialog box appears. The LUN security for a path assigned to the host will not be changed, and then go to step 7.

6. Confirm the information displayed in the Modify Properties - *host-name* dialog box (LUN List).

   The dialog box lists the storage assigned to the host (see Figure 9.8).

   If necessary, select the check box of the storage for which you want to use the new WWN you are registering as LUN security.

   If you click the **OK** button, the Modify Properties - Confirmation dialog box appears. In this dialog box, a list of storages whose LUN security is to be modified is displayed.

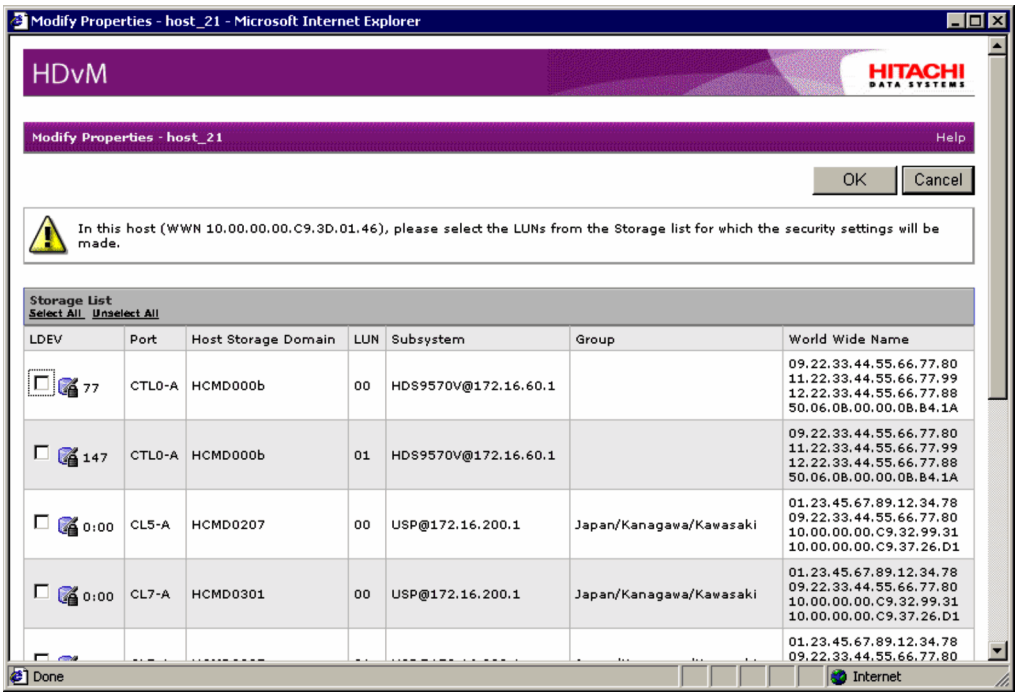


Figure 9.8 Modify Host Properties – Selecting LUN Security Changes

Note for host storage domain: For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V in the LUN Management mode, if you change the LUN security settings for storage in the host storage domain, the change applies to all storage in the same host storage domain. If the storage selected in the Modify Properties - *host-name* dialog box (LUN List) belongs to the host storage domain, a list of the storage that will be affected by the changed LUN security setting is displayed (see Figure 9.9). Click the **OK** button to change the LUN security setting for all affected storage. The Modify Properties - Confirmation dialog box appears, displaying a list of storages whose LUN security is to be modified. Click the **Cancel** button to cancel modification of host properties and return to the Show Properties - *host-name* dialog box.

7. Confirm the information displayed in the Modify Properties - Confirmation dialog box. Click the **OK** button to modify the host properties. Click the **Cancel** button to cancel modification of host properties.

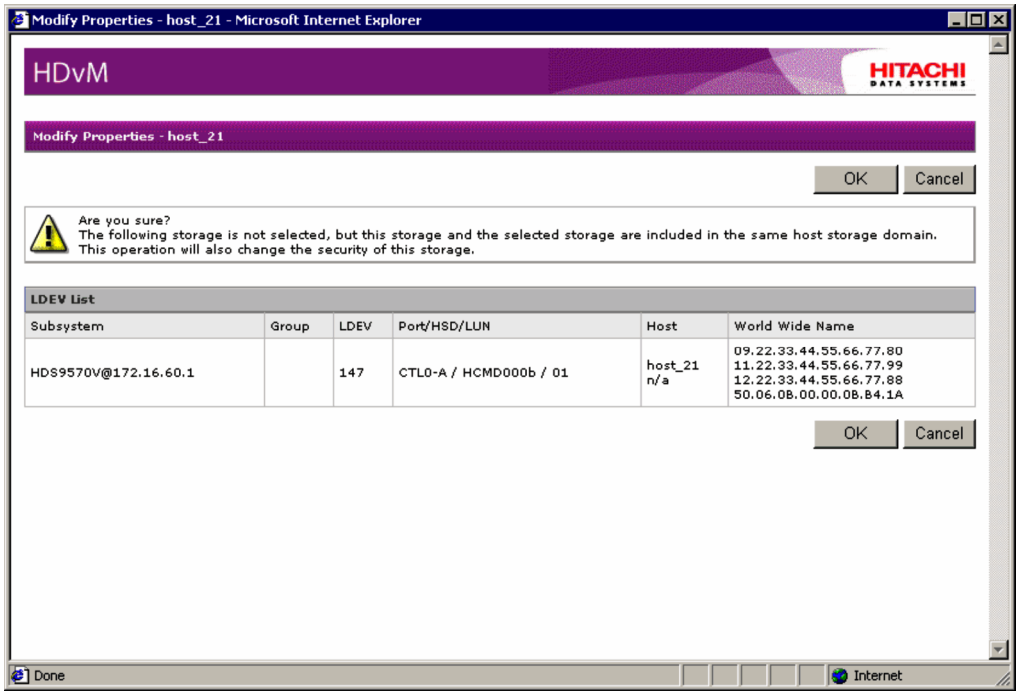


Figure 9.9 Modifying Host Properties - Confirming LUN Security Changes

Note: If you rename the host with the Device Manager agent installed, performing one of the following actions causes both the new name host and old name host to be displayed in the Web client host management window:

- Executing the `HiScan` command
- Restarting the Device Manager agent
- Refreshing the host

Delete the old name host, and then refresh the storage subsystem. If you do not delete the old name host, the information about the volumes managed by that host might be displayed incorrectly or you might not be able to use a copy pair.

9.7 Adding Storage from Host Management

Users with the Modify permission can add storage to a logical group.

To add storage:

1. In the Explorer menu, choose Resources and then Hosts. Then, expand the Hosts object tree in the navigation area.
2. In the navigation area, select a host.
3. Perform either of the following operations:
   - To select a path and logical group to be set for the storage you are adding:

     In the *host-name* subwindow displayed in the method area, execute the **Add Storage** method. A dialog box for selecting a logical group appears (see Figure 9.10).

     In the displayed dialog box, select the logical group to which you want to add the storage, and then click the **OK** button. The Add Storage (STEP: Define Host/Port Connections) dialog box appears and the Add Storage wizard starts.

     For the operations you perform in this dialog box and subsequent tasks, see step 6 onward in section 7.6.2.
   - To set a path for the storage you are adding, with the same port and LUN security as those of the storage assigned to the host, and add the storage to the same logical group:

     In the Show Properties - *host-name* subwindow displayed in the information area, select LDEVs, and then click the **Add Like Storage** button. The Add Storage (STEP: Allocate Storage) dialog box appears, and the Add Storage wizard starts.

     Note: When selecting multiple LDEVs, make sure the selected LDEVs belong to the same logical group.

For the operations you perform in this dialog box and subsequent tasks, see step 8 onward in section 7.6.2.

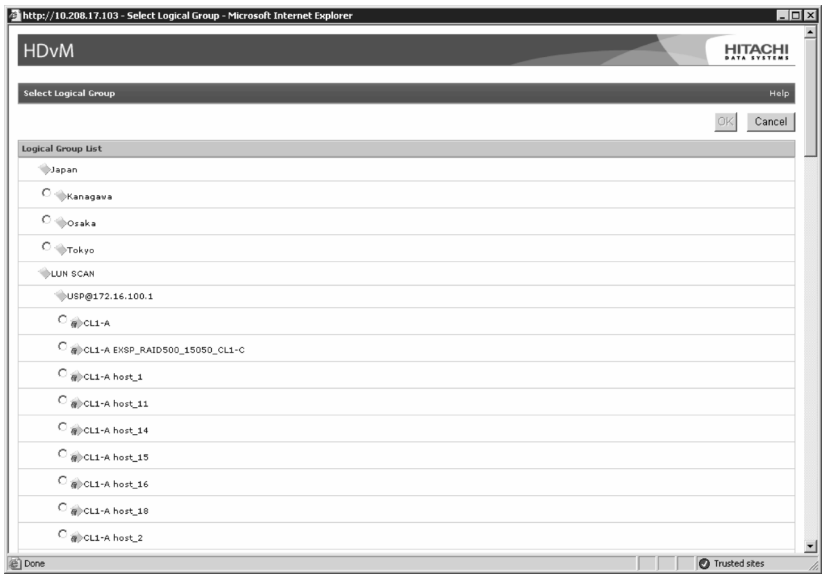


Figure 9.10 Selecting the Logical Group

9.8 Refreshing Host Information

Users with the Modify permission can update the host information reported by the Device Manager agent.

When you update host information, Device Manager updates the information displayed in the **Last Updated**, **% Used**, and **File System** fields for all storage allocated to the selected host. Device Manager also updates the copy status (**Copy Status**) for copy pairs managed by the selected host and paired by ShadowImage, QuickShadow/Copy-on-Write Snapshot, and TrueCopy. For details about the system configuration for displaying information about copy pairs, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

CAUTION: To update host information, Device Manager 2.3 or later must be installed on the host.

To update host information:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. Select the host in the navigation area for which you want to update host information (see Figure 9.11).

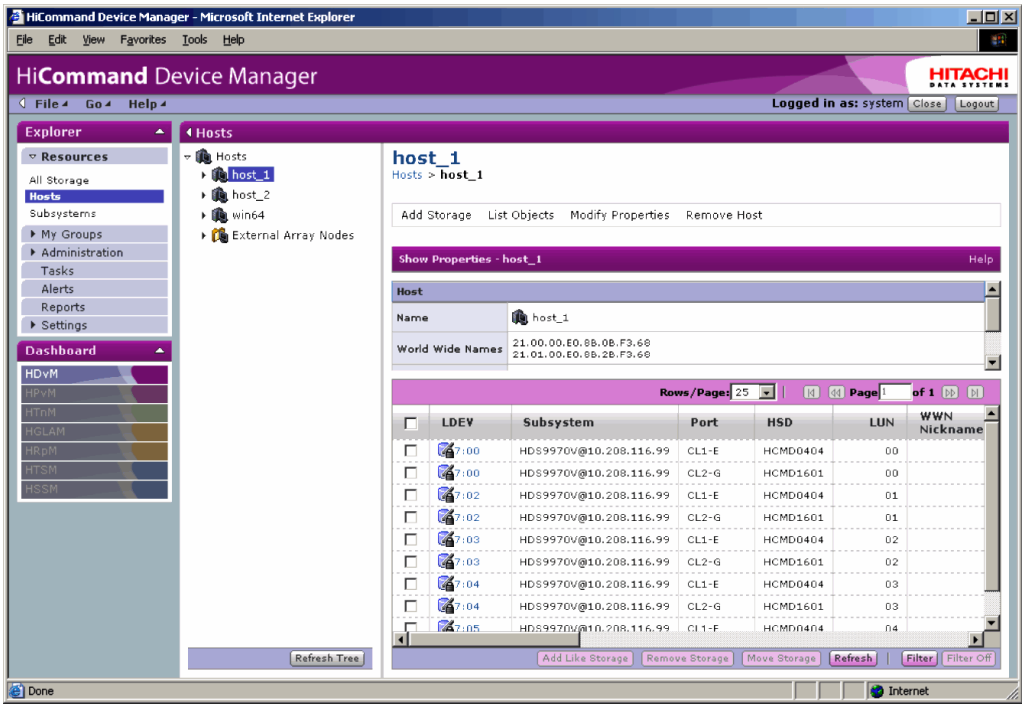


Figure 9.11 Refreshing a Host- Refresh Button

3. Select the **Refresh** button in the Show Properties – *host-name* subwindow in the information area. The Refresh Host - Confirmation panel displays.

   Note: The View Pair Information panel also provides access to the update host information function. To select a host performing batch management of pairs, select the target host from the **Replication Management Console** drop-down list. Then, in the View Pair Information panel, select the **Refresh** button. The Refresh Host - Confirmation panel displays.

4. Check the information in the Refresh Host - Confirmation panel. If the information is correct, select the **OK** button to update the host information, or select **Cancel** to cancel your request to modify the host.

   You are notified when the operation is complete.

CAUTION:

- If a copy pair for ShadowImage or QuickShadow/Copy-on-Write Snapshot for the TagmaStore AMS/WMS series or Thunder 9500V is detected while host information is being updated, the **Copy Type** field for that copy pair is left blank. In this case, you must update the information about the storage subsystem. For details on updating the storage subsystem information, see section 10.5.
- When you update the host information, the status of the copy pairs managed by the host is updated, but the modification of the configuration definition file is not reflected. In this case, you must update the storage subsystem information. For details on updating the storage subsystem information, see section 10.5.

9.9 Managing Copy Pairs

Users with the Modify permission can manage ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot, and Universal Replicator copy pairs.

The copy pair operations include:

- Creating copy pairs (see section 9.9.1)
- Modifying copy pairs (see section 9.9.2)
- Deleting copy pairs (see section 9.9.4)

Notes:

- For details on the host and storage subsystem requirements for managing copy pairs, see the *HiCommand Device Manager Server Installation and Configuration Guide*. For details on requirements of P-VOLs and S-VOLs that make up the copy pairs, see section 4.3.
- When permitting a user (who is assigned to a user-defined resource group) to perform copy pair operations, assign the following to the resource group of that user: A host fulfilling the conditions required for performing copy pair operations, and a command device recognized by that host.

9.9.1 Creating Copy Pairs

WARNING: When the create copy pair operation is performed, the data on the LDEV that will become an S-VOL will be lost. You must back up any data and make sure the LDEV that will become an S-VOL is no longer in use before creating a copy pair.

Users with the Modify permission can create ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot, and Universal Replicator copy pairs.

Note on formatted LDEVs: Make sure that LDEVs are formatted before creating a copy pair. You cannot specify an unformatted LDEV to create a copy pair.

The following methods can be used to check whether the LDEVs are formatted:

- For Universal Storage Platform V or TagmaStore USP in which the capability to create LDEVs separately from the formatting of LDEVs is enabled:

  Use Storage Navigator to make sure that the statuses of the LDEVs to be used are Normal.

- For TagmaStore AMS/WMS series:

  Use Storage Navigator Modular to make sure that the LDEVs to be used have been formatted.

- For Thunder 9500V and Thunder 9200:

  Use Storage Navigator Modular or DAMP to make sure that the LDEVs to be used have been formatted.

- For Universal Storage Platform V or TagmaStore USP in which the capability to create LDEVs separately from the formatting of LDEVs is disabled, Lightning 9900V, and Lightning 9900:

  LDEVs are formatted by default, so no confirmation is required.

Notes:

- Before creating Universal Replicator pairs, you must set the journal volume and journal group, which you can do by using Physical View of Universal Storage Platform V or TagmaStore USP. For details about Physical View, see section Chapter 11.
- Universal Replicator (Resync) is a copy type that is used in the 3DC Multi-Target configuration. You can select this copy type only for TagmaStore USP. In a 3DC Multi-Target configuration, a TrueCopy Sync copy pair and Universal Replicator copy pair that use the same volume for their P-VOL are created. In a 3DC Multi-Target configuration, if you create a new Universal Replicator copy pair whose P-VOL is the existing TrueCopy Sync S-VOL and whose S-VOL is the existing Universal Replicator S-VOL, select Universal Replicator (Resync) for the copy type. When you create a Universal Replicator (Resync) copy pair, the storage subsystem, to which the True Copy Sync P-VOL and Universal Replicator P-VOL in 3DC Multi-Target configuration belong, must also be managed by Device Manager. For details about the 3DC Multi-Target configuration, see the relevant manual for Universal Replicator.

To create one or more copy pairs:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. In the navigation area select the host that contains the P-VOL(s) of the copy pair(s) that you want to create.

   If copy pairs are not managed in a batch management configuration, the selected host will manage copy pairs.

   If copy pairs are managed in a batch management configuration, select a host that will manage copy pairs from **Replication Management Console** in the information area.
3. In the information area, select the check box for each volume that will become the P-VOL of a new copy pair to be created (see Figure 9.12). You can only create pairs of one copy type at one time, so make sure to select P-VOLs for one copy type only.

   You can select a maximum of 100 LDEVs in one operation. If you want to operate more than 100 LDEVs, operate them in multiple operations, selecting no more than 100 LDEVs in each operation.

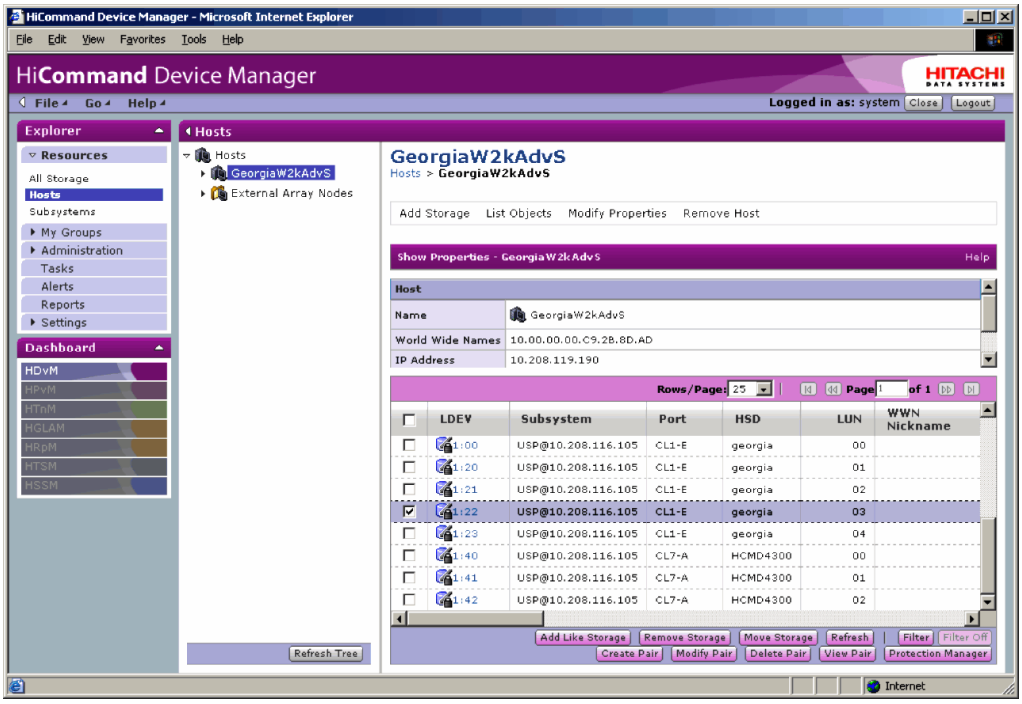


Figure 9.12 Creating a Pair – Selecting P-VOLs

4. Select **Create Pair** to open the Create Pair wizard (see Figure 9.13). If copy pairs are managed in a batch management configuration, select the host that manages copy pairs from the **Replication Management Console** drop-down list, and then select the **Create Pair** button to open the Create Pair wizard.

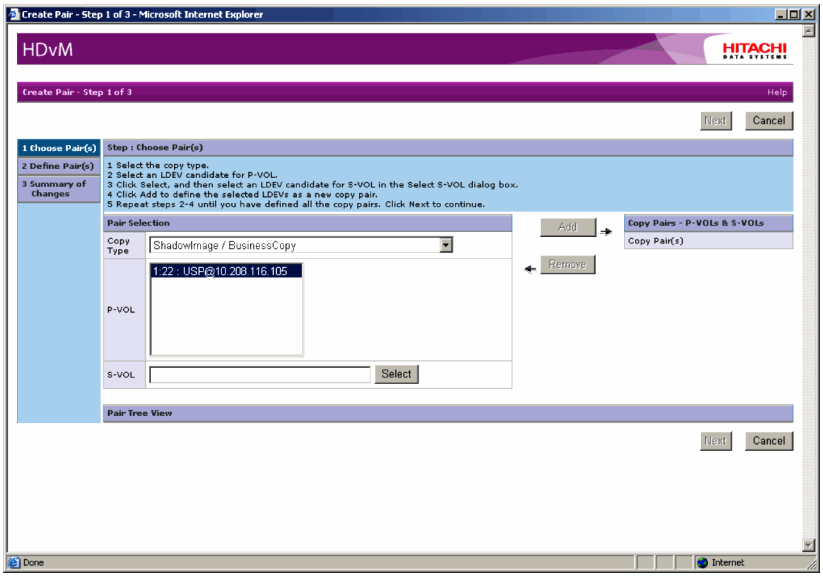


Figure 9.13 Creating a Pair – Choosing Pair(s) Step

If the **Create Pair** button is not enabled, one or more of the copy pair requirements for the selected host and/or P-VOL(s) have not been met (see section 4.3).

5. **Choose Pair(s) Step.** The Choose Pair(s) panel (see Figure 9.13) displays the selected P-VOL(s) in the **P-VOL** box and enables you to choose the desired copy type and S-VOL(s) for the copy pair(s) to be created.

On the Choose Pair(s) panel, choose the copy type and S-VOL for each pair as follows:

a) In the **Copy Type** list box, select the desired copy type for all pairs that you are creating now. The following copy types are displayed: ShadowImage, TrueCopy Sync, TrueCopy Async, TrueCopy Extended Distance, QuickShadow/Copy-on-Write Snapshot, Universal Replicator, or Universal Replicator (Resync). You can select one copy type for pairs to be created at a time. After you have added one pair to the **Copy Pairs** box, the **Copy Type** box will only display the type of that pair.

b) In the **P-VOL** box, select the P-VOL of the pair to be created. Only items that satisfy the selected copy type conditions are displayed in the P-VOL column.

   Note: For the Universal Storage Platform V, TagmaStore USP, Lightning 9900V and Lightning 9900, if you select a ShadowImage-controlled S-VOL to be the P-VOL of a new TrueCopy-controlled volume pair, the status of the ShadowImage-controlled pair must be `Split`.

c) In the **S-VOL** field, select the **Select** button to open the Select S-VOL panel (see Figure 9.14) of the Create Pair wizard.

d) In the **Host (WWN)** list box, select the host for the S-VOL of the pair to be created, and then select the **List LDEV** button. The Host (WWN) list box displays the following hosts.

   - If copy pair management is performed by a batch management configuration:

     Hosts that are not on external ports.

   - If copy pair management is not performed by a batch management configuration:

     Hosts where the Device Manager agent is installed.

     Hosts where CCI is installed.

     Hosts that recognizes a command device for which LUN security is set up.

     Hosts that recognizes the V-VOL that is defined for the selected P-VOL (only when creating a pair of QuickShadow/Copy-on-Write Snapshot).

e) In the **LDEV List** box, select the LDEV that you want to set as the S-VOL for the selected P-VOL, and then select **OK**. The **LDEV List** box displays only the eligible LDEVs.

   Note: When creating a ShadowImage pair in a storage subsystem that is using Virtual Partition Manager, do not select an LDEV that belongs to a different SLPR. If you select such an LDEV, the partition storage administrator can no longer manage the storage subsystem.

   Note: For the TagmaStore AMS/WMS series with microcode version 5 or later, one P-VOL and from 1 to 3 S-VOLs can make up a ShadowImage pair, but only one pair can have a copy status other than **Simplex** or **Split**. Therefore, you can only set one S-VOL for one operation to create a pair. However, when creating a configuration definition file without creating a pair, you can set up no more than three S-VOLs including existing pairs in a single operation.

f) Return to the Choose Pair(s) panel, and make sure that the S-VOL field contains the selected LDEV. Then, choose the **Add** button to add the P-VOL and S-VOL pair. The **Copy Pairs – P-VOLs and S-VOLs** box now displays the pair to be added.

To delete a pair from the **Copy Pairs - P-VOLs and S-VOLs** field, select the check box for the pair that you want to delete, and then select the **Remove** button.

g) Repeat steps a through f until you have selected all the copy pairs to be created, and select **Next**.

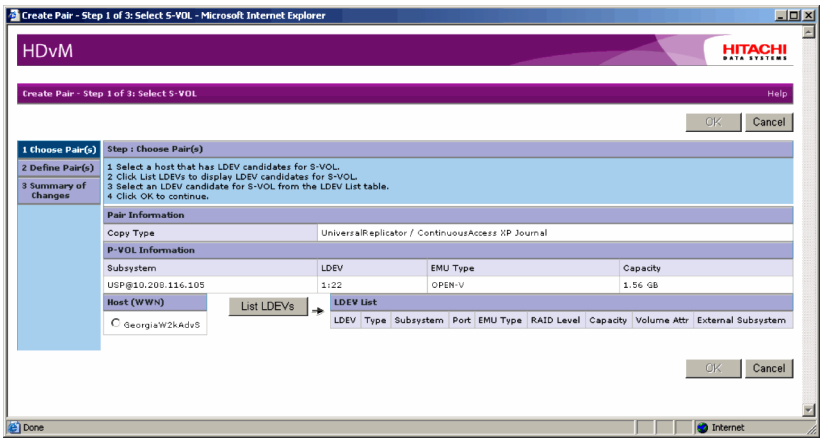


Figure 9.14 Creating a Pair – Selecting S-VOL(s)

6. **Define Pair(s) Step.** In the Define Pair(s) panel (see Figure 9.15), define the parameters for each pair.

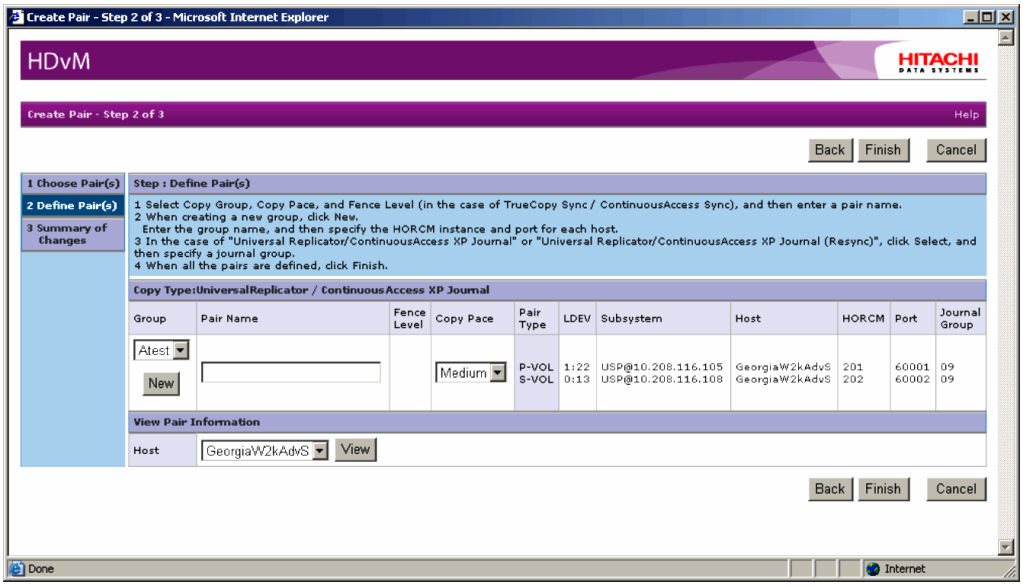


Figure 9.15 Creating a Pair –Defining Pair(s) Step

From **View Pair Information**, you can view the parameters of existing copy pairs. To view the parameters of the existing copy pairs, select a host that is managing copy pairs you want to view from the **Hosts** drop-down list, and then click the **View** button to open a window for viewing copy pair information (see Figure 9.16).

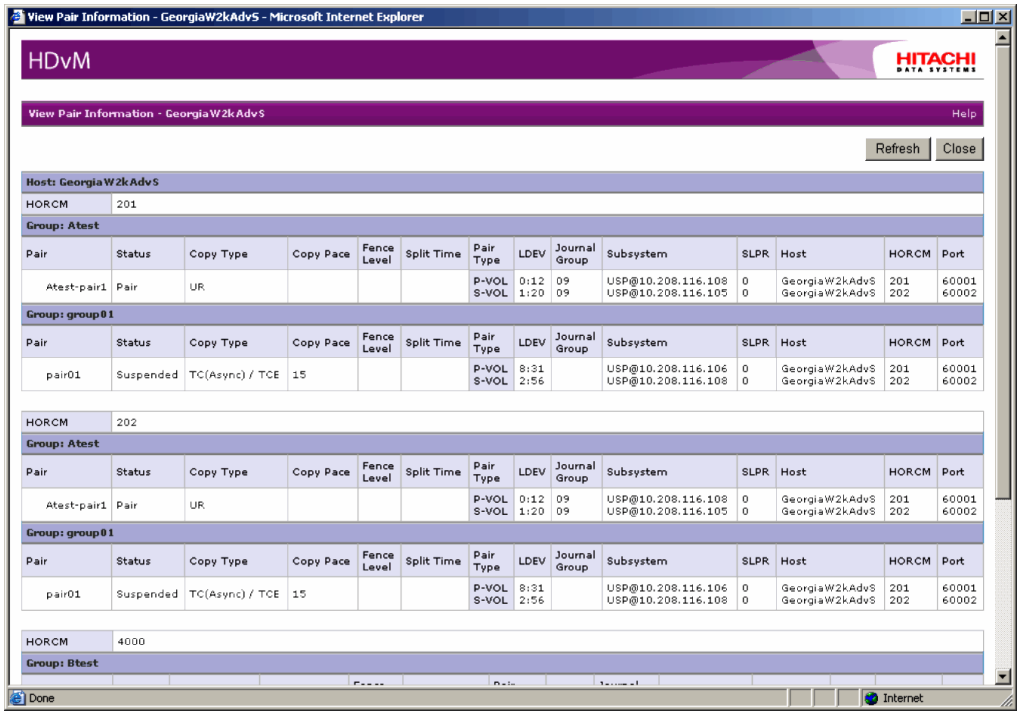


Figure 9.16 Creating a Pair – View Pair Information

On the Define Pair(s) panel, define the parameters for the copy pairs as follows. After defining the parameters for all copy pairs, select **Finish**.

Group. Select the desired copy group for all copy pairs being created, or create a new group if desired. For details on copy groups, refer to the ShadowImage, TrueCopy or Universal Replicator manual for the storage subsystem.

The following combinations of copy pairs cannot be registered to the same copy group or to an existing copy group.

- The LDEVs comprising the copy pair are allocated to different hosts.
- Copy pairs of level 1 and level 2 when using ShadowImage cascade
- Copy pairs of different copy types
- Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900 copy pairs and the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200 copy pairs
- Copy pairs of different fence levels
- Universal Replicator copy pairs registered in different journal groups

To create a new copy group, select **New**, and then use the New Copy Group panel (see Figure 9.17) to specify the group name, P-VOL, S-VOL, CCI (HORCM) instance name for each host, and port number for the new group.

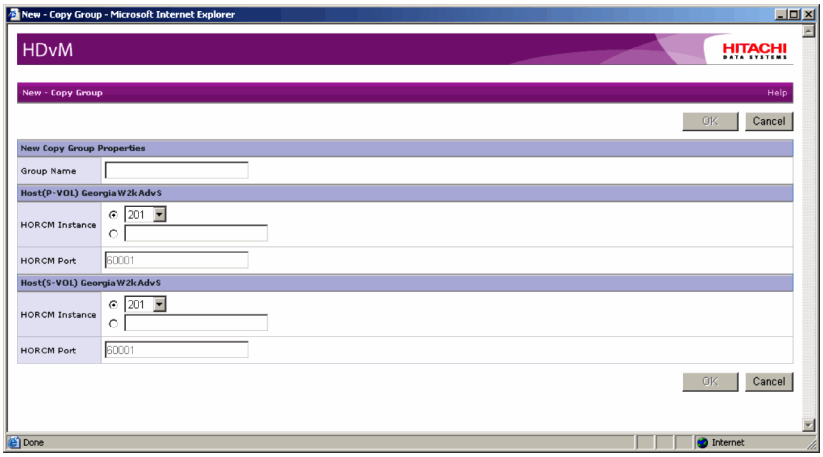


Figure 9.17 Creating a Pair – Defining a New Copy Group

Pair Name. Enter the desired name for the pair. The name must not be longer than 31 characters. You can use the following characters to specify the name:
`A - Z a - z 0 - 9 - _ . @`

If the name is omitted, the following name is automatically set:
HCMD-CP*xxxx* (***xxxx***: hexadecimal)

CAUTION: You cannot use a hyphen (-) at the beginning of the pair name.

Fence Level (TrueCopy Sync only). Select the desired fence level (**Never**, **Data**, or **Status**). For details on fence level, refer to the TrueCopy manual for the storage subsystem.

Copy Pace (ShadowImage, TrueCopy, and Universal Replicator). Select the desired pace for the initial copy operation: `Slower`, `Medium`, or `Faster` for ShadowImage (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900), for TrueCopy (TagmaStore AMS/WMS series), or for Universal Replicator. For cases other than the above, specify the number of tracks to be copied at one time as follows: `1` through `15` for the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900 TrueCopy; `15` for ShadowImage (TagmaStore AMS/WMS series), Thunder 9500V, and Thunder 9200.

CAUTION: For ShadowImage (TagmaStore AMS/WMS series), Thunder 9500V, and Thunder 9200, a warning message appears if you specify a value other than `15`. Contact the system administrator if you want to modify this value.

The faster the copy pace (15 tracks or faster), the shorter the period of time required for copying. However, a fast copy pace may affect the I/O performance of the storage subsystem (only during the initial copy operation).

Journal Group (Universal Replicator only): If you want to register a copy pair to be created into a copy group in which a Universal Replicator copy pair has been registered, for the newly created copy pair, the same journal group number as the number for the already registered copy pair will be displayed. If you want to register the copy pair in a new copy group, you can select the journal group in which you want to register copy pair volumes. After you create a new copy group, the Select button becomes active. Choosing the Select button displays a dialog box for selecting a journal group (see Figure Figure 9.18). From the **Journal Group List (P-VOL)** list, select a journal group in which no P-VOL is registered. If you selected a journal group in which there is no registered P-VOL, select a mirror ID. When you select a journal group in which a P-VOL is to be registered, the sub-journal group candidates of the selected journal group are displayed in the **Journal Group List (S-VOL)** list. Select the journal group in which the S-VOL is to be registered, and then select the **OK** button. The pair definition window reappears.

Note: In one copy group, you can register only Universal Replicator copy pairs that belong to the same journal group. Therefore, when you register multiple copy pairs in the same new copy group, if you select a journal group for one copy pair, that journal group is also set for the other copy pairs.

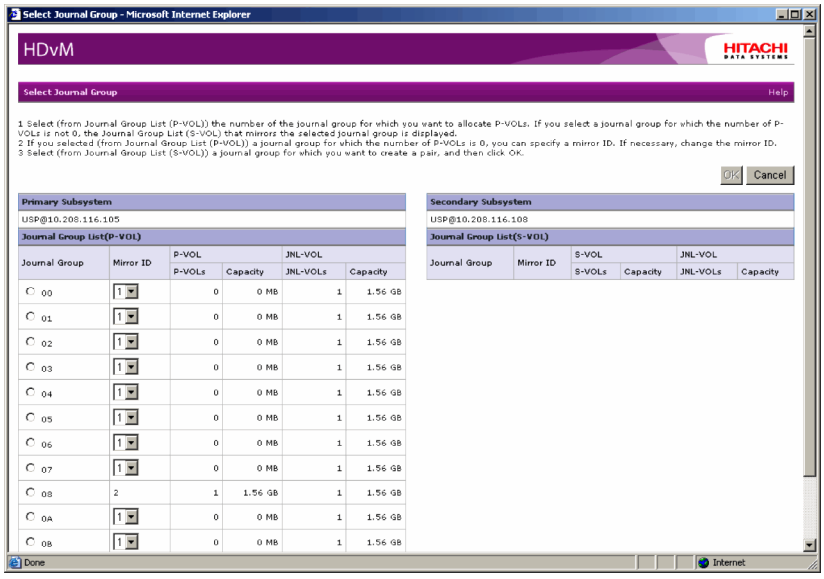


Figure 9.18 Selecting a Journal Group

7. **Summary of Changes Step.** The Summary of Changes panel (see Figure 9.19) displays the requested create pair operation(s) and asks you to confirm the requested operation(s). Review the operation(s) carefully, and select **OK** to confirm the operation(s), or select **Cancel** to cancel your request. If you need to make any changes, select **Back** to return to the previous panel(s). The **Cancel (Output HORCM)** button is displayed when the function used to create configuration definition files is enabled. Select the **Cancel (Output HORCM)** button to create a configuration definition file.

   For details on how to enable the function to create configuration definition files, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

   Note: When creating a ShadowImage pair in the TagmaStore AMS/WMS series with microcode 0750/A or later, if either of the following conditions is met, the **OK** button becomes inactive and pair creation is disabled. To create a configuration definition file, select the **Cancel (Output HORCM)** button.

– Multiple S-VOLs are specified.

– The status of an existing pair sharing the same P-VOL is not **Simplex** or **Split**.

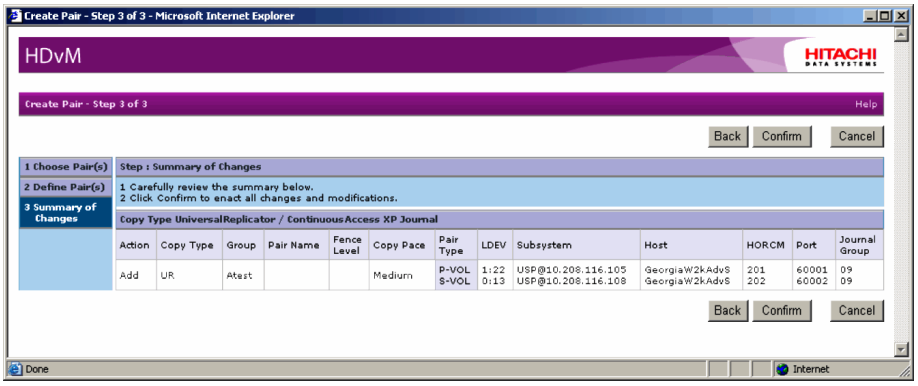


Figure 9.19 Creating a Pair – Confirmation Step

8. Device Manager displays the new S-VOL(s) and warns you that the data on these volumes will be lost (see Figure 9.20). Select **Confirm** to start the requested create pair operation(s), or select **Cancel** to cancel your request to create the pair(s). You are notified when the create copy pair operation(s) is/are complete. Once a copy pair has been created, the initial copy starts. The copy status of P-VOL and S-VOL becomes `Copying` and then changes to `Pair` when the initial copy is complete. Refresh the host to update the copy status to the latest information

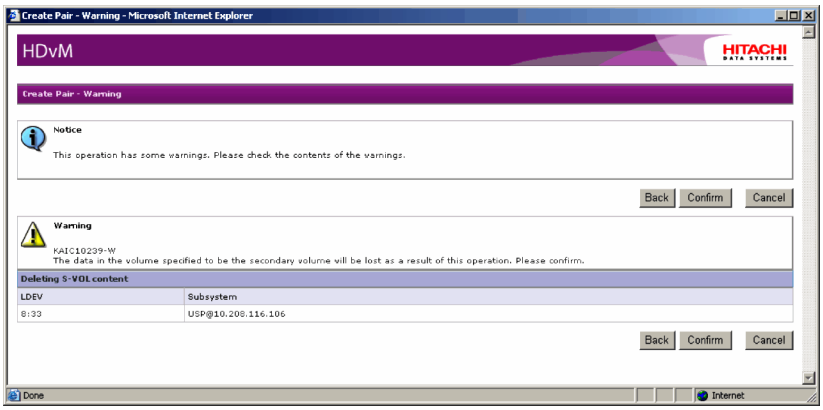


Figure 9.20 Creating a Pair – Warning of Data Loss

Note: The displayed host is the host that manages copy pairs. If pair management is performed by a central management method, the host that manages copy pairs centrally is displayed.

9.9.2 Modifying Copy Pairs

Users with the Modify permission can modify the status of ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot and Universal Replicator copy pairs.

Note: The status of Universal Replicator (Resync) copy pairs cannot be changed.

Table 9.3 shows the operations that you can perform when you modify a copy pair. For resync and restore operations, you can specify the copy pace.

Note: See section 4.3 for important information on copy pair requirements.

Table 9.3 Requirements for Modify Pair Operations

Target of Operation		Operations
Copy group		If one or more copy pairs in the group are in the Suspend or Error In LUSE status: ▪ For TrueCopy and Universal Replicator, select **Resync**. ▪ For ShadowImage, select **Resync** or **Restore**. If all copy pairs in the group are in the Split status: ▪ For TrueCopy and Universal Replicator, select **Resync**. ▪ For ShadowImage and QuickShadow/Copy-on-Write Snapshot, select **Resync** or **Restore**. If all copy pairs in the group are in the Pair, Copying, or Reverse-Copying status, select **Split**. Other than above: ▪ For TrueCopy and Universal Replicator, select **Split** or **Resync**. ▪ For ShadowImage and QuickShadow/Copy-on-Write Snapshot, select **Split**, **Resync**, or **Restore**.
Copy pair	QuickShadow/Copy-on-Write Snapshot P-VOL and TrueCopy cascade pairs (TagmaStore AMS/WMS series, Thunder 9500V)	If the copy pair is in the Pair, Copying, or `Suspended` status, select **Split** or **Resync**. In other cases, select **Split**, **Resync**, or **Restore**.
	Other pairs	If the copy pair is in the `Pair`, `Copying`, or `Reverse-Copying` status, select `Split`. If the copy pair is in the Split or Suspended status: ▪ For TrueCopy and Universal Replicator, select **Resync**. ▪ For ShadowImage and QuickShadow/Copy-on-Write Snapshot, select **Resync** or **Restore**. If the copy pair is in Error In LUSE status (for TrueCopy from Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900), select **Resync**. If the copy pair is in the Pair, Copying, or Reverse-Copying status, select **Split**. Other than above: ▪ For TrueCopy and Universal Replicator, select **Split** or **Resync**. ▪ For ShadowImage and QuickShadow/Copy-on-Write Snapshot, select **Split**, **Resync**, or **Restore**.

CAUTION: When using QuickShadow/Copy-on-Write Snapshot, the **Restore** operation cannot be performed on the copy pair that shares the same P-VOL. The **Restore** operation cannot be selected on the copy group that contains multiple copy pairs that share the same P-VOL.

Note: If you want to change the status of a Universal Storage Platform V, USP/9900V/9900 ShadowImage copy pair whose S-VOL is a TrueCopy P-VOL, the status of the TrueCopy pair must be "Split".

Table 9.4 lists the requirements for performing operations on ShadowImage cascaded pairs (Universal Storage Platform V, USP/9900V/9900 only). The first cascade level is called L1, and the second level is called L2. An example of cascaded pairs for LDEV1, LDEV2, and LDEV 3 is:

LDEV1 and LDEV2 is the pair for L1, and LDEV2 and LDEV3 is the pair for L2. LDEV2 is an S-VOL for L1 and a P-VOL for L2.

Table 9.4 Requirements for Operations on ShadowImage Cascade Pairs

Operation	Required Status
Split operation for L1 pair	L2 pair status must be Pair, Copying, Split, or Suspended.
Split operation for L2 pair	L1 pair status must be Split.
Resync operation for L1 pair	L2 pair status must be Pair, Copying, Split, or Suspended.
Resync operation for L2 pair	L1 pair status must be Pair, Copying, Reverse-Copying, Split, or Suspended.
Restore operation for L1 pair	L2 pair status must be Pair, Copying, Split, or Suspended.
Restore operation for L2 pair	Not allowed.

To modify one or more copy pairs:

1. In the **Explorer** menu, select **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. In the navigation area, select the host that manages the copy pair(s) you want to modify (see Figure 9.21).

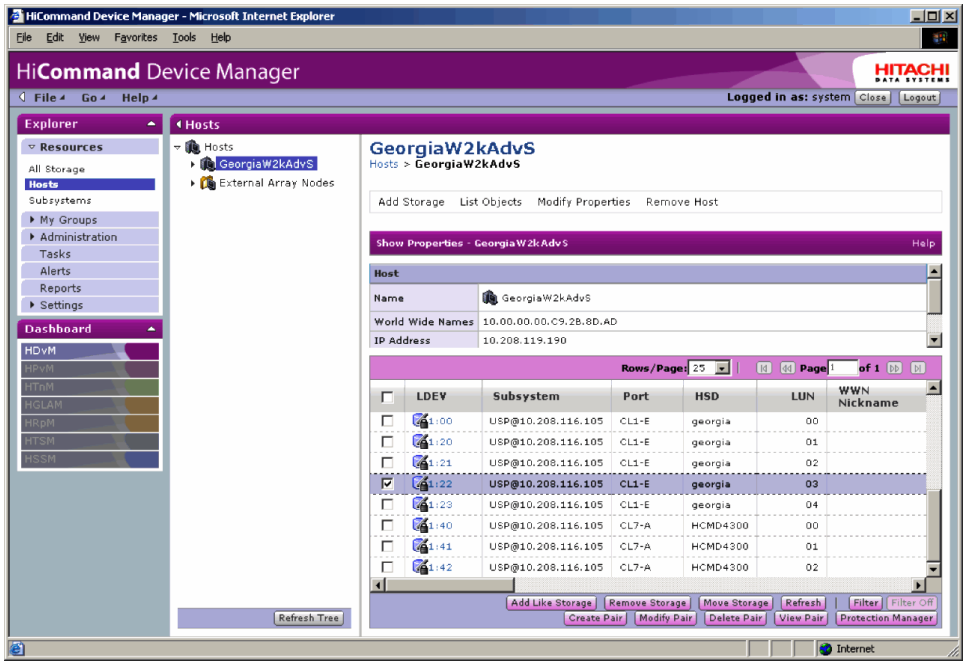


Figure 9.21 Modifying a Pair – Selecting the Host

If the host selected in the navigation area centrally manages copy pairs, in **Replication Management Console** in the information area you can change the host that manages the copy pair that you want to modify.

3. Select **Modify Pair** to open the Modify Pair wizard (see Figure 9.22).

   The window used to select pairs appears.

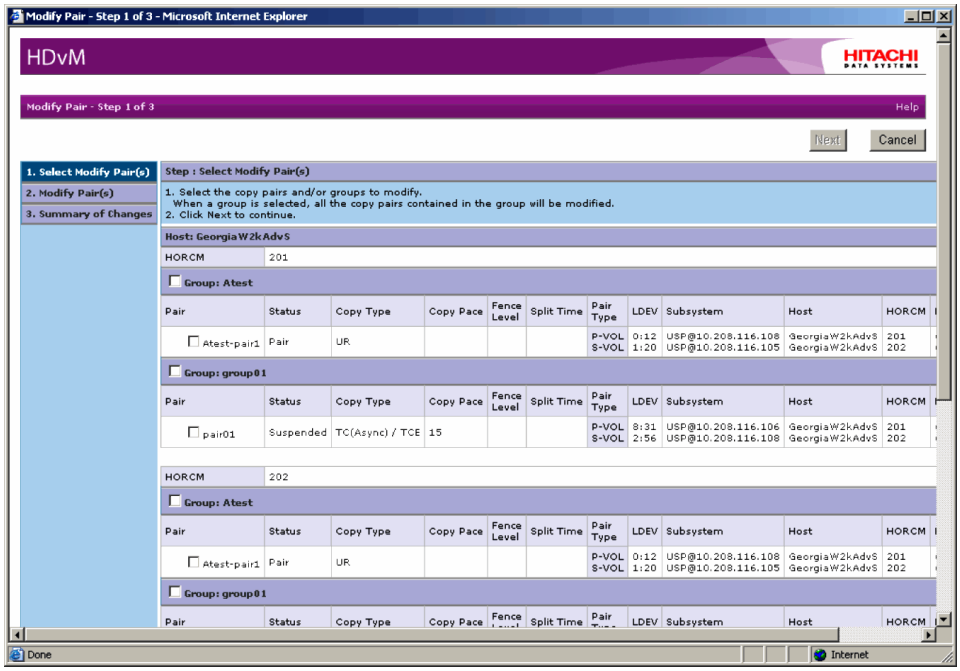


Figure 9.22 Modifying a Pair – Select Modify Pair(s) Step

4. **Select Modify Pair(s) Step.** The Select Modify Pair(s) panel (see Figure 9.22) allows you to select the copy group(s) and/or copy pair(s) for which you want to modify the status. When you are finished selecting copy groups/pairs, select **Next**.

   Note: You can only perform one type of operation at a time (split, resync, or restore), so make sure to select copy groups/pairs for one operation type only.

5. **Modify Pair(s) Step.** The Modify Pair(s) panel (see Figure 9.23) allows you to select the desired **Operation** (split, resync, or restore) and **Copy Pace** for the selected copy group(s)/pair(s). When you are finished selecting the operation and copy pace for the pair(s), select **Finish**.

   Operation: Select **Split**, **Resync**, or **Restore**. For requirements for performing the Split, Resync, and Restore operations, see Table 9.3. For requirements on performing Split, Resync, and Restore operations for ShadowImage cascade pairs, see Table 9.4.

   Copy Pace: Instead of the displayed current value for the copy pace, select the changed value: `Slower`, `Medium`, or `Faster` for ShadowImage (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900), for TrueCopy (TagmaStore AMS/WMS series), and for Universal Replicator; `1` through `15` for other storage subsystems.

   You cannot change the value for the copy pace if:

   – `Split` is selected from **Operations** for TrueCopy or Universal Replicator.

   – A setting other than `Restore` is selected from **Operations** for QuickShadow/Copy-on-Write Snapshot.

   CAUTION: For ShadowImage (TagmaStore AMS/WMS series), Thunder 9500V, and Thunder 9200, specify `15` for **Copy Pace**. Specifying a value other than 15 causes a warning message to display. Contact the system administrator if you want to modify this value.

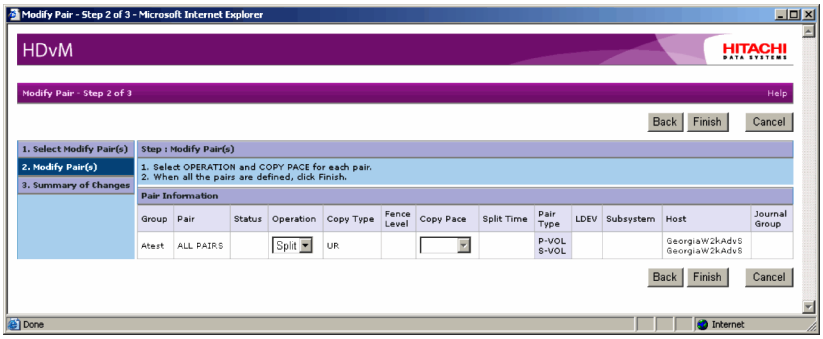


Figure 9.23 Modifying Pair(s) Step

Notes:

- If you want to change the status of a Universal Storage Platform V, USP/9900V/9900 ShadowImage copy pair whose S-VOL is a P-VOL for TrueCopy, the status of the TrueCopy pair must be Split.

- The Copy Pace value does not appear for a copy pair that was created using other management tools (such as Storage Navigator or SVP) or that was created by another Device Manager server. If you used another management tool to modify the Copy Pace, the modified value will not be applied and the value set by Device Manager will be displayed. Therefore, use Device Manager to modify the Copy Pace of a copy pair managed by Device Manager.

6. **Summary of Changes Step.** The Summary of Changes panel (see Figure 9.24) displays the requested modify pair operation(s) and asks you to confirm the operation(s). If you selected a copy group, **ALL PAIRS** displays for **Pair**.

   Review the operation(s) carefully, and select **Confirm** to confirm the operation(s), or select **Cancel** to cancel your request. If you need to make any changes, select **Back** to return to the previous panel(s).

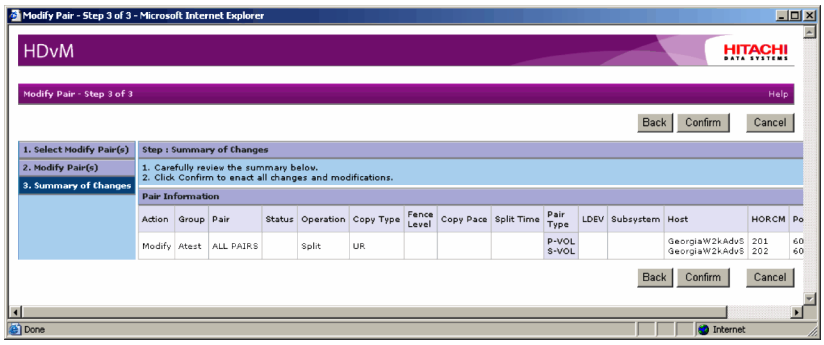


Figure 9.24 Modifying a Pair – Summary of Changes Step

7. If you selected the split operation, Device Manager warns you that the data on the S-VOL may not be complete if you split a pair during I/O processing on the P-VOL (see Figure 9.25). Read the warning carefully, and select **OK** if there is no problem, or select **Cancel** to cancel your request to split the pair(s). You are notified when the modify copy pair operation is complete.

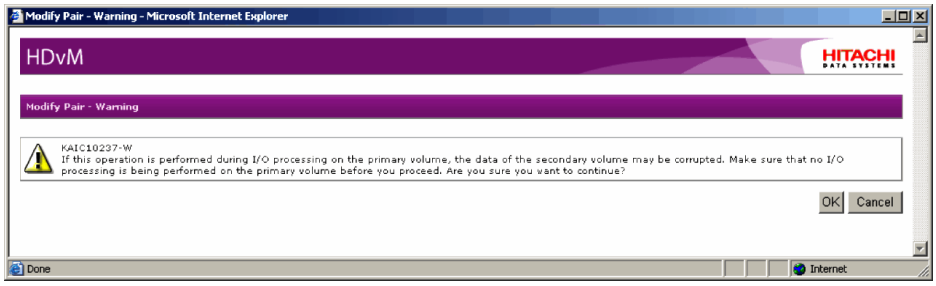


Figure 9.25 Modifying a Pair – Warning of I/O Activity on P-VOL

Note: The displayed host is the host that manages copy pairs. If pair management is performed by a central management method, the host that manages copy pairs centrally is displayed.

9.9.3 Notes on Copy Pair Operations

Table 9.5 lists items to consider before creating copy pairs.

