CHAPTER 10

Configuring Interface Characteristics

This chapter defines the types of interfaces on the Catalyst 2960 switch and describes how to configure them.

The chapter consists of these sections:

Note For complete syntax and usage information for the commands used in this chapter, see the switch command reference for this release and the online *Cisco IOS Interface Command Reference, Release 12.2.*

Understanding Interface Types

This section describes the different types of interfaces supported by the switch with references to chapters that contain more detailed information about configuring these interface types. The rest of the chapter describes configuration procedures for physical interface characteristics.

These sections describe the interface types:

Port-Based VLANs

A VLAN is a switched network that is logically segmented by function, team, or application, without regard to the physical location of the users. For more information about VLANs, see Chapter 12, "Configuring VLANs." Packets received on a port are forwarded only to ports that belong to the same VLAN as the receiving port. Network devices in different VLANs cannot communicate with one another without a Layer 3 device to route traffic between the VLANs.

VLAN partitions provide hard firewalls for traffic in the VLAN, and each VLAN has its own MAC address table. A VLAN comes into existence when a local port is configured to be associated with the VLAN, when the VLAN Trunking Protocol (VTP) learns of its existence from a neighbor on a trunk, or when a user creates a VLAN.

To configure normal-range VLANs (VLAN IDs 1 to 1005), use the **vlan** *vlan-id* global configuration command to enter config-vlan mode or the **vlan database** privileged EXEC command to enter VLAN database configuration mode. The VLAN configurations for VLAN IDs 1 to 1005 are saved in the VLAN database. To configure extended-range VLANs (VLAN IDs 1006 to 4094), you must use config-vlan mode with VTP mode set to transparent. Extended-range VLANs are not added to the VLAN database. When VTP mode is transparent, the VTP and VLAN configuration is saved in the switch running configuration, and you can save it in the switch startup configuration file by entering the **copy running-config startup-config** privileged EXEC command.

Add ports to a VLAN by using the **switchport** interface configuration commands:

- Identify the interface.
- For a trunk port, set trunk characteristics, and if desired, define the VLANs to which it can belong.
- For an access port, set and define the VLAN to which it belongs.

Switch Ports

Switch ports are Layer 2-only interfaces associated with a physical port. Switch ports belong to one or more VLANs. A switch port can be an access port or a trunk port. You can configure a port as an access port or trunk port or let the Dynamic Trunking Protocol (DTP) operate on a per-port basis to set the switchport mode by negotiating with the port on the other end of the link. Switch ports are used for managing the physical interface and associated Layer 2 protocols.

Configure switch ports by using the **switchport** interface configuration commands.

For detailed information about configuring access port and trunk port characteristics, see Chapter 12, "Configuring VLANs."

Access Ports

An access port belongs to and carries the traffic of only one VLAN (unless it is configured as a voice VLAN port). Traffic is received and sent in native formats with no VLAN tagging. Traffic arriving on an access port is assumed to belong to the VLAN assigned to the port. If an access port receives a tagged packet (IEEE 802.1Q tagged), the packet is dropped, and the source address is not learned.

Two types of access ports are supported:

- Static access ports are manually assigned to a VLAN (or through a RADIUS server for use with IEEE 802.1x. For more information, see the "Using IEEE 802.1x Authentication with VLAN Assignment" section on page 9-9.)
- VLAN membership of dynamic access ports is learned through incoming packets. By default, a dynamic access port is not a member of any VLAN, and forwarding to and from the port is enabled only when the VLAN membership of the port is discovered. Dynamic access ports on the switch are assigned to a VLAN by a VLAN Membership Policy Server (VMPS). The VMPS can be a Catalyst 6500 series switch; the Catalyst 2960 switch cannot be a VMPS server.

You can also configure an access port with an attached Cisco IP Phone to use one VLAN for voice traffic and another VLAN for data traffic from a device attached to the phone. For more information about voice VLAN ports, see Chapter 14, "Configuring Voice VLAN."

Trunk Ports

A trunk port carries the traffic of multiple VLANs and by default is a member of all VLANs in the VLAN database. Only IEEE 802.1Q trunk ports are supported.

An IEEE 802.1Q trunk port supports simultaneous tagged and untagged traffic. An IEEE 802.1Q trunk port is assigned a default port VLAN ID (PVID), and all untagged traffic travels on the port default PVID. All untagged traffic and tagged traffic with a NULL VLAN ID are assumed to belong to the port default PVID. A packet with a VLAN ID equal to the outgoing port default PVID is sent untagged. All other traffic is sent with a VLAN tag.

