



Audio Video Bridging Configuration Guide, Cisco IOS XE Fuji 16.8.x (Catalyst 3850 Switches)

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Audio Video Bridging

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

Introduction to Audio Video Bridging Networks

Information about Audio Video Bridging (AVB)

Audio and video equipment deployments have traditionally been analog single-purpose point-to-point one-way links. Migration to digital transmission also continued to retain the point-to-point one-way links architecture. The dedicated connection model resulted in a mass of cabling in professional and consumer applications, which was hard to manage and operate.

In order to accelerate the adoption to Ethernet based audio/video deployments in an interoperable way IEEE came up with the IEEE Audio Video Bridging standards - IEEE 802.1BA. This defines a mechanism where endpoints and the network will function as a whole to enable high quality A/V streaming across consumer applications to professional audio-video over an Ethernet infrastructure.



Note

- AVB is not supported on stacked systems.
 - AVB is not supported on Etherchannel interfaces.
 - AVB is supported only on STP-enabled network.
-

Licenses Supporting AVB

AVB is supported on the following two license levels only:

- ipbase
- ipservices

Benefits of AVB

AVB is a standard based mechanism to enable Ethernet based audio-video transmission which has the following benefits:

- Guaranteed max Latency
- Synchronized Time

- Guaranteed Bandwidth
- Professional Grade

Components of AVB Network

AVB protocols operate only in domains where every device is AVB capable. The AVB network comprises of the AVB talkers, AVB listeners, AVB switches and the grandmaster clock source.

- AVB Talker - An AVB end station that is the source or producer of a stream, i.e. microphones, video camera, and so on.
- AVB Listener - An AVB end station that is the destination or consumer of a stream, i.e. speaker, video screen, and so on.
- AVB Switch - An Ethernet switch that complies with IEEE802.1 AVB standards.
- AVB stream: A data stream associated with a stream reservation compliant with the Stream Reservation Protocol (SRP).

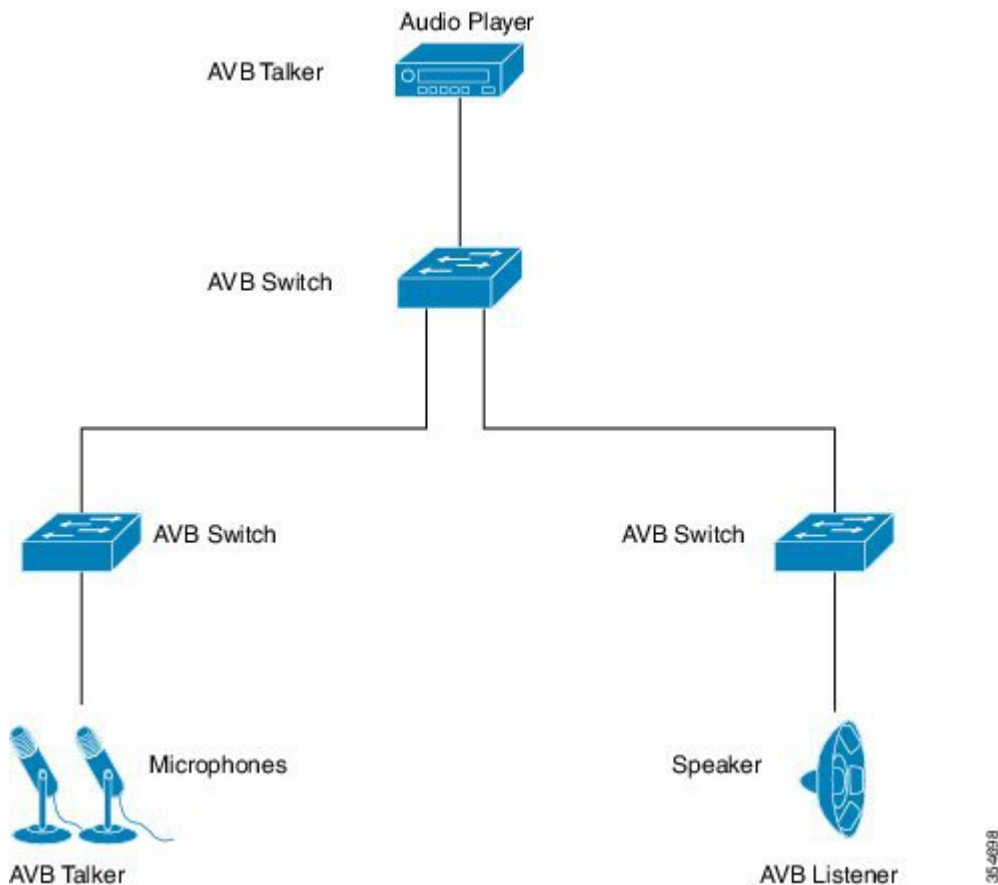


Note In some instances, the word “bridge” is used. In this context, it references to a switch.

The IEEE 802.1BA specification requires that an AVB talker must be grandmaster capable. In a typical deployment a network node can also be the grandmaster, provided it can either source or derive timing from a grandmaster capable device and provide the timing to the AVB network using IEEE 802.1AS.

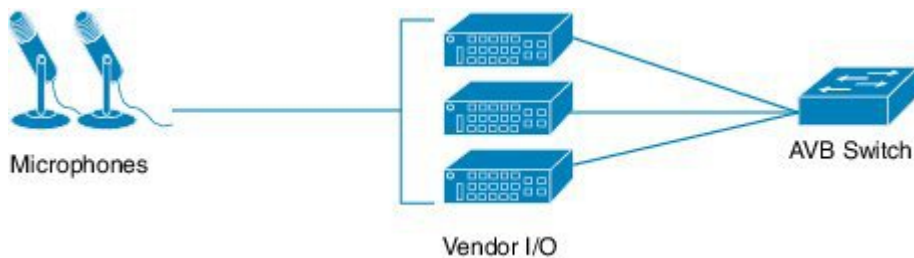
Figure 1 shows a simple illustration of AVB network with different components.

Figure 1: Figure 1: AVB Network



In many instances, the Audio/Video end points (Microphone, Speaker, etc.) are analog devices. AVB end-point vendors introduce Digital Signal Processors (DSP) and I/O devices that provide extensive audio/video processing and aggregate the end-points into an AVB Ethernet interface, as shown in Figure 2.

Figure 2: Figure 2: Vendor audio I/O System



Supported SKUs for AVB

AVB is supported on the following Catalyst 3850 and Catalyst 3650 SKUs.

- WS-C3650-24PDM
- WS-C3650-48FQM

- WS-C3650-8X24UQ
- WS-C3650-12X48UQ
- WS-C3850-12X48U
- WS-C3850-12XS
- WS-C3850-16XS
- WS-C3850-24XS
- WS-C3850-24XU
- WS-C3850-32XS
- WS-C3850-48XS



Note In Cisco IOS XE Denali 16.3.1, AVB is supported only on the non-mGig interfaces on WS-3850-12X48U. Starting from Cisco IOS XE Denali 16.3.2, AVB is supported on the mGig interfaces on WS-3850-12X48U and WS-C3850-24XU.

Information about Generalized Precision Time Protocol (gPTP)

Generalized Precision Time Protocol (gPTP) is an IEEE 802.1AS standard, which provides a mechanism to synchronize clocks of the bridges and end point devices in an AVB network. It defines the mechanism to elect the grandmaster clock (BMCA) among the time-aware bridges and talker and listener. The grandmaster is the root of the timing hierarchy that gets established in the time-aware network and distributes time to nodes below to enable synchronization.

Time synchronization also requires determining the link delay and switch delays in the network nodes. The gptp switch is a IEEE 1588 boundary clock, which also determines the link delay using the peer-to-peer delay mechanism. The delays computed are included in the correction field of the PTP messages and relayed to the end-points. The talker and listener use this gPTP time as a shared clock reference, which is used to relay and recover the media clock. gPTP currently defines only domain 0, which is what the switch supports.

The peer to peer delay mechanism runs on STP blocked ports as well. No other PTP messages are sent over blocked ports.

In a PTP domain, Best Master Clock (BMC) algorithm organizes Clocks and Ports into a hierarchical fashion, which includes clocks and port states:

Clocks

- Grandmaster (GM/GMC)
- Boundary Clock (BC)

Port States

- Master (M)
- Slave (S)
- Passive (P)

Information about Multiple Stream Reservation Protocol (MSRP)

Multiple Stream Reservation Protocol (MSRP) provides a mechanism for end stations to reserve network resources that will guarantee the transmission and reception of data streams across a network with the requested QoS. It is one of the core protocols required on an AVB device (talker, listener and switches). It allows talkers to advertise streams across a network of AVB switches and listeners to register for receiving the streams.

MSRP is the key software protocol module for supporting AVB. It enables stream establishment and teardown. It interfaces with gPTP to update the latency information for the streams. It interfaces with the QoS module to setup the hardware resources that would guarantee requested bandwidth for the streams. It also provides the QoS shaping parameters required for the credit based shaper.



