# Chapter 4

VLAN Trunking Protocol (VTP)

Note for Instructors

- These presentations are the result of a collaboration among the instructors at St. Clair College in Windsor, Ontario.
- Thanks must go out to Rick Graziani of Cabrillo College. His material and additional information was used as a reference in their creation.
- If anyone finds any errors or omissions, please let me know at:
  - tdame@stclaircollege.ca.

VLAN Trunking Protocol

VTP Concepts

VTP Server
VTP Client
VTP Transparent
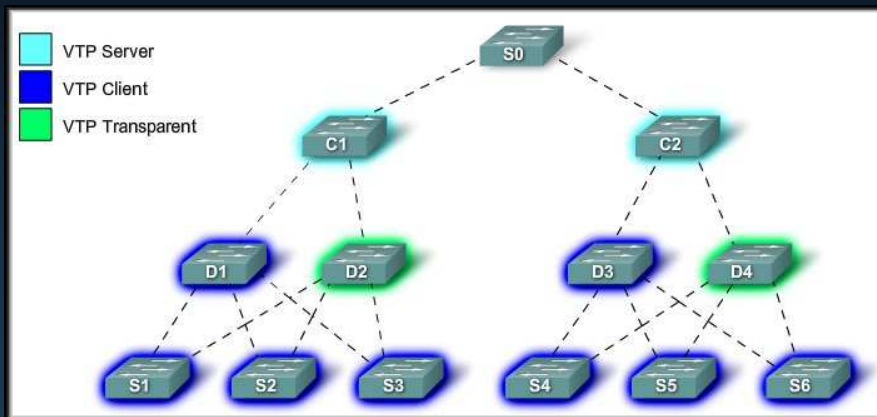
What is VTP?

- The VLAN Trunking Protocol (VTP) allows you to simplify the management of the VLAN database across multiple switches.

- As the number of switches increases on a small- or medium-sized business network, the overall administration required to manage VLANs and trunks in a network becomes a challenge.
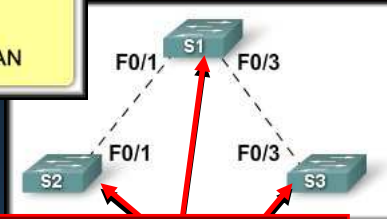
What is VTP?

- Simple Network.

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

VLAN Management Task:
- Add VLAN 30 - guest

F0/1   S1   F0/3

F0/1   F0/3

S2   S3

Create VLAN 30
Choose interface(s).
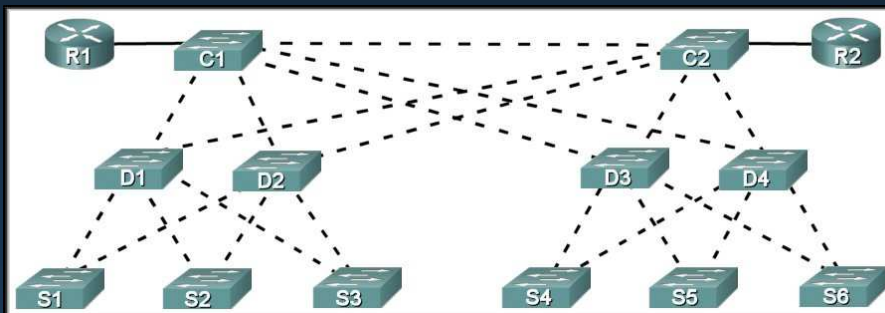Add interface(s) to VLAN 30.

What is VTP?

- How about now?

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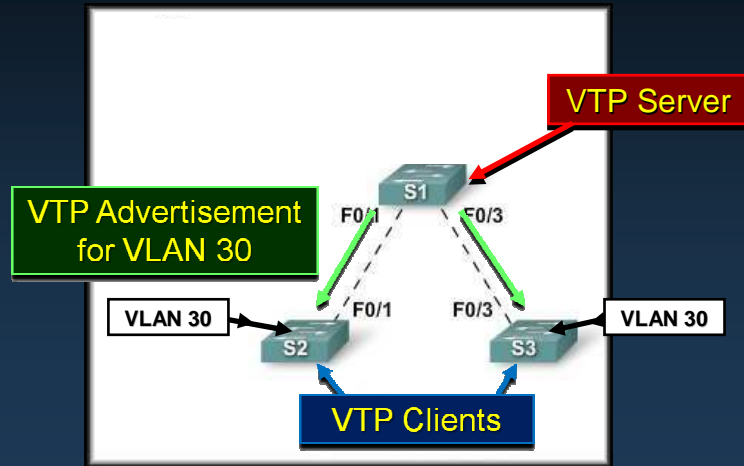- VLAN 20 - students
- VLAN 99 - management VLAN

VLAN Management Task:
- Add VLAN 30 - guest

R1   C1   C2   R2

D1   D2   D3   D4

S1   S2   S3   S4   S5   S6

What is VTP?

