Configuring the Fast Ethernet SPA and Gigabit Ethernet SPA

This chapter provides information about configuring the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. It includes the following sections:

For information about managing your system images and configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2* and *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2* publications.

For more information about the commands used in this chapter, first see Chapter 18, "Command Reference," which documents new and modified commands, and the *Cisco 7300 Series Platform-Specific Commands.* Also refer to the related Cisco IOS Release 12.2 software command reference and master index publications. For more information about accessing these publications, see the "Related Documentation" section on page xiv.

Configuration Tasks

This section describes how to configure the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA and includes information about verifying the configuration.

It includes the following topics:

- Saving the Configuration, page 6-16
- Shutting Down and Restarting an Interface on a SPA, page 6-16

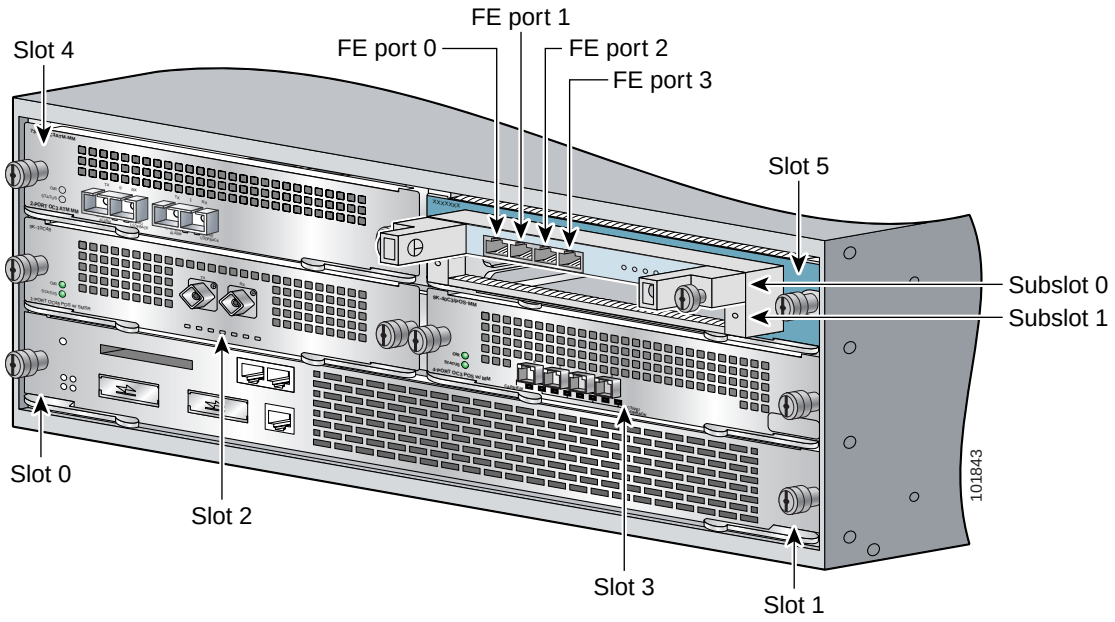
Specifying the Interface Address

The implementation of SPAs on the Cisco 7304 router introduces a new addressing format to specify the physical location of the MSC, SPA, and interface. The interface address format is *slot*/*subslot*/*port*:

- *slot*—Specifies the slot number (2 through 5) in the Cisco 7304 router in which the MSC that contains the SPA is installed.
- *subslot*—Specifies the secondary slot (top [0] or bottom [1]) on the MSC where the SPA that you want to select is installed. The MSC-100 can contain up to two SPAs.
- *port*—Specifies the interface number that you want to select on the SPA:
  - For the 4-Port 10/100 Fast Ethernet SPA—0 through 3
  - For the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1

Figure 6-1 shows the slot, subslot, and interface port locations of the 4-Port 10/100 Fast Ethernet SPA in an MSC-100 on the Cisco 7304 router.

Figure 6-1 Slot, Subslot, and Port Locations for the 4-Port 10/100 Fast Ethernet SPA



For more information about the installation of SPAs on the Cisco 7304 router, refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*.

Required Configuration Tasks

This section lists the required configuration steps to configure the Fast Ethernet and 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.

