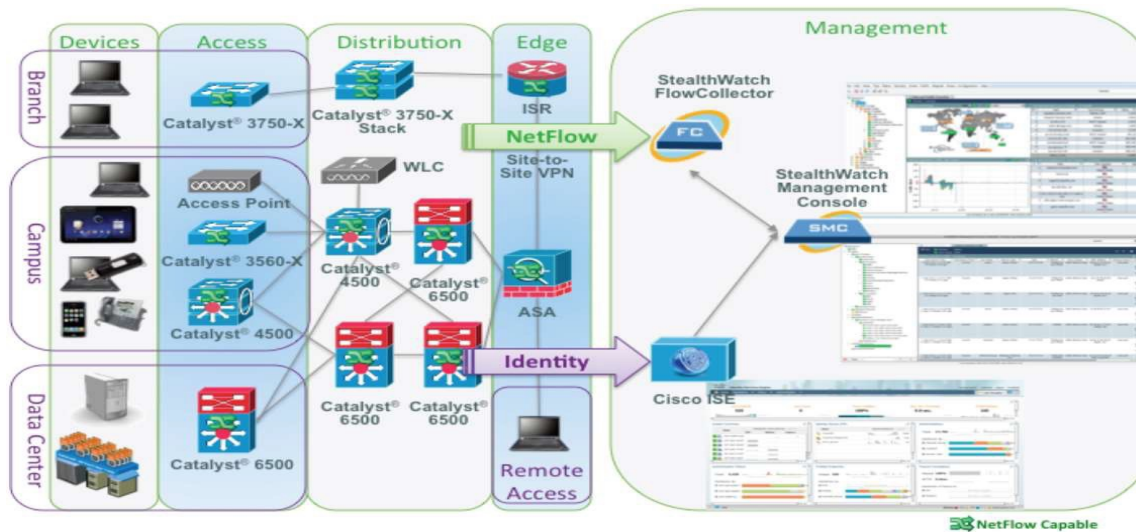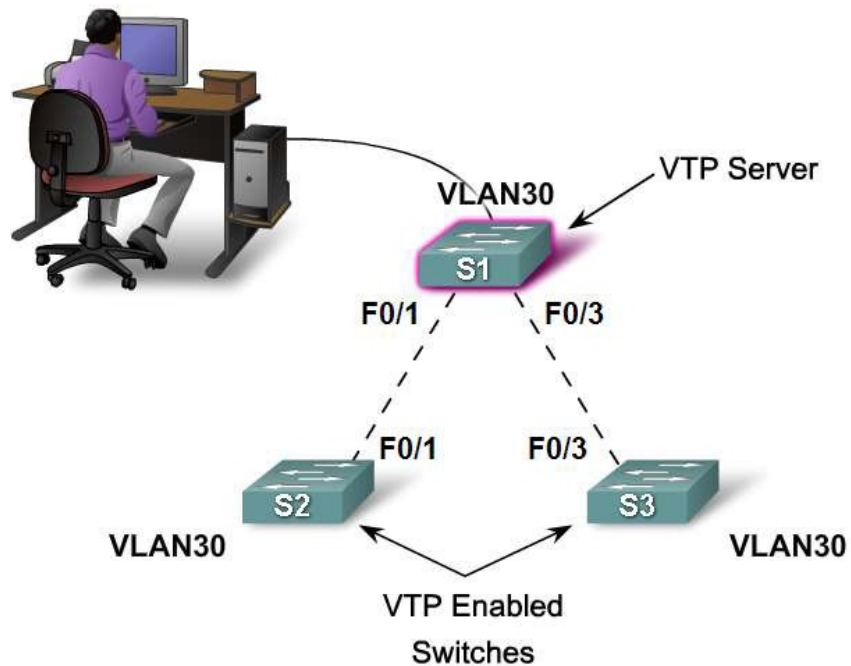# CIS 3250
VLAN Trunking Protocol (VTP)

The Role of VTP in a Converged Switched Network

What is VTP?

What is VTP?

- VTP allows a network manager to configure a switch so that it will propagate VLAN configurations to other switches in the network.

- The switch can be configured as a VTP server or as a VTP client. VTP only learns about normal-range VLANs (VLAN IDs 1 to 1005). VTP versions 1 and 2 do not support extended-range VLANs (IDs greater than 1005), but VTP version 3 does.

- VTP allows a network manager to make changes on a switch that is configured as a VTP server.

