CHAPTER 10

Configuring the Ethernet SPAs

This chapter provides information about configuring the Fast Ethernet and Gigabit Ethernet SPAs and on the Cisco ASR 1000 Series Aggregation Services Routers. It includes the following sections:

For more information about the commands used in this chapter, refer to the related Cisco IOS software command reference and master index publications and the publication that corresponds to your Cisco IOS XE software release. For more information about accessing these publications, see the "Related Documentation" section on page xx.

For information about managing your system images and configuration files, refer to the *Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide, the Cisco IOS Configuration Fundamentals Configuration Guide,* and the *Cisco IOS Configuration Fundamentals Command Reference* publications that correspond to your Cisco IOS software release.

Configuration Tasks

This section describes how to configure the Gigabit Ethernet and Fast Ethernet SPAs and includes information about verifying the configuration.

This section includes the following topics:

Required Configuration Tasks

This section lists the required configuration steps to configure the Gigabit Ethernet SPAs. Some of the required configuration commands implement default values that might be appropriate for your network. If the default value is correct for your network, then you do not need to configure the command. These commands are indicated by "(As Required)" in the Purpose column.

To configure the Fast Ethernet or Gigabit Ethernet SPAs, complete the following steps:

	Command	Purpose
Step 1	Router# **configure terminal**	Enters global configuration mode.
Step 2	Router(config)# **interface gigabitethernet** *slot/subslot/port*[**.***subinterface-number*] or Router(config)# **interface tengigabitethernet** *slot/subslot/port*[**.***subinterface-number*] or Router(config)# **interface fastethernet** *slot/subslot/port*[**.***subinterface-number*]	Specifies the Gigabit Ethernet, Ten Gigabit Ethernet, or Fast Ethernet interface to configure, where: • *slot/subslot/port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 10-4. • **.***subinterface-number*—(Optional) Specifies a secondary interface (subinterface) number.
Step 3	Router(config-if)# **ip address** [*ip-address mask* {**secondary**} | **dhcp** {**client-id** *interface-name*}{**hostname** *host-name*}]	Sets a primary or secondary IP address for an interface that is using IPv4, where: • *ip-address*—Specifies the IP address for the interface. • *mask*—Specifies the mask for the associated IP subnet. • **secondary**—(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address. • **dhcp**—Specifies that IP addresses will be assigned dynamically using DHCP. • **client-id** *interface-name*—Specifies the client identifier. The *interface-name* sets the client identifier to the hexadecimal MAC address of the named interface. • **hostname** *host-name*—Specifies the hostname for the DHCP purposes. The *host-name* is the name of the host to be placed in the DHCP option 12 field.

	Command	Purpose
Step 4	Router(config-if)# **ip accounting mac-address** {**input** | **output**}	(Optional) Enables MAC address accounting. MAC address accounting provides accounting information for IP traffic based on the source and destination MAC addresses of the LAN interfaces, where: • **input**—Specifies MAC address accounting for traffic entering the interface. • **output**—Specifies MAC address accounting for traffic leaving the interface.
Step 5	Router(config-if)# **mtu** *bytes*	(As Required) Specifies the maximum packet size for an interface, where: • *bytes*—Specifies the maximum number of bytes for a packet. The default is 1500 bytes; the range is 1500 to 9216.
Step 6	Router(config-if)# **standby** [*group-number*] **ip** [*ip-address* [**secondary**]]	(Required for HSRP Configuration Only) Creates (or enables) the HSRP group using its number and virtual IP address, where: • (Optional) *group-number*—Specifies the group number on the interface for which HSRP is being enabled. The range is 0 to 255; the default is 0. If there is only one HSRP group, you do not need to enter a group number. • (Optional on all but one interface if configuring HSRP) *ip-address*—Specifies the virtual IP address of the hot standby router interface. You must enter the virtual IP address for at least one of the interfaces; it can be learned on the other interfaces. • (Optional) **secondary**—Specifies the IP address is a secondary hot standby router interface. If neither router is designated as a secondary or standby router and no priorities are set, the primary IP addresses are compared and the higher IP address is the active router, with the next highest as the standby router. This command enables HSRP but does not configure it further. For additional information on configuring HSRP, refer to the HSRP section of the *Cisco IP Configuration Guide* publication that corresponds to your Cisco IOS software release.
Step 7	Router(config-if)# **no shutdown**	Enables the interface.

