

# Configuring Ethernet and Fast Ethernet Switching

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This chapter describes how to configure Ethernet and Fast Ethernet switching on the Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches. The configuration tasks in this chapter apply to Ethernet and Fast Ethernet switch ports on switching modules and fixed-configuration switches, as well as to supervisor engine Fast Ethernet uplink ports.

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**Note** For complete information on installing Catalyst 5000 series Ethernet and Fast Ethernet modules, refer to the *Catalyst 5000 Series Module Installation Guide*. For complete information on installing Catalyst 4000 series Fast Ethernet modules, refer to the *Catalyst 4000 Series Installation Guide*.

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**Note** For complete syntax and usage information for the commands used in this chapter, refer to the *Command Reference* for your switch.

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This chapter consists of these sections:

- Understanding How Ethernet Works on page 4-1
- Default Ethernet and Fast Ethernet Configuration on page 4-3
- Configuring Ethernet and Fast Ethernet Ports on page 4-3

## Understanding How Ethernet Works

These sections describe how Ethernet switching works on the Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches:

- Ethernet Overview on page 4-1
- Switching Frames Between Segments on page 4-2
- Building the Address Table on page 4-2

## Ethernet Overview

The Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches support simultaneous, parallel conversations between Ethernet segments. Switched connections between Ethernet segments last only for the duration of the packet. New connections can be made between different segments for the next packet.

The Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches solve congestion problems caused by high bandwidth devices and a large number of users by assigning each device (for example, a server) to its own 10-, 100-, or 1000-Mbps segment. Because each Ethernet port on the switch represents a separate Ethernet segment, servers in a properly configured switched environment achieve full access to the bandwidth.

Because the major bottleneck in Ethernet networks is usually due to collisions, an effective solution is full-duplex communication, an option for each port on the switches (Gigabit Ethernet ports *only* support full duplex). Normally, Ethernet operates in half-duplex mode, which means that stations can either receive or transmit. In full-duplex mode, two stations can transmit and receive at the same time. When packets can flow in both directions simultaneously, effective Ethernet bandwidth for Ethernet ports is 20 Mbps, for Fast Ethernet ports 200 Mbps, and for Gigabit Ethernet ports 2 Gbps.

## Switching Frames Between Segments

Each Ethernet port on the switch can connect to a single workstation or server, or to a hub through which workstations or servers connect to the network.

Ports on a typical Ethernet hub all connect to a common backplane within the hub, and the bandwidth of the network is shared by all devices attached to the hub. If two stations establish a session that uses a significant level of bandwidth, the network performance of all other stations attached to the hub is degraded.

To reduce degradation, the Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches treat each port as an individual segment. When stations on different ports need to communicate, the switch forwards frames from one port to the other at wire speed to ensure that each session receives the full bandwidth available.

To switch frames between ports efficiently, the switch maintains an address table. When a frame enters the switch, it associates the Media Access Control (MAC) address of the sending station with the port on which it was received.

## Building the Address Table

The switch builds the address table by using the source address of the frames received. When the switch receives a frame for a destination address not yet listed in its address table, it floods the frame to all ports of the same virtual LAN (VLAN) except the port that received the frame. When the destination station replies, the switch adds its relevant source address and port ID to the address table. The switch then forwards subsequent frames to a single port without flooding to all ports.

The address table can store at least 16,000 address entries without flooding any entries. The switch uses an aging mechanism, defined by a configurable aging timer, so if an address remains inactive for a specified number of seconds, it is removed from the address table.

## Default Ethernet and Fast Ethernet Configuration

Table 4-1 shows the Ethernet and Fast Ethernet default configuration.

**Table 4-1 Ethernet and Fast Ethernet Default Configuration**

Feature	Default Value
Port enable state	All ports are enabled
Port name	None
Port priority	Normal
Duplex mode	<ul style="list-style-type: none"> <li>• Half duplex for 10-Mbps Ethernet ports</li> <li>• Autonegotiate speed and duplex for 10/100-Mbps Fast Ethernet ports</li> <li>• Autonegotiate duplex for 100-Mbps Fast Ethernet ports</li> </ul>
Spanning-Tree Protocol	Enabled for VLAN 1
Native VLAN	VLAN 1
Port VLAN cost	<ul style="list-style-type: none"> <li>• Port VLAN cost of 100 for 10-Mbps Ethernet ports</li> <li>• Port VLAN cost of 19 for 10/100-Mbps Fast Ethernet ports</li> <li>• Port VLAN cost of 19 for 100-Mbps Fast Ethernet ports</li> </ul>
Fast EtherChannel	Disabled on all Fast Ethernet ports ( <b>auto</b> mode)

## Configuring Ethernet and Fast Ethernet Ports

These sections describe how to configure Ethernet and Fast Ethernet switching ports on the Catalyst 5000, 4000, 2948G, 2926G, and 2926 series switches:

- Setting the Port Name on page 4-4
- Setting the Port Priority Level on page 4-4
- Setting the Port Speed on page 4-5
- Setting the Port Duplex Mode on page 4-6
- Checking Connectivity on page 4-6

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**Note** For information on configuring Fast EtherChannel, refer to Chapter 6, “Configuring Fast EtherChannel and Gigabit EtherChannel.”

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## Setting the Port Name

You can assign names to the ports on Ethernet and Fast Ethernet modules to facilitate switch administration.

