



## Configuring EtherChannel

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This chapter describes how to use the command-line interface (CLI) to configure EtherChannel on the Catalyst 6000 family switches. The configuration tasks in this chapter apply to Ethernet, Fast Ethernet, and Gigabit Ethernet switching modules, as well as to the uplink ports on the supervisor engine.



**Note**

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For complete syntax and usage information for the commands used in this chapter, refer to the *Catalyst 6000 Family Command Reference* publication.

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This chapter consists of these sections:

- [Understanding How EtherChannel Works, page 6-1](#)
- [EtherChannel Configuration Guidelines, page 6-4](#)
- [Configuring EtherChannel, page 6-5](#)



**Note**

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The commands in the following sections can be used on all Ethernet ports in the Catalyst 6000 family switches.

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## Understanding How EtherChannel Works

EtherChannel bundles individual Ethernet links into a single logical link that provides bandwidth up to 1600 Mbps (Fast EtherChannel full duplex) or 16 Gbps (Gigabit EtherChannel) between a Catalyst 6000 family switch and another switch or host.

All Ethernet ports on all modules, including those on a standby supervisor engine, support EtherChannel (maximum of eight compatibly configured ports) with no requirement that ports be contiguous or on the same module. All ports in each EtherChannel must be the same speed.



**Note**

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With software release 6.2(1) and earlier releases, the 6- and 9-slot Catalyst 6000 family switches support a maximum of 128 EtherChannels.

With software release 6.2(2) and later releases, due to the port ID handling by the spanning tree feature, the maximum supported number of EtherChannels is 126 for a 6- or 9-slot chassis and 63 for a 13-slot chassis. Note that the 13-slot chassis was first supported in software release 6.2(2).

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**Note**

The network device to which a Catalyst 6000 family 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. A trap is sent upon a failure identifying 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.

You can configure EtherChannels as trunks. After a channel is formed, configuring any port in the channel as a trunk applies the configuration to all ports in the channel. Identically configured trunk ports can be configured as an EtherChannel.

These sections describe EtherChannel:

- [Understanding Administrative Groups, page 6-2](#)
- [Understanding EtherChannel IDs, page 6-2](#)
- [Understanding Port Aggregation Protocol, page 6-2](#)
- [Understanding Frame Distribution, page 6-3](#)

## Understanding Administrative Groups

Configuring an EtherChannel creates an administrative group, designated by an integer between 1 and 1024, to which the EtherChannel belongs. When an administrative group is created, you can assign an administrative group number or let the next available administrative group number be assigned automatically. Forming a channel without specifying an administrative group number creates a new automatically numbered administrative group. An administrative group may contain a maximum of eight ports.

## Understanding EtherChannel IDs

Each EtherChannel is automatically assigned a unique EtherChannel ID. Use the **show channel group admin\_group** command to display the EtherChannel ID.

## Understanding Port Aggregation Protocol

The Port Aggregation Protocol (PAgP) facilitates the automatic creation of EtherChannels by exchanging packets between Ethernet ports. PAgP packets are exchanged only between ports in **auto** and **desirable** modes. Ports configured in **on** or **off** mode do not exchange PAgP packets. The protocol learns the capabilities of port groups dynamically and informs the other ports. After PAgP identifies correctly matched EtherChannel links, it groups the ports into an EtherChannel. The EtherChannel is then added to the spanning tree as a single bridge port.

EtherChannel includes four user-configurable modes: **on**, **off**, **auto**, and **desirable**. Only **auto** and **desirable** are PAgP modes. You can modify the **auto** and **desirable** modes with the **silent** and **non-silent** keywords. By default, ports are in **auto silent** mode.

Table 6-1 describes EtherChannel modes.

