Configuring Control Plane Policing

Restrictions for CoPP

Restrictions for control plane policing (CoPP) include the following:

- Only ingress CoPP is supported. The **system-cpp-policy** policy-map is available on the control plane interface, and only in the ingress direction.
- Only the **system-cpp-policy** policy-map can be installed on the control plane interface.
- The **system-cpp-policy** policy-map and the seventeen system-defined classes cannot be modified or deleted.
- Only the **police** action is allowed under the **system-cpp-policy** policy-map. The police rate for system-defined classes must be configured only in packets per second (pps); for user-defined class maps this must be configured only in bits per second (bps).
- One or more CPU queues are part of each class-map. Where multiple CPU queues belong to one class-map, changing the policer rate of a class-map affects all CPU queues that belong to that class-map. Similarly, disabling the policer in a class-map disables all queues that belong to that class-map. See Table 1: System-Defined Values for CoPP, on page 3 for information about which CPU queues belong to each class-map.

Related Topics

Enabling a CPU Queue or Changing the Policer Rate, on page 6
Disabling a CPU Queue, on page 8
Setting the Default Policer Rates for All CPU Queues, on page 9
Creating A User-Defined Class Map , on page 10
User-Configurable Aspects of CoPP, on page 5

Information About Control Plane Policing

This chapter describes how control plane policing (CoPP) works on your device and how to configure it.

CoPP Overview

The CoPP feature improves security on your device protecting the CPU from unnecessary traffic and DoS attacks. It can also protect control and management traffic from traffic drops caused by high volumes of other, lower priority traffic.

Your device is typically segmented into three planes of operation, each with its own objective:

- The data plane, to forward data packets.
- The control plane, to route data correctly.
- The management plane, to manage network elements.

You can use CoPP to protect most of the CPU-bound traffic and ensure routing stability, reachability, and packet delivery. Most importantly, you can use CoPP to protect the CPU from a DoS attack.

CoPP uses the modular QoS command-line interface (MQC) and CPU queues to achieve these objectives. Different types of control plane traffic are grouped together based on certain criteria, and assigned to a CPU queue. You can manage these CPU queues by configuring dedicated policers in hardware. For example, you can modify the policer rate for certain CPU queues (traffic-type), or you can disable the policer for a certain type of traffic.

Although the policers are configured in hardware, CoPP does not affect CPU performance or the performance of the data plane. But since it limits the number of packets going to CPU, the CPU load is controlled. This means that services waiting for packets from hardware may see a more controlled rate of incoming packets (the rate being user-configurable).

System-Defined Aspects of CoPP

When you power-up the device for the first time, the system automatically performs the following tasks:

- Looks for policy-map **system-cpp-policy**. If not found, the system creates and installs it on the control-plane.
- Creates seventeen class-maps under **system-cpp-policy**.

  The next time you power-up the device, the system detects the policy and class maps that have already been created.
- Enables sixteen out of the thirty-two CPU queues (after the policy is installed), with their respective default rate. The CPU queues that are enabled by default and their default rates are indicated in the table *System-Defined Values for CoPP*.

The following table lists the class-maps that the system creates when you load the device. It lists the policer that corresponds to each class-map and one or more CPU queues that are grouped under each class-map. There is a one-to-one mapping of class-maps to policers; and one or more CPU queues map to a class-map.