Required Configuration Tasks for the Fast Ethernet SPA

To configure the 4-Port 10/100 Fast Ethernet SPA, complete the following steps:

	Command	Purpose
Step 1	Router# **configure terminal**	Enters global configuration mode.
Step 2	Router(config)# **interface fastethernet** *slot*/*subslot*/*port*[**.***subinterface-number*]	Specifies the Fast Ethernet interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address" section on page 6-2. • **.***subinterface-number*—(Optional) Specifies a secondary interface (subinterface) number.
Step 3	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.
Step 4	Router(config-if)# **duplex** {**full** | **half** | **auto**}	(As Required) Configures the duplex operation on an interface. The default is **auto**—Enables advertisement of both duplex modes and enables autonegotiation.
Step 5	Router(config-if)# **speed** {**10** | **100** | **auto**}	(As Required) Configures the speed of an interface (Mbps). The default is **auto**—Enables advertisement of all speed modes and enables autonegotiation.
Step 6	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.
Step 7	Router(config-if)# **no shutdown**	Enables the interface.

Required Configuration Tasks for the Gigabit Ethernet SPA

To configure the 2-Port 10/100/1000 Gigabit Ethernet SPA, 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*]	Specifies the Gigabit Ethernet interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address" section on page 6-2. • **.***subinterface-number*—(Optional) Specifies a secondary interface (subinterface) number.
Step 3	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.
Step 4	Router(config-if)# **media-type** {**gbic** | **rj45**}	(As Required) Specifies the type of media used to make the network connection on the router, where: • **gbic**—Gigabit Interface Converter (GBIC). Specifies that the interface supports fiber media using a small form-factor pluggable (SFP) optical transceiver. **Note** When you configure the **gbic** media type, the interface advertises full duplex and 1000 Mbps only during autonegotiation. • **rj45**—Specifies that the interface supports RJ-45 media. The default is **rj45**. **Note** If you connect both RJ-45 and fiber media to the same interface on the Gigabit Ethernet SPA, be sure that you configure the **media-type** command to specify whether you want to use the copper (RJ-45) or fiber media.

	Command	Purpose
Step 5	Router(config-if)# **duplex** {**full** | **half** | **auto**}	(As Required for RJ-45 Media) Configures the duplex operation on an interface. The default is **auto**—Enables advertisement of both modes and autonegotiation. **Note** When using fiber media, the 2-Port 10/100/1000 Gigabit Ethernet SPA only advertises and negotiates full-duplex mode when the **negotiation auto** command is enabled (default).
Step 6	Router(config-if)# **speed** {**10** | **100** | **1000** | **auto**}	(As Required for RJ-45 Media) Configures the speed of an interface (Mbps). The default is **auto**—Enables advertisement of all speed modes and enables autonegotiation. **Note** When using fiber media, the 2-Port 10/100/1000 Gigabit Ethernet SPA only advertises and negotiates 1000 Mbps speed when the **negotiation auto** command is enabled (default).
Step 7	Router(config-if)# **mtu** *bytes*	(As Required) Configures the maximum packet size for an interface, where: • *bytes*—Specifies the maximum number of bytes for a packet. The default is 1500 bytes.
Step 8	Router(config-if)# **no shutdown**	Enables the interface.

Modifying the Media Type

RJ-45 is the only supported media type for copper interfaces on the 4-Port 10/100 Fast Ethernet SPA. Therefore, you do not need to configure the **media-type** command on the Fast Ethernet SPA.

However, if you are using fiber connections on the 2-Port 10/100/1000 Gigabit Ethernet SPA, you must configure the **media-type** command to change the default value. If you connect both RJ-45 and fiber media to the same interface on the Gigabit Ethernet SPA, be sure that you configure the **media-type** command to specify the media type.

To modify the default media type of an interface from RJ-45 for Gigabit Ethernet SPAs, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **media-type gbic**	Specifies the interface supports fiber media using an SFP optical transceiver.

For a list of the compatible SFP modules for the 2-Port 10/100/1000 Gigabit Ethernet SPA, refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*.

Verifying the Media Type

To verify the media type for an interface, use the **show interfaces fastethernet** or **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the "media type" field.