Specifying the Interface Address on a SPA

SPA interface ports begin numbering with "0" from left to right. Single-port SPAs use only the port number 0. To configure or monitor SPA interfaces, you need to specify the physical location of the SIP, SPA, and interface in the CLI. The interface address format is *slot/subslot/port*, where:

- *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Routers where the SIP is installed.
- *subslot*—Specifies the slot of the SIP where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.

The following example shows how to specify the first interface (0) on a SPA installed in the first subslot of a SIP (0) installed in chassis slot 0:

```
Router(config)# interface GigabitEthernet 0/0/0
interface GigabitEthernet0/0/0
no ip address
shutdown
negotiation auto
no cdp enable
```

Modifying the MAC Address on the Interface

The Gigabit Ethernet SPAs use a default MAC address for each port that is derived from the base address that is stored in the electrically erasable programmable read-only memory (EEPROM) on the backplane of the Cisco ASR 1000 Series Aggregation Services Routers.

To modify the default MAC address of an interface to some user-defined address, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **mac-address** *ieee-address*	Modifies the default MAC address of an interface to some user-defined address, where: • *ieee-address*—Specifies the 48-bit Institute of Electrical and Electronics Engineers (IEEE) MAC address written as a dotted triple of four-digit hexadecimal numbers (*xxxx.yyyy.zzzz*).

To return to the default MAC address on the interface, use the **no** form of the command.

Verifying the MAC Address

To verify the MAC address of an interface, use the **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the "address is" field.

The following example shows that the MAC address is 000a.f330.2e40 for interface 1 on the SPA installed in subslot 0 of the SIP installed in slot 2 of the Cisco ASR 1000 Series Router:

```
Router# show interfaces gigabitethernet 2/0/1
GigabitEthernet2/0/1 is up, line protocol is up
  Hardware is SPA-1X10GE-L-V2, address is 000a.f330.2e40 (bia 000a.f330.2e40)
  Internet address is 2.2.2.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
```

```
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full-duplex, 1000Mb/s, link type is force-up, media type is SX
  output flow-control is on, input flow-control is on
(Additional output removed for readability)
```

Gathering MAC Address Accounting Statistics

The **ip accounting mac-address** [**input** | **output**] command can be entered to enable MAC Address Accounting on an interface. After enabling MAC Address Accounting, MAC address statistics can be displayed by entering the **show interfaces mac-accounting** command.

Configuring HSRP

Hot Standby Router Protocol (HSRP) provides high network availability because it routes IP traffic from hosts without relying on the availability of any single router. HSRP is used in a group of routers for selecting an active router and a standby router. (An *active router* is the router of choice for routing packets; a *standby router* is a router that takes over the routing duties when an active router fails, or when preset conditions are met).

HSRP is enabled on an interface by entering the **standby** [*group-number*] **ip** [*ip-address* [**secondary**]] command. The **standby** command is also used to configure various HSRP elements. This document does not discuss more complex HSRP configurations. For additional information on configuring HSRP, refer to the HSRP section of the *Cisco IP Configuration Guide* publication that corresponds to your Cisco IOS XE software release. In the following HSRP configuration, standby group 2 on Gigabit Ethernet port 2/1/0 is configured at a priority of 110 and is also configured to have a preemptive delay should a switchover to this port occur:

```
Router(config)# interface GigabitEthernet 2/1/0
Router(config-if)# standby 2 ip 120.12.1.200
Router(config-if)# standby 2 priority 110
Router(config-if)# standby 2 preempt
```

Verifying HSRP

To display HSRP information, use the **show standby** command in EXEC mode:

```
Router# show standby
Ethernet0 - Group 0
Local state is Active, priority 100, may preempt
Hellotime 3 holdtime 10
Next hello sent in 0:00:00
Hot standby IP address is 198.92.72.29 configured
Active router is local
Standby router is 198.92.72.21 expires in 0:00:07
Standby virtual mac address is 0000.0c07.ac00
Tracking interface states for 2 interfaces, 2 up:
UpSerial0
UpSerial1
```

Modifying the Interface MTU Size

The Cisco IOS software supports three different types of configurable maximum transmission unit (MTU) options at different levels of the protocol stack:

- Interface MTU—Checked by the SPA on traffic coming in from the network. Different interface types support different interface MTU sizes and defaults. The interface MTU defines the maximum packet size allowable (in bytes) for an interface before drops occur. If the frame is smaller than the interface MTU size, but is not smaller than the minimum frame size for the interface type (such as 64 bytes for Ethernet), then the frame continues to process.
- IP MTU—Can be configured on an interface or subinterface. If an IP packet exceeds the IP MTU size, then the packet is fragmented.
- Tag or Multiprotocol Label Switching (MPLS) MTU—Can be configured on an interface or subinterface and allows up to six different labels, or tag headers, to be attached to a packet. The maximum number of labels is dependent on your Cisco IOS software release.

