



Configuring Policing

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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 and dual-rate policers. Single-rate policers monitor the committed information rate (CIR) of traffic.

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.

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

Licensing Requirements for Policing

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	The QoS feature does not require license. Any feature not included in a license package is bundled with the NX-OS image and is provided at no extra charge to you. For a complete explanation of the Cisco NX-OS licensing scheme, see the Cisco NX-OS Licensing Guide .

Prerequisites for Policing

Policing has the following prerequisites:

- You must be familiar with using modular QoS CLI.
- You are logged on to the device.

Guidelines and Limitations for Policing

Policing has the following guidelines and limitations:

Common

The following are guidelines and limitations common to all policers:

- **show** commands with the **internal** keyword are not supported.
- Each slice applies policing independently, which can affect QoS features that are applied to traffic that is distributed across multiple modules. The following are examples of these QoS features:
 - Policers that are applied to a port channel interface.
 - Policers that are applied to a VLAN.
- Using the optional keyword, **no-stats** disables statistics and ensures that applicable policies are shared.
- You can only use the **set qos-group** command in ingress policies.
- Policer rate may be less than configured value. There can be a slight difference between the configured rate and actual applied rate.

Ingress Policing

The following are guidelines and limitations for ingress policing:

- All policers in the ingress direction must use the same mode.
- QoS Ingress policers can be enabled on subinterfaces.

Egress Policing

The following are guidelines and limitations for egress policing:

- Policing counters for different colors are not supported. There is only a single hit counter for TCAM entry.
- Egress QoS policies are not supported on subinterfaces.
- Egress policers with remarking action are not supported.

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

The following are guidelines and limitations for 1-Rate and 2-Rate, 2-Color and 3-Color policing:

- 2-rate 3-color policing is not supported (only 1 rate 2 color policers are supported).

Configuring Policing

You can configure a single or dual-rate policer.

Configuring Ingress Policing

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

Configuring 1-Rate and 2-Color Policing

The type of policer created by the device is based on a combination of the **police** command arguments described in the following Arguments to the police Command table.



Note You must specify the identical value for **pir** and **cir** to configure 1-rate 2-color policing.



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

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.

Argument	Description
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.
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 bps to 480 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. 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 the following Policer Actions for Conform table. 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.

Although all the arguments in the above Arguments to the police Command table 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 following Policer Types and Actions from Police Arguments Present 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	<= cir , conform ; else violate

The policer actions that you can specify are described in the following Policer Actions for Exceed or Violate table and the following Policer Actions for Conform table.

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.
set-cos-transmit	Sets CoS and transmits the packet.
set-dscp-transmit	Sets DSCP and transmits the packet.

Action	Description
set-prec-transmit	Sets precedence and transmits the packet.
set-qos-transmit	Sets qos-group and transmits the packet.

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 a 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.



Note The policer can only drop or mark down packets that exceed or violate the specified parameters. For information on marking down packets, see the [Configuring Marking](#) section.

The data rates used in the **police** command are described in the following Data Rates for the police Command table.

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 following Burst Sizes for the police Command table.

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

SUMMARY STEPS

1. **configure terminal**
2. **policy-map** [**type qos**] [**match-first**] [*policy-map-name*]
3. **class** [**type qos**] {*class-map-name* | **class-default**} [**insert-before** *before-class-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**} | **exceed** {**drop**} | **violate** {**drop** | **set-cos-transmit** | **set-dscp-transmit** | **set-prec-transmit** | **set-qos-transmit**}]}
5. [**violate** {**drop** | **set-cos-transmit** | **set-dscp-transmit** | **set-prec-transmit** | **set-qos-transmit**}]
6. **exit**
7. **exit**
8. **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
9. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	policy-map [type qos] [match-first] [<i>policy-map-name</i>] Example: switch(config)# policy-map policyl switch(config-pmap-qos)#	Creates or accesses the policy map named <i>policy-map-name</i> 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] { <i>class-map-name</i> class-default } [insert-before <i>before-class-name</i>] Example: switch(config-pmap-qos)# class class-default switch(config-pmap-c-qos)#	Creates a reference to <i>class-map-name</i> 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

	Command or Action	Purpose
		keyword to select all traffic that is not currently matched by classes in the policy map.
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} [exceed {drop} [violate {drop set-cos-transmit set-dscp-transmit set-prec-transmit set-qos-transmit}]]}]	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 the Policer Actions for Exceed or Violate table and the Policer Actions for Conform table. The data rates and link speeds are described in the Data Rates for the police Command table and the Burst Sizes for the police Command table.
Step 5	[violate {drop set-cos-transmit set-dscp-transmit set-prec-transmit set-qos-transmit}]	set-cos-transmit —Set cos and send it. set-dscp-transmit —Set dscp and send it. set-prec-transmit —Set precedence and send it. set-qos-transmit —Set qos-group and send it.
Step 6	exit Example: switch(config-pmap-c-qos)# exit switch(config-pmap-qos)#	Exits policy-map class configuration mode and enters policy-map mode.
Step 7	exit Example: switch(config-pmap-qos)# exit switch(config)#	Exits policy-map mode and enters global configuration mode.
Step 8	show policy-map [type qos] [policy-map-name qos-dynamic] Example: 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 Example: switch(config)# copy running-config startup-config	(Optional) 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 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 Policer Actions for Exceed or Violate table and the Policer Actions for Conform table.

SUMMARY STEPS

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

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	policy-map [type qos] [match-first] [<i>policy-map-name</i>] Example: switch(config)# policy-map policy1 switch(config-pmap-qos)#	Creates or accesses the policy map named <i>policy-map-name</i> 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] { <i>class-name</i> class-default } [insert-before <i>before-class-name</i>] Example: switch(config-pmap-qos)# class class-default switch(config-pmap-c-qos)#	Creates a reference to <i>class-name</i> 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	police [cir] { <i>committed-rate</i> [<i>data-rate</i>] percent <i>cir-link-percent</i> } [[bc burst] <i>burst-rate</i> [<i>link-speed</i>]] [[be peak-burst] <i>peak-burst-rate</i> [<i>link-speed</i>]] [conform <i>conform-action</i> [exceed [violate drop set dscp <i>dscp table</i> <i>pir-markdown-map</i>]]]	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 the Policer Actions for Exceed or Violate table and the Policer Actions for Conform table. The data rates and link speeds are described in the Data Rates for the police Command table and the Burst Sizes for the police Command table.

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

Verifying the Policing Configuration

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

Command	Purpose
show policy-map	Displays information about policy maps and 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 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
```