Although by default, a trunk port is a member of every VLAN known to the VTP, you can limit VLAN membership by configuring an allowed list of VLANs for each trunk port. The list of allowed VLANs does not affect any other port but the associated trunk port. By default, all possible VLANs (VLAN ID 1 to 4094) are in the allowed list. A trunk port can become a member of a VLAN only if VTP knows of the VLAN and if the VLAN is in the enabled state. If VTP learns of a new, enabled VLAN and the VLAN is in the allowed list for a trunk port, the trunk port automatically becomes a member of that VLAN and traffic is forwarded to and from the trunk port for that VLAN. If VTP learns of a new, enabled VLAN that is not in the allowed list for a trunk port, the port does not become a member of the VLAN, and no traffic for the VLAN is forwarded to or from the port.

For more information about trunk ports, see Chapter 12, "Configuring VLANs."

EtherChannel Port Groups

EtherChannel port groups treat multiple switch ports as one switch port. These port groups act as a single logical port for high-bandwidth connections between switches or between switches and servers. An EtherChannel balances the traffic load across the links in the channel. If a link within the EtherChannel fails, traffic previously carried over the failed link changes to the remaining links. You can group multiple trunk ports into one logical trunk port or multiple access ports into one logical access port. Most protocols operate over either single ports or aggregated switch ports and do not recognize the physical ports within the port group. Exceptions are the DTP, the Cisco Discovery Protocol (CDP), and the Port Aggregation Protocol (PAgP), which operate only on physical ports.

When you configure an EtherChannel, you create a port-channel logical interface and assign an interface to the EtherChannel. Use the **channel-group** interface configuration command to dynamically create the port-channel logical interface. This command binds the physical and logical ports together. For more information, see Chapter 28, "Configuring EtherChannels."

Dual-Purpose Uplink Ports

Some Catalyst 2960 switches support dual-purpose uplink ports. Each uplink port is considered as a single interface with dual front ends—an RJ-45 connector and an small form-factor pluggable (SFP) module connector. The dual front ends are not redundant interfaces, and the switch activates only one connector of the pair.

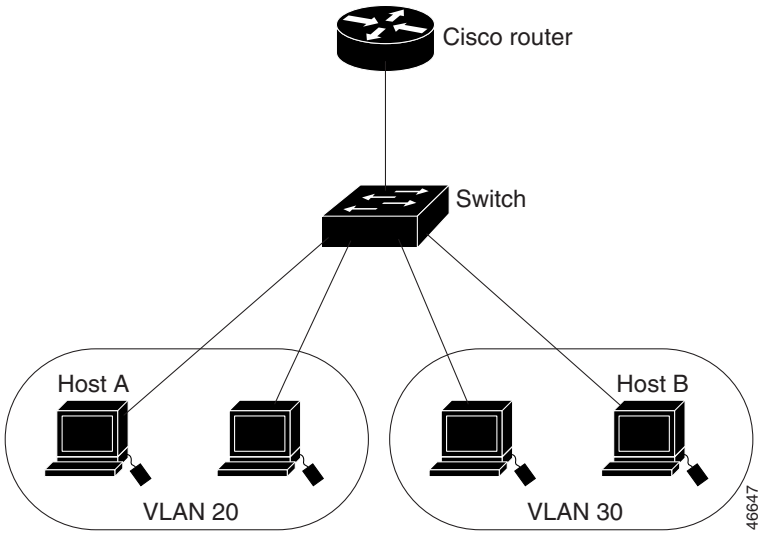
By default, the switch dynamically selects the interface type that first links up. However, you can use the **media-type** interface configuration command to manually select the RJ-45 connector or the SFP module connector. For information about configuring speed and duplex settings for a dual-purpose uplink, see the "Setting the Interface Speed and Duplex Parameters" section on page 10-13.

Each uplink port has two LEDs: one shows the status of the RJ-45 port, and one shows the status of the SFP module port. The port LED is on for whichever connector is active. For more information about the LEDs, see the hardware installation guide.

Connecting Interfaces

Devices within a single VLAN can communicate directly through any switch. Ports in different VLANs cannot exchange data without going through a routing device. In the configuration shown in Figure 10-1, when Host A in VLAN 20 sends data to Host B in VLAN 30, the data must go from Host A to the switch, to the router, back to the switch, and then to Host B.

Figure 10-1 Connecting VLANs with Layer 2 Switches



Using Interface Configuration Mode

The switch supports these interface types:

- Physical ports—switch ports
- VLANs—switch virtual interfaces
- Port channels—EtherChannel interfaces

You can also configure a range of interfaces (see the "Configuring a Range of Interfaces" section on page 10-6).

To configure a physical interface (port), specify the interface type, module number, and switch port number, and enter interface configuration mode.

