Configuring VTP

Prerequisites for VTP

Before you create VLANs, you must decide whether to use the VLAN Trunking Protocol (VTP) in your network. Using VTP, you can make configuration changes centrally on one or more switches and have those changes automatically communicated to all the other devices in the network. Without VTP, you cannot send information about VLANs to other switches.

VTP is designed to work in an environment where updates are made on a single switch and are sent through VTP to other switches in the domain. It does not work well in a situation where multiple updates to the VLAN database occur simultaneously on switches in the same domain, which would result in an inconsistency in the VLAN database.

The switch supports a total of 64 VLANs. If the switch is notified by VTP of a new VLAN and the switch is already using the maximum available hardware resources, it sends a message that there are not enough hardware resources available and shuts down the VLAN. The output of the **show vlan** user EXEC command shows the VLAN in a suspended state.

Because trunk ports send and receive VTP advertisements, you must ensure that at least one trunk port is configured on the switch and that this trunk port is connected to the trunk port of another switch. Otherwise, the switch cannot receive any VTP advertisements.

Restrictions for VTP

Note Before adding a VTP client switch to a VTP domain, always verify that its VTP configuration revision number is lower than the configuration revision number of the other switches in the VTP domain. Switches in a VTP domain always use the VLAN configuration of the switch with the highest VTP configuration revision number. If you add a switch that has a revision number higher than the revision number in the VTP domain, it can erase all VLAN information from the VTP server and VTP domain.

The following are restrictions for configuring VTPs:

- It is normal to have approximately 10 access interfaces or 5 trunk interfaces to flap simultaneously with negligible impact to CPU utilization. If there are more interfaces that flap simultaneously, then CPU usage may be excessively high.

Information About VTP

VTP

VTP is a Layer 2 messaging protocol that maintains VLAN configuration consistency by managing the addition, deletion, and renaming of VLANs on a network-wide basis. VTP minimizes misconfigurations and configuration inconsistencies that can cause several problems, such as duplicate VLAN names, incorrect VLAN-type specifications, and security violations.

VTP version 1 and version 2 supports the entire VLAN range (VLANs 1 to 4094).

VTP Domain

A VTP domain (also called a VLAN management domain) consists of one switch or several interconnected switches under the same administrative responsibility sharing the same VTP domain name. A switch can be in only one VTP domain. You make global VLAN configuration changes for the domain.

By default, the switch is in the VTP no-management-domain state until it receives an advertisement for a domain over a trunk link (a link that carries the traffic of multiple VLANs) or until you configure a domain name. Until the management domain name is specified or learned, you cannot create or modify VLANs on a VTP server, and VLAN information is not propagated over the network.

If the switch receives a VTP advertisement over a trunk link, it inherits the management domain name and the VTP configuration revision number. The switch then ignores advertisements with a different domain name or an earlier configuration revision number.

When you make a change to the VLAN configuration on a VTP server, the change is propagated to all switches in the VTP domain. VTP advertisements are sent over all IEEE trunk connections, including IEEE 802.1Q. VTP dynamically maps VLANs with unique names and internal index associates across multiple LAN types. Mapping eliminates excessive device administration required from network administrators.

If you configure a switch for VTP transparent mode, you can create and modify VLANs, but the changes are not sent to other switches in the domain, and they affect only the individual switch. However, configuration changes made when the switch is in this mode are saved in the switch running configuration and can be saved to the switch startup configuration file.

VTP Modes

Table 1: VTP Modes

VTP Mode	Description
VTP server	In VTP server mode, you can create, modify, and delete VLANs, and specify other configuration parameters (such as the VTP version) for the entire VTP domain. VTP servers advertise their VLAN configurations to other switches in the same VTP domain and synchronize their VLAN configurations with other switches based on advertisements received over trunk links. VTP server is the default mode. In VTP server mode, VLAN configurations are saved in NVRAM. If the switch detects a failure while writing a configuration to NVRAM, VTP mode automatically changes from server mode to client mode. If this happens, the switch cannot be returned to VTP server mode until the NVRAM is functioning.
VTP client	A VTP client functions like a VTP server and transmits and receives VTP updates on its trunks, but you cannot create, change, or delete VLANs on a VTP client. VLANs are configured on another switch in the domain that is in server mode. In VTP versions 1 and 2 in VTP client mode, VLAN configurations are not saved in NVRAM.