The following example shows that the media type is SX for interface port 0 (the first port) on the SPA installed in the bottom subslot (1) of the MSC that is located in slot 4 of the Cisco 7304 router:

```
Router# show interfaces gigabitethernet 4/1/0
GigabitEthernet4/1/0 is up, line protocol is up
  Hardware is SPA-2GE-7304, address is 0007.0ed3.ba88 (bia 0007.0ed3.ba88)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, link type is auto, media type is SX
.
.
.
```

You also can use the **show controllers gigabitethernet** privileged EXEC command to verify the media type. The following example shows that the GBIC type is 1000BaseSX for interface port 0 (the first port) on the SPA installed in the bottom subslot (1) of the MSC that is located in slot 4 of the Cisco 7304 router:

```
Router# show controllers gigabitethernet 4/1/0
Interface GigabitEthernet4/1/0
  Hardware is SPA-2GE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is GBIC, GBIC type is 1000BaseSX
.
.
.
```

Modifying the MAC Address on the Interface

The 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA 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 7304 router.

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 a 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 fastethernet** or **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 00b0.64ff.5d80 for interface port 0 (the first port) on the SPA installed in the top subslot (0) of the MSC that is located in slot 4 of the Cisco 7304 router:

```
Router# show interfaces fastethernet 4/0/0
FastEthernet4/0/0 is up, line protocol is up
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
.
.
.
```

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 a subinterface and is used by the Cisco IOS software to determine whether fragmentation of a packet takes place. 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 a 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 the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA, the default MTU size is 1500 bytes. The maximum configurable MTU is 9216 bytes. The SPA automatically adds an additional 36 bytes to the configured MTU size to accommodate some of the additional overhead.

The MTU size on a SPA interface affects the recording of the "giants" statistic in the **show interfaces fastethernet** and **show interfaces gigabitethernet** commands. When using the default MTU size of 1500 bytes, the giants counter increments when the interface receives a packet that is greater than 1536 bytes.

Interface MTU Configuration Guidelines

When configuring the interface MTU size on a 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA, consider the following guidelines:

- If you change the interface MTU size, the giants counter increments when the interface receives a packet that exceeds the MTU size that you configured, plus an additional 36 bytes. For example, with a maximum MTU size of 9216 bytes, the giants counter increments when receiving packets larger than 9252 bytes, or (9216 + 36) bytes.
- The default interface MTU size accommodates a 1500-byte packet, plus 36 additional bytes to cover the following additional overhead:
  - Layer 2 header—14 bytes
  - SNAP header—8 bytes
  - Dot1q header—2 bytes
  - 2 MPLS labels—8 bytes
  - CRC—4 bytes

Note Depending on your Cisco IOS software release, a certain maximum number of MPLS labels are supported. If you need to support more than two MPLS labels, then you should increase the default interface MTU size on the SPA interface.

- 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.

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 fastethernet** or **show interfaces gigabitethernet** privileged EXEC command and observe the value shown in the "MTU" field.

The following example shows an MTU size of 9216 bytes for interface port 0 (the first port) on the SPA installed in the top subslot (0) of the MSC that is located in slot 4 of the Cisco 7304 router:

```
Router# show interfaces fastethernet 4/0/0
FastEthernet4/0/0 is up, line protocol is up
```

```
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
.
.
.
```

Configuring the Encapsulation Type

By default, the interfaces on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA support Advanced Research Projects Agency (ARPA) encapsulation. They do not support configuration of service access point (SAP) or SNAP encapsulation for transmission of frames; however, the interfaces will properly receive frames that use SAP and SNAP encapsulation.

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

Configuring a Subinterface on a VLAN

You can configure subinterfaces on the the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on a VLAN using IEEE 802.1Q encapsulation.

Note The 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA do not support Inter-Switch Link (ISL) encapsulation.

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

	Command	Purpose
Step 1	Router(config)# **interface fastethernet** *slot*/*subslot*/*port*.*subinterface-number*	Specifies the Fast Ethernet interface to configure, where: • *slot*/*subslot*/*port*—Specifies the location of the interface. See the "Specifying the Interface Address" section on page 6-2. • .*subinterface-number*—Specifies a secondary interface (subinterface) number.
Step 2	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 (1–4095).
Step 3	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.

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 268 on port 2 (third port) on the SPA in VLAN number 269:

```
Router# show vlans 269

Virtual LAN ID:  269 (IEEE 802.1Q Encapsulation)

   vLAN Trunk Interface:   FastEthernet4/1/2.268

   Protocols Configured:   Address:              Received:        Transmitted:
           PXF:FastEthernet4/1/2.268               941668                   0
           RP Switched:
           IP              10.1.13.1                    5                   0
```

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.

If autonegotiation fails for some reason, the Fast Ethernet or Gigabit Ethernet interface is configured for half-duplex mode and automatically senses the speed on the link. For Gigabit Ethernet interfaces using fiber media, full-duplex mode and 1000-Mbps speed only is supported.

