



## Configuration Guide

# Configuring Enhanced Ethernet Quality of Service

---

This configuration guide will aid in the setup of enhanced Ethernet quality of service (EEQoS) for ADTRAN Operating System (AOS) products. An overview of EEQoS general concepts combined with detailed command descriptions and network examples provide step-by-step assistance for configuration. The troubleshooting section outlines proper use of **show** commands to verify that EEQoS has been configured properly on the AOS product(s).

This guide consists of the following sections:

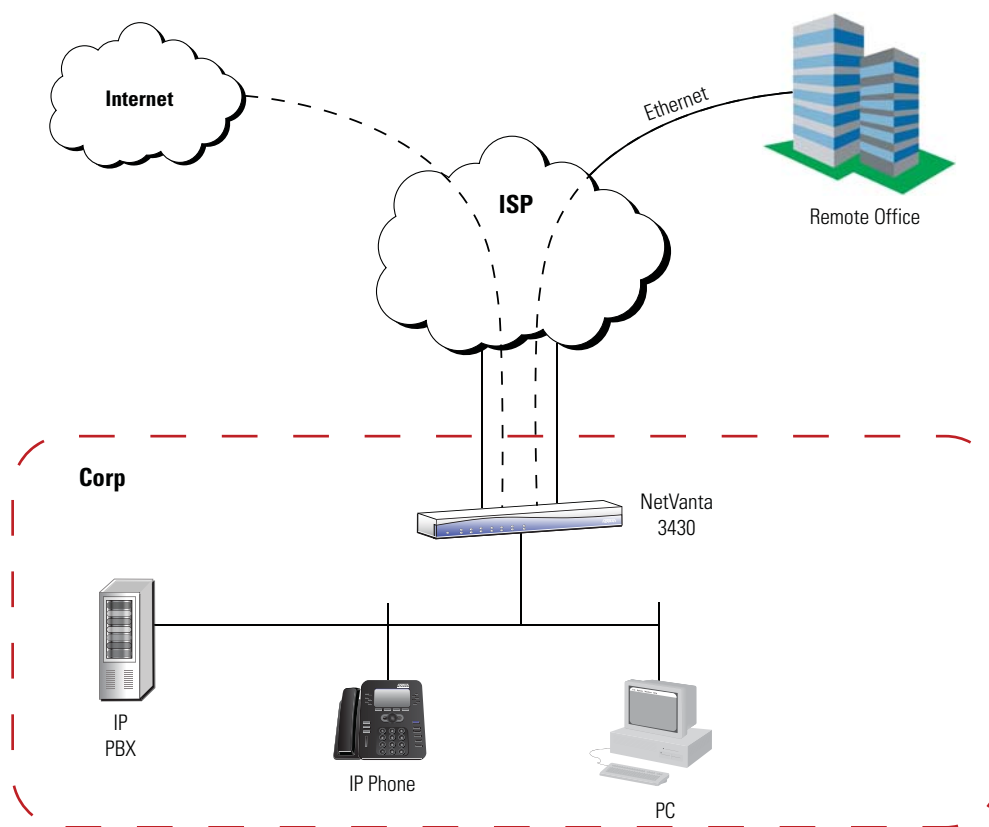
- *EEQoS Overview on page 2*
- *Hardware and Software Requirements and Limitations on page 3*
- *IPv4 and IPv6 Address Support in AOS on page 3*
- *Configuring QoS on page 3*
- *CLI Configuration on page 4*
- *GUI Configuration on page 12*
- *Example Configurations on page 22*
- *Command Summary on page 28*
- *Troubleshooting on page 31*

## EEQoS Overview

EEQoS provides a customer's router connected to a carrier Ethernet user network interface (UNI) the ability to the best use of the bandwidth supplied by the carrier. In network installations where a customer has purchased a set amount of bandwidth, a portion of the customer's traffic could be dropped due to traffic policing by the network provider. The provisioned bandwidth is usually less than the physical interface bandwidth so that when packets are transmitted by the customer's router, the network provider's equipment will limit the traffic to the provisioned amount. Traffic policing ensures a customer's packet flow is within the assigned bandwidth by dropping packets as they exceed the rate profile. Transmission Control Protocol (TCP) will greatly reduce a data application's transfer rate when packet drops occur. The result is throughput that is actually much less than the provisioned bandwidth.

A better method to transmit TCP throughput is to delay traffic instead of dropping packets. This is done by shaping outgoing traffic in the customer's router. Traffic in excess of the configured throughput is put into a queue and transmitted when sufficient budget has accumulated, smoothing out bursts.

Once a group of flows are shaped to a particular rate, further subclass division of traffic can be done by dividing the traffic into class-based queueing (CBQ), low-latency queueing (LLQ), and best effort groups. This is done by applying CBQ/LLQ classes to the shaped queue.



**Figure 1. Enhanced Ethernet Quality of Service Example Application**

## Hardware and Software Requirements and Limitations

Enhanced Ethernet QoS capability was introduced in AOS 17.2 and is currently available on AOS products as outlined in the [AOS Feature Matrix](#) (article number 2272). This matrix is available online at <https://supportforums.adtran.com>. Some commands are interface specific and may not be available on all platforms listed. Use the context-sensitive help (type `?`) from the command line interface (CLI) to determine if a command is supported by your hardware platform.

## IPv4 and IPv6 Address Support in AOS

The next generation Internet protocol requires an increased number of available addresses to replace the current standard of Internet Protocol version 4 (IPv4). Due to its limiting 32-bit addressing, the available IPv4 address space is diminishing. Internet Protocol version 6 (IPv6) is emerging and can provide enough IP addresses for the foreseeable future, as well as many other benefits.

In the interest of supporting both IPv4 and IPv6 addresses in multiple networks, changes have been made to the AOS CLI. These changes affect QoS with the release of firmware R10.1.0 and where applicable, are noted in this configuration guide. Some commands can be executed in multiple syntax structures to accommodate IPv4 addresses only, IPv6 addresses only, or both.

For more information, refer to *Using IPv6 in AOS* (article number 3505) available online from ADTRAN's Support Forum at <https://supportforums.adtran.com>.

## Configuring QoS

There are two ways to configure EEQoS: (1) the CLI and (2) the Web-based graphical user interface (GUI). Both configuration modes are covered in this guide, beginning with [CLI Configuration on page 4](#) and followed by [GUI Configuration on page 12](#).

To configure EEQoS, we begin by creating a QoS map which is an object specifying the QoS class (traffic to manipulate) and an action to take on the selected traffic. The creation of a QoS map consists of naming the map, specifying the match criteria (using the **match** command), and defining one or more action items (using the **priority**, **bandwidth**, **shape**, or **set** commands). Once the map is defined, assign the QoS map to a selected interface. The interface must also be correctly configured before the QoS map creation is successful. Together these items create the QoS policy.

The following is the minimum configuration required to configure EEQoS on an AOS product:

1. Create QoS map.
2. Classify traffic using match criteria.
3. Configure traffic shaping.
4. Configure the interface.
5. If VLANs are required, configure routing between VLANs with IEEE 802.1q encapsulation.
6. Assign the QoS map to the interface.
7. Configure Ethernet subinterface and assign VLAN ID.

If your application requires more in-depth traffic classification than is explained in this guide, refer to [Configuring QoS in AOS Configuration Guide](#), available at <https://supportforums.adtran.com> (article number 1617).

## CLI Configuration

To access the CLI on your AOS unit, follow these steps:

1. Boot up the unit.
2. Telnet to the unit (**telnet** <ip address>), for example:

```
telnet 10.10.10.1.
```



*If during the unit's setup process you have changed the default IP address (10.10.10.1), use the configured IP address.*

3. Enter your user name and password at the prompt.



*The AOS default user name is **admin** and the default password is **password**. If your product no longer has the default user name and password, contact your system administrator for the appropriate user name and password.*

4. Enable your unit by entering **enable** at the prompt as follows: >**enable**
5. If configured, enter your Enable mode password at the prompt.
6. Enter the unit's Global Configuration mode as follows:

```
#configure terminal
(config)#
```

### Step 1: Create QoS Map

A QoS map is a named list with sequenced entries each defined by a name and a number. QoS maps are used to define matched traffic and place the traffic in priority or class-based queues or other traffic groupings, such as shaped classes. A QoS map contains multiple class entries, each of which has packet match cases, and a set of actions for the particular class (actions are defined by **bandwidth**, **priority**, **set**, and **shape** commands). You can create a single QoS map with multiple entries, but a unique sequence number is required to differentiate each entry. The sequence number is used to assign the order in which the conditions are matched.

To create a QoS map and enter the QoS map configuration mode, enter this command from the Global Configuration mode:

Syntax: **qos map** <name> <number> [**match-any** | **match-all**]

<name> Specifies the QoS map name.

<number> Assigns a sequence number to differentiate this QoS map and provide a match order. Valid range is **0** to **65535**.

**match-all** Optional. Used when defining QoS maps with multiple match conditions. Indicates the traffic must match all conditions before the set action is issued. (This modifier is rarely used or required.)

**match-any** Optional. Used when defining QoS maps with multiple match conditions. Indicates the traffic can match any of the conditions to be processed, which is the default behavior.

For example, enter:

```
(config)#qos map SHAPE 10
(config-qos-map)#
```

## Step 2: Classify Traffic Using Match Criteria

The **match** commands specify a parameter to which traffic (on an interface with the active QoS policy) is compared. QoS maps have a matching selector and an action (how the traffic should be handled) which make up the QoS policy. The special handling instructions contained in the QoS map action are applied to all packets that contain the specified match parameter.

Depending on your configuration, it could be necessary to configure multiple traffic matches from within one QoS map entry (map name and sequence number). Multiple match statements can exist within the same QoS map, allowing a single QoS map to service various types of traffic.

Traffic is matched based on IP access control list (ACL), differentiated service code point (DSCP) values, precedence value, or VLAN ID. The commands in this step specify which traffic should be processed by a particular QoS map. Enter the appropriate command from within the QoS map configuration mode.

