# Configuring EtherChannels


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# Finding Feature Information

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

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

# Restrictions for EtherChannels

The following are restrictions for EtherChannels:

- All ports in an EtherChannel must be assigned to the same VLAN or they must be configured as trunk port.

# Information About EtherChannels

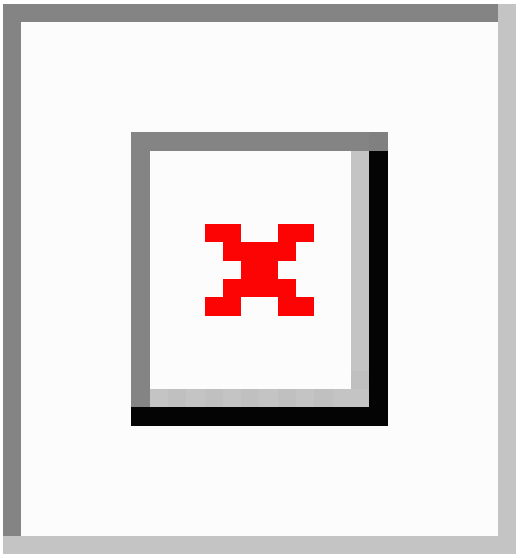
## EtherChannel Overview

EtherChannel provides fault-tolerant high-speed links between switches, routers, and servers. You can use the EtherChannel to increase the bandwidth between the wiring closets and the data center, and you can deploy

it anywhere in the network where bottlenecks are likely to occur. EtherChannel provides automatic recovery for the loss of a link by redistributing the load across the remaining links. If a link fails, EtherChannel redirects traffic from the failed link to the remaining links in the channel without intervention.

An EtherChannel consists of individual Ethernet links bundled into a single logical link.

***Figure 1: Typical EtherChannel Configuration***



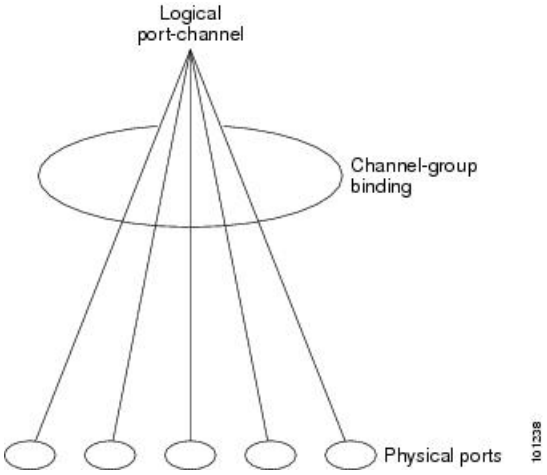
Each EtherChannel can consist of up to eight compatibly configured Ethernet ports.

# Channel Groups and Port-Channel Interfaces

An EtherChannel comprises a channel group and a port-channel interface. The channel group binds physical ports to the port-channel interface. Configuration changes applied to the port-channel interface apply to all the physical ports bound together in the channel group.

***Figure 2: Relationship of Physical Ports, Channel Group and Port-Channel Interface***

The **channel-group** command binds the physical port and the port-channel interface together. Each EtherChannel has a port-channel logical interface numbered from 1 to 252. This port-channel interface number corresponds to the one specified with the **channel-group** interface configuration command.




- With Layer 2 ports, use the **channel-group** interface configuration command to dynamically create the port-channel interface.

  You also can use the **interface port-channel** *port-channel-number* global configuration command to manually create the port-channel interface, but then you must use the **channel-group** *channel-group-number* command to bind the logical interface to a physical port. 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.

- With Layer 3 ports, you should manually create the logical interface by using the **interface port-channel** global configuration command followed by the **no switchport** interface configuration command. You then manually assign an interface to the EtherChannel by using the **channel-group** interface configuration command.

# Port Aggregation Protocol

The Port Aggregation Protocol (PAgP) is a Cisco-proprietary protocol that can be run only on Cisco devices and on those devices licensed by vendors to support PAgP. PAgP facilitates the automatic creation of EtherChannels by exchanging PAgP packets between Ethernet ports.

By using PAgP, the device or device stack learns the identity of partners capable of supporting PAgP and the capabilities of each port. It then dynamically groups similarly configured ports (on a single device in the stack) into a single logical link (channel or aggregate port). Similarly configured ports are grouped based on hardware, administrative, and port parameter constraints. For example, PAgP groups the ports with the same speed, duplex mode, native VLAN, VLAN range, and trunking status and type. After grouping the links into an EtherChannel, PAgP adds the group to the spanning tree as a single device port.

# PAgP Modes

PAgP modes specify whether a port can send PAgP packets, which start PAgP negotiations, or only respond to PAgP packets received.

***Table 1: EtherChannel PAgP Modes***

| Mode | Description |
|---|---|
| **auto** | 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. This setting minimizes the transmission of PAgP packets. |
| **desirable** | Places a port into an active negotiating state, in which the port starts negotiations with other ports by sending PAgP packets. |

Switch ports exchange PAgP packets only with partner ports configured in the **auto** or **desirable** modes. Ports configured in the **on** mode do not exchange PAgP packets.

Both the **auto** and **desirable** modes enable ports to negotiate with partner ports to form an EtherChannel based on criteria such as port speed. and for Layer 2 EtherChannels, based on trunk state and VLAN numbers.

Ports can form an EtherChannel when they are in different PAgP modes as long as the modes are compatible. For example:

- A port in the **desirable** mode can form an EtherChannel with another port that is in the **desirable** or **auto** mode.
- A port in the **auto** mode can form an EtherChannel with another port in the **desirable** mode.

A port in the **auto** mode cannot form an EtherChannel with another port that is also in the **auto** mode because neither port starts PAgP negotiation.

### Silent Mode

If your switch is connected to a partner that is PAgP-capable, you can configure the switch port for nonsilent operation by using the **non-silent** keyword. If you do not specify **non-silent** with the **auto** or **desirable** mode, silent mode is assumed.

