

3 MPLS QoS Configuration

On an MPLS network, MPLS QoS controls enterprise network traffic, and implements congestion avoidance and congestion management to reduce packet loss. In addition, MPLS QoS provides dedicated bandwidth for enterprise users or differentiated services (such as voice, video, and data services).

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3.1 Overview of MPLS QoS

Definition

Multiprotocol Label Switching quality of service (MPLS QoS) is implemented using the Differentiated Services (DiffServ) model on an MPLS network. MPLS QoS provides differentiated services to meet diversified requirements.

Purpose

MPLS uses label-based forwarding to replace route-based forwarding and provides powerful and flexible functions to meet requirements of new applications. In addition, MPLS supports multiple network protocols including IPv4 and IPv6. MPLS has been widely used for building large-scale networks. On an MPLS network, IP QoS cannot be used to guarantee quality of services, so MPLS QoS is used.

Similar to the way IP QoS differentiates services based on priorities of IP packets, MPLS QoS differentiates data flows based on the EXP field and provides differentiated services for data flows. The use of MPLS QoS helps minimize delays and ensure low packet loss ratios for voice and video data streams.

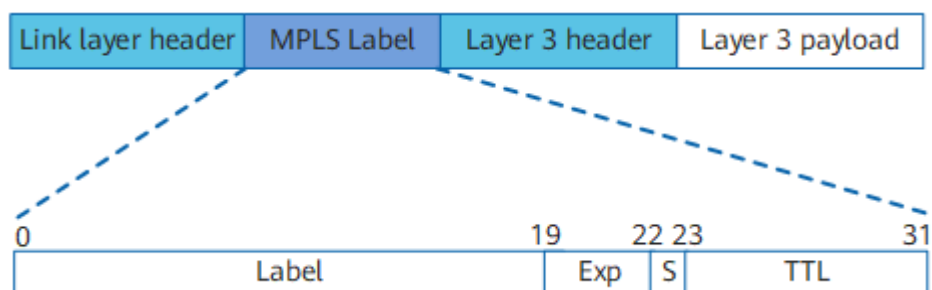
3.2 Understanding MPLS QoS

3.2.1 MPLS DiffServ

Implementation

In the DiffServ model, network edge nodes map a service to a service class based on QoS requirements of the service. A service class is identified by the differentiated service (DS) field (Type of Service (ToS) field) in IP packets or the PRI field (802.1p priority) in VLAN packets. Nodes on a backbone network apply preset policies to the service based on the DS or PRI field to ensure service quality. For details, see Priority Mapping Configuration (CE Switches Excluding CE6870EI) or Priority Mapping Configuration (CE6870EI) in *CloudEngine 9800, 8800, 6800, 5800 Series Switches Configuration Guide - QoS*. The service classification and label distribution mechanisms of DiffServ are similar to MPLS label distribution. MPLS DiffServ combines DS or PRI distribution with MPLS label distribution.

Figure 3-1 Fields in an MPLS packet



MPLS DiffServ maps the EXP field (as shown in [Figure 3-1](#)) to a per-hop behavior (PHB). LSRs forward MPLS packets based on EXP fields in the MPLS packets. MPLS DiffServ provides the following solutions for label switched path (LSP) setup:

- E-LSP: an LSP whose PHB is determined by the EXP field. E-LSP applies to a network with fewer than eight PHBs. A differentiated services code point (DSCP) or 802.1p priority is mapped to a specified EXP value that identifies a PHB. [Table 3-1](#) describes the mapping between PHBs and EXP values. Packets are forwarded based on labels, and the EXP field determines the packet scheduling algorithm and drop priority at each hop. An LSP transmits a maximum of eight PHB flows that are identified by the EXP field in the MPLS packet header. The EXP value can be configured by the Internet service provider (ISP) or mapped from the DSCP or 802.1p priority in a packet. In E-LSP, PHB information does not need to be transmitted by signaling protocols. Additionally, the label efficiency is high, and the label status is easy to maintain.

Table 3-1 Mapping between DiffServ PHBs and EXP values

PHB	EXP Value
BE	0
AF1	1
AF2	2
AF3	3
AF4	4
EF	5
CS6	6
CS7	7

- L-LSP: an LSP whose PHB is determined by both the label and EXP value. L-LSP applies to a network with any number of PHBs. During packet forwarding, the label of a packet determines the forwarding path and scheduling algorithm, whereas the EXP field determines the drop priority of the packet. Labels differentiate service flows, so service flows of a specified type are transmitted over the same LSP. This solution requires more labels and occupies a large number of system resources.

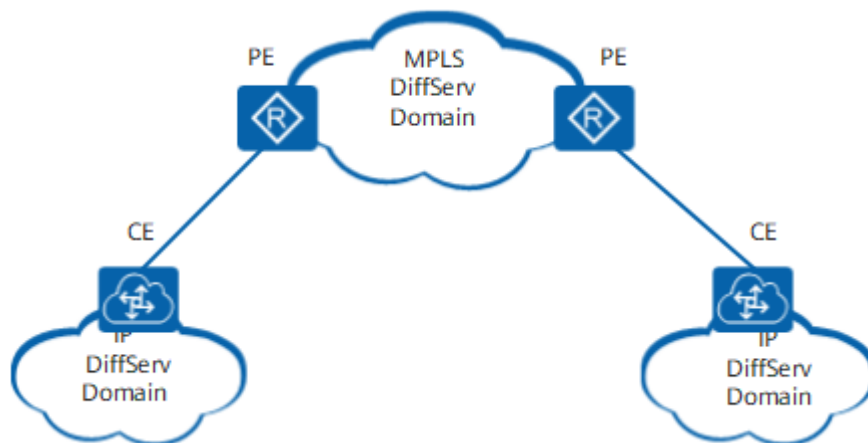
NOTE

The device supports only E-LSP.