For example, enter:

```
(config)#qos map SHAPE 10
(config-qos-map)#match vlan 3
```

### Match by Access Control List

Traffic can be matched based on a configured ACL. ACLs are traffic selectors that include a matching parameter (to select the traffic) and an action statement (to either permit or deny the matched traffic). The special handling instructions defined in the QoS map are applied to all packets allowed by the specified ACL. The ACL must be configured prior to creating and using QoS maps. Create an ACL to permit or deny specified traffic by using the **ip access-list extended** or **ipv6 access-list extended** commands as indicated in the *AOS Command Reference Guide* available online at <https://supportforums.adtran.com> (article number 2219).



*Only extended ACLs can be used with QoS.*

To match traffic based on an IPv4 ACL, enter this command from within the QoS Map Configuration mode:

Syntax: **match ip list** <ipv4 acl name>

To match traffic based on an IPv6 ACL, enter this command from within the QoS Map Configuration mode:

Syntax: **match ipv6 list** <ipv6 acl name>

For example, the following command matches the QoS map **MY\_VOICE** to traffic using the IPv4 ACL **MATCHALL**:

```
(config)#qos map MY_VOICE 10
(config-qos-map)#match ip list MATCHALL
```

### Match by DSCP Value

DSCP values (as specified by RFC 2474) are contained in six bits of the IPv4 or IPv6 header. A QoS map entry can specify up to eight DSCP values as matching criteria. If any one of the DSCP values match, the packet will be processed. DSCP values are explained in greater detail in *Configuring QoS in AOS Configuration Guide*, available at <https://supportforums.adtran.com> (article number 1617).



*Beginning with AOS firmware release R10.1.0, the **match dscp** command can be used to match both IPv6 and IPv4 packets simultaneously. To limit matching only IPv4 packets, use the **match ip dscp** command. To limit matching only IPv6 packets, use the **match ipv6 dscp** command.*

To match traffic based on the DSCP value in the IP header of IPv4 and IPv6 packets, use the following syntax:

Syntax: **match dscp [afx | csx | default | ef | <value>]**

To match traffic based on the DSCP value in the IP header of only IPv4 packets, use the following syntax:

Syntax: **match ip dscp [afx | csx | default | ef | <value>]**

To match traffic based on the DSCP value in the IP header of only IPv6 packets, use the following syntax:

Syntax: **match ipv6 dscp [afx | csx | default | ef | <value>]**

Assured forwarding (AF) class and subclass can be specified using the **afx** keyword. Select from the options shown in *Table 1 on page 6*. Class selector (CS) value can be specified using the **csx** keyword. Valid range for CS is **1** to **7**. The **default** keyword indicates using the default IP DSCP value (000000). Marking for expedited forwarding (EF) is indicated by the **ef** keyword. Valid range for **<value>** is **0** to **63**.

To remove a match DSCP statement, enter the command string with the **no** keyword. For example:

```
(config-qos-map)#no match dscp 8
```

**Table 1. Assured Forwarding DSCP Values**

CLI Entry	DSCP Value
11	001010
12	001100
13	001110
21	010010
22	010100
23	010110
31	011010

**Table 1. Assured Forwarding DSCP Values**

CLI Entry	DSCP Value
32	011100
33	011110
41	100010
42	100100
43	100110

### Match by Precedence Value

Packets can also be matched based on the precedence value in the IP header of IPv4 or IPv6 packets. Precedence values are explained in greater detail in *Configuring QoS in AOS Configuration Guide*, available at <https://supportforums.adtran.com> (article number 1617).



*Beginning with AOS firmware release R10.1.0, the **match precedence** command can be used to match both IPv6 and IPv4 packets simultaneously. To limit matching only IPv4 packets, use the **match ip precedence** command. To limit matching only IPv6 packets, use the **match ipv6 precedence** command.*

To match traffic based on precedence value for IPv4 and IPv6 packets, use the following syntax from the QoS Map Configuration mode:

Syntax: **match precedence** <value>

To match traffic based on precedence value for only IPv4 packets, use the following syntax:

Syntax: **match ip precedence** <value>

To match traffic based on precedence value for only IPv6 packets, use the following syntax:

Syntax: **match ipv6 precedence** <value>

Valid range for <value> is **0** to **7**, in ascending order of importance.

### Match by VLAN Identifier

Packets associated with a particular VLAN can be matched using the VLAN ID with the **match** command. Use the following syntax:

Syntax: **match vlan** <id>

Valid range for <id> is an identifier from **1** to **4095**.

### Match Any Packets

Packets not matched in a previous QoS map entry can be matched using the **match any** command. This variation of the **match** command can also serve as a default case if it is specified as the last QoS map entry.

To match any packets, enter this command from within the QoS Map Configuration mode:

Syntax: **match any**

### Step 3: Configure Traffic Shaping

One of the actions that can be applied to traffic once it is matched in a QoS class is shaping. Traffic shaping allows the traffic to be smoothed in order to maintain a uniform rate to take full advantage of the provisioned bandwidth. Short bursts of traffic above the configured rate are allowed when there is sufficient budget. Traffic outside of the current budget is put into a shaping queue and transmitted once the budget is available.

Traffic shaping is required at one of three different levels depending on the ingress bandwidth profile being used to police the packets in the network. Shaping should be configured at either the UNI port level, per Ethernet virtual connection (EVC) subinterface, or per class. An EVC is an association of two or more UNIs, connecting multiple subscriber sites. It provides a level of security and privacy for networks. Examples of each of these configurations are provided in [Example Configurations on page 22](#).

To specify the traffic shaping for a QoS class, enter this command from within the QoS map configuration mode:

Syntax: **shape average** <rate> [bps | Kbps | Mbps] [burst <size>] [Bytes | KB | MB] [count-eth-overhead]

<rate>	Specifies an average bandwidth. Range is <b>8192</b> to <b>1000000000</b> bits per second (bps).
<b>burst</b> <size>	Optional. Specifies the maximum burst size (MBS) (in bytes) for traffic in this QoS map entry. This parameter should be left unconfigured for optimal performance. Range is <b>1600</b> to <b>6250000</b> bytes.
<b>count-eth-overhead</b>	Optional. Indicates to include the Ethernet header overhead bytes when determining packet size.
<b>bps</b>	Optional. Indicates the rate specified is in bps.
<b>Kbps</b>	Optional. Indicates the rate specified is in kilobits per second (kbps).
<b>Mbps</b>	Optional. Indicates the rate specified is in megabits per second (Mbps).
<b>Bytes</b>	Optional. Indicates the burst size specified is in bytes.
<b>KB</b>	Optional. Indicates the burst size specified is in kilobytes (kB).
<b>MB</b>	Optional. Indicates the burst size specified is in megabytes (MB).

For example, enter:

```
(config)#qos map EVC2_CLASS 10
(config-qos-map)#shape average 2000000
```

A maximum of five different traffic shapers per QoS map can be defined using the **shape average** command.

If only interface level shaping is required, then the interface **traffic-shape rate** command can be used to set up shaping without applying a map. This command is specified at the interface level.



*The **traffic-shape rate** command can only be applied to Ethernet, 802.1q encapsulated Ethernet, and switch-router VLAN interfaces.*



Syntax: **traffic-shape rate** <value> [<burst>]

<value> Specifies the rate (in bits per second) at which the interface should be shaped.

<burst> Optional. Specifies the allowed burst in bytes. By default, the burst is specified as the rate divided by 5 and represents the number of bytes that would flow within 200 ms.

For example, enter:

```
(config)#interface eth 0/1
(config-eth 0/1)#traffic-shape rate 2000000
```

#### Step 4: Configure the Interface

To process packets on an outgoing interface, the QoS map is applied to the interface. The Ethernet interface must next be configured in order to apply the QoS map to it. To configure the interface, enter the following command:

Syntax: **interface eth** <slot/port>

For example, configure the Ethernet interface in slot 0, port 1:

```
(config-qos-map)#interface eth 0/1
(config-eth 0/1)#
```

Shaping can only be applied to maps used on Ethernet, 802.1q encapsulated Ethernet, and VLAN interfaces on router products with switch ports. To see a list of available interfaces on your unit, enter the following command from the Enable mode command prompt:

Syntax: **show interfaces description**

Example output for this command:

Interface	Status	Protocol	Description
eth 0/1	Admin Up	Line Up	
eth 0/2	Admin Up	Line Up	
swx 0/1	Admin Up	Line Up	
swx 0/2	Admin Up	Line Up	
swx 0/3	Admin Up	Line Up	
swx 0/4	Admin Up	Line Up	
swx 0/5	Admin Up	Line Down	
swx 0/6	Admin Up	Line Down	
swx 0/7	Admin Up	Line Down	

#### Step 5: Configure Routing Between VLANs with 802.1q Encapsulation

If VLANs are required, enable 802.1q encapsulation by entering the following command from the appropriate Ethernet interface configuration mode:

Syntax: **encapsulation 802.1q**

For example, enable 802.1q encapsulation on the Ethernet interface in slot 0, port 1:

```
(config-eth 0/1)#encapsulation 802.1q
```

## Step 6: Assign the QoS Map to the Interface

To finalize the QoS map configuration, it must be applied to the Ethernet interface. Enter the following command from the Ethernet or VLAN Interface Configuration mode:

Syntax: **qos-policy out** <name>

For example, enter:

```
(config-eth 0/1)#qos-policy out EVC2_CLASS
```

**EVC2\_CLASS** is the name of the QoS map previously created in Step 1. If more than one QoS map is used in the configuration, such as with additional subclasses, this command is only used to apply the parent or base map to the Ethernet interface. Refer to [Subdividing QoS Classes \(Optional\) on page 11](#) for more information on subclasses. Shaping may only be performed on an outgoing QoS map, so the **out** keyword is required.