Different encapsulation methods and the number of MPLS MTU labels add additional overhead to a packet. For example, Subnetwork Access Protocol (SNAP) encapsulation adds an 8-byte header, dot1q encapsulation adds a 2-byte header, and each MPLS label adds a 4-byte header (*n* labels x 4 bytes).

For Gigabit Ethernet SPAs on the Cisco ASR 1000 Series Routers, the default MTU size is 1500 bytes. The maximum configurable MTU is 9216 bytes. The SPA automatically adds an additional 22 bytes to the configured MTU size to accommodate some of the additional overhead.

Interface MTU Configuration Guidelines

When configuring the interface MTU size on a Gigabit Ethernet SPA on a Cisco ASR 1000 Series Router, consider the following guidelines:

- The default interface MTU size accommodates a 1500-byte packet, plus 22 additional bytes to cover the following additional overhead:
  - Layer 2 header—14 bytes
  - Dot1q header—4 bytes
  - CRC—4 bytes
- If you are using MPLS, be sure that the **mpls mtu** command is configured for a value less than or equal to the interface MTU.
- If you are using MPLS labels, then you should increase the default interface MTU size to accommodate the number of MPLS labels. Each MPLS label adds 4 bytes of overhead to a packet.

Interface MTU Configuration Task

To modify the MTU size on an interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **mtu** *bytes*	Configures the maximum packet size for an interface, where: • *bytes*—Specifies the maximum number of bytes for a packet. The default is 1500 bytes and the maximum configurable MTU is 9216 bytes.

To return to the default MTU size, use the **no** form of the command.

Verifying the MTU Size

To verify the MTU size for an interface, use the **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the "MTU" field.

The following example shows an MTU size of 1500 bytes for interface port 1 (the second port) on the Gigabit Ethernet SPA installed in the top subslot (0) of the SIP that is located in slot 2 of the Cisco ASR 1000 Series Router:

```
Router# show interfaces gigabitethernet 2/0/1
GigabitEthernet2/0/1 is up, line protocol is up
  Hardware is SPA-1X10GE-L-V2, address is 000a.f330.2e40 (bia 000a.f330.2e40)
  Internet address is 2.2.2.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
```

QoS Classification

The physical level interface module (PLIM) is the hardware component in the data path between the media interface and the forwarding engine.

Use the following commands in interface configuration mode to configure QoS:

Command	Purpose
Router(config-if)# **plim qos input map ip** {**precedence-based** | **precedence** *precedence-value* **queue low-latency**}	Classifies incoming IP traffic according to the value of the IP precedence bits and places the traffic into the appropriate queue. • *precedence-value*—Specifies the value of the IP precedence bits (0 to 7). You can specify a range of values separated by a dash or a list of values. By default, the Gigabit Ethernet SPA classifies IP precedence range 6-7 as high priority. • **low-latency**—Specifies the high priority queue. Enter 0 for low priority. Use the **no** form of the command to remove the configured values.
Router(config-if)# **plim qos input map ipv6 all queue low-latency** | **0**	Classifies all IPv6 packets as high or low priority. • **low-latency**—Specifies high priority traffic. Enter 0 for low priority. The **no** form of this command disables all IPv6 classification By default, without using this command, the command is disabled.
Router(config-if)# **plim qos input map ipv6 tc** [*tc-value* | *tc-range*] **queue low-latency** | **0**	Classifies ingress IPv6 traffic based on the value of the traffic-class bits and places the traffic into the appropriate queue. • *tc-value* | *tc-range*—Specifies the value of the traffic class bits. You can specify a range of values separated by a dash or a list of values. • **low-latency**—Specifies the high priority queue. Enter 0 for the low priority queue. The **no** form of this command sets the classification according to default DSCP EF. By default, IPv6 traffic with a traffic-class value equal to ef uses the high-priority queue and all other traffic uses the low-priority queue. Only the most significant six bits of the traffic-class octet is used for the classification.
Router(config-if)# **plim qos input map mpls all queue low-latency** | **0**	Classifies all MPLS packets as high or low priority. • **low-latency**—Specifies high priority packets. Enter 0 for low priority packets. The **no** form of this command disables MPLS classification. By default, without using this command, the command is disabled.