Table 9.5 Items to Consider Before Creating Copy Pairs

Item	Description
Existing copy pair	A copy pair can be created by using Remote Console, Storage Navigator, or SVP. However, no HORCM configuration file is created for CCI control for copy pairs created by the above management tools. Therefore, the status of the copy pair cannot be changed or deleted by using the Device Manager server. To change or delete the status of a copy pair by using the Device Manager server, delete the copy pair by using the appropriate management tool, and then create the copy pair again by using the Device Manager server.
HORCM configuration file (horcm.conf)	Store the configuration definition file for CCI in the location predefined by each OS. For details on the storage location of the configuration definition file, see the *HiCommand Device Manager Agent Installation Guide*. It might take some time to add a storage subsystem or refresh operations when both of the following conditions are satisfied: ▪ Device Manager agent and CCI are installed on a host that the Device Manager server recognizes. ▪ There is an unused HORCM configuration file on the host, or a lot of unused copy pairs are defined in the HORCM configuration file. In such a case, disable the unused HORCM configuration file or the unused copy pair definitions in the HORCM configuration file, by using the following methods: ▪ Disabling an unnecessary HORCM configuration file Set the instance number of the unused HORCM configuration file to the Device Manager agent's property server.agent.rm.exclusion.instance, stop Device Manager agent, and then restart Device Manager agent. ▪ Disabling an unused copy pair definitions in the HORCM configuration file Delete the unused copy pair definition in the HORCM configuration file, or make the definition a comment line.
Central management method	When a single host centrally manages the creation, status change, and deletion of copy pairs, disable the command device security functions on the host that manages the copy pairs. If command device security is enabled, an LU not recognized by the host cannot be managed by the copy pair.
HRX intermediate volume	Copy pair information cannot be acquired when the same port is assigned to an open-system volume and an HRX intermediate volume. If the storage subsystem using the copy pair capability is using an HRX intermediate volume, prepare a dedicated port for the HRX intermediate volume in order to separate the port for the open-system volume.

Table 9.6 provides notes on copy pair operations.

Table 9.6 Notes on Copy Pair Operations

Item	Description
Creating copy pair	When a ShadowImage and TrueCopy copy pair is created for one LU, or when a ShadowImage cascaded copy pair is defined, use different combinations of group names and pair names for each copy pair. When creating a new copy pair, make sure that the pair definition for that LU has not already been defined. If there is an invalid pair definition, delete the corresponding copy pair definition from the HORCM configuration file as necessary.
Creating or changing a copy pair of the TagmaStore AMS/WMS series where Power Saving is enabled	When creating a copy pair, specify an LU that belongs to an array group in the SpinUp status. In addition, when changing a copy pair, if you select an LU that belongs to an array group in the SpinDown status, the copy pair change might fail. Before creating or changing a copy pair, make sure that the array group to which the target LU belongs is in the SpinUp status, and then execute the operation. To check the array group status or to change the array group to the SpinUp status, use Storage Navigator Modular.
Displaying a copy pace	The copy pace value is not displayed for copy pairs created by other management tools such as Storage Navigator and SVP, or copy pairs created by another HiCommand Device Manager server. Also, if you used another management tool to modify the Copy Pace, the modified value will not be applied and the value set by Device Manager will be displayed. Therefore, use Device Manager to modify the Copy Pace of a copy pair managed by Device Manager.
Cascaded copy pair	When using Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, the conditions listed in Table 9.4 must be satisfied to operate the cascaded copy pair.
LDEV with multiple paths assigned	When a copy pair is created using an LDEV with multiple paths assigned, the Device Manager server automatically determines the port for the copy pair volume specified in the HORCM configuration file. Device Manager server selects the ports in ascending alphabetical order of their names. For example, when the LDEV where the paths via CL1-A and CL2-A are assigned is selected to create a copy pair, CL1-A is specified as the HORCM configuration file. If the path via CL1-A is deleted, this copy pair will become inoperable. In such a case, the HORCM configuration file must be edited directly.

Item	Description
Error code 7774	Error code 7774 occurs when Device Manager agent fails to create a HORCM configuration file, start the HORCM instance, or execute the pair creation or status change command. In this case, the error messages output by the Web client and their causes are as follows: This Config File could not be modified. Cause 1: The HORCM configuration file could not be created because Device Manager agent could not recognize the LU specified for the copy pair. Action 1: Update the database by refreshing the storage subsystem or the host. Cause 2: The HORCM configuration file could not be created because Device Manager agent could not recognize the command device. Action 2: Assign the command device to the host that is running Device Manager agent, and then secure the required disk space by deleting the host. This HORCM instance could not be started (see ***Note*** 1). Detailed message: starting HORCM inst instance-number. HORCM inst instance-number has failed to start. Cause 1: The specified instance port-number is being used by another application. Action 1: Check the usage status of the port numbers by executing the netstat command, and then specify an unused port number. Cause 2: Disk space is insufficient. Each instance requires about 100 KB of free disk space. Action 2: Check the free disk space, and then make more free disk space by deleting any unnecessary files. Could not create pair *copy-group-name*:*pair-name* (see ***Note*** 2). Detailed message: paircreate: [EX_CMDIOE] Control command I/O error Refer to the command log (/HORCM/log123/horcc_japan.log) for details. Cause 1: The maximum number of copy pairs that can be created on the device has been reached. For details on the maximum number of copy pairs, refer to the manual for copy pairs for the storage subsystem. Action 1: Delete any unnecessary copy pairs. Check the number of copy pairs by using SVP or Storage Navigator. Cause 2: When using TrueCopy, the remote path was blocked. Action 2: Check the remote path status using SVP, Storage Navigator, or the storage subsystem management tool, and then release the blockage. The ConfigFile of this instance number does not exist. Cause 1: An inconsistency occurred between the host status and the database of the Device Manager server. Action 1: Update the database by refreshing the storage subsystem and executing the `HiScan` command on the target host. If the same error still occurs, restart Device Manager agent.
`HiScan` command	When the `HiScan` command is executed on a host that recognizes an LU the Device Manager server is using to create or delete a copy pair, the pair status displayed in the Web client might be incorrect. In such a case, refresh the storage subsystem from the Web client. However, the copy pace display is not restored. If the copy pace display is needed, reset the copy pace by changing the copy pair status.

Item	Description
Updating information for a host that manages copy pairs centrally	The copy status of a copy pair created using a host that is not the host centrally managing copy pairs is not updated, even though the host information is updated, if the host centrally managing copy pairs does not recognize the copy pair volumes. In this case, refresh the storage subsystem that has the copy pair volume for which you want to change the copy status.
Configuration definition file (`horcm.conf`)	■ For the cases listed below, refresh the storage subsystem to which the copy pair volume coded in the configuration definition file belongs. When the storage subsystem is refreshed, the contents of the configuration definition file are applied to Device Manager. - When the contents of a CCI configuration definition file, which was created by Device Manager, were changed - When you want to apply the contents of a CCI configuration definition file, which was not created by Device Manager, to Device Manager ■ If you want to apply, to Device Manager, the contents of a CCI configuration definition file that was not created by Device Manager, specify the `HORCM_CMD` parameter in the configuration definition file. For details on the syntax of the parameter, see the *HiCommand Device Manager Agent Installation Guide* (see ***Note*** 3).

Notes:

1: An error might occur when attempting to create a copy pair by using an LU that satisfies the following conditions:

- The LU is assigned to the CL1-A port (for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900), the CTL0-A port (for the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200), or LUN0.
- The host used for creating the copy pair recognizes the above path. In such a case, either assign a different port to the LU or assign a LUN other than LUN0, and then re-create the copy pair.

2: The [EX_xxxxx] displayed in the detailed message is a CCI error message. If the situation does not improve, even after performing the above operations, contact the Support Center.

3: You can also use the property file for the Device Manager agent to apply the contents of the configuration definition file to Device Manager. When you use the property file for the Device Manager agent to specify this setting, the specified configuration definition file will be optimized. For details about optimizing the configuration definition file, see the *HiCommand Device Manager Agent Installation Guide*.

Table 9.7 provides notes on managing the host.

Table 9.7 Notes on Managing the Host

Item	Description
Shutting down the host or stopping Device Manager agent	When operating a copy pair, shutting down the host that recognizes that copy pair, or stopping Device Manager agent, will cause the copy pair operation to time out within 15 minutes. Make sure that the host or Device Manager agent restarts, and then perform the copy pair operation again.
HORCM instance	The HORCM instance that was started by Device Manager agent in Windows cannot be fully operated, including finishing. To avoid this, the Device Manager agent `HBsA Service` permissions must be changed from local system to administrator. When you want to operate the HORCM instance, change the HBsA Service permissions as shown above.
Changing the host's IP address or host name	If a copy pair is created when ipaddress is specified for server.horcmconfigfile.hostname in the server.properties file, changing the host's IP address will make the copy pair inoperable. If a copy pair is created when hostname is specified for server.horcmconfigfile.hostname in the server.properties file, changing the host name will make the copy pair inoperable. In such a case, refresh the storage subsystem by following this procedure: ▪ Modify the configuration definition file on the applicable host ▪ Restart the Device Manager agent on the applicable host ▪ Modify the HORCM configuration file on the host of the copy pair source against the applicable host of the copy pair destination.
AIX host	For AIX hosts, the operating system stores disk management information on the volume. Therefore, when P-VOL and S-VOL are assigned to the same host, the disk management information stored on the volume is copied from P-VOL to S-VOL, and the operating system might not be able to recognize the volume as normal. In such a case, execute the recreatevg command to re-create the volume group. When using Hitachi Dynamic Link Manager, execute the dlmrecreatevg command to re-create the volume group. For details on these commands, refer to the AIX system documentation or the Hitachi Dynamic Link Manager (AIX) manual.
Refreshing the storage subsystem	Performing discovery or refresh operations for the storage subsystem will update information about the HORCM configuration file and information about copy pairs recognized by each host. If the system cannot communicate normally with the host during the operation, the information about the copy pair recognized by that host and information about the HORCM configuration file might be lost. In such a case, the **Modify Pair** button in the host management window is not displayed and the information about the copy pair recognized by the host is not displayed. Check the host status, perform any necessary operations, and then refresh the storage subsystem.
Buttons for copy pair capability are not displayed	If the buttons for copy pair capability (such as the Create Pair button) are not displayed, perform the following operations: 1. Note that CCI must be installed on the host managed by Device Manager. 2. Verify that the host recognizes the command device. 3. Verify that the host recognizes the LDEV that the host can manage as a pair. 4. Verify that the command device is not mounted. 5. Restart the Device Manager agent. 6. Refresh the storage subsystem.

Item	Description
TrueCopy fence level information for the TagmaStore AMS/WMS series	When a TrueCopy copy pair for the TagmaStore AMS/WMS series is created with a product other than Device Manager, fence level information is not displayed even when you add or refresh a storage subsystem. In this case, refresh the host.

9.9.4 Deleting Copy Pairs

Users with the Modify permission can delete ShadowImage, TrueCopy, QuickShadow/Copy-on-Write Snapshot and Universal Replicator copy pairs. When a copy pair is deleted, the P-VOL and S-VOL are changed to Simplex status, and the storage subsystem stops replicating the P-VOL updates on the S-VOL.

Note: See section 4.3 for important information on copy pair requirements.

To delete one or more copy pairs:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area.
2. In the navigation area select the host that manages the copy pair(s) that you want to delete (see Figure 9.21).

   If the host selected in the navigation area centrally manages copy pairs, in **Replication Management Console** you can change the host that manages the copy pairs that you want to delete.
3. Select the **Delete Pair** button to open the Delete Pair wizard (see Figure 9.26).

   The window used to select pairs appears.

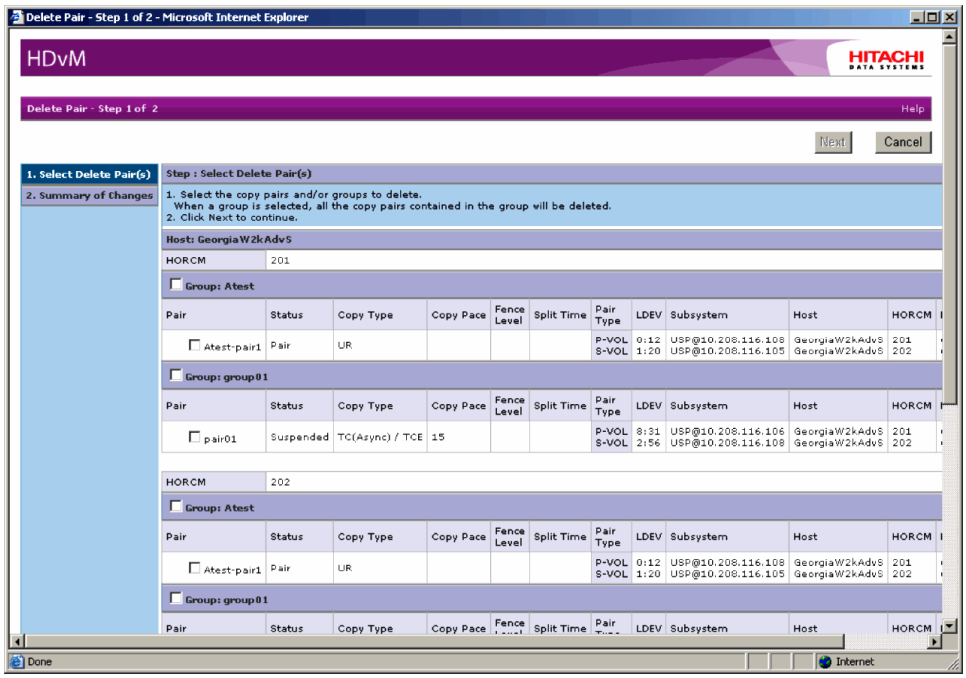


Figure 9.26 Deleting a Pair – Select Delete Pair(s) Step

4. **Select Delete Pair(s) Step.** The Select Delete Pair(s) panel (see Figure 9.26) enables you to select the copy group(s) and/or copy pair(s) that you want to delete. When you are finished selecting groups/pairs, select **Next**.

5. **Summary of Changes Step.** The Summary of Changes panel (see Figure 9.27) displays the requested delete pair operation(s) and asks you to confirm the operation(s). If you selected a copy group, **ALL PAIRS** displays for **Pair**.

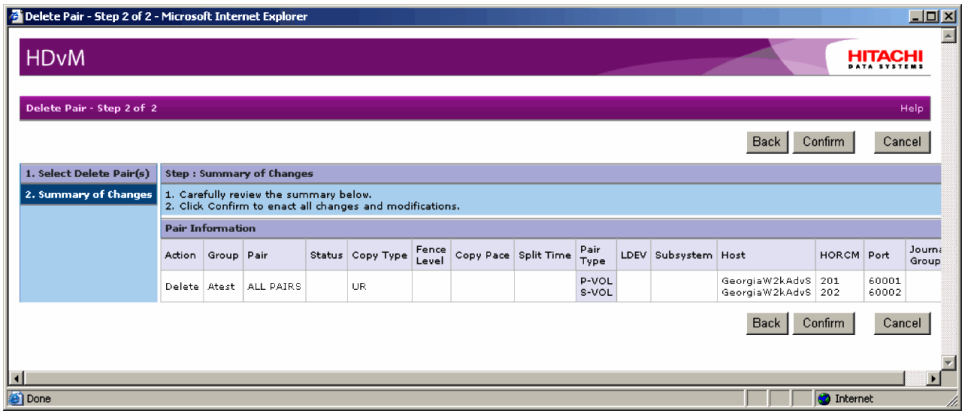


Figure 9.27 Delete Pair Confirmation (Summary of Changes Step)

Review the operation(s) carefully, and select **Confirm** to confirm the operation(s), or select **Cancel** to cancel your request. If you need to make any changes, select **Back** to return to the previous panel(s).

6. Device Manager warns you that the data on the S-VOL may not be complete if you delete a pair during I/O processing on the P-VOL. Read the warning carefully, and select **OK** if there is no problem, or select **Cancel** to cancel your request to delete the pair(s).

   You are notified when the delete copy pair operation(s) is/are complete.

Notes:

- The displayed host is the host that manages copy pairs. If pair management is performed by a central management method, the host that manages copy pairs centrally is displayed.
- The displayed host is the host that manages copy pairs. If pair management is performed by a central management method, the host that manages copy pairs centrally is displayed.

9.10 Removing a Host

Users with the Modify permission can remove an existing HiCommand Device Manager host. Note that you cannot delete the external port.

You can remove multiple hosts together in one operation as required, or you can check the host properties before removing a host from the system.

9.10.1 Removing Multiple Hosts in One Operation

In one operation, remove multiple hosts registered with Device Manager. If a target host's WWN is used as LUN security, removing the host will not clear the LUN security; and any storage path set in the WWN remains.

To remove multiple hosts from Device Manager in one operation:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, choose the **Hosts** object in the navigation area.
2. In the sortable table, select the check box es of the hosts you want to remove, and then click the **Remove Hosts** button in the information area.

   You can remove a maximum of 40 hosts in one operation.
3. A dialog box for confirming that you want to remove the hosts is displayed. Check the hosts listed in the sortable table, and then click the **OK** button to remove them. To cancel removal of the hosts, click the **Cancel** button.

   You are notified when the operation is complete.

9.10.2 Removing Hosts Individually

Remove hosts registered with Device Manager individually. You can check the host properties before removing each host. You can specify whether to clear the LUN security if a WWN of the target host is used as LUN security.

To remove individual hosts from Device Manager:

1. In the **Explorer** menu, choose **Resources** and then **Hosts**. Then, expand the **Hosts** object tree in the navigation area (see Figure 9.1).
2. In the navigation area, select a host name to remove. The Show Properties - *host-name* subwindow appears in the information area. To remove the selected host, execute the **Remove Host** method in the method area.

3. A dialog box confirms your removal of the host (see Figure 9.28). If a WWN of the host you are removing is used as LUN security, a list of the storage subsystems that have LUN security is displayed.
4. To remove the host and clear the set LUN security, select **Remove LUN Security**.

   If you do not select this option, the host will be removed, but the LUN security will persist.
5. Click the **OK** button to remove the host. To cancel removal, click the **Cancel** button.

   You are notified when the operation is complete.

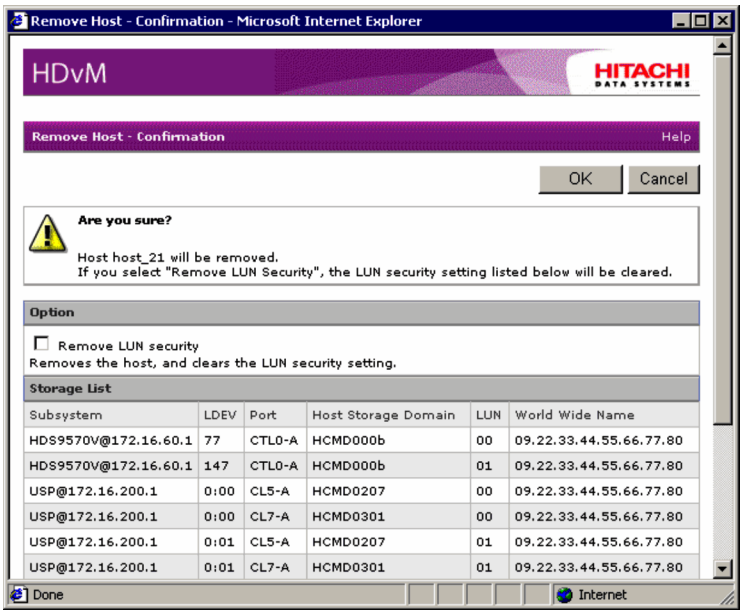


Figure 9.28 Remove Host Confirmation

9.11 Processing When Replacing Host Bus Adapters

This section describes how to apply host WWN information to Device Manager when you replace the host bus adapter of a host managed by Device Manager.

To apply WWN information:

1. Add a WWN for the new host bus adapter you are installing. (For details on how to add the WWN, see section 9.6.)
2. Stop the host and physically replace the host bus adapter.
3. Start the host. The host can access the LUN associated with the host via the new host bus adapter.
4. Delete the WWN for the host bus adapter you removed. (For details on how to remove the WWN, see section 9.6.) The new WWN is set for LUN security associated with the host.

Chapter 10 Managing Storage Subsystems

This chapter describes HiCommand Device Manager storage subsystem operations in the following sections:

- Overview (see section 10.1)
- Viewing the list of storage subsystems (see 10.2)
- Adding a storage subsystem (see section 10.3)
- Viewing and editing storage subsystem properties (see section 10.4)
- Performing a refresh operation (see section 10.5)
- Adding a new IP address (see section 10.6)
- Removing a storage subsystem (see section 10.7)

10.1 Overview

Users who are assigned to the All Resources resource group can manipulate storage subsystems. Available operations depend on the permission set for the user. The following describes available operations for each permission:

- Users with the Modify permission can add storage subsystems to Device Manager, remove storage subsystems from Device Manager, and edit storage subsystem properties.
- Users with the View permission can view information about storage subsystems.

Users assigned to a user-defined resource group cannot manipulate storage subsystems.

Device Manager storage subsystem operations include:

- Viewing the list of storage subsystems (see 10.2)
- Adding a storage subsystem (see section 10.3)
- Viewing and editing storage subsystem properties (see section 10.4)
- Performing a refresh operation (see section 10.5)
- Adding a new IP address (see section 10.6)
- Removing a storage subsystem (see section 10.7)

You can also scan LUNs. For information, see section 8.3.

Notes:

- If you used a subsystem-management tool other than Device Manager to change the user ID, password, or IP address that were specified when the storage subsystem was added, you need to update the information registered in Device Manager (see section 10.4 and 10.6).
- If you change the storage subsystem configuration, you should back up the new information. For details, refer to the manual for the corresponding storage subsystem.

10.2 Viewing a List of Storage Subsystems

Users assigned to the All Resources resource group can view a list of storage subsystems. To display a list of storage subsystems managed by HiCommand Device Manager, in the Web client **Explorer** menu, choose **Resources** and then **Subsystems** (see Figure 10.1).

When the **Subsystems** object is selected in the navigation area, the method area displays the **Add Subsystem** method (see section 10.3), and the information area displays the list of storage subsystems. You can view the information about a storage subsystem by selecting the link for the storage subsystem name in this list.

When a storage subsystem is selected in the navigation area, the method area displays the following operations:

- **Modify Properties** (see section 10.4)
- **Refresh** (see section 10.5)
- **LUN Scan** (see section 8.3)
- **Remove Subsystem** (see section 10.7)
- **Show Properties** (see section 10.4)

When a storage subsystem is selected in the navigation area, the **Show Properties -** *subsystem-name* subwindow in the information area displays the properties of the storage subsystem (see section 10.4). The **Physical View** button opens the Physical View for the selected storage subsystem (see section Chapter 11).

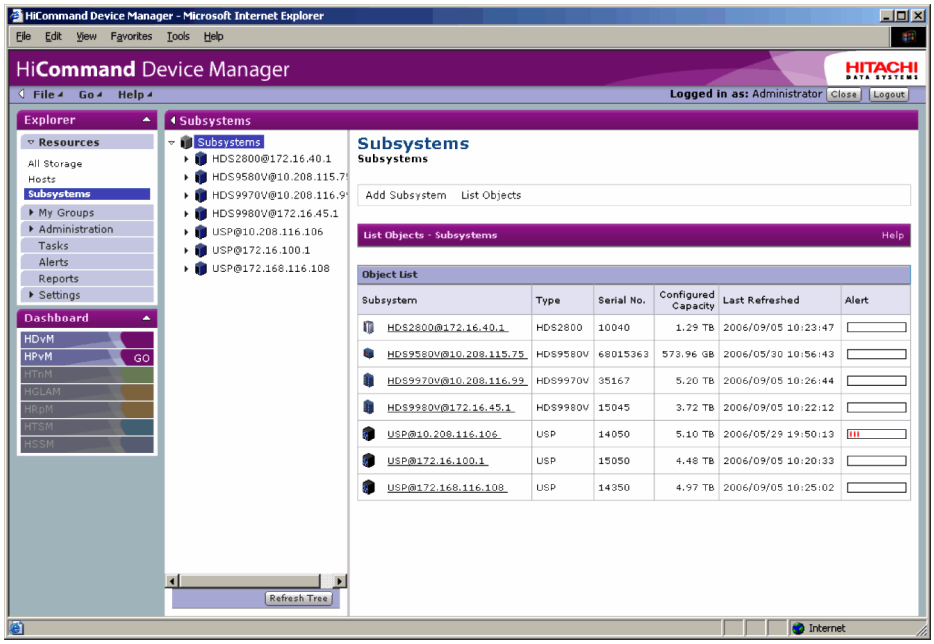


Figure 10.1 Viewing List of Subsystems

Note: The total size (configured capacity) that is displayed is not the total size of the physical disk. It is the total available disk size, which means the total of the sizes of all logical devices on the machine. Thus, this total size is increased or decreased by creating or deleting logical devices.

10.3 Adding a Storage Subsystem

Users with the Modify permission who are assigned to the All Resources resource group can add a storage subsystem to Device Manager.

When you add a storage subsystem, Device Manager locates the storage subsystem, performs an initial configuration check, and then creates groups for each storage subsystem under the **All Storage** object or the **My Storage** object. The **Open-Allocated**, **Open-Unallocated**, and **Open-Reserved** groups are also created under the groups for each subsystem. For a storage subsystem that supports mainframe volumes, it also creates the **Mainframe-Unspecified** group. In the **Open-Allocated** group, a list of open volumes on which paths are allocated is displayed, and in the **Open-Unallocated** group, a list of open volumes on which paths are not allocated is displayed. Mainframe volumes are displayed in the **Mainframe-Unspecified** group.

Notes:

- Multiple storage subsystems cannot be added concurrently. Add storage subsystems individually.
- Processing to add a storage subsystem is complex and might take a while.
- When adding a storage subsystem, you need use a storage subsystem-management tool to set a user ID used in Device Manager. We recommend that you use different user IDs for the user ID used in Device Manager and for the user ID used for storage subsystem-management tool operations.
- Note the following points when you manage an external subsystem under Device Manager while you are using Universal Volume Manager:
  - If an external subsystem is the only object that has been added to Device Manager, Device Manager is unable to recognize that the added external subsystem is connected as an external subsystem. When an external subsystem has been added to Device Manager, make sure that a storage subsystem that uses Universal Volume Manager has also been added.
  - After you add an external subsystem to Device Manager to which a storage subsystem that uses Universal Volume Manager has been added, you must perform a refresh operation on the storage subsystem. This enables Device Manager to acquire information to recognize the external subsystem.

To add a storage subsystem to Device Manager:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems** (see Figure 10.1). Select the **Add Subsystem** method in the method area.
2. On the Add Subsystem panel, select the type of storage subsystem to be added, such as HDS9900V. The displayed information depends on the selected type of storage subsystem. See Figure 10.2. To add a TagmaStore NSC55 storage subsystem, select **USP**.

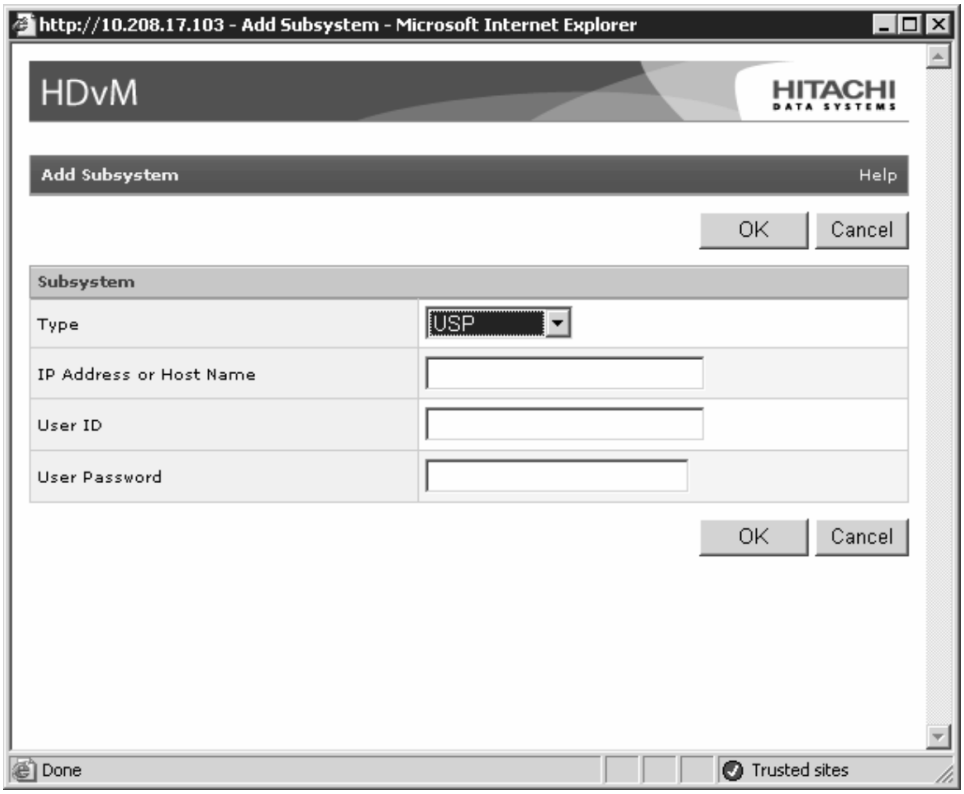


Figure 10.2 Adding a Subsystem

3. Enter the IP address(es) or host name of the storage subsystem.

   To enter a host name, enter a maximum of 50 bytes, using the following characters:

   A - Z a - z 0 - 9 - _ . @

   Note: If an IP address conversion server (such as a firewall) exists between the Device Manager server and the storage subsystem, specify the IP address that is accessible from the Device Manager server.

4. Enter the information required for Device Manager to access the storage subsystems.
   - For Universal Storage Platform V, TagmaStore USP and Lightning 9900V, enter the user ID and password set in Storage Navigator.
   - For the Lightning 9900, enter the SNMP community name (such as public) for the storage subsystem. You can enter a maximum of 15 bytes, using the following characters:

     A - Z a - z 0 - 9

– When the user ID and password for Password Protection have been set in the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, make sure that you enter the user ID and password for Password Protection in Device Manager. If the user ID and password for Password Protection have been set, the storage subsystem is locked while Device Manager is issuing a command to the storage subsystem. If the user ID and password for Password Protection have not been set, do not enter a user ID or password.

About Account Authentication

When Account Authentication is used in the TagmaStore AMS/WMS series, make sure that you enter the required permissions: User ID and passward. A user of Account Authentication has been set an operating permission that is called a role. When you add a TagmaStore AMS/WMS series that uses Account Authentication to Device Manager, you must specify the user ID to which the "Storage administrator (view and modify)" and "Account administrator (view and modify)" roles are set. Table 10.1 shows the roles required for Device Manager to manage the TagmaStore AMS/WMS series that uses Account Authentication.

Note: Do not use a built-in account user ID for Account Authentication when adding a storage subsystem.

Table 10.1 Account Authentication Roles

Role Type	Description	Remarks
Storage administrator (view and modify)	This role must be fulfilled if the storage subsystems configuration is to be managed correctly. To add a storage subsystem to Device Manager, you must specify a user ID to which this role is assigned.	Required
Account administrator (view and modify)	This role is required for starting Storage Navigator Modular (for Web) from Device Manager. To add a storage subsystem to Device Manager, you must specify a user ID to which this role is assigned.	Required
Audit log administrator (view and modify)	This role is required for viewing and specifying the settings related to audit logs of a storage subsystem from Storage Navigator Modular (for Web) that is started from Device Manager.	Optional
Audit log administrator (view)	This role is required for viewing the settings related to audit logs of a storage subsystem from Storage Navigator Modular (for Web) that is started from Device Manager.	Optional

Legend:

Required: Role necessary for adding a storage subsystem to Device Manager

Optional: Role necessary depending on operations executed using Storage Navigation Modular (for Web) that is started from Device Manager.

For details about permissions, see the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Account Authentication User's Guide*.

5. When you are finished entering the information for the storage subsystem to be added, select **OK** to add the storage subsystem. Device Manager locates the storage subsystem on the network. While this operation is in progress, you can perform other operations, but you cannot add other storage subsystems.

   You are notified when the add storage subsystem operation is complete. The name of the new storage subsystem is in the following format:

   - storage-subsystem-type@storage-subsystem-IP-address
   - for example: HDS9980V@172.16.45.1

6. Before performing a LUN scan operation on the new storage subsystem, change the name of the storage subsystem, if desired, using the Modify Properties panel (see section 10.4). If you perform a LUN scan, then change the name, and then perform another LUN scan, you will have two groups for the same storage subsystem in the LUN scan logical group.

7. After changing the storage subsystem name, you can perform a LUN scan operation on the newly discovered storage subsystem (see section 8.3). When a storage subsystem is added for the first time, its existing LUNs do not belong to any user-defined logical group in Device Manager. The LUN scan creates a hierarchy of logical groups and storage groups organized by port to contain all LUNs on the storage subsystem. When you execute LUN scan, Device Manager also registers all hosts with a WWN related to the LUNs. The attributes of the hosts registered by Device Manager are updated when host information is reported by the Device Manager Agents. For details on host operations, see Chapter 9.

10.4 Viewing and Editing Storage Subsystem Properties

Users assigned the All Resources resource group can manipulate storage subsystem properties. Available operations depend on the permission set for the user. The following describes available operations for each permission:

- Users with the Modify permission can edit storage subsystem properties.
- Users with the View permission can view information about storage subsystem properties.

Note: Device Manager uses the user ID and password set in a storage subsystem to access that storage subsystem. Specify, for the storage subsystem properties in Device Manager, which user ID and password to be used to access that storage subsystem. We recommend that you specify a user ID different from the one used for storage subsystem-maganement tool operations. If the user ID and password used by Device Manager to access a storage subsystem are changed, edit the storage subsystem properties for that storage subsystem in Device Manager.

To view and edit the properties of a storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems** (see Figure 10.1), and then select the desired storage subsystem in the navigation area. The Show Properties - s*ubsystem-name* subwindow in the information area displays the following storage subsystem properties (see Figure 10.3):
   - **Name**: the name of the storage subsystem
   - **Type**: the type (vendor model) of the storage subsystem such as HDS9980V
   - **Serial number** (for other than Universal Storage Platform V) or **DKC** (for Universal Storage Platform V): the serial number of the storage subsystem
   - **LDKC#0** (for Universal Storage Platform V): logical DKC serial number for logical DKC number 0
   - **LDKC#1** (for Universal Storage Platform V): logical DKC serial number for logical DKC number 1
   - **IP Address** (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900): the IP address of the storage subsystem
   - **IP Address 1** and **IP Address 2** (the TagmaStore AMS/WMS series, Thunder 9500V, Thunder 9200): the two IP addresses of the subsystem
   - **Microcode DKC**: the microcode level of the disk controller
   - **Microcode SVP** (Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900): the microcode level of the service processor (SVP)
   - **Configured Capacity**: the configured capacity of the storage subsystem, not the total size of the physical disks. Configured Capacity is the total available disk size, that is, the total of the sizes of all logical devices on the machine. It increases or decreases when logical devices are created or deleted.
   - **Actual Capacity**: the actual capacity of the LDEVs in the storage subsystem
   - **Total Cache**: the total cache capacity of the storage subsystem

- **Security Option** (9500V): the status of the security option for 9500V
- **Last Refreshed**: the last time the storage subsystem was refreshed or added to Device Manager
- **Alerts**: the number of red vertical bars indicates the number of alerts for the storage subsystem If you click a red vertical bar, a list of the alerts displays.

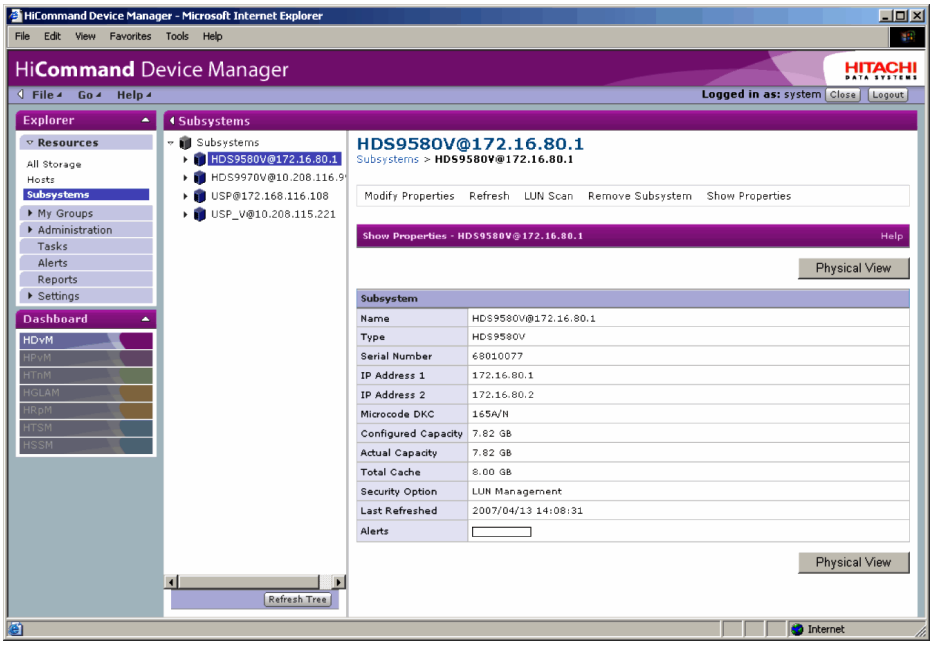


Figure 10.3 Viewing Storage Subsystem Properties

Notes:

- The **Physical View** button opens the Physical View for the selected storage subsystem (see section Chapter 11).
- If you are using the URLLink feature in Device Manager, a *URLLink-name* button displays. (see section 5.5.13). Clicking the *URLLink-name* button launches a Web application specified using the URLLink feature. If you are logged in as a user who has the View permission only, this button is inactive. If the URLLink destination points to Storage Navigator Modular (for Web) or DAMP (for Web), the *URLLink-name* button displays only in the Physical View dialog box, not in the Show Properties - *subsystem-name* subwindow.
- When Storage Navigator is installed on Lightning 9900V, the **Storage Navigator** button is displayed in the Lightning 9900V Show Properties - *subsystem-name* subwindow. Click the **Storage Navigator** button to start Storage Navigator (see section 5.5.9).
- The **NAS/Management** button appears if a NAS-CHA running NAS Manager resides on TagmaStore USP or Lightning 9900V. Clicking the **NAS/Management** button opens the Select Nas/Management Port Controller dialog box. Select **NAS-CHA**, and then click the **OK** button to launch NAS Manager (see section 5.5.10). If you are logged in as a user who has the View permission only, this button does not appear.

2. To edit the storage subsystem properties, select the **Modify Properties** method in the method area to open the Modify Properties panel for the storage subsystem (see Figure 10.4).

   In the Modify Properties panel, you can enter the following properties:

   - **Name**: Enter a name that identifies the storage subsystem. You can enter a maximum of 50 bytes. The name can include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded. You can use the following characters : `A - Z a - z 0 - 9 - _ . @`

     Note on LUN scan: If you change the storage subsystem name after a LUN scan, the names of the corresponding logical groups in the LUN scan group are not updated. You need to rename those groups to match the new storage subsystem name. Otherwise, when you execute another LUN scan on the renamed storage subsystem, a second set of logical groups will be created in the LUN scan group using the new storage subsystem name.

   - **IP Address 1** and **IP Address 2** (displayed for the TagmaStore AMS/WMS series, Thunder 9500V and Thunder 9200): When one of the items is not specified, you can enter the IP address for the item that is not specified.

   - **User ID** (not displayed for Lightning 9900): Enter the user ID that has been set in a storage subsystem-management tool. You can enter a maximum of 512 bytes.

   - **New Password** (not displayed for 9900): Enter the password that has been set in a storage subsystem-management tool. You can enter a maximum of 512 bytes.

     For Universal Storage Platform V, TagmaStore USP, and Lightning 9900V, the user ID is required, but the password is optional.

     When the user ID and password for Password Protection have been set in the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, make sure that you enter the user ID and password for Password Protection in Device Manager. If the user ID and password for Password Protection have been set, the storage subsystem is locked while Device Manager is issuing a command to the storage subsystem. If the user ID and password for Password Protection have not been set, do not enter a user ID or password.

     When Account Authentication is used in the TagmaStore AMS/WMS series, make sure that you enter the user ID and password required for Account Authentication.

3. After modifying the properties, select **OK** to apply the request. Otherwise, click **Cancel**.

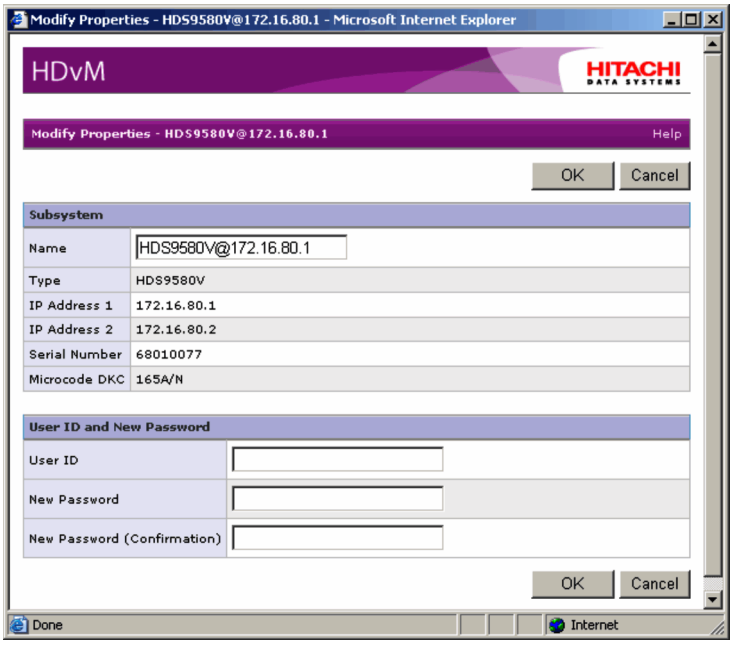


Figure 10.4 Modifying Properties (9500V)

10.5 Refreshing a Storage Subsystem

Users with the Modify permission who are assigned to the All Resources resource group can perform refresh operations.

A refresh operation rediscovers the storage subsystem. You should perform a refresh operation when changes have been made to a storage subsystem other than through the Device Manager system (such as adding new disk drives or new ShadowImage pairs using CCI or Storage Navigator).

CAUTION: Perform a refresh operation after the storage subsystem microcode is updated.

WARNING: After the microcode is updated, the SVP tuning parameters must be set and the SVP must be rebooted before you use Device Manager to refresh the storage subsystem. If you refresh the storage subsystem after the SVP tuning parameters are set, but do not reboot the SVP reboot, the disk unit (DKU) and logical unit number (LUN) information is deleted from the refreshed storage subsystem.

CAUTION: You do not need to stop the Device Manager server in order to replace the microcode of a storage subsystem. However, you must ensure that no Device Manager refresh or setup operations (such as add storage, remove storage, create logical devices, delete logical devices, or set host mode) are being executed on the corresponding storage subsystem.

During microcode replacement, an error may be output to the trace log or error log by polling on the storage subsystem. This error will no longer be output once replacement of the microcode has terminated normally.

Notes:

- While a storage subsystem is being refreshed, if you shut down the host using a volume of the corresponding storage subsystem or shut down its agents, it may take about 15 minutes to complete the refresh operation.
- For the Universal Storage Platform V, TagmaStore USP, the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, if you enable the automatic refresh function in the Device Manager server properties, Device Manager executes the refresh operation automatically when:
  - In the Physical View for the Universal Storage Platform V and TagmaStore USP: When the mode is changed from `Modify` to `View`
  - In the Physical View for the TagmaStore AMS/WMS series: When the Physical View is terminated
  - For the Thunder 9500V or Thunder 9200: When the active Storage Navigator Modular (for Web) is terminated
- If you are using TagmaStore USP Universal Volume Manager, each time you add an external subsystem after adding TagmaStore USP, you must refresh the TagmaStore USP subsystem. If you add an external subsystem to Device Manager after you have added a storage subsystem that uses Universal Volume Manager, you must perform a refresh operation on the storage subsystem.

To refresh a storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area (see Figure 10.3).
2. In the method area, select the **Refresh** method.
3. When the Refresh Storage Subsystem – Confirmation panel displays, click **OK** to refresh the storage subsystem information, or select **Cancel** to cancel your request. You are notified when the refresh operation is complete.

10.6 Changing an IP Address

When the IP address of a storage subsystem is changed, a user with the Modify permission who is assigned the All Resources resource group must re-register that storage subsystem.

To re-register a storage subsystem:

1. Back up the databases on the Device Manager server. For details on database backup, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.
2. Add the storage subsystem with the changed IP address to Device Manager, making sure to enter the new IP address in the Add Subsystem panel (see section 10.3 for instructions).
3. After the storage subsystem discovery is complete, check the storage subsystem properties to verify that the new IP address is displayed.

   Note: When you change the IP address of the storage subsystem, even if you re-register the storage subsystem using the new IP address, the following information will not be updated:

   - **Storage subsystem name used in the Web Client.** To change the storage subsystem name, enter the new name on the Modify Properties panel (see section 10.4 for instructions).
   - **Name of the logical group in LUN Scan.** To change the name of the logical group in the LUN SCAN group, enter the new name on the Modify Properties panel for the logical group (see section 7.4 for instructions).

10.7 Removing a Storage Subsystem

Users with the Modify permission who are who are assigned to the All Resources resource group can remove a storage subsystem from HiCommand Device Manager.

Notes:

- If you remove a storage subsystem, all related volumes, components, and storage groups are removed from Device Manager, but the removal operation has no effect on the storage subsystem itself.
- If you remove a storage subsystem that has alert information, and then attempt to display the alert information for the removed subsystem, **ARRAY.***storage -subsystem-type* (such as ARRAY.HDS9980V) is displayed as the source. In this case, either delete the alert information if it is not needed, or add the storage subsystem to Device Manager again.

To remove a storage subsystem from the Device Manager system:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select a storage subsystem in the navigation area (see Figure 10.3).
2. In the method area, select the **Remove Subsystem** method.
3. When the Remove Subsystem – Confirmation panel displays, select **OK** to delete the storage subsystem, or select **Cancel** to cancel your request.
4. If the storage subsystem is associated with any logical groups, Device Manager displays an important warning. After reading the warning, select **YES** to go ahead and remove the storage subsystem, or select **NO** to cancel your request. You are notified when the remove storage subsystem operation is complete.

Chapter 11 Performing Physical View Operations

This chapter describes the Physical View operations in the following sections:

- Starting the Physical View (see section 11.1)
- Working with the Physical View for TagmaStore USP (see section 11.2)
- Using the Physical View for Thunder/Lightning (see section 11.3)

11.1 Starting the Physical View

Users who are assigned to the All Resources resource group can perform Physical View operations.

Notes:

- To display a Physical View panel, JRE must be installed. The Physical View cannot be displayed if JRE is not installed. For details on JRE, see section 3.1.
- To display Physical View for Universal Storage Platform V or TagmaStore USP, Storage Navigator must be installed on the storage subsystem that is to be managed by Device Manager.
- To display a Physical View panel for the TagmaStore AMS/WMS series, you must specify the settings related to the Storage Navigator Modular (for Web) linkage at the Device Manager server. For details about the requirements and settings for linking Storage Navigator Modular (for Web see the *HiCommand Device Manager Server Installation and Configuration Guide*.
- If Mozilla is used on Solaris, you must set up the Java plug-in to display the Physical View panel in the TagmaStore AMS/WMS series. For details on how to set up the Java plug-in, see section 4.2.2.

The Physical View provides access to the storage subsystem-based link-and-launch applications. These include Storage Navigator (Lightning 9900V), NAS Manager (Lightning 9900V), DAMP (for Web) (Thunder 9500V and 9200), and URLs for customer-defined third-party applications (see section 2.5). The Physical View also provides access to the port, array group, and LDEV operations for the storage subsystem (see section 11.2, 11.3.2, and 11.3.3).

Physical View operations include: 11.1

- Starting the Physical View (see section 11.1)
- Working with the Physical View for TagmaStore USP (see section 11.2)
- Using the Physical View for Thunder/Lightning (see section 11.3)

Note: The total size that is displayed is not the total size of the physical disk. It is the total available disk size, which means the total of the sizes of all logical devices on the machine. Thus, this total size is increased or decreased by creating or deleting logical devices.

11.1.1 Starting the Physical View for Universal Storage Platform V

Users assigned the All Resources resource group can use the Physical View for Universal Storage Platform V. Available operations depend on the permission set for the user. The following describes available operations for each permission:

- Users with the Modify permission can set the configuration of Universal Storage Platform V.
- Users with the View permission can view detailed information of Universal Storage Platform V.

Notes:

- In Universal Storage Platform V, if you enable the automatic refresh function in the Device Manager server properties, Device Manager automatically performs a refresh operation when the mode is changed from Modify to View in the Physical View for Universal Storage Platform V.
- If SSL is set on Storage Navigator, a warning dialog box for security might appear. After the certificate has been imported to the browser, this dialog box is no longer displayed.

To view detailed information for Universal Storage Platform V:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired Universal Storage Platform V in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, select the **Physical View** button to open the Physical View for the selected Universal Storage Platform V.

   Storage Navigator starts as the Physical View for Universal Storage Platform V. In the Physical View, you can view and configure (for example, set up a port, set up a channel adapter, create an LDEV, or set up LUN security) the detailed information about Universal Storage Platform V. For details on the operation, see the Storage Navigator documentation.

11.1.2 Starting the Physical View for TagmaStore USP

Users who are assigned to the All Resources resource group can use the Physical View for TagmaStore USP. Available operations depend on the permission set for the user. The following describes available operations for each permission:

- Users with the Modify permission can set the configuration of TagmaStore USP.
- Users with the View permission can view detailed information of TagmaStore USP.

CAUTION: To display Physical View for TagmaStore USP, the Java heap size for Storage Navigator must be set to 256 MB. For details on how to set the Java heap size for Storage Navigator, see the Storage Navigator manual.

Notes:

- In TagmaStore USP, if you enable the automatic refresh function in the Device Manager Server properties, Device Manager automatically performs a refresh operation when the mode is changed from Modify to View in the Physical View for TagmaStore USP.
- If SSL is set on Storage Navigator, a warning dialog box for security might appear. After the certificate has been imported to the browser, this dialog box is no longer displayed.

To view detailed information about TagmaStore USP:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired TagmaStore USP in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, select the **Physical View** button to open the Physical View for the selected TagmaStore USP.

   Storage Navigator starts as the Physical View for TagmaStore USP. In the Physical View, you can view and configure the detailed information about TagmaStore USP.

11.1.3 Starting the Physical View for Lightning 9900V

Users who are assigned to the All Resources resource group can perform Physical View operations.

To view detailed information for a Lightning 9900V storage subsystem:

1. In the **Explorer** menu, choose Resources and then **Subsystems**, and then select the desired Lightning 9900V storage subsystem.
2. In the Show Properties - subsystem-name subwindow, select the **Physical View** button to open the Physical View for the selected Lightning 9900V storage subsystem (see Figure 11.1). The **CONFIGURATION** button is selected in the initial window, which displays the storage subsystem properties, such as serial number, IP address, microcode, and capacity.

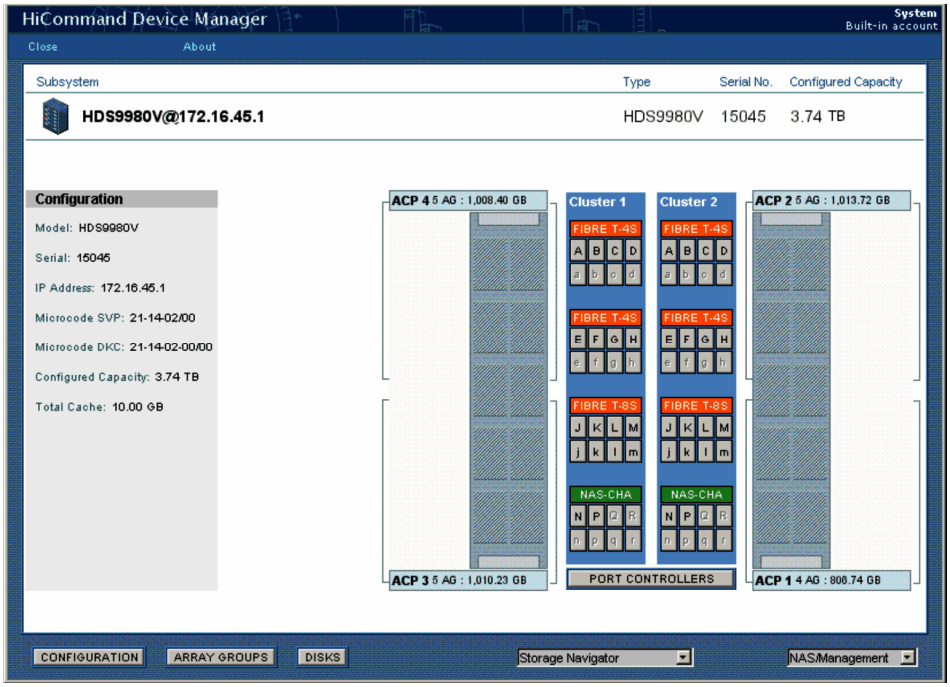


Figure 11.1 Physical View for Lightning 9900V (Configuration)

3. In the Physical View, you can select the desired port to open the Port Information panel. For example, to view the information for the CL1-A port, select the **A** button inside the Cluster 1 frame. For details on the Port Information panel, see section 11.2.
4. In the Physical View, you can select the **PORT CONTROLLERS** button to open the Port Controller panel. For details on the Port Controller panel, see section 11.3.1.4.
5. To view array group information, select the **ARRAY GROUPS** button (see Figure 11.2).