- How does it work?

Benefits of VTP

- The VLAN Trunking Protocol (VTP) allows you to simplify the management of the VLAN database across multiple switches.

- Benefits:
  - VLAN configuration consistency across the entire network.
  - Accurate tracking and monitoring of VLANs.
  - Dynamic reporting of added VLANs across a network.

VTP Components

- **VTP Domain:**
  - Consists of one or more interconnected switches.
  - All switches in a domain share VLAN configuration details using VTP advertisements.
  - Router or Layer 3 switch defines the boundary of domain.
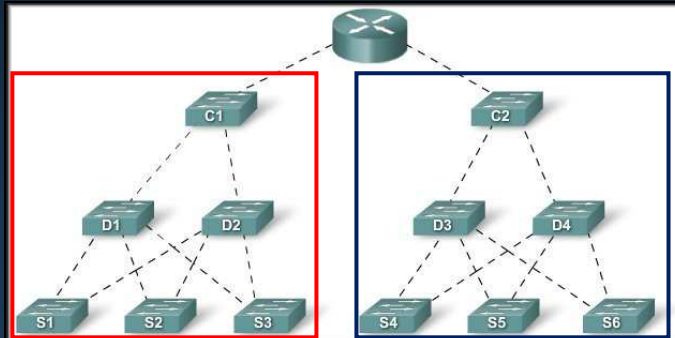
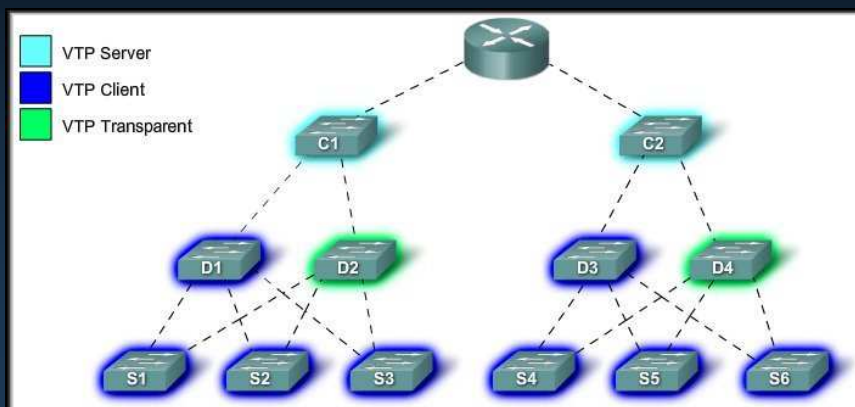# VTP Components