- The VTP server distributes and synchronizes VLAN information to VTP-enabled switches throughout the switched network, which minimizes the problems caused by incorrect configurations and configuration inconsistencies. VTP stores VLAN configurations in the VLAN database called vlan.dat.
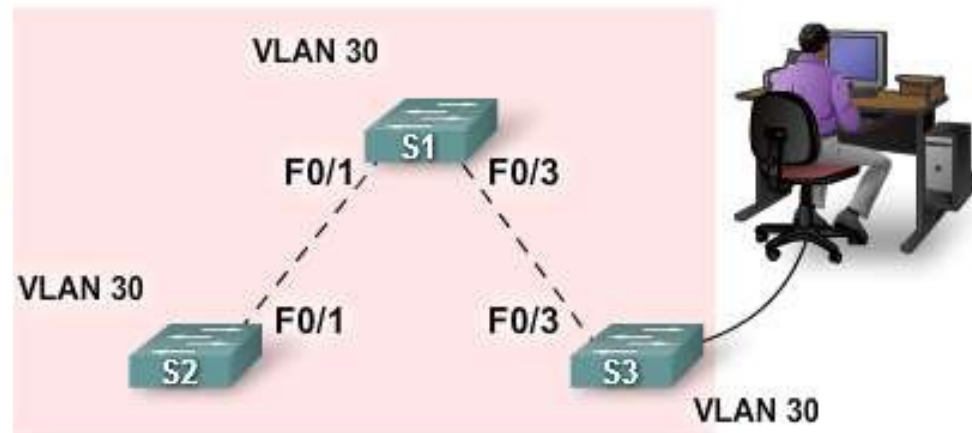
Small Network

The VLAN Management Challenge

Existing VLANs:
- VLAN 10 - faculty/staff
- VLAN 20 - students
- VLAN 99 - management VLAN

VLAN Management Task:
- Add VLAN 30 - guest

VLAN 30

VLAN 30

S1   F0/1   F0/3

S2   F0/1   F0/3   S3
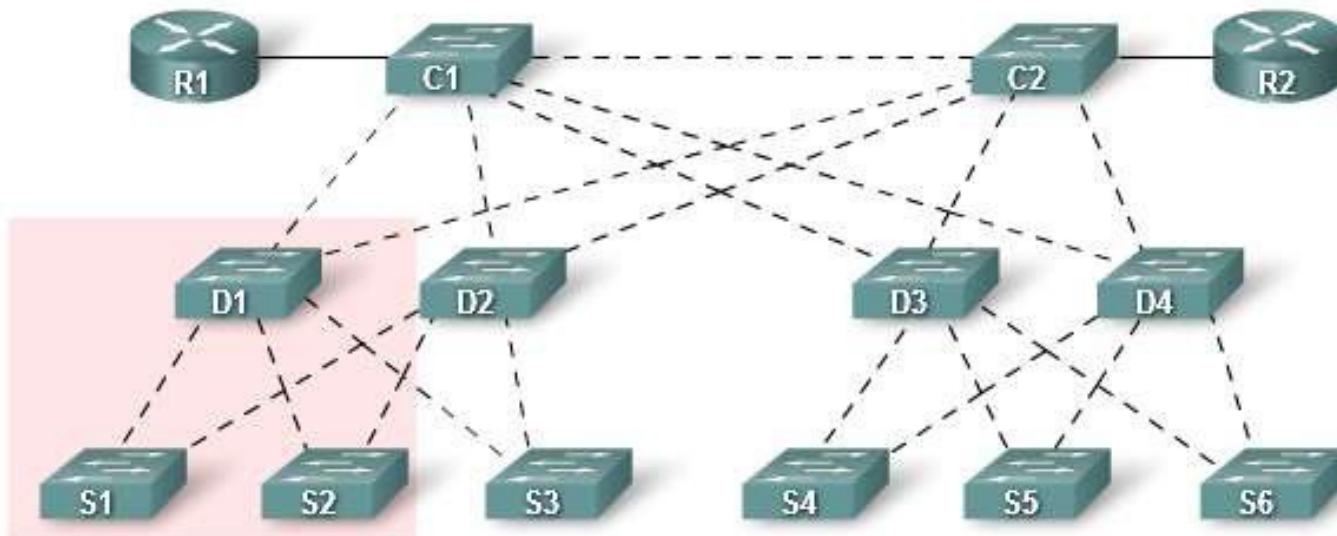
VLAN 30

Large Network

Existing VLANs: 10 ,20 99

VLAN Management Task: Add VLAN 30

VTP Benefits

VTP Benefits

- VLAN configuration consistency across the network
- Accurate tracking and monitoring of VLANs
- Dynamic reporting of added VLANs across a network
- Dynamic trunk configuration when VLANs are added to the network

