Layer 2/3 Commands

channel-group

To assign an Ethernet port to an EtherChannel group, or to enable an EtherChannel mode, or both, use the **channel-group** command in interface configuration mode. To remove an Ethernet port from an EtherChannel group, use the **no** form of this command.

channel-group *channel-group-number* **mode** {**active** | **auto** [**non-silent**] | **desirable** [**non-silent**] | **on** | **passive**}
no channel-group

Syntax Description

channel-group-number	Channel group number. The range is 1 to 192.
mode	Specifies the EtherChannel mode.
active	Unconditionally enables Link Aggregation Control Protocol (LACP).
auto	Enables the Port Aggregation Protocol (PAgP) only if a PAgP device is detected.
non-silent	(Optional) Configures the interface for nonsilent operation when connected to a partner that is PAgP-capable. Use in PAgP mode with the **auto** or **desirable** keyword when traffic is expected from the other device.
desirable	Unconditionally enables PAgP.
on	Enables the on mode.
passive	Enables LACP only if a LACP device is detected.

Command Default

No channel groups are assigned.

No mode is configured.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

For Layer 2 EtherChannels, the **channel-group** command automatically creates the port-channel interface when the channel group gets its first physical port. You do not have to use the **interface port-channel** command

in global configuration mode to manually create a port-channel interface. If you create the port-channel interface first, the *channel-group-number* can be the same as the *port-channel-number*, or you can use a new number. If you use a new number, the **channel-group** command dynamically creates a new port channel.

Although it is not necessary to disable the IP address that is assigned to a physical port that is part of a channel group, we strongly recommend that you do so.

You create Layer 3 port channels by using the **interface port-channel** command followed by the **no switchport** interface configuration command. Manually configure the port-channel logical interface before putting the interface into the channel group.

After you configure an EtherChannel, configuration changes that you make on the port-channel interface apply to all the physical ports assigned to the port-channel interface. Configuration changes applied to the physical port affect only the port where you apply the configuration. To change the parameters of all ports in an EtherChannel, apply configuration commands to the port-channel interface, for example, spanning-tree commands or commands to configure a Layer 2 EtherChannel as a trunk.

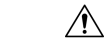
Active mode places a port into a negotiating state in which the port initiates negotiations with other ports by sending LACP packets. A channel is formed with another port group in either the active or passive mode.

Auto mode places a port into a passive negotiating state in which the port responds to PAgP packets it receives but does not start PAgP packet negotiation. A channel is formed only with another port group in desirable mode. When auto is enabled, silent operation is the default.

Desirable mode places a port into an active negotiating state in which the port starts negotiations with other ports by sending PAgP packets. An EtherChannel is formed with another port group that is in the desirable or auto mode. When desirable is enabled, silent operation is the default.

If you do not specify non-silent with the auto or desirable mode, silent is assumed. The silent mode is used when the switch is connected to a device that is not PAgP-capable and rarely, if ever, sends packets. An example of a silent partner is a file server or a packet analyzer that is not generating traffic. In this case, running PAgP on a physical port prevents that port from ever becoming operational. However, it allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission. Both ends of the link cannot be set to silent.

In on mode, a usable EtherChannel exists only when both connected port groups are in the on mode.



Caution Use care when using the on mode. This is a manual configuration, and ports on both ends of the EtherChannel must have the same configuration. If the group is misconfigured, packet loss or spanning-tree loops can occur.

Passive mode places a port into a negotiating state in which the port responds to received LACP packets but does not initiate LACP packet negotiation. A channel is formed only with another port group in active mode.

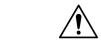
Do not configure an EtherChannel in both the PAgP and LACP modes. EtherChannel groups running PAgP and LACP can coexist on the same switch or on different switches in the stack (but not in a cross-stack configuration). Individual EtherChannel groups can run either PAgP or LACP, but they cannot interoperate.

If you set the protocol by using the **channel-protocol** interface configuration command, the setting is not overridden by the **channel-group** interface configuration command.

Do not configure a port that is an active or a not-yet-active member of an EtherChannel as an IEEE 802.1x port. If you try to enable IEEE 802.1x authentication on an EtherChannel port, an error message appears, and IEEE 802.1x authentication is not enabled.

Do not configure a secure port as part of an EtherChannel or configure an EtherChannel port as a secure port.

For a complete list of configuration guidelines, see the "Configuring EtherChannels" chapter in the software configuration guide for this release.



Caution Do not enable Layer 3 addresses on the physical EtherChannel ports. Do not assign bridge groups on the physical EtherChannel ports because it creates loops.

This example shows how to configure an EtherChannel on a single switch in the stack. It assigns two static-access ports in VLAN 10 to channel 5 with the PAgP mode desirable:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/1 - 2
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode desirable
Device(config-if-range)# end
```

This example shows how to configure an EtherChannel on a single switch in the stack. It assigns two static-access ports in VLAN 10 to channel 5 with the LACP mode active:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/1 - 2
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode active
Device(config-if-range)# end
```

This example shows how to configure a cross-stack EtherChannel in a switch stack. It uses LACP passive mode and assigns two ports on stack member 2 and one port on stack member 3 as static-access ports in VLAN 10 to channel 5:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/4 - 5
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode passive
Device(config-if-range)# exit
Device(config)# interface GigabitEthernet 3/0/3
Device(config-if)# switchport mode access
Device(config-if)# switchport access vlan 10
Device(config-if)# channel-group 5 mode passive
Device(config-if)# exit
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

channel-protocol

To restrict the protocol used on a port to manage channeling, use the **channel-protocol** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

channel-protocol {**lacp** | **pagp**}
no channel-protocol

Syntax Description

lacp	Configures an EtherChannel with the Link Aggregation Control Protocol (LACP).
pagp	Configures an EtherChannel with the Port Aggregation Protocol (PAgP).

Command Default

No protocol is assigned to the EtherChannel.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use the **channel-protocol** command only to restrict a channel to LACP or PAgP. If you set the protocol by using the **channel-protocol** command, the setting is not overridden by the **channel-group** command in interface configuration mode.

You must use the **channel-group** command in interface configuration mode to configure the EtherChannel parameters. The **channel-group** command also can set the mode for the EtherChannel.

You cannot enable both the PAgP and LACP modes on an EtherChannel group.

PAgP and LACP are not compatible; both ends of a channel must use the same protocol.

You cannot configure PAgP on cross-stack configurations.

This example shows how to specify LACP as the protocol that manages the EtherChannel:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# channel-protocol lacp
```

You can verify your settings by entering the **show etherchannel** [*channel-group-number*] **protocol** command in privileged EXEC mode.

clear l2protocol-tunnel counters

To clear the protocol counters in protocol tunnel ports, use the **clear l2protocol-tunnel counters** command in privileged EXEC mode.

clear l2protocol-tunnel counters [*interface-id*]

Syntax Description

interface-id	(Optional) The interface (physical interface or port cha counters are to be cleared.

Command Default

None

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

Usage Guidelines

Use this command to clear protocol tunnel counters on the switch or on the specified interface.

This example shows how to clear Layer 2 protocol tunnel counters on an interface:

```
Device# clear l2protocol-tunnel counters gigabitethernet1/0/3
```

clear lacp

To clear Link Aggregation Control Protocol (LACP) channel-group counters, use the **clear lacp** command in privileged EXEC mode.

clear lacp [*channel-group-number*] **counters**

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 192.
counters	Clears traffic counters.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can clear all counters by using the **clear lacp counters** command, or you can clear only the counters for the specified channel group by using the **clear lacp** *channel-group-number* **counters** command.

This example shows how to clear all channel-group information:

```
Device> enable
Device# clear lacp counters
```

This example shows how to clear LACP traffic counters for group 4:

```
Device> enable
Device# clear lacp 4 counters
```

You can verify that the information was deleted by entering the **show lacp counters** or the **show lacp** *channel-group-number* **counters** command in privileged EXEC mode.

clear pagp

To clear the Port Aggregation Protocol (PAgP) channel-group information, use the **clear pagp** command in privileged EXEC mode.

clear pagp [*channel-group-number*] **counters**

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 192.
counters	Clears traffic counters.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can clear all counters by using the **clear pagp counters** command, or you can clear only the counters for the specified channel group by using the **clear pagp** *channel-group-number* **counters** command.

This example shows how to clear all channel-group information:

```
Device> enable
Device# clear pagp counters
```

This example shows how to clear PAgP traffic counters for group 10:

```
Device> enable
Device# clear pagp 10 counters
```

You can verify that the information was deleted by entering the **show pagp** command in privileged EXEC mode.

clear spanning-tree counters

To clear the spanning-tree counters, use the **clear spanning-tree counters** command in privileged EXEC mode.

clear spanning-tree counters [**interface** *interface-id*]

Syntax Description

interface *interface-id*	(Optional) Clears all spanning-tree counters on the specified include physical ports, VLANs, and port channels. The VLAN range is 1 to 4094. The port channel range is 1 to 128.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

If the *interface-id* value is not specified, spanning-tree counters are cleared for all interfaces.

This example shows how to clear spanning-tree counters for all interfaces:

```
Device> enable
Device# clear spanning-tree counters
```

clear spanning-tree detected-protocols

To restart the protocol migration process and force renegotiation with neighboring devices on the interface, use the **clear spanning-tree detected-protocols** command in privileged EXEC mode.

clear spanning-tree detected-protocols [**interface** *interface-id*]

Syntax Description

interface *interface-id*	(Optional) Restarts the protocol migration process on the specified in channels. The VLAN range is 1 to 4094. The port-channel range is 1 to 192.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

A device running the rapid per-VLAN spanning-tree plus (rapid-PVST+) protocol or the Multiple Spanning Tree Protocol (MSTP) supports a built-in protocol migration method that enables it to interoperate with legacy IEEE 802.1D devices. If a rapid-PVST+ or an MSTP device receives a legacy IEEE 802.1D configuration bridge protocol data unit (BPDU) with the protocol version set to 0, the device sends only IEEE 802.1D BPDUs on that port. A multiple spanning-tree (MST) device can also detect that a port is at the boundary of a region when it receives a legacy BPDU, an MST BPDU (Version 3) associated with a different region, or a rapid spanning-tree (RST) BPDU (Version 2).

The device does not automatically revert to the rapid-PVST+ or the MSTP mode if it no longer receives IEEE 802.1D BPDUs because it cannot learn whether the legacy switch has been removed from the link unless the legacy switch is the designated switch. Use the **clear spanning-tree detected-protocols** command in this situation.

This example shows how to restart the protocol migration process on a port:

```
Device> enable
Device# clear spanning-tree detected-protocols interface gigabitethernet2/0/1
```

debug etherchannel

To enable debugging of EtherChannels, use the **debug etherchannel** command in privileged EXEC mode. To disable debugging, use the **no** form of the command.

debug etherchannel [{**all** | **detail** | **error** | **event** | **idb** }]
no debug etherchannel [{**all** | **detail** | **error** | **event** | **idb** }]

Syntax Description

all	(Optional) Displays all EtherChannel debug messages.
detail	(Optional) Displays detailed EtherChannel debug messages.
error	(Optional) Displays EtherChannel error debug messages.
event	(Optional) Displays EtherChannel event messages.
idb	(Optional) Displays PAgP interface descriptor block debug messages.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug etherchannel** command is the same as the **no debug etherchannel** command.

Note Although the **linecard** keyword is displayed in the command-line help, it is not supported.

This example shows how to display all EtherChannel debug messages:

```
Device> enable
Device# debug etherchannel all
```

This example shows how to display debug messages related to EtherChannel events:

```
Device> enable
Device# debug etherchannel event
```

debug lacp

To enable debugging of Link Aggregation Control Protocol (LACP) activity, use the **debug lacp** command in privileged EXEC mode. To disable LACP debugging, use the **no** form of this command.

debug lacp [{**all** | **event** | **fsm** | **misc** | **packet**}]
no debug lacp [{**all** | **event** | **fsm** | **misc** | **packet**}]

Syntax Description

all	(Optional) Displays all LACP debug messages.
event	(Optional) Displays LACP event debug messages.
fsm	(Optional) Displays messages about changes within the LACP finite state machine.
misc	(Optional) Displays miscellaneous LACP debug messages.
packet	(Optional) Displays the receiving and transmitting LACP control packets.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug etherchannel** command is the same as the **no debug etherchannel** command.

This example shows how to display all LACP debug messages:

```
Device> enable
Device# debug LACP all
```

This example shows how to display debug messages related to LACP events:

```
Device> enable
Device# debug LACP event
```

debug pagp

To enable debugging of Port Aggregation Protocol (PAgP) activity, use the **debug pagp** command in privileged EXEC mode. To disable PAgP debugging, use the **no** form of this command.

debug pagp [{**all** | **dual-active** | **event** | **fsm** | **misc** | **packet**}]
no debug pagp [{**all** | **dual-active** | **event** | **fsm** | **misc** | **packet**}]

Syntax Description

all	(Optional) Displays all PAgP debug messages.
dual-active	(Optional) Displays dual-active detection messages.
event	(Optional) Displays PAgP event debug messages.
fsm	(Optional) Displays messages about changes within the PAgP finite state machine.
misc	(Optional) Displays miscellaneous PAgP debug messages.
packet	(Optional) Displays the receiving and transmitting PAgP control packets.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug pagp** command is the same as the **no debug pagp** command.

This example shows how to display all PAgP debug messages:

```
Device> enable
Device# debug pagp all
```

This example shows how to display debug messages related to PAgP events:

```
Device> enable
Device# debug pagp event
```

debug platform pm

To enable debugging of the platform-dependent port manager software module, use the **debug platform pm** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

debug platform pm {**all** | **counters** | **errdisable** | **fec** | **if-numbers** | **l2-control** | **link-status** | **platform** | **pm-vectors** [**detail**] | **ses** | **vlans**}
no debug platform pm {**all** | **counters** | **errdisable** | **fec** | **if-numbers** | **l2-control** | **link-status** | **platform** | **pm-vectors** [**detail**] | **ses** | **vlans**}

Syntax Description

all	Displays all port manager debug messages.
counters	Displays counters for remote procedure call (RPC) debug messages.
errdisable	Displays error-disabled-related events debug messages.
fec	Displays forwarding equivalence class (FEC) platform-related events debug messages.
if-numbers	Displays interface-number translation event debug messages.
l2-control	Displays Layer 2 control infra debug messages.
link-status	Displays interface link-detection event debug messages.
platform	Displays port manager function event debug messages.
pm-vectors	Displays port manager vector-related event debug messages.
detail	(Optional) Displays vector-function details.
ses	Displays service expansion shelf (SES) related event debug messages.
vlans	Displays VLAN creation and deletion event debug messages.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug platform pm** command is the same as the **no debug platform pm** command.

This example shows how to display debug messages related to the creation and deletion of VLANs:

```
Device> enable
Device# debug platform pm vlans
```

debug platform udld

To enable debugging of the platform-dependent UniDirectional Link Detection (UDLD) software, use the **debug platform udld** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

debug platform udld [{**error** | **event**}] [**switch** *switch-number*]
no debug platform udld [{**error** | **event**}] [**switch** *switch-number*]

Syntax Description

error	(Optional) Displays error condition debug messages.
event	(Optional) Displays UDLD-related platform event debug messages.
switch *switch-number*	(Optional) Displays UDLD debug messages for the specified stack member.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug platform udld** command is the same as the **no debug platform udld** command.

When you enable debugging on a switch stack, it is enabled only on the active switch. To enable debugging on a stack member, you can start a session from the active switch by using the **session** *switch-number* command in privileged EXEC mode. Then enter the **debug** command at the command-line prompt of the stack member.

debug spanning-tree

To enable debugging of spanning-tree activities, use the **debug spanning-tree** command in EXEC mode. To disable debugging, use the **no** form of this command.

debug spanning-tree {**all** | **backbonefast** | **bpdu** | **bpdu-opt** | **config** | **etherchannel** | **events** | **exceptions** | **general** | **ha** | **mstp** | **pvst+** | **root** | **snmp** | **synchronization** | **switch** | **uplinkfast**}
no debug spanning-tree {**all** | **backbonefast** | **bpdu** | **bpdu-opt** | **config** | **etherchannel** | **events** | **exceptions** | **general** | **mstp** | **pvst+** | **root** | **snmp** | **synchronization** | **switch** | **uplinkfast**}

Syntax Description

all	Displays all spanning-tree debug messages.
backbonefast	Displays BackboneFast-event debug messages.
bpdu	Displays spanning-tree bridge protocol data unit (BPDU) debug messages.
bpdu-opt	Displays optimized BPDU handling debug messages.
config	Displays spanning-tree configuration change debug messages.
etherchannel	Displays EtherChannel-support debug messages.
events	Displays spanning-tree topology event debug messages.
exceptions	Displays spanning-tree exception debug messages.
general	Displays general spanning-tree activity debug messages.
ha	Displays high-availability spanning-tree debug messages.
mstp	Debugs Multiple Spanning Tree Protocol (MSTP) events.
pvst+	Displays per-VLAN spanning-tree plus (PVST+) event debug messages.
root	Displays spanning-tree root-event debug messages.
snmp	Displays spanning-tree Simple Network Management Protocol (SNMP) handling debug messages.
switch	Displays switch shim command debug messages. This shim is the software module that is the interface between the generic Spanning Tree Protocol (STP) code and the platform-specific code of various device platforms.
synchronization	Displays the spanning-tree synchronization event debug messages.
uplinkfast	Displays UplinkFast-event debug messages.

Command Default

Debugging is disabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **undebug spanning-tree** command is the same as the **no debug spanning-tree** command.

When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch, start a session from the active switch by using the **session** *switch-number* command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command** *switch-number LINE* command in privileged EXEC mode.

This example shows how to display all spanning-tree debug messages:

```
Device> enable
Device# debug spanning-tree all
```

instance (VLAN)

To map a VLAN or a group of VLANs to a multiple spanning tree (MST) instance, use the **instance** command in MST configuration mode. To return the VLANs to the default internal spanning tree (CIST) instance, use the **no** form of this command.

instance *instance-id* **vlans** *vlan-range*
no instance *instance-id*

Syntax Description

instance-id	Instance to which the specified VLANs are mapped. The range is from 0 to 4094.
vlans *vlan-range*	Specifies the number of the VLANs to be mapped to the specified instance. The range is from 1 to 4094.

Command Default

No VLANs are mapped to any MST instance (all VLANs are mapped to the CIST instance).

Command Modes

MST configuration mode (config-mst)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **vlans** *vlan-range* is entered as a single value or a range.

The mapping is incremental, not absolute. When you enter a range of VLANs, this range is added or removed to the existing instances.

Any unmapped VLAN is mapped to the CIST instance.

Examples

The following example shows how to map a range of VLANs to instance 2:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# instance 2 vlans 1-100
Device(config-mst)#
```

The following example shows how to map a VLAN to instance 5:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# instance 5 vlans 1100
Device(config-mst)#
```

The following example shows how to move a range of VLANs from instance 2 to the CIST instance:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# no instance 2 vlans 40-60
Device(config-mst)#
```

The following example shows how to move all the VLANs that are mapped to instance 2 back to the CIST instance:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# no instance 2
Device(config-mst)#
```

Related Commands

Command	Description
name (MST configuration mode)	Sets the name of an MST region.
revision	Sets the revision number for the MST configuration.
show spanning-tree mst	Displays the information about the MST protocol.
spanning-tree mst configuration	Enters MST configuration mode.

interface port-channel

To access or create a port channel, use the **interface port-channel** command in global configuration mode. Use the **no** form of this command to remove the port channel.

interface port-channel *port-channel-number*
no interface port-channel

Syntax Description

port-channel-number	Channel group number. The range is 1 to 192.

Command Default

No port channel logical interfaces are defined.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

For Layer 2 EtherChannels, you do not have to create a port-channel interface before assigning physical ports to a channel group. Instead, you can use the **channel-group** command in interface configuration mode, which automatically creates the port-channel interface when the channel group obtains its first physical port. If you create the port-channel interface first, the *channel-group-number* can be the same as the *port-channel-number*, or you can use a new number. If you use a new number, the **channel-group** command dynamically creates a new port channel.

You create Layer 3 port channels by using the **interface port-channel** command followed by the **no switchport** command in interface configuration mode. You should manually configure the port-channel logical interface before putting the interface into the channel group.

Only one port channel in a channel group is allowed.

Caution When using a port-channel interface as a routed port, do not assign Layer 3 addresses on the physical ports that are assigned to the channel group.

Caution Do not assign bridge groups on the physical ports in a channel group used as a Layer 3 port channel interface because it creates loops. You must also disable spanning tree.

Follow these guidelines when you use the **interface port-channel** command:

- If you want to use the Cisco Discovery Protocol (CDP), you must configure it on the physical port and not on the port channel interface.
- Do not configure a port that is an active member of an EtherChannel as an IEEE 802.1x port. If IEEE 802.1x is enabled on a not-yet active port of an EtherChannel, the port does not join the EtherChannel.

For a complete list of configuration guidelines, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.

This example shows how to create a port channel interface with a port channel number of 5:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 5
```

You can verify your setting by entering either the **show running-config** in privileged EXEC mode or the **show etherchannel** *channel-group-number* **detail** command in privileged EXEC mode.

l2protocol-tunnel

To enable tunneling of Layer 2 protocols on an access port, IEEE 802.1Q tunnel port, or a port channel, use the **l2protocol-tunnel** command in interface configuration mode on the switch stack or on a standalone switch. Use the **no** form of this command to disable tunneling on the interface.

l2protocol-tunnel [{**drop-threshold** | **shutdown-threshold**}] [*value*] [{**cdp** | **stp** | **vtp** }] [**lldp**] [{**point-to-point** | [{**pagp** | **lacp** | **udld**}]}]
no l2protocol-tunnel [{**drop-threshold** | **shutdown-threshold**}] [*value*] [{**cdp** | **stp** | **vtp** }] [**lldp**] [{**point-to-point** | [{**pagp** | **lacp** | **udld**}]}]

Syntax Description

drop-threshold	(Optional) Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets.
shutdown-threshold	(Optional) Sets a shutdown threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface is shut down.
value	A threshold in packets per second to be received for encapsulation before the interface shuts down, or the threshold before the interface drops packets. The range is 1 to 4096. The default is no threshold.
cdp	(Optional) Enables tunneling of CDP, specifies a shutdown threshold for CDP, or specifies a drop threshold for CDP.
stp	(Optional) Enables tunneling of STP, specifies a shutdown threshold for STP, or specifies a drop threshold for STP.
vtp	(Optional) Enables tunneling or VTP, specifies a shutdown threshold for VTP, or specifies a drop threshold for VTP.
lldp	(Optional) Enables tunneling of LLDP packets.
point-to-point	(Optional) Enables point-to point tunneling of PAgP, LACP, and UDLD packets.
pagp	(Optional) Enables point-to-point tunneling of PAgP, specifies a shutdown threshold for PAgP, or specifies a drop threshold for PAgP.
lacp	(Optional) Enables point-to-point tunneling of LACP, specifies a shutdown threshold for LACP, or specifis a drop threshold for LACP.
udld	(Optional) Enables point-to-point tunneling of UDLD, specifies a shutdown threshold for UDLD, or specifies a drop threshold for UDLD.

