CHAPTER 9

Configuring Interface Characteristics

This chapter defines the types of interfaces on the switch and describes how to configure them. The chapter has these sections:

Note For complete syntax and usage information for the commands used in this chapter, refer to the *Catalyst 2950 Desktop Switch Command Reference* for this release and the online *Cisco IOS Interface Command Reference for Release 12.1.*

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 are included:

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 13, "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 adds a VLAN to the local VTP database.

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 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) when the enhanced software image is installed, 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. A switch port can be either 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 determine if a switch port should be an access port or a trunk port by negotiating with the port on the other end of the link.

Configure switch ports (access ports and trunk ports) by using the **switchport** interface configuration commands. For detailed information about configuring access ports and trunk ports, see Chapter 13, “Configuring VLANs.”

Access Ports

An access port belongs to and carries the traffic of only one VLAN. 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. An access port can forward a tagged packet (802.1P and 802.1Q).

Two types of access ports are supported:

- Static access ports are manually assigned to a VLAN.
- VLAN membership of dynamic access ports is learned through incoming packets. By default, a dynamic access port is a member of no VLAN, and forwarding to and from the port is enabled only when the VLAN membership of the port is discovered. In the Catalyst 2950 switch, dynamic access ports are assigned to a VLAN by a VLAN Membership Policy Server (VMPS). The VMPS can be a Catalyst 6000 series switch; the Catalyst 2950 switch does not support the function of a VMPS.

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 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 when the enhanced software image is installed and 1 to 1005 when the standard software image is installed) are in the allowed list. A trunk port can only become a member of a VLAN if VTP knows of the VLAN and 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.

Note VLAN 1 cannot be excluded from the allowed list.

For more information about trunk ports, see Chapter 13, “Configuring VLANs.”

EtherChannel Port Groups

EtherChannel port groups provide the ability to 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 group 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.

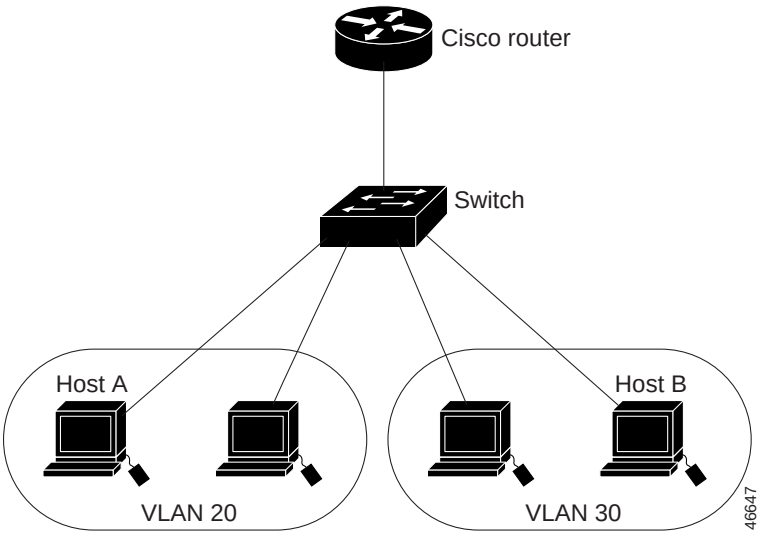
When you configure an EtherChannel, you create a port-channel logical interface and assign an interface to the EtherChannel. In Layer 2 interfaces, the logical interface is dynamically created. For Layer 2 interfaces, you manually assign an interface to the EtherChannel by using the **channel-group** interface configuration command. This command binds the physical and logical ports together. For more information, see Chapter 25, “Configuring EtherChannels.”

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 or interface.

With a standard Layer 2 switch, ports in different VLANs have to exchange information through a router. In the configuration shown in Figure 9-1, when Host A in VLAN 20 sends data to Host B in VLAN 30, it must go from Host A to the switch, to the router, back to the switch, and then to Host B.