*QoS maps containing **bandwidth**, **priority**, or **shape** commands cannot be applied to Ethernet subinterfaces. Instead, a QoS map should be applied to the main Ethernet interface that matches based on the VLAN ID or an ACL applicable to the desired Ethernet subinterface.*

## Step 7: Configure the Ethernet Subinterface and Assign a VLAN ID

The final step in basic configuration is necessary if using VLANs on an 802.1q encapsulated router interface. To create a VLAN, first configure the subinterface and assign it a VLAN ID. If you are using multiple VLANs, issue the commands in this step as many times as necessary for each subinterface.

To configure an Ethernet subinterface, enter the following command from the Ethernet Interface Configuration mode:

Syntax: **interface eth** <slot/port.sublink>

For example, to create a subinterface at Ethernet slot 0, port and sublink 1.2, enter:

```
(config-eth 0/1)#interface eth 0/1.2
```

To assign a VLAN ID to the subinterface, enter the following command:

Syntax: **vlan-id** <number>

For example, to assign VLAN 2 to the Ethernet subinterface 0/1.2, enter:

```
(config-eth 0/1.2)#vlan-id 2
```

## Step 8: Optional Settings Using the CLI

The following section provides information about additional settings not covered in the previous steps. These settings may pertain to your particular configuration.

## Subdividing QoS Classes (Optional)

The **qos-policy** command can also be used within a map to further subdivide a traffic class into more specific subclasses. The more specific QoS map (or child map) is created first and then the map is referenced using the **qos-policy** command within the QoS map entry of the base (or parent) map that is being subdivided. The base (or parent) map is applied to the Ethernet interface using the **qos-policy out** command (shown in [Step 6: Assign the QoS Map to the Interface on page 10](#)).

Only two levels of maps are allowed, which means child maps (or subclasses) cannot be further subdivided. A child map cannot reference another child map. If a child map is deleted, then the parent map is also deleted.

For example, the following configuration uses the **SHAPE\_EVCs** QoS map to constrain each VLAN's traffic to specific rates. The VLAN 2 traffic that is put into the shaping queue is broken up into CBQ or LLQ subclasses using the **CLASS\_QUEUES** QoS map. Traffic not matching a QoS map entry is treated as best effort, and is dynamically assigned to a best effort weighted fair queue (WFQ).

```
(config)#qos map CLASS_QUEUES 10
(config-qos-map)#match dscp ef
(config-qos-map)#priority 200

(config-qos-map)#qos map CLASS_QUEUES 20
(config-qos-map)#match dscp af31 af32 af33
(config-qos-map)#bandwidth 500          ! class based rate in Kbps

(config-qos-map)#qos map SHAPE_EVCs 10
(config-qos-map)#match vlan 2
(config-qos-map)#shape average 1000000 ! vlan2Rate in bps
(config-qos-map)#qos-policy CLASS_QUEUES

(config-qos-map)#qos map SHAPE_EVCs 20
(config-qos-map)#match vlan 3
(config-qos-map)#shape average 2000000 ! vlan3Rate

(config-qos-map)#interface eth 0/1
(config-eth 0/1)#encapsulation 802.1q
(config-eth 0/1)#qos-policy out SHAPE_EVCs

(config-eth 0/1)#interface eth 0/1.2
(config-eth 0/1.2)#vlan-id 2
(config-eth 0/1.2)#interface eth 0/1.3
(config-eth 0/1.3)#vlan-id 3
```

## Packet Marking (Optional)

The **set** commands are used for packet marking, allowing changes to be made to the class of service (CoS) value, DSCP field, or IP precedence value for outgoing traffic serviced by the QoS policy. Every IPv4 header contains an 8-bit ToS field used for marking packets requiring special handling instructions for the next hop router. IPv6 headers have an 8-bit traffic-class field serving the same purpose. Originally, this ToS field was used for IP precedence markings (using only the first three bits of the 8-bit field), but was later revised in RFC 2474 to create the 6-bit DSCP field (reserving the last two bits of the field for future use).

The DSCP field can be manipulated to indicate higher or lower traffic priority using a value between 0 and 63. DSCP and precedence remarking can be applied to both IPv4 and IPv6 packets. For more details on determining DSCP values, refer to [Configuring QoS in AOS Configuration Guide](#), available at <https://supportforums.adtran.com> (article number 1617).

To change the CoS value on matching packets, use the following syntax from within the QoS Map Configuration mode:

Syntax: **set cos** <value>

The valid range for <value> is **0** to **7**.

For example, the following command sets the CoS value for all matching traffic to **5**:

```
(config-qos-map)#set cos 5
```

To change the DSCP field on matching packets, use the following syntax from within the QoS Map Configuration mode:

Syntax: **set dscp** [<value> | **afxx** | **csxx** | **default** | **ef**]

The valid range for <value> is **0** to **63**. AF class and subclass can be specified using the **afxx** keyword. Select from the options shown in [Table 1 on page 6](#). CS value can be specified using the **csx** keyword. The valid range for CS is **1** to **7**. The **default** keyword indicates using the default IP DSCP value (000000). Matching the packets marked for EF is accomplished by using the **ef** keyword.

For example, the following command sets the DSCP value for all matching traffic to **46**:

```
(config-qos-map)#set dscp 46
```

To change the IP precedence value on matching packets, use the following syntax from within the QoS Map Configuration mode:

Syntax: **set precedence** <value>

The valid range for <value> is **0** to **7**.

For example, the following sets the IP precedence value for all matching traffic to **1**:

```
(config-qos-map)#set precedence 1
```



*Beginning with AOS firmware release R10.1.0, the **set dscp** and **set precedence** commands apply remark packet DSCP and precedence values to all IPv4 and IPv6 packets that match the QoS map entry. In order to mark a particular version of traffic, it is necessary to create a QoS map match for that particular version.*

## GUI Configuration

The GUI is an especially useful tool for those who are less familiar with CLI configuration. AOS products ship with a user-friendly GUI that can be used to perform many basic management and configuration functions on the AOS product. Some advanced options can be configured using the GUI as well.

### Accessing the GUI

To begin configuring the EEQoS through the GUI, follow these steps to access the GUI:

1. Open a new Web page in your Internet browser.

2. Enter your AOS product's IP address in the browser's address field, **http://<ip address>**, for example:  
**http://65.162.109.200**
3. At the prompt, enter your user name and password and select **OK**.



The default user name is **admin** and the default password is **password**.

## Step 1: Create QoS Map

As described in [CLI Configuration on page 4](#), the first step is to create a QoS map. To access the QoS Map configuration menu, navigate to **Data > Router/Bridge > QoS Maps** from the left side of the menu. The **Add/Modify/Delete QoS Map** menu appears.

Multiple map entries for the same QoS map are differentiated by a sequence number. The sequence number is used to assign match order. For example, when creating multiple entries in the QoS map named **EVC2**, the sequence numbers are provided in increments as follows: **EVC2-10**, **EVC2-20**, and **EVC2-30**.

To create the QoS map, enter a name for the map and a sequence number. Select **Add** to create the map entry. The **QoS Map Setup** menu appears, displaying the **Packet Matching** menu (shown in [Figure 3 on page 14](#)) for further configuration.

Enter a name for the QoS map.

Enter a sequence number for the map entry.

Select **Add** to create the map entry.

QoS Map	QoS-Policy	Matching	Marking	Bandwidth
<a href="#">EVC2-10</a>	<none>	DSCP(6)	disabled	disabled
<a href="#">EVC2-20</a>	<none>	Any	disabled	disabled
<a href="#">EVC2-30</a>	<none>	disabled	disabled	disabled

Figure 2. Add/Modify/Delete QoS Map Menu

## Step 2: Classify Traffic Using Match Criteria

Multiple match criteria can exist within the same QoS policy, allowing a single QoS policy to service various types of traffic. Traffic is matched based on DSCP values, precedence value, VLAN ID, or ACL. If the **Packet Matching** menu does not initially display from the **QoS Map Setup** menu, select the **Packet Matching** tab. Enable the match criteria as described in [Table 2 on page 15](#) and select **Apply** to accept the new settings.

The **Match All** check box is normally left unchecked, indicating that a packet may match any of the packet matching cases specified. If it is checked, it requires that all specified packet matching cases must be true before a packet will be processed as part of this class.

**NOTE** *The GUI does not currently support configuration of IPv4- and IPv6-specific matching. Any packet match cases added in the GUI will apply to both IPv4 and IPv6 packets.*

Do not select **Match All** unless you want to require matching all packet matching criteria.

**QoS Map Setup for EVC2-10**

**WARNING:** Any IPv6 match cases or IPv4-specific "match ip dscp", "match ip precedence", or "match protocol ipv4" cases added previously through the CLI will be deleted if changes are applied to this QoS Map entry using the Web GUI. The GUI does not support adding these match types.

If Match All is enabled and multiple match options are selected for this QoS Map entry, then they must ALL be true before a packet will be processed.  
**NOTE:** This option is typically not required.

Match All

QoS-Policy <none> Specify child QoS-Policy.

**Packet Matching** | Packet Marking | Queuing

Disable *Disable packet matching.*

Match any *Match Any packets.*

VLAN Id 1 *Match IP packets by VLAN Id (1-4095).*

DLCI 16 *Match all packets on a frame relay DLCI (16-1007).*

IP RTP  
 Start Port 10000  
 End Port 10048 *Match IP RTP packets.*

Enable Even and Odd Ports

Precedence  
 0  1  2  3  
 4  5  6  7 *Select up to 8 different precedence values. (0 - 7)*

List <Please Select an ACL name> *Match using access-list. Go to the 'Firewall' page and click on the 'Configure ACLs' button at the bottom of the page to configure an 'Extended ACL'.*

Bridged *Match frames being bridged.*

NetBEUI *Match bridged NetBEUI frames.*

DSCP *Match packet DSCP value(s).*

Cancel Apply

Select Apply.

