Enabling AVB on Cisco Catalyst Switches

This article describes how to enable AVB on supported Cisco® Catalyst® switches. This article does not detail Cisco firmware upgrade or initial switch setup procedure. Please see Cisco Catalyst documentation for more detail. Biamp recommends a Cisco certified technician performs switch configuration.

Supported Catalyst models

AVB is supported on select models of the following Catalyst series.

Please always check Cisco AVB for updates on their current models.

Please always reach out to Cisco Support regarding information about their latest software updates.

<table>
<thead>
<tr>
<th>Catalyst 3650 Series</th>
<th>Catalyst 3850 Series</th>
<th>Catalyst 9300 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required license level:</td>
<td>Required license level:</td>
<td>Required license level:</td>
</tr>
<tr>
<td>ipbase or ipsevices</td>
<td>ipbase or ipsevices</td>
<td>Network Advantage</td>
</tr>
<tr>
<td>Cisco minimum:</td>
<td>Cisco minimum:</td>
<td>Cisco minimum:</td>
</tr>
<tr>
<td>IOS XE Gibraltar 16.12.7</td>
<td>IOS XE Gibraltar 16.12.7</td>
<td>IOS XE Amsterdam-17.3.5</td>
</tr>
<tr>
<td>C3650-24PDM</td>
<td>C3850-12X48U</td>
<td>All models.</td>
</tr>
<tr>
<td>C3650-48FQM</td>
<td>C3850-24XU</td>
<td></td>
</tr>
<tr>
<td>C3650-8X24PD</td>
<td>C3850-12XS</td>
<td></td>
</tr>
<tr>
<td>C3650-8X24UQ</td>
<td>C3850-16XS</td>
<td></td>
</tr>
<tr>
<td>C3650-12X48FD</td>
<td>C3850-24XS</td>
<td></td>
</tr>
<tr>
<td>C3650-12X48UQ</td>
<td>C3850-32XS</td>
<td></td>
</tr>
<tr>
<td>C3650-12X48UR</td>
<td>C3850-48XS</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE: The following Cisco models PTP is not supported on all ports.**

- **C9300-48UXM only ports 1-16, 18-34, 36, 38, 44 support PTP.**
- **C9300-48UN only ports 1-36, 38 support PTP.**

Catalyst 3650 and 3850 series switches have been certified by the Avnu Alliance.

Catalyst 9300 and 9500 series switches have been certified by the Avnu Alliance.
The following Cisco license levels are required for AVB support.

- ipbase or ipservices license level for Catalyst 3000 family.
- Network Advantage for Catalyst 9000 family.
- DNA Subscription license not required for AVB support.

Cisco recommends the following minimum Cisco IOS® XE Software release versions are required for AVB support.

- IOS XE Gibraltar-16.12.7 for Catalyst 3000 family.
- IOS XE Amsterdam-17.3.5 for the Catalyst 9000 family

Please always follow Cisco recommendations for newer versions of IOS.

Limitations

Cisco Catalyst IOS applies following limitations apply when AVB is enabled:

- AVB is not supported on StackWise connected switches. Fiber and copper uplinks are supported.
- AVB is not supported on ports that are combined using link aggregation (EtherChannel).
- Cisco specifies up to 200 streams are supported per switch*** Biamp has successfully tested with up to 143 streams per switch.

Enabling AVB

**Prerequisites:**

- Cisco IOS XE Software with AVB support.
- Switches have appropriate license levels.
- User has access to CLI with configure permissions.
- Switches are not in stacking mode
- Interfaces are not configured for Etherchannel
- Default VLAN 1 / Native VLAN 1 must be enabled on AVB ports
- Default username *cisco*. The default password is the serial number of the switch chassis.

**Step 1 - Enable AVB feature**

Enter the following commands to enable AVB and MVRP (automatic VLAN) on the switch.

<table>
<thead>
<tr>
<th>Command</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch&gt; enable</td>
<td>Enable EXEC mode.</td>
</tr>
<tr>
<td>Switch# configure terminal</td>
<td>Enter global configuration mode.</td>
</tr>
</tbody>
</table>
Command

Switch(config)# avb vlan 2
Switch(config)# avb
Switch(config)# mvrp global
Switch(config)# vtp mode off
Switch(config)# mvrp vlan create
Switch(config)# avb mvrp-join-timer 200
Switch(config)# avb mvrp-leave-timer 1200
Switch(config)# avb mvrp-leaveall-timer 25000
Switch(config)# qos queue-softmax-multiplier 1200
Switch(config)# avb msrp-tx-slow
Switch(config)# end
Switch# write memory

Note

Enable AVB vlan 2
Enable AVB.
Enter MVPR global configuration.
VLAN Trunking Protocol (VTP) can be configured for operation.
Enable MVRP to create VLANs
Set MSRP join timer to expected value
Set MSRP leave timer to expected value
Set MSRP leave-all timer to expected value
QOS increase this buffer requested by Cisco
MSRP optimization command requested by Cisco
End global configuration mode and return to EXEC mode
Save the switch configuration.

For further details, see the Cisco IOS XE command reference guide for configuring Audio Video Bridging.

Step 2 - Configure interfaces with AVB connections to VLAN trunk mode.

Any ports with AVB devices attached must be configured for VLAN trunking mode. The port must also not be administratively shutdown. The following commands show enabling trunk mode for interface GigabitEthernet1/0/1.

