EtherChannels

- Prerequisites for EtherChannels, page 20-1
- Restrictions for EtherChannels, page 20-2
- Information About EtherChannels, page 20-3
- Default Settings for EtherChannels, page 20-7
- How to Configure EtherChannels, page 20-7

Note
- For complete syntax and usage information for the commands used in this chapter, see these publications:
- Cisco IOS Release 12.2SY supports only Ethernet interfaces. Cisco IOS Release 12.2SY does not support any WAN features or commands.

Tip
For additional information about Cisco Catalyst 6500 Series Switches (including configuration examples and troubleshooting information), see the documents listed on this page:
Participate in the Technical Documentation Ideas forum

Prerequisites for EtherChannels
None.
Restrictions for EtherChannels

- LACP EtherChannels and the 802.1ad provider-bridge mode are mutually exclusive. LACP EtherChannels cannot transmit traffic when the 802.1ad provider-bridge mode is enabled.
- LACP 1:1 redundancy must be enabled at both ends of the LACP EtherChannel.
- LACP does not support half-duplex links. Half-duplex links in an LACP EtherChannel are put in the suspended state.

**Caution**

Serious traffic problems can result from mixing manual mode with LACP mode, or by connecting an EtherChannel member port to a port not configured as part of the EtherChannel. For example, if a port configured in on mode is connected to another port configured in desirable mode, or to a port not configured as a member of the EtherChannel, a bridge loop is created and a broadcast storm can occur. If one end uses the on mode, the other end must also.

- When EtherChannel interfaces are configured improperly, they are disabled automatically to avoid network loops and other problems.
- Frames with SAP/SNAP encapsulation are load-balanced as Layer 2 traffic.
- The commands in this chapter can be used on all Layer 2 Ethernet ports, including the ports on the supervisor engine and a redundant supervisor engine.
- All Layer 2 Ethernet ports on all modules, including those on a redundant supervisor engine, support EtherChannels (maximum of eight LAN ports) with no requirement that the LAN ports be physically contiguous or on the same module.
- Configure all LAN ports in an EtherChannel to use the same EtherChannel protocol; you cannot run two EtherChannel protocols in one EtherChannel.
- Configure all LAN ports in an EtherChannel to operate at the same speed and in the same duplex mode.
- Enable all LAN ports in an EtherChannel. If you shut down a LAN port in an EtherChannel, it is treated as a link failure and its traffic is transferred to one of the remaining ports in the EtherChannel.
- An EtherChannel will not form if any of the LAN ports is a Switched Port Analyzer (SPAN) destination port.
- For Layer 3 EtherChannels, assign Layer 3 addresses to the port channel logical interface, not to the LAN ports in the channel.
- For Layer 2 EtherChannels:
  - Assign all LAN ports in the EtherChannel to the same VLAN or configure them as trunks.
  - If you configure an EtherChannel from trunking LAN ports, verify that the trunking mode is the same on all the trunks. LAN ports in an EtherChannel with different trunk modes can operate unpredictably.
  - An EtherChannel supports the same allowed range of VLANs on all the LAN ports in a trunking Layer 2 EtherChannel. If the allowed range of VLANs is not the same, the LAN ports do not form an EtherChannel.
  - LAN ports with different STP port path costs can form an EtherChannel as long they are compatibly configured with each other. If you set different STP port path costs, the LAN ports are not incompatible for the formation of an EtherChannel.
  - An EtherChannel will not form if protocol filtering is set differently on the LAN ports.
– Configure static MAC addresses on the EtherChannel only and not on physical member ports of the EtherChannel.

• After you configure an EtherChannel, the configuration that you apply to the port channel interface affects the EtherChannel. The configuration that you apply to the LAN ports affects only the LAN port where you apply the configuration.

• Cisco IOS Release 12.2SY does not support ISL trunk encapsulation. If a non-trunking Layer 2 EtherChannel includes member ports that are not capable of ISL trunk encapsulation, the `switchport trunk encapsulation dot1q` command is added to the port-channel interface. The command has no affect when the switchport mode is “access” (CSCta45114).

• When QoS is enabled, enter the no platform qos channel-consistency port-channel interface command to support EtherChannels that have ports with and without strict-priority queues.

**Information About EtherChannels**

• EtherChannel Feature Overview, page 20-3
• Information about EtherChannel Configuration, page 20-3
• Information about Port Channel Interfaces, page 20-7
• Information about LACP 1:1 Redundancy, page 20-6
• Information about Load Balancing, page 20-7

**EtherChannel Feature Overview**

An EtherChannel bundles individual Ethernet links into a single logical link that provides the aggregate bandwidth of up to eight physical links.