Figure 3. Packet Matching Tab Menu

**Table 2. Packet Matching Options**

Menu Options	Description																								
<b>Disable</b>	Select to disable packet matching for this traffic class.																								
<b>Match any</b>	Select to match any packets within the QoS map. Since map entries are processed in the order of their sequence numbers, the <b>match any</b> class can be used to process all packets not previously matched by a QoS map entry.																								
<b>VLAN Id</b>	Select to match packets associated with a particular VLAN. Indicate VLAN ID number ( <b>1 to 4095</b> ).																								
<b>DLCI</b>	Select to match packets based on the Frame Relay DLCI number associated with a packet. (Not used for this feature configuration.)																								
<b>IP RTP</b>	<p>Select to matches IPv4 RTP packets with the specified UDP destination port.</p> <p><b>Start Port</b> - Specify port number <b>0 to 65535</b>.</p> <p><b>End Port</b> - Specify port number <b>0 to 65535</b>. This value must be greater than or equal to the start port number.</p> <p><b>Enable Even and Odd Ports</b> - Select to enable all ports in the start to end range. Otherwise, only even ports are enabled.</p>																								
<b>Precedence</b>	Packets are matched on precedence value in IP header. Indicate a value <b>0 to 7</b> , in ascending order of importance.																								
<b>List</b>	Select an IPv4 ACL from the drop-down list to match packets.																								
<b>Bridged</b>	Select to match frames being bridged. (Not used for this feature configuration.)																								
<b>NetBEUI</b>	Select to match bridged NetBEUI frames. (Not used for this feature configuration.)																								
<b>DSCP</b>	<p>Select to match packets based on DSCP values in the IP header. Select <b>Add a new DSCP Line</b> to create a new entry. Up to eight DSCP values can be indicated per QoS map. If any one of the values match, the packet will be processed. Select from the following:</p> <table data-bbox="464 1339 1252 1591"> <tbody> <tr> <td><b>Default</b> (000000)</td> <td><b>AF32</b> (011100)</td> <td><b>CS3</b> (011000)</td> </tr> <tr> <td><b>AF11</b> (001010)</td> <td><b>AF33</b> (011110)</td> <td><b>CS4</b> (100000)</td> </tr> <tr> <td><b>AF12</b> (001100)</td> <td><b>AF41</b> (100010)</td> <td><b>CS5</b> (101000)</td> </tr> <tr> <td><b>AF13</b> (001110)</td> <td><b>AF42</b> (100100)</td> <td><b>CS6</b> (110000)</td> </tr> <tr> <td><b>AF21</b> (010010)</td> <td><b>AF43</b> (100110)</td> <td><b>CS7</b> (111000)</td> </tr> <tr> <td><b>AF22</b> (010100)</td> <td><b>CS1</b> (001000)</td> <td><b>EF</b> (101110)</td> </tr> <tr> <td><b>AF23</b> (010110)</td> <td><b>CS2</b> (010000)</td> <td><b>1 to 63</b></td> </tr> <tr> <td><b>AF31</b> (011010)</td> <td></td> <td></td> </tr> </tbody> </table> <p>To remove a DSCP value, select <b>Delete</b> from the corresponding line.</p>	<b>Default</b> (000000)	<b>AF32</b> (011100)	<b>CS3</b> (011000)	<b>AF11</b> (001010)	<b>AF33</b> (011110)	<b>CS4</b> (100000)	<b>AF12</b> (001100)	<b>AF41</b> (100010)	<b>CS5</b> (101000)	<b>AF13</b> (001110)	<b>AF42</b> (100100)	<b>CS6</b> (110000)	<b>AF21</b> (010010)	<b>AF43</b> (100110)	<b>CS7</b> (111000)	<b>AF22</b> (010100)	<b>CS1</b> (001000)	<b>EF</b> (101110)	<b>AF23</b> (010110)	<b>CS2</b> (010000)	<b>1 to 63</b>	<b>AF31</b> (011010)		
<b>Default</b> (000000)	<b>AF32</b> (011100)	<b>CS3</b> (011000)																							
<b>AF11</b> (001010)	<b>AF33</b> (011110)	<b>CS4</b> (100000)																							
<b>AF12</b> (001100)	<b>AF41</b> (100010)	<b>CS5</b> (101000)																							
<b>AF13</b> (001110)	<b>AF42</b> (100100)	<b>CS6</b> (110000)																							
<b>AF21</b> (010010)	<b>AF43</b> (100110)	<b>CS7</b> (111000)																							
<b>AF22</b> (010100)	<b>CS1</b> (001000)	<b>EF</b> (101110)																							
<b>AF23</b> (010110)	<b>CS2</b> (010000)	<b>1 to 63</b>																							
<b>AF31</b> (011010)																									

### Step 3: Configure Traffic Shaping

One of the actions that can be applied to traffic once it is matched in a QoS class is shaping. Traffic shaping allows the traffic to be smoothed in order to maintain a uniform rate to take full advantage of the provisioned bandwidth. Short bursts of traffic above the configured rate are allowed when there is sufficient budget. Traffic outside of the current budget is put into a shaping queue and transmitted once the budget is available. There are many options available for shaping traffic and these are explained in [Table 3 on page 17](#).

From the **QoS Map Setup** menu, select the **Queuing** tab. Select the **Traffic Class Queuing** button to shape the traffic to an average rate. Select **Average**, and enter a rate in bps. This example will smooth the traffic through the interface using the SHAPE 10 policy to 2000000 bps. Bursts of traffic above this rate will be placed in a queue for transmission when enough bandwidth is available. Select **Apply** to save the settings.

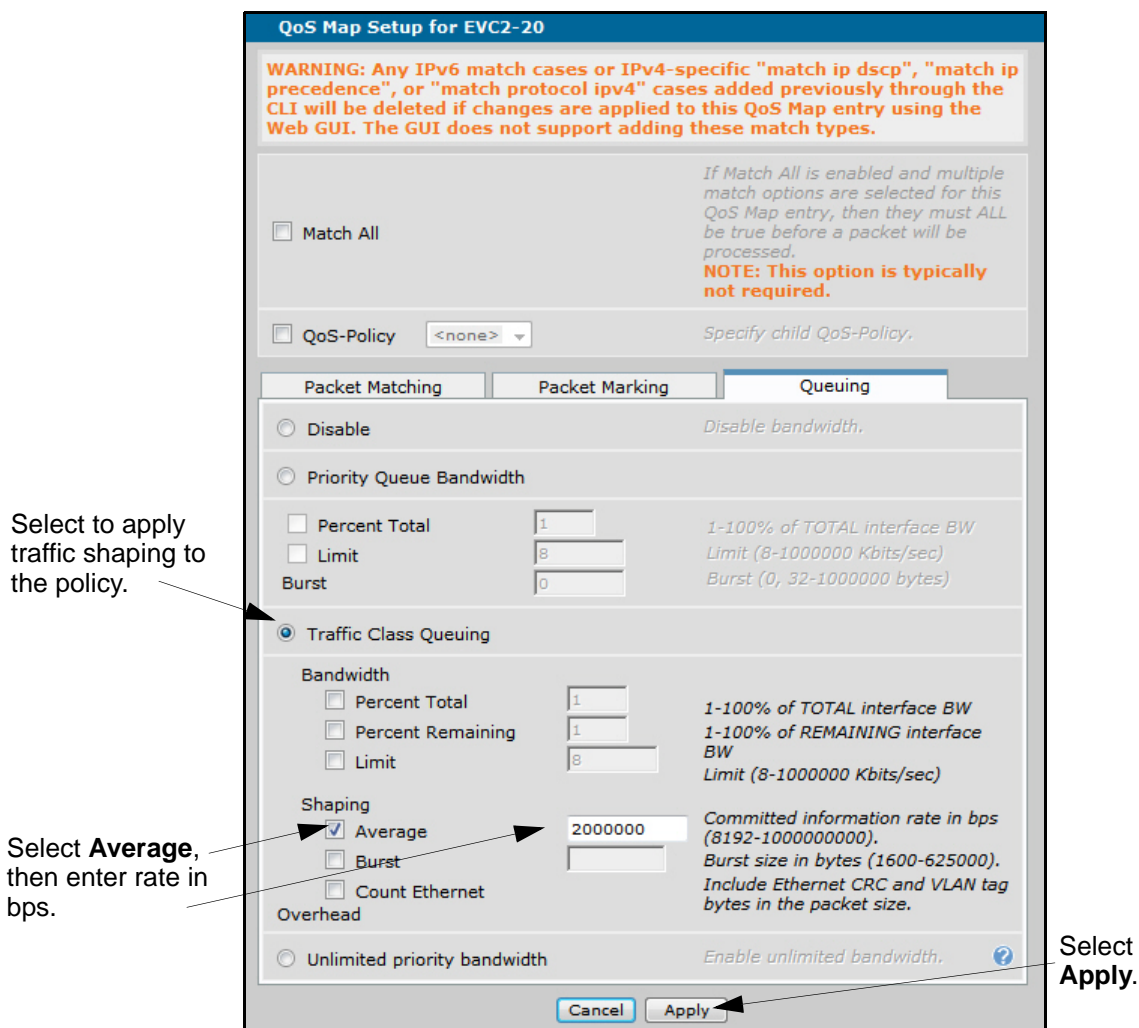


Figure 4. Queuing Tab Menu

Only one of the four options listed on this menu can be configured per traffic class. When selecting **Disable**, **Priority Queue Bandwidth**, **Traffic Class Queuing**, or **Unlimited priority bandwidth**, the other options will not be available.



