QoS Monitoring

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QoS Monitoring

The QoS Monitoring feature describes the Quality of Service (QoS) through sample configuration examples. This document is for networking professionals who are responsible for the design, implementation, or administration of a network that includes a standalone Cisco Catalyst 3850 Series or a Cisco Catalyst 3850 Series Switch-stack, referred to as the switch-stack.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for QoS Monitoring

We recommend that you have basic knowledge about the concepts and terminology of Multi-Layer Switching (MLS) and Modular QoS CLI (MQC).

Note

The information in this document was created from devices configured in a lab environment. All devices used in this document had a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of the CLIs used in the configuration.

Supported Platforms

- Cisco Catalyst 3750 Series Switches
- Cisco Catalyst 3850 Series Switches

Restrictions for QoS Monitoring

QoS monitoring is applicable only for Wired components.
Information about QoS

Monitoring QoS Overview
QoS refers to the ability of a network to provide better service to various network traffic over different technologies such as, Asynchronous Transfer Mode (ATM), Ethernet and 802.1 networks, Frame Relay, IP-routed networks, and SONET.

QoS is a collection of technologies that allows applications to request and receive predictable service levels in terms of data throughput capacity (bandwidth), latency variations (jitter), and delay.

QoS Comparison
QoS configuration on Cisco Catalyst 3850 Series Switches uses the MQC (universal QoS configuration model) configuration instead of the MLS QoS (platform-dependent QoS) used in the Cisco Catalyst 3560 Series Switches and Cisco Catalyst 3750 Series Switches.

The following table lists the differences between the Cisco Catalyst 3750 Series Switches MLS QoS and Cisco Catalyst 3850 Series Switches MQC QoS:

<table>
<thead>
<tr>
<th>Switch Type</th>
<th>Cisco Catalyst 3750 Series Switch</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Structure</strong></td>
<td>MLS</td>
<td>MQC</td>
</tr>
<tr>
<td><strong>QoS default</strong></td>
<td>Disabled</td>
<td>Enabled</td>
</tr>
<tr>
<td><strong>Global Configuration</strong></td>
<td>• Supports MLS QoS</td>
<td>• Does not support MLS QoS</td>
</tr>
<tr>
<td></td>
<td>• Supports some of MQC at ingress</td>
<td></td>
</tr>
<tr>
<td><strong>Interface Configuration</strong></td>
<td>Supports MLS QoS configuration and some of MQC CLI at the ingress interface</td>
<td>Attaches the policy to the interface.</td>
</tr>
<tr>
<td><strong>Port trust default</strong></td>
<td>Disabled</td>
<td>Enabled</td>
</tr>
<tr>
<td><strong>Port Ingress</strong></td>
<td>• Classification</td>
<td>• Classification</td>
</tr>
<tr>
<td></td>
<td>• Policing</td>
<td>• Policing</td>
</tr>
<tr>
<td></td>
<td>• Marking</td>
<td>• Marking</td>
</tr>
<tr>
<td></td>
<td>• Queuing</td>
<td>• Queuing</td>
</tr>
<tr>
<td><strong>Port Egress</strong></td>
<td>Queuing</td>
<td></td>
</tr>
</tbody>
</table>
### QoS Model on a Cisco Catalyst 3750 Series Switch

The following illustration represents a QoS model on a Cisco Catalyst 3750 Series Switch:

**Figure 1: QoS model on a Cisco Catalyst 3750 Series Switch**

<table>
<thead>
<tr>
<th>Switch Virtual Interface (SVI) Ingress</th>
<th>SVI Egress</th>
<th>Trust Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classification</td>
<td>None</td>
<td>Must be applied to preserve Layer 2 and Layer 3 QoS marking</td>
</tr>
<tr>
<td>• Policing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Marking</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All packets are trusted (Layer 2 and Layer 3 QoS marking is preserved) by default, unless changed with an application of a specific policy map on the ingress or egress interface.
QoS Model on a Cisco Catalyst 3850 Series Switch

The following illustration represents a QoS model on a Cisco Catalyst 3850 Series Switch:

**Figure 2: QoS model on a Cisco Catalyst 3850 Series Switch**

### Ingress Features

The following table compares the various ingress features available on Cisco Catalyst 3750 Series and Cisco 3850 Series Switches:

**Table 2: Ingress Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Cisco Catalyst 3750 Series Switch</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
</table>
### Classification

Class-map matches:
- Differentiated Services Code Point (DSCP)
- Precedence
- Access Control List (ACL)
- Supports both match-all and match-any

Class-map matches:
- Class of Service (CoS)
- Precedence
- DSCP
- ACL
- VLAN

Supports only match-any.

### Marking (unconditional set)

- Set DSCP
- Precedence

- Set Cos
- Precedence
- DSCP
- QoS-group

### Marking (conditional Marking)

- DSCP mutation

- Class-default
- table-map

### Policing

- One-rate, two-color (1r2c)

- 1r2c and two-rate, three-color (2r3c)

### Policing markdown

Policing exceeds markdown. Only supports DSCP.

Policing exceeds and violates markdown. The markdown is supported through a table-map. Supports:
- CoS
- DSCP
- Precedence

### Aggregate Policing

Supports aggregate policing

Aggregate policing (one type of Hierarchal QoS [HQoS])

### Ingress Queuing

Supports only on 3750 but does not support on 3750x.

Does not support.

### Hierarchical QoS (HQoS)

VLAN based HQoS only

Port-based aggregate policing and per-VLAN.

### Egress Features

The following table compares the various egress features available on Cisco Catalyst 3750 Series and Cisco Catalyst 3850 Series Switches:
### Table 3: Egress Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Cisco Catalyst 3750 Series Switch</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Classification support for none queuing action</strong></td>
<td>Does not support</td>
<td>• CoS,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• precedence,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DSCP,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• QoS-group,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACL, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• VLAN</td>
</tr>
<tr>
<td><strong>Classification support for queuing action</strong></td>
<td>CoS and DSCP</td>
<td>• CoS,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• precedence,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DSCP,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• QoS-group,</td>
</tr>
<tr>
<td><strong>Marking</strong></td>
<td>Does not support</td>
<td>• Set CoS,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• precedence,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DSCP</td>
</tr>
<tr>
<td><strong>Policing</strong></td>
<td>Does not support</td>
<td>1r2c, 2r3c with exceed or violate markdown through table-map</td>
</tr>
<tr>
<td><strong>Maximum number of queues and queue types</strong></td>
<td>1-priority queue, 3-standard queues, 3-thresholds per standard queue (1P3Q3T) [4 queues]</td>
<td>2-priority queue, 6-standard queue, 3-threshold per standard queue (2P6Q3T) [up to 8 queues]</td>
</tr>
<tr>
<td></td>
<td>Expedite queue is the priority queue</td>
<td></td>
</tr>
<tr>
<td><strong>Egress Queuing</strong></td>
<td>• Share mode,</td>
<td>• Bandwidth,</td>
</tr>
<tr>
<td></td>
<td>• shape mode,</td>
<td>• bandwidth remaining,</td>
</tr>
<tr>
<td></td>
<td>• queue-limit,</td>
<td>• shaping,</td>
</tr>
<tr>
<td></td>
<td>• priority, and</td>
<td>• queue-limit,</td>
</tr>
<tr>
<td></td>
<td>• queue-buffer</td>
<td>• priority, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• queue-buffer</td>
</tr>
</tbody>
</table>
DSCP Transparency Mode

The Cisco Catalyst 3850 Series Switch supports DSCP transparency. The Cisco Catalyst 3850 Series Switch uses the DSCP field of a packet at egress. By default, DSCP transparency is disabled. The Cisco Catalyst 3850 Series Switch modifies the DSCP field in an incoming packet, and the DSCP field in the outgoing packet is based on the QoS configuration, including the port trust setting, policing and marking, and the x-to-DSCP AVV table.

