QoS

This chapter contains the following QoS commands:

class

To define a traffic classification match criteria for the specified class-map name, use the **class** command in policy-map configuration mode. Use the **no** form of this command to delete an existing class map.

class {*class-map-name* | **class-default**}
no class {*class-map-name* | **class-default**}

Syntax Description

class-map-name	Assigns a name to the class map.
class-default	Refers to a system default class that matches unclassified packets.

Command Default

No policy map class-maps are defined.

Command Modes

Policy-map configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was intro

Usage Guidelines

Before using the **class** command, you must use the **policy-map** global configuration command to identify the policy map and enter policy-map configuration mode. After specifying a policy map, you can configure a policy for new classes or modify a policy for any existing classes in that policy map. You attach the policy map to a port by using the **service-policy** interface configuration command.

After entering the **class** command, you enter policy-map class configuration mode. These configuration commands are available:

- **exit**—Exits policy-map class configuration mode and returns to policy-map configuration mode.
- **no**—Returns a command to its default setting.
- **police**—Defines a policer for the classified traffic. The policer specifies the bandwidth limitations and the action to take when the limits are exceeded. For more information, see **police**.
- **set**—Specifies a value to be assigned to the classified traffic. For more information, see **set**.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

The **class** command performs the same function as the **class-map** global configuration command. Use the **class** command when a new classification, which is not shared with any other ports, is needed. Use the **class-map** command when the map is shared among many ports.

You can configure a default class by using the **class class-default** policy-map configuration command. Unclassified traffic (traffic that does not meet the match criteria specified in the traffic classes) is treated as default traffic.

Examples

This example shows how to configure a default traffic class to a policy map:

```
Device# configure terminal
```

```
Device(config)# class-map cm-3
Device(config-cmap)# match ip dscp 30
Device(config-cmap)# exit
Device(config)# class-map cm-4
Device(config-cmap)# match ip dscp 40
Device(config-cmap)# exit
Device(config)# policy-map pm3
Device(config-pmap)# class class-default
Device(config-pmap-c)# set dscp 10
Device(config-pmap-c)# exit
Device(config-pmap)# class cm-3
Device(config-pmap-c) set dscp 4
Device(config-pmap-c)# exit
Device(config-pmap)# class cm-4
Device(config-pmap-c)# exit
Device(config-pmap)# exit
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

This example shows how the default traffic class is automatically placed at the end of policy-map pm3 even though **class-default** was configured first:

```
Device# show policy-map pm3
  Policy Map pm3
    Class cm-3
      set dscp 4
    Class class-default
      set dscp 10
Device#
```

Related Commands

Command	Description
class	Creates a class map to be used for matching packets to the class whose name you specify.
police	Defines a policer for classified traffic.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy.
set	Classifies IP traffic by setting a DSCP or IP-precedence value in the packet.
show policy map	Displays quality of service (QoS) policy maps.

debug qos

To enable debugging of the quality of service (QoS) software, use the **debug qos** in privileged EXEC mode. Use the **no** form of this command to disable QoS debugging.

debug qos {**capability** | **command-installation-time** | **events** | **index** | **pre-classify** | **provision** | **service-policy** | **set** | **snmp** | **tunnel_marking**}
no debug qos {**capability** | **command-installation-time** | **events** | **index** | **pre-classify** | **provision** | **service-policy** | **set** | **snmp** | **tunnel_marking**}

Syntax Description

capability	Displays all QoS capability debug messages.
command-installation-time	Displays the amount of time the QoS command takes to become effective.
events	Displays QoS MQC events.
index	Displays class-based QoS MIB index persistency.
pre-classify	Displays QoS pre-classify events for VPN.
provision	Displays QoS provisions.
service-policy	Displays QoS service policies.
set	Displays QoS packet marking.
snmp	Displays class-based QoS configuration and statistics information.
tunnel_marking	Displays QoS packet tunnel marking.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was introd

Usage Guidelines

The **undebug qos** command is the same as the **no debug qos** command.

When you enable debugging on a switch stack, it is enabled only on the active switch. To enable debugging on a member switch, you can start a session from the active switch by using the **session** *switch-number* privileged EXEC command, then enter the **debug** command at the command-line prompt of the member switch. You also can use the **remote command** *stack-member-number LINE* privileged EXEC command on the active switch to enable debugging on a member switch without first starting a session.

Related Commands

Command	Description
show debugging	Displays information about the types of debugging that are enabled.

mls qos

To enable quality of service (QoS) for the entire switch, use the **mls qos** command in global configuration mode. Use the **no** form of this command to reset all the QoS-related statistics and to disable the QoS features for the entire switch.

mls qos
no mls qos

Syntax Description

This command has no arguments or keywords.

Command Default

QoS is disabled. There is no concept of trusted or untrusted ports because the packets are not modified (the CoS values in the packet are not changed). Traffic is switched in pass-through mode (packets are switched without any rewrites and classified as best effort without any policing).

When QoS is enabled with the **mls qos** global configuration command and all other QoS settings are set to their defaults, traffic is classified as best effort (the CoS value is set to 0) without any policing. No policy maps are configured. The default port trust state on all ports is untrusted. The default egress queue settings are in effect.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was introduced.

Usage Guidelines

When the **mls qos** command is entered, QoS is enabled with the default parameters on all ports in the system.

QoS must be globally enabled to use QoS classification, policing, marking or dropping, queueing, and traffic shaping features. You can create a policy map and attach it to a port before entering the **mls qos** command. QoS processing is disabled until you enter the **mls qos** command.

When you enter the **no mls qos** command, policy maps and class maps that are used to configure QoS are not deleted from the configuration, but entries corresponding to policy maps are removed from the switch hardware to save system resources. To reenable QoS with the previous configurations, enter the **mls qos** command.

Toggling the QoS status of the switch with this command modifies (reallocates) the sizes of the queues. During the queue size modification, the queue is temporarily shut down during the hardware reconfiguration, and the switch drops newly arrived packets for this queue.

Examples

This example shows how to enable QoS on the switch:

```
Device(config)# mls qos
```

You can verify your settings by entering the **show mls qos** privileged EXEC command.

Related Commands

Command	Description
show mls qos	Displays QoS information.

mls qos cos

To define the default class of service (CoS) value of a port or to assign the default CoS to all incoming packets on the port, use the **mls qos cos** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

mls qos cos {*default-cos* | **override**}
no qos mls cos {*default-cos* | **override**}

Syntax Description

default-cos	The default CoS value that is assigned to a port. If packets are untagged, the default CoS value becomes the packet CoS value. The CoS range is 0 to 7.
override	Overrides the CoS value of the incoming packets, and apply the default CoS value on the port to all incoming packets.

Command Default

The default CoS value for a port is 0.

CoS override is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was i

Usage Guidelines

You can use the default value to assign a CoS value to all incoming packets that are untagged (if the incoming packet does not have a CoS value). You also can assign a default CoS value to all incoming packets by using the **override** keyword.

Use the **override** keyword when all incoming packets on certain ports deserve higher or lower priority than packets entering from other ports. Even if a port is previously set to trust CoS, this command overrides the previously configured trust state, and all the incoming CoS values are assigned the default CoS value configured with the **mls qos cos** command. If an incoming packet is tagged, the CoS value of the packet is modified with the default CoS of the port at the ingress port.

Examples

This example shows how to configure the default port CoS to 4 on a port:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# mls qos trust cos
Device(config-if)# mls qos cos 4
```