Command

Switch> enable
Switch# configure terminal
Switch(config)# interface GigabitEthernet1/0/1
Switch(config-if)# switchport mode trunk
Switch(config-if)# spanning-tree portfast trunk

Note

Enable EXEC mode.
Enter global configuration mode.
Enter interface configuration mode.
Configure VLAN mode to trunk.
Interface moves directly to spanning-tree forwarding state.

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Command | Note
---|---
Switch(config-if)# **ptp sync interval -2**<br>Switch(config-if)# **no shutdown**<br>Switch(config-if)# **end**<br>Switch# **write memory**<br>Switch>enable<br>Switch#configure terminal<br>Switch(config)#interface range GigabitEthernet1/0/1 - 24<br>Switch(config-if-range)#switchport mode trunk<br>Switch(config-if-range)#spanning-tree portfast trunk<br>Switch(config-if-range)#ptp sync interval -2<br>Switch(config-if-range)#no shutdown<br>Switch(config-if-range)#end<br>Switch#write memory<br>Switch#exit

Configuring port by port is time consuming. The following is an example for configuring all ports 1-24 using the interface range command:

**Step 3 - Optional Configuration of interfaces connecting to devices requiring class 4 (POE+ and PPoE).**

Biamp class 4 devices will require additional 2-event classification commands to negotiate with Cisco Power Sourcing Equipment (PSE).

Cisco indicates 2-event classification allows class 4 Powered devices (PDs) to detect a PSE capability of providing 30W from hardware then register itself moving upward to PoE+ level without waiting for any CDP/LLDP packet exchange.

After 2-event is enabled on a port, you must manually shut/un-shut the port or re-connect the PD again to re-start the IEEE detection process.

Note that power budget allocation for a class-4 device will be 30W when 2-event classification is enabled on the port; otherwise it will be 15.4W.

The following is an example for configuring all ports 1-24 using the interface range command, 2-event POE configuration with additional easy to identify interface description of BIAMP on the ports:

Switch>enable
Switch#configure terminal
Switch(config)#interface range GigabitEthernet1/0/1 - 24
Switch(config)#description BIAMP
Switch(config-if-range)#power inline port 2-event
Switch(config-if-range)#shutdown
Switch(config-if-range)#no shutdown
Switch(config-if-range)#end
Switch#write memory
Switch#exit

The switch does not require a reboot. Connected AVB enabled end points will begin transmitting protocol messages within moments of configuring the switch. Many other specific configuration options are available for the AVB protocols. Please see the IOS XE command reference guides for further details.

AVB status and monitoring commands

The following commands are used to view the status of AVB on the switch and for assisting with diagnosing issues.

<table>
<thead>
<tr>
<th>Command</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>show msrp stream</td>
<td>Shows the total amount of AVB streams.</td>
</tr>
<tr>
<td>show msrp stream</td>
<td>Shows a high level overview of AVB operation on the switch, stream reservation domain active ports, gPTP neighbor delay, VLAN membership.</td>
</tr>
<tr>
<td>show avb domain</td>
<td>Displays a high level overview of all AVB streams advertised on the network.</td>
</tr>
<tr>
<td>show avb stream</td>
<td>Provides a brief view of AVB streams on the network.</td>
</tr>
<tr>
<td>show msrp streams brief</td>
<td>Provides a detailed output of AVB streams and reservations on the network.</td>
</tr>
<tr>
<td>show msrp streams detail</td>
<td>Shows current stream reservation consumption on the switch.</td>
</tr>
<tr>
<td>show msrp port bandwidth</td>
<td>Shows a summary of VLANs created automatically.</td>
</tr>
<tr>
<td>show mvrp summary</td>
<td>Displays interface specific MVRP details.</td>
</tr>
<tr>
<td>show mvrp interface</td>
<td>Shows a brief overview of gPTP operation.</td>
</tr>
<tr>
<td>show ptp brief</td>
<td>Shows the current clock details.</td>
</tr>
</tbody>
</table>
### Command

- `show ptp parent`
- `show platform software fed switch active ptp if-id {interface-id}`
- `show version`
- `show license right-to-use`

### Note

- Shows details of the parent clock.
- Detailed output of the gPTP operation of a port. Provides neighbor delay threshold and current measured neighbor delay.
- Shows details of the switch's software version. See [Enabling AVB on Cisco Catalyst Switches](#)
- Shows details of the switch's enabled licenses. See [Enabling AVB on Cisco Catalyst Switches](#)

### Further reading

- [List of AVB-capable Ethernet switches](#)
- [Understand AVB in Catalyst 3K and Catalyst 9000 Series Switches](#)
- [Cisco.com AVB website](#)
- [Cisco Audio Video Bridging Configuration Guide, Cisco IOS XE Gibraltar 16.12.x (Catalyst 3850 Switches)](#)
- [Release Notes for Cisco Catalyst 3850 Series Switches, Cisco IOS XE Gibraltar 16.12.x](#)
- [Cisco Audio Video Bridging Configuration Guide, Cisco IOS XE Gibraltar 16.12.x (Catalyst 3650 Switches)](#)
- [Release Notes for Cisco Catalyst 3650 Series Switches, Cisco IOS XE Gibraltar 16.12.x](#)
- [Command Reference, Cisco IOS XE Cupertino 17.7.x (Catalyst 9300 Switches)](#)
- [Configuring 2-event (PoE+) Classification](#)
- [Extensive PoE Configuration details - C3850](#)
- "POE in depth" Biamp Cornerstone