If DSCP transparency is enabled by using the `no qos rewrite ip dscp` command, the Cisco Catalyst 3850 Series Switch does not modify the DSCP field in the incoming packet, and the DSCP field in the outgoing packet is the same as that in the incoming packet.

Regardless of the DSCP transparency configuration, the Cisco Catalyst 3850 Series Switch modifies the internal QoS label of the packet, based on the configured QoS policy. The Cisco Catalyst 3850 Series Switch also uses the internal QoS label to select an egress queue and threshold.

How to Enable QoS Monitoring

Verifying QoS Configuration on a Cisco Catalyst 3750 Series Switch

Use the following commands to verify the QoS configuration on a Cisco Catalyst 3750 Series Switch:

### Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Step 1 | `enable` | Enables privileged EXEC mode.  
* Enter your password if prompted. |
<p>| Example: | Device&gt; enable | |
| Step 2 | <code>show running-config class-map</code> | Displays information about the configured class maps. |
| Example: | Device# show running-config class-map {class-map-name} | |
| Step 3 | <code>show running-config policy-map</code> | Displays the information about the configured policy maps. |
| Example: | Device# show running-config policy-map {policy-map-name} | |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 4</strong></td>
<td><code>show policy-map interface</code></td>
<td>Displays statistics and configurations of the input and output policies that are attached to an interface.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Device# <code>show policy-map interface [interface-type-number]</code></td>
<td></td>
</tr>
</tbody>
</table>
| **Step 5** | `show mls qos maps` | Displays multilayer switching (MLS) QoS information. The following options can be used with the `show mls qos maps` command:  
- `cos-dscp`  
- `cos-mutation`  
- `dscp-cos`  
- `dscp-exp`  
- `dscp-mutation`  
- `exp-dscp`  
- `exp-mutation`  
- `ip-prec-dscp`  
- `policed-dscp` |
| **Example:** | Device# `show mls qos maps` | |
| **Step 6** | `show mls qos queue-set` | Displays QoS settings for the egress queues. |
| **Example:** | Device# `show mls qos queue-set` | |
| **Step 7** | `show mls qos interface queuing` | Displays the queuing statistics of an interface. |
| **Example:** | Device# `show mls qos interface [interface-type-number] queuing` | |
| **Step 8** | `show platform port-asic stats drop statistics` | Displays platform-dependent port application-specific integrated circuit (ASIC) register information. |
| **Example:** | Device# `show platform port-asic stats drop [interface-type-number] statistics` | |
| **Step 9** | `show mls qos aggregate-policer` | Displays information about the aggregate policer for MLS QoS. |
| **Example:** | Device# `show mls qos aggregate-policer` | |

**Verifying QoS Configuration on a Cisco Catalyst 3850 Series Switch**

Use the following commands to verify the QoS configuration on a Cisco Catalyst 3850 Series Switch:
## Procedure

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>Example: Device&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td>Step 2</td>
<td>show running-config class-map</td>
<td>Displays class map information.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show running-config class-map [class-map-name]</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>show running-config policy-map</td>
<td>Displays the policy-map configuration.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show running-config policy-map [policy-map-name]</td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td>show table-map</td>
<td>Displays the configuration of a specified table map or all table maps.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show table-map [table-map-name]</td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td>show policy-map interface</td>
<td>Displays the statistics and the configurations of the input and output policies that are attached to an interface.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show policy-map interface [interface-type-number]</td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td>show platform software fed switch 1 qos policy target status</td>
<td>Displays information about QoS policy status.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show platform software fed switch 1 qos policy target status</td>
<td>Note: fed = Forwarding Engine Driver</td>
</tr>
<tr>
<td>Step 7</td>
<td>show platform hardware fed switch 1 qos queue configuration interface type</td>
<td>Displays the port queue configuration information.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show platform hardware fed switch 1 qos queue configuration interface gigabitEthernet 1/0/1</td>
<td></td>
</tr>
<tr>
<td>Step 8</td>
<td>show platform hardware fed switch 1 qos queue stats interface type</td>
<td>Displays the port queue statistics.</td>
</tr>
<tr>
<td></td>
<td>Example: Device# show platform hardware fed switch 1 qos queue stats interface gigabitEthernet 1/0/1</td>
<td></td>
</tr>
</tbody>
</table>

### Enabling DSCP Transparency Mode

Perform this task to enable DSCP transparency mode on a Cisco Catalyst 3850 Series Switch:
### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> qos rewrite ip dscp</td>
<td>Enables QoS globally.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config)# qos rewrite ip dscp</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> no qos rewrite ip dscp</td>
<td>Enables DSCP transparency.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config)# no qos rewrite ip dscp</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> end</td>
<td>Exits the global configuration and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td>Device(config)# end</td>
<td></td>
</tr>
</tbody>
</table>

### Examples for QoS Monitoring

**Example: Displaying Port Queue Statistics**

⚠️ **Caution**

The show commands used in this document are for troubleshooting purposes. Use the commands with caution.

The show platform commands are typically reserved for Cisco TAC personnel and are subject to change without notice.

The following sample output from the `show platform hardware fed switch 1 qos queue statistics interface gigabitethernet` command displays the port queue statistics:

```
Device# show platform hardware fed switch 1 qos queue stats interface gigabitEthernet 1/0/1
DATA Port:21 Enqueue Counters
-------------------------------
Queue Buffers Enqueue-TH0 Enqueue-TH1 Enqueue-TH2
----- ------ ----------- -----------
```


DATA Port:21 Drop Counters

<table>
<thead>
<tr>
<th>Queue</th>
<th>Drop-TH0</th>
<th>Drop-TH1</th>
<th>Drop-TH2</th>
<th>SBufDrop</th>
<th>QebDrop</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

AQM Broadcast Early WTD COUNTERS (In terms of Bytes)

<table>
<thead>
<tr>
<th>PORT TYPE</th>
<th>ENQUEUE</th>
<th>DROP</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPLINK PORT-0</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>UPLINK PORT-1</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>UPLINK PORT-2</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>UPLINK PORT-3</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>NETWORK PORTS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RCP PORTS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CPU PORT</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note**
The queuing statistics are in bytes.

**Table 4: Field description**

<table>
<thead>
<tr>
<th>Drop-TH0</th>
<th>Refers to packet drop due to crossing Threshold0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop-TH1</td>
<td>Refers to packet drop due to crossing Threshold1</td>
</tr>
<tr>
<td>Drop-TH2</td>
<td>Refers to packet drop due to crossing Threshold2</td>
</tr>
</tbody>
</table>

**Example: Displaying Target Port Type**

**Caution**
The show platform commands are typically reserved for Cisco TAC personnel and are subject to change without notice.

