Audio Video Bridging for IE9300

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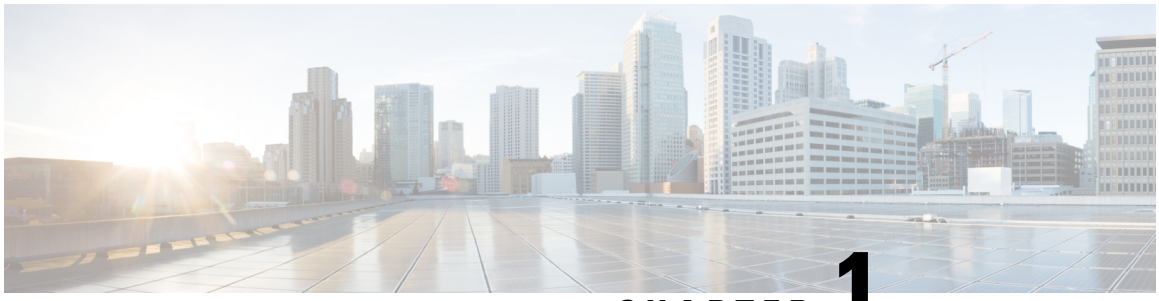


CHAPTER 1

Audio Video Bridging for IE9300

Introduction to Audio Video Bridging Networks

Information about Audio Video Bridging

Audio and video bridging (AVB) 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 supported on SKU's running Network Advantage License.
- AVB is supported on a total of 16 ports (12 downlinks and 4 uplinks) and on STP-enabled network.
- Currently, AVB validates with MSTP/RSTP only.
- AVB is supported with MTU 1500. AVB is not supported with MTU that is configured higher than 1500 or when in SDAccess deployment.
- All switches between the talkers and listeners must be AVB aware for the MSRP streams to be established.
- MVRP is an optional protocol but recommended to automatically manages the vlans across all the AVB nodes.
- The maximum streams supported across the switch are 256. The exact number of streams is limited to the consumption of 75% bandwidth reservation on each port.
- AVB Class-A and Class-B reservation happens on first-come first-serve basis. If Class-B reservation happens when there is shortage of b/w and if Class-A comes later, Class-A is rejected.
- If in use, PTPv1 clock must be in forward mode.

AVB is not supported for the following:

- On 2.5Gig (Mulit-Gigabit) ports.
- On Ports where copper SFP is used.
- Not supported with Interface speed of 10/100 Mbps.
- On stacked systems.
- On Port-Channel interfaces.
- Does not interoperate with redundancy protocols (REP,PRP,etc.)

Audio Video Bridging Supported Platforms

Audio video bridging (AVB) is supported on the Network Advantage license.

Refer the table below for the supported platforms for the AVB:

Table 1: Supported platforms for AVB:

PID ID	Product ID	No.of ports * Speed	Downlinks	AVB support
1	IE-9310-26S2C	1G SFP/ 4 ports/ 25 - 28	1G SFP/ 22 ports / 1 - 22	Yes. First 12 downlink ports and 4 uplink ports.
			1G Combo/ 2 ports / 23 -24	

PID ID	Product ID	No.of ports * Speed	Downlinks	AVB support
2	IE-9320-26S2C	1G SFP/4 X 1Gig SFP (Ports 25-28)	1G SFP/ 20 ports / 1 - 20	No AVB Support.
			1G SFP/ 2 ports / 21- 22	
			1G Combo/ 2 ports / 23-24	
3	IE-9320-22S2C4X	10G SFP+/ 4 X 10 Gig SFP/ 25 - 28	1G SFP/ 22 ports / 1 - 22	No AVB Support.
			1G Combo/ 2 ports / 23 -24	
4	IE-9320-24T4X	10G SFP+/ 4 ports/ 25 - 28	1G Copper/24 port/1-24	Yes. First 12 downlink ports and 4 uplink ports.
5	IE-9320-24P4X	10G SFP+/ 4 ports/ 25 - 28	1G Copper/24 port/1-24	Yes. First 12 downlink ports and 4 uplink ports.
6	IE-9320-16P8U4X	10G SFP+/ 4 ports/ 25 - 28	1G Copper/16 port/1-16	Yes. First 12 downlink ports and 4 uplink ports.
			2.5G Copper/8 port/17-24	No support on Mgig ports.
7	IE-9320-24P4S	1G SFP/ 4 ports/ 25 - 28	1G Copper/24 port/1-24	Yes. First 12 downlink ports and 4 uplink ports.