Operation of VTP

- Importance of the default VTP configuration

Switch Output | Default VTP Configuration

VTP Version = 1
VTP Domain Name = null
VTP Mode = Server
Config Revision = 0
VLANs = 1
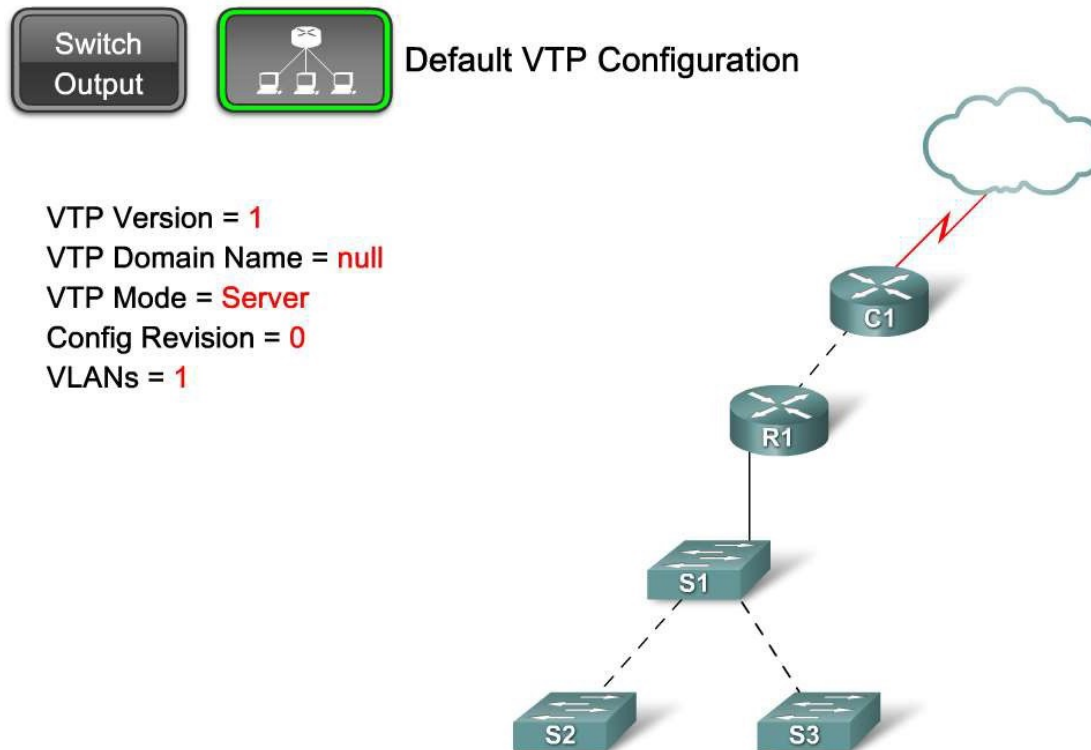
VTP Version

- VTP has three versions: 1, 2, and 3. Only one VTP version is allowed in a VTP domain.

- The default is VTP version 1. Cisco 2960 switches supports VTP version 2, but it is disabled.

Displaying VTP Status

- **VTP Version**-Displays the VTP version the switch is capable of running.
- **Configuration Revision**-Current configuration revision number on this switch. You will learn more about revision numbers in this chapter.
- **Maximum VLANs Supported Locally**-Maximum number of VLANs supported locally.
- **Number of Existing VLANs**-Number of existing VLANs.
- **VTP Operating Mode**-Can be server, client, or transparent.
- **VTP Domain Name**-Name that identifies the administrative domain for the switch.

VTP Status Displayed Discontinued

- **VTP Pruning Mode**-Displays whether pruning is enabled or disabled.
- **VTP V2 Mode**-Displays if VTP version 2 mode is enabled. VTP version 2 is disabled by default.
- **VTP Traps Generation**-Displays whether VTP traps are sent to a network management station.
- **MD5 Diges**t-A 16-byte checksum of the VTP configuration.
- **Configuration Last Modified**-Date and time of the last configuration modification. Displays the IP address of the switch that caused the configuration change to the database.

Show VTP Status

```
S1#show vtp status
VTP Version                    : 2
Configuration Revision         : 0
Maximum VLANs supported locally : 255
Number of existing VLANs       : 5
VTP Operating Mode             : Server
VTP Domain Name                :
VTP Pruning Mode               : Disabled
VTP V2 Mode                    : Disabled
VTP Traps Generation           : Disabled
MD5 digest                     : 0x3F 0x37 0x45 0x9A 0x37 0x53 0xA6 0xDE
Configuration last modified by 0.0.0.0 at 3-1-93 00:14:07
S1#
```

VTP Components

- **VTP Domain** - One or more interconnected switches. All switches in a domain share VLAN configuration details via VTP advertisements. A router or Layer 3 switch defines the domain boundary.

