



Configuring QoS Policing

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Information About Policing

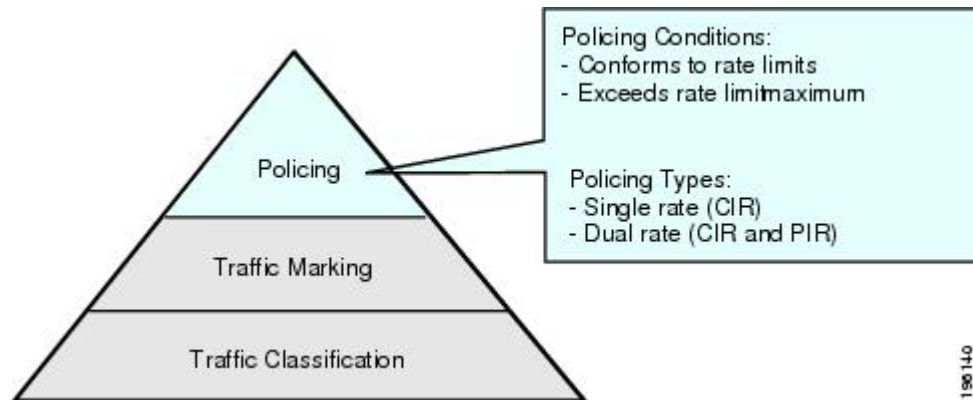
Policing is the monitoring of the data rates for a particular class of traffic. When the data rate exceeds user-configured values, marking or dropping of packets occurs immediately. Policing does not buffer the traffic, so transmission delay is not affected. When traffic exceeds the data rate, you instruct 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 the 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 256,000 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 policies, see [RFC 2697](#), [RFC 2698](#), and [RFC4115](#).

Figure 1: Policing Condition and Types



The following table lists the conditions that trigger actions by the policer depending on the defined data rate.

Table 1: Policer Actions for Exceed or Violate

Condition	Color	Description	Policer Action ¹
Conform	Green	The packet traffic data rate is within the defined boundaries.	The policer either transmits these packets as is or changes the value in the header (DSCP, precedence, or CoS) and then transmits these packets.
Exceed	Yellow	The packet traffic data rate exceeds the defined boundary.	The policer can drop or mark down these packets.
Violate	Red	The packet traffic data rate violates the defined boundaries.	The policer can drop or mark down these packets.

¹ Only one policer action is allowed per condition.

Prerequisites for Policing

- You are logged on to the CLI in EXEC mode.

Guidelines and Limitations for QoS Policing

Each module polices independently, which might affect a policer that is applied to traffic distributed across more than one module, such as in the case of a port channel interface.

Configuring Policing

Police Command and Policer Types

Police Command Arguments

The type of policer that is created by the Cisco Nexus 1000V is based on a combination of the **police** command arguments.



Note

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

Argument	Description
cir	Committed information rate (cir), 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 that are mathematically significant is 250 Kbps to 80 Gbps.
percent	Rate as a percentage of the interface rate. The range of values is from 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 (pir), which is 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 that are mathematically significant is from 250 Kbps to 80 Gbps. The range of percentage values is from 1 to 100%.
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. The default is transmit.
exceed	Single action to take if the traffic data rate exceeds the specified boundaries. 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.

Policer Types and Actions

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

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

Policer Action

You can take the following actions when the packet exceeds the parameters or violates the parameters:

Action	Description
drop	Drops the packet. This action is available only when the packet exceeds or violates the parameters.
set dscp dscp table { <i>cir-markdown-map</i> <i>pir-markdown-map</i> }	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 QoS Marking Policies . This action is available only when the packet exceeds the parameters (use the <i>cir-markdown-map</i>) or violates the parameters (use the <i>pir-markdown-map</i>).

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 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 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 the 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.

Police Command Data Rates

The policer can only drop or mark down packets that exceed or violate the specified parameters. For more information, see [Configuring QoS Marking Policies](#).

The **police** command uses the following data rates:

Table 2: Data Rates for the police Command

Rate	Description
bps	Bits per second (default)
kbps	1000 bits per seconds
mbps	1,000,000 bits per second
gbps	1,000,000,000 bits per second

Police Command Burst Sizes

The **police** command uses the following burst sizes:

Speed	Description
bytes	bytes
kbytes	1000 bytes
mbytes	1,000,000 bytes
ms	milliseconds
us	microseconds

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 conform described in [Configuring Mark Down Policing](#).