Table 1: System-Defined Values for CoPP

Class Maps Names	Policer Index (Policer No.)	CPU queues (Queue No.)	CPU Queues Enabled by Default	Default Policer Rate—in packets per second (pps)
system-cpp-police-data	WK_CPP_POLICE_DATA(0)	WK_CPU_Q_ICMP_GEN(3) WK_CPU_Q_BROADCAST(12)	Yes	200
system-cpp-police-l2-control	WK_CPP_POLICE_L2_ CONTROL(1)	WK_CPU_Q_L2_CONTROL(1)	No	500
system-cpp-police-routing-control	WK_CPP_POLICE_ROUTING_CONTROL(2)	WK_CPU_Q_ROUTING_CONTROL(4)	Yes	500
system-cpp-police-control-low-priority	WK_CPP_POLICE_CO NTROL_LOW_PRI(3)	WK_CPU_Q_ICMP_REDIRECT(6) WK_CPU_Q_GENERAL_PUNT(25)	No	500
system-cpp-police-punt-webauth	WK_CPP_POLICE_PU NT_WEBAUTH(7)	WK_CPU_Q_PUNT_WEBAUTH(22)	No	1000
system-cpp-police-topology-control	WK_CPP_POLICE_TOPOLOGY_CONTROL(8)	WK_CPU_Q_TOPOLOGY_CONTROL(15)	No	13000
system-cpp-police-multicast	WK_CPP_POLICE_MULTICAST(9)	WK_CPU_Q_TRANSIT_TRAFFIC(18) WK_CPU_Q_MCAST_DATA(30)	Yes	500
system-cpp-police-sys-data	WK_CPP_POLICE_SYS _DATA (10)	WK_CPU_Q_LEARNING_CACHE_OVFL(13) WK_CPU_Q_CRYPTO_CONTROL(23) WK_CPU_Q_EXCEPTION(24) WK_CPU_Q_EGR_EXCEPTION(28) WK_CPU_Q_NFL_SAMPLED_DATA(26) WK_CPU_Q_GOLD_PKT(31) WK_CPU_Q_RPF_FAILED(19)	Yes	100
system-cpp-police-dot1x-auth	WK_CPP_POLICE_DOT1X(11)	WK_CPU_Q_DOT1X_AUTH(0)	No	1000
system-cpp-police-protocol-snooping	WK_CPP_POLICE_PR	WK_CPU_Q_PROTO_SNOOPING(16)	No	500
system-cpp-police-sw-forward	WK_CPP_POLICE_SW_FWD (13)	WK_CPU_Q_SW_FORW ARDING_Q(14) WK_CPU_Q_SGT_CACHE_FULL(27) WK_CPU_Q_LOGGING(21)	Yes	1000

Class Maps Names	Policer Index (Policer No.)	CPU queues (Queue No.)	CPU Queues Enabled by Default	Default Policer Rate—in packets per second (pps)
system-cpp-police-forus	WK_CPP_POLICE_FORUS(14)	WK_CPU_Q_FORUS_ADDR_RESOLUTION(5) WK_CPU_Q_FORUS_TRAFFIC(2)	No	1000
system-cpp-police-multicast-end-station	WK_CPP_POLICE_MULTICAST_SNOOPING(15)	WK_CPU_Q_MCAST_END_STATION_SERVICE(20)	Yes	2000
system-cpp-default	WK_CPP_POLICE_DEFAULT_POLICER	WK_CPU_Q_DHCP_SNOOPING WK_CPU_Q_SHOW_FORWARD	No	1000

When you upgrade or downgrade the software version on your device, note the following:

- When upgrading from one software release to another:

  The upgrade could be from Cisco IOS XE Release 3.x.xE to a Cisco IOS XE 16.x.x release, or from one Cisco IOS XE 16.x.x release to another Cisco IOS XE 16.x.x release:

  - If the device did not have a `system-cpp-policy` policy map before upgrade, then on upgrade, a default policy is created.
  - If the device had a `system-cpp-policy` policy map before upgrade, then on upgrade, the policy is not re-generated. Enter the **cpp system-default** command in global configuration mode to get the default policy working.

  Note We recommend that you to enter the **cpp system-default** command after any major upgrade to get the latest, default policer rates.

- When downgrading from one software release to another:

  The downgrade could be from a Cisco IOS XE 16.x.x release to a Cisco IOS XE Release 3.x.xE, or from one Cisco IOS XE 16.x.x release to another Cisco IOS XE 16.x.x release:

  - The `system-cpp-policy` policy map is retained on the device, but not installed on the control plane. You can delete the policy.

- If you downgrade to an earlier release and then upgrade to a later release:

  For example, if you downgrade from Cisco IOS XE 16.x.x release to Cisco IOS XE Release 3.x.xE and then upgrading to a Cisco IOS XE 16.x.x release:

  - If you delete the policy after downgrading to Cisco IOS XE Release 3.x.xE and then upgrade to a Cisco IOS XE 16.x.x release, the policy is generated with defaults.
  - If you do not delete the policy after downgrading to Cisco IOS XE Release 3.x.xE, then on upgrade to a Cisco IOS XE 16.x.x release, the policy is not regenerated.