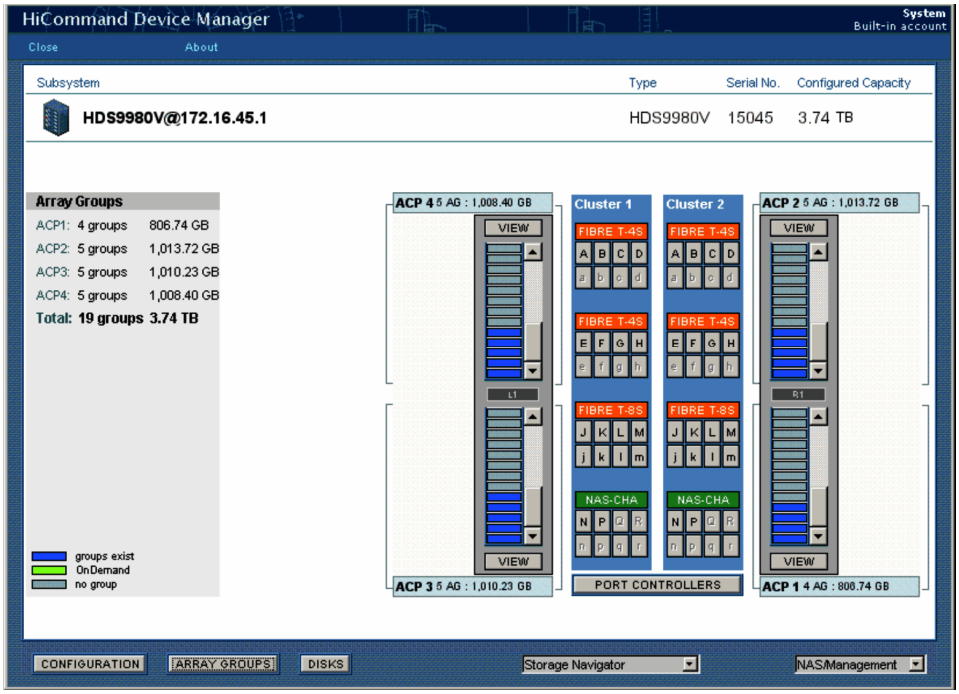


Figure 11.2 Physical View for Lightning 9900V (Array Groups)

6. In the array groups view, you can click the **VIEW** button for the desired frame to open the Frame Information (level 1) panel (see Figure 11.3).

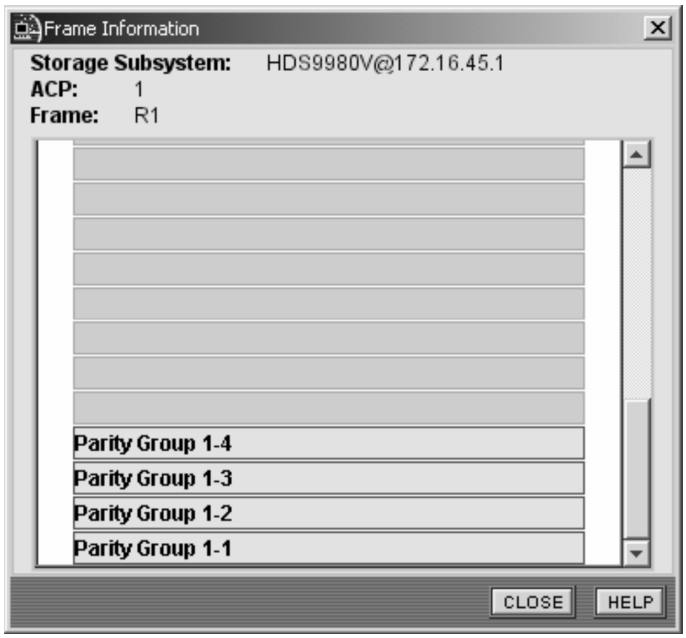


Figure 11.3 Frame Information Panel for Lightning 9900V (Level 1)

Important: The Lightning 9900V can integrate two array groups and handle them as a single array group. This is called a discrete VDEV configuration (see Figure 11.4). A discrete VDEV configuration logically integrates two sets of 2D+2D (RAID1) into a single set of 2D+2D (RAID1) by integrating two array groups.

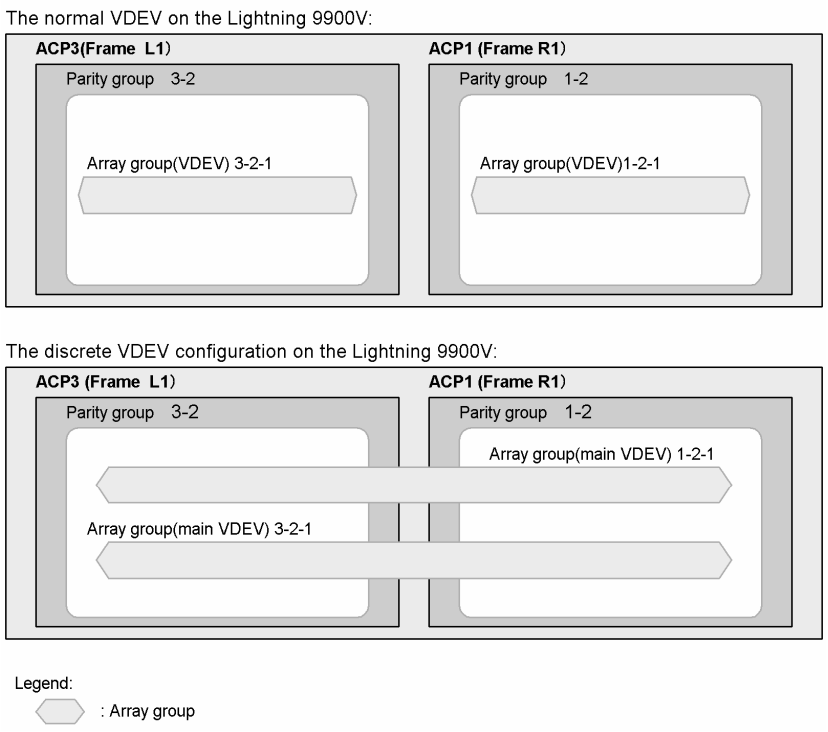


Figure 11.4 Discrete VDEV Configuration for Lightning 9900V

For a discrete VDEV configuration, **Coupled** is displayed in the parity group list along with the remote parity group (**Coupled:1-2**). If you select a parity group of a discrete VDEV configuration in the Frame Information (level 1) panel, Frame Information (level 2) panel displays information only for array groups belonging to the representative VDEV. No information is displayed for array groups that do not belong to the representative VDEV.

For a discrete VDEV configuration, the Frame Information panel displays the information shown in Figure 11.5.

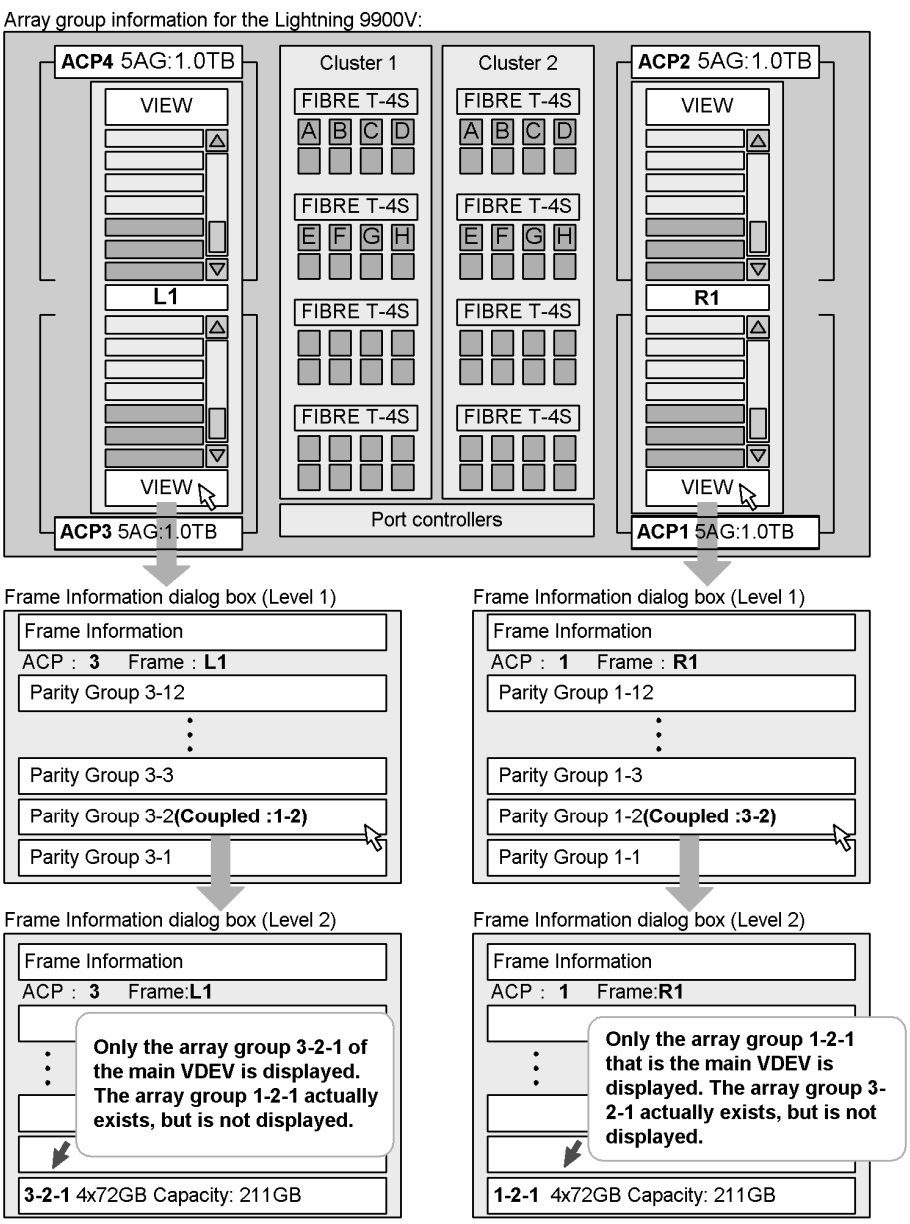


Figure 11.5 Frame Information Panel for Discrete VDEV Configuration

Note: For a 7D+1P array group, **Coupled** displays next to the parity group number (Parity Group 1-2(Coupled:2-2)). In this case, information about the parity group indicated by Coupled (example: 2-2) is not displayed.

7. In the Frame Information (level 1) panel, you can select the desired array group to open the Frame Information (level 2) panel (see Figure 11.6).

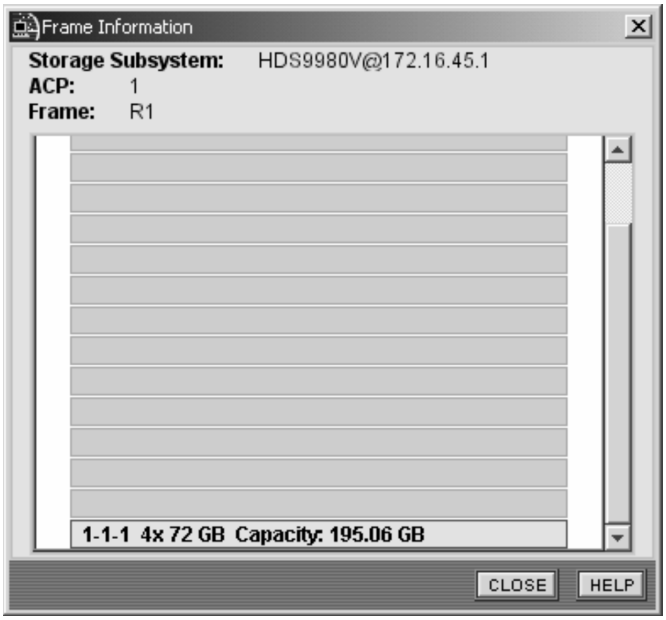


Figure 11.6 Frame Information Panel for Lightning 9900V (Level 2)

8. In the Frame Information (level 2) panel, you can select the desired array group to open the LDEV Information panel. For details on this panel, see section 11.3.3.1.
9. To view the disk information, select the **DISKS** button in Physical View (see Figure 11.7).

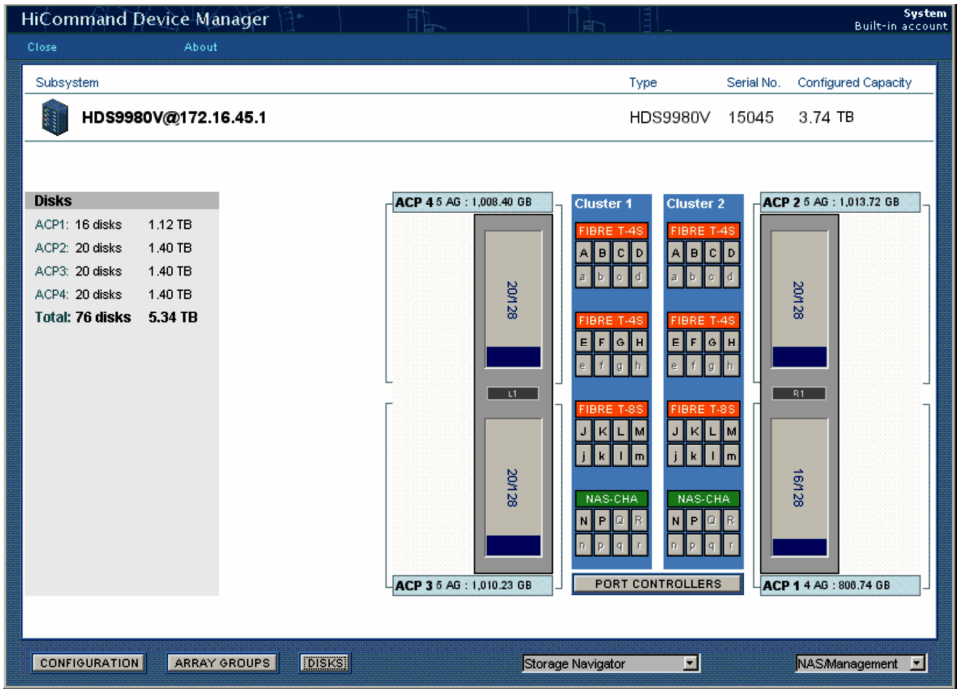


Figure 11.7 Physical View for Lightning 9900V (Disks)

The 9900V Physical View (Configuration) panel displays the following information and buttons:

- **Model**: the type (vendor model) of the storage subsystem, such as HDS9980V
- **Serial**: the (vendor) serial number of the storage subsystem
- **IP address**: the IP address of the storage subsystem
- **Microcode SVP**: the microcode level of the service processor
- **Microcode DKC**: the microcode level of the disk controller
- **Configured Capacity**: the configured capacity of the storage subsystem (the total capacity of all LDEVs, not the total capacity of the physical disks). The **Configured Capacity** increases or decreases when logical devices are created or deleted.
- **Total Cache**: the total cache capacity of the storage subsystem
- **PORT CONTROLLERS** button: opens the Port Controller panel (see section 11.3.1.4)
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port (see section 11.2)

  Notes:

  – The following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.

  – If you use disk units of Lightning 9900 for Lightning 9900V, the Physical View displays six disk units (three units on each side) in total in the maximum configuration.

The Lightning 9900V Physical View (Array Groups) panel displays the following information and buttons:

- **Array Groups**: Displays the number of array groups and capacity for each array control processor (ACP) and the total number of array groups and total capacity for all ACPs.

  Note: The displayed capacity of the array group is truncated to two decimal places. This may cause the total capacity of the array group to be less than the sum of the capacity of the array groups. However, this does not mean that the actual available capacity has been reduced.

- **VIEW** button: opens the Frame Information (level 1) panel for the selected frame (see Figure 11.3)
- **PORT CONTROLLERS** button: opens the Port Controller panel (see section 11.3.1.4)
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port (see section 11.2)

  Notes:

  - The following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.
  - If you use disk units of Lightning 9900 for Lightning 9900V, virtual devices and parity groups appear to be in a one-to-one relationship. For example, if you use disk units of Lightning 9900 in six frames of Lightning 9900V, 1 to 12 parity groups (blue icons) are displayed.

The 9900V Frame Information (level 1) panel displays the storage subsystem name, ACP number, frame number, and list of parity groups (maximum 32) for the frame that you selected using the **VIEW** button on the array group view of the Physical View. The Lightning 9900V has a maximum of 512 array groups on one chassis (the parts displayed in pairs, both at the top and bottom of the frame). The Frame Information (level 1) panel displays from 1 to 32 parity groups, each of which can have a maximum of 16 array groups. Selecting a parity group opens the Frame Information (level 2) panel.

Note: If you use disk units of Lightning 9900 for Lightning 9900V, the Frame Information (level 1) panel displays from 1 to 12 parity groups in line. Because the actual device has only one virtual device in one parity group, the Frame Information (level 2) panel always displays only one array group.

The Frame Information (level 2) panel displays the storage subsystem name, ACP number, frame number, and list of array groups (16 maximum) for the parity group that you selected in the Frame Information (level 1) panel. The following information is displayed for each array group:

- Array group ID
- Number of disks in the array group and their capacity (4 x 72 GB: Four 72-GB disk drives)
- Capacity of the array group

Selecting an array group opens the LDEV Information panel (see section 11.3.3.1).

Note: If you use disk units of Lightning 9900 for Lightning 9900V, the Frame Information (level 1) panel displays from 1 to 12 parity groups in line. Because the actual device has only one virtual device in one parity group, the Frame Information (level 2) panel always displays only one array group.

The disks view of the 9900V Physical View displays the following information and buttons:

- **ACP**: Displays the number of disks and capacity for each array control processor and the total number of disks and total capacity for all ACPs
- **PORT CONTROLLERS** button: opens the Port Controller panel
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port

  Notes:

  - The following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.
  - If you use disk units from Lightning 9900 for Lightning 9900V, the number of installed disks and the total number of installable disks are displayed for each chassis in the same way as when you use these disk units.

11.1.4 Starting the Physical View for Lightning 9900

Users who are assigned to the All Resources resource group can perform Physical View operations.

To view detailed information for a Lightning 9900 storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired Lightning 9900 storage subsystem.
2. In the Show Properties - *subsystem-name* subwindow, select the **Physical View** button to open the Physical View for the selected Lightning 9900 storage subsystem (see Figure 11.8).

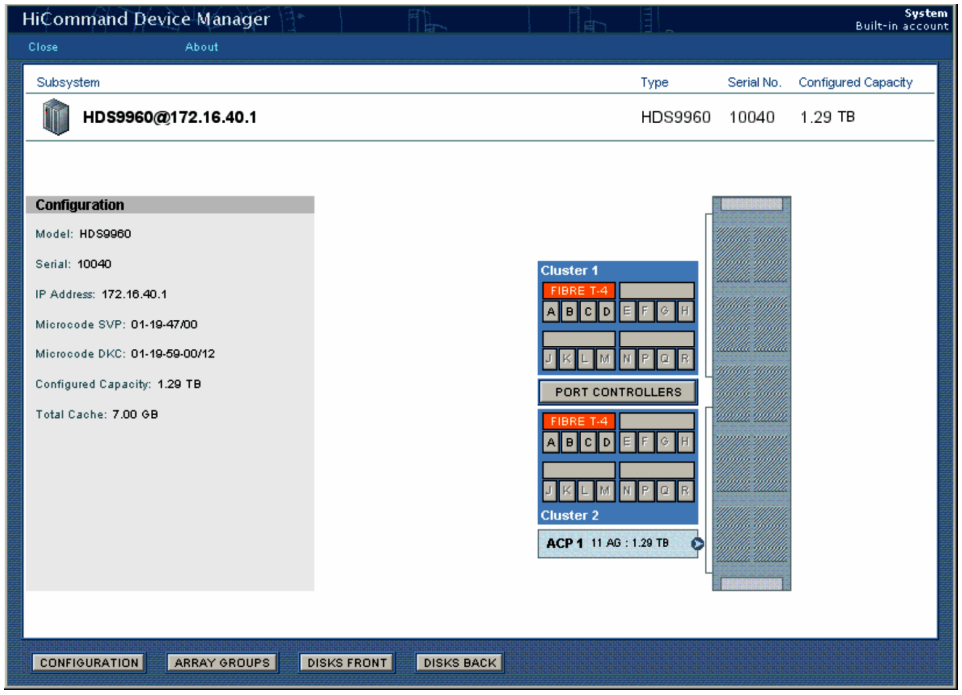


Figure 11.8 Physical View for Lightning 9900 (Configuration)

The **CONFIGURATION** button is selected in the initial window, which displays the storage subsystem properties, such as serial number, IP address, microcode, and capacity.

3. In the Physical View, you can select the desired port to open the Port Information panel. For example, to view the information for the CL1-A port, select the **A** button inside the **Cluster 1** frame. For details on the Port Information panel, see section 11.2.
4. In the Physical View, you can select the **PORT CONTROLLERS** button to open the Port Controller panel. For details on the Port Controller panel, see section 11.3.1.4.
5. To view array group information, select the **ARRAY GROUPS** button (see Figure 11.9).

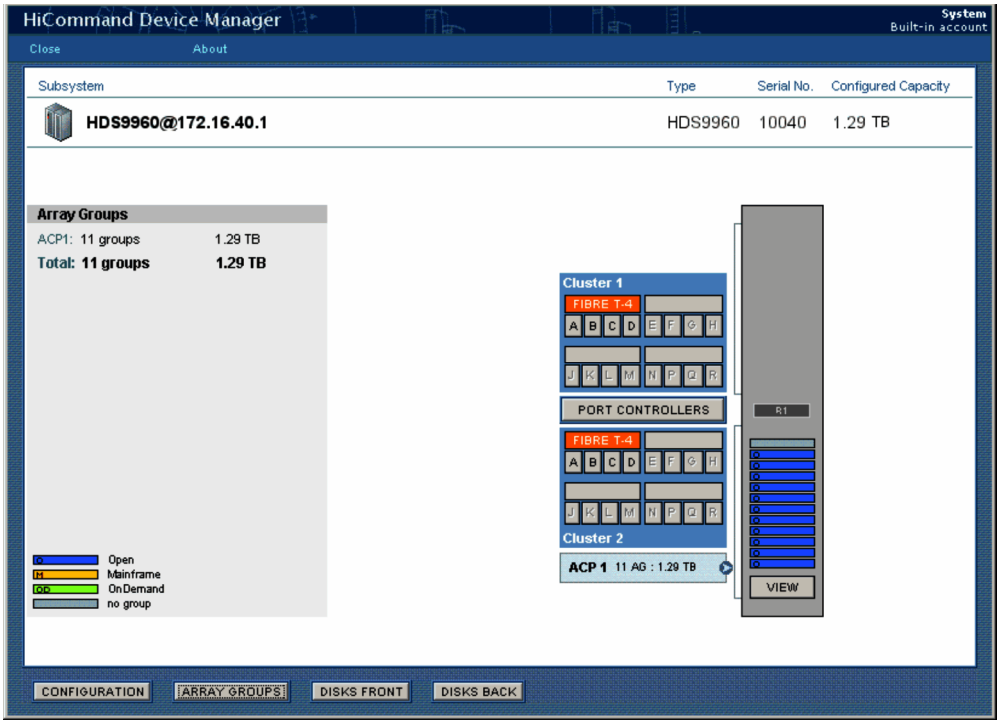


Figure 11.9 Physical View for Lightning 9900 (Array Groups)

In the array groups view, you can select the **VIEW** button for the desired frame to open the Frame Information panel (see Figure 11.10).

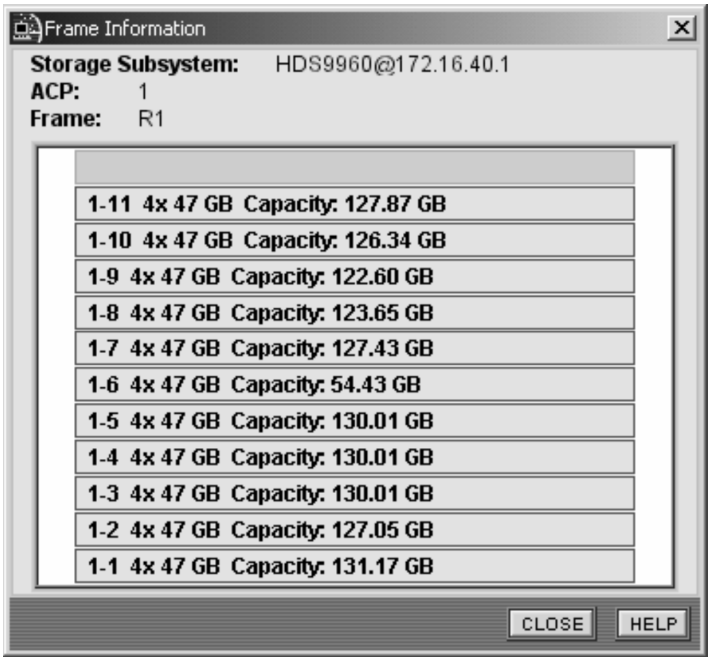


Figure 11.10 Frame Information Panel for Lightning 9900

In the Frame Information panel, you can select the desired array group to open the LDEV Information panel. For details on the LDEV Information panel, see section 11.3.3.1.

6. In the Physical View, select the **DISKS FRONT** or **DISKS BACK** button (**DISKS** button for Lightning 9910) to view the disk information (see Figure 11.11).

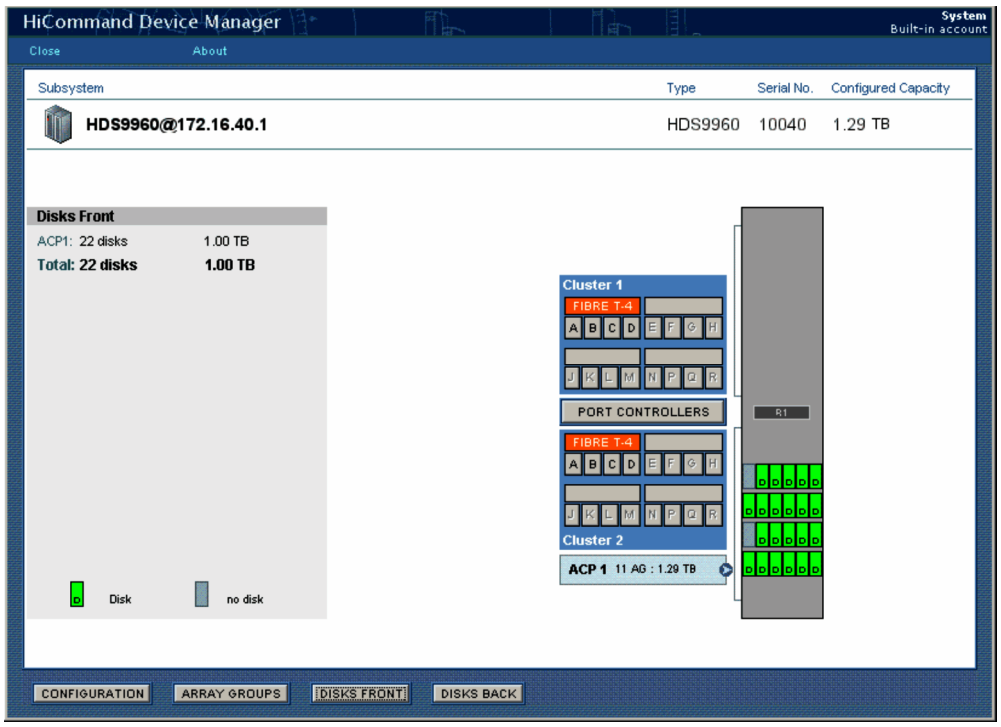


Figure 11.11 Physical View for Lightning 9900 (Disks)

The 9900 Physical View (Configuration) displays the following Information and buttons:

- **Model**: the vendor model of the storage subsystem, such as HDS9960
- **Serial**: the (vendor) serial number of the storage subsystem
- **IP address**: the IP address of the storage subsystem
- **Microcode SVP**: the microcode level of the service processor
- **Microcode DKC**: the microcode level of the disk controller
- **Configured Capacity**: the configured capacity of the storage subsystem (the total capacity of all LDEVs, not the total capacity of the physical disks). The **Configured Capacity** increases or decreases when logical devices are created or deleted.
- **Total Cache**: the total cache capacity of the storage subsystem
- **PORT CONTROLLERS** button: opens the Port Controller panel (see section 11.3.1.4)
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port (see section 11.2)

The 9900 Physical View (Array Groups) displays the following information and buttons:

- **Array Groups**: Displays the number of array groups and capacity for each array control processor (ACP) and the total number of array groups and total capacity for all ACPs

  Notes:

  For the Lightning 9900 storage subsystem, 0 GB is determined as the capacity of an array group for which a mainframe emulation type (such as 3390-3) is set.

  The displayed capacity of the array group is truncated to two decimal places. This may cause the total capacity of the array group to be less than the sum of the capacity of the array groups. However, this does not mean that the actual available capacity has been reduced.

- **VIEW** button: opens the Frame Information panel for the selected frame
- **PORT CONTROLLERS** button: opens the Port Controller panel (see section 11.3.1.4)
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port (see section 11.2)

The Frame Information panel displays the storage subsystem name, ACP number, frame number, and list of array groups for the selected frame. The following information is displayed for each array group:

- Array group ID
- Number of disks in the array group and their capacity (4 x 72 GB: Four 72-GB disk drives)
- Capacity of the array group

Selecting an array group opens the LDEV Information panel (see section 11.3.3.1).

The Disks view of the Lightning 9900 Physical View displays the following information and buttons:

- **ACP**: Displays the number of disks and capacity for each array control processor and the total number of disks and total capacity for all ACPs
- **PORT CONTROLLERS** button: opens the Port Controller panel (see section 11.3.1.4)
- **Port** buttons (such as **A** under **Cluster 1** for port CL1-A): open the Port Information panel for the selected port (see section 11.2)

11.1.5 Starting the Physical View for the TagmaStore AMS/WMS Series

Users who are assigned to the All Resources resource group can operate the Physical View for the TagmaStore AMS/WMS series. Available operations depend on the permission set for the user. The following describes available operations for each permission:

- Users with the Modify permission can set the configuration of the TagmaStore AMS/WMS series.
- Users with the View permission can view detailed information of the TagmaStore AMS/WMS series.

Notes:

- To perform Physical View operations in the TagmaStore AMS/WMS series, you must set Storage Navigator Modular (for Web) to the Device Manager server. If you do not set Storage Navigator Modular (for Web), clicking the Physical View button results in an error being displayed.
- If Storage Navigator Modular (for Web) does not access the Web server in a set period of time, it is automatically logged off the Web server. For details on the automatic logoff, see the manual for Storage Navigator Modular (for Web).
- If Storage Navigator Modular (for Web) is automatically logged off from a storage subsystem for which the password protection option is enabled, it remains logged in to the storage subsystem, and Device Manager cannot perform operations such as changing the configuration of, and perform a refresh for, the storage subsystem. In this case, start Storage Navigator Modular (for Web) again, and then manually close the window
- In the TagmaStore AMS/WMS series, if you enable the automatic refresh function in the Device Manager server properties, Device Manager executes the refresh operation automatically when the active Physical View for the TagmaStore AMS/WMS series is terminated.
- In the TagmaStore AMS/WMS series, the Physical View of the same storage subsystem cannot be used concurrently by multiple clients. If an attempt is made to do so, an error is displayed.
- The Physical View for the TagmaStore AMS/WMS series uses the URLLink function. You can set only one application for the URLLink function. Thus, if you set the URLLink function to start another application, Physical View becomes disabled. In such a case, refreshing the storage subsystem enables the Physical View. For details on how to set up TagmaStore AMS to use the URLLink function to start other applications, see section 5.5.13.
- Device Manager will not be able to poll the storage subsystem while Physical View for the TagmaStore AMS/WMS series is open.
- You cannot perform a manual refresh of the storage subsystem while Physical View for the TagmaStore AMS/WMS series is open.

To view detailed information about the TagmaStore AMS/WMS series:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired TagmaStore AMS/WMS series in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, select **Physical View** to open the Physical View for the selected TagmaStore AMS/WMS series subsystem.

   Storage Navigator Modular (for Web) starts as the Physical View for the TagmaStore AMS/WMS series. In the Physical View, you can view and configure detailed information about the TagmaStore AMS/WMS series. For details see the *Storage Navigator Modular (for Web) User's Guide*.

11.1.6 Starting the Physical View for Thunder 9500V

Users who are assigned to the All Resources resource group can perform Physical View operations.

To view detailed information on a 9500V storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired Thunder 9500 V storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to open the Physical View for the selected Thunder 9500V subsystem (see Figure 11.12).

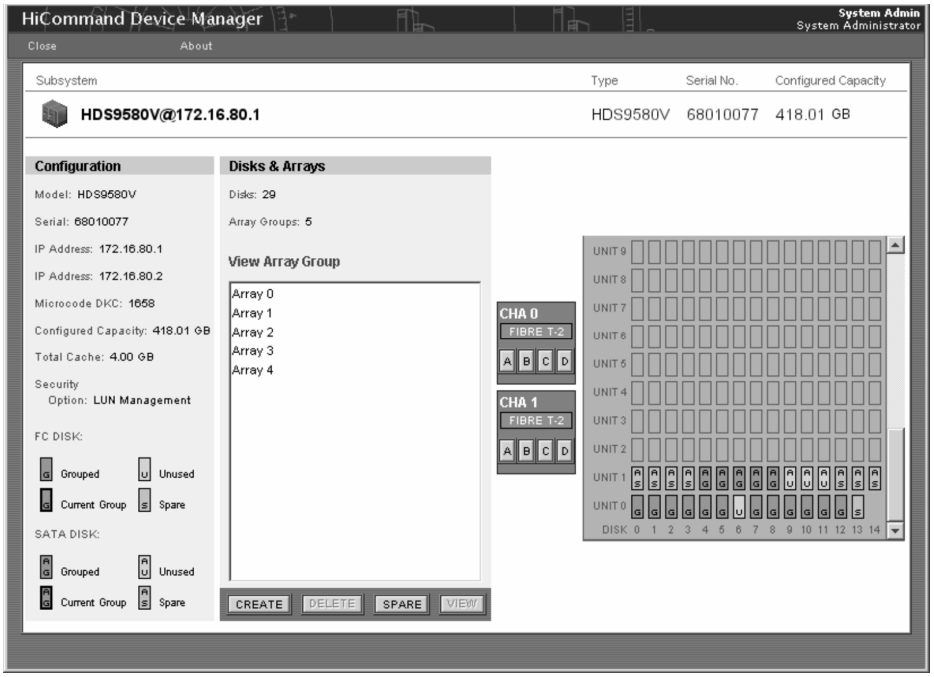


Figure 11.12 Physical View for Thunder 9500V

The Physical View displays the following information for the selected 9500V:

- **CONFIGURATION** button: displays the model, serial number, IP addresses, DKC microcode, configured capacity, total cache, and security option
- Legend for FC disk layout grid: **Grouped** (assigned to an array group of the FC drive), **Current Group** (assigned to the selected array group of the FC drive), **Unused**, **Spare**
- Legend for SATA disk layout grid: **Grouped** (assigned to an array group of the SATA drive), **Current Group** (assigned to the selected array group of the SATA drive), **Unused**, **Spare**
- Legend for BD disk layout grid: **B_G** (assigned to an array group of the BD drive), **B_G with bold edge** (assigned to the selected array group of the BD drive), **B_U** (Unused), **B_S** (Spare)
- **Disks and Arrays**: displays the total number of disks, the total number of array groups, and a list of the existing array groups
- The **CREATE** button enables you to create a new array group
- The **DELETE** button enables you to delete an array group
- The **SPARE** button enables you to set a spare drive
- The **VIEW** button displays the LDEV Information panel

3. In the Physical View, you can select the desired port to open the Port Information panel. For example, to view the information for port A in CHA-0, select the **A** button in the **CHA 0** box. For details on the Port Information panel, see section 11.2.

The 9500V Physical View displays the following information:

- **Configuration**:
  - **Model**: the type (vendor model) of the storage subsystem, such as HDS9570V
  - **Serial**: the (vendor) serial number of the storage subsystem
  - **IP addresses**: the two IP addresses of the storage subsystem
  - **Microcode DKC**: the microcode level of the disk controller
  - **Configured Capacity**: the configured capacity of the storage subsystem (the total capacity of all LDEVs, not the total capacity of the physical disks). The configured capacity increases or decreases when logical devices are created or deleted.
  - **Total Cache**: the total cache capacity of the storage subsystem
  - **Security Option**: status of the security option: **No Security**, **LUN Security**, **LUN Management**, or **Unknown**
  - Legend for FC disk layout grid: **Grouped** (assigned to an array group of the FC drive), **Current Group** (assigned to the selected array group of the FC drive), **Unused**, **Spare**
  - Legend for SATA disk layout grid: **Grouped** (assigned to an array group of the SATA drive), **Current Group** (assigned to the selected array group of the SATA drive), **Unused**, **Spare**

- **Disks and Arrays**:
  - **Disks**: displays the total number of disks
  - **Array Groups**: displays the total number of array groups
  - **View Array Group**: displays a list of the existing array groups. When you select an array group, the **Delete** and **View** buttons are enabled, and the disks in the selected array group are highlighted in the disk layout grid.

11.1.7 Starting the Physical View for Thunder 9200

Users who are assigned to the All Resources resource group can perform Physical View operations.

To view detailed information for a Thunder 9200 storage subsystem:

1. In the Explorer menu, choose Resources and then Subsystems, and then select the desired Thunder 9200 storage subsystem in the navigation area.
2. In the **Show Properties** *subsystem-name* subwindow, select the **Physical View** button to open the Physical View for the selected Thunder 9200 storage subsystem (see Figure 11.13).

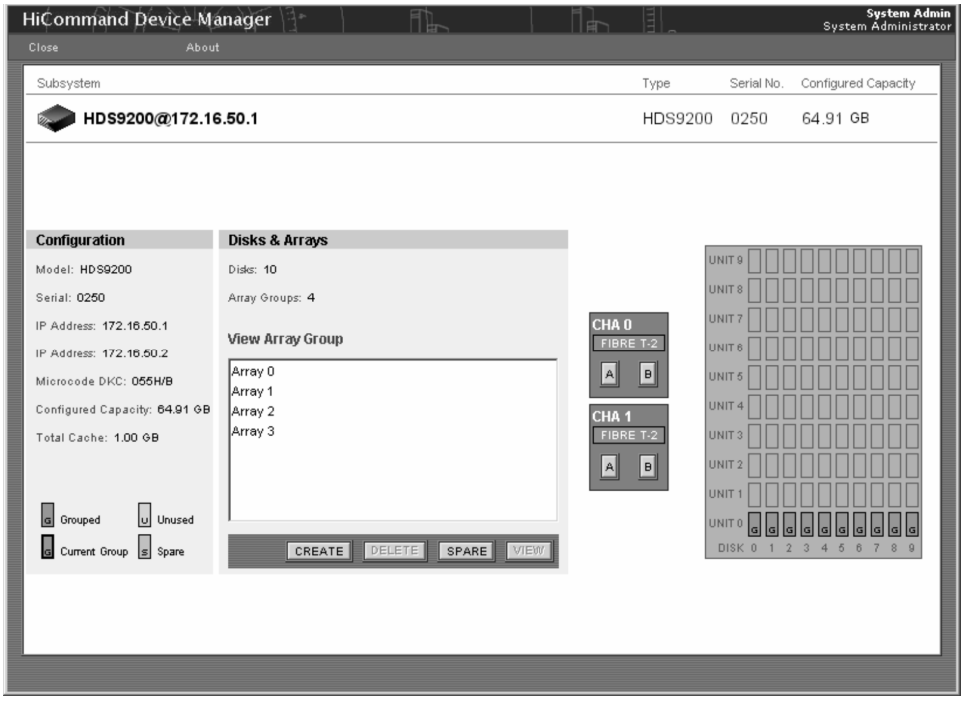


Figure 11.13 Physical View for Thunder 9200

The Physical View displays the following information for the selected 9200:

- **Configuration**: displays the model, serial number, IP addresses, DKC microcode, configured capacity, and total cache
- Legend for disk layout grid: **Grouped** (assigned to an array group), **Current Group** (assigned to the selected array group), **Unused**, **Spare**

- **Disks and Arrays**: displays the total number of disks, the total number of array groups, and a list of the existing array groups
- **CREATE** Enables you to create a new array group
- **DELETE** Enables you to delete an array group
- **SPARE** Enables you to set a spare drive
- **VIEW** displays the LDEV Information panel

3. in the Physical View, you can select the desired port to open the Port Information panel. For example, to view the information for port A in CHA-0, select the **A** button in the **CHA 0** box. For details on the Port Information panel, see section 11.2.

The 9200 Physical View displays the following information:

- **Configuration**:
  - **Model**: the type (vendor model) of the storage subsystem, such as HDS9200
  - **Serial**: the (vendor) serial number of the storage subsystem
  - **IP addresses**: the two IP addresses of the storage subsystem
  - **Microcode DKC**: the microcode level of the disk controller
  - **Configured Capacity**: the configured capacity of the storage subsystem (the total capacity of all LDEVs, not the total capacity of the physical disks). The configured capacity increases or decreases when logical devices are created or deleted.
  - **Total Cache**: the total cache capacity of the storage subsystem
  - Legend for disk layout grid: **Grouped** (assigned to an array group), **Current Group** (assigned to the selected array group), **Unused**, **Spare**
- **Disks and Arrays**:
  - **Disks**: displays the total number of disks
  - **Array Groups**: displays the total number of array groups
  - **View Array Group**: displays a list of the existing array groups. When you select an array group, the **Delete** and **View** buttons are enabled, and the disks in the selected array group are highlighted in the disk layout grid.

11.2 Working with the Physical View for TagmaStore USP

11.2.1 Managing User Accounts

To use Storage Navigator, you need a user account. The user account of Storage Navigator contains the following information.

- User ID
- User type
- Password
- Operation authority

For Storage Navigator, the user account of “root” is initially set. By default, the operation authority for all functions of Storage Navigator and program product options is given to the user account of user ID “root”. You cannot delete the user account of user ID “root”. You may register up to 500 user accounts including the user account of user ID “root” for Storage Navigator.

You have to set user ID, user type and password when you enter a user account. An operation authority can be set for each registered user account. To register the user account, or to set an operation authority, use the Account window.

The following sections describe the user types and the operation authority.

User Types

There are different types of Storage Navigator user, which are storage administrator and storage partition administrator. You can decide the user type, storage administrator or storage partition administrator, when you register the user account.

The operating range of USP V vary by the user type. The storage administrator and the storage partition administrator are described below.

- Storage administrator

  A storage administrator is the type of user who can operate the entire USP V. Only storage administrator can perform the **Storage Device List**, **Control Panel** and **Audit log**-related operations of Storage Navigator. The user account of user ID “root”, which is set to Storage Navigator by default, is a kind of storage administrator.

- Storage partition administrator

  A storage partition administrator is the type of user who can operate an SLPR (Storage Management Logical Partition) allocated by Storage Navigator. A storage partition administrator cannot perform the **Storage Device List**, **Control Panel** and **Audit log**-related operations of Storage Navigator.

  Note: A storage partition administrator can use only a part of program product options.

  For further information on an SLPR or details of the program product options that a storage partition administrator can use, see to the *Virtual Partition Manager User's Guide*.

Operation Authority

If you set user ID and password when you register a user account, you can set various types of operation authorities for registered user account. In Storage Navigator, the operation authority might be called “role”.

The types of operation authorities that can be set to each user account are as follows.

- Account administrator role (user account operation authority)

  Account administrator role is the authority to operate the window that can be used for managing Storage Navigator user accounts.

  All users can change their own passwords and view the details of settings of their own user accounts. However, if you want to change the password of another user account, or details of settings of other user account, you need an authority for modification of the account administrator role.

  You cannot change the account administrator role settings that are set for the user account of user ID “root”.

  For each user account, you may select the authority of account administrator role from the following three types.

  - **Modify:** If you have this authority, you can add and delete all user accounts excepting the user ID “root” and change the details of settings of them. For the user account of user ID “root”, you can change the password and the operation authority other than the account administrator role. The operation authority “Modify” has been set for the user account of user ID “root”.
  - **View:** If you have this authority, you can view the operation authority of all user accounts. You cannot add, change and delete the user accounts. However, you can change your own password.
  - **Disable:** You cannot view or change settings of other user accounts. However, you can change your password, and view the operation authorities for your user account.

- Audit log administrator role (audit log operation authority)

  Audit log administrator role is the authority to operate the button for downloading the audit log file and to perform the syslog-related operation. You can set the audit log administrator role for the user account of which the user type is the storage administrator. For further information on the audit log file, see the *Audit Log User and Reference Guide*.

  For each user account, you may select the authority of audit log administrator role from the following three types.

  - **Modify:** If you have this authority, you can download an audit log file by using the button for audit log file download. You can also set the syslog server and download the syslog information file by using the Syslog window. The operation authority “Modify” has been set for the user account of user ID “root”.
  - **View:** If you have this authority, you can download an audit log file by using the button for audit log file download. You can also use the Syslog window to view the setting and download the syslog information file. However, you are not allowed to change the setting of the Syslog window.

- **Disable:** You have no operation authority for the audit log. You cannot use the audit log file download button and the Syslog window.

- Storage administrator role (storage operation authority)

  Storage administrator role is the authority to perform the **Storage Device List** operation, the operation using program product options and the operations of Set Env. dialog box. For each user account, you may select the authority of storage administrator role from the following two types.

  - **Enable:** You have authority to perform the **Storage Device List** operations, the operations using program product options and the operations for the Set Env. dialog box.

    Only the user accounts for which the storage administrator role authority is set to "Enable" can be used to set the details of the operation authority for each program product option. The operation authority "Enable" has been set for the user account of user ID "root". And for the user account of user ID "root", the "Modify" authority is set for the operations of all program product options.

  - **Disable:** You do not have authority to perform the **Storage Device List** operations, the operations using program product options and Set Env. dialog box operations. For the operation authority for each function, the "Modify" authority might be set. However, if "Disable" is set for the authority of storage administrator role, the operation authority for each function also will be disabled.

- Operation authority for each function

  You can set the operation authority for Storage Navigator or for each function of program product options. To set the operation authority of functions for each user account, set "Enable" to the authority of storage administrator role. For each user account, you may select the operation authority from the following two types.

  - **Modify:** You can perform the operations by using each function.
  - **View:** You can view the window of each function. However, you cannot perform the operation.

11.2.1.1 Adding a User Account

You can newly register a user account by using the Account window. You may register up to 500 users including the user ID “root” for Storage Navigator. To register a new user account, log in with a user account of which **Modify** is set for **Account Administrator Role**.

When you register new user account, you have to decide the user ID of the user account to register, the password for logging in Storage Navigator, and the operation authority to set.

You can use the following characters for setting a user ID and password.

- User ID

  For setting a user ID, you can use up to 256 alphanumeric characters (ASCII codes) and the following symbols (! # $ % & ' * + - . / = ? @ ^ _ ` { | } ~). You cannot register multiple instances of the same user ID.

- Password

  For setting password, you can use all the alphanumeric characters (ASCII codes). Password must be from 6 to 256 characters.

To register a new user account:

1. Log in to Storage Navigator, and open the Account window (see Figure 11.14).
2. Change to **Modify** mode.
3. In the **Account Information** tree, select the folder to which you want to register a user account.

   To register a user account as a storage administrator, select the **SA** folder. To register a user account as a storage partition administrator, select the folder of SLPR No. to which you want to register the user account.
4. Right-click the folder to which you want to register a user account. Then, click the **New User** command.

   The New User dialog box (see Figure 11.14) is displayed.
5. In the New User dialog box, register the following items.
   - **User ID**: Enter the user ID of user account which you want to register.
   - **Password**: Enter the password to be used to log in to Storage Navigator.
   - **Re-enter Password:** Enter the password again for confirmation.
6. Click **Set** on the New User dialog box.

   The New User dialog box is closed, and then the icon  and a user ID of the registered user account are displayed in the **Account Information** tree.
   - To change the password of registered user account, select a user ID in the **Account Information** tree, and right-click to perform the **Change Password** command.
   - To delete the registered user account, select a user ID in the **Account Information** tree, and right-click to perform the **Delete User** command.
7. In the **Account Information** tree, select the user ID of registered user account.

8. Set the authority of **Account Administrator Role**, **Audit Log Administrator Role** and **Storage Administrator Role** by selecting from their each drop-down list.
9. Set the operation authority of each function in the **Permission Information** list if **Enable** is set for **Storage Administrator Role**.

   To set the operation authority of each function:

   – Select the row to which you want to set the operation authority. You can also select plural rows by using the **Shift** key or **Ctrl** key.

   – Select the operation authority either **View** or **Modify** by right-clicking.

     The selected authority is displayed on the **Permission** column.
10. To register plural user accounts at a time, repeat step 3 to step 9.
11. Click **Apply**.

    The settings are applied to the storage system.

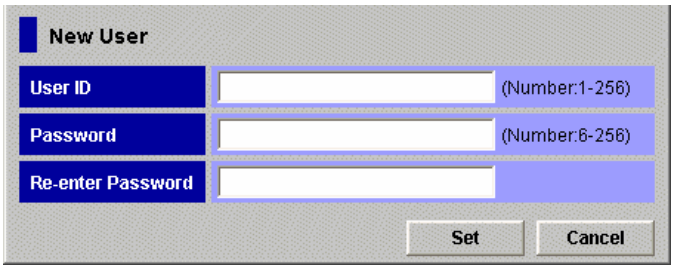


Figure 11.14 The New User Dialog Box

11.2.1.2 Changing User Account Properties

Changing User Passwords

All users can change the passwords of their own user accounts. To change the user accounts of others, log in with a user account of which **Modify** is set for **Account Administrator Role**.

When setting a password, you can use all the alphanumeric characters (ASCII codes). The password must be from 6 to 256 characters.

To change the password of a user account:

1. Log in to Storage Navigator, and open the Account window (see Figure 11.14).
2. Change to **Modify** mode.
3. In the **Account Information** tree, open the folder to which user account that you want to change password is registered.
4. In the **Account Information** tree, select the user ID of user account of which you want to change the password.
5. Right-click the mouse and then click the **Change Password** command.

   The Change Password dialog box (Figure 11.15) is displayed.
6. In the Change Password dialog box, enter the passwords as follows.
   - **Current Password**: Enter the current password. The current password is required when **Modify** is not set for **Account Administrator Role** of your user account.
   - **New Password**: Enter the new password.
   - **Re-enter New Password**: Enter the new password again for confirmation.
7. Click **Set** on the Change Password dialog box.

   The Change Password dialog box is closed, and you return to the Account window.
8. Click **Apply**.

   The settings are applied to the storage system.

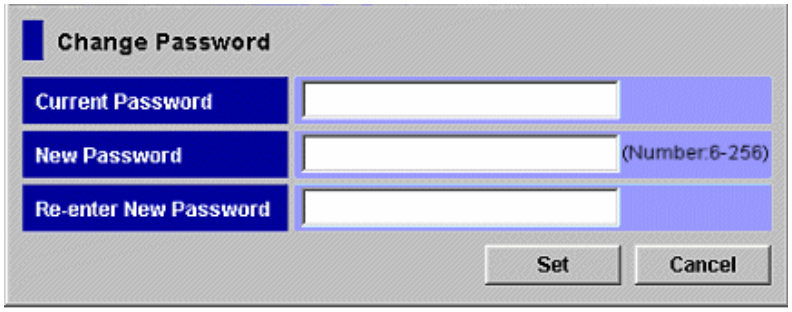


Figure 11.15 The Change Password Dialog Box (when Modify is not set for Account Administrator Role)

Changing User Operation Authority

To change the operation authority of user account, log in with a user account of which **Modify** is set for **Account Administrator Role**.

Note: To change the operation authority of the user account which is set to disable, you need to set the user account to enable, change the operation authority of the user account, and then set the user account to disable.

To change the operation authority of user account:

1. Log in to Storage Navigator, and open the Account window (see Figure 11.14).
2. Change to **Modify** mode.
3. In the **Account Information** tree, open the folder to which user account of which you want to change the operation authority is registered.
4. In the **Account Information** tree, select the user ID of user account of which you want to change the operation authority. In the **User Information** and **Permission Information** lists, the operation authority of the selected user account is displayed.
5. Set the operation authority of **Account Administrator Role**, **Audit Log Administrator Role** and **Storage Administrator Role** by selecting from their each drop-down list.
6. Set the operation authority of each function in the **Permission Information** list if **Enable** is set for the operation authority of **Storage Administrator Role**.

   To set the operation authority of each function:

   - Select the row to which you want to set the operation authority. You can also select plural rows by using the **Shift** key or **Ctrl** key.
   - Right-click the mouse and then select the operation authority either **View** or **Modify**.

     The selected authority is displayed on the column of **Permission**.
7. To change the operation authority of plural user accounts at a time, repeat step 3 to step 6.
8. Click **Apply**.

   The settings are applied to the storage system.

Enabling or Disabling User Accounts

To set a user account to enable or disable, log in with a user account of which **Modify** is set for **Account Administrator Role**.

When you set a user account to disable, you cannot change the operation authority of the user account. To change the operation authority of the user account which is set to disable, you need to set the user account to enable, change the operation authority of the user account, and then set the user account to disable.

To set a user account to enable or disable:

1. Log in to Storage Navigator, and open the Account window (see Figure 11.14).
2. Change to **Modify** mode.
3. In the **Account Information** tree, open the folder to which user account that you want to set enable or disable is registered.
4. In the **Account Information** tree, select the user ID of user account which you want to set enable or disable.
5. Right-click the mouse, and then click the **Enable -> Disable** command to set disable or the **Disable -> Enable** command to set enable.

   You return to the Account window.

   When you set to disable, the icon of user ID to be set will change to the  icon in the **Account Information** tree. When you set to enable, the icon of user ID to be set will change to the  icon in the **Account Information** tree.
6. Click **Apply**.

   The settings are applied to the storage system.

11.2.1.3 Deleting a User Account

To delete a user account, log in with a user account of which **Modify** is set for **Account Administrator Role**. You cannot delete the user account of user ID "root".

To delete a user account:

1. Log in to Storage Navigator, and open the Account window (see Figure 11.14).
2. Change to **Modify** mode.
3. In the **Account Information** tree, open the folder to which user account that you want to delete is registered.
4. In the **Account Information** tree, select the user ID of user account which you want to delete.
5. Right-click the mouse and then click the **Delete User** command.

   The Account window displays. In the **Account Information** tree, the icon of the user ID to be deleted changes:  .

   To cancel deleting the user, select a user ID in the **Account Information** tree, and right-click to select the **Restore user** command.
6. Click **Apply** to apply the settings to the storagte system.

11.2.2 Managing LDEVs

In order to operate Virtual LVI/LUN or Volume Shredder, you need the following items:

- USP V series storage system (or simply "USP V storage system" where applicable hereafter).
- Storage Navigator computer
- Open Volume Management, Virtual LVI and/or Volume Shredder software.

Notes:

- To use the Virtual LUN function, you need the software called Open Volume Management. Note that this software is only for open systems.
- To use the Virtual LVI function, you need the software called Virtual LVI. Note that this software is only for mainframe systems.
- To use the Shredding function, you need the software called Volume Shredder. Note that this software is both for open systems and mainframe systems.

Preparing to Use Virtual LVI/LUN

Before starting a VLL operation on a selected storage system, make sure that the desired mainframe volumes are disconnected from the host, and/or remove the LU paths to the open volumes. For instructions on removing LU paths, please refer to *LUN Manager User's Guide*.

11.2.2.1 Creating an LDEV

The Install CV function allows you to define and install one or more Virtual LVI/LUN volumes. To define and install one or more Virtual LVI/LUN volumes (CVs) in spaces created with the **Volume to Space** operation, please perform **Install CV** operations. Also, to define and install one or more Virtual LVI/LUN volumes (CVs) in free spaces created as a result of creating volumes in VDEVs, please perform Install CV operations.