By default, the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA support autonegotiation of the speed and duplex settings. The SPA automatically implements flow control (transmission of pause frames), which is advertised, but is not negotiable. For more information about flow control configuration requirements if you disable autonegotiation, see the "Configuring Flow Control Support on the Link" section on page 6-15.

Note Autonegotiation is recommended to ensure compatibility of transmission settings. If you do not use autonegotiation, be sure that your interface configuration matches the configuration supported by the remote device on the link.

Autonegotiation configuration varies slightly depending on the media type that you are using. The following sections describe these configuration differences:

- Configuring Autonegotiation on RJ-45 Interfaces, page 6-11
- Configuring Autonegotiation on Fiber Interfaces, page 6-13

Configuring Autonegotiation on RJ-45 Interfaces

The 4-Port 10/100 Fast Ethernet SPA only supports RJ-45 media for its interfaces. The 2-Port 10/100/1000 Gigabit Ethernet SPA supports both RJ-45 and fiber media for its interfaces.

When using the RJ-45 media type, the interface enables autonegotiation when either the **speed** or **duplex** interface configuration commands are configured to **auto**. By default, both the **speed** and **duplex** commands are set to **auto**, which means that the interface advertises that it can support either 10-Mbps or 100-Mbps operation for Fast Ethernet interfaces, or 10-Mbps, 100-Mbps, or 1000-Mbps operation for Gigabit Ethernet interfaces, and that it can also support half-duplex or full-duplex mode on the link, in any combination as follows:

- 10 Mbps and half duplex
- 10 Mbps and full duplex
- 100 Mbps and half duplex
- 100 Mbps and full duplex
- 1000 Mbps and half duplex—Gigabit Ethernet only
- 1000 Mbps and full duplex—Gigabit Ethernet only (This is also the only advertisement supported when using fiber media. For more information, see the "Configuring Autonegotiation on Fiber Interfaces" section on page 6-13.)

Note Flow control support is always advertised when autonegotiation is enabled.

If you want to force a particular speed or duplex setting, while still enabling autonegotiation, then you can specify a value for that parameter while leaving the other parameter configured for **auto**.

For more information, see the following sections:

- Specifying the Speed with Autonegotiation of the Duplex Mode Only on RJ-45 Interfaces, page 6-12
- Specifying the Duplex Mode with Autonegotiation of the Speed Only on RJ-45 Interfaces, page 6-12
- Disabling Autonegotiation on RJ-45 Interfaces, page 6-13

Specifying the Speed with Autonegotiation of the Duplex Mode Only on RJ-45 Interfaces

To configure an interface using RJ-45 media on the 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA for a specific speed, but also advertise support of either full-duplex or half-duplex operation, use the following commands beginning in interface configuration mode:

	Command	Purpose
Step 1	Router(config-if)# **speed 10**	Specifies that the interface advertises 10-Mbps support only.
	or	or
	Router(config-if)# **speed 100**	Specifies that the interface advertises 100-Mbps support only.
	or	or
	Router(config-if)# **speed 1000**	Specifies that the interface advertises 1000-Mbps support only. This speed is supported only by Gigabit Ethernet interfaces.
Step 2	Router(config-if)# **duplex auto**	Specifies that the interface advertises support of either half-duplex or full-duplex operation. The default is **auto**.

Specifying the Duplex Mode with Autonegotiation of the Speed Only on RJ-45 Interfaces

To configure an interface using RJ-45 media on the 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA for a specific duplex mode, but also advertise support of either 10-Mbps, 100-Mbps, or 1000-Mbps operation, use the following commands beginning in interface configuration mode:

	Command	Purpose
Step 1	Router(config-if)# **speed auto**	Specifies that the interface advertises support of either 10-Mbps or 100-Mbps operation for Fast Ethernet interfaces, or 10-Mbps, 100-Mbps, or 1000-Mbps operation for Gigabit Ethernet interfaces. The default is **auto**.
Step 2	Router(config-if)# **duplex full**	Specifies that the interface advertises full-duplex support only.
	or	or
	Router(config-if)# **duplex half**	Specifies that the interface advertises half-duplex support only.

Disabling Autonegotiation on RJ-45 Interfaces

When you specify a particular value for both the **duplex** and **speed** commands when using RJ-45 media, you disable autonegotiation on the link. Therefore, the interface does not advertise its capabilities to the remote device and it forces operation of the interface port according to the settings that you configured.

