CHAPTER 8

Configuring EtherChannel

This chapter describes how to configure EtherChannel for the Layer 3 switch routers. For additional information about the Cisco IOS commands used in this chapter, refer to the *Cisco IOS Command Reference* publication. This chapter contains the following sections:

Note You are at Step 7 in the suggested process for configuring your Layer 3 switch router (see the "Suggested Process for Configuring the Layer 3 Switch Routers" section on page 2-1). This is an optional step. You may have already configured bridging, and you may now proceed with configuring EtherChannel as an optional step.

Understanding EtherChannel

This section describes how to configure Fast EtherChannel (FEC) or Gigabit EtherChannel (GEC) in Layer 3 switching. EtherChannel is a trunking technology that groups together multiple full-duplex 802.3 Ethernet interfaces to provide fault-tolerant high-speed links between switches, routers, and servers. EtherChannel is a logical aggregation of multiple Ethernet interfaces. EtherChannel forms a single higher bandwidth routing or bridging endpoint. EtherChannel is designed primarily for host-to-switch connectivity or Inter-Switch Link (ISL) switch-to-switch connectivity (for example, connectivity to a Catalyst 5000 family or a Catalyst 6000 family switch).

EtherChannel provides the following benefits:

- Logical aggregation of bandwidth
- Load balancing
- Fault tolerance

The EtherChannel interface (consisting of up to four Fast Ethernet interfaces) is treated as a single interface, which is called a *port channel*. You must perform all EtherChannel configurations on the EtherChannel interface rather than on the individual member Ethernet interfaces. You can create the

EtherChannel interface by entering the **interface port-channel** interface configuration command. The Catalyst 2948G-L3 switch router supports up to 16 FEC port channels and 1 GEC port channel, and the Catalyst 4908G-L3 switch router supports up to 4 GEC port channels.

EtherChannel connections are fully compatible with Cisco IOS VLAN and routing technologies. The ISL VLAN Trunk Protocol (VTP) can carry multiple VLANs across an EtherChannel, and routers attached to EtherChannel links can provide full multiprotocol routing with support for the Hot Standby Router Protocol (HSRP).

Cisco's FEC technology builds upon standards-based 802.3 full-duplex Fast Ethernet to provide a reliable high-speed solution for the campus network backbone. FEC provides bandwidth scalability within the campus by providing up to 800 Mbps full-duplex Fast Ethernet.

Cisco's GEC technology provides bandwidth scalability within the campus by providing 4-Gbps full-duplex aggregate capacity per channel on the Catalyst 2948G-L3 switch router and 8-Gbps full-duplex aggregate capacity per channel on the Catalyst 4908G-L3 switch router.

Configuring EtherChannel

You can configure a FEC or a GEC by creating an EtherChannel interface (port channel) and assigning a network (IP or IPX) address. All interfaces that are members of a FEC or a GEC should have the same link parameters such as duplex and speed.

Note When assigning interfaces to a specific port channel, the interfaces must be all Fast Ethernet or all Gigabit Ethernet. You cannot mix interface types within a single port channel.

To create an EtherChannel interface and assign its IP address and subnet mask, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface port-channel** *channel-number* Router(config-if)#	Create the EtherChannel interface. You can configure up to 16 FECs and 1 GEC on the Catalyst 2948G-L3 switch router and up to 4 GECs on the Catalyst 4908G-L3 switch router.
Step 2	Router(config-if)# **ip address** *ip-address subnet-mask*	Assign an IP address and subnet mask to the EtherChannel interface. For IPX, enter the **ipx network** *network-number* command.
Step 3	Router(config-if)# **exit** Router(config)#	Exit this mode. Optionally, you can remain in interface configuration mode and enable other supported interface commands to meet your requirements.

For information on other configuration tasks for the EtherChannel, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*.

To assign Ethernet interfaces to the EtherChannel, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *number* Router(config-if)# or Router(config)# **interface gigabitethernet** *number* Router(config-if)#	Enter Ethernet interface configuration mode to configure the Fast Ethernet or Gigabit Ethernet interface you want to assign to the EtherChannel. You can assign any interface on the system to the EtherChannel.
Step 2	Router(config-if)# **no ip address**	Disable the IP address. If the Fast Ethernet or Gigabit Ethernet interface already exists and has an IP address assigned, you must disable the IP address before performing the next step. The Ethernet interface uses the IP address assigned to the EtherChannel interface.
Step 3	Router(config-if)# **channel-group** *channel-number*	Assign the Fast Ethernet or Gigabit Ethernet interfaces to the EtherChannel. The channel number must be the same channel number you assigned to the EtherChannel interface.
Step 4	Router(config-if)# **end** Router#	Exit interface configuration mode. Repeat Steps 1 through 4 to add up to four Fast Ethernet or two Gigabit Ethernet interfaces to the EtherChannel on the Catalyst 2948G-L3 switch router. You can add up to four Gigabit Ethernet interfaces to the EtherChannel on the Catalyst 4908G-L3 switch router.
Step 5	Router# **copy running-config startup-config**	Save configuration changes to NVRAM.

