Configuring Policing

This chapter describes how to configure policing of traffic classes on the Cisco NX-OS device.

Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at https://tools.cisco.com/bugsearch/ and the release notes for your 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 "New and Changed Information"chapter or the Feature History table in this chapter.

Information About Policing

Policing is the monitoring of the data rates for a particular class of traffic. When the data rate exceeds user-configured values, marking or dropping of packets occurs immediately. Policing does not buffer the traffic; therefore, the transmission delay is not affected. When traffic exceeds the data rate, you instruct the system to either drop the packets or mark QoS fields in them.

You can define single-rate, dual-rate, and color-aware policers.

Single-rate policers monitor the committed information rate (CIR) of traffic. Dual-rate policers monitor both CIR and peak information rate (PIR) of traffic. In addition, the system monitors associated burst sizes. Three colors, or conditions, are determined by the policer for each packet depending on the data rate parameters supplied: conform (green), exceed (yellow), or violate (red).

You can configure only one action for each condition. For example, you might police for traffic in a class to conform to the data rate of 256000 bits per second, with up to 200 millisecond bursts. The system would apply

the conform action to traffic that falls within this rate, and it would apply the violate action to traffic that exceeds this rate.

Color-aware policers assume that traffic has been previously marked with a color. This information is then used in the actions taken by this type of policer.

For more information about policers, see RFC 2697 and RFC 2698.

Shared Policers

QoS applies the bandwidth limits specified in a shared policer cumulatively to all flows in the matched traffic. A shared policer applies the same policer to more than one interface simultaneously.

For example, if you configure a shared policer to allow 1 Mbps for all Trivial File Transfer Protocol (TFTP) traffic flows on VLAN 1 and VLAN 3, the device limits the TFTP traffic for all flows combined on VLAN 1 and VLAN 3 to 1 Mbps.

The following are guidelines for configuring shared policers:

- You create named shared policers by entering the qos shared-policer command. If you create a shared policer and create a policy using that shared policer and attach the policy to multiple ingress ports, the device polices the matched traffic from all the ingress ports to which it is attached.

- You define shared policers in a policy map class within the police command. If you attach a named shared policer to multiple ingress ports, the device polices the matched traffic from all the ingress ports to which it is attached.

- Shared policing works independently on each module.

Prerequisites for Policing

Policing has the following prerequisites:

- You must be familiar with "Using Modular QoS CLI."

- You are logged on to the switch.

- You are in the correct VDC. A VDC is a logical representation of a set of system resources. You can use the **switchto vdc** command with a VDC number.

Guidelines and Limitations

Policing has the following configuration guidelines and limitations:

- F1 modules do not support policing.

- Each module polices independently, which might affect QoS features that are being applied to traffic that is distributed across more than one module. The following are examples of these QoS features:

    - Policers applied to a port channel interface.

- Egress policers applied to a Layer 3 interface. The device performs egress policing decisions at the ingress module.

- Policers applied to a VLAN.

- All policers in either the ingress or egress direction must use the same mode. For example, if the color-aware mode is needed for a class, all classes in that policy in the same direction must be in the color-aware mode.

- An interface policer does not work for the Layer 2 traffic data and control traffic in native VLAN in the following scenarios:

  - When the **native vlan** (ID other than 1) command is configured on the interface and the native VLAN ID is missing in the configuration.

  - If the **vlan dot1q tag native exclude control** command is configured.

- The police rate for traffic between two different port ASIC instances on a module is set differently for all modules in Cisco Nexus 7000 Series.

  - When traffic is between two different instances on an M1 module, the police rate is shared between the instances. If you add another interface as a third instance, the same police rate is shared as was between the two existing instances. For example, if a police rate of 5 Mbps is shared between two instances and an interface on a third instance is added, then the police rate of 5 Mbps is shared among all three instances.

  - When the traffic is between two different instances (on all modules in Cisco Nexus 7000 Series), the police rate is not shared between the instances. The police rate is shared only among the interfaces on the same instance. For example, if a police rate of 5 Mbps is set for the interfaces on one instance, this 5 Mbps police rate is not shared with interfaces on another instance.