Command Default

The default is that no Layer 2 protocol packets are tunneled.

The default is no shutdown threshold for the number of Layer 2 protocol packets.

The default is no drop threshold for the number of Layer 2 protocol packets.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

Usage Guidelines

You can enable tunneling for Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. You can also enable point-to-point tunneling for Port Aggregation Protocol (PAgP), Link Aggregation Control Protocol (LACP), or UniDirectional Link Detection (UDLD) packets.

You must enter this command, with or without protocol types, to tunnel Layer 2 packets.

If you enter this command for a port channel, all ports in the channel must have the same configuration.

Layer 2 protocol tunneling across a service-provider network ensures that Layer 2 information is propagated across the network to all customer locations. When protocol tunneling is enabled, protocol packets are encapsulated with a well-known Cisco multicast address for transmission across the network. When the packets reach their destination, the well-known MAC address is replaced by the Layer 2 protocol MAC address.

You can enable Layer 2 protocol tunneling for CDP, STP, and VTP individually or for all three protocols.

In a service-provider network, you can use Layer 2 protocol tunneling to enhance the creation of EtherChannels by emulating a point-to-point network topology. When protocol tunneling is enabled on the service-provider switch for PAgP or LACP, remote customer switches receive the protocol data units (PDUs) and can negotiate automatic creation of EtherChannels.

To enable tunneling of PAgP, LACP, and UDLD packets, you must have a point-to-point network topology. To decrease the link-down detection time, you should also enable UDLD on the interface when you enable tunneling of PAgP or LACP packets.

You can enable point-to-point protocol tunneling for PAgP, LACP, and UDLD individually or for all three protocols.

Caution PAgP, LACP, and UDLD tunneling is only intended to emulate a point-to-point topology. An erroneous configuration that sends tunneled packets to many ports could lead to a network failure.

Enter the **shutdown-threshold** keyword to control the number of protocol packets per second that are received on an interface before it shuts down. When no protocol option is specified with the keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a drop threshold on the interface, the shutdown-threshold value must be greater than or equal to the drop-threshold value.

When the shutdown threshold is reached, the interface is error-disabled. If you enable error recovery by entering the **errdisable recovery cause l2ptguard** global configuration command, the interface is brought out of the error-disabled state and allowed to retry the operation again when all the causes have timed out. If the error recovery function is not enabled for **l2ptguard**, the interface stays in the error-disabled state until you enter the **shutdown** and **no shutdown** interface configuration commands.

Enter the **drop-threshold** keyword to control the number of protocol packets per second that are received on an interface before it drops packets. When no protocol option is specified with a keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a shutdown threshold on the interface, the drop-threshold value must be less than or equal to the shutdown-threshold value.

When the drop threshold is reached, the interface drops Layer 2 protocol packets until the rate at which they are received is below the drop threshold.

The configuration is saved in NVRAM.

For more information about Layer 2 protocol tunneling, see the software configuration guide for this release.

Examples

This example shows how to enable protocol tunneling for CDP packets and to configure the shutdown threshold as 50 packets per second:

```
Device(config-if)# l2protocol-tunnel cdp
Device(config-if)# l2protocol-tunnel shutdown-threshold cdp 50
```

This example shows how to enable protocol tunneling for STP packets and to configure the drop threshold as 400 packets per second:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet1/0/11
Device(config-if)# l2protocol-tunnel stp
Device(config-if)# l2protocol-tunnel drop-threshold stp 400
```

This example shows how to enable point-to-point protocol tunneling for PAgP and UDLD packets and to configure the PAgP drop threshold as 1000 packets per second:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# switchport access vlan 19
Device(config-if)# switchport mode dot1q-tunnel
Device(config-if)# l2protocol-tunnel point-to-point pagp
Device(config-if)# l2protocol-tunnel point-to-point udld
Device(config-if)# l2protocol-tunnel drop-threshold point-to-point pagp 1000
```

lacp fast-switchover

To enable Link Aggregation Control Protocol (LACP) 1:1 link redundancy, use the **lacp fast-switchover** command in interface configuration mode. To disable LACP 1:1 link redundancy, use the **no** form of this command.

lacp fast-switchover [**dampening** *time*]
no lacp fast-switchover [**dampening** *time*]

Syntax Description

dampening *time*	Enables LACP 1:1 hot-standby dampening. The range is 30 to 180 seconds.

Command Default

LACP 1:1 link redundancy is disabled by default.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.3.1	This command was introduced.

Usage Guidelines

Prior to entering the **lacp fast-switchover** command, you must ensure the following:

- The port channel protocol type is LACP.
- The **lacp max-bundle 1** command has been entered on the port channel. The **lacp fast-switchover** command will not affect the **lacp max-bundle** command.

Prior to entering the **lacp fast-switchover dampening** command, you must ensure the following:

- The port channel protocol type is LACP.
- The **lacp max-bundle 1** and **lacp fast-switchover** commands have been entered on the port channel.

When you enable LACP 1:1 link redundancy, based on the system priority and port priority, the port with the higher system priority chooses the link as the active link and the other link as the standby link (lower the LACP port priority, higher the preference, and lower the LACP system priority, higher the preference). In the case of LACP 1:1 redundancy feature, when the active link fails, the standby link is selected as the new active link without taking down the port channel. When the original active link recovers, it reverts to its active link status. During this change-over, the port channel is also up.

In the case of LACP 1:1 hot standby dampening feature, it configures a timer that delays switchover back to the higher priority port after it becomes active.

Note

- We recommend that you configure two ports only (one active and one hot-standby) in the bundle for optimum performance.
- LACP 1:1 redundancy must be enabled at both ends of the LACP EtherChannel.
- LACP 1:1 redundancy and dampening works only on LACP port-channels.

Examples

This example shows how to enable LACP 1:1 link redundancy:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 40
Device(config-if)# lacp fast-switchover
Device(config-if)# lacp max-bundle 1
```

This example shows how to enable LACP 1:1 hot standby dampening:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 40
Device(config-if)# lacp fast-switchover
Device(config-if)# lacp max-bundle 1
Device(config-if)# lacp fast-switchover dampening 70
```

Related Commands

Command	Description
lacp max-bundle	Assigns and configures an EtherChannel interface to an EtherChannel group.
show etherchannel	Displays the EtherChannel information for a channel.
show lacp	Displays the LACP channel-group information.

lacp max-bundle

To define the maximum number of active LACP ports allowed in a port channel, use the **lacp max-bundle** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

lacp max-bundle *max_bundle_number*
no lacp max-bundle

Syntax Description

max_bundle_number	The maximum number of active LACP ports in the port channel. The range is 1 to 8. The default is 8.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in hot-standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.

The **lacp max-bundle** command must specify a number greater than the number specified by the **port-channel min-links** command.

Use the **show etherchannel summary** command in privileged EXEC mode to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

This example shows how to specify a maximum of five active LACP ports in port channel 2:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 2
Device(config-if)# lacp max-bundle 5
```

lacp port-priority

To configure the port priority for the Link Aggregation Control Protocol (LACP), use the **lacp port-priority** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

lacp port-priority *priority*
no lacp port-priority

Syntax Description

priority	Port priority for LACP. The range is 1 to 65535.

Command Default

The default is 32768.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **lacp port-priority** command in interface configuration mode determines which ports are bundled and which ports are put in hot-standby mode when there are more than eight ports in an LACP channel group.

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode.

In port-priority comparisons, a numerically lower value has a higher priority: When there are more than eight ports in an LACP channel group, the eight ports with the numerically lowest values (highest priority values) for LACP port priority are bundled into the channel group, and the lower-priority ports are put in hot-standby mode. If two or more ports have the same LACP port priority (for example, they are configured with the default setting of 65535), then an internal value for the port number determines the priority.

Note The LACP port priorities are only effective if the ports are on the device that controls the LACP link. See the **lacp system-priority** command in global configuration mode for determining which device controls the link.

Use the **show lacp internal** command in privileged EXEC mode to display LACP port priorities and internal port number values.

For information about configuring LACP on physical ports, see the configuration guide for this release.

This example shows how to configure the LACP port priority on a port:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# lacp port-priority 1000
```

You can verify your settings by entering the **show lacp** [*channel-group-number*] **internal** command in privileged EXEC mode.

lacp rate

To set the rate at which Link Aggregation Control Protocol (LACP) control packets are ingressed to an LACP-supported interface, use the **lacp rate** command in interface configuration mode. To return to the default settings, use the **no** form of this command

lacp rate {**normal** | **fast**}
no lacp rate

Syntax Description

normal	Specifies that LACP control packets are ingressed at the normal rate, every 30 seconds after the link is bundled.
fast	Specifies that LACP control packets are ingressed at the fast rate, once every 1 second.

Command Default

The default ingress rate for control packets is 30 seconds after the link is bundled.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use this command to modify the duration of LACP timeout. The LACP timeout value on Cisco switch is three times the LACP rate that is configured on the interface. Using the **lacp rate**command, you can select the LACP timeout value for a switch to be either 90 seconds or 3 seconds.

This command is supported only on LACP-enabled interfaces.

This example shows how to specify the fast (1 second) ingress rate on interface GigabitEthernet 0/0:

```
Device> enable
Device# configure terminall
Device(config)# interface gigabitEthernet 0/0
Device(config-if)# lacp rate fast
```

lacp system-priority

To configure the system priority for the Link Aggregation Control Protocol (LACP), use the **lacp system-priority** command in global configuration mode on the device. To return to the default setting, use the **no** form of this command.

lacp system-priority *priority*
no lacp system-priority

Syntax Description

priority	System priority for LACP. The range is 1 to 65535.

Command Default

The default is 32768.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **lacp system-priority** command determines which device in an LACP link controls port priorities.

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.

In priority comparisons, numerically lower values have a higher priority. Therefore, the system with the numerically lower value (higher priority value) for LACP system priority becomes the controlling system. If both devices have the same LACP system priority (for example, they are both configured with the default setting of 32768), the LACP system ID (the device MAC address) determines which device is in control.

The **lacp system-priority** command applies to all LACP EtherChannels on the device.

Use the **show etherchannel summary** command in privileged EXEC mode to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

This example shows how to set the LACP system priority:

```
Device> enable
Device# configure terminal
Device(config)# lacp system-priority 20000
```

You can verify your settings by entering the **show lacp sys-id** command in privileged EXEC mode.

loopdetect

To detect network loops, use the **loopdetect** command in interface configuration mode. To disable loop-detection guard use the **no** form of this command.

loopdetect [*time* | **action syslog** | **source-port**]
no loopdetect [*time* | **action syslog** | **source-port**]

Syntax Description

time	(Optional) Time interval at which loop-detect frames are sent, in seconds. Range: 0 to 10. Default: 5.
action syslog	(Optional) Displays a system message when a loop is detected.
source-port	(Optional) Error-disables the source port.

Command Default

Loop-detection guard is not enabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.2.1	This command was introduced.

Usage Guidelines

You can error-disable either the source port or the destination port depending on your requirement. When the **loopdetect** command is configured without any of the keywords or variables, the feature is enabled and the destination port is error-disabled when a loop is detected.We recommend that you error-disable the source port to better control traffic flow to and from your network.

The **loopdetect action syslog** command displays only a system message and does not error-disable the configured port. The **no loopdetect action syslog** command reverts the system to the last configured option.

Examples

The following example shows how to enable loop-detection guard. In this example, the destination port is error-disabled by default and loop-detect frames are sent at the default time interval of five seconds:

```
Device# enable
Device# configure terminal
Device(config)# interface tengigabitethernet 1/0/18
Device(config-if)# loopdetect
```

The following example shows how to configure the time interval to send loop-detect frames. In this example, loop-detect frames are sent every 7 seconds and destination port is error-disabled when a loop is detected:

```
Device# enable
Device# configure terminal
Device(config)# interface tengigabitethernet 1/0/18
Device(config-if)# loopdetect 7
```

The following example shows how to enable the feature and only display a system message. There is no action taken on either the destination port or the source port:

```
Device# enable
Device# configure terminal
Device(config)# interface tengigabitethernet 1/0/18
Device(config-if)# loopdetect action syslog
```

The following example shows how to enable the feature and error-disable the source port:

```
Device# enable
Device# configure terminal
Device(config)# interface tengigabitethernet 1/0/18
Device(config-if)# loopdetect source-port
```

The following example shows how the **no loopdetect action syslog** command works. In the first part of the example, the feature has been configured to error disable the source port (**loopdetect source-port**). The feature is then reconfigured to display a system message and not error-disable a port (**loopdetect action syslog**). In the last part of the example, the **no** form of the **loopdetect action syslog** command is configured, which causes the system to revert to the last configured option, that is, to error disable the source port.

Part 1: Error-disabling the source port:

```
Device# enable
Device# configure terminal
Device(config)# interface twentyfivegigabitethernet 1/0/20
Device(config-if)# loopdetect source-port
```

Part 2: Reconfiguring to display a system message and not error-disable a port:

```
Device(config-if)# loopdetect action syslog
```

Part 3: Using the **no** form of **loopdetect action syslog** (see `Twe1/0/20`):

```
Device(config-if)# no loopdetect action syslog
Device(config-if)# end

Device# show loopdetect
Interface Interval Elapsed-Time Port-to-Errdisbale     ACTION
--------- -------- ------------ --------------------  ---------
Twe1/0/1      5        3        errdisable Source Port  SYSLOG
Twe1/0/20     5        0        errdisable Source Port  ERRDISABLE
Twe2/0/3      5        2        errdisable Dest Port    ERRDISABLE
Loopdetect is ENABLED
```

Related Commands

Command	Description
show loopdetect	Displays details of all the interfaces where loop-detection guard is enabled.

mvrp vlan creation

To enable dynamic VLAN creation on a device using Multiple VLAN Registration Protocol (MVRP), use the **mvrpvlancreation**command in global configuration mode. To disable dynamic VLAN creation for MVRP, use the **no** form of this command.

mvrp vlan creation
no mvrp vlan creation

Syntax Description

This command has no arguments or keywords.

Command Default

MVRP is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

MVRP dynamic VLAN creation can be used only if Virtual Trunking Protocol (VTP) is in transparent mode.

Examples

The following example shows a command sequence enabling MVRP dynamic VLAN creation. Notice that the device recognizes that the VTP mode is incorrect and rejects the request for dynamic VLAN creation. Once the VTP mode is changed, MVRP dynamic VLAN creation is allowed.

```
Device(config)# mvrp vlan creation
%Command Rejected: VTP is in non-transparent (server) mode.
Device(config)# vtp mode transparent
Setting device to VTP TRANSPARENT mode.
Device(config)# mvrp vlan creation
%VLAN now may be dynamically created via MVRP/
```

Related Commands

Command	Description
mvrp global	Enables MVRP globally on a device.
vtp mode	Sets the mode for VTP mode on the device.

mvrp registration

To set the registrars in a Multiple Registration Protocol (MRP) Attribute Declaration (MAD) instance associated with an interface, use the **mvrpregistration**command in global configuration mode. To disable the registrars, use the **no** form of this command.

mvrp registration {**normal** | **fixed** | **forbidden**}
no mvrp registration

Syntax Description

normal	Registrar responds normally to incoming Multiple VLAN Registration Protocol (MVRP) messages. Normal is the default state.
fixed	Registrar ignores all incoming MVRP messages and remains in the IN state.
forbidden	Registrar ignores all incoming MVRP messages and remains in the EMPTY (MT) state.

Command Default

Registrars are set to the normal state.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **mvrpregistration** command is operational only if MVRP is configured on an interface.

The **nomvrpregistration** command sets the registrar state to the default (normal).

This command can be used to set the registrar in a MAD instance associated with an interface to one of the three states. This command is effective only if MVRP is operational on the interface.

Given that up to 4094 VLANs can be configured on a trunk port, there may be up to 4094 Advanced Services Module (ASM) and Route Switch Module (RSM) pairs in a MAD instance associated with that interface.

Examples

The following example sets a fixed, forbidden, and normal registrar on a MAD instance:

```
Device(config)# mvrp global
%MVRP is now globally enabled. MVRP is operational on IEEE 802.1q trunk ports only.
Device(config)# interface fastethernet2/1
Device(config-if)# mvrp registration fixed
Device(config-if)# interface fastethernet2/2
Device(config-if)# mvrp registration forbidden
Device(config-if)# interface fastethernet2/3
Device(config-if)# no mvrp registration
```

Related Commands

Command	Description
clear mvrp statistics	Clears MVRP-related statistics recorded on one or all MVRP-enabled ports.

Command	Description
debug mvrp	Displays MVRP debugging information.
mvrp global	Enables MVRP globally on a device and on a particular interface.
mvrp mac-learning auto	Enables automatic learning of MAC table entries by MVRP.
mvrp timer	Sets period timers that are used in MRP on a given interface.
mvrp vlan create	Enables an MVRP dynamic VLAN.
show mvrp interface	Displays details of the administrative and operational MVRP states of all or one particular IEEE 802.1Q trunk port in the device.
show mvrp summary	Displays the MVRP configuration at the device level.

mvrp timer

To set period timers that are used in Multiple VLAN Registration Protocol (MVRP) on a given interface, use the **mvrp timer** command in interface configuration mode. To remove the timer value, use the **no** form of this command.

mvrp timer {**join** | **leave** | **leave-all** | **periodic**} [*centiseconds*]
no mvrp timer

Syntax Description

join	Specifies the time interval between two transmit opportunities that are applied to the Applicant State Machine (ASMs).
leave	Specifies the duration time before a registrar is moved to EMPTY (MT) state from leave-all (LV) state.
leave-all	Specifies the time it takes for a LeaveAll timer to expire.
periodic	Sets the timer value to periodic, a fixed value of 100 centiseconds.
centiseconds	Timer value measured in centiseconds. • Join timer value range is 20 to 10000000. • Leave timer value range is 60 to 10000000. • LeaveAll timer value range is 10000 and 10000000. • Periodic timer value is fixed at 100 centiseconds.

Command Default

Join timer value: 20 centiseconds

Leave timer value: 60 centiseconds

LeaveAll timer value: 10000 centiseconds

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **nomvrptimer** command resets the timer value to the default value.

Examples

The following example sets the timer levels on an interface:

```
Device(config)# mvrp global
%MVRP is now globally enabled. MVRP is operational on IEE 802.1q trunk ports.
Device(config)# interface GigabitEthernet 6/1
Device(config-if)# mvrp timer join 30
```

```
Device(config-if)# mvrp timer leave 70
Device(config-if)# mvrp timer leaveAll 15000
```

Related Commands

Command	Description
clear mvrp statistics	Clears MVRP-related statistics recorded on one or all MVRP enabled ports.
debug mvrp	Displays MVRP debugging information.
mvrp global	Enables MVRP globally on a device and on a particular interface.
mvrp mac-learning auto	Enables automatic learning of MAC table entries by MVRP.
mvrp registration	Sets the registrars in a MAD instance associated with an interface.
mvrp vlan create	Enables an MVRP dynamic VLAN.
show mvrp interface	Displays details of the administrative and operational MVRP states of all or one particular IEEE 802.1q trunk port in the device.
show mvrp summary	Displays the MVRP configuration at the device level.

name (MST)

To set the name of a Multiple Spanning Tree (MST) region, use the **name** command in MST configuration submode. To return to the default name, use the **no** form of this command.

name *name*
no name *name*

Syntax Description

name	Name to give the MST region. It can be any string with a maximum length of 32 characters.

Command Modes

MST configuration (config-mst)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Two or more devices with the same VLAN mapping and configuration version number are considered to be in different MST regions if the region names are different.

Note Be careful when using the **name** command to set the name of an MST region. If you make a mistake, you can put the device in a different region. The configuration name is a case-sensitive parameter.

