CHAPTER 9
Catalyst 2950 Desktop Switch Software Configuration Guide

78-14982-02

Configuring the Switch Interfaces

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

- Understanding Interface Types, page 9-1
- Using the Interface Command, page 9-4
- Configuring Switch Interfaces, page 9-9
- Monitoring and Maintaining the Interfaces, page 9-16

Note
For complete syntax and usage information for the commands used in this chapter, refer to the 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 switch ports.

Switch ports are Layer 2-only interfaces associated with a physical port. They are used for managing the physical interface and associated Layer 2 protocols and do not handle routing or bridging. 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 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 by using the `switchport` interface configuration commands. For detailed information about configuring access port and trunk port characteristics, see Chapter 14, “Configuring VLANs.”

Note
The physical switch ports switches can be 10/100 Ethernet ports, 10/100/1000 Ethernet ports, 100BASE-FX ports, 1000BASE-SX ports, GBIC module ports, and Long-Reach Ethernet (LRE) ports. For more information, refer to the switch hardware installation guide.
These sections describe these types of interfaces:

- Access Ports, page 9-2
- Trunk Ports, page 9-2
- Port-Based VLANs, page 9-3
- EtherChannel Port Groups, page 9-3
- Connecting Interfaces, page 9-4

**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. If an access port receives an 802.1P- or 802.1Q-tagged packet for the VLAN assigned to the port, the packet is forwarded. If the port receives an 802.1P- or 802.1Q-tagged packet for another VLAN, the packet is dropped, the source address is not learned, and the frame is counted in the No destination statistic.

The Catalyst 2950 switch does not support ISL-tagged packets. If the switch receives an ISL-tagged packet, the packet is flooded in the native VLAN of the port on which it was received because the MAC destination address in the ISL-tagged packet is a multicast address.

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. Dynamic access ports on the switch 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 1005 when the standard software image [SI] is installed or VLAN ID 1 to 4094 when the enhanced software image [EI] 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.
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 14, “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 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 EI 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.

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. For Layer 2 interfaces, the logical interface is dynamically created. 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 27, “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 routed 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](image)

Using the Interface Command

To configure a physical interface (port), use the `interface` global configuration command to enter interface configuration mode and to 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 (always 0 on this switch).
- **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, fastethernet 0/1, fastethernet 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: gigabitethernet 0/1, gigabitethernet 0/2.

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.

This section describes how to configure all types of interfaces and how to configure a range of interfaces:

- **Procedures for Configuring Interfaces**, page 9-5
- **Configuring a Range of Interfaces**, page 9-6
- **Configuring and Using Interface-Range Macros**, page 9-8
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 Interfaces” 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 EtherSVI, address is 0000.0000.0000 (bia 0000.0000.00
   Internet address is 10.1.1.64/24
   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 00:00:35, output 2d14h, output hang never
   Last clearing of "show interface" counters never
   Queueing strategy: fifo
   Output queue 0/40, 1 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
       264251 packets input, 163850228 bytes, 0 no buffer
       Received 0 broadcasts, 0 runs, 0 giants, 0 throttles
       0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
       380 packets output, 26796 bytes, 0 underruns
       0 output errors, 0 interface resets
       0 output buffer failures, 0 output buffers swapped out
FastEthernet0/1 is up, line protocol is down
   Hardware is Fast Ethernet, address is 0000.0000.0001 (bia 0000.00
   MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
```
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:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td><code>configure terminal</code></td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td>`interface range {port-range</td>
<td>macro`</td>
</tr>
<tr>
<td><code>macro_name}</code></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• You can use the <code>interface range</code> command to configure up to five port ranges or a previously defined macro.</td>
</tr>
<tr>
<td></td>
<td>• The <code>macro</code> variable is explained in the “Configuring and Using Interface-Range Macros” section on page 9-8.</td>
</tr>
<tr>
<td></td>
<td>• Each comma-separated port-range must consist of the same port type. You do not need to enter spaces before or after the comma.</td>
</tr>
<tr>
<td></td>
<td>• When you define a range, the space between the first port and the hyphen is required.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>You can now use the normal configuration commands to apply the configuration parameters to all interfaces in the range.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td><code>end</code></td>
<td>Return to privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td><code>show interfaces [interface-id]</code></td>
<td>Verify the configuration of the interfaces in the range.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td></td>
</tr>
<tr>
<td><code>copy running-config startup-config</code></td>
<td>(Optional) Save your entries in the configuration file.</td>
</tr>
</tbody>
</table>
When using the **interface range** global configuration command, note these guidelines:

- **Valid entries for** `port-range`:
  - `vlan vlan-ID - vlan-ID`, where VLAN ID is from 1 to 1005 with the SI installed or 1 to 4094 with the EI installed
  - `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 output shows the configured VLAN interfaces). VLAN interfaces that do not appear by using 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 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 08:29:28: %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 FastEthernet0/4, changed state to up
*Oct 6 08:29:28: %LINK-3-UPDOWN: Interface FastEthernet0/5, changed state to up
```

```
*Oct 6 08:29:28: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/05, 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 Gigabit Ethernet interfaces 0/1 and 0/2:

```
Switch# configure terminal
Switch(config)# interface range fastethernet0/1 - 3, gigabitethernet0/1 - 2
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 GigabitEthernet0/1, changed state to up
*Oct 6 08:29:28: %LINK-3-UPDOWN: Interface GigabitEthernet0/2, changed state to up
```

```
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
```

```
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/05, changed state to up
```

```
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/03, changed state to up
```

```
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/04, changed state to up
```

```
*Oct 6 08:29:29: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/05, 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:

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><code>configure terminal</code> Enter global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td><code>define interface-range macro_name</code> Define the interface-range macro, and save it in NVRAM.</td>
</tr>
<tr>
<td></td>
<td>- The <code>macro_name</code> is a 32-character maximum character string.</td>
</tr>
<tr>
<td></td>
<td>- A macro can contain up to five comma-separated interface ranges. You do not need to enter spaces before or after the comma.</td>
</tr>
<tr>
<td></td>
<td>- Each <code>interface-range</code> must consist of the same port type.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td><code>interface range macro macro_name</code> Select the interface range to be configured by using the values saved in the interface-range macro called <code>macro_name</code>. You can now use the normal configuration commands to apply the configuration to all interfaces in the defined macro.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td><code>end</code> Return to privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>`show running-config</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td><code>copy running-config startup-config</code> (Optional) Save your entries in the configuration file.</td>
</tr>
</tbody>
</table>

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`, where VLAN ID is from 1 to 1005 with the SI installed or 1 to 4094 with the EI installed
  - `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 entering an `interface-range`. For example, `fastethernet 0/1 - 5` is a valid range; `fastethernet 0/1-5` is not a valid range.
The switch supports these interface types:

- Physical ports—Switch ports, including access, trunk, and LRE ports
- VLANs—Switch virtual interfaces (SVIs)
- Port-channels—EtherChannel of interfaces

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

- Default Ethernet Interface Configuration, page 9-10
- SFP Configuration, page 9-10
- Configuring Interface Speed and Duplex Mode, page 9-11
- Configuring Media Types for Gigabit Interfaces, page 9-14
- Configuring IEEE 802.3X Flow Control on Gigabit Ethernet Ports, page 9-14
- Adding a Description for an Interface, page 9-16
Default Ethernet Interface Configuration

Table 9-1 shows the Ethernet interface default configuration. For more details on the VLAN parameters listed in the table, see Chapter 14, “Configuring VLANS.” For details on controlling traffic to the port, see Chapter 18, “Configuring Port-Based Traffic Control.”