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# policy-map [type qos] [match-first] <i>policy-map-name</i>	Places you into policy map QoS configuration mode for the specified policy map and configures the map name in the running configuration. The <i>policy-map-name</i> argument is a unique alphabetic string that can be up to 40 case-sensitive characters long, including hyphen (-) and underscore (_) characters. The map name must be unique across class-maps and policy-maps. For example, you cannot have a class-map and a policy-map with the same name of HR_Map.
Step 3	switch(config-pmap-qos)# class [type qos] { <i>class_map_name</i> class-default }	Creates a reference to <i>class-map-name</i> and enters policy-map class QoS configuration mode for the specified class map. By default, the class is added to the end of the policy map. Changes are saved in the running configuration. Use the class-default keyword to select all traffic that is not currently matched by classes in the policy map. The <i>class_map_name</i> argument is a unique alphabetic string that can be up to 40 case-sensitive characters long, including hyphen (-) and underscore (_) characters.

	Command or Action	Purpose
Step 4	<code>switch(config-pamp-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 action [exceed {drop set dscp dscp table cir-markdown-map} [violate {drop set dscp dscp table pir-markdown-map}]]]; }</code>	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, then the exceed action is taken if the data rate \leq pir , and the violate action is taken otherwise.
Step 5	<code>switch(config-pamp-c-qos)# show policy-map [type qos] [policy-map-name]</code>	(Optional) Displays information about all configured policy maps or a selected policy map of type QoS.
Step 6	<code>switch(config-pmap-c-qos)# copy running-config startup-config</code>	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

This example shows a 1-rate, 3-color policer that transmits if the data rate is within 300 milliseconds of traffic at 256000 bps and how to mark 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:

```
switch# configure terminal

switch(config)# policy-map poll
switch(config-pmap-qos)# class class-default
switch(config-pmap-c-qos)# police cir 256000 bps conform transmit violate set dscp dscp
table pir-markdown-map
switch(config)# show policy-map pollType qos policy-maps
=====
policy-map type qos poll
class class-default
police cir 256000 bps bc 200 ms conform transmit violate set dscp dscp table pir-markdown-map
switch(config)# show table-map pir-markdown-map
Table-map pir-markdown-map
default copy
from 10,12 to 14
from 18,20 to 22
from 26,28 to 30
from 34,36 to 38
```

Verifying the Policing Configuration

Use the following command to verify the configuration:

Command	Description
<code>show policy-map</code>	Displays information about policy maps and policing.

Configuration Example for QoS Policing

This example shows a 2 rate, 3 color policer that sets CoS to 4 if the data rate is within 300 kbps. It also shows how to mark down DSCP using the system-defined cir-markdown-map table map if the data rate is within 750 kbps and how to mark down DSCP using the system-defined pir-markdown-map table map if the data rate is greater 750 kbps:

```
switch(config)# policy-map ty qos 2rate3clr
switch(config-pmap-qos)# class class1
switch(config-pmap-c-qos)# police cir 300 kbps pir 750 kbps conform set-cos-transmit 4
exceed set dscp dscp table cir-markdown-map violate set dscp dscp table pir-mar
tdown-map

switch(config-pmap-c-qos)# show policy-map 2rate3clr

Type qos policy-maps
=====

policy-map type qos 2rate3clr
  class class1
    police cir 300 kbps bc 200 ms pir 750 kbps be 200 ms conform set-cos-transmit 4 exceed
    set dscp dscp table cir-markdown-map violate set dscp dscp table pir-mar
    tdown-map
```

This example shows a 1 rate, 2 color policer that transmits if the data rate is within 200 milliseconds of traffic at 600 kbps:

```
switch(config)# policy-map ty qos 1rate2clr
switch(config-pmap-qos)# class class2
switch(config-pmap-c-qos)# police cir 600 kbps conform transmit violate drop
switch(config-pmap-c-qos)# show policy-map 1rate2clr

Type qos policy-maps
=====

policy-map type qos 1rate2clr
  class class2
    police cir 600 kbps bc 200 ms conform transmit violate drop
switch(config-pmap-c-qos)#
```

This example shows how to configure single-rate three-color policer that polices traffic at 4,000,000 bits per second and allows normal or committed bursts of 200 kbytes and excess bursts of 400 kbytes. The policer transmits traffic that conforms to the policing rate, marks down the DSCP using system-defined "cir-markdown-map" table map for traffic that exceeds the burst sizes, and drops traffic that violates the policing rate.

```
switch(config)# policy-map 1rate3clr
switch(config-pmap-qos)# class class1
switch(config-pmap-c-qos)# police cir 4 mbps bc 200 kbytes pir 4 mbps be 400 kbytes conform
transmit exceed set dscp dscp table cir-markdown-map violate drop
switch(config-pmap-c-qos)# show policy-map 1rate3clr

Type qos policy-maps
=====

policy-map type qos 1rate3clr
  class class1
    police cir 4 mbps bc 200 kbytes pir 4 mbps be 400 kbytes conform transmit exceed set
    dscp dscp table cir-markdown-map violate drop
```


Feature History for QoS Policing

This section provides the QoS policing release history.

Feature Name	Release	Feature Information
QoS Policing	4.0	This feature was introduced.