Command	Purpose
Router(config-if)# **plim qos input map mpls exp** *exp-value* | *exp-range* **queue low-latency | 0**	Classifies incoming MPLS traffic according to the value of the **exp** bits and places the traffic into the appropriate queue. • *exp-value* | *exp-range*—Specifies which MPLS **exp** value or range to use. • **low-latency**—Specifies high priority MPLS traffic. Enter **0** for low priority. By default, without using this command, the Gigabit Ethernet SPA classifies MPLS EXP range 6-7 as high priority. The **no** form of this command sets the classification according to default **exp** range 6-7.
Router(config-if)# **plim qos input queue low-latency | 0 pause** [**enable | threshold** *percent*]	Enables Ethernet pause frame generation due to flow control status. • **low latency**—Specifies high priority queue. Enter **0** for a low priority queue. • **pause**—Sets up the queue threshold to send a pause frame, which is a percentage of queue limit for packet drop. • The default threshold is 90 percent. By default, without using the command, pause frame generation is enabled for **low latency** queue. The **no** form of this command disables pause generation for a queue.
Router(config-if)# **plim qos input** [**bandwidth** *value_in_Kbps* [**low-latency**]] [**weight** *weight*]	Specifies the whole port, regardless of priority, or specifies priority only (**low-latency**) to receive minimum bandwidth guarantee, what minimum bandwidth is demanded, and what weight value is assigned for the excess scheduling. The default mode (without using this command) is that minimum scheduling is *off* and only excess scheduling is in service, which uses default weight proportional to the interface bandwidth. The **no** form of this command sets the interface to the default minimum bandwidth and weight.

Port or Physical Level QoS Classification

Use the following commands for port or physical level classification:

Command	Purpose
Router(config-if)# **plim qos input map ip all queue low-latency | 0**	Allows user to specify all IPv4 packets as high or low priority. • **low latency**—Specifies high priority packets. Enter **0** for a low priority packets The **no** form of this command disables all IPv4 classification. By default, without using this command, the command is disabled.
Router(config-if)# **plim qos input map ip dscp-based**	Enables IP DSCP-based classification. By default, without using this command, the Gigabit Ethernet SPA enables IP precedence-based classification for the Cisco ASR 1000 Series Routers.]The **no** form of this command totally disables the IP DSCP-based classification.
Router(config-if)#**plim qos input map ip dscp** *dscp-value* **|** *dscp-range* **queue low-latency | 0**	Allows the user to specify an IP DSCP value or range. • **low-latency**—Specifies high priority IP DSCP value. Enter **0** for low priority. By default, without this command, the Gigabit Ethernet SPA classifies DSCP cs6-cs7 as high priority. The **no** form of this command removes the IP DSCP value or range.

Configuring the Encapsulation Type

By default, the interfaces on the Gigabit Ethernet SPAs support Advanced Research Projects Agency (ARPA) encapsulation. They do not support configuration of service access point or SNAP encapsulation for transmission of frames; however, the interfaces will properly receive frames that use service access point and SNAP encapsulation.

The only other encapsulation supported by the SPA interfaces is IEEE 802.1Q encapsulation for virtual LANs (VLANs).

Configuring Autonegotiation on an Interface

Fast Ethernet and Gigabit Ethernet interfaces use a connection-setup algorithm called *autonegotiation.* Autonegotiation allows the local and remote devices to configure compatible settings for communication over the link. Using autonegotiation, each device advertises its transmission capabilities and then agrees upon the settings to be used for the link.

For the Gigabit Ethernet interfaces on the Cisco ASR 1000 Series Routers, flow control is autonegotiated when autonegotiation is enabled. Autonegotiation is enabled by default.

The following guidelines should be followed regarding autonegotiation:

- If autonegotiation is disabled on one end of a link, it must be disabled on the other end of the link. If one end of a link has autonegotiation disabled while the other end of the link does not, the link will not come up properly on both ends.
- Autonegotiation is not supported on the 10-Port Gigabit Ethernet SPA on the Cisco ASR1000-SIP10.
- Flow control is enabled by default.
- Flow control will be on if autonegotiation is disabled on both ends of the link.

Disabling Autonegotiation

Autonegotiation is automatically enabled and can be disabled on the Fast Ethernet and Gigabit Ethernet interfaces on the Cisco ASR1000-SIP10. During autonegotiation, advertisement for flow control, speed, and duplex occurs. If the interface is connected to a link that has autonegotiation disabled, autonegotiation should either be re-enabled on the other end of the link or disabled on the Fast Ethernet or Gigabit Ethernet SPA, if possible. Both ends of the link will not come up properly if only one end of the link has disabled autonegotiation.

