



Understanding and Configuring VLANs

This chapter describes VLANs on the Catalyst 4000 family switches. It also provides guidelines, procedures, and configuration examples.

This chapter consists of the following sections:

- [VLANs Overview, page 7-1](#)
- [VLAN Default Configuration, page 7-3](#)
- [VLAN Configuration Guidelines and Restrictions, page 7-3](#)
- [Configuring VLANs, page 7-5](#)



Note

For complete syntax and usage information for the commands used in this chapter, refer to the *Command Reference for the Catalyst 4006 Switch with Supervisor Engine III* and the publications at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/index.htm>

VLANs Overview

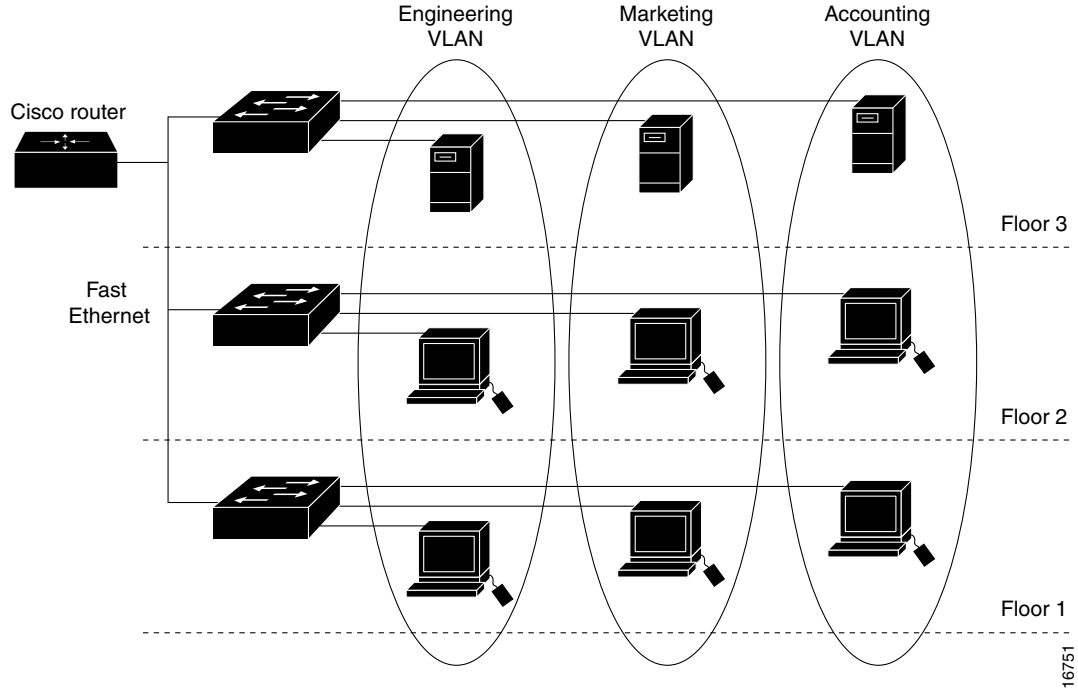
In the technical definition set forth by the IEEE, VLANs define broadcast domains in a Layer 2 network. A broadcast domain is the extent that a frame propagates through a network. Legacy networks use routers to define broadcast domain boundaries. Layer 2 switches create broadcast domains based on the configuration of the switch. Switches are multi-port bridges that allow you to create multiple broadcast domains. Each broadcast domain is like a distinct virtual bridge within a switch.

You can define one or many virtual bridges within a switch. Each virtual bridge you create in the switch defines a new broadcast domain (VLAN). Traffic cannot pass directly to another VLAN (between broadcast domains) within the switch or between two switches. To interconnect two different VLANs, you must use routers or Layer 3 switches. See “[Layer 3 Interfaces Overview](#)” section on [page 10-1](#) for information on inter-VLAN routing on the Catalyst 4000 family switches.

VLANs have the same attributes as a physical LAN but VLANs allow you to group end stations even when they are not connected physically to the same LAN segment.

[Figure 7-1](#) shows an example of three VLANs in logically defined networks.

Figure 7-1 VLANs in Logically Defined Networks



VLANs are often associated with IP subnetworks. For example, all of the end stations in a particular IP subnet belong to the same VLAN. Traffic between VLANs must be routed. LAN interface VLAN membership is assigned manually on an interface-by-interface basis. When you assign LAN interfaces to VLANs using this method, it is known as interface-based or static VLAN membership.

You can set the following parameters when you create a VLAN in the management domain:

- VLAN number
- VLAN name
- VLAN type (Ethernet, FDDI, FDDI network entity title [NET], TrBRF, or TrCRF)
- VLAN state (active or suspended)
- Security Association Identifier (SAID)
- Bridge identification number for TrBRF VLANs
- Ring number for FDDI and TrCRF VLANs
- Parent VLAN number for TrCRF VLANs
- Spanning Tree Protocol (STP) type for TrCRF VLANs
- VLAN number to use when translating from one VLAN type to another


Note

When translating from one VLAN type to another, the software requires a different VLAN number for each media type.