- **VTP Modes:**
  - Three different modes:
    - Server, Client, Transparent

VTP Server
VTP Client
VTP Transparent

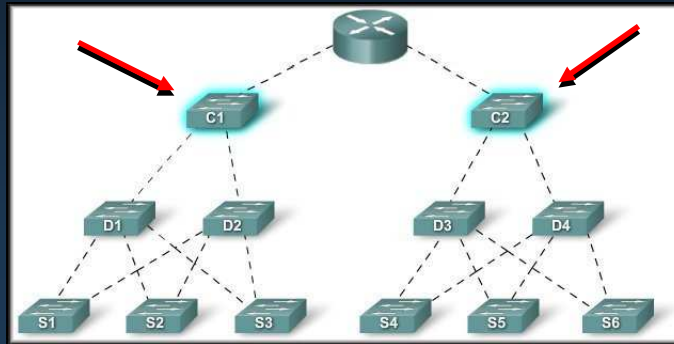# VTP Components

- **VTP Server:**
  - VTP servers **advertise the VTP VLAN information** to other switches in the same VTP domain.
  - The server is where VLANs can be **created, deleted, or renamed** for the domain.
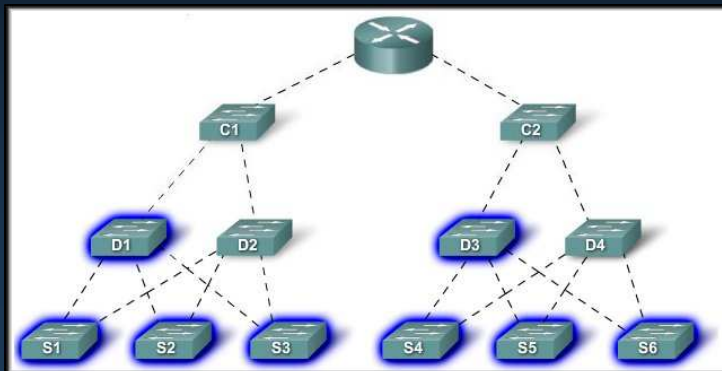
VTP Components

- **VTP Client:**
  - VTP clients Forward advertisements to other clients.
  - You cannot create, change, or delete VLANs.
  - You must configure VTP Client mode.

VTP Components

- **VTP Pruning:**
  - VTP pruning **increases network available bandwidth** by restricting flooded traffic to those trunk links used to reach the destination devices.
  - Without VTP pruning, broadcasts, multicasts and unknown unicasts are flooded across all trunk links within a VTP domain.
  - What it means is that the **destination switch does not have the same VLAN** as the switch that initiates the broadcast.
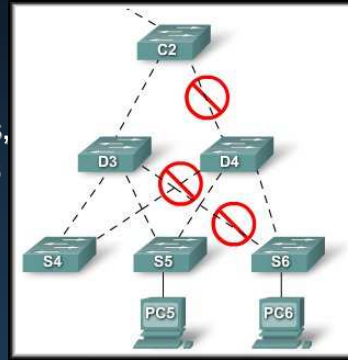
VLAN Trunking Protocol

VTP Operation

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
VLANs = 1
S4 Client
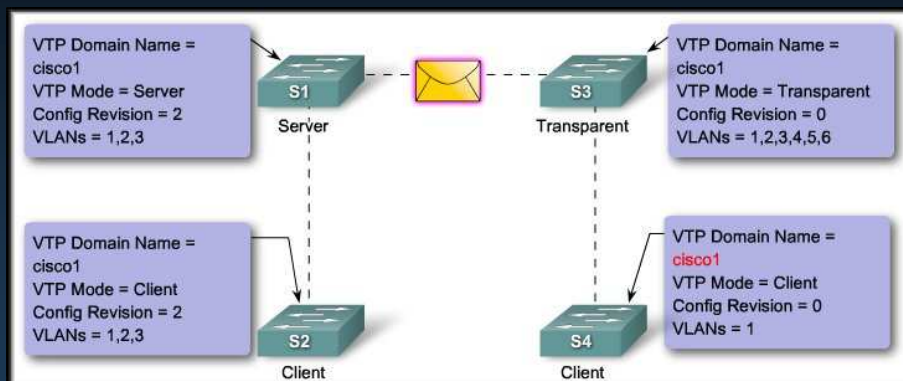
Default VTP Configuration

The version the switch is capable of running. Default is Version 1.

```
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                      : . . .
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
S1#
```
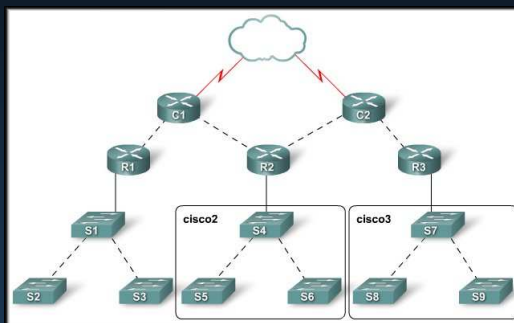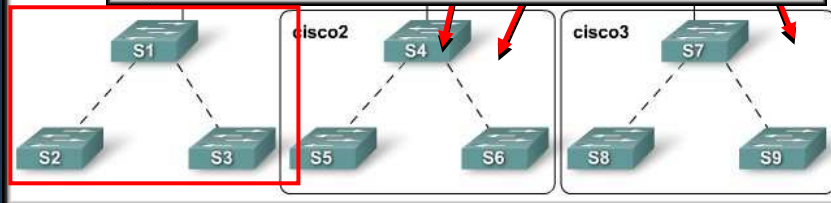
Server Mode

NO Domain Name

Version 2

VTP Domains

- VTP allows you to separate your network into smaller management domains to help reduce VLAN management.