Benefits of Audio Video Bridging

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

- Guaranteed max latency
- Time synchronized
- Bandwidth guaranteed
- Professional grade

Components of Audio Video Bridging Network

AVB protocols operate only in domains where every device is AVB capable. The AVB network comprises of 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.

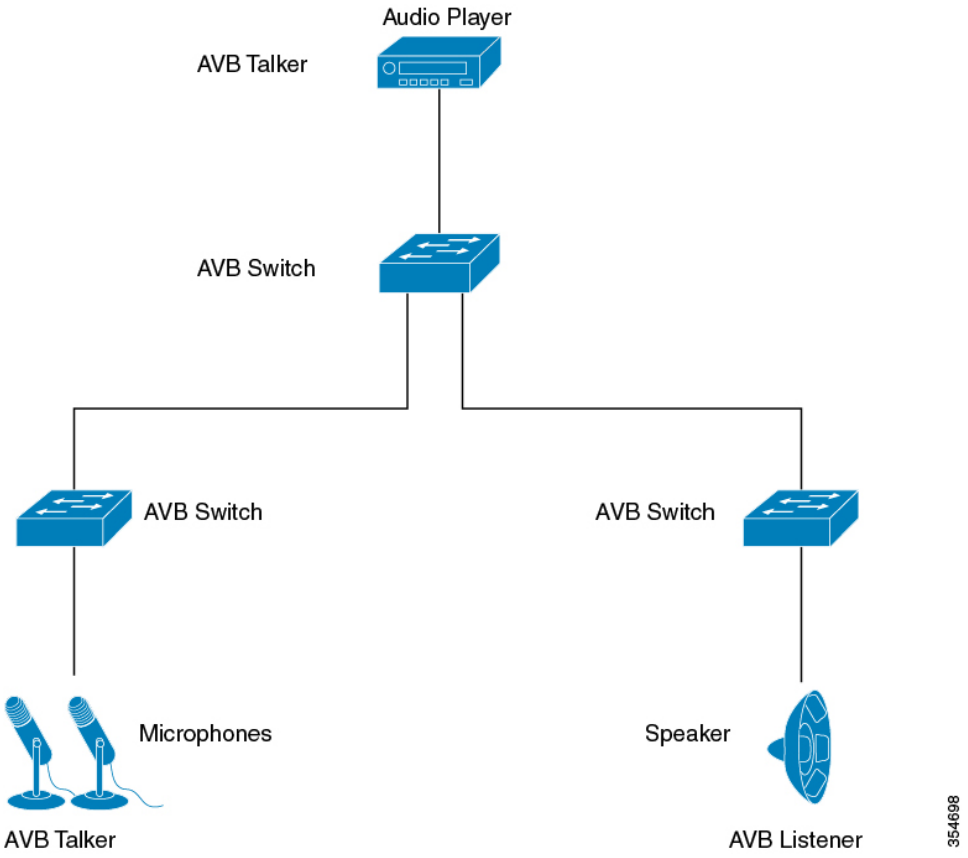
- AVB Listener - An AVB end station that is the destination or consumer of a stream, i.e. speaker, video screen, and so on.
- AVB Switch - An Ethernet switch that complies with IEEE802.1 AVB standards (IE-9300).
- AVB stream: A data stream associated with a stream reservation compliant with the Stream 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.