DiffServ Domain

As shown in [Figure 3-2](#), DiffServ domains include MPLS DiffServ and IP DiffServ domains.

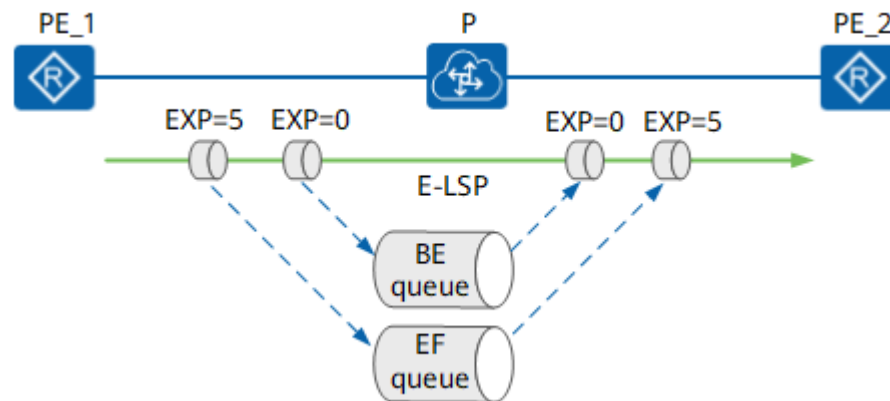
In the E-LSP solution, MPLS DiffServ manages and schedules the two DiffServ domains and implements bidirectional mapping between DSCP or 802.1p priorities and EXP priorities at the MPLS network edge.

Figure 3-2 DiffServ domain

As shown in [Figure 3-3](#), the MPLS DiffServ domain forwards MPLS packets based on EXP values and provides differentiated services.

When MPLS packets enter the P device, the P device classifies packets and maps EXP values in packets to class of service (CoS) values and drop priorities. After traffic classification, QoS implementations including traffic shaping, traffic policing, and congestion avoidance are the same as those on an IP network. When MPLS packets leave the P device, the packets carry EXP values.

Figure 3-3 E-LSP



3.2.2 MPLS DiffServ Tunnel Modes

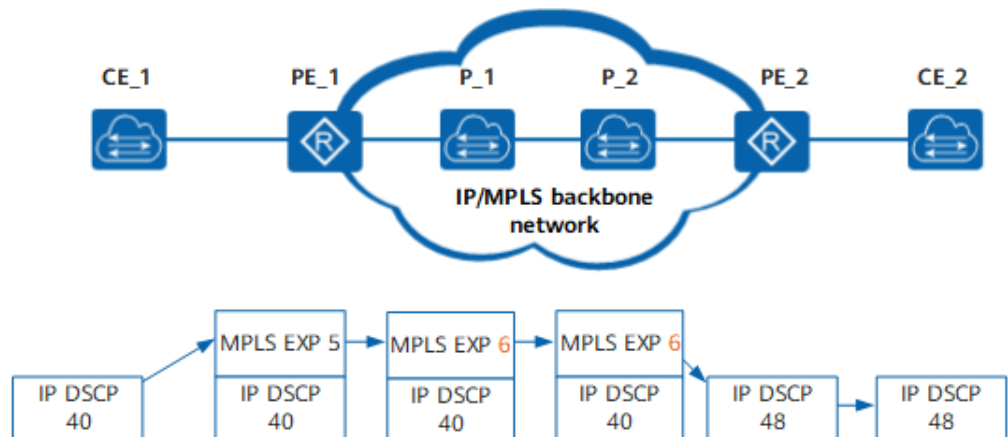
An MPLS DiffServ domain supports three tunnel modes:

- **Uniform:** Packet priorities are uniformly defined on the IP network and the MPLS network, so the priorities are globally valid. On the ingress node, each packet is assigned a label and its DSCP priority is mapped to an EXP value. A change in the EXP value on the MPLS network determines the PHB used when the packet leaves the MPLS network. The egress node maps the EXP value to the DSCP priority. [Figure 3-4](#) shows priority mapping in a uniform tunnel. P_1 changes the MPLS EXP value to 6. PE_2 changes the DSCP priority to 48. (PE_2 maps EXP value 6 to DSCP priority 48 by default.)

NOTE

The preceding description is based on a non-PHP scenario. In a PHP scenario, packets received by PE_2 do not carry MPLS EXP values; therefore, PE_2 does not implement MPLS QoS on the packets. To use MPLS QoS in a PHP scenario, it is recommended that you configure related configurations on the penultimate hop instead of the egress node, or configure the egress node to allocate an explicit null label to the penultimate hop.

