

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. 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.

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

Shared Policers

Note The shared policer feature is only supported on the Cisco Nexus 9508 switch (NX-OS 7.0(3)F3(3) and later 7.0(3)F3(x) releases).

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.
- When the shared policer is applied on interfaces or a VLAN with member ports that are across different cores or instances, the rate becomes two times the configured CIR rate.
- Use the **show qos shared-policer** [**type qos**] [*policer-name*] command to display information about shared policers.

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

Note For scale information, see the release-specific Cisco Nexus 9000 Series NX-OS Verified Scalability Guide.

Common

The following are guidelines and limitations common to all policers:

- PVLANs do not provide support for PVLAN QoS.
- **show** commands with the **internal** keyword are not supported.
- Each module 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.
- Policing only supports violated and nonviolated statistics when using either double width or single width TCAM with e-qos-lite.
- 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.
- Beginning with Cisco NX-OS Release 10.1(2), Policing is supported on the N9K-X9624D-R2 and N9K-C9508-FM-R2 platform switches. For R2, markdown action in policing is not supported.
- Beginning with Cisco NX-OS Release 10.3(1)F, the following policer limitation applies on Cisco Nexus GX/GX2 platform switches:
  - For 25.6T ASIC, the policer limit is 282G.
  - For 12.2T ASIC, the policer limit is 300G.
- The calculation of the policer rate is dependent on the hardware frequency. Prior to Cisco NX-OS Release 10.5(5)M and 10.6(3)F, if the calculated rate resulted in a floating-point value, it was rounded down to the nearest integer (floor), leading to a slight deviation below the configured policing rate. Beginning with Cisco NX-OS Release 10.5(5)M and 10.6(3)F, floating-point values are now rounded up to the nearest integer (ceiling). As a result, the actual policing rate may exceed the configured CIR/PIR values, causing a marginally higher deviation.

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:

- Egress QoS policing is not supported on Cisco Nexus 9500 platform switches with the following line cards:
  - Cisco Nexus 9636C-R
  - Cisco Nexus 9636Q-R

    - Cisco Nexus 9636C-RX
    - Cisco Nexus 96136YC-R
    - Cisco Nexus 9624D-R2

- The egress RACL feature is not supported on the Cisco Nexus 9508 switch.
- Egress QoS policy statistics for CPU generated traffic are not supported on the following:
    - Cisco Nexus 9300-FX platform switches
    - Cisco Nexus 9500 platform switches with the following line cards:
        - Cisco Nexus 97160YC-EX
        - Cisco Nexus 9736C-FX
        - Cisco Nexus 9716D-GX
        - Cisco Nexus 9736C-FX3

- The total number of policers that can be successfully attached in the egress direction is only half the size of the qos-lite TCAM region.
- When egress RACL and egress QoS are applied together, you can only enable statistics for one or the other, not both.
- The egress policing feature does not support egress QoS policers on ALE uplink ports on top-of-rack (ToR) platforms.
- When using egress QoS, we recommend using the appropriate match criteria to match data traffic. Avoid match criteria such as **permit ip any any**.
- Remark action for violated packets in the egress direction is not supported on the following Cisco Nexus platform switches and line cards:
    - Cisco Nexus 97160YC-EX
    - Cisco Nexus 9736C-FX
    - Cisco Nexus 9716D-GX
    - Cisco Nexus 9736C-FX3

  They only support the drop action for violate in the egress direction.
- VLAN Egress QoS and Egress QoS on Layer 2 Port Channel (L2PO) are not supported on the following Cisco Nexus 9000 line cards:
    - Cisco Nexus 97160YC-EX
    - Cisco Nexus 9736C-FX
    - Cisco Nexus 9716D-GX
    - Cisco Nexus 9736C-FX3

- Beginning with Cisco NX-OS Release 10.6(1)F, egress QoS policies are supported on subinterfaces of Layer 3 physical interfaces, port channels and breakout ports of Cisco Nexus 9300-FX/FX2/FX3/GX/GX2/H2R/H1 Series switches, and 9500 Series switches with Nexus X97160YC-EX, 9700-FX/FX3/GX line cards.

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

The following are guidelines and limitations for 1-rate 2-color (1R2C) and 2-rate 3-color (2R3C) policing:

- Only 1R2C policing in the egress direction is supported on the Cisco Nexus 9300-FX/FX2/FX3/GX/GX2/H2R/H1 Series switches, and 9500 Series switches with Nexus X97160YC-EX, 9700-FX/FX3/GX line cards.
- Beginning with Cisco NX-OS Release 10.6(1)F, the 1R2C policer is supported at egress on subinterfaces of Layer 3 physical interfaces, and port channels of Cisco Nexus 9300-FX/FX2/FX3/GX/GX2/H2R/H1 Series switches, and 9500 Series switches with Nexus X97160YC-EX, 9700-FX/FX3/GX line cards.
- A 2-rate 3-color policer is not supported at egress on Cisco Nexus 9300-FX/FX2/FX3/GX/GX2/H2R/H1 platform switches and Nexus X97160YC-EX, 9700-FX/FX3/GX line cards.