Speed and duplex configurations are negotiated using autonegotiation. However, the only values that are negotiated are 100 Mbps for speed and full-duplex for duplex for Fast Ethernet SPAs, and 1000 Mbps for speed and full-duplex for duplex for Gigabit Ethernet SPAs. From a user's perspective, these settings are not negotiated, but are enabled using autonegotiation.

To disable autonegotiation, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **no negotiation auto**	Disables autonegotiation on Fast Ethernet or Gigabit Ethernet SPA interfaces on the Cisco ASR1000-SIP10. No advertisement of flow control occurs.

Configuring Speed and Duplex

When autonegotiation is turned off on Fast Ethernet or the RJ-45 interface in the 2-Port Gigabit Ethernet SPA, you can manually specify the speed and duplex configuration.

To configure the speed for a Fast Ethernet or Gigabit Ethernet interface, use the **speed** command in interface configuration mode. To return to the default setting, use the **no** form of this command:

Command	Purpose
Router(config-if)# **speed** {**10** | **100** | **1000**}	Configures the interface to transmit at 10 Mbps, 100 Mbps, or 1000 Mbps. (The **1000** keyword is only valid for Gigabit Ethernet.)

To configure duplex operation on an interface, use the **duplex** command in interface configuration mode. Use the **no** form of this command to return to the default value.

Command	Purpose
Router(config-if)# **duplex** {**full** | **half**}	Specifies full- or half-duplex operation.

Configuring the Media Type

The 2-Port Gigabit Ethernet SPA supports RJ-45 and fiber ports. Use the **media-type** configuration command to select either the RJ-45 or fiber media for a given port.

Command	Purpose
Router(config-if)# **media-type** {**10baset** | **100baset** | **rj45** | **gbic**}	Specifies the physical connection on an interface.

Enabling Autonegotiation

To re-enable autonegotiation on a Fast Ethernet or Gigabit Ethernet interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **negotiation auto**	Enables autonegotiation on a Fast Ethernet SPA interface on a Cisco ASR1000-SIP10 or a Gigabit Ethernet SPA interface on the Cisco ASR1000-SIP10. Advertisement of flow control occurs.

Configuring a Subinterface on a VLAN

Note You can configure no more than 8100 802.1Q VLAN subinterfaces per Ethernet SPA in software releases prior to Cisco IOS XE Release 2.5. Beginning in Cisco IOS XE Release 2.5, you can use the **hw-module subslot ethernet vlan unlimited** command to increase the system default and enable support for configuration of up to 4094 dot1q VLANs per port per SPA. The default is 8100 VLANs.

You can configure subinterfaces on the Fast Ethernet SPA interfaces and Gigabit Ethernet SPA interfaces on a VLAN using IEEE 802.1Q encapsulation. Cisco Discovery Protocol (CDP) is disabled by default on the 2-Port Gigabit Ethernet SPA interfaces and subinterfaces on the Cisco ASR1000-SIP10.

To configure a SPA subinterface on a VLAN, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# **hw-module subslot** *slot*/*subslot* **ethernet vlan unlimited**	(Optional) Enables configuration of up to 4094 dot1q VLANs per port per Ethernet SPA, where: • *slot*—Specifies the chassis slot number where the SIP is installed. • *subslot*—Specifies the slot of the SIP where the SPA is installed.
Step 2	Router(config)# **interface gigabitethernet** *slot*/*subslot*/*port*.*subinterface-number* or Router(config)# **interface tengigabitethernet** *slot*/*subslot*/*port*.*subinterface-number*	Specifies the Gigabit Ethernet interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address on a SPA" section on page 10-4. • .*subinterface-number*—Specifies a secondary interface (subinterface) number.
Step 3	Router(config-subif)# **encapsulation dot1q** *vlan-id*	Defines the encapsulation format as IEEE 802.1Q ("dot1q"), where *vlan-id* is the number of the VLAN (1–4094).
Step 4	Router(config-if)# **ip address** *ip-address mask* [**secondary**]	Sets a primary or secondary IP address for an interface, where: • *ip-address*—Specifies the IP address for the interface. • *mask*—Specifies the mask for the associated IP subnet. • **secondary**—(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address.

VLAN Classification

Note When the **hw-module subslot ethernet vlan unlimited** command is configured, the default classification of CoS bits 6-7 as high priority is still supported. However, other user-defined CoS values for high and low priority classification using the **plim qos input map cos queue** command are not supported.