Enter the **cpp system-default** command in global configuration mode to get the default policy working.

User-Configurable Aspects of CoPP

You can perform these tasks to manage control plane traffic:

Note All `system-cpp-policy` configurations must be saved so they are retained after reboot.

Enable or Disable a Policer for CPU Queues

Enable a policer for a CPU queue, by configuring a policer action (in packets per second) under the corresponding class-map, within the `system-cpp-policy` policy-map.

Disable a policer for CPU queue, by removing the policer action under the corresponding class-map, within the `system-cpp-policy` policy-map.

Note If a default policer is already present, carefully consider and control its removal; otherwise the system may see a CPU hog or other anomalies, such as control packet drops.

Set Policer Rates to Default

Set the policer for CPU queues to their default values, by entering the **cpp system-default** command in global configuration mode.

Create User-Defined Class Maps

If a given traffic class does not have a designated class map, and you want to protect this traffic, you can create specific class maps (with filters) for such traffic packets and add these user-defined class maps to `system-cpp-policy`.

While `system-cpp-policy` is applied in the ingress direction, the forwarding engine driver (FED) changes policers on user-defined class maps to the egress. The filters and the policers in all user-defined classes must therefore be applied as egress classifications and actions, respectively. The policy map itself is unaffected by this change in the direction.

When you add a user-defined class map to `system-cpp-policy`, the system automatically installs it on all 32 CPU queues (in addition to the control plane), resulting in 33 instances of the policy. You can see this by entering the **show platform software fed switch** {*switch_number* | **active** | **standby**} qos policy target status command in privileged EXEC mode.

The police rate on these class maps is controlled by the Active Queue Management (AQM) policer. AQM provides buffering control of traffic flows prior to queuing a packet into the transmit queue of a port, ensuring that certain flows do not hog the switch packet memory. If the AQM policer feature is enabled, any user-defined police rates exceeding the AQM policer limits are disregarded.

User defined class maps have normal QoS or ACL classification filters.

Related Topics

Enabling a CPU Queue or Changing the Policer Rate, on page 6
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How to Configure CoPP

Enabling a CPU Queue or Changing the Policer Rate

The procedure to enable a CPU queue and change the policer rate of a CPU queue is the same. Follow these steps:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**policy-map** *policy-map-name*
	Example:
	`Device(config)# policy-map system-cpp-policy`
	`Device(config-pmap)#`
		Enters the policy map configuration mode.

Step 4	**class** *class-name*
	Example:
	`Device(config-pmap)# class system-cpp-police-protocol-snooping`
	`Device(config-pmap-c)#`
		Enters the class action configuration mode. Enter the name of the class that corresponds to the CPU queue you want to enable. See table *System-Defined Values for CoPP*.

	Command or Action	Purpose

Step 5	**police rate** *rate* **pps**
	Example:
	`Device(config-pmap-c)# police rate 100 pps`
	`Device(config-pmap-c-police)#`
		Specifies an upper limit on the number of incoming packets processed per second, for the specified traffic class.
		Note The rate you specify is applied to all CPU queues that belong to the class-map you have specified.

Step 6	exit
	Example:
	`Device(config-pmap-c-police)# exit`
	`Device(config-pmap-c)# exit`
	`Device(config-pmap)# exit`
	`Device(config)#`
		Returns to the global configuration mode.

Step 7	**control-plane**
	Example:
	`Device(config)# control-plane`
	`Device(config-cp)#`
		Enters the control plane (config-cp) configuration mode

Step 8	**service-policy input** *policy-name*
	Example:
	`Device(config)# control-plane`
	`Device(config-cp)#service-policy input system-cpp-policy`
	`Device(config-cp)#`
		Installs system-cpp-policy in FED. This command is required for you to see the FED policy. Not configuring this command will lead to an error.