If necessary, you can perform Install CV operations to create system disks. A system disk can be used to contain a backup copy of audit logs. If you need to store a backup copy of audit logs in a system disk, you must make sure that the capacity of the system disk is 130 MB.

Notes:

- The Install CV function allocates VLL volumes in the order in which the function finds sufficient free space for the VLL volumes, so for optimum space allocation you should allocate VLL volumes in descending order of capacity.
- When you specify the capacity and the emulation type other than OPEN-V for a VLL volume to be created, the **Install CV** function automatically creates and formats the VLL volume in sufficient free space.
- If you select free space and perform an **Install CV** operation, VLL volumes will be created only in the selected free space.
- For OPEN-V volumes, you can specify from 46 MB (50 cylinders) up to the maximum capacity of VDEV for the capacity of a VLL volume.

To create a VLL volume:

1. Make sure that Storage Navigator is in Modify mode.

   For detailed information about Modify mode, please refer to the *Storage Naviagtor User's Guide*.

2. On the tree at the left of the **VLL** window, open a folder and select the desired disk group, parity group, and VDEV. The table on the right of the window displays detailed information about the LDEVs of the selected VDEV.
3. Right-click any part of the tree view to display a pop-up menu.
4. Select **Install CV** from the pop-up menu. The Install CV dialog box (1) is displayed (see Figure 11.16).
5. From the **Emulation** drop-down list, select the emulation type of the VLL volume. If you select OPEN-V, go to step 6. If you select an emulation type other than OPEN-V, go to step 7.
6. For OPEN-V, do the following on the Install CV dialog box (1):
   a) Select the capacity unit of the selected volume from the following three options available in the **Capacity Unit** drop-down list: MB, Cyl, or block.
   b) Select one of the VLL volume creation methods from Specify capacity and number, Divide free space by number, Divide free space by capacity, or Set remaining space as volume.

Note: If there are two or more free spaces in the VDEV, the **Divide free space by number**, **Divide free space by capacity** and the **Set remaining space as volume** buttons are not available.

c) Specify the capacity of the VLL volume, and/or the number of CVs according to the selected method. For example:

- If you select **Specify capacity and number**, enter the capacity in the **Capacity** box, and then enter the number of CVs in the **No.** box.
- If you select **Divide free space by number**, enter the number of CVs in the **No.** box.
- If you select **Divide free space by capacity**, enter the capacity in the **Capacity** box.
- If you select **Set remaining space as volume**, go to the next step.

Note: The Install CV function allocates VLL volumes in the order in which the function finds sufficient free space for the VLL volumes, so for optimum space allocation you should allocate VLL volumes in descending order of capacity.

d) Select **Set** to display the setting in the **How to create volume** table. To remove VLL volume settings displayed in the **How to create volume** table, do the following:

- To remove a setting, select the VLL volume, and select **Delete**. When a confirmation message displays, select **OK**.
- To remove all settings, select **Clear**. When a confirmation message displays, select **OK**.

e) To create other VLL volumes, repeat steps (a) – (d). After setting all VLL volumes, go to step 8.

7. For non-OPEN-V, do the following on the Install CV dialog box (1):

a) In the **Capacity** field, enter the capacity of the VLL volume you want to create, either in MB or block for open systems, or in cylinders (Cyl) for mainframe volumes. The available capacity range (minimum - maximum) is shown to the right of the **Capacity** field. The value can be incremented by one MB or one block for open systems or by one Cyl for mainframe systems.

Note: The Install VLL Volume function allocates VLL volumes in the order in which the function finds sufficient free space for the VLL volumes, so for optimum space allocation you should allocate VLL volumes in descending order of capacity.

b) Select **Set** to display the setting in the **How to create volume** table. To remove VLL volume settings displayed in the **How to create volume** table, do the following:

- To remove a setting, select the VLL volume, and select **Delete**. When a confirmation message displays, select **OK**.
- To remove all settings, select **Clear**. When a confirmation message displays, select **OK**.

c) To create other VLL volumes, repeat steps (a)- (b). After setting all VLL volumes, go to step 8.

8. Select **Next** to display the Install CV dialog box (2) (Figure 11.17).
9. On the Install CV dialog box (2), select one or more VLL volume numbers to assign an LDKC number, a CU number and an LDEV number.

10. Select a CU number from the **Select CU No.** drop-down list.
11. Select an LDEV number from the white LDEV numbers in the **Select LDEV No.** table. Gray indicates LDEV numbers that are not selectable, white indicates unused LDEV numbers, and blue indicates available LDEV numbers. The LDKC number, CU number, and LDEV number appear in the **LDKC:CU:LDEV** field of the VLL volume-setting information table.

    Note: You cannot specify an LDEV number, if free LDEV numbers in LUSE configuration are not available in the selected CU.
12. To set other VLL volumes, repeat steps 9 - 11 to set other VLL volumes. If you want to remove a LDKC:CU:LDEV number that is already assigned, select one or more VLL volume numbers corresponding to the LDKC:CU:LDEV numbers that you want to remove. Then right-click and select **Clear** from the pop-up menu.
13. After setting all CU numbers and LDEV numbers, select **Next**. If the boundary area of the selected LDEV number does not have an SSID, the SSID setting dialog box appears. Go to step 14. If the boundary area of the selected LDEV number has an SSID, go to step 19.
14. On the SSID setting dialog box, select the CU number.
15. Select a new SSID in the **Input SSID** dropdown-list.

    Note: When you have logged in as a storage administrator and the **SSID number of another SLPR is used.** check box is selected, you can also enter an SSID in the **Input SSID** dropdown-list.
16. Select **Set**. The SSID is displayed in the **SSID** field of the SSID setting area.
17. To set two or more SSIDs, repeat steps 14 - 16.
18. After setting all of the SSIDs, select **Next**. A dialog box appears.
19. Make system disk settings, and then click Next. The Install CV confirmation dialog box appears.
20. Verify that the information displayed in the Install CV confirmation dialog box is correct, and then select **OK**.

    The new settings are displayed in ***blue bold italics*** in the **LDEV Information** table on the VLL window.

    Note: The setting changes are not yet implemented in the storage system. You cannot manipulate blue VDEVs until you do either of the following, but you can install additional CVs in VDEV with red icons:

    - Click **Apply** or **Cancel**.
    - Right-click blue LDEVs and select **Reset** from the pop-up menu.
21. To apply the changes to the storage system, select **Apply** (or **Cancel** to cancel them).
22. Select **OK** to complete the process.

    Note: When the Install CV operation starts, a notation appears across the bottom of the window to indicate the progress, and completion at the end of operation.

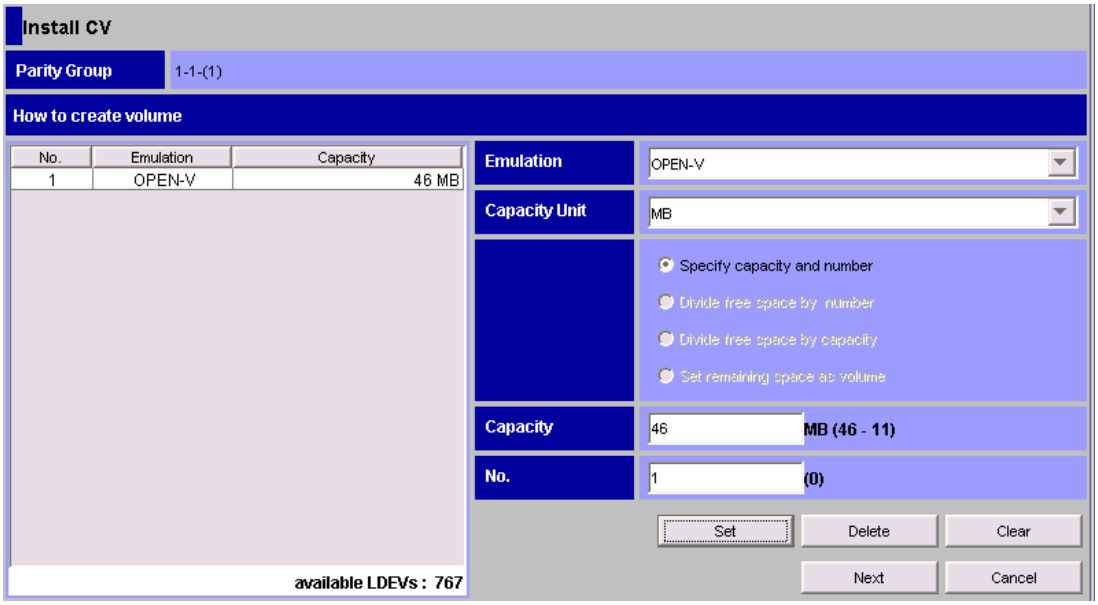


Figure 11.16 Install CV Dialog Box (1)

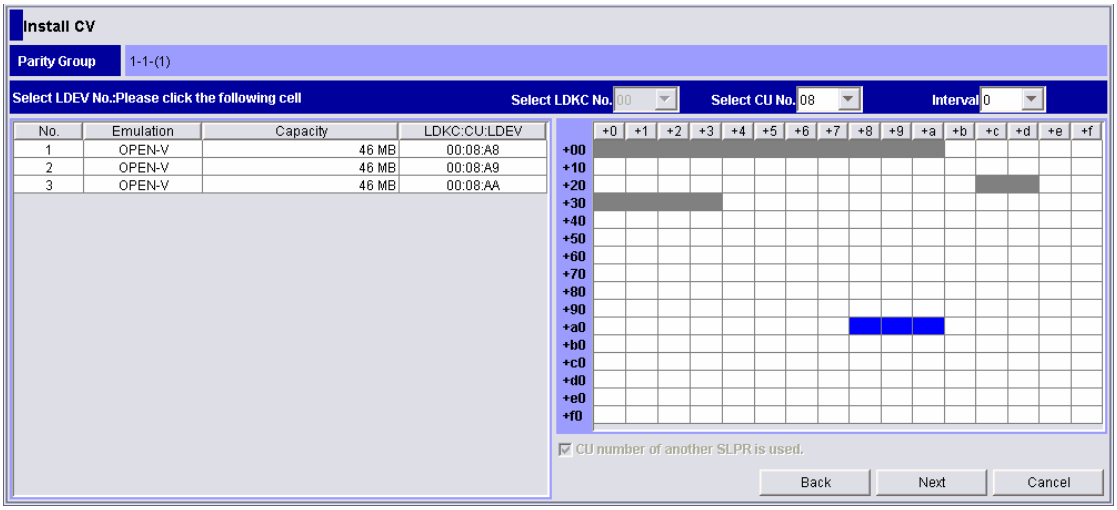


Figure 11.17 Install CV Dialog Box (2)

11.2.2.2 Deleting an LDEV

To delete an individual Virtual LVI/LUN volume within a VDEV, use the Volume to Space operation.

Converting Logical Volumes to Space

WARNING: The volume to space function is a destructive operation. The data on the logical volume(s) being converted is lost when the operation is complete. The user is responsible for backing up the data as needed before performing this operation.

The **Volume to Space** function allows you to convert one or more logical volumes (LDEVs) to space, which deletes the selected LDEVs from that VDEV. In other words, the **Volume to Space** function converts one or more selected LDEVs (FVs or CVs) in a VDEV into spaces.

The Volume to Space operation has the following restrictions:

- The LDEV must not be path-defined (including TrueCopy for z/OS, TrueCopy, ShadowImage for z/OS, ShadowImage, and Universal Replicator pair volumes).
- The LDEV must not be a component of a LUSE volume.
- The LDEV must not be reserved for Volume Migration.
- The LDEV must be read/write-enabled.
- The LDEV or the LUSE volume must not be a pool volume (pool-VOL).
- The LDEV must not be a journal volume.
- The LDEV must not be a remote command device.
- The LDEV must not be a volume used by Volume Security.

To convert a normal volume to free space:

1. Make sure that Storage Navigator is in Modify mode.

   For detailed information about Modify mode, please refer to the *Storage Naviagtor User's Guide*.

2. On the tree at the left of the **VLL** window, open a folder and select the desired disk group, parity group, and VDEV. The table at the right of the window displays detailed information about the LDEVs of the selected VDEV.
3. Select one or more LDEVs from the **LDKC:CU:LDEV** column.
4. Right-click on the selected LDEV to display a pop-up menu.
5. Select **Volume to Space** from the pop-up menu. A messasge appears.

6. Select **OK** to close the message.

   The change is not yet implemented in the storage system, but the following changes appear in the **VLL** tab:

   - The selected LDEVs are listed as **Free**.
   - The figures in the **Capacity** column are not yet updated.
   - The color of the VDEV icon that you manipulated in the tree view changes from red to blue. You cannot manipulate blue VDEVs until you select **Apply** or **Cancel** but you can perform additional Volume to Space operations on VDEVs with red icons.

7. Select **Apply**.
8. In the confirmation panel, select **OK**.

   Conversion to space starts. When the conversion ends, a message appears.

9. Click **OK** to close the message.

11.2.2.3 Setting a Command Device

Specifying Logical Devices as Command Devices

To enable the system administrator to execute CCI commands from an open-system host, you must select at least one logical device that will not be manipulated by TrueCopy or ShadowImage, and then specify the device(s) as the command device(s). When a CCI command is issued from a host, the command is received by the command device. The command device transfers the command to another logical device. Then, the command performs a TrueCopy or ShadowImage operation on that logical device.

To specify a logical device as a command device:

1. Start LUN Manager and display the **LUN Manager** window (Figure 11.35).
2. In the upper-right **LU Path** list or the lower-right **LDEV** list, select and right-click the desired logical device.

   Notes:

   - If nothing is displayed in the **LU Path** list, select a host group  in the tree.
   - The icons  and  indicate command devices.
   - The icon  does not indicate any logical device.

3. From the pop-up menu, select **Command Device: Disable -> Enable**.

   A message appears, asking whether you want to use the logical device as a command device.

4. Click **YES** button to close the message.
5. Click **Apply** button in the **LUN Manager** window.

   A message appears and asks whether you want to apply the setting to the storage system.

6. Click **OK** to close the message and apply the settings to the storage subsystem.

Deleting Command Devices

To delete a command device:

1. Start LUN Manager and display the **LUN Manager** window (Figure 11.35).
2. In the upper-right **LU Path** list or the lower-right **LDEV** list, select and right-click a command device (or).
3. From the pop-up menu, select **Command Device: Enable -> Disable**.

   A message appears.
4. Click **YES** button to close the message.
5. Click **Apply** button in the **LUN Manager** window.

   A message appears and asks whether you want to apply the setting to the storage system.
6. Click the **OK** button to close the message.

   The settings are applied to the storage system.

Enabling Command Device Security

If you want to protect logical volumes from CCI commands, you must apply command device security to the logical volumes. If command device security is applied to a logical device, the logical device will not be affected by CCI commands issued via command devices from the hosts.

To apply command device security to a logical device:

1. Start LUN Manager and display the **LUN Manager** window (Figure 11.18).
2. In the upper-right **LU Path** list or in the lower-right **LDEV** list, select and right-click the desired command device.

   Notes:

   - If nothing is displayed in the **LU Path** list, select a host group in the tree.
   - The icon indicates a logical volume to which command device security is already applied.
   - The icon does not indicate any logical device.
3. Select **Cmd. Dev. Security: Disable -> Enable** from the pop-up menu.

   A message appears, asking whether you want to apply command device security.
4. Click **OK** button to close the message.
5. Click **Apply** button in the **LUN Manager** window.

   A message appears and asks whether you want to apply the setting to the storage system.
6. Click the **OK** button to close the message.

   The settings are applied to the storage system.

Related topic: To remove command device security from a logical device, you must select and right-click the logical device ( ) in the upper-right **LU Path** list or the lower-right **LDEV** list and then select **Cmd. Dev. Security: Enable -> Disable** from the pop-up menu.

Releasing Command Device Security

To release command device security:

1. Start LUN Manager and display the **LUN Manager** window (Figure 11.18).
2. In the upper-right **LU Path** list or in the lower-right **LDEV** list, select and right-click the desired command device.

   Note: The icon indicates a logical volume to which command device security is already applied.
3. Select **Cmd. Dev. Security: Enable -> Disable** from the pop-up menu.

   A message appears.
4. Click **OK** button to close the message.
5. Click **Apply** button in the **LUN Manager** window.

   A message appears and asks whether you want to apply the setting to the storage system.
6. Click the **OK** button to close the message.

   The settings are applied to the storage system.

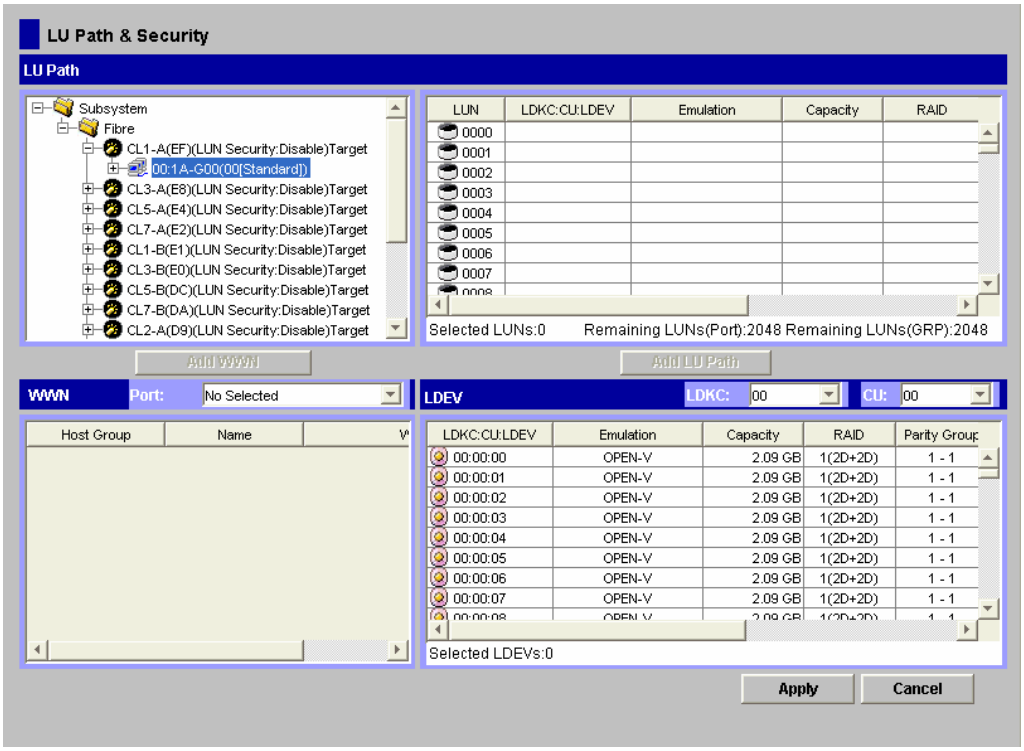


Figure 11.18 The LUN Manager Window (When Selecting Icon under Fibre Folder)

11.2.3 Using Dynamic Provisioning

Dynamic Provisioning Features

Dynamic Provisioning allows customers to allocate “virtual” disk storage based on their anticipated future needs, but with less physical disk initially required. Additional physical disks can be purchased later and installed transparently without an application service interruption.

The primary benefits of Dynamic Provisioning are:

- **Elimination of application service interruptions** that are normally required to install new disk capacity. Because the application only sees the amount of virtual capacity that is allocated to it, additional physical disk capacity can be installed when needed, without interruption.
- **Reduced TCO** by deferring some portion of storage acquisitions to a later date. Over an extended period of time the storage acquisition costs will be reduced by the use of Dynamic Provisioning.
- **Potentially enhanced performance** because the “virtual capacity” is provisioned from a global pool of LDEVs and thus the data and the I/O activity may be spread across a wider number of disks, resulting in potentially higher performance. You can level the workload without being constrained by the physical disk structure.
- **Simplified Administration** by reducing the impact of volume creation and volume formatting associated with the installation of physical disk capacity. A Dynamic Provisioning volume will be displayed as a Virtual LVI/LUN volume that has no actual storage capacity. Actual storage capacity from the Dynamic Provisioning pool is assigned when the data is written.
- **Potentially reduced power and cooling** requirements due to fewer physical disks required.

The following figure illustrates the difference between purchases made before and after installing Dynamic Provisioning.

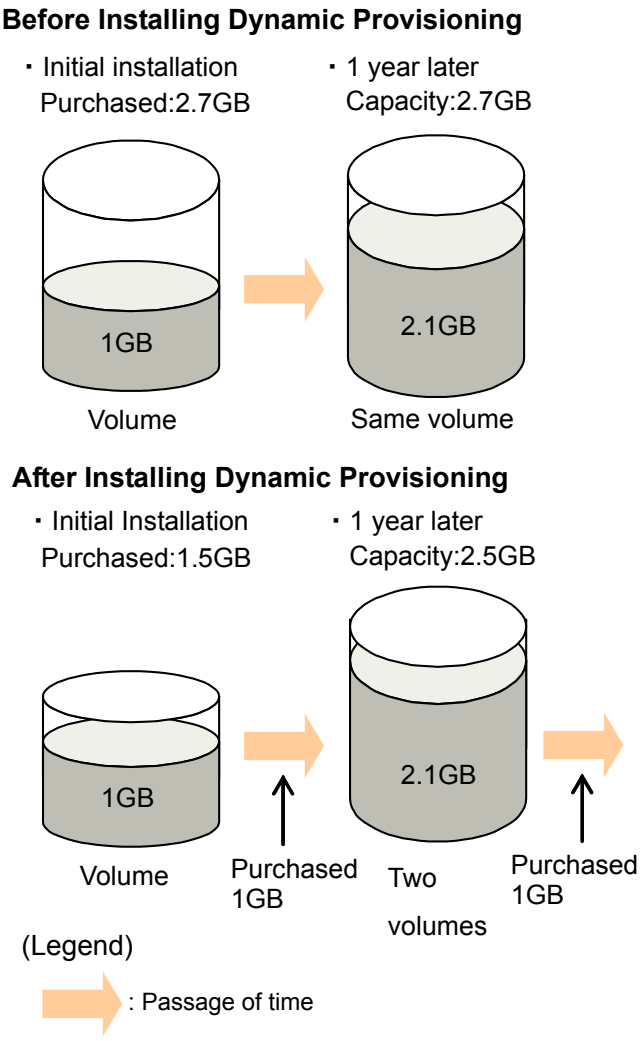


Figure 11.19 Benefits of Dynamic Provisioning

When you define volumes, you need to create volumes of the same capacity, which may incur additional initial installation expenses. In the first example, without Dynamic Provisioning the used volume capacity will exceed 80% within a year, requiring you to restructure the system when you add capacity.

Dynamic Provisioning decreases the cost to obtain the same volume capacity. Because you can purchase additional capacity only when needed, you can more effectively use the volumes that you create. You will avoid incurring the cost and downtime involved in restructuring the system, because capacity can be added without taking the system offline.

Requirements and Restrictions

For Dynamic Provisioning operations, you need the Hitachi Universal Storage Platform V (USP V) storage system including volumes and the license key of Dynamic Provisioning enabled on the Storage Navigator. Following are the requirements to use Dynamic Provisioning.

Volume and Pool Requirements

Pool-VOL requirements, pool requirements, and V-VOL requirements are described in the following tables.

Table 11.1 Pool-VOL Requirements

Item	Requirement
Volume type	Logical volume (LDEV) ***Note:*** Separating normal volumes and pool-VOLs into different parity groups is recommended for best performance. You cannot specify the following volumes as Dynamic Provisioning Pool-VOLs: ▪ Volumes used by ShadowImage, Volume Migration, TrueCopy, TrueCopy Asynchronous, or Universal Replicator ▪ LUSE volumes ▪ Volumes defined by Cache Residency Manager ▪ Volumes already registered in pools of Copy-on-Write Snapshot or Dynamic Provisioning ▪ Volumes used as Copy-on-Write Snapshot P-VOL or S-VOL ▪ Data Retention Utility volumes with a Protect, Read Only, or S-VOL Disable attribute ▪ Volumes created by Universal Volume Manager ▪ Volumes whose LDEV attribute is other than normal ▪ External volumes
Emulation type	OPEN-V
RAID level	All RAID levels. Pool-VOLs whose RAID levels are different can be registered in the same pool. However, in view of performance, it is recommended that you specify the same RAID level for pool-VOLs registered in the same pool.
Drive type	All drive types. Pool-VOLs whose drive types are different can be registered in the same pool. However, in view of performance, it is recommended that you specify the same drive type for pool-VOLs registered in the same pool.
Volume capacity	8 GB to 2TB. ***Note:*** Dividing a parity group into 16 volumes is recommended for best performance.
LDEV format	When you change volumes that are used as normal volumes to pool-VOL, perform LDEV formatting before you register the volumes to a pool. Once you register volumes in a pool, you cannot perform LDEV formatting of the pool-VOLs.
Deleting pool-VOLs	You cannot delete pool-VOLs registered in pools. You need to delete pools themselves and then delete the pool-VOLs.
Path definition	Not available. A volume with a path definition cannot be specified as a pool-VOL.

Table 11.2 Pool Requirements

Item	Requirement
Pool capacity	8 GB to 286 TB per pool The capacity of the pool is calculated by the following formulas. The capacity of the pool (MB) = total page number × 42 – (4116 + 84 × pool-VOL number) Total page number = Σ(↓↓block number of pool-VOL ÷ 512↓ ÷ 168↓) ↓↓: truncate the part of the formula between the arrows after the decimal point.
Number of pool-VOLs	1 to 256 per pool You cannot register volumes that have already been registered as pool-VOLs to another pool. If you create pools for Copy-on-Write Snapshot, the pools for Dynamic Provisioning will decrease.
Number of Pools	Up to 32 total pools maximum per storage system for both Copy-on-Write Snapshot and Dynamic Provisioning. Pool IDs (0 to 127) are assigned as pool identifiers.
Increasing capacity	Although you can increase pool-VOL capacity online, increasing parity group capacity instead is recommended.
Reducing capacity	You cannot reduce pool capacity. You must delete and then reconfigure the pool.
Deleting	You can delete pools to which V-VOLs doesn't have any association.
Threshold	The following two thresholds are for monitoring free area in the pool. Pool threshold 1: Default value is 70 % of total pool capacity. You can set it between 5 % and 95%, in 5 % increments. The default value is recommended. Pool threshold 2: Always 80 % of total pool capacity. Pool usage over either threshold will cause a warning to be issued via a SIM and an SNMP trap.
Data allocation unit	42 MB At least 42 MB of the area is allocated in a pool for writing by the host.

Table 11.3 V-VOL Requirements

Item	Requirement
Volume type	V-VOL. The LDEV number is the same as for normal volumes.
Emulation type	OPEN-V Servers (including Command Control Interface) will show you the emulation type of the V-VOLs with “0” such as OPEN-0V.
Maximum number	4096 volumes per pool 1024 volumes per volume group 63232 volume groups per system
Volume capacity	46 MB to 2 TB per volume 1.1 PB per storage system maximum
Threshold	V-VOL threshold: Default value is 5 % of unused pool capacity. You can set it between 5 % and 300%, in 5 % increments. The default value is recommended. The V-VOL threshold is the proportion of the unused V-VOL capacity and the unused pool capacity.
Path definition	Available. However, you cannot define paths unless you set the pool association information to the V-VOL.

Item	Requirement
LDEV format	Available. When you perform LDEV format to the V-VOLs, USP V initializes data only in the allocated pages of the V-VOLs. However, after you perform LDEV format, the free space in the pool does not increase because the pages are not released.

Dynamic Provisioning Requirements

To use Dynamic Provisioning, all USP V hardware, microcode, and software required for Dynamic Provisioning operations must be installed and enabled. You also need to purchase the license key of Dynamic Provisioning and install it in Storage Navigator. For detailed information about the license key and software installation, please refer to the *Storage Navigator User's Guide*.

Note that you must operate the Storage Navigator in modify mode to perform Dynamic Provisioning operations. Users in view mode can only view Dynamic Provisioning information, but they cannot create new pools or V-VOLs. For information about how to set up and use the Storage Navigator computer, please refer to the *Storage Navigator User's Guide*.

License Requirements

To operate Dynamic Provisioning, you need to install Dynamic Provisioning program product in Storage Navigator. Therefore, purchase of the license of Dynamic Provisioning is required.

You will need a Dynamic Provisioning license for the total pool capacity. When you set Dynamic Provisioning pools to SLPRs, you are not be charged by the SLPRs.

If you use V-VOLs of Dynamic Provisioning as P-VOLs or S-VOLs of ShadowImage, you will need a ShadowImage license for the total used pool capacity. If the total volume capacity exceeds the licensed capacity, the additional capacity will be treated as a temporary license. You will be able to use the additional capacity for 30 days. Once 30 days has passed, you will not be able to perform ShadowImage operations except for suspending copy operations or deleting pairs.

For information about licenses, please refer to the *Storage Navigator User's Guide*.

Shared Memory Requirements

Dynamic Provisioning requires its own dedicated shared memory for the V-VOL management area, which is separate from the shared memory for Copy on Write Snapshot. The required shared memory will be installed by your Hitachi Data Systems representative.

Operating System and File System Capacity

Certain combinations of operating systems and file systems can reduce file system capacity for Dynamic Provisioning. The following table shows the effects of those combinations. For more information, contact your Hitachi Data Systems representative.

Table 11.4 Operating System and File System Capacity

Operating System	File System	Meta-Data Writing	Capacity reduction
Windows Server 2003	NTFS	Writes the first meta-data.	Yes
Linux®	XFS	Writes the meta-data in Allocation Group Size units.	Yes If the Allocation Group Size settings is 640MB when you create the file system, the page size is 42MB, and the ratio will be 42MB ÷ 640MB = 6.5%. Therefore, the pool capacity as much as the 6.5% of the V-VOL capacity will be used when you create the file system. There will be no effects in reduction. if the setting of the Allocation Group Size is too small.
	Ext2 Ext3	Writes the meta-data in 128 MB increments.	Yes However, pool capacity, which is about 30 % of the V-VOL capacity, is used to create the file system.
Solaris®	UFS	Writes the meta-data in 52 MB increments.	No
	VxFS	Writes the first meta-data.	Yes
AIX®	JFS	Writes the meta-data in 8 MB increments.	No If you change the Allocation Group Size settings when you create the file system, the meta-data can be written to a maximum of 64 MB. Approximately 65 % of the pool is used.
	JFS2	Writes the first meta-data.	Yes
	VxFS	Writes the first meta-data.	Yes
HP-UX	JFS (VxFs)	Writes the first meta-data.	Yes
	HFS	Writes the meta-data in 10 MB increments.	No

Note: There will be less effects in reduction if the volume capacity is too small. For example, if V VOL capacity is 100MB when you use Windows 2003 or NTFS, the first page (42MB) will surely be assigned. Therefore, the pool capacity as much as 42% of the V VOL capacity will be used when you create the file system.

Notes on Reducing the Pool Capacity

You cannot delete Pool-VOLs that has once been registered in a pool. So in order to decrease pool capacity, you need to create another pool, or to delete Pool-VOLs themselves and recreate a pool.

Notes on Switching Off the Power Supply

Before you switch off the power supply while Dynamic Provisioning is running, stop the host I/O operations first. When you switch off the power supply, the management table on the shared memory for Dynamic Provisioning is backed up to the hard disk drive in the SVP. And when you switch on the power supply, the management table in the hard disk drive is recovered to the shared memory, so you can use the storage system in the same status as when you switched off the power supply.

Using Dynamic Provisioning

The following flow charts illustrate procedures for using Dynamic Provisioning:

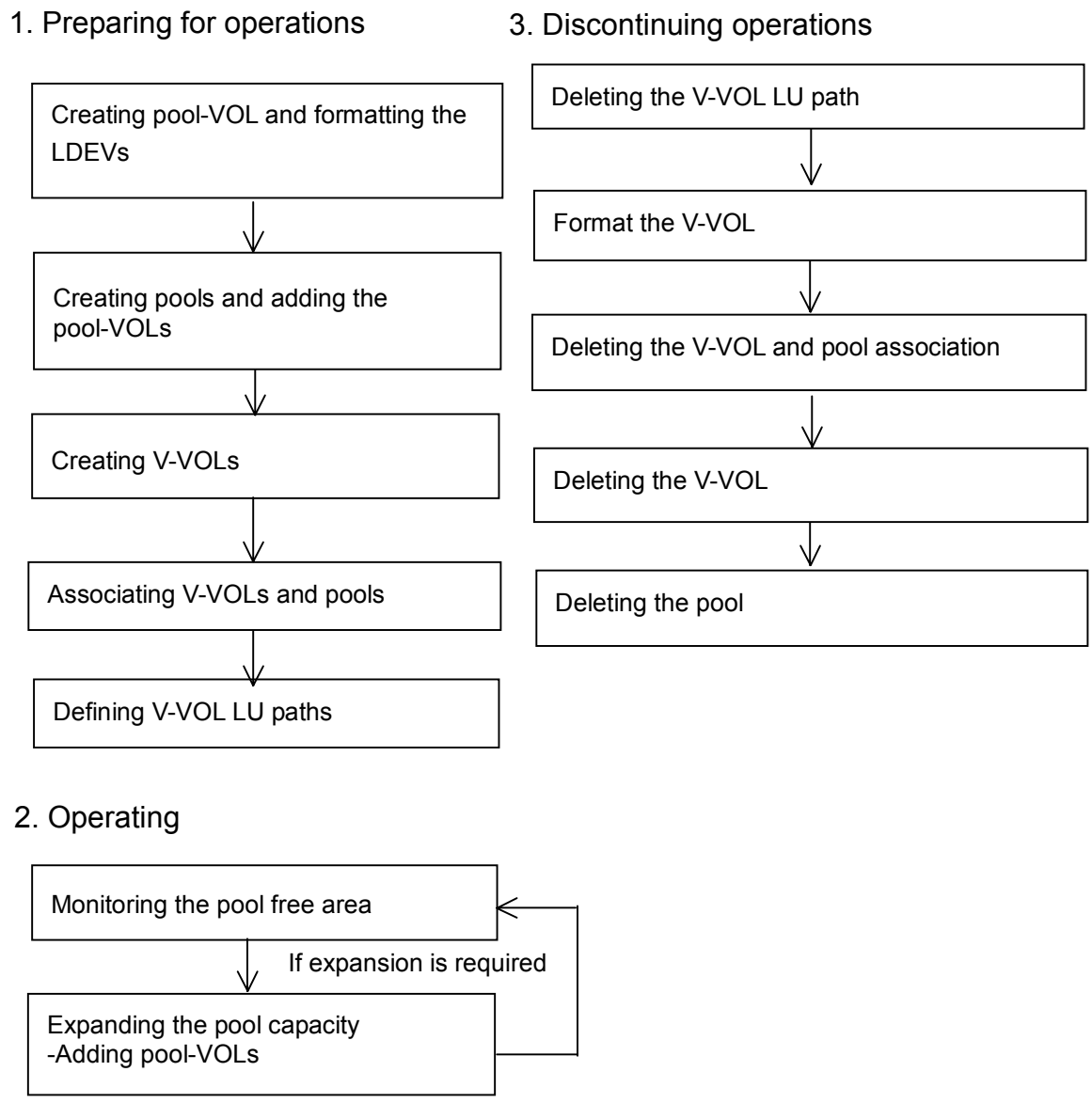


Figure 11.20 Dynamic Provisioning Flow Chart

Note: Before creating a pool, it is required that the V-VOL management area is created in the shared memory. The V-VOL management area is automatically created when the additional shared memory is installed. For details on installing additional shared memory, please call the Support Center.

Note: Only the storage administrator can perform "1. Preparing for operations", "2. Operating (Adding pool-VOLs)", and "3. Discontinuing operations".

11.2.3.1 Managing Pools

Creating Pools

Required time for creating pools depends on the number and the capacity of the pools and pool-VOLs that you add to the pool. If you create many pools, or if you add a pool-VOL of large capacity, it may take up to about 20 minutes until the entire processing ends.

To create a new pool:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. Right click **Dynamic Provisioning** in the **Pool** tree of the Pool window (Figure 11.21).

   A pop-up menu is displayed.

3. Select **New Pool** from the pop-up menu.

   The New Pool dialog box (Figure 11.21) is displayed.

4. Enter the pool ID in the **Pool ID** text box.

   Note: You can enter only a whole number from 0 to 127 in this text box. Do not enter any number that is already used for another pool.

5. Select the threshold of the pool usage rate from the **Threshold** dropdown list.

6. Select **Dynamic Provisioning** from the **Attribute** dropdown list.

7. Check the contents of the setting and if there is no problem, click **Set**.

   The New Pool dialog box closes and the new pool will be displayed in the **Pool** tree.

8. Select the pool in the **Pool** tree.

9. Select the volumes that you want to register in the pool as the pool-VOLs from the **Free LDEVs** list.

   Note:

   - If you select the CU number from the **CU** dropdown list, the volumes in the CU will be displayed in the list. Within the same CU, you can select the multiple volumes at a time.
   - If you select an LDKC number from the dropdown list, only the CU of the LDKC will be displayed in the **CU** dropdown list.

10. Click **Add Pool-VOL**.

    The dialog box that lists the volumes you selected in step 9 is displayed.

    ***Note*:** If you select and right click the volume in the **Free LDEVs** list, a pop-up menu will be displayed. If you select **Add Pool-VOL** from the pop-up menu, the result will be the same as when you click **Add Pool-VOL**.

11. Check the list of the volumes and if there is no problem, click **OK**.

    The dialog box closes and the selected volumes will be displayed in the **Pool-VOL** list.

12. If you want to add more pool-VOLs, repeat step 9 and the subsequent steps.

    Note:

    - Total capacity of the pool-VOLs in the pool is the storage capacity of the pool.
    - The capacity of the pool management blocks in use will increase if you add the pool-VOLs. You need to be careful to keep the capacity of the pool management blocks in use less than its total capacity.

13. If you want to create another pool, repeat step 2 and the subsequent steps.
14. Click **Apply**.

    The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

    Caution: You cannot delete the pool-VOLs after you add them. So, check and make sure that settings of the pool-VOLs you are going to add are correct.

15. Click **OK**.

    The confirmation message closes and the new pool information is applied to the storage system.

16. Click **Initialize** in the Pool window.

    This pool initialization will require time depending on the pool capacity as below.

    - Approximately 20 seconds when the pool capacity is 3TB.
    - Approximately 3 minutes when the pool capacity is 30TB.
    - Approximately 30 minutes when the pool capacity is 300TB.

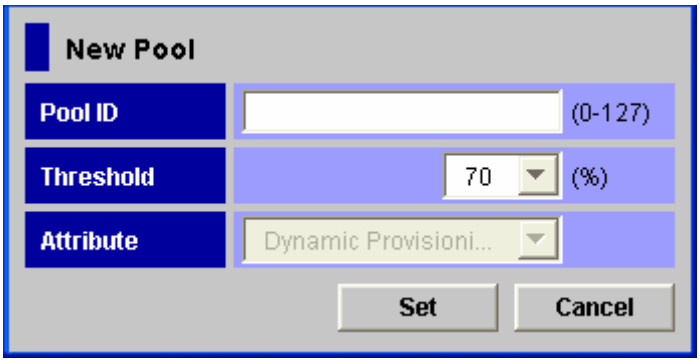


Figure 11.21 New Pool Dialog Box

The **New Pool** dialog box displays the following items.

- Pool ID text box

  You can enter the pool ID in the text box. A whole number from 0 to 127 can be entered in the text box.

  Note: Do not enter the pool ID that is already used by another pool. If you enter the pool ID that is already used by another pool and click **Set**, an error message will be displayed. In that case, please enter a different number for the new pool ID.

- Threshold dropdown list

You can select the threshold of the pool usage rate between 5 and 95. 70 is the default value.

Note: Unit of the threshold is percent (%). If the pool usage rate exceeds the threshold, the pool status changes to Warning. You cannot create new pool-VOLs in Warning status. Be careful not to set too small value for the threshold.

- **Attribute** dropdown list

  You can select the program product that uses the pool.

- **Set** button

  Creates a new pool according to the settings in the New Pool dialog box and closes the dialog box.

- **Cancel** button

  Cancels the settings in the New Pool dialog box and closes the dialog box. No pool will be created.

Changing the Pool Information

After you created the pool, the only setting you can change is the threshold.

To change the threshold of the pool:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. Select and right click the pool whose setting you want to change.

   A pop-up menu is displayed.

   Note: If the pool usage rate is 95 % or higher, the pop-up menu will not be displayed.

3. Select **Change Pool Information** from the pop-up menu.

   The Change Pool Information dialog box (Figure 11.22) is displayed.

4. Select the value for the threshold from the **Threshold** dropdown list.

   Note: In the dropdown list, only the values that are higher than the pool usage rate are displayed.

5. Click **Set**.

   The Change Pool Information dialog box closes.

6. Click **Apply**.

   The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

7. Click **OK**.

   The confirmation message closes and the change of the setting is applied to the storage system.

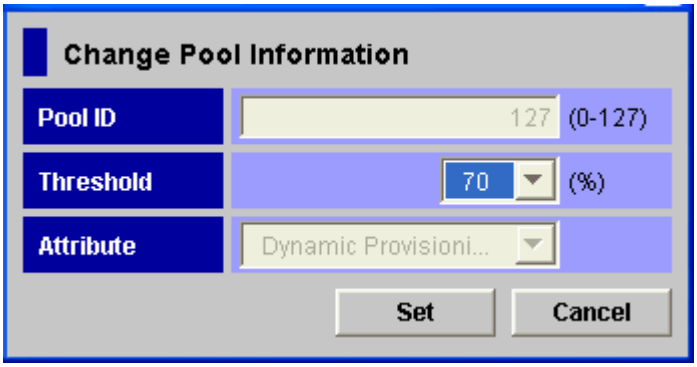


Figure 11.22 Change Pool Information Dialog Box

The items in the **Change Pool Information** dialog box are same with those of the New Pool dialog box. However, in the Change Pool Information dialog box, you cannot enter or select the items other than the **Threshold** dropdown list.

Deleting Pools

As a general rule you will specify and delete a single pool. If you choose to delete multiple pools, all pools that can be deleted will be deleted.

Deleting a Pool

To delete a pool:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. Select and right click the pool you want to delete.

   A pop-up menu is displayed.

3. Select **Delete Pool** from the pop-up menu.

   The confirmation message is displayed to ask you if it is OK to delete the selected pool.

4. Click **OK**.

   The icon of the selected pool changes to the icon that indicates the deleting process.

5. Click **Apply**.

   The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

6. Click **OK**.

   The confirmation message closes and the deletion of the pool is applied to the storage system.

Deleting Multiple Pools

To delete multiple pools:

Caution: If you execute the following operation, all the pools that can be deleted will be deleted. If there is any pool that you do not want to delete, you must delete one pool at a time by following the steps in **Deleting a Pool**.

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For information about how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. Select and right click the **Dynamic Provisioning** icon in the **Pool** tree of the Pool window.

   A pop-up menu is displayed.

3. Select **Delete Pool(s)** from the pop-up menu.

   The confirmation message is displayed to ask you if it is OK to delete the pools.

4. Click **OK**.

   The icons of the pools change to indicate the pools that are being deleted.

5. Click **Apply**.

   The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

6. Click **OK**.

   The confirmation message closes and the deletion of the pools is applied to the storage system.

Recovering Pools

This operation is for failure recovery. Normally do not perform this operation.

You can specify one pool and recover that pool only, or you can recover multiple pools at a time. The procedure to recover the specified pool and the procedure to recover multiple tools at a time are described below.

Recovering a Pool

To recover a pool:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, see the *Storage Navigator User's Guide*.

2. Select and right click the pool you want to recover in the **Pool** tree of the Pool window.

   A pop-up menu is displayed.

3. Select **Restore Pool** from the pop-up menu.

   The confirmation message is displayed to ask you if it is OK to restore the selected pool.

4. Click **OK**.

   The icons of the pools change to indicate the normal pools.

5. Click **Apply**.

The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

6. Click **OK**.

   The confirmation message closes and the restoration of the pool is applied to the storage system.

Recovering Multiple Pools

To recover multiple pools:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For information about how to change the mode, see the *Storage Navigator User's Guide*.

2. Select and right click the **Dynamic Provisioning** icon in the **Pool** tree of the Pool window.

   A pop-up menu is displayed.

3. Select **Restore Pools** from the pop-up menu.

   The confirmation message is displayed to ask you if it is OK to restore the pools.

4. Click **OK**.

   The icons of the pools change to indicate the normal pools.

5. Click **Apply**.

   The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

6. Click **OK**.

   The confirmation message closes and the restoration of the pools is applied to the storage system.

11.2.3.2 Managing V-VOLs

Creating V-VOLs

To create new V-VOLs:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. Right click **Dynamic Provisioning** in the V-VOL group tree of the V-VOL window.

   A pop-up menu is displayed.

3. Select **New V-VOL Group** from the pop-up menu.

   The New V-VOL Group dialog box (Figure 11.40) is displayed.

4. Select or enter the V-VOL group ID in the **V-VOL Group** dropdown list.

Note: You can enter only the whole number from 1 to 65535. Do not enter the number that is already used for another V-VOL group.

5. Select the emulation type of the V-VOL group from the **Emulation Type** dropdown list.
6. Select the CLPR number in which you want to register the V-VOL group from the **CLPR** dropdown list.
7. Enter the number of V-VOL Group to the **Copy of V-VOL Group** text box.

   Notes:

   - You can enter only the whole number from 0 to 63231 to the **Copy of V-VOL Groups** text box. However, when the external volume groups of Universal Volume Manager or the V-VOL groups of Copy-on-Write Snapshot are created, the available V-VOL groups for Dynamic Provisioning will be fewer than the maximum number according to the number of the external volume groups and V-VOL groups of Copy-on-Write Snapshot. For example, if 10 external volume groups are created for Universal Volume Manager, you can enter only the whole number under 63221.
   - If you create multiple V-VOL groups at a time, all the V-VOLs that are going to be registered in each V-VOL group will have the same emulation type and capacity.

8. Click **Next**.

   The Create V-VOL wizard dialog box (1) (Figure 11.24) is displayed.

9. Select the emulation type of the V-VOL from the **Emulation Type** dropdown list.
10. Select the unit of the capacity of the V-VOL from the **Capacity Unit** dropdown list.

    The selected unit is displayed after the **Capacity** text box.

11. Enter the capacity of the V-VOL in the **Capacity** text box.

    Note: If the unit is megabyte (MB), you can enter only the whole number from 46 to 2097152. If the unit is block, enter the whole number from 96000 to 424967296. If the unit is cylinder, enter the whole number from 50 to 2236962.

12. Enter the number of the V-VOLs you want to create in the **Number of V-VOL** text box.

    Note: You can enter only the whole number from 1 to 1024 in this text box.

13. Click **Set**.

    The volumes are added to the V-VOL information setting list (i.e. middle of the window). If you want to create more V-VOLs, repeat step 9 to step 13.

    Note: You cannot add new V-VOLs to the V-VOL group when you complete the operations to create the V-VOLs. Make sure to add enough V-VOLs to create at this point.

14. Click **Next**.

    The Create V-VOL wizard dialog box (2) (Figure 11.25) is displayed.

15. Select the volume in the V-VOL information setting list (i.e. upper right area of the dialog box).
16. Select the LDKC number from the **Select LDKC No.** dropdown list, and select the CU number from the **Select CU No.** dropdown list.

Areas of the CU selected from the dropdown list are displayed in the **Select LDEV No.** area (i.e. middle of the dialog box).

Notes:

- Only the areas displayed by the white cells are available for the V-VOLs. You cannot use the areas displayed by the gray cells to create the V-VOLs.
- If you want to select the CUs that belong to other SLPRs, select the **CU number of another SLPR is used.** check box.

17. Select the interval between the LDEV numbers from the **Interval** dropdown list.

    Note: If you select **0**, the LDEV number will be sequential.

18. Select the area in the **Select LDEV No.** area.

    The color of the selected area changes to blue. CU number and LDEV number are added to the V-VOL information setting list, and the blue italic fonts changes to the black normal fonts.

    If there are multiple V-VOLs to set, repeat the step 15 to step 18.

19. Click **Next**.

    The Create V-VOL wizard dialog box (3) (Figure 11.26) is displayed.

20. Check the settings and if there is no problem, click **OK**.

    The Create V-VOL wizard dialog box (3) closes and the V-VOL window is displayed again.

    In the V-VOL window, the settings are displayed in the blue italic fonts.

21. Click **Apply**.

    The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.

22. Click **OK**.

    The confirmation message closes and the new V-VOL information is applied to the storage system.

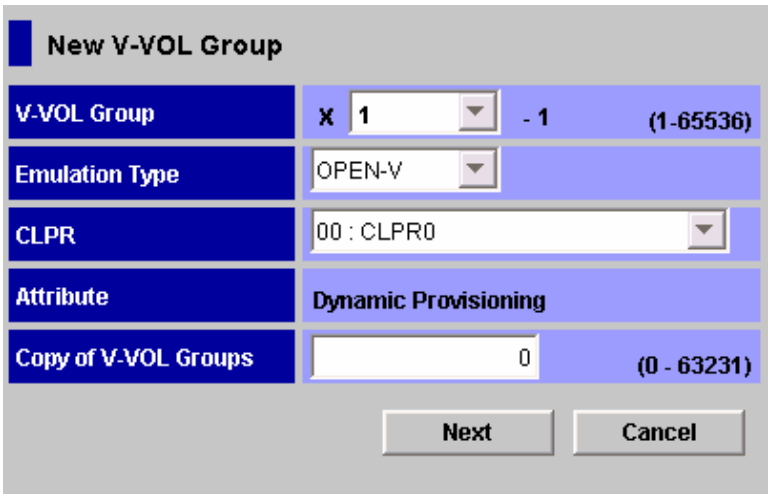


Figure 11.23 New V-VOL Group Dialog Box

New V-VOL Group dialog box displays the following items.

- **V-VOL Group** dropdown list

  You can select or enter the V-VOL group ID in the dropdown list. The whole number from 1 to 65535 can be selected or entered in the dropdown list.

  Note: Do not enter the V-VOL group ID that is already used by another V-VOL group. If you enter the V-VOL group ID that is already used by another V-VOL group and click **Next**, an error message will be displayed. In that case, please select or enter a different number for the new V-VOL group ID.

- **Emulation Type** dropdown list

  You can select the emulation type of the V-VOL group.

- **CLPR** dropdown list

  You can select the CLPR of the V-VOL group.

- **Attribute**

  The name of the program product that is going to use the V-VOL group is displayed. This is the name of the program product whose icon you right clicked in order to display the New V-VOL Group dialog box.

- **Copy of V-VOL Groups** text box

  Allows you to enter the number of the V-VOL groups to be copied. You can enter the whole number from 0 to 63231. Note that no V-VOL group will be copied if you enter 0.

- **Next** button

  Fixes the settings in the New V-VOL Group dialog box and displays the Create V-VOL wizard dialog box (1).

- **Cancel** button

  Cancels the settings in the New V-VOL Group dialog box and closes the dialog box.

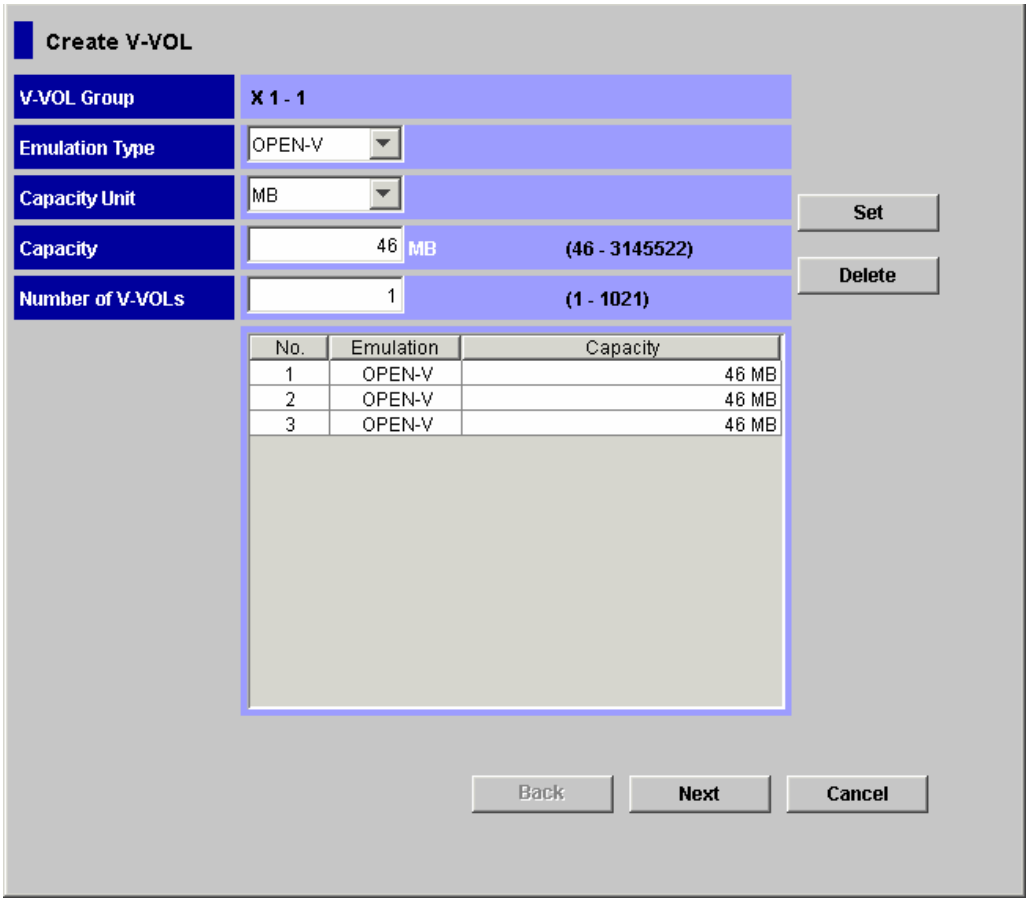


Figure 11.24 Create V-VOL Wizard Dialog Box (1)

The **Create V-VOL** wizard dialog box (1) displays the following items.

- **V-VOL Group**

  V-VOL group ID that you set in the New V-VOL Group dialog box is displayed.

- **Emulation Type** dropdown list

  You can select the emulation type of the V-VOL.

- **Capacity Unit** dropdown list

  You can select the unit of the capacity of the V-VOL. **MB** (megabyte), **block**, or **Cyl** (cylinder).

- **Capacity** text box

  You can enter the capacity of the V-VOL in the text box.

  If you selected **MB** from the **Capacity Unit** dropdown list, you can enter the whole number from 46 to 2097152. If you selected **block** from the dropdown list, you can enter the whole number from 96000 to 424967296. If you selected **Cyl** from the **Capacity Unit** dropdown list, you can enter the whole number from 50 to 2236962.