Use the silent mode when the switch is connected to a device that is not PAgP-capable and seldom, 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 connected to a silent partner prevents that switch port from ever becoming operational. However, the silent setting allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission.

# PAgP Learn Method and Priority

Network devices are classified as PAgP physical learners or aggregate-port learners. A device is a physical learner if it learns addresses by physical ports and directs transmissions based on that knowledge. A device is an aggregate-port learner if it learns addresses by aggregate (logical) ports. The learn method must be configured the same at both ends of the link.

When a device and its partner are both aggregate-port learners, they learn the address on the logical port-channel. The device sends packets to the source by using any of the ports in the EtherChannel. With aggregate-port learning, it is not important on which physical port the packet arrives.

PAgP cannot automatically detect when the partner device is a physical learner and when the local device is an aggregate-port learner. Therefore, you must manually set the learning method on the local device to learn addresses by physical ports. You also must set the load-distribution method to source-based distribution, so that any given source MAC address is always sent on the same physical port.

You also can configure a single port within the group for all transmissions and use other ports for hot-standby. The unused ports in the group can be swapped into operation in just a few seconds if the selected single port loses hardware-signal detection. You can configure which port is always selected for packet transmission by changing its priority with the **pagp port-priority** interface configuration command. The higher the priority, the more likely that the port will be selected.

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

When the link partner of the device is a physical learner, we recommend that you configure the device as a physical-port learner by using the **pagp learn-method physical-port** interface configuration command. Set the load-distribution method based on the source MAC address by using the **port-channel load-balance src-mac** global configuration command. The device then sends packets to the physcial learner using the same port in the EtherChannel from which it learned the source address. Only use the **pagp learn-method** command in this situation.

## PAgP Interaction with Other Features

The Dynamic Trunking Protocol (DTP) and the Cisco Discovery Protocol (CDP) send and receive packets over the physical ports in the EtherChannel. Trunk ports send and receive PAgP protocol data units (PDUs) on the lowest numbered VLAN.

In Layer 2 EtherChannels, the first port in the channel that comes up provides its MAC address to the EtherChannel. If this port is removed from the bundle, one of the remaining ports in the bundle provides its MAC address to the EtherChannel. For Layer 3 EtherChannels, the MAC address is allocated by the active device as soon as the interface is created (through the **interface port-channel** global configuration command).

PAgP sends and receives PAgP PDUs only from ports that are up and have PAgP enabled for the auto or desirable mode.

# Link Aggregation Control Protocol

The LACP is defined in IEEE 802.3ad and enables Cisco devices to manage Ethernet channels between devices that conform to the IEEE 802.3ad protocol. LACP facilitates the automatic creation of EtherChannels by exchanging LACP packets between Ethernet ports.

By using LACP, the device or device stack learns the identity of partners capable of supporting LACP and the capabilities of each port. It then dynamically groups similarly configured ports into a single logical link (channel or aggregate port). Similarly configured ports are grouped based on hardware, administrative, and port parameter constraints. For example, LACP groups the ports with the same speed, duplex mode, native VLAN, VLAN range, and trunking status and type. After grouping the links into an EtherChannel, LACP adds the group to the spanning tree as a single device port.

The independent mode behavior of ports in a port channel is changed. With CSCtn96950, by default, standalone mode is enabled. When no response is received from an LACP peer, ports in the port channel are moved to suspended state.

## LACP Modes

LACP modes specify whether a port can send LACP packets or only receive LACP packets.

*Table 2: EtherChannel LACP Modes*

| Mode | Description |
|---|---|
| **active** | Places a port into an active negotiating state in which the port starts negotiations with other ports by sending LACP packets. |
| **passive** | Places a port into a passive negotiating state in which the port responds to LACP packets that it receives, but does not start LACP packet negotiation. This setting minimizes the transmission of LACP packets. |

Both the **active** and **passive LACP** modes enable ports to negotiate with partner ports to an EtherChannel based on criteria such as port speed, and for Layer 2 EtherChannels, based on trunk state and VLAN numbers.

Ports can form an EtherChannel when they are in different LACP modes as long as the modes are compatible. For example:

- A port in the **active** mode can form an EtherChannel with another port that is in the **active** or **passive** mode.
- A port in the **passive** mode cannot form an EtherChannel with another port that is also in the **passive** mode because neither port starts LACP negotiation.

## LACP and Link Redundancy

LACP port-channel operation, bandwidth availability, and link redundancy can be further refined with the LACP port-channel min-links and the LACP max-bundle features.

The LACP port-channel min-links feature:

- Configures the minimum number of ports that must be linked up and bundled in the LACP port channel.
- Prevents a low-bandwidth LACP port channel from becoming active.
- Causes an LACP port channel to become inactive if there are too few active members ports to supply the required minimum bandwidth.

The LACP max-bundle feature:

- Defines an upper limit on the number of bundled ports in an LACP port channel.
- Allows hot-standby ports with fewer bundled ports. For example, in an LACP port channel with five ports, you can specify a max-bundle of three, and the two remaining ports are designated as hot-standby ports.

## LACP Interaction with Other Features

The DTP and the CDP send and receive packets over the physical ports in the EtherChannel. Trunk ports send and receive LACP PDUs on the lowest numbered VLAN.

In Layer 2 EtherChannels, the first port in the channel that comes up provides its MAC address to the EtherChannel. If this port is removed from the bundle, one of the remaining ports in the bundle provides its MAC address to the EtherChannel. For Layer 3 EtherChannels, the MAC address is allocated by the active device as soon as the interface is created through the **interface port-channel** global configuration command.

LACP sends and receives LACP PDUs only from ports that are up and have LACP enabled for the active or passive mode.

# EtherChannel On Mode

EtherChannel **on** mode can be used to manually configure an EtherChannel. The **on** mode forces a port to join an EtherChannel without negotiations. The **on** mode can be useful if the remote device does not support PAgP or LACP. In the **on** mode, a usable EtherChannel exists only when the devices at both ends of the link are configured in the **on** mode.

