Chapter 8
Configuring Rate Limiting on the 9408sl

This chapter describes how to configure rate limiting on the 9408sl that do not have Standard or EP modules.

NOTE: To configure rate limiting on a 9300 series Standard module, see “Configuring Rate Limiting on the 9300 Series (with M2, M4, and T-flow)” on page 6-1. To configure rate limiting on a 9300 series EP Chassis device, see “Configuring EP Rate Limiting on the 9300 Series (with EP Modules)” on page 7-1.

Rate Limiting on ProCurve 9408sl

ProCurve 9408sl supports rate limiting. It provides line-rate rate limiting in hardware on inbound ports.

You can configure the ProCurve 9408sl to use one of the following modes of rate limiting policies:

• Port-based – Limits the rate on an individual physical port to a specified rate. Only one port-based inbound rate limiting policy can be applied to a port.

• Port-and-priority-based – Limits the rate on an individual hardware forwarding queue on an individual physical port. Only one port-and-priority-based rate limiting policy can be specified per priority queue for a port. This means that a maximum of four port-and-priority-based policies can be configured on a port.

• Port-and-VLAN-based – Limits the rate of packets tagged with a specific VLAN on an individual physical port. Only one rate can be specified for each VLAN. Up to 10 VLAN-based policies can be configured for a port.

• Port-and-ACL-based – Limits the rate of IP traffic on an individual physical port that matches the permit conditions in IP Access Control Lists (ACLs). You can use standard or extended IP ACLs. Standard IP ACLs match traffic based on source IP address information. Extended ACLs match traffic based on source and destination IP address and IP protocol information. Extended ACLs for TCP and UDP also match on source and destination TCP or UDP addresses and protocol information.

NOTE: The total of port-and-vlan-based and port-and-ACL-based policies on all ports of a given packet processor cannot exceed 100.

Rate Limiting Parameters and Algorithm

A rate limiting policy specifies two parameters: average rate and maximum burst. These parameters are used to configure credits and credit totals.
**Average Rate**

The **Average Rate** is the maximum number of bits a port is allowed to receive during a one-second interval. The rate of the traffic that matches the rate limiting policy will not exceed the average rate.

The Average Rate represents a percentage of an interface's line rate (bandwidth), expressed in bits per second (bps). It cannot be smaller than 515,624 bits per second (bps) and it cannot be larger than the port's line rate.

Average Rate must be entered in multiples of 515,624 bps. If you enter a number that is not a multiple of 515,624, the software adjusts the rate down to the lowest multiple of the number so that the calculation of credits does not result in a remainder of a partial Credit. For example, if you enter 600,000 bps, the value will be adjusted to 515,624 bps. The adjusted rate is sometimes called the *adjusted average rate*.

**Maximum Burst**

*Maximum burst* provides a higher than average rate to traffic that meet the rate limiting criteria. When the traffic on the port is less than the specified average rate, the rate limiting policy can accumulate credits up to a maximum, as specified in the maximum burst value. The accumulated credit allows traffic to pass through the port for a short period of time, at a rate higher than the average rate. The time period is determined by the amount of credit accumulated and the rate of traffic passing through the port.

**Credits and Credit Total**

Each rate limiting policy is assigned a class. A *class* uses the average rate and maximum allowed burst in the rate limiting policy to calculate credits and credit totals.

*Credit size* is measured in bytes. A credit is a forwarding allowance for a rate-limited port, and is the smallest number of bytes that can be allowed during a rate limiting interval. The minimum credit size can be 1 byte.

During a rate limiting interval, a port can send or receive only as many bytes as the port has Credits for. For example, if an inbound rate limiting policy results in a port receiving two credits per rate limiting interval, the port can send or receive a maximum of 2 bytes of data during that interval.

The credit size is calculated using the following algorithm:

\[
\text{Credit} = \frac{\text{Average rate in bits per second}}{8 \times 64453}
\]

One second is divided into 64,453 intervals. In each interval, the number of bytes equal to the credit size is added to the running total of the class. The running total of a class represents the number of bytes that can be allowed to pass through without being subject to rate limiting.

The second parameter is the maximum credit total, which is also measured in bytes. The maximum credit total is calculated using the following algorithm.

\[
\text{Maximum credit total} = \frac{\text{Maximum burst in bits}}{8}
\]

The running total can never exceed the maximum credit total. When packets arrive at the port, a class is assigned to the packet, based on the rate limiting policies. If the running total of the class is less than the size of the packet, then the packet is dropped. Otherwise, the size of the packet is subtracted from the running total and the packet is forwarded. If there is no traffic that matches rate limiting criteria, then the running total can increase until it reaches the maximum credit total.