Examples

This example shows how to name a region:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# name Cisco
Device(config-mst)#
```

Related Commands

Command	Description
instance	Maps a VLAN or a set of VLANs to an MST instance.
revision	Sets the revision number for the MST configuration.
show spanning-tree mst	Displays the information about the MST protocol.
spanning-tree mst configuration	Enters MST configuration submode.

no ptp enable

To disable PTP on an interface, use the **no ptp enable** command in interface configuration mode.

To re-enable PTP on the same interface, use the **ptp enable** command in interface configuration mode.

no ptp enable
ptp enable

Syntax Description

This command has no aruguments or keywords.

Command Default

PTP is enabled on all the ports, by default.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to disable PTP on an interface:

```
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# no ptp enable
```

Related Commands

Command	Description
ptp (interface)	Configures PTP on interfaces.
ptp profile dot1as	Enables Generalized Precision Time Protocol (gPTP) globally.

pagp learn-method

To learn the source address of incoming packets received from an EtherChannel port, use the **pagp learn-method** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

pagp learn-method {**aggregation-port** | **physical-port**}
no pagp learn-method

Syntax Description

aggregation-port	Specifies address learning on the logical port channel. The device sends packets to the source using any port in the EtherChannel. This setting is the default. With aggregation-port learning, it is not important on which physical port the packet arrives.
physical-port	Specifies address learning on the physical port within the EtherChannel. The device sends packets to the source using the same port in the EtherChannel from which it learned the source address. The other end of the channel uses the same port in the channel for a particular destination MAC or IP address.

Command Default

The default is aggregation-port (logical port channel).

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The learn method must be configured the same at both ends of the link.

The device supports address learning only on aggregate ports even though the **physical-port** keyword is provided in the command-line interface (CLI). The **pagp learn-method** and the **pagp port-priority** commands in interface configuration mode have no effect on the device hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports.

When the link partner to the device is a physical learner, we recommend that you configure the device as a physical-port learner by using the **pagp learn-method physical-port** command in interface configuration mode. We also recommend that you set the load-distribution method based on the source MAC address by using the **port-channel load-balance src-mac** command in global configuration mode. Use the **pagp learn-method** command in interface configuration mode only in this situation.

This example shows how to set the learning method to learn the address on the physical port within the EtherChannel:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 2
Device(config-if)# pagp learn-method physical-port
```

This example shows how to set the learning method to learn the address on the port channel within the EtherChannel:

```
Device> enable
Device# configure terminal
```

```
Device(config)# interface port-channel 2
Device(config-if)# pagp learn-method aggregation-port
```

You can verify your settings by entering either the **show running-config** command in privileged EXEC mode or the **show pagp** *channel-group-number* **internal** command in privileged EXEC mode.

pagp port-priority

To select a port over which all Port Aggregation Protocol (PAgP) traffic through the EtherChannel is sent, use the **pagp port-priority** command in interface configuration mode. If all unused ports in the EtherChannel are in hot-standby mode, they can be placed into operation if the currently selected port and link fails. To return to the default setting, use the **no** form of this command.

pagp port-priority *priority*
no pagp port-priority

Syntax Description

priority	Priority number. The range is from 0 to 255.

Command Default

The default is 128.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The physical port with the highest priority that is operational and has membership in the same EtherChannel is the one selected for PAgP transmission.

The device supports address learning only on aggregate ports even though the **physical-port** keyword is provided in the command-line interface (CLI). The **pagp learn-method** and the **pagp port-priority** commands in interface configuration mode have no effect on the device hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports, such as the Catalyst 1900 switch.

When the link partner to the device is a physical learner, we recommend that you configure the device as a physical-port learner by using the **pagp learn-method physical-port** command in interface configuration mode. We also recommend that you set the load-distribution method based on the source MAC address by using the **port-channel load-balance src-mac** command in global configuration mode. Use the **pagp learn-method** command in interface configuration mode only in this situation.

This example shows how to set the port priority to 200:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# pagp port-priority 200
```

You can verify your setting by entering the **show running-config** command in privileged EXEC mode or the **show pagp** *channel-group-number* **internal** command in privileged EXEC mode.

policy-map

To enter policy-map configuration mode and create or modify a policy map that can be attached to one or more interfaces to specify a service policy, use the **policy-map**command in global configuration mode. To delete a policy map, use the **no** form of this command.

policy-map [**type** { **access-control** | **control subscriber** | **packet-service** | **performance-monitor** }] *policy-map name*

Syntax Description

type	(Optional) Specifies the policy-map type.
access-control	(Optional) Enables the access-control specific policy map.
control subscriber	(Optional) Enables subscriber control policy domain.
packet-service	(Optional) Enables packet service policy map.
performance-monitor	(Optional) Enables policy map for the performance monitoring feature.
policy-map name	Specifies the policy map.

Command Default

The policy map is not configured.

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration (config)

Usage Guidelines

Use the **policy-map** command to specify the name of the policy map to create (add or modify) before you configure policies for classes whose match criteria are defined in a class map with the **class-map** and **match** commands.

Note You can configure class policies in a policy map only if the classes have match criteria defined for them.

Note Because you can configure a maximum of 64 class maps, a policy map cannot contain more than 64 class policies.

A single policy map can be attached concurrently to more than one interface. Except as noted, when you attempt to attach a policy map to an interface, the attempt is denied if the available bandwidth on the interface cannot accommodate the total bandwidth requested by the multiple policies. In such cases, if the policy map is already attached to other interfaces, the map is removed.

Example:

The following is sample output from the **policy-map** command:

```
Device# policy-map AVB-Output-Child-Policy

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
```

port-channel

To convert the auto created EtherChannel into a manual channel and adding configuration on the EtherChannel, use the **port-channel** command in privileged EXEC mode.

port-channel {*channel-group-number* **persistent** | **persistent** }

Syntax Description

channel-group-number	Channel group number. The range is 1 to 192.
persistent	Converts the auto created EtherChannel into a manual channel and allows you to add configuration on the EtherChannel.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can use the **show etherchannel summary** command in privileged EXEC mode to display the EtherChannel information.

Examples

This example shows how to convert the auto created EtherChannel into a manual channel:

```
Device> enable
Device# port-channel 1 persistent
```

port-channel auto

To enable the auto-LAG feature on a switch globally, use the **port-channel auto** command in global configuration mode. To disable the auto-LAG feature on the switch globally, use **no** form of this command.

port-channel auto
no port-channel auto

Command Default

By default, the auto-LAG feature is disabled globally and is enabled on all port interfaces.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can use the **show etherchannel auto** command in privileged EXEC mode to verify if the EtherChannel was created automatically.

Examples

This example shows how to enable the auto-LAG feature on the switch:

```
Device> enable
Device# configure terminal
Device(config)# port-channel auto
```

port-channel load-balance

To set the load-distribution method among the ports in the EtherChannel, use the **port-channel load-balance** command in global configuration mode. To reset the load-balancing mechanism to the default setting, use the **no** form of this command.

port-channel load-balance {**dst-ip** | **dst-mac** | **dst-mixed-ip-port** | **dst-port** | **extended** | **src-dst-ip** | **src-dst-mac** | **src-dst-mixed-ip-port** | **src-dst-port** | **src-ip** | **src-mac** | **src-mixed-ip-port** | **src-port** | **vlan-dst-ip** | **vlan-dst-mixed-ip-port** | **vlan-src-dst-ip** | **vlan-src-dst-mixed-ip-port** | **vlan-src-ip** | **vlan-src-mixed-ip-port**}

no port-channel load-balance

Syntax Description

dst-ip	Specifies load distribution based on the destination host IP address.
dst-mac	Specifies load distribution based on the destination host MAC address. Packets to the same destination are sent on the same port, but packets to different destinations are sent on different ports in the channel.
dst-mixed-ip-port	Specifies load distribution based on the destination IPv4 or IPv6 address and the TCP/UDP (Layer 4) port number.
dst-port	Specifies load distribution based on the destination TCP/UDP (Layer 4) port number for both IPv4 and IPv6.
extended	Sets extended load balance methods among the ports in the EtherChannel.
src-dst-ip	Specifies load distribution based on the source and destination host IP address.
src-dst-mac	Specifies load distribution based on the source and destination host MAC address.
src-dst-mixed-ip-port	Specifies load distribution based on the source and destination host IP address and TCP/UDP (layer 4) port number.
src-dst-port	Specifies load distribution based on the source and destination TCP/UDP (Layer 4) port number.
src-ip	Specifies load distribution based on the source host IP address.
src-mac	Specifies load distribution based on the source MAC address. Packets from different hosts use different ports in the channel, but packets from the same host use the same port.
src-mixed-ip-port	Specifies load distribution based on the source host IP address and TCP/UDP (Layer 4) port number.
src-port	Specifies load distribution based on the TCP/UDP (Layer 4) port number.
vlan-dst-ip	Specifies load distribution based on the VLAN ID and destination IP address.

vlan-dst-mixed-ip-port	Specifies load distribution based on the VLAN ID, destination IP address, and TCP/UDP port number.
vlan-src-dst-ip	Specifies load distribution based on the VLAN ID, source and destination IP address.
vlan-src-dst-mixed-ip-port	Specifies load distribution based on the VLAN ID, source and destination IP address, and TCP/UDP port number.
vlan-src-ip	Specifies load distribution based on the VLAN ID and source IP address.
vlan-src-mixed-ip-port	Specifies load distribution based on the VLAN ID, source IP address, and TCP/UDP port number.

Command Default

The default is **src-dst-mixed-ip-port**

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can verify your setting by entering either the **show running-config** command in privileged EXEC mode or the **show etherchannel load-balance** command in privileged EXEC mode.

Examples

The following example shows how to set the load-distribution method to dst-mac:

```
Device> enable
Device# configure terminal
Device(config)# port-channel load-balance dst-mac
```

Related Commands

Command	Description
show etherchannel load-balance	Displays information about EtherChannel load balancing.
show running-config	Displays the running configuration.

port-channel load-balance extended

To set combinations of load-distribution methods among the ports in the EtherChannel, use the **port-channel load-balance extended** command in global configuration mode. To reset the extended load-balancing mechanism to the default setting, use the **no** form of this command.

port-channel load-balance extended {**dst-ip** | **dst-mac** | **dst-port** | **ipv6-label** | **l3-proto** | **src-ip** | **src-mac** | **src-port**}
no port-channel load-balance extended

Syntax Description

dst-ip	Specifies load distribution based on the destination host IP address.
dst-mac	Specifies load distribution based on the destination host MAC address. Packets to the same destination are sent on the same port, but packets to different destinations are sent on different ports in the channel.
dst-port	Specifies load distribution based on the destination TCP/UDP (Layer 4) port number for both IPv4 and IPv6.
ipv6-label	Specifies load distribution based on the source MAC address and IPv6 flow label.
l3-proto	Specifies load distribution based on the source MAC address and Layer 3 protocols.
src-ip	Specifies load distribution based on the source host IP address.
src-mac	Specifies load distribution based on the source MAC address. Packets from different hosts use different ports in the channel, but packets from the same host use the same port.
src-port	Specifies load distribution based on the TCP/UDP (Layer 4) port number.

Command Default

The default is **src-mac**.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
Cisco IOS XE Amsterdam 17.3.x	The command was modified. You have to mandatorily configure atleast one of the keywords for the **port-channel load-balance extended** command.

Usage Guidelines

You can verify your setting by entering either the **show running-config** command in privileged EXEC mode or the **show etherchannel load-balance** command in privileged EXEC mode.

Examples

This example shows how to set the extended load-distribution method:

```
Device> enable
Device# configure terminal
Device(config)# port-channel load-balance extended dst-ip dst-mac src-ip
```

port-channel min-links

To define the minimum number of LACP ports that must be bundled in the link-up state and bundled in the EtherChannel in order that a port channel becomes active, use the **port-channel min-links** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

port-channel min-links *min_links_number*
no port-channel min-links

Syntax Description

min_links_number	The minimum number of active LACP ports in the port channel. The range is 2 to 8 if the port channel number is 128 or lesser and the range is 2 to 4 if the port channel number is 129 or greater. The default is 1.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in hot-standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.

The **port-channel min-links** command must specify a number a less than the number specified by the **lacp max-bundle** command.

Use the **show etherchannel summary** command in privileged EXEC mode to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

This example shows how to specify a minimum of three active LACP ports before port channel 2 becomes active:

```
Device> enable
Device# configure terminal
Device(config)# interface port-channel 2
Device(config-if)# port-channel min-links 3
```

ptp priority1 value

To specify the priority 1 value to use when advertising a PTP clock, use the **ptp priority1 value** command in global configuration mode.

ptp priority1 *value*

Syntax Description

value	Specifies the priority 1 number to use for this clock. The range is 0 to 255. The default value is 128. **Note** If the value of priority1 is configured to 255, the clock cannot become as Grandmaster.

Command Default

Default is 128.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Example

This example shows how to specify the priority1 value:

```
Device> enable
Device# configure terminal
Device(config)# ptp priority1 120
```

Related Commands

Command	Description
ptp priority2 value	Specifies the priority 2 number to use for this clock.
no ptp enable	Disables PTP on an interface.
ptp profile dot1as	Enables Generalized Precision Time Protocol (gPTP) globally.

ptp priority2 value

To specify the priority 2 number to use when advertising a PTP clock, use the **ptp priority2 value** command in global configuration mode

ptp priority2 *value*

Syntax Description

value	Specifies the priority 2 number to use for this clock. The range is 0 to 255. The default value is 128.

Command Default

Default is 128.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Example

This example shows how to specify the priority2 value:

```
Device> enable
Device# configure terminal
Device(config)# ptp priority 2 120
```

Related Commands

Command	Description
ptp priority1 value	Specifies the priority 1 number to use for this clock.
no ptp enable	Disables PTP on an interface.
ptp profile dot1as	Enables Generalized Precision Time Protocol (gPTP) globally.

ptp profile dot1as

To enable Generalized Precision Time Protocol (gPTP) globally, use the **ptp profile dot1as** command in global configuration mode. To disable gPTP, use the **no** form of the command.

ptp profile dot1as
no ptp profile dot1as

Command Default

PTP is disabled on interfaces.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to enable gPTP:

```
Device> enable
Device# configure terminal
Device(config)# ptp profile dot1as
```

Related Commands

Command	Description
ptp (interface)	Configures PTP on interfaces.
no ptp enable	Disables PTP on an interface.

revision

To set the revision number for the Multiple Spanning Tree (802.1s) (MST) configuration, use the **revision** command in MST configuration submode. To return to the default settings, use the **no** form of this command.

revision *version*
no revision

Syntax Description

version	Revision number for the configuration; valid values are from 0 to 65535.

Command Default

version is **0**

Command Modes

MST configuration (config-mst)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Devices that have the same configuration but different revision numbers are considered to be part of two different regions.

Note Be careful when using the **revision** command to set the revision number of the MST configuration because a mistake can put the switch in a different region.

Examples

This example shows how to set the revision number of the MST configuration:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)# revision 5
Device(config-mst)#
```

Related Commands

Command	Description
instance	Maps a VLAN or a set of VLANs to an MST instance.
name (MST configuration submode)	Sets the name of an MST region.
show spanning-tree	Displays information about the spanning-tree state.
spanning-tree mst configuration	Enters MST-configuration submode.

show avb domain

To display the AVB domain information, use the **show avb domain** command.

show avb domain

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode (#)

Example:

The following is sample output from the **show avb domain** command:

```
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
-------------------------------------------------------------------------------
Te1/0/1        down      N/A                      Oper state not up
Te1/0/2        down      N/A                      Oper state not up
Te1/0/3        down      N/A                      Oper state not up
Te1/0/4        down      N/A                      Oper state not up
Te1/0/5          up      N/A                    Port is not asCapable
Te1/0/6        down      N/A                      Oper state not up
Te1/0/7        down      N/A                      Oper state not up
Te1/0/8        down      N/A                      Oper state not up
Te1/0/9        down      N/A                      Oper state not up
Te1/0/10       down      N/A                      Oper state not up
Te1/0/11       down      N/A                      Oper state not up
Te1/0/12       down      N/A                      Oper state not up
Te1/0/13       down      N/A                      Oper state not up
Te1/0/14       down      N/A                      Oper state not up
Te1/0/15       down      N/A                      Oper state not up
Te1/0/16       down      N/A                      Oper state not up
 Te1/0/17      down      N/A                      Oper state not up
Te1/0/18       down      N/A                      Oper state not up
Te1/0/19         up      N/A                    Port is not asCapable
Te1/0/20       down      N/A                      Oper state not up
Te1/0/21       down      N/A                      Oper state not up
Te1/0/22       down      N/A                      Oper state not up
Te1/0/23         up      N/A                    Port is not asCapable
Te1/0/24       down      N/A                      Oper state not up
Te1/0/25       down      N/A                      Oper state not up
Te1/0/26       down      N/A                      Oper state not up
```

```
Te1/0/27       down      N/A                       Oper state not up
Te1/0/28       down      N/A                       Oper state not up
Te1/0/29         up      N/A                    Port is not asCapable
Te1/0/30       down      N/A                       Oper state not up
Te1/0/31       down      N/A                       Oper state not up
Te1/0/32       down      N/A                       Oper state not up
Te1/0/33       down      N/A                       Oper state not up
Te1/0/34       down      N/A                       Oper state not up
Te1/0/35         up      N/A                    Port is not asCapable
Te1/0/36       down      N/A                       Oper state not up
Te1/0/37       down      N/A                       Oper state not up
Te1/0/38       down      N/A                       Oper state not up
Te1/0/39         up    507ns
   Class-  A        core             3    2
   Class-  B        core             2    2
Te1/0/40       down      N/A                       Oper state not up
Te1/0/41       down      N/A                       Oper state not up
Te1/0/42       down      N/A                       Oper state not up
Te1/0/43       down      N/A                       Oper state not up
Te1/0/44       down      N/A                       Oper state not up
Te1/0/45       down      N/A                       Oper state not up
Te1/0/46       down      N/A                       Oper state not up
Te1/0/47       down      N/A                       Oper state not up
Te1/0/48       down      N/A                       Oper state not up
Te1/1/1        down      N/A                       Oper state not up
Te1/1/2        down      N/A                       Oper state not up
Te1/1/3        down      N/A                       Oper state not up
Te1/1/4        down      N/A                       Oper state not up
Te1/1/5        down      N/A                       Oper state not up
Te1/1/6        down      N/A                       Oper state not up
Te1/1/7        down      N/A                       Oper state not up
Te1/1/8        down      N/A                       Oper state not up
Te1/1/9        down      N/A                       Oper state not up
Te1/1/10       down      N/A                       Oper state not up
Te1/1/11       down      N/A                       Oper state not up
Te1/1/12       down      N/A                       Oper state not up
Te1/1/13       down      N/A                       Oper state not up
Te1/1/14       down      N/A                       Oper state not up
Te1/1/15       down      N/A                       Oper state not up
Te1/1/16       down      N/A                       Oper state not up
Fo1/1/1        down      N/A                       Oper state not up
Fo1/1/2        down      N/A                       Oper state not up
Fo1/1/3        down      N/A                       Oper state not up
Fo1/1/4        down      N/A                       Oper state not up
.
.
.
```

show avb streams

To display the AVB stream information, use the **show avb streams** command.

show avb streams

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode (#)

Example:

The following is sample output from the **show avb streams** command:

```
Device# show avb streams

Stream ID:          0011.0100.0001:1    Incoming Interface:    Te1/1/1
    Destination  : 91E0.F000.FE00
    Class        : A
    Rank         : 1
    Bandwidth    : 6400 Kbit/s

    Outgoing Interfaces:
    ------------------------------------------------------------------------------
    Interface         State      Time of Last Update         Information
    ------------------------------------------------------------------------------
    Te1/1/1           Ready      Tue Apr 26 01:25:40.634

Stream ID:          0011.0100.0002:2    Incoming Interface:    Te1/1/1
    Destination  : 91E0.F000.FE01
    Class        : A
    Rank         : 1
    Bandwidth    : 6400 Kbit/s

    Outgoing Interfaces:
    ------------------------------------------------------------------------------
    Interface         State      Time of Last Update         Information
    ------------------------------------------------------------------------------
    Te1/1/1           Ready      Tue Apr 26 01:25:40.634
.
.
.
```

show dot1q-tunnel

To display information about IEEE 802.1Q tunnel ports, use the **show dot1q-tunnel** in EXEC mode.

show dot1q-tunnel [**interface** *interface-id*]

Syntax Description

interface *interface-id*	(Optional) Specifies the interface for which to display IEEE 802.1Q tunneling information. Valid interfaces include physical ports and port channels.

Command Default

None

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

Examples

The following are examples of output from the **show dot1q-tunnel** command:

```
Device# show dot1q-tunnel

dot1q-tunnel mode LAN Port(s)
------------------------------
Gi1/0/1
Gi1/0/2
Gi1/0/3
Gi1/0/6
Po2


Device# show dot1q-tunnel interface gigabitethernet1/0/1

dot1q-tunnel mode LAN Port(s)
------------------------------
Gi1/0/1
```

show etherchannel

To display EtherChannel information for a channel, use the **show etherchannel** command in user EXEC mode.

show etherchannel [{ *channel-group-number* | { **detail** | **port** | **port-channel** | **protocol** | **summary** } }] | [{ **detail** | **load-balance** | **port** | **port-channel** | **protocol** | **summary** | **platform** }]

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 192.
detail	(Optional) Displays detailed EtherChannel information.
load-balance	(Optional) Displays the load-balance or frame-distribution scheme among ports in the port channel.
port	(Optional) Displays EtherChannel port information.
port-channel	(Optional) Displays port-channel information.
protocol	(Optional) Displays the protocol that is being used in the channel.
summary	(Optional) Displays a one-line summary per channel group.
platform	(Optional) Displays channel-group platform specific fields.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

If you do not specify a channel group number, all channel groups are displayed.

In the output, the passive port list field is displayed only for Layer 3 port channels. This field means that the physical port, which is still not up, is configured to be in the channel group (and indirectly is in the only port channel in the channel group).