Ports that are configured in the **on** mode in the same channel group must have compatible port characteristics, such as speed and duplex. Ports that are not compatible are suspended, even though they are configured in the **on** mode.

**Caution** You should 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.

# Load-Balancing and Forwarding Methods

EtherChannel balances the traffic load across the links in a channel by reducing part of the binary pattern formed from the addresses in the frame to a numerical value that selects one of the links in the channel. You can specify one of several different load-balancing modes, including load distribution based on MAC addresses, IP addresses, source addresses, destination addresses, or both source and destination addresses. The selected mode applies to all EtherChannels configured on the device.

**Note** Layer 3 Equal-cost multi path (ECMP) load balancing is based on source IP address, destination IP address, source port, destination port, and layer 4 protocol. Fragmented packets will be treated on two different links based on the algorithm calculated using these parameters. Any changes in one of these parameters will result in load balancing.

## MAC Address Forwarding

With source-MAC address forwarding, when packets are forwarded to an EtherChannel, they are distributed across the ports in the channel based on the source-MAC address of the incoming packet. Therefore, to provide load-balancing, packets from different hosts use different ports in the channel, but packets from the same host use the same port in the channel.

With destination-MAC address forwarding, when packets are forwarded to an EtherChannel, they are distributed across the ports in the channel based on the destination host's MAC address of the incoming packet. Therefore, packets to the same destination are forwarded over the same port, and packets to a different destination are sent on a different port in the channel.

With source-and-destination MAC address forwarding, when packets are forwarded to an EtherChannel, they are distributed across the ports in the channel based on both the source and destination MAC addresses. This forwarding method, a combination source-MAC and destination-MAC address forwarding methods of load distribution, can be used if it is not clear whether source-MAC or destination-MAC address forwarding is better suited on a particular device. With source-and-destination MAC-address forwarding, packets sent from host A to host B, host A to host C, and host C to host B could all use different ports in the channel.

## IP Address Forwarding

With source-IP address-based forwarding, packets are distributed across the ports in the EtherChannel based on the source-IP address of the incoming packet. To provide load balancing, packets from different IP addresses use different ports in the channel, and packets from the same IP address use the same port in the channel.

With destination-IP address-based forwarding, packets are distributed across the ports in the EtherChannel based on the destination-IP address of the incoming packet. To provide load balancing, packets from the same IP source address sent to different IP destination addresses could be sent on different ports in the channel. Packets sent from different source IP addresses to the same destination IP address are always sent on the same port in the channel.

With source-and-destination IP address-based forwarding, packets are distributed across the ports in the EtherChannel based on both the source and destination IP addresses of the incoming packet. This forwarding method, a combination of source-IP and destination-IP address-based forwarding, can be used if it is not clear whether source-IP or destination-IP address-based forwarding is better suited on a particular device. In this method, packets sent from the IP address A to IP address B, from IP address A to IP address C, and from IP address C to IP address B could all use different ports in the channel.

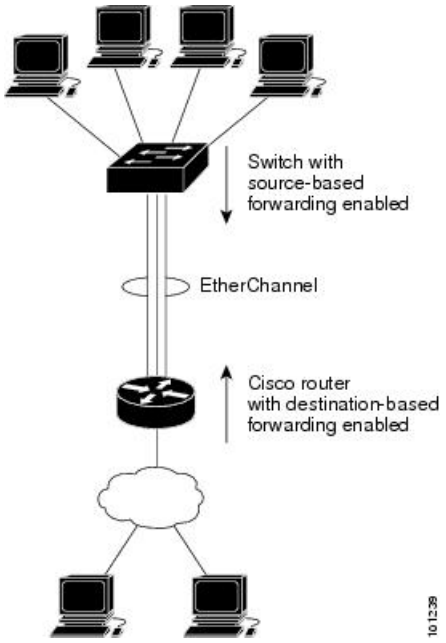
## Load-Balancing Advantages

Different load-balancing methods have different advantages, and the choice of a particular load-balancing method should be based on the position of the device in the network and the kind of traffic that needs to be load-distributed.

***Figure 3: Load Distribution and Forwarding Methods***

In the following figure, an EtherChannel of four workstations communicates with a router. Because the router is a single MAC-address device, source-based forwarding on the device EtherChannel ensures that the device uses all available bandwidth to the router. The router is configured for destination-based forwarding because

the large number of workstations ensures that the traffic is evenly distributed from the router EtherChannel.




Use the option that provides the greatest variety in your configuration. For example, if the traffic on a channel is going only to a single MAC address, using the destination-MAC address always chooses the same link in the channel. Using source addresses or IP addresses might result in better load-balancing.

# EtherChannel and Device Stacks

If a stack member that has ports participating in an EtherChannel fails or leaves the stack, the active device removes the failed stack member device ports from the EtherChannel. The remaining ports of the EtherChannel, if any, continue to provide connectivity.

When a device is added to an existing stack, the new device receives the running configuration from the active device and updates itself with the EtherChannel-related stack configuration. The stack member also receives the operational information (the list of ports that are up and are members of a channel).

When two stacks merge that have EtherChannels configured between them, self-looped ports result. Spanning tree detects this condition and acts accordingly. Any PAgP or LACP configuration on a winning device stack is not affected, but the PAgP or LACP configuration on the losing device stack is lost after the stack reboots.

## Device Stack and PAgP

With PAgP, if the active device fails or leaves the stack, the standby device becomes the new active device. The new active device synchronizes the configuration of the stack members to that of the active device. The PAgP configuration is not affected after an active device change unless the EtherChannel has ports residing on the old active device.

## Device Stacks and LACP

With LACP, the system ID uses the stack MAC address from the active device. When an active device fails or leaves the stack and the standby device becomes the new active device change, the LACP system ID is unchanged. By default, the LACP configuration is not affected after the active device changes.

# Default EtherChannel Configuration

The default EtherChannel configuration is described in this table.

