CHAPTER 6

# Configuring Policing

This chapter describes how to configure policing of traffic classes.

This chapter includes the following sections:



## 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, so 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 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.

# Licensing Requirements for Policing

The following table shows the licensing requirements for this feature:

| Product | License Requirement |
|---|---|
| NX-OS | QoS requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the NX-OS licensing scheme, see the *Cisco Nexus 7000 Series NX-OS Licensing Guide, Release 4.2*. |

However, using VDCs requires an Advanced Services license.

# Prerequisites for Policing

Policing has the following prerequisites:

- You must be familiar with Chapter 2, “Using Modular QoS CLI.”
- You are logged on to the switch.
- You are in the correct virtual device context (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

Use the following guidelines to configure 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. Note that the device performs egress policing decisions at the ingress interface, on 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 color-aware mode is needed for a class, all classes in that policy in the same direction must be in color-aware mode.

# Configuring Policing

You can configure a single- or dual-rate policer.

This section includes the following topics:



## 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 Table 6-1.

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

*Table 6-1 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 1 to 80000000000; the range of policing values that are mathematically significant is 8000 to 80 Gbps. |
| **percent** | Specifies the rate as a percentage of the interface rate. The range of values is 1 to 100%. |
| **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 1 to 80000000000; the range of policing values that are mathematically significant is 8000 to 80 Gbps. The range of percentage values is 1 to 100%. |

*Table 6-1 Arguments to the police Command (continued)*

| Argument | Description |
|---|---|
| **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.<br>**Note** You must specify a value for **pir** before the device displays this argument. |
| **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 Table 6-4. 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 on page 6-8.

Although all the arguments in Table 6-1 are optional, you must specify a value for **cir**. In this section, **cir** indicates what is its value but not necessarily the keyword itself. The combination of these arguments and the resulting policer types and actions are shown in Table 6-2.

*Table 6-2 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 | <= **cir**, then **conform**; else **violate** |
| **cir** and **pir** | 1-rate, 3-color | <= **cir**, then **conform**; <= **pir**, then **exceed**; else **violate**<br>**Note** You must specify identical values for **cir** and **pir**. |
| **cir** and **pir** | 2-rate, 3-color | <= **cir**, then **conform**; <= **pir**, then **exceed**; else **violate** |

The policer actions that you can specify are described in Table 6-3 and Table 6-4.

*Table 6-3 Policer Actions for Exceed or Violate*

| Action | Description |
|---|---|
| **drop** | Drops the packet. This is only available when the packet exceeds or violates the parameters. |
| **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 Chapter 4, "Configuring Marking." This is available only when the packet exceeds the parameters (use the cir-markdown-map) or violates the parameters (use the pir-markdown-map). |

*Table 6-4 Policer Actions for Conform*

| Action | Description |
|---|---|
| **transmit** | Transmits the packet. This 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 is available only when the packet conforms to the parameters. |
| **set-dscp-transmit** | Sets the DSCP field to a specified value and transmits the packet. This is available only when the packet conforms to the parameters |
| **set-cos-transmit** | Sets the CoS field to a specified value and transmits the packet. This 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 markdown packets that exceed or violate the specified parameters. See Chapter 4, "Configuring Marking" for information on marking down packets.

The data rates used in the **police** command are described in Table 6-5.

*Table 6-5 The 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 Table 6-6.

*Table 6-6 Burst Sizes for the police Command*

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

## SUMMARY STEPS

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

1. **config t**
2. **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
3. **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
4. **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. **exit**
6. **exit**
7. **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
8. **copy running-config startup-config**

**Note** A 1-rate 2-color policer with the violate markdown action is not supported.

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **config t**<br><br>**Example:**<br>switch# config t<br>switch(config)# | Enters configuration mode. |
| **Step 2** | **policy-map** [**type qos**] [**match-first**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>switch(config)# policy-map policy1<br>switch(config-pmap-qos)# | Creates or accesses the policy map named *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** | **class** [**type qos**] {*class-map-name* \| **qos-dynamic** \| **class-default**} [**insert-before** *before-class-map-name*]<br><br>**Example:**<br>switch(config-pmap-qos)# class class-default<br>switch(config-pmap-c-qos)# | 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. Specify **class-default** to select all traffic that is not matched by classes in the policy map so far. |
| **Step 4** | **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*}}]]]<br><br>**Example:**<br>switch(config-pmap-c-qos)# police cir 256000 pir 256000 conform transmit exceed set dscp dscp table cir-markdown-map violate drop<br>switch(config-pmap-c-qos)# | 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 are described in Table 6-3 and Table 6-4. The data rates and link speeds are described in Table 6-5 and Table 6-6.<br><br>This example shows a 1-rate, 3-color policer that transmits if the data rate is within 200 milliseconds of traffic at 256000 bps, marks DSCP to 6 if the data rate is within 300 milliseconds of traffic at 256000 bps, and drops packets otherwise.<br><br>**Note** You must specify identical values for **cir** and **pir.** |