This is an example of output from the **show etherchannel** *channel-group-number* **detail** command:

```
Device> show etherchannel 1 detail
Group state = L2
Ports: 2   Maxports = 16
Port-channels: 1 Max Port-channels = 16
Protocol:      LACP
                   Ports in the group:
                   -------------------
Port: Gi1/0/1
------------
Port state    = Up Mstr In-Bndl
```

```
Channel group = 1        Mode  = Active        Gcchange = -
Port-channel  =          Po1GC = -             Pseudo port-channel = Po1
Port index    =          0Load = 0x00          Protocol = LACP

Flags: S - Device is sending Slow LACPDUs   F - Device is sending fast LACPDU
       A - Device is in active mode.        P - Device is in passive mode.

Local information:
                         LACP port   Admin   Oper   Port   Port
Port     Flags   State   Priority    Key     Key    Number State
Gi1/0/1   SA      bndl     32768      0x1     0x1    0x101  0x3D
Gi1/0/2    A      bndl     32768      0x0     0x1    0x0    0x3D

Age of the port in the current state: 01d:20h:06m:04s

                  Port-channels in the group:
                  ----------------------

Port-channel: Po1   (Primary Aggregator)

Age of the Port-channel = 01d:20h:20m:26s
Logical slot/port = 10/1          Number of ports = 2
HotStandBy port   = null
Port state        = Port-channel Ag-Inuse
Protocol          = LACP

Ports in the Port-channel:

Index  Load   Port      EC state        No of bits
------+------+------+------------------+-----------
 0      00    Gi1/0/1    Active           0
 0      00    Gi1/0/2    Active           0

Time since last port bundled:   01d:20h:24m:44s   Gi1/0/2
```

This is an example of output from the **show etherchannel** *channel-group-number* **summary** command:

```
Device> show etherchannel 1 summary
Flags: D - down P - in port-channel
       I - stand-alone s - suspended
       H - Hot-standby (LACP only)
       R - Layer3 S - Layer2
       u - unsuitable for bundling
       U - in use f - failed to allocate aggregator
       d - default port

Number of channel-groups in use: 1
Number of aggregators: 1

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------
 1     Po1(SU)       LACP        Gi1/0/1(P) Gi1/0/2(P)
```

This is an example of output from the **show etherchannel** *channel-group-number* **port-channel** command:

```
Device> show etherchannel 1 port-channel
Port-channels in the group:
----------------------
Port-channel: Po1 (Primary Aggregator)
------------
Age of the Port-channel = 01d:20h:24m:50s
```

```
Logical slot/port = 10/1 Number of ports = 2
Logical slot/port = 10/1 Number of ports = 2
Port state = Port-channel Ag-Inuse
Protocol = LACP

Ports in the Port-channel:

Index  Load   Port   EC state           No of bits
------+------+------+------------------+-----------
 0      00    Gi1/0/1 Active             0
 0      00    Gi1/0/2 Active             0

Time since last port bundled: 01d:20h:24m:44s Gi1/0/2
```

This is an example of output from **show etherchannel protocol** command:

```
Device# show etherchannel protocol
Channel-group listing:
----------------------
Group: 1
----------
Protocol: LACP
Group: 2
----------
Protocol: PAgP
```

This is an example of output from the **show etherchannel** *channel-group-number* **platform** command:

```
Device> show etherchannel 3 platform

===== pm channel-group summary  ======
--------------------------------------
EC Channel-Group : 3
EC Mac :
# Of Active Ports : 2
If Name                       If Id         EC Index
----------+--------------------+-------+
GigabitEthernet1/0/4           0xC          6
GigabitEthernet2/0/5           0x4F         7

======= pm interface-flaps summary ==============

Field                     AdminFields          OperFields
================================================================
Access Mode               Static               Static
Access Vlan Id            775                  0
Voice Vlan Id             4096                 0
VLAN Unassigned                                0
ExAccess Vlan Id          32767
Native Vlan Id            1
Port Mode                 access               access
Encapsulation             802.1Q               Native
disl                      trunk off
Media                     unknown
DTP Nonegotiate           0                    0
Port Protected            0                    0
Unknown Unicast Blocked   0                    0
Unknown Multicast Blocked 0                    0
Vepa Enabled              0                    0
App interface             0                    0
Span Destination          0

Duplex                    auto                 full
```

```
Default Duplex            auto
Speed                     auto                1000
Auto Speed Capable        1                   1
No Negotiate              0                   0
No Negotiate Capable      0                   0
Flow Control Receive      ON                  ON
Flow Control Send         Off                 Off
Jumbo                     0                   0
saved_holdqueue_out       0
saved_input_defqcount     2000
Jumbo Size                1500

Forwarding Vlans : 775
Current Pruned Vlans : none
Previous Pruned Vlans : none


Sw LinkNeg State : LinkStateUp
No.of LinkDownEvents :    0
XgxsResetOnLinkDown(10GE):
LastLinkDownDuration(sec) 0
LastLinkUpDuration(sec):  1585770902

======== fed group-mask summary ============
Group Mask Info
Aggport IIF Id: 0x00000000000000d3
# Of Active Ports : 2

Member Ports
If Name                            If Id           local    Group Mask
-------------------------------------------------------------------------
GigabitEthernet1/0/4          0x000000000000000c  true   5555555555555555
GigabitEthernet2/0/5          0x000000000000004f  false  aaaaaaaaaaaaaaaa

                     ==== Switch 1 ======
============== fed ifm if-id etherchannel summary ================

Interface Name  : Port-channel3
Interface State : Enabled
Interface Type  : ETHERCHANNEL
Port Type       : SWITCH PORT
EC Channel-Group: 3
# Of Active Ports : 2
Base GPN          : 1552

Member Interface Name : GigabitEthernet1/0/4

Member Interface State : Enabled
Member Interface Type  : ETHER
Port Type         : SWITCH PORT
Port Location     : LOCAL
Asic/core/Port    : 0/0/3
EC GPN            : 1558
EC Channel-Group  : 3
EC Index          : 6

Port Physical Subblock:
EC Port Mask ...... [0x5555555555555555]

===== switch 2 ===
Member Interface Name : GigabitEthernet2/0/5

Member Interface State : Enabled
Member Interface Type  : ETHER
```

```
Port Type          : SWITCH PORT
Port Location      : LOCAL
Asic/core/Port     : 0/1/5
EC GPN             : 1559
EC Channel-Group   : 3
EC Index           : 7

Port Physical Subblock:
EC Port Mask ...... [0xaaaaaaaaaaaaaaaa]
```

show l2protocol-tunnel

To display information about Layer 2 protocol tunnel ports, use the **show l2protocol-tunnel** in EXEC mode.

show l2protocol-tunnel [**interface** *interface-id*] **summary**

Syntax Description

interface *interface-id*	(Optional) Specifies the interface for which protocol tunneling information appears. Valid interfaces are physical ports and port channels. The port-channel range is 1 to 192.
summary	(Optional) Displays only Layer 2 protocol summary information.

Command Default

None

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

Usage Guidelines

After enabling Layer 2 protocol tunneling on an access or IEEE 802.1Q tunnel port by using the **l2protocol-tunnel** interface configuration command, you can configure some or all of these parameters:

- Protocol type to be tunneled
- Shutdown threshold
- Drop threshold

If you enter the **show l2protocol-tunnel interface** command, only information about the active ports on which all the parameters are configured appears.

If you enter the **show l2protocol-tunnel summary** command, only information about the active ports on which some or all of the parameters are configured appears.

Examples

This is an example of output from the **show l2protocol-tunnel** command:

```
Device> show l2protocol-tunnel

COS for Encapsulated Packets: 5
Drop Threshold for Encapsulated Packets: 0

Port       Protocol Shutdown  Drop      Encapsulation Decapsulation Drop
                    Threshold Threshold Counter       Counter       Counter
---------- -------- --------- --------- ------------- ------------- -------------
Gi3/0/3    ---            ----      ----          ----          ----          ----
           ---            ----      ----          ----          ----          ----
           ---            ----      ----          ----          ----          ----
           pagp           ----      ----             0         242500
           lacp           ----      ----         24268         242640
           udld           ----      ----             0         897960
```

```
Gi3/0/4    ---          ----      ----         ----         ----         ----
           ---          ----      ----         ----         ----         ----
           ---          ----      ----         ----         ----         ----
           pagp         1000      ----        24249        242700
           lacp         ----      ----        24256        242660
           udld         ----      ----            0        897960
Gi6/0/1    cdp          ----      ----       134482       1344820
           ---          ----      ----         ----         ----         ----
           ---          ----      ----         ----         ----         ----
           pagp         1000      ----            0        242500
           lacp          500      ----            0        485320
           udld          300      ----        44899        448980
Gi6/0/2     cdp          ----      ----       134482       1344820
           ---          ----      ----         ----         ----         ----
           ---          ----      ----         ----         ----         ----
           pagp         ----      1000            0        242700
           lacp         ----      ----            0        485220
           udld          300      ----        44899        448980
```

This is an example of output from the **show l2protocol-tunnel summary** command:

```
Device> show l2protocol-tunnel summary

COS for Encapsulated Packets: 5
Drop Threshold for Encapsulated Packets: 0

Port    Protocol       Shutdown         Drop             Status
                       Threshold        Threshold
                       (cdp/stp/vtp)    (cdp/stp/vtp)
                       (pagp/lacp/udld) (pagp/lacp/udld)
------- -------------   ---------------- ---------------- ----------
Gi3/0/2 pagp lacp udld  ----/----/----   ----/----/----   up
Gi4/0/3 pagp lacp udld  1000/ 500/----   ----/----/----   up
Gi9/0/1 pagp ---- ----  ----/----/----   1000/----/----   down
Gi9/0/2 pagp ---- ----  ----/----/----   1000/----/----   down
```

show lacp

To display Link Aggregation Control Protocol (LACP) channel-group information, use the **show lacp** command in user EXEC mode.

show lacp [*channel-group-number*] {**counters** | **internal** | **neighbor** | **sys-id**}

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 192.
counters	Displays traffic information.
internal	Displays internal information.
neighbor	Displays neighbor information.
sys-id	Displays the system identifier that is being used by LACP. The system identifier consists of the LACP system priority and the device MAC address.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can enter any **show lacp** command to display the active channel-group information. To display specific channel information, enter the **show lacp** command with a channel-group number.

If you do not specify a channel group, information for all channel groups appears.

You can enter the *channel-group-number* to specify a channel group for all keywords except **sys-id**.

This is an example of output from the **show lacp counters** user EXEC command. The table that follows describes the fields in the display.

```
Device> show lacp counters
               LACPDUs        Marker     Marker Response   LACPDUs
Port        Sent  Recv     Sent  Recv     Sent  Recv     Pkts  Err
--------------------------------------------------------------------
Channel group:1
Gi2/0/1      19    10        0    0         0    0        0
Gi2/0/2      14    6         0    0         0    0        0
```

Table 1: show lacp counters Field Descriptions

Field	Description
LACPDUs Sent and Recv	The number of LACP packets sent and received by a port.
Marker Sent and Recv	The number of LACP marker packets sent and received by a port.

Field	Description
Marker Response Sent and Recv	The number of LACP marker response packets sent and received by a port.
LACPDUs Pkts and Err	The number of unknown and illegal packets received by LACP for a port.

This is an example of output from the **show lacp internal** command:

```
Device> show lacp 1 internal
Flags:  S - Device is requesting Slow LACPDUs
        F - Device is requesting Fast LACPDUs
        A - Device is in Active mode       P - Device is in Passive mode

Channel group 1
                            LACP port    Admin    Oper    Port     Port
Port      Flags   State     Priority     Key      Key     Number   State
Gi2/0/1    SA      bndl      32768         0x3     0x3       0x4    0x3D
Gi2/0/2    SA      bndl      32768         0x3     0x3       0x5    0x3D
```

The following table describes the fields in the display:

Table 2: show lacp internal Field Descriptions

Field	Description
State	State of the specific port. These are the allowed values: • **–** —Port is in an unknown state. • **bndl**—Port is attached to an aggregator and bundled with other ports. • **susp**—Port is in a suspended state; it is not attached to any aggregator. • **hot-sby**—Port is in a hot-standby state. • **indiv**—Port is incapable of bundling with any other port. • **indep**—Port is in an independent state (not bundled but able to handle data traffic. In this case, LACP is not running on the partner port). • **down**—Port is down.
LACP Port Priority	Port priority setting. LACP uses the port priority to put ports in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

Field	Description
Admin Key	Administrative key assigned to this port. LACP automatically generates an administrative key value as a hexadecimal number. The administrative key defines the ability of a port to aggregate with other ports. A port's ability to aggregate with other ports is determined by the port physical characteristics (for example, data rate and duplex capability) and configuration restrictions that you establish.
Oper Key	Runtime operational key that is being used by this port. LACP automatically generates this value as a hexadecimal number.
Port Number	Port number.
Port State	State variables for the port, encoded as individual bits within a single octet with these meanings: • bit0: LACP_Activity • bit1: LACP_Timeout • bit2: Aggregation • bit3: Synchronization • bit4: Collecting • bit5: Distributing • bit6: Defaulted • bit7: Expired **Note** In the list above, bit7 is the MSB and bit0 is the LSB.

This is an example of output from the **show lacp neighbor** command:

```
Device> show lacp neighbor
Flags: S - Device is sending Slow LACPDUs  F - Device is sending Fast LACPDUs
       A - Device is in Active mode        P - Device is in Passive mode

Channel group 3 neighbors

Partner's information:

          Partner               Partner              Partner
Port      System ID             Port Number   Age    Flags
Gi2/0/1   32768,0007.eb49.5e80   0xC             19s    SP

          LACP Partner          Partner       Partner
          Port Priority         Oper Key      Port State
          32768                 0x3           0x3C

Partner's information:
```

```
          Partner                 Partner                 Partner
Port      System ID               Port Number   Age       Flags
Gi2/0/2   32768,0007.eb49.5e80    0xD             15s     SP

          LACP Partner            Partner       Partner
          Port Priority           Oper Key      Port State
          32768                   0x3           0x3C
```

This is an example of output from the **show lacp sys-id** command:

```
Device> show lacp sys-id
32765,0002.4b29.3a00
```

The system identification is made up of the system priority and the system MAC address. The first two bytes are the system priority, and the last six bytes are the globally administered individual MAC address associated to the system.

show loopdetect

To display the details of all the interfaces where loop-detection guard is enabled, use the **show loopdetect** command in user EXEC or privileged EXEC mode.

Syntax Description

This command has no arguments or keywords.

Command Default

None

Command Modes

User EXEC (>)

Privileged EXEC(#)

Command History

Release	Modification
Cisco IOS XE Amsterdam 17.2.1	This command was introduced.

Examples

The following is a sample output of the **show loopdetect** command:

```
Device# show loopdetect
Interface Interval Elapsed-Time Port-to-Errdisbale     ACTION
--------- -------- ------------ ---------------------  ---------
Twe1/0/1      5        3        errdisable Source Port  SYSLOG
Twe1/0/20     5        0        errdisable Source Port  ERRDISABLE
Twe2/0/3      5        2        errdisable Dest Port    ERRDISABLE
Loopdetect is ENABLED
```

The table below describes the significant fields shown in the display.

Table 3: show loopdetect Field Descriptions

Field	Description
`Interface`	Displays the interfaces that have loop-detection guard enabled.
`Interval`	Displays the time interval set to send the loop-detect frames in seconds.
`Elapsed-Time`	Displays the time elapsed within the set time interval to send loop-detect frames.
`Port-to-Errdisbale`	Displays the port that is configured to be error-disabled.
`Action`	Displays the action the system will take when it detects a network loop.

show msrp port bandwidth

To display Multiple Stream Reservation Protocol (MSRP) port bandwidth information, use the **show msrp port bandwidth** command.

show msrp port bandwidth

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode (#)

Example:

The following is sample output from the **show msrp port bandwidth** command:

```
Device# show msrp port bandwidth

-------------------------------------------------------------------------------
Ethernet      Capacity       Assigned       Available       Reserved
Interface     (Kbit/s)        A | B          A | B           A | B
-------------------------------------------------------------------------------
Te1/0/1     10000000         75 | 0         75 | 75          0 | 0
Te1/0/2     10000000         75 | 0         75 | 75          0 | 0
Te1/0/3     1000000          75 | 0         75 | 75          0 | 0
Te1/0/4     10000000         75 | 0         75 | 75          0 | 0
Te1/0/5     10000000         75 | 0         75 | 75          0 | 0
Te1/0/6     10000000         75 | 0         75 | 75          0 | 0
Te1/0/8     10000000         75 | 0         75 | 75          0 | 0
Te1/0/9     10000000         75 | 0         75 | 75          0 | 0
Te1/0/10    10000000         75 | 0         75 | 75          0 | 0
Te1/0/11    10000000         75 | 0         75 | 75          0 | 0
Te1/0/12    10000000         75 | 0         75 | 75          0 | 0
Te1/0/13    1000000          75 | 0         75 | 75          0 | 0
Te1/0/14    10000000         75 | 0         75 | 75          0 | 0
Te1/0/15    10000000         75 | 0         75 | 75          0 | 0
Te1/0/16    10000000         75 | 0         75 | 75          0 | 0
Te1/0/17    10000000         75 | 0         75 | 75          0 | 0
Te1/0/18    10000000         75 | 0         75 | 75          0 | 0
Te1/0/19    1000000          75 | 0         75 | 75          0 | 0
Te1/0/20    10000000         75 | 0         75 | 75          0 | 0
Te1/0/21    10000000         75 | 0         75 | 75          0 | 0
Te1/0/22    10000000         75 | 0         75 | 75          0 | 0
Te1/0/23    10000000         75 | 0         75 | 75          0 | 0
Te1/0/24    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
Te1/1/1     10000000         75 | 0         75 | 75          0 | 0
Te1/1/2     10000000         75 | 0         75 | 75          0 | 0
Te1/1/3     10000000         75 | 0         75 | 75          0 | 0
Te1/1/4     10000000         75 | 0         75 | 75          0 | 0
Te1/1/5     10000000         75 | 0         75 | 75          0 | 0
Te1/1/6     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
```

show msrp streams

To display information about the Multiple Stream Reservation Protocol (MSRP) streams, use the **show msrp streams** command.

show msrp streams [**detailed** | **brief**]

Syntax Description

detailed	Displays detailed MSRP stream information.
brief	Displays MSRP stream information in brief.

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode (#)

Example:

The following is sample output from the **show msrp streams** command:

```
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
```

The following is sample output from the **show msrp streams detailed** command:

```
Device# show msrp streams detailed

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
    ----
```

```
  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
----
  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
```

The following is sample output from the **show msrp streams brief** command:

```
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
```

show pagp

To display Port Aggregation Protocol (PAgP) channel-group information, use the **show pagp** command in EXEC mode.

show pagp [*channel-group-number*] {**counters** | **dual-active** | **internal** | **neighbor**}

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 192.
counters	Displays traffic information.
dual-active	Displays the dual-active status.
internal	Displays internal information.
neighbor	Displays neighbor information.

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can enter any **show pagp** command to display the active channel-group information. To display the nonactive information, enter the **show pagp** command with a channel-group number.

Examples

This is an example of output from the **show pagp 1 counters** command:

```
Device> show pagp 1 counters
             Information        Flush
Port         Sent   Recv     Sent   Recv
---------------------------------------
Channel group: 1
  Gi1/0/1    45     42       0      0
  Gi1/0/2    45     41       0      0
```

This is an example of output from the **show pagp dual-active** command:

```
Device> show pagp dual-active
PAgP dual-active detection enabled: Yes
PAgP dual-active version: 1.1

Channel group 1
          Dual-Active     Partner             Partner   Partner
Port      Detect Capable  Name                Port      Version
Gi1/0/1   No              -p2                 Gi3/0/3   N/A
Gi1/0/2   No              -p2                 Gi3/0/4   N/A

<output truncated>
```

This is an example of output from the **show pagp 1 internal** command:

```
Device> show pagp 1 internal
Flags:  S - Device is sending Slow hello.  C - Device is in Consistent state.
        A - Device is in Auto mode.
Timers: H - Hello timer is running.        Q - Quit timer is running.
        S - Switching timer is running.    I - Interface timer is running.

Channel group 1
                              Hello    Partner  PAgP     Learning  Group
Port        Flags State   Timers  Interval Count   Priority   Method  Ifindex
Gi1/0/1     SC    U6/S7   H       30s      1        128        Any      16
Gi1/0/2     SC    U6/S7   H       30s      1        128        Any      16
```

This is an example of output from the **show pagp 1 neighbor** command:

```
Device> show pagp 1 neighbor

Flags:  S - Device is sending Slow hello.  C - Device is in Consistent state.
        A - Device is in Auto mode.        P - Device learns on physical port.

Channel group 1 neighbors
            Partner              Partner          Partner           Partner Group
Port        Name                 Device ID        Port         Age  Flags   Cap.
Gi1/0/1     -p2            0002.4b29.4600   Gi01//1        9s SC      10001
Gi1/0/2     -p2            0002.4b29.4600   Gi1/0/2       24s SC      10001
```

show platform etherchannel

To display platform-dependent EtherChannel information, use the **show platform etherchannel** command in privileged EXEC mode.

show platform etherchannel *channel-group-number* {**group-mask** | **load-balance mac** *src-mac dst-mac* [**ip** *src-ip dst-ip* [**port** *src-port dst-port*]]} [**switch** *switch-number*]

Syntax Description

channel-group-number	Channel group number. The range is 1 to 192.
group-mask	Displays EtherChannel group mask.
load-balance	Tests EtherChannel load-balance hash algorithm.
mac *src-mac dst-mac*	Specifies the source and destination MAC addresses.
ip *src-ip dst-ip*	(Optional) Specifies the source and destination IP addresses.
port *src-port dst-port*	(Optional) Specifies the source and destination layer port numbers.
switch *switch-number*	(Optional) Specifies the stack member.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use this command only when you are working directly with a technical support representative while troubleshooting a problem.

Do not use this command unless a technical support representative asks you to do so.

show platform hardware fed active vlan ingress

To display if native vlan tagging is enabled or disabled for a particular vlan, use the **show platform hardware fed active vlan ingress**

show platform hardware fed active vlan *vlan ID* **ingress**

Syntax Description

Syntax	Description
vlan *vlan ID*	Specifies the VLAN ID.
ingress	Specifies Spanning Tree Protocol (STP) state information in ingress direction.

Command Modes

Privileged EXEC mode (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Example

The following is sample output from the **show platform hardware fed active vlan ingress** command:

```
Device# show platform hardware fed active vlan 1 ingress
VLAN STP State in hardware


vlan id is:: 1

Interfaces in forwarding state: : Hu1/0/45(Tagged)

flood list: : Hu1/0/45
```

show platform pm

To display platform-dependent port manager information, use the **show platform pm** command in privileged EXEC mode.

show platform pm {**etherchannel** *channel-group-number* **group-mask** | **interface-numbers** | **port-data** *interface-id* | **port-state**}

Syntax Description

etherchannel *channel-group-number* **group-mask**	Displays the EtherChannel group-mask table for the specified channel group. The range is 1 to 192.
interface-numbers	Displays interface numbers information.
port-data *interface-id*	Displays port data information for the specified interface.
port-state	Displays port state information.

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use this command only when you are working directly with your technical support representative while troubleshooting a problem.