Note If you need to force an interface port to operate with certain settings and therefore disable autonegotiation, you must be sure that the remote link is configured with compatible link settings for proper transmission. This includes support of flow control on the link. For information about how disabling autonegotiation affects the configuration of flow control, see the "Configuring Flow Control Support on the Link" section on page 6-15.

To disable autonegotiation on an interface using RJ-45 media and configure it for a specific duplex mode and speed, use the following commands beginning in interface configuration mode:

	Command	Purpose
Step 1	Router(config-if)# **speed 10**	Forces the interface to operate at 10 Mbps.
	or	or
	Router(config-if)# **speed 100**	Forces the interface to operate at 100 Mbps.
	or	or
	Router(config-if)# **speed 1000**	Forces the interface to operate at 1000 Mbps. This speed is supported only by Gigabit Ethernet interfaces.
Step 2	Router(config-if)# **duplex full**	Forces the interface to operate in full-duplex mode only.
	or	or
	Router(config-if)# **duplex half**	Forces the interface to operate in half-duplex mode only.

Note The interface forces the settings for the **speed** and **duplex** commands without advertisement when you specify a value for the commands and do not configure either of them with the **auto** keyword.

Configuring Autonegotiation on Fiber Interfaces

The 4-Port 10/100 Fast Ethernet SPA only supports RJ-45 media for its interfaces. The 2-Port 10/100/1000 Gigabit Ethernet SPA supports both RJ-45 and fiber media for its interfaces. To configure autonegotiation for interfaces using RJ-45 media, see the "Configuring Autonegotiation on RJ-45 Interfaces" section on page 6-11.

When using SFP media on the 2-Port 10/100/1000 Gigabit Ethernet SPA, use the instructions in this section to configure autonegotiation.

Disabling Autonegotiation on Fiber Interfaces

Autonegotiation is automatically enabled. During autonegotiation on fiber interfaces, advertisement and configuration of full-duplex mode and 1000-Mbps speed occurs. Flow control support is also advertised. When you disable autonegotiation on a Gigabit Ethernet SPA interface that uses fiber media, the interface no longer advertises but automatically configures itself for full-duplex mode and 1000-Mbps speed.

To disable autonegotiation on a Gigabit Ethernet interface using fiber media, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **no negotiation auto**	Disables autonegotiation on Gigabit Ethernet SPA interfaces that are using fiber media. No advertisement of duplex, speed, or flow control occurs.

Enabling Autonegotiation on Fiber Interfaces

Autonegotiation is automatically enabled. During autonegotiation on fiber interfaces, advertisement and configuration of full-duplex mode and 1000-Mbps speed occurs. Flow control support is also advertised. To re-enable autonegotiation on a Gigabit Ethernet interface using fiber media, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# **negotiation auto**	Enables autonegotiation on Gigabit Ethernet SPA interfaces that are using fiber media. Advertisement of full duplex, 1000 Mbps, and flow control occurs.

Verifying Autonegotiation Status

To verify the status of autonegotiation on a Fast Ethernet or Gigabit Ethernet interface on a SPA, use the **show controllers fastethernet** or **show controllers gigabitethernet** privileged EXEC command.

The following example shows that the connection mode is autonegotiation for interface port 0 (the first port) on the SPA located in the top subslot (0) of the MSC that is installed in slot 4 of the Cisco 7304 router, and that autonegotiation is enabled and complete.

The settings established on the link are 100-Mbps operation with full-duplex support. The output also displays the advertised capabilities of both the local interface (beside “Advertised capabilities”) and the remote device (beside “Partner capabilities”):