To specify VLAN classification, use the following commands in subinterface configuration mode:

Command	Purpose
Router(config-subif)# **plim qos input map cos enable**	Enables packet classification based on 802.1q VLAN COS bits. By default, this command is enabled on the Gigabit Ethernet SPA. The **no** form of this command totally disables the COS classification. The command is used in the dot1q subinterface configuration mode which can be either under the main physical interface or the Gigabit EtherChannel (GEC) link bundle.
Router(config-subif)# **plim qos input map cos** *cos-value* | *cos-range* **queue low-latency | 0**	Allows the user to specify which COS value or range for high priority (**low-latency**) or low priority (**0**). By default, without this command, COS value 6-7 is classified as high priority. Only the default behavior is supported when the **hw-module subslot ethernet vlan unlimited** command is configured. The **no** form of this command sets the classification according to the default value (COS priority value 6-7). This command is in the VLAN subinterface configuration mode under either the main physical interface or the GEC link bundle.

Verifying Subinterface Configuration on a VLAN

To verify the configuration of a subinterface and its status on the VLAN, use the **show vlans** privileged EXEC command.

The following example shows the status of subinterface number 1 on port 0 on the SPA in VLAN number 200:

```
Router# show vlans
VLAN ID:200 (IEEE 802.1Q Encapsulation)

Protocols Configured:         Received:       Transmitted:
          IP                  0                  2

VLAN trunk interfaces for VLAN ID 200:

GigabitEthernet4/1/0.1 (200)

      IP:12.200.21.21

      Total 0 packets, 0 bytes input
      Total 2 packets, 120 bytes output
```

Saving the Configuration

To save your running configuration to nonvolatile random-access memory (NVRAM), use the following command in privileged EXEC configuration mode:

Command	Purpose
Router# **copy running-config startup-config**	Writes the new configuration to NVRAM.

For information about managing your system image and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* and *Cisco IOS Configuration Fundamentals Command Reference* publications that correspond to your Cisco IOS software release.

Shutting Down and Restarting an Interface on a SPA

You can shut down and restart any of the interface ports on a SPA independently of each other. Shutting down an interface stops traffic and enters the interface into an "administratively down" state.

There are no restrictions for online insertion and removal (OIR) on Gigabit Ethernet SPAs. Gigabit Ethernet SPAs can be removed from a SIP at any time. SIPs populated with any type of SPAs can be removed from the router at any time.

If you are preparing for an OIR of a SPA, it is not necessary to independently shut down each of the interfaces prior to deactivation of the SPA. The **hw-module subslot stop** command automatically stops traffic on the interfaces and deactivates them along with the SPA in preparation for OIR.

In similar fashion, you do not need to independently restart any interfaces on a SPA after OIR of a SPA or SIP.

To shut down an interface on a SPA, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **shutdown**	Disables an interface.

To restart an interface on a SPA, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **no shutdown**	Restarts a disabled interface.

Verifying the Interface Configuration

Besides using the **show running-configuration** command to display your Cisco ASR 1000 Series Router configuration settings, you can use the **show interfaces gigabitethernet** command to get detailed information on a per-port basis for your Gigabit Ethernet SPAs.

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the Gigabit Ethernet SPAs, use the **show interfaces gigabitethernet** command.

The following example provides sample output for interface port 1 on the SPA located in the top subslot (0) of the SIP that is installed in slot 2 of the Cisco ASR 1000 Series Router:

```
Router# show interfaces gigabitethernet 2/0/1
GigabitEthernet2/0/1 is up, line protocol is up
  Hardware is SPA-1X10GE-L-V2, address is 000a.f330.2e40 (bia 000a.f330.2e40)
  Internet address is 2.2.2.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full-duplex, 1000Mb/s, link type is force-up, media type is SX
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 03:18:49, output 03:18:44, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     1703 packets input, 638959 bytes, 0 no buffer
     Received 23 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 1670 multicast, 0 pause input
     1715 packets output, 656528 bytes, 0 underruns
     0 output errors, 0 collisions, 4 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
```

Using show Commands to Check SFP Module and XFP Module Status

You can use various **show** commands to view information specific to SFP, XFP, CWDM, and DWDM optical transceiver modules.

