Layer 2 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 24.
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 15.0(2)EX	This command was introduced.

Usage Guidelines

The LAN Lite feature set supports up to six EtherChannels.

The LAN Base feature set supports up to 24 EtherChannels; however, in mixed stack configurations, only six EtherChannels are supported.

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.

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.

channel-group

⚠️

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

Examples   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:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet2/0/1 -2
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# channel-group 5 mode desirable
Switch(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:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet2/0/1 -2
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# channel-group 5 mode active
Switch(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:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet2/0/4 -5
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# channel-group 5 mode passive
Switch(config-if-range)# exit
Switch(config)# interface gigabitethernet3/0/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 10
Switch(config-if)# channel-group 5 mode passive
Switch(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 15.0(2)EX	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** interface configuration command.

You must use the **channel-group** interface configuration command 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.

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

```
Switch(config-if)# channel-protocol lacp
```

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

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 24.
counters	Clears traffic counters.

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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.

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

```
Switch# clear lacp counters
```

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

```
Switch# 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** privileged EXEC command.

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 24.
counters	Clears traffic counters.

Command Default None

Command Modes Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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.

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

```
Switch# clear pagp counters
```

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

```
Switch# clear pagp 10 counters
```

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

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 interface. Valid interfaces include physical ports, VLANs, and port channels.
	The VLAN range is 1 to 4094.
	The port-channel range is 1 to 24.

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

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

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

```
Switch# clear spanning-tree counters
```

clear spanning-tree detected-protocols

To restart the protocol migration process and force renegotiation with neighboring switches 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 interface. Valid interfaces include physical ports, VLANs, and port channels.	
	The VLAN range is 1 to 4094.	
	The port-channel range is 1 to 24.	

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   A switch 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 switches. If a rapid-PVST+ or an MSTP switch receives a legacy IEEE 802.1D configuration bridge protocol data unit (BPDU) with the protocol version set to 0, the switch sends only IEEE 802.1D BPDUs on that port. A multiple spanning-tree (MST) switch 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 switch 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.

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

```
Switch# 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 15.0(2)EX	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.

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

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

Examples   This example shows how to display all EtherChannel debug messages:

```
Switch# debug etherchannel all
```

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

```
Switch# 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 15.0(2)EX	This command was introduced.

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

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

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

Examples   This example shows how to display all LACP debug messages:

```
Switch# debug LACP all
```
This example shows how to display debug messages related to LACP events:

```
Switch# 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 15.0(2)EX	This command was introduced.

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

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

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

Examples   This example shows how to display all PAgP debug messages:

```
Switch# debug pagp all
```

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

```
Switch# debug pagp event
```

debug platform etherchannel

To enable debugging of platform-dependent EtherChannel events, use the **debug platform etherchannel** command in EXEC mode. To disable debugging, use the **no** form of this command.

debug platform etherchannel{**init**| **link-up**| **rpc**| **warnings**}

no debug platform etherchannel {**init**| **link-up**| **rpc**| **warnings**}

Syntax Description

init	Displays EtherChannel module initialization debug messages.
link-up	Displays EtherChannel link-up and link-down related debug messages.
rpc	Displays EtherChannel remote procedure call (RPC) debug messages.
warnings	Displays EtherChannel warning debug messages.

Command Default   Debugging is disabled.

Command Modes   User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

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

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

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

Examples   This example shows how to display debug messages related to Etherchannel initialization:

```
Switch# debug platform etherchannel init
```

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**| **atom**| **counters**| **errdisable**| **etherchnl**| **exceptions**| **gvi**| **hpm-events**| **idb-events**| **if-numbers**| **ios-events**| **link-status**| **platform**| **pm-events**| **pm-span**| **pm-vectors** [**detail**]| **rpc** [**general**| **oper-info**| **state**| **vectors**| **vp-events**]| **soutput-vectors**| **stack-manager**| **sync**| **vlans**}

no debug platform pm {**all**| **counters**| **errdisable**| **etherchnl**| **exceptions**| **hpm-events**| **idb-events**| **if-numbers**| **ios-events**| **link-status**| **platform**| **pm-events**| **pm-span**| **pm-vectors** [**detail**]| **rpc** [**general**| **oper-info**| **state**| **vectors**| **vp-events**]| **soutput-vectors**| **stack-manager**| **sync**| **vlans**}

Syntax Description		
all	Displays all port manager debug messages.	
atom	Displays AToM related events.	
counters	Displays counters for remote procedure call (RPC) debug messages.	
errdisable	Displays error-disabled-related events debug messages.	
etherchnl	Displays EtherChannel-related events debug messages.	
exceptions	Displays system exception debug messages.	
gvi	Displays IPe GVI-related messages.	
hpm-events	Displays platform port manager event debug messages.	
idb-events	Displays interface descriptor block (IDB)-related events debug messages.	
if-numbers	Displays interface-number translation event debug messages.	
ios-events	Displays Cisco IOS software events.	
link-status	Displays interface link-detection event debug messages.	
platform	Displays port manager function event debug messages.	
pm-events	Displays port manager event debug messages.	
pm-span	Displays port manager Switched Port Analyzer (SPAN) event debug messages.	
pm-vectors	Displays port manager vector-related event debug messages.	

detail	(Optional) Displays vector-function details.
rpc	Displays RPC-related messages.
general	(Optional) Displays general RPC-related messages.
oper-info	(Optional) Displays operational- and informational-related RPC messages.
state	(Optional) Displays administrative- and operational-related RPC messages.
vectors	(Optional) Displays vector-related RPC messages.
vp-events	(Optional) Displays virtual ports-related RPC messages.
soutput-vectors	Displays IDB output vector event debug messages.
stack-manager	Displays stack manager-related events debug messages. This keyword is supported only on stacking-capable switches.
sync	Displays operational synchronization and VLAN line-state 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 15.0(2)EX	This command was introduced.

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

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

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

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

```
Switch# debug platform pm vlans
```

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** | **csuf/csrt** | **etherchannel** | **events** | **exceptions** | **general** | **mstp** | **pvst+**| **root** | **snmp** | **synchronization** | **switch** | **uplinkfast**}

no debug spanning-tree {**all** | **backbonefast** | **bpdu** | **bpdu-opt** | **config** | **csuf/csrt** | **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.
csuf/csrt	Displays cross-stack UplinkFast and cross-stack rapid transition activity 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.
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 switch 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 15.0(2)EX	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 stack master. To enable debugging on a stack member , start a session from the stack master by using the **session** *switch-number* command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the stack member.