The following sample output from the `show platform software fed switch 1 qos policy target status` command displays the target port type:

```
Device# show platform software fed switch 1 qos policy target status
TCG status summary:
Loc Interface IIF-ID Dir State:(cfg,opr) Policy
--- --------------------- ---------------- --- --------------- --------------------
L:0 GigabitEthernet1/0/1 0x0000000000000000 OUT VALID,SET_INHW police
```
Example: Displaying Queue Configuration

Caution  The show platform commands are typically reserved for Cisco TAC personnel and are subject to change without notice.

Note  The show platform hardware fed switch 1 qos queue configuration interface command displays the differences in buffers and threshold settings. The values may not be representative of customer scenarios.

The following sample output from the show platform hardware fed switch 1 qos queue configuration interface command displays the queue configuration information:

```
Device# show platform hardware fed switch 1 qos queue configuration interface gigabitEthernet1/0/1

DATA Port:21 GPN:1 AFD:Disabled QoSMap:0 HW Queues: 168 - 175
DrainFast:Disabled PortSoftStart:1 - 1080
----------------------------------------------------------
DTS Hardmax Softmax PortSMin GlblSMin PortStEnd
--- -------- -------- -------- --------- ---------
0 1 5 120 6 480 6 320 0 0 3 1440
1 1 4 0 7 720 3 480 2 180 3 1440
2 1 4 0 5 0 5 0 0 0 3 1440
3 1 4 0 5 0 5 0 0 0 3 1440
4 1 4 0 5 0 5 0 0 0 3 1440
5 1 4 0 5 0 5 0 0 0 3 1440
6 1 4 0 5 0 5 0 0 0 3 1440
7 1 4 0 5 0 5 0 0 0 3 1440
Priority Shaped/shared weight shaping_step
---------- ---------- ----------
0 Shared 0 0 50 0
1 Shared 0 75 0
2 Shared 10000 24
3 Shared 10000 255
4 Shared 10000 96
5 Shared 10000 255
6 Shared 10000 0
7 Shared 10000 0
Weight0 Max_Th0 Min_Th0 Weigh1 Max_Th1 Min_Th1 Weight2 Max_Th2 Min_Th2
---------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
0 0 478 0 0 534 0 0 600 0
1 0 573 0 0 641 0 0 720 0
2 0 0 0 0 0 0 0 0 0
3 0 0 0 0 0 0 0 0 0
4 0 0 0 0 0 0 0 0 0
5 0 0 0 0 0 0 0 0 0
6 0 0 0 0 0 0 0 0 0
7 0 0 0 0 0 0 0 0 0
```

Example: Displaying Port-Shaper Information

Use the following commands to display the port-shaper information:

```
Device# show running-config class-map class_dscp

class-map match-any class_dscp
match dscp af11

Device# show running-config class-map dscp2

class-map match-any dscp2
```
match dscp af12

Device# show running-config policy-map child

policy-map child
class class_dscp
  bandwidth percent 25
class dscp2
  bandwidth percent 25

Device# show running-config policy-map port_shaper

policy-map port_shaper
class class-default
  shape average percent 40
  service-policy child

Device# show running-config interface gigabitEthernet1/0/1

interface GigabitEthernet1/0/1
service-policy output port_shaper

Device# show policy-map interface gigabitEthernet1/0/1

GigabitEthernet1/0/1
Service-policy output: port_shaper

Class-map: class-default (match-any)
  10 packets
  Match: any
  Queueing
    (total drops) 0
    (bytes output) 350
  shape (average) cir 400000000, bc 4000000, be 4000000
  target shape rate 400000000
Service-policy : child
Class-map: class_dscp (match-any)
  0 packets
  Match: dscp af11 (10)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
    (total drops) 0
    (bytes output) 0
    bandwidth 25% (100000 kbps)
Class-map: dscp2 (match-any)
  0 packets
  Match: dscp af12 (12)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
    (total drops) 0
    (bytes output) 0
    bandwidth 25% (100000 kbps)
Class-map: class-default (match-any)
  10 packets
  Match: any
    (total drops) 0
    (bytes output) 350
### Example: Disabling QoS

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>No MLS QoS</td>
<td>Two queues:</td>
<td>No policy is installed on an egress interface. Control packets in queue 0 and data packets in queue 1</td>
</tr>
<tr>
<td></td>
<td>• Control packets in queue 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Data packets in queue 4</td>
<td></td>
</tr>
</tbody>
</table>

### Disabling QoS-Cisco Catalyst 3750 Series Switch

Device# `show mls qos`

QoS is disabled
QoS ip packet dscp rewrite is enabled

Device# `show mls qos interface gigabitEthernet 1/0/1 statistics`

output queues enqueued:

```plaintext
queue:  threshold1  threshold2  threshold3
queue 0:        4           0           0  <- control
queue 1:        0           0           0  <- data
queue 2:        0           0           0
queue 3:        0           0           0
```

output queues dropped:

```plaintext
queue:  threshold1  threshold2  threshold3
queue 0:        0           0           0  <- control
queue 1:        0           0           0  <- data
queue 2:        0           0           0
queue 3:        0           0           0
```

Policer: Inprofile: 0  OutofProfile:

### Disabling QoS-Cisco Catalyst 3850 Series Switch

⚠️ **Caution** The show platform commands are typically reserved for Cisco TAC personnel and are subject to change without notice.

Device# `show running-config interface gigabitEthernet1/0/1`

Device# `show platform hardware fed switch 1 qos queue stats interface gigabitEthernet 1/0/1`

DATA Port:21 GPN:1 AFD:Disabled QoSMap:0 HW Queues: 168 - 175

DrainFast:Disabled PortSoftStart:1 - 600

<table>
<thead>
<tr>
<th>DTS Hardmax</th>
<th>Softmax</th>
<th>PortSMin</th>
<th>GlobSMin</th>
<th>PortStEnd</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 5</td>
<td>120 6</td>
<td>480 0</td>
<td>0 0 0</td>
<td>800       &lt;- control</td>
</tr>
<tr>
<td>1 1 4</td>
<td>0 7 720</td>
<td>2 480 2</td>
<td>180 2</td>
<td>800       &lt;- data</td>
</tr>
<tr>
<td>2 1 4</td>
<td>0 5</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>800</td>
</tr>
<tr>
<td>3 1 4</td>
<td>0 5</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>800</td>
</tr>
<tr>
<td>4 1 4</td>
<td>0 5</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>800</td>
</tr>
<tr>
<td>5 1 4</td>
<td>0 5</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>800</td>
</tr>
<tr>
<td>6 1 4</td>
<td>0 5</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td>800</td>
</tr>
</tbody>
</table>
Example: Enabling Trust CoS

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
</table>

Enabling Trust CoS-Cisco Catalyst 3750 Series Switch

Global config:
Device(config)# mls qos

Interface config:
Device# interface GigabitEthernet1/0/1
Device(config-if)# mls qos trust cos