Table 9-1 Default Ethernet Interface Configuration

<table>
<thead>
<tr>
<th>Feature</th>
<th>Default Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode</td>
<td>Layer 2.</td>
</tr>
<tr>
<td>Allowed VLAN range</td>
<td>VLANs 1 to 1005 with the SI installed or 1 to 4094 with the EI installed.</td>
</tr>
<tr>
<td>Default VLAN (for access ports)</td>
<td>VLAN 1.</td>
</tr>
<tr>
<td>Native VLAN (for 802.1Q trunks)</td>
<td>VLAN 1.</td>
</tr>
<tr>
<td>VLAN trunking</td>
<td>Switchport mode dynamic desirable (supports DTP).</td>
</tr>
<tr>
<td>Port enable state</td>
<td>All ports are enabled.</td>
</tr>
<tr>
<td>Port description</td>
<td>None defined.</td>
</tr>
<tr>
<td>Speed</td>
<td>Autonegotiate.</td>
</tr>
<tr>
<td>Duplex mode</td>
<td>Autonegotiate.</td>
</tr>
<tr>
<td>Flow control</td>
<td>Flow control is set to off for receive and desired for send for Gigabit Ethernet ports.</td>
</tr>
<tr>
<td>EtherChannel (PAgP)</td>
<td>Disabled on all Ethernet ports. See Chapter 27, “Configuring EtherChannels.”</td>
</tr>
<tr>
<td>Broadcast, multicast, and unicast</td>
<td>Disabled. See the “Default Storm Control Configuration” section on page 18-2.</td>
</tr>
<tr>
<td>storm control</td>
<td></td>
</tr>
<tr>
<td>Protected port</td>
<td>Disabled. See the “Configuring Protected Ports” section on page 18-3.</td>
</tr>
<tr>
<td>Port security</td>
<td>Disabled. See the “Default Port Security Configuration” section on page 18-7.</td>
</tr>
<tr>
<td>Port Fast</td>
<td>Disabled.</td>
</tr>
<tr>
<td>Media Type</td>
<td>Media type is set to prefer-sfp by default.</td>
</tr>
</tbody>
</table>

SFP Configuration

The Catalyst 2950 LRE switch has four physical input ports that are logically bundled as two ports. Each logical port consists of a copper 10/100/1000 port and a fiber-optic small form-factor pluggable (SFP) module slot. These ports display as a vertical column on the front panel and are labeled Uplink Port 1 and Uplink Port 2 on the Catalyst 2950 LRE switch.

Within each port, you can use only one of the two physical ports, either the SFP module port or the 10/100/1000 port. For example, you can connect to either the SFP module port or the 10/100/1000 port under Uplink Port 1. The default operation is that if the SFP module is plugged in, the fiber-optic medium has the priority over copper medium. If the SFP module is not plugged in, then the copper medium becomes active. If the SFP module is plugged in later (even after the copper medium establishes the link), then the link of the copper medium will be disconnected and the fiber-optic medium will...
become active. In that scenario, a valid configuration is to install the fiber-optic under Uplink Port 1 by having an SFP module plugged in, and to install the copper under Uplink Port 2 without the SFP module plugged in.

**Note**

By using the media-type auto-select command in Cisco IOS command-line interface (CLI), you can configure the Catalyst 2950 LRE so that the SFP module port does not take precedence over the 10/100/1000 port. In that scenario, whichever media type establishes a link first will have precedence over the other.

For more information about the **media-type auto-select**, **media-type sfp**, and **media-type rj45** interface configuration commands, refer to the *Catalyst 2950 Desktop Switch Command Reference*.

### Configuring Interface Speed and Duplex Mode

The 10/100 Ethernet interfaces on the Catalyst 2950 switch operate in 10 or 100 Mbps and in either full- or half-duplex mode. (There are no 10/100 Ethernet interfaces on the Catalyst 2950 LRE switch.) The 10/100/1000 Ethernet interfaces operate in 10, 100, or 1000 Mbps only in full-duplex mode. In full-duplex mode, two stations can send and receive at the same time. When packets can flow in both directions simultaneously, effective Ethernet bandwidth doubles to 20 Mbps for 10-Mbps interfaces, to 200 Mbps for Fast Ethernet interfaces, and to 2 Gbps for Gigabit interfaces. Full-duplex communication is often an effective solution to collisions, which are major constrictions in Ethernet networks. Normally, 10-Mbps ports operate in half-duplex mode, which means that stations can either receive or send.