  - In M3 modules, MQC supports a *shared-policer* construct, which allows traffic from multiple targets to share a common policer. The only restriction is that the policing rate for a *shared-policer* can be supported only within a single decision engine instance.

- The traffic is policed if the policer is applied as follows on M1 and F2 modules when the **mac packet-classify** command is not enabled:

  - Layer 2 traffic is matched when the policer is configured with MAC access list.

  - Layer 3 traffic is matched when the policer is configured with IP access list.

  - Layer 2 and Layer 3 traffic are matched when the policer is configured with MAC access list and IP access list.

- When the policer is applied on M1 or F2 modules having Layer 2 and Layer 3 traffic with MAC and IP access list, only the Layer 2 traffic matched with MAC access list is classified if the **mac packet-classify** command is enabled.

- When the port mode is changed, from **switchport** to **no switchport** or vice versa, the policy-map configured on the interface will revert to system default, after the interface is bounced or the switch is reloaded.

Configuring Policing

Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing

The type of policer created by the device is based on a combination of the police command arguments described in the table below.

> **Note** You must specify the identical value for pir and cir to configure 1-rate 3-color policing.

Table 1: Arguments to the police Command

Argument	Description
cir	Committed information rate, or desired bandwidth, specified as a bit rate or a percentage of the link rate. Although a value for cir is required, the argument itself is optional. The range of values is from 1 to 80000000000. The range of policing values is from 8000 to 80 Gbps.
percent	Rate as a percentage of the interface rate. The range of values is from 1 to 100 percent.
bc	Indication of how much the **cir** can be exceeded, either as a bit rate or an amount of time at **cir**. The default is 200 milliseconds of traffic at the configured rate. The default data rate units are bytes, and the Gigabit per second (gbps) rate is not supported for this parameter.
pir	Peak information rate, specified as a PIR bit rate or a percentage of the link rate. There is no default. The range of values is from 1 to 80000000000; the range of policing values is from 8000 to 80 Gbps. The range of percentage values is from 1 to 100 percent.
be	Indication of how much the **pir** can be exceeded, either as a bit rate or an amount of time at **pir**. When the **bc** value is not specified, the default is 200 milliseconds of traffic at the configured rate. The default data rate units are bytes, and the Gigabit per second (gbps) rate is not supported for this parameter. **Note** You must specify a value for **pir** before the device displays this argument.

Argument	Description
conform	Single action to take if the traffic data rate is within bounds. The basic actions are transmit or one of the set commands listed in the table below (Policer Actions for Conform). The default is transmit.
exceed	Single action to take if the traffic data rate is exceeded. The basic actions are drop or markdown. The default is drop.
violate	Single action to take if the traffic data rate violates the configured rate values. The basic actions are drop or markdown. The default is drop.

Note For information on the color-aware police command arguments, see the "Configuring Color-Aware Policing" section.

Although all the arguments in the table above are optional, you must specify a value for **cir**. In this section, **cir** indicates its value but not necessarily the keyword itself. The combination of these arguments and the resulting policer types and actions are shown in the next table.

Table 2: Policer Types and Actions from Police Arguments Present

Police Arguments Present	Policer Type	Policer Action
cir, but not **pir**, **be**, or **violate**	1-rate, 2-color	$\leq$ **cir**, **conform**; else **violate**
cir and **pir**	1-rate, 3-color	$\leq$ **cir**, **conform**; $\leq$ **pir**, **exceed**; else **violate** **Note** You must specify identical values for **cir** and **pir**.
cir and **pir**	2-rate, 3-color	$\leq$ **cir**, **conform**; $\leq$ **pir**, **exceed**; else **violate**

The policer actions that you can specify are described in the following two tables.

Table 3: Policer Actions for Exceed or Violate

Action	Description
drop	Drops the packet. This action is available only when the packet exceeds or violates the parameters.