VLAN Configuration Guidelines and Restrictions

Follow these guidelines and restrictions when creating and modifying VLANs in your network:

- Before you can create a VLAN, the Catalyst 4000 family switch must be in VTP server mode or VTP transparent mode. If the Catalyst 4000 family switch is a VTP server, you must define a VTP domain. For information on configuring VTP, see [Chapter 9, “Understanding and Configuring VTP.”](#)
- The Cisco IOS **end** command is not supported in VLAN database mode.
- You cannot enter **Ctrl-Z** to exit VLAN database mode.

VLAN Default Configuration

Tables 7-1 through 7-5 show the default configurations for the different VLAN media types.

Table 7-1 Ethernet VLAN Defaults and Ranges

Parameter	Default	Range
VLAN ID	1	1–1005
VLAN name	“default”	No range
802.10 SAID	100001	1–4294967294
MTU size	1500	No range
Translational bridge 1	1002	0–1005
Translational bridge 2	1003	0–1005
VLAN state	active	active, suspend, shutdown



Note

Catalyst 4000 family switches do not support Token Ring or FDDI media. The switch does not forward FDDI, FDDI-Net, TrCRF, or TrBRF traffic, but it does propagate the VLAN configuration via VTP.

Table 7-2 FDDI VLAN Defaults and Ranges

Parameter	Default	Range
VLAN ID	1002	1–1005
VLAN name	“fddi-default”	No range
802.10 SAID	101002	1–4294967294
MTU size	1500	No range
Ring number	0	1–4095
Parent VLAN	0	0–1005
Translational bridge 1	0	0–1005
Translational bridge 2	0	0–1005
VLAN state	active	active, suspend

Table 7-3 Token Ring (TrCRF) VLAN Defaults and Ranges

Parameter	Default	Range
VLAN ID	1003	1–1005
VLAN name	VTPv1 “token-ring-default”; VTPv2 “trcrf-default”	No range
Parent VLAN	VTPv1 0; VTPv2 1005	No range
802.10 SAID	101003	1–4294967294
Ring Number	VTPv1 0; VTPv2 3276	1–4095
MTU size	VTPv1 default 1500; VTPv2 default 4472	No range
Translational bridge 1	0	0–1005
Translational bridge 2	0	0–1005
VLAN state	active	active, suspend
Bridge mode	VTPv1 none; VTPv2 srb	srb, srt
ARE max hops	7	0–13
STE max hops	7	0–13
Backup CRF	disabled	disable; enable

Table 7-4 FDDI-Net VLAN Defaults and Ranges

Parameter	Default	Range
VLAN ID	1004	1–1005
VLAN name	“fddinet-default”	No range
802.10 SAID	101004	1–4294967294
MTU size	1500	No range
Bridge number	0	0–15
STP type	ieee	auto, ibm, ieee
VLAN state	active	active, suspend

Table 7-5 Token Ring (TrBRF) VLAN Defaults and Ranges

Parameter	Default	Range
VLAN ID	1005	1–1005
VLAN name	VTPv1 “trnet-default”; VTPv2 “trbrf-default”	No range
802.10 SAID	101005	1–4294967294
MTU size	VTPv1 1500; VTPv2 4472	No range
Bridge number	VTPv1 0; VTPv2 15	0–15
STP type	ibm	auto, ibm, ieee
VLAN state	active	active, suspend

Configuring VLANs

**Note**

Before you configure VLANs, you must decide whether to use VLAN Trunk Protocol (VTP) to maintain global VLAN configuration information for your network. For complete information on VTP, see [Chapter 9, “Understanding and Configuring VTP.”](#)

**Note**

VLANs support a number of parameters that are not discussed in detail in this section. For complete information, refer to the *Command Reference for the Catalyst 4006 Switch with Supervisor Engine III*.

These sections describe how to configure VLANs:

- [VLAN Configuration Options, page 7-5](#)
- [Configuring VLANs in Global Mode, page 7-6](#)
- [Assigning a Layer 2 LAN Interface to a VLAN, page 7-8](#)

VLAN Configuration Options

These sections describe the VLAN configuration options:

- [VLAN Configuration in Global Configuration Mode, page 7-5](#)
- [VLAN Configuration in VLAN Database Mode, page 7-6](#)

**Note**

The VLAN configuration is stored in the `vlan.dat` file, which is stored in nonvolatile memory. You can cause inconsistency in the VLAN database if you manually delete the `vlan.dat` file. If you want to modify the VLAN configuration or VTP, use the commands described in the following sections and in the *Command Reference for the Catalyst 4006 Switch with Supervisor Engine III*.

VLAN Configuration in Global Configuration Mode

If the switch is in VTP server or transparent mode (see the [“Configuring VTP” section on page 9-6](#)), you can configure VLANs in global and `config-vlan` configuration modes. When you configure VLANs in global and `config-vlan` configuration modes, the VLAN configuration is saved in the `vlan.dat` files. To display the VLAN configuration, enter the **show vlan** command.