On the Catalyst 2950 LRE switch, the copper media (10/100/1000) of the Gigabit interface operate in 10/100 full-duplex or half-duplex mode and 1000 Mbps only in full-duplex mode. The fiber-optic media of the Gigabit interface only operate in 1000 Mbps and full-duplex mode.

**Note**

You cannot configure speed and duplex on the LRE ports by normal speed and duplex commands, but need the special local speed and local duplex commands.

You can configure interface speed on Fast Ethernet (10/100-Mbps) and Gigabit Ethernet (10/100/1000-Mbps) interfaces on the Catalyst 2950 switch; you cannot configure speed on 100BASE-FX, 1000BASE-SX, and Gigabit Interface Converter (GBIC) module interfaces. You can configure duplex mode on any Fast Ethernet interfaces that are not set to autonegotiate; you cannot configure duplex mode on 100BASE-FX, 1000BASE-SX, and GBIC-module interfaces. The 10/100/1000 interfaces can operate only in full-duplex mode.

**Note**

The speed and duplex commands are meant for copper media. The fiber-optic media always operate as 1000 Mbps with full auto negotiation no matter what has been setting for speed and duplex from the command line. For example, you can use the command-line interface to configure the speed to be 10 Mbps and half-duplex. If the fiber-optic medium is active, then the switch attempts to perform auto negotiation as 1000 Mbps with full autonegotiation. If the copper medium is active, then the switch advertises as 10 Mbps and half-duplex.
You cannot configure speed or duplex mode on Gigabit Interface Converter (GBIC) ports, but for certain types of GBICs, you can configure speed to not negotiate (nongotiate) if the GBIC ports are connected to a device that does not support autonegotiation.

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

- Configuration Guidelines, page 9-12
- Setting the Interface Speed and Duplex Parameters, page 9-13

The CPE Ethernet port settings have special considerations and different default settings from the switch 10/100 ports. For this information, see the CPE device considerations in the “CPE Ethernet Links” section on page 10-6.

### Configuration Guidelines

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

- Ethernet ports set to 1000 Mbps should always be set to full duplex.
- Gigabit Ethernet ports that do not match the settings of an attached device can lose connectivity and do not generate statistics.
  
- If both ends of the line support autonegotiation, we highly recommend the default setting of autonegotiation.
- When connecting an interface to a 100BASE-T device that does not autonegotiate, set the duplex mode to full or half to match the device, and set the speed to auto. Autonegotiation for the speed setting selects the correct speed even if the attached device does not autonegotiate, but duplex mode must be explicitly set.
- When connecting an interface to a Gigabit Ethernet device that does not autonegotiate, disable autonegotiation on the switch and set the duplex and flow control parameters to be compatible with the remote device.
- 100BASE-FX ports operate only at 100 Mbps and in full-duplex mode.
- 1000BASE-SX ports operate only at 1000 Mbps and in full-duplex mode.
- GigaStack-to-GigaStack cascade connections operate in half-duplex mode, and GigaStack-to-GigaStack point-to-point connections operate in full-duplex mode.
- When Spanning Tree Protocol (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

The Ethernet link settings on the CPE Ethernet ports have special considerations and different default settings from the 10/100 ports. For this information, see the “Ports on the Catalyst 2950 LRE Switches, page 10-2” section on page 10-2.

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 configure terminal</td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td>Step 2 interface interface-id</td>
<td>Enter interface configuration mode and the physical interface identification.</td>
</tr>
<tr>
<td>Step 3 speed {10</td>
<td>100</td>
</tr>
<tr>
<td>Step 4 duplex {auto</td>
<td>full</td>
</tr>
<tr>
<td>Step 5 end</td>
<td>Return to privileged EXEC mode.</td>
</tr>
<tr>
<td>Step 6 show interfaces interface-id</td>
<td>Display the interface speed and duplex mode configuration.</td>
</tr>
<tr>
<td>Step 7 copy running-config startup-config</td>
<td>(Optional) Save your entries in the configuration file.</td>
</tr>
</tbody>
</table>

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)# end
Switch# show running-config
Building configuration...

