Configuration Guide

Ethernet Switch QoS Configuration

QoS Over Ethernet

This Configuration Guide explains how to configure your ADTRAN OS Switch Product to manage and prioritize incoming packets using Layer 2 QoS. For detailed information regarding specific command syntax, refer to the *AOS Command Reference Guide* on your *ADTRAN OS System Documentation* CD.

This guide consists of the following sections:

Understanding Layer 2 QoS

The NetVanta 1000 Series of Ethernet switches provides Layer 2 QoS functionality, allowing you to better prioritize and manage packets. If all traffic running on a network has equal priority, each packet has an equal chance of being delivered in a timely fashion. Likewise, if congestion occurs on the network, each packet has an equal chance of being dropped.

Layer 2 QoS is based on 802.1p class of service (CoS) values. Using the CoS value (0-7), the switch maps packets to a designated queue. Up to four transmit queues *per output interface* are available for classifying incoming packets. This allows delay-sensitive or mission-critical traffic to be delivered in a more predictable fashion. When network congestion occurs, lower priority traffic can be dropped to allow higher priority traffic to be delivered.

Basic Requirements of Setup

There are three basic requirements when setting up QoS over Ethernet:
- *Setting the CoS Value for Incoming Packets* (discussed in the next section)
- *Assigning CoS Values to the Four Queues* (discussed on page 3)
- *Choosing a Queuing Type* (discussed on page 3)

Step 1: Setting the CoS Value for Incoming Packets
Traffic is divided into queues using 802.1p CoS values. CoS operates at Layer 2 of the OSI model, and values range from 0 to 7 (0 being lowest priority). By default, all incoming packets are marked with the default CoS value of 0. Therefore if nothing is changed, all packets are sent to the first transmit queue. The default CoS value can be assigned per interface (using the **qos default-cos** command), OR the interface can be programmed to trust CoS values of incoming packets if the values have already been set (using the **qos trust cos** command).

In other words, based on the switch configuration, the CoS value will be determined as follows:
- If the interface is set up to accept (trust) predetermined CoS values, incoming traffic retains its current CoS value.
- If the interface is set up to reclassify CoS values, CoS values of inbound traffic are changed to the value specified using the **qos default-cos** command. If no value has been specified, they will receive the value 0.

> **NOTE**
>
> *The **qos trust-cos** command is not available on the NetVanta 123x series. Instead, on these products the CoS of arriving tagged frames will be trusted. For untagged frames, the CoS value will be replaced according to the configuration of the **qos default-cos** <value> command (the default is **0**).*

Commands used to determine CoS values are listed and described in Table 1 on page 3.

Table 1. Commands Used to Determine CoS Values of Incoming Traffic

Command	Description
(config-eth 0/x)#**qos trust cos**	Trust is enabled. The switch will not change existing CoS values on inbound traffic.
(config-eth 0/x)#**no qos trust cos**	Trust is disabled. The switch will change existing CoS values on inbound traffic to the value specified by the **qos default-cos** command.
(config-eth 0/x)#**qos default-cos** *<0-7>*	Specifies the CoS value assigned to traffic received on the Ethernet port (0 is least important).
(config-eth 0/x)#**no qos default-cos**	Resets default CoS value to 0.
(config-eth 0/x)#**no qos trust cos** (config-eth 0/x)#**qos default-cos 0**	These are the default setting on all ports. If not changed, all traffic will end up in queue 1 of each output interface.

Step 2: Assigning CoS Values to the Four Queues

The switch supports four output queues. Each queue can be assigned specific CoS values (using the **qos cos-map** command). Packets with a particular CoS value are then mapped to the specified queue. Table 2 shows the four queues and identifies the default CoS values assigned to each. CoS values can be moved from queue to queue as desired.