Step 9	**end** **Example:** `Device(config-cp)# end`	Returns to the privileged EXEC mode.
Step 10	**show policy-map control-plane** **Example:** `Device# show policy-map control-plane`	Displays all the classes configured under `system-cpp policy`, the rates configured for the various traffic types, and statistics

Related Topics

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Restrictions for CoPP, on page 1
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Disabling a CPU Queue

Follow these steps to disable a CPU queue:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**policy-map** *policy-map-name*
	Example:
	`Device(config)# policy-map system-cpp-policy`
	`Device(config-pmap)#`
		Enters the policy map configuration mode.

Step 4	**class** *class-name*
	Example:
	`Device(config-pmap)# class system-cpp-police-protocol-snooping`
	`Device(config-pmap-c)#`
		Enters the class action configuration mode. Enter the name of the class that corresponds to the CPU queue you want to disable. See the table, *System-Defined Values for CoPP*.

Step 5	**no police rate** *rate* **pps** **Example:** `Device(config-pmap-c)# no police rate 100 pps`	Disables incoming packet processing for the specified traffic class. **Note** This disables all CPU queues that belong to the class-map you have specified.
Step 6	**end** **Example:** `Device(config-pmap-c)# end`	Returns to the privileged EXEC mode.
Step 7	**show policy-map control-plane** **Example:** `Device# show policy-map control-plane`	Displays all the classes configured under `system-cpp policy` and the rates configured for the various traffic types and statistics.

Related Topics

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Setting the Default Policer Rates for All CPU Queues

Follow these steps to set the policer rates for all CPU queues to their default rates:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**cpp system-default**
	Example:
	`Device(config)# cpp system-default`
	`Defaulting CPP : Policer rate for all classes will be set to their defaults`
		Sets the policer rates for all the classes to the default rate.

Step 4	**end** **Example:** `Device(config)# end`	Returns to the privileged EXEC mode.
Step 5	**show platform hardware fed switch** {*switch-number* | *active* | *standby*} **qos que stats internal cpu policer** **Example:** `Device# show platform hardware fed switch 1 qos que stat internal cpu policer`	Displays the rates configured for the various traffic types.

Related Topics

User-Configurable Aspects of CoPP, on page 5
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Creating A User-Defined Class Map

Follow these steps to create user-defined class maps in system-cpp-policy and set the policer rates in bps

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**class-map** *class-map-name*
	Example:
	`Device(config)# class-map example_class`
	`Device(config-cmap)#`
		Specify the class map you want to create. Enters the class map configuration mode.

Step 4	**exit**
	Example:
	`Device(config-cmap)# exit`
	`Device(config)#`
		Exits the class map configuration mode.

Step 5	**policy-map** *policy-map-name*
	Example:
	`Device(config)# policy-map system-cpp-policy`
	`Device(config-pmap)#`
		Enter the policy map name. Enters the policy map configuration mode.

Step 6	**class-map** *class-map-name* **Example:**	Enters the class action configuration mode. Enter the name of the class.

	Command or Action	Purpose
	`Device(config-pmap)# class example_class` `Device(config-pmap-c)#`	
Step 7	**[no] police rate** *target_bit_rate* **Example:** `Device(config-pmap-c)# police 90000`	Specifies the bit rate per second, enter a value between 8000 and 10000000000. **Note** The police rate for user-defined class-maps must not exceed 10000 pps worth of traffic.

Step 8	**end**
	Example:
	`Device(config-pmap-c-police)# end`
	`Device#`
		Returns to the privileged EXEC mode.

Step 9	**show policy-map control-plane** **Example:** `Device# show policy-map control-plane`	Displays all the classes configured under `system-cpp policy`, including the user-defined class maps, and the rates configured.

Related Topics

User-Configurable Aspects of CoPP, on page 5
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Example: Enabling a CPU Queue or Changing the Policer Rate of a CPU Queue, on page 11
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Examples for Configuring CoPP