Action	Description
set dscp dscp table {*cir-markdown-map* | *pir-markdown-map*}	Sets the specified fields from a table map and transmits the packet. For more information on the system-defined or default table maps, see "Configuring Marking." This action is available only when the packet exceeds the parameters (use the cir-markdown-map) or violates the parameters (use the pir-markdown-map). **Note** If the packet has a CoS value configured on VLAN, then the CoS value is used to set the value for the DSCP field.

Table 4: Policer Actions for Conform

Action	Description
transmit	Transmits the packet. This action is available only when the packet conforms to the parameters.
set-prec-transmit	Sets the IP precedence field to a specified value and transmits the packet. This action is available only when the packet conforms to the parameters.
set-dscp-transmit	Sets the Differentiated Service Code Point (DSCP) field to a specified value and transmits the packet. This action is available only when the packet conforms to the parameters.
set-cos-transmit	Sets the class of service (CoS) field to a specified value and transmits the packet. This action is available only when the packet conforms to the parameters
set-qos-transmit	Sets the QoS group internal label to specified value and transmits the packet. This action can be used only in input policies and is available only when the packet conforms to the parameters.
set-discard-class-transmit	Sets the discard-class internal label to a specified value and transmits the packet. This action can be used only in ingress policies and is available only when the packet conforms to the parameters.

Note The policer can only drop or mark down packets that exceed or violate the specified parameters. For information on marking down packets, see "Configuring Marking."

The data rates used in the police command are described in the table below.

Table 5: Data Rates for the police Command

Rate	Description
bps	Bits per second (default)
kbps	1,000 bits per seconds
mbps	1,000,000 bits per second
gbps	1,000,000,000 bits per second

Burst sizes used in the police command are described in the table below.

Table 6: Burst Sizes for the police Command

Speed	Description
bytes	bytes
kbytes	1,000 bytes
mbytes	1,000,000 bytes
ms	milliseconds
us	microseconds

Note You must specify the identical value for **pir** and **cir** to configure 1-rate 3-color policing.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
3. switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
4. switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*] | **percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*] | **percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit** | **set-prec-transmit** | **set-dscp-transmit** | **set-cos-transmit** | **set-qos-transmit** | **set-discard-class-transmit**} [**exceed** {**drop** | **set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop** | **set dscp dscp table** {*pir-markdown-map*}}]]}
5. switch(config-pmap-c-qos)# **exit**
6. switch(config-pmap-qos)# **exit**
7. (Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
8. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}	Creates or accesses the policy map named *qos-policy-map-name*, and then enters policy-map mode. The policy-map name can contain alphabetic, hyphen, or underscore characters, is case sensitive, and can be up to 40 characters.
Step 3	switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]	Creates a reference to *class-map-name*, and enters policy-map class configuration mode. The class is added to the end of the policy map unless **insert-before** is used to specify the class to insert before. Use the **class-default** keyword to select all traffic that is not currently matched by classes in the policy map.
Step 4	switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*] | **percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*] | **percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit** | **set-prec-transmit** | **set-dscp-transmit** | **set-cos-transmit** | **set-qos-transmit** | **set-discard-class-transmit**} [**exceed** {**drop** | **set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop** | **set dscp dscp table** {*pir-markdown-map*}}]]}	Polices **cir** in bits or as a percentage of the link rate. The **conform** action is taken if the data rate is $\leq$ **cir**. If **be** and **pir** are not specified, all other traffic takes the **violate** action. If **be** or **violate** are specified, the **exceed** action is taken if the data rate $\leq$ **pir**, and the **violate** action is taken otherwise. The actions, data rates, and link speeds are described in the tables above. **Note**　　You must specify identical values for **cir** and **pir**.
Step 5	switch(config-pmap-c-qos)# **exit**	Exits policy-map class configuration mode and enters policy-map mode.
Step 6	switch(config-pmap-qos)# **exit**	Exits policy-map mode and enters global configuration mode.
Step 7	(Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]	Displays information about all configured policy maps or a selected policy map of type qos.
Step 8	(Optional) switch(config)# **copy running-config startup-config**	Saves the running configuration to the startup configuration.