***Table 3: Default EtherChannel Configuration***

| Feature | Default Setting |
|---|---|
| Channel groups | None assigned. |
| Port-channel logical interface | None defined. |
| PAgP mode | No default. |
| PAgP learn method | Aggregate-port learning on all ports. |
| PAgP priority | 128 on all ports. |
| LACP mode | No default. |
| LACP learn method | Aggregate-port learning on all ports. |
| LACP port priority | 32768 on all ports. |
| LACP system priority | 32768. |
| LACP system ID | LACP system priority and the switch or stack MAC address. |
| Load-balancing | Load distribution on the switch is based on the source-MAC address of the incoming packet.<br>The source-MAC address is **src-mac**. |

# EtherChannel Configuration Guidelines

If improperly configured, some EtherChannel ports are automatically disabled to avoid network loops and other problems. Follow these guidelines to avoid configuration problems:

- A maximum of 128 EtherChannels (non-StackWise Virtual setup) and 126 EtherChannels (StackWise Virtual setup) are supported on a switch or switch stack.
- Configure a PAgP EtherChannel with up to eight Ethernet ports of the same type.
- Configure a LACP EtherChannel with 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.
- Configure all ports in an EtherChannel to operate at the same speeds and duplex modes.
- Enable all ports in an EtherChannel. A port in an EtherChannel that is disabled by using the **shutdown** interface configuration command is treated as a link failure, and its traffic is transferred to one of the remaining ports in the EtherChannel.

- When a group is first created, all ports follow the parameters set for the first port to be added to the group. If you change the configuration of one of these parameters, you must also make the changes to all ports in the group:
  - Allowed-VLAN list
  - Spanning-tree path cost for each VLAN
  - Spanning-tree port priority for each VLAN
  - Spanning-tree Port Fast setting
- Do not configure a port to be a member of more than one EtherChannel group.
- 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. Individual EtherChannel groups can run either PAgP or LACP, but they cannot interoperate.
- 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 on an EtherChannel port, an error message appears, and IEEE 802.1x is not enabled.
- If EtherChannels are configured on device interfaces, remove the EtherChannel configuration from the interfaces before globally enabling IEEE 802.1x on a device by using the **dot1x system-auth-control** global configuration command.

## Layer 2 EtherChannel Configuration Guidelines

When configuring Layer 2 EtherChannels, follow these guidelines:

- Assign all ports in the EtherChannel to the same VLAN, or configure them as trunks. Ports with different native VLANs cannot form an EtherChannel.
- An EtherChannel supports the same allowed range of VLANs on all the ports in a trunking Layer 2 EtherChannel. If the allowed range of VLANs is not the same, the ports do not form an EtherChannel even when PAgP is set to the **auto** or **desirable** mode.
- Ports with different spanning-tree path costs can form an EtherChannel if they are otherwise compatibly configured. Setting different spanning-tree path costs does not, by itself, make ports incompatible for the formation of an EtherChannel.

## Layer 3 EtherChannel Configuration Guidelines

For Layer 3 EtherChannels, assign the Layer 3 address to the port-channel logical interface, not to the physical ports in the channel.

# Auto-LAG

The auto-LAG feature provides the ability to auto create EtherChannels on ports connected to a switch. By default, auto-LAG is disabled globally and is enabled on all port interfaces. The auto-LAG applies to a switch only when it is enabled globally.

On enabling auto-LAG globally, the following scenarios are possible:

- All port interfaces participate in creation of auto EtherChannels provided the partner port interfaces have EtherChannel configured on them. For more information, see the *"The supported auto-LAG configurations between the actor and partner devices"* table below.
- Ports that are already part of manual EtherChannels cannot participate in creation of auto EtherChannels.
- When auto-LAG is disabled on a port interface that is already a part of an auto created EtherChannel, the port interface will unbundle from the auto EtherChannel.

The following table shows the supported auto-LAG configurations between the actor and partner devices:

***Table 4: The supported auto-LAG configurations between the actor and partner devices***

| Actor/Partner | Active | Passive | Auto |
|---|---|---|---|
| Active | Yes | Yes | Yes |
| Passive | Yes | No | Yes |
| Auto | Yes | Yes | Yes |

On disabling auto-LAG globally, all auto created Etherchannels become manual EtherChannels.

You cannot add any configurations in an existing auto created EtherChannel. To add, you should first convert it into a manual EtherChannel by executing the **port-channel**<*channel-number*>**persistent**.

**Note** Auto-LAG uses the LACP protocol to create auto EtherChannel. Only one EtherChannel can be automatically created with the unique partner devices.

## Auto-LAG Configuration Guidelines

Follow these guidelines when configuring the auto-LAG feature.

- When auto-LAG is enabled globally and on the port interface , and if you do not want the port interface to become a member of the auto EtherChannel, disable the auto-LAG on the port interface.
- A port interface will not bundle to an auto EtherChannel when it is already a member of a manual EtherChannel. To allow it to bundle with the auto EtherChannel, first unbundle the manual EtherChannel on the port interface.
- When auto-LAG is enabled and auto EtherChannel is created, you can create multiple EtherChannels manually with the same partner device. But by default, the port tries to create auto EtherChannel with the partner device.
- The auto-LAG is supported only on Layer 2 EtherChannel. It is not supported on Layer 3 interface and Layer 3 EtherChannel.
- The auto-LAG is supported on cross-stack EtherChannel.

# How to Configure EtherChannels

After you configure an EtherChannel, configuration changes applied to the port-channel interface apply to all the physical ports assigned to the port-channel interface, and configuration changes applied to the physical port affect only the port where you apply the configuration.

## Configuring Layer 2 EtherChannels

You configure Layer 2 EtherChannels by assigning ports to a channel group with the **channel-group** interface configuration command. This command automatically creates the port-channel logical interface.

### SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-id*
3. **switchport mode** {**access** | **trunk**}
4. **switchport access vlan** *vlan-id*
5. **channel-group** *channel-group-number* **mode** {**auto** [**non-silent**] | **desirable** [**non-silent** ] | **on** } | { **active** | **passive**}
6. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet` | Specifies a physical port, and enters interface configuration mode.<br>Valid interfaces are physical ports.<br>For a PAgP EtherChannel, you can configure up to eight ports of the same type and speed for the same group.<br>For a LACP EtherChannel, you can configure 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. |
| **Step 3** | **switchport mode** {**access** | **trunk**}<br>**Example:**<br>`Device(config-if)# switchport mode access` | Assigns all ports as static-access ports in the same VLAN, or configure them as trunks.<br>If you configure the port as a static-access port, assign it to only one VLAN. The range is 1 to 4094. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **switchport access vlan** *vlan-id*<br>**Example:**<br>`Device(config-if)# switchport access vlan 22` | (Optional) If you configure the port as a static-access port, assign it to only one VLAN. The range is 1 to 4094. |
| **Step 5** | **channel-group** *channel-group-number* **mode** {**auto** [**non-silent**] \| **desirable** [**non-silent** ] \| **on** } \| { **active** \| **passive**}<br>**Example:**<br>`Device(config-if)# channel-group 5 mode auto` | Assigns the port to a channel group, and specifies the PAgP or the LACP mode.<br>For **mode**, select one of these keywords:<br>• **auto** –Enables PAgP only if a PAgP device is detected. It places the port into a passive negotiating state, in which the port responds to PAgP packets it receives but does not start PAgP packet negotiation..<br>• **desirable** –Unconditionally enables PAgP. It places the port into an active negotiating state, in which the port starts negotiations with other ports by sending PAgP packets. .<br>• **on** –Forces the port to channel without PAgP or LACP. In the **on** mode, an EtherChannel exists only when a port group in the **on** mode is connected to another port group in the **on** mode.<br>• **non-silent** –(Optional) If your device is connected to a partner that is PAgP-capable, configures the device port for nonsilent operation when the port is in the **auto** or **desirable** mode. If you do not specify **non-silent**, silent is assumed. The silent setting is for connections to file servers or packet analyzers. This setting allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission.<br>• **active**—Enables LACP only if a LACP device is detected. It places the port into an active negotiating state in which the port starts negotiations with other ports by sending LACP packets.<br>• **passive** –Enables LACP on the port and places it into a passive negotiating state in which the port responds to LACP packets that it receives, but does not start LACP packet negotiation. |
| **Step 6** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |

# Configuring Layer 3 EtherChannels

Follow these steps to assign an Ethernet port to a Layer 3 EtherChannel. This procedure is required.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-id*
4. **no ip address**
5. **no switchport**
6. **channel-group** *channel-group-number* **mode** { **auto** [ **non-silent** ] | **desirable** [ **non-silent** ] | **on** } | { **active** | **passive** }
7. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet 1/0/2` | Specifies a physical port, and enters interface configuration mode.<br>Valid interfaces include physical ports.<br>For a PAgP EtherChannel, you can configure up to eight ports of the same type and speed for the same group.<br>For a LACP EtherChannel, you can configure 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. |
| **Step 4** | **no ip address**<br>**Example:**<br>`Device(config-if)# no ip address` | Ensures that there is no IP address assigned to the physical port. |
| **Step 5** | **no switchport**<br>**Example:** | Puts the port into Layer 3 mode. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(config-if)# no switchport` | |
| **Step 6** | **channel-group** *channel-group-number* **mode** { **auto** [ **non-silent** ] \| **desirable** [ **non-silent** ] \| **on** } \| { **active** \| **passive** }<br>**Example:**<br>`Device(config-if)# channel-group 5 mode auto` | Assigns the port to a channel group, and specifies the PAgP or the LACP mode.<br>For **mode**, select one of these keywords:<br>• **auto**—Enables PAgP only if a PAgP device is detected. It places the port into a passive negotiating state, in which the port responds to PAgP packets it receives but does not start PAgP packet negotiation. This keyword is not supported when EtherChannel members are from different devices in the device stack.<br>• **desirable**—Unconditionally enables PAgP. It places the port into an active negotiating state, in which the port starts negotiations with other ports by sending PAgP packets. This keyword is not supported when EtherChannel members are from different devices in the device stack.<br>• **on**—Forces the port to channel without PAgP or LACP. In the **on** mode, an EtherChannel exists only when a port group in the **on** mode is connected to another port group in the **on** mode.<br>• **non-silent**—(Optional) If your device is connected to a partner that is PAgP capable, configures the device port for nonsilent operation when the port is in the **auto** or **desirable** mode. If you do not specify **non-silent**, silent is assumed. The silent setting is for connections to file servers or packet analyzers. This setting allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission.<br>• **active**—Enables LACP only if a LACP device is detected. It places the port into an active negotiating state in which the port starts negotiations with other ports by sending LACP packets.<br>• **passive** –Enables LACP on the port and places it into a passive negotiating state in which the port responds to LACP packets that it receives, but does not start LACP packet negotiation. |
| **Step 7** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |

# Configuring EtherChannel Load-Balancing

You can configure EtherChannel load-balancing to use one of several different forwarding methods.

This task is optional.

**Procedure**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **port-channel load-balance** {**dst-ip** \| **dst-mac** \| **dst-mixed-ip-port** \| **dst-port** \| **extended** \| **src-dst-ip** \| **src-dst-mac** \| **src-dst-mixed-ip-port** \| **src-dst-port** \| **src-ip** \| **src-mac** \| **src-mixed-ip-port** \| **src-port** }<br>**Example:**<br>`Device(config)# port-channel load-balance src-mac` | Configures an EtherChannel load-balancing method.<br>The default is **src-mac**.<br>Select one of these load-distribution methods:<br>• **dst-ip**—Specifies destination-host IP address.<br>• **dst-mac**—Specifies the destination-host MAC address of the incoming packet.<br>• **dst-mixed-ip-port**—Specifies the host IP address and TCP/UDP port.<br>• **dst-port**—Specifies the destination TCP/UDP port.<br>• **src-dst-ip**—Specifies the source and destination host IP address.<br>• **src-dst-mac**—Specifies the source and destination host MAC address.<br>• **src-dst-mixed-ip-port**—Specifies the source and destination host IP address and TCP/UDP port.<br>• **src-dst-port**—Specifies the source and destination TCP/UDP port.<br>• **extended**—Specifies extended load balance methods--combinations of source and destination methods beyond those available with the standard command.<br>• **src-ip**—Specifies the source host IP address.<br>• **src-mac**—Specifies the source MAC address of the incoming packet. |

| | Command or Action | Purpose |
|---|---|---|
| | | • **src-mixed-ip-port**—Specifies the source host IP address and TCP/UDP port.<br>• **src-port**—Specifies the source TCP/UDP port. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |

# Configuring EtherChannel Extended Load-Balancing

Configure EtherChannel extended load-balancing when you want to use a combination of load-balancing methods.

