This chapter applies to the following devices:

- 10 Gigabit Ethernet modules
- EP devices
- T-Flow modules
- 9408sl

HP devices can read Layer 2 and Layer 3 Quality of Service (QoS) information in an IP packet and select a forwarding queue for the packet based on the information. In addition, HP devices also can modify the packet's QoS information so that the packet's next hop uses the modified information.

By default, Type-of-Service (ToS) based QoS is disabled.

**Basic and Advanced ToS-Based QoS**

IP ToS-based QoS offers two levels of support, basic and advanced.

- **Basic** – When you globally enable ToS-based QoS, the HP device maps a packet's DiffServ Control Point (DSCP) value to an internal forwarding priority, and sends the packet to the hardware forwarding queue that corresponds to the internal forwarding priority.

  If the egress port for the packet is an 802.1q tagged port, the device also maps the device's DSCP value to an 802.1p value and changes the packet's 802.1p value accordingly.

- **Advanced** – In addition to globally enabling basic support, you also can enable advanced ToS-based QoS on individual interfaces. Enabling advanced ToS-based QoS on an interface allows you to specify the trust level and packet marking used for packets received on that interface. The **trust level** determines the type of QoS information the device uses for performing QoS. **Marking** is the process of changing the packet's QoS information for the next hop. Trust levels and marking are described in detail in “Classification, Marking, and Scheduling” on page 3-2.

**NOTE:** You cannot use advanced ToS-based QoS and rate limiting on the same interface.

Basic and advanced ToS-based QoS each map a packet's QoS value to an internal forwarding priority. The internal forwarding priorities are mapped to one of the four hardware forwarding queues (qosp0, qosp1, qosp2, or qosp3). During a forwarding cycle, the device gives more preference to the higher numbered queues, so that more packets are forwarded from these queues. Queue qosp3 receives the highest preference while queue qosp0, the best-effort queue, receives the lowest preference.
NOTE: For finer control of QoS, use the QoS options for ACLs. Refer to “QoS Options for IP ACLs” on page 5-10.

QoS Support When IP ToS-Based QoS Is Disabled

When ToS-based QoS is disabled, a packet’s priority can be changed only by directly resetting its internal forwarding priority as it travels through the system or by using an ACL to explicitly change the priority. (See “Alternative QoS Methods” on page 3-5.) Otherwise, the packet’s Layer 2 and Layer 3 QoS information is not examined by the device and does not affect how the packet is forwarded through the device.

Classification, Marking, and Scheduling

The ToS-based QoS process involves the following stages:

- Classification
- Marking
- Scheduling

Classification

Classification is the process of selecting packets on which to perform QoS and reading the QoS information. A packet can have multiple types of QoS information. The trust level in effect on an interface determines the type of QoS information the device uses for performing QoS. The trust level can be one of the following:

- Layer 2 CoS – The 802.1p priority in the Ethernet frame. The priority is a value from 0 – 7. The 802.1p priority is also called the Class of Service (CoS).

  NOTE: This trust level is not supported on 10 Gigabit Ethernet modules.

- Layer 3 IP Precedence – The value in the three most significant bits of the IP packet header’s 8-bit ToS field. The IP Precedence is a value from 0 – 7. The IP Precedence values are described in RFC 791.

- Layer 3 DSCP – The value in the six most significant bits of the IP packet header’s 8-bit ToS field. The DSCP is the six most significant bits in the IP packet header’s ToS field. The DSCP value is sometimes called the DiffServ value, and can be from 0 – 63. The DSCP values are described in RFCs 2474 and 2475.

Marking

Marking is the process of changing the packet’s QoS information for the next hop. For example, for traffic coming from a device that does not support DiffServ, you can change the packet’s IP Precedence value into a DSCP value before forwarding the packet.

You can mark a packet’s Layer 2 CoS value, its Layer 3 DSCP value, or both values. The Layer 2 CoS or DSCP value the device marks in the packet is the same value that results from mapping the packet’s QoS value into a Layer 2 CoS or DSCP value.