Figure 9-1 Connecting VLANs with Layer 2 Switches



Using the Interface Command

The Catalyst 2950 switch supports these interface types:

- Physical ports—switch ports
- VLANs—Interfaces
- Port-channels—EtherChannel of interfaces

You can also configure a range of interfaces (see the "Configuring a Range of Interfaces" section on page 9-7).

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

- Type—Fast Ethernet (fastethernet or fa) for 10/100 Ethernet or Gigabit Ethernet (gigabitethernet or gi)
- Slot—The slot number on the switch. On the Catalyst 2950 switch, the slot number is 0.
- Port number—The interface number on the switch. The port numbers always begin at 1, starting at the left when facing the front of the switch, for example, gigabitethernet 0/1, gigabitethernet 0/2. If there is more than one media type (for example, 10/100 ports and Gigabit Ethernet ports), the port number starts again with the second media: fastethernet0/1, fastethernet0/2.

You can identify physical interfaces by physically checking the interface location on the switch. You can also use the IOS **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 interface 0/1 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 your particular interface requires. The commands 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 Interface" section on page 9-16.

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:

```
Switch# show interfaces
Vlan1 is up, line protocol is up
  Hardware is CPU Interface, address is 0030.85f5.7200 (bia 0030.85f5.7200)
  Internet address is 172.20.135.102/27
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output never, 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
     168738 packets input, 12529173 bytes, 0 no buffer
     Received 56994 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     246794 packets output, 23981814 bytes, 0 underruns
     0 output errors, 2 interface resets
     0 output buffer failures, 0 output buffers swapped out
FastEthernet0/1 is down, line protocol is down
  Hardware is Fast Ethernet, address is 0030.85f5.7201 (bia 0030.85f5.7201)
  MTU 1500 bytes, BW 100000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Auto-duplex, Auto-speed
  input flow-control is off, output flow-control is off
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 1d21h, output 1d21h, 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
     20214 packets input, 2753835 bytes, 0 no buffer
     Received 18380 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 254 ignored
     0 watchdog, 16167 multicast, 0 pause input
     0 input packets with dribble condition detected
     20823 packets output, 1481235 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 PAUSE output
     0 output buffer failures, 0 output buffers swapped out

<output truncated>

GigabitEthernet0/1 is up, line protocol is down
  Hardware is Gigabit Ethernet, address is 0030.85f5.7219 (bia 0030.85f5.7219)
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Auto-duplex, Auto-speed
  input flow-control is off, output flow-control is off
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input never, output 2d00h, 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
   1 packets input, 64 bytes, 0 no buffer
   Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 watchdog, 0 multicast, 0 pause input
   0 input packets with dribble condition detected
   1 packets output, 64 bytes, 0 underruns
   0 output errors, 0 collisions, 2 interface resets
   0 babbles, 0 late collision, 0 deferred
   0 lost carrier, 0 no carrier, 0 PAUSE output
   0 output buffer failures, 0 output buffers swapped out
```

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*}	Enter interface range configuration mode by entering the range of interfaces (VLANs or physical ports) to be configured. • 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 9-9. • Each comma-separated *port-range* must consist of the same port type. You do not need to enter spaces before or after the comma. • When you define a range, the space between the first port and the hyphen is required.
Step 3		You can now use the normal configuration commands to apply the configuration parameters to all interfaces in the range.
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 - vlan-ID*
  - **fastethernet** slot/{*first port*} - {*last port*}, where slot is **0**

  - **gigabitethernet** slot/{*first port*} - {*last port*}, where slot is **0**
  - **port-channel** *port-channel-number - port-channel-number*, where *port-channel-number* is from 1 to 6

- You must add a space between the interface numbers and the hyphen when using the **interface range** command. For example, the command **interface range fastethernet 0/1 - 5** is a valid range; the command **interface range fastethernet 0/1-5** is not a valid range.
- The **interface range** command works only 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 in a range must be the same type; that is, all Fast Ethernet ports, all Gigabit Ethernet ports, all EtherChannel ports, or all VLAN interfaces.