VTP Mode	Description
VTP transparent	VTP transparent switches do not participate in VTP. A VTP transparent switch does not advertise its VLAN configuration and does not synchronize its VLAN configuration based on received advertisements. However, in VTP version 2, transparent switches do forward VTP advertisements that they receive from other switches through their trunk interfaces. You can create, modify, and delete VLANs on a switch in VTP transparent mode. When the switch is in VTP transparent mode, the VTP and VLAN configurations are saved in NVRAM, but they are not advertised to other switches. In this mode, VTP mode and domain name are saved in the switch running configuration, and you can save this information in the switch startup configuration file by using the **copy running-config startup-config** privileged EXEC command.
VTP off	A switch in VTP off mode functions in the same manner as a VTP transparent switch, except that it does not forward VTP advertisements on trunks.

VTP Advertisements

Each switch in the VTP domain sends periodic global configuration advertisements from each trunk port to a reserved multicast address. Neighboring switches receive these advertisements and update their VTP and VLAN configurations as necessary.

VTP advertisements distribute this global domain information:

- VTP domain name
- VTP configuration revision number
- Update identity and update timestamp
- MD5 digest VLAN configuration, including maximum transmission unit (MTU) size for each VLAN
- Frame format

VTP advertisements distribute this VLAN information for each configured VLAN:

- VLAN IDs (including IEEE 802.1Q)
- VLAN name
- VLAN type
- VLAN state
- Additional VLAN configuration information specific to the VLAN type

VTP Version 2

If you use VTP in your network, you must decide which version of VTP to use. By default, VTP operates in version 1.

VTP version 2 supports these features that are not supported in version 1:

- Token Ring support—VTP version 2 supports Token Ring Bridge Relay Function (TrBRF) and Token Ring Concentrator Relay Function (TrCRF) VLANs.
- Unrecognized Type-Length-Value (TLV) support—A VTP server or client propagates configuration changes to its other trunks, even for TLVs it is not able to parse. The unrecognized TLV is saved in NVRAM when the switch is operating in VTP server mode.
- Version-Dependent Transparent Mode—In VTP version 1, a VTP transparent switch inspects VTP messages for the domain name and version and forwards a message only if the version and domain name match. Although VTP version 2 supports only one domain, a VTP version 2 transparent switch forwards a message only when the domain name matches.
- Consistency Checks—In VTP version 2, VLAN consistency checks (such as VLAN names and values) are performed only when you enter new information through the CLI or SNMP. Consistency checks are not performed when new information is obtained from a VTP message or when information is read from NVRAM. If the MD5 digest on a received VTP message is correct, its information is accepted.

VTP Pruning

VTP pruning increases network available bandwidth by restricting flooded traffic to those trunk links that the traffic must use to reach the destination devices. Without VTP pruning, a switch floods broadcast, multicast, and unknown unicast traffic across all trunk links within a VTP domain even though receiving switches might discard them. VTP pruning is disabled by default.

VTP pruning blocks unneeded flooded traffic to VLANs on trunk ports that are included in the pruning-eligible list. Only VLANs included in the pruning-eligible list can be pruned. By default, VLANs 2 through 1001 are pruning eligible switch trunk ports. If the VLANs are configured as pruning-ineligible, the flooding continues. VTP pruning is supported in all VTP versions.

With VTP versions 1 and 2, when you enable pruning on the VTP server, it is enabled for the entire VTP domain. Making VLANs pruning-eligible or pruning-ineligible affects pruning eligibility for those VLANs on that trunk only (not on all switches in the VTP domain).

VTP pruning takes effect several seconds after you enable it. VTP pruning does not prune traffic from VLANs that are pruning-ineligible. VLAN 1 and VLANs 1002 to 1005 are always pruning-ineligible; traffic from these VLANs cannot be pruned. Extended-range VLANs (VLAN IDs higher than 1005) are also pruning-ineligible.

VTP Configuration Guidelines

VTP Configuration Requirements

When you configure VTP, you must configure a trunk port so that the switch can send and receive VTP advertisements to and from other switches in the domain.