Marking is optional and is disabled by default. When marking is disabled, the device still performs the mappings listed in “Classification” for scheduling the packet, but leaves the packet’s QoS values unchanged when the device forwards the packet.

NOTE: Starting in software release 07.6.04, the T-Flow supports marking of ToS bits. This is the only enhanced-QoS feature supported on T-Flow. T-Flow does not support basic ToS-based QoS. Also, although the T-Flow uses advanced ToS-based QoS, it does not support ToS-based QoS scheduling.
NOTE: Because of hardware limitations on EP modules, if the outbound interface for a packet is an 802.1q interface (the interface is tagged), the device may change the 802.1p priority of the packet to one value lower, even if you have not configured marking of this value. This can occur if the packet's 802.1 priority is odd (1, 3, 5, or 7). In this case, the device changes the 802.1p priority to the next lower value: 7 is changed to 6, 5 is changed to 4, 3 is changed to 2, and 1 is changed to 0. If the packet's 802.1p priority is an even value, the value is unchanged. This behavior does not affect the DSCP/ToS value.

Scheduling

Scheduling is the process of mapping a packet to an internal forwarding queue based on its QoS information, and placing the packet into one of the four hardware forwarding queues for forwarding. The HP device maps the packet's QoS value into a CoS or DSCP value, then maps that value to an internal forwarding queue. The device then places the packet in the hardware forwarding queue corresponding to the internal forwarding queue.

You can modify the scheduling by changing the following mappings:

- CoS -> DSCP
- IP Precedence -> DSCP
- DSCP -> DSCP
- DSCP -> internal forwarding priority

The first three mappings are the same ones described in “Classification” and are applicable for DSCP marking. The trusted QoS source (CoS, IP Precedence, or DSCP) is mapped to a DSCP value and the packet is marked with that DSCP value.

The DSCP -> internal forwarding priority mapping is used to translate the results of the first three mappings into a value that the HP device can use to select a hardware forwarding queue. In addition, if the outgoing interface is an 802.1q tagged interface, the DSCP value is mapped to an 802.1p value and the packet is marked with the 802.1p value.

NOTE: T-Flow does not support ToS-based QoS scheduling for IPv4 traffic

NOTE: In the current release, the device schedules a packet by mapping the higher of the packet's 802.1p or DSCP/ToS values to one of the hardware forwarding queues. Unless other priority settings change the packet to a higher queue, the queue sleeted when the packet is received is used for forwarding the packet. A packet's forwarding priority (hardware forwarding queue) can be changed to a higher queue but cannot be changed to a lower queue.

Default QoS Mappings

Default CoS -> DSCP Mappings

Table 3.1 list the default mappings of CoS (802.1p) values to DSCP values. These mappings are used if the trust level is CoS and DSCP marking is enabled.

<table>
<thead>
<tr>
<th>802.1p</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCP value</td>
<td>0</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
<td>48</td>
<td>56</td>
</tr>
</tbody>
</table>

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Default IP Precedence → DSCP Mappings

Table 3.2 list the default mappings of IP precedence values to DSCP values. These mappings are used if the trust level is IP Precedence and DSCP marking is enabled.

<table>
<thead>
<tr>
<th>IP precedence</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSCP value</td>
<td>0</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
<td>48</td>
<td>56</td>
</tr>
</tbody>
</table>

Default DSCP → DSCP Mappings

By default, the device maps a packet's DSCP value to the same DSCP value. For example, if the packet has DSCP value 63 when the packet is received, the packet still has DSCP value 63 when the packet is placed in the hardware forwarding queue.

Default DSCP → Internal Forwarding Priority Mappings

Table 3.3 list the default mappings of DSCP values to internal forwarding priority values.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Forwarding Priority</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

After performing this mapping, the device maps the DSCP value to one of the hardware forwarding queues.