**Table 6-1 EtherChannel Modes**

Mode	Description
<b>on</b>	Mode that forces the port to channel without PAgP. With the <b>on</b> mode, a usable EtherChannel exists only when a port group in <b>on</b> mode is connected to another port group in <b>on</b> mode.
<b>off</b>	Mode that prevents the port from channeling.
<b>auto</b>	PAgP mode that places a port into a passive negotiating state, in which the port responds to PAgP packets it receives but does not initiate PAgP packet negotiation. (Default)
<b>desirable</b>	PAgP mode that places a port into an active negotiating state, in which the port initiates negotiations with other ports by sending PAgP packets.
<b>silent</b>	Keyword that is used with the <b>auto</b> or <b>desirable</b> mode when no traffic is expected from the other device to prevent the link from being reported to the Spanning Tree Protocol as down. (Default)
<b>non-silent</b>	Keyword that is used with the <b>auto</b> or <b>desirable</b> mode when traffic is expected from the other device.

Both the **auto** and **desirable** modes allow ports to negotiate with connected ports to determine if they can form an EtherChannel, based on criteria such as port speed, trunking state, and VLAN numbers.

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

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

## Understanding Frame Distribution

EtherChannel distributes frames 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.

Enter the **show module** command for the supervisor engine to determine if EtherChannel frame distribution is configurable on your switch:

- If the display shows the “Sub-Type” to be “L2 Switching Engine I WS-F6020,” then EtherChannel frame distribution is not configurable on your switch; it uses source and destination Media Access Control (MAC) addresses.
- EtherChannel frame distribution is configurable with all other switching engines. The default is to use source and destination IP addresses.

When configurable, EtherChannel frame distribution can use MAC addresses, IP addresses, and Layer 4 port numbers. You can specify either source or destination address or both source and destination addresses and Layer 4 port numbers. The mode you select applies to all EtherChannels configured on the switch. Use the option that provides the greatest variety in your configuration. For example, if the traffic on a channel is going to a single MAC address only, using source addresses or IP addresses or Layer 4 port numbers as the basis for frame distribution may provide better frame distribution than selecting MAC addresses as the basis.

## EtherChannel Configuration Guidelines

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

- You can have a maximum of eight compatibly configured ports per EtherChannel; the ports do not have to be contiguous or on the same module.



**Note** To configure the EtherChannel across different modules, you must put the ports in the same administrative group using the **set port channel port\_list admin\_group** command.

- Assign all ports in an EtherChannel to the same VLAN, or configure them as trunk ports.
- If you configure the EtherChannel as a trunk, configure the same trunk mode on all the ports in the EtherChannel. Configuring ports in an EtherChannel in different trunk modes can have unexpected results.
- An EtherChannel supports the same allowed range of VLANs on all the ports in a trunking EtherChannel. If the allowed range of VLANs is not the same for a port list, the ports do not form an EtherChannel even when set to the **auto** or **desirable** mode with the **set port channel** command.
- Ports with different port path costs, set by the **set spantree portcost** command, can form an EtherChannel as long they are otherwise compatibly configured. Setting different port path costs does not, by itself, make ports incompatible for the formation of an EtherChannel.
- Do not configure the ports in an EtherChannel as dynamic VLAN ports. Doing so can adversely affect switch performance.
- An EtherChannel will not form with ports that have different GARP VLAN Registration Protocol (GVRP), GARP Multicast Registration Protocol (GMRP), and quality of service (QoS) configurations.
- Configure all ports in an EtherChannel to operate at the same speed and duplex mode.
- An EtherChannel will not form with ports where the port security feature is enabled.
- You cannot enable the port security feature for ports in an EtherChannel.
- An EtherChannel will not form if one of the ports is a SPAN destination port.
- An EtherChannel will not form if protocol filtering is set differently on the ports.
- Enable all ports in an EtherChannel. If you disable a 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.
- With software release 6.3(1) and later releases, an EtherChannel is preserved even if it contains only one port. In software releases prior to 6.3(1), traffic was disrupted when you removed a 1-port channel from spanning tree and then added it to spanning tree as an individual port.

