Configuring VLAN Trunks on Fast Ethernet and Gigabit Ethernet Ports

This chapter describes how to configure Fast Ethernet and Gigabit Ethernet virtual LAN (VLAN) trunks on the Catalyst enterprise LAN switches.

Note For complete information on configuring VLANs, see Chapter 10, "Configuring VLANs."

Note For complete syntax and usage information for the commands used in this chapter, refer to the *Command Reference—Catalyst 4000 Family, Catalyst 2948G, and Catalyst 2980G Switches*.

This chapter consists of these sections:

Understanding How VLAN Trunks Work

These sections describe how VLAN trunks work on the Catalyst enterprise LAN switches:

Trunking Overview

A trunk is a point-to-point link between one or more switch ports and another networking device such as a router or a switch. Trunks carry the traffic of multiple VLANs over a single link and allow you to extend VLANs across an entire network.

The Catalyst 4000, 2948G, and 2980G switches support IEEE 802.1Q—802.1Q trunking encalsulation.

You can configure a trunk on a single Fast or Gigabit Ethernet port or on a Fast or Gigabit EtherChannel bundle. For more information about Fast and Gigabit EtherChannel, see Chapter 6, "Configuring Fast EtherChannel and Gigabit EtherChannel."

Fast Ethernet and Gigabit Ethernet trunk ports support five different trunking modes (see Table 11-1). In addition, on certain Fast Ethernet and Gigabit Ethernet ports you can specify whether the trunk will use ISL encapsulation, 802.1Q encapsulation, or whether the encapsulation type will be autonegotiated.

For trunking to be autonegotiated on Fast Ethernet and Gigabit Ethernet ports, the ports must be in the same VTP domain. However, you can use the **on** or **nonegotiate** mode to force a port to become a trunk, even if it is in a different domain. For more information on VTP domains, see Chapter 9, "Configuring VTP."

Trunk negotiation is managed by the Dynamic Trunking Protocol (DTP). DTP supports autonegotiation of both ISL and 802.1Q trunks.

Note Trunking capabilities are hardware-dependent. For example, the Catalyst 4000 family switch modules support only 802.1Q encapsulation. To determine whether your hardware supports trunking, and to determine which trunking encapsulations are supported, see your hardware documentation or use the **show port capabilities** command.

Trunking Modes and Encapsulation Types

Table 11-1 lists the trunking modes used with the **set trunk** command and describes how they function on Fast Ethernet and Gigabit Ethernet ports.

Table 11-1 Fast Ethernet and Gigabit Ethernet Trunking Modes

Mode	Function
on	Puts the port into permanent trunking mode and negotiates to convert the link into a trunk link. The port becomes a trunk port even if the neighboring port does not agree to the change.
off	Puts the port into permanent nontrunking mode and negotiates to convert the link into a nontrunk link. The port becomes a nontrunk port even if the neighboring port does not agree to the change.
desirable	Makes the port actively attempt to convert the link to a trunk link. The port becomes a trunk port if the neighboring port is set to **on**, **desirable**, or **auto** mode.
auto	Enables the port to convert the link to a trunk link. The port becomes a trunk port if the neighboring port is set to **on** or **desirable** mode. This is the default mode for Fast and Gigabit Ethernet ports.
nonegotiate	Puts the port into permanent trunking mode but prevents the port from generating DTP frames. You must configure the neighboring port manually as a trunk port to establish a trunk link.

Table 11-2 lists the encapsulation type used with the **set trunk** command and describes how it functions on Fast Ethernet and Gigabit Ethernet ports. You can use the **show port capabilities** command to determine which encapsulation types a particular port supports.

Table 11-2 Fast Ethernet and Gigabit Ethernet Trunk Encapsulation Type

Encapsulation	Function
dot1q	Specifies 802.1Q encapsulation on the trunk link. 802.1Q trunks are supported in Catalyst 4000 family with 802.1Q-capable hardware. Automatic negotiation of 802.1Q trunks is supported in software release 4.2 and later.

The trunking mode, the trunk encapsulation type, and the hardware capabilities of the two connected ports determine whether a trunk link comes up and the type of trunk the link becomes. Table 11-3 shows the result of the possible trunking configurations.

Table 11-3 Results of Possible Fast Ethernet and Gigabit Ethernet Trunk Configurations

Neighbor Port Trunk Mode and Trunk Encapsulation	Local Port Trunk Mode and Trunk Encapsulation			
	off dot1q	**on dot1q**	**desirable dot1q**	**auto dot1q**
off dot1q	Local: Nontrunk Neighbor: Nontrunk	Local: 1Q trunk Neighbor: Nontrunk	Local: Nontrunk Neighbor: Nontrunk	Local: Nontrunk Neighbor: Nontrunk
on dot1q	Local: Nontrunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk
desirable dot1q	Local: Nontrunk Neighbor: Nontrunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk
auto dot1q	Local: Nontrunk Neighbor: Nontrunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: 1Q trunk Neighbor: 1Q trunk	Local: Nontrunk Neighbor: Nontrunk

Note DTP is a point-to-point protocol. However, some internetworking devices might forward DTP frames improperly. To avoid this problem, ensure that trunking is turned **off** on ports connected to non-switch devices if you do not intend to trunk across those links. When manually enabling trunking on a link to a Cisco router, use the **nonegotiate** keyword to cause the port to become a trunk but not generate DTP frames.

Trunking Support

Trunking capabilities are hardware-dependent. Table 11-4 shows which switches have available hardware that supports the two trunking encapsulations. To determine whether a specific piece of hardware supports trunking, and to determine which trunking encapsulations are supported, see your hardware documentation or use the **show port capabilities** command.