Table 3. Traffic Queuing Options

Menu Option	Description
<b>Disable</b>	Select to remove any specific queuing requirement for the traffic class on interfaces using this QoS policy.
<b>Priority Queue Bandwidth</b>	<p><b>Percent Total</b> - Specify <b>1</b> to <b>100</b> percent of the total interface bandwidth.</p> <p><b>Limit</b> - Specify <b>8</b> to <b>1000000</b> kbps.</p> <p><b>Burst</b> - Specify <b>0</b> to let the router determine the optimum burst size, or <b>32</b> to <b>1000000</b> bytes to set the value manually.</p>
<b>Traffic Class Queuing</b>	<p><b>Bandwidth</b></p> <p><b>Percent Total</b> - Specify <b>1</b> to <b>100</b> percent of total interface bandwidth.</p> <p><b>Percent Remaining</b> - Specify <b>1</b> to <b>100</b> percent of remaining interface bandwidth.</p> <p><b>Limit</b> - Specify <b>8</b> to <b>1000000</b> kbps.</p> <p><b>Shaping</b></p> <p><b>Average</b> - Specify <b>8192</b> to <b>1000000000</b> bps.</p> <p><b>Burst</b> - Specify <b>1600</b> to <b>625000</b> bytes. If the <b>Burst</b> checkbox is not selected, the router will choose the default automatically.</p> <p><b>Count Ethernet Overhead</b> - Select to include Ethernet CRC and VLAN/MAC header bytes in the packet size.</p>
<b>Unlimited Priority Bandwidth</b>	Select to allow unlimited priority traffic. No rate limiting will be performed on this traffic class. Use this option with caution as excessive traffic matching the QoS map can potentially use all of the available bandwidth on the wide area network (WAN) port, blocking out other important traffic.



*Additional settings are available from the **QoS Map Setup** menu. These are described in [Packet Marking \(Optional\)](#) on page 20.*

### Step 4: Configure the Interface

The next step requires configuring the interface in order to apply the QoS map. Navigate to **System > Physical Interfaces**. Select the interface hyperlink from the list of physical interfaces.

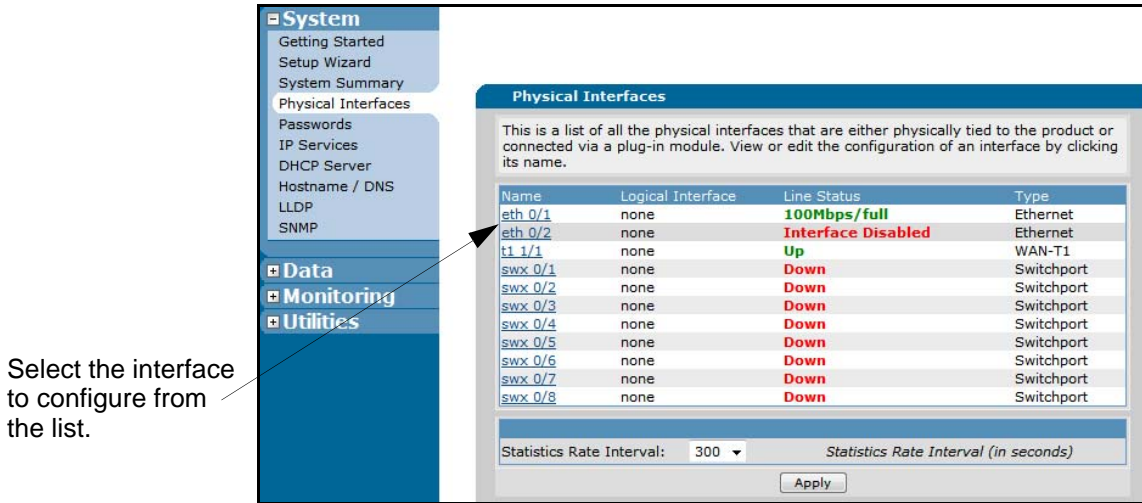


Figure 5. Physical Interfaces Menu

### Step 5: Configure Routing Between VLANs with IEEE 802.1q Encapsulation

Enable IEEE 802.1q encapsulation on the interface selected in Step 4. Selecting **802.1q** from the drop-down list under **Interface Mode** brings up the Ethernet subinterface configuration section in the menu for configuring subinterfaces.

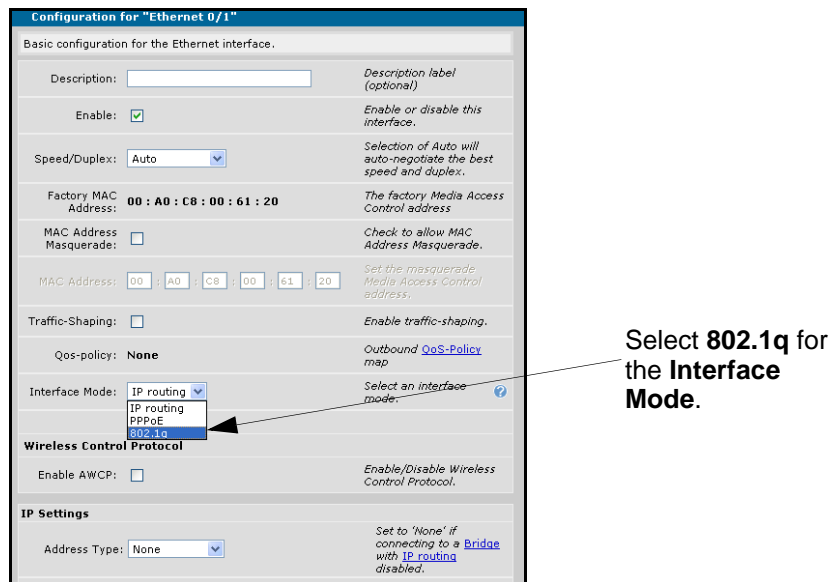


Figure 6. Ethernet Port Configuration Menu

## Step 6: Configure the Ethernet Subinterface and Apply a VLAN ID

Create an Ethernet subinterface and associate a VLAN ID to it. To create the subinterface **eth 0/1.2**, place a **2** in the **ID** field. Identify a VLAN for this subinterface. Enter the number of the appropriate VLAN in the **VLAN ID** field. Indicate whether this VLAN is native by selecting the check box. Select **Apply** to save the settings and return to the Ethernet Interface Configuration menu.

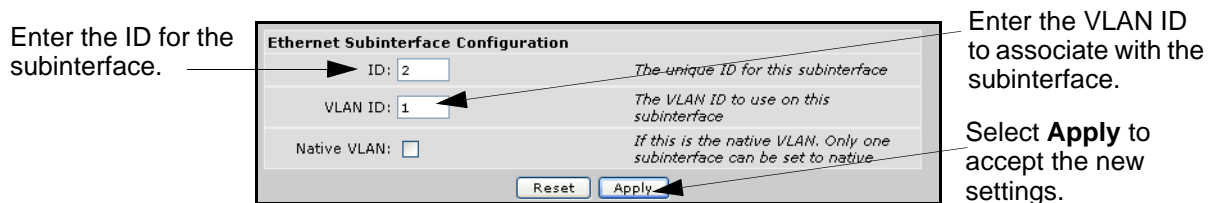


Figure 7. Ethernet Subinterface Configuration Menu

## Step 7: Assign the QoS Map to the Interface

After the QoS map is created and the settings have been applied, return to the **Add/Modify/Delete QoS Map** configuration menu by selecting **System > Physical Interfaces**. It is easiest to apply the map to the interface now and then continue with the rest of the interface configuration. From the QoS configuration menu located at **Data > Router/Bridge > QoS Maps**, scroll down to the **QoS-policy assignment and statistics** section. Under **Modify Assignment**, select an **Outbound QoS-policy** for the appropriate interface. For example, in [Figure 8](#), the QoS policy **EVC2** has been selected for **eth 0/ 1**. Select **Apply** to save the settings.

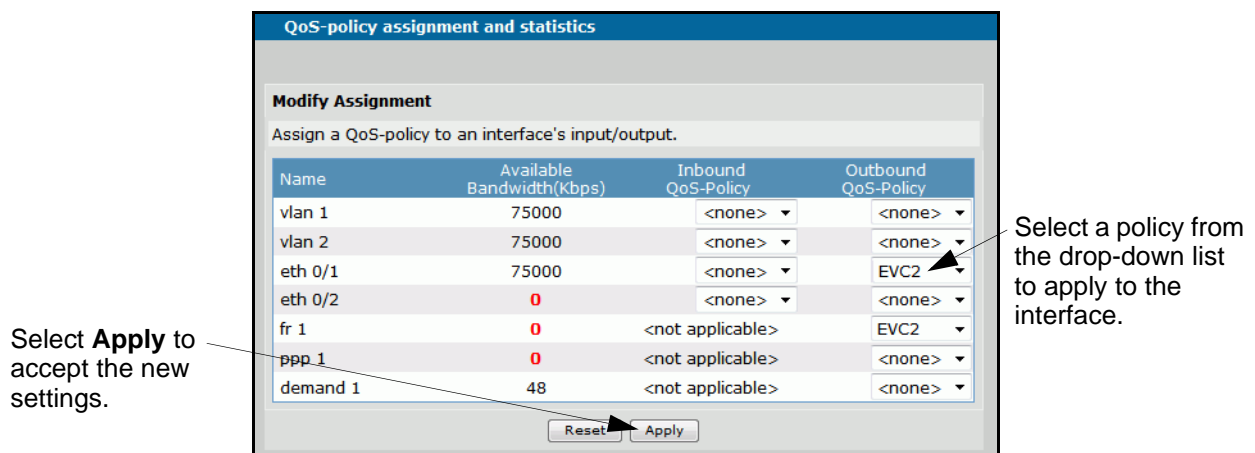


Figure 8. Apply QoS Policy to the Ethernet Interface

## Step 8: Optional Settings Using the GUI

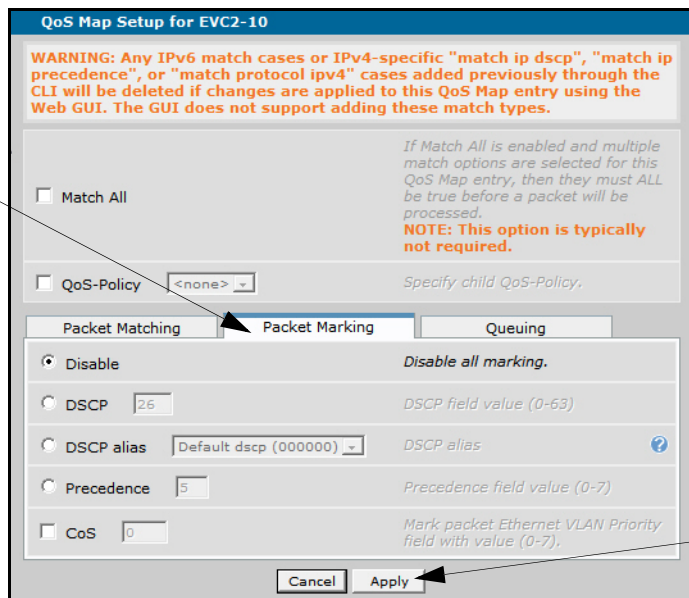
The following section provides information about additional settings not covered in the previous steps. These settings may pertain to your particular configuration. You can also refer to [Step 8: Optional Settings Using the CLI on page 10](#) for more information.