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

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

```
Switch# debug spanning-tree all
```

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 [**all**| **error**| **switch**| **rpc** {**events** | **messages**}]

no platform udld [**all** | **error**| **rpc** {**events** | **messages**}]

Syntax Description

all	(Optional) Displays all UDLD debug messages.
error	(Optional) Displays error condition debug messages.
rpc {**events** | **messages**}	(Optional) Displays UDLD remote procedure call (RPC) debug messages. The keywords have these meanings: • **events**—Displays UDLD RPC events. • **messages**—Displays UDLD RPC messages.

Command Default   Debugging is disabled.

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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 stack, it is enabled only on the stack master. To enable debugging on a stack member , start a session from the stack master by using the **session** *switch-number* command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the stack member.

To enable debugging on a stack member without first starting a session on the stack master, use the **remote command** *switch-number LINE* command in privileged EXEC 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	(Optional) Channel group number. The range is 1 to 24.

Command Default No port channel logical interfaces are defined.

Command Modes Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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** interface configuration command, 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.

Only one port channel in a channel group is allowed.

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.

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

```
Switch(config)# interface port-channel 5
```

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

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 15.0(2)EX	This command was introduced.

Usage Guidelines   The **lacp port-priority** interface configuration command 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 switch that controls the LACP link. See the **lacp system-priority** global configuration command for determining which switch controls the link.

Use the **show lacp internal** privileged EXEC command 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.

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

```
Switch# interface gigabitethernet2/0/1
Switch(config-if)# lacp port-priority 1000
```

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

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 switch. 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 15.0(2)EX	This command was introduced.

Usage Guidelines   The **lacp system-priority** command determines which switch 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 switch 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 switch (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 switches have the same LACP system priority (for example, they are both configured with the default setting of 32768), the LACP system ID (the switch MAC address) determines which switch is in control.

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

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

Examples   This example shows how to set the LACP system priority:

```
Switch(config)# lacp system-priority 20000
```

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

link state group

To configure an interface as a member of a link-state group, use the **link state group** command in interface configuration mode. Use the **no** form of this command to remove an interface from a link-state group.

link state group [*number*]{**downstream**| **upstream**}

no link state group [*number*]{**downstream**| **upstream**}

Syntax Description

number	(Optional) Specifies the number of the link-state group. The range is 1 to 2. The default group number is 1.
downstream	Configures the interface as a downstream interface in the group.
upstream	Configures the interface as an upstream interface in the group.

Command Default

No link-state group is configured.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

This command is supported only on the LAN Base image.

Add upstream interfaces to the link-state group before adding downstream interfaces, otherwise, the downstream interfaces move into error-disable mode. These are the limitations:

- An interface can be an upstream interface or a downstream interface.

- An interface can belong to only one link-state group.

- Only two link-state groups can be configured on a switch.

Examples

This example shows how to configure the interfaces as upstream in group 2:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet2/0/1 -2
Switch(config-if-range)# link state group 2 upstream
Switch(config-if-range)# end
```

link state track

To enable a link-state group, use the **link state track** command in global configuration mode. Use the **no** form of this command to disable a link-state group.

link state track [*number*]

no link state track [*number*]

Syntax Description

number	(Optional) Specifies the number of the link-state group. The range is 1 to 2. The default is 1.

Command Default Link-state tracking is disabled.

Command Modes Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines This command is supported only on the LAN Base image.

Use the **link state group** command to create and configure the link-state group. You then can use this command to enable the link-state group.

Examples This example shows how to enable link-state group 2:

```
Switch# configure terminal
Switch(config)# link state track 2
Switch(config)# end
```

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 switch 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 switch 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 15.0(2)EX	This command was introduced.

Usage Guidelines

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

The switch 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** interface configuration commands have no effect on the switch hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports.

When the link partner to the switch is a physical learner, we recommend that you configure the switch as a physical-port learner by using the **pagp learn-method physical-port** interface configuration command. 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** global configuration command. Use the **pagp learn-method** interface configuration command only in this situation.

Examples

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

```
Switch(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:

```
Switch(config-if)# pagp learn-method aggregation-port
```

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

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 15.0(2)EX	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 switch 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** interface configuration commands have no effect on the switch 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 switch is a physical learner, we recommend that you configure the switch as a physical-port learner by using the **pagp learn-method physical-port** interface configuration command. 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** global configuration command. Use the **pagp learn-method** interface configuration command only in this situation.

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

```
Switch(config-if)# pagp port-priority 200
```

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

pagp timer

To set the PAgP timer expiration, use the **pagp timer** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

pagp timer *time*

no pagp timer

Syntax Description

time	Specifies the number of seconds after which PAgP informational packets are timed-out. The range is 45 to 90.

Command Default   None

Command Modes   Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   This command is available for all interfaces configured as part of a PAgP port channel.

Examples   This example shows how to set the PAgP timer expiration to 50 seconds:

```
Switch(config-if)# pagp timer 50
```

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 function to the default setting, use the **no** form of this command.

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

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.
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-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.

Command Default

The default is **src-mac**.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

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

Examples

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

```
Switch(config)# port-channel load-balance dst-mac
```

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**]

Syntax Description

channel-group-number	(Optional) Channel group number. The range is 1 to 24.
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.

Command Default   None

Command Modes   User EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

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

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

```
Switch> 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:

```
Switch> 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:

```
Switch> 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:

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

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 24.
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 switch MAC address.

Command Default

None

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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**.

Examples

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

```
Switch> 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.
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:

```
Switch> 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.
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.

Field	Description
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:

```
Switch> 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:

```
Switch> 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 link state group

To display link-state group information, use the **show link state group** command in privileged EXEC mode.

show link state group [*number*][**detail**]

Syntax Description		
number	(Optional) Specifies the number of the link-state group number. The range is 1 to 2.
detail	(Optional) Displays detailed information about the link-state group.

Command Default

None

Command Modes

Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

This command is supported only on the LAN Base image.

To display information about all link-state groups, enter this command without keywords. To display information about a specific link-state group enter the link-state group number.

The output for the **show link state group detail** displays information for only those link-state groups that have link-state tracking enabled or that have upstream or downstream interfaces configured. If the group does not have a configuration, the group is not shown as enabled or disabled.

Examples

This example shows the output from the **show link state group** *number* command:

```
Switch# show link state group 1

Link State Group: 1     Status: Enabled. Down
```

This example shows the output from the **show link state group detail** command:

```
Switch# show link state group detail

(Up):Interface up (Dwn):Interface Down (Dis):Interface disabled

Link State Group: 1 Status: Enabled, Down
Upstream Interfaces : Gi1/0/15(Dwn) Gi1/0/16(Dwn)
Downstream Interfaces : Gi1/0/11(Dis) Gi1/0/12(Dis) Gi1/0/13(Dis) Gi1/0/14(Dis)