- **Number of V-VOL** text box

  You can enter the number of the V-VOLs that you want to add in the text box. Enter the whole number from 1 to 1024.

Note: The number of the V-VOLs that you can enter changes by the number of the V-VOL groups to be copied in the Figure 11.23. For example, when the number of the V-VOLs that you can enter is 1024, if you specify 100 to the V-VOL groups to be copied, you can specify 10 V-VOLs per V-VOL group. Therefore, the range that is displayed in the number of the V-VOLs is (1 - 10).

- **Set** button

  Adds the V-VOL(s) to the V-VOL information setting list.

- **Delete** button

  Deletes the selected V-VOL(s) from the V-VOL information setting list.

- V-VOL information setting list (i.e. middle of the dialog box)

  Information about the V-VOL(s) that you are going to create is displayed.

  - **No.**: number
  - **Emulation**: emulation type of the V-VOL
  - **Capacity**: capacity of the V-VOL

- **Back** button

  Returns to the New V-VOL Group dialog box while maintaining the settings in this dialog box.

- **Next** button

  Confirms the setting in this dialog box and moves to the Create V-VOL wizard dialog box (2)

- **Cancel** button

  Cancels the setting in the Create V-VOL wizard dialog box (1) and closes the dialog box.

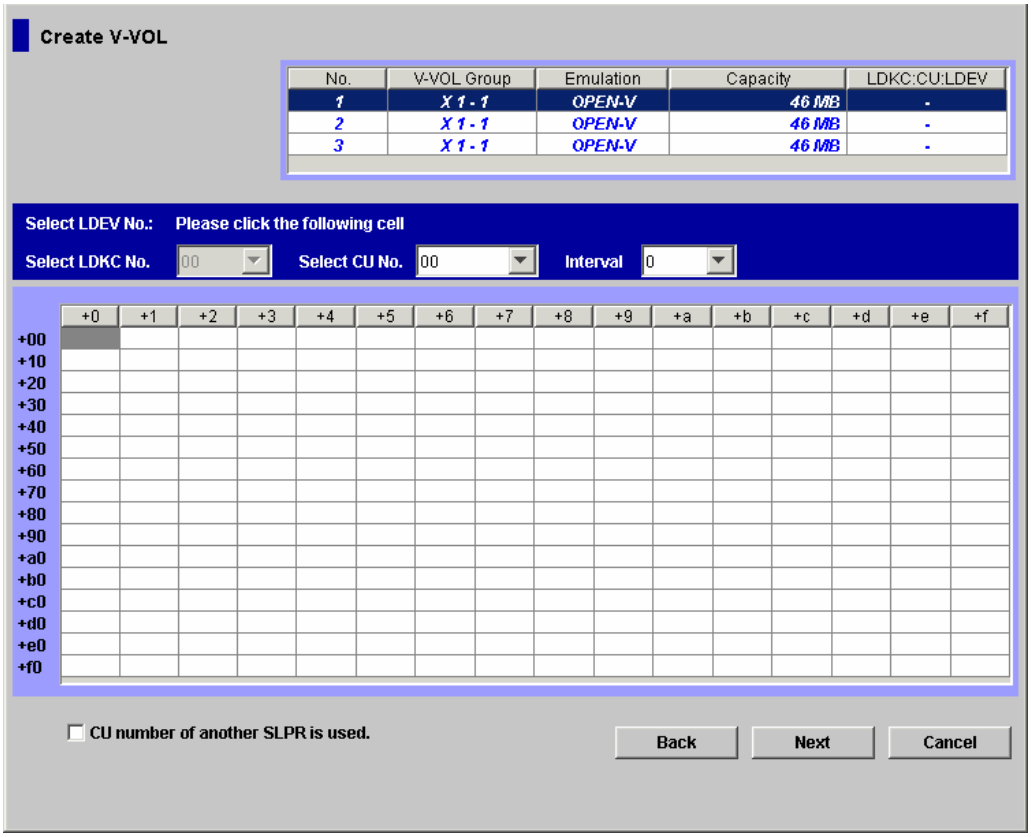


Figure 11.25 Create V-VOL Wizard Dialog Box (2)

The **Create V-VOL** wizard dialog box (2) displays the following items.

- V-VOL information setting list (i.e. upper right area of the dialog box)

  Information about the V-VOL(s) that you are going to create is displayed.

  - **No.**: number
  - **V-VOL Group**: V-VOL group ID
  - **Emulation**: emulation type of the V-VOL
  - **Capacity**: capacity of the V-VOL
  - **LDCK:CU:LDEV**: LDKC number, CU number and LDEV number of the V-VOL.

  V-VOL of Dynamic Provisioning has an LDEV number followed by **X**.

- **Select LDKC No.** dropdown list

  You can select the LDKC number.

- **Select CU No.** dropdown list

  You can select the CU number.

- **Interval** dropdown list

  You can select the interval between the LDEV numbers that need to be assigned to the newly created V-VOLs. If you select **0**, the LDEV numbers will be sequential.

  Notes:

- The value you specify as the interval between LDEV numbers counts only the available LDEV numbers and skips those that are not selectable.
- Even when you use the multiple CUs, LDEV numbers will be assigned according to the setting in the **Interval** dropdown list.

- **Select LDEV No.** area

  The settings of LDEV numbers for the CU number selected from the **Select CU No.** dropdown list are displayed. Numbers in the upper end and the left side indicate the LDEV number. For example, the LDEV number of the cell whose upper end is **+2** and the left side is **+10** is 12.

  Gray cells indicate the LDEV numbers that are already used for other volumes, white cells indicate the unused LDEV numbers, and blue cells indicate the LDEV numbers that are selected for the V-VOLs in this dialog box.

- **CU number of another SLPR is used.** check box

  Allows you to select the CU numbers of the SLPR other than the SLPR now you are in.

- **Back** button

  Returns to the Create V-VOL wizard dialog box (1) while maintaining the settings in this dialog box.

- **Next** button

  Fixes the setting in this dialog box and moves to the Create V-VOL wizard dialog box (3).

- **Cancel** button

  Cancels the setting in the Create V-VOL wizard dialog box (2) and closes the dialog box.

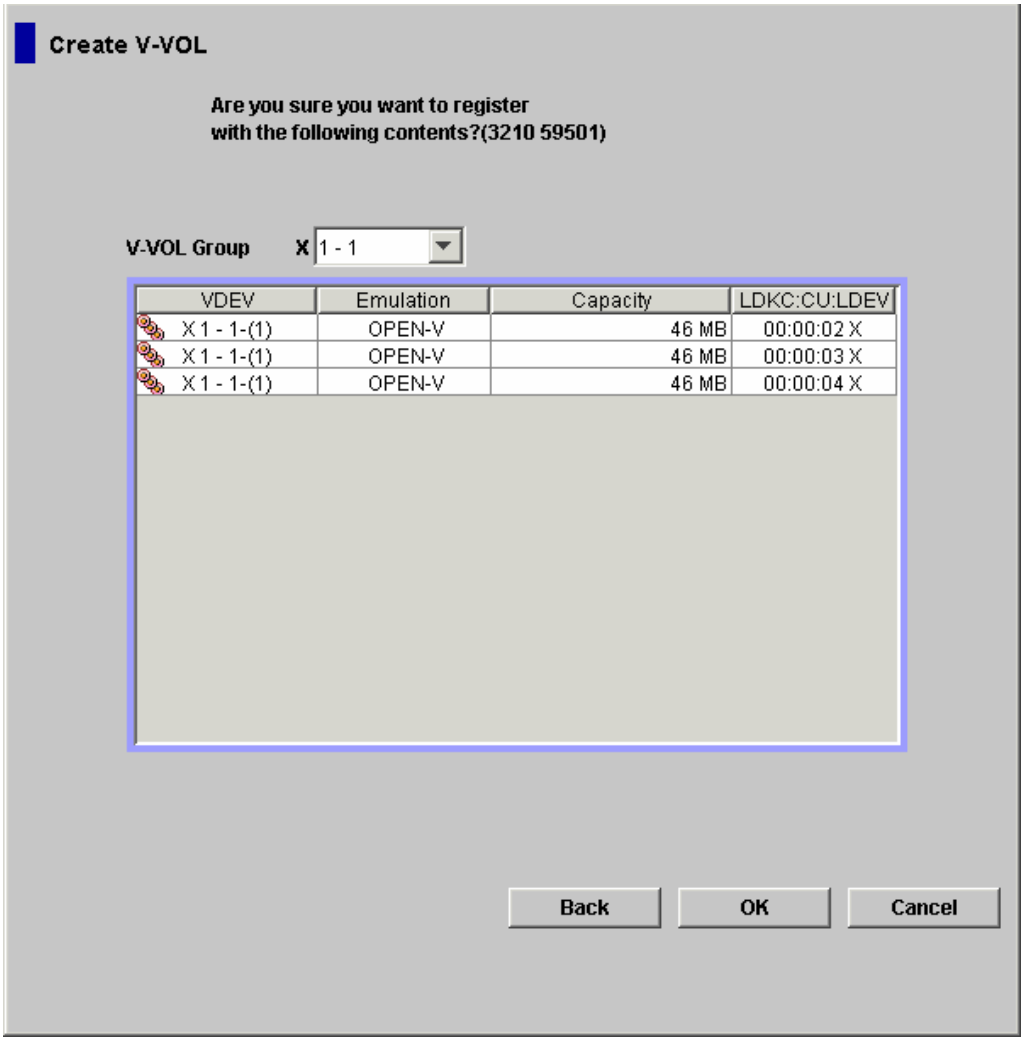


Figure 11.26 Create V-VOL Wizard Dialog Box (3)

The **Create V-VOL** wizard dialog box (3) displays the following items.

- **V-VOL Group** dropdown list

  You can select the V-VOL group ID of the V-VOL you set. Note that you cannot enter the ID.

- V-VOL information setting list (i.e. middle of the dialog box)

  Information about the V-VOL(s) that you are going to create is displayed.

  - **VDEV:** V-VOL group ID and VDEV number
  - **Emulation:** emulation type of the V-VOL
  - **Capacity:** capacity of the V-VOL
  - **LDKC:CU:LDEV:** LDKC number, CU number and LDEV number of the V-VOL

- **Back** button

  Returns to the Create V-VOL wizard dialog box (2) while maintaining the settings in this dialog box.

- **OK** button

  Fixes the setting in the Create V-VOL wizard dialog box (3) and closes the dialog box.

- **Cancel** button

  Cancels the setting in the Create V-VOL wizard dialog box (3) and closes the dialog box.

Changing the V-VOL Information

You can set the information of V-VOL such as the pool association and the threshold with right-clicking the V-VOL list that is indicated on the right of the V-VOL window. Make sure to set after creating V-VOLs. If you want to change the associated pool, change the settings (pool association and threshold). If you want to change only the threshold of the V-VOLs, please refer to **Changing Threshold of the V-VOL**.

Setting the Pool Association Information to the V-VOL

To apply the information of the pool associated with the V-VOL:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. In the V-VOL group tree of the V-VOL window, select the V-VOL group that contains the V-VOL(s) you want to associate with pool information.

3. Right click the row(s) of the V-VOL that you want to set in the V-VOL list and click the **Connect Pool** command from the pop-up menu.

   The Connect Pool dialog box will be displayed. (Figure 11.27)

   Notes:

   - The area that you can set is only the black colored rows. You cannot set if you select the rows including the blue colored rows. After setting, the area becomes blue. When it reflects to the storage system, it changes into black.
   - If the V-VOL has already been associated with the pool, right click the row containing the V-VOL and click the **Release Pool** command from the pop-up menu, then execute the operation from step 7 onward to fix the deletion.

4. Select the pool ID of the pool that you want to associate with and click **Next**. The Change Threshold dialog box (Figure 11.28) will be displayed.

5. Select the threshold (%) of the relevant V-VOL from the dropdown list in the Change Threshold dialog box

6. Click **Set** and decide to associate the V-VOL with the pool.

7. Click **Apply** in the V-VOL window.

   The confirmation message is displayed to ask you whether or not the setting can be applied to the disk storage system.

8. Click **OK**.

   The confirmation message closes and the new V-VOL information (pool association and threshold) is applied to the storage system.

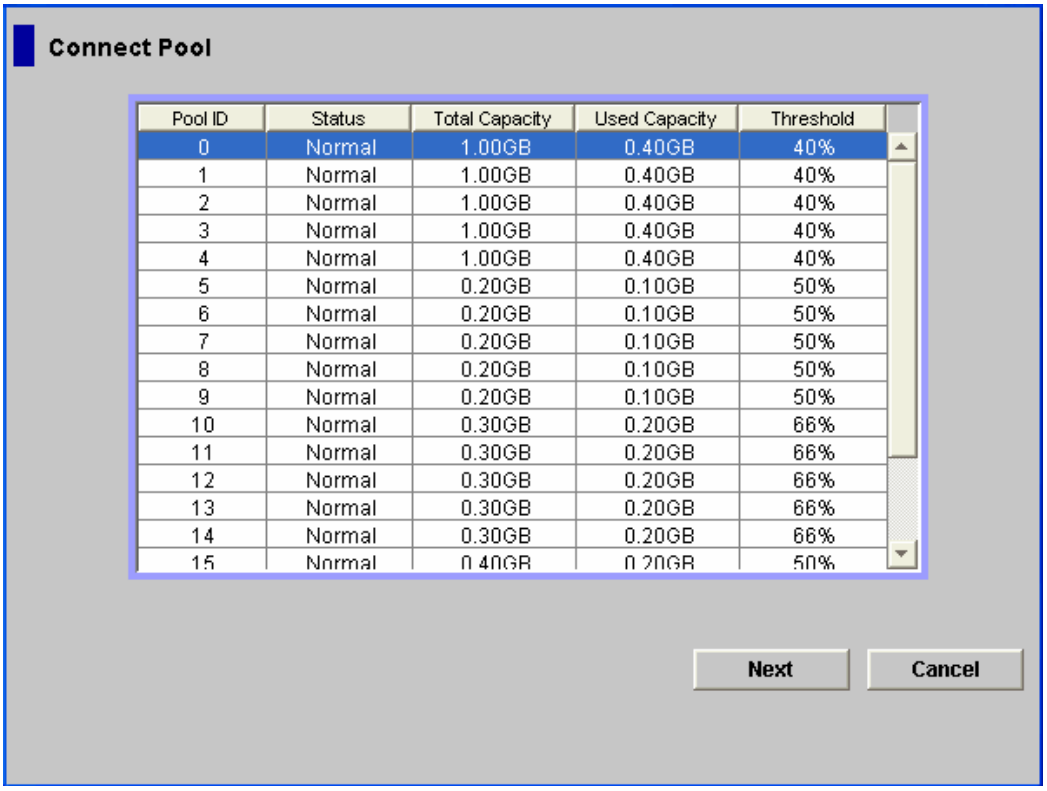


Figure 11.27 Connect Pool Dialog Box

The **Connect Pool** dialog box displays the following items.

- Pool ID

  Displays the pool ID.

- **Status**

  Displays the status (normal or blocked) of the pool.

- **Total Capacity**

  Displays the total capacity (GB) of the pool (the value is truncated to 2 decimal places).

- **Used Capacity**

  Displays the used capacity (GB) of the pool (the value is truncated to 2 decimal places).

- **Threshold**

  Displays the threshold for pool usage rate (%).

- **Next** button

  Displays Change Threshold dialog box.

  Note: You have to select a row before you click **Next** without selecting a row, the dialog box will not be changed.

- **Cancel** button

  Cancels all the settings and returns to the V-VOL window.

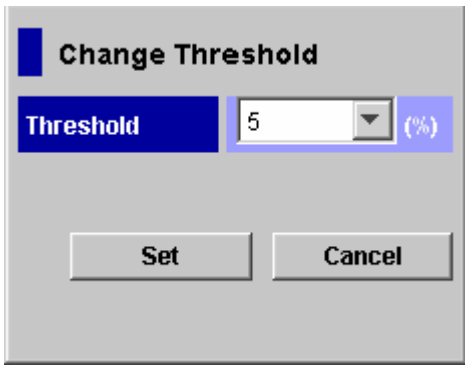


Figure 11.28 Change Threshold Dialog Box

The **Change Threshold** dialog box displays the following items.

- **Threshold** dropdown list

  You can select the value of threshold (%) for the V-VOL from the dropdown list. The value will be within 5 % to 300 % and counted by 5 %.

- **Set** button

  Determines the threshold set to the V-VOL and displays the V-VOL window.

  The pool ID that has been selected will be set to the V-VOL window.

- **Cancel** button

  Cancels all the settings and returns to the V-VOL window.

Changing Threshold of the V-VOL

To change only the threshold of the V-VOL associated with the pool:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.

2. In the V-VOL group tree of the V-VOL window, select the V-VOL group that contains the V-VOL(s) you want to change.

3. Right click the row containing the V-VOL that you want to change in the V-VOL list and select **Change Threshold**.

   Change Threshold dialog box will be displayed.

   Note: In this case, the V-VOL should be associated with a pool ID. When the V-VOL is not associated with a pool ID, associate the V-VOL with a pool ID in the Connect Pool dialog box, then click **Next** and move the Change Threshold dialog box to set the threshold.

4. Select the threshold (%) of the relevant V-VOL from the dropdown list in the Change Threshold dialog box.

   Note: The area that you can set is only the black colored rows. You cannot set if you select the rows including the blue colored rows. After setting, the area becomes blue. When it reflects to the storage system, it changes into black.

5. Click **Set** and decide to change the threshold of the V-VOL.
6. Click **Apply** in the V-VOL window.

   The confirmation message is displayed to ask you whether or not the setting can be applied to the disk storage system.
7. Click **OK**.

   The confirmation message closes and the new V-VOL information is applied to the storage system.

Deleting V-VOL Group

By performing this operation, all the V-VOLs in the V-VOL group will be deleted.

To delete V-VOL Group:

1. Change the mode of the Storage Navigator to Modify.

   If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the *Storage Navigator User's Guide*.
2. In the V-VOL group tree of the V-VOL window, select and right click the V-VOL group that contains the V-VOL(s) you want to delete.

   A pop-up menu is displayed.

   Note: When the V-VOL group that you want to delete is associated with a pool ID, you cannot delete the V-VOL group. After you delete the association with the pool ID, delete the V-VOL group.
3. Select **Delete V-VOL Group** from the pop-up menu.

   The confirmation message is displayed to ask you if it is OK to delete the selected V-VOL group.
4. Click **OK**.

   The icon of the selected V-VOL group changes to the icon that indicates the deleting process.
5. Click **Apply**.

   The confirmation message is displayed to ask you if it is OK to apply the setting to the disk storage system.
6. Click **OK**.

   The confirmation message closes and the deletion of the V-VOL group is applied to the storage system.

Deleting V-VOLs

By performing this operation, random V-VOLs in the V-VOL group will be deleted.

To delete V-VOL(s):

1. Change the mode of the Storage Navigator to Modify.

If the mode is already changed to Modify, you can skip this step. For the information how to change the mode, please refer to the Storage Navigator User's Guide.

2. When the V-VOL group that you want to delete is associated with a pool ID, you cannot delete the V-VOL group. Delete the association with the pool ID.
3. Delete the V-VOLs in the Virtual LVI/LUN window. Delete V-VOLs by performing Volume to Space operation in the Virtual LVI/LUN and Volume Shredder User's Guide.

   Note:

   - Select **Dynamic Provisioning** folder in the VDEV tree and the parity group of VLL window.
   - Select the target V-VOL group from the list of the V-VOL group that will be displayed.
   - Select the LDEV which is the target to delete from the LDEV list in the V-VOL group.

11.2.3.3 Viewing Pool Information

To view the pool information:

1. Click **File**, and **Basic Information** () on the menu bar of the Storage Navigator main window.

   The Basic Information Display window will be displayed.

2. Click the **Dynamic Provisioning** tab in the Basic Information Display window.

   The **Dynamic Provisioning** window will be displayed.

3. When you search DP-VOLs using LDKC number or CU number, confirm that **LDKC:CU** radio button is selected and select LDKC number or CU number of the DP-VOL in each combo box.

   The DP-VOL information is displayed in the DP-VOL detailed information table.

4. When you search DP-VOLs using Pool ID, select **Pool** radio button and select Pool ID of the DP-VOL in the **Pool ID** combo box.

   The DP-VOL information is displayed in the DP-VOL detailed information table.

5. Select the line of the pool ID that you want to display in the DP-VOL detailed information table.

   The Pool-VOL information of the pool whose pool ID equals to the one you selected is displayed in the Pool-VOL detailed information table.

11.2.4 Using Universal Replicator

Universal Replicator (UR)

The Universal Replicator (UR) feature enables you to create and maintain duplicate copies of all user data stored on the distant Hitachi Universal Storage Platform V (USP V) storage system for data duplication, backup, and disaster recovery purposes. This will enable you to recover your valuable data and protect them from the disaster, e.g. an earthquake, a fire, or the system failure. UR for UNIX or PC server provides asynchronous copy modes to accommodate a wide variety of user requirements and data copy/movement scenario. UR provides a superior hardware-based solution for data duplication, data migration, remote copy, and disaster recovery tasks.

UR operations are nondisruptive and allow the primary data volume of each UR volume pair to remain online to all hosts for both read and write I/O operations. Once established, UR continues unattended to provide continuous, real-time data backup. By establishing the primary data volumes and secondary data volumes on the different storage systems, you can perform the asynchronous operations remotely. For fibre-channel connection, UR operations can be performed across distances of up to 30 km (18.6 miles) using single-mode longwave optical fibre cables in a switch configuration.

When UR is used, data to be copied will be temporarily stored in *journal volumes*, which are a type of volumes (LUs). UR enables you to configure and manage highly reliable data replication systems, by using journal volumes to reduce chances of suspension of copy operations; copy operations can be suspended due to restrictions on data transfers from the primary site to the secondary site.

UR operations can be performed in conjunction with ShadowImage operations to provide multiple internal copies of UR volumes. UR also supports Virtual LVI/LUN and Cache Residency Manager features of the USP V storage system, so that UR meets a variety of user needs and facilitates data copying and data migration.

The Storage Navigator software displays detailed UR information and allows you to configure and perform UR operations. USP V Storage Navigator software communicates with the SVP of USP V storage system via defined TCP/IP connections. In the event of a system failure or disaster at the primary site, USP V Storage Navigator software also simplifies and expedites disaster recovery procedure.

This document describes and provides instructions for performing UR operations using the licensed USP V Storage Navigator remote console software. UR operations can also be performed from the UNIX or PC server host using the Command Control Interface (CCI) software product. For information and instructions on using CCI to perform UR operations, please refer to the *Hitachi Command Control Interface User and Reference Guide*. This user's guide does not cover Universal Replicator for z/OS® (UR for z/OS) operations for the mainframe data. For information and instruction on performing UR for z/OS operations, please refer to the *Universal Replicator for IBM z/OS User's Guide*, or contact your Hitachi account team.

System Requirements

UR operations involve the USP V primary storage systems and secondary storage systems containing the primary and secondary data volumes, the remote copy connections between the primary storage systems and secondary storage systems, the host(s) at the primary and remote sites, and the licensed UR remote console software. The UR system requirements are:

- Primary storage system: USP V storage system with UR installed.
- Secondary storage system: USP V storage system with UR installed.

Note: UR can coexist with UR for z/OS® in the same USP V storage system.

- Remote copy connections – fibre channel:
  - Multimode or single-mode optical fibre cables are required at both the primary storage system and secondary storage system.
  - For distance up to 0.5 km, multimode optical shortwave fiber cables are required between the primary storage system and secondary storage system.
  - For distances from 0.5 km to 1.5 km (1,640 to 4,920 feet), multimode shortwave fibre-channel interface cables with up to two switches are required.
  - For distance up to 10 km, single optical longwave fiber cables are required between the primary storage system and secondary storage system.
  - For distances from 10 km to 30 km (6.2 to 18.6 miles), single-mode longwave fibre-channel interface cables with up to two switches are required.
  - For distances greater than 30 km (18.6 miles), approved third-party channel extender products and telecommunications lines are required. Long-distance UR solutions are provided based on user requirements and workload characteristics.
- Host platforms:

  USP V supports UR operations for a variety of UNIX® based and PC-server platforms, including HP-UX® 11.0, HP-UX® 11i, Sun® Solaris® 9, Windows® 2000, Windows® 2003, and IBM® AIX® 5.1 platforms.

  Please contact your Hitachi account team for the latest information on platform support for UR.
- A computer that runs Storage Navigator(Storage Navigator computer):

  The USP V Storage Navigator remote console software is required for USP V UR operations. The UR remote console software is a component of the USP V Hitachi Storage Navigator product. The UR license key(s) are required to enable the UR option(s) on the USP V storage system. Separate license keys are required for each USP V storage system. For further information on USP V Storage Navigator operations, please refer to the *Storage Navigator User's Guide*, or contact your Hitachi account team.

  Note: Administrator or UR write access to the USP V Storage Navigator software is required to perform UR operations. Users without Administrator or UR write access can only view UR information.
- About the license of Universal Replicator:

If you want to use Universal Replicator, you must install not only a license for Universal Replicator but also a license for TrueCopy.

- Connection with TagmaStore USP / NSC

  UR can execute remote copy operations by connecting USP V with TagmaStore USP/NSC. Specifically, the following configurations are supported.

  - System configuration for remote copy operation using UR from USP V to TagmaStore USP.
  - System configuration for remote copy operation using UR from TagmaStore USP/NSC to USP V.

11.2.4.1 Creating a Journal Group

Journal Operation Window

To configure journal groups, use the Journal Operation window of UR.

To display the Journal Operation window, do either of the following:

- **If Universal Replicator has not been started:**

1. Use your Web browser to display the storage device list. In the storage device list, select the storage system to log in. Enter a user name and the password, and then click **OK**.

   The Storage Navigator main window is displayed.

   Note: For detailed instructions on this step, please refer to *Storage Navigator User's Guide*.

2. Click **Go**, **Universal Replicator** and then **Journal Operation** on the menu bar of the Storage Navigator main window.

   UR starts and the Journal Operation window is displayed.

- **If Universal Replicator has already been started:**

1. Select the **Journal Operation** tab.

   The Journal Operation window is displayed.

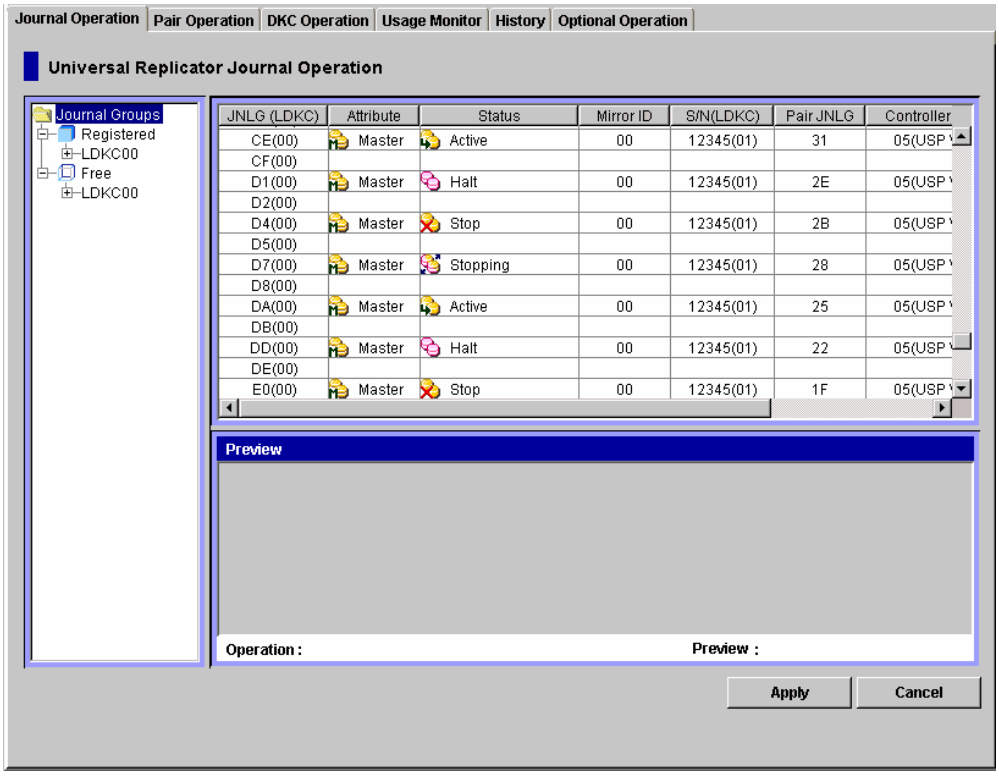


Figure 11.29 Journal Operation Window

The Journal Operation window displays the following:

- **Tree:** Lists journal groups in the local storage system, which is a storage system you are logged in.

  Note: The tree displays journal groups used with UR, and does not display journal groups used with Universal Replicator for z/OS®.

  - **Journal Groups:** This item is located at the top of the tree. When you select this item, the upper-right list displays journal groups in the local storage system.
  - **Registered:** When you select this item, the upper-right list displays journal groups in which journal volumes are registered.

    When you double-click this item, LDKCs are displayed in the tree. When you select an LDKC in the tree, the upper-right list displays information about the LDKC.

    When you double-click the LDKC, the tree displays journal groups in which journal volumes are registered. When you select a journal group in the tree, information about the journal group appears in the upper-right list.

    The journal group icons are:

    A journal group in initial status.

    Journal volumes are registered in this journal group, but no data volumes (primary data volumes nor secondary data volumes) are registered in this journal group.

    A master journal group.

    Journal volumes and primary data volumes are registered in this journal group.

    A restore journal group.

    Journal volumes and secondary data volumes are registered in this journal group.

- **Free:** When you select this item, the upper-right list displays journal groups in which no journal volumes are registered.

  When you double-click this item, LDKCs are displayed in the tree. When you double-click the LDKC, the tree displays journal groups in which no journal volumes are registered.

- **Upper-right list:** If a master journal group or a restore journal group is selected in the tree, the upper-right list displays a list of *mirrors*. A mirror is a combination of a master journal group and a restore journal group.

  If another journal group is selected in the tree, the upper-list displays information about the selected journal group.

  One row in this list represents one mirror (or one journal group).

  - **JNLG (LDKC):** Indicates the number of a journal group in the local storage system. The LDKC number is enclosed in the parentheses following the journal group number.
  - **Attribute:** Indicates the attribute of a journal group in the local storage system.

 **Initial**	A journal group in initial status. Journal volumes are registered in this journal group, but no data volumes (primary data volumes nor secondary data volumes) are registered in this journal group.
 **Master**	A master journal group. Journal volumes and primary data volumes are registered in this journal group.
 **Restore**	A restore journal group. Journal volumes and secondary data volumes are registered in this journal group.
Blank	Neither journal volumes nor data volumes are registered in this journal group.

  - **Status:** Indicates the status of a journal group in the local storage system.

 **Initial**	A journal group in initial status. Journal volumes are registered in this journal group, but no data volumes (primary data volumes nor secondary data volumes) are registered in this journal group. When you create a UR volume pair, data volumes will be registered in a journal group. The status of the journal group will change to **Active**.
 **Active**	Either of the following: ▪ Initial copy is in progress. The primary data volume and the secondary data volume are not synchronized. ▪ Initial copy is finished. The primary data volume and the secondary data volume are synchronized. ***Note***: If a journal group is in **Active** status, some of the data volume pairs in the journal group might be split. If this happens, the word **Warning** is displayed. To restore such data volume pairs, use the Pair Operation window.
 HaltAccept	An operation for splitting the mirror has been started. The status of the journal group will immediately change to **Halting**. ***Note:*** HaltAccept can indicate status of restore journal groups, but cannot indicate status of master journal groups.
 Halting	An operation for splitting or deleting the mirror is in progress. The primary

	data volume and the secondary data volume are not synchronized. When you split a mirror, the status will change in the following order: Halting, Halt, Stopping, and finally Stop. When you delete a mirror, the status will change in the following order: Halting, Halt, Stopping, Stop, and finally Initial.
 Halt	An operation for splitting or deleting the mirror is in progress. The primary data volume and the secondary data volume are not synchronized.
 Stopping	An operation for splitting or deleting the mirror is in progress. The primary data volume and the secondary data volume are not synchronized.
 Stop	Either of the following: ▪ An operation for splitting the mirror is finished. ▪ The operation for deleting the mirror is in progress. The primary data volume and the secondary data volume are not synchronized.
Blank	No data volumes are registered in this journal group.

- **Mirror ID:** Indicates a mirror ID.

  This column is blank if the attribute of the journal group is neither Master nor Restore.

- **S/N (LDKC):** Indicates the serial number of the remote storage system. The LDKC number is enclosed in the parentheses following the serial number.

  This column is blank if the attribute of the journal group is neither Master nor Restore.

- **Pair JNLG**: Indicates the number of a journal group in the remote storage system.

  This column is blank if the attribute of the journal group is neither Master nor Restore.

- **Controller ID:** Indicates the controller ID (model name that indicates the model) of the remote storage system.

  This column is blank if the attribute of the journal group is neither Master nor Restore.

  Note: The controller ID for a USP V storage system is **5**.

- **Path Gr. ID:** Displays *path group IDs*, which are used to identify path groups (i.e., groups of logical paths). Up to eight logical paths can be registered in one path group.

  This column is blank if the attribute of the journal group is neither Master nor Restore.

- **CTG**: Indicates the number of a consistency group to which the mirror belongs.

  This column is blank if the journal group does not have any volume pair.

- **Preview:** Displays detailed information about operations that will occur when you click **Apply**.
  - **List:** Displays changes that have been made in the window. When you change settings in the window, the changes will be displayed in the **Preview** list before the changes are applied to storage systems. If you are sure that information in the **Preview** is correct, click the **Apply** button to apply the settings that you have made.

Note: When the **Preview** list displays changes that have been made, you can only perform the same type of operation that you have been doing and cannot perform most of other operations (note that you can only view detailed information about journal groups even when the **Preview** list displays changes). For example, if you are trying to delete journal groups and the **Preview** list is displaying the journal groups that you want to delete, you are unable to perform any other operations; for example, you are unable to split mirrors and restore mirrors.

- **Operation:** Indicates the operation that will occur when you click **Apply**.

Edit JNL Volumes	Register or delete journal volumes
Change JNL Option	Change journal group options
Delete JNL Groups	Delete journal group
Pairsplit -r	Split a mirror.
Pairresync	Restore a mirror
Pairsplit -S	Delete a mirror
Blank	Nothing will occur when you click **Apply**

- **Preview:** The number to the left of the slash (/) indicates the number of items displayed in the **Preview** list.

  The number to the right of the slash indicates the maximum number of items that can be displayed in the **Preview** list.

  For example, if **Preview 010/256** is displayed, you can add another 246 items to the **Preview** list.

- **Apply:** Applies settings in the **Preview** list to the storage systems.
- **Cancel:** Cancels settings in the **Preview** list.

Note: Information on the Journal Operation window will be updated when you do one of the following:

- Select another tab and then reselect the **Journal Operation** tab.
- Click **File**, **Refresh** on the menu bar of the Storage Navigator main window.
- Select the **Apply** button.
- Select modify mode when you are in view mode.

Deleting a Journal Group

To delete a journal group from the primary storage system, log into the primary storage system and then perform the following operation.

To delete a journal group from the secondary storage system, log into the secondary storage system and then perform the following operation.

Note: You cannot delete master journal groups and restore journal groups. You can only delete journal groups whose attribute is **Initial**.

1. Ensure that the Storage Navigator main window is in Modify mode.

For detailed information about how to do this, please refer to *Storage Navigator User's Guide*.

2. Ensure that the Journal Operation window is displayed.
3. Do either of the following:
   - In the upper-right list, right-click a journal group whose attribute is **Initial**.
   - In the tree, select and right-click a journal group in initial status ().
4. Select **JNL Groups** and **Delete JNL** from the pop-up menu.
5. See the **Preview** list to check the journal groups that you want to delete.
   - If you want to cancel deleting a journal group, select and right-click the journal group and then select **Cancel**.
   - If necessary, you can repeat steps 3 to 5 to specify other journal groups.
6. Select **Apply** to apply the settings.

Note: If an error occurs, the right most column of the **Preview** list displays the error code. To view detailed information about the error, right-click the error code and then select **Error Detail**. An error message appears and gives you detailed information about the error.

11.2.4.2 Creating a Journal Volume

Registering Journal Volumes in a Journal Group

To be able to perform remote copy operations with UR, the primary site administrator must register journal volumes in journal groups in the primary storage system. Also, the secondary site administrator must register journal volume in journal groups in the secondary storage system. One journal group can contain up to 64 journal volumes.

To register journal volumes, follow the procedure below. Both the primary storage system administrator and the secondary storage system administrator must perform this operation:

1. Ensure that the Storage Navigator main window is in Modify mode.

   For detailed information about how to do this, please refer to *Storage Navigator User's Guide*.
2. Ensure that the Journal Operation window is displayed.
3. In the tree of the Journal Operation window, do either of the following:
   - If you want to register new volumes to a journal group in which journal groups are already registered, select the journal group from below **Registered**.

     Caution: You can register volumes only when the attribute of the journal group is **Initial** or when the status of the journal group is **Active**, or **Stop**.
   - If you want to register volumes to a journal group in which journal groups have not been registered, select the journal group from below **Free**.

   Note: You cannot select more than one journal group.

4. Do either of the following:
   - In the tree, right-click the selected journal group and then select **Edit JNL Volumes** from the pop-up menu.
   - In the upper-right list, right-click the desired journal group and then select **Edit JNL Volumes** from the pop-up menu.
5. In the **Free Volumes** list of the Edit JNL Volumes window (Figure 11.30), select the volumes that you want to register.

   In the **Free Volumes** list, one row represents one volume. If you cannot find the volumes that you want to register, do any of the following:
   - Select the **PG** radio button, enter a parity group number in the text boxes to the right, and then select **Show**. The list displays volumes in the specified parity group. Finally, select the volumes that you want to register.
   - To register external volumes, select the **PG(Ext.)** radio button, enter a parity group number in the text boxes to the right, and then select **Show**. The list displays volumes in the specified parity group. Finally, select the volumes that you want to register. ***Note:*** Parity group numbers for external volumes start with the letter "E", but you do not need to enter "E" in the text boxes. For example, if you want to specify the parity group number "E1-2", you only need to enter 1 and 2 into the text boxes.
   - Select the **CU** radio button, select a CU number from the drop-down list to the right. The list displays volumes in the specified CU. Finally, select the volumes that you want to register.

   Note: In the current version, the **Free Volume** list only displays OPEN-V volumes.
6. Select **Add**.

   The **JNL Volumes** list displays the volumes that you want to register. The **Operation** column of the list displays **Add**.
7. Select **Set** to close the Edit JNL Volumes window.
8. See the **Preview** list to check the settings that you have made.
   - If you want to add volumes to register, select and right-click a volume in the **Preview** list and then select **Modify**. A window appears and allows you to add volumes.
   - If you want to cancel registering a volume, select and right-click the volume and then select **Cancel**.
   - If necessary, you can repeat steps 3 to 8 to add volumes to other journal groups.
9. Select **Apply** to register journal volumes.

   After volumes are registered, the journal groups will be displayed below **Registered** in the tree.

   Note: If an error occurs, the right most column of the **Preview** list displays the error code. To view detailed information about the error, right-click the error code and then select **Error Detail**. An error message appears and gives you detailed information about the error.

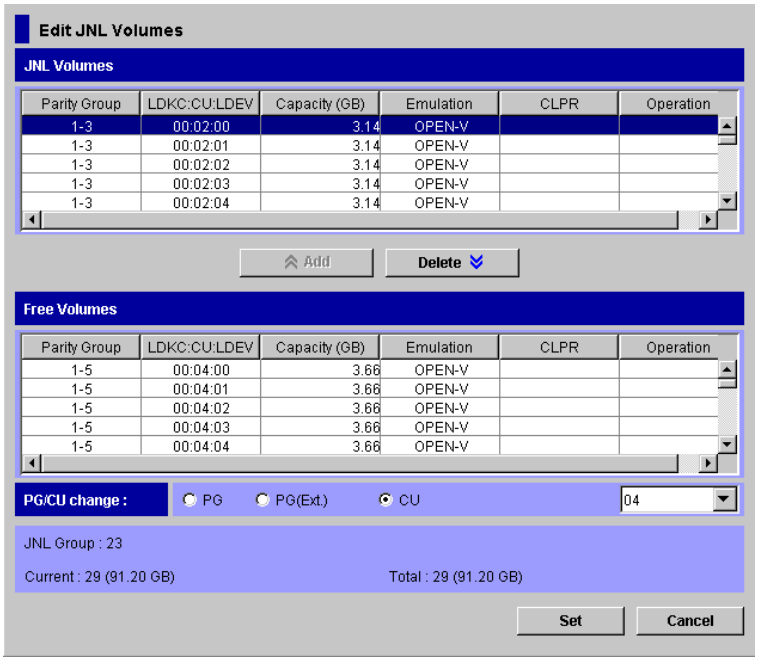


Figure 11.30 Edit JNL Volumes Window

The Edit JNL Volumes window displays the following:

- **JNL Volumes:** Displays information about journal volumes.
  - **Parity Group:** indicates the parity group where a journal volume belongs.

    Note: If the letter "E" is displayed at the beginning of a parity group name, the journal volume is an external volume.
  - **LDKC:CU:LDEV:** Indicates the LDKC number, the CU number and the LDEV number of a journal volume.

    Note: If a sharp symbol (#) is displayed at the end of a volume, the volume is an external volume.
  - **Capacity:** Indicates the capacity of a journal volume in gigabytes.
  - **Emulation:** Indicates the emulation type of a journal volume.
  - **CLPR:** Indicates the number and the name of the CLPR where the journal volume belongs.
  - **Operation:** Displays one of the following:

Blank	This column usually displays a blank.
Add	Indicates a volume to be added to a journal group
Delete	Indicates a volume to be deleted from a journal group

- **Add**: Use this button when you register volumes in a journal groups. When registering volumes, you select the volumes from **Free Volumes** and then select **Add** to add the volumes to **JNL Volumes**.
- **Delete**: Use this button when you delete volumes from a journal groups. When deleting volumes, you select the volumes from **JNL Volumes** and then select **Delete**.

- **Free Volumes**: Displays information about free volumes, which are not registered in journal groups.

  Note: LUN Expansion (LUSE) volumes are not displayed.

  - **Parity Group:** indicates the parity group where a volume belongs.

    Note: If the letter "E" is displayed at the beginning of a parity group name, the volume is an external volume.

  - **LDKC:CU:LDEV:** Indicates the LDKC number, the CU number and the LDEV number of a volume.

    Note: If a sharp symbol (#) is displayed at the end of a volume, the volume is an external volume.

  - **Capacity:** Indicates the capacity of a volume in gigabytes.
  - **Emulation:** Indicates the emulation type of a volume.
  - **CLPR:** Indicates the number and the name of the CLPR where the volume belongs.
  - **Operation:** Displays one of the following:

Blank	This column usually displays a blank.
Add	Indicates a volume to be added to a journal group
Delete	Indicates a journal volume to be deleted from a journal group

- **PG/CU change**: The following radio buttons enables you to switch information in the **Free Volumes** list.
  - **PG**: Use this radio button if you want the **Free Volumes** list to display volumes belonging to a parity group.

    If you select this radio button, specify a parity group number in the text boxes to the right, and then select the **Show** button, **Free Volumes** will display volumes in the specified parity group (see Figure 11.31).
  - **PG(Ext.)**: Use this radio button if you want the **Free Volumes** list to display external volumes belonging to a parity group.

    If you select this radio button, specify a parity group number in the text boxes to the right, and then select the **Show** button, **Free Volumes** will display volumes in the specified parity group.
  - **CU:** Use this radio button if you want the **Free Volumes** list to display volumes belonging to a CU.

    If you select this radio button and then select a CU from the drop-down list to the right, **Free Volumes** will display volumes in the selected CU (see Figure 11.32).

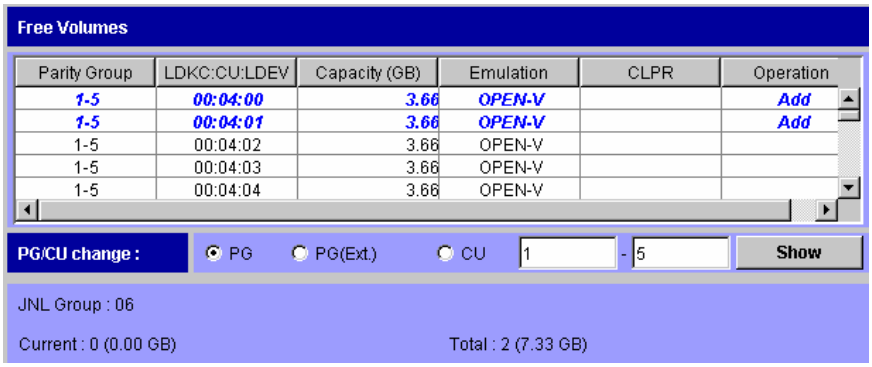


Figure 11.31 The Free Volumes List and the PG Button in the Edit JNL Volumes Window

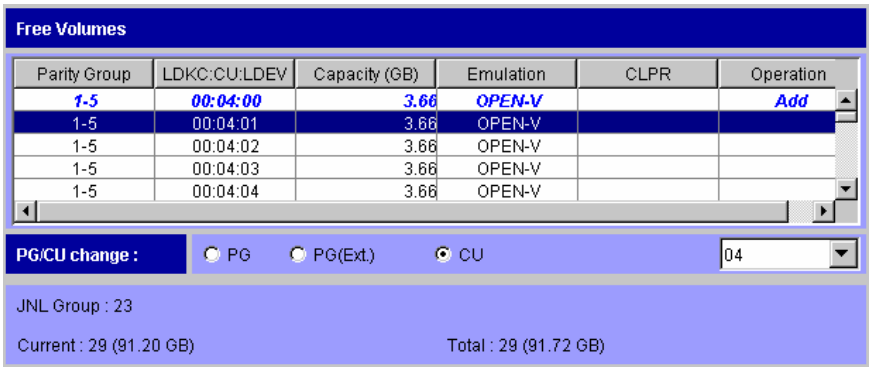


Figure 11.32 The Free Volumes List and the CU Button in the Edit JNL Volumes Window

- **JNL Group**: Indicates the number of a journal group.
- **Current**: Indicates the number and the capacity of journal volumes that currently exist in the journal group.
- **Total**: Estimates the number and the capacity of journal volumes after addition or deletion, and then displays the estimated number and the capacity.
- **Set**: Applies the settings in the window to the Journal Operation window (Figure 11.29).
- **Cancel**: Cancels the settings.

Deleting Journal Volumes from a Journal Group

To delete journal volumes from the primary storage system, log into the primary storage system and then perform the following operation.

To delete journal volumes from the secondary storage system, log into the secondary storage system and then perform the following operation.

1. Ensure that the Storage Navigator main window is in Modify mode.

   For detailed information about how to do this, please refer to *Storage Navigator User's Guide*.

2. Ensure that the Journal Operation window is displayed.

3. In the tree of the Journal Operation window, select a journal group from below **Registered**.

   Note: You cannot select more than one journal group.

4. Do either of the following:

   – In the tree, right-click the selected journal group and then select **JNL Volumes** from the pop-up menu.

   – In the upper-right list, select and right-click the desired journal group and then select **JNL Volumes** from the pop-up menu.

   Caution: You can delete journal volumes only when the attribute of the journal group is **Initial** or when the status of the journal group is **Stop**.

5. In the **JNL Volumes** list of the Edit JNL Volumes window (Figure 11.30), select the volumes that you want to delete.

   In the **JNL Volumes** list, one row represents one volume.

6. Select **Delete**.

   The volumes that you want to delete will be displayed in blue italics. The **Operation** column of the list displays **Delete**.

7. Select **Set** to close the Edit JNL Volumes window.

8. See the **Preview** list to check the volumes that you want to delete.

   – If you want to add volumes to delete, select and right-click a volume in the **Preview** list and then select **Modify**. A window appears and allows you to specify volumes to delete.

   – If you want to cancel deleting a volume, select and right-click the volume and then select **Cancel**.

   – If necessary, you can repeat steps 3 to 8 to specify volumes that should be deleted from other journal groups.

9. Select **Apply** to delete journal volumes.

   Note: If an error occurs, the right most column of the **Preview** list displays the error code. To view detailed information about the error, right-click the error code and then select **Error Detail**. An error message appears and gives you detailed information about the error.

11.2.5 Using Universal Volume Manager

System Requirements

The system requirements for Universal Volume Manager are:

- USP V storage system (First storage system)

  All the necessary hardware and microcode required for Universal Volume Manager operations must be installed and enabled. In this user's guide, the first storage system is called “local storage system”.

- Storage system other than the first storage system

  A second storage system must be available and operated as an external storage system. The kinds of storage systems that can be used as an external storage system include the Lightning 9900V series storage system, the Thunder 9500V series storage system, the Lightning 9900C series storage system, and other similar storage systems.

- USP V Storage Navigator computer (user-supplied computer)

  Please see the *Storage Navigator User’s Guide* for instructions on installing and using the Storage Navigator computer.

  Note: You must operate the Storage Navigator computer in **Modify** mode to perform Universal Volume Manager operations. Users in **View** mode can only view Universal Volume Manager information.

- License key for Universal Volume Manager program product

  You need a license key to install Universal Volume Manager.

Universal Volume Manager Requirements

The following table describes the Universal Volume Manager requirements.

Table 11.5 Universal Volume Manager Requirements

Item	Requirement
Maximum number of ports in the connected external storage system(WWN is used as a port identification number)	1,024 per port
Maximum number of external volumes which can be connected	63,232 volumes can be connected. 4,096 volumes can be connected per port. ***Note:*** If you use Copy-on-Write Snapshot or Dynamic Provisioning, the number of external volumes which can be connected is as follows: Number of external volumes¸ Number of virtual volumes ≤ 63,232
Maximum number of mapping paths can be set for one external volume	8
Maximum capacity of an external volume	4 TB per external volume (8,589,934,592 blocks) If you specify an external volume which is more than 4 TB you can access the data stored in the field up to 4 TB. You cannot access the data that is stored in the field over 4 TB.

Item	Requirement
Minimum capacity of an external volume	77,760 blocks (about 38 MB) per external volume. However, when the emulation type of the volume is OPEN-V, the minimum capacity becomes 96,000 blocks (about 47 MB) per external volume
Maximum number of external volume groups	16,384
Maximum number of external volumes which can be registered in one external volume group	4,096

11.2.5.1 Setting an External Port

The attribute of the port used for Universal Volume Manager needs to be set to the external port.

Note: If the storage system is partitioned by using Virtual Partition Manager, the ports that can be set as external ports are only the ports allocated to SLPR 0.

To set the port attribute to the external port:

1. Start Storage Navigator, and open the Port Operation window.
2. Make sure that Storage Navigator is in Modify mode.
3. Right-click the port that you want to set to external port in the Port Operation list.

   A pop-up menu is displayed.

   Note: To set multiple ports to external ports at a time, select and right-click all the ports you want to set.
4. Click **Change to External** in the pop-up menu.

   In the **Port Operation** list, the attribute of the selected port is changed to **External**, and the row of the selected port is displayed in blue and italics.
5. Verify the settings in the Preview dialog box.
6. Click **Apply** in the Port Operation window.

   The settings are applied to the local storage system and the Port Operation window is displayed normally. When an error occurs, an error message is displayed. Verify the details in the Preview dialog box.
7. Set the topology information according to the configuration of the connection.

   When the switch is connected, set the **Fabric** to **Enable**. When the switch is not connected, set the **Fabric** to **Disable** and set **FC-AL**. Set the **Connection** according to the configuration of the actual connection. For detailed information on setting the topology information, see the *LUN Manager User's Guide*.
8. According to the configuration, set the data transfer speed.

   For the data transfer speed, select Auto Negotiation setting.

Note: When you connect a TagmaStore AMS storage system or a TagmaStore WMS storage system, use LUN Manager to set the data transfer speed of the external port which you use to a fixed value other than the **Auto**. Also, set the data transfer speed of the target port of the TagmaStore AMS storage system or the TagmaStore WMS storage system to the fixed value according to the data transfer speed of the external port.

11.2.5.2 Mapping an External Volume to TagmaStore USP

After setting the attribute of the port used for Universal Volume Manager to the external port, you are enabled to map the external volume as an internal volume.

External volumes can be mapped either automatically or manually. This section explains the automatic mapping.

Caution: Do not specify 01 for the LDKC number when you map a volume of which the emulation type is 3380 series except for 3380-3, 3380-3A, 3380-3B, 3380-3C. Before you apply the mapping configuration, make sure the LDKC number which is automatically assigned is 00.

Note: Before you map the external volume, you need to check whether the execution of any application (for example, Command Control Interface) that is using the command device is in progress. If the execution of any application that is using the command device is in progress, stop the application.

To map the external volume automatically:

1. Start Storage Navigator, and open the Volume Operation window.
2. Make sure that Storage Navigator is in Modify mode.
3. Right-click one of the following in the Volume Operation tree:
   - **Subsystem:** Allows you to create a new path group, and add external volumes to the new path group.
   - Path group: Allows you to add external volumes to the existing path group.

   A pop-up menu is displayed.
4. Click **Add Volume (Auto)** in the pop-up menu and click the desired mapping policy in the submenu.
   - When you click the **Subsystem** in the Volume Operation tree, the Configure Cross-subsystem Paths dialog box is displayed. Go on to step 5.
   - When you click the path group in the Volume Operation tree, the Volume Discovery is executed and all the external volumes found by the Volume Discovery are displayed in blue and italics in the Volume Operation window. Go on to the step 7.
5. Configure cross-subsystem paths in the Configure Cross-subsystem Paths dialog box.

   Configure at least two cross-subsystem paths and change the priority if necessary.

6. Click **OK** to close the Configure Cross-subsystem Paths dialog box.

   You are returned to the Volume Operation window. The Volume Discovery is executed, and all the external volumes found by the Volume Discovery are mapped. The settings are displayed in blue and italics.

7. Verify the settings in the Preview dialog box.

8. Click **Apply** in the Volume Operation window.

   The settings are applied to the local storage system and the Volume Operation window is displayed normally. When an error occurs, an error message is displayed. Verify the details in the Preview dialog box.

11.2.6 Using Virtual Partition Manager

Virtual Partition Manager is the function to logically partition the resources in the USP V subsystem. Virtual Partition Manager contains the Cache Logical Partition function and the Storage Management Logical Partition function.

Cache Logical Partition enables you to partition the built-in cache memory in the USP V subsystem into multiple virtual cache memories. Furthermore, by allocating the partitioned virtual cache to a host, the I/O performance of other hosts can be protected from decreasing even if one host issues many I/O requests.