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
```

```
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
.
.
.
```

Configuring Flow Control Support on the Link

The 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA automatically support transmission of pause frames to stop packet flow when the per-port MSC buffer is full. You can not disable flow control on the 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA.

Therefore, flow control support on the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA is not configurable, but it is advertised during autonegotiation.

Verifying Flow Control Status

To verify the status of flow control on a Fast Ethernet interface on a SPA, use the **show controllers fastethernet** privileged EXEC command and view the "Total pause frames" counters in the "MAC counters" section of the output.

The following example shows that zero pause frames have been transmitted and received by the MAC device for interface port 0 (the first port) on the SPA located in the top subslot (0) of the MSC that is installed in slot 4 of the Cisco 7304 router:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
MAC counters:
  Input: packets = 15, bytes = 1776
         FIFO full/reset removed = 0, error drop = 0
  Output: packets = 18, bytes = 2622
          FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 15, TCAM drops: 4
         Satisfy (host-backpressure) drops: 0, CRC drops: 0
         PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 11, bytes = 1476, drops = 0
  Output: packets = 18, bytes = 2550, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
```

```
MAC destination address filtering table:
  Table entries: Total = 512, Used = 4, Available = 508
  Index MAC destination address       Mask
  ----- ----------------------  --------------
  1     0007.0ed3.ba80          ffff.ffff.ffff
  2     ffff.ffff.ffff          ffff.ffff.ffff
  3     0100.0000.0000          0100.0000.0000
  4     0100.0ccc.cccc          ffff.ffff.ffff
VLAN filtering table:
  Number of VLANs configured on this interface = 0
  Table entries: Total = 1024, Used = 2, Available = 1022
  Index  VLAN identifier  Enabled  Tunnel
  -----  ---------------  -------  ------
  1           0             No      No
  2           0             Yes     No
Platform details:
  PXF tif number: 0x10
```

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 more information about managing configuration files, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2* and *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2* publications.

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.

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 MSC. For more information about performing an OIR for a SPA, see the “Preparing for Online Insertion and Removal of MSCs and SPAs on the Cisco 7304 Router” section on page 3-8.

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 7304 router configuration settings, you can use the **show interfaces fastethernet** command and **show interfaces gigabitethernet** command, and the **show controllers fastethernet** command and **show controllers gigabitethernet** command to get detailed information on a per-port basis for your 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA.

Verifying Per-Port Interface Status

To find detailed interface information on a per-port basis for the 4-Port 10/100 Fast Ethernet SPA, use the **show interfaces fastethernet** command. For a description of the command output, see Chapter 18, "Command Reference."

The following example provides sample output for interface port 1 (the second port), on the SPA located in the bottom subslot (1), of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
Router# show interfaces fastethernet 2/1/1
FastEthernet2/1/1 is up, line protocol is up
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:22, output 00:00:02, 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
     5 packets input, 320 bytes
     Received 1 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog
     0 input packets with dribble condition detected
     8 packets output, 529 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     2 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Monitoring Per-Port Interface Statistics

To find detailed status and statistical information on a per-port basis for the 4-Port 10/100 Fast Ethernet SPA, use the **show controllers fastethernet** command. For a description of the command output, see Chapter 18, "Command Reference."

The following example provides sample output for interface port 0 (the first port), on the SPA located in the top subslot (0), of the MSC that is installed in slot 4 of the Cisco 7304 router:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD
MAC counters:
  Input: packets = 15, bytes = 1776
         FIFO full/reset removed = 0, error drop = 0
  Output: packets = 18, bytes = 2622
          FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 15, TCAM drops: 4
         Satisfy (host-backpressure) drops: 0, CRC drops: 0
         PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 11, bytes = 1476, drops = 0
  Output: packets = 18, bytes = 2550, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
MAC destination address filtering table:
  Table entries: Total = 512, Used = 4, Available = 508
  Index MAC destination address       Mask
  ----- ----------------------  --------------
  1     0007.0ed3.ba80          ffff.ffff.ffff
  2     ffff.ffff.ffff          ffff.ffff.ffff
  3     0100.0000.0000          0100.0000.0000
  4     0100.0ccc.cccc          ffff.ffff.ffff
VLAN filtering table:
  Number of VLANs configured on this interface = 0
  Table entries: Total = 1024, Used = 2, Available = 1022
  Index  VLAN identifier  Enabled  Tunnel
  -----  ---------------  -------  ------
  1           0             No      No
  2           0             Yes     No
Platform details:
  PXF tif number: 0x10
```

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 (the second port) on the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 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 fastethernet 2/1/1
!
! 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
```

Media Type Configuration Example

The following example changes the default media type from RJ-45 to GBIC to support SFP module on the Gigabit Ethernet interface:

```
! Enter global configuration mode
!
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface gigabitethernet 4/1/0
!
! Configure the interface for fiber media
!
Router(config-if)# media-type gbic
```

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 fastethernet 2/1/1
!
! Modify the MAC address
!
Router(config-if)# mac-address 1111.2222.3333
```

MTU Configuration Example

The following example sets the interface MTU to 9216 bytes:

Note The SPA automatically adds an additional 36 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 fastethernet 2/1/1
!
! Configure the interface MTU
!
Router(config-if)# mtu 9216
```