Do not use this command unless your technical support representative asks you to do so.

show platform software fed switch ptp

To display information about ptp status on the port, use the **show platform software fed switch ptp** command.

show platform software fed switch { *switch-number* | **active** | **standby** } **ptp** { **domain** *domain-value* | **if-id** *value* | **test** }

Syntax Description

switch *switch-number*	Displays information about the switch. Valid values for *switch-number* argument are from 0 to 9.
active	Displays information about the active instance of the switch.
standby	Displays information about the standby instance of the switch.
domain *domain-value*	Displays information about the specified domain.
if-id *value*	Displays information about the specified interface.
test	Executes ptp test

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode (#)

Example:

The following is sample output from the **show platform software fed switch active ptp if-id** *0x20* command:

```
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
```

show ptp brief

To display a brief status of PTP on the interfaces, use the **show ptp brief** command in global configuration mode.

show ptp brief

Syntax Description

This command has no aruguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

The following is a sample output from the **show ptp brief** command:

```
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
.
.
.
```

Related Commands

Command	Description
show ptp clock	Displays PTP clock information.
show ptp parent	Displays the parent clock information.
show ptp port	Displays the PTP port information.
show ptp time-property	Displays the PTP clock time property.

show ptp clock

To display PTP clock information, use the **show ptp clock** command in global configuration mode.

show ptp clock

Syntax Description

This command has no aruguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

The following is a sample output from the **show ptp clock** command:

```
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

-------------------------------------------------------------
```

Related Commands

Command	Description
show ptp brief	Displays a brief status of PTP on the interfaces.
show ptp parent	Displays the parent clock information.
show ptp port	Displays the PTP port information.
show ptp time-property	Displays the PTP clock time property.

show ptp parent

To display the PTP parent clock information, use the **show ptp parent** command in global configuration mode.

show ptp parent

Syntax Description

This command has no aruguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

The following is a sample output from the **show ptp parent** command:

```
Device# show ptp parent

  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

------------------------------------------------------------------------------
```

Related Commands

Command	Description
show ptp brief	Displays a brief status of PTP on the interfaces.
show ptp clock	Displays PTP clock information.
show ptp port	Displays the PTP port information.

Command	Description
show ptp time-property	Displays the PTP clock time property.

show ptp port

To display the PTP port information, use the **show ptp port** command in global configuration mode.

show ptp port

Syntax Description

This command has no aruguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

The following is a sample output from the **show ptp port** command:

```
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—

--------------------------------------------------------------------------------
```

Related Commands

Command	Description
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 time-property	Displays the PTP clock time property.

show spanning-tree

To display spanning-tree information for the specified spanning-tree instances, use the **show spanning-tree** command in privileged EXEC mode.

show spanning-tree [*bridge-group*] [{ **active** | **backbonefast** | **blockedports** | **bridge** [*id*] | **detail** | **inconsistentports** | **instances** | **interface** *interface-type interface-number* | **mst** [{ *list* | **configuration** [**digest**] }] | **pathcost method** | **root** | **summary** [**totals**] | **uplinkfast** | **vlan** *vlan-id* }]

Syntax Description

bridge-group	(Optional) Specifies the bridge group number. The range is 1 to 255.
active	(Optional) Displays spanning-tree information on active interfaces only.
backbonefast	(Optional) Displays spanning-tree BackboneFast status.
blockedports	(Optional) Displays blocked port information.
bridge	(Optional) Displays status and configuration of this switch.
detail	(Optional) Shows status and configuration details.
inconsistentports	(Optional) Displays information about inconsistent ports.
instances	(Optional) Displays information about maximum STP instances.
interface *interface-type interface-number*	(Optional) Specifies the type and number of the interface. Enter each interface designator, using a space to separate it from the one before and the one after. Ranges are not supported. Valid interfaces include physical ports and virtual LANs (VLANs). See the “Usage Guidelines” for valid values.
mst	(Optional) Specifies multiple spanning-tree.
list	(Optional) Specifies a multiple spanning-tree instance list.
configuration digest	(Optional) Displays the multiple spanning-tree current region configuration.
pathcost *method*	(Optional) Displays the default path-cost calculation method that is used. See the “Usage Guidelines” section for the valid values.
root	(Optional) Displays root-switch status and configuration.
summary	(Optional) Specifies a summary of port states.
totals	(Optional) Displays the total lines of the spanning-tree state section.
uplinkfast	(Optional) Displays spanning-tree UplinkFast status.
vlan *vlan-id*	(Optional) Specifies the VLAN ID. The range is 1 to 4094. If the *vlan-id* value is omitted, the command applies to the spanning-tree instance for all VLANs.
id	(Optional) Identifies the spanning tree bridge.

port-channel *number*	(Optional) Identifies the Ethernet channel associated with the interfaces.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The keywords and arguments that are available with the **show spanning-tree** command vary depending on the platform you are using and the network modules that are installed and operational.

The **port-channel** *number* values from 257 to 282 are supported on the Content Switching Module (CSM) and the Firewall Services Module (FWSM) only.

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 2 to 13 and valid values for the port number are from 1 to 48.

When checking spanning tree-active states and you have a large number of VLANs, you can enter the **show spanning-tree summary total** command. You can display the total number of VLANs without having to scroll through the list of VLANs.

The valid values for keyword **pathcoast** *method* are:

- **append**: Appends the redirected output to a URL (supporting the append operation).
- **begin**: Begins with the matching line.
- **exclude**: Excludes matching lines.
- **include**: Includes matching lines.
- **redirect**: Redirects output to a URL.
- **tee**: Copies output to a URL.

When you run the **show spanning-tree** command for a VLAN or an interface the switch router will display the different port states for the VLAN or interface. The valid spanning-tree port states are listening, learning, forwarding, blocking, disabled, and loopback.

```
Device#
show spanning-tree
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     5c71.0dfe.8380
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     5c71.0dfe.8380
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec
```

```
Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Gi1/0/1             Desg FWD 20000     128.1    P2p
Gi1/0/18            Desg FWD 20000     128.18   P2p
Gi1/0/21            Desg FWD 20000     128.21   P2p
Te1/0/25            Desg FWD 20000     128.25   P2p
Te1/0/37            Desg FWD 2000      128.37   P2p
Te1/0/38            Desg FWD 2000      128.38   P2p
Te1/0/45            Desg FWD 20000     128.45   P2p
Te1/0/48            Desg FWD 20000     128.48   P2p
```

See the table below for definitions of the port states:

Table 4: show spanning-tree vlan Command Port States

Field	Definition
BLK	Blocked is when the port is still sending and listening to BPDU packets but is not forwarding traffic.
DIS	Disabled is when the port is not sending or listening to BPDU packets and is not forwarding traffic.
FWD	Forwarding is when the port is sending and listening to BPDU packets and forwarding traffic.
LBK	Loopback is when the port recieves its own BPDU packet back.
LIS	Listening is when the port spanning tree initially starts to listen for BPDU packets for the root bridge.
LRN	Learning is when the port sets the proposal bit on the BPDU packets it sends out

This example shows how to display a summary of interface information:

```
Device#
show spanning-tree
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     6cb2.ae4a.4fc0
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     6cb2.ae4a.4fc0
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Fif1/0/17           Desg FWD 2000      128.17   P2p
Fif1/0/19           Desg FWD 800       128.19   P2p
Fif1/0/21           Desg FWD 2000      128.21   P2p
Fif1/0/23           Desg FWD 2000      128.23   P2p
TwoH1/0/42          Desg FWD 500       128.42   P2p
Fou1/0/44           Desg FWD 50        128.44   P2p
Fif2/0/17           Back BLK 2000      128.185  P2p
Fif2/0/19           Back BLK 800       128.187  P2p
Fif2/0/21           Back BLK 2000      128.189  P2p
Fif2/0/23           Back BLK 2000      128.191  P2p
Fou2/0/43           Desg FWD 50        128.211  P2p
Fou2/0/44           Back BLK 50        128.212  P2p
Hu5/0/13            Desg FWD 500       128.685  P2p
```

```
Hu5/0/15            Desg FWD 500       128.687  P2p
Hu5/0/21            Back BLK 500       128.693  P2p
Hu5/0/23            Back BLK 500       128.695  P2p
Fou6/0/27           Back BLK 50        128.867  P2p
Hu6/0/29            Desg FWD 200       128.869  P2p
Hu6/0/30            Back BLK 200       128.870  P2p
```

The table below describes the fields that are shown in the example.

Table 5: show spanning-tree Command Output Fields

Field	Definition
Port ID Prio.Nbr	Port ID and priority number.
Cost	Port cost.
Sts	Status information.

This example shows how to display information about the spanning tree for this bridge only:

```
Device# show spanning-tree bridge

                                                    Hello  Max  Fwd
Vlan                         Bridge ID               Time  Age  Dly  Protocol
---------------- ---------------------------------- -----  ---  ---  --------
VLAN0001         32769 (32768,   1) 5c71.0dfe.8380    2    20   15  rstp
```

This example shows how to display detailed information about the interface:

```
Device#
show spanning-tree detail
 VLAN0001 is executing the rstp compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, sysid 1, address 5c71.0dfe.8380
  Configured hello time 2, max age 20, forward delay 15, transmit hold-count 6
  We are the root of the spanning tree
  Topology change flag not set, detected flag not set
  Number of topology changes 27 last change occurred 4d19h ago
          from TenGigabitEthernet1/0/48
  Times:  hold 1, topology change 35, notification 2
          hello 2, max age 20, forward delay 15
  Timers: hello 0, topology change 0, notification 0, aging 300

 Port 1 (GigabitEthernet1/0/1) of VLAN0001 is designated forwarding
   Port path cost 20000, Port priority 128, Port Identifier 128.1.
   Designated root has priority 32769, address 5c71.0dfe.8380
   Designated bridge has priority 32769, address 5c71.0dfe.8380
   Designated port id is 128.1, designated path cost 0
   Timers: message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   Link type is point-to-point by default
   BPDU: sent 208695, received 1

 Port 18 (GigabitEthernet1/0/18) of VLAN0001 is designated forwarding
!
!
<<output truncated>>
```

This example shows how to display a summary of port states:

```
Device#
```

```
show spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: VLAN0001
Extended system ID                       is enabled
Portfast Default                         is disabled
PortFast BPDU Guard Default             is disabled
Portfast BPDU Filter Default            is disabled
Loopguard Default                       is disabled
EtherChannel misconfig guard             is enabled
UplinkFast                               is disabled
BackboneFast                             is enabled but inactive in rapid-pvst mode
Configured Pathcost method used is long

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                    1         0        0         26         27
---------------------- -------- --------- -------- ---------- ----------
1 vlan                      1         0        0         26         27
```

This example shows how to display the total lines of the spanning-tree state section:

```
Device#
show spanning-tree summary total Switch is in rapid-pvst mode
Root bridge for: VLAN0001
Extended system ID                       is enabled
Portfast Default                         is disabled
PortFast BPDU Guard Default             is disabled
Portfast BPDU Filter Default            is disabled
Loopguard Default                       is disabled
EtherChannel misconfig guard             is enabled
UplinkFast                               is disabled
BackboneFast                             is enabled but inactive in rapid-pvst mode
Configured Pathcost method used is long

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
1 vlan                      1         0        0         26         27
```

This example shows how to display information about the spanning tree for a specific VLAN:

```
Device#
show spanning-tree vlan 200
VLAN0001
  Spanning tree enabled protocol rstp
  Root ID    Priority    32769
             Address     5c71.0dfe.8380
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769  (priority 32768 sys-id-ext 1)
             Address     5c71.0dfe.8380
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Gi1/0/1             Desg FWD 20000     128.1    P2p
Gi1/0/18            Desg FWD 20000     128.18   P2p
Gi1/0/21            Desg FWD 20000     128.21   P2p
Te1/0/25            Desg FWD 20000     128.25   P2p
Te1/0/37            Desg FWD 2000      128.37   P2p
Te1/0/38            Desg FWD 2000      128.38   P2p
Te1/0/45            Desg FWD 20000     128.45   P2p
```

```
Te1/0/48            Desg FWD 20000     128.48   P2p
!
!
<<output truncated>>
```

The table below describes the fields that are shown in the example.

Table 6: show spanning-tree vlan Command Output Fields

Field	Definition
Role	Current 802.1w role; valid values are Boun (boundary), Desg (designated), Root, Altn (alternate), and Back (backup).
Sts	Spanning-tree states; valid values are BKN* (broken)[1], BLK (blocking), DWN (down), LTN (listening), LBK (loopback), LRN (learning), and FWD (forwarding).
Cost	Port cost.
Prio.Nbr	Port ID that consists of the port priority and the port number.
Status	Status information; valid values are as follows: • P2p/Shr: The interface is considered as a point-to-point (resp. shared) interface by the spanning tree. • Edge: PortFast has been configured (either globally using the **default**command or directly on the interface) and no BPDU has been received. • *ROOT_Inc, *LOOP_Inc, *PVID_Inc and *TYPE_Inc: The port is in a broken state (BKN*) for an inconsistency. The port would be (respectively) Root inconsistent, Loopguard inconsistent, PVID inconsistent, or Type inconsistent. • Bound(type): When in MST mode, identifies the boundary ports and specifies the type of the neighbor (STP, RSTP, or PVST). • Peer(STP): When in PVRST rapid-pvst mode, identifies the port connected to a previous version of the 802.1D bridge.

[1] For information on the *, see the definition for the Status field.

show spanning-tree mst

To display the information about the Multiple Spanning Tree (MST) protocol, use the **show spanning-tree mst** command in privileged EXEC mode.

show spanning-tree mst [{ **configuration** [**digest**] | *instance-id-number* }] [**interface** *interface*] [**detail**] [**service instance**]

Syntax Description

instance-id-number	(Optional) Instance identification number. The range is from 0 to 4094.
detail	(Optional) Displays detailed information about the MST protocol.
interface	(Optional) Displays the information about the interfaces. See the "Usage Guidelines" section for valid number values.
configuration	(Optional) Displays information about the region configuration.
digest	(Optional) Displays information about the message digest 5 (MD5) algorithm included in the current MST configuration identifier (MSTCI).
interface	(Optional) Displays information about the interface type.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The valid values for the *interface* argument depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 2 to 13 and valid values for the port number are from 1 to 48.

The number of valid values for **port-channel** *number* are a maximum of 64 values ranging from 1 to 282. The **port-channel** *number* values from 257 to 282 are supported on the Content Switching Module (CSM) and the Firewall Services Module (FWSM) only.

The number of valid values for **vlan** are from 1 to 4094.

In the output display of the **show spanning-tree mst configuration** command, a warning message may be displayed. This message appears if you do not map secondary VLANs to the same instance as the associated primary VLAN. The display includes a list of the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The warning message is as follows:

```
These secondary vlans are not mapped to the same instance as their primary:
-> 3
```

In the output display of the **show spanning-tree mst configuration digest** command, if the output applies to both standard and prestandard bridges at the same time on a per-port basis, two different digests are displayed.

If you configure a port to transmit prestandard PortFast bridge protocol data units (BPDUs) only, the prestandard flag displays in the **show spanning-tree** commands. The variations of the prestandard flag are as follows:

- Pre-STD (or pre-standard in long format): This flag is displayed if the port is configured to transmit prestandard BPDUs and if a prestandard neighbor bridge has been detected on this interface.
- Pre-STD-Cf (or pre-standard (config) in long format): This flag is displayed if the port is configured to transmit prestandard BPDUs but a prestandard BPDU has not been received on the port, the autodetection mechanism has failed, or a misconfiguration, if there is no prestandard neighbor, has occurred.
- Pre-STD-Rx (or prestandard (rcvd) in long format): This flag is displayed when a prestandard BPDU has been received on the port, but it has not been configured to send prestandard BPDUs. The port will send prestandard BPDUs, but Cisco recommends that you change the port configuration so that the interaction with the prestandard neighbor does not rely only on the autodetection mechanism.

If the configuration is not prestandard compliant (for example, a single MST instance has an ID that is greater than or equal to 16,) the prestandard digest is not computed and the following output is displayed:

```
Device# show spanning-tree mst configuration digest

Name      [region1]
Revision  2     Instances configured 3
Digest          0x3C60DBF24B03EBF09C5922F456D18A03
Pre-std Digest  N/A, configuration not pre-standard compatible
```

MST BPDUs include an MSTCI that consists of the region name, region revision, and an MD5 digest of the VLAN-to-instance mapping of the MST configuration.

See the **show spanning-tree mst** command field description table for output descriptions.

Examples

The following example shows how to display information about the region configuration:

```
Device# show spanning-tree mst configuration

Name      [train]
Revision  2702
Instance  Vlans mapped
--------  ---------------------------------------------------------------------
0         1-9,11-19,21-29,31-39,41-4094
1         10,20,30,40
---------------------------------------------------------------------------
```

The following example shows how to display additional MST-protocol values:

```
Device# show spanning-tree mst 3 detail

###### MST03 vlans mapped: 3,3000-3999
Bridge address 0002.172c.f400 priority 32771 (32768 sysid 3)
Root this switch for MST03
GigabitEthernet1/1 of MST03 is boundary forwarding
Port info port id 128.1 priority 128
cost 20000
Designated root address 0002.172c.f400 priority 32771
cost 0
Designated bridge address 0002.172c.f400 priority 32771 port
id 128.1
Timers: message expires in 0 sec, forward delay 0, forward transitions 1
Bpdus (MRecords) sent 4, received 0
FastEthernet4/1 of MST03 is designated forwarding
Port info port id 128.193 priority 128 cost
200000
Designated root address 0002.172c.f400 priority 32771
```

```
cost 0
Designated bridge address 0002.172c.f400 priority 32771 port id
128.193
Timers: message expires in 0 sec, forward delay 0, forward transitions 1
Bpdus (MRecords) sent 254, received 1
FastEthernet4/2 of MST03 is backup blocking
Port info port id 128.194 priority 128 cost
200000
Designated root address 0002.172c.f400 priority 32771
cost 0
Designated bridge address 0002.172c.f400 priority 32771 port id
128.193
Timers: message expires in 2 sec, forward delay 0, forward transitions 1
Bpdus (MRecords) sent 3, received 252
```

The following example shows how to display the MD5 digest included in the current MSTCI:

```
Device# show spanning-tree mst configuration digest

Name      [mst-config]
Revision  10    Instances configured 25
Digest          0x40D5ECA178C657835C83BBCB16723192
Pre-std Digest  0x27BF112A75B72781ED928D9EC5BB4251
```

Related Commands

Command	Description
spanning-tree mst	Sets the path cost and port-priority parameters for any MST instance.
spanning-tree mst forward-time	Sets the forward-delay timer for all the instances on the Cisco 7600 series router.
spanning-tree mst hello-time	Sets the hello-time delay timer for all the instances on the Cisco 7600 series router.
spanning-tree mst max-hops	Specifies the number of possible hops in the region before a BPDU is discarded.

show udld

To display UniDirectional Link Detection (UDLD) administrative and operational status for all ports or the specified port, use the **show udld** command in user EXEC mode.

show udld [**ANI** | **AccessTunnel** | **Auto-Template** | **BDI** | **CEM-PG** | **GMPLS** | **GigabitEthernet** | **HundredGigE** | **InternalInterface** | **LISP** | **Loopback** | **Null** | **PROTECTION_GROUP** | **Port-channel** | **SDH_ACR** | **SERIAL-ACR** | **Serial-PG** | **TLS-VIF** | **Tunnel** | **Tunnel-tp** | **TwentyFiveGigE** | **VirtualPortGroup** | **Vlan** | **nve**] *interface_number*
show udld neighbors
show udld fast-hello *interface_number*

Syntax Description

ANI	(Optional) Displays UDLD operational status of the Autonomic-Networking virtual interface.
AccessTunnel	(Optional) Displays UDLD operational status of the Access Tunnel Interface.
Auto-Template	(Optional) Displays UDLD operational status of the auto-template interface. The range is from 1 to 999.
BDI	(Optional) Displays UDLD operational status of the Bridge-Domain interface.
CEM-PG	(Optional) Displays UDLD operational status of the Circuit Emulation interface with Protection group.
GMPLS	(Optional) Displays UDLD operational status of the MPLS interface.
GigabitEthernet	(Optional) Displays UDLD operational status of the GigabitEthernet interface.
HundredGigE	(Optional) Displays UDLD operational status of the Hundred Gigabit Ethernet.
InternalInterface	(Optional) Displays UDLD operational status of the internal interface. The range is from 0 to 9.
LISP	(Optional) Displays UDLD operational status of the Locator/ID Separation Protocol Virtual Interface.
Loopback	(Optional) Displays UDLD operational status of the loopback interface. The range is from 0 to 2147483647.
Null	(Optional) Displays UDLD operational status of the null interface.
PROTECTION_GROUP	(Optional) Displays UDLD operational status of the Protection-group controller.

Port-channel	(Optional) Displays UDLD operational status of the Ethernet channel interfaces. The port-channel range is 1 to 192.
SDH_ACR	(Optional) Displays UDLD operational status of the Virtual SDH-ACR controller.
SERIAL-ACR	(Optional) Displays UDLD operational status of the Serial interface with ACR.
Serial-PG	(Optional) Displays UDLD operational status of the Serial interface with Protection Group.
TLS-VIF	(Optional) Displays UDLD operational status of the TLS Virtual Interface.
Tunnel	(Optional) Displays UDLD operational status of the tunnel interface. The range is from 0 to 2147483647.
Tunnel-tp	(Optional) Displays UDLD operational status of the MPLS Transport Profile interface.
TwentyFiveGigE	(Optional) Displays UDLD operational status of the Twenty Five Gigabit Ethernet.
VirtualPortGroup	(Optional) Displays UDLD operational status of the Virtual Port Group.
Vlan	(Optional) Displays UDLD operational status of the VLAN interface. The range is from 1 to 4095.
interface_number	(Optional) ID of the interface and port number. Valid interfaces include physical ports, VLANs, and port channels.
nve	(Optional) Displays UDLD operational status of Network virtualization endpoint interface
neighbors	(Optional) Displays neighbor information only.
fast-hello	(Optional) Displays ports that have fast-hello configured and their fast-hello operational status.
fast-hello *interface_number*	(Optional) Displays the fast-hello information of a specific interface.

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

If you do not enter an interface ID, administrative and operational UDLD status for all interfaces appear.

