

Configuring Fast EtherChannel and Gigabit EtherChannel

This chapter describes how to configure Fast EtherChannel and Gigabit EtherChannel. The configuration tasks in this chapter apply to Ethernet, Fast Ethernet, and Gigabit Ethernet switch ports on switching modules and fixed-configuration switches, as well as to supervisor engine Fast Ethernet and Gigabit Ethernet uplink ports.

Note For complete information on installing Catalyst 5000 series Ethernet, Fast Ethernet, and Gigabit Ethernet modules, refer to the *Catalyst 5000 Series Module Installation Guide*. For complete information on installing Catalyst 4000 series Fast Ethernet and Gigabit Ethernet modules, refer to the *Catalyst 4000 Series Installation Guide*.

Note For complete syntax and usage information for the commands used in this chapter, refer to the *Command Reference* for your switch.

This chapter consists of these sections:

- Understanding How EtherChannel Works on page 6-1
- Default EtherChannel Configuration on page 6-3
- Hardware Support for EtherChannel on page 6-3
- EtherChannel Configuration Guidelines and Restrictions on page 6-3
- Configuring EtherChannel on page 6-6

Understanding How EtherChannel Works

Fast EtherChannel provides parallel bandwidth of up to 800 Mbps (400-Mbps full duplex) between a switch and a router, host, or another switch by grouping multiple Fast Ethernet interfaces into a single logical transmission path.

Fast EtherChannel segments must be contiguous ports on a Fast EtherChannel-capable Fast Ethernet switching module. You can configure Fast Ethernet ports into Fast EtherChannel groups containing two or four ports, yielding 400- or 800-Mbps bidirectional bandwidth, respectively.

Gigabit EtherChannel provides parallel bandwidth of up to 8 Gbps (4 Gbps full duplex) between a switch and a router, host, or another switch by grouping multiple Gigabit Ethernet interfaces into a single logical transmission path.

You can configure Gigabit Ethernet ports into Gigabit EtherChannel groups containing two or four ports, yielding 4- or 8-Gbps bidirectional bandwidth, respectively.

Both Fast and Gigabit EtherChannel bundles can be configured as trunk links. For more information, refer to the “EtherChannel Configuration Guidelines and Restrictions” section on page 6-3 and to Chapter 11, “Configuring VLAN Trunks on Fast Ethernet and Gigabit Ethernet Ports.”

The Port Aggregation Protocol (PAgP) facilitates the automatic creation of Fast EtherChannel and Gigabit EtherChannel links by exchanging packets between channel-capable ports. The protocol learns the capabilities of port groups dynamically and informs the neighboring ports.

After PAgP identifies correctly paired channel-capable links, it groups the ports into a channel. The channel is then added to the spanning tree as a single bridge port. Inbound broadcast and multicast packets on one segment in a channel are blocked from returning on any other segment of the channel. Outbound broadcast and multicast packets are sent through only one segment in the channel.

There are four user-configurable channel modes. Table 6-1 describes each mode. PAgP packets are exchanged only between ports in **auto** and **desirable** mode. Ports configured in **on** or **off** mode do not exchange PAgP packets. By default, ports are in **auto** mode.

Table 6-1 Channel Modes

Mode	Description
on	Forces the port to channel without negotiation. PAgP packets are not exchanged. The port is channeling regardless of how the peer port is configured. If the peer port is in on mode, a channel is formed. In any other mode, the peer port is placed in the errdisable state due to a channel misconfiguration.
off	Prevents the port from channeling. PAgP packets are not exchanged. The port is not channeling regardless of how the peer port is configured. No channel is formed.
auto	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. A channel is formed only with another port group in desirable mode. (Default)
desirable	Places a port into an active negotiating state, in which the port initiates negotiations with other ports by sending PAgP packets. A channel is formed with another port group in either desirable or auto mode.

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

Channel ports can be in different channel modes as long as the modes are compatible. A port in **desirable** mode can form a channel successfully with another port that is in **desirable** or **auto** mode. Similarly, a port in **auto** mode can form a channel with another port in **desirable** mode.

A port in **auto** mode cannot form a channel with another port that is also in **auto** mode, since neither port will initiate negotiation. In addition, a port in **on** mode can form a channel only with a port in **on** mode, because ports in **on** mode do not exchange PAgP packets.

If a segment within a channel fails, traffic previously carried over the failed link switches to the remaining segments within the channel. A trap is sent upon a failure identifying the switch, the channel, and the failed link.

Channels are configured using the standard CLI or Simple Network Management Protocol (SNMP).

Default EtherChannel Configuration

Table 6-2 shows the Fast EtherChannel and Gigabit EtherChannel default configuration.