Figure 3-4 Uniform mode

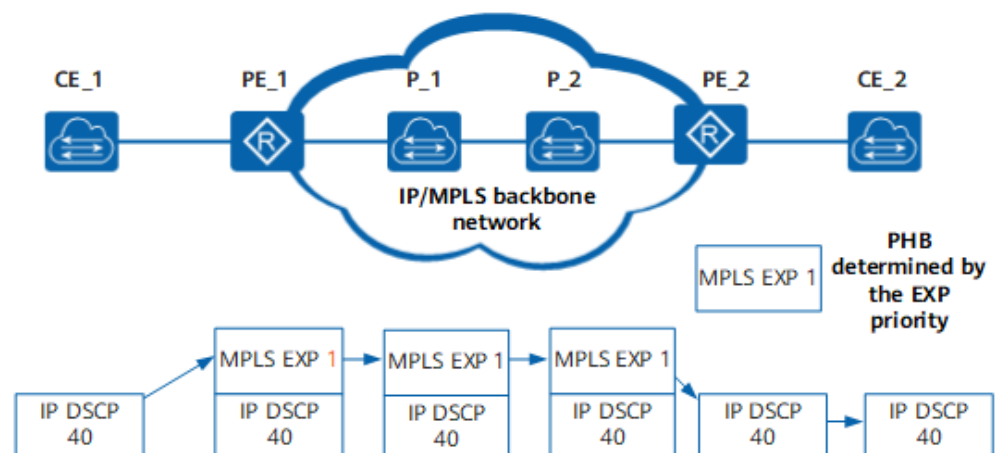


- Pipe: The EXP value can be manually configured, and the ingress node adds this EXP value to MPLS packets. Any change in the EXP value is valid only on the MPLS network. The egress node selects the PHB for MPLS packets according to the EXP value. When the packets leave the MPLS network, their DSCP priority is still valid. [Figure 3-5](#) shows priority mapping in a pipe tunnel. PE_1 changes the MPLS EXP values to 1. PE_2 retains the DSCP priority of packets and selects a PHB based on the MPLS EXP value.

NOTE

The preceding description is based on a non-PHP scenario. In a PHP scenario, packets received by PE_2 do not carry MPLS EXP values; therefore, PE_2 does not implement MPLS QoS on the packets. To use MPLS QoS in a PHP scenario, it is recommended that you configure related configurations on the penultimate hop instead of the egress node, or configure the egress node to allocate an explicit null label to the penultimate hop.

Figure 3-5 Pipe mode

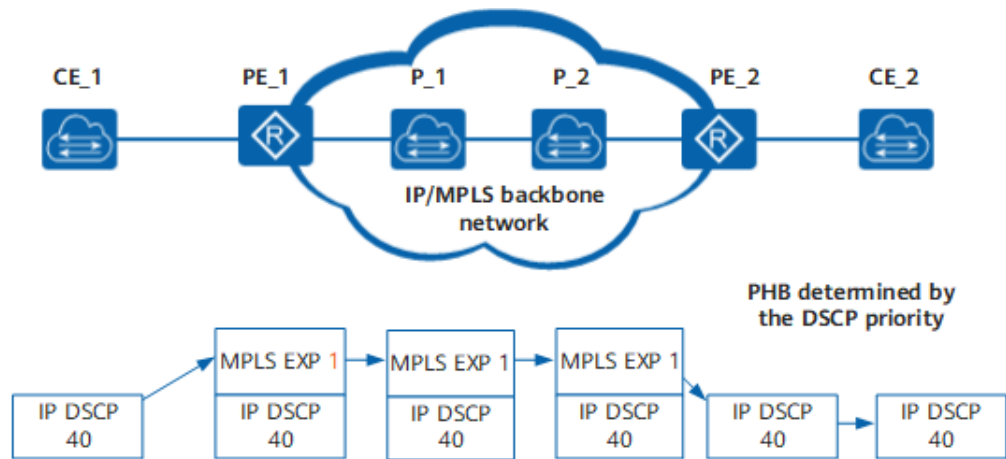


- Short pipe: The EXP value can be manually configured, and the ingress node adds this EXP value to MPLS packets. Any change in the EXP value is valid only on the MPLS network. The egress node selects the PHB for MPLS packets according to the DSCP priority. When the packets leave the MPLS network, their DSCP priority is still valid. [Figure 3-6](#) shows priority mapping in a short-pipe tunnel. PE_1 changes the MPLS EXP values to 1. PE_2 retains the DSCP priority of packets and selects a PHB on the DSCP priority.

NOTE

The preceding description is based on a non-PHP scenario.

Figure 3-6 Short pipe mode



3.3 Licensing Requirements and Limitations for MPLS QoS

Involved Network Elements

Other network elements are not required.

License Requirements

MPLS QoS is a basic function of the switch, and as such is controlled by the license for basic software functions. The license for basic software functions has been installed and activated on the device before delivery. You do not need to manually activate it.

