

AOS-CX 10.09 Quality of Service Guide

8400 Switch Series



a Hewlett Packard
Enterprise company

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This document describes features of the AOS-CX network operating system. It is intended for administrators responsible for installing, configuring, and managing Aruba switches on a network.

Applicable products

This document applies to the following products:

- Aruba 8400 Switch Series (JL375A, JL376A)

Latest version available online

Updates to this document can occur after initial publication. For the latest versions of product documentation, see the links provided in [Support and Other Resources](#).

Command syntax notation conventions

Convention	Usage
<code>example-text</code>	Identifies commands and their options and operands, code examples, filenames, pathnames, and output displayed in a command window. Items that appear like the example text in the previous column are to be entered exactly as shown and are required unless enclosed in brackets ([]).
example-text	In code and screen examples, indicates text entered by a user.
Any of the following: <ul style="list-style-type: none">■ <code><example-text></code>■ <code><example-text></code>■ <i>example-text</i>■ <i>example-text</i>	Identifies a placeholder—such as a parameter or a variable—that you must substitute with an actual value in a command or in code: <ul style="list-style-type: none">■ For output formats where italic text cannot be displayed, variables are enclosed in angle brackets (< >). Substitute the text—including the enclosing angle brackets—with an actual value.■ For output formats where italic text can be displayed, variables might or might not be enclosed in angle brackets. Substitute the text including the enclosing angle brackets, if any, with an actual value.
	Vertical bar. A logical OR that separates multiple items from which you can choose only one. Any spaces that are on either side of the vertical bar are included for readability and are not a required part of the command syntax.
{ }	Braces. Indicates that at least one of the enclosed items is required.
[]	Brackets. Indicates that the enclosed item or items are optional.

Convention	Usage
<p>... or</p> <p>...</p>	<p>Ellipsis:</p> <ul style="list-style-type: none"> ■ In code and screen examples, a vertical or horizontal ellipsis indicates an omission of information. ■ In syntax using brackets and braces, an ellipsis indicates items that can be repeated. When an item followed by ellipses is enclosed in brackets, zero or more items can be specified.

About the examples

Examples in this document are representative and might not match your particular switch or environment. The slot and port numbers in this document are for illustration only and might be unavailable on your switch.

Understanding the CLI prompts

When illustrating the prompts in the command line interface (CLI), this document uses the generic term `switch`, instead of the host name of the switch. For example:

```
switch>
```

The CLI prompt indicates the current command context. For example:

```
switch>
```

Indicates the operator command context.

```
switch#
```

Indicates the manager command context.

```
switch (CONTEXT-NAME)#
```

Indicates the configuration context for a feature. For example:

```
switch(config-if)#
```

Identifies the `interface` context.

Variable information in CLI prompts

In certain configuration contexts, the prompt may include variable information. For example, when in the VLAN configuration context, a VLAN number appears in the prompt:

```
switch(config-vlan-100)#
```

When referring to this context, this document uses the syntax:

```
switch(config-vlan-<VLAN-ID>)#
```

Where `<VLAN-ID>` is a variable representing the VLAN number.

Identifying switch ports and interfaces

Physical ports on the switch and their corresponding logical software interfaces are identified using the format:

```
member/slot/port
```

On the 8400 Switch Series

- *member*: Always 1. VSF is not supported on this switch.
- *slot*: Specifies physical location of a module in the switch chassis.
 - Management modules are on the front of the switch in slots 1/5 and 1/6.
 - Line modules are on the front of the switch in slots 1/1 through 1/4, and 1/7 through 1/10.
- *port*: Physical number of a port on a line module

For example, the logical interface 1/1/4 in software is associated with physical port 4 in slot 1 on member 1.

Identifying modular switch components

- Power supplies are on the front of the switch behind the bezel above the management modules. Power supplies are labeled in software in the format: *member/power supply*:
 - *member*: 1.
 - *power supply*: 1 to 4.
- Fans are on the rear of the switch and are labeled in software as: *member/tray/fan*:
 - *member*: 1.
 - *tray*: 1 to 4.
 - *fan*: 1 to 4.
- Fabric modules are not labeled on the switch but are labeled in software in the format: *member/module*:
 - *member*: 1.
 - *member*: 1 or 2.
- The display module on the rear of the switch is not labeled with a member or slot number.

Quality of Service (QoS) enables network administrators to customize how different types of traffic are serviced on a network, taking into account the unique characteristics of each traffic type and its importance within an organization's infrastructure. QoS ensures uniform and efficient traffic handling, keeping the most important traffic moving at an acceptable speed, regardless of current bandwidth usage. It also provides methods for administrators to control the priority settings of inbound traffic arriving at each network device.

End-to-end QoS behavior

The QoS settings on each network device must be aligned to achieve the desired end-to-end QoS behavior for a network. Three service types can be used to categorize and prioritize network traffic:

- Best Effort Service
- Ethernet Class of Service (CoS)
- Internet Differentiated Services (DiffServ)

For a network as a whole, it is best to select one service type to use as the primary end-to-end behavior, and then use the other two service types as needed.

Best effort service

This is the simplest service type. All traffic is treated equally in a first-come, first-served manner. If the traffic load is low in relation to the capacity of the network links, then there is no need for the administrative complexity and costs of maintaining a more complex end-to-end policy. This is sometimes called over-provisioning, as all link speeds are much higher than peak loads on the network.

Class of Service

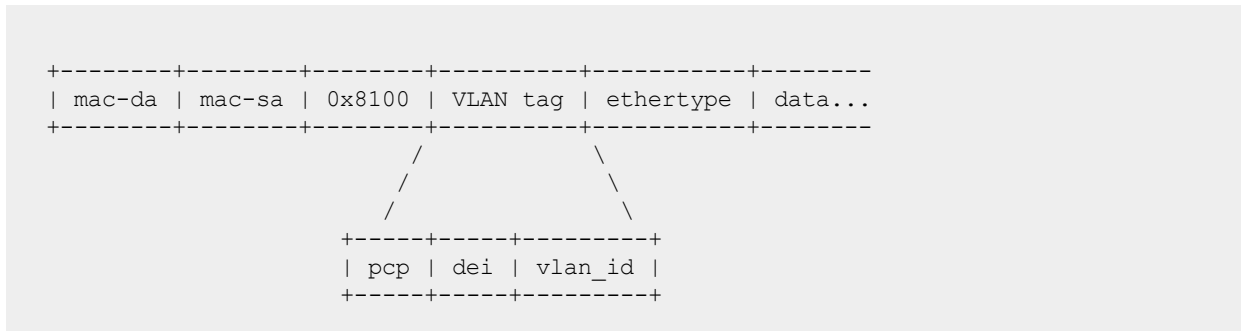
Class of Service (CoS) is a method for classifying network traffic at layer 2 by marking 802.1Q VLAN Ethernet frames with one of eight service classes.

CoS	Traffic type	Example protocols
7	Network Control	STP, PVST
6	Internetwork Control	BGP, OSPF, PIM
5	Voice (<10ms latency)	VoIP(UDP)
4	Video (<100ms latency)	RTP
3	Critical Applications	SQL RPC, SNMP
2	Excellent Effort	NFS, SMB

CoS	Traffic type	Example protocols
0	Best Effort	HTTP, TELNET
1	Background	SMTP, IMAP

CoS 1 is deliberately set as the lowest CoS. This enables a traffic service level below the default (best effort) traffic level to be specified.

The 3-bit Priority Code Point (PCP) field within the 16-bit Ethernet VLAN tag is used to mark the CoS.



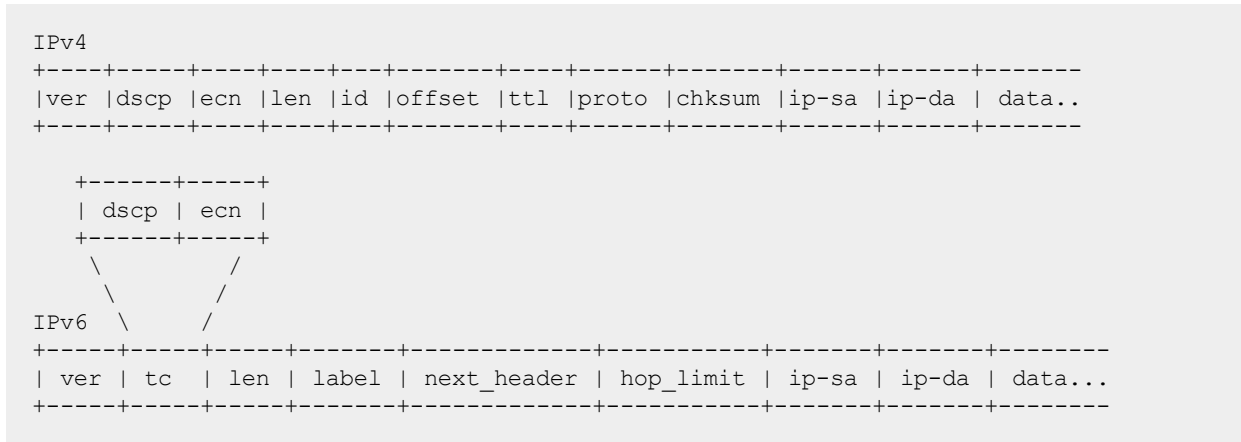
Differentiated services

Differentiated services (DiffServ) is a method for classifying network traffic at layer 3 by marking packets with one of 64 different service classes. Services classes are identified by the Differentiated services Code Point (DSCP) value. Some common DSCP values are:

DSCP	Name	Service class	RFC
56	CS6	Network Control	2474
46	EF	Telephony	3246
40	CS5	Signaling	2474
34, 36, 38	AF41, AF42, AF43	Multimedia Conferencing	2597
32	CS4	Real-Time Interactive	2474
26, 28, 30	AF31, AF32, AF33	Multimedia Streaming	2597
24	CS3	Broadcast Video	2474
18, 20, 22	AF21, AF22, AF23	Low-Latency Data	2597
16	CS2	OAM	2474
00	CS0, BE, DF	Best Effort	2474
10, 12, 14	AF11, AF12, AF13	Bulk Data	2597
08	CS1	Low-Priority Data	3662

DSCP CS1 (08) CoS 1 is deliberately set as the lowest priority. This enables a traffic service level below the standard (best effort or default forwarding) level to be specified.