Table 6-2 Fast EtherChannel and Gigabit EtherChannel Default Configuration

Feature	Default Value
Fast EtherChannel	Disabled on all Fast Ethernet ports (auto mode)
Gigabit EtherChannel	Disabled on all Gigabit Ethernet ports (auto mode)

Hardware Support for EtherChannel

EtherChannel support is hardware-dependent. To determine whether your hardware supports EtherChannel, see the documentation for your hardware or use the **show port capabilities** command.

EtherChannel Configuration Guidelines and Restrictions

These sections describe restrictions that apply and guidelines to follow when configuring Fast or Gigabit EtherChannel:

- General EtherChannel Configuration Guidelines on page 6-3
- Fast EtherChannel Configuration Restrictions on page 6-4
- Gigabit EtherChannel Configuration Restrictions on page 6-5

General EtherChannel Configuration Guidelines

If improperly configured, some Fast EtherChannel or Gigabit EtherChannel ports are disabled automatically to avoid network loops and other problems. Use the following guidelines to avoid configuration problems:

- Assign all ports in a channel to the same VLAN, or configure them as trunk ports.
- If you configure the channel as a trunk, configure the same trunk mode on all the ports in the channel, on both ends of the link. Configuring ports in a channel in different trunk modes can have unexpected results.
- Configure all ports in a channel to operate at the same speed and duplex mode (full or half duplex).
- If you configure a broadcast limit on the ports, configure the broadcast limit as a percentage limit for the channeled ports. With a packets-per-second broadcast limit, unicast packets might get dropped for one second when the broadcast limit is exceeded.
- If the channel is composed of trunk ports, you must configure the same allowed VLAN range on all the ports. When the allowed VLAN range is not the same for all trunks in a channel, trunk ports on which a particular VLAN is not allowed will drop the packets for that VLAN while ports on which the VLAN is allowed will transmit the traffic. If the allowed VLAN range is not the same on all ports in the channel, the ports do not form a channel when set to the **auto** or **desirable** mode with the **set port channel** command.
- Do not configure the ports in a channel as dynamic VLAN ports. Doing so can adversely affect switch performance.

- Make sure port security is disabled on channeled ports. If you enable port security on a channeled port, the port shuts down when it receives packets with source addresses that do not match the secure address of the port.
- Enable all ports in a channel. If you disable a port in a channel, it is treated as a link failure and its traffic is transferred to one or more of the remaining ports in the channel.
- Ensure that all ports in a channel have the same configuration on both ends of the channel.
- The hardware controlling channeling on the Catalyst 5000 series switches prevents certain ports or groups of ports from forming channels. For more information, refer to the “Fast EtherChannel Configuration Restrictions” section on page 6-4 and the “Gigabit EtherChannel Configuration Restrictions” section on page 6-5.

Fast EtherChannel Configuration Restrictions

On all Fast EtherChannel-capable hardware, port groups determine which ports can form a channel. Channels must be composed of contiguous ports from the same port group. A channel cannot have some ports from one group and some ports from another. However, you can configure multiple channels within a single group.

Use the **show port capabilities** command to determine the port groups on your hardware. On modules with two EtherChannel-capable ports, the ports form one group of two ports. On modules with four or more ports, the ports form one or more four-port groups.

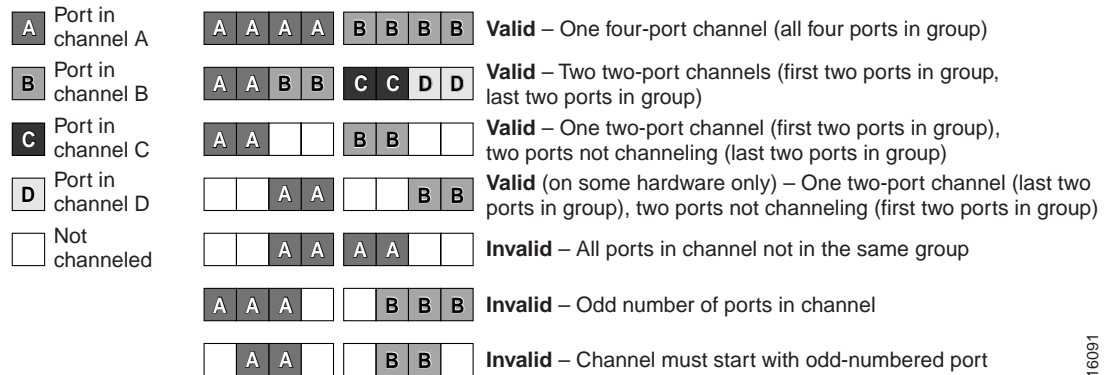
On modules with two channel-capable ports, the group of two ports can be channeled in any of the following ways:

- One channel with two ports in the channel
- No ports channeled

On modules with four or more channel-capable ports, each group of four ports can be channeled in any of the following ways:

- One channel of four contiguous ports (for example, ports 1–4 channeled or ports 9–12 channeled)
- Two channels with two contiguous ports in each channel (for example, ports 1–2 channeled and ports 3–4 channeled)
- One channel of the first two contiguous ports in the group with the other two ports in the group not channeled (for example, ports 5–6 channeled and ports 7–8 not channeled)
- One channel of the last two contiguous ports in the group with the first two ports in the group not channeled (for example, ports 3–4 channeled and ports 1–2 not channeled)—This configuration option is supported *only* on the Catalyst 4000 series modules, the 24 10/100-Mbps ports on the Catalyst 2926G, and the Catalyst 5000 series WS-5201R and WS-5225R modules.
- No ports channeled

Figure 6-1 shows valid and invalid Fast EtherChannel configurations (assuming at least two four-port port groups).