- *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.

VTP Domains

```
S4#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               : Cisco2
VTP Pruning Mode              : Disabled
VTP V2 Mode                   : Disabled
VTP Traps Generation          : Disabled
MD5 digest                    : 0x5A 0x33 0x7E . . .
Configuration last modified by 0.0.0.0 at 0-0-00 00:00:00
Local updater ID is 0.0.0.0 (no valid interface found)
S4#
```

VTP Domains

- For a VTP server or client switch to participate in a VTP-enabled network, it must be a part of the same domain.
- Domain name propagation uses three VTP components: servers, clients, and advertisements.

VTP Advertising

- **VTP Frame Structure:**
  - VTP advertisements (or messages) distribute VTP domain name and VLAN configuration changes to VTP-enabled switches.
  - The VTP frame is encapsulated in the same manner as any other tagged frame.
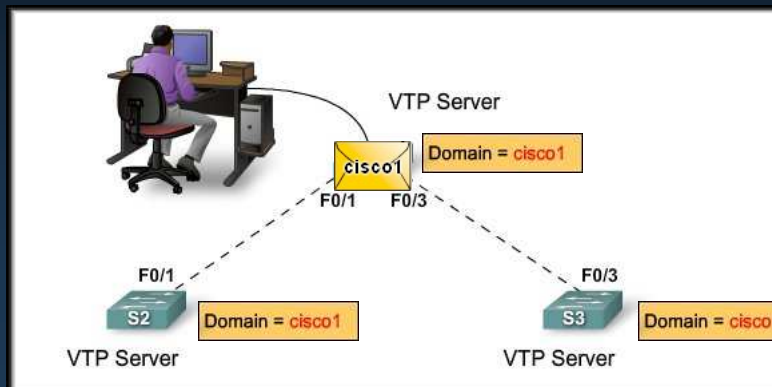
Chapter 4

VTP Advertising

- **VTP Frame Details:**
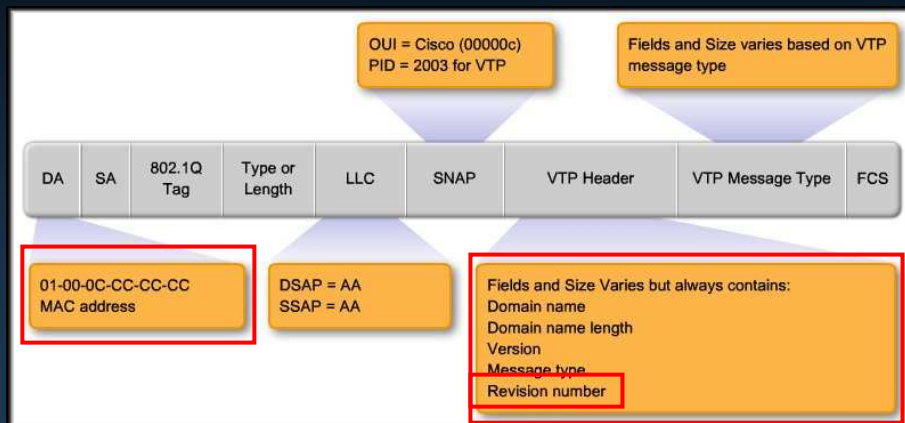
Chapter 4

VTP Revision Number

- **VTP Revision Number** (Default Zero):
  - The configuration revision number is a 32-bit number that indicates the **level of revision** for a VTP frame.
  - Each time a VLAN is added or removed, the configuration revision number is incremented.
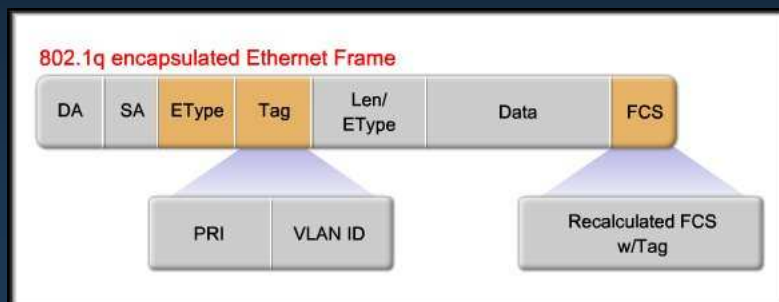 - Each VTP device tracks the VTP configuration revision number.
  - A VTP domain name change resets the revision number to zero.
- The revision number plays an important role in enabling VTP to distribute and synchronize VTP domain and VLAN configuration information. **(More to come)**