- **VTP Advertisements** - VTP uses a hierarchy of advertisements to distribute and synchronize VLAN configurations across the network.

- **VTP Modes** - A switch can be configured in one of three modes: server, client, or transparent.

- **VTP Server** - VTP servers advertise the VTP domain VLAN information to other VTP-enabled switches in the same VTP domain. VTP servers store the VLAN information for the entire domain in NVRAM. On the server, VLANs can be created, deleted, or renamed for the domain.

- **VTP Client** - VTP clients function like VTP servers, but you cannot create, change, or delete VLANs on a VTP client. A VTP client only stores the VLAN information for the entire domain while the switch is on. A switch reset deletes the VLAN information. You must configure VTP client mode on a switch.

VTP Components Continued

- **VTP Transparent**-Transparent switches forward VTP advertisements to VTP clients and VTP servers. Transparent switches do not participate in VTP. VLANs that are created, renamed, or deleted on transparent switches are local to that switch only.

- **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.

Describe the Operation of VTP

- Explain the role of domains in VTP
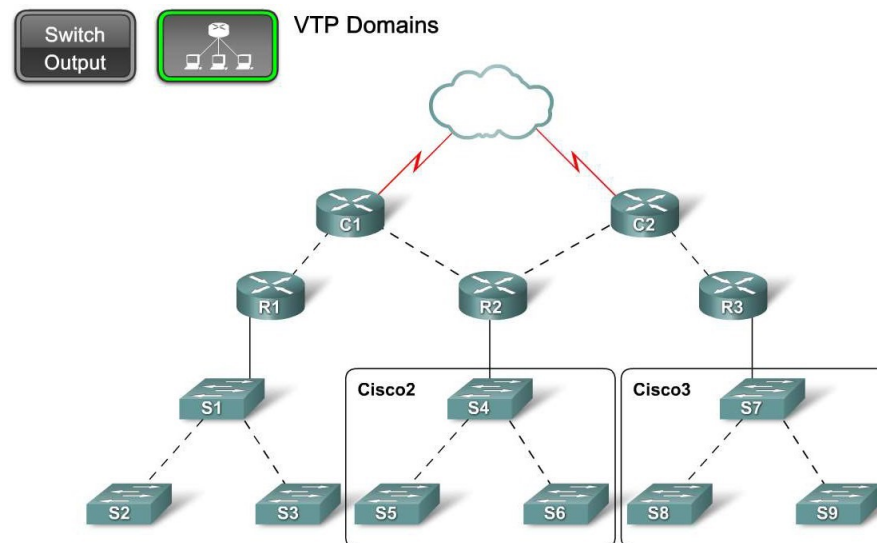

```
S4#show vtp status
VTP Version                    : 1
Configuration Revision         : 3
Maximum VLANs supported locally : 255
Number of existing VLANs       : 8
VTP Operating Mode             : Server
VTP Domain Name                : cisco2
VTP Pruning Mode               : Disabled
VTP V2 Mode                    : Disabled
VTP Traps Generation           : Disabled
MD5 digest                     : 0x3F 0x37 0x45 0x9A 0x37 0x53 0xA6 0xDE
Configuration last modified by 192.168.0.99 at 3-9-93 05:20:38
S4#
```

VTP Domains

- VTP lets you separate your network into smaller management domains to help reduce VLAN management. Configuring VTP domains also limits the extent to which configuration changes are propagated in the network if an error occurs.

- A VTP domain consists of one switch or several interconnected switches sharing the same VTP domain name.

- A switch can be a member of only one VTP domain at a time. Until the VTP domain name is specified, you cannot create or modify VLANs on a VTP server, and VLAN information is not propagated over the network.
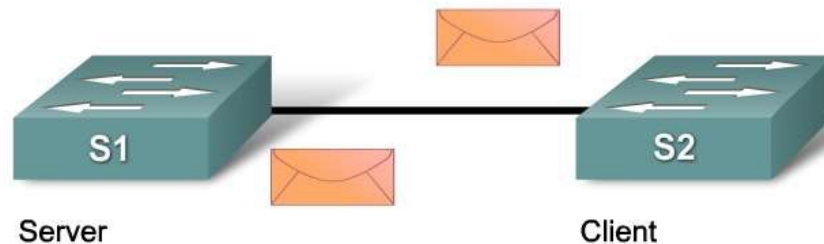
Describe the Operation of VTP

- Describe how VTP exchanges domain and VLAN information between switches in the same VTP domain

VTP Advertisements

Summary advertisements:
- Are sent every 5 minutes by a VTP Server
- Inform VTP enabled switches of the current VTP configuration revision number
- Are sent immediately after a configuration change

S1 — Server

S2 — Client

VTP Name Propagation

- A VTP server or client switch must be part of the same domain to participate in a VTP-enabled network.