Link State Group: 2 Status: Enabled, Down
Upstream Interfaces : Gi1/0/15(Dwn) Gi1/0/16(Dwn) Gi1/0/17(Dwn)
```

```
        Downstream Interfaces : Gi1/0/11(Dis) Gi1/0/12(Dis) Gi1/0/13(Dis) Gi1/0/14(Dis)
        (Up):Interface up (Dwn):Interface Down (Dis):Interface disabled
```

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 24.
counters	Displays traffic information.
dual-active	Displays the dual-active status.
internal	Displays internal information.
neighbor	Displays neighbor information.

Command Default   None

Command Modes   User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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:

```
Switch> 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:

```
Switch> 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               Switch                 Gi3/0/3   N/A
Gi1/0/2  No               Switch                 Gi3/0/4   N/A

<output truncated>
```

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

```
Switch> 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:

```
Switch> 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     switch-p2            0002.4b29.4600   Gi01//1     9s    SC      10001
Gi1/0/2     switch-p2            0002.4b29.4600   Gi1/0/2    24s    SC      10001
```

show platform backup interface

To display platform-dependent backup information used in a Flex Links configuration, use the **show platform backup interface** privileged EXEC command.

show platform backup interface [*interface-id* | **dummyQ**]

Syntax Description

interface-id	(Optional) Backup information for all interfaces or the specified interface. The interface can be a physical interface or a port channel.
dummyQ	(Optional) Displays dummy queue information.

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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 etherchannel

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

show platform etherchannel {**data-structures**| **flags**| **time-stamps**}

Syntax Description

data-structures	Displays EtherChannel data structures.
flags	Displays EtherChannel port flags.
time-stamps	Displays EtherChannel time stamps.

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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 pm

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

show platform pm {**counters**| **group-masks**| **idbs** {**active-idbs**| **deleted-idbs**}| **if-numbers**| **link-status**| **module-info**| **platform-block**| **port-info** *interface-id*| **stack-view**| **vlan** {**info**| **line-state**}}

Syntax Description

counters	Displays module counters information.
group-masks	Displays EtherChannel group masks information.
idbs {**active-idbs** | **deleted-idbs**}	Displays interface data block (IDB) information. The keywords have these meanings: • **active-idbs**—Displays active IDB information. • **deleted-idbs**—Displays deleted and leaked IDB information.
if-numbers	Displays interface numbers information.
link-status	Displays local port link status information.
module-info	Displays module status information.
platform-block	Displays platform port block information.
port-info *interface-id*	Displays port administrative and operation fields for the specified interface.
stack-view	Displays status information for the stack. This keyword is not supported in the LAN Lite image.

vlan {**info** | **line-state**}	Displays platform VLAN information. The keywords have these meanings:
	• **info**—Displays information for active VLANs.
	• **line-state**—Displays line-state information.

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   The **stack-view** keyword is not supported on switches running the LAN Lite image.

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 spanning-tree

To display platform-dependent spanning-tree information, use the **show platform spanning-tree** privileged EXEC command.

show platform spanning-tree synchronization [**detail** | **vlan** *vlan-id*]

Syntax Description

synchronization	Displays spanning-tree state synchronization information.
detail	(Optional) Displays detailed spanning-tree information.
vlan *vlan-id*	(Optional) Displays VLAN switch spanning-tree information for the specified VLAN. The range is 1 to 4094.

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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 spanning-tree

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

show spanning-tree [**active**| **backbonefast**| **blockedports**| **bridge**| **detail**| **inconsistentports**| **interface** *interface-type interface-number*| **mst**| **pathcost**| **root**| **summary [totals]**| **uplinkfast**| **vlan** *vlan-id*]

Syntax Description

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) Displays detailed information.
inconsistentports	(Optional) Displays information about inconsistent ports.
interface *interface-type interface-number*	(Optional) Specifies the type and number of the interface.
mst	(Optional) Specifies multiple spanning-tree.
pathcost	(Optional) Displays spanning-tree pathcost options.
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.

Command Modes

User EXEC

Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines If you do not specify a *vlan-id* value when you use the **vlan** keyword, the command applies to spanning-tree instances for all VLANs.

Examples This is an example of output from the **show spannning-tree active** command:

```
Switch# show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32768
             Address     0001.42e2.cdd0
             Cost        3038
             Port        24 (GigabitEthernet2/0/1)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    49153  (priority 49152 sys-id-ext 1)
             Address     0003.fd63.9580
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 300
  Uplinkfast enabled

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Gi2/0/1          Root FWD 3019      128.24   P2p
Gi0/1            Root FWD 3019      128.24   P2p
<output truncated>
```

This is an example of output from the **show spanning-tree detail** command:

```
Switch# show spanning-tree detail
  Bridge Identifier has priority 49152, sysid 1, address 0003.fd63.9580
  Configured hello time 2, max age 20, forward delay 15
  Current root has priority 32768, address 0001.42e2.cdd0
  Root port is 1 (GigabitEthernet2/0/1), cost of root path is 3038
  Topology change flag not set, detected flag not set
  Number of topology changes 0 last change occurred 1d16h ago
  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
  Uplinkfast enabled

 Port 1 (GigabitEthernet2/0/1) of VLAN0001 is forwarding
   Port path cost 3019, Port priority 128, Port Identifier 128.24.
   Designated root has priority 32768, address 0001.42e2.cdd0
   Designated bridge has priority 32768, address 00d0.bbf5.c680
   Designated port id is 128.25, designated path cost 19
   Timers: message age 2, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   Link type is point-to-point by default
   BPDU: sent 0, received 72364

<output truncated>
```

This is an example of output from the **show spanning-tree summary** command:

```
Switch# show spanning-tree interface mst configuration
Switch is in pvst mode
Root bridge for: none
EtherChannel misconfiguration guard is enabled
Extended system ID   is enabled
Portfast             is disabled by default
PortFast BPDU Guard  is disabled by default
Portfast BPDU Filter is disabled by default
Loopguard            is disabled by default
UplinkFast           is enabled
```

```
BackboneFast        is enabled
Pathcost method used is short

Name                    Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN0001                    1        0        0        11         12
VLAN0002                    3        0        0        1          4
VLAN0004                    3        0        0        1          4
VLAN0006                    3        0        0        1          4
VLAN0031                    3        0        0        1          4
VLAN0032                    3        0        0        1          4
<output truncated>
---------------------- -------- --------- -------- ---------- ----------
37 vlans                  109        0        0        47         156
Station update rate set to 150 packets/sec.