Example: Enabling a CPU Queue or Changing the Policer Rate of a CPU Queue

This example shows how to enable a CPU queue or to change the policer rate of a CPU queue. Here the **class system-cpp-police-protocol-snooping** CPU queue is enabled with the policer rate of **2000 pps** .

```
Device> enable
Device# configure terminal
Device(config)# policy-map system-cpp-policy
Device(config-pmap)# class system-cpp-police-protocol-snooping
Device(config-pmap-c)# police rate 2000 pps
Device(config-pmap-c-police)# end


Device# show policy-map control-plane
Control Plane

  Service-policy input: system-cpp-policy
```

```
<output truncated>


Class-map: system-cpp-police-dot1x-auth (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0000 bps, drop rate 0000 bps
  Match: none
  police:
      rate 1000 pps, burst 244 packets
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop

Class-map: system-cpp-police-protocol-snooping (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0000 bps, drop rate 0000 bps
  Match: none
  police:
      rate 2000 pps, burst 488 packets
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop

<output truncated>

Class-map: class-default (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0000 bps, drop rate 0000 bps
  Match: any
```

Related Topics

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Example: Disabling a CPU Queue

This example shows how to disable a CPU queue. Here the **class system-cpp-police-protocol-snooping** CPU queue is disabled.

```
Device> enable
Device# configure terminal
Device(config)# policy-map system-cpp-policy
Device(config-pmap)# class system-cpp-police-protocol-snooping
Device(config-pmap-c)# no police rate 100 pps
Device(config-pmap-c)# end


Device# show running-config | begin system-cpp-policy

policy-map system-cpp-policy
 class system-cpp-police-data
  police rate 200 pps
```

```
 class system-cpp-police-sys-data
  police rate 100 pps
 class system-cpp-police-sw-forward
  police rate 1000 pps
 class system-cpp-police-multicast
  police rate 500 pps
 class system-cpp-police-multicast-end-station
  police rate 2000 pps
 class system-cpp-police-punt-webauth
 class system-cpp-police-l2-control
 class system-cpp-police-routing-control
  police rate 500 pps
 class system-cpp-police-control-low-priority
 class system-cpp-police-wireless-priority1
 class system-cpp-police-wireless-priority2
 class system-cpp-police-wireless-priority3-4-5
 class system-cpp-police-topology-control
 class system-cpp-police-dot1x-auth
 class system-cpp-police-protocol-snooping
 class system-cpp-police-forus
 class system-cpp-default

<output truncated>
```

Related Topics

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Example: Setting the Default Policer Rates for All CPU Queues

This example shows how to set the policer rates for all CPU queues to their default and then verify the setting.

```
Device> enable
Device# configure terminal
Device(config)# cpp system-default
Defaulting CPP : Policer rate for all classes will be set to their defaults
Device(config)# end

Deviceshow platform hardware fed switch 1 qos queue stats internal cpu policer

(default) (set)
QId PlcIdx  Queue Name                Enabled   Rate     Rate      Drop
-------------------------------------------------------------------------
0    11     DOT1X Auth                  No      1000      1000        0
1    1      L2 Control                  No      500       400         0
2    14     Forus traffic               No      1000      1000        0
3    0      ICMP GEN                    Yes     200       200         0
4    2      Routing Control             Yes     1800      1800        0
5    14     Forus Address resolution    No      1000      1000        0
6    3      Punt Copy to ICMP Redirect  No      500       400         0
7    6      WLESS PRI-5                 No      1000      1000        0
8    4      WLESS PRI-1                 No      1000      1000        0
9    5      WLESS PRI-2                 No      1000      1000        0
10   6      WLESS PRI-3                 No      1000      1000        0
11   6      WLESS PRI-4                 No      1000      1000        0
12   0      BROADCAST                   Yes     200       200         0
13   10     Learning cache ovfl         Yes     100       200         0
```

```
14   13     Sw forwarding                Yes     1000      1000        0
15   8      Topology Control             No      13000     13000       0
16   12     Proto Snooping               No      500       400         0
17   16     DHCP Snooping                No      1000      1000        0
18   9      Transit Traffic              Yes     500       400         0
19   10     RPF Failed                   Yes     100       200         0
20   15     MCAST END STATION            Yes     2000      2000        0
21   13     LOGGING                      Yes     1000      1000        0
22   7      Punt Webauth                 No      1000      1000        0
23   10     Crypto Control               Yes     100       200         0
24   10     Exception                    Yes     100       200         0
25   3      General Punt                 No      500       400         0
26   10     NFL SAMPLED DATA             Yes     100       200         0
27   2      Low Latency                  Yes     1800      1800        0
28   10     EGR Exception                Yes     100       200         0
29   16     Nif Mgr                      No      1000      1000        0
30   9      MCAST Data                   Yes     500       400         0
31   10     Gold Pkt                     Yes     100       200         0
<output truncated>
```

Related Topics

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Example: Creating a User-Defined Class Map

Device

This example shows how to create a user-defined class map, apply it to `system-cpp-policy` and display information about where the policy is applied.