Example

This example shows how to display the policy1 policy-map configuration:

```
switch# show policy-map policy1
```

Configuring Color-Aware Policing

Color-aware policing implies that the QoS DSCP field in a class of traffic has been previously marked with values that you can use in a policer. This feature allows you to mark traffic at one node in a network and then take action based on this marking at a subsequent node.

For information on the police command, see the "Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing" section.

You can use one or more of the four police command class maps conform-color or exceed-color to perform color-aware policing. These keywords require a class-map name that is used to classify packets. Based on the match criteria that you specify in the class maps, the traffic is classified into one of these two classes or class-default if there is no match. The policer then takes the following action:

- Packets that belong to the **conform-color** class are policed with the **cir** and **pir** arguments to the **police** command.

- Packets that belong to the **exceed-color** class are policed only against the **pir** argument to the **police** command. If **pir** is not specified, the **cir** values are used.

- Packets that end up in class-default because they fail to match either the **conform-color** or **exceed-color** class will immediately take the violate action.

A color other than class-default cannot be assigned to the violate action because according to RFC 2697 and RFC 2698, all packets must be assigned a color.

You can set the DSCP value for color-aware policing to a specified value. The list of valid DSCP values is shown in the table below.

Table 7: Color-Aware Policing Valid DSCP Values

Value	List of DSCP Values
af11	AF11 dscp (001010)—decimal value 10
af12	AF12 dscp (001100)—decimal value 12
af13	AF13 dscp (001110)—decimal value 14
af21	AF21 dscp (010010)—decimal value 18
af22	AF22 dscp (010100)—decimal value 20
af23	AF23 dscp (010110)—decimal value 22
af31	AF31 dscp (011010)—decimal value 26
af32	AF40 dscp (011100)—decimal value 28
af33	AF33 dscp (011110)—decimal value 30
af41	AF41 dscp (100010)—decimal value 34
af42	AF42 dscp (100100)—decimal value 36
af43	AF43 dscp (100110)—decimal value 38

Value	List of DSCP Values
cs1	CS1 (precedence 1) dscp (001000)—decimal value 8
cs2	CS2 (precedence 2) dscp (010000)—decimal value 16
cs3	CS3 (precedence 3) dscp (011000)—decimal value 24
cs4	CS4 (precedence 4) dscp (100000)—decimal value 32
cs5	CS5 (precedence 5) dscp (101000)—decimal value 40
cs6	CS6 (precedence 6) dscp (110000)—decimal value 48
cs7	CS7 (precedence 7) dscp (111000)—decimal value 56
default	Default dscp (000000)—decimal value 0
ef	EF dscp (101110)—decimal value 46

After you apply color-aware policing, all matching packets in the device are policed according to the specifications of the color-aware policer.

To configure color-aware policing:

1. Create the class map. For information about configuring class maps, see "Configuring Classification."

2. Create a policy map. For information about policy maps, see this chapter and "Using Modular QoS CLI."

3. Configure the color-aware class map as described in this section.

4. Apply the service policy to the interfaces. For information about attaching policies to interfaces, see "Using Modular QoS CLI."

Note The rates specified in the shared policer are shared by the number of interfaces to which you apply the service policy. Each interface does not have its own dedicated rate as specified in the shared policer.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **class-map** {**conform-color-in** | **conform-color-out** | **exceed-color-in** | **exceed-color-out**}
3. switch(config-color-map)# **match dscp** *dscp-value*
4. switch(config-color-map)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
5. switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]

6. switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*] | **percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*] | **percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit** | **set-prec-transmit** | **set-dscp-transmit** | **set-cos-transmit** | **set-qos-transmit** | **set-discard-class-transmit**} [**exceed** {**drop** | **set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop** | **set dscp dscp table** {*pir-markdown-map*}}]]}

7. switch(config-color-map)# **exit**

8. (Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]

9. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.