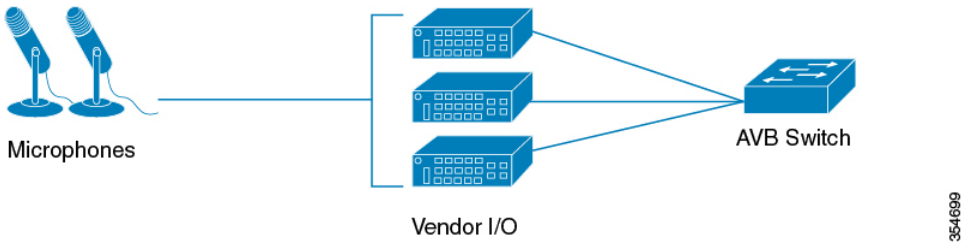
The figure below shows a simple illustration of AVB network with different components.

Figure 1: AVB Network



In many instances, the Audio/Video end points (Microphone, Speaker, and so on) 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 the figure Vendor Audio I/O System below.

Figure 2: Vendor Audio I/O System



Information About Generalized Precision Time Protocol

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. A gPTP switch is an 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

Multiple Stream Reservation Protocol (MSRP) provides a mechanism for end stations to reserve network resources that guarantee the transmission and reception of data streams across a network with the requested QoS. It is one of the core protocols that are 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 that are required for the credit based shaper.

Functions of Multiple Stream Reservation Protocol

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 Hierarchical QoS

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.

AVB supports hierarchical QoS. 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, for example 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

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 id, and for propagating the information that 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 Audio Video Bridging

You can enable AVB using the below command on the switch.

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 global configuration mode.
Step 3	**avb** **Example:** `Device(config)# avb`	Enables AVB on the switch.
Step 4	**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 Audio Video Bridging

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. Enter your password if prompted.
Step 2	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Device# configure terminal`	
Step 3	**interface** *interface-id* **Example:** `Device(config)# interface Gig1/0/1`	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** *vlan-id* **Example:** `Device(config)# avb vlan 10`	(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 *vlan-id* varies from 2 to 4094.
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

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

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

Note The following configuration sections are optional and ideally need not be modified, if AVB is enabled.

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 global configuration mode.
Step 3	**[no]ptp clock boundary domain 0 profile dot1as** **Example:** `Device(config)# ptp clock boundary domain 0 profile dot1as`	gPTP is enabled globallywhen you enable AVB. Use the **no** form of this command to disable gPTP globally.
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** *interface-id* **Example:** `Device(config)# interface Gig1/0/1`	Defines the interface to be configured as a trunk, and enters interface configuration mode. The interface that you specify can be part of an EtherChannel.
Step 4	**ptp enable** **Example:** `Device(config-if)# ptp enable`	Enables gPTP on all the interfaces. To disable gPTP on a port, 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 Precision Time Protocol Clocks

Note Enabling the AVB command on the IE9300 automatically enables the dot1as protocol on all AVB supported interfaces by default.

How to Configure Hierarchical QoS

The following section provide configurational information about Hierarchical QoS:

Enabling Hierarchical QoS

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

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
```

How to Configure Multiple VLAN Registration Protocol

The following sections provide configurational information about MVRP:

Enabling Multiple VLAN Registration Protocol

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. 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:**	Sets the VTP to **transparent** or **off** mode.

	Command or Action	Purpose
	`Device(config)# vtp mode off`	
Step 5	**mvrp vlan create** **Example:** `Device(config)# mvrp vlan create`	Enables MVRP on the switches.

Configuring Multiple VLAN Registration Protocol on an 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. Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *interface-id* **Example:** `Device(config)# interface Gi1/0/1`	Defines the interface to be configured as a trunk, and enters interface configuration mode.
Step 4	**mvrp registration** {*fixed* | *forbidden* | *normal*} **Example:** `Device(config-if)# mvrp registration fixed`	Registers MVRP with the MAD instance. • fixed - Fixed registration • forbidden - Forbidden registration • normal - Normal registration
Step 5	**mvrp timer** {*join* | *leave* | *leave-all* | *periodic*} **Example:** `Device(config-if)# mvrp timer join`	Configures the MVRP timer. • 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

	Command or Action	Purpose
		• 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 Audio Video Bridging

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

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

Monitoring Generalized Precision Time Protocol

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

Command	Purpose
show ptp clock running	Displays a brief status of ptp clock on the interfaces.
show ptp clock dataset	Displays ptp clock information.
sshow ptp clock dataset parent	Displays the parent clock information.
show ptp lan port interface gi1/0/1	Displays the ptp port information.

Monitoring Multiple Stream Reservation Protocol

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.

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

Monitoring Hierarchical QoS

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 Multiple VLAN Registration Protocol

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 Audio Video Bridging

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
-------------------------------------------------------------------------------
Gig1/0/1        down      N/A                      Oper state not up
Gig1/0/2        down      N/A                      Oper state not up
Gig1/0/3        down      N/A                      Oper state not up
Gig1/0/4        down      N/A                      Oper state not up
Gig1/0/5          up      N/A                    Port is not asCapable
Gig1/0/6        down      N/A                      Oper state not up
Gig1/0/7        down      N/A                      Oper state not up
Gig1/0/8        down      N/A                      Oper state not up
Gig1/0/9        down      N/A                      Oper state not up
Gig1/0/10       down      N/A                      Oper state not up
Gig1/0/11       down      N/A                      Oper state not up
Gig1/0/12       down      N/A                      Oper state not up

   Class-  A        core             3    2

   Class-  B        core             2    2

Gig1/0/1        down      N/A                      Oper state not up
Gig1/0/2        down      N/A                      Oper state not up
Gig1/0/3        down      N/A                      Oper state not up
Gig1/0/4        down      N/A                      Oper state not up
Gig1/0/5          up      N/A                    Port is not asCapable
Gig1/0/6        down      N/A                      Oper state not up
Gig1/0/7        down      N/A                      Oper state not up
Gig1/0/8        down      N/A                      Oper state not up
Gig1/0/9        down      N/A                      Oper state not up
Gig1/0/10       down      N/A                      Oper state not up
Gig1/0/11       down      N/A                      Oper state not up
Gig1/0/12       down      N/A                      Oper state not up
-------------------------------------------------------------------------------------------------------------------
```

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

```
Device#show avb stream

Stream ID:         0011.0100.0001:1    Incoming Interface:    Gi1/0/1
    Destination  : 91E0.F000.FE00
    Class        : A
    Rank         : 1
    Bandwidth    : 6400 Kbit/s
```

```
    Outgoing Interfaces:

-------------------------------------------------------------------------------

    Interface         State      Time of Last Update         Information

-------------------------------------------------------------------------------

    Gig1/0/1           Ready      Tue Apr 26 01:25:40.634


Stream ID:          0011.0100.0002:2    Incoming Interface:    Gi1/0/1
    Destination  : 91E0.F000.FE01
    Class        : A
    Rank         : 1
    Bandwidth    : 6400 Kbit/s

    Outgoing Interfaces:

-------------------------------------------------------------------------------

    Interface         State      Time of Last Update         Information

-------------------------------------------------------------------------------

    Gig1/0/1           Ready      Tue Apr 26 01:25:40.634
```

Example: Verifying Generalized Precision Time Protocol

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

This command can be used to view ptp clock information.

```
Device# show ptp lan 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 clock dataset 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 port information for a particular interface.