Note When AVB is enabled globally the default queuing values will be programmed to 1% bandwidth on the 10G interface. When stream reservation happens via MSRP, the ports will be moved accordingly from the boundary to the core port and the calculated bandwidth will be reserved for the outgoing interfaces for given streams. If a port is enabled with a capture feature like SPAN, RSPAN or Wireshark, there is no MSRP stream reservation. Queuing is programmed with default values of 1% for Class A & Class B of AVB traffic. Hence, all AVB traffic is rate limited to 1% of the bandwidth.

Functions of MSRP

MSRP performs the following functions:

- Allows Talkers to advertise Streams and Listeners to discover and register for Streams.
- Establishes a path through an Ethernet between a Talker and one or more Listeners.
- Provides guaranteed bandwidth for AVB Streams.
- Guarantees an upper bound on latency.
- Discovers and reports the worst case end-to-end latency between the Talker and each of its Listeners.
- Reports failure reason and location when a path between the Talker and a Listener cannot satisfy bandwidth requirements.
- Supports multiple classes of traffic with different latency targets.
- Protects best effort traffic from starvation by limiting AVB traffic.
- MSRP Talker declarations are not forwarded along the STP blocked ports.
- MSRP listens to the STP TCN notification to generate MSRP declarations tear /modify / establish streams.

Information about QoS HQoS

AVB networks guarantee bandwidth and minimum bounded latency for the time-sensitive audio and video streams. AVB defines Class A and Class B as the time-sensitive streams, based on the worst-case latency targets of the traffic from talker to listener.

The latency targets for the two streams are listed as below:

- SR-Class A: 2ms
- SR-Class B: 50ms

The sum of the worst-case latency contributions per hop should result in an overall end-to-end latency of 2 ms or less for SR-Class A and 50ms or less for SR-Class B. A typical AVB deployment of 7 hops from talker to listener meets these latency requirements.

The priority code points map the traffic to the specific stream. Frame forwarding behavior is based on this priority. A credit-based shaper is used to shape the transmission of these streams in accordance with the bandwidth that has been reserved on a given outbound queue so that the latency targets are met.

Starting with Cisco XE Denali 16.3.2, support for hierarchical QoS for AVB is enabled. AVB Hierarchical QoS policy is two level Parent-Child Policy. AVB Parent policy segregates audio, video traffic streams(SR-Class A , SR-Class B) and Network Control packets from standard best-effort ethernet traffic (Non-SR) and manage streams accordingly. Hierarchical QoS allows you to specify QoS behavior at multiple policy levels, which provides a high degree of granularity in traffic management. You can use hierarchical policies to:

- Allow a parent class to shape multiple queues in a child policy
- Apply specific policy map actions on the aggregate traffic
- Apply class-specific policy map actions

You can modify only ingress and egress HQoS child policy's class-map and its actions using **policy-map** *AVB-Output-Child-Policy* and **policy-map** *AVB-Input-Child-Policy* command.



Note You should not modify the PCP in child policy to map with PCP configured in Parent Policy, e.g. SR Class A cos 3 and SR Class B Cos 2.

Hierarchical Policing

Hierarchical policing is supported on ingress and egress interfaces. Hierarchical QoS separates the SR and Non-SR class related rules into parent and child policies respectively. AVB SR classes are completely controlled by MSRP client and hence, parent policies containing SR class attributes are governed by MSRP. The end user has complete control over child policies which contain Non-SR class attributes and can modify only the child policies.

AVB HQoS child policies are user modifiable and NVGENed to preserve the configuration if user saves the configuration to the startup-config. So, AVB HQoS child policy configurations are retained even after reload.

Information about Multiple VLAN Registration Protocol (MVRP)

Multiple VLAN Registration Protocol (MVRP) is an application based on MRP. MVRP provides a mechanism for dynamic maintenance of the contents of Dynamic VLAN Registration Entries for each vlan ids, and for propagating the information they contain to other Bridges. This information allows MVRP-aware devices to dynamically establish and update their knowledge of the set of vlan ids associated with VLANs that currently have active members, and through which Ports those members can be reached.

MVRP, from an AVB perspective, is mandatory on the talkers and the listeners. Independent of AVB, MVRP is an IEEE 802.1Q requirement on the VLAN-aware switches. However, manual configuration of VLANS on the switches is sufficient for AVB.



Note VTP should be in the disabled mode or transparent mode for MVRP to work.

Configuring the AVB Network

Configuring AVB

This section describes the various configurations available for AVB.

Enabling AVB on the switch

Perform the following task to enable AVB on the switch.



Note Both, the **avb** and **avb strict** commands must be configured to enable AVB.

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	avb Example: Device(config)# avb	Enables AVB on the switch.
Step 4	avb strict Example: Device(config)# avb strict	Enables AVB on the switch. This command is used in combination with the avb command to enable AVB. Note This command will be deprecated in the future releases.
Step 5	end Example: Device(config)# end	Returns to privileged EXEC mode.

What to do next

To disable AVB on the switch, use the "no" form of the command.

Configuring AVB on the devices

You can configure the interfaces along the connectivity path for AVB devices as dot1q trunk ports by using the below commands.

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	interface <i>interface-id</i> Example: Device(config)# interface tel1/1/1	Defines the interface to be configured as a trunk, and enters interface configuration mode.
Step 4	switchport mode trunk Example: Device(config-if)# switchport mode trunk	Configures the port as a trunk port.
Step 5	exit Example: Device(config-if)# exit	Returns to global configuration mode.
Step 6	vlan 2 Example: Device(config)# vlan 2	Configures VLAN 2 on the switch. Note VLAN 2 is the default AVB VLAN. If you need to configure another VLAN as the default AVB VLAN, use the command in Step 7.
Step 7	avb vlan <i>vlan-id</i> Example:	(Optional) Sets the specified VLAN as the default AVB VLAN on the switch. Use this command when you need to set the default AVB VLAN other than VLAN 2. The range for <i>vlan-id</i> varies from 2 to 4094.

	Command or Action	Purpose
	Device(config) # avb vlan 10	
Step 8	avb Example: Device(config-vlan) # avb	Configures AVB on the specified interface.
Step 9	end Example: Device(config) # end	Returns to privileged EXEC mode.

What to do next

To disable AVB on the switch, use the "**no**" form of the command.

Configuring gPTP

This section describes the various configurations available for gPTP.

Enabling gPTP on a port

When AVB is enabled on the switch, gPTP for AVB also gets enabled.



Note When gPTP is enabled, Flowcontrol is disabled on all ports.

You can also enable gPTP globally using the command given below:

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	ptp profile dot1as Example: Device(config)# ptp profile dot1as	Enables gPTP on the port.
Step 4	end Example: Device(config)# end	Returns to privileged EXEC mode.

Enabling gPTP on an interface

You can also enable gPTP on an interface using the command given below:

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters the global configuration mode.
Step 3	interface <i>interface-id</i> Example: Device(config)# interface te1/1/1	Defines the interface to be configured as a trunk, and enters interface configuration mode.
Step 4	ptp enable Example: Device(config-if)# ptp enable	Enables gPTP on the specified interface. To disable gPTP on the interface, use the no form of this command as shown below: Device(config-if)# no ptp enable
Step 5	end Example: Device(config-if)# end	Returns to privileged EXEC mode.

Configuring the values of PTP clocks

When you configure a profile or mode, the priority1 and priority2 values will be initialised with their default values.

The priority1 and priority2 default values for dot1as profile is 246 and 248 respectively. The priority1 and priority2 default values for default profile is 128 and 128 respectively.

You can configure the values of ptp clock priority1 and priority2 using the commands below:

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	ptp priority1 Example: Device(config)# ptp priority1	Configure the values of ptp clock priority1. 0-255 - This is the range for the value of the ptp clock priority. Select a value within this range. Note If the value of priority1 is configured to 255, the clock cannot become as Grandmaster.
Step 4	ptp priority2 Example: Device(config)# ptp priority2	Configure the values of ptp clock priority2. 0-255 - This is the range for the value of the ptp clock priority. Select a value within this range.
Step 5	exit Example: Device(config)# exit	Returns to global configuration mode.

Configuring QoS

This section describes the various configurations available for QoS.

Enabling QoS

When AVB is enabled on the switch, QoS for AVB also gets enabled.

Configuring HQoS

This section describes the various configurations available for HQoS.

Enabling HQoS

When AVB is enabled on the switch, HQoS for AVB also gets enabled.

Migrating from Flat Policy Formats to Hierarchical Policy Formats - Guidelines and Restrictions

Follow the below guidelines when migrating from flat policy formats to hierarchical policy formats for AVB:

- If you upgrade from Cisco IOS XE Denali 16.3.1 to Cisco IOS XE Denali 16.3.2, QoS policies that are in startup configuration of the device will fail with errors. Follow the steps below to properly install HQoS policies on your device:

1. Use the **no avb** command to disable AVB globally.



Note When you disable AVB, all the policy-maps and class-maps are automatically removed from the configuration. But, the access-lists are not removed automatically. You must remove the access-lists manually. Ensure that all the QoS policy constructs are removed before upgrading to Cisco IOS XE Denali 16.3.2.

