CHAPTER 4

Configuring Interfaces

This chapter describes basic interface configurations for your Layer 3 switch router. Also included are sections about configuring virtual LANs (VLANs), packet-over-SONET interfaces, ATM uplink interfaces, and port snooping.

Unless otherwise noted, the information in this chapter applies to the Catalyst 8540 CSR, Catalyst 8510 CSR, and Catalyst 8540 MSR with Layer 3 functionality. 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:

- Overview of Interface Configuration
- General Instructions for Configuring Interfaces
- About Layer 3 Switching Interfaces
- About Virtual LANs
- Configuring ISL VLAN Encapsulation
- Configuring 802.1Q VLAN Encapsulation
- About Packet over SONET (Catalyst 8540)
- Configuring the POS OC-12c Uplink Interface (Catalyst 8540)
- About ATM Uplinks (Catalyst 8540)
- Configuring the ATM Uplink Interface (Catalyst 8540)
- About Port Snooping
- Configuring Snooping

Note You are at Step 3 in the suggested process for configuring your switch router (see the “Suggested Procedure for Configuring Your Switch Router” section on page 2-1). You should have already configured the processor module (and LAN emulation on the Catalyst 8540 MSR) and now be ready to proceed with configuring interfaces.

Overview of Interface Configuration

A router's main function is to relay packets from one data link to another. To do that, the characteristics of the interfaces through which the packets are received and sent must be defined. Interface characteristics include, but are not limited to, IP address, address of the port, data encapsulation method, and media type.

Many features are enabled on a per-interface basis. Interface configuration mode contains commands that modify the interface operation, for example, of an Ethernet port. When you issue the **interface** command, you must define the interface type and number.

The following general guidelines apply to all physical and virtual interface configuration processes.

- Each interface must be configured with an IP address and an IP subnet mask.
- The virtual interfaces supported by Cisco switch routers include subinterfaces and IP tunnels.

  A subinterface is a mechanism that allows a single physical interface to support multiple logical interfaces or networks—that is, several logical interfaces or networks can be associated with a single hardware interface. Configuring multiple virtual interfaces, or subinterfaces, on a single physical interface allows greater flexibility and connectivity on the network.

Layer 3 interfaces have both a Media Access Control (MAC) address and an interface port ID. The router keeps track of these designators and uses them to route traffic.

Media Access Control Address

The *MAC address*, also referred to as the hardware address, is required for every port or device that connects to a network. Other devices in the network use MAC addresses to locate specific ports in the network and to create and update routing tables and data structures.

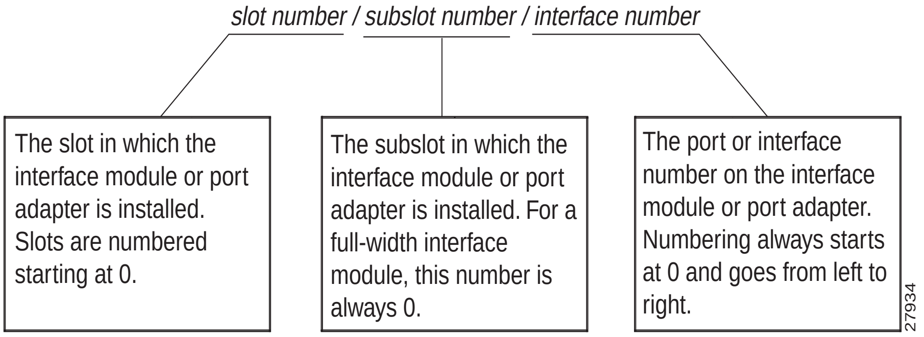
Tips To find the MAC address for a device, use the **show interfaces** command.

Interface Port Identifier

The *interface port identifier* designates the physical location of the Layer 3 interface within the chassis. This is the name that you use to identify the interface when configuring it. The system software uses interface port identifiers to control activity within the switch router and to display status information. Interface port identifiers are not used by other devices in the network; they are specific to the individual switch router and its internal components and software.

You can find the interface port identifier on the rear of the switch router. It is composed of three parts, formatted as *slot*/*subslot*/*interface* as depicted in Figure 4-1.

Figure 4-1 Interface Port Identifier Format


slot number / subslot number / interface number
The slot in which the interface module or port adapter is installed. Slots are numbered starting at 0.
The subslot in which the interface module or port adapter is installed. For a full-width interface module, this number is always 0.
The port or interface number on the interface module or port adapter. Numbering always starts at 0 and goes from left to right.
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The interface port identifiers on the Ethernet modules remain the same regardless of whether other modules are installed or removed. However, when you move an interface module to a different slot, the first number in the address changes to reflect the new slot number.

You can identify module ports by physically checking the *slot/subslot/interface* location on the back of the switch router. You can also use Cisco IOS **show** commands to display information about a specific interface, or all the interfaces, in the switch router.

General Instructions for Configuring Interfaces

The following general configuration instructions apply to all interfaces. Begin in global configuration mode. To configure an interface, follow these steps:

Step 1 Use the **configure** EXEC command at the privileged EXEC prompt to enter the global configuration mode.

```
Router> enable
Router# configure terminal
Router (config)#
```

Step 2 Enter the **interface** command, followed by the interface type (for example, Fast Ethernet or Gigabit Ethernet) and its interface port identifier (see the “Interface Port Identifier” section on page 4-2).

For example, to configure the Gigabit Ethernet port on slot 1, port 1, use this command:

```
Router(config)# interface gigabitethernet 1/0/1
```

Step 3 Follow each **interface** command with the interface configuration commands required for your particular interface.

The commands you enter define the protocols and applications that will run on the interface. The commands are collected and applied to the **interface** command until you enter another **interface** command, a command that is not an interface configuration command, or you enter **end** to return to privileged EXEC mode.

Step 4 Check the status of the configured interface by using the EXEC **show** commands.

```
Router# show interface gigabitethernet 1/0/1
GigabitEthernet1/0/1 is up, line protocol is up
Hardware is K1 Gigabit Port, address is 00d0.ba1d.3207 (bia 00d0.ba1d.3207)
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive set (10 sec)
Full-duplex mode, 1000Mb/s, Auto-negotiation, 1000BaseSX
output flow-control is unsupported, input flow-control is unsupported
ARP type: ARPA, ARP Timeout 04:00:00
```

About Layer 3 Switching Interfaces

Layer 3 switching supports two different Gigabit Ethernet interfaces, an eight-port module and a two-port module. This section describes the initial configurations for both interface types.

Tips Before you configure interfaces, be sure to have the interface network (IP or IPX) addresses and the corresponding subnet mask information. If you do not have this information, consult your network administrator.

The Gigabit Ethernet interface modules can be configured as trunk ports, non-trunking ports, routed ports, or bridged ports. The trunk ports employ 802.1Q encapsulation; Inter-Switch Link (ISL) is not supported. You can use the Gigabit Ethernet ports as routed interfaces, or you can configure the ports into a bridge group, which is the recommended configuration.

By configuring as many ports as possible in a bridge group, you can optimize the throughput of your switch router. You can also ensure that your networks are routed by using integrated routing and bridging features from Cisco IOS software. For configuration instructions, see the “About Integrated Routing and Bridging” section on page 6-4.

Between ports on the eight-port Gigabit Ethernet interface module itself, local switching at Layer 2 provides nonblocking performance at wire speed. For ports on this module configured as a bridge group, Layer 2 traffic is processed at full Gigabit Ethernet rates. For Layer 3 traffic, however, this interface module provides 2-Gbps routing bandwidth from the switch fabric.

Initially Configuring Gigabit Ethernet Interfaces

To configure an IP address and autonegotiation on a Gigabit Ethernet interface, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface gigabitethernet** *slot/subslot/interface* Router(config-if)#	Enters Ethernet interface configuration mode to configure the Gigabit Ethernet interface.
Step 2	Router(config-if)# [**no**] **negotiation auto**	Specifies the negotiation mode. When you set negotiation mode to **auto**, the Gigabit Ethernet port attempts to negotiate the link (that is, both port speed and duplex setting) with the partner port. When you set the Gigabit Ethernet interface to **no negotiation auto**, the port forces the link up no matter what the partner port setting is. This brings up the link with 1000 Mbps and full duplex only.
Step 3	Router(config-if)# **ip address** *ip-address subnet-mask*	Specifies the IP address and IP subnet mask to be assigned to the Gigabit Ethernet interface.
Step 4	Router(config-if)# **exit** Router(config)#	Returns to global configuration mode. Repeat Steps 1 to 3 to configure another Gigabit Ethernet interface on this interface module.
Step 5	Router(config)# **end**	Returns to privileged EXEC mode.
Step 6	Router# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example demonstrates initially configuring a Gigabit Ethernet interface with autonegotiation and an IP address:

```
Router(config)# interface gigabitethernet 0/0/0
Router(config-if)# negotiation auto
Router(config-if)# ip address 10.1.2.3 255.0.0.0
Router(config-if)# exit
Router(config)# ^Z
C8540-CSR# copy system:running-config nvram:startup-config
```

About the Enhanced Gigabit Ethernet Interfaces (Catalyst 8540)

The enhanced Gigabit Ethernet interface module provides two Gigabit Ethernet interfaces with built-in ACL support; no daughter card is required. The POS OC-12c uplink interface module and the ATM uplink interface module also include a single enhanced Gigabit Ethernet interface. See “Configuring the POS OC-12c Uplink Interface (Catalyst 8540)” section on page 4-14” and “Configuring the ATM Uplink Interface (Catalyst 8540)” section on page 4-28.