To check or verify the status of an SFP Module or XFP Module, use the following **show** commands:

- show hw-module *slot/subslot* transceiver *port* **idprom detail**
- show hw-module *slot/subslot* transceiver *port* **idprom brief**
- show hw-module *slot/subslot* transceiver *port* **idprom dump**
- show hw-module *slot/subslot* transceiver *port* **idprom status**

Following are sample output of several **show** commands for SFP Modules and XFP Modules.

The following **show hw-module subslot** command sample output is for SFP-GE-S:

```
Router# show hw-module subslot 2/0 transceiver 0 idprom
```

```
IDPROM for transceiver GigabitEthernet2/0/0:
Description = SFP optics (type 3)
Transceiver Type: = GE SX (19)
Product Indentifier (PID) = FTRJ8519P1BNL-C6
Vendor Revision = A
Serial Number (SN) = FNS1037R8DH
Vendor Name = CISCO-FINISAR
Vendor OUI (IEEE company ID) = 00.90.65 (36965)
CLEI code = IPUIALJRAA
Cisco part number = 10-2143-01
Device State = Enabled.
Date code (yy/mm/dd) = 06/09/14
Connector type = LC.
Encoding = 8B10B
NRZ
Nominal bitrate = GE (1300 Mbits/s)
Minimum bit rate as % of nominal bit rate = not specified
Maximum bit rate as % of nominal bit rate = not specified
```

The following **show hw-module subslot** command sample output is for CWDM 1490:

```
Router# show hw-module subslot 2/0 transceiver 2 idprom
IDPROM for transceiver GigabitEthernet2/0/2:
Description = SFP optics (type 3)
Transceiver Type: = GE CWDM 1490 (28)
Product Indentifier (PID) = FWDM-16217D49CSC
Vendor Revision = C
Serial Number (SN) = FNS10500HA9
Vendor Name = CISCO-FINISAR
Vendor OUI (IEEE company ID) = 00.90.65 (36965)
CLEI code = CNTRVX0FAA
Cisco part number = 10-1884-01
Device State = Enabled.
Date code (yy/mm/dd) = 06/12/12
Connector type = LC.
Encoding = 8B10B
NRZ
Nominal bitrate = (2700 Mbits/s)
Minimum bit rate as % of nominal bit rate = not specified
Maximum bit rate as % of nominal bit rate = not specified
```

The following **show hw-module subslot** command sample output is for an XFP module:

```
Router# show hw-module subslot 2/2 transceiver 0 idprom brief
IDPROM for transceiver TenGigabitEthernet2/2/0:
Description = XFP optics (type 6)
Transceiver Type: = OC192 + 10GBASE-L (97)
Product Indentifier (PID) = TRF5011AN-LF004
Vendor Revision = 05
Serial Number (SN) = ONT11061053
Vendor Name = CISCO-OPNEXT
Vendor OUI (IEEE company ID) = 00.0B.40 (2880)
CLEI code = WMOTBEVAAB
Cisco part number = 10-1989-02
Device State = Enabled.
Date code (yy/mm/dd) = 07/02/06
Connector type = LC.
Encoding = 64B/66B
SONET Scrambled
NRZ
```

```
Minimum bit rate = 9900 Mbits/s
Maximum bit rate = 10500 Mbits/s
```

The following sample output is for SFP-GE-SX:

```
Router# show hw-module subslot 2/0 transceiver 0 idprom dump
IDPROM for transceiver GigabitEthernet2/0/0:
Description = SFP optics (type 3)
Transceiver Type: = GE SX (19)
Product Indentifier (PID) = FTRJ8519P1BNL-C6
Vendor Revision = A
Serial Number (SN) = FNS1037R8DH
Vendor Name = CISCO-FINISAR
Vendor OUI (IEEE company ID) = 00.90.65 (36965)
CLEI code = IPUIALJRAA
Cisco part number = 10-2143-01
Device State = Enabled.
SFP IDPROM Page 0xA0:
000: 03 04 07 00 00 00 01 00 00 00
010: 00 01 0D 00 00 00 37 1B 00 00
020: 43 49 53 43 4F 2D 46 49 4E 49
030: 53 41 52 20 20 20 00 00 90 65
040: 46 54 52 4A 38 35 31 39 50 31
050: 42 4E 4C 2D 43 36 41 20 20 20
060: 03 52 00 74 00 1A 00 00 46 4E
070: 53 31 30 33 37 52 38 44 48 20
080: 20 20 20 20 30 36 30 39 31 34
090: 20 20 58 80 01
SFP IDPROM Page 0xA2:
000: 6D 00 E3 00 67 00 F3 00 98 58
010: 69 78 90 88 71 48 1D 4C 01 F4
020: 17 70 03 E8 25 19 02 F5 25 19
030: 04 A9 E3 EE 01 DF 8F C5 02 EC
040: 00 00 00 00 00 00 00 00 00 00
050: 00 00 00 00 00 00 00 00 00 00
060: 00 00 00 00 00 00 00 00 3E 5D
070: 01 79 C0 5B AC 86 01 00 00 00
080: 00 AA FF FD 01 00 00 00 01 00
090: 00 00 00 00 00 3A 1B 70 80 D8
100: 00 62 00 28 00 22 00 00 00 00
110: 82 F8 05 40 00 00 05 40 00 00
120: 00 00 00 00 00 00 00 01 49 50
130: 55 49 41 4C 4A 52 41 41 31 30
140: 2D 32 31 34 33 2D 30 31 56 30
150: 31 20 89 FB 55 00 00 00 00 78
160: 00 00 00 00 00 00 00 00 00 00
170: 00 00 00 00 00 00 00 00 00 00
180: 00 00 00 00 00 00 00 00 00 00
190: AA AA 53 46 50 2D 47 45 2D 53
200: 20 20 20 20 20 20 20 20 20 20
210: 20 20 00 00 00 00 00 00 00 00
220: 00 00 00 A2 00 00 00 00 00 00
230: 00 00 00 00 00 00 00 00 00 00
240: 00 00 00 00 00 00 00 00 00 40
250: 00 40 00 00 00 00
Router#
```