2. Enable AVB using the **avb** command. When AVB is enabled, HQoS for AVB also gets enabled.
- We do not recommend migrating from a hierarchical policy format supported release to a flat policy format supported release.
 - You can only modify child policies. Parent policies are completely governed by MSRP.
 - **show running config** command displays only the child policies.
 - Starting from Cisco IOS XE Denali 16.3.2, **show running config interface** command will not display any details of the policy attached. You should use **show policy-map interface** command for displaying all the details of the policy attached.

Hierarchical QoS Policy Formats

This following example shows hierarchical remarking policy at the ingress interface:

```
policy-map AVB-Input-Child-Policy
  class VOIP-DATA-CLASS
    set dscp EF
  class MULTIMEDIA-CONF-CLASS
    set dscp AF41
  class BULK-DATA-CLASS
    set dscp AF11
  class TRANSACTIONAL-DATA-CLASS
    set dscp AF21
  class SCAVENGER-DATA-CLASS
    set dscp CS1
  class SIGNALING-CLASS
    set dscp CS3
  class class-default
    set dscp default

policy-map AVB-Input-Policy-Remark-AB
  class AVB-SR-A-CLASS
    set cos 0 (set 0 for boundary & SR class A PCP value for core port)
  class AVB-SR-B-CLASS
    set cos 0 (set 0 for boundary & SR class B PCP value for core port)
  class class-default
    service-policy AVB-Input-Child-Policy

policy-map AVB-Input-Policy-Remark-A
  class AVB-SR-A-CLASS
```

```

    set cos 0 (set 0 for boundary & SR class A PCP value for core port)
class class-default
  service-policy AVB-Input-Child-Policy

policy-map AVB-Input-Policy-Remark-B
class AVB-SR-B-CLASS
  set cos 0 (set 0 for boundary & SR class B PCP value for core port)
class class-default
  service-policy AVB-Input-Child-Policy

policy-map AVB-Input-Policy-Remark-None
class class-default
  service-policy AVB-Input-Child-Policy

```

This following example shows hierarchical queuing policy at the egress interface:

```

policy-map AVB-Output-Child-Policy
class VOIP-PRIORITY-QUEUE
  bandwidth remaining percent 30
  queue-buffers ratio 10
class MULTIMEDIA-CONFERENCING-STREAMING-QUEUE
  bandwidth remaining percent 15
  queue-limit dscp AF41 percent 80
  queue-limit dscp AF31 percent 80
  queue-limit dscp AF42 percent 90
  queue-limit dscp AF32 percent 90
  queue-buffers ratio 10
class TRANSACTIONAL-DATA-QUEUE
  bandwidth remaining percent 15
  queue-limit dscp AF21 percent 80
  queue-limit dscp AF22 percent 90
  queue-buffers ratio 10
class BULK-SCAVENGER-DATA-QUEUE
  bandwidth remaining percent 15
  queue-limit dscp AF11 percent 80
  queue-limit dscp AF12 percent 90
  queue-limit dscp CS1 percent 80
  queue-buffers ratio 15
class class-default
  bandwidth remaining percent 25
  queue-buffers ratio 25

policy-map AVB-Output-Policy
class AVB-SR-A-CLASS
  priority level 1 (Shaper value based on stream registration)
class AVB-SR-B-CLASS
  priority level 2 (Shaper value based on stream registration)
class CONTROL-MGMT-QUEUE
  priority level 3 percent 15
class class-default
  bandwidth remaining percent 100
  queue-buffers ratio 80
  service-policy AVB-Output-Child-Policy

```

Configuring MVRP

This section describes the various configurations available for MVRP.

Enabling MVRP

You can enable MVRP on the switches in the topology to enable Vlan propagation using the below command.



Note You must change VTP mode to **transparent** or **off** , before enabling dynamic vlan creation via MVRP.

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	mvrp global Example: Device(config)# mvrp global	Enters the MVRP Global configuration mode.
Step 4	vtp mode {transparent off} Example: Device(config)# vtp mode transparent Example: Device(config)# vtp mode off	Sets the VTP to transparent or off mode.
Step 5	mvrp vlan create Example: Device(config)# mvrp vlan create	Enables MVRP on the switches.

Configuring MVRP on the switch interface

You can configure MVRP on the switch interfaces using the below commands

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	interface <i>interface-id</i> Example: Device(config)# interface te1/1/1	Defines the interface to be configured as a trunk, and enters interface configuration mode.
Step 4	mvrp registration { <i>fixed</i> <i>forbidden</i> <i>normal</i> } Example: Device(config-if)# mvrp registration fixed	Registers MVRP with the MAD instance. <ul style="list-style-type: none"> • fixed - Fixed registration • forbidden - Forbidden registration • normal - Normal registration
Step 5	mvrp timer { <i>join</i> <i>leave</i> <i>leave-all</i> <i>periodic</i> } Example: Device(config-if)# mvrp timer join	Configures the MVRP timer. <ul style="list-style-type: none"> • join - Timer controls the interval between transmit opportunities that are applied to the ASM • leave - The timer controls the RSM waits in the LV state before transiting to the MT state • leave-all - The timer control the frequency with which the LeaveAll SM generates LeaveAll PDUs • periodic - Periodic timer
Step 6	exit Example: Device(config-if)# exit	Returns to global configuration mode.

Monitoring the AVB Network

Monitoring AVB

To display the AVB details, use the commands in the following table:

Command	Purpose
show avb domain	Displays the AVB domain.
show avb streams	Displays the AVB stream information.

Monitoring gPTP

To display the gPTP protocol details, use the commands in the following table:

Command	Purpose
show ptp brief	Displays a brief status of ptp on the interfaces.
show ptp clock	Displays ptp clock information.
show ptp parent	Displays the parent clock information.
show ptp port	Displays the ptp port information.
show platform software fed switch active ptp if-id {interface-id}	Displays details info about ptp status on the port.

Monitoring MSRP

To display the MSRP details, use the commands in the following table:

Command	Purpose
show msrp streams	Displays MSRP stream information.
show msrp streams detailed	Displays detailed MSRP stream information.
show msrp streams brief	Displays MSRP stream information in brief.
show msrp port bandwidth	Displays MSRP port bandwidth information.

Monitoring QoS

To display the QOS details, use the commands in the following table:

Command	Purpose
show run interface	Displays the qos policy details and the interface level policy application.
show run	Displays all the policy map details.

Command	Purpose
show policy-map	Displays the details of the policy map configuration.
show policy-map interface (int-id)	Displays QoS statistics.

Monitoring HQoS

To display the HQoS details, use the commands in the following table:

Command	Purpose
show run	Displays all the child policy map details.
show policy-map	Displays the details of the policy map configuration.
show platform hardware fed switch active qos queue stats interface interface-id	Displays the QoS statistics for different queue mappings in AVB.
show platform hardware fed switch active qos queue config interface interface-id	Displays the QoS queue configurations.
show policy-map interface interface-id [input output]	Displays the AVB QoS statistics. Packet counters for ingress and bytes counters for egress are accounted for QoS Statistics.

Monitoring MVRP

To display the MVRP details, use the commands in the following table:

Command	Purpose
show mvrp summary	Displays MVRP summary information.
show mvrp interface	Displays interface MVRP information.

Examples of AVB Configurations and Monitoring

Examples for AVB

This example shows how you can view the AVB domain.

```
Device#show avb domain
```

```
AVB Class-A
  Priority Code Point      : 3
  VLAN                    : 2
  Core ports              : 1
  Boundary ports          : 67
```