The DSCP value is carried within the IPv4 DSCP field or the upper 6-bits of the 8-bit IPv6 Traffic Class (TC) field.



QoS on the switch

There are five key stages a packet passes through when traversing a switch: ingress, prioritization, destination determination, egress queuing, and transmission. The following table provides an overview of each stage, and lists the commands that can be used to configure QoS settings.

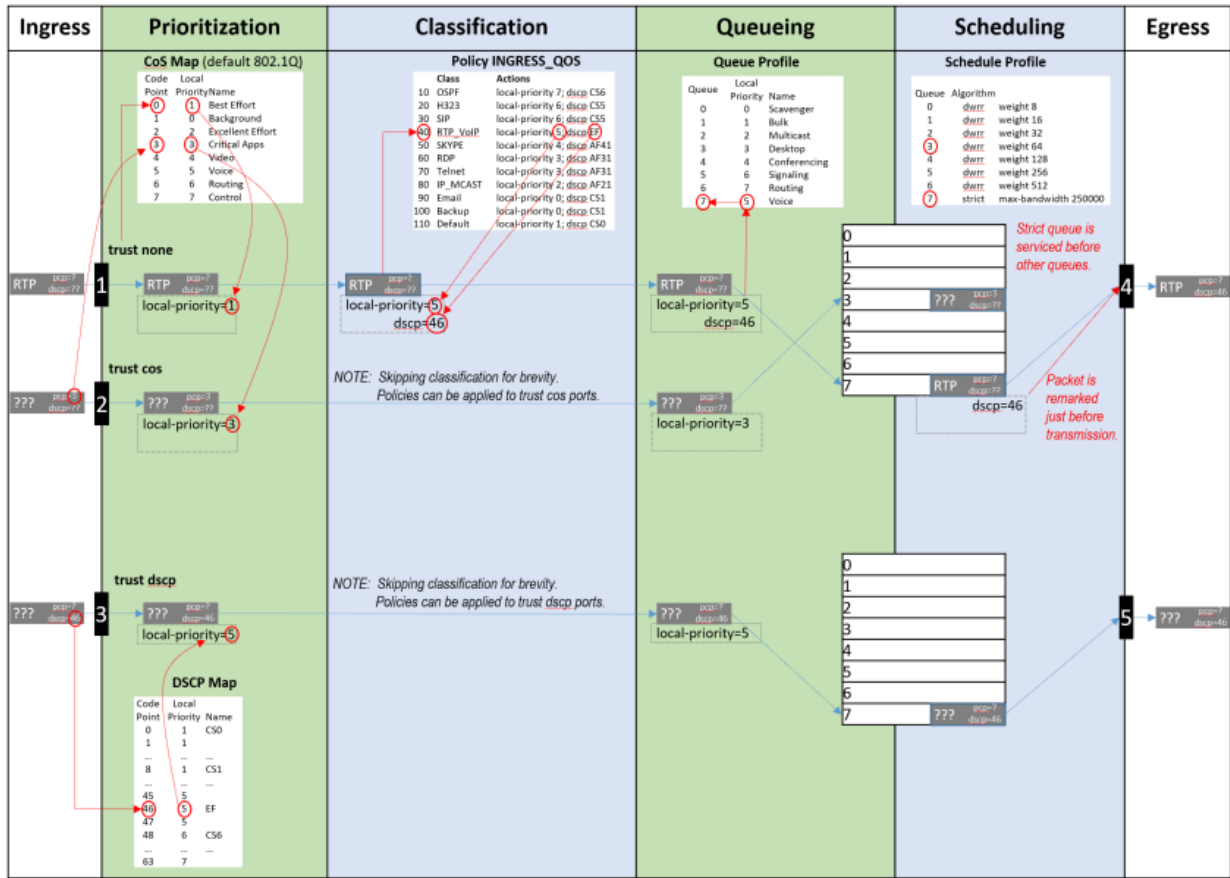


Switches with at least 52 ports will experience negative performance if a flood occurs where at least 42 ports are members of the same VLAN and all 52 ports have QoS rules applied to them.

Ingress	Prioritization	Classification	Queueing	Transmission
Packets arrive at switch interface (port).	An initial local-priority value is assigned to the packet based on VLAN CoS or IP DSCP.	Packets local-priority and code points can be remarked, and rates policed, based on many packet header fields. <i>(see ACL & Policy Guide)</i>	Packets are queued based on the destination interface and local-priority of the packet.	A scheduler defines the order in which packets are selected from queues to be transmitted from the interface.
rate-limit Rate limiting can control ingress flow by packet type: broadcast, multicast, or unknown-unicast.	qos trust {cos dscp none} Assigns which packet values are used to determine initial local-priority either globally for all interfaces, or to specific interface(s). qos cos-map Defines how CoS values are mapped to local-priority values. qos dscp-map Defines how IP DSCP values are mapped to local-priority values. qos dscp Remarks egress DSCP value.	class {ip ipv6 mac} NAME match TERMS [count] ignore TERMS [count] Creates an ordered list of rules to identify packets to match the class. policy NAME class NAME ACTIONS Creates an ordered list of classes to which traffic is evaluated, and the actions to be taken on matching packets: remarking, policing etc. apply policy NAME Assigns the policy to evaluate all traffic inbound or outbound globally, or on specific interfaces or VLANs.	qos queue-profile Creates a profile that defines transmit queues. map queue Assigns a local-priority to a queue. Packets with a matching local-priority are placed in the queue. name queue Assigns a name to a queue. qos threshold-profile Creates a profile that defines ECN limits for queues. queue NUM action ecn Assigns an ECN limit for a queue. apply qos Assigns queue, schedule, or threshold profiles globally to all interfaces, or schedule or threshold profiles to a specific interface(s).	qos schedule-profile Creates a profile that defines the order in which packets are selected from the queues for transmission. strict queue Assigns the strict priority algorithm, with optional max-bandwidth, to a queue. wfq queue Assigns the weighted WFQ algorithm to a queue. qos shape Assigns the maximum rate for traffic to be transmitted by the interface.

Ingress	Prioritization	Classification	Queueing	Transmission
Packets arrive at switch interface (port).	An initial local-priority value is assigned to the packet based on VLAN CoS or IP DSCP.	Packets local-priority and code points can be remarked, and rates policed, based on many packet header fields. <i>(see ACL & Policy Guide)</i>	Packets are queued based on the destination interface and local-priority of the packet.	A scheduler defines the order in which packets are selected from queues to be transmitted from the interface.
	<p>show int IFNAME qos Displays all the QoS settings configured on an interface:</p> <ul style="list-style-type: none"> • Profiles • Rate-limits • DSCP remarks • Egress shape • Trust <p>show qos cos-map Displays the contents of the CoS Map table.</p> <p>show qos dscp-map Displays the content of the DSCP Map table.</p> <p>show qos trust Display the current default trust mode.</p>	<p>show class {ip ipv6 mac} Displays the ordered list of the match and ignore statements in the class.</p> <p>show policy Displays the order list of classes in the policy.</p> <p>show policy hitcounts Displays the ordered list of classes in the policy. For each class the number of times that each match or ignore statement in the class matched a packet.</p>	<p>show int IFNAME queues Displays the per-queue counts of packets transmitted, packets dropped, bytes transmitted, and maximum byte depth.</p> <p>show qos queue-profile Displays the definition of queue profiles.</p> <p>show qos threshold-profile Displays the definition of threshold profiles.</p>	show qos schedule-profile Displays the definition of schedule profiles.

The following diagram shows how different packets might traverse a switch. It also shows how QoS configuration settings apply at each stage.



QoS trust

Traffic priorities for networks can be carried in VLAN tags, using the CoS Priority Code Point (PCP), or in IP packet headers, using the Differentiated Services Code Point (DSCP). Whether these priorities affect how traffic is serviced, depends on how QoS trust mode is configured on the switch. QoS trust mode specifies how the switch assigns local priority values to ingress packets. Trust mode can be set globally for all interfaces, or individually for each interface. By default, trust mode is set to `none`, meaning that any QoS information in the packet (CoS or DSCP) is ignored, and local priority values are assigned from the CoS map value for code point 0.

When trust mode is set to CoS or DSCP, the switch translates the QoS settings in VLAN tags (for CoS), or the DS field in an IP header (for DSCP), to local priority values on the switch. Translation is controlled by the CoS map or DSCP map tables.

For example:

CoS Map

When QoS trust mode = CoS

Code Point	Local Priority	Name
0	1	Best Effort
1	0	Background
2	2	Excellent Effort
3	3	Critical Apps
4	4	Video
5	5	Voice
6	6	Routing
7	7	Control

Untagged packet → [0] → Packet local-priority = ①

Tagged PCP=3 packet → [3] → Packet local-priority = ③

DSCP Map

When QoS trust mode = DSCP

Code Point	Local Priority	Name
0	1	CS0
1	1	
...
8	0	CS1
...
45	5	
46	5	EF
47	5	
48	6	CS6
...
63	7	

IP DSCP=46 packet → [46] → Packet local-priority = ⑤ & DSCP = 46

When QoS trust mode = None



Dynamic QoS trust mode

The device profile feature can dynamically set the QoS trust mode on an interface based on the LLDP information exchanged with a link partner. The device profile's trust mode temporarily overrides the static trust mode configured for an interface. The override remains in place as long as that link partner is connected and its link state is **up**. Use command `show interface IFNAME qos` to view the current QoS trust mode for an interface.

Port rate limiting

Port rate limiting helps control undesirable traffic. Its purpose is to allow enough broadcast, multicast, and ICMP rate-limit traffic for the network to function properly, while preventing flooding and traffic storms.

A certain amount of each type of traffic is required for normal network operation. Broadcast packets may include ARP and DHCP traffic, for instance. Video streams, and certain types of network protocol packets, are multicasts. Unknown-unicast packets may be intended for devices whose addresses have temporarily aged out of network-forwarding caches. Configuring rate limits can help provide the balance between necessary and flooded traffic.