### Packet Marking (Optional)

The options provided for packet marking allow you to change the DSCP field or precedence value for outgoing traffic serviced by the QoS policy. Every IPv4 header contains an 8-bit type of service (ToS) field used for marking packets requiring special handling when traveling through the network. IPv6 headers have an 8-bit traffic-class field serving the same purpose. Originally this ToS field was used for IP precedence markings (using only the first three bits of the eight-bit field), and was later revised in RFC 2474 to create the six-bit DSCP field (reserving the last two bits of the field for future use). The DSCP field can be manipulated to indicate higher or lower traffic priority using a value between 0 and 63. DSCP and precedence remarking can be applied to both IPv4 and IPv6 packets.

To change the DSCP field on matching packets, enable the **DSCP** or **DSCP alias** options from the **Packet Marking** tab menu (see *Figure 9* below). Similarly, to change the precedence value for matching packets, enable the **Precedence** option and enter a value between 0 and 7. Be sure to select **Apply** to save the settings.

Select **Packet Marking** to mark the DSCP field, IP precedence value, or CoS value for outgoing traffic.



Select **Apply**.

**Figure 9. Packet Marking Tab Menu**

Table 4. Packet Marking Options

Menu Options	Description																					
<b>Disable</b>	Select to discontinue marking of packets. By default, packet marking is disabled.																					
<b>DSCP</b>	Changes the DSCP field value for outgoing traffic serviced by the QoS policy. Indicate a value of <b>0</b> to <b>63</b> .																					
<b>DSCP alias</b>	Changes the DSCP field value for outgoing traffic serviced by the QoS policy. Select an alias from the drop-down list:  <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"><b>Default</b> (000000)</td> <td style="width: 33%;"><b>AF31</b> (011010)</td> <td style="width: 33%;"><b>CS2</b> (010000)</td> </tr> <tr> <td><b>AF11</b> (001010)</td> <td><b>AF32</b> (011100)</td> <td><b>CS3</b> (011000)</td> </tr> <tr> <td><b>AF12</b> (001100)</td> <td><b>AF33</b> (011110)</td> <td><b>CS4</b> (100000)</td> </tr> <tr> <td><b>AF13</b> (001110)</td> <td><b>AF41</b> (100010)</td> <td><b>CS5</b> (101000)</td> </tr> <tr> <td><b>AF21</b> (010010)</td> <td><b>AF42</b> (100100)</td> <td><b>CS6</b> (110000)</td> </tr> <tr> <td><b>AF22</b> (010100)</td> <td><b>AF43</b> (100110)</td> <td><b>CS7</b> (111000)</td> </tr> <tr> <td><b>AF23</b> (010110)</td> <td><b>CS1</b> (001000)</td> <td><b>EF</b> (101110)</td> </tr> </table>	<b>Default</b> (000000)	<b>AF31</b> (011010)	<b>CS2</b> (010000)	<b>AF11</b> (001010)	<b>AF32</b> (011100)	<b>CS3</b> (011000)	<b>AF12</b> (001100)	<b>AF33</b> (011110)	<b>CS4</b> (100000)	<b>AF13</b> (001110)	<b>AF41</b> (100010)	<b>CS5</b> (101000)	<b>AF21</b> (010010)	<b>AF42</b> (100100)	<b>CS6</b> (110000)	<b>AF22</b> (010100)	<b>AF43</b> (100110)	<b>CS7</b> (111000)	<b>AF23</b> (010110)	<b>CS1</b> (001000)	<b>EF</b> (101110)
<b>Default</b> (000000)	<b>AF31</b> (011010)	<b>CS2</b> (010000)																				
<b>AF11</b> (001010)	<b>AF32</b> (011100)	<b>CS3</b> (011000)																				
<b>AF12</b> (001100)	<b>AF33</b> (011110)	<b>CS4</b> (100000)																				
<b>AF13</b> (001110)	<b>AF41</b> (100010)	<b>CS5</b> (101000)																				
<b>AF21</b> (010010)	<b>AF42</b> (100100)	<b>CS6</b> (110000)																				
<b>AF22</b> (010100)	<b>AF43</b> (100110)	<b>CS7</b> (111000)																				
<b>AF23</b> (010110)	<b>CS1</b> (001000)	<b>EF</b> (101110)																				
<b>Precedence</b>	Changes the IP precedence field value for incoming traffic serviced by the QoS policy. Indicate a value of <b>0</b> to <b>7</b> .																					
<b>CoS</b>	Assigns the class of service (CoS) value for outgoing traffic serviced by the QoS policy. Indicate a value of <b>0</b> to <b>7</b> .																					

### Subdividing QoS Classes (Optional)

The **qos-policy** command can be used within a map to further subdivide a traffic class into more specific subclasses. The more specific QoS map (or child map) is created first. The base (or parent) map is created next and then the map is referenced by selecting the QoS parent map from within the QoS map configuration menu. The base (or parent) map is applied to the Ethernet interface (shown in [Step 4: Configure the Interface on page 18](#)).

Only two levels of maps are allowed, which means child maps (or subclasses) cannot be further subdivided. A child map cannot reference another child map. If a child map is deleted, then the parent map is also deleted.

To apply a child map to a parent QoS map, navigate to **Data > Router/Bridge > QoS Maps**. Select the parent QoS map to configure. The QoS policy option is available at the top of the menu as shown in [Figure 10 on page 22](#). Select the **QoS Policy** option and choose the child map to apply to it from the drop-down list. Select **Apply** to accept the settings.

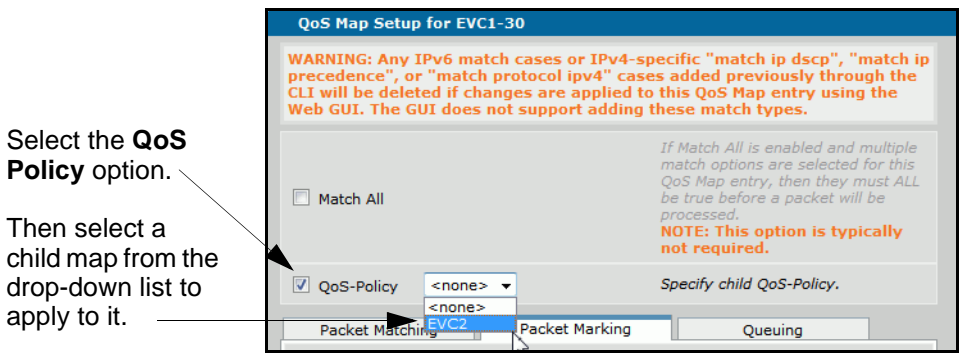


Figure 10. Adding a QoS Policy within a QoS Map

### Example Configurations

The following CLI examples are some of the common scenarios where EEQoS might be used. The syntax used for matching packets in these examples, assumes the use of both IPv4 and IPv6 addresses in the network. Adjust the commands appropriately to fit your specific network requirements.

#### Example 1: Traffic Shaping at the UNI Level

Traffic shaping can be applied to an Ethernet interface with 802.1q encapsulation enabled. In this example, all traffic transmitted out the **eth 0/1** interface is shaped at 2 Mbps. This application could be used to apply QoS for voice over IP (VoIP), allowing data traffic to be queued during heavy congestion and passed when bandwidth allows.

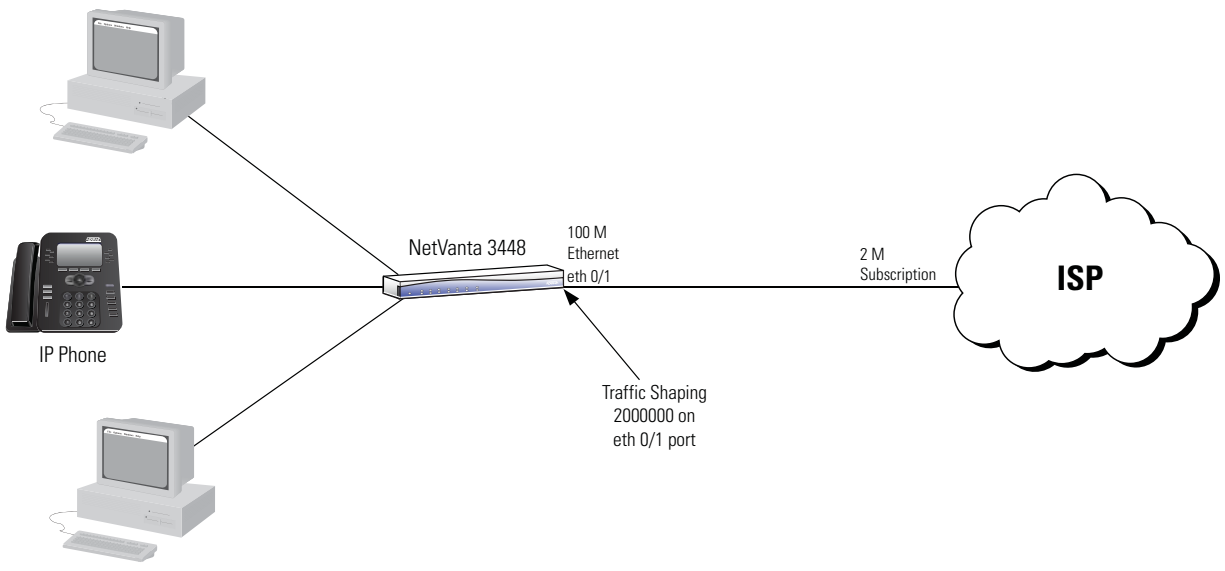


Figure 11. Configuration Example 1

The following commands are entered to configure EEQoS for Example 1:

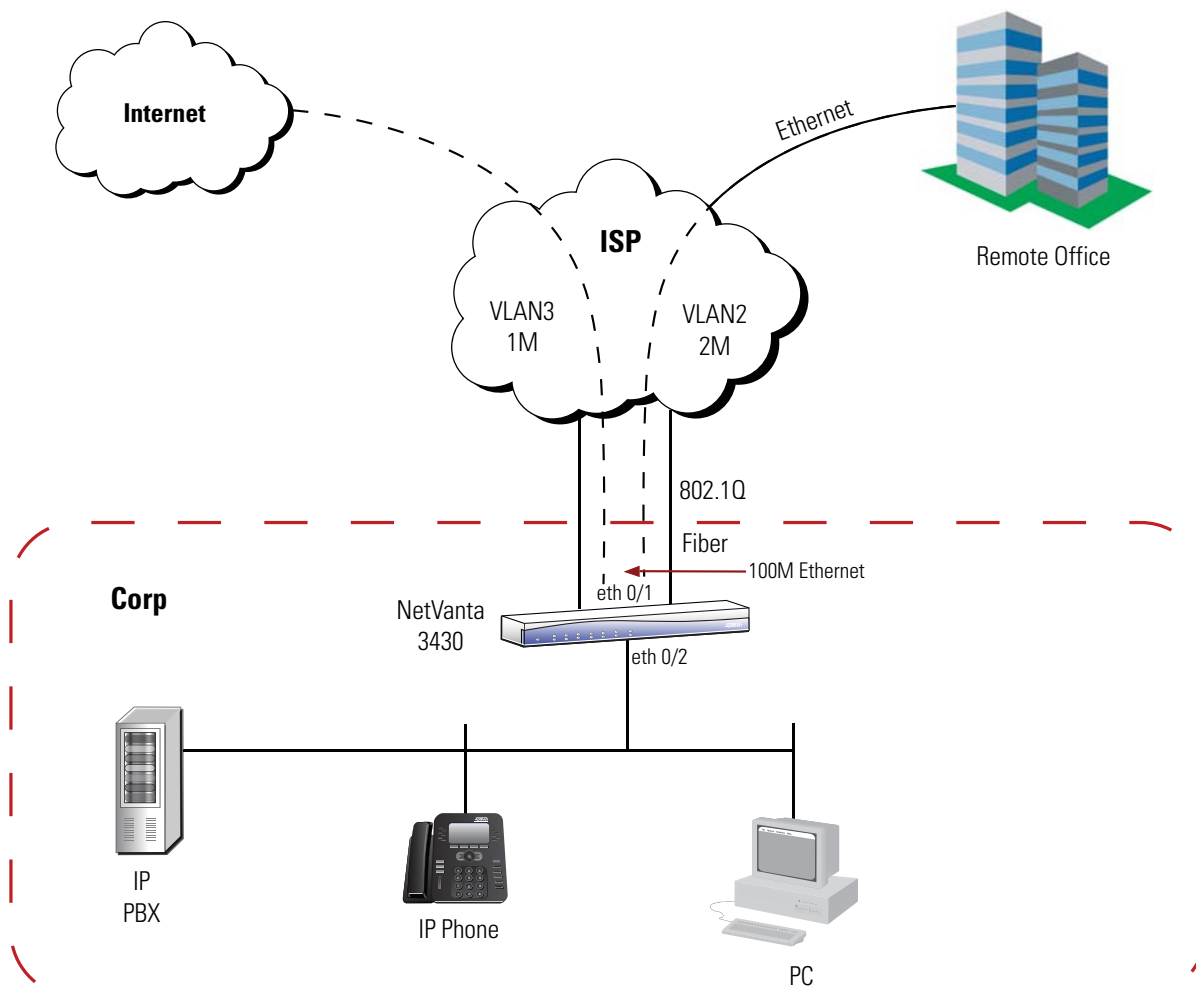
```
!  
qos map SHAPE 10  
    match vlan 2  
    shape average 2000000  
!  
interface ethernet 0/1  
    encapsulation 802.1q  
    qos-policy out SHAPE  
!  
interface eth 0/1.2  
    vlan-id 2  
!
```

UNI level traffic shaping can also be accomplished using an interface shaper command instead of a QoS map. This example configures the traffic shaping the same as above:

```
!  
interface ethernet 0/1  
    encapsulation 802.1q  
    traffic-shape rate 2000000  
!
```

## Example 2: Traffic Shaping on Ethernet Virtual Connections

Traffic shaping can be configured for EVCs. This example shapes traffic over two separate VLANs that exist on an 802.1q encapsulated Ethernet interface with a 3 Mbps subscription from the service provider. Traffic transmitted across VLAN 2 is shaped at 2 Mbps and traffic transmitted across VLAN 3 is shaped at 1 Mbps. In addition, this example shows the use of a child map to separate shaped VLAN 2 traffic into LLQ, CBQ, and best effort groups.



**Figure 12. Configuration Example 2**

The following commands are entered to configure EEQoS for Example 2:

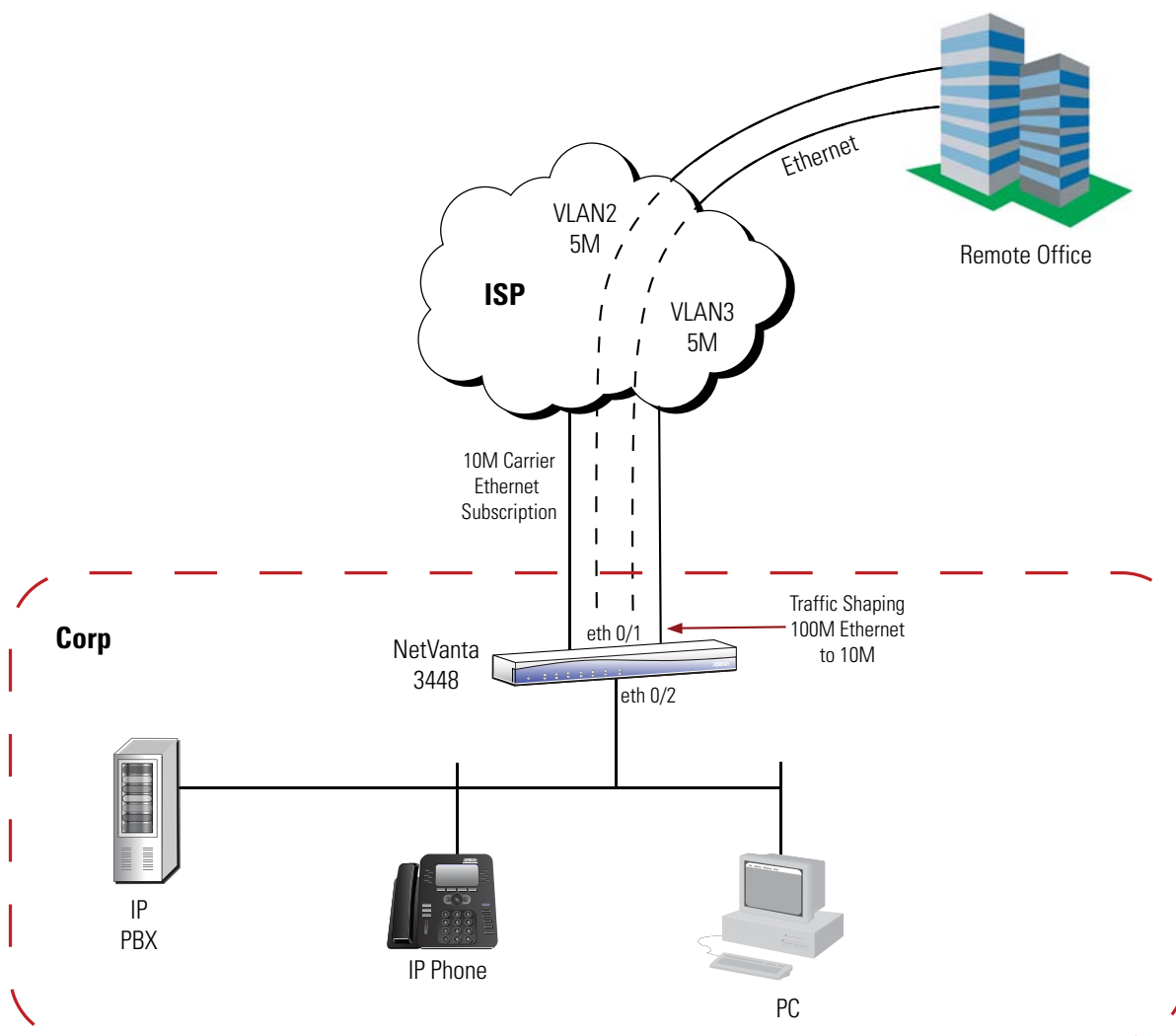
```
!
qos map CHILD 10
  match dscp ef
  priority 500
qos map CHILD 20
  match dscp af31 af32 af33
  bandwidth 500
!
```



```
qos map SHAPE 10
  match vlan 2
  shape average 2000000
  qos-policy CHILD
qos map SHAPE 20
  match vlan 3
  shape average 1000000
!
interface eth 0/1
  encapsulation 802.1q
  qos-policy out SHAPE
!
interface eth 0/1.2
  vlan-id 2
!
interface eth 0/1.3
  vlan-id 3
!
```

### Example 3: Class of Service Traffic Shaping

Traffic shaping can also be applied to individual traffic classes. This example provides class-based shaping for multiple VLANs on an 802.1q encapsulated Ethernet interface.