AVB Class-B

Priority Code Point : 2
 VLAN : 2
 Core ports : 1
 Boundary ports : 67

Interface	State	Delay	PCP	VID	Information
Tel1/0/1	down	N/A			Oper state not up
Tel1/0/2	down	N/A			Oper state not up
Tel1/0/3	down	N/A			Oper state not up
Tel1/0/4	down	N/A			Oper state not up
Tel1/0/5	up	N/A			Port is not asCapable
Tel1/0/6	down	N/A			Oper state not up
Tel1/0/7	down	N/A			Oper state not up
Tel1/0/8	down	N/A			Oper state not up
Tel1/0/9	down	N/A			Oper state not up
Tel1/0/10	down	N/A			Oper state not up
Tel1/0/11	down	N/A			Oper state not up
Tel1/0/12	down	N/A			Oper state not up
Tel1/0/13	down	N/A			Oper state not up
Tel1/0/14	down	N/A			Oper state not up
Tel1/0/15	down	N/A			Oper state not up
Tel1/0/16	down	N/A			Oper state not up
Tel1/0/17	down	N/A			Oper state not up
Tel1/0/18	down	N/A			Oper state not up
Tel1/0/19	up	N/A			Port is not asCapable
Tel1/0/20	down	N/A			Oper state not up
Tel1/0/21	down	N/A			Oper state not up
Tel1/0/22	down	N/A			Oper state not up
Tel1/0/23	up	N/A			Port is not asCapable
Tel1/0/24	down	N/A			Oper state not up
Tel1/0/25	down	N/A			Oper state not up
Tel1/0/26	down	N/A			Oper state not up
Tel1/0/27	down	N/A			Oper state not up
Tel1/0/28	down	N/A			Oper state not up
Tel1/0/29	up	N/A			Port is not asCapable
Tel1/0/30	down	N/A			Oper state not up
Tel1/0/31	down	N/A			Oper state not up
Tel1/0/32	down	N/A			Oper state not up
Tel1/0/33	down	N/A			Oper state not up
Tel1/0/34	down	N/A			Oper state not up
Tel1/0/35	up	N/A			Port is not asCapable
Tel1/0/36	down	N/A			Oper state not up
Tel1/0/37	down	N/A			Oper state not up
Tel1/0/38	down	N/A			Oper state not up
Tel1/0/39	up	507ns			
Class- A		core	3	2	
Class- B		core	2	2	
Tel1/0/40	down	N/A			Oper state not up

```

Tel1/0/41      down      N/A                Oper state not up
Tel1/0/42      down      N/A                Oper state not up
Tel1/0/43      down      N/A                Oper state not up
Tel1/0/44      down      N/A                Oper state not up
Tel1/0/45      down      N/A                Oper state not up
Tel1/0/46      down      N/A                Oper state not up
Tel1/0/47      down      N/A                Oper state not up
Tel1/0/48      down      N/A                Oper state not up
Tel1/1/1       down      N/A                Oper state not up
Tel1/1/2       down      N/A                Oper state not up
Tel1/1/3       down      N/A                Oper state not up
Tel1/1/4       down      N/A                Oper state not up
Tel1/1/5       down      N/A                Oper state not up
Tel1/1/6       down      N/A                Oper state not up
Tel1/1/7       down      N/A                Oper state not up
Tel1/1/8       down      N/A                Oper state not up
Tel1/1/9       down      N/A                Oper state not up
Tel1/1/10      down      N/A                Oper state not up
Tel1/1/11      down      N/A                Oper state not up
Tel1/1/12      down      N/A                Oper state not up
Tel1/1/13      down      N/A                Oper state not up
Tel1/1/14      down      N/A                Oper state not up
Tel1/1/15      down      N/A                Oper state not up
Tel1/1/16      down      N/A                Oper state not up
Fol1/1/1       down      N/A                Oper state not up
Fol1/1/2       down      N/A                Oper state not up
Fol1/1/3       down      N/A                Oper state not up
Fol1/1/4       down      N/A                Oper state not up

```

This example shows how you can view the AVB stream information.

Device#**show avb streams**

```

Stream ID:      0011.0100.0001:1      Incoming Interface:  Tel1/1/1
  Destination   : 91E0.F000.FE00
  Class         : A
  Rank          : 1
  Bandwidth     : 6400 Kbit/s

```

Outgoing Interfaces:

```

-----
Interface      State      Time of Last Update      Information
-----
Tel1/1/1       Ready     Tue Apr 26 01:25:40.634

```

```

Stream ID:      0011.0100.0002:2      Incoming Interface:  Tel1/1/1
  Destination   : 91E0.F000.FE01
  Class         : A
  Rank          : 1
  Bandwidth     : 6400 Kbit/s

```

Outgoing Interfaces:

Interface	State	Time of Last Update	Information
Tel1/1/1	Ready	Tue Apr 26 01:25:40.634	

Examples for gPTP

This command can be used to see a brief status of ptp on the interfaces.

Device#**show ptp brief**

Interface	Domain	PTP State
FortyGigabitEthernet1/1/1	0	FAULTY
FortyGigabitEthernet1/1/2	0	SLAVE
GigabitEthernet1/1/1	0	FAULTY
GigabitEthernet1/1/2	0	FAULTY
GigabitEthernet1/1/3	0	FAULTY
GigabitEthernet1/1/4	0	FAULTY
TenGigabitEthernet1/0/1	0	FAULTY
TenGigabitEthernet1/0/2	0	FAULTY
TenGigabitEthernet1/0/3	0	MASTER
TenGigabitEthernet1/0/4	0	FAULTY
TenGigabitEthernet1/0/5	0	FAULTY
TenGigabitEthernet1/0/6	0	FAULTY
TenGigabitEthernet1/0/7	0	MASTER
TenGigabitEthernet1/0/8	0	FAULTY
TenGigabitEthernet1/0/9	0	FAULTY
TenGigabitEthernet1/0/10	0	FAULTY
TenGigabitEthernet1/0/11	0	MASTER
TenGigabitEthernet1/0/12	0	FAULTY
TenGigabitEthernet1/0/13	0	FAULTY
TenGigabitEthernet1/0/14	0	FAULTY
TenGigabitEthernet1/0/15	0	FAULTY
TenGigabitEthernet1/0/16	0	FAULTY
TenGigabitEthernet1/0/17	0	FAULTY
TenGigabitEthernet1/0/18	0	FAULTY
TenGigabitEthernet1/0/19	0	MASTER
TenGigabitEthernet1/0/20	0	FAULTY
TenGigabitEthernet1/0/21	0	FAULTY
TenGigabitEthernet1/0/22	0	FAULTY
TenGigabitEthernet1/0/23	0	FAULTY
TenGigabitEthernet1/0/24	0	FAULTY
TenGigabitEthernet1/1/1	0	FAULTY
TenGigabitEthernet1/1/2	0	FAULTY
TenGigabitEthernet1/1/3	0	FAULTY
TenGigabitEthernet1/1/4	0	FAULTY
TenGigabitEthernet1/1/5	0	FAULTY
TenGigabitEthernet1/1/6	0	FAULTY

```
TenGigabitEthernet1/1/7      0      FAULTY
TenGigabitEthernet1/1/8      0      FAULTY
```

This command can be used to view ptp clock information.

```
Device#show ptp clock
```

```
PTP CLOCK INFO
PTP Device Type: Boundary clock
PTP Device Profile: IEEE 802/1AS Profile
Clock Identity: 0x4:6C:9D:FF:FE:4F:95:0
Clock Domain: 0
Number of PTP ports: 38
PTP Packet priority: 4
Priority1: 128
Priority2: 128
Clock Quality:
  Class: 248
  Accuracy: Unknown
  Offset (log variance): 16640
Offset From Master(ns): 0
Mean Path Delay(ns): 0
Steps Removed: 3
Local clock time: 00:12:13 UTC Jan 1 1970
```

This command can be used to view the parent clock information.

```
Device#show ptp parent
```

```
PTP PARENT PROPERTIES
Parent Clock:
Parent Clock Identity: 0xB0:7D:47:FF:FE:9E:B6:80
Parent Port Number: 3
Observed Parent Offset (log variance): 16640
Observed Parent Clock Phase Change Rate: N/A

Grandmaster Clock:
Grandmaster Clock Identity: 0x4:6C:9D:FF:FE:67:3A:80
Grandmaster Clock Quality:
  Class: 248
  Accuracy: Unknown
  Offset (log variance): 16640
  Priority1: 0
  Priority2: 128
```

This command can be used to view the ptp port information.

```
Device#show ptp port
```

```
PTP PORT DATASET: FortyGigabitEthernet1/1/1
  Port identity: clock identity: 0x4:6C:9D:FF:FE:4E:3A:80
  Port identity: port number: 1
  PTP version: 2
  Port state: FAULTY
  Delay request interval(log mean): 5
  Announce receipt time out: 3
  Peer mean path delay(ns): 0
  Announce interval(log mean): 1
  Sync interval(log mean): 0
  Delay Mechanism: End to End
  Peer delay request interval(log mean): 0
  Sync fault limit: 500000000
```

```
PTP PORT DATASET: FortyGigabitEthernet1/1/2
  Port identity: clock identity: 0x4:6C:9D:FF:FE:4E:3A:80
  Port identity: port number: 2
  PTP version: 2
  Port state: FAULTY
  Delay request interval(log mean): 5
  Announce receipt time out: 3
  Peer mean path delay(ns): 0
  Announce interval(log mean): 1
--More--
```

This command can be used to view the port information for a particular interface.

```
Device#show ptp port gi1/0/26
```

```
PTP PORT DATASET: GigabitEthernet1/0/26
  Port identity: clock identity: 0x4:6C:9D:FF:FE:4E:3A:80
  Port identity: port number: 28
  PTP version: 2
  Port state: MASTER
  Delay request interval(log mean): 5
  Announce receipt time out: 3
  Peer mean path delay(ns): 0
  Announce interval(log mean): 1
  Sync interval(log mean): 0
  Delay Mechanism: Peer to Peer
  Peer delay request interval(log mean): 0
  Sync fault limit: 500000000
```

This command can be used to view the

```
Device#show platform software fed switch active ptp if-id 0x20
```

```
Displaying port data for if_id 20
```

```

=====
Port Mac Address 04:6C:9D:4E:3A:9A
Port Clock Identity 04:6C:9D:FF:FE:4E:3A:80
Port number 28
PTP Version 2
domain_value 0
dot1as_capable: FALSE
sync_recpt_timeout_time_interval 375000000 nanoseconds
sync_interval 125000000 nanoseconds
neighbor_rate_ratio 0.000000
neighbor_prop_delay 0 nanoseconds
compute_neighbor_rate_ratio: TRUE
compute_neighbor_prop_delay: TRUE
port_enabled: TRUE
ptt_port_enabled: TRUE
current_log_pdelay_req_interval 0
pdelay_req_interval 0 nanoseconds
allowed_lost_responses 3
neighbor_prop_delay_threshold 2000 nanoseconds
is_measuring_delay : FALSE
Port state: : MASTER
sync_seq_num 22023
delay_req_seq_num 23857
num sync messages transmitted 0
num sync messages received 0
num followup messages transmitted 0
num followup messages received 0
num pdelay requests transmitted 285695
num pdelay requests received 0
num pdelay responses transmitted 0
num pdelay responses received 0
num pdelay followup responses transmitted 0
num pdelay followup responses received 0

```

Examples for MSRP

This example shows how you can view the MSRP stream information.

```
Device#show msrp streams
```

```

-----
Stream ID Talker Listener
Advertise Fail Ready ReadyFail AskFail
R | D R | D R | D R | D
-----
yy:yy:yy:yy:yy:yy:0001 1 | 2 0 | 0 1 | 0 0 | 1 1 | 0
zz:zz:zz:zz:zz:zz:0002 1 | 0 0 | 1 1 | 0 0 | 0 0 | 1
-----

```

This example shows how you can view the detailed MSRP stream information.