Version Requirements

Table 3-2 Products and minimum version supporting this feature

Product Model	Minimum Version Required
CE6856HI	V200R002C50
CE6857EI	V200R005C10
CE6857E	V200R020C10
CE6857F	V200R021C00
CE6865EI	V200R005C00

Product Model	Minimum Version Required
CE6865E	V200R021C00
CE8850E-32CQ-EI	V200R021C10
CE6870-48S6CQ-EI	V200R001C00
CE6870-48S6CQ-EI-A	V200R022C00
CE6870-48T6CQ-EI	V200R002C50
CE8850-32CQ-EI	V200R002C50
CE8850-64CQ-EI	V200R005C00
CE8861EI	V200R005C10
CE8868EI	V200R005C10

Feature Limitations

When configuring MPLS QoS on the switch, pay attention to the following points:

- CE switches cannot function as PE devices on an MPLS network.
- When configuring MPLS QoS or MPLS L3VPN QoS on the CE6870EI switch, you can configure the MPLS DiffServ mode only on the ingress and egress nodes. The MPLS DiffServ mode does not take effect on the transit node.
- In V200R005C00, if the CE6856HI functions as the ingress node of the VPLS network, the **MPLS TTL** field has a fixed value of 255.
- When the CE6870EI switch is not configured with the MPLS PHP function and uses the inner label to forward packets after the outer label pops up (for example, the switch serves as an ASBR in the inter-AS VPN Option B or inter-AS VPN Option C scenario), the EXP in the label of the forwarded packets cannot be obtained from outbound priority mappings based on the PHB, and the EXP in the inner label is used.
- The user-configured EXP value is preferred as the EXP value in the outer label of L2VPN packets on the CE6870EI. If no EXP value is configured, the EXP value in the inner label is used as the EXP value in the outer label.
In addition, MPLS QoS is developed based on MPLS LDP. For other configuration notes about MPLS LDP, see [MPLS LDP Configuration Notes](#).
- When the CE6856HI functions as the penultimate hop in an MPLS PHP scenario and receives single-tagged packets, the **qos phb marking dscp enable** command does not take effect.
- For the CE6870EI, in the MPLS PHP scenario in uniform mode, the user-defined mapping between DSCP priorities and EXP priorities does not take effect for outgoing packets.

3.4 Default Settings for MPLS QoS

By default, the mappings in the DiffServ domain are as follows:

- **Table 3-3** lists the mappings from DSCP priorities to EXP priorities in MPLS packets on other models excluding the CE6870EI.
- **Table 3-4** lists the mappings from DSCP priorities to EXP priorities in MPLS packets on the CE6870EI.
- **Table 3-5** lists the mappings between EXP priorities in MPLS packets, DSCP priorities, and PHBs and colors.

Table 3-3 Mapping from PHBs and colors to EXP priorities in the outbound direction in the DiffServ domain (CE8861EI, CE8868EI, CE8850EI, CE6865EI, CE6865E, CE8850E-32CQ-EI, CE6857EI, CE6857E, CE6857F, and CE6856HI)

PHB	Color	EXP
BE	green	0
BE	yellow	0
BE	red	0
AF1	green	1
AF1	yellow	1
AF1	red	1
AF2	green	2
AF2	yellow	2
AF2	red	2
AF3	green	3
AF3	yellow	3
AF3	red	3
AF4	green	4
AF4	yellow	4
AF4	red	4
EF	green	5
EF	yellow	5
EF	red	5
CS6	green	6
CS6	yellow	6
CS6	red	6
CS7	green	7
CS7	yellow	7

PHB	Color	EXP
CS7	red	7

Table 3-4 Mapping from DSCP priorities to EXP priorities in the outbound direction in the DiffServ domain

DSCP Priority	EXP Priority	DSCP Priority	EXP Priority
0	0	32	4
1	0	33	4
2	0	34	4
3	0	35	4
4	0	36	4
5	0	37	4
6	0	38	4
7	0	39	4
8	1	40	5
9	1	41	5
10	1	42	5
11	1	43	5
12	1	44	5
13	1	45	5
14	1	46	5
15	1	47	5
16	2	48	6
17	2	49	6
18	2	50	6
19	2	51	6
20	2	52	6
21	2	53	6
22	2	54	6
23	2	55	6
24	3	56	7

DSCP Priority	EXP Priority	DSCP Priority	EXP Priority
25	3	57	7
26	3	58	7
27	3	59	7
28	3	60	7
29	3	61	7
30	3	62	7
31	3	63	7

Table 3-5 Mapping between EXP priorities in MPLS packets, DSCP priorities, and PHBs and colors in the inbound direction in the DiffServ domain

EXP Priority	CoS Value	Color	DSCP
0	BE	Green	0
1	AF1	Green	10
2	AF2	Green	18
3	AF3	Green	26
4	AF4	Green	34
5	EF	Green	46
6	CS6	Green	48
7	CS7	Green	56

3.5 Configuring MPLS QoS

3.5.1 Configuring MPLS Public QoS (CE6870EI)

Pre-configuration Tasks

After you configure MPLS Public QoS, differentiated services are provided for different services on the MPLS public network based on the service priorities.

Before configuring MPLS QoS, complete the following tasks:

- Configure IP addresses for interfaces to ensure that neighboring nodes are reachable at the network layer.
- Configure an IGP to advertise the network segments connecting to interfaces on each node and the routes of hosts with LSR IDs.