**Configuration Considerations**

- In this release, rate limiting is available only on inbound ports on ProCurve 9408sl.
- Only one type of inbound rate limiting policy can be applied on a physical port. For example, you cannot apply inbound port-and-ACL-based and inbound port-based rate limiting policies on the same port.
- When a port-and-VLAN-based rate limiting policy is applied to a port, all the ports controlled by the same packet processor are rate limited for that VLAN. You cannot apply a port-and-VLAN-based rate limiting policy on another port of the same packet processor for the same VLAN ID.
- Port-and-VLAN-based rate limiting can limit only tagged packets that match the VLAN ID specified in the policy. Untagged packets are not subject to rate limiting.
- The average rate in a rate limiting policy cannot be less than 515,624 bits per second, must be in multiples of
515,624, and cannot be more than the port's line rate.

- The maximum burst in a rate limit policy cannot be less than the average rate and cannot be more than the port's line rate.
- Control packets are not subject to rate limiting.

**Configuring Rate Limiting on ProCurve 9408sI**

The following sections show examples of how to configure each rate limiting policy type.

**Configuring a Port-Based Rate Limiting Policy**

To configure port based rate limiting policy:

```bash
ProCurveRS(config)# interface ethernet 1/1
ProCurveRS(config-if-1/1)# rate-limit in 500000000 750000000
Average rate is adjusted to 499639656 bits per second
```

The commands configure a rate limiting policy for inbound traffic on port 1/1. The policy limits the average rate of all inbound traffic to 500 Mbps with a maximum burst size of 750 Mbps.

**Syntax:** [no] rate-limit in <average-rate> <maximum-burst>

The `in` parameter applies the policy to traffic on inbound ports.

Only one port-based rate limiting policy can be applied to a port.

The `<average-rate>` parameter specifies the maximum rate allowed on a port during a one-second interval. The software automatically adjusts the number you enter to the lower multiple of 515,624 bps. Refer to the section “Average Rate” on page 8-2 for more details.

The `<maximum-burst>` parameter specifies the extra bits above the average-rate that traffic can have. Refer to the section “Maximum Burst” on page 8-2 for more details.

**Configuring a Port-and-Priority-Based Rate Limiting Policy**

To configure port-and-priority based rate limiting policy:

```bash
ProCurveRS(config)# interface ethernet 1/1
ProCurveRS(config-if-1/1)# rate-limit in priority q0 q2 500000000 750000000
Average rate is adjusted to 499639656 bits per second
```

These commands configure a rate limiting policy for inbound port 1/1 that limits the average rate of all inbound traffic for hardware forwarding queues q0 and q2. Traffic on each hardware forwarding queue is limited to an average rate of 500 Mbps with a maximum burst size of 750 Mbits.

**Syntax:** [no] rate-limit in priority q0 | q1 | q2 | q3 <average-rate> <maximum-burst>

The `in` parameter applies the policy to traffic on inbound ports.

The `priority` q0 | q1 | q2 | q3 parameter specifies the hardware forwarding queue to which the policy applies. The device prioritizes the queues from q0 (normal priority) to q3 (highest priority). Only one rate can be specified per priority queue for a port.

The `<average-rate>` parameter specifies the maximum rate allowed on a port during a one-second interval. The software automatically adjusts the number you enter to the lower multiple of 515,624 bps. Refer to the section “Average Rate” on page 8-2 for more details.

The `<maximum-burst>` parameter specifies the extra bits above the average-rate that traffic can have. Refer to the section “Maximum Burst” on page 8-2 for more details.

**Configuring a Port-and-VLAN-Based Rate Limiting Policy**

To configure a port-and-VLAN based rate limiting policy, enter commands such as the following:

```bash
ProCurveRS(config)# interface ethernet 1/1
ProCurveRS(config-if-1/1)# rate-limit in vlan 10 500000000 750000000
Average rate is adjusted to 499639656 bits per second
```
ProCurveRS(config-if-1/1)# rate-limit in vlan 20 100000000 200000000
Average rate is adjusted to 99515432 bits per second

These commands configure two rate limiting policies that limit the average rate of all inbound traffic on port 1/1 with VLAN tag 10 and 20. The first policy limits packets with VLAN tag 10 to an average rate of 500 Mbps with a maximum burst size of 750 bits. The second policy limits packets with VLAN tag 20 to an average rate of 100 Mbps with a maximum burst size of 200 Mbits. Tagged packets belonging to VLANs other than 10 and 20 and untagged packets are not subject to rate limiting.