Cisco IOS Release 12.2SY supports a maximum of 256 EtherChannels in standalone mode and 512 EtherChannels in VVS mode. You can form an EtherChannel with up to eight compatibly configured LAN ports on any switching module. All LAN ports in each EtherChannel must be the same speed and must all be configured as either Layer 2 or Layer 3 LAN ports.

**Note**

The network device to which a switch is connected may impose its own limits on the number of ports in an EtherChannel.

If a segment within an EtherChannel fails, traffic previously carried over the failed link switches to the remaining segments within the EtherChannel. When a failure occurs, the EtherChannel feature sends a trap that identifies the switch, the EtherChannel, and the failed link. Inbound broadcast and multicast packets on one segment in an EtherChannel are blocked from returning on any other segment of the EtherChannel.

**Information about EtherChannel Configuration**

• EtherChannel Configuration Overview, page 20-4
• Information about Manual EtherChannel Configuration, page 20-5
• Information about PAgP EtherChannel Configuration, page 20-5
EtherChannel Configuration Overview

You can configure EtherChannels manually or you can use the Port Aggregation Control Protocol (PAgP) or the Link Aggregation Control Protocol (LACP) to form EtherChannels. The EtherChannel protocols allow ports with similar characteristics to form an EtherChannel through dynamic negotiation with connected network devices. PAgP is a Cisco-proprietary protocol and LACP is defined in IEEE 802.3ad.

PAgP and LACP do not interoperate with each other. Ports configured to use PAgP cannot form EtherChannels with ports configured to use LACP. Ports configured to use LACP cannot form EtherChannels with ports configured to use PAgP. Neither interoperates with ports configured manually.

Table 20-1 lists the user-configurable EtherChannel modes.

Table 20-2 lists the EtherChannel member port states.

Table 20-1  EtherChannel Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>on</td>
<td>Mode that forces the LAN port to channel unconditionally. In the on mode, a usable EtherChannel exists only when a LAN port group in the on mode is connected to another LAN port group in the on mode. Because ports configured in the on mode do not negotiate, there is no negotiation traffic between the ports. You cannot configure the on mode with an EtherChannel protocol. If one end uses the on mode, the other end must also.</td>
</tr>
<tr>
<td>auto</td>
<td>PAgP mode that places a LAN port into a passive negotiating state, in which the port responds to PAgP packets it receives but does not initiate PAgP negotiation. (Default)</td>
</tr>
<tr>
<td>desirable</td>
<td>PAgP mode that places a LAN port into an active negotiating state, in which the port initiates negotiations with other LAN ports by sending PAgP packets.</td>
</tr>
<tr>
<td>passive</td>
<td>LACP mode that places a port into a passive negotiating state, in which the port responds to LACP packets it receives but does not initiate LACP negotiation. (Default)</td>
</tr>
<tr>
<td>active</td>
<td>LACP mode that places a port into an active negotiating state, in which the port initiates negotiations with other ports by sending LACP packets.</td>
</tr>
</tbody>
</table>

Table 20-2  EtherChannel Member Port States

<table>
<thead>
<tr>
<th>Port States</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bundled</td>
<td>The port is part of an EtherChannel and can send and receive BPDUs and data traffic.</td>
</tr>
<tr>
<td>suspended</td>
<td>The port is not part of an EtherChannel. The port can receive BPDUs but cannot send them. Data traffic is blocked.</td>
</tr>
<tr>
<td>standalone</td>
<td>The port is not bundled in an EtherChannel. The port functions as a standalone data port. The port can send and receive BPDUs and data traffic.</td>
</tr>
</tbody>
</table>

Note When one end of an EtherChannel has more members than the other, the unmatched ports enter the standalone state. In a topology that is not protected from Layer 2 loops by the spanning tree protocol (STP), a port in the standalone state can cause significant network errors. You can enter the port-channel standalone-disable interface configuration mode command to put ports into the suspended state instead of the standalone state. See the “Configuring LACP Port-Channel Standalone Disable” section on page 20-15.
Information about Manual EtherChannel Configuration

Manually configured EtherChannel ports do not exchange EtherChannel protocol packets. A manually configured EtherChannel forms only when you configure all ports in the EtherChannel compatibly.

Information about PAgP EtherChannel Configuration

PAgP supports the automatic creation of EtherChannels by exchanging PAgP packets between LAN ports. PAgP packets are exchanged only between ports in auto and desirable modes.