There is no special configuration required for the enhanced Gigabit Ethernet interfaces other than that used for other Gigabit Ethernet interfaces.

Initially Configuring Fast Ethernet Interfaces

Use the following procedure to assign an IP address to the Fast Ethernet 10BaseT or 100BaseT interface of your switch router so that it can be recognized as a device on the Ethernet LAN. The Fast Ethernet interface supports 10-Mbps and 100-Mbps speeds with Cisco 10BaseT and 100BaseT routers, hubs, switches, and switch routers.

	Command	Description
Step 1	Router(config)# **interface fastethernet** *slot/subslot/interface* Router(config-if)#	Enters Ethernet interface configuration mode to configure the Fast Ethernet interfaces.
Step 2	Router(config-if)# **ip address** *ip-address subnet-mask*	Specifies the IP address and IP subnet mask to be assigned to the FastEthernet interface.
Step 3	Router(config-if)# [**no**] **speed** [**10** | **100** | **auto**]	Configures the transmission speed for 10 or 100 Mbps, or for autonegotiation (the default). If you set the speed to **auto**, you enable autonegotiation, and the switch router matches the speed of the partner node.
Step 4	Router(config-if)# [**no**] **duplex** [**full** | **half** | **auto**]	Configures for full or half duplex. If you set duplex for **auto**, the switch router matches the duplex setting of the partner node.
Step 5	Router(config-if)# **end** Router#	Returns to privileged EXEC mode.
Step 6	Router# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example demonstrates initially configuring a Fast Ethernet interface with an IP address and autonegotiated speed and duplex:

```
Router(config)# interface fastethernet 1/0/0
Router(config-if)# ip address 10.1.2.4 255.0.0.0
Router(config-if)# speed auto
Router(config-if)# duplex auto
Router(config-if)# ^Z
Router# copy system:running-config nvram:startup-config
```

Verifying the Ethernet Interface Configuration

To verify the settings after you have configured Gigabit Ethernet or Ethernet 10/100 BaseT operation, use the following commands:

Command	Purpose
show interface gigabitethernet *slot/subslot/interface*	Displays the status and global parameters of the Gigabit Ethernet interface.
show interface fastethernet *slot/subslot/interface*	Displays the status and global parameters of the Fast Ethernet interface.

Examples

The following example shows sample output from the **show interface gigabitethernet** command:

```
Router# show interface gigabitethernet 0/0/0
GigabitEthernet0/0/0 is administratively down, line protocol is down
  Hardware is K1 Gigabit Port, address is 00d0.ba1d.3207 (bia 00d0.ba1d.3207)
  Internet address is 10.1.2.3/8
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Full-duplex mode, 1000Mb/s, Auto-negotiation, 1000BaseSX
  output flow-control is unsupported, input flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns(0/0/0)
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

The following example shows sample output from the **show interface fastethernet** command:

```
Router# show interface fastethernet 1/0/0
FastEthernet1/0/0 is administratively down, line protocol is down
  Hardware is epif_port, address is 0010.073c.050f (bia 0010.073c.050f)
  Internet address is 10.1.2.4/8
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Auto-duplex, Auto Speed, 100BaseTX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

About Virtual LANs

Virtual LANs enable network managers to group users logically rather than by physical location. A virtual LAN (VLAN) is an emulation of a standard LAN that allows data transfer and communication to occur without the traditional restraints placed on the network. It can also be considered a broadcast domain set up within a switch. With VLANs, switches can support more than one subnet (or VLAN) on each switch, and give routers and switches the opportunity to support multiple subnets on a single physical link. A group of devices on a LAN are configured so that they communicate as if they were attached to the same LAN segment, when they are actually located on different segments. Layer 3 switching supports up to 255 VLANs per system.

VLANs enable efficient traffic separation and provide excellent bandwidth utilization. VLANs also alleviate scaling issues by logically segmenting the physical LAN structure into different subnetworks so that packets are switched only between ports within the same VLAN. This can be very useful for security, broadcast containment, and accounting.

Layer 3 switching software supports a port-based VLAN on a trunk port, which is a port that carries the traffic of multiple VLANs. Each frame transmitted on a trunk link is tagged as belonging to only one VLAN.

Layer 3 switching software supports VLAN frame encapsulation through the Inter-Switch Link (ISL) protocol and the 802.1Q standard.

Note The four adjacent ports (such as 0 through 3, or 4 through 7) on a 10/100 interface must all use the same VLAN encapsulation; that is, either 802.1Q and native, or ISL and native.

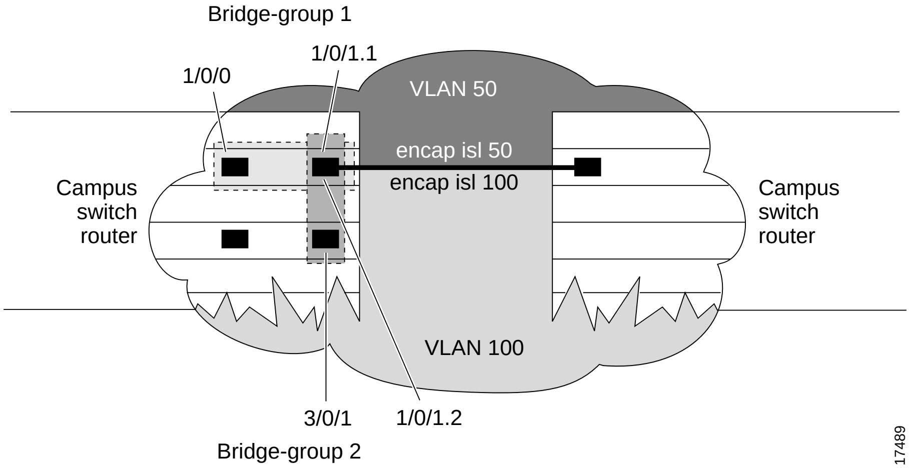
Configuring ISL VLAN Encapsulation

ISL is a Cisco protocol for interconnecting multiple switches and maintaining VLAN information as traffic travels between switches.

The VLAN configuration example shown in Figure 4-2 depicts the following:

- Fast Ethernet port 1/0/0 and subinterface 1/0/1.1 on the switch router are in bridge group 1. They are part of VLAN 50, which uses ISL encapsulation.
- Fast Ethernet port 3/0/1 and subinterface 1/0/1.2 are in bridge group 2. They are part of VLAN 100, which uses ISL encapsulation.
- Fast Ethernet port 1/0/1 is configured as an ISL trunk.

Figure 4-2 Example of an ISL VLAN Bridging Configuration



To configure the Layer 3 VLANs shown in Figure 4-2, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *slot/subslot/interface.subinterface* Router(config-subif)#	Enters subinterface configuration mode.
Step 2	Router(config-subif)# **encapsulation isl** *vlan-id*	Specifies ISL encapsulation for the Ethernet frames sent from this subinterface with a header that maintains the specified VLAN ID between network nodes.
Step 3	Router(config-subif)# **bridge-group** *bridge-group*	Assigns the subinterface a bridge group number. **Note** When you are configuring VLAN routing, skip this step.
Step 4	Router(config-subif)# **interface fastethernet** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode to configure the Fast Ethernet main interface.
Step 5	Router(config-if)# **bridge-group** *bridge-group*	Assigns the main interface to the bridge group.
Step 6	Router(config-if)# **exit** Router(config)#	Returns to global configuration mode.
Step 7	Router(config)# **bridge** *bridge-group* **protocol ieee**	Specifies that the bridge group will use the IEEE Ethernet Spanning Tree Protocol.

Example

The following example shows how to configure the interfaces for VLAN bridging with ISL encapsulation shown in Figure 4-2:

```
Router(config)# interface fastethernet 1/0/1.1
Router(config-subif)# encap isl 50
Router(config-subif)# bridge-group 1
Router(config-subif)# interface fastethernet 1/0/0
Router(config-if)# bridge-group 1
Router(config-if)# exit
Router(config)# bridge 1 protocol ieee
Router(config)# interface fastethernet 1/0/1.2
Router(config-subif)# encap isl 100
Router(config-subif)# bridge-group 2
Router(config-subif)# interface fastethernet 3/0/1
Router(config-subif)# bridge-group 2
Router(config-subif)# exit
Router(config)# bridge 2 protocol ieee
Router(config)# exit
Router# copy system:running-config nvram:startup-config
```

When configuring ISL with IP, you cannot configure IP addresses on a subinterface unless the VLANs are already configured (that is, you must have already entered the **encapsulation isl** or **encapsulation dot1q** command). That is not the case with IPX, however—you can configure IPX networks on a subinterface even when the VLANs have not been configured.

The maximum VLAN bridge group values are as follows:

- Maximum number of bridge groups: 64
- Maximum number of interfaces per bridge group: 128
- Maximum number of subinterfaces per system: 255

For a complete configuration example for VLANs with ISL encapsulation, see the “Catalyst 8540 CSR with ISL, VLAN, and BVI with GEC” section on page C-1.

To monitor the VLANs once they are configured, use the commands described in the “Monitoring VLAN Operation” section on page 4-12.