This example shows how to use the **interface range** global configuration command to enable Fast Ethernet interfaces 0/1 to 0/5:

```
Switch# configure terminal
Switch(config)# interface range fastethernet0/1 - 5
Switch(config-if-range)# no shutdown
Switch(config-if-range)#
*Oct  6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Oct  6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet0/2, changed state to up
*Oct  6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to up
*Oct  6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet0/4, changed state to up
*Oct  6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet0/5, changed state to up
*Oct  6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/05,
changed state to up
*Oct  6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up
*Oct  6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to up
```

This example shows how to use a comma to add different interface type strings to the range to enable all Fast Ethernet interfaces in the range 0/1 to 0/3 and both Fast Ethernet interfaces 0/7 and 0/8:

```
Switch# configure terminal
Switch(config)# interface range fastethernet0/1 - 3, fastethernet0/7 - 8
Switch(config-if-range)# no shutdown
Switch(config-if-range)#
*Oct  6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Oct  6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/2, changed state to up
*Oct  6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to up
*Oct  6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/7, changed state to up
*Oct  6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/8, changed state to up
*Oct  6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/ 7,
changed state to up
*Oct  6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/ 2,
changed state to up
*Oct  6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/ 4,
changed state to up
```

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 together 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. You do not need to enter spaces before or after the comma. • 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 - vlan-ID*
  - **fastethernet** slot/{*first port*} - {*last port*}, where slot is **0**
  - **gigabitethernet** slot/{*first port*} - {*last port*}, where slot is **0**
  - **port-channel** *port-channel-number - port-channel-number*, where *port-channel-number* is from 1 to 64.
- You must add a space between the interface numbers and the hyphen when entering an *interface-range*. For example, **fastethernet 0/1 - 5** is a valid range; **fastethernet 0/1-5** 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 in a range must be the same type; that is, 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 macro named *enet_list* to select Fast Ethernet ports 1 to 4 and to verify the macro configuration:

```
Switch# configure terminal
Switch(config)# define interface-range enet_list fastethernet0/1 - 4
Switch(config)# end
Switch# show running-config | include define
define interface-range enet_list FastEthernet0/1 - 4
Switch#
```

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

```
Switch# configure terminal
Switch(config)# define interface-range macro1 fastethernet0/1 - 2, fastethernet0/5 - 7
Switch(config)# end
Switch#
```

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 has been deleted.

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

Configuring Layer 2 Interfaces

These sections describe the default interface configuration and the optional features that you can configure on most physical interfaces:

Default Layer 2 Ethernet Interface Configuration

Table 9-1 shows the Layer 2 Ethernet interface default configuration. For more details on the VLAN parameters listed in the table, see Chapter 13, "Configuring VLANs." For details on controlling traffic to the port, see Chapter 17, "Configuring Port-Based Traffic Control."

Table 9-1 Default Layer 2 Ethernet Interface Configuration

Feature	Default Setting
Operating mode	Layer 2.
Allowed VLAN range	VLANs 1– 4094 when the enhanced software image is installed and 1 to 1005 when the standard software image is installed.
Default VLAN (for access ports)	VLAN 1.
Native VLAN (for 802.1Q trunks)	VLAN 1.
VLAN trunking	Switchport mode dynamic desirable (supports DTP).
Port enable state	All ports are enabled.
Port description	None defined.
Speed	Autonegotiate.
Duplex mode	Autonegotiate.
Flow control	Flow control set to *off* for **receive** and *desired* for **send** for 10/100/1000 Mbps. For 10/100 Mbps ports, **send** is always *off*.
EtherChannel (PAgP)	Disabled on all Ethernet ports. See Chapter 25, "Configuring EtherChannels."
Broadcast, multicast, and unicast storm control	Disabled. See the "Configuring Storm Control" section on page 17-1.
Protected port	Disabled. See the "Configuring Protected Ports" section on page 17-3.
Port security	Disabled. See the "Configuring Port Security" section on page 17-3.
Port Fast	Disabled.

Configuring the Port Speed and Duplex Mode

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

Caution If you reconfigure the port through which you are managing the switch, a Spanning Tree Protocol (STP) reconfiguration could cause a temporary loss of connectivity.