UplinkFast statistics
---------------------
Number of transitions via uplinkFast (all VLANs)          : 0
Number of proxy multicast addresses transmitted (all VLANs) : 0

BackboneFast statistics
-----------------------
Number of transition via backboneFast (all VLANs)         : 0
Number of inferior BPDUs received (all VLANs)             : 0
Number of RLQ request PDUs received (all VLANs)           : 0
Number of RLQ response PDUs received (all VLANs)          : 0
Number of RLQ request PDUs sent (all VLANs)               : 0
Number of RLQ response PDUs sent (all VLANs)              : 0
```

This is an example of output from the **show spanning-tree mst configuration** command:

```
Switch# show spanning-tree interface mst configuration
Name     [region1]
Revision  1
Instance  Vlans Mapped
--------  ------------------
0         1-9,21-4094
1         10-20
----------------------------
```

This is an example of output from the **show spanning-tree interface mst interface** *interface-id* command:

```
Switch# show spanning-tree interface mst configuration
GigabitEthernet2/0/1 of MST00 is root forwarding
Edge port: no           (default)        port guard : none        (default)
Link type: point-to-point (auto)         bpdu filter: disable     (default)
Boundary : boundary      (STP)           bpdu guard : disable     (default)
Bpdus sent 5, received 74

Instance role state cost      prio vlans mapped
0       root FWD  200000      128 1,12,14-4094
```

This is an example of output from the **show spanning-tree interface mst** *instance-id* command:

```
Switch# show spanning-tree interface mst 0
GigabitEthernet2/0/1 of MST00 is root forwarding
Edge port: no           (default)        port guard : none        (default)
Link type: point-to-point (auto)         bpdu filter: disable     (default)
Boundary : boundary      (STP)           bpdu guard : disable     (default)
Bpdus sent 5, received 74

Instance role state cost      prio vlans mapped
0       root FWD  200000      128 1,12,14-4094
```

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 [*interface_id*| **neighbors**]

Syntax Description

interface-id	(Optional) ID of the interface and port number. Valid interfaces include physical ports, VLANs, and port channels.
neighbors	(Optional) Displays neighbor information only.

Command Default

None

Command Modes

User EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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. The table that follows describes the fields in this display.

```
Switch> show udld gigabitethernet2/0/1
Interface gi2/0/1
---
Port enable administrative configuration setting: Follows device default
Port enable operational state: Enabled
Current bidirectional state: Bidirectional
Current operational state: Advertisement - Single Neighbor detected
Message interval: 60
Time out interval: 5
Entry 1
Expiration time: 146
Device ID: 1
Current neighbor state: Bidirectional
Device name: Switch-A
Port ID: Gi2/0/1
Neighbor echo 1 device: Switch-B
Neighbor echo 1 port: Gi2/0/2
Message interval: 5
CDP Device name: Switch-A
```

Table 3: show udld Field Descriptions

Field	Description
Interface	The interface on the local device configured for UDLD.
Port enable administrative configuration setting	How UDLD is configured on the port. If UDLD is enabled or disabled, the port enable configuration setting is the same as the operational enable state. Otherwise, the enable operational setting depends on the global enable setting.
Port enable operational state	Operational state that shows whether UDLD is actually running on this port.
Current bidirectional state	The bidirectional state of the link. An unknown state appears if the link is down or if it is connected to an UDLD-incapable device. A bidirectional state appears if the link is a normal two-way connection to a UDLD-capable device. All other values mean miswiring.
Current operational state	The current phase of the UDLD state machine. For a normal bidirectional link, the state machine is most often in the Advertisement phase.
Message interval	How often advertisement messages are sent from the local device. Measured in seconds.
Time out interval	The time period, in seconds, that UDLD waits for echoes from a neighbor device during the detection window.
Entry 1	Information from the first cache entry, which contains a copy of echo information received from the neighbor.
Expiration time	The amount of time in seconds remaining before this cache entry is aged out.
Device ID	The neighbor device identification.
Current neighbor state	The neighbor's current state. If both the local and neighbor devices are running UDLD normally, the neighbor state and local state should be bidirectional. If the link is down or the neighbor is not UDLD-capable, no cache entries appear.

Field	Description
Device name	The device name or the system serial number of the neighbor. The system serial number appears if the device name is not set or is set to the default (Switch).
Port ID	The neighbor port ID enabled for UDLD.
Neighbor echo 1 device	The device name of the neighbors' neighbor from which the echo originated.
Neighbor echo 1 port	The port number ID of the neighbor from which the echo originated.
Message interval	The rate, in seconds, at which the neighbor is sending advertisement messages.
CDP device name	The CDP device name or the system serial number. The system serial number appears if the device name is not set or is set to the default (Switch).

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

```
Switch# 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
```

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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   Enable BackboneFast so that the switch detects indirect link failures and starts the spanning-tree reconfiguration sooner than it would under normal spanning-tree rules.

You can configure BackboneFast for rapid PVST+ or for multiple spanning-tree (MST) mode; however, the feature remains disabled until you change the spanning-tree mode to PVST+.

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

Examples   The following example shows how to enable BackboneFast on the switch:

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

spanning-tree bpdufilter

To enable bridge protocol data unit (BPDU) filtering on the interface, use the **spanning-tree bpdufilter** command in interface 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 bpdufilter default** command.

Command Modes   Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   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 the operational PortFast state and if you configure the **spanning-tree portfast bpdufilter default** command.

⚠
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.

You can enable BPDU filtering when the switch is operating in the per-VLAN spanning-tree plus (PVST+) mode, the rapid-PVST mode, or the multiple spanning-tree (MST) mode.

You can globally enable BPDU filtering on all Port Fast-enabled interfaces with the **spanning-tree portfast bpdufilter default** command.

The **spanning-tree bpdufilter enable** command overrides the PortFast configuration.

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

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

spanning-tree bpduguard

To enable bridge protocol data unit (BPDU) guard on the interface, use the **spanning-tree bpduguard** command in interface 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 Default   The setting that is already configured when you enter the **spanning-tree portfast bpduguard default** command.

Command Modes   Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   Use the BPDU guard feature in a service-provider environment 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** —Enables BPDU guard on the interface if the interface is in the operational PortFast state and if you configure the **spanning-tree portfast bpduguard default** command.

Examples   This example shows how to enable BPDU guard on an interface:

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

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 mode. To revert to the default value, use the **no** form of this command.

spanning-tree [**vlan** *vlan-id*] **cost** *cost*

no spanning-tree cost

Syntax Description

vlan *vlan-id*	(Optional) Specifies the VLAN range associated with the spanning-tree instance. The range of VLAN IDs is 1 to 4094.
cost	The path cost; valid values are from 1 to 200000000.

Command Default

The default path cost is computed from the bandwidth setting of the interface. Default path costs are:

* 1 Gb/s: 4
* 100 Mb/s: 19
* 10 Mb/s: 100

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

When you specify VLANs associated with a spanning tree instance, you can specify a single VLAN identified by a VLAN ID number, a range of VLANs separated by a hyphen, or a series of VLAN IDs separated by a comma.

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

Examples

This example shows how to set the path cost on an interface to a value of 250:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# spanning-tree cost 250
```