Device# show mls qos
QoS is enabled
QoS ip packet dscp rewrite is enabled

Device# show mls qos interface gigabitEthernet1/0/1

GigabitEthernet1/0/1
trust state: trust cos
trust mode: trust cos
trust enabled flag: ena
COS override: dis
default COS: 0
DSCP Mutation Map: Default DSCP Mutation Map
Trust device: none
goos mode: port-based

Device# show mls qos maps cos-output-q

Cos-outputq-threshold map:
cos: 0 1 2 3 4 6 7
---------------------------------------------------------------
queue-threshold: 2-1 2-1 3-1 3-1 4-1 1-1 4-1 4-1
Enabling Trust CoS-Cisco Catalyst 3850 Series Switches

Ingress: apply policy-map trust-cos
Egress: create class based on cos and have queuing action for each class

Interface configuration:
Device(config)# interface GigabiEthernet1/0/1
Device(config-if)# service-policy input <policy-name>

Ingress policy:
Device# show running-config policy-map trust-cos

class class-default
  set cos cos table default

Device# show table-map default

Table Map default
default copy

Egress policy:
Device# show running-config policy-map example2

class cos5
  bandwidth percent 15
class cos0_1
  bandwidth percent 25
class cos2_3
  bandwidth percent 40
class cos4_6_7
  bandwidth percent 20

Device# show running-config class-map cos5

class=map match-any cos5
  match cos 5

Device# show running-config class-map cos0_1

class=map match-any cos0_1
  match cos 0
  match cos 1

Device# show running-config class-map cos2_3

class=map match-any cos2_3
  match cos 2
  match cos 3

Device# show running-config class-map cos4_6_7

class=map match-any cos4_6_7
  match cos 4
  match cos 6
  match cos 7

Example: Enabling Trust DSCP

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
</table>

Note: cos value 0 maps to 2-1 [queue-set1 : queue2 threshold 1]
MLS QoS | MLS QoS trust Differentiated Services Code Point (DSCP) interface (based on the default DSCP-mapping to the queue-set 1) | • Input default trusts DSCP  
• Egress queuing policy based on DSCP

Enabling Trust DSCP-Cisco Catalyst 3750 Series Switch

Device# configure terminal
Device(config)# mls qos
Device(config-if)# interface GigabitEthernet1/0/1
Device(config-if)# mls qos trust dscp

Device# show mls qos interface gigabitEthernet 1/0/1

GigabitEthernet1/0/1
trust state: trust dscp
trust mode: trust dscp
trust enabled flag: ena
COS override: dis
default COS: 0
DSCP Mutation Map: Default DSCP Mutation Map
Trust device: none
qos mode: port-based

Device# show mls qos maps dscp-output-q

Dscp-outputq-threshold map:
<table>
<thead>
<tr>
<th>d0</th>
<th>d1</th>
<th>d2</th>
<th>d3</th>
<th>d4</th>
<th>d5</th>
<th>d6</th>
<th>d7</th>
<th>d8</th>
<th>d9</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>02-01 02-01 02-01 02-01 02-01 02-01 03-01 03-01 03-01 03-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>03-01 03-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enabling Trust DSCP-Cisco Catalyst 3850 Series Switch

Note

Ingress: Default trust DSCP, no policy needed.

Egress: Use DSCP as classification and add queuing action based on customer need.

One Sample config:

Policy-map:
Device# show running-config policy-map dscp-shape

class dscp56
  shape average percent 10
class dscp48
  shape average percent 11
class dscp40
  shape average percent 12
class dscp32
  shape average percent 13
Class-map:

Device# show running-config class-map dscp56

class-map match-any dscp56
  match dscp cs7
Device# show running-config class-map dscp48
  class-map match-any dscp48
    match dscp cs6
Device# show running-config class-map dscp40
  class-map match-any dscp40
    match dscp cs5
Device# show running-config class-map dscp32
  class-map match-any dscp32
    match dscp cs4

Example: Enabling QoS on an Interface that has a set Policy

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLQoS</td>
<td>Interface input policy with set action to mark the CoS or DSCP value or both. (Marked value will be used for egress mapping)</td>
<td>Need explicit egress policy to do queuing mapping.</td>
</tr>
</tbody>
</table>

Enabling QoS on an Interface that has a set Policy-Cisco Catalyst 3750 Series Switch

Device# show running-config class-map dscp-1
  class-map match-any dscp-1
    match ip dscp 1
Device# show running-config policy-map set-dscp-63
  class dscp-1
    set dscp 63
Device# show running-config interface fastEthernet7/0/2
  interface FastEthernet7/0/2
    mls qos trust dscp
    service-policy input set-dscp-63
Device# show policy-map int fastEthernet7/0/2
  FastEthernet7/0/2
  Service-policy input: set-dscp-63
  Class-map: dscp-1 (match-any)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match: ip dscp 1
  Class-map: class-default (match-any)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps

Note: Packets come in interface fa7/0/2, dscp1 will be marked to dscp63 which mapping
based on the existing mapping table, other pkts will retain original dscp value mapping accordingly

### Enabling QoS on an Interface that has a set Policy—Cisco Catalyst 3850 Series Switch

**Note**

Input will be the same as Cisco Catalyst 3750 configuration. For the egress interface, queuing action is added under class dscp-63.

Device# `show running-config class-map dscp-1`

```bash
class-map match-any dscp-1
match ip dscp 1
```

Device# `show running-config policy-map set-dscp-63`

```bash
policy-map set-dscp-63
class dscp-1
  set dscp 63
```

Device# `show running-config interface gigabitEthernet1/0/2`

```bash
interface GigabitEthernet1/0/2
service-policy input set-dscp-63
```

Device# `show policy-map interface gigabitEthernet1/0/2`

```bash
GigabitEthernet1/0/2
Service-policy input: set-dscp-63

Class-map: dscp-1 (match-any)
  0 packets
  Match: ip dscp 1
  0 packets, 0 bytes
  5 minute rate 0 bps
  QoS Set
dscp 63

Class-map: class-default (match-any)
  0 packets
  Match: any
```

### Example: Enabling No MLS QoS Trust on an Interface

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MLS QoS</strong></td>
<td>• Interface does not configure MLS QoS trust CoS or DSCP.</td>
<td>• Interface input policy with class-default.</td>
</tr>
<tr>
<td></td>
<td>• CoS or DSCP will be set to 0.</td>
<td>• Set DSCP 0, output policy with class DSCP 0 with queuing action.</td>
</tr>
</tbody>
</table>
Enabling No MLS QoS Trust on an Interface-Cisco Catalyst 3750 Series Switch

Global:
Device(config)# mls qos

Interface:
interface GigabitEthernet2/0/45

Enabling No MLS QoS Trust on an Interface-Cisco Catalyst 3850 Series Switch

Input policy:
Device# show running-config policy-map example5-input
class class-default
  set dscp default

Output policy:
Device# show running-config policy-map example5-output
class dscp0
  shape average percent 10 <- queuing action based on customer need

Attach to the ingress port:
Device# show running-config interface gigabitEthernet1/0/1
interface GigabitEthernet1/0/1
  service-policy input example5-input

