Configuring Rate Limits

This chapter describes how to configure rate limits for supervisor-bound traffic on Cisco NX-OS devices.

This chapter includes the following sections:

About Rate Limits

Rate limits can prevent redirected packets for exceptions from overwhelming the supervisor module on a Cisco NX-OS device.

You can configure rate limits for the following types of redirected packets:

- Access-list log packets
- Bidirectional Forwarding Detection (BFD) packets
- Catch-all exception traffic
- Fabric Extender (FEX) traffic
- Layer 3 glean packets
- Layer 3 multicast data packets
- SPAN egress traffic

For Cisco Nexus 9200, 9332C, 9364C, 9300-EX, 9300-FX/FXP/FX2/FX3, and 9300-GX platform switches and Cisco Nexus 9500 platform switches with -EX/FX line cards, the CoPP policer rate is kilo bits per second. For other Cisco Nexus 9000 Series switches, the CoPP policer rate is in packets per second; However, it is kilo bits per second for SPAN egress traffic.

Guidelines and Limitations for Rate Limits

Rate limits has the following configuration guidelines and limitations:

- You can set rate limits for supervisor-bound exception and redirected traffic. Use control plane policing (CoPP) for other types of supervisor-bound traffic.

Note Hardware rate-limiters protect the supervisor CPU from excessive inbound traffic. The traffic rate allowed by the hardware rate-limiters is configured globally and applied to each individual I/O module. The resulting allowed rate depends on the number of I/O modules in the system. CoPP provides more granular supervisor CPU protection by utilizing the modular quality-of-service CLI (MQC).

- You can configure a hardware rate-limiter to show statistics for outbound traffic on SPAN egress ports. This rate-limiter is supported on all Cisco Nexus 9000, 9300, and 9500 Series switches, and the Cisco Nexus 3164Q, 31128PQ, 3232C, and 3264Q switches.
- The rate-limiter on egress ports is limited per pipe on the Cisco Nexus 9300 and 9500 Series switches, Cisco Nexus 3164Q, 31128PQ, Cisco Nexus 3232C, and 3264Q switches. The rate-limiter on egress ports is limited per slice on the Cisco Nexus 9200 and 9300-EX Series switches.
- Cisco Nexus 9300 and 9500 Series switches, Cisco Nexus 3164Q, Cisco Nexus 31128PQ, Cisco Nexus 3232C, and Cisco Nexus 3264Q switches support both local and ERSPAN. However, the rate-limiter only applies to ERSPAN. You must configure e-racl ACL TCAM region to enable the rate-limiter on these switches. For more information, see the Configuring ACL TCAM Region Sizes section in the Cisco Nexus 9000 Series NX-OS Security Configuration Guide.
- For Cisco Nexus 9200 and 9300-EX Series switches and the N9K-X9736C-EX, N9K-97160YC-EX, N9K-X9732C-EX, N9K-X9732C-EXM line cards, the SPAN egress rate-limiter applies to both ERSPAN and local SPAN. You do not require special TCAM carving to use the rate-limiter on these devices.
- For Cisco Nexus 92160YC-X, 92304QC, 9272Q, 9232C, 92300YC, 9348GC-FXP, 93108TC-FX, 93180YC-FX Series switches and Cisco Nexus 3232C and Cisco Nexus 3264Q switches, you should not configure both, sFlow and ERSPAN.
- Logging rate-limit is enabled by default. No default configuration is shown up in **show running-config** and in **show running-config all**. Use **show logging** cli to check if rate-limit is enabled. It has a dedicated field to verify if rate-limit is enabled or disabled.

  Once no logging rate-limit config is applied, it appears in the running-config and displayed in show logging output.

Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Default Settings for Rate Limits

This table lists the default settings for rate limits parameters.

Table 1: Default Rate Limits Parameters Settings

Parameters	Default
Access-list log packets rate limit	100 packets per second
BFD packets rate limit	10000 packets per second
Exception packets rate limit	50 packets per second
FEX packets rate limit	1000 packets per second
Layer 3 glean packets rate limit	100 packets per second
Layer 3 multicast data packets rate limit	3000 packets per second
SPAN egress rate limit	No limit

Configuring Rate Limits

You can set rate limits on supervisor-bound traffic.

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**hardware rate-limiter access-list-log** {*packets* | **disable**} [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter access-list-log 200`	Configures rate limits for packets that are copied to the supervisor module for access list logging. The range is 0–10000.
Step 3	**hardware rate-limiter bfd** *packets* [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter bfd 500`	Configures rate limits for bidirectional forwarding detection (BFD) packets. The range is 0–10000.