This example shows how to assign all the packets entering a port to the default port CoS value of 4 on a port:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# mls qos cos 4
Device(config-if)# mls qos cos override
```

You can verify your settings by entering the **show mls qos interface** privileged EXEC command.

Related Commands

Command	Description
show mls qos interface	Displays quality of service (QoS) information.

mls qos wrr-queue output cos-map

To map class of service (CoS) values to an egress queue or to map CoS values to a queue and to a threshold ID, use the **mls qos wrr-queue output cos-map** command global configuration mode. Use the **no** form of this command to return to the default setting.

mls qos wrr-queue output cos-map queue *queue-id* { *cos1 ... cos8* | **threshold** *threshold-id cos1 ... cos8* }
no mls qos wrr-queue output cos-map

Syntax Description

queue *queue-id*	Specifies a queue number. For *queue-id*, the range is 1 to 4.
cos1 ... cos8	CoS values that are mapped to an egress queue. For *cos1...cos8*, enter up to eight values, and separate each value with a space. The range is 0 to 7.
threshold *threshold-id cos1...cos8*	Maps CoS values to a queue threshold ID. For *threshold-id*, the range is 1 to 3. For *cos1...cos8*, enter up to eight values, and separate each value with a space. The range is 0 to 7.

Command Default

For default CoS output queue thresholds values, see *Default Cos Output Queue Threshold Map*.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command is introd

Usage Guidelines

The drop-threshold percentage for threshold 3 is predefined. It is set to the queue-full state.

Note The egress queue default settings are suitable for most situations. Change them only when you have a thorough understanding of the egress queues and if these settings do not meet your quality of service (QoS) solution.

You can map each CoS value to a different queue and threshold combination, allowing the frame to follow different behavior.

Table 1: Default Cos Output Queue Threshold Map

CoS Value	0	1	2	3	4	5	6	7
Queue ID–Threshold ID	2–1	2–1	3–1	3–1	4–1	1–1	4–1	4–1

Examples:

This example shows how to map a port to queue set 1. It maps CoS values 0 to 3 to egress queue 1 and to threshold ID 1.

```
Device(config)# mls qos wrr-queue output cos-map queue 1 threshold 1 0 1 2 3
```

Related Commands

Command	Description
show mls qos maps	Displays QoS mapping information.

priority-queue out

To enable the egress priority queue, use the **priority-queue out** command in interface configuration mode. Use the **no** form of this command disable the priority queue.

priority-queue out

no priority-queue out

Command Modes

Interface configuration mode (config-if)

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was introduced

Examples:

This example shows how to enable the egress priority queue:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# srr-queue bandwidth shape  3  0  0  0
Device(config-if)# priority-queue out
```

show mls qos

To display global quality of service (QoS) configuration information, use the **show mls qos** command in EXEC mode.

show mls qos

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was introduc

Examples

This is an example of output from the **show mls qos** command when QoS is enabled:

```
Device# show mls qos
QoS is enabled
```

Related Commands

Command	Description
mls qos	Enables QoS on the entire switch.

show mls qos interface

To display quality of service (QoS) information at the port level, use the **show mls qos interface** command in EXEC mode.

show mls qos interface [*interface-id*[{**policers** | **queueing** | **statistics**}]**stack-port statistics**]

Syntax Description

interface-id	(Optional) Displays the QoS information for the specified port. Valid interfaces include physical ports.
policers	(Optional) Displays the policers for the interfaces.
queueing	(Optional) Displays the queueing strategy and the weights corresponding to the queues.
statistics	(Optional) Displays statistics for sent and received 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.
stack-port statistics	(Optional) Displays the QoS statistics for the stacking ports.

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was introc

Usage Guidelines

Though visible in the command-line help string, the **policers** keyword is not supported.