VTP Advertisement Types

- **Summary Advertisement:**
  - Contains the VTP domain name, the current revision number, and other VTP configuration details.
  - Summary advertisements are 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 change.
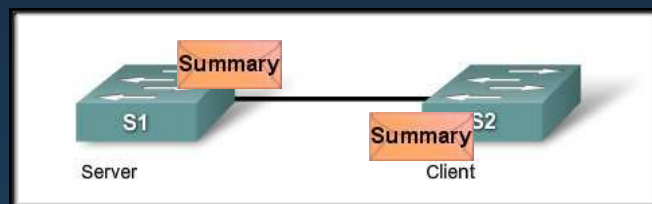
VTP Advertisement Types

- **Subset Advertisement:**
  - 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 of a VLAN.

VTP Advertisement Types

- **Request Advertisement:**
  - A request advertisement is sent to a VTP server.
  - The VTP server responds to the client by sending a summary advertisement followed by a subset ad...
  - Re...

  - ...
  - ... with a ...own.
  - A subset advertisement message is missed for some reason.
  - The switch has been reset.

VTP Advertisement Types

- Details of the formats can be found in the text or in the online curriculum.
  - Summary Advertisement
  - Subset advertisement
  - Request Advertisement

VTP Modes

- A Cisco switch can be configured in either:
  - Server mode
  - Client mode
  - Transparent mode
- These modes differ in how they are used to manage and advertise VTP domains and VLANs.

	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

VTP Modes

- **VTP Server Mode:**

	VTP Server
Description	Manage Domain and VLAN configurations.
Respond to VTP advertisements?	Participates fully.
Global VLAN configuration preserved on restart?	Yes, global configurations stored in NVRAM.
Update other VTP enabled switches?	Yes

VTP Modes

- **VTP Client Mode:**

	VTP Client
Description	Updates VTP configurations VTP client switches cannot change VLAN configurations.
Respond to VTP advertisements?	Participates fully.
Global VLAN configuration preserved on restart?	No, global configurations stored in RAM, not in NVRAM.
Update other VTP enabled switches?	Yes

VTP Modes

- **VTP Transparent Mode:**

	VTP Transparent
Description	Able to manage local VLAN configurations. Local VLAN configurations not shared with VTP network.
Respond to VTP advertisements?	Only Forwards VTP advertisements.
Global VLAN configuration preserved on restart?	No, local VLAN configuration only is stored in NVRAM.
Update other VTP enabled switches?	No

VTP – Server to Client

Switch S3 in VTP Transparent mode remains configured the same. In this example it does not participate in VTP.

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

S1
Server

VTP Domain Name = null
VTP Mode = Transparent
Config Revision = 0
VLANs = 1

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

S2
Client

802.1Q Trunks

S3
Transparent
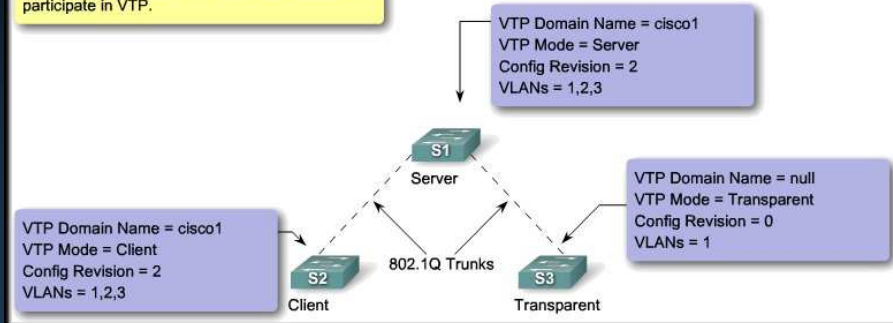
VTP – Server to Transparent to Client

Throughout this sequence switch S3 only forwards VTP advertisements
Revision number and VLAN configurations are unchanged

