CHAPTER 9

Configuring Bridging

This chapter describes how to configure bridging for the Catalyst 4840G SLB switch. For further information about the commands used in this chapter, refer to the command reference publications in the Cisco IOS documentation set and to Appendix A, "Command Reference."

This chapter includes the following sections:

Note You are at Step 7 in the suggested process for configuring your Catalyst 4840G SLB switch. See the "Switch Configuration Steps" section on page 2-1.

About Bridging

Cisco IOS software supports transparent bridging for Ethernet. In addition, Cisco supports all the mandatory MIB variables specified for transparent bridging in RFC 1286.

Cisco IOS software bridging functionality combines the advantages of a spanning tree bridge and a full multiprotocol router. This combination provides the speed and protocol transparency of an adaptive spanning tree bridge, along with the functionality, reliability, and security of a router.

The Catalyst 4840G SLB switch can be configured to serve as both an IP router and a MAC-level bridge, bridging any traffic that cannot otherwise be routed.

You configure a group of interfaces to belong to the same bridge group. These interfaces will be part of the same spanning tree. This allows the SLB switch to bridge all nonrouted traffic among the network interfaces comprising the bridge group. Interfaces that are not part of the bridge group cannot forward bridged traffic.

If the packet's destination address is known in the bridge table, it is forwarded on a single interface in the bridge group. If the packet's destination is unknown in the bridge table, it is flooded on all forwarding interfaces in the bridge group. The bridge places source addresses in the bridge table as it learns them during the process of bridging.

A separate spanning tree process runs for each configured bridge group. Each bridge group participates in a separate spanning tree. A bridge group establishes a spanning tree based on the bridge protocol data units (BPDUs) it receives on its member interfaces.

Configuring Bridging

To configure bridging, you must perform these tasks:

- In global configuration mode:
  - Select spanning tree protocol (IEEE preferred).
  - Assign a priority to the bridge (optional).
- In interface configuration mode:
  - Specify which interfaces belong to the same bridge group.
  - Assign a cost to the outgoing interface (optional).

To configure bridging for a router and an interface, perform this task:

	Command	Purpose
Step 1	`SLB-Switch(config)# bridge` *bridge-group* `protocol {ibm | ieee | dec}`	Assign a bridge group number and defines a spanning tree protocol as either the IEEE 802.1D standard or DEC. **Note** The 802.1D STP is the preferred way of running the bridge.
Step 2	`SLB-Switch(config)# bridge` *bridge-group* `priority` *number*	Assign a specific priority to the bridge, assisting in the spanning tree root definition. The lower the priority, the more likely the bridge will be selected as the root.
Step 3	`SLB-Switch(config)# interface fastethernet` *interface_number* `SLB-Switch(config-if)#`	Enter Ethernet interface configuration mode to configure the Fast Ethernet interface.
Step 4	`SLB-Switch(config-if)# bridge-group` *bridge-group*	Assign a network interface to a bridge group.
Step 5	`SLB-Switch(config-if)# interface fastethernet` *interface_number*	Select the next interface if you need to assign additional interfaces to a bridge group.
Step 6	`SLB-Switch(config-if)# end` `SLB-Switch#`	Return to privileged EXEC mode.
Step 7	`SLB-Switch# copy system:running-config nvram:startup-config`	Save your configuration changes to NVRAM.

Administering Bridging

After you set up the switch for bridging, you can administer its operation by performing one of these tasks:

Command	Purpose
SLB-Switch# **clear bridge** *bridge-group*	Remove any learned entries from the forwarding database and clear the transmit and receive counts for any statically configured forwarding entries.
SLB-Switch# **clear vlan statistics**	Remove VLAN statistics from any static or system configured entries.
SLB-Switch# **show bridge** [*bridge-group*]	Display classes of entries in the bridge forwarding database.
SLB-Switch# **show bridge** [**bridge-group**] **circuit-group** [*circuit-group*] [*src-mac-address*] [*dest-mac-address*]	Display the interfaces configured in each circuit group and show whether they are participating in load distribution.
SLB-Switch# **show bridge group verbose**	Display extended information about configured bridge groups.
SLB-Switch# **show bridge vlan**	Display 802.10 transparently bridged VLAN configuration.
SLB-Switch# **show span**	Display the spanning tree topology known to the load-balancing switch.
SLB-Switch# **show vlans**	Display a summary of VLAN subinterfaces.

Integrated Routing and Bridging

Your network might require you to bridge local traffic within several segments while having hosts on the bridged segments reach the hosts or routers on routed networks. For example, if you are migrating bridged topologies into routed topologies, you might want to start by connecting some of the bridged segments to the routed networks.

Using the integrated routing and bridging (IRB) feature, you can route a given protocol between routed interfaces and bridge groups within a single Catalyst 4840G SLB switch. Specifically, local or unroutable traffic is bridged among the bridged interfaces in the same bridge group, while routable traffic is routed to other routed interfaces or bridge groups.