This task is optional.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **port-channel load-balance extended** [ **dst-ip** \| **dst-mac dst-port** \| **ipv6-label** \| **l3-proto** \| **src-ip** \| **src-mac** \| **src-port** ]<br>**Example:**<br>`Device(config)# port-channel load-balance extended dst-ip dst-mac src-ip` | Configures an EtherChannel extended load-balancing method.<br>The default is **src-mac**.<br>Select one of these load-distribution methods:<br>• **dst-ip**—Specifies destination-host IP address.<br>• **dst-mac**—Specifies the destination-host MAC address of the incoming packet.<br>• **dst-port**—Specifies the destination TCP/UDP port.<br>• **ipv6-label**—Specifies the IPv6 flow label.<br>• **l3-proto**—Specifies the Layer 3 protocol.<br>• **src-ip**—Specifies the source host IP address.<br>• **src-mac**—Specifies the source MAC address of the incoming packet.<br>• **src-port**—Specifies the source TCP/UDP port. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |

# Configuring the PAgP Learn Method and Priority

This task is optional.

### SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-id*
3. **pagp learn-method physical-port**
4. **pagp port-priority** *priority*
5. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet` | Specifies the port for transmission, and enters interface configuration mode. |
| **Step 3** | **pagp learn-method physical-port**<br>**Example:**<br>`Device(config-if)# pagp learn-method physical port` | Selects the PAgP learning method.<br>By default, **aggregation-port learning** is selected, which means the device sends packets to the source by using any of the ports in the EtherChannel. With aggregate-port learning, it is not important on which physical port the packet arrives.<br>Selects **physical-port** to connect with another device that `is` a physical learner.<br>Make sure to configure the **port-channel load-balance** global configuration command to **src-mac**.<br>The learning method must be configured the same at both ends of the link. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **pagp port-priority** *priority*<br>**Example:**<br>`Device(config-if)# pagp port-priority 200` | Assigns a priority so that the selected port is chosen for packet transmission.<br>For *priority*, the range is 0 to 255. The default is 128. The higher the priority, the more likely that the port will be used for PAgP transmission. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |

# Configuring LACP Hot-Standby Ports

When LACP is enabled, the software, by default, tries to configure the maximum number of LACP-compatible ports in a channel, up to a maximum of 16 ports. Only eight LACP links can be active at one time; the remaining eight links are placed in hot-standby mode. If one of the active links becomes inactive, a link that is in the hot-standby mode becomes active in its place.

You can override the default behavior by specifying the maximum number of active ports in a channel, in which case, the remaining ports become hot-standby ports. For example, if you specify a maximum of five ports in a channel, up to 11 ports become hot-standby ports.

If you configure more than eight links for an EtherChannel group, the software automatically decides which of the hot-standby ports to make active based on the LACP priority. To every link between systems that operate LACP, the software assigns a unique priority made up of these elements (in priority order):

- LACP system priority
- System ID (the device MAC address)
- LACP port priority
- Port number

In priority comparisons, numerically lower values have higher priority. The priority decides which ports should be put in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

Determining which ports are active and which are hot standby is a two-step procedure. First the system with a numerically lower system priority and system ID is placed in charge of the decision. Next, that system decides which ports are active and which are hot standby, based on its values for port priority and port number. The port priority and port number values for the other system are not used.

You can change the default values of the LACP system priority and the LACP port priority to affect how the software selects active and standby links.

## Configuring the LACP Max Bundle Feature

When you specify the maximum number of bundled LACP ports allowed in a port channel, the remaining ports in the port channel are designated as hot-standby ports.

Beginning in privileged EXEC mode, follow these steps to configure the maximum number of LACP ports in a port channel. This procedure is optional.

### SUMMARY STEPS

1. **configure terminal**
2. **interface port-channel** *channel-number*
3. **lacp max-bundle** *max-bundle-number*
4. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface port-channel** *channel-number*<br>**Example:**<br>`Device(config)# interface port-channel 2` | Enters interface configuration mode for a port channel.<br>The range is 1 to 128. |
| **Step 3** | **lacp max-bundle** *max-bundle-number*<br>**Example:**<br>`Device(config-if)# lacp max-bundle 3` | Specifies the maximum number of LACP ports in the port-channel bundle.<br>The range is 1 to 8. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |

## Configuring LACP Port-Channel Standalone Disable

To disable the standalone EtherChannel member port state on a port channel, perform this task on the port channel interface:

### SUMMARY STEPS

1. **configure terminal**
2. **interface port-channel** *channel-group*
3. **port-channel standalone-disable**
4. **end**
5. **show etherchannel**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 2** | **interface port-channel** *channel-group*<br>**Example:**<br>`Device(config)# interface port-channel channel-group` | Selects a port channel interface to configure. |
| **Step 3** | **port-channel standalone-disable**<br>**Example:**<br>`Device(config-if)# port-channel standalone-disable` | Disables the standalone mode on the port-channel interface. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config-if)# end` | Exits configuration mode. |
| **Step 5** | **show etherchannel**<br>**Example:**<br>`Device# show etherchannel channel-group port-channel`<br>`Device# show etherchannel channel-group detail` | Verifies the configuration. |

## Configuring the LACP Port Channel Min-Links

You can specify the minimum number of active ports that must be in the link-up state and bundled in an EtherChannel for the port channel interface to transition to the link-up state. Using EtherChannel min-links, you can prevent low-bandwidth LACP EtherChannels from becoming active. Port channel min-links also cause LACP EtherChannels to become inactive if they have too few active member ports to supply the requiredminimum bandwidth.