| | Command | Purpose |
|---|---|---|
| Step 5 | **exit**<br><br>**Example:**<br>`switch(config-pmap-c-qos)# exit`<br>`switch(config-pmap-qos)#` | Exits policy-map class configuration mode and enters policy-map mode. |
| Step 6 | **exit**<br><br>**Example:**<br>`switch(config-pmap-qos)# exit`<br>`switch(config)#` | Exits policy-map mode and enters configuration mode. |
| Step 7 | **show policy-map** [**type qos**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>`switch(config)# show policy-map` | (Optional) Displays information about all configured policy maps or a selected policy map of type qos. |
| Step 8 | **copy running-config startup-config**<br><br>**Example:**<br>`switch(config)# copy running-config startup-config` | (Optional) Saves the running configuration to the startup configuration. |

Use the **show policy-map** command 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.

**Note** For information on the **police** command, see the "Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing" section on page 6-3.

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, then 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.

**Note** 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 Table 6-7.

*Table 6-7 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 |
| 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 will be policed according to the specifications of the color-aware policer.

To configure color-aware policing, follow these steps:

**Step 1** Create the class map. For information about configuring class maps, see Chapter 3, "Configuring Classification."

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

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

**Step 4** Apply the service policy to the interfaces. For information about attaching policies to interfaces, see Chapter 2, "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. **config t**
2. **class-map** {**conform-color-in** | **conform-color-out** | **exceed-color-in** | **exceed-color-out**}
3. **match dscp** *dscp-value*
4. **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
5. **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
6. **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. **exit**
8. **show policy-map** [*policy-map-name* | **qos-dynamic**]
9. **copy running-config startup-config**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **config t**<br><br>**Example:**<br>switch# config t<br>switch(config)# | Enters configuration mode. |
| **Step 2** | **class-map** {**conform-color-in** \| **conform-color-out** \| **exceed-color-in** \| **exceed-color-out**}<br><br>**Example:**<br>switch(config)# class-map conform-color-in<br>switch(config-color-map)# | Accesses the color-aware class map, and enters color-map mode. When you enter this command, the system returns the following message:<br><br>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** | **match dscp** *dscp-value*<br><br>**Example:**<br>switch(config-color-map)# match dscp af22<br>switch(config-color-map)# | Specifies the DSCP value to match for color-aware policers. See Table 6-7 for list of valid values. |
| **Step 4** | **policy-map** [**type qos**] [**match-first**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>switch(config)# policy-map policy1<br>switch(config-pmap-qos)# | Creates or accesses the policy-map named *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** | **class** [**type qos**] {*class-map-name* \| **qos-dynamic** \| **class-default**} [**insert-before** *before-class-map-name*]<br><br>**Example:**<br>switch(config-pmap-qos)# class class-default<br>switch(config-pmap-c-qos)# | 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. Specify **class-default** to select all traffic that is not matched by classes in the policy map so far. |

| | Command | Purpose |
|---|---|---|
| Step 6 | **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*}}]]]<br><br>**Example #1:**<br>switch(config-pmap-c-qos)# police cir 256000 be 300 ms conform-class my_conform_class_map exceed-class my_exceed_class_map conform transmit exceed set dscp dscp table cir-markdown-map violate drop<br>switch(config-pmap-c-qos)#<br><br>**Example #2:**<br>switch(config-pmap-c-qos)# police cir 256000 pir 512000 conform-class my_conform_class_map exceed-class my_exceed_class_map conform transmit exceed set dscp dscp table cir-markdown-map violate drop<br>switch(config-pmap-c-qos)# | 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, then the **exceed** action is taken if the data rate <= **pir**, and the **violate** action is taken otherwise. The actions are described in Table 6-3 and Table 6-4. The data rates and link speeds are described in Table 6-5 and Table 6-6.<br><br>This first example shows a 1-rate, 3-color color-aware policer that transmits if conform-class the data rate is within 200 milliseconds of traffic at 256000 bps, marks DSCP to 6 if the exceed-class the data rate is within 300 milliseconds of traffic at 256000 bps, and drops packets otherwise.<br><br>This second example shows a 2-rate, 3-color color-aware policer that transmits if the data rate is within 200 milliseconds of traffic at 256000 bps, marks CoS to 5 if the data rate exceeds 200 milliseconds of traffic at 512 bps, and drops packets otherwise |
| Step 7 | **exit**<br><br>**Example:**<br>switch(config-color-map)# exit<br>switch(config)# | Exits color-map mode and then enters configuration mode. |
| Step 8 | **show policy-map** [**type qos**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>switch(config)# show policy-map | (Optional) Displays information about all configured policy maps or a selected policy map of type qos. |
| Step 9 | **copy running-config startup-config**<br><br>**Example:**<br>switch(config)# copy running-config startup-config | (Optional) Saves the running configuration to the startup configuration. |