Current configuration : 1954 bytes
!
version 12.1
no service pad
service timestamps debug uptime
```
Configuring Media Types for Gigabit Interfaces

You can use the `media-type` interface configuration command to configure the media-type for Gigabit interfaces. The `media-type` interface configuration command allows you to enable or disable fiber-optic or copper connections on a Long-Reach Ethernet (LRE) switch. It also allows you to manually set the port to select an SFP connector or an RJ45 connector. Use the no form of this command to return to the default setting of SFP-preferred. To configure media types, use the `media-type {auto-select | sfp | rj45}` interface configuration command.

Refer to the Catalyst 2950 Desktop Switch Command Reference for further details.

Configuring IEEE 802.3X Flow Control on Gigabit Ethernet Ports

Flow control is supported only on switch and module ports operating at 1000 Mbps. 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 of the congestion 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 return to the default QoS settings listed in the “Default QoS Configuration” section on page 26-9.

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 Gigabit Ethernet ports is `receive off` and `send desired`. The default state for Fast Ethernet ports is `receive off` and `send off`.

```
service timestamps log uptime
no service password-encryption
!
hostname Switch
!
<output truncated>
!
interface FastEthernet0/3
  switchport mode trunk
  no ip address
duplex half
  speed 10
!
<output truncated>
```
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 about the command settings and the resulting flow control resolution on local and remote ports, refer to 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:

<table>
<thead>
<tr>
<th>Step</th>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>configure terminal</td>
<td>Enter global configuration mode</td>
</tr>
<tr>
<td>2</td>
<td>interface interface-id</td>
<td>Enter interface configuration mode and the physical interface to be configured.</td>
</tr>
<tr>
<td>3</td>
<td>flowcontrol {receive</td>
<td>send} {on</td>
</tr>
<tr>
<td>4</td>
<td>end</td>
<td>Return to privileged EXEC mode.</td>
</tr>
<tr>
<td>5</td>
<td>show interfaces interface-id</td>
<td>Verify the interface flow control settings.</td>
</tr>
<tr>
<td>6</td>
<td>copy running-config startup-config</td>
<td>(Optional) Save your entries in the configuration file.</td>
</tr>
</tbody>
</table>

To disable flow control, use the `flowcontrol receive off` and `flowcontrol send off` interface configuration commands.

This example shows how to turn off all flow control on Gigabit Ethernet interface 0/1 and to display the results:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# flowcontrol receive off
Switch(config-if)# flowcontrol send off
Switch(config-if)# end
Switch# show running-config
```
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:

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

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# config 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 Interfaces

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

- Monitoring Interface and Controller Status, page 9-16
- Clearing and Resetting Interfaces and Counters, page 9-19
- 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

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>show interfaces [interface-id]</code></td>
<td>Display the status and configuration of all interfaces or a specific interface.</td>
</tr>
<tr>
<td><code>show interfaces interface-id status [err-disabled]</code></td>
<td>Display interface status or a list of interfaces in error-disabled state.</td>
</tr>
<tr>
<td>`show interfaces [media</td>
<td>&lt;interface-id&gt; media]`</td>
</tr>
<tr>
<td><code>show interfaces [interface-id] switchport</code></td>
<td>Display administrative and operational status of switching (nonrouting) ports.</td>
</tr>
<tr>
<td><code>show interfaces [interface-id] description</code></td>
<td>Display the description configured on an interface or all interfaces and the interface status.</td>
</tr>
<tr>
<td><code>show ip interface [interface-id]</code></td>
<td>Display the usability status of all interfaces configured for IP or the specified interface.</td>
</tr>
<tr>
<td><code>show running-config interface [interface-id]</code></td>
<td>Display the running configuration in RAM for the interface.</td>
</tr>
<tr>
<td><code>show version</code></td>
<td>Display the hardware configuration, software version, the names and sources of configuration files, and the boot images.</td>
</tr>
</tbody>
</table>

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

```
Switch# show interfaces status

Port  Name       Status     Vlan  Duplex  Speed  Type
Fa0/1  connected  1       a-full a-100 10/100BaseTX
Fa0/2  notconnect 1       auto   auto  10/100BaseTX
Fa0/3  notconnect 1       auto   auto  10/100BaseTX
<output truncated>

Fa0/23  notconnect 1       auto   auto  10/100BaseTX
Fa0/24  notconnect 1       auto   auto  10/100BaseTX
Gi0/1  notconnect 1       auto   auto  unknown
Gi0/2  notconnect 1       auto   auto  unknown
```

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
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled

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

This example shows how to display the running configuration of Fast Ethernet interface 0/2:

Switch# show running-config interface fastethernet0/2
Building configuration...