The protocol learns the capabilities of LAN port groups dynamically and informs the other LAN ports. Once PAgP identifies correctly matched Ethernet links, it facilitates grouping the links into an EtherChannel. The EtherChannel is then added to the spanning tree as a single bridge port.

Both the auto and desirable modes allow PAgP to negotiate between LAN ports to determine if they can form an EtherChannel, based on criteria such as port speed and trunking state. Layer 2 EtherChannels also use VLAN numbers.

LAN ports can form an EtherChannel when they are in different PAgP modes if the modes are compatible. For example:

- A LAN port in desirable mode can form an EtherChannel successfully with another LAN port that is in desirable mode.
- A LAN port in desirable mode can form an EtherChannel with another LAN port in auto mode.
- A LAN port in auto mode cannot form an EtherChannel with another LAN port that is also in auto mode, because neither port will initiate negotiation.

Information about IEEE 802.3ad LACP EtherChannel Configuration

LACP supports the automatic creation of EtherChannels by exchanging LACP packets between LAN ports. LACP packets are exchanged only between ports in passive and active modes.

The protocol learns the capabilities of LAN port groups dynamically and informs the other LAN ports. Once LACP identifies correctly matched Ethernet links, it facilitates grouping the links into an EtherChannel. The EtherChannel is then added to the spanning tree as a single bridge port.

Both the passive and active modes allow LACP to negotiate between LAN ports to determine if they can form an EtherChannel, based on criteria such as port speed and trunking state. Layer 2 EtherChannels also use VLAN numbers.

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

- A LAN port in active mode can form an EtherChannel successfully with another LAN port that is in active mode.
- A LAN port in active mode can form an EtherChannel with another LAN port in passive mode.
- A LAN port in passive mode cannot form an EtherChannel with another LAN port that is also in passive mode, because neither port will initiate negotiation.
LACP uses the following parameters:

- LACP system priority—You must configure an LACP system priority on each switch running LACP. The system priority can be configured automatically or through the CLI (see the “Configuring the LACP System Priority and System ID” section on page 20-11). LACP uses the system priority with the switch MAC address to form the system ID and also during negotiation with other systems.

Note: The LACP system ID is the combination of the LACP system priority value and the MAC address of the switch.

- LACP port priority—You must configure an LACP port priority on each port configured to use LACP. The port priority can be configured automatically or through the CLI (see the “Configuring Channel Groups” section on page 20-9). LACP uses the port priority with the port number to form the port identifier. LACP uses the port priority to decide which ports should be put in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

- LACP administrative key—LACP automatically configures an administrative key value equal to the channel group identification number on each port configured to use LACP. 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 these factors:
  - Port physical characteristics, such as data rate, duplex capability, and point-to-point or shared medium
  - Configuration restrictions that you establish

On ports configured to use LACP, LACP tries to configure the maximum number of compatible ports in an EtherChannel, up to the maximum allowed by the hardware (eight ports). If LACP cannot aggregate all the ports that are compatible (for example, the remote system might have more restrictive hardware limitations), then all the ports that cannot be actively included in the channel are put in hot standby state and are used only if one of the channeled ports fails. You can configure an additional 8 standby ports (total of 16 ports associated with the EtherChannel).

### Information about LACP 1:1 Redundancy

The LACP 1:1 redundancy feature supports an EtherChannel configuration with one active link and fast switchover to a hot standby link. The link connected to the port with the lower port priority number (and therefore a higher priority) will be the active link, and the other link will be in a hot standby state. If the active link goes down, LACP performs fast switchover to the hot standby link to keep the EtherChannel up. When the failed link becomes operational again, LACP performs another fast switchover to revert to the original active link.

See the “Configuring LACP 1:1 Redundancy” section on page 20-14.
Information about Port Channel Interfaces

Each EtherChannel has a numbered port channel interface. You can configure a maximum of 512 port-channel interfaces, numbered from 1 to 512 in VSS mode. In the stand-alone, the max number of port channel interfaces is 256, numbered from 1 to 256. The configuration that you apply to the port channel interface affects all LAN ports assigned to the port channel interface.

After you configure an EtherChannel, the configuration that you apply to the port channel interface affects the EtherChannel; the configuration that you apply to the LAN ports affects only the LAN port where you apply the configuration. To change the parameters of all ports in an EtherChannel, apply the configuration commands to the port channel interface, for example, Spanning Tree Protocol (STP) commands or commands to configure a Layer 2 EtherChannel as a trunk.