Attach to the egress port:
Device# show running-config interface gigabitEthernet1/0/2
interface GigabitEthernet1/0/2
  service-policy output example5-output

Example: Enabling Change CoS or DSCP Queue Mapping

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS trust CoS, MLS QoS trust DSCP. Input policy with set action to mark the DSCP value, and No MLS QoS trust config [both CoS/DSCP will be set zero] will use the new mapping table. (CoS 4 and 5 will be mapped to queue 1 threshold 3)</td>
<td>Egress explicit classification with queuing action.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>SRR = Shaped Round Robin</td>
</tr>
</tbody>
</table>

Enabling Change CoS or DSCP Queue Mapping-Cisco Catalyst 3750 Series Switch

Device(config)# mls qos srr-queue mapping configuration

Before Enabling Change CoS or DSCP Queue Mapping:
Device# show mls qos maps cos-output-q

Cos-outputq-threshold map:
cos: 0 1 2 3 4 5 6 7
---------------------------------
queue-threshold: 2-1 2-1 3-1 3-1 4-1 1-1 4-1 4-1

User configuration mapping:
Device(config)# mls qos srr-queue output cos-map queue 3 threshold 3 0

New mapping table after configuration:
Device# show mls qos maps cos-output-q

Cos-outputq-threshold map:
<table>
<thead>
<tr>
<th>cos:</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>queue-threshold:</td>
<td>3-3</td>
<td>2-1</td>
<td>3-1</td>
<td>3-1</td>
<td>4-1</td>
<td>1-1</td>
<td>4-1</td>
<td>4-1</td>
</tr>
</tbody>
</table>

Enabling Change CoS or DSCP Queue Mapping-Cisco Catalyst 3850 Series Switch

Input : need apply trust-cos policy:
Device# show running-config policy-map trust-cos

  class class-default
    set cos cos table default

Device# show table-map default
  Table Map default
    default copy

Egress policy:

Before changing mapping:
Sample config:
Device# show running-config policy-map example2

  class cos5
    bandwidth percent 15
  class cos0_1
    bandwidth percent 25
  class cos2_3
    bandwidth percent 40
  class cos4_6_7
    bandwidth percent 20

Device# show running-config class-map cos5

  class-map match-any cos5
    match cos 5

Device# show running-config class-map cos0_1

  class-map match-any cos0_1
    match cos 0
    match cos 1

Device# show running-config class-map cos2_3

  class-map match-any cos2_3
    match cos 2
    match cos 3

Device# show running-config class-map cos4_6_7

  class-map match-any cos4_6_7
    match cos 4
    match cos 6
    match cos 7

After mapping changing, corresponding sample configuration:
Device# show running-config policy-map example6

  class cos5
    bandwidth percent 15
  class cos1
    bandwidth percent 25
  class cos0_2_3
    bandwidth percent 40
class cos4_6_7
    bandwidth percent 20

Device# show class-map cos5
Class Map match-any cos5 (id 25)
    Match cos 5

Device# show running-config class-map cos1
class-map match-any cos1
    match cos 1

Device# show running-config class-map cos0_2_3
class-map match-any cos0_2_3
    match cos 0
    match cos 2
    match cos 3

Device# show running-config class-map cos4_6_7
class-map match-any cos4_6_7
    match cos 4
    match cos 6
    match cos 7

Device# show policy-map interface gigabitEthernet1/0/1

Example: Enabling MLS with DSCP Mutation

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS DSCP Mutation</td>
<td>• Interface needs MLS QoS trust DSCP configuration.</td>
<td>Interface input policy with table-map mapping different DSCP</td>
</tr>
<tr>
<td></td>
<td>• MLS QoS DSCP-mutation name (name is defined in global).</td>
<td></td>
</tr>
</tbody>
</table>

Enabling MLS with DSCP Mutation-Cisco Catalyst 3750 Series Switch

Device(config)# mls qos map dscp-mutation dscp-mutation 0 1 to 63
Device(config)# mls qos map dscp-mutation dscp-mutation 2 3 to 62

Device# show mls qos maps dscp-mutation
Dscp-dscp mutation map:
dscp-mutation:
d1 : d2 0 1 2 3 4 5 6 7 8 9
----------------------------------------
0 : 63 63 62 62 04 05 06 07 08 09
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
Dscp-dscp mutation map:
Default DSCP Mutation Map:
d1 : d2 0 1 2 3 4 5 6 7 8 9
---------------------------------------
0 : 00 01 02 03 04 05 06 07 08 09
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

Interface config:
interface FastEthernet7/0/3
description trust dscp
mls qos trust dscp
mls qos dscp-mutation dscp-mutation

Device# show mls qos interface fastEthernet7/0/3

FastEthernet7/0/3
trust state: trust dscp
trust mode: trust dscp
trust enabled flag: ena
COS override: dis
default COS: 0
DSCP Mutation Map: dscp-mutation
Trust device: none
qos mode: port-based

Interface using default dscp-table:

Device# show mls qos interface gigabitEthernet3/0/1

GigabitEthernet3/0/1
trust state: not trusted
trust mode: not trusted
trust enabled flag: ena
COS override: dis
default COS: 0
DSCP Mutation Map: Default DSCP Mutation Map
Trust device: none
qos mode: port-based

---

Note: d1 and d2 are combined to form the 1st and 2nd digit in the original DSCP value and that they intersect at the marked down DSCP value.

---

Enabling MLS with DSCP Mutation-Cisco Catalyst 3850 Series Switch

---

Note:
- Ingress: Apply policy with DSCP table-map
- Egress: Classify on new DSCP value with queuing action

---

Ingress:
Device# show table-map dscp-2-dscp
Table Map dscp-2-dscp
from 0 to 63
from 1 to 63
from 2 to 62
Example: Enabling Aggregate Policing

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS aggregate policing.</td>
<td>Needs interface level configuration.</td>
<td>Cisco Catalyst 3850 Series Switch does not support named aggregate policers. However, aggregate policing can be achieved using a hierarchical policy as described in the example described below.</td>
</tr>
<tr>
<td>(All classes using the aggregate-policing will share the policing rate.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mls QoS aggregate-policer agg_traffic 8000 8000 exceed-action drop</td>
<td>Interface having policy which has agg_traffic as aggregate policer name.</td>
<td></td>
</tr>
</tbody>
</table>

Enabling Aggregate Policing-Cisco Catalyst 3750 Series Switch

Global:
mls qos aggregate-policer agg_traffic 8000 8000 exceed-action drop

Access-list:
access-list 1 permit 192.168.0.0 0.0.0.255
access-list 2 permit 10.0.0.0 0.0.0.255

Class-map:
class-map match-all agg1
match access-group 1
class-map match-all agg2
match access-group 2

Policy-map:
policy-map agg_policer
class agg1
set dscp 40
police aggregate agg_traffic
class agg2
set dscp 55
police aggregate agg_traffic

Note: class agg1 and agg2 will share the same policing rate

Device# show mls qos aggregate-policer
aggregate-policer agg_traffic 8000 8000 exceed-action drop