Device#show msrp streams detail

Stream ID: 0011.0100.0001:1
Stream Age: 01:57:46 (since Mon Apr 25 23:41:11.413)
Create Time: Mon Apr 25 23:41:11.413
Destination Address: 91E0.F000.FE00
VLAN Identifier: 1
Data Frame Priority: 3 (Class A)
MaxFrameSize: 100
MaxIntervalFrames: 1 frames/125us
Stream Bandwidth: 6400 Kbit/s
Rank: 1
Received Accumulated Latency: 20
Stream Attributes Table:

Interface	Attr State	Direction	Type
Gil/0/1	Register	Talker	Advertise
Attribute Age: 01:57:46 (since Mon Apr 25 23:41:11.413)			
MRP Applicant: Very Anxious Observer, send None			
MRP Registrar: In			
Accumulated Latency: 20			

Te1/1/1	Declare	Talker	Advertise
Attribute Age: 00:19:52 (since Tue Apr 26 01:19:05.525)			
MRP Applicant: Quiet Active, send None			
MRP Registrar: In			
Accumulated Latency: 20			

Te1/1/1	Register	Listener	Ready
Attribute Age: 00:13:17 (since Tue Apr 26 01:25:40.635)			
MRP Applicant: Very Anxious Observer, send None			
MRP Registrar: In			

Gil/0/1	Declare	Listener	Ready
Attribute Age: 00:13:17 (since Tue Apr 26 01:25:40.649)			
MRP Applicant: Quiet Active, send None			
MRP Registrar: In			

This example shows how you can view the MSRP stream information in brief.

Device#show msrp streams brief

Legend: R = Registered, D = Declared.

Stream ID	Destination Address	Bandwidth (Kbit/s)	Talkers R D	Listeners R D	Fail
0011.0100.0001:1	91E0.F000.FE00	6400	1 1	1 1	No
0011.0100.0002:2	91E0.F000.FE01	6400	1 1	1 1	No

0011.0100.0003:3	91E0.F000.FE02	6400	1 1	1 1	No
0011.0100.0004:4	91E0.F000.FE03	6400	1 1	1 1	No
0011.0100.0005:5	91E0.F000.FE04	6400	1 1	1 1	No
0011.0100.0006:6	91E0.F000.FE05	6400	1 1	1 1	No
0011.0100.0007:7	91E0.F000.FE06	6400	1 1	1 1	No
0011.0100.0008:8	91E0.F000.FE07	6400	1 1	1 1	No
0011.0100.0009:9	91E0.F000.FE08	6400	1 1	1 1	No
0011.0100.000A:10	91E0.F000.FE09	6400	1 1	1 1	No

This example shows how you can view the MSRP port bandwidth information.

Device#show msrp port bandwidth

Ethernet Interface	Capacity (Kbit/s)	Assigned		Available		Reserved	
		A	B	A	B	A	B
Tel1/0/1	10000000	75	0	75	75	0	0
Tel1/0/2	10000000	75	0	75	75	0	0
Tel1/0/3	1000000	75	0	75	75	0	0
Tel1/0/4	10000000	75	0	75	75	0	0
Tel1/0/5	10000000	75	0	75	75	0	0
Tel1/0/6	10000000	75	0	75	75	0	0
Tel1/0/8	10000000	75	0	75	75	0	0
Tel1/0/9	10000000	75	0	75	75	0	0
Tel1/0/10	10000000	75	0	75	75	0	0
Tel1/0/11	10000000	75	0	75	75	0	0
Tel1/0/12	10000000	75	0	75	75	0	0
Tel1/0/13	1000000	75	0	75	75	0	0
Tel1/0/14	10000000	75	0	75	75	0	0
Tel1/0/15	10000000	75	0	75	75	0	0
Tel1/0/16	10000000	75	0	75	75	0	0
Tel1/0/17	10000000	75	0	75	75	0	0
Tel1/0/18	10000000	75	0	75	75	0	0
Tel1/0/19	1000000	75	0	75	75	0	0
Tel1/0/20	10000000	75	0	75	75	0	0
Tel1/0/21	10000000	75	0	75	75	0	0
Tel1/0/22	10000000	75	0	75	75	0	0
Tel1/0/23	10000000	75	0	75	75	0	0
Tel1/0/24	10000000	75	0	75	75	0	0
Gi1/1/1	1000000	75	0	75	75	0	0
Gi1/1/2	1000000	75	0	75	75	0	0
Gi1/1/3	1000000	75	0	75	75	0	0
Gi1/1/4	1000000	75	0	75	75	0	0
Tel1/1/1	10000000	75	0	75	75	0	0
Tel1/1/2	10000000	75	0	75	75	0	0
Tel1/1/3	10000000	75	0	75	75	0	0
Tel1/1/4	10000000	75	0	75	75	0	0
Tel1/1/5	10000000	75	0	75	75	0	0
Tel1/1/6	10000000	75	0	75	75	0	0

Te1/1/7	10000000	75 0	75 75	0 0
Te1/1/8	10000000	75 0	75 75	0 0
Fo1/1/1	40000000	75 0	75 75	0 0
Fo1/1/2	40000000	75 0	75 75	0 0

Examples for QoS

This example shows how you can view all the policy map details when AVB is NOT enabled.

Device#**show run**

Building configuration...

```

Current configuration : 12069 bytes
!
! Last configuration change at 02:49:13 UTC Wed Jul 27 2016
!
version 16.3
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-recovery
no platform punt-keepalive disable-kernel-core
!
hostname avb2
!
!
vrf definition Mgmt-vrf
!
  address-family ipv4
  exit-address-family
!
  address-family ipv6
  exit-address-family
!
!
no aaa new-model
facility-alarm critical exceed-action shutdown
switch 1 provision ws-c3850-12x48u
no ptp globalprotocolenable
!
!
!
vtp domain cisco
vtp mode transparent
!
!
crypto pki trustpoint TP-self-signed-2183322626
  enrollment selfsigned
  subject-name cn=IOS-Self-Signed-Certificate-2183322626
  revocation-check none
  rsakeypair TP-self-signed-2183322626

```

```
!  
!  
--More-----
```

This example shows how you can view all the policy map details when AVB is enabled.

```
Device(config)#avb  
Device#show run  
Building configuration...  
  
*Jul 27 02:49:51.780: %SYS-5-CONFIG_I: Configured from console by console  
Current configuration : 21114 bytes  
!  
! Last configuration change at 02:49:51 UTC Wed Jul 27 2016  
!  
!  
class-map match-any AVB-VOIP-DATA-CLASS  
  match dscp ef  
  match cos 5  
class-map match-any AVB-BULK-DATA-CLASS  
  match access-group name AVB-BULK-DATA-CLASS-ACL  
class-map match-any system-cpp-police-multicast  
  description Transit Traffic and MCAST Data  
class-map match-any AVB-VOIP-PRIORITY-QUEUE  
  match dscp cs4 cs5 ef  
  match precedence 4 5  
  match cos 5  
class-map match-any AVB-MULTIMEDIA-CONF-CLASS  
  match access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL  
class-map match-any AVB-SIGNALING-CLASS  
  match access-group name AVB-SIGNALING-CLASS-ACL  
class-map match-any AVB-MULTIMEDIA-CONF-STREAMING-QUEUE  
  match dscp af41 af42 af43  
  match dscp af31 af32 af33  
  match cos 4  
class-map match-any AVB-BULK-SCAVENGER-DATA-QUEUE  
  match dscp cs1 af11 af12 af13  
  match precedence 1  
  match cos 1  
class-map match-any AVB-TRANSACTIONAL-DATA-CLASS  
  match access-group name AVB-TRANSACTIONAL-DATA-CLASS-ACL  
class-map match-any AVB-TRANSACTIONAL-DATA-QUEUE  
  match dscp af21 af22 af23  
class-map match-any AVB-SR-CLASS-B  
  match cos 2  
class-map match-any AVB-SR-CLASS-A  
  match cos 3  
class-map match-any AVB-SCAVENGER-DATA-CLASS  
  match access-group name AVB-SCAVENGER-DATA-CLASS-ACL  
class-map match-any AVB-CONTROL-MGMT-QUEUE
```

```

match dscp cs2 cs3 cs6 cs7
match precedence 2 3 6 7
match cos 6 7
!
policy-map AVB-Input-Policy-Remark-B
  class AVB-SR-CLASS-A
    set cos 3
  class AVB-SR-CLASS-B
    set cos 0
  class AVB-VOIP-DATA-CLASS
    set dscp ef
  class AVB-MULTIMEDIA-CONF-CLASS
    set dscp af41
  class AVB-BULK-DATA-CLASS
    set dscp af11
  class AVB-TRANSACTIONAL-DATA-CLASS
    set dscp af21
  class AVB-SCAVENGER-DATA-CLASS
    set dscp cs1
  class AVB-SIGNALING-CLASS
    set dscp cs3
  class class-default
    set dscp default
policy-map AVB-Input-Policy-Remark-A
  class AVB-SR-CLASS-A
    set cos 0
  class AVB-SR-CLASS-B
    set cos 2
  class AVB-VOIP-DATA-CLASS
    set dscp ef
  class AVB-MULTIMEDIA-CONF-CLASS
    set dscp af41
  class AVB-BULK-DATA-CLASS
    set dscp af11
  class AVB-TRANSACTIONAL-DATA-CLASS
    set dscp af21
  class AVB-SCAVENGER-DATA-CLASS
    set dscp cs1
  class AVB-SIGNALING-CLASS
    set dscp cs3
  class class-default
    set dscp default
policy-map AVB-Output-Policy-Default
  class AVB-SR-CLASS-A
    priority level 1 percent 1
  class AVB-SR-CLASS-B
    priority level 2 percent 1
  class AVB-CONTROL-MGMT-QUEUE
    bandwidth remaining percent 10
    queue-buffers ratio 10
  class AVB-VOIP-PRIORITY-QUEUE