Storage Management Logical Partition enables you to partition a subsystem into multiple virtual subsystems. Because the administrator of the virtual subsystem cannot access the other virtual subsystem that he/she administrates, your data is protected from the risks, such as the data destroyed by other administrators who administrate other virtual subsystem, or the data leaked.

11.2.6.1 Setting up a CLPR

Creating a Cache Logical Partition

If you have not created only one CLPR yet, entire cache is indicated CLPR0 in the Partition Definition window. To partition the cache, create a CLPR. The created CLPR can be allocated to each SLPR. The CLPR(s) can be created in a SLPR that you selected.

Note: Only the storage administrators can create the CLPRs. The storage partition administrators are not permitted to create CLPR.

Note: If a CLPR is created, the default value of the cache size is 4 GB. To create a CLPR, the desired size of cache is allocated from CLPR0 (entire cache).

Note: To create a CLPR, the remaining cache size which is calculated by subtracting Cache Residency Size and Partial Cache Residence size from the cache size of CLPR0 needs 8GB or more.

To create a CLPR:

1. Right-click an SLPR on the tree in the Partition Definition window to display the pop-up menu.
2. Select **Create CLPR** in the pop-up menu to add a CLPR to the tree.
3. Select a CLPR from the tree. The detailed information of selected CLPR is displayed in the **Detail For CLPR** field in the Partition Definition window.
4. Change the settings of CLPR as needed.
5. Click **Apply** to apply the settings. The progress bar is displayed.

   Note: Even though you clicked **Apply**, the parity groups have not been allocated to a CLPR yet. To allocate the parity groups to a CLPR, migrate the parity groups from other CLPR, usually CLPR0.

Note: If you want to change the settings of an existing CLPR, repeat procedures from 3 to 5.

Migrating Resources To and From Cache Logical Partitions

The parity groups in the CLPR can be migrate to another CLPR.

Notes:

- The plural parity groups which construct the concatenated parity groups must belong to the same CLPR.
- The parity group that contains the LDEVs to which the Cache Residency cache extents is defined cannot migrate to another CLPR.

To migrate the parity groups in a CLPR to another CLPR:

1. Double-click the SLPR on the tree in the Partition Definition window to display the CLPRs. CLPRs are displayed under the specified SLPR on the tree.
2. Select a CLPR from the tree. The CLPR resource list of the specified CLPR is displayed.

   Note: By using the CU Select button on the upper right of the Partition Definition window, you can specify the desired CU. To specify the CU:

   - Click CU Select on the upper right of the Partition Definition window. The CU Select dialog box is displayed (see Figure 11.33).
   - Click the Specific CU or Unallocated radio button. If you click the Unallocated radio button, skip to step d).
   - Select the LDKC from the **LDKC**: drop-down list and the CU from the CU: drop-down list respectively.
   - Click **Set**. Only the information of the selected CUs in the CLPR resource list.
3. Select the parity group(s) that you want to migrate from the CLPR resource list and right-click the list to display the pop-up menu. ***Note:*** You can select the multiple parity groups.
4. Select **Cut** from the pop-up menu.

5. Select the CLPR that you want to migrate the parity groups to from the tree and right-click to display the pop-up menu.
6. Select Paste Parity Group from the pop-up menu. The selected parity groups are added to the CLPR resource list.
7. Click **Apply** to apply the settings. The progress bar is displayed.

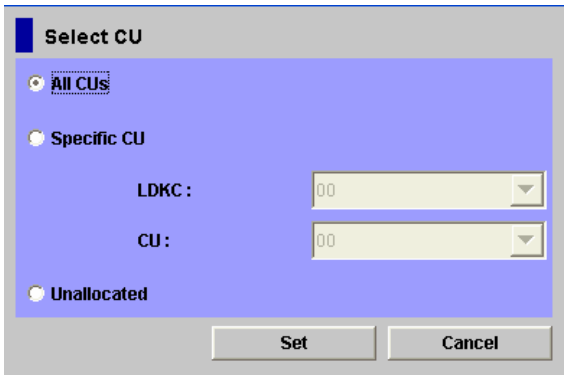


Figure 11.33 Select CU Dialog Box

- If you select **All CUs** radio button, information about all CUs can be displayed on the CLPR resource list.
- If you select **Specific CU** radio button, information about only the specified CU can be displayed on the CLPR resource list.
  - The LDKC drop-down list can be used to specify LDKC.
  - The CU drop-down list can be used to specify CU.
- If you select **Unallocated radio** button, only the information about CUs unallocated to CLPR can be displayed on the CLPR resource list.

Deleting Cache Logical Partitions

The CLPRs which are not necessary may be deleted. Note that CLPR0 cannot be deleted.

To delete an CLPR:

1. Right-click the CLPR that you want to delete on the tree to display the pop-up menu.
2. Select **Delete CLPR** in the pop-up menu to delete the CLPR from the tree. The selected CLPR is deleted from the tree.
3. Click **Apply** to apply the settings. The progress bar is displayed.

Note: To delete the CLPR to which parity groups are allocated, move the parity groups that are allocated to the CLPR you are going to delete to another CLPR. Before you delete the CLPR, make sure that no parity group is allocated to that CLPR.

11.2.6.2 Setting up an SLPR

Creating a Storage Management Logical Partition Operations

If you have not created only one SLPR yet in the subsystem, all resources in the subsystem, i.e. CLPRs and ports, belong in SLPR0. To divide the resources of the subsystem, create new SLPR in the subsystem.

Note: Only the storage administrators can create the SLPRs. The storage partition administrators are not permitted to create SLPR.

To create SLPR in the subsystem:

1. Right-click **Subsystem** on the tree in the Partition Definition window to display the pop-up menu.
2. Select Create SLPR in the pop-up menu to add an SLPR to the tree. ***Note:*** If you want to create multiple SLPRs continuously, repeat procedures 1 and 2.
3. Select an SLPR from the tree (see Figure 11.34).
4. Change the variables in Details for SLPR area with Partition Definition window as needed.
5. Click **Apply** to apply the settings. The progress bar is displayed. ***Note:*** Even though you clicked **Apply**, the resources (CLPRs and ports) have not been allocated to an SLPR yet. To allocate the resources to an SLPR:
   - Create a CLPR in an SLPR, and/or
   - Migrate a port from another SLPR.

Note: If you want to change the settings of an existing SLPR, repeat procedures from 3 to 5.

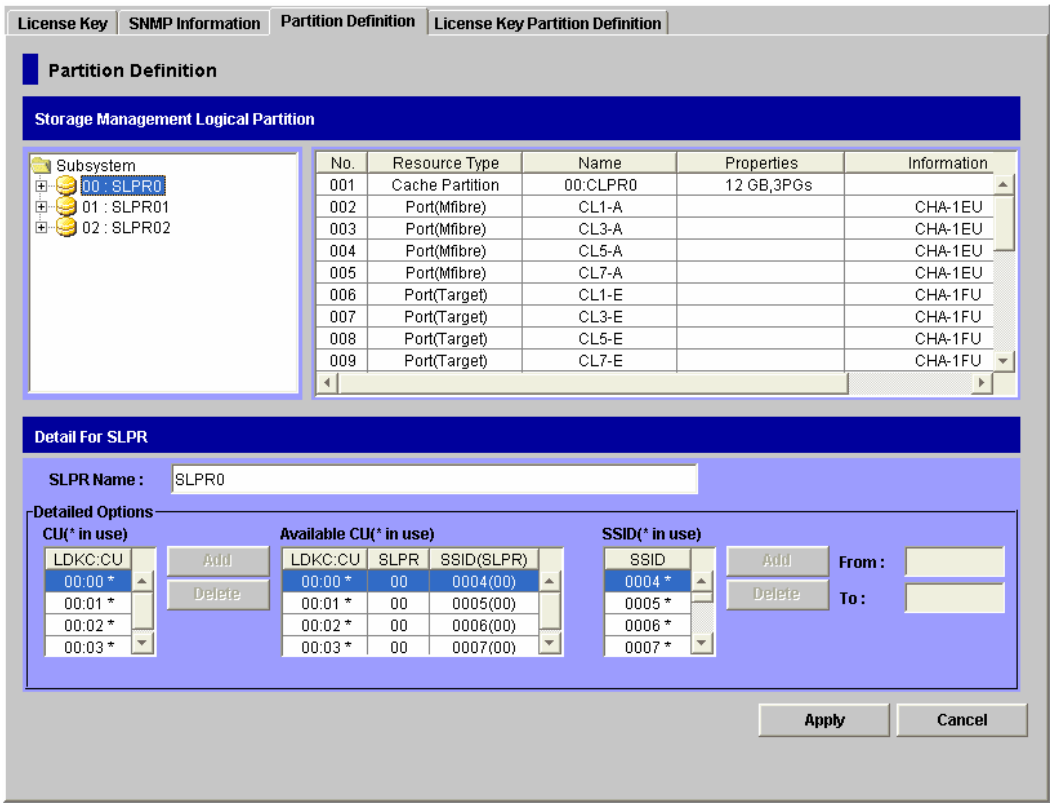


Figure 11.34 Partition Definition Window (SLPR Selected)

Migrating Resources To and From Storage Management Logical Partitions

The CLPRs and ports that are managed in an SLPR can be migrated to the other SLPR.

Notes:

- You cannot migrate CLPRs and ports to an SLPR that belongs to the different LDKC from the current SLPR.
- The ports that can be migrated to the other SLPR are only Target ports. The Initiator ports, External ports, RCU Target ports, Mfibre ports, and LCP ports cannot be migrated.

To migrate the CLPRs and ports to other SLPR:

1. Select an SLPR from the tree in the Partition Definition window. The SLPR resource list is displayed.
2. Select a CLPR or port that you want to migrate from the SLPR resource list and right-click the list to display the pop-up menu.

   Note: You can select multiple CLPRs or ports.
3. Select **Cut** from the pop-up menu.
4. Select the SLPR that you want to migrate the CLPR or port to from the tree and right-click to display the pop-up menu.

5. Select **Paste CLPRs, Ports** from the pop-up menu. If you migrate the CLPR(s), the CLPR(s) are added to the tree and the SLPR resource list. If you migrate the port(s), the ports are added to the SLPR resource list only.
6. Click **Apply** to apply the settings. The progress bar is displayed.

Deleting Storage Management Logical Partitions

If you delete an SLPR, the resources that are partitioned will be automatically returned to SLPR0. Only the storage administrators can delete the SLPRs. The storage partition administrators are not permitted to delete an SLPR. ***Note:*** SLPR0 cannot be deleted.

When you delete an SLPR, set 0 GB to the license capacity or select the Disable button for all program products that are assigned to the SLPR with the **License Key Partition Definition** window before you delete the SLPR. You also have to delete all user accounts of SLPR that you want to delete before deleting an SLPR.

To delete an SLPR:

1. Right-click the SLPR that you want to delete on the tree in the Partition Definition window to display the pop-up menu.
2. Select **Delete SLPR** in the pop-up menu to delete an SLPR from the tree.
3. Click **Apply** to apply the settings. The progress bar is displayed.

11.3 Using the Physical View for Thunder/Lightning

11.3.1 Port Operations

Device Manager port operations include:

- Configuring the ports (Lightning 9900V, Lightning 9900, Thunder 9500V, and Thunder 9200) (see section 11.3.1.1)
- Managing LUN groups (Lightning 9900 only) (see section 11.3.1.2)
- Managing WWN groups (Lightning 9900 only) (see section 11.3.1.3)
- Configuring the Fibre Channel adapters (Lightning 9900V and Lightning 9900) (see section 11.3.1.4)

Notes:

- For the iSCSI ports (Lightning 9900V), NAS-CHA ports (Lightning 9900V), and mainframe ports (Lightning 9900V or Lightning 9900), you can reference the port configuration but you cannot change it.
- To perform an operation on a port for Universal Storage Platform V, use the Physical View for Universal Storage Platform V.
- To perform an operation on a port for TagmaStore USP, use the Physical View for TagmaStore USP.
- To perform an operation on a port of the TagmaStore AMS/WMS series, use the Physical View of the TagmaStore AMS/WMS series.

11.3.1.1 Configuring Ports (9900V, 9900, 9500V, and 9200)

Users with the Modify permission who are assigned to the All Resources resource group can configure Fibre Channel ports on the Lightning 9900V, Lightning 9900, Thunder 9500V, and Thunder 9200 storage subsystems.

Table 11.6 lists available arbitrated loop-port address (AL-PA) values ranging from 01 to EF.

Table 11.6 Available AL-PA Values

EF	CD	B2	98	72	55	3A	25
E8	CC	B1	97	71	54	39	23
E4	CB	AE	90	6E	53	36	1F
E2	CA	AD	8F	6D	52	35	1E
E1	C9	AC	88	6C	51	34	1D
E0	C7	AB	84	6B	4E	33	1B
DC	C6	AA	82	6A	4D	32	18
DA	C5	A9	81	69	4C	31	17
D9	C3	A7	80	67	4B	2E	10
D6	BC	A6	7C	66	4A	2D	0F
D5	BA	A5	7A	65	49	2C	08
D4	B9	A3	79	63	47	2B	04
D3	B6	9F	76	5C	46	2A	02
D2	B5	9E	75	5A	45	29	01
D1	B4	9D	74	59	43	27	
CE	B3	9B	73	56	3C	26	

To configure the ports:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. In the Physical View, select the desired port (e.g., for 9900V port CL1-A, click on **A** in **Cluster 1**) to open the Port Information panel (see Figure 11.35).

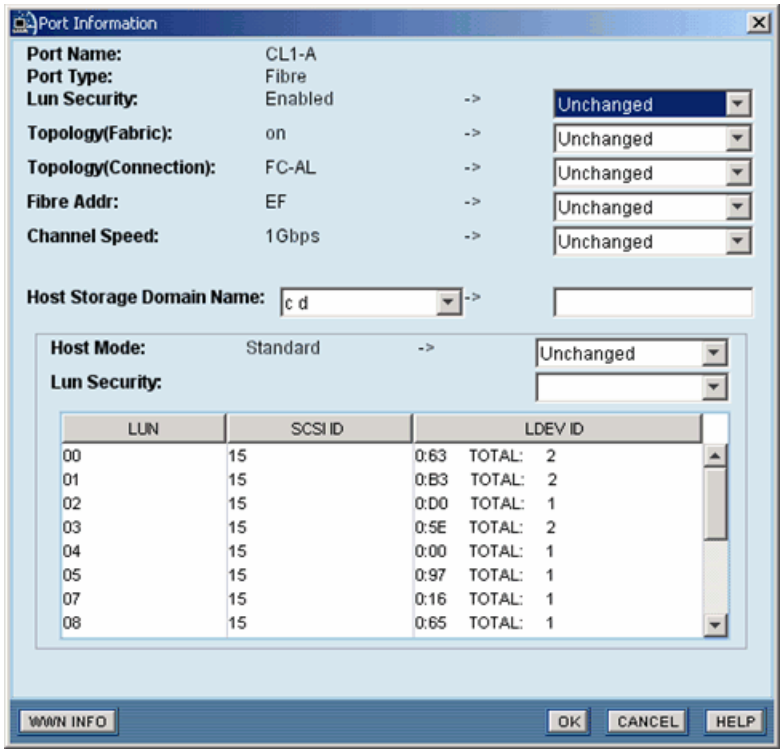


Figure 11.35 Port Information Panel for the Lightning 9900V

Note: For Lightning 9900V, the following ports are not displayed in the Physical View: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.

4. On the Port Information panel, change the port settings as desired. For details on the port information and settings for each storage subsystem, see the descriptions below.

   Notes:

   - If you change the **Topology (Connection)** settings, the attributes displayed by the Web client may not change because it takes time for the change to take effect in the storage subsystem. In such a case, wait for ten seconds after changing the setting, and then refresh the storage subsystem (see section 10.5). The updated **Topology (Connection)** value should appear.
   - If you change the **Fibre Addr** setting, the new setting may not take effect immediately. In such a case, make sure that the specified port is connected to a fibre network, and then refresh the storage subsystem information (see section 10.5).

5. After making the desired changes to the port settings, select **OK**. Otherwise, click **Cancel** to cancel your request. Changes will not be applied.

6. When the Confirmation panel displays, review the requested operations, and select **YES** to change the port settings, or select **NO** to cancel your request.

   You are notified when the port change operation is complete.

WARNING: If you change the attributes of a port, the host currently accessing the port may no longer be able to access the storage. Before changing the settings, you must stop all I/O operations with the host. If you use Device Manager to change the port settings while I/O operations between the host and the storage subsystem are underway, the I/O operations may terminate abnormally. For Thunder 9200, when a logical unit number is set, an I/O operation between the host and the 9200 subsystem may terminate abnormally.

For the Thunder 9200, Device Manager notifies you that the storage subsystem will be rebooted so that the new port settings become effective. Select **OK** to reboot the 9200 storage subsystem and change the port settings, or select **Cancel** to cancel your request and the reboot.

The Port Information panel for Lightning 9900 V: For more information on the 9900V port settings, refer to the *Hitachi Lightning 9900 V Series Windows NT Configuration Guide*, or contact your Hitachi Data Systems team.

- **Port name:** Ports with lower-case characters are activated for Lightning 9900V with a 16-port channel adapter. For a port with lower-case characters that exists in a channel adapter on cluster 1, **CL3-*x*** is displayed as the port name. For a port with lower-case characters that exists in a channel adapter on cluster 2, **CL4-*x*** is displayed as the port name.
- **Port settings:**
  - **LUN Security:** Enable or disable LUN security for all LUNs on the port. To secure LUNs, select **Enabled**. If no LUN security at all is desired, you can select **Disabled**.
  - **Topology** (**Fabric** On, Off)
  - **Topology (Connection):** FC-AL, Point-to-Point
  - **Fibre Addr:** In fabric environments, the port address is assigned automatically by fabric switch port number and is not controlled by the 9900V port settings In arbitrated loop environments, select an AL-PA (or loop ID) value to be set for the port address from the drop-down list. See Table 11.6 for the available AL-PA values.
  - **Channel speed:** 1 GB/s, 2 GB/S, or auto (cannot be modified for some port types)
- **Host storage domain settings:**
  - **Host Storage Domain Name:** Displays the host storage domain name and enables you to change it. A maximum of eight characters can be specified. You can use only the following characters for the name:

    `A - Z a - z 0 - 9 ! # $ % & ' ( ) + - . = @ [ ] ^ _ ` { } ~`

    The host storage domain name can include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded.

- **Host Mode:** Solaris, HP, AIX, Windows, NetWare, etc. Select the host mode for the connected platform to enable the host to "see" all LUNs on the port.

  Notes:

  - If Device Manager cannot recognize the host mode specified for the host storage domain, **Unknown** is displayed.
  - Selectable host modes vary depending on the microcode version.
- **LUN Security:** Host name/WWN for each WWN in the selected host storage domain
- **WWN INFO button:** Displays the WWN(s) registered to the port.

Port Information Panel for Lightning 9900: For more information on the 9900 port settings, refer to the *Hitachi Lightning 9900 HP-UX Configuration Guide*, or contact your Hitachi Data Systems team.

- **LUN Security:** Enable or disable LUN security for all LUNs on the port. To secure LUNs, select **Enabled**. If no LUN security at all is desired, you can select **Disabled**.
- **Topology** (**Fabric** On, Off)
- **Topology (Connection):** FC-AL, Point-to-point
- **Fibre address.** In fabric environments, the port address is assigned automatically by fabric switch port number and is not controlled by the Lightning 9900 port settings. In arbitrated loop environments, select an AL-PA (or loop ID) value to be set for the port address from the drop-down list. See Table 11.6 for the available AL-PA values.
- **Host mode:** Solaris, HP, AIX, Windows, NetWare, etc. Select the host mode for the connected platform to enable the host to "see" all LUNs on the port.

  Note: If Device Manager cannot recognize the host mode that is specified for the port, **Unknown** is displayed.
- **Modify LUN Group:** Opens the Modify LUN Group panel (see section 11.3.1.2).
- **Modify WWN Group:** Opens the Modify WWN Group panel (see section 11.3.1.3).
- **WWN INFO button:** Displays the WWN(s) registered to the port and the WWN Group to which each WWN belongs (if any)

Port Information Panel for Thunder 9500 V Series: For more information on the 9500V port settings, refer to the *Hitachi Thunder 9500 V Series Solaris Configuration Guide*, or contact your Hitachi Data Systems account team.

- **LUN Security**: Enable or disable LUN security for all LUNs on the port. To secure LUNs, select **Enabled**. If no LUN security at all is desired, you can select **Disabled**.
- **Topology (Fabric):** You cannot change this item.
- **Topology (Connection):** Loop, or Point-to-Point
- **Fibre address:** In fabric environments, the port address is assigned automatically by fabric switch port number and is not controlled by the 9500V port settings. In arbitrated loop environments, select an AL-PA (or loop ID) value to be set for the port address from the drop-down list. Table 11.6 for the available AL-PA values.

- **Port Option:** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected.
- **Host Storage Domain Name** (LUN Management mode): Displays the host storage domain name and enables you to change it. A maximum of 16 characters can be specified. You can use only the following characters for the name:

  A - Z a - z 0 - 9 ! # $ % & ' ( ) + - . = @ [ ] ^ _ ` { } ~

  The host storage domain name can include spaces, but cannot consist only of spaces. Leading or trailing spaces are discarded.
- **Host mode:** Standard, Open VMS, Wolfpack, TRESPASS, etc. Select the host mode for the connected platform to enable the host to "see" all LUNs on the port.

  Notes:

  – If Device Manager cannot recognize the host storage domain or the host mode that is specified for the port, **Unknown** is displayed.

  – Selectable host modes vary depending on the microcode version.
- **Extended Host Mode (Host Mode2):** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected.

  Note: Selectable host modes vary depending on the microcode version.
- **WWN INFO button:** Displays the WWN(s) registered to the port.

Port Information Panel for Thunder 9200: For further information on the 9200 port settings, refer to the *Hitachi Thunder 9200 Solaris Configuration Guide*, or contact your Hitachi Data Systems team.

- **LUN Security:** Enable or disable LUN security for all LUNs on the port. To secure LUNs, select **Enabled**. If no LUN security at all is desired, you can select **Disabled**.
- **Topology (Fabric):** You cannot change this item
- **Topology (Connection):** Loop, or Point-to-Point
- **Fibre address.** In fabric environments, the port address is assigned automatically by fabric switch port number and is not controlled by the 9200 port settings. In arbitrated loop environments, select an AL-PA (or loop ID) value to be set for the port address from the drop-down list. Table 11.6 for the available AL-PA values.
- **Port Option:** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected.
- **Host mode:** Standard, Open VMS, Wolfpack, TRESPASS, etc. Select the host mode for the connected platform to enable the host to "see" all LUNs on the port.

  Note: If Device Manager cannot recognize the host mode that is specified for the port, **Unknown** is displayed.
- **Extended Host Mode (Host Mode2):** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected.
- **WWN INFO button:** Displays the WWN(s) registered to the port

11.3.1.2 Managing LUN Groups

Users with the Modify permission who are assigned to the All Resources resource group can manage LUN groups on Lightning 9900.

The Modify LUN Group panel (see Figure 11.36) enables you to create, modify, and delete LUN groups. To open the Modify LUN Group panel, open the Port Information panel for the desired port (see section 11.3.1.1), and select the **MODIFY LUN GROUP** button.

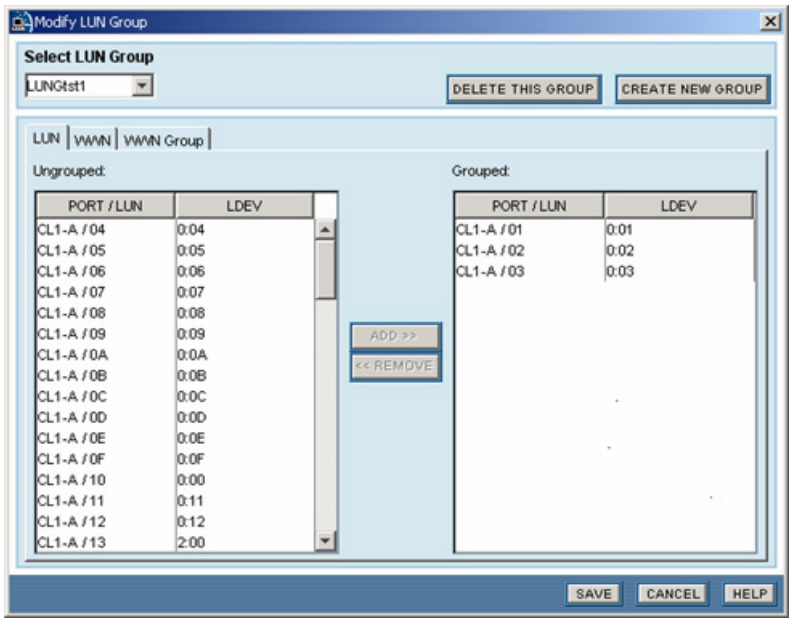


Figure 11.36 Modify LUN Group Panel

The **Select LUN Group** drop-down list box enables you to select the desired LUN group. The **DELETE THIS GROUP** button enables you to delete the selected LUN group. The **CREATE NEW GROUP** button enables you to create a new LUN group to the selected port. The **SAVE** button saves your changes on this panel and returns you to the Port Information panel.

- **LUN** tab: The **Ungrouped** list box displays the LUN(s) that can be added to the selected LUN group. The **Grouped** list box displays the LUN(s) in the selected LUN group. The **ADD>>** button moves the selected LUN(s) to the **Grouped** list. The **<< REMOVE** button moves the selected LUN(s) to the **Ungrouped** list.
- **WWN** tab: The **Unsecured** list box displays the WWN(s) that can be added to the selected LUN group. The **Secured** list box displays the WWN(s) in the selected LUN group. The **ADD>>** button moves the selected WWN(s) to the **Secured** list. The **<< REMOVE** button moves the selected WWN(s) to the **Unsecured** list.
- **WWN Group** tab: The **Unsecured** list displays the WWN group(s) that can be added to the selected LUN group. The **Secured** list box displays the WWN group(s) in the selected LUN group. The **ADD>>** button moves the selected WWN group(s) to the **Secured** list. The **<< REMOVE** button moves the selected WWN group(s) to the **Unsecured** list.

Creating a LUN Group

To create a new LUN group:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. In the Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel.
4. Select **MODIFY LUN GROUP** to open the Modify LUN Group panel (see Figure 11.36).
5. Select **CREATE NEW GROUP**, enter the desired name for the new LUN group, and select **OK**. The name must be no more than 8 bytes in length, and you can only use the following characters:

   A - Z a - z 0 - 9 ! # $ % & ' ( ) + - . = @ [ ] ^ _ ` { } ~

   LUN group names are case-sensitive. You cannot enter a name that is already in use.
6. On the **LUN** tab of the Modify LUN Group panel, add the desired LUN(s) to the new LUN group: select the desired LUN(s) in the **Ungrouped** list, and select **ADD>>** to move the selected LUN(s) to the **Grouped** list (see Figure 11.37). If necessary, use the **<< REMOVE** button to move LUN(s) back into the **Ungrouped** list.
7. On the **WWN** tab of the Modify LUN Group panel, add the desired WWN(s) to the new LUN group: select the desired host WWN(s) in the **Unsecured** list, and select **ADD>>** to move the selected WWN(s) to the **Secured** list (see Figure 11.38). If necessary, use the **<< REMOVE** button to move WWN(s) back into the **Unsecured** list.
8. On the **WWN Group** tab of the Modify LUN Group panel, add the desired WWN group(s) to the new LUN group: select the desired WWN group(s) in the **Unsecured** list, and select **ADD>>** to move the selected WWN group(s) to the **Secured** list (see Figure 11.39). If necessary, use **<< REMOVE** to move WWN group(s) back into the **Unsecured** list.
9. When you have added all desired LUN(s), WWN(s), and WWN group(s) to the new LUN group, select **SAVE**, or select **CANCEL** to cancel your request to create a new LUN group.
10. When the confirmation panel displays, select **YES** to add the new LUN group, or select **NO** to cancel your request to add the new LUN group.

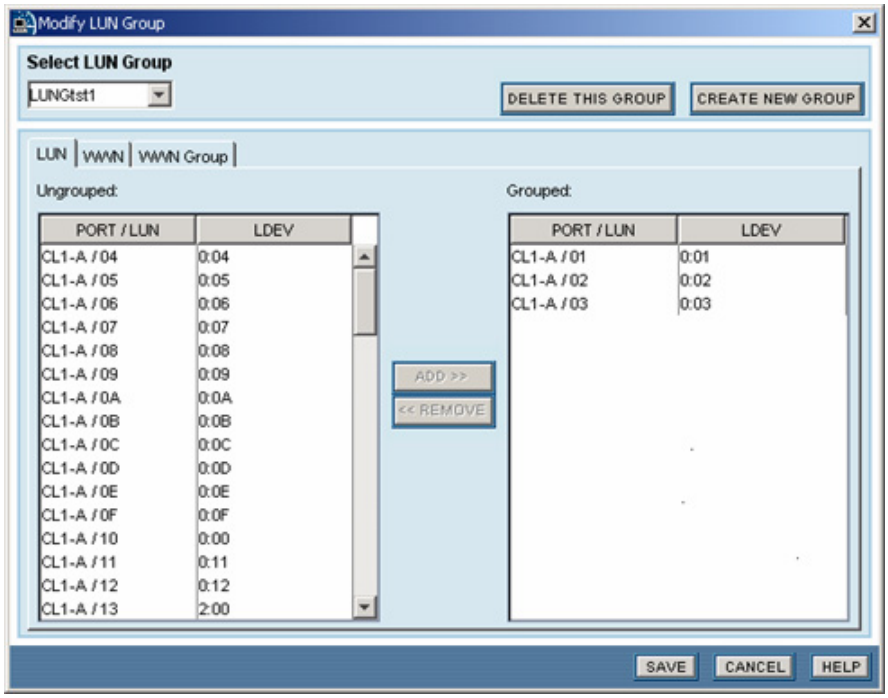


Figure 11.37 Creating a New LUN Group – Selecting the LUN(s)

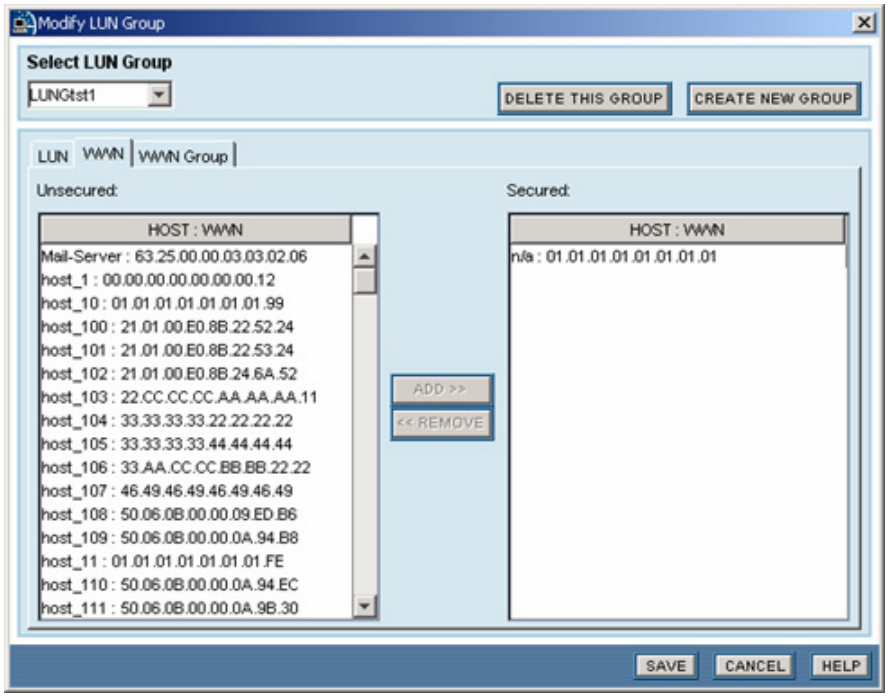


Figure 11.38 Creating a New LUN Group – Selecting the WWN(s)

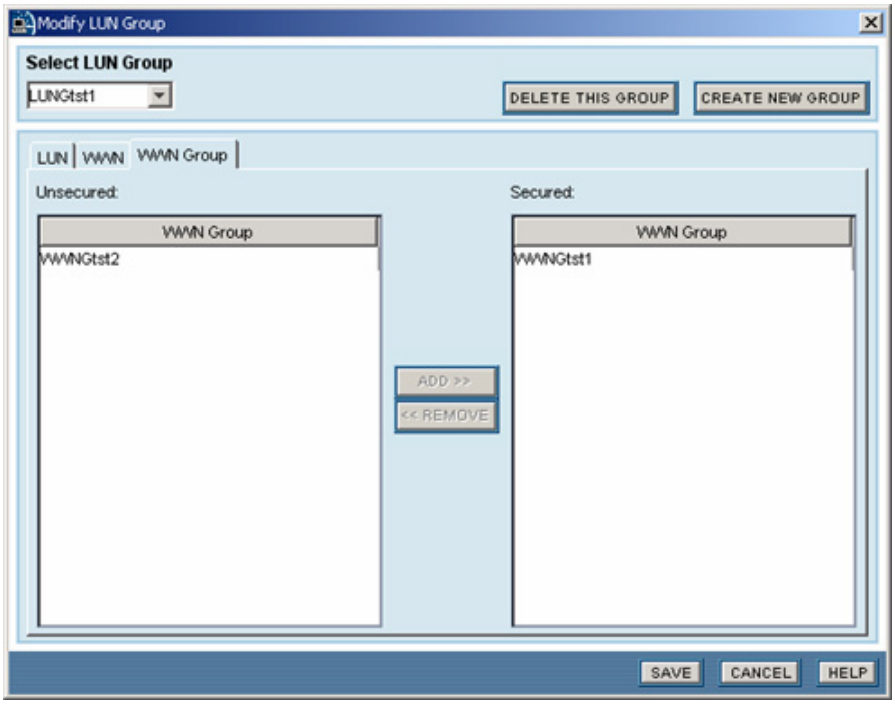


Figure 11.39 Creating a New LUN Group – Selecting the WWN Group(s)

Modifying a LUN Group

To modify an existing LUN group:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. In the Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel.
4. Select **MODIFY LUN GROUP** to open the Modify LUN Group panel (see Figure 11.36).
5. Select the desired LUN group, and make the desired changes to the LUN group. Select the **LUN** tab to add/ remove LUN(s), select the **WWN** tab to add/ remove WWN(s), and select the **WWN Group** tab to add/ remove WWN group(s). To change the name of a LUN group, enter the new name in the **Select LUN Group** field.
6. When the Modify LUN Group panel displays the desired changes for the selected LUN group, select **SAVE**, or select **CANCEL** to cancel your request to modify the LUN group.
7. When the confirmation panel displays, select **YES** to modify the LUN group, or select **NO** to cancel your request to modify the LUN group.

Deleting a LUN Group

To delete a LUN group:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. In Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel (see Figure 11.35).
4. Select **MODIFY LUN GROUP** to open the Modify LUN Group panel (see Figure 11.36).
5. Select the desired LUN group, select the **DELETE THIS GROUP** button, and select **YES** on the confirmation panel, or select **NO** to cancel your request to delete the LUN group.

   If you selected **YES**, the LUN group to be deleted is no longer displayed on the Modify LUN Group panel.
6. Choose **SAVE** on the Modify LUN Group panel to delete the LUN group(s), or choose **CANCEL** to cancel your request to delete the LUN group(s).
7. When the confirmation panel displays, select **YES** to delete the LUN group. To cancel your request to delete the LUN group, select **NO** on the confirmation panel, and then select **CANCEL** on the Modify LUN Group panel.

11.3.1.3 Managing WWN Groups

Users with the Modify permission who are assigned to the All Resources resource group can manage WWN groups on Lightning 9900 storage subsystem.

The Modify WWN Group panel (see Figure 11.40) enables you to create, modify, and delete WWN groups for each 9900 port. To open the Modify WWN Group panel, open the Port Information panel for the desired port (see section 11.3.1.1), and select **Modify WWN Group**.

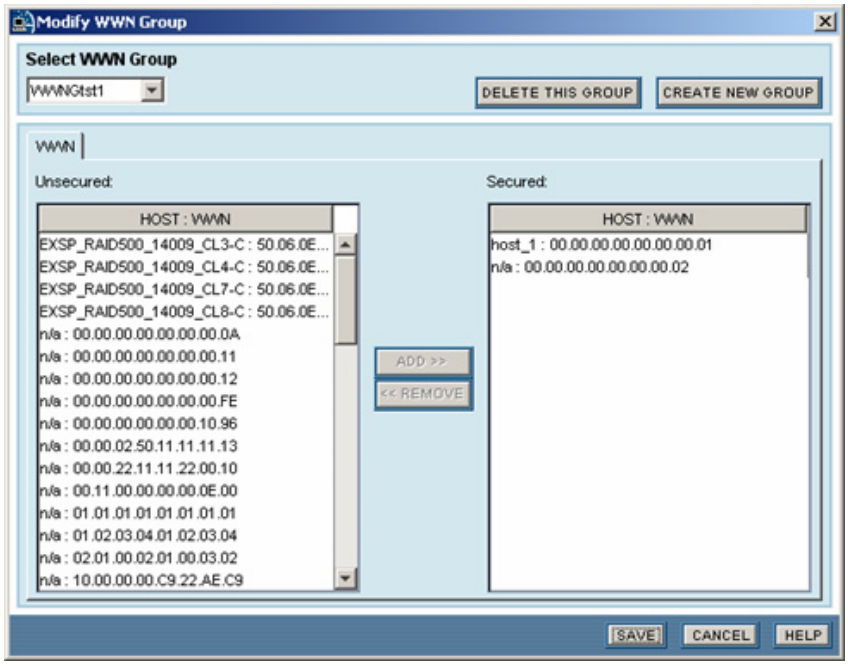


Figure 11.40 Modify WWN Group Panel

The **Select WWN Group** drop-down list box enables you to select the desired WWN group. The **DELETE THIS GROUP** button enables you to delete the selected WWN group. The **CREATE NEW GROUP** button enables you to create a new WWN group to the selected port. The **Unsecured** list box displays the WWN(s) that can be added to the selected WWN group. The **Secured** list box displays the WWN(s) in the selected WWN group. The **ADD>>** button moves the selected WWN(s) to the **Secured** list. The **<< REMOVE** button moves the selected WWNs to the **Unsecured** list. The **SAVE** button saves your changes on this panel and returns you to the Port Information panel.

Creating a New WWN Group

To create a new WWN group:

1. In the **Explorer** menu, choose **Resources**, then **Subsystems**, then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display the Physical View for the storage subsystem.
3. In the Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel.
4. Select **MODIFY WWN GROUP** to open the Modify WWN Group panel (see Figure 11.40).
5. Select **CREATE NEW GROUP**, enter the name for the new WWN group, and select **OK**. LUN group names are case-sensitive. You cannot enter a name that is already in use. The name must be no more than 8 bytes in length, and you can only use the following characters:

   A - Z a - z 0 - 9 ! # $ % & ' ( ) + - . = @ [ ] ^ _ ` { } ~

6. On the Modify WWN Group panel, select the desired host WWN(s) in the **Unsecured** list, and select **ADD>>** to move the selected WWN(s) to the **Secured** list. If necessary, use the **<< REMOVE** button to move WWN(s) back into the **Unsecured** list.
7. When the **Secured** list displays the WWN(s) that you want to add to the new WWN group, select **SAVE**, or select **CANCEL** to cancel your request.
8. When the confirmation panel displays, select **YES** to create the new WWN group, or select **NO** to cancel your request to add the new WWN group.

Modifying a WWN Group

To modify an existing WWN group:

1. In the **Explorer** menu, choose **Resources**, then **Subsystems**, then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display the Physical View for the storage subsystem.
3. In the Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel.
4. Select the desired WWN group, and use the **ADD>>** and **<<REMOVE** buttons to add WWN(s) to and remove WWN(s) from the selected WWN group. To change the name of a WWN group, enter the new name in the **Select WWN Group** field.
5. When the **Secured** list displays the desired WWN(s) for the selected WWN group, select **SAVE**, or select **CANCEL** to cancel your request to modify the WWN group.
6. When the confirmation panel displays, select **YES** to modify the WWN group, or select **NO** to cancel your request to modify the WWN group.

Deleting a WWN Group

To delete a WWN group:

1. In the **Explorer** menu, choose **Resources**, then **Subsystems**, then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. In the Physical View, select the desired port (for 9900 port CL1-A, click **A** in **Cluster 1**) to open the Port Information panel.
4. Select **MODIFY WWN GROUP** to open the Modify WWN Group panel (see Figure 11.40).
5. Select the desired WWN group, and click the **DELETE THIS GROUP** button.
6. When the confirmation panel displays, click **YES**, or select **NO** to cancel your request to delete the WWN group.

   If you selected **YES**, the WWN group to be deleted is no longer displayed on the Modify WWN Group panel.

7. Select **SAVE** on the Modify WWN Group panel to continue, or select **CANCEL** to cancel your request to delete the WWN group.
8. When the confirmation panel displays, select **YES** to delete the WWN group. To cancel your request to delete the WWN group, select **NO** on the confirmation panel, and then select **CANCEL** on the Modify WWN Group panel.

11.3.1.4 Configuring Fibre Channel Adapters (9900V, 9900)

WARNING: Before changing the setting of a channel adapter, make sure that the storage subsystem is equipped with channel adapters capable of high-speed mode, that you are aware of the impact of changing the setting, and that you understand the procedure for connecting hosts to a channel adapter in high-speed mode.

Users with the Modify permission who are assigned to the All Resources resource group can configure Fibre Channel adapters on the Lightning 9900V and Lightning 9900 storage subsystems.

The three types of Fibre Channel adapters for the Lightning 9900V are 4-port, 8-port, and 16-port adapters. You can set the fibre printed circuit board (PCB) mode only for 4-port Fibre Channel adapters.

Standard mode is the default channel adapter mode. High-speed mode provides faster access speed by using more processors to handle data access. However, high-speed mode limits the number of available ports on the channel adapter card (one port for Lightning 9900V, half of the ports for Lightning 9900). Servers or switches attached to these ports must be changed for this configuration. Once the storage subsystem and attached servers or switches are configured for high-speed mode, you can use Device Manager to change the mode of the channel adapter. Please contact your Hitachi Data Systems representative for assistance in planning and implementing high-speed port access. For more information on the channel adapter settings, refer to the *Hitachi Lightning 9900 V Series LUN Manager User's Guide*.

To configure the speed mode of the Fibre Channel adapters in the Lightning 9900V or Lightning 9900 storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. Select **Port Controllers** to open the Port Controller panel (see Figure 11.41).
4. Make the desired Fibre PCB mode changes for the channel adapter, and then select **OK**.

   When the confirmation panel appears (see Figure 11.42), review the changes carefully. Select **YES** to change the modes as specified, or select **NO** to cancel your request.
5. If you selected **YES**, a message is displayed to warn you that you cannot change the Fibre PCB mode while I/O operations with the host are underway.

   After reviewing the information displayed in the warning message and stopping the hosts, select **OK**. To cancel your request to change the Fibre PCB mode, select **CANCEL**.

6. When you are notified that the channel adapter mode change operation is complete, reboot the host.

   You are notified when the operation is complete. You can now restart the host(s).

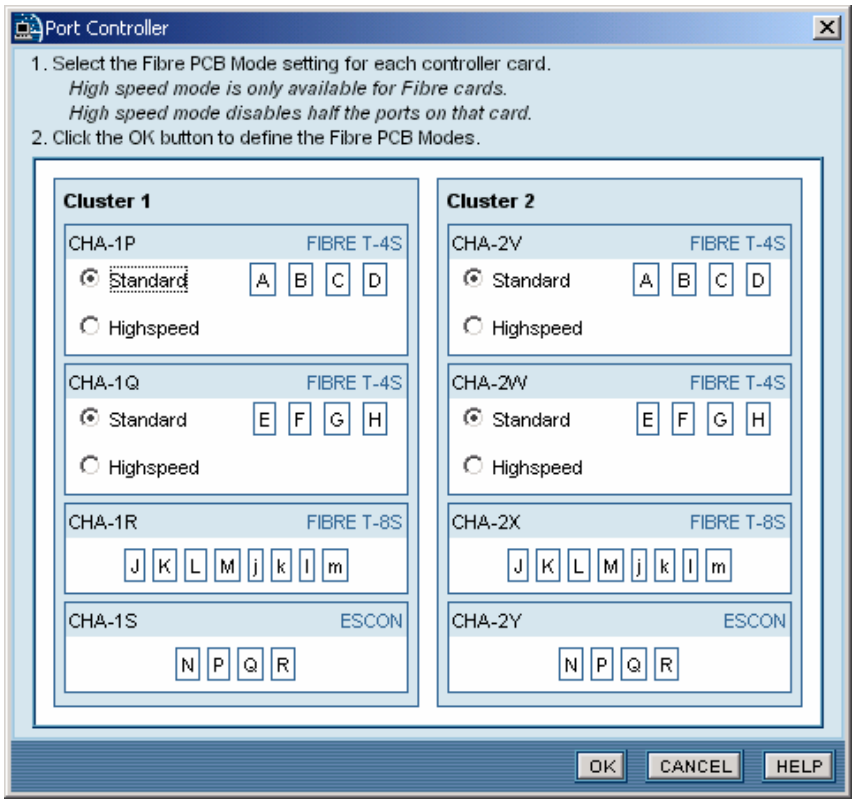


Figure 11.41 Changing the Channel Adapter Mode (9900V)

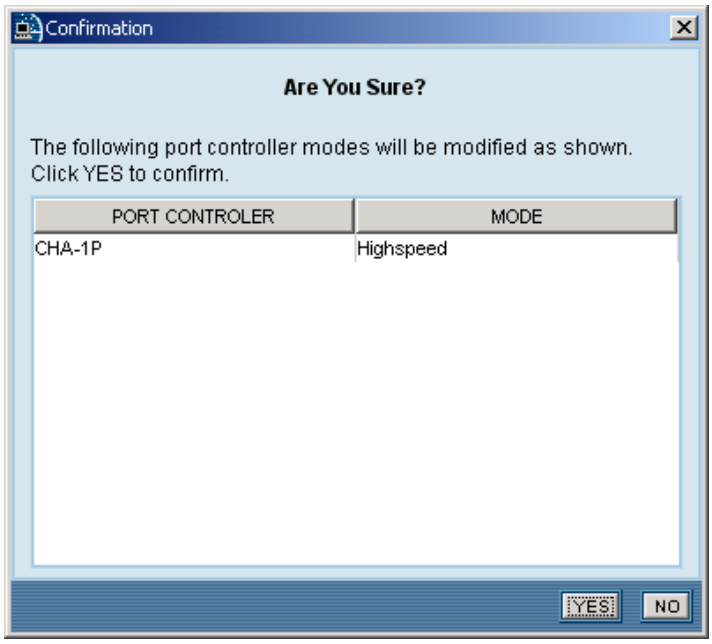


Figure 11.42 Changing the Channel Adapter Mode Confirmation

11.3.2 Array Group Operations

Device Manager array group operations include:

- Creating an array group on a 9500V or 9200 subsystem (see section 11.3.2.1)
- Deleting an array group on a 9500V or 9200 subsystem (see section 11.3.2.2)
- Configuring spare drives on a 9500V or 9200 subsystem (see section 11.3.2.3)

11.3.2.1 Creating an Array Group on the Thunder 9500V and 9200 Subsystems

Users with the Modify permission who are assigned to the All Resources resource group can create new array groups on the Thunder 9500V and Thunder 9200 storage subsystems.

When you create a new array group on the 9500V or 9200, you select the RAID level, width, depth, and disks for the new array group. The spare drives on the 9500V/9200 are configured separately.

Note: To use a new 9500V or 9200 array group, you must create LDEV(s) in the array group.

To create a new array group in an existing Thunder 9500V or 9200 storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display the Physical View for the storage subsystem.
3. Select **CREATE** in the **Disks & Arrays** box. The Create Array Group panel displays the current array group configuration.

   The following lists and describes the disk types displayed in the panel:

   - G = disk in an FC drive comprising the array group
   - U = unused disk in an FC drive
   - S = spare disk in an FC drive
   - A_G = disk in an SATA drive comprising the array group
   - A_U = unused disk in an SATA drive
   - A_S = spare disk in an SATA drive
   - B_G = disk in a BD drive comprising the array group
   - B_U = unused disk in a BD drive
   - B_S = spare disk in a BD drive

4. Select the desired RAID level, width, and depth, and then select (check) the disk that you want to assign as the top disk in the new array group. The other disks are selected automatically according to the RAID level, width, and depth settings (see Figure 11.43).

   If a spare drive has already been used, select disks whose size is equal to or less than the smallest disk in the spare drive.

   CAUTION: The following array group cannot be created:

   - An array group that contains both an SATA and FC drive
   - An array group that contains both an SATA and BD drive
   - A RAID0 array group for an SATA drive
   - A RAID0 array group for a BD drive

5. When the information displayed on the Create Array Group panel is correct, select **OK**.
6. When the confirmation panel appears (see Figure 11.44), select **YES** to create the new array group, or select **NO** to cancel your request to create a new array group.

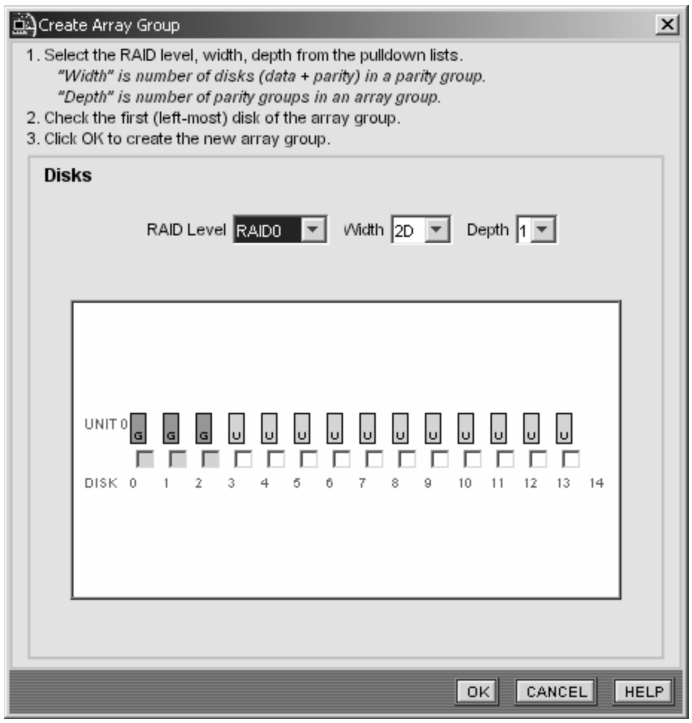


Figure 11.43 Create Array Group - Selecting Array Group Parameters

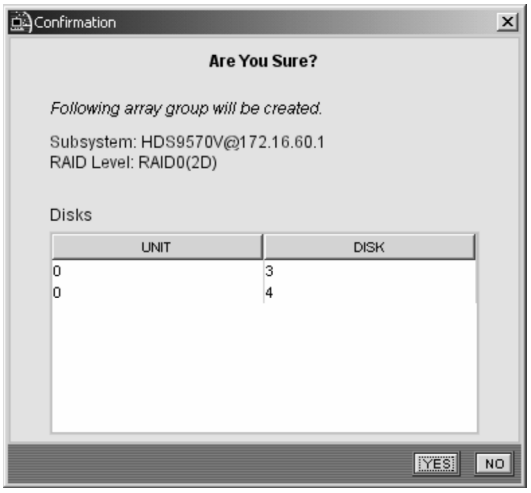


Figure 11.44 Create Array Group - Confirmation

Table 11.7 shows acceptable level and width value combinations for 9200 and 9500V.

Table 11.7 Acceptable RAID Level and Width Value Combinations (9200 and 9500V)

RAID Level	Width		
	Thunder 9200	**Thunder 9520V, Thunder 9530V, and Thunder 9570V**	**Thunder 9580V and Thunder 9585V**
RAID0	2D to 5D	2D to 11D	2D to 16D
RAID0+1 (see ***Note***)	2D + 2P	2D + 2P 3D + 3P 4D + 4P 5D + 5P	2D + 2P 3D + 3P 4D + 4P 5D + 5P 6D + 6P 7D + 7P 8D + 8P
RAID1	1D + 1P		
RAID5	(2D to 4D) + 1P	(2D to 10D) + 1P	(2D to 15D) + 1P
Note: RAID1+0 for Storage Navigator Modular and DAMP is displayed as RAID0+1 in Device Manager.			

Table 11.8 shows acceptable level and depth value combinations for 9200 and 9500V.

Table 11.8 Acceptable RAID Level and Depth Value Combinations (9200 and 9500V)

RAID Level	Depth		
	Thunder 9200	Thunder 9520V, Thunder 9530V, and Thunder 9570V	Thunder 9580V and Thunder 9585V
RAID0	1 to 2	1 to 5	1 to 222
RAID0+1 (see ***Note***)	1	1 to 2	1 to 111
RAID1	1 to 2	1 to 5	1 to 222
RAID5	1	1 to 3	1 to 148
Note: RAID1+0 for Storage Navigator Modular and DAMP is displayed as RAID0+1 in Device Manager.			

11.3.2.2 Deleting an Array Group (9500V and 9200)

WARNING: The delete array group operation is destructive. Data stored on the devices in the array group will be lost. We strongly recommend that you back up the data before deleting an array group.

Users with the Modify permission who are assigned to the All Resources resource group can delete an array group on the Thunder 9500V storage subsystem and Thunder 9200 storage subsystem. When you delete an existing array group, the data on the disks in the array group is deleted, and the disks are then displayed as unused disks.

You cannot delete an array group that contains a logical device. To delete such an array group, make a backup of the data, and then delete the logical device(s) from the array group.

To delete an array group on the 9500V or 9200 array:

1. Make sure that the LDEVs in the array group to be deleted are no longer in use and have been backed up and deleted.
2. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
3. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
4. In the **Disks & Arrays** box, select the array group that you want to delete, and then select **DELETE.**
5. When the confirmation panel displays, select **YES** to delete the selected array group, or select **NO** to cancel your request to delete an array group.
6. Device Manager displays a warning message. Check the warning message carefully. If it is acceptable to delete the array group and lose the data, select **OK**. To cancel your request to delete the array group, select **CANCEL**.

11.3.2.3 Configuring Spare Drives on Thunder 9500V and 9200 Subsystems

Users with the Modify permission who are assigned to the All Resources resource group can configure (add and release) the spare drives on the Thunder 9500V and Thunder 9200 storage subsystems.

When you configure the spare drives on 9500V/9200 storage subsystems, you can add new spare drive(s) and/or release existing spare drive(s). When you release a spare drive, the drive changes to unused and can be assigned to a new array group.