Figure 6-1 Valid and Invalid EtherChannel Configurations


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Gigabit EtherChannel Configuration Restrictions

On all Gigabit EtherChannel-capable hardware, port groups determine which ports can form a channel. Channels must be composed of contiguous ports from the same port group. A channel cannot have some ports from one group and some ports from another. However, you can configure multiple channels within a single group.

Use the **show port capabilities** command to determine the port groups on your hardware. On modules with two EtherChannel-capable ports, the ports form one group of two ports. On modules with four or more ports, the ports form one or more four-port groups.

On these modules, the ports are grouped as follows:

- On the Catalyst 5000 series nine-port Gigabit EtherChannel Switching Module (WS-X5410), the ports form two groups of four ports each (ports 1–4 and 5–8). Port 9 cannot be channeled.
- On the Catalyst 4000 series six-port Gigabit Ethernet module (WS-X4306), the ports form one group of two ports (ports 1–2) and one group of four ports (ports 3–6).

On modules with two channel-capable ports, the group of two ports can be channeled in any of the following ways:

- One channel with two ports in the channel
- No ports channeled

On modules with four or more channel-capable ports, each group of four ports can be channeled in any of the following ways:

- One channel of four contiguous ports (for example, ports 1–4 channeled)
- Two channels with two contiguous ports in each channel (for example, ports 1–2 channeled and ports 3–4 channeled)
- One channel of the first two contiguous ports in the group with the last two ports in the group not channeled (for example, ports 1–2 channeled and ports 3–4 not channeled)
- One channel of the last two contiguous ports in the group with the first two ports in the group not channeled (for example, ports 3–4 channeled and ports 1–2 not channeled)
- No ports channeled

Configuring EtherChannel

These sections describe how to configure an EtherChannel bundle:

- Creating an EtherChannel Bundle on page 6-6
- Removing an EtherChannel Bundle on page 6-6

Creating an EtherChannel Bundle

To configure a Fast EtherChannel or Gigabit EtherChannel bundle, perform this task in privileged mode:

Task	Command
Step 1 If you are unsure which ports you can channel or how the ports are grouped, verify the port groups for the module or switch you are configuring.	show port capabilities [<i>mod_num</i> [/ <i>port_num</i>]]
Step 2 Make sure that the ports you want to channel are configured correctly. (Refer to the “EtherChannel Configuration Guidelines and Restrictions” section on page 6-3.)	
Step 3 Create a channel on the desired ports.	set port channel <i>mod_num</i> / <i>ports</i> { on off auto desirable }
Step 4 Verify the channeling configuration.	show port channel [<i>mod_num</i> [/ <i>port_num</i>]] [info statistics]

This example shows how to create a two-port Fast EtherChannel bundle and verify the configuration:

```

Console> (enable) set port channel 1/1-2 on
Port(s) 1/1-2 channel mode set to on.
Console> (enable) 06/30/1998,17:09:32:PAGP-5:Port 1/1 left bridge port 1/1.
06/30/1998,17:09:32:PAGP-5:Port 1/2 left bridge port 1/2.
06/30/1998,17:09:33:PAGP-5:Port 1/1 joined bridge port 1/1-2.
06/30/1998,17:09:33:PAGP-5:Port 1/2 joined bridge port 1/1-2.
Console> (enable) show port channel
Port  Status      Channel  Channel  Neighbor  Neighbor
      mode        status   device   device   port
-----
1/1   connected  on      channel  WS-C2926 007475320 1/1
1/2   connected  on      channel  WS-C2926 007475320 1/2
-----
Console> (enable)
    
```

Removing an EtherChannel Bundle

To return a Fast EtherChannel or Gigabit EtherChannel bundle to its default configuration, perform this task in privileged mode:

Task	Command
Step 1 Return a channel to its default configuration (you must perform this task on both sides of the channel).	set port channel <i>port_list</i> auto
Step 2 Verify the configuration.	show port channel [<i>mod_num</i> [/ <i>port_num</i>]] [info statistics]

This example shows how to return a channel to its default configuration and how to verify the configuration:

```
Console> (enable) set port channel 1/1-2 auto  
Port(s) 1/1-2 channel mode set to auto.  
Console> (enable) show port channel  
No ports channelling  
Console> (enable)
```