- Configure MPLS and MPLS LDP.

Context

To implement certain QoS functions on an MPLS network, devices on the network need to determine the packet priorities based on the MPLS labels. Therefore, you need to map the MPLS labels to EXP priorities.

MPLS QoS can differentiate different services on an MPLS network. If you want to retain priorities carried in original packets regardless of the change in the EXP field, set the DiffServ mode to short pipe. If you set the DiffServ mode to uniform, priorities carried in original packets may be changed. In uniform mode, the egress node determines the per-hop behavior (PHB) based on EXP priorities of packets. In short pipe mode, the egress node determines the PHB based on Differentiated Service Code Point (DSCP) priorities of packets.

NOTE

The MPLS DiffServ mode configured on a transit device does not take effect.

Procedure

Step 1 Run **system-view**

The system view is displayed.

Step 2 Create a DiffServ domain and configure priority mapping.

For details, see Priority Mapping Configuration in *CloudEngine 9800, 8800, 6800, 5800 Series Switches Configuration Guide - QoS*.

- Performing the following steps on the ingress:
 - a. Run **diffserv domain** *ds-domain-name*
A DiffServ domain is created and the DiffServ domain view is displayed.
The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of six user-defined DiffServ domains can be created.
 - b. Run **mpls-exp-outbound** *dscp-value* **map** *exp-value*
The DSCP priority is mapped to the EXP priority of MPLS packets in the outbound direction of an interface.
For details on the default mapping from the DSCP priority to the EXP priority, see **mpls-exp-outbound**.
The DSCP priority in this command is the priority carried in packets of a device's outbound interface.
 - c. Run **quit**
Return to the system view.
- Performing the following steps on the egress:
 - a. Run **diffserv domain** *ds-domain-name*
A DiffServ domain is created and the DiffServ domain view is displayed.
The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but

cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of six user-defined DiffServ domains can be created.

- b. Run **mpls-exp-inbound** *exp-value* **phb** *service-class*

The EXP priority of MPLS packets is mapped to the PHB in the inbound direction of an interface.

For details on the default mapping from the EXP priority to the PHB, see **mpls-exp-inbound**.

The EXP priority of MPLS packets is mapped to green in the inbound direction of an interface.

- c. Run **quit**

Return to the system view.

 NOTE

To apply a user-defined DiffServ domain to a Layer 3 interface on the ingress node receiving the packets or a Layer 3 interface on the egress node receiving the packets, run the **trust upstream** *ds-domain-name* command in the Layer 3 interface view.

Step 3 Configure the MPLS DiffServ mode.

Run **mpls mode** { **short-pipe** [[**ttl** *ttl-value* **exp** *exp-value*] | **domain** *ds-name*] | **uniform** [**domain** *ds-name*] }

The MPLS DiffServ mode is set.

By default, the MPLS DiffServ mode is uniform.

 NOTE

When running the **mpls mode short-pipe ttl** *ttl-value* **exp** *exp-value* command, specify the same EXP value for the outer and inner MPLS labels. If the parameter **exp** is not specified, the inbound interface performs priority mapping for incoming packets based on the original priorities.

When the MPLS DiffServ mode is uniform, the egress node maps EXP priorities of packets to DSCP priorities. To map PHBs to DSCP priorities, configure the **qos phb marking dscp enable** command in the system view.

Step 4 Run **commit**

The configuration is committed.

----End

Checking the Configuration

Run the **display diffserv domain** [**brief** | *ds-domain-name*] command to view the DiffServ domain configuration.

3.5.2 Configuring MPLS Public QoS (CE Switches Excluding CE6870EI)

After you configure MPLS Public QoS, differentiated services are provided for different services on the MPLS public network based on the service priorities.

Pre-configuration Tasks

Before configuring MPLS QoS, complete the following tasks:

- Configure IP addresses for interfaces to ensure that neighboring nodes are reachable at the network layer.
- Configure an IGP to advertise the network segments connecting to interfaces on each node and the routes of hosts with LSR IDs.
- Configure MPLS and MPLS LDP.

Context

To implement certain QoS functions on an MPLS network, devices on the network need to determine the packet priorities based on the MPLS labels. Therefore, you need to map the MPLS labels to EXP priorities.

MPLS QoS can differentiate different services on an MPLS network. If you want to retain priorities carried in original packets regardless of the change in the EXP field, set the DiffServ mode to pipe or short pipe. If you set the DiffServ mode to uniform, priorities carried in original packets may be changed. In uniform and pipe modes, the egress node determines the per-hop behavior (PHB) based on EXP priorities of packets. In short pipe mode, the egress node determines the PHB based on Differentiated Service Code Point (DSCP) priorities of packets.

Procedure

Step 1 Run **system-view**

The system view is displayed.

Step 2 Create a DiffServ domain and configure priority mapping.

For details, see Priority Mapping Configuration in *CloudEngine 9800, 8800, 6800, 5800 Series Switches Configuration Guide - QoS*.

A DiffServ domain comprises the connected DiffServ nodes, which use the same service policy and implement the same PHBs.

When traffic enters a device, the device maps packet priorities to PHBs and colors, and performs congestion management based on PHBs and congestion avoidance based on colors. When traffic flows out of the device, the device maps PHBs and colors of packets to priorities. The downstream device provides QoS services based on packet priorities.