# Configuring EtherChannel

These sections describe how to configure EtherChannel:

- [Configuring an EtherChannel, page 6-5](#)
- [Setting the EtherChannel Port Mode, page 6-5](#)
- [Setting the EtherChannel Port Path Cost, page 6-6](#)
- [Setting the EtherChannel VLAN Cost, page 6-6](#)
- [Configuring EtherChannel Frame Distribution, page 6-8](#)
- [Displaying EtherChannel Traffic Utilization, page 6-8](#)
- [Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number, page 6-8](#)
- [Disabling an EtherChannel, page 6-9](#)

## Configuring an EtherChannel

To configure EtherChannel on a group of Ethernet ports, perform this task in privileged mode:

Task	Command
Configure the EtherChannel on the desired ports.	<b>set port channel</b> <i>mod/ports...</i> [ <i>admin_group</i> ] <b>set port channel</b> <i>mod/port mode</i> { <i>on</i>   <i>off</i>   <i>desirable</i>   <i>auto</i> } [ <i>silent</i>   <i>non-silent</i> ]

This example shows how to configure a seven-port EtherChannel in a new administrative group:

```
Console> (enable) set port channel 2/2-8 mode desirable
Ports 2/2-8 left admin_group 1.
Ports 2/2-8 joined admin_group 2.
Console> (enable)
```

## Setting the EtherChannel Port Mode

To set a port's EtherChannel mode, perform this task in privileged mode:

Task	Command
Set a port's EtherChannel mode.	<b>set port channel</b> <i>mod/ports...</i> [ <i>admin_group</i> ] <b>set port channel</b> <i>mod/port mode</i> { <i>on</i>   <i>off</i>   <i>desirable</i>   <i>auto</i> } [ <i>silent</i>   <i>non-silent</i> ]

This example shows how to set port 2/1 to **auto** mode:

```
Console> (enable) set port channel 2/1 mode auto
Ports 2/1 channel mode set to auto.
Console> (enable)
```

## Setting the EtherChannel Port Path Cost

To set the EtherChannel port path cost, perform this task in privileged mode:

	Task	Command
Step 1	Use the administrative group number to display the EtherChannel ID.	<b>show channel group</b> <i>admin_group</i>
Step 2	Use the EtherChannel ID to set the EtherChannel port path cost.	<b>set channel cost</b> { <i>channel_id</i>   <b>all</b> } <i>cost</i>



### Note

When you enter the **set channel cost** command, it does not appear in the configuration file. The command causes a “set spantree portcost” entry to be created for each port in the channel. See the “[Configuring the PVST+ Port Cost](#)” section in [Chapter 8, “Configuring Spanning Tree,”](#) for information on using the **set spantree portcost** command.

This example shows how to set the EtherChannel port path cost for channel ID 768:

```

Console> (enable) show channel group 20
Admin Port  Status      Channel  Channel
group      Mode        id
-----
   20    1/1 notconnect on          768
   20    1/2  connected on          768

Admin Port  Device-ID                               Port-ID          Platform
group
-----
   20    1/1
   20    1/2  066510644 (cat26-lnf (NET25))          2/1              WS-C6009
Console> (enable)

Console> (enable) set channel cost 768 12
Port(s) 1/1,1/2 port path cost are updated to 31.
Channel 768 cost is set to 12.
Warning:channel cost may not be applicable if channel is broken.
Console> (enable)

```

## Setting the EtherChannel VLAN Cost

The EtherChannel VLAN cost feature provides load balancing of VLAN traffic across multiple channels configured with trunking.

You enter the **set channel vlancost** command to set the initial spanning tree costs for all VLANs in the channel. The **set channel vlancost** command provides an alternate cost for some of the VLANs in the channel (assuming you are trunking across the channel). This command allows you to have up to two different spanning tree costs assigned per channel; some VLANs in the channel can have the “vlancost” while the remaining VLANs in the channel have the “cost.”

The **set channel vlancost** command creates a “set spantree portvlancost” entry to the configuration file for each port in the channel. Once you have entered the **set channel vlancost** command, you must enter the **set spantree portvlancost** command for at least one port in the channel, specifying the VLAN or VLANs that you want associated with each port. The following examples show what occurs when each command is entered:

```
Console> (enable) set channel vlancost 856 10
Port(s) 3/47-48 vlan cost are updated to 16.
Channel 856 vlancost is set to 10.
```

The following commands are added to the configuration file:

- **set spantree portvlancost 3/47 cost 16**
- **set spantree portvlancost 3/48 cost 16**