- When switches are in different VTP domains, they do not exchange VTP messages.

- A VTP server propagates the VTP domain name to all switches for you. Domain name propagation uses three VTP components: servers, clients, and advertisements.

- Note: Cisco recommends that a password protect access to the domain name configuration functions.

VTP Advertising

```
S1#show vtp status
VTP Version                    : 2
Configuration Revision         : 3
Maximum VLANs supported locally : 255
Number of existing VLANs       : 8
VTP Operating Mode             : Server
VTP Domain Name                : cisco1
VTP Pruning Mode               : Disabled
VTP V2 Mode                    : Disabled
VTP Traps Generation           : Disabled
MD5 digest                     : 0x3F 0x37 0x45 0x9A 0x37 0x53 0xA6 0xDE
Configuration last modified by 192.168.0.99 at 3-9-93 05:20:38
S1#
```

Configuration Revision Number

- A 32-bit number that indicates the level of revision for a VTP frame.

- The starting configuration number for a switch is zero. Each time a VLAN is added or removed, the configuration revision number is incremented. Each VTP device tracks the VTP configuration revision number that is assigned to it.

- **Note:** A VTP domain name change does not increment the revision number; instead, it resets it to zero.

Summary Advertisements

- Sent every 5 minutes by a VTP server or client to inform neighboring VTP-enabled switches of the current VTP configuration revision number for its VTP domain

- Immediately after a configuration has been made

Subset Advertisements

- A subset advertisement contains VLAN information.

- Changes that trigger the subset advertisement include:

  - Creating or deleting a VLAN

  - Suspending or activating a VLAN

  - Changing the name of a VLAN

  - Changing the MTU (Maximum Transmission Unit) of a VLAN

Request Advertisement

- When a request advertisement is sent to a VTP server in the same VTP domain, the VTP server responds by sending a summary advertisement and then a subset advertisement.
  - Request advertisements are sent if:
  - The VTP domain name has been changed
  - The switch receives a summary advertisement with a higher configuration revision number than its own
  - A subset advertisement message is missed for some reason
  - The switch has been reset

Summary Advertisement

Summary Advertisement			
Version	Code	Followers	MgmtD Len
Management Domain Name (Zero-Padded to 32 Bytes)			
Configuration Revision Number			
Updater Identity			
Update Timestamp (12 Bytes)			
MD5 Digest (16 Bytes)			

Subset Details

The VLAN-info field contains information for each VLAN and is formatted as follows:

VLAN-Info			
Info Length	Status	VLAN-Type	VLAN-name Len
ISL VLAN-id		MTU Size	
802.10 Index			
VLAN-name (Padded with 0s to Multiples of 4 bytes)			

Advertisement Details

Advertisement Request			
Version	Code	Rsvd	MgmtD Len
Management Domain Name (zero-padded to 32 bytes)			
Start Value			

Describe the Operation of VTP

- The role VTP modes play in enabling VTP to distribute and synchronize domain and VLAN configuration information.

Transparent Mode in Action

Switch S3 in VTP Transparent has been configured with VLANs
Switch S4 has been added to the network

VTP Domain Name = cisco1
VTP Mode = Server
Config Revision = 2
VLANs = 1,2,3

S1
Server

VTP Domain Name = cisco1
VTP Mode = Transparent
Config Revision = 0
VLANs = 1,2,3,4,5,6

S3
Transparent

VTP Domain Name = cisco1
VTP Mode = Client
Config Revision = 2
VLANs = 1,2,3

S2
Client

VTP Domain Name = cisco1
VTP Mode = Client
Config Revision = 0

S4
Client

VTP Modes

	VTP Server	VTP Client	VTP Transparent
Description	Manage Domain and VLAN configurations	Updates VTP configurations VTP client switches cannot change VLAN configurations.	Able to manage local VLAN configurations. Local VLAN configurations not shared with VTP network
Respond to VTP advertisements?	Participates fully	Participates fully	Only Forwards VTP advertisements
Global VLAN configuration preserved on restart?	Yes, global configurations stored in NVRAM	No, global configurations stored in RAM, not in NVRAM	No, local VLAN configuration only is stored in NVRAM
Update other VTP enabled switches?	Yes	Yes	No

Server Mode

- In server mode, you can create, modify, and delete VLANs for the entire VTP domain.

- VTP server mode is the default mode for a Cisco switch.