Examples:

This is an example of output from the **show udld** *interface-id* command. For this display, UDLD is enabled on both ends of the link, and UDLD detects that the link is bidirectional.

```
Device> show udld TwentyFiveGigE1/0/1
Interface TwentyFiveGigE1/0/1
---
Port enable administrative configuration setting: Enabled
Port enable operational state: Enabled
Current bidirectional state: Bidirectional
Current operational state: Advertisement - Single neighbor detected
Message interval: 7000 ms
Time out interval: 5000 ms

Port fast-hello configuration setting: Enabled
Port fast-hello interval: 200 ms
Port fast-hello operational state: Enabled
Neighbor fast-hello configuration setting: Enabled
Neighbor fast-hello interval: 200 ms

Entry 1
    ---
    Expiration time: 1400 ms
    Cache Device index: 1
    Current neighbor state: Bidirectional
    Device ID: 0A74286120
    Port ID: Hu1/0/2
    Neighbor echo 1 device: 0A74286A80
    Neighbor echo 1 port: Hu1/0/10

    TLV Message interval: 15
    TLV fast-hello interval: 500 ms
    TLV Time out interval: 5
    TLV CDP Device name: SkyFox-59
```

This is an example of output from the **show udld fast-hello** *interface-id* command. For this display, UDLD is enabled on both ends of the link, and UDLD detects that the link is bidirectional. The fast-hello information of the port is disaplayed along with the UDLD operational status.

```
Device> show udld fast-hello hundredGigE 1/0/10
Interface hundredGigE 1/0/10
---Port enable administrative configuration setting: Enabled
Port enable operational state: Enabled
Current bidirectional state: Bidirectional
Current operational state: Advertisement - Single neighbor detected
Message interval: 500 ms
Time out interval: 5000 ms

Port fast-hello configuration setting: Enabled
Port fast-hello interval: 500 ms
Port fast-hello operational state: Enabled
Neighbor fast-hello configuration setting: Enabled
Neighbor fast-hello interval: 500 ms

Entry 1
    ---
    Expiration time: 1400 ms
    Cache Device index: 1
    Current neighbor state: Bidirectional
    Device ID: 0A74286120
    Port ID: Hu1/0/2
    Neighbor echo 1 device: 0A74286A80
```

```
    Neighbor echo 1 port: Hu1/0/10

    TLV Message interval: 15
    TLV fast-hello interval: 500 ms
    TLV Time out interval: 5
    TLV CDP Device name: SkyFox-59
```

This is an example of output from the **show udld fast-hello** global command.

```
Device> show udld fast-hello
Total ports on which fast hello can be configured: 32
Total ports with fast hello configured: 3
Total ports with fast hello operational: 3
Total ports with fast hello non-operational: 0

Port-ID    Hello Neighbor-Hello Neighbor-Device Neighbor-Port Status
-------    ----- -------------- --------------- ------------- ------
Hu1/0/10   500   500            0A74286120      Hu1/0/2       Operational
Hu1/0/12   500   500            0A74286120      Hu1/0/18      Operational
Hu1/0/14   500   500            0A74286120      Hu1/0/4       Operational
```

This is an example of output from the **show udld neighbors** command:

```
Device> enable
Device# show udld neighbors
Port     Device Name          Device ID  Port-ID  OperState
-------- -------------------- ---------- -------- --------------
Gi2/0/1  Switch-A             1          Gi2/0/1  Bidirectional
Gi3/0/1  Switch-A             2          Gi3/0/1  Bidirectional
```

show vlan dot1q tag native

To display the status of tagging on the native VLAN use the **show vlan dot1q tag native** command.

show vlan dot1q tag native

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC mode (#)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Example

The following is sample output from the **show vlan dot1q tag native** command:

```
Device# show vlan dot1q tag native
*Feb  1 06:47:30.719: %SYS-5-CONFIG_I: Configured from console by console
dot1q native vlan tagging is enabled globally

Per Port Native Vlan Tagging State
----------------------------------

Port       Operational        Native VLAN
              Mode            Tagging State
-------------------------------------------

Hu1/0/45   trunk                 enabled
```

spanning-tree backbonefast

To enable BackboneFast to allow a blocked port on a switch to change immediately to a listening mode, use the **spanning-tree backbonefast** command in global configuration mode. To return to the default setting, use the **no** form of this command.

spanning-tree backbonefast
no spanning-tree backbonefast

Syntax Description

This command has no arguments or keywords.

Command Default

BackboneFast is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

BackboneFast should be enabled on all of the Cisco devices containing an Ethernet switch network module. BackboneFast provides for fast convergence in the network backbone after a spanning-tree topology change. It enables the switch to detect an indirect link failure and to start the spanning-tree reconfiguration sooner than it would under normal spanning-tree rules.

Use the **show spanning-tree** privileged EXEC command to verify your settings.

Examples

The following example shows how to enable BackboneFast on the device:

```
Device(config)# spanning-tree backbonefast
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

spanning-tree bpdufilter

To enable bridge protocol data unit (BPDU) filtering on the interface, use the **spanning-tree bpdufilter** command in interface configuration or template configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree bpdufilter { **enable** | **disable** }
no spanning-tree bpdufilter

Syntax Description

enable	Enables BPDU filtering on this interface.
disable	Disables BPDU filtering on this interface.

Command Default

The setting that is already configured when you enter the **spanning-tree portfast edge bpdufilter default** command .

Command Modes

Interface configuration (config-if)

Template configuration (config-template)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Caution Be careful when you enter the **spanning-tree bpdufilter enable** command. Enabling BPDU filtering on an interface is similar to disabling the spanning tree for this interface. If you do not use this command correctly, you might create bridging loops.

Entering the **spanning-tree bpdufilter enable** command to enable BPDU filtering overrides the PortFast configuration.

When configuring Layer 2-protocol tunneling on all the service-provider edge switches, you must enable spanning-tree BPDU filtering on the 802.1Q tunnel ports by entering the **spanning-tree bpdufilter enable** command.

BPDU filtering prevents a port from sending and receiving BPDUs. The configuration is applicable to the whole interface, whether it is trunking or not. This command has three states:

- **spanning-tree bpdufilter enable**: Unconditionally enables BPDU filtering on the interface.
- **spanning-tree bpdufilter disable**: Unconditionally disables BPDU filtering on the interface.
- **no spanning-tree bpdufilter**: Enables BPDU filtering on the interface if the interface is in operational PortFast state and if you configure the **spanning-tree portfast bpdufilter default** command.

Use the **spanning-tree portfast bpdufilter default** command to enable BPDU filtering on all ports that are already configured for PortFast.

Examples

This example shows how to enable BPDU filtering on this interface:

```
Device(config-if)# spanning-tree bpdufilter enable
Device(config-if)#
```

The following example shows how to enable BPDU filtering on an interface using interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree bpdufilter enable
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.
spanning-tree portfast edge bpdufilter default	Enables BPDU filtering by default on all PortFast ports.

spanning-tree bpduguard

To enable bridge protocol data unit (BPDU) guard on the interface, use the **spanning-tree bpduguard** command in interface configuration and template configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree bpduguard { **enable** | **disable** }
no spanning-tree bpduguard

Syntax Description

enable	Enables BPDU guard on this interface.
disable	Disables BPDU guard on this interface.

Command Modes

Interface configuration (config-if)

Template configuration (config-template)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

BPDU guard prevents a port from receiving BPDUs. Typically, this feature is used in a service-provider environment where the network administrator wants to prevent an access port from participating in the spanning tree. If the port still receives a BPDU, it is put in the error-disabled state as a protective measure. This command has three states:

- **spanning-tree bpduguard enable**: Unconditionally enables BPDU guard on the interface.
- **spanning-tree bpduguard disable**: Unconditionally disables BPDU guard on the interface.
- **no spanning-tree bpduguard**: E nables BPDU guard on the interface if it is in the operational PortFast state and if the **spanning-tree portfast bpduguard default** command is configured.

Examples

This example shows how to enable BPDU guard on this interface:

```
Device(config-if)# spanning-tree bpduguard enable
Device(config-if)#
```

The following example shows how to enable BPDU guard on an interface using interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree bpduguard enable
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

Command	Description
spanning-tree portfast edge bpduguard default	Enables BPDU guard by default on all PortFast ports.

spanning-tree bridge assurance

To enable bridge assurance on all network ports on the device, use the **spanning-tree bridge assurance** command in global configuration mode. To disable bridge assurance, use the **no** form of this command.

spanning-tree bridge assurance
no spanning-tree bridge assurance

Syntax Description

This command has no arguments or keywords.

Command Default

Bridge assurance is enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Bridge assurance protects against a unidirectional link failure or other software failure and a device that continues to forward data traffic when it is no longer running the spanning tree algorithm.

Bridge assurance is enabled only on spanning tree network ports that are point-to-point links. Both ends of the link must have bridge assurance enabled. If the device on one side of the link has bridge assurance enabled and the device on the other side either does not support bridge assurance or does not have this feature enabled, the connecting port is blocked.

Disabling bridge assurance causes all configured network ports to behave as normal spanning tree ports.

Examples

This example shows how to enable bridge assurance on all network ports on the switch:

```
Device(config)#
spanning-tree bridge assurance
Device(config)#
```

This example shows how to disable bridge assurance on all network ports on the switch:

```
Device(config)#
no spanning-tree bridge assurance
Device(config)#
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

spanning-tree cost

To set the path cost of the interface for Spanning Tree Protocol (STP) calculations, use the **spanning-tree cost** command in interface configuration or template configuration mode. To revert to the default value, use the **no** form of this command.

spanning-tree cost *cost*
no spanning-tree cost

Syntax Description

cost	Path cost. The range is from 1 to 200000000.

Command Modes

Interface configuration (config-if)

Template configuration (config-template)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

When you specify a value for the cost argument, higher values indicate higher costs. This range applies regardless of the protocol type specified.

If a loop occurs, spanning tree uses the path cost when selecting an interface to place into the forwarding state. A lower path cost represents higher-speed transmission.

Examples

The following example shows how to access an interface and set a path cost value of 250 for the spanning tree VLAN associated with that interface:

```
Router(config)# interface ethernet 2/0
Router(config-if)# spanning-tree cost 250
```

The following example shows how to set a path cost value of 250 for the spanning tree VLAN associated with an interface using an interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree cost 250
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree	Displays spanning-tree information for the specified spanning-tree instances.
spanning-tree port-priority	Sets an interface priority when two bridges tie for position as the root bridge.

Command	Description
spanning-tree portfast (global)	Enables PortFast mode, where the interface is immediately put into the forwarding state upon linkup without waiting for the timer to expire.
spanning-tree portfast (interface)	Enables PortFast mode, where the interface is immediately put into the forwarding state upon linkup without waiting for the timer to expire.
spanning-tree uplinkfast	Enables the UplinkFast feature.
spanning-tree vlan	Configures STP on a per-VLAN basis.

spanning-tree etherchannel guard misconfig

To display an error message when a loop due to a channel misconfiguration is detected, use the **spanning-tree etherchannel guard misconfig** command in global configuration mode. To disable the error message, use the **no** form of this command.

spanning-tree etherchannel guard misconfig
no spanning-tree etherchannel guard misconfig

Syntax Description

This command has no arguments or keywords.

Command Default

Error messages are displayed.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

EtherChannel uses either Port Aggregation Protocol (PAgP) or Link Aggregation Control Protocol (LACP) and does not work if the EtherChannel mode of the interface is enabled using the **channel-group** group-number mode on command.

The **spanning-tree etherchannel guard misconfig** command detects two types of errors: misconfiguration and misconnection errors. A misconfiguration error is an error between the port-channel and an individual port. A misconnection error is an error between a device that is channeling more ports and a device that is not using enough Spanning Tree Protocol (STP) Bridge Protocol Data Units (BPDUs) to detect the error. In this case, the device will only error disable an EtherChannel if the switch is a nonroot device.

When an EtherChannel-guard misconfiguration is detected, this error message displays:

```
msgdef(CHNL_MISCFG, SPANTREE, LOG_CRIT, 0, "Detected loop due to etherchannel misconfiguration
 of %s %s")
```

To determine which local ports are involved in the misconfiguration, enter the **show interfaces status err-disabled** command. To check the EtherChannel configuration on the remote device, enter the **show etherchannel summary** command on the remote device.

After you correct the configuration, enter the **shutdown** and the **no shutdown** commands on the associated port-channel interface.

Examples

This example shows how to enable the EtherChannel-guard misconfiguration:

```
Device(config)# spanning-tree etherchannel guard misconfig
 Device(config)#
```

Related Commands

Command	Description
show etherchannel summary	Displays the EtherChannel information for a channel.

Command	Description
show interfaces status err-disabled	Displays the interface status or a list of interfaces in an error-disabled state on LAN ports only.
shutdown	Disables an interface.

spanning-tree extend system-id

To enable the extended-system ID feature on chassis that support 1024 MAC addresses, use the **spanning-tree extend system-id** command in global configuration mode. To disable the extended system identification, use the **no** form of this command.

spanning-tree extend system-id
no spanning-tree extend system-id

Syntax Description

This command has no arguments or keywords.

Command Default

Enabled on systems that do not provide 1024 MAC addresses.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Enabling or disabling the extended-system ID updates the bridge IDs of all active Spanning Tree Protocol (STP) instances, which might change the spanning-tree topology.

Examples

This example shows how to enable the extended-system ID:

```
Device(config)# spanning-tree extend system-id
Device(config)#
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

spanning-tree guard

To enable or disable the guard mode, use the **spanning-tree guard** command in interface configuration and template configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree guard { **loop** | **root** | **none** }
no spanning-tree guard

Syntax Description

loop	Enables the loop-guard mode on the interface.
root	Enables root-guard mode on the interface.
none	Sets the guard mode to none.

Command Default

Guard mode is disabled.

Command Modes

Interface configuration (config-if)

Template configuration (config-template)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to enable root guard:

```
Device(config-if)# spanning-tree guard root
Device(config-if)#
```

The following example shows how to enable root guard on an interface using an interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree guard root
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.
spanning-tree loopguard default	Enables loop guard as a default on all ports of a given bridge.

spanning-tree link-type

To configure a link type for a port, use the **spanning-tree link-type** command in the interface configuration and template configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree link-type { **point-to-point** | **shared** }
no spanning-tree link-type

Syntax Description

point-to-point	Specifies that the interface is a point-to-point link.
shared	Specifies that the interface is a shared medium.

Command Default

Link type is automatically derived from the duplex setting unless you explicitly configure the link type.

Command Modes

Interface configuration (config-if)

Template configuration (config-template)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Rapid Spanning Tree Protocol Plus (RSTP+) fast transition works only on point-to-point links between two bridges.

By default, the switch derives the link type of a port from the duplex mode. A full-duplex port is considered as a point-to-point link while a half-duplex configuration is assumed to be on a shared link.

If you designate a port as a shared link, RSTP+ fast transition is forbidden, regardless of the duplex setting.

If you connect a port (local port) to a remote port through a point-to-point link and the local port becomes a designated port, the device negotiates with the remote port and rapidly changes the local port to the forwarding state

Examples

This example shows how to configure the port as a shared link:

```
Device(config-if)# spanning-tree link-type shared
Device(config-if)#
```

The following example shows how to configure the port as a shared link using an interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree link-type shared
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree interface	Displays information about the spanning-tree state.

spanning-tree loopguard default

To enable loop guard as a default on all ports of a given bridge, use the **spanning-tree loopguard default** command in global configuration mode. To disable loop guard, use the **no** form of this command.

spanning-tree loopguard default
no spanning-tree loopguard default

Syntax Description

This command has no arguments or keywords.

Command Default

Loop guard is disabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Loop guard provides additional security in the bridge network. Loop guard prevents alternate or root ports from becoming the designated port due to a failure that could lead to a unidirectional link.

Loop guard operates only on ports that are considered point to point by the spanning tree.

The individual loop-guard port configuration overrides this command.

Examples

This example shows how to enable loop guard:

```
Device(config)# spanning-tree loopguard default
Device(config)#
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.
spanning-tree guard	Enables or disables the guard mode.

spanning-tree mode

To switch between Per-VLAN Spanning Tree+ (PVST+), Rapid-PVST+, and Multiple Spanning Tree (MST) modes, use the **spanning-tree mode** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mode [{ **pvst** | **mst** | **rapid-pvst** }]
no spanning-tree mode

Syntax Description

pvst	(Optional) PVST+ mode.
mst	(Optional) MST mode.
rapid-pvst	(Optional) Rapid-PVST+ mode.

Command Default

pvst

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Note Be careful when using the **spanning-tree mode** command to switch between PVST+, Rapid-PVST+, and MST modes. When you enter the command, all spanning-tree instances are stopped for the previous mode and are restarted in the new mode. Using this command may cause disruption of user traffic.

Examples

This example shows how to switch to MST mode:

```
Device(config)# spanning-tree mode mst
Device(config)#
```

This example shows how to return to the default mode (PVST+):

```
Device(config)# no spanning-tree mode
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst

To set the priority parameters or configure the device as a root for any Multiple Spanning Tree (MST) instance, use the **spanning-tree mst** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst *instance-id* { **priority** *priority* | **root** { **primary** | **secondary** } }
no spanning-tree mst *instance-id* { { **priority** *priority* | **root** { **primary** | **secondary** } } }

Syntax Description

priority *priority*	Port priority for an instance. The range is from 0 to 61440 in increments of 4096.
root	Configures the device as a root.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to set the priority:

```
Device(config-if)#
spanning-tree mst 0 priority 1
Device(config-if)#
```

This example shows how to set the device as a primary root:

```
Device(config-if)#
spanning-tree mst 0 root primary
Device(config-if)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst configuration

To enter MST-configuration submode, use the **spanning-tree mst configuration** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst configuration
no spanning-tree mst configuration

Syntax Description

This command has no arguments or keywords.

Command Default

The default value for the Multiple Spanning Tree (MST) configuration is the default value for all its parameters:

- No VLANs are mapped to any MST instance (all VLANs are mapped to the Common and Internal Spanning Tree [CIST] instance).
- The region name is an empty string.
- The revision number is 0.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The MST configuration consists of three main parameters:

- Instance VLAN mapping: See the **instance** command.
- Region name: See the **name** command (MST configuration submode).
- Configuration revision number: See the **revision** command.

The **abort** and **exit** commands allow you to exit MST configuration submode. The difference between the two commands depends on whether you want to save your changes or not.

The **exit** command commits all the changes before leaving MST configuration submode. If you do not map secondary VLANs to the same instance as the associated primary VLAN, when you exit MST-configuration submode, a warning message displays and lists the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The warning message is as follows:

```
These secondary vlans are not mapped to the same instance as their primary:
-> 3
```

The **abort** command leaves MST-configuration submode without committing any changes.

Changing an MST-configuration submode parameter can cause connectivity loss. To reduce service disruptions, when you enter MST-configuration submode, make changes to a copy of the current MST configuration. When you are done editing the configuration, you can apply all the changes at once by using the exit keyword, or you can exit the submode without committing any change to the configuration by using the abort keyword.

In the unlikely event that two users commit a new configuration at exactly at the same time, this warning message displays:

```
% MST CFG:Configuration change lost because of concurrent access
```

Examples

This example shows how to enter MST-configuration submode:

```
Device(config)# spanning-tree mst configuration
Device(config-mst)#
```

This example shows how to reset the MST configuration to the default settings:

```
Device(config)# no spanning-tree mst configuration
Device(config)#
```

Related Commands

Command	Description
instance	Maps a VLAN or a set of VLANs to an MST instance.
name (MST)	Sets the name of an MST region.
revision	Sets the revision number for the MST configuration.
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst forward-time

To set the forward-delay timer for all the instances on the device, use the **spanning-tree mst forward-time** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst forward-time *seconds*
no spanning-tree mst forward-time

Syntax Description

seconds	Number of seconds to set the forward-delay timer for all the instances on the device. The range is from 4 to 30 seconds.

Command Default

15 seconds.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to set the forward-delay timer:

```
Device(config)# spanning-tree mst forward-time 20
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst hello-time

To set the hello-time delay timer for all the instances on the device, use the **spanning-tree mst hello-time** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst hello-time *seconds*
no spanning-tree mst hello-time

Syntax Description

seconds	Number of seconds to set the hello-time delay timer for all the instances on the device. The range is from 1 to 10 in seconds.

Command Default

2 seconds

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

If you do not specify the *hello-time* value, the value is calculated from the network diameter.

Examples

This example shows how to set the hello-time delay timer:

```
Device(config)# spanning-tree mst hello-time 3
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst max-age

To set the max-age timer for all the instances on the device, use the **spanning-tree mst max-age** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst max-age *seconds*
no spanning-tree mst max-age

Syntax Description

seconds	Number of seconds to set the max-age timer for all the instances on the device. The range is from 6 to 40 in seconds.

Command Default

20 seconds

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to set the max-age timer:

```
Device(config)# spanning-tree mst max-age 40
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst max-hops

To specify the number of possible hops in the region before a bridge protocol data unit (BPDU) is discarded, use the **spanning-tree mst max-hops** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst max-hops *hopnumber*
no spanning-tree mst max-hops

Syntax Description

hopnumber	Number of possible hops in the region before a BPDU is discarded. The range is from 1 to 255 hops.

Command Default

20 hops

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Examples

This example shows how to set the number of possible hops:

```
Device(config)# spanning-tree mst max-hops 25
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst pre-standard

To configure a port to transmit only prestandard bridge protocol data units (BPDUs), use the **spanning-tree mst pre-standard** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst pre-standard
no spanning-tree mst pre-standard

Syntax Description

This command has no arguments or keywords.

Command Default

The default is to automatically detect prestandard neighbors.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Even with the default configuration, the port can receive both prestandard and standard BPDUs.

Prestandard BPDUs are based on the Cisco IOS Multiple Spanning Tree (MST) implementation that was created before the IEEE standard was finalized. Standard BPDUs are based on the finalized IEEE standard.