Information about Load Balancing

An EtherChannel balances the traffic load across the links in an EtherChannel 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.

EtherChannel load balancing can use MAC addresses or IP addresses. EtherChannel load balancing can also use Layer 4 port numbers. EtherChannel load balancing can use either source or destination or both source and destination addresses or ports. The selected mode applies to all EtherChannels configured on the switch. EtherChannel load balancing can use MPLS Layer 2 information.

Use the option that provides the balance criteria with the greatest variety in your configuration. For example, if the traffic on an EtherChannel is going only to a single MAC address and you use the destination MAC address as the basis of EtherChannel load balancing, the EtherChannel always chooses the same link in the EtherChannel; using source addresses or IP addresses might result in better load balancing.

Default Settings for EtherChannels

None.

How to Configure EtherChannels

• Configuring Port Channel Logical Interfaces, page 20-8
• Configuring Channel Groups, page 20-9
• Configuring the LACP System Priority and System ID, page 20-11
• Configuring EtherChannel Load Balancing, page 20-11
• Configuring the EtherChannel Hash-Distribution Algorithm, page 20-12
• Configuring the EtherChannel Min-Links Feature, page 20-13
• Configuring LACP 1:1 Redundancy, page 20-14
• Configuring LACP Port-Channel Standalone Disable, page 20-15

Note: Make sure that the LAN ports are configured correctly (see the “Restrictions for EtherChannels” section on page 20-2).

Configuring Port Channel Logical Interfaces

Note: To move an IP address from a Layer 3 LAN port to an EtherChannel, you must delete the IP address from the Layer 3 LAN port before configuring it on the port channel logical interface.

To create a port channel interface for a Layer 3 EtherChannel, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Router(config)# interface port-channel <em>group_number</em></td>
<td>Creates the port channel interface.</td>
</tr>
<tr>
<td><strong>Step 2</strong> Router(config-if)# ip address <em>ip_address</em> <em>mask</em></td>
<td>Assigns an IP address and subnet mask to the EtherChannel.</td>
</tr>
<tr>
<td><strong>Step 3</strong> Router(config-if)# end</td>
<td>Exits configuration mode.</td>
</tr>
</tbody>
</table>

The *group_number* can be 1 through 256, up to a maximum of 256 port-channel interfaces in standalone mode. In VSS-mode the group number can be through 1 through 512, up to a maximum of 512 port-channel-interfaces. This example shows how to create port channel interface 1:

```
Router# configure terminal
Router(config)# interface port-channel 1
Router(config-if)# ip address 172.32.52.10 255.255.255.0
Router(config-if)# end
```

This example shows how to verify the configuration of port channel interface 1:

```
Router# show running-config interface port-channel 1
Building configuration...

Current configuration:
  !
  interface Port-channel1
  ip address 172.32.52.10 255.255.255.0
  no ip directed-broadcast
  end
Router#
```
### Configuring Channel Groups

**Note**
For Cisco IOS to create port channel interfaces for Layer 2 EtherChannels, the Layer 2 LAN ports must be connected and functioning.

To configure channel groups, perform this task for each LAN port:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# interface type slot/port</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-if)# no ip address</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# channel-protocol {lacp</td>
</tr>
<tr>
<td>Step 4</td>
<td>Router(config-if)# channel-group group_number mode {active</td>
</tr>
<tr>
<td>Step 5</td>
<td>Router(config-if)# lACP port-priority priority_value</td>
</tr>
<tr>
<td>Step 6</td>
<td>Router(config-if)# do show interface port-channel group_number</td>
</tr>
<tr>
<td>Step 7</td>
<td>Router(config-if)# no shutdown</td>
</tr>
<tr>
<td>Step 8</td>
<td>Router(config-if)# end</td>
</tr>
</tbody>
</table>

This example shows how to configure Gigabit Ethernet ports 5/6 and 5/7 into port channel 2 with PAgP mode desirable:

```
Router# configure terminal
Router(config)# interface range gigabitethernet 5/6 -7
Router(config-if)# channel-group 2 mode desirable
Router(config-if)# no shutdown
Router(config-if)# end
```

**Note**
See the “How to Configure a Range of Interfaces” section on page 10-2 for information about the range keyword.

This example shows how to verify the configuration of port channel interface 2:

```
Router# show running-config interface port-channel 2
Building configuration...

Current configuration:
!
interface Port-channel2
```
no ip address
switchport
switchport access vlan 10
switchport mode access
end
Router#

This example shows how to verify the configuration of Gigabit Ethernet port 5/6:

Router# show running-config interface gigabitethernet 5/6
Building configuration...