Queue profiles

A queue profile defines the queues that are associated with an interface to control the transmission of packets. Each profile supports up to eight queues, numbered 0 to 7. The larger the queue number, the

higher its priority during transmission scheduling. Packets are assigned to a queue based on their local priority value (0 to 7). A queue profile must map all eight local priority values to whatever queues are being used on the switch, and a schedule profile must specify the configuration for those same queues. A queue without a local priority value assigned to it is not used to store packets.

The switch is automatically provisioned with an initial queue profile named `factory-default` which assigns each local priority to the queue of the same number. To see the default queue profile, use the command `show qos queue-profile factory-default`:

More than one local priority value can be assigned to the same queue. For example,

Local Priority	Queue
0	0
1	1
2	2
3	3
4	4
5	5
6	5
7	5

Commonly used commands for working with QoS queues are as follows:

- `qos queue-profile`: Creates an empty queue-profile and enters the profile configuration context.
- `name queue`: Assigns a descriptive name to a queue.
- `map queue`: Assigns a local-priority to a queue.
- `apply qos queue-profile`: Applies a queue-profile globally to all interfaces.

Schedule profiles

A schedule profile determines the order in which queues are selected for transmission, and the amount of service available for each queue. A schedule profile must be configured on every interface at all times. A schedule profile can be applied globally to all interfaces, or only to specific interfaces.

Three options are available:

- All queues use weighted fair queuing (WFQ)
- All queues use strict priority queuing
- The highest priority queue uses strict priority, and all other queues use WFQ

A weighted schedule profile assigns relative servicing for each queue. The amount of service per weight is relative to the underlying hardware implementation, and to the weights assigned to the other non-empty queues. Strict scheduling can be used to service queues purely on the basis of highest priority first (at the risk of starving lower-priority queues during high stress periods). A combination of strict and weighted scheduling offers more service to the highest priority queue when needed, while preserving scheduling between the remaining queues, thus decreasing the risk of starvation.

The switch is automatically provisioned with a schedule profile named **factory-default**, which assigns DWRR to all queues with a weight of 1. Use the command `show schedule-profile factory-default` to view the default schedule profile. (Do not use `show running-configuration`, as it only displays changes from the initial settings.)

```
switch# show qos schedule-profile default
queue_num algorithm weight
-----
0          wfq         1
1          wfq         1
2          wfq         1
3          wfq         1
4          wfq         1
5          wfq         1
6          wfq         1
7          wfq         1
```

Egress queue shaping

Egress queue shaping limits the amount of traffic transmitted per strict output queue. The buffer associated with each egress queue stores excess traffic to absorb bursts and smooths the output rate. For example, an administrator might limit strict-priority queue traffic to prevent low-priority queue starvation in the event that a device inappropriately sends too many higher-priority packets.

Egress queue shaping can be configured on an Ethernet port or on a link aggregation group (LAG). To configure egress queue shaping, define a schedule profile with the strict priority algorithm assigned to each queue.

Egress port shaping

Egress port shaping limits the amount of aggregate traffic transmitted through a port. To be effective, the egress port-shaping rate must be less than the port's line rate. By default, the egress port-shaping rate is the same as the line-rate of the port. Buffers associated with each port store excess traffic. When both egress port-shaping and egress queue-shaping are configured on the same interface, the switch respects the minimum of both configurations.

Explicit Congestion Notification

Explicit Congestion Notification (ECN) provides a mechanism for two end-points to exchange end-to-end notification of network congestion. ECN uses a 2-bit field in the IP header to indicate that the traffic load on network equipment in the path between an ECN-capable sender and receiver is causing packets to be buffered, as defined by IETF RFC 3168 (<https://tools.ietf.org/html/rfc3168>).

Threshold profiles

Threshold profiles configure individual queue utilization thresholds as triggers for taking action (i.e., ECN marking) on a packet. A threshold profile is applied per-port and defines the threshold and action for each queue. Omitting configuration for a queue in a threshold profile means that queue will not be configured with a threshold value or action.

In an environment where responsive transport protocols are in use and congestion management features are required to reduce latency, ECN can be configured on queues carrying delay-sensitive traffic. The result is that queue utilization is actively managed, resulting in ECT packets being CE marked when queue utilization reaches or exceeds a configured threshold.

Virtual output queues

8400 switch series

The switch uses a virtual output queue (VOQ) architecture where most packet buffering occurs on the ingress line module. Traffic destined for one port (unicast), uses different buffering and scheduling than traffic destined for multiple ports (flood). The relative priority and the amount of packet transmission for these two types of traffic differ.

For unicast traffic, each line module contains eight VOQs for every destination port in the chassis (one per local priority). The queue profile determines which VOQ is used to buffer a local priority. The schedule profile determines the order of VOQ servicing. Unicast packets wait in VOQs until the scheduler selects them to cross the fabric. Each destination port has a shallow egress transmit queue that buffers unicast packets.

Broadcast, multicast, and unknown-unicast packets, collectively called flooded traffic, use a separate path to the destination ports. Each line module contains eight VOQs per destination line module (including itself) to buffer traffic to be flooded (one VOQ per local priority). A copy of the packet to be flooded is buffered in VOQs for each destination line module. The queue profile determines which VOQ is used for each local priority.

Flooded traffic VOQs use a fixed strict schedule profile to determine the order of VOQ servicing. Flooded packets wait in VOQs until the scheduler selects them to cross the fabric. On the destination line module, they are replicated to one or more destination ports. Each destination port has a second shallow egress queue for replicated packets buffered for transmit.

A WFQ scheduler is used to select packets for transmission from the unicast and replicated traffic egress queues. When selecting packets between two non-empty queues, WFQ uses a fixed data weight of four for unicast traffic, and a weight of one for replicated traffic. As long as both queues are non-empty, replicated (flooded) packets comprise approximately 20% of the transmitted traffic, independent of the unicast scheduled percentages.

Terms

Class

For networking, a set of packets sharing a common characteristic. For example, all IPv4 packets.

Code point

The name of a packet header field, or the value carried within a packet header field:

- Example 1: Priority code point (PCP) is the name of a field in the IEEE 802.1Q VLAN tag.
- Example 2: Differentiated services code point (DSCP) is the name of a field carried within the DS field of an IP packet header.

Color

A metadata label associated with each packet within the switch. It has three values: green (0), yellow (1), or red (2). When packets encounter congestion for a resource (queue), the switch uses packet color to distinguish which packets must be dropped, and is mostly used for packets marked with Assured Forwarding (AF) DSCP values.

Not supported in this release.

Class of service (CoS)

A 3-bit value used to mark packets with one of eight classes (levels of priority). It is carried within the priority code point (PCP) field of the IEEE 802.1Q VLAN tag.

Differentiated services code point (DSCP)

A 6-bit value used to mark packets for different per-hop behavior as originally defined by IETF RFC 2474. It is carried within the differentiated services (DS) field of the IPv4 or IPv6 header.

Local priority

A meta-data label associated with a packet within the switch which is used to classify packets for different treatment (such as queue assignment). Eight local priorities are defined on the switch, numbered from 0 to 7. A queue profile must map all eight local priorities to whatever queues are in use on the switch, and a schedule profile must specify the configuration for these same queues.

Metadata

Information labels associated with each packet in the switch, separate from the packet headers and data. These labels are used by the switch in its handling of the packet. For example: arrival port, egress port, VLAN membership, and local priority.

Priority code point (PCP)

The name of a 3-bit field in the IEEE 802.1Q VLAN tag. It carries the CoS value to mark a packet with one of eight classes (priority levels).

Quality of service (QoS)

General term used when describing or measuring performance. For networking, it means how different classes of packets are treated when traversing a network or device.

Traffic class (TC)

General term for a set of packets sharing a common characteristic. It used to be the name of an 8-bit field in the IPv6 header originally defined by IETF RFC 2460. This field name was changed to differentiated services by IETF RFC 2474.

Type of service (ToS)

General term when there are different levels of treatment (fare class). It used to be the name of an 8-bit field in the IPv4 header originally defined by IETF RFC 791. This field name was changed to differentiated services by IETF RFC 2474.

Configuring QoS

Procedure

1. Configure how local priority values are assigned to ingress packets with the commands `qos dscp-map`, and `qos trust`.
2. Optionally, add a rate limit for ingress traffic on one or more interfaces with the command `rate-limit`.
3. If you do not want to use the default QoS queue profile to map local priority to queue, create one or more custom queue profiles with the command `qos queue-profile`. For each queue in a custom queue profile:
 - a. Assign a local priority value with the command `map queue`.
 - b. Optionally, define a descriptive name with the command `name queue`. All local priorities (0 to 7) must be mapped to a queue, and the queues selected for use must be in contiguous order starting at 0.
4. If you do not want to use the default QoS schedule profile to determine the order in which queues are selected to transmit a packet, create one or more custom schedule profiles with the command `qos schedule-profile`. For each queue in a custom schedule queue profile, define scheduling priority with the commands `strict queue` and `wfq queue`.
5. Optionally, create a threshold profile to limit throughput on one or more queues with the command `qos threshold-profile`. Assign threshold values to the queue with the command `queue`. Then, apply the profile with the command `apply qos threshold-profile`
6. Optionally for strict queues, configure egress queue shaping to limit egress bandwidth on an interface to a value that is less than its line rate. Use the `max-bandwidth` parameter of the `strict queue` command.
7. Activate QoS settings with the command `apply qos`. This command lets you apply a queue profile and schedule profile globally to all interfaces, or a schedule profile override to individual interfaces.

When applying QoS settings to a port configured to support priority-based flow control, specific configuration settings must be respected when defining a CoS map and queue profile. See the command `flow-control` in the *Command-Line Interface Guide* for details.
8. View QoS configuration settings with the provided `show` commands.