Step 2	switch(config)# **class-map** {**conform-color-in**	**conform-color-out**	**exceed-color-in**	**exceed-color-out**}	Accesses the color-aware class map, and enters color-map mode. When you enter this command, the system returns the following message:
					
					`Warning: Configuring match for any DSCP values in`
					` this class-map will make`
					`ALL policers in the system color-aware for those`
					`DSCP values.`

Step 3	switch(config-color-map)# **match dscp** *dscp-value*	Specifies the DSCP value to match for color-aware policers. See the table above for a list of valid values.
Step 4	switch(config-color-map)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name*	**qos-dynamic**}	Creates or accesses the policy map named *qos-policy-map-name*, and then enters policy-map mode. The policy-map name can contain alphabetic, hyphen, or underscore characters, is case sensitive, and can be up to 40 characters.
Step 5	switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name*	**qos-dynamic**	**class-default**} [**insert-before** *before-class-map-name*]	Creates a reference to *class-map-name*, and enters policy-map class configuration mode. The class is added to the end of the policy map unless **insert-before** is used to specify the class to insert before. Use the **class-default** keyword to select all traffic that is not currently matched by classes in the policy map.
Step 6	switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*]	**percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*]	**percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit**	**set-prec-transmit**	**set-dscp-transmit**	**set-cos-transmit**	**set-qos-transmit**	**set-discard-class-transmit**} [**exceed** {**drop**	**set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop**	**set dscp dscp table** {*pir-markdown-map*}}]]}	Polices **cir** in bits or as a percentage of the link rate. The **conform** action is taken if the data rate is ≤ **cir**. If **be** and pir are not specified, all other traffic takes the **violate** action. If **be** or **violate** are specified, the **exceed** action is taken if the data rate ≤ **pir**, and the **violate** action is taken otherwise. The actions, data rates, and link speeds are described in Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing, on page 4 above.
Step 7	switch(config-color-map)# **exit**	Exits color-map mode and then enters global configuration mode.

	Command or Action	Purpose
Step 8	(Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name*	**qos-dynamic**]	Displays information about all configured policy maps or a selected policy map of type qos.
Step 9	(Optional) switch(config)# **copy running-config startup-config**	Saves the running configuration to the startup configuration.

Example

This example shows how to display the policy1 policy-map configuration:

```
switch# show policy-map policy1
```

Configuring Ingress and Egress Policing

You can apply the policing instructions in a QoS policy map to ingress or egress packets by attaching that QoS policy map to an interface. To select ingress or egress, you specify either the input or output keyword in the service-policy command. For more information on attaching and detaching a QoS policy action from an interface, see "Using Modular QoS CLI."

Configuring Markdown Policing

Markdown policing is the setting of a QoS field in a packet when traffic exceeds or violates the policed data rates. You can configure markdown policing by using the set commands for policing action described in .

The example in this section shows you how to use a table map to perform a markdown.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
3. switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
4. switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*] | **percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*] | **percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit** | **set-prec-transmit** | **set-dscp-transmit** | **set-cos-transmit** | **set-qos-transmit** | **set-discard-class-transmit**} [**exceed** {**drop** | **set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop** | **set dscp dscp table** {*pir-markdown-map*}}]]}
5. switch(config-pmap-c-qos)# **exit**
6. switch(config-pmap-qos)# **exit**
7. (Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
8. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name*	**qos-dynamic**}	Creates or accesses the policy map named *qos-policy-map-name*, and then enters policy-map mode. The policy-map name can contain alphabetic, hyphen, or underscore characters, is case sensitive, and can be up to 40 characters.
Step 3	switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name*	**qos-dynamic**	**class-default**} [**insert-before** *before-class-map-name*]	Creates a reference to *class-map-name*, and enters policy-map class configuration mode. The class is added to the end of the policy map unless **insert-before** is used to specify the class to insert before. Use the **class-default** keyword to select all traffic that is not currently matched by classes in the policy map.
Step 4	switch(config-pmap-c-qos)# **police** [**cir**] {*committed-rate* [*data-rate*]	**percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*]	**percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {**conform** {**transmit**	**set-prec-transmit**	**set-dscp-transmit**	**set-cos-transmit**	**set-qos-transmit**	**set-discard-class-transmit**} [**exceed** {**drop**	**set dscp dscp table** {*cir-markdown-map*}} [**violate** {**drop**	**set dscp dscp table** {*pir-markdown-map*}}]]}	Polices **cir** in bits or as a percentage of the link rate. The **conform** action is taken if the data rate is ≤ **cir**. If **be** and pir are not specified, all other traffic takes the **violate** action. If **be** or **violate** are specified, the **exceed** action is taken if the data rate ≤ **pir**, and the **violate** action is taken otherwise. The actions, data rates, and link speeds are described in Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing, on page 4 above.
Step 5	switch(config-pmap-c-qos)# **exit**	Exits policy-map class configuration mode and enters policy-map mode.
Step 6	switch(config-pmap-qos)# **exit**	Exits policy-map mode and enters global configuration mode.
Step 7	(Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name*	**qos-dynamic**]	Displays information about all configured policy maps or a selected policy map of type qos.
Step 8	(Optional) switch(config)# **copy running-config startup-config**	Saves the running configuration to the startup configuration.