Device# show mls qos interface gigabitEthernet 1/0/2 policers
GigabitEthernet1/0/2
policymap-agg_policer
Device# show mls qos interface gigabitEthernet 1/0/2 statistics
GigabitEthernet1/0/2 (All statistics are in packets)

dscp: incoming
-------------------------------
<table>
<thead>
<tr>
<th>dscp</th>
<th>0 - 4</th>
<th>5</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 - 9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10 - 14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>15 - 19</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>20 - 24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>25 - 29</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>30 - 34</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>35 - 39</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>40 - 44</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>45 - 49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>91</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50 - 54</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>55 - 59</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>60 - 64</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

dscp: outgoing
-------------------------------
<table>
<thead>
<tr>
<th>dscp</th>
<th>0 - 4</th>
<th>5</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 - 9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10 - 14</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>15 - 19</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>20 - 24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>25 - 29</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>30 - 34</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>35 - 39</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>40 - 44</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>45 - 49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>91</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50 - 54</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>55 - 59</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>60 - 64</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

cos: incoming
-------------------------------
<table>
<thead>
<tr>
<th>cos</th>
<th>0 - 4</th>
<th>226</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 - 7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

cos: outgoing
-------------------------------
<table>
<thead>
<tr>
<th>cos</th>
<th>0 - 4</th>
<th>8</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 - 7</td>
<td>0</td>
<td>91</td>
<td>127</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

output queues enqueued:
queue: threshold1 threshold2 threshold3
-----------------------------------------------
queue 0: 2 0 0
queue 1: 0 6 218
queue 2: 0 0 0
queue 3: 0 0 0

output queues dropped:
queue: threshold1 threshold2 threshold3
-----------------------------------------------
queue 0: 0 0 0
queue 1: 0 0 0
queue 2: 0 0 0
queue 3: 0 0 0

Policer: Inprofile: 11 OutofProfile: 0

Enabling Aggregate Policing-Cisco Catalyst 3850 Series Switch

Device# show running-config class-map dscp1
class-map match-any dscp1
match dscp af11

Device# show running-config class-map dscp2

class-map match-any dscp2
match dscp af12

Device# show running-config policy-map child

policy-map child
class dscp1
set cos 5
class dscp2
set cos 7
class class-default
    set precedence 6

Device# show running-config class-map vlan18

class-map match-any vlan18
match vlan 18

Device# show running-config policy-map agg_policing

policy-map agg_policing
class vlan18
    police rate percent 50
    service-policy child
class class-default

Device# show running-config interface gigabitEthernet1/0/1

interface GigabitEthernet1/0/1
    service-policy input agg_policing

Device# show policy-map interface gigabitEthernet1/0/1

GigabitEthernet1/0/1
    Service-policy input: agg_policing
        Class-map: vlan18 (match-any)
            0 packets
            Match: vlan 18
            0 packets, 0 bytes
            5 minute rate 0 bps
            police:
                rate 50 %
                rate 500000000 bps, burst 15625000 bytes
                conformed 0 bytes; actions:
                    transmit
                exceeded 0 bytes; actions:
                    drop
                conformed 0000 bps, exceeded 0000 bps

        Service-policy : child
        Class-map: dscp1 (match-any)
            0 packets
            Match: dscp af11 (10)
                0 packets, 0 bytes
                5 minute rate 0 bps
                QoS Set
                    cos 5

        Class-map: dscp2 (match-any)
            0 packets
            Match: dscp af12 (12)
                0 packets, 0 bytes
                5 minute rate 0 bps
                QoS Set
                    cos 7
**Example: Enabling Policing Remark**

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS map policed-DSCP x-to-y</td>
<td>If the interface has a policing policy, exceed is transmit, the global CLI will take effect (input only).</td>
<td>One table-map for exceed and one for violate action of policing, input, and output.</td>
</tr>
</tbody>
</table>

**Note** Only one table-map for exceed and one table-map for violate police action is supported in the system regardless of the direction.

---

**Enabling Policing Remark-Cisco Catalyst 3750 Series Switch**

Default policed-dscp map:
Device# show mls qos map policed-dscp

Policed-dscp map:
d1 : d2 0 1 2 3 4 5 6 7 8 9
                        --------------------
0 : 00 01 02 03 04 05 06 07 08 09
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

User define policed-dscp map:

Device(config)# mls qos map policed-dscp 0 10 18 24 46 to 8
Device(config)# exit
Device# show mls qos map policed-dscp

Policed-dscp map:
d1 : d2 0 1 2 3 4 5 6 7 8 9
                        --------------------
0 : 08 01 02 03 04 05 06 07 08 09
1 : 08 11 12 13 14 15 16 17 08 19
2 : 20 21 22 23 08 25 26 27 08 29
3 : 30 31 32 33 34 35 36 37 38 39
4 : 40 41 42 43 44 45 08 47 48 49
5 : 50 51 52 53 54 55 56 57 58 59
6 : 60 61 62 63

Policy config:
class-map match-all policed-dscp
match access-group 2
class policed-dscp
police 8000 8000 exceed-action policed-dscp-transmit

Attach the above policy at ingress:

**Note** Remark table can be used by policing and interface policing as long as exceed action is transmit.
d1 and d2 are combined to form the 1st and 2nd digit in the original DSCP value and that they intersect at the marked down DSCP value.

Enabling Policing Remark-Cisco Catalyst 3850 Series Switch

Device(config)# table-map policed-dscp
Device(config-tablemap)# map from 0 to 8
Device(config-tablemap)# map from 10 to 8
Device(config-tablemap)# map from 18 to 8
Device(config-tablemap)# map from 24 to 8
Device(config-tablemap)# map from 46 to 8
Device(config-tablemap)# end
Device# show table-map policed-dscp

Table Map policed-dscp
from 0 to 8
from 10 to 8
from 18 to 8
from 24 to 8
from 46 to 8
default copy

Device# show policy-map policed-dscp

Policy Map policed-dscp
Class class-default
  police cir percent 10
  conform-action transmit
  exceed-action set-dscp-transmit dscp table policed-dscp

Cisco Catalyst 3850 Series Switch does not support remark statistics

Example: Enabling Queue-Limit Configuration

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MLS QoS queue-set output 1 threshold 1100 100 50 200 (queue-limit)</strong></td>
<td>Interface configuration queue-set (Default is queue-set 1)</td>
<td>Egress queuing policy with queuing action and queue-limit configuration.</td>
</tr>
<tr>
<td>[1 -&gt;queue-set 1, 1-&gt;first queue, 100 -&gt;threshold 1, 100 -&gt;threshold 2, 50 -&gt; reserved buffer, 200 -&gt; max threshold,</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Enabling Queue Limit Configuration-Cisco Catalyst 3750 Series Switch