Configuration Examples

This section includes the following configuration examples:

Basic Interface Configuration Example

The following example shows how to enter global configuration mode to specify the interface that you want to configure, configure an IP address for the interface, and save the configuration. This example configures interface port 1 on the SPA that is located in subslot 0 of the SIP that is installed in slot 0 of the Cisco ASR 1000 Series Router:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address.
!
Router(config)# interface gigabitethernet 0/0/1
!
! Configure an IP address.
!
Router(config-if)# ip address 192.168.50.1 255.255.255.0
!
! Start the interface.
!
Router(config-if)# no shut
!
! Save the configuration to NVRAM.
!
Router(config-if)# exit
Router# copy running-config startup-config
```

MAC Address Configuration Example

The following example changes the default MAC address on the interface to 1111.2222.3333:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 0/0/1
!
! Modify the MAC address.
!
Router(config-if)# mac-address 1111.2222.3333
```

MAC Address Accounting Configuration Example

The following example enables MAC Address Accounting:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Enable MAC address accounting
Router(config)# ip accounting mac-address {input | output}
Router(config-if)# ip accounting ?
access-violations Account for IP packets violating access lists on this interface
mac-address Account for MAC addresses seen on this interface
output-packets Account for IP packets output on this interface
precedence Count packets by IP precedence on this interface
<cr>
Router(config-if)# ip accounting mac-address ?
input Source MAC address on received packets
output Destination MAC address on transmitted packets
Router(config-if)# ip accounting mac-address input ?
<cr>
! Specify MAC address accounting for traffic entering the interface.
!
Router(config-if)# ip accounting mac-address input
! Specify MAC address accounting for traffic leaving the interface.
!
Router(config-if)# ip accounting mac-address output
Router(config-if)# end
! Verify the MAC Address on the interface.
!
Router# show interfaces GigabitEthernet 4/0/2 mac-accounting
GigabitEthernet4/0/2
Input (511 free)
000f.f7b0.5200(26 ): 124174 packets, 7450440 bytes, last: 1884ms ago
Total: 124174 packets, 7450440 bytes
Output (511 free)
000f.f7b0.5200(26 ): 135157 packets, 8109420 bytes, last: 1884ms ago
Total: 135157 packets, 8109420 bytes
```

MTU Configuration Example

The following example sets the interface MTU to 9216 bytes:

Note The SPA automatically adds an additional 38 bytes to the configured interface MTU size.

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 0/0/1
!
! Configure the interface MTU.
!
Router(config-if)# mtu 9216
```

VLAN Configuration Example

The following example creates subinterface number 268 on SPA interface port 2 (the third port), and configures the subinterface on the VLAN with ID number 268, using IEEE 802.1Q encapsulation:

```
! Enter global configuration mode.
!
Router# configure terminal
! Enter configuration commands, one per line. End with CNTL/Z.
!
! Specify the interface address
!
Router(config)# interface gigabitethernet 2/0/1.268
!
! Configure dot1q encapsulation and specify the VLAN ID.
!
Router(config-subif)# encapsulation dot1q 268
```