Table 2. Default CoS Queue Assignments

Queue and Assigned CoS values	Two CoS values are assigned to each queue by default
(config)#**qos cos-map 1 0 1** (config)#**qos cos-map 2 2 3** (config)#**qos cos-map 3 4 5** (config)#**qos cos-map 4 6 7**	CoS values 0 and 1 are assigned to Queue1. CoS values 2 and 3 are assigned to Queue2. CoS values 4 and 5 are assigned to Queue3. CoS values 6 and 7 are assigned to Queue4.

Step 3: Choosing a Queuing Type

Queuing types are set on a per-switch basis. All queuing types supported by the switch are 802.1p aware. Choices include:
- Weighted Round Robin (WRR)
- Strict Priority
- WRR with Expedite Queue

The default queue type is WRR, with an equal percentage of the packet weight assigned to each of the four queues. Table 3 lists and describes the different queuing options.

Table 3. Setting Queue Types and Weights

Command	Description
(config)#**qos queue-type wrr 25 25 25 25**	Each of the four queues has the same value. The system will remove one packet at a time from each queue (this is the default setting).
(config)#**qos queue-type wrr 1 2 3 4**	Queue1 is set to 1, Queue2 is set to 2, Queue3 is set to 3, and Queue4 is set to 4. For every cycle, one packet is removed from Queue1, two packets from Queue2, three from Queue3, and four from Queue4.
(config)#**qos queue-type wrr 1 2 3 expedite**	Processes the first three queues as WRR and Queue4 as the priority (or expedite) queue. Queue4 empties before all other queues. Queues1-3 maintain their round robin behavior, but only after Queue4 is empty.
(config)#**qos queue-type strict-priority**	Empties all packets from Queue4, then Queue3, Queue2, and finally Queue1. The highest queue will always be serviced first. Queue weight is not used here. *Note: The possible drawback to this scheme is that if enough traffic is received for a higher priority queue, lower priority queues can be blocked from transmitting.*

DSCP-to-CoS Mapping

CoS values can also be determined based on the packet's DSCP value (if DSCP-to-CoS mapping is enabled using the **qos dscp-cos** command). If DSCP-to-CoS mapping is enabled, CoS values are altered when specified DSCP values are detected on inbound traffic. Use the commands listed in Table 4 to configure this option.

Table 4. DSCP-to-CoS Mapping Commands

Command	Description								
(config)#**qos dscp-cos 24 48 to 1 2**	Enables DSCP-to-CoS mapping for the entire switch. When one of the specified DSCP values is detected in an incoming packet, the CoS value is changed based on the corresponding mapped DSCP value. This example maps DSCP values 24 and 48 to CoS values 1 and 2 (respectively). All eight CoS values (0-7) can be mapped using this command.								
(config)#**qos dscp-cos default**	Enables DSCP-to-CoS mapping for the default values shown below:								
	DSCP	0	8	16	24	32	40	48	56
	CoS	0	1	2	3	4	5	6	7
(config)#**no qos dscp-cos**	Disables DSCP-to-CoS mapping.								

Show Commands

Use the following commands to view information on QoS functionality.

Table 5. Show Command Definitions

| Command	Description
show qos queuing	Displays information on the current queue types and weights.
show qos cos-map	Displays information on the CoS-to-queue mapping.
show qos interface *<interface>*	Displays the configured values for default CoS and trust settings for the designated interface.
show dscp-qos	Displays the configured DSCP-to-CoS priority map.

Configuring Using the Web Interface

The setup described in this document is also configurable via the web interface. You may access the web-based GUI from any web browser on your network by following these steps:

1. Connect the switch to your PC using any of the 24 Ethernet ports on the front of the unit.

2. Change the IP address of your PC to 10.10.10.2. If you cannot change the PC's IP address, you will need to change the unit's IP address using the CLI.