Use the **show policy-map** command 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 the Chapter 2, "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 Table 6-3 and Table 6-4.

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

## SUMMARY STEPS

1. **config t**
2. **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
3. **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
4. **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** *conform-action* [**exceed** {**drop** | **set dscp dscp table** *cir-markdown-map*} [**violate** {**drop** | **set dscp dscp table** *pir-markdown-map*}]]}}
5. **exit**
6. **exit**
7. **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
8. **copy running-config startup-config**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **config t**<br><br>**Example:**<br>switch# config t<br>switch(config)# | Enters configuration mode. |
| **Step 2** | **policy-map** [**type qos**] [**match-first**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>switch(config)# policy-map policy1<br>switch(config-pmap-qos)# | Creates or accesses the policy-map named *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** | **class** [**type qos**] {*class-map-name* \| **qos-dynamic** \| **class-default**} [**insert-before** *before-class-map-name*]<br><br>**Example:**<br>switch(config-pmap-qos)# class class-default<br>switch(config-pmap-c-qos)# | 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. Specify **class-default** to select all traffic not matched by classes in the policy map so far. |
| **Step 4** | **police** [**cir**] {*committed-rate* [*data-rate*] \| **percent** cir-*link-percent*} [[**bc** \| **burst**] *burst-rate* [*link-speed*]] [[**be** \| **peak-burst**] *peak-burst-rate* [*link-speed*]] [**conform** *conform-action* [**exceed set dscp dscp table** *cir-markdown-map* [**violate set dscp dscp table** *pir-markdown-map*]]]<br><br>**Example:**<br>switch(config-pmap-c-qos)# police cir 256000 be 300 ms conform transmit exceed set dscp dscp table cir-markdown-map violate drop<br>switch(config-pmap-c-qos)# | 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, then the **exceed** action is taken if the data rate <= **pir**, and the **violate** action is taken otherwise. The actions are described in Table 6-3 and Table 6-4. The data rates and link speeds are described in Table 6-5 and Table 6-6.<br><br>This example shows a 1-rate, 3-color policer that transmits if the data rate is within 200 milliseconds of traffic at 256000 bps; marks down DSCP using the system-defined table map if the data rate is within 300 milliseconds of traffic at 256000 bps; and drops packets otherwise. |

| | Command | Purpose |
|---|---|---|
| Step 5 | **exit**<br><br>**Example:**<br>`switch(config-pmap-c-qos)# exit`<br>`switch(config-pmap-qos)#` | Exits policy-map class configuration mode and enters policy-map mode. |
| Step 6 | **exit**<br><br>**Example:**<br>`switch(config-pmap-qos)# exit`<br>`switch(config)#` | Exits policy-map mode and enters configuration mode. |
| Step 7 | **show policy-map** [**type qos**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>`switch(config)# show policy-map` | (Optional) Displays information about all configured policy maps or a selected policy map of type qos. |
| Step 8 | **copy running-config startup-config**<br><br>**Example:**<br>`switch(config)# copy running-config startup-config` | (Optional) Saves the running configuration to the startup configuration. |

Use the **show policy-map** command 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 following sections: "Configuring 1-Rate and 2-Rate, 2-Color and 3-Color Policing" section on page 6-3, "Configuring Color-Aware Policing" section on page 6-8, "Configuring Ingress and Egress Policing" section on page 6-13, and - "Configuring Markdown Policing" section on page 6-13.

To configure shared policing, follow these steps:

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

**Step 2** Create the class map. For information about configuring class maps, see Chapter 3, "Configuring Classification."

**Step 3** Create a policy map. For information about policy maps, see this chapter and Chapter 2, "Using Modular QoS CLI."