This example shows how to set the path cost to 300 for VLANS 10, 12 to 15, and 20:

```
Switch(config-if)# spanning-tree vlan 10,12-15,20 cost 300
```

spanning-tree etherchannel guard misconfig

To display an error message when the switch detects an EtherChannel misconfiguration, 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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   When the switch detects an EtherChannel misconfiguration, this error message is displayed:

```
PM-4-ERR_DISABLE: Channel-misconfig error detected on [chars], putting [chars] in err-disable
 state.
```

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:

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

spanning-tree extend system-id

To enable extended system identification, use the **spanning-tree extend system-id** command in global configuration mode. To disable 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   The extended system ID is enabled.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   The spanning tree uses the extended system ID, the switch priority, and the allocated spanning-tree MAC address to make the bridge ID unique for each VLAN or multiple spanning-tree instance. Because a switch stack appears as a single switch to the rest of the network, all switches in the stack use the same bridge ID for a given spanning tree. If the stack master fails, the stack members recalculate their bridge IDs of all running spanning trees based on the new MAC address of the stack master.

Support for the extended system ID affects how you manually configure the root switch, the secondary root switch, and the switch priority of a VLAN.

If your network consists of switches that do not support the extended system ID and switches that do support it, it is unlikely that the switch with the extended system ID support will become the root switch. The extended system ID increases the switch priority value every time the VLAN number is greater than the priority of the connected switches.

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

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

spanning-tree guard

To enable or disable root-guard mode or loop-guard mode on the VLANs associated with an interface, use the **spanning-tree guard** command in interface 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

Root-guard mode is disabled.

Loop-guard mode is configured according to the **spanning-tree loopguard default** command in global configuration mode.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

You can enable root guard or loop guard when the switch is operating in the per-VLAN spanning-tree plus (PVST+), rapid-PVST+, or the multiple spanning-tree (MST) mode.

You cannot enable both root guard and loop guard at the same time.

Use the **spanning-tree guard loop** command to override the setting of the spanning-tree loop guard default setting.

When root guard is enabled, if spanning-tree calculations cause an interface to be selected as the root port, the interface transitions to the root-inconsistent (blocked) state to prevent the switch from becoming the root switch or from being in the path to the root. The root port provides the best path from the switch to the root switch.

When the **no spanning-tree guard** or the **no spanning-tree guard none** command is entered, root guard is disabled for all VLANs on the selected interface. If this interface is in the root-inconsistent (blocked) state, it automatically transitions to the listening state.

Do not enable root guard on interfaces that will be used by the UplinkFast feature. With UplinkFast, the backup interfaces (in the blocked state) replace the root port in the case of a failure. However, if root guard is also enabled, all the backup interfaces used by the UplinkFast feature are placed in the root-inconsistent state (blocked) and are prevented from reaching the forwarding state. The UplinkFast feature is not available when the switch is operating in the rapid-PVST+ or MST mode.

Examples   This example shows how to enable root guard on all the VLANs associated with the specified interface:

```
Switch(config)# interface gigabitethernet1/0/1
Switch(config-if)# spanning-tree guard root
```

spanning-tree link-type

To configure a link type for a port, use the **spanning-tree link-type** command in the interface 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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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.

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

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

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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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:

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

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	Enables PVST+ mode.
mst	Enables MST mode.
rapid-pvst	Enables Rapid-PVST+ mode.

Command Default   The default mode is PVST+.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   Only one mode can be active at a time.

All stack members run the same spanning-tree mode.

⚠️
Caution   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 enable MST mode:

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

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

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

spanning-tree mst configuration

To enter MST-configuration mode, 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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

You can use these commands for MST configuration:

- **abort** Exits the MST region configuration mode without applying configuration changes.

- **exit** Exits the MST region configuration mode and applies all configuration changes.

- **instance** *instance_id* **vlan** *vlan_id* Maps VLANs to an MST instance. The range for instance IDs is 1 to 4094. The range for VLANs is 1 to 4094. You can specify a single VLAN identified by a VLAN ID number, a range of VLANs separated by a hyphen, or a series of VLANs separated by a comma.

- **name** *name* Sets the configuration name. The *name* string is case sensitive and can be up to 32 characters long.

- **no** Negates the instance, name and revision commands or sets them to their defaults.

- **revision** *version* Sets the configuration revision number. The range is 0 to 65535.

- **show** [**current** | **pending** Displays the current or pending MST region configuration.

In MST mode, a switch stack supports up to 65 MST instances. The number of VLANs that can be mapped to a particular MST instance is unlimited.

For two or more switches to be in the same MST region, they must have the same VLAN mapping, the same configuration name, and the same configuration revision number.

When you map VLANs to an MST instance, the mapping is incremental, and VLANs specified in the command are added to or removed from the VLANs that were previously mapped. To specify a range, use a hyphen; for example, **instance 1 vlan 1-63** maps VLANs 1 to 63 to MST instance 1. To specify a series, use a comma; for example, **instance 1 vlan 10, 20, 30** maps VLANs 10, 20, and 30 to MST instance 1.

All VLANs that are not explicitly mapped to an MST instance are mapped to the common and internal spanning tree (CIST) instance (instance 0) and cannot be unmapped from the CIST by using the **no** form of this command.

Changing an MST-configuration mode parameter can cause connectivity loss. To reduce service disruptions, when you enter MST-configuration mode, make changes to a copy of the current MST configuration. When you have finished editing the configuration, you can apply all the changes at once by using the **exit** keyword, or you can exit the mode without committing any change to the configuration by using the **abort** keyword.