Example

This example shows how to display the policy1 policy-map configuration:

```
switch# show policy-map policy1
```

Configuring Shared Policers

The shared-policer feature allows you to apply the same policing parameters to several interfaces simultaneously. You create a shared policer by assigning a name to a policer, and then applying that policer to a policy map

that you attach to the specified interfaces. The shared policer is also referred to as the named aggregate policer in other Cisco documentation.

✎

Note After you configure the shared policer, you can use the shared-policer name to configure any type of shared policing, as described in the "Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing" section, the "Configuring Color-Aware Policing" section, the "Configuring Ingress and Egress Policing" section, and the "Configuring Markdown Policing" section.

To configure shared policing:

1. Configure the shared policer as described in this section.

2. Create the class map. For information about configuring class maps, see "Configuring Classification."

3. Create a policy map. For information about policy maps, see this chapter and "Using Modular QoS CLI."

4. Reference the shared policer to the policy map as described in this section.

5. Apply the service policy to the interfaces. For information about attaching policies to interfaces, see "Using Modular QoS CLI."

✎

Note The rates specified in the shared policer are shared by the number of interfaces to which you apply the service policy. Each interface does not have its own dedicated rate as specified in the shared policer.

SUMMARY STEPS

1. switch# **configure terminal**
2. switch(config)# **qos shared-policer** [**type qos**] *shared-policer-name* [**cir**] {*committed-rate* [*data-rate*] | **percent** *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*] | **percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {{**conform** *conform-action* [**exceed** {**drop** | **set dscp dscp table** *cir-markdown-map*} [**violate** {**drop** | **set dscp dscp table** *pir-markdown-map*}]]}}
3. switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
4. switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
5. switch(config-pmap-c-qos)# **police aggregate shared-policer-name**
6. switch(config-pmap-c-qos)# **exit**
7. switch(config-pmap-qos)# **exit**
8. (Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
9. (Optional) switch(config)# **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configure terminal**	Enters global configuration mode.
Step 2	switch(config)# **qos shared-policer** [**type qos**] *shared-policer-name* [**cir**] {*committed-rate* [*data-rate*]		Creates or accesses the shared policer. The shared-policer-name can contain alphabetic, hyphen, or