Table 11-4 Trunking Encapsulation Support

Trunking Method	Catalyst 4000 Family	Catalyst 2948G Catalyst 2980G
ISL	No	No
802.1Q	Yes	Yes
Negotiate	No	No

802.1Q Trunk Restrictions

The following configuration guidelines and restrictions apply when using 802.1Q trunks impose some limitations on the trunking strategy for a network. Note these restrictions when using 802.1Q trunks:

- When connecting Cisco switches through an 802.1Q trunk, make sure the native VLAN for an 802.1Q trunk is the same on both ends of the trunk link. If the native VLAN on one end of the trunk is different from the native VLAN on the other end, spanning tree loops might result.
- Disabling spanning tree on the native VLAN of an 802.1Q trunk without disabling spanning tree on every VLAN in the network can cause spanning-tree loops. We recommend that you leave spanning tree enabled on the native VLAN of an 802.1Q trunk. If this is not possible, disable spanning tree on every VLAN in the network. Make sure your network is free of physical loops before disabling spanning tree.
- When you connect two Cisco switches through 802.1Q trunks, the switches exchange spanning-tree BPDUs on each VLAN allowed on the trunks. The BPDUs on the native VLAN of the trunk are sent untagged to the reserved IEEE 802.1d spanning-tree multicast MAC address (01-80-C2-00-00-00). The BPDUs on all other VLANs on the trunk are sent tagged to the reserved Cisco Shared Spanning Tree (SSTP) multicast MAC address (01-00-0c-cc-cc-cd).
- Non-Cisco 802.1Q switches maintain only a single instance of spanning tree (the Mono Spanning Tree, or MST) that defines the spanning-tree topology for all VLANs. When you connect a Cisco switch to a non-Cisco switch through an 802.1Q trunk, the MST of the non-Cisco switch and the native VLAN spanning-tree of the Cisco switch combine to form a single spanning-tree topology known as the Common Spanning Tree (CST).
- Because Cisco switches transmit BPDUs to the SSTP multicast MAC address on VLANs other than the native VLAN of the trunk, non-Cisco switches do not recognize these frames as BPDUs and flood them on all ports in the corresponding VLAN. Other Cisco switches connected to the non-Cisco 802.1Q cloud receive these flooded BPDUs. This allows Cisco switches to maintain a per-VLAN spanning-tree topology across a cloud of non-Cisco 802.1Q switches. The non-Cisco 802.1Q cloud separating the Cisco switches is treated as a single broadcast segment between all switches connected to the non-Cisco 802.1Q cloud through 802.1Q trunks.

- Make sure that the native VLAN is the same on ALL of the 802.1Q trunks connecting the Cisco switches to the non-Cisco 802.1Q cloud.
- If you are connecting multiple Cisco switches to a non-Cisco 802.1Q cloud, all of the connections MUST be through 802.1Q trunks. You CANNOT connect Cisco switches to a non-Cisco 802.1Q cloud through ISL trunks or through access ports. Doing so will cause the switch to place the ISL trunk port or access port into the spanning-tree "port inconsistent" state and no traffic will pass through the port.

Default Trunk Configuration

Table 11-5 shows the default Fast Ethernet and Gigabit Ethernet trunk configuration.

Table 11-5 Default Fast Ethernet and Gigabit Ethernet Trunk Configuration

Feature	Default Configuration
Trunk mode	**auto**
Trunk encapsulation	**dot1q** (on hardware supporting 802.1Q only)
Allowed VLAN range	VLANs 1–1005

Configuring a Trunk Link

These sections describe how to configure a trunk link on Fast Ethernet and Gigabit Ethernet ports and how to define the allowed VLAN range on a trunk:

- Configuring an 802.1Q Trunk, page 11-5
- Defining the Allowed VLANs on a Trunk, page 11-6
- Disabling a Trunk Port, page 11-7

Configuring an 802.1Q Trunk

Note Some hardware does not support 802.1Q encapsulation. To determine whether your hardware supports 802.1Q, see your hardware documentation or use the **show port capabilities** command.

Caution You must configure the ports on both ends of the trunk link as 802.1Q trunks using the **set trunk** command with the **nonegotiate** and **dot1q** keywords. Expect Spanning Tree Protocol (STP) to block the port on the other end of the trunk link until you configure that end of the link as an 802.1Q trunk as well. Do not configure one end of a trunk as an 802.1Q trunk and the other end as an ISL trunk or a nontrunk port. Errors will occur and no traffic can pass over the link. For more information, see the "Trunking Modes and Encapsulation Types" section on page 11-2.

To configure an 802.1Q trunk, perform this task in privileged mode:

	Task	Command
Step 1	Configure an 802.1Q trunk.	**set trunk** *mod_num/port_num* [**on** | **desirable** | **auto** | **nonegotiate**] **dot1q**
Step 2	Verify the trunking configuration.	**show trunk** [*mod_num/port_num*]

This example shows how to configure an 802.1Q trunk and how to verify the trunk configuration:

```
Console> (enable) set trunk 2/9 desirable dot1q
Port(s) 2/9 trunk mode set to desirable.
Port(s) 2/9 trunk type set to dot1q.
Console> (enable) 07/02/1998,18:22:25:DTP-5:Port 2/9 has become dot1q trunk

Console> (enable) show trunk
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 2/9      desirable    dot1q          trunking      1

Port      Vlans allowed on trunk
--------  --------------------------------------------------------------------
 2/9      1-1005

Port      Vlans allowed and active in management domain
--------  --------------------------------------------------------------------
 2/9      1,5,10-32,101-120,150,200,250,300,400,500,600,700,800,900,1000

Port      Vlans in spanning tree forwarding state and not pruned
--------  --------------------------------------------------------------------
 2/9      5,10-32,101-120,150,200,250,300,400,500,600,700,800,900,1000
Console> (enable)
```

Defining the Allowed VLANs on a Trunk

When you configure a trunk port, all VLANs are added to the allowed VLANs list for that trunk. However, you can remove VLANs from the allowed list to prevent traffic for those VLANs from passing over the trunk.

Note When you first configure a port as a trunk, the **set trunk** command always adds all VLANs to the allowed VLAN list for the trunk, even if you specify a VLAN range (any specified VLAN range is ignored). To modify the allowed VLANs list, use a combination of the **clear trunk** and **set trunk** commands to specify the allowed VLANs.

To define the allowed VLAN list for a trunk port, perform this task in privileged mode:

	Task	Command
Step 1	Remove VLANs from the allowed VLANs list for a trunk.	**clear trunk** *mod_num/port_num vlans*
Step 2	(Optional) Add specific VLANs to the allowed VLANs list for a trunk.	**set trunk** *mod_num/port_num vlans*
Step 3	Verify the allowed VLAN list for the trunk.	**show trunk** [*mod_num/port_num*]

This example shows how to define the allowed VLANs list for trunk port 1/1 to allow VLANs 1–100, VLAN 250, and VLANs 500–1005, and how to verify the allowed VLAN list for the trunk:

```
Console> (enable) clear trunk 1/1 101-499
Removing Vlan(s) 101-499 from allowed list.
Port 1/1 allowed vlans modified to 1-100,500-1005.
Console> (enable) set trunk 1/1 250
Adding vlans 250 to allowed list.
Port(s) 1/1 allowed vlans modified to 1-100,250,500-1005.
Console> (enable) show trunk 1/1
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 1/1      desirable    dot1q           trunking      1
Port      Vlans allowed on trunk
--------  ---------------------------------------------------------------------
 1/1      1-100,250,500-1005
Port      Vlans allowed and active in management domain
--------  ---------------------------------------------------------------------
 1/1      1,521-524
Port      Vlans in spanning tree forwarding state and not pruned
--------  ---------------------------------------------------------------------
 1/1      1,521-524
Console> (enable)
```