VTP Settings

The VTP information is saved in the VTP VLAN database. When VTP mode is transparent, the VTP domain name and mode are also saved in the switch running configuration file, and you can save it in the switch startup configuration file by entering the **copy running-config startup-config** privileged EXEC command. You must use this command if you want to save VTP mode as transparent, even if the switch resets.

When you save VTP information in the switch startup configuration file and reboot the switch, the switch configuration is selected as follows:

- If the VTP mode is transparent in the startup configuration and the VLAN database and the VTP domain name from the VLAN database matches that in the startup configuration file, the VLAN database is ignored (cleared), and the VTP and VLAN configurations in the startup configuration file are used. The VLAN database revision number remains unchanged in the VLAN database.
- If the VTP mode or domain name in the startup configuration do not match the VLAN database, the domain name and VTP mode and configuration for VLAN IDs 1 to 1005 use the VLAN database information.

Domain Names for Configuring VTP

When configuring VTP for the first time, you must always assign a domain name. You must configure all switches in the VTP domain with the same domain name. Switches in VTP transparent mode do not exchange VTP messages with other switches, and you do not need to configure a VTP domain name for them.

Note If the NVRAM and DRAM storage is sufficient, all switches in a VTP domain should be in VTP server mode.

Caution Do not configure a VTP domain if all switches are operating in VTP client mode. If you configure the domain, it is impossible to make changes to the VLAN configuration of that domain. Make sure that you configure at least one switch in the VTP domain for VTP server mode.

Passwords for the VTP Domain

You can configure a password for the VTP domain, but it is not required. If you do configure a domain password, all domain switches must share the same password and you must configure the password on each switch in the management domain. switches without a password or with the wrong password reject VTP advertisements.

If you configure a VTP password for a domain, a switch that is booted without a VTP configuration does not accept VTP advertisements until you configure it with the correct password. After the configuration, the switch accepts the next VTP advertisement that uses the same password and domain name in the advertisement.

If you are adding a new switch to an existing network with VTP capability, the new switch learns the domain name only after the applicable password has been configured on it.

Caution When you configure a VTP domain password, the management domain does not function properly if you do not assign a management domain password to each switch in the domain.

VTP Version

Follow these guidelines when deciding which VTP version to implement:

- All switches in a VTP domain must have the same domain name, but they do not need to run the same VTP version.
- A VTP version 2-capable switch can operate in the same VTP domain as a switch running VTP version 1 if version 2 is disabled on the version 2-capable switch (version 2 is disabled by default).
- If a switch running VTP version 1, but capable of running VTP version 2, receives VTP version 3 advertisements, it automatically moves to VTP version 2.
- Do not enable VTP version 2 on a switch unless all of the switches in the same VTP domain are version-2-capable. When you enable version 2 on a switch, all of the version-2-capable switches in the domain enable version 2. If there is a version 1-only switch, it does not exchange VTP information with switches that have version 2 enabled.
- Cisco recommends placing VTP version 1 and 2 switches at the edge of the network because they do not forward VTP version 3 advertisements.
- If there are TrBRF and TrCRF Token Ring networks in your environment, you must enable VTP version 2 for Token Ring VLAN switching to function properly. To run Token Ring and Token Ring-Net, disable VTP version 2.
- Devices that are only VTP version 1 capable cannot interoperate with VTP version 3 devices.
- VTP version 1 and version 2 do not propagate configuration information for extended range VLANs (VLANs 1006 to 4094). You must manually configure these VLANs on each device.

Default VTP Configuration

The following table shows the default VTP configuration.

Table 2: Default VTP Configuration

Feature	Default Setting
VTP domain name	Null
VTP mode (VTP version 1 and version 2)	Server
VTP version	Version 1
MST database mode	Transparent
VTP password	None
VTP pruning	Disabled

How to Configure VTP

Configuring VTP Mode

You can configure VTP mode as one of these:

- VTP server mode: In VTP server mode, you can change the VLAN configuration and have it propagated throughout the network.
- VTP client mode: In VTP client mode, you cannot change its VLAN configuration. The client switch receives VTP updates from a VTP server in the VTP domain and then modifies its configuration accordingly.
- VTP transparent mode: In VTP transparent mode, VTP is disabled on the switch. The switch does not send VTP updates and does not act on VTP updates received from other switch. However, a VTP transparent switch running VTP version 2 does forward received VTP advertisements on its trunk links.
- VTP off mode: VTP off mode is the same as VTP transparent mode except that VTP advertisements are not forwarded.