- qosp3 – the highest priority queue
- qosp2 – the second-highest priority queue
- qosp1 – the third-highest priority queue
- qosp0 – the best-effort (lowest priority) queue

Table 3.4 list the default mappings of internal forwarding priority values to the hardware forwarding queues.

<table>
<thead>
<tr>
<th>Internal Forwarding Priority</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forwarding Queue</td>
<td>qosp0</td>
<td>qosp0</td>
<td>qosp1</td>
<td>qosp1</td>
<td>qosp2</td>
<td>qosp2</td>
<td>qosp3</td>
<td>qosp3</td>
</tr>
</tbody>
</table>
Layer 4 CAM Usage

Basic ToS-based QoS does not use Layer 4 CAM entries. Advanced ToS-based QoS does use Layer 4 CAM entries of the interface where the feature is enabled. The number of CAM entries used by QoS depends on the trust level, as listed in Table 3.5.

Table 3.5: Layer 4 CAM Usage

<table>
<thead>
<tr>
<th>Trust level</th>
<th>Number of Layer 4 CAM entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoS</td>
<td>4 per interface</td>
</tr>
<tr>
<td>IP Precedence</td>
<td>7 per interface</td>
</tr>
<tr>
<td>DSCP</td>
<td>63 per interface</td>
</tr>
</tbody>
</table>

Since advanced ToS-based QoS uses Layer 4 CAM entries, HP recommends that you enable advanced ToS-based QoS on an interface only if required by the type of traffic received on the interface. Other features including ACLs, PBR, and NAT also require Layer 4 CAM entries.

Using ACLs, PBR, or NAT and IP ToS-Based QoS

You can use ACLs and IP ToS-based QoS on the same interfaces. However, for basic and advanced QoS, if an interface has an ACL applied to it, the only packets on that interface that are eligible for IP ToS-based QoS are the packets that match the permit ip any any ACL. A packet that matches any other ACL on the interface is not eligible for IP ToS-based QoS. This is true regardless of whether the ACLs are used for traffic filtering, for PBR, or for NAT. Nonetheless, you still can provide QoS for these packets using the ACL options listed in “Alternative QoS Methods” on page 3-5.

Note Regarding DSCP Processing for Traffic Forwarded by the CPU

In general, most traffic on a Routing Switch is forwarded in hardware. However, some traffic, including traffic forwarded on interfaces that have outbound ACLs, is sent to the CPU for forwarding. DSCP mapping is performed for traffic forwarded by the CPU on a Routing Switch, which can increase processing time.

Alternative QoS Methods

If you do not want to enable IP ToS-based QoS, you still can configure the device to prioritize and even mark packets. When ToS-based QoS is disabled, HP devices prioritize IP packets as follows:

- If the packet's internal forwarding priority is reset directly, the reset priority is used. You can directly reset a packet's internal forwarding priority based on any of the following:
  - Incoming port (sometimes called ingress port)
  - IP source and destination addresses
  - Layer 4 source and destination information (for all IP addresses or specific IP addresses)
  - Static MAC entry
  - AppleTalk socket number
  - Layer 2 port-based VLAN membership
  - 802.1q tag

  Resetting the priority has a local effect only. The priority controls the hardware forwarding queue the device uses to forward the packet but does not change the contents of the packet's 802.1p or IP ToS fields. For information about directly resetting the priority, see “Assigning QoS Priorities to Traffic” on page 2-10.
• If the packet matches an ACL that explicitly sets the priority, the priority specified by the ACL is used. You can set a packet's priority using the following ACL options:
  • **priority** – Assigns traffic that matches the ACL to a hardware forwarding queue. In addition to changing the internal forwarding priority, if the outgoing interface is an 802.1q interface, this option maps the specified priority to its equivalent 802.1p (CoS) priority and marks the packet with the new 802.1p priority.
  • **dscp-marking** – Marks the DSCP value in the outgoing packet with the value you specify.

If you use an ACL on an interface, ToS-based QoS assumes that the ACLs will perform QoS for all packets except the packets that match the `permit ip any any` ACL.