Disabling a Trunk Port

To explicitly turn off trunking on a port, perform this task in privileged mode:

	Task	Command
Step 1	Turn off trunking on a port.	**set trunk** *mod_num/port_num* **off**
Step 2	Verify the trunking configuration.	**show trunk** [*mod_num/port_num*]

To return a port to the default trunk type and mode for that port type, perform this task in privileged mode:

	Task	Command
Step 1	Return the port to the default trunking type and mode for that port type.	**clear trunk** *mod_num/port_num*
Step 2	Verify the trunking configuration.	**show trunk** [*mod_num/port_num*]

Example VLAN Trunk Configurations

This section contains example VLAN trunk configurations:

- 802.1Q Trunk over Gigabit EtherChannel Link Example, page 11-8
- Load-Sharing VLAN Traffic over Parallel Trunks Example, page 11-11
- 802.1Q Nonegotiate Trunk Configuration Example, page 11-18

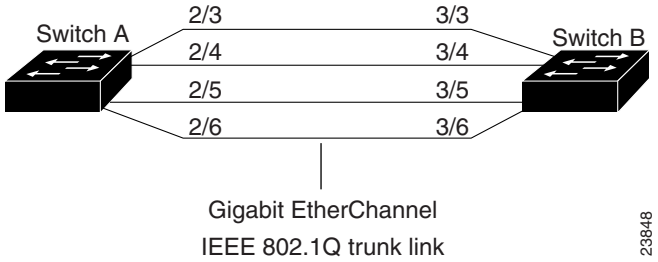
Note For examples of configuring trunk links between switches and routers, refer to the *Layer 3 Switching Software Configuration Guide—Catalyst 5000 Family, 4000 Family, 2926G Series, 2926 Series, 2948G, and 2980G Switches* publication.

802.1Q Trunk over Gigabit EtherChannel Link Example

This example configuration shows how to configure an 802.1Q trunk over a Gigabit EtherChannel link between two switches with 802.1Q-capable hardware. (Use the **show port capabilities** command to see if your hardware is 802.1Q-capable.)

Figure 11-1 shows two switches connected through four 1000BASE-SX Gigabit Ethernet ports.

Figure 11-1 IEEE 802.1Q Trunk Over Gigabit EtherChannel Link



This example shows how to configure the switches to form a four-port Gigabit EtherChannel bundle, and then configure the EtherChannel bundle as an 802.1Q trunk link.

Note For complete information on configuring Gigabit EtherChannel, see Chapter 6, "Configuring Fast EtherChannel and Gigabit EtherChannel."

Step 1 Make sure that all ports on both Switch A and Switch B are assigned to the same VLAN. This VLAN is used as the 802.1Q native VLAN for the trunk. In this example, all ports are configured as members of VLAN 1.

```
Switch_A> (enable) set vlan 1 2/3-6
VLAN  Mod/Ports
---- ----------------------
1     2/1-6

Switch_A> (enable)

Switch_B> (enable) set vlan 1 3/3-6
VLAN  Mod/Ports
---- ----------------------
1     3/1-6

Switch_B> (enable)
```

Step 2 Confirm the channeling and trunking status of the switches by entering the **show port channel** and **show trunk** commands.

```
Switch_A> (enable) show port channel
No ports channelling
Switch_A> (enable) show trunk
```

```
No ports trunking.
Switch_A> (enable)

Switch_B> (enable) show port channel
No ports channelling
Switch_B> (enable) show trunk
No ports trunking.
Switch_B> (enable)
```

Step 3 Configure the ports on Switch A to negotiate a Gigabit EtherChannel bundle with the neighboring switch. This example assumes that the neighboring ports on Switch B are in EtherChannel **auto** mode. The system logging messages provide information about the formation of the EtherChannel bundle.

```
Switch_A> (enable) set port channel 2/3-6 desirable
Port(s) 2/3-6 channel mode set to desirable.
Switch_A> (enable) %PAGP-5-PORTFROMSTP:Port 2/3 left bridge port 2/3
%PAGP-5-PORTFROMSTP:Port 2/4 left bridge port 2/4
%PAGP-5-PORTFROMSTP:Port 2/5 left bridge port 2/5
%PAGP-5-PORTFROMSTP:Port 2/6 left bridge port 2/6
%PAGP-5-PORTFROMSTP:Port 2/4 left bridge port 2/4
%PAGP-5-PORTFROMSTP:Port 2/5 left bridge port 2/5
%PAGP-5-PORTFROMSTP:Port 2/6 left bridge port 2/6
%PAGP-5-PORTFROMSTP:Port 2/3 left bridge port 2/3
%PAGP-5-PORTTOSTP:Port 2/3 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/4 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/5 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/6 joined bridge port 2/3-6

Switch_B> (enable) %PAGP-5-PORTFROMSTP:Port 3/3 left bridge port 3/3
%PAGP-5-PORTFROMSTP:Port 3/4 left bridge port 3/4
%PAGP-5-PORTFROMSTP:Port 3/5 left bridge port 3/5
%PAGP-5-PORTFROMSTP:Port 3/6 left bridge port 3/6
%PAGP-5-PORTFROMSTP:Port 3/4 left bridge port 3/4
%PAGP-5-PORTFROMSTP:Port 3/5 left bridge port 3/5
%PAGP-5-PORTFROMSTP:Port 3/6 left bridge port 3/6
%PAGP-5-PORTFROMSTP:Port 3/3 left bridge port 3/3
%PAGP-5-PORTTOSTP:Port 3/3 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/4 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/5 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/6 joined bridge port 3/3-6
```