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

S1
Server

S3
Transparent

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

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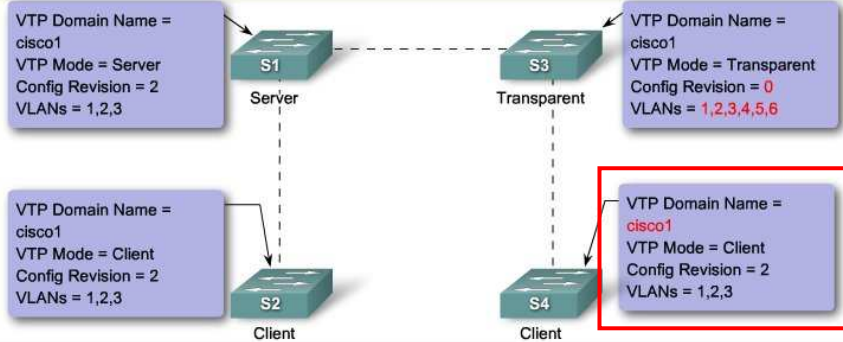Config Revision = 2
VLANs = 1,2,3

S2
Client

S4
Client

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

VTP Pruning

- VTP Pruning:
  - Prevents unnecessary flooding of broadcast information from one VLAN across all trunks in a VTP domain.
  - Permits switches to negotiate which VLANs are assigned to ports at the other end of a trunk and prune the VLANs that are not assigned to ports on the remote switch.
  - Disabled by default.
  - Enabled using the `vtp pruning` global configuration command.

VTP Pruning
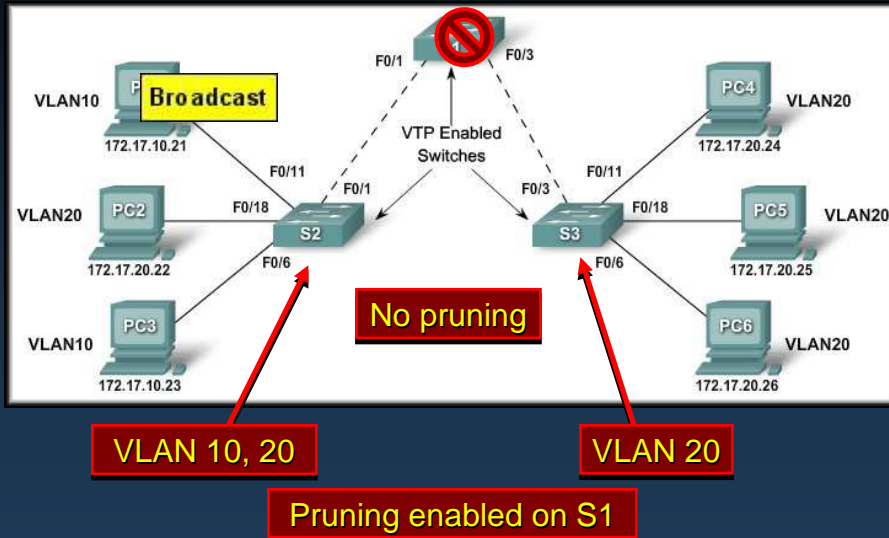
VLAN Trunking Protocol

Configure VTP

Configuring VTP

- **Configuration Guidelines:**

VTP Configuration Guidelines

On the VTP Server:
- Confirm default settings
- Configure 2 switches as VTP servers
- Configure the VTP domain on the first switch in the network
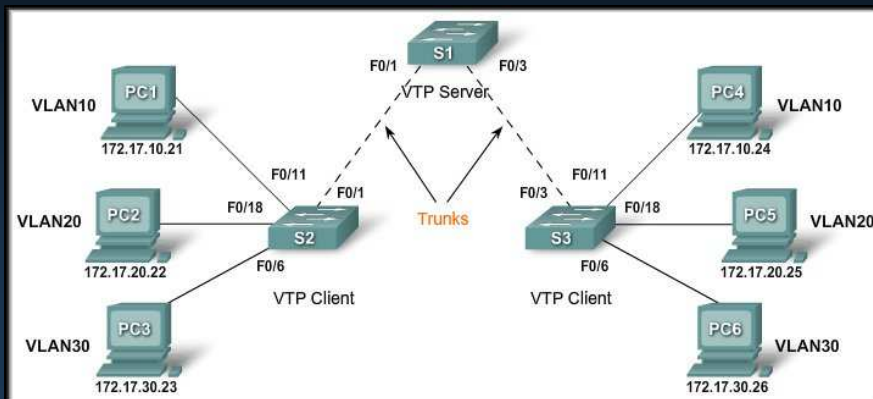- Ensure all switches are in the same VTP protocol version mode
- Configure VLANs and trunk ports