Now you have to add the desired VLANs to the above created commands by entering the following:

```
Console> (enable) set spantree portvlancost 3/47 cost 16 1-1005
Port 3/47 VLANs 1025-4094 have path cost 19.
Port 3/47 VLANs 1-1005 have path cost 16.
Port 3/48 VLANs 1-1005 have path cost 16.
```

To set the EtherChannel VLAN cost, perform this task in privileged mode:

	Task	Command
Step 1	Use the administrative group number to display the EtherChannel ID.	<b>show channel group</b> <i>admin_group</i>
Step 2	Use the EtherChannel ID to set the EtherChannel VLAN cost.	<b>set channel vlancost</b> <i>channel_id cost</i>
Step 3	Configure the port cost for the desired VLANs on each port.	<b>set spantree portvlancost</b> { <i>mod/port</i> } [ <b>cost</b> <i>cost</i> ] [ <i>vlan_list</i> ]

This example shows how to set the EtherChannel VLAN cost for channel ID 856:

```
Console> (enable) show channel group 22
Admin Port  Status      Channel  Channel
group      Mode      id
-----
   22    1/1 notconnect on          856
   22    1/2 connected on          856

Admin Port  Device-ID                               Port-ID           Platform
group
-----
   22    1/1
   22    1/2 066510644 (cat26-1nf (NET25))    2/1              WS-C6009
Console> (enable)
```

```
Console> (enable) set channel vlancost 856 10
Port(s) 3/47-48 vlan cost are updated to 16.
Channel 856 vlancost is set to 10.
Console> (enable) set spantree portvlancost 3/47 cost 16 1-1005
Port 3/47 VLANs 1025-4094 have path cost 19.
Port 3/47 VLANs 1-1005 have path cost 16.
Port 3/48 VLANs 1-1005 have path cost 16.
Console> (enable)
```

## Configuring EtherChannel Frame Distribution

To configure EtherChannel frame distribution, perform this task in privileged mode:

Task	Command
Configure EtherChannel frame distribution.	<b>set port channel all distribution {ip   mac} [source   destination   both]</b> <b>set port channel all distribution {session} [both]</b>



### Note

The **set port channel all distribution session** command option is supported on Supervisor Engine 2 only.

This example shows how to configure EtherChannel to use MAC source addresses:

```
Console> (enable) set port channel all distribution mac source
Channel distribution is set to mac source.
Console> (enable)
```

## Displaying EtherChannel Traffic Utilization

To display the traffic utilization on the EtherChannel ports, perform this task in privileged mode:

Task	Command
Display traffic utilization.	<b>show channel traffic</b>

This example shows how to display traffic utilization on EtherChannel ports:

```
Console> (enable) show channel traffic
ChanId Port  Rx-Ucst Tx-Ucst Rx-Mcst Tx-Mcst Rx-Bcst Tx-Bcst
-----
   808  2/16   0.00%  0.00%  50.00%  75.75%  0.00%  0.00%
   808  2/17   0.00%  0.00%  50.00%  25.25%  0.00%  0.00%
   816  2/31   0.00%  0.00%  25.25%  50.50%  0.00%  0.00%
   816  2/32   0.00%  0.00%  75.75%  50.50%  0.00%  0.00%
Console> (enable)
```

## Displaying Outgoing Ports for a Specified Address or Layer 4 Port Number

To display the outgoing port used in an EtherChannel for a specific address or Layer 4 port number, perform this task in privileged mode:

Task	Command
Display the outgoing port for a specified address or Layer 4 port number.	<b>show channel hash <i>channel_id src_ip_addr [dest_ip_addr]   dest_ip_address   src_mac_addr [dest_mac_addr]   dest_mac_addr   src_port dest_port</i></b>

This example shows how to display the outgoing port for the specified source and destination IP addresses:

```
Console> (enable) show channel hash 808 172.20.32.10 172.20.32.66  
Selected channel port:2/17  
Console> (enable)
```

## Disabling an EtherChannel

To disable an EtherChannel, perform this task in privileged mode:

Task	Command
Disable an EtherChannel.	<b>set port channel <i>mod/port</i> mode off</b>

This example shows how to disable an EtherChannel:

```
Console> (enable) set port channel 2/2-8 mode off  
Ports 2/2-8 channel mode set to off.  
Console> (enable)
```