```

```

bandwidth remaining percent 30
queue-buffers ratio 10
class AVB-MULTIMEDIA-CONF-STREAMING-QUEUE
bandwidth remaining percent 10
queue-limit dscp af41 percent 80
queue-limit dscp af31 percent 80
queue-limit dscp af42 percent 90
queue-limit dscp af32 percent 90
queue-buffers ratio 10
class AVB-TRANSACTIONAL-DATA-QUEUE
bandwidth remaining percent 10
queue-limit dscp af21 percent 80
queue-limit dscp af22 percent 90
queue-buffers ratio 10
class AVB-BULK-SCAVENGER-DATA-QUEUE
bandwidth remaining percent 15
queue-limit dscp af11 percent 80
queue-limit dscp af12 percent 90
queue-limit dscp cs1 percent 80
queue-buffers ratio 15
class class-default
bandwidth remaining percent 25
queue-buffers ratio 25
policy-map AVB-Input-Policy-Remark-AB
class AVB-SR-CLASS-A
set cos 0
class AVB-SR-CLASS-B
set cos 0
class AVB-VOIP-DATA-CLASS
set dscp ef
class AVB-MULTIMEDIA-CONF-CLASS
set dscp af41
class AVB-BULK-DATA-CLASS
set dscp af11
class AVB-TRANSACTIONAL-DATA-CLASS
set dscp af21
class AVB-SCAVENGER-DATA-CLASS
set dscp cs1
class AVB-SIGNALING-CLASS
set dscp cs3
class class-default
set dscp default
policy-map AVB-Input-Policy-Remark-None
class AVB-SR-CLASS-A
set cos 3
class AVB-SR-CLASS-B
set cos 2
class AVB-VOIP-DATA-CLASS
set dscp ef
class AVB-MULTIMEDIA-CONF-CLASS
set dscp af41

```

```

class AVB-BULK-DATA-CLASS
  set dscp af11
class AVB-TRANSACTIONAL-DATA-CLASS
  set dscp af21
class AVB-SCAVENGER-DATA-CLASS
  set dscp cs1
class AVB-SIGNALING-CLASS
  set dscp cs3
class class-default
  set dscp default
!
!
--More-----

```

This example shows how you can check the qos policy details and the interface level policy application.

```
Device#show run int Gig 1/0/1
```

```
Building configuration...
```

```
Current configuration : 159 bytes
!
interface GigabitEthernet1/0/1
  switchport mode trunk
  service-policy input AVB-Input-Policy-Remark-AB
  service-policy output AVB-Output-Policy-Default
end

```

This example shows how you can view the qos statistics on the interface where AVB policy is attached.

```
Device#show policy-map int Gig 1/0/1
```

```
GigabitEthernet1/0/1
```

```
Service-policy input: AVB-Input-Policy-Remark-AB
```

```
Class-map: AVB-SR-CLASS-A (match-any)
  0 packets
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos 0

```

```
Class-map: AVB-SR-CLASS-B (match-any)
  0 packets
  Match: cos 2

```

```
    0 packets, 0 bytes
    5 minute rate 0 bps
QoS Set
  cos 0
```

```
Class-map: AVB-VOIP-DATA-CLASS (match-any)
  0 packets
  Match: dscp ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp ef
```

```
Class-map: AVB-MULTIMEDIA-CONF-CLASS (match-any)
  0 packets
  Match: access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af41
```

```
Class-map: AVB-BULK-DATA-CLASS (match-any)
  0 packets
  Match: access-group name AVB-BULK-DATA-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af11
```

--More--

This example shows how you can check the qos policy details and the interface level policy application with Class A traffic.

```
Device#show run int gig 1/0/1
```

```
Building configuration...
```

```
Current configuration : 158 bytes
!
interface GigabitEthernet1/0/1
  switchport mode trunk
  service-policy input AVB-Input-Policy-Remark-B
  service-policy output AVB-Output-Policy-Gi1/0/1
end
```

This example shows how you can view the qos statistics on the interface where Class A AVB traffic sent.

Device#show policy-map int Gig 1/0/1

GigabitEthernet1/0/1

Service-policy input: AVB-Input-Policy-Remark-B

Class-map: AVB-SR-CLASS-A (match-any)

0 packets

Match: cos 3

0 packets, 0 bytes

5 minute rate 0 bps

QoS Set

cos 3

Class-map: AVB-SR-CLASS-B (match-any)

0 packets

Match: cos 2

0 packets, 0 bytes

5 minute rate 0 bps

QoS Set

cos 0

Class-map: AVB-VOIP-DATA-CLASS (match-any)

0 packets

Match: dscp ef (46)

0 packets, 0 bytes

5 minute rate 0 bps

Match: cos 5

0 packets, 0 bytes

5 minute rate 0 bps

QoS Set

dscp ef

Class-map: AVB-MULTIMEDIA-CONF-CLASS (match-any)

0 packets

Match: access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL

0 packets, 0 bytes

5 minute rate 0 bps

QoS Set

dscp af41

Class-map: AVB-BULK-DATA-CLASS (match-any)

0 packets

Match: access-group name AVB-BULK-DATA-CLASS-ACL

0 packets, 0 bytes

5 minute rate 0 bps

QoS Set

dscp af11

--More--

This example shows how you can check the qos policy details and the interface level policy application with Class B traffic.

```
Device#show run int gig 1/0/1
```

```
Building configuration...
```

```
Current configuration : 158 bytes
```

```
!
```

```
interface GigabitEthernet1/0/1
  switchport mode trunk
  service-policy input AVB-Input-Policy-Remark-A
  service-policy output AVB-Output-Policy-Gil/0/1
end
```

This example shows how you can view the qos statistics on the interface where Class B AVB traffic is sent.

```
Device#show policy-map int Gig 1/0/1
```

```
GigabitEthernet1/0/1
```

```
  Service-policy input: AVB-Input-Policy-Remark-A
```

```
    Class-map: AVB-SR-CLASS-A (match-any)
```

```
      0 packets
```

```
      Match: cos 3
```

```
        0 packets, 0 bytes
```

```
        5 minute rate 0 bps
```

```
      QoS Set
```

```
        cos 0
```

```
    Class-map: AVB-SR-CLASS-B (match-any)
```

```
      0 packets
```

```
      Match: cos 2
```

```
        0 packets, 0 bytes
```

```
        5 minute rate 0 bps
```

```
      QoS Set
```

```
        cos 2
```

```
    Class-map: AVB-VOIP-DATA-CLASS (match-any)
```

```
      0 packets
```

```
      Match: dscp ef (46)
```

```
        0 packets, 0 bytes
```

```
        5 minute rate 0 bps
```

```
      Match: cos 5
```

```
        0 packets, 0 bytes
```

```
        5 minute rate 0 bps
```

```
      QoS Set
```

```
        dscp ef
```

```
Class-map: AVB-MULTIMEDIA-CONF-CLASS (match-any)
  0 packets
  Match: access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af41
```

```
Class-map: AVB-BULK-DATA-CLASS (match-any)
  0 packets
  Match: access-group name AVB-BULK-DATA-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af11
```

--More--

Examples for HQoS

This example shows how you can view all the policy-map configuration details when AVB is enabled.