Global config:

```mls qos srr-queue output cos-map queue queue-id { cos1...cos8 | threshold threshold-id cos1...cos8 }
mls qos srr-queue output cos-map queue 2 threshold 1 2
mls qos srr-queue output cos-map queue 2 threshold 2 3
mls qos srr-queue output cos-map queue 2 threshold 3 6 7```

Device> show mls qos interface [interface-id] [buffers | queueing | statistics] [ | {begin | exclude | include} expression]
Device> show mls qos interface gigabitethernet1/0/2 statistics

GigabitEthernet1/0/2

dscp: incoming
-------------------------------
0 - 4 : 4213 0 0 0 0 0
5 - 9 : 0 0 0 0 0 0
10 - 14 : 0 0 0 0 0 0
15 - 19 : 0 0 0 0 0 0
20 - 24 : 0 0 0 0 0 0
25 - 29 : 0 0 0 0 0 0
30 - 34 : 0 0 0 0 0 0
35 - 39 : 0 0 0 0 0 0
40 - 44 : 0 0 0 0 0 0
45 - 49 : 0 0 0 0 0 0
50 - 54 : 0 0 0 0 0 0
55 - 59 : 0 0 0 0 0 0
60 - 64 : 0 0 0 0 0 0
dscp: outgoing
-------------------------------
0 - 4 : 363949 0 0 0 0 0
5 - 9 : 0 0 0 0 0 0
10 - 14 : 0 0 0 0 0 0
15 - 19 : 0 0 0 0 0 0
20 - 24 : 0 0 0 0 0 0
25 - 29 : 0 0 0 0 0 0
30 - 34 : 0 0 0 0 0 0
35 - 39 : 0 0 0 0 0 0
40 - 44 : 0 0 0 0 0 0
45 - 49 : 0 0 0 0 0 0
50 - 54 : 0 0 0 0 0 0
55 - 59 : 0 0 0 0 0 0
60 - 64 : 0 0 0 0 0 0
cos: incoming
-------------------------------
0 - 4 : 132067 0 0 0 0 0
5 - 9 : 0 0 0 0 0 0
10 - 14 : 0 0 0 0 0 0
15 - 19 : 0 0 0 0 0 0
20 - 24 : 0 0 0 0 0 0
25 - 29 : 0 0 0 0 0 0
30 - 34 : 0 0 0 0 0 0
35 - 39 : 0 0 0 0 0 0
40 - 44 : 0 0 0 0 0 0
45 - 49 : 0 0 0 0 0 0
50 - 54 : 0 0 0 0 0 0
55 - 59 : 0 0 0 0 0 0
60 - 64 : 0 0 0 0 0 0
cos: outgoing
-------------------------------
0 - 4 : 739155 0 0 0 0 0
5 - 9 : 90 0 0 0 0 0
Policer: Inprofile: 0 OutofProfile: 0

If no interface config, the queue-set 1 will be used:
Device# show mls qos queue-set 1

Queueset: 1
Queue : 1 2 3 4
buffers : 15 25 40 20
threshold1: 100 125 100 60
threshold2: 100 125 100 150
reserved : 50 100 100 50
maximum : 200 400 400 200

For interface config queue-set 2 explicitly:
Device# show mls qos queue-set 2

Queueset: 2
show mls qos interface

Use the `show mls qos interface` user EXEC command to display quality of service (QoS) information at the port level.

**Table 5: Syntax Description**

<table>
<thead>
<tr>
<th>Interface-ID</th>
<th>(Optional) Display QoS information for the specified port. Valid interfaces include physical ports.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffers</td>
<td>(Optional) Display the buffer allocation among the queues.</td>
</tr>
<tr>
<td>Queueing</td>
<td>(Optional) Display the queuing strategy (shared or shaped) and the weights corresponding to the queues.</td>
</tr>
<tr>
<td>Statistics</td>
<td>(Optional) Display statistics for sent and received Differentiated Services Code Points (DSCPs) and class of service (CoS) values, the number of packets enqueued or dropped per egress queue, and the number of in-profile and out-of-profile packets for each policer.</td>
</tr>
<tr>
<td>Begin</td>
<td>(Optional) Display begins with the line that matches the expression.</td>
</tr>
<tr>
<td>Exclude</td>
<td>(Optional) Display excludes lines that match the expression.</td>
</tr>
<tr>
<td>Include</td>
<td>(Optional) Display includes lines that match the specified expression.</td>
</tr>
<tr>
<td>Expression</td>
<td>Expression in the output to use as a reference point.</td>
</tr>
</tbody>
</table>

**Note**

Though visible in the command-line help string, the `policer` keyword is not supported.

**Enabling Queue Limit Configuration—Cisco Catalyst 3850 Series Switch**

(multiple class with queue-limit turn on)

Device# show policy-map q-limit

Policy Map q-limit
Class users-class
  Queueing action (shaper, bandwidth and bandwidth remaining)
  queue-limit cos 2 percent 50
  queue-limit cos 3 percent 50
  queue-limit cos 6 percent 70
  queue-limit cos 7 percent 70
Device# show policy-map interface gigbitEthernet1/0/1

The policy have to be applied to the interface to view the output of the show policy-map interface command.

Using the above configuration, cos 2 and cos 3 will be dropped earlier than cos 6 and 7.

---

**Example: Enabling Queue-Buffer**

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS queue-set output [1] buffers (15 25 40 20)</td>
<td>Interface config queue-set (default queue-set 1)</td>
<td>Policy-map with queuing action and queue-buffers ratio (0-100)</td>
</tr>
</tbody>
</table>

---

**Enabling Queue-Buffer-Cisco Catalyst 3750 Series Switch**

Default queue-buffer:
Device# show mls qos queue-set 1

Queue-set: 1
Queue : 1 2 3 4
-------------------------------
buffers : 25 25 25 25
threshold1: 100 200 100 100
threshold2: 100 200 100 100
reserved : 50 50 50 50
maximum : 400 400 400 400

User define queue-buffer:
mls qos queue-set output 1 buffers 15 25 40 20
Device# show mls qos queue-set 1

Queue-set: 1
Queue : 1 2 3 4
-------------------------------
buffers : 15 25 40 20
threshold1: 100 125 100 60
threshold2: 100 125 100 150
reserved : 50 100 100 50
maximum : 200 400 400 200

---

**Enabling Queue-Buffer-Cisco Catalyst 3850 Series Switch**

Device# show policy-map queue-buffer

Policy Map queue-buffer
Class cos7
  bandwidth percent 10
  queue-buffers ratio 15
Class cos1
  bandwidth percent 30
  queue-buffers ratio 25

class-map:
Device# show class-map cos7
Class Map match-any cos7 (id 22)
Match cos 7

Device# show class-map cos1
Class Map match-any cos1 (id 28)

Match cos 1

Attach to the interface at egress direction:
Device# show policy-map interface gigabitEthernet1/0/1

Example: Enabling Bandwidth

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS (share mode)</td>
<td>• Interface level configuration</td>
<td>Bandwidth in policy map</td>
</tr>
<tr>
<td></td>
<td>• srr-queue bandwidth share 1 30 35 5</td>
<td></td>
</tr>
</tbody>
</table>

Enabling Bandwidth-Cisco Catalyst 3750 Series Switch

Default share and shape mode:

Device# show mls qos interface gigabitEthernet 1/0/1 queueing

GigabitEthernet1/0/1
Egress Priority Queue : disabled
Shaped queue weights (absolute) :  25 0 0 0
Shared queue weights : 25 25 25 25
The port bandwidth limit : 100  (Operational Bandwidth:100.0)
The port is mapped to qset : 1

User config share mode under interface:
interface GigabitEthernet1/0/1
srr-queue bandwidth share 40 30 20 10
srr-queue bandwidth shape 0 0 0 0

Device# show mls qos interface gigabitEthernet1/0/1 queueing

GigabitEthernet1/0/1
Egress Priority Queue : disabled
Shaped queue weights (absolute) : 0 0 0 0
Shared queue weights : 40 30 20 10
The port bandwidth limit : 100  (Operational Bandwidth:100.0)
The port is mapped to qset : 1

Enabling Bandwidth-Cisco Catalyst 3850 Series Switch

Device# show policy-map bandwidth