- VTP servers advertise their VLAN configurations to switches in the same VTP domain and synchronize their VLAN configurations with other switches based on advertisements received over trunk links.

- VTP servers keep track of updates through a configuration revision number.

- Other switches in the same VTP domain compare their configuration revision number with the revision number received from a VTP server to see if they need to synchronize their VLAN database.
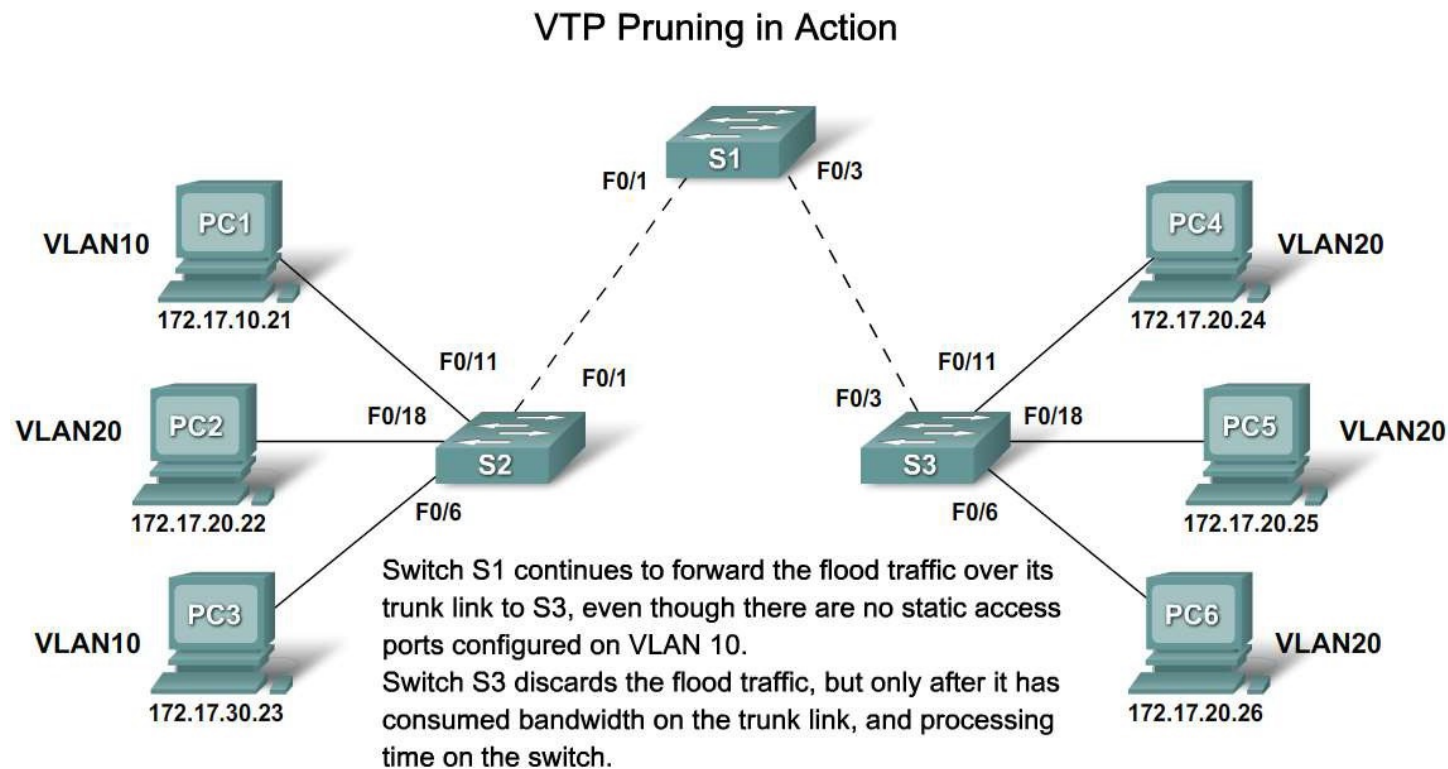
Client Mode

- In client mode, you cannot create, change, or delete VLANs.

- VLAN configuration information that a VTP client switch receives from a VTP server switch is stored in a VLAN database, not NVRAM.

- VTP clients require less memory than VTP servers.

- When a VTP client is shut down and restarted, it sends a request advertisement to a VTP server for updated VLAN configuration information.

- Having only a few switches that can maintain VLAN configurations makes it easier to control VLAN upgrades and track which network administrators performed them.

Transparent Mode

- Switches forward VTP advertisements they receive on trunk ports to other switches in the network.

- VTP transparent mode switches do not advertise their VLAN configuration and do not synchronize it with any other switch.