- Type—Fast Ethernet (fastethernet or fa) for 10/100 Mb/s Ethernet, Gigabit Ethernet (gigabitethernet or gi) for 10/100/1000 Mb/s Ethernet ports, or small form-factor pluggable (SFP) module Gigabit Ethernet interfaces.
- Module number—The module or slot number on the switch (always 0 on the Catalyst 2960 switch).
- Port number—The interface number on the switch. The port numbers always begin at 1, starting with the far left port when facing the front of the switch, for example, fastethernet0/1 or gigabitethernet0/1. If there is more than one interface type (for example, 10/100 ports and SFP module ports, the port numbers restart with the second interface type: gigabitethernet0/1. For a switch with 10/100/1000 ports and SFP module ports, SFP module ports are numbered consecutively following the 10/100/1000 ports.

You can identify physical interfaces by physically checking the interface location on the switch. You can also use the **show** privileged EXEC commands to display information about a specific interface or all the interfaces on the switch. The remainder of this chapter primarily provides physical interface configuration procedures.

Procedures for Configuring Interfaces

These general instructions apply to all interface configuration processes.

Step 1 Enter the **configure terminal** command at the privileged EXEC prompt:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
```

Step 2 Enter the **interface** global configuration command. Identify the interface type and the number of the connector. In this example, Gigabit Ethernet port 1 is selected:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)#
```

Note You do not need to add a space between the interface type and interface number. For example, in the preceding line, you can specify either **gigabitethernet 0/1**, **gigabitethernet0/1**, **gi 0/1**, or **gi0/1**.

Step 3 Follow each **interface** command with the interface configuration commands that the interface requires. The commands that you enter define the protocols and applications that will run on the interface. The commands are collected and applied to the interface when you enter another interface command or enter **end** to return to privileged EXEC mode.

You can also configure a range of interfaces by using the **interface range** or **interface range macro** global configuration commands. Interfaces configured in a range must be the same type and must be configured with the same feature options.

Step 4 After you configure an interface, verify its status by using the **show** privileged EXEC commands listed in the "Monitoring and Maintaining the Interfaces" section on page 10-18.

Enter the **show interfaces** privileged EXEC command to see a list of all interfaces on or configured for the switch. A report is provided for each interface that the device supports or for the specified interface.

Configuring a Range of Interfaces

You can use the **interface range** global configuration command to configure multiple interfaces with the same configuration parameters. When you enter the interface-range configuration mode, all command parameters that you enter are attributed to all interfaces within that range until you exit this mode.

Beginning in privileged EXEC mode, follow these steps to configure a range of interfaces with the same parameters:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface range** {*port-range* | **macro** *macro_name*}	Specify the range of interfaces (VLANs or physical ports) to be configured, and enter interface-range configuration mode. • You can use the **interface range** command to configure up to five port ranges or a previously defined macro. • The **macro** variable is explained in the "Configuring and Using Interface Range Macros" section on page 10-8. • In a comma-separated *port-range*, you must enter the interface type for each entry and enter spaces before and after the comma. • In a hyphen-separated *port-range*, you do not need to re-enter the interface type, but you must enter a space before the hyphen.
Step 3		Use the normal configuration commands to apply the configuration parameters to all interfaces in the range. Each command is executed as it is entered.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show interfaces** [*interface-id*]	Verify the configuration of the interfaces in the range.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

When using the **interface range** global configuration command, note these guidelines:

- Valid entries for *port-range*:
  - **vlan** *vlan-ID*, where the VLAN ID is 1 to 4094

    Note Although the command-line interface shows options to set multiple VLANs, these options are not supported.

  - **fastethernet** module/{first *port*} - {*last port*}, where the module is always 0
  - **gigabitethernet** module/{*first port*} - {*last port*}, where the module is always 0
  - **port-channel** *port-channel-number - port-channel-number*, where the *port-channel-number* is 1 to 6

    Note When you use the **interface range** command with port channels, the first and last port-channel number must be active port channels.

- You must add a space between the first interface number and the hyphen when using the **interface range** command. For example, the command **interface range gigabitethernet0/1 - 4** is a valid range; the command **interface range gigabitethernet0/1-4** is not a valid range.
- The **interface range** command only works with VLAN interfaces that have been configured with the **interface vlan** command. The **show running-config** privileged EXEC command displays the configured VLAN interfaces. VLAN interfaces not displayed by the **show running-config** command cannot be used with the **interface range** command.
- All interfaces defined in a range must be the same type (all Fast Ethernet ports, all Gigabit Ethernet ports, all EtherChannel ports, or all VLANs), but you can enter multiple ranges in a command.