**Figure 13. Configuration Example 3**

The following commands are entered to configure EEQoS for Example 3:

```
!
qos map EVC2_CLASS 10
  match dscp af31 af32 af33
  shape average 3000000
qos map EVC2_CLASS 20
  match dscp af11
  shape average 1500000
qos map EVC2_CLASS 30
  match any
  shape average 500000
```

```
qos map EVC3_CLASS 10
  match dscp ef
  shape average 4000000
qos map EVC3_CLASS 20
  match any
  shape average 1000000
!
qos map VLAN_POLICY 10
  match vlan 2
  qos-policy EVC2_CLASS
qos map VLAN_POLICY 20
  match vlan 3
  qos-policy EVC3_CLASS
!
interface eth 0/1
  encapsulation 802.1q
  qos-policy out VLAN_POLICY
!
interface eth 0/1.2
  vlan-id 2
!
interface eth 0/1.3
  vlan-id 3
!
```

## Command Summary

The following tables summarize the minimum steps and additional settings required to configure EEQoS on an AOS product.

**Table 5. EEQoS Configuration Steps**

Step	Command and Description
<b>Step 1</b>	<p>(config)#<b>qos map</b> &lt;name&gt; &lt;number&gt; [<b>match-any</b>   <b>match-all</b>]</p> <p>Creates a QoS map and assigns a sequence number. Both <b>match-all</b> and <b>match-any</b> parameters can be used when defining QoS maps with multiple conditions. When the <b>match-all</b> keyword is specified, the traffic must match all conditions before the actions are performed. When the <b>match-any</b> keyword is specified, the behavior is set back to the default which is to match any of the conditions.</p>
<b>Step 2</b>	<p>(config-qos-map)#<b>match</b> [<b>ip</b>   <b>ipv6</b>] <b>dscp</b> [<b>afxx</b>   <b>csx</b>   <b>default</b>   <b>ef</b>   &lt;value&gt;]</p> <p>Specifies which traffic should be processed by this QoS map based on the DSCP value in the IPv4 or IPv6 header of the packet. Use the <b>no</b> form of this command to discontinue matching. Use <b>ip</b> keyword to match only IPv4 packets. Use the <b>ipv6</b> keyword to match only IPv6 packets. Omitting the keywords <b>ip</b> and <b>ipv6</b> will match both IPv4 and IPv6 packets. Assured forwarding (AF) class and subclass can be specified using the <b>afxx</b> keyword. Select from <b>11</b> (001010), <b>12</b> (001100), <b>13</b> (001110), <b>21</b> (010010), <b>22</b> (010100), <b>23</b> (010110), <b>31</b> (011010), <b>32</b> (011100), <b>33</b> (011110), <b>41</b> (100010), <b>42</b> (100100), or <b>43</b> (100110). Class selector (CS) value can be specified using the <b>csx</b> keyword. Valid range for CS is <b>1</b> to <b>7</b>. The <b>default</b> keyword indicates using the default IP DCSP value (0). Marking for expedited forwarding (EF) is indicated by the <b>ef</b> keyword. Valid range for &lt;value&gt; is <b>0</b> to <b>63</b>.</p> <p>(config-qos-map)#<b>match</b> [<b>ip</b>   <b>ipv6</b>] <b>precedence</b> &lt;value&gt;</p> <p>Specifies which traffic should be processed by this QoS map based on the precedence value in the IPv4 or IPv6 header of the packet. Use the <b>no</b> form of this command to discontinue matching. Use <b>ip</b> keyword to match only IPv4 packets. Use the <b>ipv6</b> keyword to match only IPv6 packets. Valid range is <b>0</b> to <b>7</b> in ascending order of importance. Omitting the keywords <b>ip</b> and <b>ipv6</b> will match both IPv4 and IPv6 packets.</p> <p>(config-qos-map)#<b>match vlan</b> &lt;id&gt;</p> <p>Allows a map that is applied to the main Ethernet interface to identify packets associated with a particular VLAN. Range is <b>1</b> to <b>4095</b>. Enter command from the QoS map configuration prompt.</p>
<b>Step 3</b>	<p>(config-qos-map)#<b>shape average</b> &lt;bps&gt; [<b>burst</b> &lt;rate&gt;] [<b>count-eth-overhead</b>]</p> <p>Shapes the traffic in this class to an average rate. Valid range is <b>8192</b> to <b>100000000</b> bps. An optional burst rate can be configured using the <b>burst</b> keyword followed by the number of bytes. Valid range for burst rate is <b>1600</b> to <b>6250000</b>. Using the keyword <b>count-eth-overhead</b> includes the Ethernet header overhead bytes when determining packet size. The <b>shape average</b> command cannot be specified in conjunction with the <b>priority</b> command in a QoS map entry.</p>

Table 5. EEQoS Configuration Steps (*Continued*)

Step	Command and Description
<b>Step 4</b>	(config)# <b>interface eth</b> <slot/port> (config-eth 0/1)#  Configures the Ethernet interface to which to apply the QoS map.
<b>Step 5</b>	(config-eth 0/1)# <b>encapsulation 802.1q</b>  Enables 802.1q encapsulation on the Ethernet interface (if VLANs are required).
<b>Step 6</b>	(config-eth 0/1)# <b>qos-policy out</b> <name>  Assigns the QoS map to the interface. Shaping may only be performed on an outgoing QoS map, so the <b>out</b> keyword is required.
<b>Step 7</b>	(config-eth 0/1)# <b>interface eth</b> <slot/port.sublink> (config-eth 0/1.2)# <b>vlan-id</b> <id>  Configures an Ethernet subinterface and assigns a VLAN ID. Valid range for VLAN ID is <b>1 to 4095</b> .

Table 6. Optional EEQoS Configuration Settings

Command and Description
<p>(config-qos-map)#<b>match any</b></p> <p>Match all packets within a QoS map entry that were not matched in previous map entries. This command can serve as a default case for the classes defined by the QoS map, if it is specified as the last QoS map entry. Enter command from the QoS map configuration prompt.</p>
<p>(config-qos-map)#<b>qos-policy</b> &lt;map name&gt;</p> <p>Divides a class into more specific subclasses within a QoS map. Child maps cannot be further subdivided. A child map cannot reference another child map. Enter command from the QoS map configuration prompt.</p>
<p>(config-qos-map)#<b>set cos</b> &lt;value&gt;</p> <p>Assigns the class of service (CoS) value within a QoS map. Valid range is <b>0</b> to <b>7</b>. Enter command from the QoS map configuration prompt.</p>
<p>(config-qos-map)#<b>set dscp</b> [&lt;value&gt;   <b>afx</b>   <b>csx</b>   <b>default</b>   <b>ef</b>]</p> <p>Assigns the DSCP value on matching packets to the specified value. Use the <b>no</b> form of this command to remove a specified DSCP value. This command applies matching to either IPv4 or IPv6 packets. Valid range for &lt;value&gt; is <b>0</b> to <b>63</b>. Assured forwarding (AF) class and subclass can be specified using the <b>afx</b> keyword. Select from <b>11</b> (001010), <b>12</b> (001100), <b>13</b> (001110), <b>21</b> (010010), <b>22</b> (010100), <b>23</b> (010110), <b>31</b> (011010), <b>32</b> (011100), <b>33</b> (011110), <b>41</b> (100010), <b>42</b> (100100), or <b>43</b> (100110). Class selector (CS) value can be specified using the <b>csx</b> keyword. Valid range for CS is <b>1</b> to <b>7</b>. The <b>default</b> keyword indicates using the default IP DCSP value (000000). Marking for expedited forwarding (EF) is indicated by the <b>ef</b> keyword. Enter command from the QoS map configuration prompt.</p>

## Troubleshooting

After configuring EEQoS, several **show** commands can be issued from Enable mode in the CLI to assist in troubleshooting and verifying your configuration. The following table contains these commands and descriptions.

**Table 7. Enable Mode Troubleshooting Commands**

Command	Description
<b>show qos map</b> [ <i>&lt;name&gt;</i>   <i>&lt;name&gt;</i> <i>&lt;number&gt;</i> ]	Displays all QoS maps, entries, and interfaces using the map. Use the <i>&lt;name&gt;</i> option to show only the entries of a specific map. Use the <i>&lt;name&gt;</i> and <i>&lt;number&gt;</i> options together to show only the specified entry of the specified map.
<b>show qos map interface</b> <i>&lt;interface&gt;</i>	Displays match and drop statistics per QoS class for the specific interface. Specify an interface in the format <i>&lt;interface type [slot/port   slot/port.subinterface id   interface id   interface id.subinterface id]&gt;</i> . For example, for an Ethernet subinterface, use <b>eth 0/1.1</b> . Type <b>show qos map interface ?</b> command for a complete list of interfaces.
<b>show queue</b> <i>&lt;interface&gt;</i> [ <b>child</b> ]	Displays summary and per-conversation information associated with an interface queue. Per-conversation details are only displayed if the interface has sufficient traffic to be congested and packets are being held in the interface queue. Use the <b>child</b> keyword to display subqueue statistics.

### Show Commands Sample Output

#### #show qos map

```
qos map SHAPE
  map entry 10
    match packets with vlan 2
    class shape rate: 2000 (kilobits/s packets matched by map: 0)

  map entry 20
    match packets with vlan 3
    class shape rate: 1000 (kilobits/sec), average

Interface using qos map SHAPE:
eth 0/1:Output (enabled)
```

**#show qos map interface ethernet 0/1**

```
qos map SHAPE
  map entry 10
    match IP packets with a DSCP value of af11
    class shape rate: 2000 (kilobits/sec), average
    budget: 160000/160000 bytes (current/max)
    1000 bytes added to budget every 25 ms
    packets sent: 0
    packets waiting: 0
    packets dropped: 0
  map entry 20
    match IP packets with a DSCP value of af31
    class bandwidth: 100 (kilobits/sec)
    conversation: 240
    packets matched: 0
    packets dropped: 0
```

**#show queue vlan 1**

```
Queueing method: weighted fair
Output queue: 0/1/540/64/0 (size/highest/max total/threshold/drops)
Conversations 0/1/256 (active/max active/max total)
Available Bandwidth 75000 kilobits/sec
```