When you configure a domain name, it cannot be removed; you can only reassign a switch to a different domain.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**vtp domain** *domain-name* **Example:** `Device(config)# vtp domain eng_group`	Configures the VTP administrative-domain name. The name can be 1 to 32 characters. All switches operating in VTP server or client mode under the same administrative responsibility must be configured with the same domain name. This command is optional for modes other than server mode. VTP server mode requires a domain name. If the switch has a trunk connection to a VTP domain, it learns the domain name from the VTP server in the domain.

	Command or Action	Purpose
		You should configure the VTP domain before configuring other VTP parameters.

Step 4	**vtp mode** {**client** | **server** | **transparent** | **off**} {**vlan** | **mst** | **unknown**}
	Example:
	`Device(config)# vtp mode server`
		Configures the switch for VTP mode (client, server, transparent, or off).
		- **vlan**—The VLAN database is the default if none are configured.
		- **mst**—The multiple spanning tree (MST) database.
		- **unknown**—An unknown database type.

Step 5	**vtp password** *password* **Example:** `Device(config)# vtp password mypassword`	(Optional) Sets the password for the VTP domain. The password can be 8 to 64 characters. If you configure a VTP password, the VTP domain does not function properly if you do not assign the same password to each switch in the domain.

Step 6	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 7	**show vtp status** **Example:** `Device# show vtp status`	Verifies your entries in the *VTP Operating Mode* and the *VTP Domain Name* fields of the display.
Step 8	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	(Optional) Saves the configuration in the startup configuration file. Only VTP mode and domain name are saved in the switch running configuration and can be copied to the startup configuration file.

Enabling the VTP Version

VTP version 2 is disabled by default.

- When you enable VTP version 2 on a switch, every VTP version 2-capable switch in the VTP domain enables version 2.
- With VTP versions 1 and 2, you can configure the version only on switches in VTP server or transparent mode.

Caution VTP version 1 and VTP version 2 are not interoperable on switches in the same VTP domain. Do not enable VTP version 2 unless every switch in the VTP domain supports version 2.

- In TrCRF and TrBRF Token Ring environments, you must enable VTP version 2 for Token Ring VLAN switching to function properly. For Token Ring and Token Ring-Net media, disable VTP version 2.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Step 3	**vtp version** {**1** | **2** | **3**}
	Example:
	`Device(config)# vtp version 2`
		Enables the VTP version on the switch. The default is VTP version 1.

Step 4	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 5	**show vtp status** **Example:** `Device# show vtp status`	Verifies that the configured VTP version is enabled.
Step 6	**copy running-config startup-config** **Example:** `Device# copy running-config startup-config`	(Optional) Saves your entries in the configuration file.

Enabling VTP Pruning

Before you begin

VTP pruning is not designed to function in VTP transparent mode. If one or more switches in the network are in VTP transparent mode, you should do one of these actions:

- Turn off VTP pruning in the entire network.
- Turn off VTP pruning by making all VLANs on the trunk of the switch upstream to the VTP transparent switch pruning ineligible.

To configure VTP pruning on an interface, use the **switchport trunk pruning vlan** interface configuration command. VTP pruning operates when an interface is trunking. You can set VLAN pruning-eligibility, whether or not VTP pruning is enabled for the VTP domain, whether or not any given VLAN exists, and whether or not the interface is currently trunking.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**vtp pruning** **Example:** `Device(config)# vtp pruning`	Enables pruning in the VTP administrative domain. By default, pruning is disabled. You need to enable pruning on only one switch in VTP server mode.

Step 4	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 5	**show vtp status** **Example:** `Device# show vtp status`	Verifies your entries in the *VTP Pruning Mode* field of the display.

Adding a VTP Client Switch to a VTP Domain

Follow these steps to verify and reset the VTP configuration revision number on a switch *before* adding it to a VTP domain.

Before you begin

Before adding a VTP client to a VTP domain, always verify that its VTP configuration revision number is *lower* than the configuration revision number of the other switches in the VTP domain. Switches in a VTP domain always use the VLAN configuration of the switch with the highest VTP configuration revision number. With VTP versions 1 and 2, adding a switch that has a revision number higher than the revision number in the VTP domain can erase all VLAN information from the VTP server and VTP domain.