Examples   This example shows how to enter MST-configuration mode, map VLANs 10 to 20 to MST instance 1, name the region region1, set the configuration revision to 1 and display the pending configuration:

```
Switch(config)# spanning-tree mst configuration
Switch(config-mst)# instance 1 vlan 10-20
Switch(config-mst)# name region1
Switch(config-mst)# revision 1
Switch(config-mst)# show pending
Pending MST configuration
Name       [region1]
Revision   1
Instance   Vlans  Mapped
--------   ------------------
0          1-9,21-4094
1          10-20
----------------------------
```

This example shows how to reset the MST configuration to the default settings:

```
Switch(config)# no spanning-tree mst configuration
```

spanning-tree mst cost

To set the path cost of the interface for multiple spanning tree (MST) calculations, use the **spanning-tree mst cost** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

spanning-tree mst *instance-id* **cost** *cost*

no spanning-tree mst *instance-id* **cost**

Syntax Description

instance-id	Range of spanning-tree instances. The range is 1 to 4094.
cost	Path cost. The range is 1 to 200000000.

Command Default

The default path cost is computed from the bandwidth setting of the interface. Default path costs are:

- 1 Gb/s: 20000
- 100 Mb/s: 200000
- 10 Mb/s: 2000000

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

When you specify a value for the cost argument, higher values indicate higher costs.

Examples

This example shows how to set the path cost for an interface associated with MST instances 2 and 4 to 50:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# spanning-tree mst 2,4 cost 250
```

spanning-tree mst forward-time

To set the forward-delay timer for MST instances, 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 MST instances. The range is 4 to 30.

Command Default

The default is 15 seconds.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Examples

This example shows how to set the forward-delay timer for all MST instances:

```
Switch(config)# spanning-tree mst forward-time 20
```

spanning-tree mst hello-time

To set the hello-time delay timer, 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	Interval, in seconds, between hello BPDUs. The range is 1 to 10.

Command Default   The default is 2.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   If you do not specify the *hello-time* value, the value is calculated from the network diameter.

Exercise care when using this command. For most situations, we recommend that you use the **spanning-tree vlan** *vlan-id* **root primary** and the **spanning-tree vlan** *vlan-id* **root secondary** global configuration commands to modify the hello time.

Examples   This example shows how to set the hello-time delay timer to 3 seconds:

```
Switch(config)# spanning-tree mst hello-time 3
```

spanning-tree mst max-age

To set the interval between messages that the spanning tree receives from the root switch, 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*	Interval, in seconds, between messages the spanning tree receives from the root switch. The range is 6 to 40.

Command Default   The default is 20.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Examples   This example shows how to set the max-age timer to 40 seconds:

```
Switch(config)# spanning-tree mst max-age 40
```

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 *hop-count*

no spanning-tree mst max-hops

Syntax Description

hop-count	Number of possible hops in the region before a BPDU is discarded. The range is 1 to 255.

Command Default

The default is 20.

Command Modes

Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Examples

This example shows how to set the number of possible hops to 25:

```
Switch(config)# spanning-tree mst max-hops 25
```

spanning-tree mst port-priority

To set the priority for an interface, use the **spanning-tree mst port-priority** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

spanning-tree mst *instance-id* **port-priority** *priority*

no spanning-tree mst *instance-id* **port-priority**

Syntax Description

instance-id	Range of spanning-tree instances. The range is 1 to 4094.
priority	Priority. The range is 0 to 240 in increments of 16.

Command Default

The default is 128.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

You can assign higher priority values (lower numerical values) to interfaces that you want selected first and lower priority values (higher numerical values) that you want selected last. If all interfaces have the same priority value, the multiple spanning tree (MST) puts the interface with the lowest interface number in the forwarding state and blocks other interfaces.

If the switch is a member of a switch stack, you must use the **spanning-tree mst** *instance_id* **cost** *cost* command to select an interface to put in the forwarding state.

Examples

This example shows how to increase the likelihood that the interface associated with spanning-tree instances 20 and 22 is placed into the forwarding state if a loop occurs:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# spanning-tree mst 20,24 port-priority 0
```

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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines　The port can accept both prestandard and standard BPDUs. If the neighbor types are mismatched, only the common and internal spanning tree (CIST) runs on this interface.

Note　If a switch port is connected to a switch running prestandard Cisco IOS software, you must use the **spanning-tree mst pre-standard** interface configuration command on the port. If you do not configure the port to send only prestandard BPDUs, the Multiple STP (MSTP) performance might diminish.

When the port is configured to automatically detect prestandard neighbors, the prestandard flag always appears in the **show spanning-tree mst** commands.

Examples　This example shows how to configure a port to transmit only prestandard BPDUs:

```
Switch(config-if)# spanning-tree mst pre-standard
```

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. The range is 0 to 4094.
priority *priority*	Specifies the bridge priority. The range is 0 to 614440 in increments of 4096.

Command Default   The default is 32768.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   You can set the bridge priority in increments of 4096 only. Valid values are 0, 4096, 8192, 12288, 16384, 20480. 24576, 28672, 32768, 40960, 45056, 49152, 53248, 57344 and 61440.

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 spanning tree priority for MST instance 0 to 4096:

```
Switch(config)# spanning-tree mst 0 priority 4096
```

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**}

no spanning-tree mst *instance* **root**

Syntax Description

instance	Instance identification number. The range is 0 to 4094.
primary	Forces this switch to be the root switch.
secondary	Specifies this switch to act as the root switch, if the primary root fail.

Command Default   None

Command Modes   Global configuration (config)

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   Use this command only on backbone switches. You can enter *instance-id* as a single instance or a range of instances, for example, 0-3,5,7-9.

When you enter the **spanning-tree mst** *instance-id* **root** command, the software tries to set a high enough priority to make this switch the root of the spanning-tree instance. Because of the extended system ID support, the switch sets the switch priority for the instance to 24576 if this value will cause this switch to become the root for the specified instance. If any root switch for the specified instance has a switch priority lower than 24576, the switch sets its own priority to 4096 less than the lowest switch priority. (4096 is the value of the least-significant bit of a 4-bit switch priority value.)

When you enter the **spanning-tree mst***instance-id* **root secondary** command, because of support for the extended system ID, the software changes the switch priority from the default value (32768) to 28672. If the root switch fails, this switch becomes the next root switch (if the other switches in the network use the default switch priority of 32768 and are therefore unlikely to become the root switch).

Examples   This example shows how to configure the switch as the root switch for instance 10:

```
Switch(config)# spanning-tree mst 10 root primary
```

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

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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:

```
Switch(config)#spanning-tree pathcost method long
```
This example shows how to set the default path-cost calculation method to short:

```
Switch(config)#spanning-tree pathcost method short
```

spanning-tree port-priority

To configure an interface priority when two bridges tie for position as the root bridge, use the **spanning-treeport-priority** command in interface configuration mode. To return to the default value, use the **no** form of this command.

spanning-tree [**vlan** *vlan-id*] **port-priority** *port-priority*

no spanning-tree [**vlan** *vlan-id*] **port-priority**

Syntax Description

vlan *vlan-id*	(Optional) Specifies the VLAN range associated with the spanning-tree instance. The range is 1 to 4094.
port-priority	The port priority in increments of sixteen. The range is 0 to 240. The default is 128.