Configuring 802.1Q VLAN Encapsulation

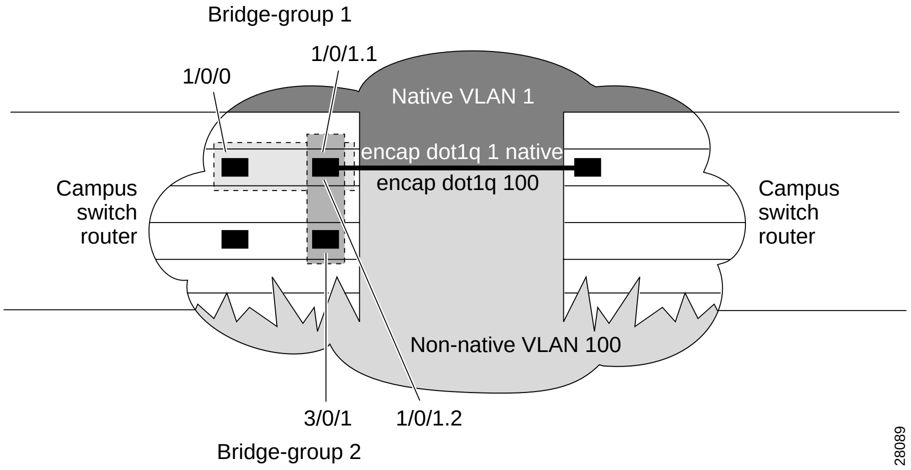
The IEEE 802.1Q standard provides a method for secure bridging of data across a shared backbone. IEEE 802.1Q VLAN encapsulation uses an internal, or one level, packet tagging scheme to multiplex VLANs across a single physical link, while maintaining strict adherence to the individual VLAN domains.

On an IEEE 802.1Q trunk port, all transmitted and received frames are tagged except for those on the one VLAN configured as the PVID (port VLAN identifier) or native VLAN for the port. Frames on the native VLAN are always transmitted untagged and are normally received untagged.

The VLAN configuration example shown in Figure 4-3 depicts the following:

- Fast Ethernet ports 1/0/0 and subinterface 1/0/1.1 on the switch router are in bridge group 1. They are part of native VLAN 1, which uses 802.1Q encapsulation.
- Fast Ethernet port 3/0/1 and subinterface 1/0/1.2 are in bridge group 2. They are part of VLAN 100, which uses 802.1Q encapsulation.
- Fast Ethernet port 1/0/1 is configured as an 802.1Q trunk.

Figure 4-3 Example of Bridging Between Native and Non-Native 802.1Q VLANs



To configure the bridging between native VLAN 1 and non-native VLAN 100 depicted in Figure 4-3, perform the following steps:

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *slot/subslot/interface.subinterface*	Enters subinterface configuration mode.
Step 2	Router(config-subif)# **encap dot1q** *vlan-id* **native**	Specifies 802.1Q encapsulation for Ethernet frames sent from the subinterface with a header that maintains the specified native VLAN ID between network nodes.
Step 3	Router(config-subif)# **bridge-group** *bridge-group*	Assigns the subinterface a bridge group number. **Note** When you are configuring VLAN routing, skip this step.
Step 4	Router(config-subif)# **interface fastethernet** *slot/subslot/interface*	Enters interface configuration mode to configure the Fast Ethernet main interface.
Step 5	Router(config-if)# **bridge-group** *bridge-group*	Assigns the main interface to the bridge group.
Step 6	Router(config-if)# **exit**	Returns to global configuration mode.
Step 7	Router(config)# **bridge** *bridge-group* **protocol ieee**	Specifies that the bridge group will use the IEEE Ethernet Spanning Tree Protocol.

Example

The following example shows how to configure the bridging between native and non-native 802.1Q VLANs shown in Figure 4-3:

```
Router(config)# interface fastethernet 1/0/1.1
Router(config-subif)# encap dot1q 1 native
Router(config-subif)# bridge-group 1
Router(config-subif)# interface fastethernet 1/0/0
Router(config-if)# bridge-group 1
Router(config-if)# exit
Router(config)# bridge 1 protocol ieee
Router(config)# interface fastethernet 1/0/1.2
Router(config-subif)# encap dot1q 100
Router(config-subif)# bridge-group 2
Router(config-subif)# interface fastethernet 3/0/1
Router(config-subif)# bridge-group 2
Router(config-subif)# exit
Router(config)# bridge 2 protocol ieee
Router(config)# exit
Router# copy system:running-config nvram:startup-config
```

Monitoring VLAN Operation

Once the VLANs are configured on the switch router, you can monitor their operation using the following commands:

Command	Purpose
show vlan *vlan-id*	Displays information on all configured VLANs or on a specific VLAN (by VLAN ID number).
clear vlan *vlan-id*	Clears the counters for all VLANs, when the VLAN ID is not specified.
debug vlan packet	Displays contents of the packets sent to and exiting from the route processor.

To configure encapsulation over the EtherChannel, see the “About Encapsulation over EtherChannel” section on page 7-6.

About Packet over SONET (Catalyst 8540)

Synchronous Optical Network (SONET) is an octet-synchronous multiplex scheme that defines a family of standard rates and formats. Optical specifications are defined for single-mode fiber and multimode fiber. The transmission rates are integral multiples of 51.840 Mbps. For example, the POS OC-12c uplink interface provides 622.080 Mbps over single-mode optical fiber.

POS provides for the serial transmission of data over SONET frames using either High-Level Data Link Control (HDLC) protocol (the default) or Point-to-Point Protocol (PPP) encapsulation. On serial interfaces, Cisco’s implementation provides error detection and synchronous framing functions of traditional HDLC without the windowing or retransmission that are found in traditional HDLC.

Because SONET/SDH (Synchronous Digital Hierarchy) is by definition a point-to-point circuit, PPP is well suited for use over SONET links. The octet stream is mapped into the SONET/SDH synchronous payload envelope (SPE) in accordance with RFC 2615, "PPP over SONET/SDH," and RFC 2615, "PPP in HDLC-like Framing." Octet boundaries are aligned with the SPE octet boundaries, and the PPP frames are located by row within the SPE payload. Because frames are variable in length, the frames can cross SPE boundaries. Using this scheme, multiprotocol data can be encapsulated and transported directly into SONET frames without relying on ATM to provide Layer 2 capability (for example, in IP over ATM over SONET).

About the POS OC-12c Uplink Interface

POS technology is ideally suited for networks that are built for providing Internet or IP data. It provides superior bandwidth utilization and efficiency over other transport methods. For expensive WAN links, POS can provide as much as 25 to 30 percent higher throughput than ATM-based networks. Transporting frames directly into the SONET/SDH payload eliminates the overhead required in ATM cell header, IP over ATM encapsulation, and segmentation and reassembly (SAR) functionality.

Figure 4-4 shows a typical application of the POS OC-12c uplink interface module in an enterprise setting. Here the enterprise backbone is comprised of POS links among Catalyst 8540 campus switch routers in each building.

Figure 4-4 POS for Enterprise Backbone Connectivity

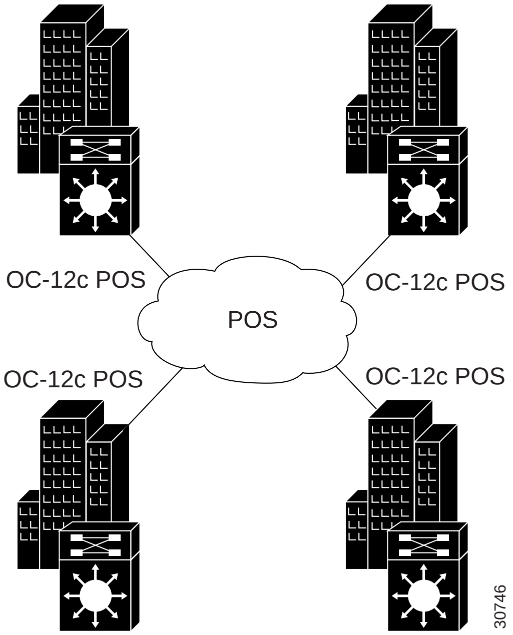
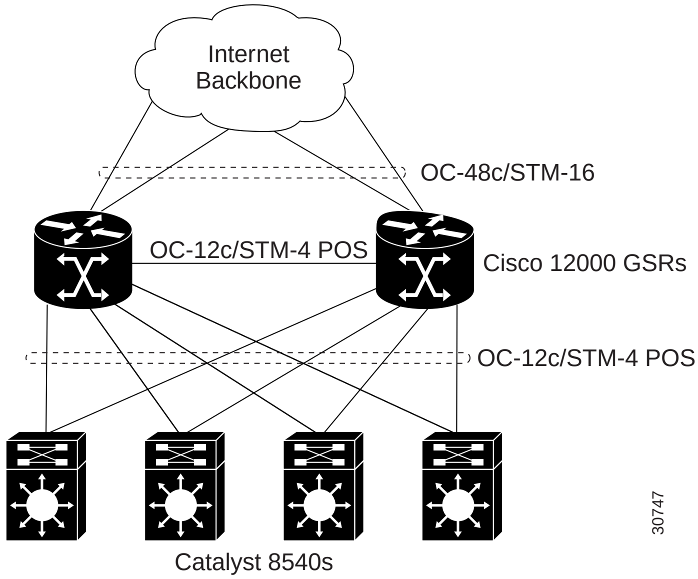


Figure 4-5 shows an example of a service provider application of the POS OC-12c uplink interface module. Here traffic is aggregated from Catalyst 8500 CSRs over POS OC-12c interfaces to Cisco 12000 GSRs. POS OC-48 interfaces on the Cisco 12000 gigabit switch routers then provide the uplinks to the Internet backbone.