Shared Policers

The following are guidelines and limitations for shared policers:

- When the shared policer is applied to interfaces or VLANs, with member ports that are across different cores or instances, the rate becomes two times the configured CIR rate.

Guidelines for UDE Policers

Beginning with Cisco NX-OS Release 10.3(3), you can use QoS template-based UDE. These are the guidelines and limitations for UDE policers.

- Enable the UDE template only on Layer 2 interfaces. Set the port to tap-aggregation mode.
- The policy-map **default-ndb-out-policy** is *not* supported under system QoS. To support this feature, carve the egress Layer 2 QoS TCAM region.

  After you reboot the switch, it might take some time to apply the **default-ndb-out-policy** to the configured interface. During this period, some packets may be forwarded. After the policy is applied, the switch drops all egress control and flood traffic.

  Even if there is no data traffic, the control traffic protocols (such as CDP, LLDP, ARP, and BPDU from the CPU) match the ACL entry and are dropped, which increments the violated count This behavior is expected when when you configure **default-ndb-out-policy**.
- You can use QoS template-based UDE on Cisco Nexus 9300-FX, FX2, FX3, GX, GX2 Series switches, and Cisco Nexus 9500 Series switches with 9700-FX or GX line cards.
- You *cannot* use QoS template on port channels.

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 Egress Policing

Note The egress policing feature is not supported on the Cisco Nexus 9508 switch (Cisco NX-OS Release 7.0(3)F3(3)).

The egress policing feature is supported on Cisco Nexus 9300-FX/FX2/FX3/GX/GX2 platform switches and Cisco Nexus Nexus X97160YC-EX/FX/GX line cards.

Note Egress QoS policing is not supported on Cisco Nexus 9500 platform switches with the following line cards:

- Cisco Nexus 9636C-R
- Cisco Nexus 9636Q-R
- Cisco Nexus 9636C-RX
- Cisco Nexus 96136YC-R

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 the **input** keyword or the **output** keyword in the **service-policy** command.

Configuring UDE policy: Beginning with Cisco NX-OS Release 10.3(3)F, you can configure default UDE policy template to block the egress traffic from NDB layer to production layer.

Before you begin

- You must carve TCAM region for egress QoS before configuring policing.
- For more information about attaching and detaching a QoS policy action from an interface, see the "Using Modular QoS CLI" section.

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*] [**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. **exit**
6. **exit**
7. **show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
8. **copy running-config startup-config**

DETAILED STEPS

Procedure

	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**] [*policy-map-name*]
	Example:
	`switch(config)# policy-map policy1`
	`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* | **class-default**} [**insert-before** *before-class-name*]
	Example:
	`switch(config-pmap-qos)# class class-default`
	`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. Use the **class-default** 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*] [**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** }]]}
	Example:
	`switch(config-pmap-qos)# policy-map type qos egressqos`
	`switch(config-pmap-qos)# class class-default`
	`switch(config-pmap-c-qos)# police [ cir] {committed-rate [data-rate] | percent cir-link-percent}`
	`[ bc committed-burst-rate][ conform { transmit | set-prec-transmit | set-dscp-transmit | set-cos-transmit | set-qos-transmit}] [ violate { drop}]}`
	`switch(config-pmap-c-qos)# exit`
	`switch(config-pmap-qos)# exit`
	`switch(config)#`
		Polices **cir** in bits or as a percentage of the link rate. The **conform** action is taken if the data rate is <= cir. 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. See Configuring 1-Rate for more information.
		The following information describes the **drop** option for **violate**:
		• set-cos-transmit—Set dscp and send it.
		• set-prec-transmit—Set precedence and send it.
		• set-qos-transmit—Set qos-group and send it.
		Note
		For **cir** pps, the packet size is 64 bytes. So the pps to bps conversion is 64*8.

	Command or Action	Purpose

Step 5	**exit**
	Example:
	`switch(config-pmap-c-qos)# exit`
	`switch(config-pmap-qos)#`
		Exits policy-map class configuration mode and enters policy-map mode.

Step 6	**exit**
	Example:
	`switch(config-pmap-qos)# exit`
	`switch(config)#`
		Exits policy-map mode and enters global configuration mode.

Step 7	**show policy-map** [**type qos**] [*policy-map-name* | **qos-dynamic**]
	Example:
	`switch(config)# show policy-map type qos egressqos`
	Example:
	`switch(config)# policy-map type qos egressqos`
	`class class-default`
	`police cir 10 mbs bc 200 ms conform transmit`
	`violate drop`
		(Optional) Displays information about the configured policy map of type qos.

Step 8	**copy running-config startup-config**
	Example:
	`switch(config)# copy running-config`
	`startup-config`
		(Optional) Saves the running configuration to the startup configuration.