Current configuration : 131 bytes
  interface FastEthernet0/2
  switchport mode access
  switchport protected
  no ip address
  mls qos cos 7
  mls qos cos override
  end

This example shows the output of the `show interfaces` privileged EXEC command for a Catalyst 2950 LRE switch:

Switch# show interfaces lo0/2

LongReachEthernet0/2 is up, line protocol is up
  Hardware is Long Reach Ethernet, address is 0056.895a.7e82 (bia 0056.895a.7e82)
  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, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 00:00:00, 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 2000 bits/sec, 2 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 input packets with dribble condition detected
  368 packets output, 33134 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

For a Catalyst 2950 LRE switch, the `show interfaces` privileged EXEC command for a LRE interface displays the statistics for the LRE interface rather than the statistics for the Ethernet ports on the CPE device. In addition, the speed and duplex of the LRE interface is never auto-negotiated, but is always forced (in other words, the speed and duplex will be 100 Mbps and half-duplex, 100 Mbps and full-duplex, 10 Mbps and half-duplex, or 10 Mbps and full-duplex).
Clearing and Resetting Interfaces and Counters

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>clear counters</code> [interface-id]</td>
<td>Clear interface counters.</td>
</tr>
<tr>
<td><code>clear interface</code> interface-id</td>
<td>Reset the hardware logic on an interface.</td>
</tr>
<tr>
<td><code>clear line</code> [number</td>
<td>console 0</td>
</tr>
</tbody>
</table>

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 output.

This example shows how to clear and reset the counters on Fast Ethernet interface 0/5:

```
Switch# clear counters fastethernet0/5
Clear "show interface" counters on this interface [confirm] y
Switch#
*Sep 30 08:42:55: %CLEAR-5-COUNTERS: Clear counter on interface FastEthernet0/5 by vty1 (171.69.115.10)
```

Use the `clear interface` or `clear line` privileged EXEC command to clear and reset an interface or serial line. Under most circumstances, you do not need to clear the hardware logic on interfaces or serial lines.

This example shows how to clear and reset Fast Ethernet interface 0/5:

```
Switch# clear interface fastethernet0/5
```

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:

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>configure terminal</code></td>
<td>Enter global configuration mode.</td>
</tr>
<tr>
<td><code>interface</code> [vlan vlan-id]</td>
<td>Select the interface to be configured.</td>
</tr>
<tr>
<td><code>shutdown</code></td>
<td>Shut down an interface.</td>
</tr>
<tr>
<td><code>interface</code> [interface-id]</td>
<td></td>
</tr>
<tr>
<td><code>clear interface</code></td>
<td></td>
</tr>
<tr>
<td><code>clear line</code></td>
<td></td>
</tr>
<tr>
<td><code>shutdown</code></td>
<td></td>
</tr>
</tbody>
</table>

```
Step 1: configure terminal
Step 2: interface fastethernet0/5
Step 3: shutdown
```
### Monitoring and Maintaining the Interfaces

#### Step 4
- **Command**: `end`
- **Purpose**: Return to privileged EXEC mode.

#### Step 5
- **Command**: `show running-config`
- **Purpose**: 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:

```plaintext
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:

```plaintext
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 output.

The `shutdown` command shuts down the LRE link when applied to an LRE interface. To shut down the Fast Ethernet ports on the CPE device use `cpe shutdown [port <num>]` command in interface configuration mode.

---

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>end</code></td>
<td>Return to privileged EXEC mode.</td>
</tr>
<tr>
<td><code>show running-config</code></td>
<td>Verify your entry.</td>
</tr>
</tbody>
</table>