If the switch is in VLAN transparent mode, the copy **running-config startup-config** command saves the VLAN configuration to the `startup-config` file. After you save the running configuration as the startup configuration, the **show running-config** and **show startup-config** commands display the VLAN configuration.

**Note**

When the switch boots, if the VTP domain name and VTP mode in the `startup-config` and `vlan.dat` files do not match, the switch uses the configuration in the `vlan.dat` file.

VLAN Configuration in VLAN Database Mode

If the switch is in VTP server or transparent mode, you can configure VLANs in the VLAN database mode. When you configure VLANs in VLAN database mode, the VLAN configuration is saved in the `vlan.dat` files. To display the VLAN configuration, enter the **show vlan** command.

You use the interface configuration command mode to define the port membership mode and add and remove ports from a VLAN. The results of these commands are written to the running-config file, and you can display the contents of the file by entering the **show running-config** command.

Configuring VLANs in Global Mode

User-configured VLANs have unique IDs from 1 to 1001. To create a VLAN, enter the **vlan** command with an unused ID. To modify a VLAN, enter the **vlan** command for an existing VLAN.

See the “[VLAN Default Configuration](#)” section on page 7-3 for the list of default parameters that are assigned when you create a VLAN. If you do not use the `media` keyword when specifying the VLAN type, the VLAN is an Ethernet VLAN.

To create a VLAN, perform this task:

	Task	Command
Step 1	Enter VLAN configuration mode.	Switch# configure terminal
Step 2	Add an Ethernet VLAN. Use the <code>no</code> keyword to delete a VLAN. Note You cannot delete the default VLANs for the different media types: Ethernet VLAN 1 and FDDI or Token Ring VLANs 1002 to 1005. When you delete a VLAN, any LAN interfaces configured as access ports assigned to that VLAN become inactive. They remain associated with the VLAN (and thus inactive) until you assign them to a new VLAN.	Switch(config)# [no] vlan <i>vlan_ID</i> Switch(config-vlan)#
Step 3	Update the VLAN database and return to privileged EXEC mode.	Switch(config-vlan)# end
Step 4	Verify the VLAN configuration.	Switch# show vlan [<i>id</i> <i>name</i>] <i>vlan_name</i>

This example shows how to create an Ethernet VLAN in global configuration mode and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 3
Switch(config-vlan)# end
Switch# show vlan id 3
```

```
VLAN Name                Status    Ports
-----
3      VLAN0003                active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo  Stp  BrdgMode  Trans1  Trans2
-----
3      enet     100003   1500  -     -     -       -    -         0      0

Primary Secondary Type            Interfaces
-----
```

Configuring VLANs in VLAN Database Mode

User-configured VLANs have unique IDs from 1 to 1001. To create a VLAN, enter the **vlan** command with an unused ID. To modify a VLAN, enter the **vlan** command for an existing VLAN.

See the “[VLAN Default Configuration](#)” section on page 7-3 for a listing of the default parameters that are assigned when you create a VLAN. If you do not use the **media** keyword when specifying the VLAN type, the VLAN is an Ethernet VLAN.

To create a VLAN, perform this task:

	Task	Command
Step 1	Enter VLAN configuration mode.	Switch# vlan database
Step 2	Add an Ethernet VLAN. Use the no keyword to delete a VLAN. Note You cannot delete the default VLANs for the different media types: Ethernet VLAN 1 and FDDI or Token Ring VLANs 1002 to 1005. When you delete a VLAN, any LAN interfaces configured as access ports assigned to that VLAN become inactive. They remain associated with the VLAN (and thus inactive) until you assign them to a new VLAN.	Switch(vlan)# vlan <i>vlan_ID</i>
Step 3	Update the VLAN database and return to privileged EXEC mode.	Switch(vlan)# exit
Step 4	Verify the VLAN configuration.	Switch# show vlan [id name] <i>vlan_name</i>

This example shows how to create an Ethernet VLAN in VLAN database mode and verify the configuration:

```
Switch# vlan database
Switch(vlan)# vlan 3
VLAN 3 added:
    Name: VLAN0003
Switch(vlan)# exit
APPLY completed.
Exiting...
Switch# show vlan name VLAN0003
VLAN Name                Status      Ports
-----
3      VLAN0003                active

```

```
VLAN Type  SAID      MTU    Parent RingNo BridgeNo Stp  Trans1  Trans2
-----
3      enet  100003   1500    -     -     -     -     0      0
Switch#
```

Assigning a Layer 2 LAN Interface to a VLAN

A VLAN created in a management domain remains unused until you assign one or more LAN interfaces to the VLAN.

**Note**

Ensure you assign LAN interfaces to a VLAN of the proper type. Assign Fast Ethernet and Gigabit Ethernet interfaces to Ethernet-type VLANs.

To assign one or more LAN interfaces to a VLAN, complete the procedures in the [“Configuring Ethernet Interfaces for Layer 2 Switching”](#) section on page 6-5.