This example shows how to use the **interface range** global configuration command to set the speed on ports 1 to 4 to 100 Mb/s:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet0/1 - 4
Switch(config-if-range)# speed 100
```

This example shows how to use a comma to add different interface type strings to the range to enable Fast Ethernet ports 1 to 3 and Gigabit Ethernet ports 1 and 2 to receive flow-control pause frames:

```
Switch# configure terminal
Switch(config)# interface range fastethernet0/1 - 3, gigabitethernet0/1 - 2
Switch(config-if-range)# flowcontrol receive on
```

If you enter multiple configuration commands while you are in interface-range mode, each command is executed as it is entered. The commands are not batched and executed after you exit interface-range mode. If you exit interface-range configuration mode while the commands are being executed, some commands might not be executed on all interfaces in the range. Wait until the command prompt reappears before exiting interface-range configuration mode.

Configuring and Using Interface Range Macros

You can create an interface range macro to automatically select a range of interfaces for configuration. Before you can use the **macro** keyword in the **interface range macro** global configuration command string, you must use the **define interface-range** global configuration command to define the macro.

Beginning in privileged EXEC mode, follow these steps to define an interface range macro:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**define interface-range** *macro_name interface-range*	Define the interface-range macro, and save it in NVRAM. • The *macro_name* is a 32-character maximum character string. • A macro can contain up to five comma-separated interface ranges. • Each *interface-range* must consist of the same port type.
Step 3	**interface range macro** *macro_name*	Select the interface range to be configured using the values saved in the interface-range macro called *macro_name.* You can now use the normal configuration commands to apply the configuration to all interfaces in the defined macro.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show running-config | include define**	Show the defined interface range macro configuration.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Use the **no define interface-range** *macro_name* global configuration command to delete a macro.

When using the **define interface-range** global configuration command, note these guidelines:

- Valid entries for *interface-range*:
  - **vlan** *vlan-ID*, where the VLAN ID is 1 to 4094

    Note Although the command-line interface shows options to set multiple VLANs, these options are not supported.

  - **fastethernet** module/{first *port*} - {*last port*}, where the module is always 0
  - **gigabitethernet** module/{*first port*} - {*last port*}, where the module is always 0
  - **port-channel** *port-channel-number - port-channel-number*, where the *port-channel-number* is 1 to 6.

    Note When you use the interface ranges with port channels, the first and last port-channel number must be active port channels.

- You must add a space between the first interface number and the hyphen when entering an *interface-range*. For example, **gigabitethernet0/1 - 4** is a valid range; **gigabitethernet0/1-4** is not a valid range.
- The VLAN interfaces must have been configured with the **interface vlan** command. The **show running-config** privileged EXEC command displays the configured VLAN interfaces. VLAN interfaces not displayed by the **show running-config** command cannot be used as *interface-ranges*.

- All interfaces defined as in a range must be the same type (all Fast Ethernet ports, all Gigabit Ethernet ports, all EtherChannel ports, or all VLANs), but you can combine multiple interface types in a macro.

This example shows how to define an interface-range named *enet_list* to include ports 1 and 2 and to verify the macro configuration:

```
Switch# configure terminal
Switch(config)# define interface-range enet_list gigabitethernet0/1 - 2
Switch(config)# end
Switch# show running-config | include define
define interface-range enet_list GigabitEthernet0/1 - 2
```

This example shows how to create a multiple-interface macro named *macro1*:

```
Switch# configure terminal
Switch(config)# define interface-range macro1 fastethernet0/1 - 2, gigabitethernet0/1 - 2
Switch(config)# end
```

This example shows how to enter interface-range configuration mode for the interface-range macro *enet_list*:

```
Switch# configure terminal
Switch(config)# interface range macro enet_list
Switch(config-if-range)#
```

This example shows how to delete the interface-range macro *enet_list* and to verify that it was deleted.