Examples

This example creates the following configuration:

- Configures CoS to be used to assign local priority to ingress packets.
- Modifies the default CoS map to assign CoS 1 to local priority **1**.
- Creates a queue profile named `q1` and assigns local priorities as follows:

Queue	Local Priority
0	0
1	1
1	2
3	3
4	4
5	5
5	6
5	7

- Creates a schedule profile named `s1` and assigns WFQ to all queues in the schedule profile with the following weights:

Queue	Weight
0	5
1	10
3	15
4	25
5	50

- Creates a threshold profile named `T1` with the following limits:

Queue	Threshold
4	40 KB
5	50 KB

- Applies **Q1** and **S1** to all interfaces that do not have a QoS override applied.

```
switch(config)# qos trust cos
switch(config)# qos cos-map 1 local-priority 1
switch(config)# qos queue-profile Q1
switch(config)# map queue 0 local-priority 0
switch(config)# map queue 1 local-priority 1
switch(config)# map queue 1 local-priority 2
switch(config)# map queue 3 local-priority 3
switch(config)# map queue 4 local-priority 4
switch(config)# map queue 5 local-priority 5
switch(config)# map queue 5 local-priority 6
switch(config)# map queue 5 local-priority 7
```

```

switch(config)# qos schedule-profile S1
switch(config-schedule)# wfq queue 0 weight 5
switch(config-schedule)# wfq queue 1 weight 10
switch(config-schedule)# wfq queue 3 weight 15
switch(config-schedule)# wfq queue 4 weight 25
switch(config-schedule)# wfq queue 5 weight 50
switch(config)# qos threshold-profile T1
switch(config-threshold)# queue 4 action ecn threshold 40 kbytes
switch(config-threshold)# queue 5 action ecn threshold 50 kbytes
switch(config-threshold)# exit
switch(config)# apply qos threshold-profile T!
switch(config)# wfq queue 5 weight 50
switch(config)# apply qos queue-profile Q1 schedule-profile S1

```

Configuring expedited forwarding for VoIP traffic

Voice over IP (VoIP) traffic is delay and jitter sensitive. For optimum transmission of VoIP traffic, dwell time in network devices must be kept to a minimum and all network devices in the data path must have identical per-hop behaviors. To configure a dedicated queue on the switch to handle VoIP traffic with priority service before all other queues, follow these steps.

Prerequisites

This scenario assumes that VoIP packets are uniquely identified using DiffServ code point 46, Expedited Forwarding (EF).

Procedure

1. Map DSCP EF packets exclusively to local priority 5. The default DSCP map has eight code points (40 through 47), that are mapped to local priority 5. To reserve local priority 5 for VoIP traffic, the other code points must be reassigned. In this scenario, local priority 6 is used for all reassignments, including for code point 40, Call Signaling protocol (CS5).

```

switch(config)# qos dscp-map 40 local-priority 6 name CS5
switch(config)# qos dscp-map 41 local-priority 6
switch(config)# qos dscp-map 42 local-priority 6
switch(config)# qos dscp-map 43 local-priority 6
switch(config)# qos dscp-map 44 local-priority 6
switch(config)# qos dscp-map 45 local-priority 6
switch(config)# qos dscp-map 47 local-priority 6

```

2. Queue 7 is the highest priority queue, so for best throughput, create a queue profile that maps local priority to queue 7.

```

switch(config)# qos queue-profile ef_priority
switch(config-queue)# name queue 7 Voice_Priority_Queue
switch(config-queue)# map queue 7 local-priority 5
switch(config-queue)# map queue 6 local-priority 7
switch(config-queue)# map queue 5 local-priority 6
switch(config-queue)# map queue 4 local-priority 4
switch(config-queue)# map queue 3 local-priority 3
switch(config-queue)# map queue 2 local-priority 2

```

```
switch(config-queue)# map queue 1 local-priority 1
switch(config-queue)# map queue 0 local-priority 0
```

3. Create a schedule profile that services queue 7 using strict priority (SP), and the remaining queues with WFQ. This scenario gives all WFQ queues equal weight.

```
switch(config)# qos schedule-profile voip
switch(config-schedule)# strict queue 7
switch(config-schedule)# wfq queue 6 weight 1
switch(config-schedule)# wfq queue 5 weight 1
switch(config-schedule)# wfq queue 4 weight 1
switch(config-schedule)# wfq queue 3 weight 1
switch(config-schedule)# wfq queue 2 weight 1
switch(config-schedule)# wfq queue 1 weight 1
switch(config-schedule)# wfq queue 0 weight 1
switch(config-schedule)# exit
switch(config)#
```

4. Apply the profiles to all interfaces.

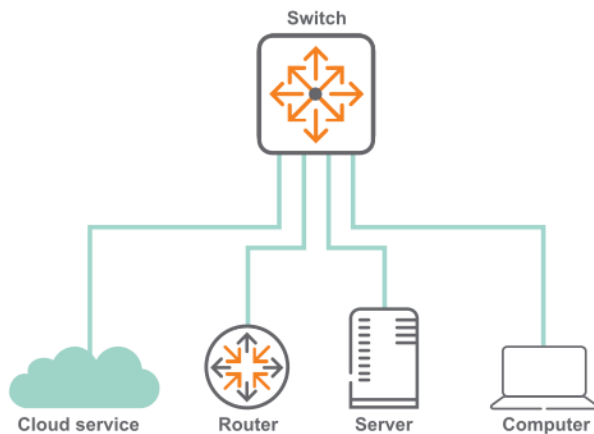
```
switch(config)# apply qos queue-profile ef_priority schedule-profile voip
```

5. Configure DSCP trust mode on all ports

```
switch(config)# qos trust dscp
```

Configuring rate limiting

This scenario illustrates how to use rate limiting to manage the traffic from various devices connected to a switch. The physical topology of the network looks like this:



A certain amount of broadcast traffic is necessary to maintain healthy network operation, particularly from routers and across service boundaries. In this scenario, both the service cloud and the router connections limit this traffic to 1 Gbps. The server has a smaller limit, as it does not require as much network protocol traffic as the service cloud and router.

A multicast server needs to be able to stream multicast traffic to clients, so a multicast rate limit may not be helpful. A computer, however, should not be generating large amounts of multicast traffic (it may be

receiving streams, but typically not sending them). In this example, the computer is configured with a multicast rate limit to prevent malicious traffic from taking up network bandwidth.

Finally, while the service cloud and router may need to send traffic for unknown unicast addresses to resolve address forwarding, the server and computer should send very little of this type of traffic. Rate limiting unknown unicast traffic on those two devices enforces that.

Procedure

1. Configure broadcast and multicast rate limiting for the service cloud connection.

```
switch# config
switch(config)# interface 1/1/1
switch(config-if)# rate-limit broadcast 1000000 kbps
switch(config-if)# rate-limit multicast 2000000 kbps
switch(config-if)# exit
```

2. Configure broadcast rate limiting for the router connection.

```
switch(config-if)# interface 1/1/2
switch(config-if)# rate-limit broadcast 1000000 kbps
switch(config-if)# exit
```

3. Configure broadcast and unknown unicast rate limiting for the server connection.

```
switch(config-if)# interface 1/1/5
switch(config-if)# rate-limit broadcast 500000 kbps
switch(config-if)# rate-limit unknown-unicast 500 kbps
switch(config-if)# exit
```

4. Configure broadcast, unknown unicast, and multicast rate limiting for the computer connection.

```
switch(config-if)# interface 1/1/10
switch(config-if)# rate-limit broadcast 1000 kbps
switch(config-if)# rate-limit multicast 500 kbps
switch(config-if)# rate-limit unknown-unicast 200 kbps
```

Configuring egress queue shaping

This example shows how to apply egress queue shaping to an interface. First, a schedule profile is created that has per-queue bandwidth limits set on all queues with `strict` as the scheduling algorithm. Next, this profile is applied to an interface or LAG.

The following example creates a schedule profile named **EQSEExample**, which services all eight queues using `strict` priority. This profile configures queues 1, 4, and 7 with a bandwidth limit of 10 Gbps, 20 Gbps, and 30 Gbps respectively. Also, queues 1 and 7 are configured with a burst of 120 KB (burst configuration is only supported on the 8320, 8325, and 10000). The profile is then applied to interface 1/1/1. (The actual burst and bandwidth configured on the interface can be found by using the `show interface <IF-NAME> qos` command.)

```
switch(config)# qos schedule-profile EQSEExample
```

```

switch(config-schedule)# strict queue 0
switch(config-schedule)# strict queue 1 max-bandwidth 10000000 burst 120
switch(config-schedule)# strict queue 2
switch(config-schedule)# strict queue 3
switch(config-schedule)# strict queue 4 max-bandwidth 20000000
switch(config-schedule)# strict queue 5
switch(config-schedule)# strict queue 6
switch(config-schedule)# strict queue 7 max-bandwidth 30000000 burst 120
switch(config-schedule)# exit
switch(config)# interface 1/1/1
switch(config-if)# apply qos schedule-profile EQSExample

```

Configuring egress port shaping

This example shows how to apply egress port shaping to an interface to limit the rate of egress traffic. Egress port shaping is configured by specifying the desired bandwidth rate in kilobits per second (kbps). An optional burst size in kilobytes (KB) may be configured for the Aruba 8400 switch. To be effective, the egress rate must be less than the line rate of the egress interface. If the configured egress rate exceeds the interface's line rate, then egress shaping has no effect.

The configured egress rate and burst on a specific interface can be found by using the `show interface` and `show interface qos` commands.

The following example configures an egress rate of 100 Mbps and a burst of 70 KB.

```

switch(config)# interface 1/1/1
switch(config-if)# qos shape 100000 burst 70

```

In the next example, both egress port shaping and egress queue shaping are configured on the same interface.