To configure the minimum number of links that are required for a port channel. Perform the following tasks.

**Procedure**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface port-channel** *channel-number*<br>**Example:**<br>`Device(config)# interface port-channel 2` | Enters interface configuration mode for a port-channel.<br>For *channel-number*, the range is 1 to 252. |
| **Step 4** | **port-channel min-links** *min-links-number*<br>**Example:**<br>`Device(config-if)# port-channel min-links 3` | Specifies the minimum number of member ports that must be in the link-up state and bundled in the EtherChannel for the port channel interface to transition to the link-up state.<br>For *min-links-number*, the range is 2 to 8. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |

## Configuring the LACP System Priority

You can configure the system priority for all the EtherChannels that are enabled for LACP by using the **lacp system-priority** global configuration command. You cannot configure a system priority for each LACP-configured channel. By changing this value from the default, you can affect how the software selects active and standby links.

You can 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).

Follow these steps to configure the LACP system priority. This procedure is optional.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **lacp system-priority** *priority*
4. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:** | Enters global configuration mode. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device# configure terminal` | |
| **Step 3** | **lacp system-priority** *priority*<br>**Example:**<br>`Device(config)# lacp system-priority 32000` | Configures the LACP system priority.<br>The range is 1 to 65535. The default is 32768.<br>The lower the value, the higher the system priority. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |

## Configuring the LACP Port Priority

By default, all ports use the same port priority. If the local system has a lower value for the system priority and the system ID than the remote system, you can affect which of the hot-standby links become active first by changing the port priority of LACP EtherChannel ports to a lower value than the default. The hot-standby ports that have lower port numbers become active in the channel first. You can 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).

**Note** If LACP is not able to aggregate all the ports that are compatible (for example, the remote system might have more restrictive hardware limitations), all the ports that cannot be actively included in the EtherChannel are put in the hot-standby state and are used only if one of the channeled ports fails.

Follow these steps to configure the LACP port priority. This procedure is optional.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-id*
4. **lacp port-priority** *priority*
5. **end**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet` | Specifies the port to be configured, and enters interface configuration mode. |
| **Step 4** | **lacp port-priority** *priority*<br>**Example:**<br>`Device(config-if)# lacp port-priority 32000` | Configures the LACP port priority.<br>The range is 1 to 65535. The default is 32768. The lower the value, the more likely that the port will be used for LACP transmission. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |

# Configuring LACP Fast Rate Timer

You can change the LACP timer rate to modify the duration of the LACP timeout. Use the **lacp rate** command to set the rate at which LACP control packets are received by an LACP-supported interface. You can change the timeout rate from the default rate (30 seconds) to the fast rate (1 second). This command is supported only on LACP-enabled interfaces.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** {**fastethernet** | **gigabitethernet** | **tengigabitethernet**} *slot/port*
4. **lacp rate** {**normal** | **fast**}
5. **end**
6. **show lacp internal**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:** | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device> enable` | |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** {**fastethernet** \| **gigabitethernet** \| **tengigabitethernet**} *slot/port*<br>**Example:**<br>`Device(config)# interface gigabitEthernet 2/1` | Configures an interface and enters interface configuration mode. |
| **Step 4** | **lacp rate** {**normal** \| **fast**}<br>**Example:**<br>`Device(config-if)# lacp rate fast` | Configures the rate at which LACP control packets are received by an LACP-supported interface.<br>• To reset the timeout rate to its default, use the **no lacp rate** command. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 6** | **show lacp internal**<br>**Example:**<br>`Device# show lacp internal`<br>`Device# show lacp counters` | Verifies your configuration. |

# Configuring Auto-LAG Globally

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. [**no**] **port-channel auto**
4. **end**
5. **show etherchannel auto**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>• Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | [**no**] **port-channel auto**<br>**Example:**<br>`Device(config)# port-channel auto` | Enables the auto-LAG feature on a switch globally. Use the no form of this command to disable the auto-LAG feature on the switch globally.<br>**Note** By default, the auto-LAG feature is enabled on the port. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Returns to privileged EXEC mode. |
| **Step 5** | **show etherchannel auto**<br>**Example:**<br>`Device# show etherchannel auto` | Displays that EtherChannel is created automatically. |

# Configuring Auto-LAG on a Port Interface

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **interface** *interface-id*
4. [**no**] **channel-group auto**
5. **end**
6. **show etherchannel auto**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:** | Enables privileged EXEC mode.<br>• Enter your password if prompted. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device> enable` | |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *interface-id*<br>**Example:**<br>`Device(config)# interface gigabitethernet` | Specifies the port interface to be enabled for auto-LAG, and enters interface configuration mode. |
| **Step 4** | [**no**] **channel-group auto**<br>**Example:**<br>`Device(config-if)# channel-group auto` | (Optional) Enables auto-LAG feature on individual port interface. Use the no form of this command to disable the auto-LAG feature on individual port interface.<br>**Note** By default, the auto-LAG feature is enabled on the port. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config-if)# end` | Returns to privileged EXEC mode. |
| **Step 6** | **show etherchannel auto**<br>**Example:**<br>`Device# show etherchannel auto` | Displays that EtherChannel is created automatically. |

### What to do next

# Configuring Persistence with Auto-LAG

You use the persistence command to convert the auto created EtherChannel into a manual one and allow you to add configuration on the existing EtherChannel.

### SUMMARY STEPS

1. **enable**
2. **port-channel** *channel-number* **persistent**
3. **show etherchannel summary**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable** | Enables privileged EXEC mode. |

| | Command or Action | Purpose |
|---|---|---|
| | **Example:**<br>`Device> enable` | • Enter your password if prompted. |
| **Step 2** | **port-channel** *channel-number* **persistent**<br>**Example:**<br>`Device# port-channel 1 persistent` | Converts the auto created EtherChannel into a manual one and allows you to add configuration on the EtherChannel. |
| **Step 3** | **show etherchannel summary**<br>**Example:**<br>`Device# show etherchannel summary` | Displays the EtherChannel information. |

# Monitoring EtherChannel, PAgP, and LACP Status

You can display EtherChannel, PAgP, and LACP status using the commands listed in this table.