Step 4 After the EtherChannel bundle is negotiated, enter the **show port channel** command to verify the configuration.

```
Switch_A> (enable) show port channel
Port  Status     Channel   Channel     Neighbor                  Neighbor
                 mode      status      device                    port
----- ---------- --------- ----------- ------------------------- ----------
 2/3  connected  desirable channel     WS-C4003    JAB023806(Sw  2/3
 2/4  connected  desirable channel     WS-C4003    JAB023806(Sw  2/4
 2/5  connected  desirable channel     WS-C4003    JAB023806(Sw  2/5
 2/6  connected  desirable channel     WS-C4003    JAB023806(Sw  2/6
----- ---------- --------- ----------- ------------------------- ----------
Switch_A> (enable)

Switch_B> (enable) show port channel
Port  Status     Channel   Channel     Neighbor                  Neighbor
                 mode      status      device                    port
----- ---------- --------- ----------- ------------------------- ----------
 3/3  connected  auto      channel     WS-C4003    JAB023806(Sw  2/3
 3/4  connected  auto      channel     WS-C4003    JAB023806(Sw  2/4
```

```
 3/5  connected  auto      channel     WS-C4003    JAB023806(Sw  2/5
 3/6  connected  auto      channel     WS-C4003    JAB023806(Sw  2/6
----- ---------- --------- ----------- ------------------------- ----------
Switch_B> (enable)
```

Step 5 Configure one of the ports in the EtherChannel bundle to negotiate an 802.1Q trunk. The configuration is applied to all of the ports in the bundle. This example assumes that the neighboring ports on Switch B are configured to use **dot1q** or **negotiate** encapsulation and are in **auto** trunk mode. The system logging messages provide information about the formation of the 802.1Q trunk.

```
Switch_A> (enable) set trunk 2/3 desirable dot1q
Port(s) 2/3-6 trunk mode set to desirable.
Port(s) 2/3-6 trunk type set to dot1q.
Switch_A> (enable) %DTP-5-TRUNKPORTON:Port 2/3 has become dot1q trunk
%DTP-5-TRUNKPORTON:Port 2/4 has become dot1q trunk
%PAGP-5-PORTFROMSTP:Port 2/3 left bridge port 2/3-6
%DTP-5-TRUNKPORTON:Port 2/5 has become dot1q trunk
%PAGP-5-PORTFROMSTP:Port 2/4 left bridge port 2/3-6
%PAGP-5-PORTFROMSTP:Port 2/5 left bridge port 2/3-6
%DTP-5-TRUNKPORTON:Port 2/6 has become dot1q trunk
%PAGP-5-PORTFROMSTP:Port 2/6 left bridge port 2/3-6
%PAGP-5-PORTFROMSTP:Port 2/3 left bridge port 2/3
%PAGP-5-PORTTOSTP:Port 2/3 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/4 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/5 joined bridge port 2/3-6
%PAGP-5-PORTTOSTP:Port 2/6 joined bridge port 2/3-6

Switch_B> (enable) %DTP-5-TRUNKPORTON:Port 3/3 has become dot1q trunk
%DTP-5-TRUNKPORTON:Port 3/4 has become dot1q trunk
%PAGP-5-PORTFROMSTP:Port 3/3 left bridge port 3/3-6
%PAGP-5-PORTFROMSTP:Port 3/4 left bridge port 3/3-6
%PAGP-5-PORTFROMSTP:Port 3/5 left bridge port 3/3-6
%PAGP-5-PORTFROMSTP:Port 3/6 left bridge port 3/3-6
%DTP-5-TRUNKPORTON:Port 3/5 has become dot1q trunk
%DTP-5-TRUNKPORTON:Port 3/6 has become dot1q trunk
%PAGP-5-PORTFROMSTP:Port 3/5 left bridge port 3/3-6
%PAGP-5-PORTFROMSTP:Port 3/6 left bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/3 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/4 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/5 joined bridge port 3/3-6
%PAGP-5-PORTTOSTP:Port 3/6 joined bridge port 3/3-6
```

Step 6 After the 802.1Q trunk link is negotiated, enter the **show trunk** command to verify the configuration.

```
Switch_A> (enable) show trunk
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 2/3      desirable    dot1q          trunking      1
 2/4      desirable    dot1q          trunking      1
 2/5      desirable    dot1q          trunking      1
 2/6      desirable    dot1q          trunking      1

Port      Vlans allowed on trunk
--------  ---------------------------------------------------------------------
 2/3      1-1005
 2/4      1-1005
 2/5      1-1005
 2/6      1-1005

Port      Vlans allowed and active in management domain
```

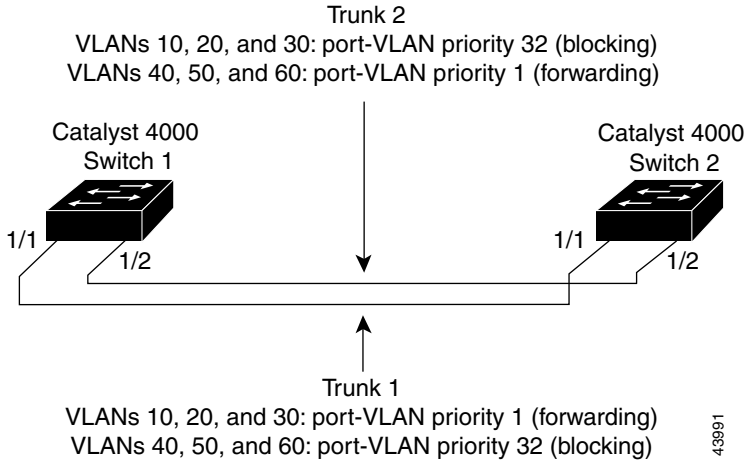
```
--------  ------------------------------------------------------------------
 2/3      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 2/4      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 2/5      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 2/6      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999

Port      Vlans in spanning tree forwarding state and not pruned
--------  ------------------------------------------------------------------
 2/3
 2/4
 2/5
 2/6
Switch_A> (enable)

Switch_B> (enable) show trunk
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 3/3      auto         dot1q          trunking      1
 3/4      auto         dot1q          trunking      1
 3/5      auto         dot1q          trunking      1
 3/6      auto         dot1q          trunking      1

Port      Vlans allowed on trunk
--------  ------------------------------------------------------------------
 3/3      1-1005
 3/4      1-1005
 3/5      1-1005
 3/6      1-1005

Port      Vlans allowed and active in management domain
--------  ------------------------------------------------------------------
 3/3      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/4      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/5      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/6      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999

Port      Vlans in spanning tree forwarding state and not pruned
--------  ------------------------------------------------------------------
 3/3      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/4      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/5      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
 3/6      1-5,10,20,50,152,200,300,400,500,521-524,570,850,917,999
Switch_B> (enable)
```

Load-Sharing VLAN Traffic over Parallel Trunks Example

Using spanning tree port-VLAN priorities, you can load-share VLAN traffic over parallel trunk ports so that traffic from some VLANs travels over one trunk, while traffic from other VLANs travels over the other trunk. This configuration allows traffic to be carried over both trunks simultaneously (instead of keeping one trunk in blocking mode), which reduces the total traffic carried over each trunk while still maintaining a fault-tolerant configuration.