Command Default

The port priority is 128.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

The priority you set breaks the tie.

Examples

The following example shows how to increase the likelihood that a port will be put in the forwarding state if a loop occurs:

```
Switch(config)# interface gigabitethernet2/0/2
Switch(config-if)# spanning-tree vlan 20 port-priority 0
```

spanning-tree portfast (global configuration)

To enable bridge protocol data unit (BPDU) filtering on PortFast-enabled interfaces, the BDPU guard feature on PortFast-enabled interfaces, or the PortFast feature on all nontrunking interfaces, use the **spanning-treeportfast** command in global configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree portfast {**bpdufilter default**| **bpduguard default**| **default**}

no portfast {**bpdufilter default**| **bpduguard default**| **default**}

Syntax Description

bdpufilter default	Enables BDPU filtering on PortFast-enabled interfaces and prevents the switch interface connect to end stations from sending or receiving BPDUs.
bdpuguard default	Enables the BDPU guard feature on PortFast-enabled interfaces and places the interfaces that receive BPDUs in an error-disabled state.
default	Enables the PortFast feature on all nontrunking interfaces.

Command Default   Disabled

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   You can enable these features when the switch is operating in the per-VLAN spanning-tree plus (PVST+) rapid-PVST+, or the multiple spanning-tree (MST) mode.

Use the **spanning-tree portfast bpdufilter default** global configuration command to globally enable BPDU filtering on interfaces that are PortFast-enabled (the interfaces are in a PortFast-operational state). The interfaces still send a few BPDUs at link-up before the switch begins to filter outbound BPDUs. You should globally enable BPDU filtering on a switch so that hosts connected to switch interfaces do not receive BPDUs. If a BPDU is received on a PortFast-enabled interface, the interface loses its PortFast-operational status and BPDU filtering is disabled.

You can override the **spanning-tree portfast bpdufilter default** command by using the **spanning-tree portfast bpdufilter** interface command.

⚠

Caution   Be careful when using this command. Enabling BPDU filtering on an interface is the same as disabling spanning tree on it and can result in spanning-tree loops.

Use the **spanning-tree portfast bpduguard default** global configuration command to globally enable BPDU guard on interfaces that are in a PortFast-operational state. In a valid configuration, PortFast-enabled interfaces do not receive BPDUs. Receiving a BPDU on a PortFast-enabled interface signals an invalid configuration, such as the connection of an unauthorized device, and the BPDU guard feature puts the interface in the error-disabled state. The BPDU guard feature provides a secure response to invalid configurations because you must manually put the interface back in service. Use the BPDU guard feature in a service-provider network to prevent an access port from participating in the spanning tree.

You can override the **spanning-tree portfast bpduguard default** command by using the **spanning-tree portfast bpduguard** interface command.

Use the **spanning-tree portfast default** command to globally enable the PortFast feature on all nontrunking interfaces. Configure PortFast only on interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data packet loop and disrupt switch and network operation. A PortFast-enabled interface moves directly to the spanning-tree forwarding state when linkup occurs; it does not wait for the standard forward-delay time.

You can override the **spanning-tree portfast default** global configuration command by using the **spanning-tree portfast** interface configuration command. You can use the **no spanning-tree portfast default** global configuration command to disable PortFast on all interfaces unless they are individually configured with the **spanning-tree portfast** interface configuration command.

Examples   This example shows how to globally enable BPDU filtering by default:

```
Switch(config)# spanning-tree portfast bpdufilter default
```

This example shows how to globally enable the BDPU guard feature by default:

```
Switch(config)# spanning-tree portfast bpduguard default
```

This example shows how to globally enable the PortFast feature on all nontrunking interfaces:

```
Switch(config)# spanning-tree portfast default
```

spanning-tree portfast (interface configuration)

To enable PortFast mode where the interface is immediately put into the forwarding state upon linkup without waiting for the timer to expire, use the **spanning-tree portfast** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

spanning-tree portfast [**disable**| **trunk**]

no spanning-tree portfast

Syntax Description

disable	(Optional) Disables PortFast on the interface.
trunk	(Optional) Enables PortFast edge mode on the interface.

Command Default   The settings that are configured by the **spanning-treeportfastdefault** command.

Command Modes   Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   You can enable this feature when the switch is operating in the per-VLAN spanning-tree plus (PVST+), Rapid PVST+, or the multiple spanning-tree (MST) mode.

This feature affects all VLANs on the interface.

Use this command only on interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data-packet loop and disrupt the switch and network operation.

To enable PortFast on trunk ports, you must use the **spanning-tree portfast trunk** interface configuration command. The **spanning-tree portfast** command is not supported on trunk ports.

An interface with the PortFast feature enabled is moved directly to the spanning-tree forwarding state without the standard forward-time delay.

You can use the **spanning-tree portfast default** global configuration command to globally enable the PortFast feature on all nontrunking interfaces. Use the **spanning-tree portfast** interface configuration command to override the global setting.

If you configure the **spanning-tree portfast default** global configuration command, you can disable PortFast on an interface that is not a trunk interface by using the **spanning-tree portfast disable** interface configuration command.

Examples   This example shows how to enable the PortFast feature on a port:

```
Switch(config)# interface gigabitethernet1/0/2
Switch(config-if)#spanning-tree portfast
```

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) sent every second. The range is 1 to 20.

Command Default   The default is 6.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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   Increasing the transmit-hold count value can have a significant impact on CPU utilization, especially in Rapid Per-VLAN Spanning Tree (PVST+) mode. Decreasing this value might result in slow convergence. We recommend that you used the default setting.

Examples   This example shows how to specify the transmit hold count 8:

```
Switch(config)# spanning-tree transmit hold-count 8
```

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 rate (number of packets per second) at which update packets are sent. The range is 0 to 320000. The default is 150.

Command Default   UplinkFast is disabled.

Command Modes   Global configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines   Use this command only on access switches.

You can configure the UplinkFast feature for rapid PVST+ or for multiple spanning-tree (MST) mode, but the feature remains disabled (inactive) until you change the spanning-tree mode to PVST+.

When you enable UplinkFast, it is enabled for the entire switch; it cannot be enabled for individual VLANs.