Figure 4-5 POS for Aggregated Traffic Uplink to Internet



Configuring the POS OC-12c Uplink Interface (Catalyst 8540)

This section describes the default configuration of the POS OC-12c uplink interface, initial configurations you should perform for a newly installed interface, and optional configurations you can do to customize the interfaces to the requirements of your network.

Note The POS OC-12c uplink interface module consists of one OC-12c port and one enhanced Gigabit Ethernet port. For instructions on configuring the Gigabit Ethernet interface, see the "About the Enhanced Gigabit Ethernet Interfaces (Catalyst 8540)" section on page 4-5.

Default Configuration

Table 4-1 shows the default configuration of an enabled POS OC-12c uplink interface. To change any of these values, see the instructions in the following sections, "Initially Configuring the POS Interface" and "Customizing the Configuration."

Table 4-1 POS OC-12c Uplink Interface Default Configuration Values

Parameter	Configuration Command	Default Value
Keepalive	[**no**] **keepalive** *seconds*	Keepalives enabled, 10 seconds
Encapsulation	**encapsulation** {**hdlc** | **ppp**}	HDLC
Cisco Discovery Protocol (CDP)	[**no**] **cdp enable**	CDP enabled
Maximum transmission unit (MTU)	[**no**] **mtu** *bytes*	4470 bytes
Framing	**pos framing** {**sdh** | **sonet**}	SONET OC-12c
Bandwidth	[**no**] **bandwidth** *kbps*	622000 kbps (not configurable)

SONET overhead	**pos flag** {**c2** *value* | **j0** *value* | **s1s0** *value*}	c2 (path signal byte) set to 0xcf;
		j0 (section trace byte) set to 0xcc;
		s1s0 (bit s1 and s0 of H1) set to 0

Loop internal	[**no**] **loopback** {**internal** | **line**}	No loopback
POS SPE scrambling	[**no**] **pos scramble-atm**	POS SPE scrambling enabled
Cyclic redundancy check	**crc** {**16** | **32**}	32
Clock source	**clock source** {**internal** | **line**}	Line

Initially Configuring the POS Interface

You should configure the following properties for a newly installed POS OC-12c uplink interface:

- IP routing
- IP address
- Encapsulation type
- Clock source

You should also configure the following properties to match those of the interface at the other end:

- Keepalive messages
- Cisco Discovery Protocol (CDP)
- Cyclic redundancy check (CRC)
- Scrambling
- Encapsulation type

To initially configure the POS OC-12c uplink interface, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **ip routing**	Enables IP routing.
Step 2	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 3	Router(config-if)# **ip address** *ip-address subnet-mask*	Assigns an IP address and subnet mask to the interface.
Step 4	Router(config-if)# **encapsulation** {**hdlc** | **ppp**}	Specifies the encapsulation type.
Step 5	Router(config-if)# **clock source** {**line** | **internal**}	Specifies the clock source for the interface. When clocking is derived from the received clock, **line** (the default) is used. When no line clocking source is available, **internal** is used.
Step 6	Router(config-if)# **no shutdown**	Enables the interface with the previous configurations.

Example

The following configuration is an example of the tasks in the preceding table:

```
Router(config)# interface pos 1/0/0
Router(config-if)# ip address 10.1.2.3 255.0.0.0
Router(config-if)# encapsulation ppp
Router(config-if)# clock source line
Router(config-if)# no shutdown
```

Automatic Reverting of Clock Source

If your system clock source is set to line clock, it uses the recovered received clock to transmit. Under some conditions, the received clock is not reliable because of severe degradation of the signal quality. Because your system software monitors SF (signal failure), it knows when there is severe degradation in the signal quality and resorts to using the internal clock temporarily. Once the conditions that caused the signal quality to deteriorate clear, your system reverts to the line clock.

When two POS interface modules are connected and configured with the default line clock, the signal quality can degrade over time and both POS interfaces revert to the internal clock. As soon as the signal quality improves, both POS interfaces revert to using the line clock. This cycle repeats itself causing the line protocol on both interfaces to toggle. You can prevent this situation by configuring one end of the connection with the default line clock and the other with the internal clock.

In addition, degradation in the signal quality causes an automatic reverting of the clock source under the following conditions:

- SLOS (section loss of signal)
- SLOF (section loss of frame)
- AIS-L (line alarm indication signal)
- SF (signal failure) due to B2 error rate crossing the SF threshold value
- SF (signal failure) due to B3 error rate crossing the SF threshold value when the **pos delay triggers path** command is configured

Additional Configurations

To configure additional properties to match those of the interface at the far end, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config-if)# **no keepalive**	Turns off keepalive messages. Keepalive messages, though not required, are recommended.
Step 2	Router(config-if)# **no cdp enable**	Turns off CDP, which is not required.
Step 3	Router(config-if)# **crc** {**16** | **32**}	Sets the CRC value. If the device to which the POS module is connected does not support the default CRC value of 32, set both devices to use a value of 16.

Note The above steps apply both to the POS OC-12c uplink interface on the switch router and to the interface to which it connects at the far end.

Customizing the Configuration

This section describe how to customize the configuration of the POS OC-12c uplink interface to match your network environment.

Setting the MTU Size

To set the maximum transmission unit (MTU), perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **mtu** *bytes*	Configures the MTU size up to a maximum of 9188 bytes. Default MTU size is 4470 bytes.

Note The POS OC-12c uplink interface supports IP unicast and IP multicast fragmentation. For IP unicast fragmentation, the packet must ingress on a POS interface and egress on any interface. For IP multicast fragmentation, IP multicast data packets greater than 1500 bytes are fragmented to 1500 bytes on the ingress POS interface before being switched to other members in the multicast group. All the members in the multicast group must have a MTU equal to or greater than 1500 bytes.

Configuring Framing

The default framing mode for the POS OC-12c uplink interface is SONET STS-12c. You can also configure the interface for SDH STM-4, which is more widely used in Europe. To configure the framing mode on the POS OC-12c uplink interface, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **pos framing** {**sdh** | **sonet**}	Configures the framing mode. POS framing defaults to SONET. The following default values are used for SONET. • s1s0 default value is 0. • J1 defaults set to host name, interface name, and IP address. The following default values are used for SDH framing: • s1s0 default value is 2. • J1 is the path trace string. Its default setting is empty and is not configurable.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

Configuring SONET Overhead

You can set the SONET overhead bytes in the frame header to meet a specific standards requirement or to ensure interoperability of the POS OC-12c uplink interface with another vendor's equipment. To configure the SONET overhead, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **pos flag** {**c2** *value* | **j0** *value* | **sls0** *value*}	Configures the SONET overhead bytes. **c2** is a path signal identifier, **j0** is the section trace byte, and **sls0** is the bit s1 and s0 of the H1 payload pointer byte.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

The value of the c2 byte is determined as follows:

- If the value of the c2 byte has not been explicitly configured with the **pos flag** command, the SONET framer sends the following values:
  - For Cisco HDLC encapsulation with or without SPE scrambling: 0xCF
  - For PPP encapsulation with scrambling: 0x16 (RFC 2615)
  - For PPP encapsulation without scrambling: 0xCF (RFC 2615)
- If the value of the c2 byte has been explicitly configured with the **pos flag** command, the configured value is sent regardless of the encapsulation method.

The value of the s1s0 bits is determined as follows:

- If the value of the s1s0 bits have not been explicitly configured with the **pos flag** command, the SONET framer sends the following values:
  - For SONET framing, the default value is 0.
  - For SDH framing, the default value is 2.
- If the value of the s1s0 bits have been explicitly configured with the **pos flag** command, the configured value is used regardless of the framing.

Configuring POS SPE Scrambling

SONET payload scrambling applies a self-synchronous scrambler of polynomial X**43+1 to the synchronous payload envelope (SPE) of the interface to ensure sufficient bit transition density. Both ends of the connection must use the same scrambling algorithm.

To configure POS SPE scrambling, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **no pos scramble-atm**	Disables payload scrambling on the interface. Payload scrambling is on by default.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

Configuring SONET Alarms

The OC-12c POS uplink interface supports SONET alarm monitoring. To configure alarm monitoring, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **pos report** {**b1-tca** | **b2-tca** | **b3-tca** | **lais** | **lrdi** | **pais** | **plop** | **prdi** | **plm-p** | **sd-ber** | **sf-ber** | **slof** | **slos** | **uneq-p**}	Permits console logging of selected SONET alarms. The alarms are as follows: • **b1-tca** (B1 bit error rate [BER] threshold crossing alarm) • **b2-tca** (B2 BER threshold crossing alarm) • **b3-tca** (B3 BER threshold crossing alarm) • **lais** (line alarm indication signal) • **lrdi** (line remote defect indication) • **pais** (path alarm indication signal) • **plop** (path loss of pointer) • **prdi** (path remote defect indication) • **plm-p** (payload label, C2 mismatch alarm) • **sd-ber** (LBIP BER in excess of threshold) • **sf-ber** (signal failure BER) • **slof** (section loss of frame) • **slos** (section loss of signal), **uneq-p** (path unequipped C2 alarm). The **b1-tca**, **b2-tca**, **b3-tca**, **sf-ber**, **slof**, and **slos** errors are reported by default.
Step 3	Router(config-if)# **pos threshold** {**b1-tca** | **b2-tca** | **b3-tca** | **sd-ber** | **sf-ber**} *rate*	Sets the BER threshold values of the specified alarms. Default values are 6 for **b1-tca**, **b2-tca**, **b3-tca**, and **sd-ber**; 3 for **sf-ber**.
Step 4	Router(config-if)# **pos ais-shut**	Sends a line alarm indication signal (AIS-L) to the other end of the link after a **shutdown** command has been issued to the specified POS interface. By default, the AIS-L is not sent to the other end of the link. You can stop transmitting the AIS-L by issuing either the **no shutdown** or the **no pos ais-shut** commands.