	Command or Action	Purpose
	percent *cir-link-percent*} [**bc** *committed-burst-rate* [*link-speed*]] [**pir**] {*peak-rate* [*data-rate*]	**percent** *cir-link-percent*} [**be** *peak-burst-rate* [*link-speed*]] {{**conform** *conform-action* [**exceed** {**drop**	**set dscp dscp table** *cir-markdown-map*} [**violate** {**drop**	**set dscp dscp table** *pir-markdown-map*}]]}}	underscore characters, is case sensitive, and can be up to 40 characters. Polices **cir** in bits or as a percentage of the link rate. The **conform** action is taken if the data rate is ≤ **cir**. If **be** and **pir** are not specified, all other traffic takes the **violate** action. If **be** or **violate** are specified, the **exceed** action is taken if the data rate ≤ **pir**, and the **violate** action is taken otherwise. The actions, data rates, and link speeds are described in Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing, on page 4 above.
Step 3	switch(config)# **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name*	**qos-dynamic**}	Creates or accesses the policy map named *qos-policy-map-name*, and then enters policy-map mode. The policy-map name can contain alphabetic, hyphen, or underscore characters, is case sensitive, and can be up to 40 characters.
Step 4	switch(config-pmap-qos)# **class** [**type qos**] {*class-map-name*	**qos-dynamic**	**class-default**} [**insert-before** *before-class-map-name*]	Creates a reference to *class-map-name*, and enters policy-map class configuration mode. The class is added to the end of the policy map unless **insert-before** is used to specify the class to insert before. Use the **class-default** keyword to select all traffic that is not currently matched by classes in the policy map.
Step 5	switch(config-pmap-c-qos)# **police aggregate** **shared-policer-name**	Creates a reference in the policy map to *shared-policer-name*.
Step 6	switch(config-pmap-c-qos)# **exit**	Exits policy-map class configuration mode and enters policy-map mode.
Step 7	switch(config-pmap-qos)# **exit**	Exits policy-map mode and enters global configuration mode.
Step 8	(Optional) switch(config)# **show policy-map** [**type qos**] [*policy-map-name*	**qos-dynamic**]	Displays information about all configured policy maps or a selected policy map of type qos.
Step 9	(Optional) switch(config)# **copy running-config** **startup-config**	Saves the running configuration to the startup configuration.

Example

This example shows how to display the test1 shared-policer configurations:

```
switch# show qos shared-policer test1
```

Verifying the Policing Configuration

To display the policing configuration information, perform one of these tasks:

show policy-map	Displays information about policy maps and policing.
show qos shared-policer [type qos] [*policer-name*]	Displays information about all shared policing.

Configuration Examples for Policing

The following example shows how to configure policing for a 1-rate, 2-color policer:

```
configure terminal
 policy-map policy1
   class one_rate_2_color_policer
     police cir 256000 conform transmit violate drop
```

The following example shows how to configure policing for a 1-rate, 2-color policer with DSCP markdown:

```
configure terminal
 policy-map policy2
   class one_rate_2_color_policer_with_dscp_markdown
     police cir 256000 conform transmit violate drop
```

The following example shows how to configure policing for a 1-rate, 3-color policer:

```
configure terminal
 policy-map policy3
   class one_rate_3_color_policer
     police cir 256000 pir 256000 conform transmit exceed set dscp dscp table
cir-markdown-map violate drop
```

The following example shows how to configure policing for a 2-rate, 3-color policer:

```
configure terminal
 policy-map policy4
   class two_rate_3_color_policer
     police cir 256000 pir 256000 conform transmit exceed set dscp dscp table
cir-markdown-map violate drop
```

The following example shows how to configure policing for a color-aware policer for specified DSCP values:

```
configure terminal
   class-map conform-color-in
     match dscp 0-10
policy-map policy5
   class one_rate_2_color_policer
     police cir 256000 conform transmit violate drop
```

The following example shows how to configure policing for a shared policer:

```
configure terminal
 qos shared-policer type qos udp_10mbps cir 10 mbps pir 20 mbps conform transmit exceed
set dscp dscp table cir-markdown-map violate drop
 policy-map type qos udp_policy
   class type qos udp_qos
     police aggregate udp_10mbps
```

Feature History for Policing

The table below summarizes the new and changed features for this document and shows the releases in which each feature is supported. Your software release might not support all the features in this document. For the latest caveats and feature information, see the Bug Search Tool at https://tools.cisco.com/bugsearch/ and the release notes for your software release.

Table 8: Feature History for Policing

Feature Name	Release	Feature Information
No changes from Release 4.1(2)	5.1(1)	——