	Command or Action	Purpose
Step 4	**hardware rate-limiter exception** *packets* [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter exception 500`	Configures rate limits for any exception traffic in the system that is not classified by the Control Plane Policing (CoPP) policy. The range is 0–10000.
Step 5	**hardware rate-limiter fex** *packets* [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter fex 500`	Configures rate limits for supervisor-bound FEX traffic. The range is 0–10000.
Step 6	**hardware rate-limiter layer-3 glean** *packets* [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter layer-3 glean 500`	Configures rate limits for Layer 3 glean packets. The range is 0–10000. A node receiving traffic for a particular destination might be unable to forward traffic because it is unaware of the rewrite information or the physical layer interface behind which the destination resides. During this time, it is possible to install a glean entry in the data path for that destination. Because this might not be a pointer to the global punt adjacency, a reserved module or port value is used to punt such packets to the supervisor. This glean rate can be controlled using the given rate limiter. **Note** The CoPP policy controls the rate of glean packets that are forwarded to CPU due to hit of global punt adjacency. The Layer 3 glean hardware rate-limiter limits the number of glean packets that are redirected to CPU by sup-redirect acess-list. This is used in special cases such as, in the VXLAN environment when the packet is received from an unknown VTEP.
Step 7	**hardware rate-limiter layer-3 multicast local-groups** *packets* [**module** *module* [**port** *start end*]] **Example:** `switch(config)# hardware rate-limiter layer-3 multicast local-groups 300`	Configures rate limits for Layer 3 multicast data packets that are punted for initiating a shortest-path tree (SPT) join. The range is 0–10000.
Step 8	**hardware rate-limiter span-egress** *rate* [**module** *module*]	Configures rate limits for SPAN for egress traffic. The range is 0–100000000.

	Command or Action	Purpose
	Example: `switch(config)# hardware rate-limiter span-egress 123`	**Note** You should not configure both sFlow and the SPAN egress rate-limiter.
Step 9	(Optional) **show hardware rate-limiter** [**access-list-log | bfd |exception | fex | layer-3 glean | layer-3 multicast local-groups | |module** *module*] **Example:** `switch# show hardware rate-limiter`	Displays the rate limit configuration. The module range is 1–30.
Step 10	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Monitoring Rate Limits

You can monitor rate limits.

Procedure

	Command or Action	Purpose
Step 1	**show hardware rate-limiter** [**access-list-log** | **bfd** | **exception** | **fex** | **layer-3 glean** | **layer-3 multicast local-groups** | **span-egress** | **module** *module*] **Example:** `switch# show hardware rate-limiter access-list-log`	Displays the rate limit statistics.

Clearing the Rate Limit Statistics

You can clear the rate limit statistics.

Procedure

	Command or Action	Purpose
Step 1	**clear hardware rate-limiter** {**all** | **access-list-log** | **bfd** | **exception** | **fex** | **layer-3 glean** | **layer-3 multicast local-groups** | **span-egress** [**module** *module*] }	Clears the rate limit statistics.

	Command or Action	Purpose
	Example: `switch# clear hardware rate-limiter access-list-log`	

Verifying the Rate Limit Configuration

To display the rate limit configuration information, perform the following tasks:

Command	Purpose
show hardware rate-limiter [**access-list-log** | **bfd** | **exception** | **fex** | **layer-3 glean** | **layer-3 multicast local-groups** | **span-egress** | **module** *module*]	Displays the rate limit configuration.

Configuration Examples for Rate Limits

The following example shows how to configure rate limits for packets copied to the supervisor module for access list logging:

```
switch(config)# hardware rate-limiter access-list-log
switch(config)# show hardware rate-limiter access-list-log
Units for Config: kilo bits per second
Allowed, Dropped & Total: aggregated since last clear counters


Module: 4
  R-L Class           Config           Allowed         Dropped             Total
 +------------------+--------+---------------+---------------+-----------------
+
  access-list-log         100               0               0                 0

  Port group with configuration same as default configuration
      Eth4/1-36

Module: 22
  R-L Class           Config           Allowed         Dropped             Total
 +------------------+--------+---------------+---------------+-----------------
+
  access-list-log         100               0               0                 0

  Port group with configuration same as default configuration
      Eth22/1-0
```

The following example shows how the SPAN egress rate limiter might be in conflict with sFlow:

```
switch(config)# hardware rate-limiter span-egress 123
Warning: This span-egress rate-limiter might affect functionality of sFlow
switch(config)# show hardware rate-limiter span-egress
Units for Config: kilo bits per second
Allowed, Dropped & Total: aggregated since Module: 1
R-L Class         Config            Allowed        Dropped           Total
+----------------+----------+--------------+--------------+----------------+
  L3 glean                100             0              0                0
  L3 mcast loc-grp       3000             0              0                0
```

```
  access-list-log          100             0               0               0
  bfd                    10000             0               0               0
  exception                 50             0               0               0
  fex                     3000             0               0               0
  span                      50             0               0               0
  dpss                    6400             0               0               0
  span-egress              123             0               0               0
<<configured
```

Additional References for Rate Limits

This section includes additional information related to implementing rate limits.

Related Documents

Related Topic	Document Title
Cisco NX-OS licensing	*Cisco NX-OS Licensing Guide*