```
Switch# configure terminal
Switch(config)# no define interface-range enet_list
Switch(config)# end
Switch# show run | include define
Switch#
```

Configuring Ethernet Interfaces

These sections contain this configuration information:

Default Ethernet Interface Configuration

Table 10-1 shows the Ethernet interface default configuration. For more details on the VLAN parameters listed in the table, see Chapter 12, "Configuring VLANs." For details on controlling traffic to the port, see Chapter 19, "Configuring Port-Based Traffic Control."

Table 10-1 Default Layer 2 Ethernet Interface Configuration

Feature	Default Setting
Allowed VLAN range	VLANs 1 to 4094.
Default VLAN (for access ports)	VLAN 1.
Native VLAN (for IEEE 802.1Q trunks)	VLAN 1.
VLAN trunking	Switchport mode dynamic auto (supports DTP).
Port enable state	All ports are enabled.
Port description	None defined.
Speed	Autonegotiate.
Duplex mode	Autonegotiate.
Flow control	Flow control is set to **receive**: **off**. It is always off for sent packets.
EtherChannel (PAgP)	Disabled on all Ethernet ports. See Chapter 28, "Configuring EtherChannels."
Port blocking (unknown multicast and unknown unicast traffic)	Disabled (not blocked). See the "Configuring Port Blocking" section on page 19-7.
Broadcast, multicast, and unicast storm control	Disabled. See the "Default Storm Control Configuration" section on page 19-3.
Protected port	Disabled. See the "Configuring Protected Ports" section on page 19-5.
Port security	Disabled. See the "Default Port Security Configuration" section on page 19-10.
Port Fast	Disabled. See the "Default Optional Spanning-Tree Configuration" section on page 17-9.
Auto-MDIX	Enabled. **Note** The switch might not support a pre-standard powered device—such as Cisco IP phones and access points that do not fully support IEEE 802.3af—if that powered device is connected to the switch through a crossover cable. This is regardless of whether auto-MIDX is enabled on the switch port.
Keepalive messages	Disabled on SFP module ports; enabled on all other ports.

Setting the Type of a Dual-Purpose Uplink Port

Some Catalyst 2960 switches support dual-purpose uplink ports. For more information, see the "Dual-Purpose Uplink Ports" section on page 10-4.

Beginning in privileged EXEC mode, follow these steps to select which dual-purpose uplink to activate so that you can set the speed and duplex. This procedure is optional.

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the dual-purpose uplink port to be configured, and enter interface configuration mode.
Step 3	**media-type** {**auto-select** | **rj45** | **sfp**}	Select the interface and type of a dual-purpose uplink port. The keywords have these meanings: • **auto-select**—The switch dynamically selects the type. When link up is achieved, the switch disables the other type until the active link goes down. When the active link goes down, the switch enables both types until one of them links up. In auto-select mode, the switch configures both types with autonegotiation of speed and duplex (the default). Depending on the type of installed SFP module, the switch might not be able to dynamically select it. For more information, see the information that follows this procedure. • **rj45**—The switch disables the SFP module interface. If you connect a cable to this port, it cannot attain a link even if the RJ-45 side is down or is not connected. In this mode, the dual-purpose port behaves like a 10/100/1000BASE-TX interface. You can configure the speed and duplex settings consistent with this interface type. • **sfp**—The switch disables the RJ-45 interface. If you connect a cable to this port, it cannot attain a link even if the SFP module side is down or if the SFP module is not present. Based on the type of installed SFP module, you can configure the speed and duplex settings consistent with this interface type. For information about setting the speed and duplex, see the "Speed and Duplex Configuration Guidelines" section on page 10-12.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show interfaces** *interface-id* **transceiver properties**	Verify your setting.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To return to the default setting, use the **no media-type** interface configuration command.

When you change the interface type, the speed and duplex configurations are removed. The switch configures both types to autonegotiate speed and duplex (the default). If you configure **auto-select**, you cannot configure the **speed** and **duplex** interface configuration commands.

When the switch powers on or when you enable a dual-purpose uplink port through the **shutdown** and the **no shutdown** interface configuration commands, the switch gives preference to the SFP module interface. In all other situations, the switch selects the active link based on which type first links up.

The Catalyst 2960 switch operates with 100BASE-*x* (where -*x* is -BX, -FX-FE, -LX) SFP modules as follows:

- When the 100BASE -*x* SFP module is inserted into the module slot and there is no link on the RJ-45 side, the switch disables the RJ-45 interface and selects the SFP module interface. This is the behavior even if there is no cable connected and if there is no link on the SFP module side.
- When the 100BASE-*x* SFP module is inserted and there is a link on the RJ-45 side, the switch continues with that link. If the link goes down, the switch disables the RJ-45 side and selects the SFP module interface.
- When the 100BASE-*x* SFP module is removed, the switch again dynamically selects the type (**auto-select**) and re-enables the RJ-45 side.

The switch does not have this behavior with 100BASE-FX-GE SFP modules.

Configuring Interface Speed and Duplex Mode

Ethernet interfaces on the switch operate at 10, 100, or 1000 Mb/s and in either full- or half-duplex mode. In full-duplex mode, two stations can send and receive traffic at the same time. Normally, 10-Mb/s ports operate in half-duplex mode, which means that stations can either receive or send traffic.

Switch models include combinations of Fast Ethernet (10/100-Mb/s) ports, Gigabit Ethernet (10/100/1000-Mb/s) ports, and small form-factor pluggable (SFP) module slots supporting SFP modules.

These sections describe how to configure the interface speed and duplex mode:

- Speed and Duplex Configuration Guidelines, page 10-12
- Setting the Interface Speed and Duplex Parameters, page 10-13

Speed and Duplex Configuration Guidelines

When configuring an interface speed and duplex mode, note these guidelines:

- Fast Ethernet (10/100-Mb/s) ports support all speed and duplex options.
- Gigabit Ethernet (10/100/1000-Mb/s) ports support all speed options and all duplex options (auto, half, and full). However, Gigabit Ethernet ports operating at 1000 Mb/s do not support half-duplex mode.
- For SFP module ports, the speed and duplex CLI options change depending on the SFP module type:
  - The 1000BASE-*x* (where -*x* is -BX, -CWDM, -LX, -SX, and -ZX) SFP module ports support the **nonegotiate** keyword in the **speed** interface configuration command. Duplex options are not supported.
  - The 1000BASE-T SFP module ports support the same speed and duplex options as the 10/100/1000-Mb/s ports.
  - The 100BASE-*x* (where -*x* is -BX, -CWDM, -LX, -SX, and -ZX) SFP module ports support only 100 Mb/s. These modules support full- and half- duplex options but do not support autonegotiation.

For information about which SFP modules are supported on your switch, see the product release notes.

- If both ends of the line support autonegotiation, we highly recommend the default setting of **auto** negotiation.
- If one interface supports autonegotiation and the other end does not, configure duplex and speed on both interfaces; do not use the **auto** setting on the supported side.
- When STP is enabled and a port is reconfigured, the switch can take up to 30 seconds to check for loops. The port LED is amber while STP reconfigures.

Caution Changing the interface speed and duplex mode configuration might shut down and re-enable the interface during the reconfiguration.

Setting the Interface Speed and Duplex Parameters

Beginning in privileged EXEC mode, follow these steps to set the speed and duplex mode for a physical interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the physical interface to be configured, and enter interface configuration mode.
Step 3	**speed** {**10** | **100** | **1000** | **auto** [**10** | **100** | **1000**] | **nonegotiate**}	Enter the appropriate speed parameter for the interface: • Enter **10**, **100**, or **1000** to set a specific speed for the interface. The **1000** keyword is available only for 10/100/1000 Mb/s ports. • Enter **auto** to enable the interface to autonegotiate speed with the connected device. If you use the **10**, **100**, or the **1000** keywords with the **auto** keyword, the port autonegotiates only at the specified speeds. • The **nonegotiate** keyword is available only for SFP module ports. SFP module ports operate only at 1000 Mb/s but can be configured to not negotiate if connected to a device that does not support autonegotiation. For more information about speed settings, see the "Speed and Duplex Configuration Guidelines" section on page 10-12.
Step 4	**duplex** {**auto** | **full** | **half**}	Enter the duplex parameter for the interface. Enable half-duplex mode (for interfaces operating only at 10 or 100 Mb/s). You cannot configure half-duplex mode for interfaces operating at 1000 Mb/s. For more information about duplex settings, see the "Speed and Duplex Configuration Guidelines" section on page 10-12.
Step 5	**end**	Return to privileged EXEC mode.
Step 6	**show interfaces** *interface-id*	Display the interface speed and duplex mode configuration.
Step 7	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Use the **no speed** and **no duplex** interface configuration commands to return the interface to the default speed and duplex settings (autonegotiate). To return all interface settings to the defaults, use the **default interface** *interface-id* interface configuration command.

This example shows how to set the interface speed to 10 Mb/s and the duplex mode to half on a 10/100 Mb/s port:

```
Switch# configure terminal
Switch(config)# interface fasttethernet0/3
Switch(config-if)# speed 10
Switch(config-if)# duplex half
```

This example shows how to set the interface speed to 100 Mb/s on a 10/100/1000 Mb/s port:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# speed 100
```

Note For interfaces gi0/1 to gi0/16, speed and duplex settings do not apply, as they are only internal server-facing interfaces. For interfaces 17 to 20, speed and duplex do not apply when they are operating in SFP module mode. For interfaces gi0/23 and gi0/24, speed and duplex do not apply when configured for media-type internal. For more information, see the "Access Ports" section on page 10-2.

Configuring IEEE 802.3x Flow Control

Flow control enables connected Ethernet ports to control traffic rates during congestion by allowing congested nodes to pause link operation at the other end. If one port experiences congestion and cannot receive any more traffic, it notifies the other port by sending a pause frame to stop sending until the condition clears. Upon receipt of a pause frame, the sending device stops sending any data packets, which prevents any loss of data packets during the congestion period.

Note Catalyst 2960 ports can receive, but not send, pause frames.

You use the **flowcontrol** interface configuration command to set the interface's ability to **receive** pause frames to **on**, **off**, or **desired**. The default state is **off**.

When set to **desired**, an interface can operate with an attached device that is required to send flow-control packets or with an attached device that is not required to but can send flow-control packets.

These rules apply to flow control settings on the device:

- **receive on** (or **desired**): The port cannot send pause frames but can operate with an attached device that is required to or can send pause frames; the port can receive pause frames.
- **receive off**: Flow control does not operate in either direction. In case of congestion, no indication is given to the link partner, and no pause frames are sent or received by either device.

Note For details on the command settings and the resulting flow control resolution on local and remote ports, see the **flowcontrol** interface configuration command in the command reference for this release.