Configuration Guidelines

Follow these guidelines when configuring the duplex and speed settings:

- Gigabit Ethernet ports should always be set to 1000 Mbps and full duplex.
- Gigabit Ethernet ports that do not match the settings of an attached device lose connectivity and do not generate statistics.
- GigaStack-to-GigaStack stack connections operate in half-duplex mode, and GigaStack-to-GigaStack point-to-point connections operate in full-duplex mode.
- If STP is enabled, the switch can take up to 30 seconds to check for loops when a port is reconfigured. The port LED is amber while STP reconfigures.

Connecting to Devices That Do Not Autonegotiate

To connect to a remote 100BASE-T device that does not autonegotiate, set the duplex setting to **Full** or **Half**, and set the speed setting to **Auto**. Autonegotiation for the speed setting selects the correct speed even if the attached device does not autonegotiate, but the duplex setting must be explicitly set.

To connect to a remote Gigabit Ethernet device that does not autonegotiate, disable autonegotiation on the local device, and set the duplex and flow control parameters to be compatible with the other device.

Setting Speed and Duplex Parameters

Beginning in privileged EXEC mode, follow these steps to set the speed and duplex parameters on a port:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface*	Enter interface configuration mode, and enter the port to be configured.
Step 3	**speed** {**10** | **100** | **1000** | **auto**}	Enter the speed parameter for the port. • The 10/100/1000 ports operate only in full-duplex mode. • The GBIC-module ports operate only at 1000 Mbps. • 100BASE-FX ports operate only at 100 Mbps in full-duplex mode. **Note** The Catalyst 2950C-24 does not support the **speed** and **duplex** interface configuration commands in Release 12.1(6)EA2 or later.
Step 4	**duplex {full | half | auto}**	Enter the duplex parameter for the port. • The 10/100/1000 ports operate only in full-duplex mode. • 100BASE-FX ports operate only at 100 Mbps in full-duplex mode. **Note** The Catalyst 2950C-24 does not support the **speed** and **duplex** interface configuration commands in Release 12.1(6)EA2 or later.
Step 5	**end**	Return to privileged EXEC mode.

	Command	Purpose
Step 6	**show running-config**	Verify your entries.
Step 7	**copy running-config startup-config**	(Optional) Save your entry in the configuration file. This retains the configuration when the switch restarts.

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*	Enter interface configuration mode and the physical interface identification.
Step 3	**speed** {**10** | **100** | **1000** | **auto** | **nonegotiate**}	Enter the appropriate speed parameter for the interface, or enter **auto** or **nonegotiate**. **Note** The **1000** keyword is available only for 10/100/1000 Mbps ports. The **nonegotiate** keyword is available only for 1000BASE-SX, -LX, and -ZX GBIC-module ports.
Step 4	**duplex** {**auto** | **full** | **half**}	Enter the duplex parameter for the interface.
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 Mbps and the duplex mode to half on FastEthernet interface 0/3 and to verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet0/3
Switch(config-if)# speed 10
Switch(config-if)# duplex half
Switch(config-if)# end
Switch# show interfaces fastethernet0/3
FastEthernet0/3 is up, line protocol is down
  Hardware is Fast Ethernet, address is 0000.0000.0003 (bia 0000.0000.0003)
  MTU 1500 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)
  Half-duplex, 10Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
```