- Configure a switch in VTP transparent mode when you have VLAN configurations that have local significance and should not be shared with the rest of the network.

- In transparent mode, VLAN configurations are saved in NVRAM (but not advertised to other switches), so the configuration is available after a switch reload. This means that when a VTP transparent mode switch reboots, it does not revert to a default VTP server mode but remains in VTP transparent mode.

Describe the Operation of VTP

- Explain how VTP pruning functions

VTP Pruning in Action

Switch S1 continues to forward the flood traffic over its trunk link to S3, even though there are no static access ports configured on VLAN 10.
Switch S3 discards the flood traffic, but only after it has consumed bandwidth on the trunk link, and processing time on the switch.
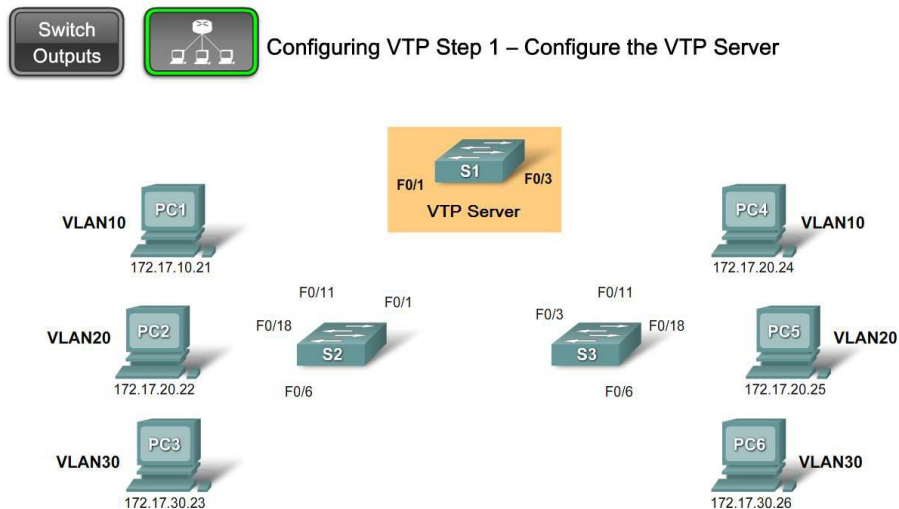
VTP Pruning

- VTP pruning prevents unnecessary flooding of broadcast information from one VLAN across all trunks in a VTP domain.

- VTP pruning permits switches to negotiate which VLANs are assigned to ports at the other end of a trunk and, hence, prune the VLANs that are not assigned to ports on the remote switch.

- Pruning is disabled by default. VTP pruning is enabled using the **VTP pruning** global configuration command.

- Pruning must be enabled on only one VTP server switch in the domain.

Configure VTP on the Switches in a Converged Network

- Configure VTP on a Cisco Catalyst Switch

Configuring VTP Server

- Confirm that all the switches you will configure have been set to their default settings.

- Always reset the configuration revision number **BEFORE** installing a previously configured switch into a VTP domain. Not resetting the configuration revision number allows for potential disruption in the VLAN configuration across the rest of the switches in the VTP domain.

- Configure at least two VTP server switches in your network. Because only server switches can create, delete, and modify VLANs, you should ensure that you have one backup VTP server in case the primary VTP server becomes disabled. If all the remaining switches in the network are configured in VTP client mode, you cannot create new VLANs on the network.

- Configure a VTP domain on the VTP server. Configuring the VTP domain on the first switch enables VTP to advertise VLAN information. Other switches connected through trunk links receive the VTP domain information automatically through VTP advertisements.

VTP Server Continued

- VTP domain names are case-sensitive.
- Ensure that the same password is set on all switches in the domain that need to be able to exchange VTP information. Switches without a password or with the wrong password reject VTP advertisements.
- Ensure that all switches are configured to use the same VTP protocol version.
- VTP version 1 is not compatible with VTP version 2. By default, Cisco Catalyst 2960 switches run version 1 but can run version 2. When the VTP version is set to version 2, all version 2 capable switches in the domain autoconfigure to use version 2 through the VTP announcement process. Any version 1-only switches cannot participate in the VTP domain after that point.
- Create the VLAN after you have enabled VTP on the VTP server. *VLANs created before you enable VTP are removed*. Always ensure that trunk ports are configured to interconnect switches in a VTP domain. VTP information is only exchanged on trunk ports.