```
Device# show ptp lan port int gi1/0/1

PTP PORT DATASET: GigabitEthernet1/0/1
  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 see a brief status of ptp clock running on the interfaces.

```
Device # show ptp clock running
                      PTP Boundary Clock [Domain 0]  [Profile: dot1as]
         State          Ports          Pkts sent      Pkts rcvd
Redundancy Mode
         FREERUN        28             30846          4791           Hot
 standby
```

```
                                PORT SUMMARY

PTP Master
Name  Tx Mode      Role         Transport    State         Sessions
Port Addr
1     mcast        negotiated   Ethernet     Faulty        1
UNKNOWN
2     mcast        negotiated   Ethernet     Faulty        1
UNKNOWN
3     mcast        negotiated   Ethernet     Faulty        1
UNKNOWN
4     mcast        negotiated   Ethernet     Faulty        1
UNKNOWN
5     mcast        negotiated   Ethernet     Faulty        1
UNKNOWN
6     mcast        negotiated   Ethernet     Master        1
UNKNOWN
```

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

```
Device # show ptp lan port int gi1/0/17
PTP PORT DATASET: GigabitEthernet1/0/17
    Port identity: clock identity: 0xcc:36:cf:ff:fe:8a:16:3f
    Port identity: port number: 17
    PTP version: 2
    Port state: MASTER
    Announce receipt time out: 3
    Peer mean path delay(ns): 27
    Neighbor Rate Ratio: 0.999990788 (-9 PPM)
    Announce interval(log mean): 0
    Sync interval(log mean): -3
    Delay Mechanism: End to End
    Peer delay request interval(log mean): 0
    Sync fault limit: 1000
    Sync receipt time out: 3
    Port 802.1AS capable: TRUE
    Peer delay request allowed lost responses: 3
    Peer delay request lost responses: 0
    Rogue master block: FALSE
    Ingress phy latency: -120
    Egress phy latency: -4
```

Example: Verifying Multiple Stream Reservation Protocol

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 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

--------------------------------------------------------------------------------

      Gi1/0/1          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
    ----
      Gi1/0/1          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
    ----
      Gi1/0/1          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
    ----
      Gi1/0/1          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         Bandwidth   Talkers   Listeners
  Fail
                       Address               (Kbit/s)    R | D      R | D
-------------------------------------------------------------------------------
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      Capacity       Assigned       Available       Reserved
Interface     (Kbit/s)        A | B          A | B           A | B
-------------------------------------------------------------------------------
Gig1/0/1     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/2     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/3     1000000          75 | 0         75 | 75          0 | 0
Gig1/0/4     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/5     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/6     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/8     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/9     10000000         75 | 0         75 | 75          0 | 0
Gig1/0/10    10000000         75 | 0         75 | 75          0 | 0
```

```
Gig1/0/11    10000000          75 | 0          75 | 75           0 | 0
Gig1/0/12    10000000          75 | 0          75 | 75           0 | 0
```

Example: Verifying Hierarchical QoS

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 1/0/12

Gig1/0/12
```

```
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
```

Example: Verifying Multiple VLAN Registration Protocol

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
gig1/0/1     on              normal
gig1/0/2     on              normal
gig1/0/3     on              normal
gig1/0/4     on              normal
gig1/0/5     on              normal
gig1/0/6     on              normal
gig1/0/7     on              normal
gig1/0/8     on              normal
gig1/0/9     on              normal
gig1/0/10     on              normal
gig1/0/11     on              normal
gig1/0/12     on              normal
gig1/0/13      off             normal

Port        Join Timeout      Leave Timeout   Leaveall Timeout   Periodic

                                                                 Timeout
Gi1/0/1     20                  60              1000               100
Gi1/0/1      20                  60              1000               100
```

```
Port         Vlans Declared
Gi1/0/1     1-2,567,900
Gi1/0/1      none

Port         Vlans Registered
Gi1/0/1     2,567
Gi1/0/1      none

Port         Vlans Registered and in Spanning Tree Forwarding State
Gi1/0/1     2,567
Gi1/0/1      none
```