Figure 11-2 shows a parallel trunk configuration between two switches, using the Fast Ethernet uplink ports on the supervisor engine.

Figure 11-2 Parallel Trunk Configuration Before Configuring VLAN-Traffic Load Sharing



By default, the port-VLAN priority for both trunks is equal (a value of 32). Therefore, STP blocks port 1/2 (Trunk 2) for each VLAN on Switch 1 to prevent forwarding loops. Trunk 2 is not used to forward traffic unless Trunk 1 fails.

This example shows how to configure the switches so that traffic from multiple VLANs is load-balanced over the parallel trunks.

Step 1 Configure a VTP domain on both Switch 1 and Switch 2 by entering the **set vtp** command so that the VLAN information configured on Switch 1 is learned by Switch 2. Make sure Switch 1 is a VTP server. You can configure Switch 2 as a VTP client or as a VTP server.

```
Switch_1> (enable) set vtp domain BigCorp mode server
VTP domain BigCorp modified
Switch_1> (enable)

Switch_2> (enable) set vtp domain BigCorp mode server
VTP domain BigCorp modified
Switch_2> (enable)
```

Step 2 Create the VLANs on Switch 1 by entering the **set vlan** command. In this example, you see VLANs 10, 20, 30, 40, 50, and 60:

```
Switch_1> (enable) set vlan 10
Vlan 10 configuration successful
Switch_1> (enable) set vlan 20
Vlan 20 configuration successful
Switch_1> (enable) set vlan 30
Vlan 30 configuration successful
Switch_1> (enable) set vlan 40
Vlan 40 configuration successful
Switch_1> (enable) set vlan 50
Vlan 50 configuration successful
Switch_1> (enable) set vlan 60
Vlan 60 configuration successful
Switch_1> (enable)
```

Step 3 Verify the VTP and VLAN configuration on Switch 1 by entering the **show vtp domain** and **show vlan** commands:

```
Switch_1> (enable) show vtp domain
Domain Name                    Domain Index VTP Version Local Mode  Password
```

```
-------------------------------- ------------ ----------- ----------- ----------
BigCorp                          1            2           server      -

Vlan-count Max-vlan-storage Config Revision Notifications
---------- ---------------- --------------- -------------
11         1023             13              disabled

Last Updater    V2 Mode  Pruning  PruneEligible on Vlans
--------------- -------- -------- -------------------------
172.20.52.10    disabled enabled  2-1000
Switch_1> (enable) show vlan
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ---------------------------
1    default                          active    1/1-2
                                                2/1-12
                                                5/1-2
10   VLAN0010                         active
20   VLAN0020                         active
30   VLAN0030                         active
40   VLAN0040                         active
50   VLAN0050                         active
60   VLAN0060                         active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
.
.
.
Switch_1> (enable)
```

Step 4 Configure the supervisor engine uplinks on Switch 1 as 802.1Q trunk ports by entering the **set trunk** command. Specifying the desirable mode on the Switch 1 ports causes the ports on Switch 2 to negotiate to become trunk links (assuming that the Switch 2 uplinks are in the default **auto** mode).

```
Switch_1> (enable) set trunk 1/1 desirable
Port(s)  1/1 trunk mode set to desirable.
2000 Jul 12 01:56:28 %DTP-5-TRUNKPORTON:Port 1/1 has become dot1q trunk
Switch_1> (enable)

Switch_1> (enable) set trunk 1/2 desirable
Port(s)  1/2 trunk mode set to desirable.
2000 Jul 12 01:56:52 %DTP-5-TRUNKPORTON:Port 1/2 has become dot1q trunk
Switch_1> (enable)
```

Step 5 Verify that the trunk links are up by entering the **show trunk** command:

```
Switch_1> (enable) show trunk 1
* - indicates vtp domain mismatch
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 1/1      desirable    dot1q          trunking      1
 1/2      desirable    dot1q          trunking      1

Port      Vlans allowed on trunk
--------  ---------------------------------------------------------------------
 1/1      1-1005
 1/2      1-1005

Port      Vlans allowed and active in management domain
--------  ---------------------------------------------------------------------
 1/1      1-2,10,20,30,40,50,60,99-105
 1/2      1-2,10,20,30,40,50,60,99-105
```

```
Port      Vlans in spanning tree forwarding state and not pruned
--------  ------------------------------------------------------------------
 1/1      1-2,10,20,30,40,50,60,99-105
 1/2Switch_1> (enable)
```

Step 6 When the trunk links come up, VTP passes the VTP and VLAN configuration to Switch 2. Verify that Switch 2 has learned the VLAN configuration by entering the **show vlan** command on Switch 2:

```
Switch_2> (enable) show vlan
VLAN Name                             Status    Mod/Ports, Vlans
---- -------------------------------- --------- ----------------------------
1    default                          active
10   VLAN0010                         active
20   VLAN0020                         active
30   VLAN0030                         active
40   VLAN0040                         active
50   VLAN0050                         active
60   VLAN0060                         active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
.
.
.
Switch_2> (enable)
```

Step 7 Spanning tree takes one to two minutes to converge. After the network stabilizes, check the spanning tree state of each trunk port on Switch 1 by entering the **show spantree** command.

Trunk 1 is forwarding for all VLANs. Trunk 2 is blocking for all VLANs. On Switch 2, both trunks are forwarding for all VLANs, but no traffic passes over Trunk 2 because port 1/2 on Switch 1 is blocking.

```
Switch_1> (enable) show spantree 1/1
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     forwarding        19        32   disabled
 1/1      10    forwarding        19        32   disabled
 1/1      20    forwarding        19        32   disabled
 1/1      30    forwarding        19        32   disabled
 1/1      40    forwarding        19        32   disabled
 1/1      50    forwarding        19        32   disabled
 1/1      60    forwarding        19        32   disabled
 1/1      1003  not-connected     19        32   disabled
 1/1      1005  not-connected     19         4   disabled
Switch_1> (enable) show spantree 1/2
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/2      1     blocking          19        32   disabled
 1/2      10    blocking          19        32   disabled
 1/2      20    blocking          19        32   disabled
 1/2      30    blocking          19        32   disabled
 1/2      40    blocking          19        32   disabled
 1/2      50    blocking          19        32   disabled
 1/2      60    blocking          19        32   disabled
 1/2      1003  not-connected     19        32   disabled
 1/2      1005  not-connected     19         4   disabled
Switch_1> (enable)
```

Step 8 Divide the configured VLANs into two groups. You might want traffic from half of the VLANs to go over one trunk link and half over the other, or if one VLAN has heavier traffic, you can have traffic from that VLAN go over one trunk and traffic from the other VLANs go over the other trunk link.