If you configure a port to transmit prestandard BPDUs only, the prestandard flag displays in the **show spanning-tree** commands. The variations of the prestandard flag are as follows:

- Pre-STD (or pre-standard in long format): This flag displays if the port is configured to transmit prestandard BPDUs and if a prestandard neighbor bridge has been detected on this interface.
- Pre-STD-Cf (or pre-standard (config) in long format): This flag displays if the port is configured to transmit prestandard BPDUs but a prestandard BPDU has not been received on the port, the autodetection mechanism has failed, or a misconfiguration, if there is no prestandard neighbor, has occurred.
- Pre-STD-Rx (or pre-standard (rcvd) in long format): This flag displays when a prestandard BPDU has been received on the port but it has not been configured to send prestandard BPDUs. The port will send prestandard BPDUs, but we recommend that you change the port configuration so that the interaction with the prestandard neighbor does not rely only on the autodetection mechanism.

If the MST configuration is not compatible with the prestandard (if it includes an instance ID greater than 15), only standard MST BPDUs are transmitted, regardless of the STP configuration on the port.

Examples

This example shows how to configure a port to transmit only prestandard BPDUs:

```
Router(config-if)# spanning-tree mst pre-standard
Router(config-if)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst priority

To set the bridge priority for an instance, use the **spanning-tree mst priority** command in global configuration mode. To return to the default setting, use the **no** form of this command.

spanning-tree mst *instance* **priority** *priority*
no spanning-tree mst priority

Syntax Description

instance	Instance identification number; valid values are from 0 to 4094.
priority *priority*	Specifies the bridge priority; see the "Usage Guidelines" section for valid values and additional information.

Command Default

priority is **32768**

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can set the bridge priority in increments of 4096 only. When you set the priority, valid values are **0**, **4096**, **8192**, **12288**, **16384**, **20480**, **24576**, **28672**, **32768**, **36864**, **40960**, **45056**, **49152**, **53248**, **57344**, and **61440**.

You can set the *priority* to **0** to make the switch root.

You can enter *instance* as a single instance or a range of instances, for example, 0-3,5,7-9.

Examples

This example shows how to set the bridge priority:

```
Device(config)# spanning-tree mst 0 priority 4096
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst root

To designate the primary and secondary root switch and set the timer value for an instance, use the **spanning-tree mst root** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree mst *instance* **root** { **primary** | **secondary** } [**diameter** *diameter* [**hello-time** *seconds*]]
no spanning-tree mst *instance* **root**

Syntax Description

instance	Instance identification number. The range is from 0 to 4094.
primary	Specifies the high enough priority (low value) to make the root of the spanning-tree instance.
secondary	Specifies the switch as a secondary root, should the primary root fail.
diameter *diameter*	(Optional) Specifies the timer values for the root switch that are based on the network diameter. The range is from 1 to 7.
hello-time *seconds*	(Optional) Specifies the duration between the generation of configuration messages by the root switch.

Command Default

The **spanning-tree mst root** command has no default settings.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You can enter *instance* as a single instance or a range of instances, for example, 0-3,5,7-9.

The **spanning-tree mst root secondary** value is 16384.

The **diameter** *diameter* and **hello-time** *seconds* keywords and arguments are available for instance 0 only.

If you do not specify the *seconds* argument, the value for it is calculated from the network diameter.

Examples

This example shows how to designate the primary root switch and timer values for an instance:

```
Router(config)# spanning-tree mst 0 root primary diameter 7 hello-time 2
Router(config)# spanning-tree mst 5 root primary
Router(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree mst simulate pvst global

To enable Per-VLAN Spanning Tree (PVST) simulation globally, enter the **spanning-tree mst simulate pvst global** command in global configuration mode. To disable PVST simulation globally, enter the **no** form of this command.

spanning-tree mst simulate pvst global
no spanning-tree mst simulate pvst global

Syntax Description

This command has no arguments or keywords.

Command Default

PVST simulation is enabled.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	Support for this command was introduced.

Usage Guidelines

PVST simulation is enabled by default so that all interfaces on the device interoperate between Multiple Spanning Tree (MST) and Rapid Per-VLAN Spanning Tree Plus (PVST+). To prevent an accidental connection to a device that does not run MST as the default Spanning Tree Protocol (STP) mode, you can disable PVST simulation. If you disable PVST simulation, the MST-enabled port moves to the blocking state once it detects it is connected to a Rapid PVST+-enabled port. This port remains in the inconsistent state until the port stops receiving Bridge Protocol Data Units (BPDUs), and then the port resumes the normal STP transition process.

To override the global PVST simulation setting for a port, enter the **spanning-tree mst simulate pvst** interface command in the interface command mode.

Examples

This example shows how to prevent the switch from automatically interoperating with a connecting device that is running Rapid PVST+:

```
Device(config)#
no spanning-tree mst simulate pvst global
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

spanning-tree pathcost method

To set the default path-cost calculation method, use the **spanning-tree pathcost method** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree pathcost method { **long** | **short** }
no spanning-tree pathcost method

Syntax Description

long	Specifies the 32-bit based values for default port-path costs.
short	Specifies the 16-bit based values for default port-path costs.

Command Default

short

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **long** path-cost calculation method utilizes all 32 bits for path-cost calculation and yields values in the range of 1 through 200,000,000.

The **short** path-cost calculation method (16 bits) yields values in the range of 1 through 65535.

Examples

This example shows how to set the default path-cost calculation method to long:

```
Device(config
#) spanning-tree pathcost method long
Device(config
#)
```

This example shows how to set the default path-cost calculation method to short:

```
Device(config
#) spanning-tree pathcost method short
Device(config
#)
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

spanning-tree port-priority

To set an interface priority when two bridges tie for position as the root bridge, use the **spanning-tree port-priority** command in interface configuration and template configuration mode. To revert to the default value, use the **no** form of this command.

spanning-tree port-priority *port-priority*
no spanning-tree port-priority

Syntax Description

port-priority	Port priority. The range is from 0 to 240 in increments of 16 . The default is 128.

Command Default

The default port priority is 128.

Command Modes

Interface configuration (config-if)

Template configuration (config-if)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The priority you set breaks the tie between two bridges to be designated as a root bridge.

Examples

The following example shows how to increase the likelihood that spanning-tree instance 20 is chosen as the root-bridge on interface Ethernet 2/0:

```
Device(config)# interface ethernet 2/0
Device(config-if)# spanning-tree port-priority 20
Device(config-if)#
```

The following example shows how increase the likelihood that spanning-tree instance 20 is chosen as the root-bridge on an interface using an interface template:

```
Device# configure terminal
Device(config)# template user-template1
Device(config-template)# spanning-tree port-priority 20
Device(config-template)# end
```

Related Commands

Command	Description
show spanning-tree	Displays spanning-tree information for the specified spanning-tree instances.
spanning-tree cost	Sets the path cost of the interface for STP calculations.
spanning-tree portfast (global)	Enables PortFast mode, where the interface is immediately put into the forwarding state upon linkup without waiting for the timer to expire.

Command	Description
spanning-tree uplinkfast	Enables the UplinkFast feature.
spanning-tree vlan	Configures STP on a per-VLAN basis.

spanning-tree portfast edge bpdufilter default

To enable bridge protocol data unit (BPDU) filtering by default on all PortFast ports, use the **spanning-tree portfast edge bpdufilter default** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree portfast edge bpdufilter default
no spanning-tree portfast edge bpdufilter default

Syntax Description

This command has no arguments or keywords.

Command Default

Disabled

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **spanning-tree portfast edge bpdufilter** command enables BPDU filtering globally on PortFast ports. BPDU filtering prevents a port from sending or receiving any BPDUs.

You can override the effects of the **portfast edge bpdufilter default** command by configuring BPDU filtering at the interface level.

Note Be careful when enabling BPDU filtering. The feature's functionality is different when you enable it on a per-port basis or globally. When enabled globally, BPDU filtering is applied only on ports that are in an operational PortFast state. Ports send a few BPDUs at linkup before they effectively filter outbound BPDUs. If a BPDU is received on an edge port, it immediately loses its operational PortFast status and BPDU filtering is disabled. When enabled locally on a port, BPDU filtering prevents the device from receiving or sending BPDUs on this port.

Caution Be careful when using this command. Using this command incorrectly can cause bridging loops.

Examples

This example shows how to enable BPDU filtering by default:

```
Device(config)#
spanning-tree portfast edge bpdufilter default
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.

Command	Description
spanning-tree bpdufilter	Enables BPDU filtering on the interface.

spanning-tree portfast edge bpduguard default

To enable bridge protocol data unit (BPDU) guard by default on all PortFast ports, use the **spanning-tree portfast edge bpduguard default** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree portfast edge bpduguard default
no spanning-tree portfast edge bpduguard default

Syntax Description

This command has no arguments or keywords.

Command Default

Disabled

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Caution Be careful when using this command. You should use this command only with interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data-packet loop and disrupt the device and network operation.

BPDU guard disables a port if it receives a BPDU. BPDU guard is applied only on ports that are PortFast enabled and are in an operational PortFast state.

Examples

This example shows how to enable BPDU guard by default:

```
Device(config)#
spanning-tree portfast edge bpduguard default
Device(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays the information about the MST protocol.
spanning-tree bpdufilter	Enables BPDU filtering on the interface.

spanning-tree portfast default

To enable PortFast by default on all access ports, use the **spanning-tree portfast** {**edge** | **network** | **normal**} **default** command in global configuration mode. To disable PortFast by default on all access ports, use the **no** form of this command.

spanning-tree portfast { **edge** [{ **bpdufilter** | **bpduguard** }] | **network** | **normal** } **default**
no spanning-tree portfast { **edge** [{ **bpdufilter** | **bpduguard** }] | **network** | **normal** } **default**

Syntax Description

bpdufilter	Enables PortFast edge BPDU filter by default on all PortFast edge ports.
bpduguard	Enables PortFast edge BPDU guard by default on all PortFast edge ports.
edge	Enables PortFast edge mode by default on all switch access ports.
network	Enables PortFast network mode by default on all switch access ports.
normal	Enables PortFast normal mode by default on all switch access ports.

Command Default

PortFast is disabled by default on all access ports.

Command Modes

Global configuration (config)

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Note Be careful when using this command. You should use this command only with interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data-packet loop and disrupt the operation of the router or switch and the network.

An interface with PortFast mode enabled is moved directly to the spanning-tree forwarding state when linkup occurs without waiting for the standard forward-time delay.

You can enable PortFast mode on individual interfaces using the **spanning-tree portfast** (interface) command.

Examples

This example shows how to enable PortFast edge mode with BPDU Guard by default on all access ports:

```
Device(config)#
spanning-tree portfast edge bpduguard default
Device(config)#
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.
spanning-tree portfast (interface)	Enables PortFast on a specific interface.

spanning-tree transmit hold-count

To specify the transmit hold count, use the **spanning-tree transmit hold-count** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree transmit hold-count *value*
no spanning-tree transmit hold-count

Syntax Description

value	Number of bridge protocol data units (BPDUs) that can be sent before pausing for 1 second. The range is from 1 to 20.

Command Default

value is **6**

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

This command is supported on all spanning-tree modes.

The transmit hold count determines the number of BPDUs that can be sent before pausing for 1 second.

Note Changing this parameter to a higher value may have a significant impact on CPU utilization, especially in rapid-Per-VLAN Spanning Tree (PVST) mode. Lowering this parameter could slow convergence in some scenarios. We recommend that you do not change the value from the default setting.

If you change the *value* setting, enter the **show running-config** command to verify the change.

If you delete the command, use the **show spanning-tree mst** command to verify the deletion.

Examples

This example shows how to specify the transmit hold count:

```
Device(config)# spanning-tree transmit hold-count 8
Device(config)#
```

Related Commands

Command	Description
show running-config	Displays the status and configuration of the module or Layer 2 VLAN.
show spanning-tree mst	Display the information about the MST protocol.

spanning-tree uplinkfast

To enable UplinkFast, use the **spanning-tree uplinkfast** command in global configuration mode. To disable UplinkFast, use the **no** form of this command.

spanning-tree uplinkfast [**max-update-rate** *packets-per-second*]
no spanning-tree uplinkfast [**max-update-rate**]

Syntax Description

max-update-rate *packets-per-second*	(Optional) Specifies the maximum rate (in packets per second) at which update packets are sent. The range is from 0 to 32000.

Command Default

The defaults are as follows:

- UplinkFast is disabled.
- *packets-per-second* is 150 packets per second.

Command Modes

Global configuration (config)

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use the **spanning-tree uplinkfast max-update-rate** command to enable UplinkFast (if it is not already enabled) and change the rate at which update packets are sent. Use the **no** form of this command to return to the default rate.

Examples

This example shows how to enable UplinkFast and set the maximum rate to 200 packets per second:

```
Device(config)#
 spanning-tree uplinkfast max-update-rate 200
Device(config)#
```

Related Commands

Command	Description
show spanning-tree	Displays information about the spanning-tree state.

spanning-tree vlan

To configure Spanning Tree Protocol (STP) on a per-virtual LAN (VLAN) basis, use the **spanning-tree vlan** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree vlan *vlan-id* [{ **forward-time** *seconds* | **hello-time** *seconds* | **max-age** *seconds* | **priority** *priority* | **root** [{ **primary** | **secondary** }] }]
no spanning-tree vlan *vlan-id* [{ **forward-time** | **hello-time** | **max-age** | **priority** | **root** }]

Syntax Description

vlan id	VLAN identification number. The range is from 1 to 4094.
forward-time *seconds*	(Optional) Sets the STP forward delay time. The range is from 4 to 30 seconds.
hello-time *seconds*	(Optional) Specifies the duration, in seconds, between the generation of configuration messages by the root switch. The range is from 1 to 10 seconds.
max-age *seconds*	(Optional) Sets the maximum number of seconds the information in a bridge packet data unit (BPDU) is valid. the range is from 6 to 40 seconds.
priority *priority*	(Optional) Sets the STP bridge priority. the range is from 0 to 65535.
root primary	(Optional) Forces this switch to be the root bridge.
root secondary	(Optional) Specifies this switch to act as the root switch should the primary root fail.

Command Default

The defaults are:

- **forward-time**: 15 seconds
- **hello-time**: 2 seconds
- **max-age**: 20 seconds
- **priority**: The default with IEEE STP enabled is 32768; the default with STP enabled is 128.
- **root** : No STP root

When you issue the **no spanning-tree vlan** *vlan_id* command, the following parameters are reset to their defaults:

- **priority**: The default with IEEE STP enabled is 32768; the default with STP enabled is 128.
- **hello-time**: 2 seconds
- **forward-time**: 15 seconds
- **max-age**: 20 seconds

Command Modes

Global configuration (config)

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Caution

- When disabling spanning tree on a VLAN using the **no spanning-tree vlan** *vlan-id* command, ensure that all switches and bridges in the VLAN have spanning tree disabled. You cannot disable spanning tree on some switches and bridges in a VLAN and leave it enabled on other switches and bridges in the same VLAN because switches and bridges with spanning tree enabled have incomplete information about the physical topology of the network.
- We do not recommend disabling spanning tree, even in a topology that is free of physical loops. Spanning tree is a safeguard against misconfigurations and cabling errors. Do not disable spanning tree in a VLAN without ensuring that there are no physical loops present in the VLAN.

When you set the **max-age** *seconds* parameter, if a bridge does not hear bridge protocol data units (BPDUs) from the root bridge within the specified interval, it assumes that the network has changed and recomputes the spanning-tree topology.

The **spanning-tree root primary** command alters this switch's bridge priority to 8192. If you enter the **spanning-tree root primary** command and the switch does not become the root switch, then the bridge priority is changed to 100 less than the bridge priority of the current bridge. If the switch still does not become the root, an error results.

The **spanning-tree root secondary** command alters this switch's bridge priority to 16384. If the root switch should fail, this switch becomes the next root switch.

Use the **spanning-tree root** commands on backbone switches only.

The **spanning-tree etherchannel guard misconfig** command detects two types of errors: misconfiguration and misconnection errors. A misconfiguration error is an error between the port-channel and an individual port. A misconnection error is an error between a switch that is channeling more ports and a switch that is not using enough Spanning Tree Protocol (STP) Bridge Protocol Data Units (BPDUs) to detect the error. In this case, the switch will only error disable an EtherChannel if the switch is a nonroot switch.

Examples

The following example shows how to enable spanning tree on VLAN 200:

```
Device(config)# spanning-tree vlan 200
```

The following example shows how to configure the switch as the root switch for VLAN 10 with a network diameter of 4:

```
Device(config)# spanning-tree vlan 10 root primary diameter 4
```

The following example shows how to configure the switch as the secondary root switch for VLAN 10 with a network diameter of 4:

```
Device(config)# spanning-tree vlan 10 root secondary diameter 4
```

Related Commands

Command	Description
spanning-tree cost	Sets the path cost of the interface for STP calculations.
spanning-tree etherchannel guard misconfig	Displays an error message when a loop due to a channel misconfiguration is detected
spanning-tree port-priority	Sets an interface priority when two bridges tie for position as the root bridge.
spanning-tree uplinkfast	Enables the UplinkFast feature.
show spanning-tree	Displays spanning-tree information for the specified spanning-tree instances.

switchport

To put an interface that is in Layer 3 mode into Layer 2 mode for Layer 2 configuration, use the **switchport** command in interface configuration mode. To put an interface in Layer 3 mode, use the **no** form of this command.

switchport
no switchport

Command Default

By default, all interfaces are in Layer 2 mode.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

Use the **no switchport** command (without parameters) to set the interface to the routed-interface status and to erase all Layer 2 configurations. You must use this command before assigning an IP address to a routed port.

Entering the **no switchport** command shuts the port down and then reenables it, which might generate messages on the device to which the port is connected.

When you put an interface that is in Layer 2 mode into Layer 3 mode (or the reverse), the previous configuration information related to the affected interface might be lost, and the interface is returned to its default configuration.

Note If an interface is configured as a Layer 3 interface, you must first enter the **switchport** command to configure the interface as a Layer 2 port. Then you can enter the **switchport access vlan** and **switchport mode** commands.

The **switchport** command is not used on platforms that do not support Cisco-routed ports. All physical ports on such platforms are assumed to be Layer 2-switched interfaces.

You can verify the port status of an interface by entering the **show running-config** privileged EXEC command.

Examples

This example shows how to cause an interface to cease operating as a Layer 2 port and become a Cisco-routed port:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# no switchport
```

This example shows how to cause the port interface to cease operating as a Cisco-routed port and convert to a Layer 2 switched interface:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport
```

switchport access vlan

To configure a port as a static-access port, use the **switchport access vlan** command in interface configuration mode. To reset the access mode to the default VLAN mode for the device, use the **no** form of this command.

switchport access vlan {*vlan-id* }
no switchport access vlan

Syntax Description

vlan-id	VLAN ID of the access mode VLAN; the range is 1 to 4094.

Command Default

The default access VLAN and trunk interface native VLAN is a default VLAN corresponding to the platform or interface hardware.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The port must be in access mode before the **switchport access vlan** command can take effect.

If the switchport mode is set to **access vlan** *vlan-id*, the port operates as a member of the specified VLAN. An access port can be assigned to only one VLAN.

The **no switchport access** command resets the access mode VLAN to the appropriate default VLAN for the device.

Examples

This example shows how to change a switched port interface that is operating in access mode to operate in VLAN 2 instead of the default VLAN:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport access vlan 2
```

switchport mode

To configure the VLAN membership mode of a port, use the **switchport mode** command in interface configuration mode. To reset the mode to the appropriate default for the device, use the **no** form of this command.

switchport mode {**access** | **dynamic** | {**auto** | **desirable**} | **trunk**}
noswitchport mode {**access** | **dynamic** | {**auto** | **desirable**} | **trunk**}

Syntax Description

access	Sets the port to access mode (either static-access or dynamic-access depending on the setting of the **switchport access vlan** interface configuration command). The port is set to access unconditionally and operates as a nontrunking, single VLAN interface that sends and receives nonencapsulated (non-tagged) frames. An access port can be assigned to only one VLAN.
dynamic auto	Sets the port trunking mode dynamic parameter to auto to specify that the interface convert the link to a trunk link. This is the default switchport mode.
dynamic desirable	Sets the port trunking mode dynamic parameter to desirable to specify that the interface actively attempt to convert the link to a trunk link.
trunk	Sets the port to trunk unconditionally. The port is a trunking VLAN Layer 2 interface. The port sends and receives encapsulated (tagged) frames that identify the VLAN of origination. A trunk is a point-to-point link between two switches or between a switch and a router.

Command Default

The default mode is **dynamic auto**.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

A configuration that uses the **access**,or **trunk** keywords takes effect only when you configure the port in the appropriate mode by using the **switchport mode** command. The static-access and trunk configuration are saved, but only one configuration is active at a time.

When you enter **access** mode, the interface changes to permanent nontrunking mode and negotiates to convert the link into a nontrunk link even if the neighboring interface does not agree to the change.

When you enter **trunk** mode, the interface changes to permanent trunking mode and negotiates to convert the link into a trunk link even if the interface connecting to it does not agree to the change.

When you enter **dynamic auto** mode, the interface converts the link to a trunk link if the neighboring interface is set to **trunk** or **desirable** mode.

When you enter **dynamic desirable** mode, the interface becomes a trunk interface if the neighboring interface is set to **trunk**, **desirable**, or **auto** mode.

To autonegotiate trunking, the interfaces must be in the same VLAN Trunking Protocol (VTP) domain. Trunk negotiation is managed by the Dynamic Trunking Protocol (DTP), which is a point-to-point protocol. However, some internetworking devices might forward DTP frames improperly, which could cause misconfigurations. To avoid this problem, configure interfaces connected to devices that do not support DTP to not forward DTP frames, which turns off DTP.

- If you do not intend to trunk across those links, use the **switchport mode access** command in interface configuration mode to disable trunking.
- To enable trunking to a device that does not support DTP, use the **switchport mode trunk** and **switchport nonegotiate** commands in interface configuration mode to cause the interface to become a trunk but to not generate DTP frames.

Access ports and trunk ports are mutually exclusive.

The IEEE 802.1x feature interacts with switchport modes in these ways:

- If you try to enable IEEE 802.1x on a trunk port, an error message appears, and IEEE 802.1x is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to trunk, the port mode is not changed.
- If you try to enable IEEE 802.1x on a port set to **dynamic auto** or **dynamic desirable**, an error message appears, and IEEE 802.1x is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to **dynamic auto** or **dynamic desirable**, the port mode is not changed.
- If you try to enable IEEE 802.1x on a dynamic-access (VLAN Query Protocol [VQP]) port, an error message appears, and IEEE 802.1x is not enabled. If you try to change an IEEE 802.1x-enabled port to dynamic VLAN assignment, an error message appears, and the VLAN configuration is not changed.

You can verify your settings by entering the **show interfaces** *interface-id* **switchport** command in privileged EXEC mode and examining information in the *Administrative Mode* and *Operational Mode* rows.

Examples

This example shows how to configure a port for access mode:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode access
```

This example shows how set the port to dynamic desirable mode:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode dynamic desirable
```

This example shows how to configure a port for trunk mode:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode trunk
```

switchport nonegotiate

To specify that Dynamic Trunking Protocol (DTP) negotiation packets are not sent on the Layer 2 interface, use the **switchport nonegotiate** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

switchport nonegotiate
no switchport nonegotiate

Command Default

The default is to use DTP negotiation to learn the trunking status.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The **no switchport nonegotiate** command removes nonegotiate status.