To determine which alarms are reported on the POS interface, and to display the BER thresholds, use the **show controllers pos** command, as described in the next section, “Verifying the POS Configuration” section on page 4-22. For a detailed description of the **pos report** and **pos threshold** commands, refer to the *Cisco IOS Interface Command Reference* publication.

Configuring SONET Delay Triggers

A trigger is an alarm, which when asserted causes the line protocol to go down.

Line and Section Triggers

Table 4-2 lists the line and section alarms that are triggers by default:

Table 4-2 Default Line and Section Alarm Triggers

Alarm	Description
SLOS	Section loss of signal
SLOF	Section loss of frame
AIS-L	Line alarm indication signal

When one or more of the alarms in Table 4-2 are asserted, the line protocol of the interface goes down without a delay. You can issue a **pos delay triggers line** command to delay triggering the line protocol of the interface from going down. You can set the delay from 50 to 10000 ms. If you do not specify a time interval, the default delay is set to 100 ms.

Path Level Triggers

Table 4-3 lists path alarms that are not triggers by default. You can configure these path alarms as triggers and also specify a delay.

Table 4-3 Configurable Path Alarm Triggers

Alarm	Description
AIS-P	Path alarm indication signal
RDI-P	Path remote defect indication
LOP-P	Path loss of pointer

You can issue the **pos delay triggers path** command to configure the path alarms listed in Table 4-3 as triggers. These triggers will bring down the line protocol of the interface. When you configure the path alarms as triggers, you can simultaneously specify a delay for the triggers. You can set the delay from 50 to 10000 ms. If you do not specify a time interval, the default delay is set to 100 ms.

The **pos delay triggers path** configuration can also bring the line protocol of the interface down when the higher of the B2 and B3 error rates is compared with the SF (signal failure) threshold. If the SF threshold is crossed, then the line protocol of the interface goes down.

To configure a delay in triggering the line protocol of the interface from going down, perform the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface pos** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the POS interface to configure.
Step 2	Router(config-if)# **pos report** {**lais** | **pais** | **plop**| **prdi** | **slof** | **slos**}	Permits console logging of selected SONET alarms. The alarms are as follows: • **lais** (line alarm indication signal) • **pais** (path alarm indication signal) • **plop** (path loss of pointer) • **prdi** (path remote defect indication) • **slof** (section loss of frame) • **slos** (section loss of signal) The **slof** and **slos** errors are reported by default.
Step 3	Router(config-if)# **pos delay triggers** {**line** | **path**} *millisecond*	Delays triggering the line protocol of the interface from going down. Delay can be set from 50 to 10000 ms. If no time intervals are specified, the default delay is set to 100 ms.

Verifying the POS Configuration

To verify the configuration of the POS OC-12c uplink interface, use the following commands:

Command	Purpose
show interfaces pos [*slot/subslot/interface*]	Displays detailed information about the POS interface.
show protocols pos [*slot/subslot/interface*]	Displays status information for the active network protocols
show controllers pos [*slot/subslot/interface*]	Displays clock source, SONET alarms and error rates, and register values to assist in troubleshooting.

Examples

The following example shows output for the **show interfaces pos** command:

```
Router# show interfaces pos 1/0/0
POS1/0/0 is up, line protocol is down
  Hardware is Packet Over SONET
  Internet address is 10.1.2.3/8
  MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation PPP, crc 32, loopback not set, keepalive not set
  Scramble enabled
  LCP REQsent
  Closed: CDPCP
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
              0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 480 bytes, 0 underruns
     0 output errors, 0 applique, 5 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

The following example shows output for the **show protocols pos** command:

```
Router# show protocols pos 1/0/0
POS1/0/0 is up, line protocol is down
  Internet address is 10.1.2.3/8
```

The following example shows output for the **show controllers pos** command:

```
Router# show controllers pos 2/0/0
Interface POS2/0/0
Hardware is Packet Over SONET, One-port OC12, Single Mode Intermediate Reach

POS2/0/0
SECTION
  LOF = 1          LOS = 0                            BIP(B1) = 96
LINE
  AIS = 0          RDI = 1          FEBE = 265        BIP(B2) = 1170
PATH
  AIS = 0          RDI = 1          FEBE = 78         BIP(B3) = 51
  LOP = 1
  PLM-P = 1        UNEQ-P = 0

Active Alarms: None
Active Defects:None
Alarm reporting enabled for:SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Framing:SONET
APS
  COAPS = 25         PSBF = 1
  State:PSBF_state = False
  Rx(K1/K2):00/00  Tx(K1/K2):00/00
  S1S0 = 00, C2 = 0x16
PATH TRACE BUFFER:UNSTABLE
  Remote hostname :acl-traffi0.
  Remote interface:POS9/0/0
  Remote IP addr  :0.0.0.0
  Remote Rx(K1/K2):00/00  Tx(K1/K2):00/00

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

  Clock source: Configured:line  Current:line

Last valid pointer from H1-H2: 0x20A
```

The following example shows output for the **show controllers pos** command with the **detail** option:

```
Router# show controller pos 2/0/0 detail
Interface POS2/0/0
Hardware is Packet Over SONET, One-port OC12, Single Mode Intermediate Reach

POS2/0/0
SECTION
  LOF = 1          LOS = 0                            BIP(B1) = 96
LINE
  AIS = 0          RDI = 1          FEBE = 265        BIP(B2) = 1170
PATH
  AIS = 0          RDI = 1          FEBE = 78         BIP(B3) = 51
  LOP = 1
  PLM-P = 1        UNEQ-P = 0

Active Alarms: None
Active Defects:None
Alarm reporting enabled for:SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Framing:SONET
APS
  COAPS = 25         PSBF = 1
  State:PSBF_state = False
  Rx(K1/K2):00/00  Tx(K1/K2):00/00
  S1S0 = 00, C2 = 0x16
PATH TRACE BUFFER:STABLE
  Remote hostname :acl-traffic
  Remote interface:POS9/0/0
  Remote IP addr  :0.0.0.0
  Remote Rx(K1/K2):00/00  Tx(K1/K2):00/00

  61 63 6C 2D 74 72 61 66  66 69 63 00 00 00 00 00    acl-traffic.....
  00 00 2F 30 00 00 00 00  50 4F 53 39 2F 30 2F 30    ../0....POS9/0/0
  00 00 00 00 00 00 30 2E  30 2E 30 2E 30 00 00 00    ......0.0.0.0...
  00 00 00 00 00 00 30 30  30 30 30 30 30 30 0D 0A    ......00000000..

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

  Clock source: Configured:line  Current:line

Last valid pointer from H1-H2: 0x20A
B1:set 564, clr 124, ber 0, err 0, lk<1eps 0/0, lk_eps 95, dly 0, set 1, clr
10
, A 0, Rd 0, R 1, D 1
B2:set 564, clr 124, ber 0, err 0, lk<1eps 0/0, lk_eps 0, dly 0, set 1, clr
10,
 A 0, Rd 0, R 1, D 1
B3:set 564, clr 124, ber 0, err 0, lk<1eps 0/0, lk_eps 50, dly 0, set 1, clr
10
, A 0, Rd 0, R 1, D 1

Total number of port interrupts = 33

----- POS module IO registers -----
Starting address @0xBC280000
FPGA Revision             = 0x0001
Reset Register            = 0x0003
Tx/Rx LED Register        = 0x0000
Alarm LED Register        = 0x0000
CD LED Register           = 0x0000
PLL Control Register      = 0x0003
Tx Clock Config Register  = 0x0000
```

```
Interrupt Mask Register   = 0x0001
Parity Error Register     = 0x0000
Scratch Register          = 0x80000000
Debug Register            = 0x0000
CRC32 enabled, PPP enc, Diag control reg 1:0x0
GPIO port:loop timed
GPIO port:no loop