The example creates a schedule profile named `EQSExample` with strict priority for all seven queues. Queue 7 is configured with a bandwidth limit of 300 Mbps and a burst of 120 KB. The profile is then applied to interface `1/1/1` with egress port shaping of 400 Mbps and a burst size of 80 KB. As egress queue shaping and egress port shaping are both configured on port `1/1/1`, egress queue shaping is subject to the lower port or queue shape rate. The effective bandwidth for the traffic egressing on queue 7 will be 300 Mbps and the effective burst will be 80 KB.

```

switch(config)# qos schedule-profile EQSExample
switch(config-schedule)# strict queue 0
switch(config-schedule)# strict queue 1
switch(config-schedule)# strict queue 2
switch(config-schedule)# strict queue 3
switch(config-schedule)# strict queue 4
switch(config-schedule)# strict queue 5
switch(config-schedule)# strict queue 6
switch(config-schedule)# strict queue 7 max-bandwidth 300000 burst 120
switch(config-schedule)# exit
switch(config)# interface 1/1/1
switch(config-if)# apply qos schedule-profile EQSExample
switch(config-if)# qos shape 400000 burst 80

```

Monitoring queue operation

Use the show interface queues command to display the traffic transmitted per queue, and the number of packets dropped due to the queue being full.. For example:

```
switch# show interface 1/1/5 queues
Interface 1/1/5 is up
Admin state is up
      Tx Bytes      Tx Packets      Tx Drops      Tx Byte Depth
Q0      157113373520      1890863919           0           1362
Q1      233312143017      2808451320          18          65550
Q2      156814056423      1887257650           0           1392
Q3      157441358980      1894815504           0           1374
Q4      157700809294      1897941370           0           1362
Q5      157872849381      1900014146           0           1392
Q6      183486049854      2208268429           0           4398
Q7      231607534141      2787913734           0           65544
```

- **Tx Bytes:** Total bytes transmitted. The byte count may include packet headers and internal metadata that are removed before the packet is transmitted. Packet headers added when the packet is transmitted may not be included.
- **Tx Packets:** Total packets transmitted.
- **Tx Drops:** The number of packets dropped by a queue before it was sent. When traffic cannot be forwarded out an egress interface, it backs up at ingress. The more servicing assigned to a queue by a schedule profile, the less likely traffic destined for that queue will back up and be dropped. Tx Drops shows the sum of packets that were dropped across all line modules (due to insufficient capacity) by the ingress Virtual Output Queues (VOQs) destined for the egress port. As the counts are read separately from each line module, the sum is not an instantaneous snapshot.
- **Tx Byte Depth:** Largest byte depth (or high watermark) found on any ingress line module Virtual Output Queue (VOQ) destined for the egress port.

apply qos

```
apply qos [queue-profile <QUEUE-NAME>] schedule-profile <SCHEDULE-NAME>
no apply qos schedule-profile <SCHEDULE-NAME>
```

Description

Applies a queue profile and schedule profile globally to all Ethernet and LAG interfaces on the switch, or applies a schedule profile to a specific interface. When applied globally, the specified schedule profile is configured only on Ethernet interfaces and LAGs that do not already have their own schedule profile.

The same profile can be applied both globally and locally to an interface. This guarantees that an interface always uses the specified profile, even if the global profile is changed.

The `no` form of this command removes the specified schedule profile from an interface and the interface uses the global schedule profile. This is the only way to remove a schedule profile override from the interface.



When applying QoS settings to a port configured to support priority-based flow control, specific configuration settings must be respected when defining a CoS map and queue profile. See the command `flow-control` in the *Command-Line Interface Guide* for details.



Interfaces may shut down briefly during reconfiguration.

Parameter	Description
<code>queue-profile <QUEUE-NAME></code>	Specifies the name of the queue profile to apply. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-). This parameter is not supported in the <code>config-if</code> context.
<code>schedule-profile <SCHEDULE-NAME></code>	Specifies the name of the schedule profile to apply. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Usage

- The switch must always have a globally-applied queue and schedule profile. To stop using a given profile, apply a different profile.
- For a queue profile to be complete and ready to be applied, all eight local priorities must be mapped to a queue.
- For a schedule profile to be complete and ready to be applied, it must define all queues specified in the queue profile. All queues must use the same algorithm, except for the highest numbered queue, which can be **strict**.

- Both the queue profile and the schedule profile must specify the same number of queues.
- Schedule profiles can be modified while applied, but only in ways where a single command will not result in the profile becoming invalid. For example, queue 7 can have the algorithm changed, and weighted queues can have their weights changed.

If there are interfaces running with priority-based flow control (PFC) and a new queue profile to be applied maps a local priority used by the PFC traffic to another queue, all PFC interfaces must be shutdown before applying the new queue profile. If the new queue profile was applied before shutting down the PFC interfaces, PFC traffic will still use the same queue from the previous profile until the interfaces are shutdown then re-enabled.

Examples

The following commands illustrate a valid configuration where every local priority value is assigned to a queue and all assigned queues are defined:

```
switch(config)# qos queue-profile Q1
switch(config)# map queue 0 local-priority 0
switch(config)# map queue 1 local-priority 1
switch(config)# map queue 1 local-priority 2
switch(config)# map queue 3 local-priority 3
switch(config)# map queue 4 local-priority 4
switch(config)# map queue 5 local-priority 5
switch(config)# map queue 5 local-priority 6
switch(config)# map queue 5 local-priority 7
switch(config)# qos schedule-profile S1
switch(config)# wfq queue 0 weight 5
switch(config)# wfq queue 1 weight 10
switch(config)# wfq queue 3 weight 15
switch(config)# wfq queue 4 weight 25
switch(config)# wfq queue 5 weight 50
```

The following commands illustrate an invalid configuration because local priority 2 is not assigned to a queue:

```
switch(config)# qos cos-map 1 local-priority 1
switch(config)# qos queue-profile Q1
switch(config)# map queue 0 local-priority 0
switch(config)# map queue 1 local-priority 1
switch(config)# map queue 3 local-priority 3
switch(config)# map queue 4 local-priority 4
switch(config)# map queue 5 local-priority 5
switch(config)# map queue 5 local-priority 6
switch(config)# map queue 5 local-priority 7
switch(config)# qos schedule-profile S1
switch(config)# wfq queue 0 weight 5
switch(config)# wfq queue 1 weight 10
switch(config)# wfq queue 3 weight 15
switch(config)# wfq queue 4 weight 25
switch(config)# wfq queue 5 weight 50
```

Applying the QoS profile **Q1** and the schedule profile **S1** to all interfaces that do not have an applied interface-specific schedule profile:

```
switch(config)# apply qos queue-profile Q1 schedule-profile S1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config config-if config-lag-if	Administrators or local user group members with execution rights for this command.

apply qos threshold-profile

```
apply qos threshold-profile <THRESHOLD-NAME>  
no apply qos threshold-profile
```

Description

Applies a threshold profile globally to all Ethernet and LAG interfaces on the switch, or to a specific interface. When applied globally, the specified threshold profile is configured only on Ethernet interfaces and LAGs that do not already have their own schedule profile.

The same profile can be applied both globally and locally to an interface. This guarantees that an interface always uses the specified threshold profile, even if the global profile is changed.

The `no` form of this command removes the specified threshold profile from an interface, and causes it to use the global threshold profile. This is the only way to remove a threshold profile override from an interface. A profile can only be deleted once it is no longer applied to any interface.

Parameter	Description
<THRESHOLD-NAME>	Specifies the name of the threshold profile to apply. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Example

Applying the threshold profile **mythreshold** to all interfaces that do not have an applied profile:

```
switch(config)# apply qos threshold-profile mythreshold
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config config-if config-lag-if	Administrators or local user group members with execution rights for this command.

map queue

```
map queue <QUEUE-NUMBER> local-priority <PRIORITY-NUMBER>
no map queue <QUEUE-NUMBER> [local-priority <PRIORITY-NUMBER>]
```

Description

Assigns a local priority to a queue in a queue profile. By default, the larger the queue number the higher its priority.

The `no` form of this command removes the specified local priority from a specific queue.

Parameter	Description
<QUEUE-NUMBER>	Specifies the queue number. Range: 0 to 7.
<PRIORITY-NUMBER>	Specifies the local priority. Range: 0 to 7, where 0 is the lowest priority and 7 is the highest.

Usage

For a queue profile to be complete and ready to be applied, all eight local priorities must be mapped to a queue. Any local priority used by interface Priority-based Flow Control (PFC) must be the only local priority mapped to its queue. In order for PFC pausing to work as intended, no other local priorities should be mapped to that same queue. This queue mapping should be configured during initial switch provisioning and only changed during maintenance periods where all ports are disabled.

The following commands illustrate a valid configuration, where every local priority value is assigned to a queue:

```
map queue 0 local-priority 0
map queue 1 local-priority 1
map queue 1 local-priority 2
map queue 3 local-priority 3
map queue 4 local-priority 4
map queue 5 local-priority 5
map queue 5 local-priority 6
map queue 5 local-priority 7
```

The following commands illustrate an invalid configuration, because local priority 2 is not assigned to a queue:

```
map queue 0 local-priority 0
map queue 1 local-priority 1
map queue 2 local-priority 3
map queue 3 local-priority 4
map queue 4 local-priority 5
map queue 5 local-priority 6
map queue 5 local-priority 7
```

Examples

Assigning priority **7** to queue **7** in profile **myprofile**:

```
switch(config)# qos queue-profile myprofile
switch(config-queue)# map queue 7 local-priority 7
```

Removing priority **7** from queue **7** in profile **myprofile**:

```
switch(config)# qos queue-profile myprofile
switch(config-queue)# no map queue 7 local-priority 7
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config-queue	Administrators or local user group members with execution rights for this command.

name queue

```
name queue <QUEUE-NUMBER> <DESCRIPTION>
no name queue <QUEUE-NUMBER>
```

Description

Assigns a description to a queue in a queue profile. This is for identification purposes and has no effect on configuration.

The `no` form of this command removes the description associated with a queue.

Parameter	Description
<QUEUE-NUMBER>	Specifies the queue number. Range: 0 to 7.
<DESCRIPTION>	Specifies a queue description for identification purposes. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Examples

Assigning the description **priority-traffic** to queue **7**:

```
switch(config)# qos queue-profile myprofile
switch(config-queue)# name queue 7 priority-traffic
```

Removing the description from queue 7:

```
switch(config)# qos queue-profile myprofile
switch(config-queue)# no name queue 7
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config-queue	Administrators or local user group members with execution rights for this command.

qos cos-map

```
qos cos-map <CODE-POINT> local-priority <PRIORITY-NUMBER> [color <COLOR>] [name
<DESCRIPTION>]
no qos cos-map <CODE-POINT>
```

Description

Defines the local priority assigned to incoming packets for a specific 802.1 VLAN priority code point (CoS) value. The CoS map values are used to mark incoming packets when QoS trust mode is set to **cos**. In **trust none** mode, CoS map entry 0 is used to set the port default local priority and color.