1. Run **diffserv domain** *ds-domain-name*

A DiffServ domain is created and the DiffServ domain view is displayed.

The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of seven user-defined DiffServ domains can be created.

2. Define a traffic policy on the device.

- Run **exp-inbound** *exp-value* **phb** *service-class* *color*

The EXP priority of MPLS packets is mapped to the PHB and color in the inbound direction of an interface.

For details on the default mapping from EXP priorities of MPLS packets to PHBs and colors in the inbound direction of an interface in a DiffServ domain, see **exp-inbound**.

- Run **exp-outbound service-class color map exp-value**

The PHB and color in original packets are mapped to the EXP priority of MPLS packets in the outbound direction of an interface.

For details on the default mapping from PHBs and colors in original packets to EXP priorities of MPLS packets in the outbound direction of an interface in a DiffServ domain, see **exp-outbound**.

3. Run **quit**

Return to the system view.

 NOTE

To apply a user-defined DiffServ domain to a Layer 2 interface on the ingress node receiving the packets or a Layer 2 interface on the egress node receiving the packets, run the **trust upstream ds-domain-name** command in the Layer 2 interface view.

Step 3 Configure the MPLS DiffServ mode.

To map priorities of incoming packets to PHBs and colors based on the mappings defined in a DiffServ domain, bind the DiffServ domain to the inbound interface of the packets. The system then maps priorities of packets to PHBs and colors based on the mappings in the DiffServ domain.

To map PHBs and colors of outgoing packets to priorities based on the mappings defined in a DiffServ domain, bind the DiffServ domain to the outbound interface of the packets. The system then maps PHBs and colors of outgoing packets to priorities based on the mappings in the DiffServ domain.

1. Run **mpls**

The MPLS view is displayed.

2. Run **mpls ldp qos-mode { pipe exp exp-value | short-pipe [exp exp-value] | uniform } [domain ds-name]**

The MPLS DiffServ mode is set.

By default, the MPLS DiffServ mode is uniform.

If no DiffServ domain name is specified, the default domain is used.

 NOTE

- When running the **mpls ldp qos-mode { pipe exp exp-value | short-pipe exp exp-value }** command, specify the EXP value for MPLS labels. When the DiffServ mode is short pipe and the **exp exp-value** parameter is not specified, the device maps the original priorities of packets on the inbound interface to the EXP values.
- If the DiffServ mode of the MPLS network is set to uniform, you need to run the **qos phb marking dscp enable** command on the penultimate hop in a PHP scenario and the egress node in a non-PHP scenario; otherwise, the EXP values of packets cannot be mapped to DSCP priorities.
- If the DiffServ mode of the MPLS network is set to pipe, DSCP priorities of original packets may be changed if the **qos phb marking dscp enable** command is configured on the outbound interface of the egress node. The changed value is determined by the DiffServ domain in use.
- In an implicit PHP scenario, the egress does not implement MPLS QoS on the packets. To use MPLS QoS in pipe or uniform mode in this scenario, it is recommended that you configure related configurations on the penultimate hop instead of the egress node, or configure the egress node to allocate an explicit null label to the penultimate hop.

Step 4 Run **commit**

The configuration is committed.

----End

Checking the Configuration

Run the **display diffserv domain [brief | ds-domain-name]** command to view the DiffServ domain configuration.

3.5.3 Configuring MPLS L3VPN QoS (CE6870EI)

Context

After you configure MPLS VPN QoS, differentiated services are provided for different services on the MPLS L3VPN network based on the service priorities.

The configuration of MPLS L3VPN QoS is similar to the configuration of QoS on the MPLS public network. For detailed configuration, see [3.5.1 Configuring MPLS Public QoS \(CE6870EI\)](#).

3.5.4 Configuring MPLS L3VPN QoS (CE Switches Excluding CE6870EI)

Context

After you configure MPLS VPN QoS, differentiated services are provided for different services on the MPLS L3VPN network based on the service priorities.

To implement certain QoS functions on an MPLS network, devices on the network need to determine the packet priorities based on the MPLS labels. Therefore, you need to map the MPLS labels to EXP priorities.

MPLS QoS can differentiate different L3VPN services on an MPLS network. If you want to retain priorities carried in original packets regardless of the change in the

EXP field, set the DiffServ mode of a VPN instance to pipe or short pipe. If you set the DiffServ mode to uniform, priorities carried in original packets may be changed. In uniform and pipe modes, the egress node determines the per-hop behavior (PHB) based on EXP priorities of packets. In short pipe mode, the egress node determines the PHB based on Differentiated Service Code Point (DSCP) priorities of packets.

Procedure

Step 1 Run **system-view**

The system view is displayed.

Step 2 Create a DiffServ domain and configure priority mapping.

For details, see Priority Mapping Configuration in *CloudEngine 9800, 8800, 6800, 5800 Series Switches Configuration Guide - QoS*.

A DiffServ domain comprises the connected DiffServ nodes, which use the same service policy and implement the same PHBs.