This command is valid only when the interface switchport mode is access or trunk (configured by using the **switchport mode access** or the **switchport mode trunk** interface configuration command). This command returns an error if you attempt to execute it in dynamic (auto or desirable) mode.

Internetworking devices that do not support DTP might forward DTP frames improperly and cause misconfigurations. To avoid this problem, turn off DTP by using the **switchport nonegotiate** command to configure the interfaces connected to devices that do not support DTP to not forward DTP frames.

When you enter the **switchport nonegotiate** command, DTP negotiation packets are not sent on the interface. The device does or does not trunk according to the **mode** parameter: **access** or **trunk.**

- If you do not intend to trunk across those links, use the **switchport mode access** interface configuration command to disable trunking.
- To enable trunking on a device that does not support DTP, use the **switchport mode trunk** and **switchport nonegotiate** interface configuration commands to cause the interface to become a trunk but to not generate DTP frames.

This example shows how to cause a port to refrain from negotiating trunking mode and to act as a trunk or access port (depending on the mode set):

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport nonegotiate
```

You can verify your setting by entering the **show interfaces** *interface-id* **switchport** command in privileged EXEC mode.

switchport trunk

To set the trunk characteristics when the interface is in trunking mode, use the **switchport trunk** command in interface configuration mode. To reset a trunking characteristic to the default, use the **no** form of this command.

switchport trunk {**allowed vlan** *vlan-list* | **native vlan** {**tag** | *vlan-id*} | **pruning vlan** *vlan-list*}
no switchport trunk {**allowed vlan** | **native vlan** [**tag**] | **pruning vlan**}

Syntax Description

allowed vlan *vlan-list*	Sets the list of allowed VLANs that can receive and send traffic on this interface in tagged format when in trunking mode. See the Usage Guidelines for the *vlan-list* choices.
native vlan *vlan-id*	Sets the native VLAN for sending and receiving untagged traffic when the interface is in IEEE 802.1Q trunking mode. The range is 1 to 4094.
native vlan tag	Enables native VLAN tagging on a particular trunk port.
pruning vlan *vlan-list*	Sets the list of VLANs that are eligible for VTP pruning when in trunking mode. See the Usage Guidelines for the *vlan-list* choices.

Command Default

VLAN 1 is the default native VLAN ID on the port.

The default for all VLAN lists is to include all VLANs.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

The *vlan-list* format is **all | none | [add | remove | except]** *vlan-atom* [,*vlan-atom...*]:

- **all** specifies all VLANs from 1 to 4094. This is the default. This keyword is not allowed on commands that do not permit all VLANs in the list to be set at the same time.
- **none** specifies an empty list. This keyword is not allowed on commands that require certain VLANs to be set or at least one VLAN to be set.
- **add** adds the defined list of VLANs to those currently set instead of replacing the list. Valid IDs are from 1 to 1005; extended-range VLANs (VLAN IDs greater than 1005) are valid in some cases.

Note You can add extended-range VLANs to the allowed VLAN list, but not to the pruning-eligible VLAN list.

Separate nonconsecutive VLAN IDs with a comma; use a hyphen to designate a range of IDs.

- **remove** removes the defined list of VLANs from those currently set instead of replacing the list. Valid IDs are from 1 to 1005; extended-range VLAN IDs are valid in some cases.

Note You can remove extended-range VLANs from the allowed VLAN list, but you cannot remove them from the pruning-eligible list.

- **except** lists the VLANs that should be calculated by inverting the defined list of VLANs. (VLANs are added except the ones specified.) Valid IDs are from 1 to 1005. Separate nonconsecutive VLAN IDs with a comma; use a hyphen to designate a range of IDs.
- *vlan-atom* is either a single VLAN number from 1 to 4094 or a continuous range of VLANs described by two VLAN numbers, the lesser one first, separated by a hyphen.

Native VLANs:

- All untagged traffic received on an IEEE 802.1Q trunk port is forwarded with the native VLAN configured for the port.
- If a packet has a VLAN ID that is the same as the sending-port native VLAN ID, the packet is sent without a tag; otherwise, the switch sends the packet with a tag.
- **vlan dot1q tag native** global command needs to be enabled to execute the **switchport trunk native vlan tag** command.
- The **no** form of the **native vlan** command resets the native mode VLAN to the appropriate default VLAN for the device.

Allowed VLAN:

- To reduce the risk of spanning-tree loops or storms, you can disable VLAN 1 on any individual VLAN trunk port by removing VLAN 1 from the allowed list. When you remove VLAN 1 from a trunk port, the interface continues to send and receive management traffic, for example, Cisco Discovery Protocol (CDP), Port Aggregation Protocol (PAgP), Link Aggregation Control Protocol (LACP), Dynamic Trunking Protocol (DTP), and VLAN Trunking Protocol (VTP) in VLAN 1.
- The **no** form of the **allowed vlan** command resets the list to the default list, which allows all VLANs.

Trunk pruning:

- The pruning-eligible list applies only to trunk ports.
- Each trunk port has its own eligibility list.
- If you do not want a VLAN to be pruned, remove it from the pruning-eligible list. VLANs that are pruning-ineligible receive flooded traffic.
- VLAN 1, VLANs 1002 to 1005, and extended-range VLANs (VLANs 1006 to 4094) cannot be pruned.

This example shows how to enable native VLAN tagging on a trunk port:

```
Device> enable
Device(config)# interface HundredGigE 1/0/45
Device(config-if)# switchport trunk native vlan tag
```

This example shows how to configure VLAN 3 as the default for the port to send all untagged traffic:

```
Device> enable
Device(config)# interface gigabitethernet1/0/2
```

```
Device(config-if)# switchport trunk native vlan 3
```

This example shows how to add VLANs 1, 2, 5, and 6 to the allowed list:

```
Device> enable
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport trunk allowed vlan add 1,2,5,6
```

This example shows how to remove VLANs 3 and 10 to 15 from the pruning-eligible list:

```
Device> enable
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport trunk pruning vlan remove 3,10-15
```

You can verify your settings by entering the **show interfaces** *interface-id* **switchport** privileged EXEC command.

switchport voice vlan

To configure voice VLAN on the port, use the **switchport voice vlan** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

switchport voice vlan {*vlan-id* | **dot1p** | **none** | **untagged** | **name** *vlan_name*}
no switchport voice vlan

Syntax Description

vlan-id	The VLAN to be used for voice traffic. The range is 1 to 4094. By default, the IP phone forwards the voice traffic with an IEEE 802.1Q priority of 5.
dot1p	Configures the telephone to use IEEE 802.1p priority tagging and uses VLAN 0 (the native VLAN). By default, the Cisco IP phone forwards the voice traffic with an IEEE 802.1p priority of 5.
none	Does not instruct the IP telephone about the voice VLAN. The telephone uses the configuration from the telephone key pad.
untagged	Configures the telephone to send untagged voice traffic. This is the default for the telephone.
name *vlan_name*	(Optional) Specifies the VLAN name to be used for voice traffic. You can enter up to 128 characters.

Command Default

The default is not to automatically configure the telephone (**none**).

The telephone default is not to tag frames.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

You should configure voice VLAN on Layer 2 access ports.

You must enable Cisco Discovery Protocol (CDP) on the switch port connected to the Cisco IP phone for the device to send configuration information to the phone. CDP is enabled by default globally and on the interface.

When you enter a VLAN ID, the IP phone forwards voice traffic in IEEE 802.1Q frames, tagged with the specified VLAN ID. The device puts IEEE 802.1Q voice traffic in the voice VLAN.

When you select **dot1p**, **none**, or **untagged**, the device puts the indicated voice traffic in the access VLAN.

In all configurations, the voice traffic carries a Layer 2 IP precedence value. The default is 5 for voice traffic.

When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to 2. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but not on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.

If any type of port security is enabled on the access VLAN, dynamic port security is automatically enabled on the voice VLAN.

You cannot configure static secure MAC addresses in the voice VLAN.

The Port Fast feature is automatically enabled when voice VLAN is configured. When you disable voice VLAN, the Port Fast feature is not automatically disabled.

This example show how to first populate the VLAN database by associating a VLAN ID with a VLAN name, and then configure the VLAN (using the name) on an interface, in the access mode: You can also verify your configuration by entering the **show interfaces** *interface-id* **switchport** in privileged EXEC command and examining information in the Voice VLAN: row.

Part 1 - Making the entry in the VLAN database:

```
Device> enable
Device# configure terminal
Device(config)# vlan 55
Device(config-vlan)# name test
Device(config-vlan)# end
```

Part 2 - Checking the VLAN database:

```
Device> enable
Device# show vlan id 55
VLAN Name Status Ports
---- -------------------------------- --------- -------------------------------
55 test active
VLAN Type  SAID   MTU  Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2
---- ----- ------ ---- -----  ------ -------- --- -------- ------ ------
55   enet  100055 1500 -      -      -        -   -        0      0
Remote SPAN VLAN
----------------
Disabled
Primary Secondary Type Ports
------- --------- ----------------- ------------------------------------------
```

Part 3- Assigning VLAN to the interface by using the name of the VLAN:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet3/1/1
Device(config-if)# switchport mode access
Device(config-if)# switchport voice vlan name test
Device(config-if)# end
Device#
```

Part 4 - Verifying configuration:

```
Device> enable
Device# show running-config
interface gigabitethernet3/1/1
Building configuration...
Current configuration : 113 bytes
!
interface GigabitEthernet3/1/1
switchport voice vlan 55
switchport mode access
Switch#
```

Part 5 - Also can be verified in interface switchport:

```
Device> enable
Device# show interface GigabitEthernet3/1/1 switchport
```

```
Name: Gi3/1/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: 55 (test)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
```

udld

To enable aggressive or normal mode in the UniDirectional Link Detection (UDLD) and to set the configurable message timer time, use the **udld** command in global configuration mode. To disable aggressive or normal mode UDLD on all fiber-optic ports, use the **no** form of the command.

udld {**aggressive** | **enable** | **fast-hello error-reporting** | **message time** *message-timer-interval* | **recovery interval** *recovery-timer-interval*}
no udld {**aggressive** | **enable** | **message**}

Syntax Description

aggressive	Enables UDLD in aggressive mode on all fiber-optic interfaces.
enable	Enables UDLD in normal mode on all fiber-optic interfaces.
fast-hello error-reporting	Reports link failure on the console instead of err-disabling the affected Fast UDLD port.
message time *message-timer-interval*	Configures the period of time between UDLD probe messages on ports that are in the advertisement phase and are determined to be bidirectional. The range is 1 to 90 seconds. The default is 15 seconds.
recovery interval *recovery-timer-interval*	Configures the error disable recovery timer value.

Command Default

UDLD is disabled on all interfaces.

The message timer is set at 15 seconds.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

UDLD supports two modes of operation: normal (the default) and aggressive. In normal mode, UDLD detects unidirectional links due to misconnected interfaces on fiber-optic connections. In aggressive mode, UDLD also detects unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and due to misconnected interfaces on fiber-optic links. For information about normal and aggressive modes, see the *Software Configuration Guide (Catalyst 9500 Switches)*.

If you change the message time between probe packets, you are making a compromise between the detection speed and the CPU load. By decreasing the time, you can make the detection-response faster but increase the load on the CPU.

This command affects fiber-optic interfaces only. Use the **udld** interface configuration command to enable UDLD on other interface types.

You can use these commands to reset an interface shut down by UDLD:

- The **udld reset** privileged EXEC command to reset all interfaces shut down by UDLD.
- The **shutdown** and **no shutdown** interface configuration commands.

- The **no udld enable** global configuration command followed by the **udld {aggressive | enable}** global configuration command to reenable UDLD globally.
- The **no udld port** interface configuration command followed by the **udld port** or **udld port aggressive** interface configuration command to reenable UDLD on the specified interface.
- The **errdisable recovery cause udld** and **errdisable recovery interval** *interval* global configuration commands to automatically recover from the UDLD error-disabled state.

This example shows how to enable UDLD on all fiber-optic interfaces:

```
Device> enable
Device# configure terminal
Device(config)# udld enable
```

You can verify your setting by entering the **show udld** command in privileged EXEC mode.

udld fast-hello

To enable Fast UniDirectional Link Detection (UDLD) on an individual interface which has UDLD configured on it, use the **udld fast-hello** command in interface configuration mode.

udld fast-hello *message-timer-interval*

Syntax Description

message-timer-interval	Configures time in milliseconds between sending of messages in steady state. The range is from 200 to 1000 milliseconds.

Command Default

Fast UDLD is disabled by default.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

A UDLD-capable port cannot detect a unidirectional link if it is connected to a UDLD-incapable port of another device.

UDLD supports two modes of operation: normal (the default) and aggressive. In normal mode, UDLD detects unidirectional links due to misconnected interfaces on fiber-optic connections. In aggressive mode, UDLD also detects unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and due to misconnected interfaces on fiber-optic links.

Fast UDLD enables detection of unidirectional links within the span of a few hundred milliseconds to a second. Fast UDLD runs on top of the UDLD process without interrupting it. To configure a port in Fast UDLD mode, it must first be configured in UDLD mode.

To enable Fast UDLD mode on a port, use the **udld fast-hello***meesage-timer-interval* interface configuration command.

Examples

This example shows how to enable Fast UDLD on an port:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet6/0/1
Device(config-if)# udld fast-hello 200
```

You can verify your settings by entering either the **show running-config** or the **show udld fast-hello** *interface* command in privileged EXEC mode.

udld port

To enable UniDirectional Link Detection (UDLD) on an individual interface or to prevent a fiber-optic interface from being enabled by the **udld** command in global configuration mode, use the **udld port** command in interface configuration mode.

udld port [**aggressive** | **disable**]
no udld port [**aggressive**]

Syntax Description

aggressive	(Optional) Enables UDLD in aggressive mode on the specified interface.
disable	(Optional) Disables UDLD on the specified interface despite the global UDLD configuration.

Command Default

On fiber-optic interfaces, UDLD is disabled and fiber-optic interfaces enable UDLD according to the state of the **udld enable** or **udld aggressive** command in global configuration mode.

On nonfiber-optic interfaces, UDLD is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

A UDLD-capable port cannot detect a unidirectional link if it is connected to a UDLD-incapable port of another device.

UDLD supports two modes of operation: normal (the default) and aggressive. In normal mode, UDLD detects unidirectional links due to misconnected interfaces on fiber-optic connections. In aggressive mode, UDLD also detects unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and due to misconnected interfaces on fiber-optic links.

To enable UDLD in normal mode, use the **udld port** command in interface configuration mode. To enable UDLD in aggressive mode, use the **udld port aggressive** command in interface configuration mode.

Use the **udld port disable** command on fiber-optic ports to return control of UDLD to the **udld enable** command in global configuration mode or to disable UDLD on nonfiber-optic ports.

Use the **udld port aggressive** command on fiber-optic ports to override the setting of the **udld enable** or **udld aggressive** command in global configuration mode. Use the **udld port disable** command on fiber-optic ports to remove this setting and to return control of UDLD enabling to the **udld** command in global configuration mode or to disable UDLD on nonfiber-optic ports.

You can use these commands to reset an interface shut down by UDLD:

- The **udld reset** command in privileged EXEC mode resets all interfaces shut down by UDLD.
- The **shutdown** and **no shutdown** command in interface configuration mode
- The **no udld enable** command in global configuration mode, followed by the **udld {aggressive | enable}** command in global configuration mode reenables UDLD globally.

- The **udld port disable** command in interface configuration mode, followed by the **udld port** or **udld port aggressive** command in interface configuration mode reenables UDLD on the specified interface.
- The **errdisable recovery cause udld** and **errdisable recovery interval** *interval* command in global configuration modeautomatically recover from the UDLD error-disabled state.

This example shows how to enable UDLD on an port:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet6/0/1
Device(config-if)# udld port
```

This example shows how to disable UDLD on a fiber-optic interface despite the setting of the **udld** global configuration command:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet6/0/1
Device(config-if)# udld port disable
```

You can verify your settings by entering the **show running-config** or the **show udld** *interface* command in privileged EXEC mode.

udld reset

To reset all interfaces disabled by UniDirectional Link Detection (UDLD) and permit traffic to begin passing through them again (though other features, such as spanning tree, Port Aggregation Protocol (PAgP), and Dynamic Trunking Protocol (DTP) still have their normal effects, if enabled), use the **udld reset** command in privileged EXEC mode.

udld reset

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Usage Guidelines

If the interface configuration is still enabled for UDLD, these ports begin to run UDLD again and are disabled for the same reason if the problem has not been corrected.

This example shows how to reset all interfaces disabled by UDLD:

```
Device> enable
Device# udld reset
1 ports shutdown by UDLD were reset.
```

vlan dot1q tag native

To enable tagging of native VLAN frames on all IEEE 802.1Q trunk ports, use the **vlan dot1q tag native** command in global configuration mode. To return to the default setting, use the **no** form of this command.

vlan dot1q tag native
no vlan dot1q tag native

Syntax Description

This command has no arguments or keywords.

Command Default

The IEEE 802.1Q native VLAN tagging is disabled.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

Usage Guidelines

When enabled, native VLAN packets going out of all IEEE 802.1Q trunk ports are tagged.

When disabled, native VLAN packets going out of all IEEE 802.1Q trunk ports are not tagged.

You can use this command with the IEEE 802.1Q tunneling feature. This feature operates on an edge device of a service-provider network and expands VLAN space by using a VLAN-in-VLAN hierarchy and tagging the tagged packets. You must use IEEE 802.1Q trunk ports for sending packets to the service-provider network. However, packets going through the core of the service-provider network might also be carried on IEEE 802.1Q trunks. If the native VLANs of an IEEE 802.1Q trunks match the native VLAN of a tunneling port on the same device, traffic on the native VLAN is not tagged on the sending trunk port. This command ensures that native VLAN packets on all IEEE 802.1Q trunk ports are tagged.

For more information about IEEE 802.1Q tunneling, see the software configuration guide for this release.

This example shows how to enable IEEE 802.1Q tagging on native VLAN frames:

```
Device> enable
Device# configure terminal
Device(config)# vlan dot1q tag native
Device(config)# end
```

You can verify your settings by entering the **show vlan dot1q tag native** privileged EXEC command.

vtp mode

To configure the VLAN Trunking Protocol (VTP) device mode, use the**vtp mode** command. To revert to the default server mode, use the **no** form of this command.

vtp mode {**client** | **off** | **transparent**}
no vtp mode

Syntax Description

client	Specifies the device as a client.
off	Specifies the device mode as off.
server	Specifies the device as a server.
transparent	Specifies the device mode as transparent.

Command Default

Server.

Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes

Global configuration mode.

Usage Guidelines

VLAN Trunking Protocol (VTP) is a Cisco Proprietary Layer 2 messaging protocol used to distribute the VLAN configuration information across multiple devices within a VTP domain. Without VTP, you must configure VLANs in each device in the network. Using VTP, you configure VLANs on a VTP server and then distribute the configuration to other VTP devices in the VTP domain.

In VTP transparent mode, you can configure VLANs (add, delete, or modify) and private VLANs. VTP transparent switches do not participate in VTP. A VTP transparent switch does not advertise its VLAN configuration and does not synchronize its VLAN configuration based on received advertisements. The VTP configuration revision number is always set to zero (0). Transparent switches do forward VTP advertisements that they receive out their trunk ports in VTP version 2.

A VTP device mode can be one of the following:

- server —You can create, modify, and delete VLANs and specify other configuration parameters, such as VTP version, for the entire VTP domain. VTP servers advertise their VLAN configuration to other switches in the same VTP domain and synchronize their VLAN configuration with other switches based on advertisements received over trunk links. VTP server is the default mode.

Note You can configure VLANs 1 to 1005. VLANs 1002 to 1005 are reserved for token ring in VTP version 2.

- client —VTP clients behave the same way as VTP servers, but you cannot create, change, or delete VLANs on a VTP client.

- transparent —You can configure VLANs (add, delete, or modify) and private VLANs. VTP transparent switches do not participate in VTP. A VTP transparent switch does not advertise its VLAN configuration and does not synchronize its VLAN configuration based on received advertisements. Because of this, the VTP configuration revision number is always set to zero (0). Transparent switches do forward VTP advertisements that they receive out their trunk ports in VTP version 2.
- off —In the above three described modes, VTP advertisements are received and transmitted as soon as the switch enters the management domain state. In the VTP off mode, switches behave the same as in VTP transparent mode with the exception that VTP advertisements are not forwarded. You can use this VTP device to monitor the VLANs.

Note If you use the no vtp mode command to remove a VTP device, the device will be configured as a VTP server. Use the vtp mode off command to remove a VTP device.

Example

This example shows how to configure a VTP device in transparent mode and add VLANs 2, 3, and 4:

```
Device> enable
Device(config)#vtp mode transparent
Device(config)# vlan 2-4
```

Example

This example shows how to remove a device configured as a VTP device:

```
Device> enable
Device(config)# vtp mode off
```

Example

This example shows how to configure a VTP device as a VTP server and adds VLANs 2 and 3:

```
Device> enable
Device# vtp mode server
Device(config)# vlan 2,3
```

Example

This example shows how to configure a VTP device as a client:

```
Device> enable
Device# vtp mode client
```