Policy Map bandwidth
Class cos1
    bandwidth percent 40
Class cos2
    bandwidth percent 30
Class cos3
    bandwidth percent 20
Class class-default
    bandwidth percent 10
Device# show class-map cos1
Class Map match-any cos1
  Match cos 1
Device# show class-map cos2
Class Map match-any cos2
  Match cos 2
Device# show class-map cos3
Class Map match-any cos3 (id 26)
  Match cos 3
Device# show class-map cos4
Class Map match-any cos4 (id 25)
  Match cos 4

Example: Enabling Priority

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLS QoS (expedite queue) Note Expedite queue is same as priority queue.</td>
<td>Interface level configuration priority-queue out (make the first queue of the corresponding queue-set as the strict priority queue.)</td>
<td>Priority level 1 in the policy map.</td>
</tr>
</tbody>
</table>

Verifying Priority-Cisco Catalyst 3750 Series Switch

interface GigabitEthernet1/0/2
priority-queue out
end
Device# show mls qos interface gigabitEthernet1/0/2 queueing

GigabitEthernet1/0/2
Egress Priority Queue : enabled
Shaped queue weights (absolute) : 25 0 0 0
Shared queue weights : 25 25 25 25
The port bandwidth limit : 100 (Operational Bandwidth:100.0)
The port is mapped to qset : 1

MQC Enable with Priority - Cisco Catalyst 3850 Series Switch

Device# show run policy-map priority-queue
class cos7
  priority level 1 strict priority
class cos1
  shape average percent 10
Attach the above policy to interface at egress side:
Example: Enabling QoS Shaper

Enabling QoS Shaper-Cisco Catalyst 3750 Series Switch

Default shape mode:
GigabitEthernet1/0/3
Egress Priority Queue : disabled
Shaped queue weights (absolute) : 25 0 0 0
Shared queue weights : 25 25 25 25
The port bandwidth limit : 100 (Operational Bandwidth:100.0)
The port is mapped to qset : 1

User define shape mode:
interface GigabitEthernet1/0/3
srr-queue bandwidth shape 4 4 4 4

Device# show mls qos interface gigabitEthernet 1/0/3 queueing

GigabitEthernet1/0/3
Egress Priority Queue : disabled
Shaped queue weights (absolute) : 4 4 4 4
Shared queue weights : 25 25 25 25
The port bandwidth limit : 100 (Operational Bandwidth:100.0)
The port is mapped to qset : 1

Enabling QoS Shaper-Cisco Catalyst 3850 Series Switch

Device# show policy-map shape

Policy Map shape
Class cos1
  Average Rate Traffic Shaping
cir 25%
Class cos2
  Average Rate Traffic Shaping
cir 25%
Class cos3
  Average Rate Traffic Shaping
cir 25%
Class cos4
  Average Rate Traffic Shaping
cir 25%

Example: Hierarchical Modular QoS

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750 Series Switch (Global Configuration)</th>
<th>Cisco Catalyst 3750 Series Switch (Interface)</th>
<th>Cisco Catalyst 3850 Series Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class-map, Policy-map</td>
<td>• Attach policy to SVI.</td>
<td>Per-VLAN Ingress policy</td>
</tr>
<tr>
<td></td>
<td>• Interface needs configuration MLS QoS VLAN_based.</td>
<td></td>
</tr>
</tbody>
</table>

Hierarchical Modular QoS - Cisco Catalyst 3750 Series Switch

Note:
SVI: Parent [class acl based class-map->policing]
Child [class interface range class-map->marking]

Child class-map:
Device(config)# class-map cm-interface-1
Device(config-cmap)# match input gigabitethernet3/0/1 - gigabitethernet3/0/2

Child policy-map:
Device(config)# policy-map port-plcmap-1
Device(config-pmap)# class cm-interface-1
Device(config-pmap-c)# police 900000 9000 drop

Parent class-map matching acl:
Device(config)# access-list 101 permit ip any any

Parent class-map:
Device(config)# class-map cm-1
Device(config-cmap)# match access 101

Device(config)# policy-map vlan-plcmap
Device(config-pmap)# class cm-1
Device(config-pmap-c)# set dscp 7
Device(config-pmap-c)# service-policy port-plcmap-1
Device(config-pmap-c)# exit
Device(config-pmap)# class cm-2
Device(config-pmap-c)# service-policy port-plcmap-1
Device(config-pmap-c)# set dscp 10

Attach the policy to the interface:
Device(config)# interface vlan 10
Device(config-if)# service-policy input vlan-plcmap

Hierarchical Modular QoS - Cisco Catalyst 3850 Series Switch

Note: Due to target change, this can’t be one to one mapping, need config based on customer requirement.

Target is at port level
Parent classify on vlan
Child: none vlan classification [for example cos/dscp]

Device# show running-config policy-map PV_parent_marking_child_policing
class vlan10
  set dscp 63
  service-policy child_class_dscp_policing
class vlan11
  set cos 5
  service-policy child_class_dscp_policing
class vlan12
  set precedence 6
  service-policy child_class_dscp_policing

Device# show running-config policy-map child_class_dscp_policing
class dscp1
  police cir percent 12
class dscp2
  police cir percent 15
class dscp3
  police cir percent 20
class class-default
  police cir percent 22

Device# show running-config class-map vlan10

class-map match-any vlan10
  match vlan 10

Device# show running-config class-map vlan11

class-map match-any vlan11
  match vlan 11
Device# show running-config class-map vlan12
  class-map match-any vlan12
    match vlan 12
Device# show running-config class-map dscp1
  class-map match-any dscp1
    match dscp 1
Device# show running-config class-map dscp2
  class-map match-any dscp2
    match dscp 2
Device# show running-config class-map dscp3
  class-map match-any dscp3
    match dscp 3

Additional References for QoS Monitoring

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Command List, All Release</td>
</tr>
<tr>
<td>Cisco Catalyst 3750 Series Switches Command Reference</td>
<td>Cisco Catalyst 3750 Series Switch Command Reference Guide</td>
</tr>
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Technical Assistance

<table>
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<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
<tr>
<td>The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.</td>
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</tr>
</tbody>
</table>

Feature Information for QoS Monitoring

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to . An account on Cisco.com is not required.
### Table 6: Feature Information for QoS Monitoring

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
</table>
| QoS Monitoring   | Cisco IOS XE Release Denali 16.1.1
Cisco IOS XE Release 3E
|                  |                                | The QoS Monitoring feature describes the Quality of Service (QoS) through sample configurations examples. |
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<td>San Jose, CA 95134-1706</td>
<td>Singapore</td>
<td>Amsterdam, The Netherlands</td>
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