VTP Clients

- Confirm that the default settings are present.
- Configure VTP client mode. The switch is not in VTP client mode by default. You must configure this mode.
- Configure trunks. VTP works over trunk links.
- Connect to a VTP server. When you connect to a VTP server or another VTP-enabled switch, it takes a few moments for the various advertisements to make their way back and forth to the VTP server.
- Verify VTP status. Before you begin configuring the access ports, confirm that the revision mode and number of VLANs have been updated.
- Configure access ports. When a switch is in VTP client mode, you cannot add new VLANs. You can only assign access ports to existing VLANs.

Configurations

- VTP mode server (client)
- VTP domain <domain name>
- VTP version <version number>
- VTP password <password>

Configure VTP on the Switches in a Converged Network

- Identify and troubleshoot common VTP configuration problems

Common VTP Configuration Issues

- Incompatible VTP Versions
- VTP Password Issues
- Incorrect VTP Mode Name
- All Switches set to VTP Client Mode

Reset VTP Version

Reset the VTP version to the lowest VTP version supported by all switches. Use these commands:

Cisco IOS Command Syntax	
Enter global configuration mode	#configure terminal
Configures the VTP version	(config)#vtp version *number*

Here is an example showing how to reset the VTP version for switch S3:

```
S3(config)#vtp version 2
```

Reset VTP Password

Configure a VTP password on each VTP enabled switch using these commands:

Cisco IOS Command Syntax	
Enter global configuration mode	`#configure terminal`
Configures the VTP password	`(config)#vtp password password`

Here is an example showing how to configure the VTP password for switch S3:

```
S3(config)#vtp password cisco
```

Reset VTP Domain

Change the VTP domain name for a VTP enabled switch using these commands:

Cisco IOS Command Syntax	
Enter global configuration mode	#configure terminal
Configures the VTP domain name	(config)#vtp domain domain-name

Here is an example showing how to change the VTP domain name for switch S3:

```
S3(config)#vtp domain cisco1
```

Reset VTP Mode

Reset two switches in the same VTP domain to be in VTP server mode using these commands:

Cisco IOS Command Syntax	
Enter global configuration mode	`#configure terminal`
Configures the VTP mode	`(config)#vtp mode server`

Here is an example showing how to change the VTP mode for switch S3 to VTP server:

```
S3#(config)#vtp mode server
```
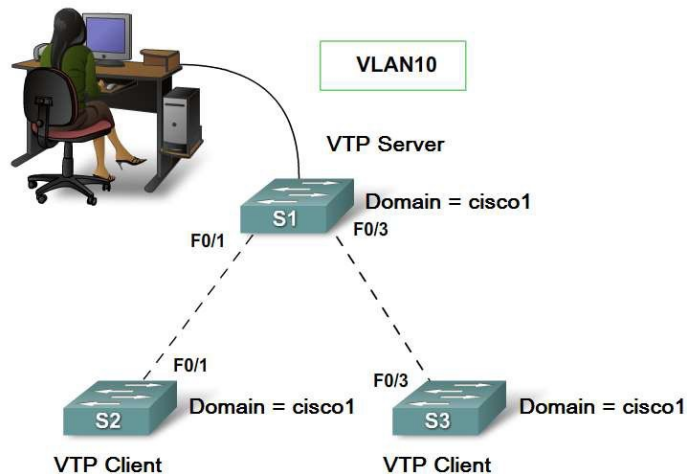
Configuration Revision Number

- Be careful when adding new switches to the network

- If the new switch has a higher configuration revision number than the switches in the network, the added new switch might cause the other switches to acquire incorrect information.

- **NOTE**: Even a client can overwrite the VLAN database in the server if it has a higher configuration revision number!

Configure VTP on the Switches in a Converged Network

- Manage VLANs on a VTP enabled network

Managing VLANs on a VTP Server

VLAN10

VTP Server

S1

Domain = cisco1

F0/1   F0/3

F0/1   F0/3

S2   Domain = cisco1   S3   Domain = cisco1

VTP Client   VTP Client

```
S1>enable
Password:
S1#configure terminal
Enterr configuration commands, one per line. End with CNTL/Z.
S1(config)#vlan 10
S1(config)#name faculty
S1(config)#exit
S1(config)#interface FastEthernet 0/11
S1(config-if)#switchport access vlan 10
S1(config-if)#exit
S1(config)#exit
S1#
```

Summary

- VTP is a Cisco proprietary protocol to exchange VLAN information across trunk links.
- A switch can be in one of 3 VTP operating modes.
    - Client
        - Cannot create, modify, or delete VLAN
    - Server
        - Can create, modify & delete VLAN
    - Transparent
        - Can create, modify, & delete LOCAL VLAN
        - Forwards VTP advertisements.

Summary

- ## VTP pruning

  - Limits unnecessary dissemination of VLAN information.

- ## Verify VTP configuration

  - `show VTP status`

  - `show interfaces trunk`