In this example, VLANs 10, 20, and 30 (Group 1) are forwarded over Trunk 1, and VLANs 40, 50, and 60 (Group 2) are forwarded over Trunk 2.

Step 9 On Switch 1, enter the **set spantree portvlanpri** command to change the port-VLAN priority for the Group 1 VLANs on Trunk 1 (port 1/1) to an integer value lower than the default of 32:

```
Switch_1> (enable) set spantree portvlanpri 1/1 1 10
Port 1/1 vlans 1-9,11-1004 using portpri 32.
Port 1/1 vlans 10 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_1> (enable) set spantree portvlanpri 1/1 1 20
Port 1/1 vlans 1-9,11-19,21-1004 using portpri 32.
Port 1/1 vlans 10,20 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_1> (enable) set spantree portvlanpri 1/1 1 30
Port 1/1 vlans 1-9,11-19,21-29,31-1004 using portpri 32.
Port 1/1 vlans 10,20,30 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_1> (enable)
```

Step 10 On Switch 1, change the port-VLAN priority for the Group 2 VLANs on Trunk 2 (port 1/2) to an integer value lower than the default of 32:

```
Switch_1> (enable) set spantree portvlanpri 1/2 1 40
Port 1/2 vlans 1-39,41-1004 using portpri 32.
Port 1/2 vlans 40 using portpri 1.
Port 1/2 vlans 1005 using portpri 4.
Switch_1> (enable) set spantree portvlanpri 1/2 1 50
Port 1/2 vlans 1-39,41-49,51-1004 using portpri 32.
Port 1/2 vlans 40,50 using portpri 1.
Port 1/2 vlans 1005 using portpri 4.
Switch_1> (enable) set spantree portvlanpri 1/2 1 60
Port 1/2 vlans 1-39,41-49,51-59,61-1004 using portpri 32.
Port 1/2 vlans 40,50,60 using portpri 1.
Port 1/2 vlans 1005 using portpri 4.
Switch_1> (enable)
```

Step 11 On Switch 2, change the port-VLAN priority for the Group 1 VLANs on Trunk 1 (port 1/1) to the same value you configured for those VLANs on Switch 1.

Caution The port-VLAN priority for each VLAN must be equal on both ends of the link.

```
Switch_2> (enable) set spantree portvlanpri 1/1 1 10
Port 1/1 vlans 1-9,11-1004 using portpri 32.
Port 1/1 vlans 10 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_2> (enable) set spantree portvlanpri 1/1 1 20
Port 1/1 vlans 1-9,11-19,21-1004 using portpri 32.
Port 1/1 vlans 10,20 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_2> (enable) set spantree portvlanpri 1/1 1 30
Port 1/1 vlans 1-9,11-19,21-29,31-1004 using portpri 32.
Port 1/1 vlans 10,20,30 using portpri 1.
Port 1/1 vlans 1005 using portpri 4.
Switch_2> (enable)
```

Step 12 On Switch 2, change the port-VLAN priority for the Group 2 VLANs on Trunk 2 (port 1/2) to the same value you configured for those VLANs on Switch 1:

```
Switch_2> (enable) set spantree portvlanpri 1/2 1 40
Port 1/2 vlans 1-39,41-1004 using portpri 32.
Port 1/2 vlans 40 using portpri 1.
```

```
Port 1/2 vlans 1005 using portpri 4.
Switch_2> (enable) set spantree portvlanpri 1/2 1 50
Port 1/2 vlans 1-39,41-49,51-1004 using portpri 32.
Port 1/2 vlans 40,50 using portpri 1.
Port 1/2 vlans 1005 using portpri 4.
Switch_2> (enable) set spantree portvlanpri 1/2 1 60
Port 1/2 vlans 1-39,41-49,51-59,61-1004 using portpri 32.
Port 1/2 vlans 40,50,60 using portpri 1.
Port 1/2 vlans 1005 using portpri 4.
Switch_2> (enable)
```

Step 13 When you have configured the port-VLAN priorities on both ends of the link, the spanning tree converges to use the new configuration.

Check the spanning tree port states on Switch 1 by entering the **show spantree** command. The Group 1 VLANs should be forwarding on Trunk 1 and blocking on Trunk 2. The Group 2 VLANs should be blocking on Trunk 1 and forwarding on Trunk 2.

```
Switch_1> (enable) show spantree 1/1
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     forwarding        19        32   disabled
 1/1      10    forwarding        19         1   disabled
 1/1      20    forwarding        19         1   disabled
 1/1      30    forwarding        19         1   disabled
 1/1      40    blocking          19        32   disabled
 1/1      50    blocking          19        32   disabled
 1/1      60    blocking          19        32   disabled
 1/1      1003  not-connected     19        32   disabled
 1/1      1005  not-connected     19         4   disabled
Switch_1> (enable) show spantree 1/2
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/2      1     blocking          19        32   disabled
 1/2      10    blocking          19        32   disabled
 1/2      20    blocking          19        32   disabled
 1/2      30    blocking          19        32   disabled
 1/2      40    forwarding        19         1   disabled
 1/2      50    forwarding        19         1   disabled
 1/2      60    forwarding        19         1   disabled
 1/2      1003  not-connected     19        32   disabled
 1/2      1005  not-connected     19         4   disabled
Switch_1> (enable)
```

Figure 11-3 shows the network after you configure VLAN traffic load-sharing.

Figure 11-3 Parallel Trunk Configuration After Configuring VLAN Traffic Load-Sharing

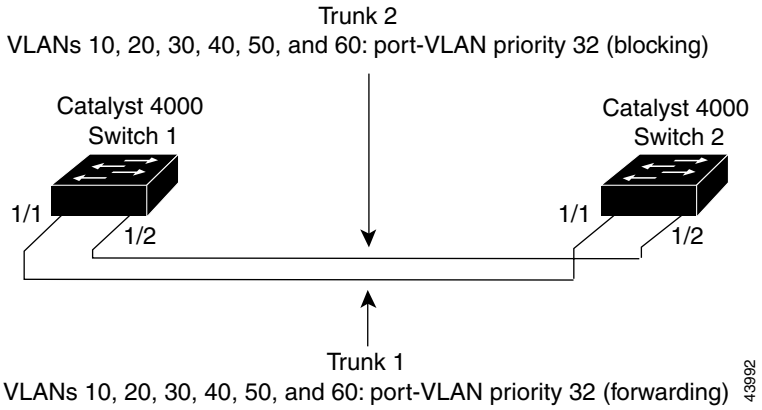


Figure 11-3 shows that both trunks are utilized when the network is operating normally and, if one trunk link fails, the other trunk link acts as an alternate forwarding path for the traffic previously traveling over the failed link.