To assign a name to a port, perform this task in privileged mode:

Task	Command
<b>Step 1</b> Assign a name to a port.	<b>set port name</b> <i>mod_num/port_num</i> [ <i>name_string</i> ]
<b>Step 2</b> Verify that the port name is configured.	<b>show port</b> [ <i>mod_num[port_num]</i> ]

This example shows how to set the name for ports 1/1 and 1/2 and how to verify that the port names are configured correctly:

```

Console> (enable) set port name 1/1 Router Connection
Port 1/1 name set.
Console> (enable) set port name 1/2 Server Link
Port 1/2 name set.
Console> (enable) show port 1
Port  Name                Status      Vlan      Level Duplex Speed Type
-----
 1/1 Router Connection    connected  trunk    normal half   100 100BaseTX
 1/2 Server Link          connected  trunk    normal half   100 100BaseTX

<...output truncated...>

Last-Time-Cleared
-----
Tue Jun 16 1998, 16:25:57
Console> (enable)
    
```

## Setting the Port Priority Level

You can configure the priority level of each port. When ports request access to the switching bus simultaneously, the switch uses the port priority level to determine the order in which ports are given access.

To set the port priority level, perform this task in privileged mode:

Task	Command
<b>Step 1</b> Configure the priority level for a port.	<b>set port level</b> <i>mod_num/port_num</i> { <b>normal</b>   <b>high</b> }
<b>Step 2</b> Verify that the port priority level is configured correctly.	<b>show port</b> [ <i>mod_num[port_num]</i> ]

This example shows how to set the port priority level to high for port 1/1 and verify that the port priority is configured correctly:

```

Console> (enable) set port level 1/1 high
Port 1/1 level set to high.
Console> (enable) show port 1
Port  Name              Status      Vlan      Level Duplex Speed Type
-----
1/1  Router Connection    connected  trunk    high  half  100 100BaseTX
1/2  Server Link          connected  trunk    normal half  100 100BaseTX

<...output truncated...>

Last-Time-Cleared
-----
Tue Jun 16 1998, 16:25:57
Console> (enable)

```

## Setting the Port Speed

You can configure the port speed on 10/100-Mbps Fast Ethernet modules. Use the **auto** keyword to have the port autonegotiate speed and duplex mode with the neighboring port.



**Caution** Make sure the device on the other end of the link is also configured for autonegotiation or a port speed or duplex mismatch will result.

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**Note** If the port speed is set to **auto** on a 10/100-Mbps Fast Ethernet port, both speed and duplex are autonegotiated.

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To set the port speed for a 10/100-Mbps port, perform this task in privileged mode:

Task	Command
<b>Step 1</b> Set the port speed of a 10/100-Mbps Fast Ethernet port.	<b>set port speed</b> <i>mod num/port num</i> {10   100   auto }
<b>Step 2</b> Verify that the speed of the port is configured correctly.	<b>show port</b> [ <i>mod_num</i> [/ <i>port_num</i> ]]

This example shows how to set the port speed to 100 Mbps on port 2/2:

```

Console> (enable) set port speed 2/2 100
Port 2/2 speed set to 100 Mbps.
Console> (enable)

```

This example shows how to make port 2/1 autonegotiate speed and duplex with the neighbor port:

```

Console> (enable) set port speed 2/1 auto
Port 2/1 speed set to auto-sensing mode.
Console> (enable)

```

## Setting the Port Duplex Mode

You can set the port duplex mode to full or half duplex for Ethernet and Fast Ethernet ports.

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**Note** If the port speed is set to **auto** on a 10/100-Mbps Fast Ethernet port, both speed and duplex are autonegotiated. You cannot change the duplex mode of ports configured for autonegotiation. For information on enabling and disabling autonegotiation on 10/100 Fast Ethernet ports, see the “Setting the Port Speed” section on page 4-5.

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To set the duplex mode of a port, perform this task in privileged mode:

Task	Command
<b>Step 1</b> Set the duplex mode of a port.	<b>set port duplex</b> <i>mod num/port num</i> {full   half}
<b>Step 2</b> Verify that the duplex mode of the port is configured correctly.	<b>show port</b> [ <i>mod_num/port_num</i> ]

This example shows how to set the duplex mode to half duplex on port 2/1:

```

Console> (enable) set port duplex 2/1 half
Port 2/1 set to half-duplex.
Console> (enable)
    
```

## Checking Connectivity

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**Note** For more detailed information on checking connectivity, see Chapter 13, “Checking Port Status and Connectivity.”

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Use the **ping** and **tracert** commands to test connectivity out Ethernet or Fast Ethernet ports.

To check connectivity out a port, perform this task in privileged mode:

Task	Command
<b>Step 1</b> Ping a remote host that is located out the port you want to test.	<b>ping</b> [-s] <i>host</i> [ <i>packet_size</i> ] [ <i>packet_count</i> ]
<b>Step 2</b> Trace the hop-by-hop route of packets from the switch to a remote host located out the port you want to test.	<b>tracert</b> <i>host</i>
<b>Step 3</b> If the host is unresponsive, check the IP address and default gateway configured on the switch.	<b>show interface</b> <b>show ip route</b>

This example shows how to ping a remote host and how to trace the hop-by-hop path of packets through the network using **traceroute**:

```
Console> (enable) ping somehost
somehost is alive
Console> (enable) traceroute somehost
traceroute to somehost.company.com (10.1.2.3), 30 hops max, 40 byte packets
 1 engineering-1.company.com (173.31.192.206) 2 ms 1 ms 1 ms
 2 engineering-2.company.com (173.31.196.204) 2 ms 3 ms 2 ms
 3 gateway_a.company.com (173.16.1.201) 6 ms 3 ms 3 ms
 4 somehost.company.com (10.1.2.3) 3 ms * 2 ms
Console> (enable)
```