Device#**show policy-map**

```
Policy Map AVB-Input-Policy-Remark-B
  Class AVB-SR-CLASS-A
    set cos 3
  Class AVB-SR-CLASS-B
    set cos 0
  Class class-default
    service-policy AVB-Input-Child-Policy
```

```
Policy Map AVB-Input-Policy-Remark-A
  Class AVB-SR-CLASS-A
    set cos 0
  Class AVB-SR-CLASS-B
    set cos 2
  Class class-default
    service-policy AVB-Input-Child-Policy
```

```
Policy Map AVB-Output-Policy-Default
  Class AVB-SR-CLASS-A
    priority level 1 1 (%)
  Class AVB-SR-CLASS-B
    priority level 2 1 (%)
  Class AVB-CONTROL-MGMT-QUEUE
    priority level 3 15 (%)
  Class class-default
    bandwidth remaining 100 (%)
    queue-buffers ratio 70
    service-policy AVB-Output-Child-Policy
```

```
Policy Map AVB-Input-Policy-Remark-AB
  Class AVB-SR-CLASS-A
    set cos 0
  Class AVB-SR-CLASS-B
    set cos 0
  Class class-default
    service-policy AVB-Input-Child-Policy
```

```
Policy Map AVB-Input-Policy-Remark-None
  Class AVB-SR-CLASS-A
    set cos 3
  Class AVB-SR-CLASS-B
    set cos 2
  Class class-default
    service-policy AVB-Input-Child-Policy
```

```
Policy Map AVB-Input-Child-Policy
  Class AVB-VOIP-DATA-CLASS
    set dscp ef
  Class AVB-MULTIMEDIA-CONF-CLASS
    set dscp af41
  Class AVB-BULK-DATA-CLASS
    set dscp af11
  Class AVB-TRANSACTIONAL-DATA-CLASS
    set dscp af21
  Class AVB-SCAVENGER-DATA-CLASS
    set dscp cs1
  Class AVB-SIGNALING-CLASS
    set dscp cs3
  Class class-default
    set dscp default
```

```
Policy Map AVB-Output-Child-Policy
  Class AVB-VOIP-PRIORITY-QUEUE
    bandwidth remaining 30 (%)
    queue-buffers ratio 30
  Class AVB-MULTIMEDIA-CONF-STREAMING-QUEUE
    bandwidth remaining 15 (%)
    queue-limit dscp af41 percent 80
    queue-limit dscp af31 percent 80
    queue-limit dscp af42 percent 90
    queue-limit dscp af32 percent 90
    queue-buffers ratio 15
  Class AVB-TRANSACTIONAL-DATA-QUEUE
    bandwidth remaining 15 (%)
    queue-limit dscp af21 percent 80
    queue-limit dscp af22 percent 90
    queue-buffers ratio 15
  Class AVB-BULK-SCAVENGER-DATA-QUEUE
    bandwidth remaining 15 (%)
```

```
queue-limit dscp af11 percent 80
queue-limit dscp af12 percent 90
queue-limit dscp cs1 percent 80
queue-buffers ratio 15
Class class-default
bandwidth remaining 25 (%)
queue-buffers ratio 25
```

This example shows how you can view all the policy-map configuration details when AVB is disabled.

Device#**show policy-map**

Building configuration...

```
Current configuration : 2079 bytes
!
policy-map AVB-Input-Child-Policy
class AVB-VOIP-DATA-CLASS
  set dscp ef
class AVB-MULTIMEDIA-CONF-CLASS
  set dscp af41
class AVB-BULK-DATA-CLASS
  set dscp af11
class AVB-TRANSACTIONAL-DATA-CLASS
  set dscp af21
class AVB-SCAVENGER-DATA-CLASS
  set dscp cs1
class AVB-SIGNALING-CLASS
  set dscp cs3
class class-default
  set dscp default
policy-map AVB-Output-Child-Policy
class AVB-VOIP-PRIORITY-QUEUE
  bandwidth remaining percent 30
  queue-buffers ratio 30
class AVB-MULTIMEDIA-CONF-STREAMING-QUEUE
  bandwidth remaining percent 15
  queue-limit dscp af41 percent 80
  queue-limit dscp af31 percent 80
  queue-limit dscp af42 percent 90
  queue-limit dscp af32 percent 90
  queue-buffers ratio 15
class AVB-TRANSACTIONAL-DATA-QUEUE
  bandwidth remaining percent 15
  queue-limit dscp af21 percent 80
  queue-limit dscp af22 percent 90
  queue-buffers ratio 15
class AVB-BULK-SCAVENGER-DATA-QUEUE
```

```

bandwidth remaining percent 15
queue-limit dscp af11 percent 80
queue-limit dscp af12 percent 90
queue-limit dscp cs1 percent 80
queue-buffers ratio 15
class class-default
  bandwidth remaining percent 25
  queue-buffers ratio 25
!
end

```

This example shows how you can view all the class-map configuration details when AVB is enabled.

Device#**show class-map**

```

Class Map match-any AVB-VOIP-DATA-CLASS (id 31)
  Match dscp ef (46)
  Match cos 5

Class Map match-any AVB-BULK-DATA-CLASS (id 33)
  Match access-group name AVB-BULK-DATA-CLASS-ACL

Class Map match-any AVB-VOIP-PRIORITY-QUEUE (id 37)
  Match dscp cs4 (32) cs5 (40) ef (46)
  Match precedence 4 5
  Match cos 5

Class Map match-any AVB-MULTIMEDIA-CONF-CLASS (id 32)
  Match access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL

Class Map match-any AVB-SIGNALING-CLASS (id 36)
  Match access-group name AVB-SIGNALING-CLASS-ACL

Class Map match-any AVB-MULTIMEDIA-CONF-STREAMING-QUEUE (id 38)
  Match dscp af41 (34) af42 (36) af43 (38)
  Match dscp af31 (26) af32 (28) af33 (30)
  Match cos 4

Class Map match-any AVB-BULK-SCAVENGER-DATA-QUEUE (id 40)
  Match dscp cs1 (8) af11 (10) af12 (12) af13 (14)
  Match precedence 1
  Match cos 1

Class Map match-any AVB-TRANSACTIONAL-DATA-CLASS (id 34)
  Match access-group name AVB-TRANSACTIONAL-DATA-CLASS-ACL

Class Map match-any AVB-TRANSACTIONAL-DATA-QUEUE (id 39)
  Match dscp af21 (18) af22 (20) af23 (22)

```

```

Class Map match-any AVB-SR-CLASS-B (id 42)
  Match cos 2

Class Map match-any AVB-SR-CLASS-A (id 41)
  Match cos 3

Class Map match-any AVB-SCAVENGER-DATA-CLASS (id 35)
  Match access-group name AVB-SCAVENGER-DATA-CLASS-ACL

Class Map match-any AVB-CONTROL-MGMT-QUEUE (id 43)
  Match ip dscp cs2 (16)
  Match ip dscp cs3 (24)
  Match ip dscp cs6 (48)
  Match ip dscp cs7 (56)
  Match ip precedence 6
  Match ip precedence 7
  Match ip precedence 3
  Match ip precedence 2
  Match cos 6
  Match cos 7

```

This example shows how you can view all the class-map configuration details when AVB is disabled.

```

Device#show class-map

Building configuration...

Current configuration : 2650 bytes
!
class-map match-any AVB-VOIP-DATA-CLASS
match dscp ef
  match cos 5
class-map match-any AVB-BULK-DATA-CLASS
match access-group name AVB-BULK-DATA-CLASS-ACL
class-map match-any AVB-VOIP-PRIORITY-QUEUE
match dscp cs4 cs5 ef
  match precedence 4 5
  match cos 5
class-map match-any AVB-MULTIMEDIA-CONF-CLASS
match access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL
class-map match-any AVB-SIGNALING-CLASS
match access-group name AVB-SIGNALING-CLASS-ACL
class-map match-any AVB-MULTIMEDIA-CONF-STREAMING-QUEUE
match dscp af41 af42 af43
  match dscp af31 af32 af33
  match cos 4
class-map match-any AVB-BULK-SCAVENGER-DATA-QUEUE
match dscp cs1 af11 af12 af13

```

```

match precedence 1
match cos 1
class-map match-any AVB-TRANSACTIONAL-DATA-CLASS
match access-group name AVB-TRANSACTIONAL-DATA-CLASS-ACL
class-map match-any AVB-TRANSACTIONAL-DATA-QUEUE
match dscp af21 af22 af23
class-map match-any AVB-SCAVENGER-DATA-CLASS
match access-group name AVB-SCAVENGER-DATA-CLASS-ACL
end

```

This example shows how you can view all the AVB QoS statistics.

```
Device#show policy-map interface gigabitEthernet 1/0/15
```

```
GigabitEthernet1/0/15
```

```
Service-policy input: AVB-Input-Policy-Remark-AB
```

```

Class-map: AVB-SR-CLASS-A (match-any)
  0 packets
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos 0

```

```

Class-map: AVB-SR-CLASS-B (match-any)
  0 packets
  Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos 0

```

```

Class-map: class-default (match-any)
  0 packets
  Match: any

```

```
Service-policy : AVB-Input-Child-Policy
```

```

Class-map: AVB-VOIP-DATA-CLASS (match-any)
  0 packets
  Match: dscp ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos 3