The maximum number of spare drives per subsystem is:

- 30, for Thunder 9585V (microcode 1658 or later) and Thunder 9580V (microcode 1658 or later)
- 15, for Thunder 9585V (under microcode 1658), Thunder 9580V (under microcode 1658), Thunder 9570V, Thunder 9530V, and Thunder 9520V
- 5, for Thunder 9200

To add and/or release one or more spare drives in a 9500V or 9200 storage subsystem:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. Select **SPARE** in the **Disks & Arrays** box. The Spare Drive panel displays the current spare drive configuration (see Figure 11.45).
4. Select (check) the unused disk(s) that you want to configure as new spare drive(s), and deselect (uncheck) the spare drive(s) that you want to release.

   CAUTIONS:

   - You cannot use disks 0-4 in UNIT0 as spare drives.
   - If an array group has been created, the size of the disk that is specified as a spare drive must at least equal the size of the existing array group (minimum size of a physical disk that constitutes the array group).
   - An error is displayed if the physical disk specified for a spare drive is smaller than the physical disk used for the array group. Use Storage Navigator Modular or DAMP to check the size of the disk used for the array group, and then create a spare drive.
   - An attempt to create a spare drive may result in error DMES059542: The specified drive cannot be used as a spare drive. In such a case, use Storage Navigator Modular or DAMP to check the physical disk size, then specify for the spare drive a disk that is at least as large.

5. When the information on the Spare Drive panel is correct, click the **OK** button, or click **Cancel** to cancel your request to create/release spare drive(s).

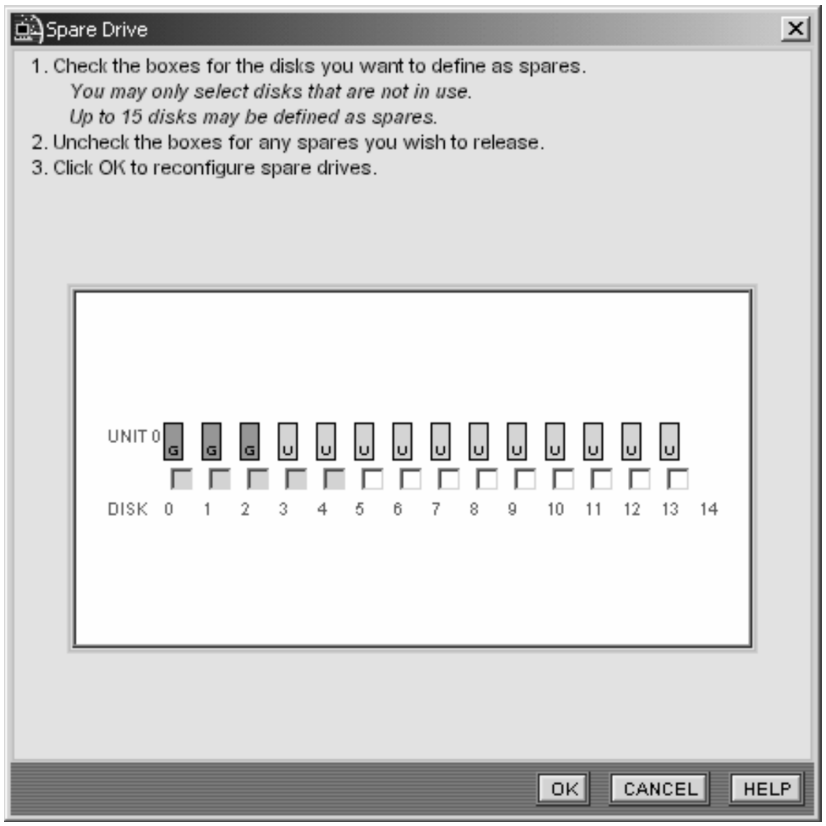


Figure 11.45 Spare Drive Panel (9500V shown)

11.3.3 LDEV Operations (9900V, 9900, 9500V, and 9200)

The Device Manager LDEV operations include:

- Allocating storage (see section 8.4)
- Unallocating storage (see section 8.5)
- Creating an LDEV (see section 11.3.3.1)
- Deleting an LDEV (see section 11.3.3.3)
- Setting a command device (see section 11.3.3.6)

Notes:

- To perform an operation on an LDEV for Universal Storage Platform V, use the Physical View for Universal Storage Platform V.
- To perform an operation on an LDEV for TagmaStore USP, use the Physical View for TagmaStore USP.
- To perform an operation on an LDEV of the TagmaStore AMS/WMS series, use the Physical View of the TagmaStore AMS/WMS series.

11.3.3.1 Viewing LDEV Information (9900V, 9900, 9500V, and 9200)

Users assigned to the All Resources resource group can view the detailed LDEV information.

Note: After you have performed an operation in the LDEV Information window, the contents of the LDEV Information window are updated. However, the LDEV list may display only some of the LDEVs. In this case, close the LDEV Information window, and then open it again to display all LDEVs.

To view the detailed LDEV information:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem, and then open the LDEV Information panel as follows:
   - For Lightning 9900V, select the **VIEW** button for the desired frame on the ARRAY GROUPS view, select the desired parity group on the Frame Information (level 1) panel, and then select the desired array group on the Frame Information (level 2) panel.
   - For Lightning 9900, select the **VIEW** button for the desired frame on the ARRAY GROUPS view, select the desired array group on the Frame Information panel.
   - For 9500V, and 9200, select the desired array group, and then select **VIEW**.

3. The LDEV Information panel consists of the following three display areas:
   - **LDEV List** (upper left): Displays a list of logical devices in the selected array group. Select the desired LDEV in this list to display the detailed LDEV information.

     Each LDEV row displays the LDEV number and size (MB, fractional portion truncated). If a path has been set, the port is also displayed. If the LDEV is part of a LUSE volume, the following is displayed: **(LUSE: *representative-logical-device-number*)**. For Lightning 9900V and Lightning 9900, the capacity of an HRX intermediate volume is also displayed (capacity in MB and Cyl). For more information on the HRX intermediate volume, refer to the documentation for the storage subsystem that you use.
   - **Array Group Info** (upper right): Displays the detailed information for the selected array group: ACP (Lightning 9900V and Lightning 9900 only), array group name, disk size (smallest physical disk size in the array group for Lightning 9500V and Thunder 9200), RAID level, Type (9500V only) emulation type (9900V and 9900 only), free space, largest space (largest amount of contiguous free space in the array group).
   - **LDEV information** (lower part): Displays the detailed information for the selected LDEV. It provides the:

     Detail tab (see Figure 11.46)

     Path Info tab (see Figure 11.47)

     Pair Info tab (see Figure 11.48)

The LDEV Information panel provides the following buttons:

- **ALLOCATE**: Enables you allocate a path to the selected logical device.
- **UNALLOCATE**: Enables you release the path that is allocated to the selected LDEV. Select the check box of the desired path on the **Path Info** tab to activate this button.
- **CREATE LDEV**: Enables you create logical devices in an array group.
- **DELETE LDEV**: Enables you delete the selected logical device from the array group. Select a logical device to which no path is set to activate this button.
- **LDEV CONFIG**: Enables you set a command device. Selecting a logical device that can be set as a command device activates **LDEV CONFIG**.

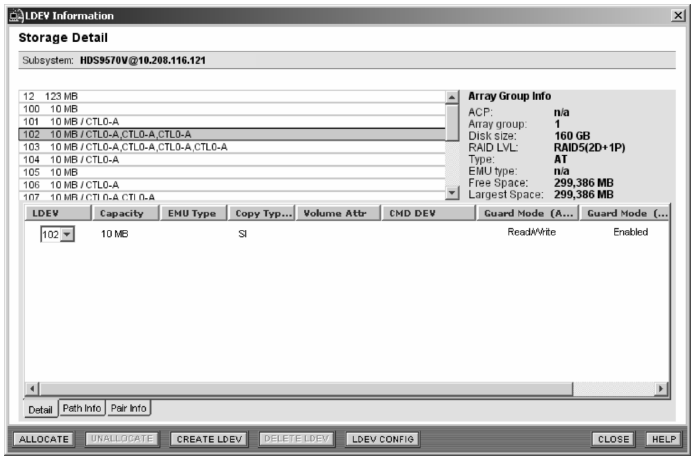


Figure 11.46 LDEV Information Panel – Detail Tab

The **Detail** tab of the LDEV Information panel displays the following information. You can sort the displayed information by selecting the desired column heading.

- **LDEV**: LDEV number. For a LUSE volume, you can select a logical device number from the drop-down list of the logical devices that make up the LUSE volume. Selecting a logical device displays its information.
- **Capacity**: capacity of the logical devices. For a LUSE volume, displays the capacity of the LUSE volume instead of the capacity of individual logical devices. For Lightning 9900V and Lightning 9900, this also displays the capacity of the HRX intermediate volume.

  The capacity values are in megabytes with the fractional portions cut off. Therefore, the displayed value may be less than the actual available capacity. For an HRX intermediate volume, the capacity in cylinders (number-of-cylinders `Cyl`) is displayed alongside the capacity in megabytes. For more information on the HRX intermediate volume, refer to the documentation for the storage subsystem that you use.
- **EMU Type**: emulation type. OPEN-***x*** (Lightning 9900V and Lightning 9900), or none (Thunder 9500V and Thunder 9200).
- **Copy Type**:
  - **SI** (ShadowImage)
  - **TC(Sync)** (TrueCopy Synchronous)
  - **TC(Async) / TCE** (TrueCopy Asynchronous)
  - **TC** (TrueCopy whose synchronization mode is unknown. See ***Note***.)
  - **QS/COW** (QuickShadow)
  - **Unpaired**, none (pair status unknown).

  Note: Displayed when the storage subsystem containing the primary volume is not registered with Device Manager. However, if the storage subsystem containing the secondary volume is a Lightning 9900V, the synchronization mode information is available as `TC(Sync)` or TC(Async) / TCE.
- **Volume Attr**: `CVS` (custom-sized volume created by using Virtual LVI/LUN), `LUSE`, `LUSE (CVS)` (LUSE volume made up of CVS volumes), `V-VOL` (V-VOL for QuickShadow), `POOL` (QuickShadow data pool), `GUARD` (Data Retention or Open LDEV Guard is set up), `External` (external volume), `OnDemand` (on-demand volume), `Migration-reserved` (reserve volume used in Volume Migration (Universal Storage Platform V and TagmaStore USP), CruiseControl (Lightning 9900V), or HIHSM (Lightning 9900)), none (normal volume).
- **CMD DEV**: **CMD DEV Remote**, or none (not a command device nor a remote command device).
- **Guard Mode(Attribute)**: attribute of the logical device (Lightning 9900V and Thunder 9500 V only))
- **Guard Mode(S-VOL)**: S-VOL Disable attribute (Lightning 9900V and Thunder 9500V only)
- **Guard Mode(Mode)**: the INH bit attribute (Lightning 9900 V and Thunder 9500 V only)

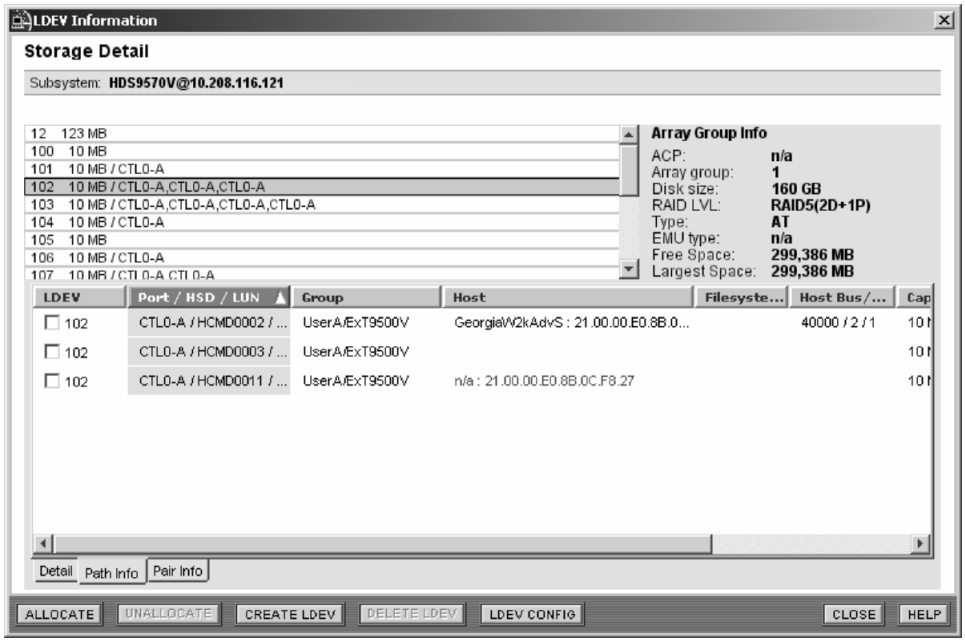


Figure 11.47 LDEV Information Panel – Path Info Tab

The **Path Info** tab of the LDEV Information panel displays the following information. You can sort the displayed information by selecting the desired column heading.

- **LDEV**: LDEV number. For a LUSE volume, displays only the representative LDEV number. To select the path of the logical device to be unallocated, select the check box of the path.
- **Port/HSD/LUN** or **Port/LUN**: port, host storage domain, and logical unit number for Lightning 9900V and Thunder 9500V in LUN Management mode. This item displays the port and logical unit number for Thunder 9500V in LUN Security mode, and Lightning 9900.
- **Group**: name of the storage group to which the volume path belongs
- **Host**: host name and WWN
- **Filesystem**: mount point on the host (displayed only when the Device Manager agent is installed on the host)
- **Host Bus/TID/LUN**: SCSI information that the host recognizes (displayed only when the Device Manager agent is installed on the host)
- **Capacity**: capacity of the LDEV. For Lightning 9900V and Lightning 9900, this item also displays the capacity of an HRX intermediate volume.

  The displayed values are in megabytes with the fractional portions cut off. Therefore, the displayed value may be less than the actual available capacity. For an HRX intermediate volume, the capacity in cylinders (*number-of-cylinders* `Cyl`) is displayed alongside the capacity in megabytes. For more information on the HRX intermediate volume, refer to the documentation for the storage subsystem that you use.
- **% Used**: percentage of volume usage (displayed only when the Device Manager agent is installed on the host).

When multiple paths are assigned to a volume, the following information is displayed:

- When a path is assigned to multiple hosts

  The percentage of volume usage on a host to which the Device Manager agent last sent the data is displayed. If the percentage of volume usage cannot be calculated on that host, -- appears even if the volume is being used by another host.

- Multiple paths are assigned to a single host

  The largest value is displayed as the percentage of storage usage.

For details about calculating the percentage and the conditions that prevent this item from being displayed, see section 8.2.1.

- **Last Updated**: time of the last update performed by Device Manager Agent (displayed only when the Device Manager agent is installed on the host). If multiple paths are assigned to the volume, the date and time when information was last updated on a host to which Device Manager agent last sent the data is displayed.

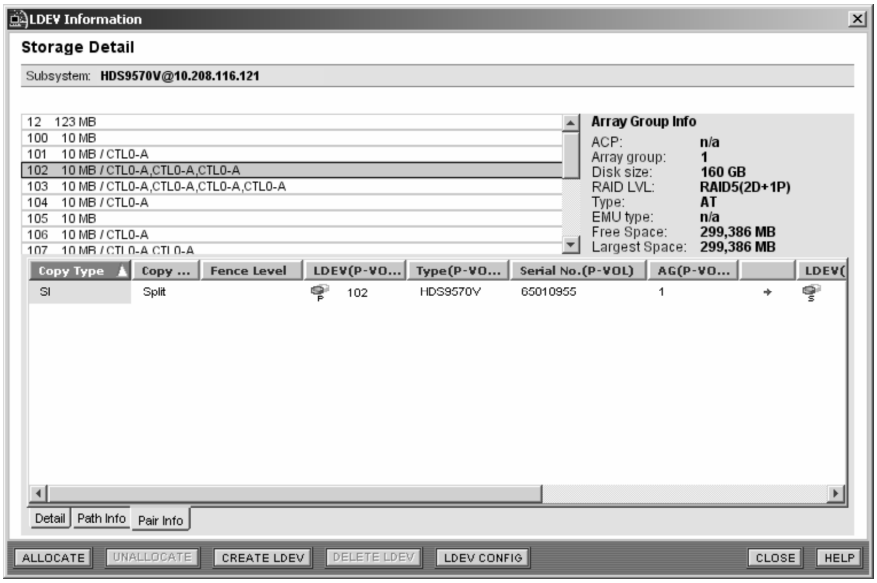


Figure 11.48 LDEV Information Panel – Pair Info Tab

The items displayed in the **Pair Info** page of the LDEV Information panel depend on the volume attribute. When the volume attribute is other than POOL, copy pair information is displayed. For a POOL volume, the POOL ID is displayed as the POOL information. You can sort the information by selecting the desired column heading. The following items display for volume attributes other than POOL:

- **Copy Type**:
  - **SI** (ShadowImage)
  - **TC(Sync)** (TrueCopy Synchronous)
  - **TC(Async)** / TCE
  - **TC** (TrueCopy whose synchronization mode is unknown. See ***Note***.)
  - **QS/COW** (QuickShadow)
  - **Unpaired**, none (pair status unknown).

  Note: Displayed when the storage subsystem containing the primary volume is not registered with Device Manager. However, if the storage subsystem containing the secondary volume is a Lightning 9900V, the synchronization mode information is available. When TC is displayed, copy information is not available, and **Copy Status** displays no value.
- **Copy Status**: **Simplex** (SMPL), **Pair** (PAIR), **Copying** (COPY(PD), COPY(RS), COPY(SP), or COPY), **Reverse-Copying** (COPY(RS-R), **Split** (PSUS or PSUS(SP)), **Suspended** (PSUE), **Error in LUSE** (PDUB), **Suspending** (Suspending), **Deleting** (Deleting), none displayed (copy status is unknown).
- **Fence Level**: setting concerning recovery that is performed when a failure occurs in the execution of TrueCopy. For details, refer to the applicable TrueCopy manual.

  Note: If a TrueCopy pair has been created by another program, the fence level does not display on the TagmaStore AMS. Perform a refresh operation to the host.
- **Split Time**: time when a snapshot is obtained when Copy Type is QuickShadow. This item is displayed only for Thunder 9500V.
- **LDEV(P-VOL)**: logical device number of the primary volume.
- **Type(P-VOL)**: model name of the storage subsystem to which the primary volume belongs. Displays **Unknown** if the storage subsystem to which the primary volume belongs is not discovered.
- **Serial No.(P-VOL)**: serial number of the storage subsystem to which the primary volume belongs. For Thunder 9200, Thunder 9500V, and Lightning 9900, displays Unknown if the storage subsystem to which the primary volume belongs is not discovered.
- **AG(P-VOL)**: number of the array group to which the primary volume belongs.
- **LDEV(S-VOL)**: logical device number of the secondary volume.

- **Type(S-VOL)**: model name of the storage subsystem to which the secondary volume belongs. Displays **Unknown** if the storage subsystem to which the secondary volume belongs is not discovered.
- **Serial No.(S-VOL)**: serial number of the storage subsystem to which the secondary volume belongs. For Thunder 9500V, this item displays **Unknown** if the storage subsystem to which the secondary volume belongs is not discovered.
- **AG(S-VOL)**: number of the array group to which the secondary volume belongs.

  Note: To display or update the following information, you must update (refresh) the storage subsystem information:

  - ShadowImage and TrueCopy settings for Lightning 9900V
  - ShadowImage settings for Thunder 9500V and Thunder 9200

For details on the system configuration required to display the ShadowImage and TrueCopy settings of storage subsystems see the *HiCommand Device Manager Server Installation and Configuration Guide*.

11.3.3.2 Creating an LDEV (9900V, 9900, 9500V, and 9200)

Users with the Modify permission who are assigned to the All Resources resource group can create an LDEV on an array group.

When you create an LDEV, you select an existing array group with free space and specify the desired LDEV parameters: device size and emulation type for 9900V and 9900, and device size and controller for Thunder 9500V and Thunder 9200. Device Manager automatically adds the new LDEV to the **Open-Unallocated** group for the storage subsystem (in **All Storage** or **My Storage**). Logical devices created using the Web client are formatted when they are created.

Note: For Thunder 9500V storage subsystems, logical devices are formatted using a Quick Format. The storage subsystems require the following microcode version:

- For Thunder 9530V and Thunder 9570V: microcode version 0655/C or later.
- For Thunder 9580V: microcode version 1655/D or later.

For details on Quick Formats, refer to the Storage Navigator Modular or DAMP user's guide.

CAUTION:

- While the restore processing of a Lightning 9900 storage subsystem is underway using CCI, logical device creation on that Lightning 9900 will result in an error. Logical device creation must not be executed while restore processing is underway using CCI.
- For Thunder 9200 storage subsystems, do not access a storage subsystem for which Device Manager is creating an LDEV using a storage subsystem-management tool other than Device Manager (for example, Storage Navigator Modular or DAMP). If you attempt to do so, an error might occur in the storage subsystem management tool or Device Manager. Applications other than storage subsystem management tools can issue an I/O for the other LDEVs, even though Device Manager is creating an LDEV.

For the Lightning 9900V and Lightning 9900 subsystems, you can create an LDEV that is a standard LU, or you can create a custom-size LDEV that is smaller than the standard LU (minimum capacity 36 MB). Table 11.9 lists the maximum capacities for the standard LU types on the Lightning 9900V and Lightning 9900 storage subsystems.

Note: LUSE volumes, which are larger than standard LU types, are created from existing unallocated LDEVs (see section 7.6.2 or 8.6).

CAUTION: For the Lightning 9900V and Lightning 9900 storage subsystems, you cannot create an LDEV whose size is the same size as the maximum amount of free space in an array group because a control area is also created in the storage subsystem. At least 30 MB of free space must be left available.

In addition to the emulation types listed Table 11.9, Lightning 9900V supports another emulation type called OPEN-V that enables you to create a logical device whose size is (*maximum size of free space - size required for the control area*). The size required for the control area depends on the size of the volume to be created (maximum of 200 MB).

Table 11.9 shows maximum capacities for standard LU types.

Table 11.9 Maximum Capacities of Standard LU Types

LU Type	OPEN-K	OPEN-3	OPEN-8	OPEN-9	OPEN-E
Maximum Capacity	1788 MB	2347 MB	7007 MB	7042 MB	13893 MB

Note: The 9900V and 9900 storage subsystems may not support the same LU types. Some LU types are not available on some platforms. Please ask your Hitachi Data Systems representative for the latest information on LU type support.

Device Manager uses the following conventions for capacity values:

- KB = 1024 bytes
- MB = 1024 KB
- GB = 1024 MB
- TB = 1024 GB

To create a new LDEV:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. Open the LDEV Information panel for the array group in which you want to create a new LDEV (see section 11.3.3.1):
   - For Lightning 9900V, select **Array Groups**, select **View** on the desired frame, select the desired parity group on the Frame Information (level 1) panel, and then select the desired array group on the Frame Information (level 2) panel.
   - For Lightning 9900, select **Array Groups**, select **View** on the desired frame, and then select the desired array group on the Frame Information panel.
   - For 9500V and 9200, select the desired array group, and then select **VIEW**.
4. On the LDEV Information panel for the desired array group (any tab), select the CREATE **LDEV** button (see Figure 11.46).
5. For Lightning 9900V, Lightning 9900, Thunder 9500V, and Thunder 9200, the Create LDEV panel opens (see Figure 11.49). Enter the desired parameters, and then select **OK**.
   - For Lightning 9900V and Lightning 9900, select the device emulation type, and enter the desired device size (see Table 11.9). The size cannot be larger than the size of the selected device type, except for OPEN-V (see the *Hitachi Lightning 9900 V Series LUN Manager User's Guide* for details).
   - For 9500V/9200, enter the desired device size, and select the desired default controller. ***Note:*** The LDEV capacity will be equal to or larger than the specified device size, because the device size is rounded up at the 9500V/9200 storage subsystem.

6. When the confirmation panel displays (see Figure 11.50), select **YES** to create the LDEV, or select **NO** to cancel your request to create the LDEV.

   You are notified when the operation is complete and the LDEV ID of the new LDEV is displayed. The new LDEV is displayed on the LDEV Information panel and is also listed in the **Open-Unallocated** group for the storage subsystem (under **All Storage** or **My Storage**).

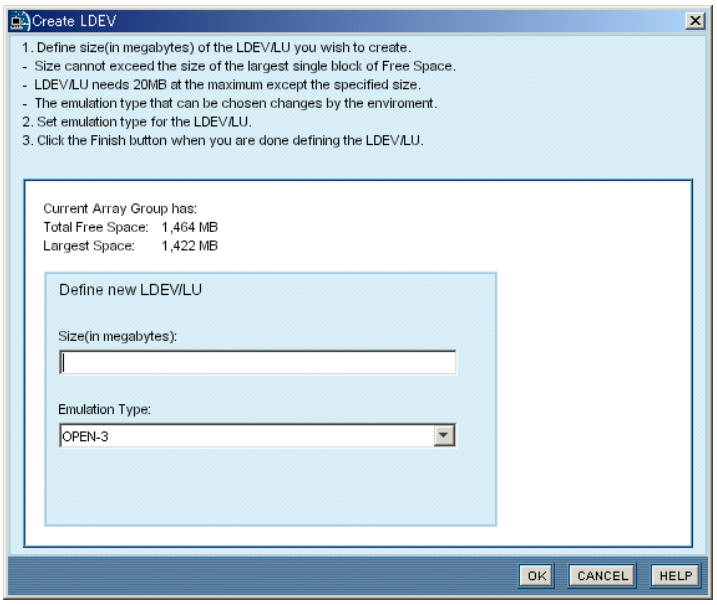


Figure 11.49 Creating an LDEV – Specifying LDEV Parameters (9900V)

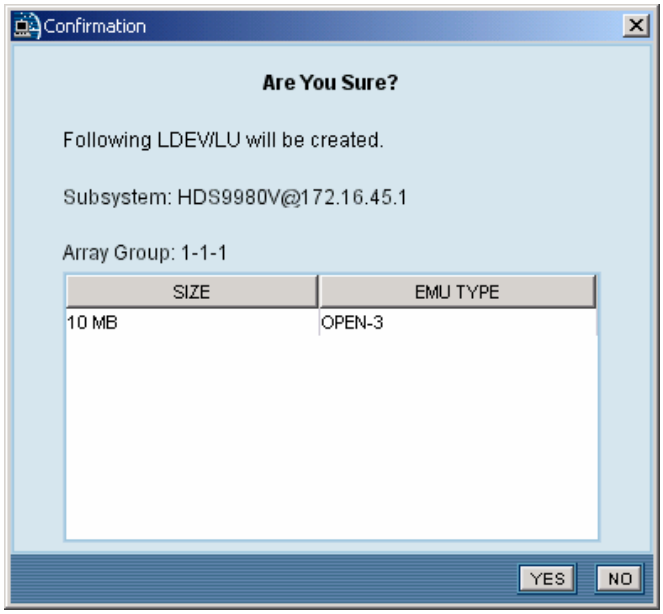


Figure 11.50 Creating an LDEV Confirmation

11.3.3.3 Deleting an LDEV (9900V, 9900, 9500V, and 9200)

WARNING: The delete LDEV operation is destructive. Data on the LDEV you are deleting will be lost. You should back up data before performing this operation.

Users with the Modify permission who are assigned to the All Resources resource group can delete LDEVs. When you delete an LDEV, the free space in the array group increases by the size of the LDEV deleted. The following LDEVs cannot be deleted:

- An LDEV to which a volume path is assigned
- An LDEV used as a command device
- An LDEV specified as a copy volume (P-VOL, S-VOL, or SP-VOL)
- An LDEV that has been set as a LUSE volume in a Thunder 9500V or 9200

In a Thunder 9500V or Thunder 9200, you can delete only the last LDEV that was created.

To delete an LDEV:

1. Verify that the LDEV to be deleted is no longer in use, that the data has been backed up, and that all access paths to the LDEV have been removed.
2. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
3. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
4. Open the LDEV Information panel for the array group in which you want to delete an LDEV.
   - For Lightning 9900V, select **Array Groups**, select **View** on the desired frame, select the desired parity group on the Frame Information (level 1) panel, and then select the desired array group on the Frame Information (level 2) panel.
   - For Lightning 9900, select **Array Groups**, select **View** on the desired frame, and then select the desired array group on the Frame Information panel.
   - For 9500V and 9200, select the desired array group, and then select **VIEW**.
5. On the LDEV Information panel for the desired array group, select the desired LDEV, and then select the **DELETE LDEV** button (see Figure 11.46). If a path to the LDEV exists, the **DELETE LDEV** button is not available.
6. When the confirmation panel displays (see Figure 11.51), select **YES** to delete the LDEV, or select **NO** to cancel your request to delete the LDEV.
7. Device Manager displays a warning message. Check the warning message carefully. If it is acceptable to delete the LDEV and lose the data, select the OK button. To cancel your request to delete the LDEV, select CANCEL.

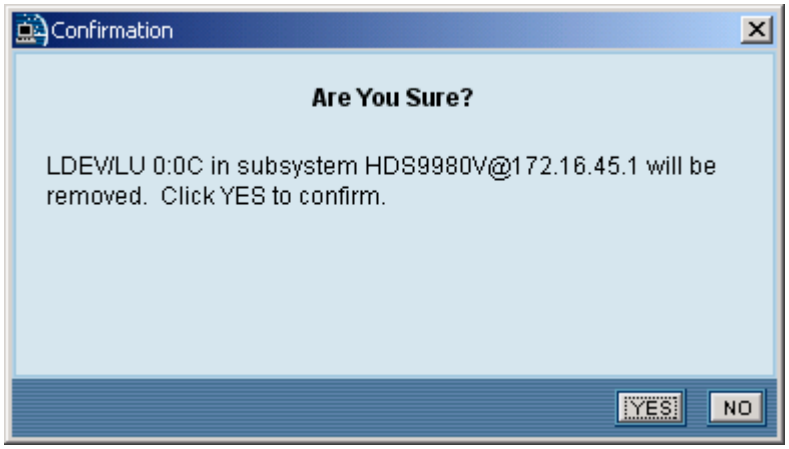


Figure 11.51 Delete LDEV – Confirmation

11.3.3.4 Allocating Storage (Adding Volume Paths)

Users with the Modify permission who are assigned to the All Resources resource group can allocate storage.

When you allocate storage, you assign one or more access paths (port/LUN) to LDEV(s), and you can optionally secure the new LUN(s) to host WWN(s). You can allocate LDEVs that are unallocated or already allocated.

You cannot assign paths to LDEVs in the following cases:

- For Lightning 9900V and Thunder 9500V in the LUN management mode. A path is already set from the same LDEV with the same security.
- For storage subsystems other than the above. A path is already set from the desired LDEV.

Note: A path cannot be assigned to an LDEV whose volume attribute is POOL, OnDemand, or Migration-reserved.

To allocate storage:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.

   Note: You can also allocate storage by starting from the **All Storage** or **My Storage** object. Under the **All Storage** or **My Storage** object, select the desired storage subsystem, and then select the **Open-Allocated** or **Open-Unallocated** group.

2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.

3. Open the LDEV Information panel for the array group that contains the LDEV(s) that you want to allocate (see section 11.3.3.1).

4. Select the desired LDEV, and then select **ALLOCATE** to open the Add Storage wizard.

5. **Define Host/Port Connections.** The Define Host/Port Connections panel (see Figure 11.52) enables you to select the desired port(s) and (optionally) the desired host WWN(s) to secure to the LDEV. After defining the port(s) and host/port connection(s), select **NEXT** to continue.

   Notes:

   - For Lightning 9900V, the following ports are not displayed: CL1-S, CL1-T, CL1-U, CL1-V, CL1-W, CL1-X, CL1-Y, CL1-Z, CL2-S, CL2-T, CL2-U, CL2-V, CL2-W, CL2-X, CL2-Y, CL2-Z.
   - Check boxes for ports other than Fibre Channel ports become inactive and cannot be selected.

   Important: WWN groups can also be set as a security option for Lightning 9900. When a WWN group is set as a security option, all the WWNs in that WWN group are applicable.

6. **Assign Host/Port Connections.** The Assign Host/Port Connections panel (see Figure 11.53) enables you to assign the LDEV to the desired port(s) and/or host/port connection(s). After assigning the desired connection(s), select **NEXT** to continue.

7. **Assign LUNs.** The Assign LUNs panel (see Figure 11.54) enables you to assign the desired LUN to each new path. You can use the selected LUN or select the desired LUN for each path. After assigning the desired LUN(s), select **FINISH** to continue.

   For Lightning 9900, the newly assigned LUN can be registered to a LUN group just by specifying the port in step 6. Select the LUN group to which you want to register the LUN from the drop-down list displayed in the Assign LUNs window.

8. **Summary of Changes.** The Summary of Changes panel (see Figure 11.55) displays the requested allocate storage operations and asks you to confirm the requested operations. If you need to make any changes, select **BACK** to return to the previous panel(s). Select **CONFIRM** to add the specified path(s) to the LDEV, or select **CANCEL** to cancel your request to allocate storage.

   Note: For Thunder 9500V and Thunder 9200, Storage Navigator Modular or DAMP can be used to set (reserve) LUN security for LUNs that do not actually exist. When a LUN that has this function set is used for the storage adding operation of Device Manager, LUN security that the Device Manager user does not intend to set might be set for the storage subsystem. When using Device Manager, do not use this Storage Navigator Modular or DAMP function.

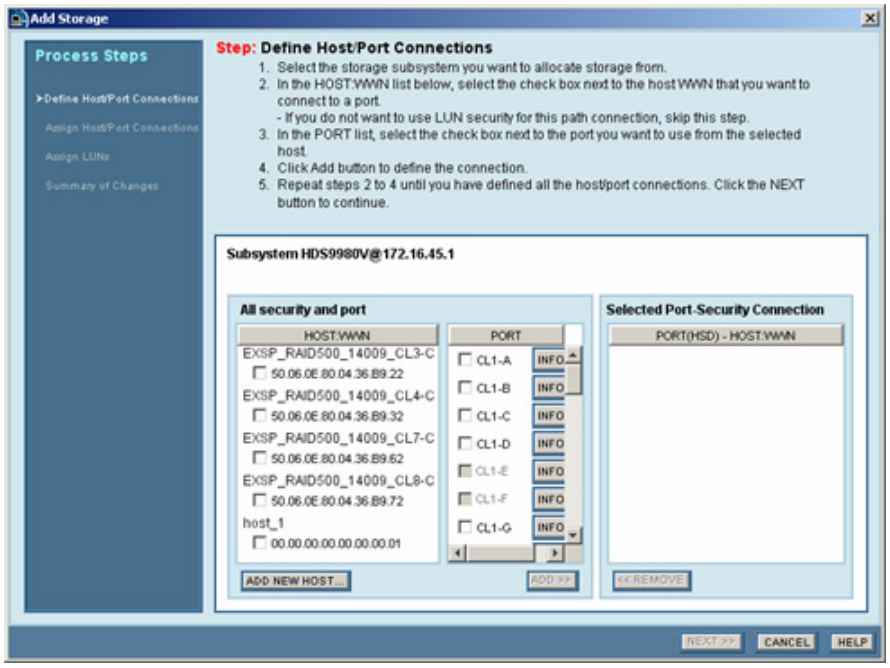


Figure 11.52 Allocating Storage – Defining Host/Port Connections

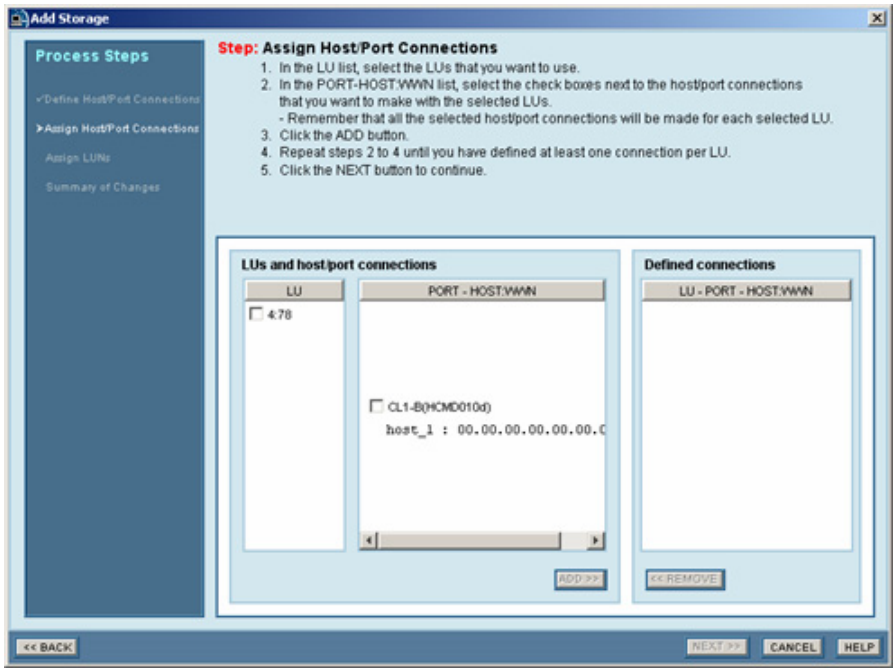


Figure 11.53 Allocating Storage – Assigning Host/Port Connections

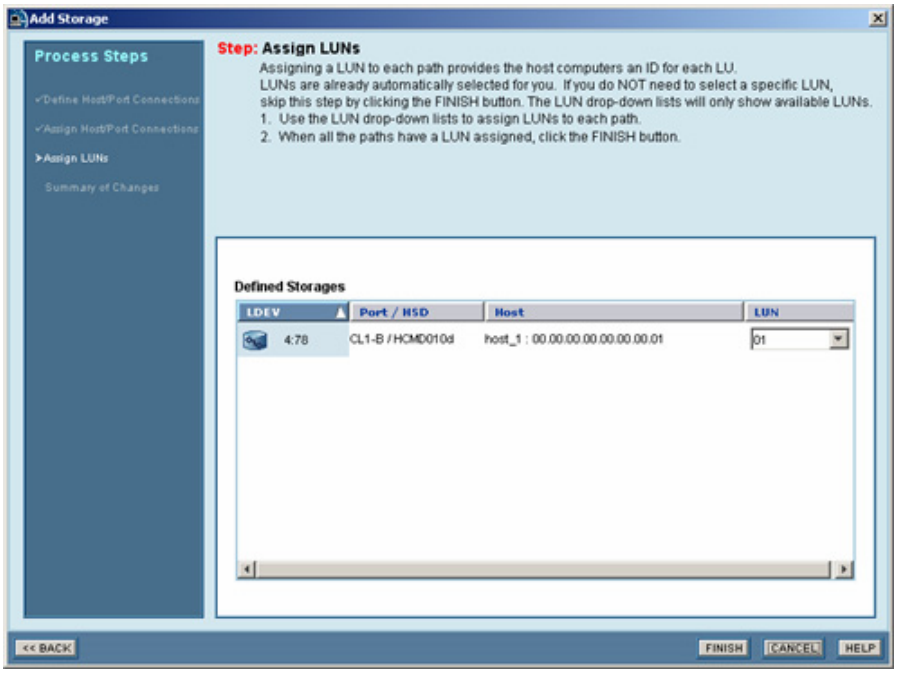


Figure 11.54 Allocating Storage – Assigning LUNs

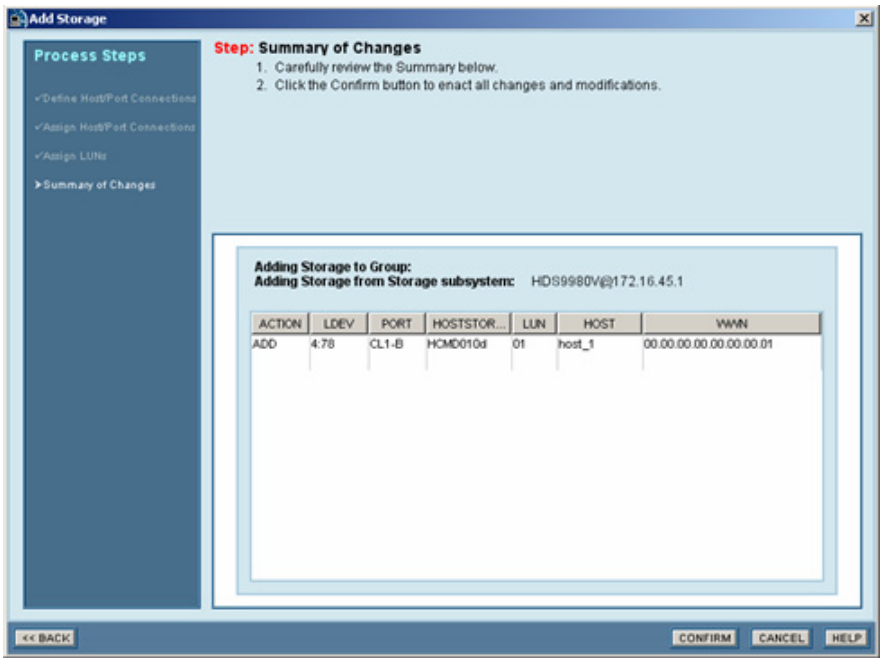


Figure 11.55 Allocating Storage Confirmation

11.3.3.5 Unallocating Storage (Removing Volume Paths)

Users with the Modify permission who are assigned to the All Resources resource group can unallocate storage. When you unallocate storage, you remove one or more access paths from an LDEV. When you unallocate a LUSE volume, you can also optionally delete the LUSE volume to make the individual LDEVs available for use.

- For the Lightning 9900 V, you cannot unallocate the last volume path from a logical device that is specified as a copy pair volume. For the Lightning 9900, you cannot unallocate the last volume path from a logical device that is specified as a command device or as a copy pair volume.
- For the Thunder 9500 V (microcode before 0655) and Thunder 9200, you cannot unallocate any volume paths from a logical device that is specified as a command device or as a copy pair volume.

Note: If you want to unallocate LUNs for more than one LDEV/LU, use the **Open-Allocated** group for the storage subsystem (see section 8.5). If you use Physical View, you can unallocate LUNs only one LDEV at a time.

To unallocate storage:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.

   Note: You can also unallocate storage by starting from the **All Storage** or **My Storage** object. Under the **All Storage** or **My Storage** object, select the desired storage subsystem, and then select the **Open-Allocated** group.

2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. Open the LDEV Information panel for the array group that contains the LDEV(s) that you want to unallocate (see section 11.3.3.1).
4. Select the **Path Info** tab. Select the desired LDEV, and then select **UNALLOCATE**. If you started from **All Storage**/**My Storage**, you can select multiple LDEVs to unallocate (see section 8.5).
5. When the confirmation panel displays (see Figure 11.56), select **YES** to delete the specified path(s), or select **NO** to cancel your request to unallocate storage.
6. If you selected LUSE volume(s), Device Manager enables you to keep or delete the LUSE volume(s) (see Figure 11.57). Select **Delete LUSE** to delete the LUSE volume(s) and the path(s), or select **Keep LUSE** to keep the LUSE volume(s) and delete only the path(s).

   You are notified when the unallocate storage operation is complete.

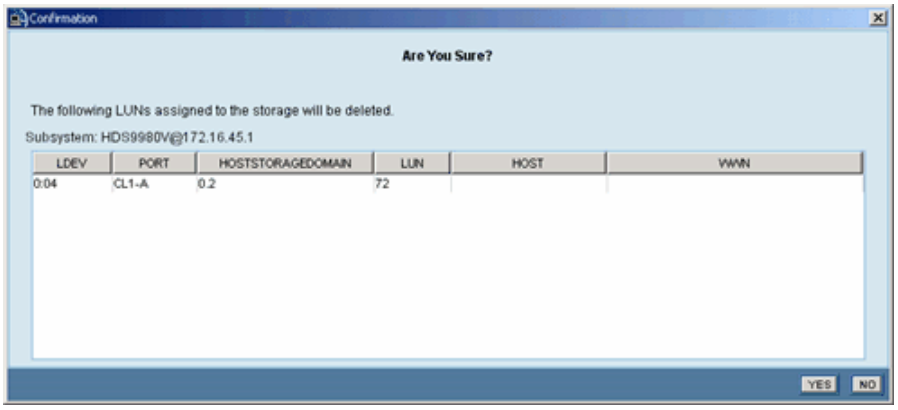


Figure 11.56 Unallocate Storage Confirmation

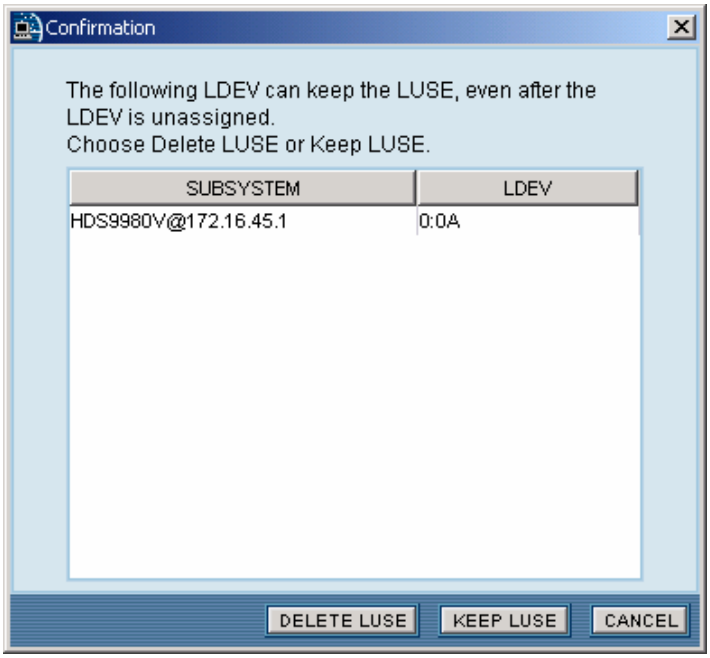


Figure 11.57 Unallocating Storage – Delete LUSE or Keep LUSE

11.3.3.6 Setting a Command Device (9900V, 9900, 9500V, and 9200)

Users with the Modify permission who are assigned to the All Resources resource group can set and cancel a command device on a Hitachi storage subsystem.

A command device is an LU dedicated to communication between the Command Control Interface (CCI) software installed on the host and the Hitachi storage subsystem. CCI enables you to issue ShadowImage, TrueCopy, Data Retention, and Open LDEV Guard commands from the host to the storage subsystem through the command device.

If you are setting a command device on the Lightning 9900V, Lightning 9900, or Thunder 9500V, you can also set security for the command device. This LUN security setting allows you to limit the logical devices that can be used as a command device to ones that are identified by the host and to prevent unwanted access from the server host(s) using the device.

To specify a logical device as a command device, the logical device must satisfy the following conditions:

- For the Lightning 9900V and Lightning 9900:
  - A volume path must be assigned to the logical device (Lightning 9900 only).
  - The logical device must not be reserved for CruiseControl (Lightning 9900V or Lightning 9900).
  - The emulation type must be an OPEN-*x* type, such as OPEN-3 (not 3390-3C.
  - There is no limitation on the number of command devices per storage subsystem.
- For the Thunder 9500V and Thunder 9200:
  - The minimum capacity for the logical device is 33 MB.
  - The logical device must not be a LUSE volume or within a LUSE volume.
  - The maximum number of command devices is two per storage subsystem.
  - A volume path for a command device cannot be deleted. However, when you use the Thunder 9500V (microcode X655 or later), a volume path for a command device can be deleted.
  - When you use Thunder 9500V (microcode X657/A or later), you can set command device security. When you use Thunder 9200, or versions of Thunder 9500V with microcodes earlier than X657/A, you cannot set command device security.

To set or cancel a command device:

1. In the **Explorer** menu, choose **Resources** and then **Subsystems**, and then select the desired storage subsystem in the navigation area.
2. In the Show Properties - *subsystem-name* subwindow, click the **Physical View** button to display Physical View for the storage subsystem.
3. From the Physical View, open the LDEV Information panel for the array group containing the LDEV that want to set or cancel as a command device (see section 11.3.3.1).
4. On the LDEV Information panel, select the logical device that you want to set or cancel as a command device, then select the **LDEV CONFIG** button to open the LDEV Configuration panel (see Figure 11.58 and Figure 11.59).
5. To set the device as a command device, select the **Use this LDEV as a command device** check box. To cancel a command device, clear the **Use this LDEV as a command device** check box.
6. Lightning 9900V, Thunder 9500V, and Lightning 9900 only: To set security for the command device, select **Assign Command Device Security** check box. To cancel the security setting, clear the **Assign Command Device Security** check box.

   Note: For the Lightning 9900, you can specify command device security only while you are setting a command device You cannot modify the command device security separately from a command device. To modify security for a device that has already been defined as a command device, you must first cancel its setup as a command device, and then modify the security when you reset the command device.
7. Select **OK** to save your changes and close the LDEV Configuration panel, or select **CANCEL** to close the LDEV Configuration panel without saving any changes. When the command device operation completes, Device Manager displays a confirmation panel.



Figure 11.58 LDEV Configuration – Set Command Device (Lightning 9900V, Lightning 9900, or Thunder 9500V)

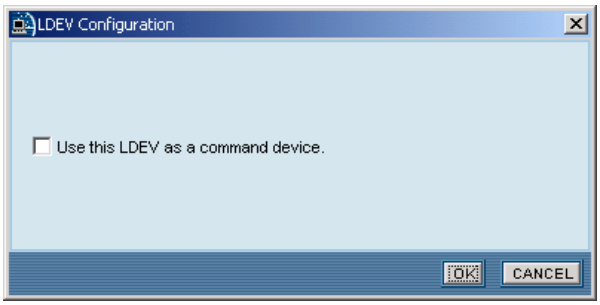


Figure 11.59 LDEV Configuration – Set Command Device (Thunder 9200)

Chapter 12 Performing Report Operations

This chapter describes the different types of HiCommand Device Manager reports that you can output:

- Overview (see section 12.1)
- Reporting on the Physical Configuration of Storage Subsystems (see section 12.2)
- Reporting on the Storage Utilization by Host (see section 12.3)
- Reporting on the Storage Utilization by Logical Group (see section 12.4)
- Reporting on the Users and Resource Groups (see section 12.5)
- Reporting on the LDEV Details (see section 12.6)

12.1 Overview

If you are assigned to the All Resources resource group, then you can generate different types of reports. Otherwise, if you are assigned to a user-defined resource group, Reports are not available to you.

To access the reports, select the **Reports** in the **Explorer** menu (see Figure 12.1).

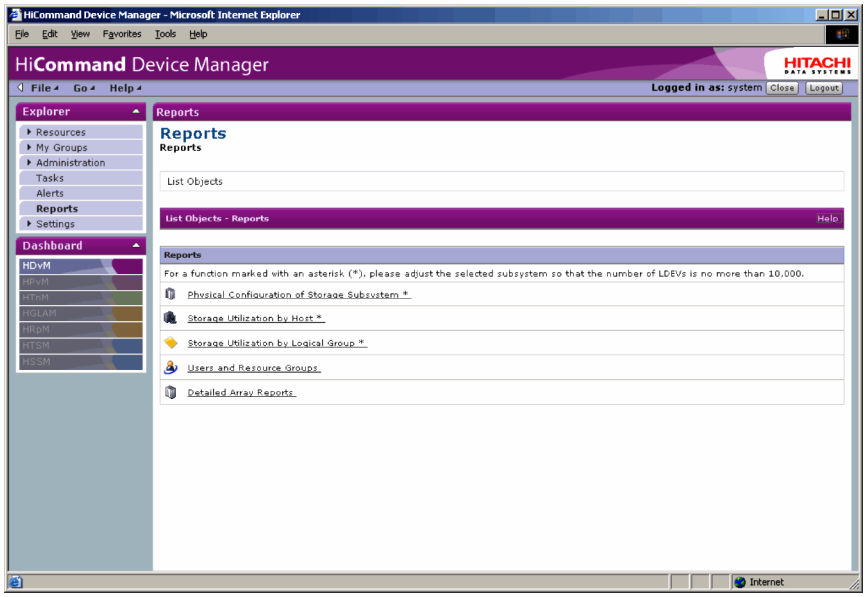


Figure 12.1 Reports

The List Objects -Reports subwindow in the information frame lists and provides access to the HiCommand Device Manager reports, where you can select the type of the report to be output. HiCommand Device Manager provides the following reports:

- Physical Configuration of Storage Subsystem
- Storage Utilization by Host
- Storage Utilization by Logical Group
- Users and Resource Groups
- Detailed Array Reports

Reports other than Detailed Array Reports are available as an HTML or CSV file.

You can choose either of the following formats for CSV reports:

- A format that uses double quotation marks to enclose each value

  This format is supported in Device Manager version 5.6 and later.

- A format that does not use double quotation marks to enclose each value

  This format is compatible with Device Manager versions earlier than 5.6.

To change the format, you must set the properties file related to the Web client. For details about how to set the properties file, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

Detailed Array Reports are available only as a CSV file in which each value is enclosed in double quotation marks (").

Notes:

- To use the Physical Configuration of Storage Subsystem report, Storage Utilization by Host report, or Storage Utilization by Logical Group report, select storage subsystems so that the number of LDEVs does not exceed 10,000. If the number of LDEVs exceeds 10,000, you might not be able to display the report.
- Regarding Unicode (UTF-8) for CSV reports: Device Manager uses the Unicode (UTF-8) code system to output reports in CSV format. If the output CSV file contains Japanese characters and is imported to a spreadsheet program that does not support Unicode (UTF-8), the displayed information may contain code system errors. In such a case, open the file with a program that supports Unicode (UTF-8), such as Windows Notepad, and then convert it to the appropriate character code system.
- If you repeat CSV output for the report facility, the font size on the Web browser may change. This has no adverse effect on the program, and you can continue operations.
- When you click the **HTML** button in the subwindow that outputs the Storage Utilization by Host report or Storage Utilization by Logical Group report, the page might not be found. In such a case, reduce the number of the selected storage subsystems, and then output the report. You can output a report by increasing the maximum value of the memory heap size. The following describes how to change the memory heap size used by HiCommand Device Manager Server. For details about how to change the heap size for memory used by the Device Manager server, see the *HiCommand Device Manager Server Installation and Configuration Guide*.

12.2 Reporting on the Physical Configuration of the Storage Subsystem

The Physical Configuration of Storage Subsystem report displays and provides detailed information on the physical configuration of each storage subsystem added to the Device Manager server. The HTML report (see Figure 12.2) shows a graphic representation of the storage subsystem's configuration and components. The CSV report provides the detailed storage subsystem information as comma-separated values.