A user-defined class map is applied to `system-cpp-policy`, which means that any control traffic matching the user-defined class map `class-cpp-user` is subject to the aggregate policer, under the user-defined class map. Statistics for the user defined traffic class are reported in Bytes.

```
Device> enable
Device# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Device(config)# class-map match-any class-cpp-user
Device(config-cmap)# match dscp cs1
Device(config-cmap)# exit
Device(config)# policy-map system-cpp-policy
Device(config-pmap)# class class-cpp-user
Device(config-pmap-c)# police rate 2m bps
Device(config-pmap-c-police)# end
```

```
Device# show policy-map control-plane
<output truncated>
Class-map: class-cpp-user (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match:  dscp cs1 (8)
      police:
          rate 2000000 bps, burst 62500 bytes
        conformed 0 bytes; actions:
          transmit
```

```
        exceeded 0 bytes; actions:
          drop
        conformed 0000 bps, exceeded 0000 bps
<output truncated>
```

When you add a user-defined class map to `system-cpp-policy`, the system automatically installs it on all 32 CPU queues, in addition to the control plane (resulting in 33 instances of the policy).

Note how the direction is display as egress (OUT), even though system-cpp-policy is applied in the ingress

```
Device# show platform software fed switch active qos policy target status

TCG status summary:

Loc Interface             IIF-ID           Dir State:(cfg,opr) Policy
--- --------------------- ---------------- --- --------------- --------------------
?:255 Control Plane       0x00000001000001 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-0          0x0000000100000d OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-1          0x0000000100000e OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-2          0x0000000100000f OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-3          0x00000001000010 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-4          0x00000001000011 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-5          0x00000001000012 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-6          0x00000001000013 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-7          0x00000001000014 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-8          0x00000001000015 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-9          0x00000001000016 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-10         0x00000001000017 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-11         0x00000001000018 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-12         0x00000001000019 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-13         0x0000000100001a OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-14         0x0000000100001b OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-15         0x0000000100001c OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-16         0x0000000100001d OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-17         0x0000000100001e OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-18         0x0000000100001f OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-19         0x00000001000020 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-20         0x00000001000021 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-21         0x00000001000022 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-22         0x00000001000023 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-23         0x00000001000024 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-24         0x00000001000025 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-25         0x00000001000026 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-26         0x00000001000027 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-27         0x00000001000028 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-28         0x00000001000029 OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-29         0x0000000100002a OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-30         0x0000000100002b OUT VALID,SET_INHW  system-cpp-policy
?:0 CoPP-Queue-31         0x0000000100002c OUT VALID,SET_INHW  system-cpp-policy
```

Monitoring CoPP

Use these commands to display policer settings, such as, traffic types and policer rates (user-configured and default rates) for CPU queues:

Command	Purpose
show policy-map control-plane	Displays the rates configured for the various traffic types

Command	Purpose
show policy-map system-cpp-policy	Displays all the classes configured under system-cpp policy, and policer rates
show platform hardware fed switch {*switch-number* | *active* | *standby*} **qos que stats internal cpu policer**	Displays the rates configured for the various traffic types
show platform software fed {*switch-number* | *active* | *standby*} **qos policy target status**	Displays information about policy status and the target port type.

Feature History and Information For CoPP

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.

Feature	Release	Feature Information
Control Plane Policing (CoPP) or CPP	Cisco IOS XE 3.2SE	This feature was introduced.
CLI configuration for CoPP	Cisco IOS XE Denali 16.1.2	This feature was made user-configurable. CLI configuration options to enable and disable CPU queues, to change the policer rate, and to set policer rates to default.
User-defined class maps	Cisco IOS XE Everest 16.5.1a	Starting with this release, you can create class maps (with filters) and add these user-defined class maps to system-cpp-policy.