***Table 5: Commands for Monitoring EtherChannel, PAgP, and LACP Status***

| Command | Description |
|---|---|
| **clear lacp** { *channel-group-number* **counters** \| **counters** } | Clears LACP channel-group information and traffic counters. |
| **clear pagp** { *channel-group-number* **counters** \| **counters** } | Clears PAgP channel-group information and traffic counters. |
| **show etherchannel** [ *channel-group-number* { **detail** \| **load-balance** \| **port** \| **port-channel** \| **protocol** \| **summary** } ] [**detail** \| **load-balance** \| **port** \| **port-channel** \| **protocol** \| **auto** \| **summary** ] | Displays EtherChannel information in a brief, detailed, and one-line summary form. Also displays the load-balance or frame-distribution scheme, port, port-channel, protocol, and Auto-LAG information. |
| **show pagp** [ *channel-group-number* ] { **counters** \| **internal** \| **neighbor** } | Displays PAgP information such as traffic information, the internal PAgP configuration, and neighbor information. |
| **show pagp** [ *channel-group-number* ] **dual-active** | Displays the dual-active detection status. |
| **show lacp** [ *channel-group-number* ] { **counters** \| **internal** \| **neighbor** \| **sys-id**} | Displays LACP information such as traffic information, the internal LACP configuration, and neighbor information. |
| **show running-config** | Verifies your configuration entries. |
| **show etherchannel load-balance** | Displays the load balance or frame distribution scheme among ports in the port channel. |

# Configuration Examples for Configuring EtherChannels

## Configuring Layer 2 EtherChannels: Examples

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

```
Device# configure terminal
Device(config)# interface range gigabitethernet -2
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode desirable non-silent
Device(config-if-range)# end
```

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

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

This example shows how to configure a cross-stack EtherChannel. It uses LACP passive mode and assigns two ports on stack member 1 and one port on stack member 2 as static-access ports in VLAN 10 to channel 5:

```
Device# configure terminal
Device(config)# interface range gigabitethernet -5
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode passive
Device(config-if-range)# exit
Device(config)# interface gigabitethernet
Device(config-if)# switchport mode access
Device(config-if)# switchport access vlan 10
Device(config-if)# channel-group 5 mode passive
Device(config-if)# exit
```

PoE or LACP negotiation errors may occur if you configure two ports from switch to the access point (AP). This scenario can be avoided if the port channel configuration is on the switch side. For more details, see the following example:

```
interface Port-channel1
  switchport access vlan 20
 switchport mode access
  switchport nonegotiate
  no port-channel standalone-disable   <--this one
  spanning-tree portfast
```

**Note** If the port reports LACP errors on port flap, you should include the following command as well: **no errdisable detect cause pagp-flap**

# Configuring Layer 3 EtherChannels: Examples

This example shows how to configure a Layer 3 EtherChannel. It assigns two ports to channel 5 with the LACP mode **active**:

```
Device# configure terminal
Device(config)# interface range gigabitethernet2/0/1 -2
Device(config-if-range)# no ip address
Device(config-if-range)# no switchport
Device(config-if-range)# channel-group 5 mode active
Device(config-if-range)# end
```

This example shows how to configure a cross-stack Layer 3 EtherChannel. It assigns two ports on stack member 2 and one port on stack member 3 to channel 7 using LACP active mode:

```
Device# configure terminal
Device(config)# interface range gigabitethernet2/0/4 -5
Device(config-if-range)# no ip address
Device(config-if-range)# no switchport
Device(config-if-range)# channel-group 7 mode active
Device(config-if-range)# exit
Device(config)# interface gigabitethernet3/0/3
Device(config-if)# no ip address
Device(config-if)# no switchport
Device(config-if)# channel-group 7 mode active
Device(config-if)# exit
```

# Configuring LACP Hot-Standby Ports: Example

This example shows how to configure an Etherchannel (port channel 2) that will be active when there are at least three active ports, will comprise up to seven active ports and the remaining ports (up to nine) as hot-standby ports :

```
Device# configure terminal
Device(config)# interface port-channel 2
Device(config-if)# port-channel min-links 3
Device(config-if)# lacp max-bundle 7
```

# Configuring Auto LAG: Examples

This example shows how to configure Auto-LAG on a switch

```
device> enable
device# configure terminal
device (config)# port-channel auto
device (config-if)# end
device#  show etherchannel auto
```

The following example shows the summary of EtherChannel that was created automatically.

```
device# show etherchannel auto
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port
        A - formed by Auto LAG

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

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SUA)        LACP      Gi1/0/45(P) Gi2/0/21(P) Gi3/0/21(P)
```

The following example shows the summary of auto EtherChannel after executing the **port-channel** 1 **persistent** command.

```
device# port-channel 1 persistent

device# show etherchannel summary
Switch# show etherchannel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port
        A - formed by Auto LAG

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

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SU)         LACP      Gi1/0/45(P) Gi2/0/21(P) Gi3/0/21(P)
```

# Additional References for EtherChannels

### Related Documents

| Related Topic | Document Title |
|---|---|
| Layer 2 command reference | |

| Related Topic | Document Title |
|---|---|
| For complete syntax and usage information for the commands used in this chapter. | See the Layer 2/3 Commands section of the*Command Reference (Catalyst 9400 Series Switches)* |

### Standards and RFCs

| Standard/RFC | Title |
|---|---|
| None | — |

### MIBs

| MIB | MIBs Link |
|---|---|
| All the supported MIBs for this release. | To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:<br>http://www.cisco.com/go/mibs |

### Technical Assistance

| Description | Link |
|---|---|
| The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.<br>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.<br>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. | http://www.cisco.com/support |

# Feature Information for EtherChannels

| Release | Modification |
|---|---|
| Cisco IOS XE Everest 16.6.1 | This feature was introduced. |