----- Skystone Performance Monitor Counters -----

rpp_pm1 (packet) = 1154
rpp_pm2 (bytes ) = 36225
rpp_pm3 (crc   ) = 105
rpp_pm4 (runts ) = 67
rpp_pm5 (giants) = 0
rpp_pm6 (ignore) = 142
rpp_pm7 (abort ) = 0

tpp_pm1 (packet) = 554
tpp_pm2 (bytes ) = 15127
tpp_pm3 (stuff ) = 41
tpp_pm4 (underflow) = 0
tpp_pm5 (ext er) = 0
tpp_pm6 (1 byte) = 0
----- Skystone Registers -----

line_cfg_cntrl=0x3
MIF_cntrl_u=0x0
gpio_port_u=0x0
gpio_port_l=0x40
gpio_port_cntrl_u=0xF
gpio_port_cntrl_l=0xFF
hi_prio_intr_mask_u=0x0
hi_prio_intr_mask_l=0x0
tor_ram_c2=0x16
rpp_cntrl_1=0x3F
rpp_max_pkt_len_u=0x11
rpp_max_pkt_len_l=0xF4
rpp_min_pkt_len=0x3
rpp_cntrl_2=0x3
tpp_cntrl_1=0x40
tpog_cntrl=0x22
tpp_inter_pkt_u=0x0
tpp_inter_pkt_l=0x0
ttog_ovrhd_src_1=0x80
tpog_cntrl=0x22
sys_intf_cntrl_1=0x5
sys_intf_cntrl_2=0x0
hi_prio_intr_status_u=0x0
hi_prio_intr_status_l=0x0
lo_prio_intr_mask=0xFF
lo_prio_intr_status=0x0

----- XPIF SLICER Registers -----
SMDR 0xFF78 SSTR 0x1200 SSMR 0x4002 EVER 0x3001
SIMR 0x0000 MBXW 0x0000 MBXR 0x0000 SPER 0xF000

Xpif Counters:
MR1  21723      MR2  0          MR3  0          MR4  0          MR5  3
MR6  0          MR7  0          MR8  0          MR9  0          MR10 0
MR11 1152       MR12 0          MR13 0          MR14 1155       MR15 0
MR16 0          MR17 0          MR18 104        MR19 0          MR20 0

MR21 0
```

```
SR1  72036      SR2  18806      SR3  0          SR4  0          SR5  0

MT1  15143      MT2  0          MT3  0          MT4  0          MT5  6
MT6  0          MT7  0          MT8  0          MT9  0
ST1  0          ST2  0
MRXS 262160     MTXS 16         SRXS 3          STXS 0
```

About ATM Uplinks (Catalyst 8540)

ATM uses cell-switching and multiplexing technology that combines the benefits of circuit switching (constant transmission delay and guaranteed capacity) with those of packet switching (flexibility and efficiency for intermittent traffic). ATM is a common network technology for enterprise backbones, MANs, and WANs. By using an ATM uplink, Layer 3 traffic can be routed over an ATM network. The ATM uplink facilitates this by segmenting packet data into fixed-size cells at the transmitting end and reassembling them into packets at the receiving end. This conversion process is defined by the ATM adaptation layer (AAL).

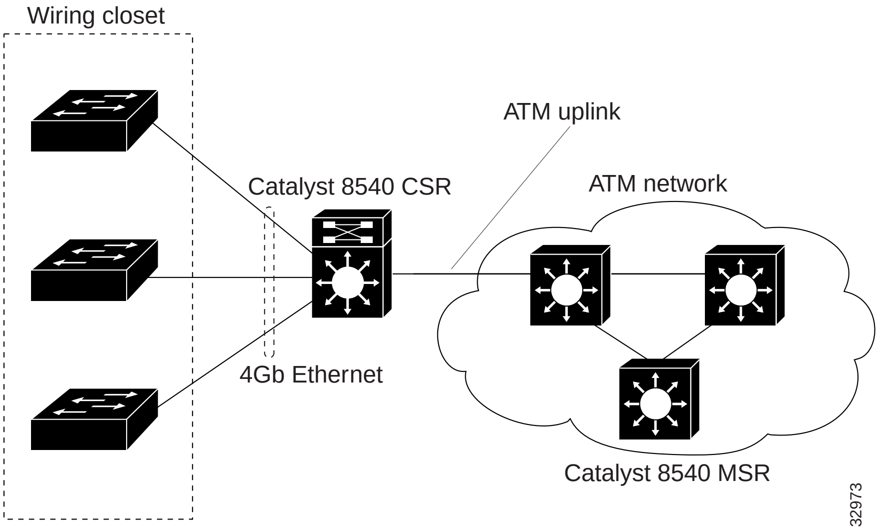
For further information about ATM and its implementation on the Catalyst 8540 MSR and Catalyst 8510 MSR, refer to the *Guide to ATM Technology.*

About the ATM Uplink Interface

The ATM uplink interface allows the Catalyst 8540 switch router to be deployed as part of an existing network where a router with an ATM interface would otherwise have been utilized. Additionally, the ATM uplink interface allows a Catalyst 8540 deployed as a Layer 3 switch (CSR) to be connected to a Catalyst 8540 deployed as an ATM switch (MSR).

Figure 4-6 shows an example application of the ATM uplink in which traffic from a LAN switch is aggregated at the Catalyst 8540 CSR and then passed to the ATM network over the ATM uplink. The Layer 3 enabled ATM uplink supports RFC 1483 (Multiprotocol Encapsulation over ATM), which provides for the mapping of Layer 3 addresses to ATM virtual circuits, and traffic shaping. Refer to the *Guide to ATM Technology* for additional information on RFC 1483.

Figure 4-6 Layer 3 Traffic with ATM Uplink



Note The ATM uplink interface module does not work in a Catalyst 8540 MSR when the ATM router module is present.

Configuring the ATM Uplink Interface (Catalyst 8540)

This section describes the default configuration of the ATM uplink interface, initial configurations you should perform for a newly installed interface, and optional configurations you can do to customize the interfaces to the requirements of your network.

Note The ATM uplink interface module consists of one OC-12c or OC-3c port and one enhanced Gigabit Ethernet port. For instructions on configuring the enhanced Gigabit Ethernet interface, see the "About the Enhanced Gigabit Ethernet Interfaces (Catalyst 8540)" section on page 4-5.

Configuration Overview

The following steps provide on overview of configuring an ATM uplink from the switch router to the ATM network:

Step 1 Configure the ATM uplink interface:

a. Enable the ATM interface.

b. Customize the configuration by configuring PVCs and SVCs.

You must configure at least one PVC or SVC. The VC options you configure must match in three places: on the switch router, on the ATM switch, and at the remote end of the PVC or SVC connection.

Step 2 Configure the ATM switch to which the ATM uplink connects.

Default Configuration

On power up, the ATM uplink interface is shut down. When you enter the **no shutdown** command, the interface is enabled with the default configuration values shown in Table 4-4.

Table 4-4 ATM Uplink Interface Default Configuration Values

Parameter	Configuration Command	Default Value
Maximum transmission unit (MTU)	[**no**] **mtu** *bytes*	4470 bytes
Loopback	[**no**] **loopback**	No loopback
SONET framing	[**no**] **atm sonet stm-1** for OC-3 [**no**] **atm sonet stm-4** for OC-12	no stm-1 no stm-4

Table 4-4 ATM Uplink Interface Default Configuration Values (continued)

Parameter	Configuration Command	Default Value
Transmit clock source	[**no**] **atm clock internal**	no internal (line)
Cisco Discovery Protocol (CDP)	[**no**] **cdp enable**	CDP enabled
ATM VCs per VP	**atm vc-per-vp**	1024

In addition, the ATM uplink interface uses the non-configurable values shown in Table 4-5.

Table 4-5 ATM Uplink Interface Nonconfigurable Values

Parameter	Value
Transmit buffers for segmentation and reassembly (SAR)	8192
Receive buffers for SAR	8192
Maximum VCs	8192
ATM AAL	AAL5
ILMI keepalives	Not supported

Initially Configuring the ATM Uplink Interface

You should configure the following properties for a newly installed ATM uplink interface:

- IP routing
- IP address

To initially configure the ATM uplink interface, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **ip routing**	Enables IP routing.
Step 2	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 3	Router(config-if)# **ip address** *ip-address subnet-mask*	Assigns an IP address and subnet mask to the interface.
Step 4	Router(config-if)# **atm clock internal**	Specifies the **internal** clock for the interface. The default mode for the clock is **no internal**, which is the same as the line clock.
Step 5	Router(config-if)# **no shutdown**	Enables the interface with the previous configurations.

Example

The following configuration is an example of the tasks in the preceding table:

```
Router(config)# interface atm 2/0/0
Router(config-if)# ip address 10.1.2.4 255.0.0.0
Router(config-if)# atm clock internal
Router(config-if)# no shutdown
```

Configuring the Clock Source

The ATM uplink interfaces support internal and line clock source. The default mode for the clock is **no internal**, which is the same as the line clock. If your system clock source is set to line clock, it uses the recovered received clock to transmit.

When two ATM uplink interfaces are connected and set to line clock, both interfaces at each end of the link cannot accurately synchronize the clock. This causes transfer of corrupt data, which might cause the line protocol on both interfaces to go down. To prevent this situation, make sure you configure one end of the connection with **internal** clock and the other end with **no internal** clock.

When your system is configured to use the line clock, the following conditions cause the clock to automatically revert to internal:

- SLOS (section loss of signal)
- SLOF (section loss of frame)
- AIS-L (line alarm indication signal)
- S1 (synchronizing status) byte in the SONET line overhead is equal to 0xF

When these conditions clear, the clock automatically restores to line clock.

Customizing the Configuration

This section describes how to configure your ATM uplink interface to match your network configuration.

Setting the MTU Size

To set the maximum transmission unit (MTU), perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **mtu** *bytes*	Configures the MTU size with a value from 64 to 9188 bytes. The default MTU size is 4478 bytes.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

Note The ATM uplink supports IP unicast and IP multicast fragmentation. For IP unicast fragmentation, the packet must ingress on a ATM interface and egress on any interface. For IP multicast fragmentation, IP multicast data packets greater than 1500 bytes are fragmented to 1500 bytes on the ingress ATM interface before being switched to other members in the multicast group. All the members in the multicast group must have a MTU equal to or greater than 1500 bytes.

Configuring SONET Framing

In STM-1 mode or STM-4 mode, the ATM uplink interface sends *idle* cells for cell-rate decoupling. In STS-3c mode or STS-12c mode, the interface sends *unassigned* cells for cell-rate decoupling. STS-3c is the default SONET framing mode for the ATM OC-3c uplink interface; STS-12c is the default SONET framing mode for the ATM OC-12c uplink interface.

To configure the SONET framing mode, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **atm sonet stm-1** or Router(config-if)# **atm sonet stm-4**	Configures the SONET framing mode to STM-1 (for the OC-3c ATM interface) or to STM-4 (for the OC-12c interface).
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

To return the SONET framing mode to the default, use the **no** form of the **atm sonet** command.

Configuring SONET Overhead

You can use the **sonet overhead** command to set the SONET overhead bytes in the frame header to meet a specific standards requirement or to ensure interoperability of the ATM uplink interface with another vendor's equipment. You can use the **no** form of this command to restore default values.

To configure the SONET overhead, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **sonet overhead** [**c2** *byte*] [**j0** {*bytes* | **msg** | *line*}] [**j1** {**16byte** {**exp-msg** *line*| **msg** *line*}| **64byte** {**exp-msg** *line* | **msg** *line*}] [**sls0** *bits*]	Configures the SONET overhead bytes. **c2** is a path signal label identifier, **j0** is the section trace bytes, **j1** is the path trace bytes, and **sls0** is part of the payload pointer byte.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

Note On the ATM OC-3c interface, you can configure the **c2** byte and the **s1s0** bits. On the ATM OC-12c interface, you can configure the **c2** byte, **j0** byte, **j1** byte, and the **s1s0** bits.

The value of the c2 byte is determined as follows:

- If the value of the c2 byte has not been explicitly configured with the **sonet overhead** command, the SONET framer sends the ATM payload value of 0x13.
- If the value of the c2 byte has been explicitly configured with the **sonet overhead** command, the configured value is sent regardless of the encapsulation method.

The value of the s1s0 byte is determined as follows:

- If the value s1s0 bytes has not been explicitly configured with the **sonet overhead** command, the SONET framer sends the following values:
  - For SONET framing, the default value is 0.
  - For SDH framing, the default value is 2.
- If the value of the s1s0 bits have been explicitly configured with the **sonet overhead** command, the configured value is used regardless of the framing.

The value of the j0 and the j1 bytes are determined as follows:

- If the value of the j0 and the j1 bytes have not been explicitly configured with the **sonet overhead** command, the SONET framer sets default values of 0x0 for both.
- If the user has specified a value using the **sonet overhead** command, the configured value is used regardless of the framing.

Configuring SONET Alarms

The ATM OC-12c and the ATM OC-3c uplink interfaces support SONET alarm monitoring. To configure alarm monitoring, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **sonet report** {**b1-tca** | **b2-tca** | **b3-tca** | **lais** | **lrdi** | **pais** | **plm-p** | **plop** | **prdi** | **rdool** | **sd-ber** | **sf-ber** | **slof** | **slos**| **tim-p** | **uneq-p**}	Permits console logging of selected SONET alarms. The alarms are as follows: • **b1-tca** (B1 bit error rate [BER] threshold crossing alarm) • **b2-tca** (B2 BER threshold crossing alarm) • **b3-tca** (B3 BER threshold crossing alarm) • **lais** (line alarm indication signal) • **lrdi** (line remote defect indication) • **pais** (path alarm indication signal) • **plm-p** (payload label, C2 mismatch alarm) • **plop** (path loss of pointer), **prdi** (path remote defect indication) • **rdool** (receive data out of lock) • **sd-ber** (LBIP BER in excess of threshold) • **sf-ber** (signal failure BER) • **slof** (section loss of frame) • **slos** (section loss of signal) • **tim-p** (path trace identifier, J1 mismatch alarm) • **uneq-p** (path unequipped C2 alarm). The **b1-tca**, **b2-tca**, **b3-tca**, **plop**, **sf-ber**, **slof**, **slos** are enabled by default.
Step 3	Router(config-if)# **sonet threshold** {**b1-tca** | **b2-tca** | **b3-tca** | **sd-ber** | **sf-ber**} *rate*	Sets the BER threshold values of the specified alarms. Default values are 6 for **b1-tca**, **b2-tca**, **b3-tca**, and **sd-ber**; 3 for **sf-ber**.

To determine which alarms are reported on the ATM interface, and to display the BER thresholds, use the **show controllers atm** command, as described in the “Verifying the ATM Configuration” section on page 4-36. For a detailed description of the **sonet report** and **sonet threshold** commands, refer to the *ATM Switch Router Command Reference* publication.

Configuring Loopback

The ATM uplink interface is configured by default with no loopback. To enable loopback, use the **loopback** command in interface configuration mode.

Configuring CDP

The ATM uplink interface is configured by default with Cisco Discovery Protocol (CDP) disabled. To enable CDP, use the **cdp enable** command in interface configuration mode.

Configuring the Maximum VCs per VP

The ATM uplink interface is configured by default to allow a maximum of 1024 VCs per VP. To change this value, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **atm vc-per-vp** *num-vcs*	Configures the maximum number of VCs per VP to 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, or 8192.
Step 3	Router(config-if)# **no shutdown**	Enables the interface with the previous configuration.

Configuring Virtual Circuits

A virtual circuit is a point-to-point connection between the switch router and a remote system. A virtual circuit is established for each ATM end node with which the router communicates. The characteristics of the virtual circuit are established when the virtual circuit is created and include the following:

- Virtual circuit descriptor (VCD), associated with a VPI/VCI paid
- Encapsulation type
- Peak, average, and burst transmission rates

To configure a PVC, you must complete the following tasks:

- Create a PVC
- Map a protocol address to a PVC

Creating a PVC

When you create a PVC, you specify a virtual circuit descriptor (VCD) and associate it with the VPI/VCI pair.The number chosen from the VCD is independent of the VPI/VCI used. When you create a PVC, you also specify the AAL and encapsulation type and traffic parameters. Traffic parameters include peak and average rate, specified in kilobits per second, and burst rate, specified in cells. Omitting a peak and average value causes the PVC to be connected at the highest bandwidth rate available. In that case, the peak and average values are equal.

To create a PVC, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 2	Router(config-if)# **atm pvc** *vcd vpi vci aal-encap*	Configures the PVC with VCD value associated with a VPI/VCI pair and specifies an encapsulation type.

The **atm pvc** command allows you to specify additional optional parameters for the connection, including peak, average, and burst transmission rate, and the frequency for generating OAM cells.

Mapping a Protocol Address to a PVC

Cisco IOS supports a mapping scheme that allows you to associate a protocol address with a VCD (for PVCs) or with an ATM NSAP address (for SVCs). To create a mapping, you first create a map list, then associate the map list to an interface.

To map a protocol address to a PVC, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **map-list** *name*	Creates a map list and assigns it a name.
Step 2	Router(config-map-list)# **ip** *ip-address* **atm-vc** *vcd*	Creates one or more map list entries, associating a protocol address with a VCD.
Step 3	Router(config-map-list)# **exit** Router(config)#	Exits map-list configuration mode.
Step 4	Router(config)# **interface atm** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode and specifies the ATM interface to configure.
Step 5	Router(config-if)#**map-group** *name*	Associates the map list with the interface.

You can create multiple map lists. An interface can have only one map list associated with it, but a map list can be associated with multiple interfaces.

PVC Example

In the following example, PVC 5 is created on ATM interface 1/0/0 by means of LLC/sNAP encapsulation over AAL5. ATM interface 1/0/0 (IP address 1.1.1.1) connects with the ATM interface (IP address 1.1.1.5) at the other end over VC 5.