To see the default CoS map settings, use the following command:

```
switch# show qos cos-map default
code_point local_priority color name
-----
0          1             green Best_Effort
1          0             green Background
2          2             green Excellent_Effort
3          3             green Critical_Applications
4          4             green Video
5          5             green Voice
6          6             green Internetwork_Control
7          7             green Network_Control
```

The `no` form of this command restores the assignments for a CoS map value to the default setting.

Parameter	Description
<CODE-POINT>	Specifies an 802.1 VLAN priority CoS value. Range: 0 to 7. Default 0.
local-priority <PRIORITY-NUMBER>	Specifies a local priority value to associate with the <code>CODE-POINT</code> value. Range: 0 to 7. Default: 0.

Parameter	Description
color <COLOR>	Reserved for future use.
name <DESCRIPTION>	Specifies a description for the CoS setting. The name is for identification only, and has no effect on queue configuration. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Usage

Any code point configured for use by interface Priority-based Flow Control (PFC) must be assigned a unique local priority in the CoS map. No other code point can be assigned that same local priority. This should be configured during initial switch provisioning and only changed during maintenance periods where all ports are disabled.

Examples

Mapping CoS value **1** to a local priority of **2**:

```
switch(config)# qos cos-map 1 local-priority 2
```

Mapping CoS value **1** to the default local priority value:

```
switch(config)# no qos cos-map 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config	Administrators or local user group members with execution rights for this command.

qos dscp-map

```
qos dscp-map <CODE-POINT> local-priority <PRIORITY-NUMBER> [color <COLOR>] [name <DESCRIPTION>]
no qos dscp-map <CODE-POINT>
```

Description

Defines the local priority assigned to incoming packets for a specific IP differentiated services code point (DSCP) value. The DSCP map values are used to prioritize incoming packets when QoS trust mode is set to **dscp**.

The **no** form of this command restores the assignments for a code point to the default setting.

Use `show qos dscp-map` to view the current settings. To see the default DSCP map settings, use the following command:

```
switch# show qos dscp-map default
code_point local_priority color name
-----
0          1              green CS0
1          1              green
2          1              green
3          1              green
4          1              green
5          1              green
...
45         5              green
46         5              green EF
47         5              green
48         6              green CS6
...
61         7              green
62         7              green
63         7              green
```

Parameter	Description
<code><CODE-POINT></code>	Specifies an IP differentiated services code point. Range: 0 to 63. Default: 0.
<code>local-priority <PRIORITY-NUMBER></code>	Specifies a local priority value to associate with the <code>CODE-POINT</code> value. Range: 0 to 7. Default: 0.
<code>color <COLOR></code>	Reserved for future use
<code>cos <PCP-VALUE></code>	Specifies an optional 802.1p VLAN Priority Code Point remark value. Range: 0 to 7. Default: No remark.
<code>name <DESCRIPTION></code>	Specifies a description for the DSCP setting. The name is used for identification only, and has no effect on queue configuration. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Examples

Setting code point **1** to a local priority of **2** and a CoS of **0**:

```
switch(config)# qos dscp-map 1 local-priority 2 cos 0
```

Setting code point **1** to the default value:

```
switch(config)# no qos dscp-map 1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config	Administrators or local user group members with execution rights for this command.

qos queue-profile

```
qos queue-profile <NAME>  
no qos queue-profile <NAME>
```

Description

Creates a new QoS queue profile and switches to the `config-queue` context for the profile. Or, if the specified QoS queue profile exists, this command switches to the `config-queue` context for the profile. A queue profile maps queues to local-priority values. Each profile has eight queues numbered 0 to 7. The larger the queue number, the higher its priority during transmission scheduling.

The `no` form of this command removes the specified QoS queue profile. Only profiles that are not currently applied can be removed.

Parameter	Description
<NAME>	Specifies the name of the QoS queue profile to create or configure. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Examples

Creating the profile **myprofile**:

```
switch(config)# qos queue-profile myprofile  
switch(config-queue)#
```

Deleting the profile **myprofile**:

```
switch(config)# no qos queue-profile myprofile
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config	Administrators or local user group members with execution rights for this command.

qos schedule-profile

```
qos schedule-profile <NAME>  
no qos schedule-profile <NAME>
```

Description

Creates a QoS schedule profile and switches to the `config-schedule` context for the profile. If the specified schedule profile exists, this command switches to the `config-schedule` context for the profile. The schedule profile determines the order in which queues are selected to transmit a packet, and the amount of service defined for each queue.

Parameter	Description
<NAME>	Specifies the name of the QoS queue profile to create or configure. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Usage

Queues in a schedule profile are numbered consecutively starting from zero. Queue zero is the lowest priority queue. The larger the queue number, the higher priority the queue has in scheduling algorithms.

A profile named **factory-default** is defined by default and applied to all interfaces. It cannot be edited or deleted. To see its settings, use the command:

```
switch# show qos schedule-profile factory-default  
queue_num algorithm weight  
-----  
0          wfq         1  
1          wfq         1  
2          wfq         1  
3          wfq         1  
4          wfq         1  
5          wfq         1  
6          wfq         1  
7          wfq         1
```

A profile named **strict** is predefined and cannot be edited or deleted. The strict profile services all queues of the queue profile to which it is applied, using the strict priority algorithm.

A schedule profile must be defined on all interfaces at all times.

There are two permitted configurations for a schedule profile:

1. All queues use the same scheduling algorithm (for example, WFQ).
2. The highest queue number uses strict priority, and all remaining (lower) queues use the same algorithm (for example, WFQ). This supports priority scheduling behavior necessary for the IETF RFC 3246 Expedited Forwarding specification (<https://tools.ietf.org/html/rfc3246>).

Only limited changes can be made to an applied schedule profile:

- The weight of a wfq queue.
- The bandwidth of a strict queue.
- The algorithm of the highest numbered queue can be swapped between wfq and strict, and vice versa.

Applicable to REST: Any other changes will result in an unusable schedule profile, and the switch will revert to the `factory-default` profile until the profile is corrected.

The `no` form of this command removes the specified QoS schedule profile when it is not applied. Only profiles that are not currently applied to an interface can be removed.

Examples

Creating the schedule profile **myschedule**:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)#
```

Deleting the schedule profile **myschedule**:

```
switch(config)# no qos schedule-profile myschedule
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config	Administrators or local user group members with execution rights for this command.

qos shape

```
qos shape <RATE> [burst <SIZE>]
no qos shape
```

Description

Limits the egress bandwidth on an interface to a value that is lower than its line rate. An optional burst value may also be specified.

The `no` form of this command removes shaping from an interface.

Parameter	Description
<RATE>	Specifies the maximum traffic rate in kbps. Range: 468 to 100000000.
<SIZE>	Specifies the maximum burst size in kilobytes. Range: 1 to 64. Default: 16.

Usage

When the traffic rate destined for the port exceeds the configured egress bandwidth, the switch will buffer the excess up to the limit of the queues. Rates larger than the interface line rate will have no effect. When set on a LAG, each member Ethernet port independently shapes its egress bandwidth to the specified rate.

Examples

Configuring an egress port shaping rate of 400 Mbps on interface **1/1/1** with a burst size of 50 KB:

```
switch(config)# interface 1/1/1  
switch(config-if)# qos shape 400000 burst 50
```

Deleting egress port shaping on interface **1/1/1**:

```
switch(config)# interface 1/1/1  
switch(config-if)# no qos shape
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config-if	Administrators or local user group members with execution rights for this command.

qos threshold-profile

```
qos threshold-profile <NAME>  
no qos threshold-profile <NAME>
```

Description

Creates a QoS threshold profile and switches to the `config-threshold` context for the profile. If the specified threshold profile exists, this command switches to the `config-threshold` context for the existing profile. The threshold profile determines the action to take when a threshold is exceeded for each queue. A threshold profile is composed of up to 8 queues, numbered from 0 to 7. Each queue defines the action to take when buffer utilization exceeds a specific threshold.

Configure queues with the command `queue`.

The `no` form of this command removes the specified QoS threshold profile. Only profiles that are not currently applied to an interface can be removed.

Parameter	Description
<NAME>	Specifies the name of the QoS threshold profile to create or configure. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).

Usage

Queues in a threshold profile can be any valid queue number, although it is also valid to create a threshold profile with no queues specified. Queue zero is the minimum allowed queue number. The maximum allowed queue number may vary by product. For products supporting eight queues, the largest queue

number is seven. If an applied threshold profile specifies configuration of a queue number that is not in use based on the configured queue profile, the threshold configuration of that unused queue is ignored.