3. Enter the unit's IP address in your browser address line (see example, below). The default IP address is 10.10.10.1.

4. You will then be prompted for the username and password (the default settings are **admin** and **password**).

                61200520L1-29.1B
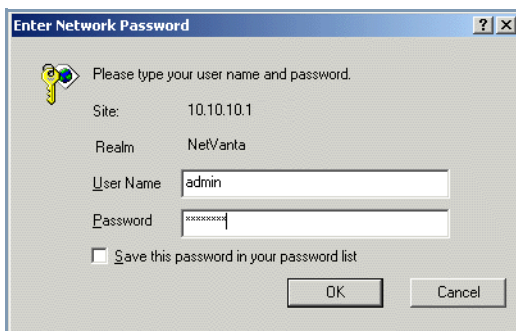
Web Interface Configuration for Individual Ports

1. To access QoS settings that apply to a particular interface (e.g., the commands described in Table 1 on page 3), click on **Ports** in the screen's left pane.

2. Once the **Configuration** screen appears, click on the port you wish to configure (e.g., **eth 0/3**). The **General Port Information** screen appears (see Figure 1).

Figure 1. QoS Configuration Options for Individual Ports

Web Interface Configuration for the Entire Switch

1. To access QoS settings that apply to the entire switch (e.g., the commands described in Table 2 on page 3, Table 3 on page 4, and Table 4 on page 5), click on **Class of Service** in the screen's left pane.
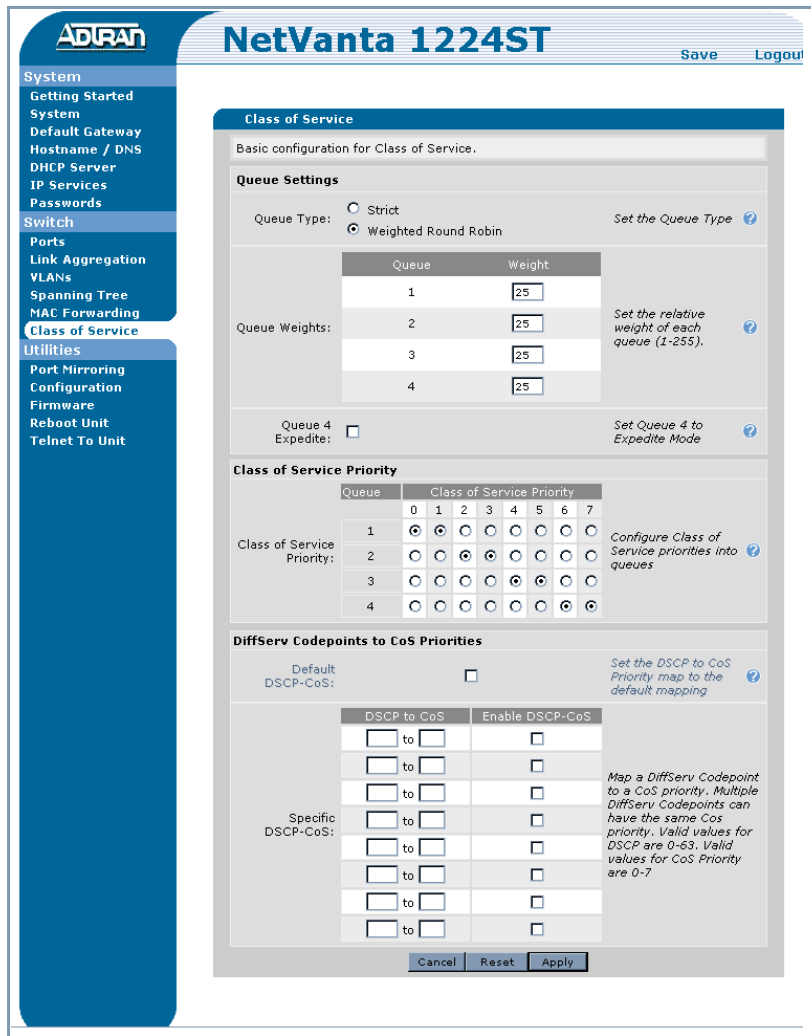
2. The resulting screen is shown in Figure 2.

Figure 2. QoS Configuration Options for the Entire Switch

For additional information and technical support, visit us online at www.adtran.com.