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

**Step 5** Apply the service policy to the interfaces. For information about attaching policies to interfaces, see Chapter 2, "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. **config t**
2. **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. **policy-map** [**type qos**] [**match-first**] {*qos-policy-map-name* | **qos-dynamic**}
4. **class** [**type qos**] {*class-map-name* | **qos-dynamic** | **class-default**} [**insert-before** *before-class-map-name*]
5. **police aggregate** *shared-policer-name*
6. **exit**
7. **exit**
8. **show qos shared-policer** *shared-policer-name*]
9. **copy running-config startup-config**

## DETAILED STEPS

| | Command | Purpose |
|---|---|---|
| **Step 1** | **config t**<br><br>**Example:**<br>switch# config t<br>switch(config)# | Enters configuration mode. |
| **Step 2** | **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 set dscp dscp table** *cir-markdown-map* [**violate set dscp dscp table** *pir-markdown-map*]]]<br><br>**Example:**<br>switch(config)# qos shared-policer test1 cir 10 mbps<br>switch(config)# | Creates or accesses the shared policer. The shared-policer-name can contain alphabetic, hyphen, or 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, then the **exceed** action is taken if the data rate <= **pir**, and the **violate** action is taken otherwise. The actions are described in Table 6-3 and Table 6-4. The data rates and link speeds are described in Table 6-5 and Table 6-6. |
| **Step 3** | **policy-map** [**type qos**] [**match-first**] [*policy-map-name* \| **qos-dynamic**]<br><br>**Example:**<br>switch(config)# policy-map policy1<br>switch(config-pmap-qos)# | Creates or accesses the policy-map named *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** | **class** [**type qos**] {*class-map-name* \| **qos-dynamic** \| **class-default**} [**insert-before** *before-class-map-name*]<br><br>**Example:**<br>switch(config-pmap-qos)# class class1<br>switch(config-pmap-c-qos)# | 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. Specify **class-default** to select all traffic that is currently not matched by classes in the policy map. |
| **Step 5** | **police aggregate** *shared-policer-name*<br><br>**Example:**<br>switch(config-pmap-c-qos)# police aggregate test1<br>switch(config-pmap-c-qos)# | Creates a reference in the policy map to *shared-policer-name*. |

| | Command | Purpose |
|---|---|---|
| **Step 6** | **exit**<br><br>**Example:**<br>`switch(config-pmap-c-qos)# exit`<br>`switch(config-pmap-qos)#` | Exits policy-map class configuration mode and enters policy-map mode. |
| **Step 7** | **exit**<br><br>**Example:**<br>`switch(config-pmap-qos)# exit`<br>`switch(config)#` | Exits policy-map mode and enters configuration mode. |
| **Step 8** | **show qos shared-policer** [**type**] [*shared-policer-name*]<br><br>**Example:**<br>`switch(config)# show qos shared-policer test1` | (Optional) Displays information about the configuration of all shared policers. |
| **Step 9** | **copy running-config startup-config**<br><br>**Example:**<br>`switch(config)# copy running-config startup-config` | (Optional) Saves the running configuration to the startup configuration. |

Use the **show qos shared-policer** command to display the test1 shared-policer configurations:

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

# Verifying the Policing Configuration

Use these command to verify the policing configuration.

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

# Example Configurations

The following are examples of how to configure policing:

- 1-rate, 2-color policer:

```
config t
  policy-map policy1
    class one_rate_2_color_policer
      police cir 256000 conform transmit violate drop
```

- 1-rate, 2-color policer with DSCP markdown:

```
config t
  policy-map policy2
    class one_rate_2_color_policer_with_dscp_markdown
```

```
      police cir 256000 conform transmit violate drop
```

- 1-rate, 3-color policer:

```
config t
  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
```

- 2-rate, 3-color policer:

```
config t
  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
```

- Color-aware policer for specified DSCP values:

```
config t
    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
```

- Shared policer:

```
config t
  qos shared-policer type qos udp_policer type cir 10 mbps pir 20 mbps conform transmit
exceed set dscp dscp table cir-markdown-map violate drop
  policy-may type qos udp_policy
   class type qos udp_qos
      police aggregate udp_1mbps
```

# Feature History for Policing

Table 6-8 lists the release history for this feature.

*Table 6-8 Feature History for Policing*

| Feature Name | Releases | Feature Information |
|---|---|---|
| No change. | 4.1(2) | - |
| No change | 4.2(1) | - |