**NOTE:** These options are new beginning in software release 07.6.01b. See “QoS Options for IP ACLs” on page 5-10.

---

### Configuring ToS-Based QoS

To configure ToS-based QoS, perform the following tasks:

• Globally enable basic ToS-based QoS. This is the only required task for basic QoS. The interface-level tasks are required only if you want to configure advanced QoS features.

• Optionally, enable advanced ToS-based QoS on an interface. Once you enable the feature on an individual interface, you can configure the trust level and marking for traffic that is forwarded on that interface.
  • Optionally, specify the trust level for packets received on the interface.
  • Optionally, enable marking of packets received on the interface.

• Optionally, change the QoS mappings. You can change the following mappings:
  • CoS -> DSCP
  • IP Precedence -> DSCP
  • DSCP -> DSCP
  • DSCP -> internal forwarding priority

The mappings are globally configurable and apply to all interfaces.

### Enabling Advanced ToS-Based QoS

To enable advanced ToS-based QoS on an interface, enter the following command at the configuration level for the interface:

```
ProCurveRS(config-if-1/1)# qos-tos
```

**Syntax:** `[no] qos-tos`

**NOTE:** You must use this command if you want to configure the trust level or marking.

---

**NOTE:** When port priority is enabled, HP devices will use the higher of the 802.1p and DSCP priority for its internal system priority. To override this internal system priority, apply the `qos-tos mark cos` command on the interface where advanced ToS-based QoS was enabled. The true internal system priority will then be based on how the `qos-tos trust` command is configured on that interface. (See “Specifying the Trust Level” on page 3-7.)

If the port for incoming traffic is a tagged port, then the outgoing 802.1p priority will be the "merged" priority even though the type of marking configured on the interface is actually lower than the “merged” priority for that port. If the port for the incoming traffic is an untagged port and the port for outgoing traffic is an 802.1p port, then the
marking configured on these ports will be used. This is useful in the case where the port priority (via priority command under interface CLI) is higher and the user wants to mark all IP packets with a lower priority. Hence, the non-IP packets will continue to use the higher 802.1p priority.

### Specifying the Trust Level

The trust level specifies where you want the device to get the QoS value for a packet received on the interface.

To set the trust level for an interface to IP Precedence, enter the following command at the configuration level for the interface:

```
ProCurveRS(config-if-1/1)# qos-tos trust ip-prec
```

**Syntax:** `[no] qos-tos trust cos | ip-prec | dscp`

The `cos | ip-prec | dscp` parameter specifies the trust level.

- **cos** – The device uses the 802.1p (CoS) priority value in the packet's Ethernet frame header. Use this trust option when you plan to mark the packet's DSCP value based on the incoming 802.1p value.

  **NOTE:** This trust level is not supported on 10 Gigabit Ethernet modules.

- **ip-prec** – The device uses the three most-significant bits in the packet's ToS field and interprets them as an IP precedence value. Use this trust option when the incoming packet is from a device that does not support DSCP and you need to mark the packet for QoS on DSCP devices.

- **dscp** – The device uses the six most-significant bits in the packet's ToS field and interprets them as a DSCP value. This is the default.

This command enables marking of the 802.1p field in the Ethernet frame.

**Syntax:** `[no] qos-tos mark cos | dscp`

The `cos | dscp` parameter specifies the type of marking.

- **cos** – The device changes the outbound packet's 802.1p priority value to match the results of the device's QoS mapping from the specified trust level.

- **dscp** – The device changes the outbound packet's DSCP value to match the results of the device's QoS mapping from the specified trust level.

### Changing the QoS Mappings

The HP device maps a packet's 802.1p, IP Precedence, or DSCP value into a DSCP value, and maps that DSCP value to an internal forwarding priority. The default mappings are listed in “Default QoS Mappings” on page 3-3. To change QoS mappings, use the commands described in the following sections.