Beginning in privileged EXEC mode, follow these steps to configure flow control on an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode
Step 2	**interface** *interface-id*	Specify the physical interface to be configured, and enter interface configuration mode.
Step 3	**flowcontrol** {**receive**} {**on** | **off** | **desired**}	Configure the flow control mode for the port.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show interfaces** *interface-id*	Verify the interface flow control settings.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable flow control, use the **flowcontrol receive off** interface configuration command.

This example shows how to turn on flow control on a port:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# flowcontrol receive on
Switch(config-if)# end
```

Configuring Auto-MDIX on an Interface

When automatic medium-dependent interface crossover (auto-MDIX) is enabled on an interface, the interface automatically detects the required cable connection type (straight through or crossover) and configures the connection appropriately. When connecting switches without the auto-MDIX feature, you must use straight-through cables to connect to devices such as servers, workstations, or routers and crossover cables to connect to other switches or repeaters. With auto-MDIX enabled, you can use either type of cable to connect to other devices, and the interface automatically corrects for any incorrect cabling. For more information about cabling requirements, see the hardware installation guide.

Auto-MDIX is enabled by default. When you enable auto-MDIX, you must also set the interface speed and duplex to **auto** so that the feature operates correctly. Auto-MDIX is supported on all 10/100 and 10/100/1000-Mb/s interfaces. It is not supported on 1000BASE-SX or -LX SFP module interfaces.

Table 10-2 shows the link states that result from auto-MDIX settings and correct and incorrect cabling.

Table 10-2 Link Conditions and Auto-MDIX Settings

Local Side Auto-MDIX	Remote Side Auto-MDIX	With Correct Cabling	With Incorrect Cabling
On	On	Link up	Link up
On	Off	Link up	Link up
Off	On	Link up	Link up
Off	Off	Link up	Link down

Beginning in privileged EXEC mode, follow these steps to configure auto-MDIX on an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode
Step 2	**interface** *interface-id*	Specify the physical interface to be configured, and enter interface configuration mode.
Step 3	**speed auto**	Configure the interface to autonegotiate speed with the connected device.
Step 4	**duplex auto**	Configure the interface to autonegotiate duplex mode with the connected device.
Step 5	**mdix auto**	Enable auto-MDIX on the interface.
Step 6	**end**	Return to privileged EXEC mode.
Step 7	**show controllers ethernet-controller** *interface-id* **phy**	Verify the operational state of the auto-MDIX feature on the interface.
Step 8	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable auto-MDIX, use the **no mdix auto** interface configuration command.

This example shows how to enable auto-MDIX on a port:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# speed auto
Switch(config-if)# duplex auto
Switch(config-if)# mdix auto
Switch(config-if)# end
```

Adding a Description for an Interface

You can add a description about an interface to help you remember its function. The description appears in the output of these privileged EXEC commands: **show configuration**, **show running-config**, and **show interfaces**.

Beginning in privileged EXEC mode, follow these steps to add a description for an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the interface for which you are adding a description, and enter interface configuration mode.
Step 3	**description** *string*	Add a description (up to 240 characters) for an interface.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show interfaces** *interface-id* **description** or **show running-config**	Verify your entry.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Use the **no description** interface configuration command to delete the description.

This example shows how to add a description on a port and how to verify the description:

```
Switch# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# description Connects to Marketing
Switch(config-if)# end
Switch# show interfaces gigabitethernet0/2 description
Interface Status         Protocol Description
Gi0/2   admin down     down     Connects to Marketing
```

Configuring the System MTU

The default maximum transmission unit (MTU) size for frames received and transmitted on all interfaces on the switch is 1500 bytes. You can increase the MTU size for all interfaces operating at 10 or 100 Mb/s by using the **system mtu** global configuration command. You can increase the MTU size to support jumbo frames on all Gigabit Ethernet interfaces by using the **system mtu jumbo** global configuration command.

Gigabit Ethernet ports are not affected by the **system mtu** command; 10/100 ports are not affected by the **system jumbo mtu** command. If you do not configure the **system mtu jumbo** command, the setting of the **system mtu** command applies to all Gigabit Ethernet interfaces.

You cannot set the MTU size for an individual interface; you set it for all 10/100 or all Gigabit Ethernet interfaces on the switch. When you change the system or jumbo MTU size, you must reset the switch before the new configuration takes effect.

Frames sizes that can be received by the switch CPU are limited to 1998 bytes, no matter what value was entered with the **system mtu** or **system mtu jumbo** commands. Although frames that are forwarded are typically not received by the CPU, in some cases packets are sent to the CPU, such as traffic sent to control traffic, SNMP, or Telnet.

Note If Gigabit Ethernet interfaces are configured to accept frames greater than the 10/100 interfaces, jumbo frames received on a Gigabit Ethernet interface and sent on a 10/100 interface are dropped.