VLAN Configuration Example

The following example creates a subinterface number 268 on SPA interface port 2 (the third port), and configures the subinterface on the VLAN with ID number 269 using IEEE 802.1Q encapsulation:

Note The SPA does not support ISL 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 fastethernet 4/1/2.268
!
! Configure dot1Q encapsulation and specify the VLAN ID
!
Router(config-subif)# encapsulation dot1q 269
```

Autonegotiation Configuration Examples

This section provides several examples including combining configuration parameters to force a specific setting while enabling autonegotiation for another setting, and also disabling autonegotiation support:

- Forcing Half-Duplex Mode and Autonegotiation of the Speed Configuration Example, page 6-21
- Forcing 10-Mbps Speed and Autonegotiation of the Duplex Configuration Example, page 6-22
- Disabling Autonegotiation on RJ-45 Interfaces Configuration Example, page 6-22
- Disabling Autonegotiation on Fiber Interfaces Configuration Example, page 6-23
- Enabling Autonegotiation on Fiber Interfaces Configuration Example, page 6-23

Forcing Half-Duplex Mode and Autonegotiation of the Speed Configuration Example

For interface port 1 (the second port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router, the following example specifies advertisement of half-duplex support only, and either 10-Mbps or 100-Mbps capability during autonegotiation:

```
! Enter global configuration mode
!
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 2/1/1
!
! Enable autonegotiation of the speed
! (This is the default setting)
!
Router(config-if)# speed auto
!
! Configure half-duplex
!
Router(config-if)# duplex half
```

With this configuration, the 4-Port 10/100 Fast Ethernet SPA advertises the following capabilities during autonegotiation:

- 10 Mbps and half duplex
- 100 Mbps and half duplex

Note Flow control support is always advertised when autonegotiation is enabled.

Forcing 10-Mbps Speed and Autonegotiation of the Duplex Configuration Example

For interface port 1 (the second port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router, the following example specifies advertisement of 10-Mbps support only, and either half-duplex or full-duplex capability during autonegotiation:

```
! Enter global configuration mode
!
Router# configure terminal
Router(config)# interface fastethernet 2/1/1
!
! Configure 10 Mbps speed
!
Router(config-if)# speed 10
!
! Enable autonegotiation of the duplex mode
! (This is the default setting)
!
Router(config-if)# duplex auto
```

With this configuration, the 4-Port 10/100 Fast Ethernet SPA advertises the following capabilities during autonegotiation:

- 10 Mbps and half duplex
- 10 Mbps and full duplex

Note Flow control support is always advertised when autonegotiation is enabled.

Disabling Autonegotiation on RJ-45 Interfaces Configuration Example

The following example specifies that interface port 1 (the second port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router, implements only full-duplex and 100-Mbps operation.

By specifying a particular value for both the **duplex** and **speed** commands, autonegotiation is disabled over the link for this interface. Therefore, the capabilities of the interface are not advertised.

```
! Enter global configuration mode
!
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 2/1/1
!
! Disable autonegotiation of the speed
! Force 100 Mbps speed
!
Router(config-if)# speed 100
!
! Disable autonegotiation of the duplex mode
! Force full-duplex mode
!
Router(config-if)# duplex full
```

Disabling Autonegotiation on Fiber Interfaces Configuration Example

The following example disables autonegotiation on fiber interface port 0 (the first port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 4 of the Cisco 7304 router.

The interface does not advertise duplex mode, speed, or flow control, but sets its configuration for full-duplex mode and 1000-Mbps speed.

```
! Enter global configuration mode
!
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface gigabitethernet 4/1/0
!
! Configure the interface for fiber media
!
Router(config-if)# media-type gbic
!
! Disable autonegotiation on a fiber interface
!
Router(config-if)# no negotiation auto
```

Enabling Autonegotiation on Fiber Interfaces Configuration Example

The following example enables autonegotiation on fiber interface port 0 (the first port) of the SPA located in the bottom subslot (1) of the MSC that is installed in slot 4 of the Cisco 7304 router.

The interface advertises full-duplex mode, 1000-Mbps speed, and flow control.

```
! Enter global configuration mode
!
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface gigabitethernet 4/1/0
!
! Configure the interface for fiber media
!
Router(config-if)# media-type gbic
!
! Disable autonegotiation on a fiber interface
!
Router(config-if)# negotiation auto
```