Caution The EtherChannel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet or Gigabit Ethernet interfaces. Do not assign bridge groups on the physical Fast Ethernet or Gigabit Ethernet interfaces because doing so creates loops.

Note You cannot delete a FEC or GEC once they are created.

To remove an IP address and subnet mask from the EtherChannel interface, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface port-channel** *channel-number* Router(config-if)#	Enter interface configuration mode for the port channel.
Step 2	Router(config-if)# **no ip address** *ip-address subnet-mask*	Remove an IP address and subnet mask assigned to the FEC or GEC interface. For IPX, use the **no ipx network** *network-number* command.
Step 3	Router(config-if)# **exit** Router(config)#	Exit this mode.

To remove Ethernet interfaces assigned to the EtherChannel, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *number* Router(config-if)# or Router(config)# **interface gigabitethernet** *number* Router(config-if)#	Enter interface configuration mode to remove the Fast Ethernet or Gigabit Ethernet interface you want to remove from the EtherChannel. You can remove any interface you previously assigned to the EtherChannel.
Step 2	Router(config-if)# **no channel-group** *channel-number*	Remove the Fast Ethernet or Gigabit Ethernet interfaces assigned to the EtherChannel. The channel number must be the same channel number you assigned to the EtherChannel interface.
Step 3	Router(config-if)# **end** Router#	Exit interface configuration mode. Repeat Steps 1 through 3 to remove any other interfaces from the EtherChannel.
Step 4	Router# **copy running-config startup-config**	Save configuration changes to NVRAM.

The Cisco IOS software automatically removes a Fast Ethernet or Gigabit Ethernet interface from the EtherChannel if the interface goes down, and the software automatically adds the interface to the EtherChannel when the interface is back up.

Understanding Encapsulation over EtherChannel

When configuring encapsulation over FEC or GEC, be sure to configure ISL or 802.1Q over EtherChannel (that is, the port-channel interface), not its member ports. Also make sure that you do not apply protocol-level configuration (such as an IP address or a bridge group assignment) to the member interfaces. All protocol-level configuration should be on the port channel or on its subinterface. You must configure ISL or 802.1Q encapsulation on the partner system of the EtherChannel as well.

Note When configuring encapsulation on EtherChannel, you cannot configure both ISL and 802.1Q on the same EtherChannel interface.

Configuring Encapsulation over EtherChannel

To configure encapsulation over the EtherChannel, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface port-channel** *channel-number* Router(config-if)#	Create the EtherChannel (or port channel) virtual interface.
Step 2	Router(config-if)# **exit** Router(config)#	Exit to enter global configuration mode.
Step 3	Router(config)# **interface fastethernet** *number* Router(config-if)# or Router(config)# **interface gigabitethernet** *number* Router(config-if)#	Enter interface configuration mode for the interface you are adding to the port channel.
Step 4	Router(config-if)# **channel-group** *channel-number*	Add the interface to the port channel. You can add up to four Fast Ethernet or two Gigabit Ethernet interfaces to the EtherChannel.
Step 5	Router(config-if)# **exit** Router(config)#	Exit to enter global configuration mode.
Step 6	Router(config)# **interface port-channel** *channel-number.subinterface-number*	Configure the subinterface on the port channel.
Step 7	Router(config-subif)# **encap isl** *vlan-id*	Assign the ISL encapsulation to the subinterface.
Step 8	Router(config-subif)# **ip address** *ip-address subnet-mask*	Assign the protocol IP address and subnet mask to the subinterface.

	Command	Purpose
Step 9	Router(config-subif)# **end** Router#	Exit this mode. Optionally, you can remain in interface configuration mode and enable other supported interface commands to meet your requirements.
Step 10	Router# **copy running-config startup-config**	Save configuration changes to NVRAM.

Note Four adjacent Fast Ethernet ports on the Catalyst 2948G-L3 switch router (such as Fast Ethernet 1 through 4 or Fast Ethernet 45 through 48) must all use the same VLAN encapsulation; that is, either ISL or 802.1Q.

The following example demonstrates how to create a port channel, add a Gigabit Ethernet interface to the port channel, and how to configure a subinterface on the port channel:

```
Router(config)# interface port-channel 3
Router(config-if)# exit
Router(config)# interface gigabitethernet 1
Router(config-if)# channel-group 3
Router(config-if)# interface port-channel 3.3
Router(config-subif)# encapsulation isl 11
Router(config-subif)# ip address 10.3.4.5 255.0.0.0
Router(config-subif)# end
Router# copy running-config startup-config
```

Monitoring and Verifying EtherChannel

After FEC or GEC is configured, you can monitor its status using the **show interfaces port-channel** command.

In addition, you have the option of configuring system management tasks to monitor and fine tune your Layer 3 switch router's performance. For these tasks, refer to the *Cisco IOS Command Reference* documentation.