```
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 input packets with dribble condition detected
0 packets output, 0 bytes, 0 underruns
0 output errors, 0 collisions, 2 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out
```

Configuring IEEE 802.3X Flow Control on Gigabit Ethernet Ports

Flow control is supported only on 10/100/1000 ports and GBIC-module ports. Flow control enables connected Gigabit 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 to stop sending until the condition clears. When the local device detects any congestion at its end, it can notify the link partner or the remote device by sending a pause frame. Upon receipt of a pause frame, the remote device stops sending any data packets, which prevents any loss of data packets during the congestion period.

Note We strongly recommend that you do not configure IEEE 802.3X flowcontrol when quality of service (QoS) is configured on the switch. Before configuring flowcontrol on an interface, make sure to disable QoS on the switch.

Flow control can be implemented in two forms, symmetric and asymmetric. The symmetric implementation is suitable for point-to-point links, and asymmetric is suitable for hub-to-end node connections, where it is desirable for the hub to pause the end system, but not vice-versa. You use the **flowcontrol** interface configuration command to set the interface's ability to **receive** and **send** pause frames to **on**, **off**, or **desired**. The default state for 10/100/1000 and GBIC-module ports is **receive off** and **send desired**.

These rules apply to flow control settings on the device:

- **receive on** (or **desired**) and **send on**: Flow control operates in both directions; both the local and the remote devices can send pause frames to show link congestion.
- **receive on** (or **desired**) and **send desired**: The port can receive pause frames and can send pause frames if the attached device supports flow control.
- **receive on** (or **desired**) and **send off**: 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** and **send on**: The port sends pause frames if the remote device supports flow control but cannot receive pause frames from the remote device.
- **receive off** and **send desired**: The port cannot receive pause frames but can send pause frames if the attached device supports flow control.
- **receive off** and **send 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, refer to the **flowcontrol** interface configuration command in the *Catalyst 2950 Desktop Switch 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*	Enter interface configuration mode and the physical interface to be configured.
Step 3	**flowcontrol** {**receive** | **send**} {**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** and **flowcontrol send off** interface configuration commands.

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 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*	Enter interface configuration mode, and enter the interface for which you are adding a description.
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 Fast Ethernet interface 0/4 and to verify the description:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fastethernet0/4
Switch(config-if)# description Connects to Marketing
Switch(config-if)# end
Switch# show interfaces fastethernet0/4 description
Interface Status         Protocol Description
Fa0/4     up             down     Connects to Marketing
```

Monitoring and Maintaining the Interface

You can perform the tasks in these sections to monitor and maintain the interfaces:

- Monitoring Interface and Controller Status, page 9-16
- Clearing and Resetting Interfaces and Counters, page 9-18
- Shutting Down and Restarting the Interface, page 9-19

Monitoring Interface and Controller Status

Commands entered at the privileged EXEC prompt display information about the interface, including the version of the software and the hardware, the controller status, and statistics about the interfaces. Table 9-2 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 for Release 12.1*.

Table 9-2 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 error-disabled state.
show interfaces [*interface-id*] **switchport**	Display administrative and operational status of switching (nonrouting) ports.
show interfaces [*interface-id*] **description**	Display the description configured on an interface or all interfaces and the interface status.
show running-config	Display the running configuration in RAM.
show version	Display the hardware configuration, software version, the names and sources of configuration files, and the boot images.

This example shows how to display the status and configuration of Gigabit Ethernet interface 0/2:

```
Switch# show interfaces gigabitethernet0/2
GigabitEthernet0/2 is up, line protocol is up
  Hardware is Gigabit Ethernet, address is 0002.4b29.4400 (bia 0002.4b29.4400)
  Internet address is 192.20.135.21/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     89245 packets input, 8451658 bytes, 0 no buffer
     Received 81551 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
```

```
     0 input packets with dribble condition detected
     60387 packets output, 5984015 bytes, 0 underruns
     0 output errors, 0 collisions, 16 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

This example shows how to display the status of all interfaces:

```
Switch# show interfaces status
Port    Name               Status       Vlan       Duplex  Speed Type
Fa0/1                      notconnect   1            auto   auto 10/100BaseTX
Fa0/2                      notconnect   1            auto   auto 10/100BaseTX
Fa0/3                      connected    trunk      a-full  a-100 10/100BaseTX
Fa0/4                      connected    trunk      a-full  a-100 10/100BaseTX
Fa0/5                      notconnect   1            auto   auto 10/100BaseTX
Fa0/6                      notconnect   1            auto   auto 10/100BaseTX
Fa0/7                      notconnect   1            auto   auto 10/100BaseTX
Fa0/8                      notconnect   0            auto   auto 10/100BaseTX
Fa0/9                      notconnect   1            auto   auto 10/100BaseTX
Fa0/10                     notconnect   1            auto   auto 10/100BaseTX
Fa0/11                     notconnect   1            auto   auto 10/100BaseTX
Fa0/12                     notconnect   1            auto   auto 10/100BaseTX
Fa0/13                     notconnect   1            auto   auto 10/100BaseTX
Fa0/14                     notconnect   1            auto   auto 10/100BaseTX
Fa0/15                     notconnect   1            auto   auto 10/100BaseTX
Fa0/16                     connected    1          a-half   a-10 10/100BaseTX
Fa0/17                     notconnect   1            auto   auto 10/100BaseTX
Fa0/18                     notconnect   1            auto   auto 10/100BaseTX
Fa0/19                     notconnect   1            auto   auto 10/100BaseTX
Fa0/20                     notconnect   1            auto   auto 10/100BaseTX
Fa0/21                     notconnect   1            auto   auto 10/100BaseTX

Port    Name               Status       Vlan       Duplex  Speed Type
Fa0/22                     notconnect   1            auto   auto 10/100BaseTX
Fa0/23                     notconnect   1            auto   auto 10/100BaseTX
Fa0/24                     notconnect   1            auto   auto 10/100BaseTX
Gi0/1                      notconnect   5            auto   auto 10/100/1000BaseTX
Gi0/2                      notconnect   5            auto   auto 10/100/1000BaseTX
Po1                        notconnect   1            auto   auto
Po2                        notconnect   1            auto   auto
```

This example shows how to display the status of switching ports:

```
Switch# show interfaces switchport
Name:Fa0/1
Switchport:Enabled
Administrative Mode:static access
Operational Mode:down
Administrative Trunking Encapsulation:dot1q
Negotiation of Trunking:Off
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001

Protected:false

Voice VLAN:dot1p (Inactive)
Appliance trust:5
Name:Fa0/2
Switchport:Enabled
Administrative Mode:static access
Operational Mode:down
```

```
Administrative Trunking Encapsulation:dot1q
Negotiation of Trunking:Off
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001

Protected:true

Voice VLAN:none (Inactive)
Appliance trust:none

<output truncated>
```

Clearing and Resetting Interfaces and Counters

Table 9-3 lists the privileged EXEC mode **clear** commands that you can use to clear counters and reset interfaces.

Table 9-3 Clear Commands for Interfaces

Command	Purpose
clear counters [*interface-id*]	Clear interface counters.
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 optional arguments are specified to 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 interfaces** privileged EXEC command.

This example shows how to clear and reset the counters on Fast Ethernet interface 0/2:

```
Switch# clear counters fastethernet0/2
Clear "show interface" counters on this interface [confirm] y
Switch#
*Sep 30 08:42:55: %CLEAR-5-COUNTERS: Clear counter on interface GigabitEthernet0/5
by vty1 (171.69.115.10)
```

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.

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.
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.

This example shows how to shut down Fast Ethernet interface 0/5:

```
Switch# configure terminal
Switch(config)# interface fastethernet0/5
Switch(config-if)# shutdown
Switch(config-if)#
*Sep 30 08:33:47: %LINK-5-CHANGED: Interface FastEthernet0/5, changed state to a
administratively down
```

This example shows how to re-enable Fast Ethernet interface 0/5:

```
Switch# configure terminal
Switch(config)# interface fastethernet0/5
Switch(config-if)# no shutdown
Switch(config-if)#
*Sep 30 08:36:00: %LINK-3-UPDOWN: Interface FastEthernet0/5, changed state to up
```

To verify that an interface is disabled, enter the **show interfaces** privileged EXEC command. A disabled interface is shown as *administratively down* in the **show interfaces** command display as with Fast Ethernet interface 0/5 in this example.

```
Switch# show interfaces
<output truncated>

FastEthernet0/2 is administratively down, line protocol is down
  Hardware is Gigabit Ethernet, address is 0002.4b29.4403 (bia 0002.4b29.4403)
  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)
  Auto-duplex, Auto-speed

<output truncated>
```