When you enable or disable UplinkFast, cross-stack UplinkFast (CSUF) also is automatically enabled or disabled on all nonstack port interfaces. CSUF accelerates the choice of a new root port when a link or switch fails or when spanning tree reconfigures itself.

When UplinkFast is enabled, the switch priority of all VLANs is set to 49152. If you change the path cost to a value less than 3000 and you enable UplinkFast or UplinkFast is already enabled, the path cost of all interfaces and VLAN trunks is increased by 3000 (if you change the path cost to 3000 or above, the path cost is not altered). The changes to the switch priority and the path cost reduces the chance that a switch will become the root switch.

When UplinkFast is disabled, the switch priorities of all VLANs and path costs of all interfaces are set to default values if you did not modify them from their defaults.

When spanning tree detects that the root port has failed, UplinkFast immediately changes to an alternate root port, changing the new root port directly to forwarding state. During this time, a topology change notification is sent.

Do not enable the root guard on interfaces that will be used by the UplinkFast feature. With UplinkFast, the backup interfaces (in the blocked state) replace the root port in the case of a failure. However, if root guard is also enabled, all the backup interfaces used by the UplinkFast feature are placed in the root-inconsistent state (blocked) and prevented from reaching the forwarding state.

If you set the max-update-rate to 0, station-learning frames are not generated, so the spanning-tree topology converges more slowly after a loss of connectivity.

Examples   This example shows how to enable UplinkFast and set the maximum rate to 200 packets per second:

```
Switch(config)# spanning-tree uplinkfast max-update-rate 200
```

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**} [**diameter** *net-diameter*]]]

no spanning-tree vlan *vlan-id* [**forward-time**| **hello-time**| **max-age**| **priority**| **root**]

Syntax Description

vlan-id	VLAN range associated with the spanning-tree instance. The range is 1 to 4094.
forward-time *seconds*	(Optional) Sets the STP forward delay time in second. The range is 4 to 30. The default is 15.
hello-time *seconds*	(Optional) Specifies the duration, in seconds, between the generation of configuration messages by the root switch. The range is 1 to 10. The default is 2.
max-age *seconds*	(Optional) Sets the maximum number of seconds the information in a bridge packet data unit (BPDU) is valid. The range is 6 to 40. The default is 20.
priority *priority*	(Optional) Sets the STP bridge priority. The range is 0 to 61440 in increments of 4096. The default for the primary root switch is 24576. The default for the secondary root switch is 28672.
root primary	(Optional) Forces this switch to be the root switch.
root secondary	(Optional) Specifies this switch to act as the root switch should the primary root fail.
diameter *net -diameter*	(Optional) Specifies the maximum number of switches between any two points of attachment of end stations. The range is 2 through 7.

Command Default   Spanning tree is enabled on all VLANs.

Command Modes   Global configuration

Command History	Release	Modification
	Cisco IOS 15.0(2)EX	This command was introduced.

Usage Guidelines

If the switch does not hear BPDUs within the time specified by the **max-age** *seconds-* value, it recomputes the spanning-tree topology.

Use the **spanning-tree vlan** *vlan-id* **root** only on backbone switches.

The **spanning-tree vlan** *vlan-id* **root secondary** command alters this switch's priority from 32768 to 28672. If the root switch should fail, this switch becomes the next root switch.

⚠️

Caution   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.

Examples

The following example shows how to enable spanning tree on VLAN 200:

```
Switch(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:

```
Switch(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:

```
Switch(config)# spanning-tree vlan 10 root secondary diameter 4
```

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, 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.

A dynamic-access port is initially a member of no VLAN and receives its assignment based on the packet it receives.

Command Modes

Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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:

```
Switch(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 15.0(2)EX	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** interface configuration command to disable trunking.

- To enable trunking to 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.

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** privileged EXEC command and examining information in the *Administrative Mode* and *Operational Mode* rows.

Examples

This example shows how to configure a port for access mode:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# switchport mode access
```

This example shows how set the port to dynamic desirable mode:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# switchport mode dynamic desirable
```

This example shows how to configure a port for trunk mode:

```
Switch(config)# interface gigabitethernet2/0/1
Switch(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

Syntax Description   This command has no arguments or keywords.

Command Default   The default is to use DTP negotiation to learn the trunking status.

Command Modes   Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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.

Examples   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):

```
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)# switchport nonegotiate
```

You can verify your setting by entering the **show interfaces** *interface-id* **switchport** privileged EXEC command.

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**| **message time** *message-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.
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.

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 15.0(2)EX	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 *Catalyst 2960-X Switch Layer 2 Configuration GuideCatalyst 2960-XR Switch Layer 2 Configuration Guide*.

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.

Examples   This example shows how to enable UDLD on all fiber-optic interfaces:

```
Switch(config)# udld enable
```

You can verify your setting by entering the **show udld** privileged EXEC command.

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** global configuration command, use the **udld port** command in interface configuration mode. To return to the **udld** global configuration command setting or to disable UDLD if entered for a nonfiber-optic port, use the **no** form of this command.

udld port [aggressive]

no udld port [aggressive]

Syntax Description

aggressive	(Optional) Enables UDLD in aggressive mode on the specified interface.

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** global configuration command.

On nonfiber-optic interfaces, UDLD is disabled.

Command Modes
Interface configuration

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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 switch.

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** interface configuration command. To enable UDLD in aggressive mode, use the **udld port aggressive** interface configuration command.

Use the **no udld port** command on fiber-optic ports to return control of UDLD to the **udld enable** global configuration command 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** global configuration command. Use the **no** form on fiber-optic ports to remove this setting and to return control of UDLD enabling to the **udld** global configuration command or to disable UDLD on nonfiber-optic ports.

You can use these commands to reset an interface shut down by UDLD:

  • The **udld reset** privileged EXEC command resets 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 reenables UDLD globally.

- The **no udld port** interface configuration command, followed by the **udld port** or **udld port aggressive** interface configuration command reenables UDLD on the specified interface.

- The **errdisable recovery cause udld** and **errdisable recovery interval** *interval* global configuration commands automatically recover from the UDLD error-disabled state.

Examples   This example shows how to enable UDLD on an port:

```
Switch(config)# interface gigabitethernet6/0/1
Switch(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:

```
Switch(config)# interface gigabitethernet6/0/1
Switch(config-if)# no udld port
```

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

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

Syntax Description   This command has no arguments or keywords.

Command Default   None

Command Modes   Privileged EXEC

Command History

Release	Modification
Cisco IOS 15.0(2)EX	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.

Examples   This example shows how to reset all interfaces disabled by UDLD:

```
Switch# udld reset
1 ports shutdown by UDLD were reset.
```