Current configuration:
!
interface GigabitEthernet5/6
  no ip address
  switchport
  switchport access vlan 10
  switchport mode access
  channel-group 2 mode desirable
end
Router# show interfaces gigabitethernet 5/6 etherchannel
Port state    = Down Not-in-Bndl
Channel group = 12          Mode = Desirable-Sl     Gcchange = 0
Port-channel  = null        GC   = 0x00000000          Pseudo port-channel = Po1
2
Port index    = 0           Load = 0x00        Protocol =   PAgP
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.
         d - PAgP is down.
Timers: H - Hello timer is running.        Q - Quit timer is running.
         S - Switching timer is running.    I - Interface timer is running.

Local information:

<table>
<thead>
<tr>
<th>Port</th>
<th>Flags</th>
<th>State</th>
<th>Timers</th>
<th>Interval</th>
<th>Count</th>
<th>Priority</th>
<th>Method</th>
<th>Ifindex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gi5/2</td>
<td>d</td>
<td>U1/S1</td>
<td>1s</td>
<td>0</td>
<td>128</td>
<td>Any</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Age of the port in the current state: 04d:18h:57m:19s

This example shows how to verify the configuration of port channel interface 2 after the LAN ports have been configured:

Router# show etherchannel 12 port-channel
Port-channels in the group:
--------------------
Port-channel: Po12

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

Port-channel: Po12

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

Age of the Port-channel   = 04d:18h:58m:50s
Logical slot/port   = 14/1        Number of ports = 0
GC                  = 0x00000000      HotStandBy port = null
Port state          = Port-channel Ag-Not-Inuse
Protocol            =   PAgP

Router#
Configuring the LACP System Priority and System ID

The LACP system ID is the combination of the LACP system priority value and the MAC address of the switch.

To configure the LACP system priority and system ID, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# <strong>lacp system-priority</strong> value</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config)# <strong>end</strong></td>
</tr>
</tbody>
</table>

This example shows how to configure the LACP system priority:

Router# **configure terminal**
Router(config)# **lacp system-priority** 23456
Router(config)# **end**

This example shows how to verify the configuration:

Router# **show lacp sys-id**
23456,0050.3e8d.6400
Router#

The system priority is displayed first, followed by the MAC address of the switch.

Configuring EtherChannel Load Balancing

To configure EtherChannel load balancing, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Router(config)# <strong>port-channel per-module load-balance</strong></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Router(config)# <strong>port-channel load-balance method</strong> [module slot]</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Router(config)# <strong>end</strong></td>
</tr>
</tbody>
</table>
The load-balancing method keywords indicate the following information:

- **dst-ip**—Destination IP addresses
- **dst-mac**—Destination MAC addresses
- **dst-mixed-ip-port**—Destination IP address and TCP/UDP port
- **dst-port**—Destination Layer 4 port
- **mpls**—Load balancing for MPLS packets
- **src-dst-ip**—(Default) Source and destination IP addresses
- **src-dst-mac**—Source and destination MAC addresses
- **src-dst-mixed-ip-port**—Source and destination IP address and TCP/UDP port
- **src-dst-port**—Source and destination Layer 4 port
- **src-ip**—Source IP addresses
- **src-mac**—Source MAC addresses
- **src-mixed-ip-port**—Source IP address and TCP/UDP port
- **src-port**—Source Layer 4 port
- **vlan-dst-ip**—VLAN number and destination IP address
- **vlan-dst-mixed-ip-port**—VLAN number and destination IP address and TCP/UDP port
- **vlan-src-dst-ip**—VLAN number and source and destination IP address
- **vlan-src-dst-mixed-ip-port**—VLAN number and source and destination IP address and TCP/UDP port
- **vlan-src-ip**—VLAN number and source IP address
- **vlan-src-mixed-ip-port**—VLAN number and source IP address and TCP/UDP port

The optional module keyword allows you to specify the load-balancing method for a specific module. This capability is supported only on DFC-equipped switching modules. You must enable per-module load balancing globally before configuring the feature on a module.

This example shows how to configure EtherChannel to use source and destination IP addresses:

```
Router# configure terminal
Router(config)# port-channel load-balance src-dst-ip
Router(config)# end
Router(config)#
```

This example shows how to verify the configuration:

```
Router# show etherchannel load-balance
Source XOR Destination IP address
```

**Configuring the EtherChannel Hash-Distribution Algorithm**

When you add a port to an EtherChannel or delete a port from an EtherChannel, the fixed algorithm updates the port ASIC for each port in the EtherChannel, which causes a short outage on each port.