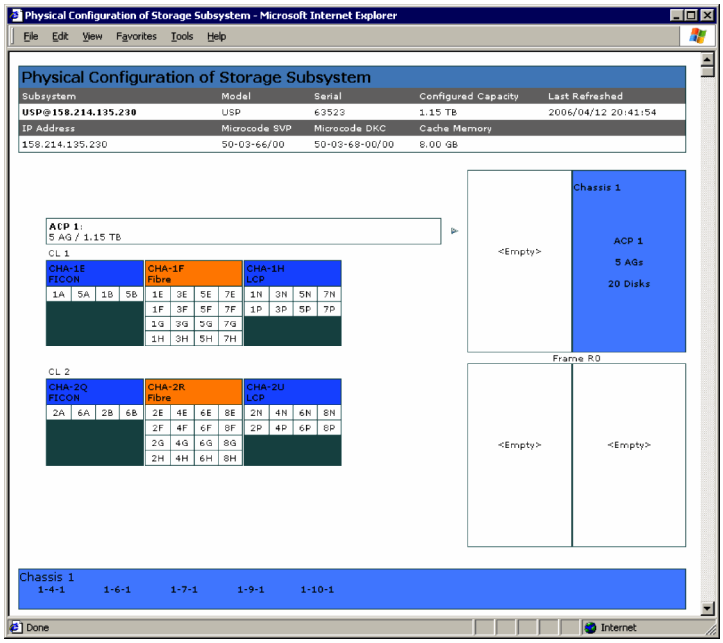


Figure 12.2 Physical Configuration of Storage Subsystem Report (HTML)

12.3 Reporting on the Storage Utilization by Host

The Storage Utilization by Host report displays storage utilization statistics and detailed storage information for each host added to the Device Manager server (see Figure 12.3). The storage utilization statistics for each host include capacity (GB) currently in use by host operating system(s) and percentage of capacity in use by host(s). The storage information for each host includes allocated storage displayed by storage group and LUN.

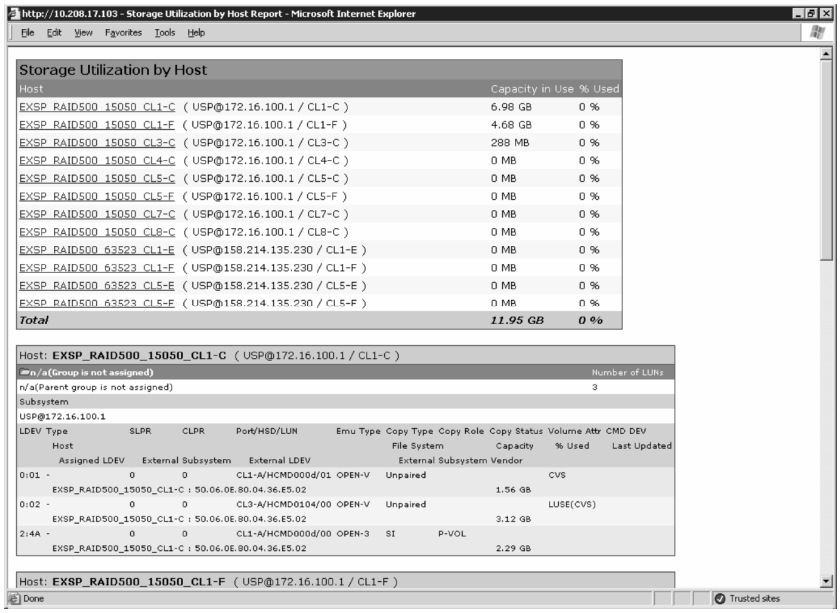


Figure 12.3 Storage Utilization by Host Report (HTML)

Note: The host Agent provides the storage utilization statistics. If the Agent is not installed on a host, Device Manager will not receive storage utilization statistics for that host.

12.4 Reporting on the Storage Utilization by Logical Group

The Storage Utilization by Logical Group report (see Figure 12.4) displays the following information:

- For each storage subsystem added to the Device Manager server: storage subsystem name, model, serial number, IP address, configured capacity, allocated capacity, and percentage of allocated capacity in use by the host operating system(s).
- For each logical group created to the Device Manager server: group name and level, capacity, and percentage of capacity in use by the host operating system(s).

Note: The host Agent provides the storage utilization statistics. If the Agent is not installed on a host, Device Manager will not receive utilization data for the storage accessed by that host.

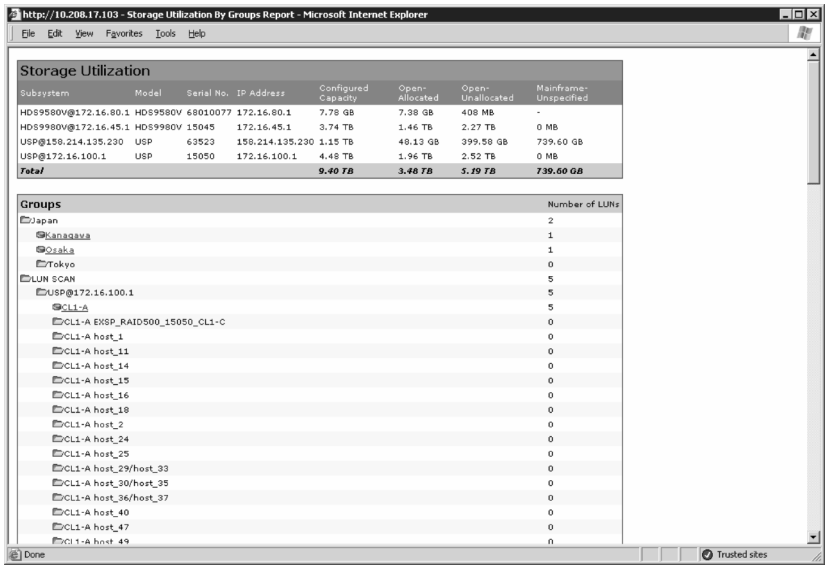


Figure 12.4 Storage Utilization by Logical Group Report (HTML)

12.5 Reporting on the Users and Resource Groups

The Users and Resource Groups report (see Figure 12.5) displays the following information for Device Manager users:

- Resource groups managed by the Device Manager server. (The **Peer** group is reserved for use by the Device Manager Agent only.)
- Number of users assigned individual resource groups
- Properties of each user (user ID, full name, and description)

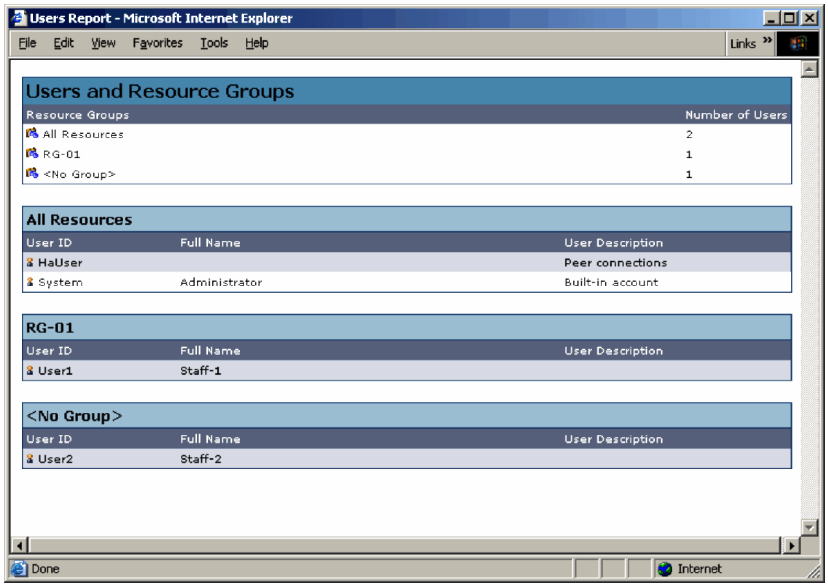


Figure 12.5 Users and Resource Groups Report (HTML)

12.6 Reporting on the LDEV Details

You can create, download, and view a detailed report on the LDEVs in each storage subsystem that has been added to the Device Manager server.

To create and download an LDEV details report:

1. In the **Explorer** menu, select **Reports**.

   The List Objects - Reports subwindow appears in the information area.

2. In the List Objects - Reports subwindow, select **Detailed Array Reports**.

   The Detailed Array Reports - Reports subwindow appears in the information area (see Figure 12.6). The subwindow displays only the reports that the logged-in user has created.

3. Click the **Create Report** button.

   The Create Detailed Array Report - Report dialog box appears (see Figure 12.7).

4. In the Create Detailed Array Report - Report dialog box, select a storage subsystem for which you want to create a report.

5. In the **Detailed Array Report name** text box, enter a name for the report you are creating.

   The name cannot exceed 32 bytes. You can use the following characters in the name:

   `A` to `Z`, `a` to `z`, `0` to `9`, hyphen (-), underscore (_)

   If you do not specify a name, the report will automatically be assigned a name in the following format: `DetailedArrayReport-`*YYYYMMDDhhmmss-nn*

   The *YYYYMMDDhhmmss* part is replaced with the report creation date and time in the local time of the server. The *nn* part is replaced with a sequence number starting at 00 to distinguish multiple reports created within one second.

6. Click the **OK** button. If you want to cancel creation of the report, click the **Cancel** button.

   When you click the **OK** button, creation of the report starts. If a report with the name you entered already exists, a dialog box asking whether you want to overwrite the existing report appears.

   Note: You cannot create a new report when there is a report in the `Processing` status. If you click the **OK** button in the Create Detailed Array Report - Report dialog box when there is a report in the `Processing` status, a warning message appears under **Subsystem List** in the dialog box.

7. In the Detailed Array Reports - Reports subwindow, check the report status.

   One of the following statuses is displayed for each report:

   `Processing`

   Indicates that the report is being created. When a report is in this status, the icon for canceling creation of the report is displayed on the left of the report name. If you click the icon, a dialog box asking you to confirm the cancellation appears.

   `Completed`

   Indicates that the report has been created successfully. When a report is in this status, the icon for downloading the report is displayed on the left of the report name. You can click this icon to download the report.

   `Incompleted`

   Indicates that the server was forcibly terminated during creation of the report and that the report has not been completed. When a report is in this status, the icon for downloading the report is displayed on the left of the report name. If you click the icon, you can download the report up to the point when the creation was canceled.

   `Error`

   Indicates that an error occurred during creation of the report and that the report has not been completed. When a report is in this status, the icon for downloading the report is displayed on the left of the report name. If you click the icon, you can download the incomplete report. If you click the icon, you can download the report up to the point when the creation was canceled. To view detailed information about the error, click the link.

`Canceled`

Indicates that the user canceled creation of the report. When a report is in this status, the icon for downloading the report is displayed on the left of the report name. If you click the icon, you can download the report up to the point when the creation was canceled.

Note: The contents of the Detailed Array Reports - Reports subwindow are automatically refreshed every 15 seconds. You can refresh the contents manually by clicking the **Update Status** button.

8. In the Detailed Array Reports - Report subwindow, click the icon for the report you want to download.

   A dialog box for downloading the report appears.

9. Read the message displayed in the dialog box, and click the **Save** button.

   The Save As dialog box appears.

10. In the Save As dialog box, specify the folder in which you want to save the report, and then save the report.

11. In the Detailed Array Reports - Report subwindow, delete unnecessary reports. To do this, select the check boxes for the reports that you want to delete, and then click the **Delete Report** button.

    A dialog box asking you to confirm the deletion appears.

    When you click the **OK** button, the selected reports are deleted.

    If you want to cancel the deletion, click the **Cancel** button.

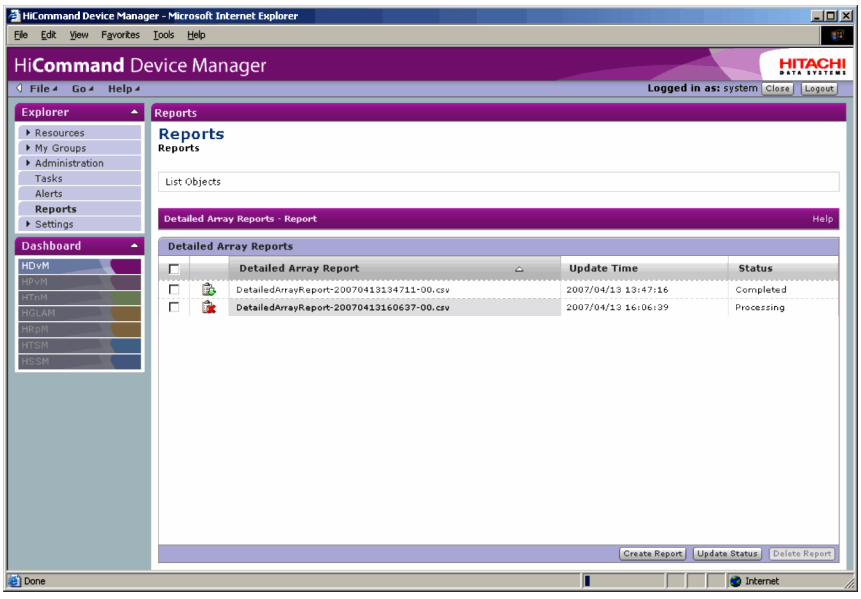


Figure 12.6 Detailed Array Reports - Reports subwindow

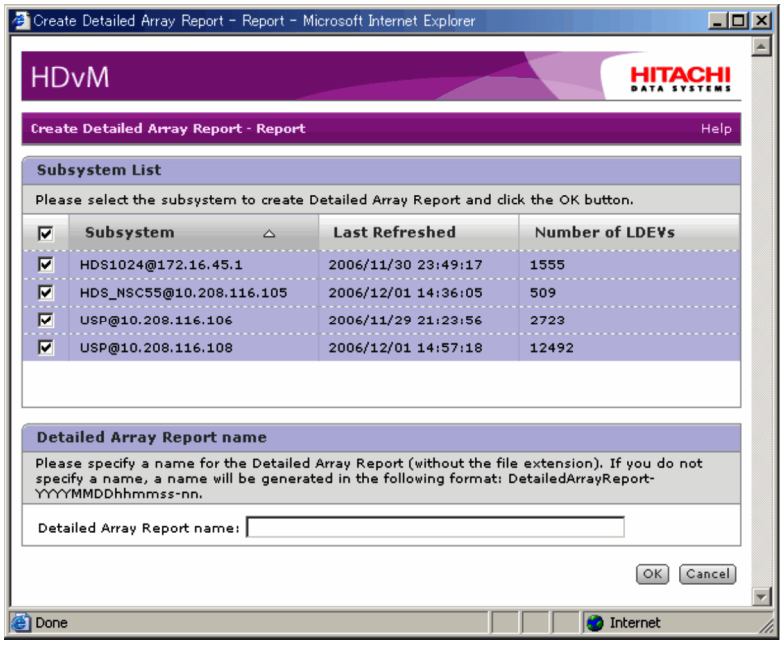


Figure 12.7 Create Detailed Array Report - Report dialog box

Chapter 13 Troubleshooting

This chapter describes Device Manager Web client troubleshooting.

- Troubleshooting Recommendations (see section 13.1)
- Responding to Warning Messages (see section 13.2)
- Responding to Error Messages (see section 13.3)
- Calling the Support Center (see section 13.4)

13.1 Troubleshooting Recommendations

If there is a problem with the Device Manager Web client interface, first make sure that the problem is not being caused by the PC or LAN hardware or software, and then restart the PC.

If you are having trouble with the Device Manager Web client, first make sure the problem is not occurring at the Device Manager server. For more information on server problems, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*.

Important: Please read the Device Manager Release Notes file. Make sure that only one Device Manager server is actively managing a single storage subsystem. If you use the storage logical partition function, one Device Manager manages one SLPR. For details about the storage logical partition function, see section 4.6.2.

Table 13.1 provides general troubleshooting information for the Device Manager Web client. Generally, difficulties installing and running the Web client are attributed to problems with the Java Web Start software and/or with proxies on the local network.

Table 13.1 General Troubleshooting Information

Problem	Description
Cannot find the Device Manager server login window.	Make sure that the Device Manager server system and software are up and running. When running the Web client on the same system as the server, a potential hazard is the resolution of the host "localhost". Generally "localhost" resolves to the loopback address (127.0.0.1), which can cause problems for the Java Web Start software. Use the primary local IP address instead.
Cannot load the Device Manager server home page. Error message: "The requested item could not be loaded by the proxy. Proxy server's network connection was refused by the server: <IP-address>:<port-number>. The server may not be accepting connections or may be busy. Try connecting again later."	The browser may have a proxy in place that is not allowing the traffic to go through. For Internet Explorer: go to **Tools**, **Internet Options**, select **Connections**, select **LAN Settings** button, then click the **Advanced** button on Local Area Network (LAN) Settings. In the **Exceptions** section, enter the IP address of the Device Manager server (123.456.78.9). Entries must be separated by semicolons. Click **OK** all the way out, and restart the browser. For the Mozilla browser: select **Edit**, **Preferences**, and then the **Advanced** category. Click on ⊕ to expand. Select **Proxies**, **Manual Proxy Configuration**, and then **View**. Enter the IP address in the box under **Exceptions**. ***Note:*** If the browser is not set to use a proxy server, this is not the source of the problem. Look for other network connectivity issues such as firewalls and routers.

Problem	Description
The Java Web Start software is unable to launch the Java GUI. Error message: "Unable to launch HiCommand Web Client."	Might be caused by old or partial installation of the Java Web Start software. Reinstall the JWS software as described in Chapter 3 Also make sure the proxies in Java Web Start are configured properly: 1. Start the Java Web Start application manager (select the JWS icon on desktop or in Start menu, for Solaris go to the Java Web Start installation directory and enter the **javaws** command). 2. From the **File** menu, choose **Preferences**, select the **General** tab, and configure the proxies so Java Web Start can find the HiCommand Device Manager server according to the URL used in your browser. Select **Manual**, and add the exact URL to the **No Proxy Hosts** box. For example, if the URL is ://localhost:<port-number>, then the name in the **No Proxy Hosts** box must be **localhost**.
When Mozilla is used as a Web browser and is started from the Java GUI, a blank window appears along with the window you opened.	The Mozilla specifications specify that a blank window that opens when the Web browser is started from the Java GUI cannot be closed automatically. If a blank window is displayed, close it manually.
The File Download panel appears when you invoke the Java GUI.	The Java Web Start software may have been previously installed and removed. When JWS was removed, the association between the file extension `.JNLP` and the JWS application may not have been removed. When the link to the .JNLP file is selected, the operating system tries to run but does not find JWS. To resolve this situation, run the installer for JWS again (the `full Java Web Start Installer`).
Cannot add the storage subsystem. Failed during initialization (was unable to find the device). Description: Attempt to add the storage subsystem fails and this error message displays: "Initialization of the SNMP connection at IP-address *IP-address* has failed."	On the machine on which the Device Manager server is running, send a ping command to the IP address of the storage subsystem to make sure that the storage subsystem is running. Verify the SNMP configuration on the SVP, and make sure that the correct community name is specified in Device Manager (this should match the community name entered when configuring the SNMP agent). A common community name is public (Device Manager default). Make sure that access to the Device Manager server IP address is not limited on the storage subsystem. For further information on SNMP troubleshooting for Device Manager, refer to the *HiCommand Device Manager Server Installation and Configuration*. For further information on the SNMP configuration for each storage subsystem, refer to the following manuals: ▪ For Universal Storage Platform V: *Hitachi SNMP Agent User and Reference Guide* ▪ For USP: *SNMP User's Guide* ▪ For Lightning 9900V: *Remote Console - Storage Navigator User's Guide* ▪ For Lightning 9900: *Remote Console User's Guide.*
Device Manager could not find (using the discovery operation) the storage subsystem.	For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and Lightning 9900, make sure that no other management tools (for example, Storage Navigator or Remote Console) are connected to the storage subsystem. HiCommand Device Manager and other management tools cannot access the same storage subsystem at the same time.
Cannot connect to the storage subsystem.	Check for LAN problems and/or SNMP problems on the HiCommand Device Manager server. Refer to the *HiCommand Device Manager Server Installation and Configuration Guide* for further information on SNMP troubleshooting. Make sure that the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, or Lightning 9900 SVP is in View mode.

Problem	Description
The storage subsystem discovery processing is very slow.	The microcode level on the Lightning 9900 does not support the FTP transfer mechanism. The FTP port must be enabled for Lightning 9900. To start up the FTP daemon, left click on **ftp daemon** icon in task bar. ***Note:*** The FTP daemon is not usually running on the SVP.
Lightning 9900 subsystem discovery does not finish.	Device Manager server may not be able to connect to the Lightning 9900 subsystem by SNMP. Contact your network administrator.
Slow SNMP response.	The storage subsystem microcode level does not support command complete.
Cannot add/delete volume paths. Cannot convert unallocated LUs.	For Universal Storage Platform V, TagmaStore USP and Lightning 9900, make sure that the LUN Manager feature is enabled. For Lightning 9900V, make sure that the LUN Management feature is enabled. For the AMS/WMS series, make sure that the LUN Manager feature is enabled. For Thunder 9500V, make sure that the LUN Security or LUN Management feature is enabled. For Thunder 9500V and Thunder 9200 make sure that the Resource Manager feature is enabled and that the microcode level is correct.
Cannot secure/unsecure LUs.	Make sure that the LUN security feature is enabled: For Universal Storage Platform V LUN Manager For TagmaStore USP LUN Manager For Lightning 9900V LUN Management For Lightning 9900 LUN Security (Hitachi SANtinel) For the TagmaStore AMS/WMS series LUN Manager For Thunder 9500V LUN Security or LUN Management For Thunder 9200LUN Security
Host storage domain information remains for a port to which a LUN has not been assigned.	For Universal Storage Platform V, TagmaStore USP, Lightning 9900V, the TagmaStore AMS/WMS series, and Thunder 9500V, even when an attempt to add or remove storage fails, host storage domain information might remain for a port to which a LUN has not been assigned.To prevent host storage domain information from remaining for a port, delete the host storage domain information, and then refresh the storage subsystem.Before deleting the host storage domain information, make sure that paths that belong to the target host storage domain are not being used. To delete host storage domain information, perform one of the following: ▪ In Storage Navigator, use LUN Manager to delete the target host storage domain. ▪ Use the CLI to delete the target host storage domain. ▪ Use the Web client to delete all the paths to which the target storage domain has been set. After deleting the host storage domain information, reassign the necessary paths.
The Java GUI does not receive alert messages from Device Manager server.	Make sure that the Java Web Start software has been configured for client/server operations (do not use proxy) as described in section 3.4.
You entered the correct password, but Device Manager tells you that the password you entered was not correct.	Log off and then log back on to Device Manager, making sure to enter the correct password in the Login panel. Always log on from this panel. Do not use the Java Web Start User Authentication panel.
After changes are made in a host configuration, the information is not applied to the window that displays the host properties.	It might take some time for the Device Manager server to recognize the changes in the host configuration. Wait a while, and then refresh the information in the Show Properties - *host-name* subwindow.

Problem	Description
The **Dynamic Link Manager** button is not displayed in the Host view.	When HDLM is installed on the host, the Device Manager server receives notification from a Device Manager agent and recognizes that HDLM is installed in that host. If the Device Manager server is not running when a Device Manager agent starts, the **Dynamic Link Manager** button is not displayed on the Show Properties - *host-name* subwindow for the host. In this case, make sure that the Device Manager server is running, and restart the Device Manager agent. It takes a few minutes for the Device Manager server to recognize HDLM after the agent starts. Wait for a while, and refresh the Show Properties - *host-name* subwindow.
The **Protection Manager** button is not displayed in the Host view.	When the Protection Manager is installed on the host, the Device Manager server receives notification from a Device Manager agent and recognizes that the Protection Manager is installed in that host. Therefore, if the Device Manager server is not running when a Device Manager agent starts, the **Protection Manager** button is not displayed on the Show Properties - *host-name* subwindow. In such a case, make sure that the Device Manager server is running, and restart the Device Manager agent. It takes a few minutes for the Device Manager server to recognize the Protection Manager after the agent starts. Wait for a while, and refresh the Show Properties - *host-name* subwindow.
The window display for the Web client fails.	If there is too much data for an operation, the window display in the Web client might fail because the HTML information cannot be received . In this case, reduce the data for operation, and then perform the operation again.
A gray window with no text or buttons is displayed.	When a Web client machine uses the NVIDIA GeForce2 GTS video card, this problem can occur due to a problem in the video driver. If this problem occurs, move the window so that the window text is off the screen, and then pull it back to the center of the screen to display it again.
When a Device Manager server is running in a cluster environment, a Web client operation error occurred abruptly or the operation being executed resulted in an error.	If failover occurs when a Device Manager server is running in a cluster environment, a Web client operation error occurs. In this case, log into the Web client again. The operation being executed also results in an error. If that operation relates to the configuration modification for the storage subsystem, refresh the storage subsystem after logging into the Web client again, and then check the operation result.
On the host in a cluster environment, the information about the file system displayed in the Web client becomes incorrect.	In a cluster environment, when an error occurs in the active host and the standby host inherits the operation being executed, the file system information might remain in the window that displays the properties on the active host. Alternatively, in a cluster environment using Microsoft Cluster Server, when a storage subsystem is moved between the management-target hosts, the file system information might not be reflected promptly in the window that displays the host properties. If these problems occur, refresh the target hosts.
Physical View does not display.	Verify the Java software environment (see section 3.3). If necessary, remove the Java software, reboot, and reinstall the Java software.
The Web client becomes disabled after pressing the Escape [Esc] key.	Do not use the [Esc] key while using the Web client. If you accidentally use the [Esc] key, click **Refresh** or press F5. If a dialog box is open, close and then re-open it.
An LDEV in Thunder 9500V managed by Device Manager is not displayed.	For Thunder 9500V, disabled LDEVs are excluded from the management of Device Manager, and are not displayed. If you use DAMP or Storage Navigator Modular to disable an LDEV in Thunder 9500V managed by Device Manager, and refresh the subsystem using Device Manager, the disabled LDEV is no longer displayed.

Problem	Description

When operations are performed on Thunder 9500V, or when Device Manager periodically monitors Thunder 9500V, the following problems occur frequently:
▪ When operations are performed on Thunder 9500V from Device Manager, a KAIC06299-E or KAIC06300-E error occurs.
▪ Either of the following alerts occur frequently during monitoring for Thunder 9500V alerts:
`Description: Service error reported for Controller #0.`
or
`Description: Controller #0 status is back to normal.`
▪ When operations are performed on Thunder 9500V from DAMP, errors occur frequently.
	The following measures prevent these problems:
	▪ Do not operate a storage subsystem concurrently in Device Manager and in Storage Navigator Modular (for Web) or DAMP (for Web) activated from the Physical View of Device Manager.
	▪ When you use Device Manager in conjunction with Storage Navigator Modular or DAMP, do not operate a storage subsystem concurrently in Device Manager and in Storage Navigator Modular or DAMP.
	▪ When you use Device Manager in conjunction with Tuning Manager - Agent for RAID, you can reduce the error frequency.
	To reduce the error frequency:
	(1) Increase the interval at which Device Manager monitors for alerts. Alternatively, specify the `server.dispatcher.daemon.pollingPeriod` property to disable alert monitoring. For details about this property, see the *HiCommand Device Manager Server Installation and Configuration Guide*.
	(2) Increase the interval at which performance data for Tuning Manager - Agent for RAID is collected.
	If errors are still frequent after you perform the above steps, stop Tuning Manager - Agent for RAID when you use Device Manager. For details on operation of HiCommand Tuning Manager, see the documentation for HiCommand Tuning Manager.
	You can solve these problems by upgrading the Thunder 9500V microcode to x65A/P or later.

`Busy` continues to be displayed on the Web client for Java applications.	When the Web client for Java applications performs communication via a proxy server and the Device Manager server is stopped during creation or deletion of an LDEV, `Busy` continues to be displayed on the client despite the interruption of processing. In this case, terminate the Web client, then restart it.
When you attempt to display information about an internal volume to which an external volume is mapped, the external subsystem name is not displayed.	Make sure that the external subsystem is being managed by Device Manager. Also check the microcode level of the storage subsystem that uses Universal Volume Manager because, if it is not supported in the connection-destination external subsystem, that external subsystem name is not displayed.
The information about an internal LU to which an external LU is mapped is not displayed in the LDEV list.	When Hi-Copy is used for Lightning 9900V, the information about internal LUs mapped to external LUs is not displayed in the list of LDEVs.
The total of the LDEV sizes displayed in the LDEV list does not match the displayed total size.	When Hi-Copy is used in Lightning 9900V, the displayed information differs because the size of the allocated volume includes the internal LUs mapped to the external LUs.
The format status of LDEVs cannot be distinguished (between formatted or unformatted).	In Device Manager, the LDEVs for the TagmaStore AMS/WMS series, Thunder 9500V, or Thunder 9200 are displayed without the format status being distinguished (between formatted or unformatted). If you want to check the format status of the LDEVs, use Storage Navigator Modular or DAMP. Although LUNs can be assigned to unformatted LDEVs, the host cannot use these LUNs. To use the LUNs, use Storage Navigator Modular or DAMP to format the LDEVs.
The value of **Split time** indicated in pair information for Universal Storage Platform V or TagmaStore USP differs in the Web client and in Storage Navigator activated from Physical View.	The display differs when the SVP time zone has been changed to a time other than the GMT. Do not change the SVP time zone from the initial setting (GMT). To correct the time, see the time displayed in Storage Navigator.

Problem	Description
Although the connection to the Device Manager server is disconnected, the following error message is not displayed: "Lost Connection to Server."	In the following operation environment or condition, this error message might not be displayed: ▪ When using a Web client in Solaris or HP-UX. ▪ When the LAN cable at the Device Manager server is disconnected.
Operation on a logical group, host, or a storage subsystem whose name contains a right angle bracket (>) is not possible.	A logical group, host, or a storage subsystem whose name contains a right angle bracket (>) might have been created by using Device Manager CLI or version 3.0 or earlier of Web client. Use Device Manager CLI to change such a name so that it only contains valid characters.
The settings specified by using the Java GUI are not applied to the storage subsystem configuration.	If the Java GUI is closed while an operation is in progress in the Java GUI, that operation will be interrupted. In such a case, the storage subsystem might not be configured as specified because only a part of the operation was processed. If an operation is interrupted, restart the Java GUI, check the configuration of the storage subsystem, and make any necessary changes. If a LUN becomes invisible, execute LUN scan.
Although a LUN allocated to a sub-LDEV of a LUSE volume is displayed, it is not operable.	For the TagmaStore AMS/WMS series, Thunder 9500V and Thunder 9200, when a LUSE volume is created using more than one LU to which a LUN is allocated, or a LUN is allocated to a sub-LDEV after a LUSE volume is created by using Storage Navigator Modular or DAMP, Device Manager displays the LUNs allocated to the sub-LDEV. The sizes of those LUNs are not displayed, and deletion or other operations cannot be performed. Use Storage Navigator or DAMP to delete the operation-target LUN, and use Device Manager to refresh the information about the storage subsystems.
When Device Manager has not created a copy pair for an LDEV, `SI` is displayed in **Copy Type** for that LDEV.	When you are using a TagmaStore USP that has been added by a user ID that has the partitioned storage administrator permission, **SI** is displayed in **Copy Type** of an LDEV for a Cross-system Copy pair. For details on cross-system copy, refer to the *Universal Volume Manager User's Guide*.
An attempt to perform the following operations for the LDEV used as a secondary volume of a deleted TrueCopy will cause an error: ▪ Creating a copy pair ▪ Creating or deleting LUSE volumes ▪ Deleting LDEVs ▪ Setting a command device	When Device Manager deletes a TrueCopy pair, the copy status of the LDEV used as a secondary volume may remain `PAIR` in the storage subsystem even though the deletion appears to have finished normally in Device Manager. If this occurs, perform the following procedure: 1. For the LDEV to be used, execute the `pairdisplay` command for CCI to make sure that: - The volume attribute is `S-VOL`. - The copy status is `PAIR`. - The copy status of the primary volume used for creating the pair is `SMPL`. 2. For the LDEV in the above status, execute the `pairsplit -R` command for CCI. For details about the CCI commands, see the CCI documentation.
In a Solaris environment, a character string in the title bar of the Web browser is not displayed correctly.	In a Solaris environment, a character string in the title bar may not be displayed correctly when the language setting of the Web browser differs from that of X-terminal. Match the language setting of the Web browser to that of X-terminal.

Problem	Description
A warning dialog box is displayed indicating that the computer might not respond when an operation is performed for a sortable table.	A warning dialog box is displayed indicating that if too many lines are displayed in one page of the sortable table, script processing will take longer, and the computer might not respond. In this case, follow the direction on the dialog box to abort the script processing, close all the Web browser windows of the process that displayed the warning dialog box, and then log in to Device Manager again. Then, change the number of lines that the sortable table can display per page to a smaller value. For details on how to change the number of lines that can be displayed in one page of a sortable table, refer to the *HiCommand Device Manager Server Installation and Configuration Guide*. For details about the maximum number of lines that can be displayed in one page, see section 5.1.9.
The contents of a message are garbled in an English language environment.	The Japanese locale is set for the management server. Set the English locale for the management server.

13.2 Responding to Warning Messages

Warning messages display if you try to perform an operation from the Device Manager server that may affect subsequent operations, such as loss of data or input/output (I/O) from hosts.

13.2.1 User Data May Be Deleted

If you try to perform an operation on a Device Manager server that will delete data, the following warning message displays:

```
Data on the array group array-group-number, which is the target of this operation, will be
lost. Make sure that the data is not necessary.

As a result of this operation, data on these volumes will be lost. Are you sure you want to
continue?
```

Continuing this operation will delete the data on the array group or volumes. Back up the data if necessary, and then continue the operation. If you click **OK**, a second warning message displays:

```
The data in the volume specified to be the secondary volume will be lost as
a result of this operation. Please confirm.
```

If you continue the operation, data will be lost. Back up the data if necessary, and continue the operation.

13.2.2 An Error Occurs in I/O from Hosts

If try to perform an operation from Device Manager that may cause an error in I/O from hosts, the following warning message displays:

```
Confirm that no host and external port is performing I/O processing on any of the aaa. If
I/O processing is being performed, the processing might terminate abnormally. Are you sure
you want to continue?
```

Continuing this operation may affect I/O to *aaa*. Confirm that the hosts and external ports are not performing I/O operations on *aaa*, and continue the operation:

```
Make sure that I/O processing is not being performed from hosts or external ports that are
using the port targeted for this operation. Performing this operation while I/O processing
is being performed might damage the file system. Also, as a result of this operation, only
the hosts and external ports that are set in the host storage domain aaa will be able to
gain access.
```

Make sure that the hosts and external ports are not issuing I/O on any LUNs that use a port subject to this operation, and continue the operation. Executing the operation during I/O operation from a host or external ports may damage the file system. Also, as a result of this operation, only the host and external ports whose host storage domain is *aaa* become accessible to the LUNs. If you perform this operation, you may have to execute Disconnect Volume in Storage Navigator.

```
If the settings for this port are changed, the storage might become inaccessible to the
hosts and external ports that are currently accessing the storage.
```

For example, depending on hardware, the servers and HBAs may not recognize the LUNs using the subject port unless a specific host mode is selected for the port. For details on how to change the port settings, refer to the manual for the corresponding storage subsystem.

```
The mode cannot be switched if a host is currently performing I/O operation with the LUNs
of the port. To proceed, shut down the host, change the mode, and then reboot the host. Are
you sure you want to continue?
```

Confirm that the host has shut down, and continue the operation.

13.2.3 LUN Security Automatically Takes Effect

If you try to perform an operation from Device Manager that may cause an error in host I/O, the following warning message displays:

```
This operation will change the port's LUN security, which may prevent other hosts and
external ports from accessing LUNs with the following ports. Are you sure you want to
continue?
```

When LUN security takes effect, the servers and HBAs that currently recognize the LUN using the subject port may no longer be able to recognize that LUN. If so, you must set LUN security for these servers and HBAs. If you perform this operation, you may have to execute Disconnect Volume in Storage Navigator.

13.2.4 Access from Hosts is Disabled

When you restart a storage subsystem to make a setting take effect, the following warning message displays:

```
The system will now be rebooted to apply the settings. I/O requests cannot be received
during the reboot. If the system is being used as an external subsystem, make sure that you
execute the Disconnect Subsystem operation on Storage Navigator.
```

Confirm that the hosts are not issuing I/Os on any LUNs for the storage subsystem you are restarting, and continue the operation. If the subsystem is used as an external subsystem, make sure that you execute Disconnect Subsystem in Storage Navigator.

13.2.5 Incomplete Data in an S-VOL (Secondary Volume)

When you change pair status to SPLIT during an I/O operation on a P-VOL (primary volume), the following warning message displays:

```
If this operation is performed during I/O processing on the primary volume, the data of the
secondary volume may be corrupted. Make sure that no I/O processing is being performed on
the primary volume before you proceed. Are you sure you want to continue?
```

Confirm that the hosts are not issuing I/Os on any primary volume (P-VOL), and continue the operation.

13.2.6 I/Os to a Primary Volume are Affected

When you set the copy pace to a value other than a recommended one, the following warning message displays:

```
An un-recommended value is specified for the copy pace. Make sure the value is correct. Are
you sure you want to continue?
```

For the TagmaStore AMS/WMS series, Thunder 9500V or Thunder 9200, set the copy pace for ShadowImage, TrueCopy, and QuickShadow/Copy-on-Write Snapshot to 15. Because changing this value affects I/O operations on the primary volume (P-VOL), contact a system administrator.

13.2.7 Pair Setting Cannot be Performed

When a volume specified as a copy pair is deleted, you may not be able to set a pair. In such a case, the following warning message displays:

```
Deleting pair volumes or command devices may disable later modification of the pair volume
settings. Are you sure you want to continue?
```

Make sure that the following conditions for setting a pair are met:

- *For copy pair volumes*: The host recognizes the copy pair volumes, and LUN security is set for that host.
- *For command devices:* The host that recognizes a copy pair volume also recognizes the command device, and LUN security is set for that host.

13.2.8 When Only a Configuration Definition File Can Be Created and a Copy Pair Cannot Be Created

If you are trying to create a ShadowImage copy pair in a TagmaStore AMS/WMS series whose microcode version is 0750/A or later, the following warning message will be displayed if both of the following conditions exist:

- The setting for using the function for creating configuration definition files has been specified.
- A P-VOL where the copy pair status of an existing pair is neither Split nor Simplex is selected.

```
The copy pair cannot be created because the copy status of multiple pairs that use the same
P-VOL cannot be specified as "Pair" in this subsystem.
```

When this warning message is displayed and you click the **Cancel(Output HORCM)** button, only a configuration definition file will be created without creating a copy pair.

When you create a copy pair, do so without using the same P-VOL, or change the copy status of the existing pair to Split or Simplex.

13.2.9 An Internal Volume to Which an External Volume is Mapped is Invalid

An internal volume mapped with an external volume may become invalid when you delete an external volume or change a security setting. The following warning message displays:

```
An assigned volume of Universal Volume Manager may be invalid. Are you sure you want to
continue?
```

Check any changes. If you perform this operation, you may have to execute Disconnect Volume in Storage Navigator.

13.2.10 Creating LUSE Volumes from Multiple External Subsystems

When creating a LUSE volume by using internal volumes to which external volumes are mapped, the following warning message displays when you specify volumes from multiple external subsystems:

```
You are creating a LUSE with multiple external subsystems or an unknown external subsystem.
(LDEV = LDEV-number)
```

Creating a LUSE with multiple external subsystems is not recommended. Select LDEVs with the same external subsystem.

13.2.11 Associating Resources with Different SLPRs

If you specify resources with different SLPRs when creating or changing a LUSE, path, or copy pair (ShadowImage), the following warning message displays:

```
If a storage resource is associated with a different storage resource, a partition storage
administrator will not be able to manage the storage resource.
```

Check the settings carefully. Set them so that the SLPRs are the same.

13.2.12 Associating Resources with Different CLPRs

If you select volumes with different CLPRs while creating or changing a LUSE volume, the following warning message displays:

```
If volumes from different cache resources are used to create a LUSE volume, the
effectiveness of the cache partition might be reduced.
```

Check the settings carefully. Set them so that the CLPRs are the same.

If you select LUSE volumes with different CLPRs when adding storage, the following warning message displays:

```
A LUSE volume that consists of volumes in different cache resources has been selected. This
might reduce the effectiveness of the cache partition.
```

Check the settings carefully. Select LUSE volumes with the same CLPRs.

13.2.13 Displaying a Window while Updating the Storage Subsystem

If you try to perform an operation that will display an information area or a dialog box while updating the storage subsystem, a warning message displays.

```
An operation was performed while the subsystem was being updated.
The displayed information might not be the latest information.
```

The information in the window and the warning message continue to display until the updating finishes. If you try to perform an operation during updating, the operation might fail.

Wait until update processing finishes and retry the operation.

13.2.14 Running a LUN Scan

When you try to run a LUN Scan, the following message displays:

```
Confirm that all hosts have been added into the host view before running a LUN Scan. After
LUN Scan, Device Manager creates new hosts that have WWNs associated with the LUNs and have
not been added into the Host View. You will need to clean up these hosts after the
attributes of them are updated when the Device Manager Agent reports information about
them. Are you sure you want to continue.
```

Check the list of hosts to make sure that all WWNs managed by Device Manager have been registered as hosts. Continue to run a LUN Scan.

13.3 Responding to Error Messages

Device Manager displays an error message when an error condition occurs. The error message includes the error code, error level (indicates the severity of the error), and error message. The error code range indicates the type of error.

The *HiCommand Device Manager Error Codes* document manual lists and describes the Device Manager error messages and provides instructions for resolving the error conditions. If you are unable to resolve an error condition, call the Hitachi Data Systems Support Center for assistance (see section 13.4).

Note: Device Manager sends all error notifications, including server errors, to Device Manager clients such as the Web client, CLI, or a third-party application.

13.4 Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, please provide as much information about the problem as possible, such as the circumstances surrounding the error or failure.

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, please call:

United States: (800) 446-0744

Outside of the United States: (858) 547-4526

Acronyms and Abbreviations

ACP	array control processor (back-end array processor on the 9900V and 9900)
AG	array group
AL	arbitrated loop
AMS	Adaptable Module Storage
API	application program interface
BD	Basic Disk
CCI	Command Control Interface
CHA	channel adapter
CLI	command line interface
CLPR	cache logical partition
cmd dev	command device
CPU	central processing unit
CSV	comma-separated value
CU	control unit
CVS	customized volume size (another term for Virtual LUN)
DAMP	Disk Array Management Program
DHCP	dynamic host configuration protocol
DKC	disk controller (applicable to 9900V and 9900 subsystems)
DKU	disk unit
Dynamic Link Manager	This abbreviation is used when it is not necessary to distinguish between HiCommand Dynamic Link Manager and Hitachi Dynamic Link Manager
FC	fibre channel
FTP	file transfer protocol
GB	gigabyte (1024 MB)
GUI	graphical user interface
HA	high availability
HBA	host bus adapter
HDD	hard disk drive
HDLM	HiCommand Dynamic Link Manager or Hitachi Dynamic Link Manager
HDP	Hitachi Dynamic Provisioning
HDU	hard disk unit
HIHSM	Hitachi Internal Hierarchical Storage Management
HOMRCF	Hitachi Open Multiple Raid Coupling Feature
HORCM	Hitachi Open Remote Copy Manager (name of CCI executable)
HRX	Hitachi RapidXchange
HSD	host storage domain
HTML	hypertext markup language
HTTP	hypertext transfer protocol
INH	inhibit
IP	internet protocol
IPF	itanium processor family

JNLP	Java Network Launching Protocol
JRE	Java Runtime Environment
JWS	Java Web Start software
KB	kilobyte (1024 bytes)
LAN	local area network
LDEV	logical device
Linux	This abbreviation is used when it is not necessary to distinguish the following products: Red Hat Enterprise Linux AS 2.1, Red Hat Enterprise Linux AS 3.0, Red Hat Enterprise Linux ES 3.0, Red Hat Enterprise Linux AS 4.0, Red Hat Enterprise Linux ES 4.0, and SUSE LINUX Enterprise Server 9.
LU	logical unit
LUN	logical unit number, logical unit
LUSE	LUN Expansion, LU Size Expansion
MB	megabyte (1024 KB)
MCU	main control unit (for TrueCopy)
MRCF	Multiple RAID Coupling Feature (another term for ShadowImage)
NAS	network attached storage
NAS Manager	This abbreviation is used when it is not necessary to distinguish NAS Blade Manager and NAS/Management
OS	operating system
PA	port address
PC	personal computer
PCB	printed circuit board
PG	parity group
P-VOL	primary volume (for TrueCopy or ShadowImage)
RAID	redundant array of independent disks
RCU	remote control unit (for TrueCopy)
SAN	storage area network
SATA	serial advanced technology attachment
SCSI	small computer systems interface
SDS	Solstice DiskSuite
SI	ShadowImage
SIM	service information message
SLPR	storage logical partition
SNMP	simple network management protocol
SP-VOL	secondary-primary volume (for ShadowImage cascade)
SSL	secure socket layer
SSO	single sign-on
S-VOL	secondary volume (for TrueCopy or ShadowImage)
SVM	Solaris Volume Manager
SVP	service processor (component of 9900V and 9900)
TB	terabyte (1024 GB)
TC	TrueCopy

TCA	TrueCopy Asynchronous
TCP/IP	transmission control protocol/internet protocol
TID	target ID
TLS	transport layer security
TrueCopy	This abbreviation is used when it is not necessary to distinguish among TrueCopy, TrueCopy Asynchronous, Hitachi TrueCopy, Hitachi TrueCopy Basic, Hitachi Remote Copy, MRCF-Lite remote pack, or Synchronous Remote Copy function.
Tuning Manager	HiCommand Tuning Manager
URL	uniform resource locator
USP	Universal Storage Platform
VDS	Virtual Disk Service
VDEV	virtual device
VM	Volume Manager
VPN	virtual private network
VxVM	VERITAS Volume Manager
WMS	Workgroup Modular Storage
WWN	worldwide name
XGA	extended graphics array
XML	extensible markup language

Glossary

Array (parity) group	A set of hard disk drives (HDDs) which have the same capacity and are treated as one RAID unit. An array group contains user data and parity information, which ensures user data integrity in the event of a disk drive failure in the array group.
Cache Partition Manager	Provides the cache logical partitioning function. For more information, see section 2.3.5.
Channel adapter/port controller	A Fibre Channel adapter in the storage subsystem that is equipped with one or more ports to establish connection with the host. For Universal Storage Platform V, TagmaStore USP, Lightning 9900 V and Lightning 9900, it is referred to as the channel adapter (CHA). For the TagmaStore AMS/WMS series, Thunder 9500V, and Thunder 9200, it is referred to as the controller.
Command control interface (CCI)	The licensed software product that enables the user to perform TrueCopy and/or ShadowImage operations by issuing commands from the host to the command device on the storage subsystem. For details about CCI, refer to the CCI manuals.
Command device	An LU used exclusively for communicating with the CCI software on the host to control copy operations.
Copy pair	A TrueCopy or Universal Replicator copy pair consists of one P-VOL and one S-VOL in different storage subsystems. A QuickShadow copy pair for the Thunder 9500V consists of one P-VOL and from 1 to 14 V-VOLs. A Copy-on-Write Snapshot copy pair for the TagmaStore AMS/WMS series consists of one P-VOL and from 1 to 15 V-VOLs. A Copy-on-Write Snapshot copy pair for the Universal Storage Platform V or TagmaStore USP consists of one P-VOL and from 1 to 64 V-VOLs. A ShadowImage copy pair (layer 1) consists of one P-VOL and from 1 to 3 S-VOLs in the same storage subsystem. A layer-2 ShadowImage cascade copy pair (for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and 9900 only) has one SP-VOL and from 1 to 2 S-VOLs in the same storage subsystem.
Copy pair volume	Any volumes that make up a copy pair, including P-VOLs, S-VOLs, SP-VOLs, and V-VOLs.
Copy-on-Write Snapshot	The Copy-on-Write Snapshot feature (for Universal Storage Platform V, TagmaStore USP and the TagmaStore AMS/WMS series only) allows the user to make backup copies of volumes in the same storage subsystem. For details on Copy-on-Write Snapshot, refer to the storage subsystem Copy-on-Write Snapshot manual.
DEVN	A device number that is used to identify an LDEV when using it in a mainframe.

Differential Management LU	A logical unit for storing differential information during a copy operation with the TagmaStore AMS/WMS series. This logical unit must be defined before a pair is manipulated.
Discrete/normal VDEV	Discrete VDEV configuration (Lightning 9900V RAID5 7D+1P only) involves using two parity groups (PGs) to create a virtual device (VDEV) (array group in Device Manager). A normal VDEV is created on a single parity group.
HDP pool volume	HDP pool volumes make up the data storage area on an HDP volume.
HDP volume	A virtual volume used for Hitachi Dynamic Provisioning (HDP).
Host	A user-defined set of worldwide names (WWNs) which represent a physical host server with one or more Fibre Channel host bus adapters (HBAs), each of which may have one or two ports with unique WWNs.
Hosts object	A display of the user-defined hosts in Device Manager and the detailed storage information for each host, including allocated capacity and storage groups in use. For each host server, the **Hosts** object displays information about storage allocated to the host. The **Hosts** object is displayed in the navigation area by choosing, in the **Explorer** menu, **Resources** and then **Hosts.**
Host storage domain	An existing host group on a Universal Storage Platform V, TagmaStore USP, Lightning 9900V, TagmaStore AMS/WMS series, or Thunder 9500V storage subsystem that is configured using the LUN Manager software for the storage subsystem. A host group in the Thunder 9500V is applicable when the security mode is set to LUN Management, and is not applicable when the security mode is LUN Security. Device Manager displays the host storage domain information for the Universal Storage Platform V, TagmaStore USP, Lightning 9900V, TagmaStore AMS/WMS Series, and Thunder 9500V storage subsystems and allows the user to change host storage domain names.
LDEV	A logical device on a storage subsystem. An unallocated LDEV is not mapped to a LUN (no access path). An allocated LDEV has one or more access paths (LUNs).
Logical group	A user-defined group for managing storage. A logical group can contain logical groups and storage groups. You can add storage to an empty logical group but not to a logical group that contains a subordinate logical group or storage group. Logical groups are displayed under the **Logical Groups** object, which is displayed in the navigation area. In the **Explorer** menu choose **My Groups** and then **Logical Groups**.

Logical groups object	The Logical Groups object is displayed in the navigation area. Choose My Groups and then Logical Groups in the Explorer menu. The Logical Groups object can be expanded to display the logical groups. The user-defined storage groups are displayed at the end of the logical groups, along with information about the storage allocated to the storage groups. The Logical Groups object can be structured as desired by the user (e.g., by platform, organizational department, etc.) with logical groups in a hierarchical configuration.
LU/volume	A logical unit (LU) on a storage subsystem. In most cases an LU, or volume, is the same as an LDEV. An exception is a LUN Expansion (LUSE) device.
LUN group	A LUN security group on a Lightning 9900 storage subsystem. Device Manager allows the user to manage LUN groups.
LUSE	An LU consisting of multiple LDEVs. You can create a LUSE volume on Universal Storage Platform V, TagmaStore USP, TagmaStore AMS/WMS series, Lightning 9900V, Thunder 9500V, Lightning 9900, and Thunder 9200 storage subsystems.
Port	CHA/port controller port where the cable from storage subsystem is connected.
Primary volume (P-VOL)	The source volume that is being copied to another volume by ShadowImage, QuickShadow/Copy-on-Write Snapshot, TrueCopy, or Universal Replicator.
QuickShadow	The QuickShadow feature (9500V only) enables the user to make backup copies of volumes in the same storage subsystem. For details about QuickShadow, refer to the storage subsystem QuickShadow manual.
Resource Group	A user-defined set of resources that can be manipulated as a group. Only users with the admin permission can operate resource groups. A resource group can consist of hosts, logical devices (LDEVs), and logical groups. A user assigned to a resource group can view and manage only the resources of the assigned group. Resource groups are displayed in the Resource Group Administration dialog box.
Secondary volume (S-VOL)	The target volume onto which a P-VOL is being copied by ShadowImage, QuickShadow/Copy-on-Write Snapshot, TrueCopy, or Universal Replicator.
Secondary-primary volume (SP-VOL)	ShadowImage volume that is an S-VOL in the top layer and a P-VOL in the second layer. When you use the ShadowImage cascade function (for Universal Storage Platform V, TagmaStore USP, Lightning 9900V, and 9900 only), you can create a copy pair (in the second layer) whose P-VOL is an S-VOL of another copy pair (in the top layer).
ShadowImage	The ShadowImage feature enables the user to make backup copies of volumes in the same storage subsystem.

Storage group	A user-defined set of paths (LUNs) which can be manipulated as a group. Adding storage to an empty logical group renders that group a storage group. The LUNs in the same storage group must physically reside in the same storage subsystem. A storage group cannot contain another storage group or logical group. Storage groups are displayed under the **Logical Groups** object, which is displayed in the navigation area. Choose **My Groups** and then **Logical Groups** in the **Explorer** menu.
Subsystems object	A display of the physical configuration information for the storage subsystems, such as: serial number, number and type(s) of ports, location and capacity of installed array groups, LDEVs and paths, and amount of cache memory. The **Subsystems** object is displayed in the navigation area. Choose, **Resources** and then **Subsystems** in the **Explorer** menu.
TrueCopy	The TrueCopy feature enables the user to make backup copies of volumes in a different storage subsystem. For details, refer to the TrueCopy manual.
Universal Replicator	The Universal Replicator feature (Universal Storage Platform V and TagmaStore USP only) enables the user to asynchronously make backup copies of volumes between different storage subsystems. This feature provides the source and destination storage subsystems with LDEVs, called journal volumes (JNL-VOL), which store the updates as journal data. For details about Universal Replicator, refer to the Universal Replicator manual.
Virtual Partition Manager	Virtual Partition Manager provides the cache logical partition and storage logical partition functions. For details on these functions, see section 4.6.

Volume path/LUN	A path to an LU (volume) in a storage subsystem which maps the LU to a port and LU number (LUN). Each LU can have one or more paths, and each path can have different LUN security settings. The type of host platform determines the number of logical units (LUs) that may be connected to each port. ▪ Universal Storage Platform V supports no more than 2,048 paths per port via a Fibre Channel port. ▪ TagmaStore USP supports no more than 1,024 paths per Fibre Channel port. ▪ Lightning 9900V supports no more than 512 paths per Fibre Channel port. ▪ Lightning 9900 supports no more than 256 paths per Fibre Channel port. ▪ TagmaStore AMS/WMS series supports no more than 32,768 paths per port. ▪ Thunder 9500V supports no more than 32,768 paths per port. ▪ Thunder 9200 supports no more than 64 paths per port.
V-VOL	Logical duplicated volume of the QuickShadow/Copy-on-Write Snapshot function consisting of physical data stored in the primary volume and differential data stored in the data pool.
WWN group	A WWN group on a Lightning 9900 storage subsystem. Device Manager allows the user to manage WWN groups.

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