**NOTE:** The mappings are globally configurable and apply to all interfaces.

**NOTE:** To place a mapping change into effect, you must enter the `ip rebind-acl all` command at the global CONFIG level of the CLI after making the mapping change. This applies to mappings that are configured using the `qos-tos map` command.

### Changing the CoS --> DSCP Mappings

The CoS --> DSCP mappings are used if the trust level is CoS and DSCP marking is enabled.

To change the CoS --> DSCP mappings, enter commands such as the following at the global CONFIG level of the CLI:

```
ProCurveRS(config)# qos-tos map cos-dscp 0 33 25 49 17 7 55 41
ProCurveRS(config)# ip rebind-acl all
```

This command configures the mappings displayed in the COS-DSCP map portion of the QoS information display.
Advanced Configuration and Management Guide for ProCurve 9300/9400 Series Routing Switches

ProCurveRS(config-if-1/1)# show qos-tos

...portions of table omitted for simplicity...

COS-DSCP map:

<table>
<thead>
<tr>
<th>COS: 0 1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>dscp: 0 33 25 49 17 7 55 41</td>
</tr>
</tbody>
</table>

Syntax: [no] qos-tos cos-dscp <dscp0> <dscp1> <dscp2> <dscp3> <dscp4> <dscp5> <dscp6> <dscp7>

The <dscp1> ... <dscp8> parameters specify the DSCP values you are mapping to the eight CoS values. You must enter DSCP values for all eight CoS values, in order from CoS value 0 – 7.

Changing the IP Precedence --> DSCP Mappings

The IP precedence --> DSCP mappings are used if the trust level is IP Precedence and DSCP marking is enabled.

To change the IP precedence --> DSCP mappings, enter commands such as the following at the global CONFIG level of the CLI:

ProCurveRS(config)# qos-tos map ip-prec-dscp 0 32 24 48 16 8 56 40
ProCurveRS(config)# ip rebind-acl all

This command configures the mappings displayed in the IP Precedence-DSCP map portion of the QoS information display.

ProCurveRS(config-if-1/1)# show qos-tos

...portions of table omitted for simplicity...

IP Precedence-DSCP map:

<table>
<thead>
<tr>
<th>ip-prec: 0 1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>dscp: 0 32 24 48 16 8 56 40</td>
</tr>
</tbody>
</table>

For information about the rest of this display, see “Displaying Configuration Information”.

Syntax: [no] qos-tos map ip-prec-dscp <dscp1> <dscp2> <dscp3> <dscp4> <dscp5> <dscp6> <dscp7> <dscp8>

The <dscp1> ... <dscp8> parameters specify the DSCP values you are mapping to the IP precedence values. You must enter DSCP values for all eight IP precedence values, in order from IP precedence value 0 – 7.

Changing the DSCP --> DSCP Mappings

To change a DSCP --> DSCP mapping, enter a command such as the following at the global CONFIG level of the CLI:

ProCurveRS(config)# qos-tos map dscp-dscp 0 10
ProCurveRS(config)# ip rebind-acl all

This command changes the mapping of DSCP value 0 from 0 to 10.

Syntax: [no] qos-tos map dscp-dscp <old-dscp-value> ... to <new-dscp-value> ...

You can change up to eight DSCP values in the same command. Make sure you enter the old values and their new values in the same order.

Changing the DSCP --> Internal Forwarding Priority Mappings

To change the DSCP --> internal forwarding priority mappings for all the DSCP ranges, enter commands such as the following at the global CONFIG level of the CLI:

ProCurveRS(config)# qos-tos map dscp-priority 0 2 3 4 to 1
ProCurveRS(config)# qos-tos map dscp-priority 8 to 5
ProCurveRS(config)# qos-tos map dscp-priority 16 to 4
ProCurveRS(config)# qos-tos map dscp-priority 24 to 2
ProCurveRS(config)# qos-tos map dscp-priority 32 to 0
ProCurveRS(config)# qos-tos map dscp-priority 40 to 7
ProCurveRS(config)# qos-tos map dscp-priority 48 to 3
ProCurveRS(config)# qos-tos map dscp-priority 56 to 6
ProCurveRS(config)# ip rebind-acl all

These commands configure the mappings displayed in the DSCP to forwarding priority portion of the QoS information display. To read this part of the display, select the first part of the DSCP value from the d1 column and select the second part of the DSCP value from the d2 row. For example, to read the DSCP to forwarding priority mapping for DSCP value 24, select 2 from the d1 column and select 4 from the d2 row. The mappings that are changed by the command above are shown below in bold type.