You can use the **vtp mode transparent** global configuration command to disable VTP on the switch and then to change its VLAN information without affecting the other switches in the VTP domain.

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. - Enter your password if prompted.
Step 2	**show vtp status** **Example:** `Device# show vtp status`	Checks the VTP configuration revision number. If the number is 0, add the switch to the VTP domain. If the number is greater than 0, follow these substeps: - Write down the domain name. - Write down the configuration revision number. - Continue with the next steps to reset the switch configuration revision number.
Step 3	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 4	**vtp domain** *domain-name* **Example:** `Device(config)# vtp domain domain123`	Changes the domain name from the original one displayed in Step 1 to a new name.

	Command or Action	Purpose

Step 5	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode.

Step 6	**show vtp status** **Example:** `Device# show vtp status`	Verifies that the configuration revision number has been reset to 0.
Step 7	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 8	**vtp domain** *domain-name* **Example:** `Device(config)# vtp domain domain012`	Enters the original domain name on the switch.

Step 9	**end**
	Example:
	`Device(config)# end`
		Returns to privileged EXEC mode. The VLAN information on the switch is updated.

Step 10	**show vtp status** **Example:** `Device# show vtp status`	(Optional) Verifies that the domain name is the same as in Step 1 and that the configuration revision number is 0.

Monitoring VTP

This section describes commands used to display and monitor the VTP configuration.

You monitor VTP by displaying VTP configuration information: the domain name, the current VTP revision, and the number of VLANs. You can also display statistics about the advertisements sent and received by the switch.

Table 3: VTP Monitoring Commands

Command	Purpose
show vtp counters	Displays counters about VTP messages that have been sent and received.
show vtp interface [*interface-id*]	Displays VTP status and configuration for all interfaces or the specified interface.
show vtp password	Displays the VTP password. The form of the password displayed depends on whether or not the **hidden** keyword was entered and if encryption is enabled on the switch.
show vtp status	Displays the VTP switch configuration information.

Configuration Examples for VTP

Example: Configuring a Switch as the Primary Server

This example shows how to configure a switch as the primary server for the VLAN database (the default) when a hidden or secret password was configured:

```
Device# vtp primary vlan
VTP Feature Conf Revision Primary Server Device ID Device Description
------------ ---- -------- -------------- -------------- ----------------------
VLAN Yes 25 bcf1.f2e4.9700 0c75.bd07.4a00 P3A_NEW
VLAN Yes 547 0c75.bd07.4a00 40a6.e8db.9780 Switch_A
MST Yes 10 006c.bc4e.2500 40a6.e8db.9780 Switch_A
VLAN Yes 25 bcf1.f2e4.9700 e8b7.489c.cc00 Switch_B-11

Do you want to continue? [confirm]
Switch#
Jun 17 01:08:50.758 PST: %SW_VLAN-4-VTP_PRIMARY_SERVER_CHG: 006c.bc4e.2500 has become the
primary server for the VLAN VTP feature
```

Example: Configuring Switch as VTP Server

This example shows how to configure the switch as a VTP server with the domain name *eng_group* and the password *mypassword*:

```
Switch(config)# vtp domain eng_group
Setting VTP domain name to eng_group.

Switch(config)# vtp mode server
Setting device to VTP Server mode for VLANS.
```

```
Switch(config)# vtp password mypassword
Setting device VLAN database password to mypassword.
Switch(config)# end
```

Example: Enabling VTP on the Interface

To enable VTP on the interface, use the **vtp** interface configuration command. To disable VTP on the interface, use the **no vtp** interface configuration command.

```
Device(config)# interface gigabitethernet 1/0/1
Device(config-if)# vtp
Device(config-if)# end
```

Example: Creating the VTP Password

The follow is an example of creating the VTP password.

```
Switch(config)# vtp password mypassword hidden
Generating the secret associated to the password.
Switch(config)# end
Switch# show vtp password
VTP password: 89914640C8D90868B6A0D8103847A733
```

Feature History for VTP

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS Release 15.2(7)E3k	VTP	VTP is a Layer 2 messaging protocol that maintains VLAN configuration consistency by managing the addition, deletion, and renaming of VLANs on a network-wide basis.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.