```
Router(config)# interface atm 1/0/0
Router(config-if)# ip address 1.1.1.1 255.255.255.0
Router(config-if)# atm pvc 5 0 10 aal5snap
Router(config-if)# map-group atm
Router(config-if)# exit
Router(config)# map-list atm
Router(config-map-list)# 1.1.1.5 atm-vc 5 broadcast
```

SVC Example

In the following example, two switch routers with Layer 3 enabled ATM interfaces are connected by means of SVCs. For SVCs, the map-list associates each IP addresses with an ATM NSAP-format address, rather than with a specific VC. This configuration could also be used to connect two switch routers with ATM interfaces through an ATM cloud of other switches:

Switch Router A

```
Router(config)# interface atm 1/0/0
Router(config-if)# ip address 192.192.192.1 25..255.255.0
Router(config-if)# atm pvc 1 0 5 qsaal
Router(config-if)# atm pvc 2 0 16 ilmi
Router(config-if)# atm esi-address 111111111111.00
Router(config-if)# map-group SVC
Router(config-if)# exit
Router(config)# map-list SVC
Router(config-map-list)# ip 192.192.192.2 atm-nsap BB.000000000000000000000000.222222222222.00 broadcast
```

Switch Router B

```
Router(config)# interface atm 1/0/0
Router(config-if)# ip address 192.192.192.2 25..255.255.0
Router(config-if)# atm pvc 1 0 5 qsaal
Router(config-if)# atm pvc 2 0 16 ilmi
Router(config-if)# atm esi-address 222222222222.00
Router(config-if)# map-group SVC
Router(config-if)# exit
Router(config)# map-list SVC
Router(config-map-list)# ip 192.192.192.1 atm-nsap BB.000000000000000000000000.111111111111.00 broadcast
```

Note the following about this configuration:

- The PVC with VPI/VCI 0 5 must be configured for signaling to set up and tear down SVCs.
- The PVC with VPI/VCI 0 16 must be configured for switch management communication using ILMI.
- The first 13 bytes of the ATM NSAP address is the prefix from the switch; the next 6 bytes is the end system identifier (ESI) and must be unique. The last byte is the selector byte and is used in making forwarding decisions.

Verifying the ATM Configuration

To verify the configuration on the ATM uplink interface, use the following commands:

Command	Purpose
show interfaces atm	Displays current ATM-specific information for the interface.
show atm vc [**vcd**]	Displays current information about VCs and traffic. You can specify a VCD to display information about.
show atm traffic	Displays information about global traffic to and from all ATM networks connected to the switch router.
show controllers atm	Displays clock source, SONET alarms and error rates, and register values to assist in troubleshooting.

Example

The following example shows sample output for the **show interfaces atm** command.

```
Router# show interfaces atm 0/0/0
ATM0/0/0 is down, line protocol is down
  Hardware is epif_port_garfield, address is 0090.2157.c407 (bia 0090.2157.c407)
  MTU 4470 bytes, sub MTU 4470, BW 155000 Kbit, DLY 10 usec, rely 0/255, load 1/
255
  Encapsulation ATM, loopback not set, keepalive not supported
  Full-duplex, Unknown Speed
  ARP type: ARPA, ARP Timeout 04:00:00
  Encapsulation(s): AAL5 AAL3/4, PVC mode
  8191 maximum active VCs, 1024 VCs per VP, 0 current VCCs
  VC idle disconnect time: 300 seconds
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     8 packets output, 2736 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Example

The following example shows sample output for the **show controllers atm** command.

```
Router# show controllers atm 0/0/0
slot: 0/0  Controller-Type :XPIF ATM OC3 PM - 1 Port SM_IR
0000  chan0 chan1 chan2 chan3 sstr 1200

task0   11    11    11    11
task1  5CB   5CB   5CB   5CB
task2   11    11    11    11
task3  5CB   5CB   5CB   5CB
SMDR 0xFF78 SSTR 0x1200 SSMR 0x4002 EVER 0x3001
SIMR 0x0000 MBXW 0x0000 MBXR 0x0000 SPER 0xF000

TX SAR (Beta 2.1.2) is Operational;
RX SAR (Beta 2.1.2) is Operational;

SAR Counters:
     tx_paks         5, tx_abort_paks         0, tx_idle_cells     48482684
     rx_paks         5, rx_drop_paks          0, rx_discard_cells         0

Xpif Counters:
     MR1  580        MR2  0          MR3  5          MR4  0          MR5  0
     MR6  0          MR7  0          MR8  0          MR9  0          MR10 0
     MR11 0          MR12 0          MR13 5          MR14 0          MR15 0
     MR16 0          MR17 0          MR18 0          MR19 0          MR20 0
     MR21 0
     SR1  2500       SR2  598        SR3  0          SR4  0          SR5  0
     MT1  560        MT2  0          MT3  5          MT4  0          MT5  0
     MT6  0          MT7  0          MT8  0          MT9  0
     ST1  0          ST2  0
     MRXS 131188     MTXS 112        SRXS 3          STXS 0
```

```
Interface Configuration Mode:
     ATM clock line; STS-3c

k1/k2 = 0/0
c2 = 0x13

Active Defects:None
Alarm reporting enabled for:SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Active ATM Payload Defect:None


OC3 counters:
  b1     - # section BIP-8 errors
  b2     - # line BIP-8 errors
  b3     - # path BIP-8 errors
  ocd    - # out-of-cell delineation errors - not implemented
  g1     - # path FEBE errors
  z2     - # line FEBE errors
  chcs   - # correctable HEC errors
  uhcs   - # uncorrectable HEC errors

b1:0, b2:0, b3:0, ocd:0
g1:0, z2:0, chcs:0, uhcs:0

OC3 errored secs:
b1:0, b2:0, b3:0, ocd:0
g1:0, z2:0, chcs:0, uhcs:0
lineAIS:0, lineRDI:0, pathAIS:0, pathRDI:0

OC3 error-free secs:
b1:110, b2:110, b3:110, ocd:0
g1:110, z2:110, chcs:110, uhcs:110

phy_tx_cnt:38947300, phy_rx_cnt:15

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6
```

About Port Snooping

Port-based snooping, or mirroring, lets you transparently mirror traffic from a source port(s) to a destination port. Multiple snooping sessions can operate simultaneously. You can specify whether the source ports are mirrored for transmit, receive, or both directions at once.

Port snooping augments the first four RMON groups (mini-RMON). For a description of RMON, see the “Remote Monitoring” section on page 1-11.

Port-based snooping features include the following:

- Traffic on one or more source ports through a destination port in the same switch router
- Traffic from multiple source ports in multiple directions: transmitting, receiving, or both
- Multiple snoop destination ports operating simultaneously (however, there is only one destination port per snooping session)

Restrictions on Port Snooping

The following restrictions apply to port snooping:

- The combined physical bandwidth of the source ports must not exceed the physical bandwidth of the destination port.
- The snooping source port and destination port cannot be the same port.
- Port snooping is not available on the eight-port Gigabit Ethernet interfaces.

About the Snooping Destination Port

The snooping destination port can be any port in the system, except for the management port on the route processor (Ethernet0) and ports configured for Fast EtherChannel. Typically, the destination port has a network analyzer or RMON probe attached to it.

When in snooping mode, all the existing connections to the snooping destination port are set to the down state, and the snooping destination port cannot perform any Layer 2 or Layer 3 operations in this state. The receive side of the snooping destination port is also disabled when in snooping mode. The snooping destination port resumes normal operation only when snooping mode is disabled.

About the Snooping Source Port

A source port is a port monitored by the snooping operation. The snooping source port can be on any interface module.

The normal operation of a snooping source port is not altered during snooping operations. Any port with bandwidth less than or equal to the bandwidth of the snooping destination port can function as a snooping source port.

Layer 3 switching software supports snooping from multiple source ports to a destination port. The total bandwidth of the snooping source ports must not exceed the bandwidth of the snooping destination port. For example, up to ten Fast Ethernet ports can be configured as snooping source ports to a 1-Gb Ethernet destination port.

Configuring Snooping

To enable port-based snooping on an interface, perform the following steps, beginning in global configuration mode:

Note You must shut down the destination interface before you enable snooping mode. To bring the interface up after you have finished configuring snooping, be sure to issue a **no shutdown** command.

	Command	Purpose
Step 1	Router(config)# **interface** *destination-port* Router(config-if)#	Defines the interface configuration for the destination (test) port.
Step 2	Router(config-if)# **shutdown**	Shuts down the destination port.
Step 3	Router(config-if)# **snoop interface** *source-port* **direction** {**receive** | **transmit** | **both**}	Defines a snoop source port and its snoop direction. You must issue separate **snoop interface** commands for each source port.
Step 4	Router(config-if)# **no shutdown**	Reenables the interface. When you bring the destination port back up, snooping mode is fully functional.
Step 5	Router(config-if)# **end** Router#	Returns to privileged EXEC mode.
Step 6	Router# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

For a complete configuration example that includes port snooping, see the "Catalyst 8540 CSR with ISL, VLAN, and BVI with GEC" section on page C-1.

To disable port-based snooping on an interface, perform the following steps:

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *slot/subslot/interface* or Router(config)# **interface gigabitethernet** *slot/subslot/interface* Router(config-if)#	Enters interface configuration mode for the previously configured destination port.
Step 2	Router(config-if)# **shutdown**	Shuts down the destination port.
Step 3	Router(config-if)# **no snoop interface** *source-port*	Disables port snooping by the destination port defined in Step 1 on the indicated source port.
Step 4	Router(config-if)# **no shutdown**	Reenables the interface. When you bring the destination port back up, snooping mode is disabled and any existing configuration and connections are reestablished.
Step 5	Router(config-if)# **end** Router#	Returns to privileged EXEC mode.
Step 6	Router# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Note For additional information on port snooping commands, refer to the "Port Snooping Commands" section on page A-1.

Monitoring Snooping

To monitor the current snooping mode configuration and status, use the following commands:

Command	Purpose
show snoop interface *destination-port*	Displays whether the indicated destination port is in snooping mode. If so, it indicates the source (monitored) port and the snooping direction.
show snoop	Displays all the snoop sessions configured on the system.
show snoop-vc interface *destination-port*	Displays the list of virtual circuits that are being monitored by the destination port.

Now that you have configured the interfaces on your switch router, see Chapter 5, "Configuring Networking Protocols," for instructions on configuring network and routing protocols.