The default adaptive algorithm does not need to update the port ASIC for existing member ports. You can configure a global value for the adaptive algorithm. You can also specify the algorithm for individual port channels.
When you change the algorithm, the change is applied at the next member link event (link down, link up, addition, deletion, no shutdown, and shutdown). When you enter the command to change the algorithm, the command console issues a warning that the command does not take effect until the next member link event.

Note • Some external devices require the fixed algorithm. For example, the service control engine (SCE) requires incoming and outgoing packets to use the same port.
• If you change the load-balancing method, EtherChannel ports on DFC-equipped switching modules or on an active supervisor engine in a dual supervisor engine configuration will flap.

Configuring the Hash-Distribution Algorithm Globally

To configure the load-sharing algorithm globally, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# port-channel hash-distribution {adaptive</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config)# end</td>
</tr>
</tbody>
</table>

This example shows how to globally set the hash distribution to adaptive:

Router(config)# port-channel hash-distribution adaptive

Configuring the Hash-Distribution Algorithm for a Port Channel

To configure the hash-distribution algorithm for a specific port channel, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# interface port-channel channel-num</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-if)# port-channel port hash-distribution {adaptive</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# end</td>
</tr>
</tbody>
</table>

This example shows how to set the hash distribution algorithm to adaptive on port channel 10:

Router (config)# interface port-channel 10
Router (config-if)# port-channel port hash-distribution adaptive

Configuring the EtherChannel Min-Links Feature

The EtherChannel min-links feature is supported on LACP EtherChannels. This feature allows you to configure 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. You can use the EtherChannel min-links feature to prevent low-bandwidth LACP EtherChannels from becoming active. This feature also causes LACP EtherChannels to become inactive if they have too few active member
ports to supply your required minimum bandwidth. In addition, when LACP max-bundle values are specified in conjunction with min-links, the configuration is verified and an error message is returned if the min-links value is not compatible with (equal to or less than) the max-bundle value.

To configure the EtherChannel min-links feature, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# interface port-channel group_number</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-if)# port-channel min-links number</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# end</td>
</tr>
</tbody>
</table>

**Note** Although the EtherChannel min-links feature works correctly when configured only on one end of an EtherChannel, for best results, configure the same number of minimum links on both ends of the EtherChannel.

This example shows how to configure port channel interface 1 to be inactive if fewer than two member ports are active in the EtherChannel:

```bash
Router# configure terminal
Router(config)# interface port-channel 1
Router(config-if)# port-channel min-links 2
Router(config-if)# end
```

### Configuring LACP 1:1 Redundancy

To configure the LACP 1:1 redundancy feature, perform this task:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# interface port-channel group_number</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-if)# lacp fast-switchover</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# lacp max-bundle 1</td>
</tr>
<tr>
<td>Step 4</td>
<td>Router(config-if)# end</td>
</tr>
</tbody>
</table>

**Note** LACP 1:1 redundancy must be enabled at both ends of the LACP EtherChannel.

This example shows how to configure an LACP EtherChannel with 1:1 redundancy. Because Gigabit Ethernet port 5/6 is configured with a higher port priority number (and therefore a lower priority) than the default of 32768, it will be the standby port.

```bash
Router# configure terminal
```
**Configuring LACP Port-Channel Standalone Disable**

To disable the standalone EtherChannel member port state on a port channel (see Table 20-2 on page 20-4), perform this task on the port channel interface:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Router(config)# interface port-channel channel-group</td>
</tr>
<tr>
<td>Step 2</td>
<td>Router(config-if)# port-channel standalone-disable</td>
</tr>
<tr>
<td>Step 3</td>
<td>Router(config-if)# end</td>
</tr>
<tr>
<td>Step 4</td>
<td>Router# show etherchannel channel-group port-channel Router# show etherchannel channel-group detail</td>
</tr>
</tbody>
</table>

This example shows how to disable the standalone EtherChannel member port state on port channel 42:

```
Router(config)# interface port-channel channel-group
Router(config-if)# port-channel standalone-disable
```

This example shows how to verify the configuration:

```
Router# show etherchannel 42 port-channel | include Standalone
Standalone Disable = enabled
Router# show etherchannel 42 detail | include Standalone
Standalone Disable = enabled
```

**Tip**

For additional information about Cisco Catalyst 6500 Series Switches (including configuration examples and troubleshooting information), see the documents listed on this page:


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