Examples

This is an example of output from the **show mls qos interface** *interface-id* command when port-based QoS is enabled:

```
Device# show mls qos interface gigabitethernet2/0/1
GigabitEthernet1/0/1
trust state: trust cos
trust mode: trust cos
trust enabled flag: ena
COS override: dis
default COS: 0
Trust device: none
qos mode: port-based
```

This is an example of output from the **show mls qos interface** *interface-id* command when port-based QoS is disabled:

```
Device# show mls qos interface interface gigabitethernet2/0/1
GigabitEthernet1/0/1
QoS is disabled. When QoS is enabled, following settings will be applied
```

```
trust state: trust cos
trust mode: trust cos
trust enabled flag: ena
COS override: dis
default COS: 0
Trust device: none
qos mode: port-based
```

This is an example of output from the **show mls qos interface** *interface-id* **queueing** command. The egress expedite queue overrides the configured shaped round robin (SRR) weights.

```
Device# show mls qos interface gigabitethernet2/0/1 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
```

This table describes the fields in this display.

Table 2: show mls qos interface statistics Field Descriptions

Field		Description
CoS	incoming	Number of packets received for each CoS value.
	outgoing	Number of packets sent for each CoS value.
Output queues	enqueued	Number of packets in the egress queue.
	dropped	Number of packets in the egress queue that are dropped.
Policer	Inprofile	Number of in-profile packets for each policer.
	Outofprofile	Number of out-of-profile packets for each policer.

Related Commands

Command	Description
mls qos wrr-queue output cos-map	Maps CoS values to an egress queue or maps CoS values to a queue and to a threshold ID.
wrr-queue bandwidth limit	Limits the maximum output on a port.
wrr-queue bandwidth shape	Assigns the shaped weights and enables bandwidth shaping on the four egress queues mapped to a port.

wrr-queue bandwidth limit

To limit the maximum output on a port, use the **wrr-queue bandwidth limit** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

wrr-queue bandwidth limit *weight1*
no wrr-queue bandwidth limit

Syntax Description

weight1	The port speed limit in percentage terms. The range is 10 to 90.

Command Default

The port is not rate limited and is set to 100 percent.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was intr

Usage Guidelines

If you configure this command to 80 percent, the port is idle 20 percent of the time. The line rate drops to 80 percent of the connected speed. These values are not exact because the hardware adjusts the line rate in increments of six.

Examples

This example shows how to limit a port to 800 Mb/s:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# wrr-queue bandwidth limit 80
```

You can verify your settings by entering the **show mls qos interface** [*interface-id*] **queueing** privileged EXEC command.

Related Commands

Command	Description
wrr-queue bandwidth shape	Assigns the shaped weights and enables bandwidth shaping on the four egress queues mapped to a port.

wrr-queue bandwidth shape

To assign the shaped weights and to enable bandwidth shaping on the four egress queues mapped to a port, use the **wrr-queue bandwidth shape** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

wrr-queue bandwidth shape *weight1 weight2 weight3 weight4*
no wrr-queue bandwidth shape

Syntax Description

weight1 weight2 weight3 weight4	The weights that specify the percentage of the port that is shaped. The inverse ratio (1/*weight*) specifies the shaping bandwidth for this queue. Separate each value with a space. The range is 0 to 65535.

Command Default

Weight1 is set to 25; weight2, weight3, and weight4 are set to 0, and these queues are in shared mode.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS Release 15.2(7)E3k	This command was intro

Usage Guidelines

In shaped mode, the queues are guaranteed a percentage of the bandwidth, and they are rate-limited to that amount. Shaped traffic does not use more than the allocated bandwidth even if the link is idle. Use shaping to smooth bursty traffic or to provide a smoother output over time.

When configuring queues for the same port for both shaping, make sure that you configure the lowest numbered queue for shaping.

Note The egress queue default settings are suitable for most situations. You should change them only when you have a thorough understanding of the egress queues and if these settings do not meet your QoS solution.

Examples

This example shows how to configure the queues for a port for shaping:

```
Device(config)#interface gigabitethernet2/0/1
Device(config-if)# srr-queue bandwidth shape 8 0 0 0
```

You can verify your settings by entering the **show mls qos interface** [*interface-id*] **queueing** privileged EXEC command.