```



```
Class-map: AVB-MULTIMEDIA-CONF-CLASS (match-any)
  0 packets
  Match: access-group name AVB-MULTIMEDIA-CONF-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af41
```

```
Class-map: AVB-BULK-DATA-CLASS (match-any)
  0 packets
  Match: access-group name AVB-BULK-DATA-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af11
```

```
Class-map: AVB-TRANSACTIONAL-DATA-CLASS (match-any)
  0 packets
  Match: access-group name AVB-TRANSACTIONAL-DATA-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af21
```

```
Class-map: AVB-SCAVENGER-DATA-CLASS (match-any)
  0 packets
  Match: access-group name AVB-SCAVENGER-DATA-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp cs1
```

```
Class-map: AVB-SIGNALING-CLASS (match-any)
  0 packets
  Match: access-group name AVB-SIGNALING-CLASS-ACL
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp cs3
```

```
Class-map: class-default (match-any)
  0 packets
  Match: any
  QoS Set
    dscp default
```

Service-policy output: AVB-Output-Policy-Default

```
queue stats for all priority classes:
  Queueing
```

```
priority level 3
(total drops) 0
(bytes output) 7595
```

```
queue stats for all priority classes:
Queueing
priority level 2
(total drops) 0
(bytes output) 0
```

```
queue stats for all priority classes:
Queueing
priority level 1
(total drops) 0
(bytes output) 0
```

```
Class-map: AVB-SR-CLASS-A (match-any)
 0 packets
Match: cos 3
 0 packets, 0 bytes
 5 minute rate 0 bps
Priority: 1% (10000 kbps), burst bytes 250000,
Priority Level: 1
```

```
Class-map: AVB-SR-CLASS-B (match-any)
 0 packets
Match: cos 2
 0 packets, 0 bytes
 5 minute rate 0 bps
Priority: 1% (10000 kbps), burst bytes 250000,
Priority Level: 2
```

```
Class-map: AVB-CONTROL-MGMT-QUEUE (match-any)
 0 packets
Match: ip dscp cs2 (16)
 0 packets, 0 bytes
 5 minute rate 0 bps
Match: ip dscp cs3 (24)
 0 packets, 0 bytes
 5 minute rate 0 bps
Match: ip dscp cs6 (48)
 0 packets, 0 bytes
 5 minute rate 0 bps
Match: ip dscp cs7 (56)
 0 packets, 0 bytes
 5 minute rate 0 bps
```

```
Match: ip precedence 6
  0 packets, 0 bytes
  5 minute rate 0 bps
Match: ip precedence 7
  0 packets, 0 bytes
  5 minute rate 0 bps
Match: ip precedence 3
  0 packets, 0 bytes
  5 minute rate 0 bps
Match: ip precedence 2
  0 packets, 0 bytes
  5 minute rate 0 bps
Match: cos 6
  0 packets, 0 bytes
  5 minute rate 0 bps
Match: cos 7
  0 packets, 0 bytes
  5 minute rate 0 bps
Priority: 15% (150000 kbps), burst bytes 3750000,

Priority Level: 3
```

```
Class-map: class-default (match-any)
```

```
  0 packets
```

```
Match: any
```

```
Queueing
```

```
(total drops) 0
```

```
(bytes output) 0
```

```
bandwidth remaining 80%
```

```
queue-buffers ratio 70
```

```
Service-policy : AVB-Output-Child-Policy
```

```
Class-map: AVB-VOIP-PRIORITY-QUEUE (match-any)
```

```
  0 packets
```

```
Match: dscp cs4 (32) cs5 (40) ef (46)
```

```
  0 packets, 0 bytes
```

```
  5 minute rate 0 bps
```

```
Match: precedence 4 5
```

```
  0 packets, 0 bytes
```

```
  5 minute rate 0 bps
```

```
Match: cos 5
```

```
  0 packets, 0 bytes
```

```
  5 minute rate 0 bps
```

```
Queueing
```

```
(total drops) 0
```

```
(bytes output) 0
```

```
bandwidth remaining 30%
```

```
queue-buffers ratio 30
```

```
Class-map: AVB-MULTIMEDIA-CONF-STREAMING-QUEUE (match-any)
  0 packets
  Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  queue-limit dscp 26 percent 80
  queue-limit dscp 28 percent 90
  queue-limit dscp 34 percent 80
  queue-limit dscp 36 percent 90
  (total drops) 0
  (bytes output) 0
  bandwidth remaining 15%

  queue-buffers ratio 15
```

```
Class-map: AVB-TRANSACTIONAL-DATA-QUEUE (match-any)
  0 packets
  Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 0
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  queue-limit dscp 18 percent 80
  queue-limit dscp 20 percent 90
  (total drops) 0
  (bytes output) 0
  bandwidth remaining 15%

  queue-buffers ratio 15
```

```
Class-map: AVB-BULK-SCAVENGER-DATA-QUEUE (match-any)
  0 packets
  Match: dscp cs1 (8) af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: precedence 1
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 1
```

```

    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

queue-limit dscp 8 percent 80
queue-limit dscp 10 percent 80
queue-limit dscp 12 percent 90
(total drops) 0
(bytes output) 0
bandwidth remaining 15%

queue-buffers ratio 15

```

```

Class-map: class-default (match-any)
  0 packets
  Match: any
  Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 25%
  queue-buffers ratio 25

```

The following is a sample output from the **show platform hardware fed switch active qos queue config interface *interface-id*** command.

```

Device#show platform hardware fed switch active qos queue config interface t1/0/11
DATA Port:2 GPN:11 AFD:Disabled QoSMap:2 HW Queues: 16 - 23
  DrainFast:Disabled PortSoftStart:1 - 3600

```

```

-----
  DTS  Hardmax  Softmax  PortSMin  GlblSMin  PortStEnd
-----
0  0  9    33   3   33    0   0   0   0   1  4800
1  0  9    33   4 2400   99  99   0   0   1  4800
2  1  6    30   4 2400   90  90   0   0   1  4800
3  1  5     0   4 2400  189 189   63  63   1  4800
4  1  5     0   4 2400   90  90   30  30   1  4800
5  1  5     0   4 2400   90  90   30  30   1  4800
6  1  5     0   4 2400   90  90   30  30   1  4800
7  1  5     0   4 2400  153 153   51  51   1  4800
Priority  Shaped/shared  weight  shaping_step
-----
0        1    Shaped      16383      163
1        2    Shaped      16383      163
2        3    Shaped      125        153
3        7    Shared        50         0
4        7    Shared      100         0
5        7    Shared      100         0
6        7    Shared      100         0
7        7    Shared       60         0

```

The following is a sample output from the **show platform hardware fed switch active qos queue stats interface interface-id** command.

```
Device#show platform hardware fed switch active qos queue stats interface t1/0/15  
DATA Port:8 Enqueue Counters
```

```
-----  
Queue Buffers Enqueue-TH0 Enqueue-TH1 Enqueue-TH2  
-----  
  0      1          0          0 23788459506  
  1      0          0          0 30973507838  
  2      0          0 12616270 13164040  
  3      0          0          0          0  
  4      0          0          0          0  
  5      0          0          0          0  
  6      0          0          0          0  
  7      0          0          0 119616
```

```
DATA Port:8 Drop Counters
```

```
-----  
Queue Drop-TH0 Drop-TH1 Drop-TH2 SBufDrop QebDrop  
-----  
  0          0          0          0          0          0  
  1          0          0          0          0          0  
  2          0          0          0          0          0  
  3          0          0          0          0          0  
  4          0          0          0          0          0
```

Examples for MVRP

This example shows how you can view the MVRP summary information.

```
Device#show mvrp summary
```

```
MVRP global state      : enabled  
MVRP VLAN creation    : enabled  
VLANs created via MVRP : 2,567  
MAC learning auto provision : disabled  
Learning disabled on VLANs : none
```

This example shows how you can view the interface MVRP information.

```
Device#show mvrp interface
```

```
Port      Status      Registrar State  
Tel1/0/47 on         normal  
Tel1/1/3  off        normal
```

```
Port      Join Timeout      Leave Timeout      Leaveall Timeout      Periodic  
Timeout
```

Te1/0/47	20	60	1000	100
Te1/1/3	20	60	1000	100

Port	Vlans Declared
Te1/0/47	1-2,567,900
Te1/1/3	none

Port	Vlans Registered
Te1/0/47	2,567
Te1/1/3	none

Port	Vlans Registered and in Spanning Tree Forwarding State
Te1/0/47	2,567
Te1/1/3	none

Feature Information for AVB

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for AVB

Releases	Modification
Cisco IOS XE Everest 16.5.1a	Support for AVB was enabled on WS-C3650-8X24UQ and WS-C3650-12X48UQ switch models.
Cisco IOS XE Denali 16.3.2	Enhanced to support hierarchical QoS, which provides a two level parent-child policy. Support for AVB was enabled on mGig interfaces of the WS-3850-12X48U and WS-C3850-24XU.
Cisco IOS XE Denali 16.3.1	This feature was introduced.



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