ProCurveRS(config-if-1/1)# show qos-tos

...portions of table omitted for simplicity...

<table>
<thead>
<tr>
<th>d2</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>d1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For information about the rest of this display, see “Displaying Configuration Information” on page 3-10.

**Syntax:** [no] qos-tos map dscp-priority <dscp-value> [ <dscp-value> ] to <priority>

The <dscp-value> [ <dscp-value> ] parameter specifies the DSCP value ranges you are remapping. You can specify up to seven DSCP values in the same command, to map to the same forwarding priority. The first command in the example above maps priority 1 to DSCP values 0, 2, 3, and 4.

The <priority> parameter specifies the internal forwarding priority.

**Changing the Internal Forwarding Priority → Hardware Forwarding Queue Mappings**

To reassign an internal forwarding priority to a different hardware forwarding queue, enter a command such as the following at the global CONFIG level of the CLI:

ProCurveRS(config)# qos tagged-priority 2 qosp0

**Syntax:** [no] qos tagged-priority <num> <queue>

The <num> parameter can be from 0 – 7 and specifies the internal forwarding priority.

The <queue> parameter specifies the hardware forwarding queue to which you are reassigning the priority. The default queue names are as follows:

- qosp3
- qosp2
- qosp1
- qosp0
Displaying Configuration Information

To display configuration information, enter the following command at any level of the CLI:

```
ProCurveRS(config)# show qos-tos
```

Interface QoS, Marking and Trust Level:

<table>
<thead>
<tr>
<th>i/f</th>
<th>QoS</th>
<th>Mark</th>
<th>Trust-Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>3</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>5</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>6</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>7</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>8</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>9</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>10</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>... &lt;lines omitted for brevity&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>50</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>ve5</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>ve8</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>ve18</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>ve22</td>
<td>No</td>
<td>No</td>
<td>L2 CoS</td>
</tr>
<tr>
<td>COS-DSCP map:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```
COS: 0 1 2 3 4 5 6 7
```

```
dscp: 0 8 16 24 32 40 48 56
```
### Configuring Enhanced Quality of Service

**IP Precedence-DSCP map:**

```
ip-prec: 0 1 2 3 4 5 6 7
---------------------------------------------
dscp:  0 8 16 24 32 40 48 56
```

**DSCP-Priority map: (dscp = d1d2)**

```
d2| 0 1 2 3 4 5 6 7 8 9
d1 |
---------------------
  0 | 0 0 0 0 0 0 0 0 1 1
  1 | 1 1 1 1 1 1 2 2 2
  2 | 2 2 2 2 3 3 3 3 3
  3 | 3 3 4 4 4 4 4 4 4
  4 | 5 5 5 5 5 5 5 5 6
  5 | 6 6 6 6 6 6 7 7 7
  6 | 7 7 7 7
```

**DSCP-DSCP map: (dscp = d1d2)**

```
d2| 0 1 2 3 4 5 6 7 8 9
d1 |
---------------------
  0 | 0 1 2 3 4 5 6 7 8 9
  1 | 10 11 12 13 14 15 16 17 18 19
  2 | 20 21 22 23 24 25 26 27 28 29
  3 | 30 31 32 33 34 35 36 37 38 39
  4 | 40 41 42 43 44 45 46 47 48 49
  5 | 50 51 52 53 54 55 56 57 58 59
  6 | 60 61 62 63
```