When traffic enters a device, the device maps packet priorities to PHBs and colors, and performs congestion management based on PHBs and congestion avoidance based on colors. When traffic flows out of the device, the device maps PHBs and colors of packets to priorities. The downstream device provides QoS services based on packet priorities.

1. Run **diffserv domain** *ds-domain-name*

A DiffServ domain is created and the DiffServ domain view is displayed.

The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of seven DiffServ domains can be created.

2. Define a traffic policy on the device.

– Run **exp-inbound** *exp-value phb service-class color*

The EXP priority of MPLS packets is mapped to the PHB and color in the inbound direction of an interface.

For details on the default mapping from EXP priorities of MPLS packets to PHBs and colors in the inbound direction of an interface in a DiffServ domain, see **exp-inbound**.

– Run **exp-outbound** *service-class color map exp-value*

The PHB and color in original packets are mapped to the EXP priority of MPLS packets in the outbound direction of an interface.

For details on the default mapping from PHBs and colors in original packets to EXP priorities of MPLS packets in the outbound direction of an interface in a DiffServ domain, see **exp-outbound**.

3. Run **quit**

Return to the system view.

Step 3 Configure the DiffServ mode for a VPN instance.

To map priorities of incoming packets to PHBs and colors based on the mappings defined in a DiffServ domain, bind the DiffServ domain to the inbound interface of

the packets. The system then maps priorities of packets to PHBs and colors based on the mappings in the DiffServ domain.

To map PHBs and colors of outgoing packets to priorities based on the mappings defined in a DiffServ domain, bind the DiffServ domain to the outbound interface of the packets. The system then maps PHBs and colors of outgoing packets to priorities based on the mappings in the DiffServ domain.

1. Run **ip vpn-instance** *vpn-instance-name*
The VPN instance view is displayed.
2. Run **qos mode { pipe exp exp-value | { short-pipe exp exp-value | uniform } domain ds-name }**

The DiffServ mode is set for the VPN instance.

By default, the DiffServ mode of a VPN instance is uniform, and the default domain is used.

NOTE

- When running the **qos mode { pipe exp exp-value | short-pipe exp exp-value domain ds-name }** command, specify the EXP value for MPLS private network labels.
- If the DiffServ mode of a VPN instance in the MPLS L3VPN scenario is set to uniform, you need to run the **qos phb marking dscp enable** command on the penultimate hop in a PHP scenario and the egress node in a non-PHP scenario; otherwise, the EXP values of packets cannot be mapped to DSCP priorities.
- If the DiffServ mode of a VPN instance in the MPLS L3VPN scenario is set to pipe, DSCP priorities of original packets may be changed if the **qos phb marking dscp enable** command is configured on the outbound interface of the egress node. The changed value is determined by the DiffServ domain in use.

Step 4 Run **commit**

The configuration is committed.

----End

Checking the Configuration

Run the **display diffserv domain [brief | ds-domain-name]** command to view the DiffServ domain configuration.

3.5.5 Configuring MPLS L2VPN QoS (CE6870EI)

Context

After you configure MPLS VPN QoS, differentiated services are provided for different services on the MPLS L2VPN network based on the service priorities.

On an MPLS L2VPN network, you can configure MPLS L2VPN QoS to differentiate services in a VPN. To retain the priorities of original packets, set the DiffServ mode to pipe. To change the priorities of original packets, set the DiffServ mode to uniform.

Procedure

Step 1 Run **system-view**

The system view is displayed.

Step 2 Create a DiffServ domain and configure priority mapping.

- Performing the following steps on the ingress:
 - a. Run **diffserv domain** *ds-domain-name*
A DiffServ domain is created and the DiffServ domain view is displayed.
The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of six user-defined DiffServ domains can be created.
 - b. Run **exp-outbound** *service-class color map exp-value*
The PHB and color in original packets are mapped to the EXP priority of VPLS packets in the outbound direction of an interface.
For details on the default mapping from PHBs and colors in original packets to EXP priorities of VPLS packets in the outbound direction of an interface in a DiffServ domain, see **exp-outbound**.
 - c. Run **quit**
Return to the system view.
- Performing the following steps on the egress:
 - a. Run **diffserv domain** *ds-domain-name*
A DiffServ domain is created and the DiffServ domain view is displayed.
The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the DiffServ domain **default**, a maximum of six user-defined DiffServ domains can be created.
 - b. Run **exp-inbound** *exp-value phb service-class color*
The EXP priority of VPLS packets is mapped to the PHB in the inbound direction of an interface.
For details on the default mapping from EXP priorities of VPLS packets to PHBs and colors in the inbound direction of an interface in a DiffServ domain, see **exp-inbound**.
 - c. Run **quit**
Return to the system view.

 NOTE

If a user-defined DiffServ domain is used:

1. When a VLANIF interface is connected to an L2VPN, you need to run the **trust upstream ds-domain-name** command in the VLAN view of the egress node to apply this domain.
2. When a BD is connected to an L2VPN, you need to run the **trust upstream ds-domain-name** command in the BD view or Layer 2 sub-interface view to apply this domain. The configuration in the Layer 2 sub-interface view takes precedence over that in the BD view.

Step 3 Run **mpls l2vpn mode { pipe | uniform } [domain ds-name]**

The DiffServ mode for MPLS L2VPN is specified and applied to a DiffServ domain.