Examples

Creating the threshold profile **mythreshold**:

```
switch(config)# qos threshold-profile mythreshold
switch(config-threshold)#
```

Deleting the threshold profile **myschedule**:

```
switch(config)# no qos threshold-profile mythreshold
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config	Administrators or local user group members with execution rights for this command.

qos trust

```
qos trust {none | cos | dscp}
no qos trust
```

Description

In the `config` context:

- This command sets the trust mode that is globally applied to all interfaces that do not have a trust mode configured.
- The `no` form of this command restores all interfaces that do not currently have a trust mode configured to the default setting.

In the `config-if` context:

- This command sets the trust mode override for a specific interface.
- The `no` form of this command clears a trust mode override. The interface then uses the global setting. This is the only way to remove a trust mode override.

Parameter	Description
none	Ignores all packet headers. Ingress packets are assigned the local priority and color values configured for CoS map entry 0. Default.

Parameter	Description
cos	For 802.1 VLAN tagged packets, use the priority code point field from the outermost VLAN header as the index into the CoS map to obtain the local priority and color values for the packet. If the packet is untagged, use the local priority and color values configured for CoS map entry 0.
dscp	For IP packets, use the DSCP field from the IP header as the index into the DSCP Map. Non-IP packets are assigned the local priority and color values configured for CoS map entry 0. Any 802.1Q VLAN header priority code points are ignored.

Example

Setting the global trust mode to **dscp**, which is applied to all interfaces that do not already have an individual trust mode configured. An override is then applied to interface **2/2/2**, and LAG 100, setting trust mode to **cos**:

```
switch(config)# qos trust dscp
switch(config)# interface 2/2/2
switch(config-if)# qos trust cos
switch(config-if)# interface lag 100
switch(config-if)# qos trust cos
```



WARNING: QoS port remark configurations are not applied when the QoS trust mode is *mode*. This warning message is seen if a port trust command other than *trust none* is attempted when there is already a remark configuration on the port. To restore the old remark configuration, configure the port trust mode to *none*.



WARNING: QoS port remark configurations are not applied when the global QoS trust mode is *mode*. This warning message is seen if a port *no qos trust* command is attempted when there is already a remark configuration on the port and the global trust mode is not *none*. To re-apply the remark configuration, set the port trust mode to *none*.

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config config-if config-lag-if	Administrators or local user group members with execution rights for this command.

queue action ecn all threshold kbytes

```
queue <QUEUE-NUMBER> action ecn all threshold <AMOUNT> kbytes
no queue <QUEUE-NUMBER>
```

Description

Defines the threshold value and action for a queue in a threshold-profile. When queue utilization exceeds the threshold value, ECT (ECN-Capable Transport) packets will be CE (Congestion Encountered) marked when transmitted.

The `no` form of this command removes the settings for a queue.

Parameter	Description
<QUEUE-NUMBER>	Specifies the queue number. Range: 0 to 7.
action ecn	Apply ECN when the threshold is exceeded.
all	Applies the action to all colors. Colors are reserved for future use.
threshold <AMOUNT> kbytes	Specifies the threshold value in kilobytes. Range: 0 to 1700.

Examples

Assigning a threshold to queue **7** in profile **mythreshold**:

```
switch(config)# qos threshold-profile mythreshold
switch(config-threshold)# queue 7 action ecn all threshold 4000 kbytes
```

Removing a threshold from queue **7** in profile **mythreshold**:

```
switch(config)# qos threshold-profile mythreshold
switch(config-threshold)# no queue 7
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config-threshold	Administrators or local user group members with execution rights for this command.

rate-limit

```
rate-limit {broadcast | multicast | unknown-unicast} <RATE> {kbps | pps}
no rate-limit {broadcast | multicast | unknown-unicast}
```

Description

Sets the amount of traffic of a specific type that can ingress on an Ethernet port, or on each port of a LAG interface. Rate limits are enforced separately on each individual member of a LAG, not on the LAG as a whole.

The `no` form of this command removes the traffic limit for the specified traffic type.

Parameter	Description
{broadcast multicast unknown-unicast}	Specifies the type of ingress traffic to which the rate limit applies: broadcast, multicast, or unknown-unicast. The multicast rate limit affects multicast and broadcast traffic. The broadcast rate limit only affects broadcast traffic. When both types are applied to the same interface, broadcast packets are limited to the lower of the two rate values. Layer 2 BPDU packets, like spanning tree, are also included in the multicast rate limit.
<RATE> {kbps pps}	Specifies the rate limit. Range: 22 to 100000000 kbps (in steps of 22 kbps), or 43 to 209090910 kbps (in steps of 43 pps). The actual rate limit varies with steps approximately equal to the minimum value. Verify the actual rate limit using the command <code>show interface <INTERFACE-NAME></code> .

Examples

Limiting **broadcast** traffic to **500kbps** on interface **1/1/3**:

```
switch(config)# interface 1/1/3
switch(config-if)# rate-limit broadcast 500 kbps
```

Limiting **multicast** traffic to **4000pps** on interface **1/1/3**:

```
switch(config)# interface 1/1/3
switch(config-if)# rate-limit multicast 4000 pps
```

Limiting **unknown unicast** traffic to **100kbps** on interface **1/1/3**:

```
switch(config)# interface 1/1/3
switch(config-if)# rate-limit unknown-unicast 100 kbps
```

Viewing the results of the previous configuration settings:

```
switch# show interface 1/1/3 qos
Interface 1/1/3 is down (Administratively down)
Admin state is down
Hardware: Ethernet, MAC Address: 1c:98:ec:e3:6a:00
MTU 1500
Full-duplex
rate-limit broadcast unknown-unicast 100 kbps (109 actual)
rate-limit broadcast 500 kbps (505 actual)
rate-limit multicast 4000 pps (3990 actual)

Speed 0 Mb/s
```



```

Auto-Negotiation is turned on
Input flow-control is off, output flow-control is off
RX
    0 input packets          0 bytes
    0 input error           0 dropped
    0 CRC/FCS
L3:
    ucast: 0 packets, 0 bytes
    mcast: 0 packets, 0 bytes
TX
    0 output packets        0 bytes
    0 input error           0 dropped
    0 collision
L3:
    ucast: 0 packets, 0 bytes
    mcast: 0 packets, 0 bytes

```

Limiting **broadcast** traffic to **50kbps** on LAG **100**:

```

switch# config
switch(config)# interface 1/1/3
switch(config)# interface lag 100
switch(config-if)# rate-limit broadcast 50 kbps

```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config-if	Administrators or local user group members with execution rights for this command.

show interface queues

show interface <INTERFACE-NAME> queues

Description

Displays interface-level queue statistics.

Parameter	Description
<INTERFACE-NAME>	Specifies the name of an Ethernet port or LAG on the switch. Format: member/slot/port or lag number.

Usage

Statistics include:

- **Tx Bytes:** Total bytes transmitted. The byte count may include packet headers and internal metadata that are removed before the packet is transmitted. Packet headers added when the packet is transmitted may not be included.
- **Tx Packets:** Total packets transmitted.
- **Tx Drops:** The sum of packets that were dropped across all line modules by Virtual Output Queues (VOQs) destined for the egress port queue due to either insufficient capacity, or an ingress Classifier Policy on another port dropping destined for this port. As the counts are read separately from each line packet's module, the sum is not an instantaneous snapshot.
- **Tx Byte Depth:** Largest byte depth (or high watermark) found on any ingress line module Virtual Output Queue (VOQ) destined for the egress port.

Examples

Showing queue statistics for interface **1/1/5**:

```
switch# show interface 1/1/5 queues
Interface 1/1/5 is up
Admin state is up
      Tx Bytes      Tx Packets      Tx Drops      Tx Byte Depth
Q0          157113373520      1890863919           0           1362
Q1          233312143017      2808451320          18          65550
Q2          156814056423      1887257650           0           1392
Q3          157441358980      1894815504           0           1374
Q4          157700809294      1897941370           0           1362
Q5          157872849381      1900014146           0           1392
Q6          183486049854      2208268429           0           4398
Q7          231607534141      2787913734           0          65544
```

Showing queue statistics for interface **lag 1**:

```
switch# show interface lag 1 queues
Aggregate-name lag1
Aggregated-interfaces :
1/1/21 1/1/22
Speed 20000 Mb/s
      Tx Bytes      Tx Packets      Tx Drops      Tx Byte Depth
Q0              0              0              0              0
Q1              0              0              0              0
Q2              0              0              0              0
Q3              0              0              0              0
Q4              0              0              0              0
Q5              0              0              0              0
Q6              0              0              0              0
Q7            3450              25              0             151
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show interface qos

show interface <INTERFACE-NAME> qos

Description

Shows various QoS settings for a specific interface.

Parameter	Description
<INTERFACE-NAME>	Specifies the name of an interface on the switch. Format: member/slot/port or lag number.

Examples

Showing QoS settings for interface **1/1/5**:

```
switch# show interface 1/1/5 qos
Interface 1/1/5 is down
Admin state is up
qos trust none (global)
qos queue-profile factory-default (global)
qos schedule-profile EQSExample (override)
qos threshold-profile DefaultThresh (global)
rate-limit unknown-unicast 50 pps (41 actual)
rate-limit broadcast 500 kbps (505 actual)
rate-limit multicast 500 kbps (505 actual)
qos shape 200000 (199999 actual) burst 70 (70 actual)
Max-Bandwidth Kbps      Burst KB
Q1                10082461          120
Q4                20164923          32
Q7                30247384          120
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos cos-map

```
show qos cos-map [default] [vsx-peer]
```

Description

Shows the global QoS CoS code point settings, or the factory default settings.

Parameter	Description
default	Shows the factory default CoS code point settings.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing the current CoS map:

```
switch# show qos cos-map
code_point local_priority color name
-----
0          2             green Best_Effort
1          0             green Background
2          1             green Spare
3          3             green Excellent_Effort
4          4             green Controlled_Load
5          5             green Video
6          6             green Voice
7          7             green Network_Control
```

Showing the default CoS map:

```
switch# show qos cos-map default
code_point local_priority color name
-----
0          1             green Best_Effort
1          0             green Background
2          2             green Excellent_Effort
3          3             green Critical_Applications
4          4             green Video
5          5             green Voice
6          6             green Intersetwork_Control
7          7             green Network_Control
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos dscp-map

```
show qos dscp-map [default] [vsx-peer]
```

Description

Displays the current or default global QoS dscp-map.

Parameter	Description
default	Shows the factory default DSCP code point settings.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing the current QoS DSCP map:

```
switch# show qos dscp-map
code_point local_priority color name
-----
0          1              green CS0
1          1              green
2          1              green
3          1              green
4          1              green
5          1              green
6          1              green
7          1              green
8          0              green CS1
...
45         5              green
46         7              green EF
47         5              green
48         6              green CS6
...
61         7              green
62         7              green
63         7              green
```

Showing the default QoS DSCP map:

```
switch# show qos dscp-map default
code_point local_priority color name
-----
0          1              green CS0
1          1              green
2          1              green
```

```

3          1          green
4          1          green
5          1          green
...
45         5          green
46         5          green   EF
47         5          green
48         6          green   CS6
...
61         7          green
62         7          green
63         7          green

```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos queue-profile

```
show qos queue-profile [<NAME> | factory-default] [vsx-peer]
```

Description

Shows the status of all queue profiles, or a specific queue profile.

Parameter	Description
<NAME>	Specifies the name of a queue profile. Range 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).
[factory-default]	Specifies the factory default queue profile.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Usage

The status of a queue profile can be:

- Applied - The profile is actively being used by the switch.
- Complete - The profile meets the criteria to be applied.
- Incomplete - The profile does not meet the criteria to be applied.

For a queue profile to be complete and ready to be applied:

- All eight local priorities must be mapped to some queue.
- There must be 8 queues.

Examples

Showing the settings of the factory default queue profile:

```
switch# show qos queue-profile factory-default
queue_num local_priorities name
-----
0          0
1          1
2          2
3          3
4          4
5          5
6          6
7          7
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos schedule-profile

```
show qos schedule-profile [<NAME> | factory-default | strict] [vsx-peer]
```

Description

Shows the status of all schedule profiles, or a specific schedule profile.