Beginning in privileged EXEC mode, follow these steps to change MTU size for all 10/100 or Gigabit Ethernet interfaces:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**system mtu** *bytes*	(Optional) Change the MTU size for all interfaces on the switch that are operating at 10 or 100 Mb/s. The range is 1500 to 1998 bytes; the default is 1500 bytes.
Step 3	**system mtu jumbo** *bytes*	(Optional) Change the MTU size for all Gigabit Ethernet interfaces on the switch. The range is 1500 to 9000 bytes; the default is 1500 bytes.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**copy running-config startup-config**	Save your entries in the configuration file.
Step 6	**reload**	Reload the operating system.

If you enter a value that is outside the allowed range for the specific type of interface, the value is not accepted.

Once the switch reloads, you can verify your settings by entering the **show system mtu** privileged EXEC command.

This example shows how to set the maximum packet size for a Gigabit Ethernet port to 1800 bytes:

```
Switch(config)# system jumbo mtu 1800
Switch(config)# exit
Switch# reload
```

This example shows the response when you try to set Gigabit Ethernet interfaces to an out-of-range number:

```
Switch(config)# system mtu jumbo 25000
                                 ^
% Invalid input detected at '^' marker.
```

Monitoring and Maintaining the Interfaces

These sections contain interface monitoring and maintenance information:

- Monitoring Interface Status, page 10-18
- Clearing and Resetting Interfaces and Counters, page 10-19
- Shutting Down and Restarting the Interface, page 10-19

Monitoring Interface Status

Commands entered at the privileged EXEC prompt display information about the interface, including the versions of the software and the hardware, the configuration, and statistics about the interfaces. Table 10-3 lists some of these interface monitoring commands. (You can display the full list of **show** commands by using the **show ?** command at the privileged EXEC prompt.) These commands are fully described in the *Cisco IOS Interface Command Reference, Release 12.2*.

Table 10-3 Show Commands for Interfaces

Command	Purpose
show interfaces [*interface-id*]	Display the status and configuration of all interfaces or a specific interface.
show interfaces *interface-id* **status** [**err-disabled**]	Display interface status or a list of interfaces in an error-disabled state.
show interfaces [*interface-id*] **switchport**	Display administrative and operational status of switching ports.
show interfaces [*interface-id*] **description**	Display the description configured on an interface or all interfaces and the interface status.
show ip interface [*interface-id*]	Display the usability status of all interfaces configured for IP routing or the specified interface.
show interface [*interface-id*] **stats**	Display the input and output packets by the switching path for the interface.
show interfaces transceiver properties	(Optional) Display speed and duplex settings on the interface.

Table 10-3 Show Commands for Interfaces (continued)

Command	Purpose
show interfaces [*interface-id*] [{**transceiver properties** | **detail**}] *module number*]	Display physical and operational status about an SFP module.
show running-config interface [*interface-id*]	Display the running configuration in RAM for the interface.
show version	Display the hardware configuration, software version, the names and sources of configuration files, and the boot images.
show controllers ethernet-controller *interface-id* **phy**	Display the operational state of the auto-MDIX feature on the interface.

Clearing and Resetting Interfaces and Counters

Table 10-4 lists the privileged EXEC mode **clear** commands that you can use to clear counters and reset interfaces.

Table 10-4 Clear Commands for Interfaces

Command	Purpose
clear counters [*interface-id*]	Clear interface counters.
clear interface *interface-id*	Reset the hardware logic on an interface.
clear line [*number* | **console 0** | **vty** *number*]	Reset the hardware logic on an asynchronous serial line.

To clear the interface counters shown by the **show interfaces** privileged EXEC command, use the **clear counters** privileged EXEC command. The **clear counters** command clears all current interface counters from the interface unless you specify optional arguments that clear only a specific interface type from a specific interface number.

Note The **clear counters** privileged EXEC command does not clear counters retrieved by using Simple Network Management Protocol (SNMP), but only those seen with the **show interface** privileged EXEC command.

Shutting Down and Restarting the Interface

Shutting down an interface disables all functions on the specified interface and marks the interface as unavailable on all monitoring command displays. This information is communicated to other network servers through all dynamic routing protocols. The interface is not mentioned in any routing updates.

Beginning in privileged EXEC mode, follow these steps to shut down an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** {**vlan** *vlan-id*} | {{**fastethernet** | **gigabitethernet**} *interface-id*} | {**port-channel** *port-channel-number*}	Select the interface to be configured.
Step 3	**shutdown**	Shut down an interface.

	Command	Purpose
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show running-config**	Verify your entry.

Use the **no shutdown** interface configuration command to restart the interface.

To verify that an interface is disabled, enter the **show interfaces** privileged EXEC command. A disabled interface is shown as *administratively down* in the display.