Because bridging is in Layer 2 and routing is in Layer 3, they have different protocol configurations. With IP, for example, bridge group interfaces belong to the same network and have a collective IP network address. In contrast, each routed interface represents a distinct network and has its own IP network address. Integrated routing and bridging uses Bridge-Group Virtual Interface (BVI) to enable these interfaces to exchange packets for a given protocol.

A BVI is a virtual interface within the campus Catalyst 4840G SLB switch that acts like a normal routed interface. A BVI does not support bridging, but actually represents the corresponding bridge group to routed interfaces within the switch. The interface number is the link between the BVI and the bridge group.

Layer 3 switching software supports the routing of IP between routed interfaces and bridged interfaces in the same router, in both fast-switching and process-switching paths.

Using IRB with BVI

Before you use IRB with BVI, consider the following:

- When IRB is enabled, the default route/bridge behavior in a bridge group is to bridge all packets. Make sure you explicitly configure routing on BVI for the protocols that you want routed.
- Packets of nonroutable protocols such as local-area transport (LAT) are always bridged. You cannot disable bridging for nonroutable traffic.
- Do not configure protocol attributes on the bridged interfaces when using IRB to bridge and route a given protocol. Bridging attributes cannot be configured on BVI.
- A bridge links several network segments into one large, flat network. To bridge a packet coming from a routed interface among the bridged interfaces, the whole bridge group should be represented by one interface.
- BVI has default data-link and network-layer encapsulations. These encapsulations are the same as on the Ethernet, except that you can configure BVI with some encapsulations that are not supported on a normal Ethernet interface.

Configuring IRB

To configure integrated routing and bridging, follow these steps:

Step 1 Configure bridge groups and routed interfaces.

a. Enable bridging.

b. Assign bridge groups to interfaces.

c. Configure routing for desired protocols.

Step 2 Configure IRB and the BVI.

a. Enable IRB.

b. Configure the BVI.

c. Enable the BVI to accept routed packets.

d. Enable routing on the BVI for desired protocols.

Step 3 Verify IRB configuration.

After a BVI is configured and routing is enabled on it, packets that come in on a routed interface destined for a host on a segment in a bridge group complete the following process:

- The packet is routed to the BVI
- The BVI forward the packet to the bridging engine.
- The packet exits through a bridged interface.

Similarly, packets that come in on a bridged interface but are destined for a host on a routed interface complete the following process:

- The packet goes to the BVI.
- The BVI forwards the packets to the routing engine.
- The packets exit on the routed interface.

To define a bridge group and configure an interface in the bridge group, perform this task beginning in global configuration mode:

	Command	Purpose
Step 1	`SLB-Switch(config)# bridge` *bridge-group* `protocol {ieee | dec}`	Define one or more bridge groups.
Step 2	`SLB-Switch(config)# interface fastethernet` *interface_number* or `SLB-Switch(config)# interface gigabitethernet` *interface_number* `SLB-Switch(config-if)#`	Enter Ethernet interface configuration mode to configure the Fast or Gigabit Ethernet interface.
Step 3	`SLB-Switch(config-if)# bridge-group` *bridge-group*	Assign a bridge group number to the designated interface.
Step 4	`SLB-Switch(config-if)# exit`	Return to global configuration mode.

To enable and configure IRB and BVI, perform this task:

	Command	Purpose
Step 1	`SLB-Switch(config)# bridge irb`	Enable IRB, allowing routing of traffic from the bridged interfaces.
Step 2	`SLB-Switch(config)# interface bvi` *bridge-group* `SLB-Switch(config-if)#`	Configure the BVI by assigning the corresponding bridge group's number to the BVI. Each bridge group can only have one corresponding BVI.
Step 3	`SLB-Switch(config-if)# ip address` *ip-address subnet-mask*	Configure protocol addresses on routed interfaces. This step shows an example for IP. Optionally, you can configure additional routing attributes to the BVI.
Step 4	`SLB-Switch(config-if)# exit` `SLB-Switch(config)#`	Exit interface configuration mode.
Step 5	`SLB-Switch(config)# bridge` *bridge-group* `route` *protocol*	Enable a BVI to accept and route routable packets received from its corresponding bridge group. You must enter this command for each protocol that you want the BVI to route from its corresponding bridge group to other routed interfaces.
Step 6	`SLB-Switch(config)# end` `SLB-Switch#`	Exit global configuration mode. Optionally, you can configure additional routing attributes to the BVI at this point.
Step 7	`SLB-Switch# copy system:running-config nvram:startup-config`	Save your configuration changes to NVRAM.

For a complete configuration example of IRB using BVI, see the "Example ISL VLAN and BVI with GEC Configuration" section on page 4-11.

To verify the IRB configuration, perform this task:

Command	Purpose
SLB-Switch# **show interfaces bvi** *interface-name*	Display BVI information, such as the BVI MAC address and processing statistics
SLB-Switch# **show interfaces irb**	Display the following BVI information: • Protocols that this bridged interface can route to the other routed interface if this packet is routable • Protocols that this bridged interface bridges • Entries in the software MAC-address filter