Parameter	Description
<NAME>	Specifies the name of a queue or schedule profile. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).
[factory-default]	Specifies the factory default queue profile.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Usage

The status of a schedule profile can be:

- Applied - The profile is actively being used by one or more ports.
- Complete - The profile meets the criteria to be applied.
- Incomplete - The profile does not meet the criteria to be applied.

For a schedule profile to be complete and ready to be applied it must have:

- An algorithm for each queue defined by the applied queue profile.
- All queues must use the same algorithm except for the highest numbered queue, which may be strict.

Example

Showing the status of all schedule profiles:

```
switch# show qos schedule-profile
profile_status profile_name
-----
applied         myschedule
complete       factory-default
complete       Test
```

Showing the configuration of factory default schedule profile:

```
switch# show qos schedule-profile factory-default
queue_num algorithm weight
-----
0          wfq         1
1          wfq         1
2          wfq         1
3          wfq         1
4          wfq         1
5          wfq         1
6          wfq         1
7          wfq         1
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos threshold-profile

```
show qos threshold-profile [<NAME> [vsx-peer]
```

Description

Shows the status of all threshold profiles, or a specific threshold profile.

Parameter	Description
<NAME>	Specifies the name of a threshold profile. Range: 1 to 64 alphanumeric characters, including period (.), underscore (_), and hyphen (-).
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Usage

Status fields are:

- **applied**: The threshold profile is applied to all configured ports.
- **partially applied**: The threshold profile is applied to some configured ports but failed on other configured ports.
- **not applied**: The threshold profile could not be applied to any configured ports.
- **blank field**: The threshold profile is not applied in the configuration (globally or as a port override).
- **error: Insufficient TCAM Resources**: The switch hardware failed to activate a threshold profile.

Examples

Showing the status of all threshold profiles:

```
switch# show qos threshold-profile
profile_status      profile_name
-----
CustomThresh
applied             mythreshold
```

Showing the status of threshold profile **mythreshold**:

```
switch# show qos threshold-profile mythreshold
queue_num action  Threshold
-----
5          ecn      2000
7          ecn      5000

Ports      Status
-----
1/1/1     applied
1/1/8     applied
1/2/2     applied
```

Showing the status of threshold profile **CustomThresh** that failed to be activated by the switch hardware:

```
switch# show qos threshold-profile mythreshold
queue_num action  Threshold
-----
3          ecn      3000
4          ecn      4000
```

Ports	Status
-----	-----
1/2/2	Error: Insufficient TCAM Resources

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

show qos trust

```
show qos trust [default] [vsx-peer]
```

Description

Shows the global QoS trust settings, or the factory default settings.

Parameter	Description
default	Shows the factory default QoS trust settings.
vsx-peer	Shows the output from the VSX peer switch. If the switches do not have the VSX configuration or the ISL is down, the output from the VSX peer switch is not displayed. This parameter is available on switches that support VSX.

Examples

Showing the current QoS trust settings:

```
switch# show qos trust
qos trust cos
```

Showing the default QoS trust settings:

```
switch# show qos trust default
qos trust none
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	Operator (>) or Manager (#)	Operators or Administrators or local user group members with execution rights for this command. Operators can execute this command from the operator context (>) only.

strict queue

```
strict queue <QUEUE-NUMBER> [[max-bandwidth <BANDWIDTH>] [burst <SIZE>]]
no strict queue <QUEUE-NUMBER>
```

Description

Assigns the strict priority algorithm to a queue. Strict priority services all packets waiting in a queue, before servicing the packets in lower priority queues.

Egress queue shaping can be configured using the `max-bandwidth` and `burst` options to limit the amount of traffic transmitted per output queue. The buffer associated with each egress queue stores the excess traffic to absorb bursts and smooth the output rate. Sustained rates of traffic above the maximum bandwidth will eventually fill the output queue causing tail drops. Use the command `show interface` to determine if any tail drop errors have occurred.

The `no` form of this command removes the the queue configuration from the schedule profile. To remove only egress queue shaping, re-enter the `strict queue` command without the `max-bandwidth` and `burst` parameters.

Parameter	Description
<code><QUEUE-NUMBER></code>	Specifies the number of the queue. Range: 0 to 7.
<code>max-bandwidth <BANDWIDTH></code>	Specifies the maximum bandwidth allowed on the queue in Kbps. Range: 468 to 100000000.
<code>burst <BURST></code>	Specifies the maximum burst allowed on the queue. Range: 1 to 64. Default: 32.

Usage

Either all the queues of the schedule profile can be *strict* or just the highest numbered queue. When applied to a LAG, each member Ethernet port independently schedules its egress transmissions using the strict settings. Only limited changes can be made to a *strict* queue that is part of an applied schedule profile:

- The max-bandwidth settings.
- The highest numbered queue can be swapped between *strict* and *wfq*

Any other changes or removing a queue (`no strict queue`) will result in an unusable schedule profile. If that schedule profile is applied in the interface context, the switch will revert to the schedule profile applied in the global context until the profile is corrected. If that schedule profile is applied in the global context, the switch will revert to using the factory-default profile until the profile is corrected.

Examples

Assigning strict priority to queue **7** in the schedule profile **myschedule**:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)# strict queue 7
```

Deleting strict priority from queue **7** in the schedule profile **myschedule**:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)# no strict queue 7
```

Assigning strict priority to queue **7** in the schedule profile **myschedule** with a maximum bandwidth of 10000 Kbps and a burst of 62 Kbytes:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)# strict queue 7 max-bandwidth 10000 burst 62
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
All platforms	config-schedule- <i><NAME></i>	Administrators or local user group members with execution rights for this command.

wfq queue

```
wfq queue <QUEUE-NUMBER> weight <WEIGHT>
no wfq queue <QUEUE-NUMBER>
```

Description

Assigns the weighted fair queuing (WFQ) algorithm and its weight to a queue. Weighted fair queuing allocates available bandwidth among all queues that are not empty, in relation to their queue weights. WFQ is applied in bytes, not packets. It is work conserving, which means that only non-empty queues are counted on each scheduling cycle. The percentage of bandwidth allotted to a non-empty queue is calculated by dividing its weight by the sum of the weights for all non-empty queues. This means that the percentage of bandwidth allotted to a queue can fluctuate, depending on the number of non-empty queues present in each cycle.

The `no` form of this command removes the weighted fair queuing algorithm from a queue.

Parameter	Description
<QUEUE-NUMBER>	Specifies the queue number. Range: 0 to 7.
weight <WEIGHT>	Specifies the scheduling weight. Range: 1 to 253.

Examples

Assigning WFQ with a weight of **17** to queue **2** in the schedule profile **myschedule**:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)# wfq queue 2 weight 17
```

Deleting WFQ for queue **2** from the schedule profile **myschedule**:

```
switch(config)# qos schedule-profile myschedule
switch(config-schedule)# no wfq queue 2
```

Command History

Release	Modification
10.07 or earlier	--

Command Information

Platforms	Command context	Authority
8400	config-schedule-<NAME>	Administrators or local user group members with execution rights for this command.

Accessing Aruba Support

Aruba Support Services	https://www.arubanetworks.com/support-services/
Aruba Support Portal	https://asp.arubanetworks.com/
North America telephone	1-800-943-4526 (US & Canada Toll-Free Number) +1-408-754-1200 (Primary - Toll Number) +1-650-385-6582 (Backup - Toll Number - Use only when all other numbers are not working)
International telephone	https://www.arubanetworks.com/support-services/contact-support/

Be sure to collect the following information before contacting Support:

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Other useful sites

Other websites that can be used to find information:

Airheads social forums and Knowledge Base	https://community.arubanetworks.com/
AOS-CX Switch Software Documentation Portal	https://www.arubanetworks.com/techdocs/AOS-CX/help_portal/Content/home.htm
Aruba Hardware Documentation and Translations	https://www.arubanetworks.com/techdocs/hardware/DocumentationPortal/Content/home.htm

Portal	
Aruba software	https://asp.arubanetworks.com/downloads
Software licensing	https://lms.arubanetworks.com/
End-of-Life information	https://www.arubanetworks.com/support-services/end-of-life/
Aruba Developer Hub	https://developer.arubanetworks.com/

Accessing Updates

You can access updates from the Aruba Support Portal or the HPE My Networking Website.

Aruba Support Portal

<https://asp.arubanetworks.com/downloads>

If you are unable to find your product in the Aruba Support Portal, you may need to search My Networking, where older networking products can be found:

My Networking

<https://www.hpe.com/networking/support>

To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:

<https://support.hpe.com/portal/site/hpsc/aae/home/>

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HP Passport set up with relevant entitlements.

Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.

To subscribe to eNewsletters and alerts:

<https://asp.arubanetworks.com/notifications/subscriptions> (requires an active Aruba Support Portal (ASP) account to manage subscriptions). Security notices are viewable without an ASP account.

Warranty Information

To view warranty information for your product, go to <https://www.arubanetworks.com/support-services/product-warranties/>.

Regulatory Information

To view the regulatory information for your product, view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at <https://www.hpe.com/support/Safety-Compliance-EnterpriseProducts>

Additional regulatory information

Aruba is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements, environmental data (company programs, product recycling, energy efficiency), and safety information and compliance data, (RoHS and WEEE). For more information, see <https://www.arubanetworks.com/company/about-us/environmental-citizenship/>.

Documentation Feedback

Aruba is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (docsfeedback-switching@hpe.com). When submitting your feedback, include the document title, part number, edition, and publication date located on the front cover of the document. For online help content, include the product name, product version, help edition, and publication date located on the legal notices page.