If Trunk 1 fails in the network shown in Figure 11-3, STP reconverges to use Trunk 2 to forward traffic from all the VLANs, as shown in the following example:

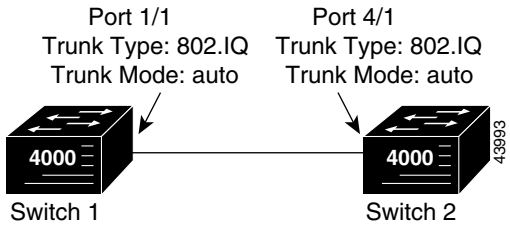
```
Switch_1> (enable) 04/21/1998,03:15:40:DISL-5:Port 1/1 has become non-trunk

Switch_1> (enable) show spantree 1/1
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     not-connected     19        32   disabled
Switch_1> (enable) show spantree 1/2
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/2      1     learning          19        32   disabled
 1/2      10    learning          19        32   disabled
 1/2      20    learning          19        32   disabled
 1/2      30    learning          19        32   disabled
 1/2      40    forwarding        19         1   disabled
 1/2      50    forwarding        19         1   disabled
 1/2      60    forwarding        19         1   disabled
 1/2      1003  not-connected     19        32   disabled
 1/2      1005  not-connected     19         4   disabled
Switch_1> (enable) show spantree 1/2
Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/2      1     forwarding        19        32   disabled
 1/2      10    forwarding        19        32   disabled
 1/2      20    forwarding        19        32   disabled
 1/2      30    forwarding        19        32   disabled
 1/2      40    forwarding        19         1   disabled
 1/2      50    forwarding        19         1   disabled
 1/2      60    forwarding        19         1   disabled
 1/2      1003  not-connected     19        32   disabled
 1/2      1005  not-connected     19         4   disabled
Switch_1> (enable)
```

802.1Q Nonegotiate Trunk Configuration Example

This example configuration shows how to configure an 802.1Q Fast Ethernet trunk between two Catalyst 4000 family switches with 802.1Q-capable hardware. (Use the **show port capabilities** command to see if your hardware is 802.1Q-capable.)

In this example, an 802.1Q trunk is configured between port 1/1 on Switch 1 and port 4/1 on Switch 2. The initial network configuration is shown in Figure 11-4. Assume that the native VLAN is VLAN 1 on both ends of the link.

Figure 11-4 802.1Q Trunking: Initial Network Configuration

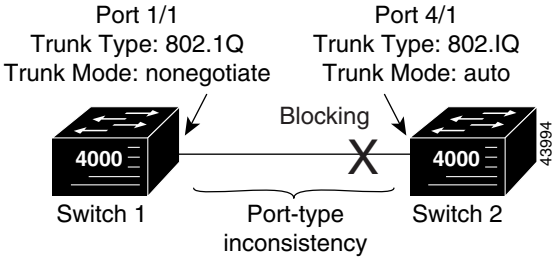


Step 1 To configure a port as an 802.1Q trunk, enter the **set trunk** command. You must use the **nonegotiate** keyword when configuring a port as an 802.1Q trunk.

```
Switch 1> (enable) set trunk 1/1 nonegotiate dot1q
Port(s) 1/1 trunk mode set to nonegotiate.
Port(s) 1/1 trunk type set to dot1q.
Switch 1> (enable) 04/15/1998,22:02:17:DISL-5:Port 1/1 has become dot1q trunk

Switch 2> (enable) 04/15/1998,22:01:42:SPANTREE-2: Rcved 1Q-BPDU on non-1Q-trunk port 4/1
vlan 1.
04/15/1998,22:01:42:SPANTREE-2: Block 4/1 on rcving vlan 1 for inc trunk port.
04/15/1998,22:01:42:SPANTREE-2: Block 4/1 on rcving vlan 1 for inc peer vlan 2.
Switch 2> (enable)
```

Note After the port on Switch 1 is configured as an 802.1Q trunk, syslog messages are displayed on the Switch 2 console, and port 4/1 on Switch 2 is blocked. STP blocks the port because there is a port-type inconsistency on the trunk link: port 1/1 on Switch 1 is configured as an 802.1Q trunk while port 4/1 on Switch 2 is configured as an ISL trunk (see Figure 11-5). Port 4/1 would also be blocked if it were configured as a nontrunk port.

Figure 11-5 802.1Q Trunking: Port-Type Inconsistency



Step 2 Display the problem on Switch 2 by entering the the **show spantree** and **show spantree statistics** commands. The configuration mismatch exists until the port on Switch 2 is properly configured.

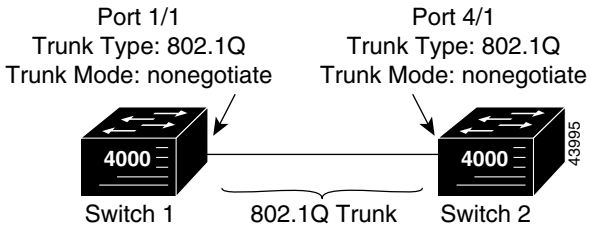
```
Switch 2> (enable) show spantree 1
VLAN 1
Spanning tree enabled
Spanning tree type          ieee

Designated Root             00-60-09-79-c3-00
Designated Root Priority    32768
Designated Root Cost        0
Designated Root Port        1/0
Root Max Age   20 sec    Hello Time 2  sec   Forward Delay 15 sec

Bridge ID MAC ADDR          00-60-09-79-c3-00
Bridge ID Priority          32768
Bridge Max Age 20 sec    Hello Time 2  sec   Forward Delay 15 sec

Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     not-connected      4        32   disabled
 1/2      1     not-connected      4        32   disabled
 4/1      1     type-pvid-inconsistent    100        32   disabled
 4/2      1     not-connected    100        32   disabled

<...output truncated...>

Switch 2> (enable) show spantree statistics 4/1
Port  4/1 VLAN 1

SpanningTree enabled for vlanNo = 1

               BPDU-related parameters
port spanning tree                  enabled
state                               broken
port_id                             0x8142
port number                         0x142
path cost                           100
message age (port/VLAN)             1(20)
designated_root                     00-60-09-79-c3-00
designated_cost                     0
designated_bridge                   00-60-09-79-c3-00
designated_port                     0x8142
top_change_ack                      FALSE
config_pending                      FALSE
port_inconsistency                  port_type & port_vlan

<...output truncated...>

Switch 2> (enable)
```