**Syntax:** [no] rate-limit in vlan <vlan-number> <average-rate> <maximum-burst>

The `in` parameter applies the policy to traffic on inbound ports.

The `<vlan-number>` parameter specifies the VLAN ID to which the policy applies. You can specify up to 10 port-and-VLAN-based rate limit policies on a port.

The `<average-rate>` parameter specifies the maximum rate allowed on a port during a one-second interval. The software automatically adjusts the number you enter to the lower multiple of 515,624 bps. Refer to the section “Average Rate” on page 8-2 for more details.

The `<maximum-burst>` parameter specifies the extra bits above the average-rate that traffic can have. Refer to the section “Maximum Burst” on page 8-2 for more details.

### Configuring a Port-and-ACL-Based Rate Limiting Policy

You can use standard or extended IP ACLs for port-and-ACL-based rate limiting.

- Standard IP ACLs match traffic based on source IP address information.
- Extended ACLs match traffic based on source and destination IP addresses and IP protocol information. Extended ACLs for TCP and UDP protocol must also match on source and destination IP addresses and TCP or UDP protocol information.
- You can apply an ACL ID to a port-and-ACL-based rate limiting policy even before you define the ACL. The rate limiting policy does not take effect until the ACL is defined.
- It is not necessary to remove an ACL from a port-and-ACL-based rate limiting policy before deleting the ACL.

Port-and-ACL-based rate limiting is supported for traffic on inbound ports only. To configure port-and-ACL-based rate limiting policies, enter commands such as the following:

```
ProCurveRS(config)#access-list 50 permit host 1.1.1.2
ProCurveRS(config)#access-list 50 deny host 1.1.1.3
ProCurveRS(config)#access-list 60 permit host 2.2.2.3
ProCurveRS(config)#access-list 60 deny host 2.2.2.3
ProCurveRS(config-if-1/1)# rate-limit in access-group 50 500000000 750000000
Average rate is adjusted to 499639656 bits per second
ProCurveRS(config-if-1/1)# rate-limit in access-group 60 100000000 200000000
Average rate is adjusted to 99515432 bits per second
```

These commands first configure access-list groups that contain the ACLs that will be used in the rate limiting policy. Use the `permit` condition for traffic that will be rate limited. Traffic that match the `deny` condition are not subject to rate limiting.

Next, the commands configure two rate limiting policies on port 1/1. The policies limit the average rate of all inbound IP traffic that match the permit rules of ACLs 50 and 60. The first policy limits the rate of all permitted IP traffic from host 1.1.1.2 to an average rate of 500 Mbps with a maximum burst size of 750 bits. Rate of all traffic from host 1.1.1.3 is not subject to rate limiting since it is denied by ACL 50; it is merely forwarded on the port.

The second policy limits the rate of all IP traffic from host 2.2.2.3 to an average rate of 100 Mbps with a maximum burst size of 200 Mbits.

All IP traffic that does not match ACLs 50 and 60 are not subject to rate limiting.

**Syntax:**

The `in` parameter applies the policy to traffic on inbound ports.
The **access-group**, group-number> parameter specifies the group number to which the ACLs used in the policy belong.

**NOTE:** An ACL must exist in the configuration before it can take effect in a rate limiting policy.

You can specify up to 100 ACL-based rate limiting policies on a port.

The `<average-rate>` parameter specifies the maximum rate allowed on a port during a one-second interval. The software automatically adjusts the number you enter to the lower multiple of 515,624 bps. Refer to the section “Average Rate” on page 8-2 for more details.

The `<maximum-burst>` parameter specifies the extra bits above the average-rate that traffic can have. Refer to the section “Maximum Burst” on page 8-2 for more details.

**Displaying Rate Limiting Policies**

Use one of the following commands to view the rate limiting policies that have been configured:

- **show run int** – Displays the configuration on an interface.
- **show run rate-limit** – Displays rate limiting policies

The rate limiting policies displays the adjusted average rate instead of the actual number you entered, if you entered a number that is not a multiple of 515,624 bps.