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 following Arguments to the police Command table.

Note You must specify the identical value for **pir** and **cir** to configure 1-rate 3-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.
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**
cir and **pir**	2-rate, 3-color	<= **cir**, conform; <= **pir**, exceed; 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.

Note Only **drop** and **transmit** actions are supported on the Cisco Nexus 9508 switch (NX-OS 7.0(3)F3(3) and later).

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.
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

Procedure

	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**] [*policy-map-name*]
	Example:
	`switch(config)# policy-map policy1`
	`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* | **class-default**} [**insert-before** *before-class-name*]
	Example:
	`switch(config-pmap-qos)# class class-default`
	`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. Use the **class-default** 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.

	Command or Action	Purpose
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.

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

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

Procedure

	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**] [*policy-map-name*]
	Example:
	`switch(config)# policy-map policy1`
	`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-name* | **class-default**} [**insert-before** *before-class-name*]
	Example:
	`switch(config-pmap-qos)# class class-default`
	`switch(config-pmap-c-qos)#`
		Creates a reference to *class-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	**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*]]}	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	**exit**
	Example:
	`switch(config-pmap-c-qos)# exit`
	`switch(config-pmap-qos)#`
		Exits policy-map class configuration mode and enters policy-map mode.

Step 6	**exit**
	Example:
	`switch(config-pmap-qos)# exit`
	`switch(config)#`
		Exits policy-map mode and enters global configuration mode.

Step 7	**show policy-map** [**type qos**] [*policy-map-name*] **Example:** `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** **Example:**	(Optional) Saves the running configuration to the startup configuration.

	Command or Action	Purpose
	`switch(config)# copy running-config startup-config`	

Configure UDE policers

Block or limit all egress traffic on the Ethernet ports using a Unidirectional Ethernet (UDE) QoS policy.

To configure Unidirectional Ethernet with a QoS template, use these steps.

Procedure

Step 1 Configure the TCAM (Ternary Content Addressable Memory) region for egress Layer 2 QoS to allocate resources using the **hardware access-list tcam region egr-l2-qos 256** command.

Set the size of this region to 256 entries.

Step 2 Save the running configuration (including the TCAM region change) using **copy run start** command.

Saving the changes keeps the configuration after a reload.

Step 3 Reload the switch with the **reload** command to apply the changes for the new TCAM configuration.

Example:

```
switch(config)# hardware access-list tcam region egr-l2-qos 256
```

You must reboot the switch after modifying TCAM regions for the changes to take effect.

Step 4 Enter interface configuration mode for the Ethernet interface using the **interface type slot/port** command.

Example:

```
switch(config)# interface Ethernet 1/6
switch(config-if)#
```

Step 5 Apply the UDE QoS service policy to the interface using the **service-policy type qos output default-ndb-out-policy** command.

The switch polices all egress traffic on the Ethernet interface. The switch forwards only traffic that meets the configured parameters and drops traffic that violates them.

The attached QoS policy limits or blocks all egress traffic on the Ethernet port. Only traffic that conforms to the configured policing parameters is forwarded; all traffic that violates these parameters is dropped

What to do next

Verify policy status using **show policy-map type qos default-ndb-out-policy** command.

```
switch# show policy-map type qos default-ndb-out-policy

Type qos policy-maps
====================
policy-map type qos default-ndb-out-policy
```

```
class class-ndb-default
police cir 0 bps conform transmit violate drop
```

Verify the UDE police statistics for a specific interface.

```
switch# show policy-map interface Ethernet 1/6 output type qos

Global statistics status : enabled
Ethernet1/6
Service-policy (qos) output: default-ndb-out-policy
SNMP Policy Index: 285213501
Class-map (qos): class-ndb-default (match-any)
Slot 1
61211339 packets 15669992128 bytes
5 minute offered rate 17721223780 bps
Aggregate forwarded :
61211339 packets 110848 bytes
police cir 0 bps
conformed 0 bytes, n/a bps action: transmit
violated 15669881280 bytes, n/a bps action: drop
```

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 The shared policer feature is only supported on the Cisco Nexus 9508 switch (NX-OS 7.0(3)F3(3) and later).

Note When the shared policer is applied on interfaces or VLANs with member ports that are across different cores or instances, the rate becomes two times the configured **cir** rate.

To configure a shared policer:

1. Create the class map.
2. Create a policy map.
3. Reference the shared policer to the policy map as described in this section.
4. Apply the service policy to the interfaces.

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

Procedure

	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*] | **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*}]]}}	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, the **exceed** action is taken if the data rate ≤ **pir**, and the **violate** action is taken otherwise. **Note** A 64 byte packet size is used for the case of **cir pps**.This results in a 64*8 **pps** to **bps** conversion. **Note** The *cir-markdown-map* and *pir-markdown-map* maps are not supported on the Cisco Nexus 9508 switch (NX-OS 7.0(3)F3(3)).
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.

	Command or Action	Purpose
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 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
      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
```