Step 3 Resolve the misconfiguration by completing the 802.1Q configuration on Switch 2:

```
Switch 2> (enable) set trunk 4/1 nonegotiate dot1q
Port(s) 4/1 trunk mode set to nonegotiate.
Port(s) 4/1 trunk type set to dot1q.
Switch 2> (enable) 2/20/1998,23:41:15:DISL-5:Port 4/1 has become dot1q trunk
```

Port 4/1 on Switch 2 changes from blocking mode to forwarding mode once the port-type inconsistency is resolved (see Figure 11-6). (This assumes that there is no wiring loop present that would cause the port to be blocked normally by spanning tree. In either case, the port state would change from "type-pvid-inconsistent" to "blocking" in the **show spantree** output.)

Figure 11-6 802.1Q Trunking: Final Network Configuration



Step 4 Verify the 802.1Q configuration on Switch 1 by entering the **show trunk** and **show spantree** commands:

```
Switch 1> (enable) show trunk 1/1
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 1/1      nonegotiate  dot1q          trunking      1

Port      Vlans allowed on trunk
--------  ---------------------------------------------------------------------
 1/1      1-1005

Port      Vlans allowed and active in management domain
--------  ---------------------------------------------------------------------
 1/1      1-3,1003,1005

Port      Vlans in spanning tree forwarding state and not pruned
--------  ---------------------------------------------------------------------
 1/1      1005
Switch 1> (enable) show spantree 1
VLAN 1
Spanning tree enabled
Spanning tree type          ieee

Designated Root             00-60-09-79-c3-00
Designated Root Priority    32768
Designated Root Cost        0
Designated Root Port        1/1
Root Max Age   20 sec    Hello Time 2  sec   Forward Delay 15 sec

Bridge ID MAC ADDR          00-10-29-b5-30-00
Bridge ID Priority          49152
Bridge Max Age 20 sec    Hello Time 2  sec   Forward Delay 15 sec

Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     forwarding         4        32   disabled
 1/2      1     not-connected      4        32   disabled

<...output truncated...>

Switch 1> (enable)
```

The output shows that port 1/1 is an 802.1Q trunk port, that its status is “trunking,” and that the port-state is “forwarding.”

Step 5 Verify the configuration on Switch 2 by entering the **show trunk** and **show spantree** commands:

```
Switch 2> (enable) show trunk 4/1
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 4/1      nonegotiate  dot1q          trunking      1
```

```
Port      Vlans allowed on trunk
--------  ------------------------------------------------------------------
 4/1      1-1005

Port      Vlans allowed and active in management domain
--------  ------------------------------------------------------------------
 4/1      1-3,1003,1005

Port      Vlans in spanning tree forwarding state and not pruned
--------  ------------------------------------------------------------------
 4/1      1005
Switch 2> (enable) show spantree 1
VLAN 1
Spanning tree enabled
Spanning tree type          ieee

Designated Root             00-60-09-79-c3-00
Designated Root Priority    32768
Designated Root Cost        0
Designated Root Port        1/0
Root Max Age   20 sec    Hello Time 2  sec   Forward Delay 15 sec

Bridge ID MAC ADDR          00-60-09-79-c3-00
Bridge ID Priority          32768
Bridge Max Age 20 sec    Hello Time 2  sec   Forward Delay 15 sec

Port      Vlan  Port-State     Cost   Priority  Fast-Start  Group-method
--------- ----  -------------  -----  --------  ----------  ------------
 1/1      1     not-connected      4        32   disabled
 1/2      1     not-connected      4        32   disabled
 4/1      1     forwarding       100        32   disabled
 4/2      1     not-connected    100        32   disabled
<...output truncated...>
Switch 2> (enable)
```

The output shows that port 4/1 is an 802.1Q trunk port, that its status is “trunking,” and that the port-state is “forwarding.”

Step 6 Verify connectivity across the trunk using the **ping** command:

```
Switch 1> (enable) ping switch_2
switch_2 is alive
Switch 1> (enable)
```

Disabling VLAN 1 on a Trunk Link

On the Catalyst enterprise LAN switches, VLAN 1 is enabled by default to allow control protocols to transmit and receive packets across the network topology. However, when VLAN 1 is enabled on trunk links in a large complex network topology, the impact of broadcast storms increases. Because spanning tree applies to the entire network topology, the possibility of spanning tree loops also increases when VLAN 1 is enabled on all trunk links. To prevent this situation, you can disable VLAN 1 on trunk interfaces.

When you disable VLAN 1 on a trunk interface, no user traffic is transmitted or received across that trunk interface, but the supervisor engine will continue to transmit and receive packets from control protocols such as Cisco Discovery Protocol (CDP), VLAN Trunking Protocol (VTP), Port Aggregation Protocol (PAgP), Dynamic Trunking Protocol (DTP), and so forth.

When a trunk port with VLAN 1 disabled becomes a nontrunk port, it is added to the native VLAN. If the native VLAN is VLAN 1, the port is enabled and added to VLAN 1.

To disable VLAN 1 on a trunk interface, perform this task in privileged mode:

	Task	Command
Step 1	Disable VLAN 1 on the trunk interface.	**clear trunk** *mod_num/port_num* [*vlan-range*]
Step 2	Verify the allowed VLAN list for the trunk.	**show trunk** [*mod_num/port_num*]

This example shows how to disable VLAN 1 on a trunk link and verify the configuration:

```
Console> (enable) clear trunk 8/1 1
Removing Vlan(s) 1 from allowed list.
Port  8/1 allowed vlans modified to 2-1005.
Console> (enable) show trunk 8/1
Port      Mode         Encapsulation  Status        Native vlan
--------  -----------  -------------  ------------  -----------
 8/1      on           isl            trunking      1

Port      Vlans allowed on trunk
--------  --------------------------------------------------------------------
 8/1      2-1005

Port      Vlans allowed and active in management domain
--------  --------------------------------------------------------------------
 8/1      2-6,10,20,50,100,152,200,300,400,500,521,524,570,776,801-802,850,917,9
99,1003,1005

Port      Vlans in spanning tree forwarding state and not pruned
--------  --------------------------------------------------------------------
 8/1      2-6,10,20,50,100,152,200,300,400,500,521,524,570,776,802,850,917,999,1
003,1005
Console> (enable)
```