When the DiffServ mode for MPLS L2VPN is Uniform, the 802.1p priorities of packets can only be mapped to EXP priorities.

 NOTE

On the CE6870EI:

1. When a VLANIF interface is connected to an L2VPN and the DiffServ mode is set to pipe, the egress node will map PHBs to 802.1p priorities for outgoing packets if the interface encapsulation type is changed to Ethernet using the **encapsulation ethernet** command. The mappings are pre-defined by the system and cannot be changed.
2. When a BD is connected to an L2VPN and the DiffServ mode is set to uniform, packets will retain their 802.1p priorities when leaving the network if a QinQ transparent transmission Layer 2 sub-interface, Dot1q transparent transmission Layer 2 sub-interface, or default Layer 2 sub-interface (allowing tagged packets) is connected to the L2VPN.
3. When a BD is connected to an L2VPN and the DiffServ mode is set to pipe, the egress node will map PHBs to 802.1p priorities for outgoing packets if a QinQ termination Layer 2 sub-interface or Dot1q termination Layer 2 sub-interface is connected to the L2VPN. The mappings are pre-defined by the system and cannot be changed.

Step 4 Run commit

The configuration is committed.

----End

Checking the Configuration

Run the **display diffserv domain [brief | *ds-domain-name*]** command to view the DiffServ domain configuration.

3.5.6 Configuring MPLS L2VPN QoS (Except CE6870EI)

Context

You can configure MPLS L2VPN QoS to distinguish services with different priorities on an MPLS L2VPN network and provide differentiated services accordingly.

On an MPLS L2VPN network, you can configure MPLS L2VPN QoS to distinguish different services from the same VPN.

If you want to retain priorities carried in original packets when the EXP priority changes, set the DiffServ mode to short pipe. If you set the DiffServ mode to uniform or pipe, priorities carried in original packets may be changed. In uniform and pipe modes, the egress node determines the per-hop behavior (PHB) based on EXP priorities of packets. In short pipe mode, the egress node determines the PHB based on 802.1p priorities of packets.

Procedure

Step 1 Run system-view

The system view is displayed.

Step 2 Run **diffserv domain *ds-domain-name***

A DiffServ domain is created and the DiffServ domain view is displayed.

The **default** domain defines default mappings from packet priorities to PHBs. You can modify the mapping defined in the **default** domain but cannot delete the **default** domain. In addition to the **default** domain, a maximum of seven DiffServ domains can be created.

Step 3 Configure priority mapping.

Choose either of the following tasks:

- **DiffServ mode: uniform**

- a. Run **exp-outbound** *service-class color map exp-value*

The PHBs and colors are mapped to the EXP priorities for outgoing MPLS packets on the ingress node.

For details about the default mapping from PHBs and colors to the EXP priorities for outgoing packets in a DiffServ domain, see **exp-outbound**.

- b. Run **exp-inbound** *exp-value phb service-class color*

The EXP priorities are mapped to PHBs and colors for incoming MPLS packets on the egress node.

For details about the default mapping from the EXP priorities to PHBs and colors for incoming packets in a DiffServ domain, see **exp-inbound**.

- c. Run **quit**

Return to the system view.

- **DiffServ mode: pipe**

- a. Run **exp-inbound** *exp-value phb service-class color*

The EXP priorities are mapped to PHBs and colors for incoming MPLS packets on the egress node.

For details about the default mapping from the EXP priorities to PHBs and colors for incoming packets in a DiffServ domain, see **exp-inbound**.

If you want to retain the 802.1p priorities of original packets and make them effective after packets leave the MPLS network, run the **qos phb marking 8021p disable** command on the outbound interface of the egress node to disable mapping from PHBs to the 8021.p priorities.

- b. Run **quit**

Return to the system view.

- **DiffServ mode: short pipe**

- a. Run **exp-outbound** *service-class color map exp-value*

The PHBs and colors are mapped to the EXP priorities for outgoing MPLS packets on the ingress node.

For details about the default mapping from PHBs and colors to the EXP priorities for outgoing packets in a DiffServ domain, see **exp-outbound**.

If *exp-value* is specified, skip this step.

In the inbound direction of the interface on the egress node, the system sends packets to the queue whose internal priority is 0 and sets the color to green by default.

- b. Run **quit**

Return to the system view.

Step 4 Configure an MPLS DiffServ mode.

1. Run **vsi** *vsi-name* **bd-mode**

The VSI view is displayed.

2. Run **diffserv-mode** { **pipe exp** *exp-value* | **short-pipe** [**exp** *exp-value*] | **uniform** } [**domain** *ds-name*]

An MPLS DiffServ mode is configured.

- If *exp-value* is specified, the EXP priority in an MPLS private network label will be changed to this value.
- When you set the DiffServ mode to short pipe, the ingress node performs priority mapping based on the 802.1p priorities of original packets if **exp** *exp-value* is not specified for packets to be transmitted over the LSP. If the packets do not carry VLAN tags, the 802.1p priority is fixed as 0.

Step 5 Run **commit**

The configuration is committed.

----End

Checking the Configuration

Run the **display diffserv domain** [**brief** | *ds-domain-name*] command to view the DiffServ domain configuration.