On the VTP Client:
- Confirm default settings
- Configure VTP client mode
- Configure trunks
- Connect to VTP server
- Verify VTP status
- Configure access ports

Configuring VTP

- V

```
S1#show vlan brief
VLAN Name                                  Status    Ports
---- -------------------------------- --------- ------------
<output omitted>
10    faculty                          active
20    student                          active
30    guest                            active
<output omitted>
S1#show interfaces fa0/1 switc
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
<output omitted>
S1#show vtp status
VTP Version                         : 2
Configuration Revision              : 6
Maximum VLANs supported locally : 255
Number of existing VLANs            : 8
VTP Operating Mode                  : Server
VTP Domain Name                     : cisco1
<output omitted>
```

Adding a name to a VLAN is considered a revision.
3 VLANs + 3 Names = 6

Configuring VTP

- VT

```
S2#show interfaces fa0/1 switchport
Name: Fa0/1
Switchport: Enabled
Administrative Mode: trunk
<output omitted>
S2#show vtp status
VTP Version                        : 2
Configuration Revision             : 0
Maximum VLANs supported locally : 255
Number of existing VLANs           : 5
VTP Operating Mode                 : Client
VTP Domain Name                    :
VTP Pruning Mode                   : Disabled
```

```
S2#show vtp status
VTP Version                        : 2
Configuration Revision             : 6
```

```
S2#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/2, Fa0/3, Fa0/4, Fa0/5
                                                 Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                 Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24, Gig1/1
                                                 Gig1/2
10   faculty                          active
20   student                          active
30   guest                            active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```
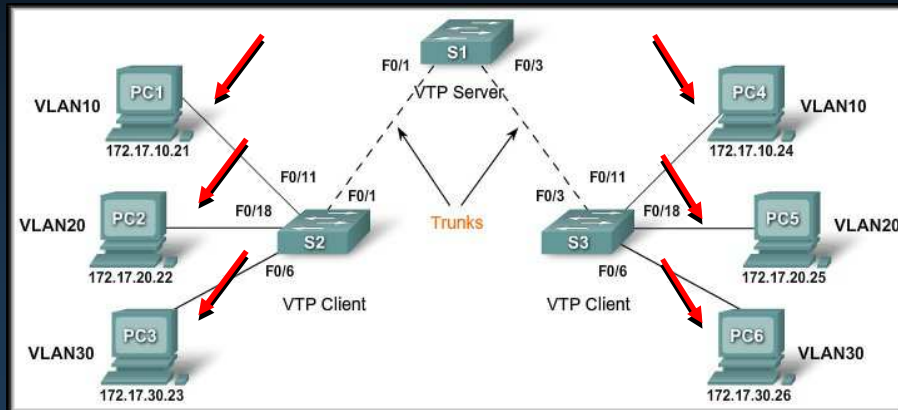
```
Request advertisements transmitted : 1
<output omitted>
```

Configuring VTP

- **Add the workstations to the appropriate VLAN.**
  - **Use the `show vlan brief` command to verify.**

Troubleshooting VTP Configurations

Incompatible VTP Versions.
- VTP versions 1 and 2 are incompatible with each other.
- Make sure all switches are running the same VTP version.

VTP Password Issues.
- Ensure passwords are all the same on all VTP enabled switches in the VTP domain.
- By default a Cisco switch does not use a VTP password.
- When a VTP advertisement is received Cisco switches do not automatically set the VTP password parameter.

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`

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

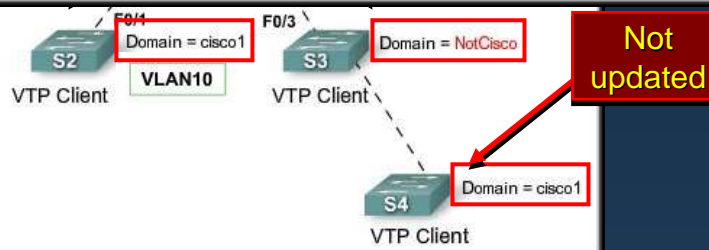| Cisco IOS Command Syntax	
Enter global configuration mode	`#configure terminal`
Configures the VTP password	`(config)#vtp password password`

Troubleshooting VTP Configurations

Incorrect VTP Domain Name

Update

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`

F0/1

S2
Domain = cisco1
VLAN10
VTP Client

F0/3
S3
Domain = NotCisco
VTP Client

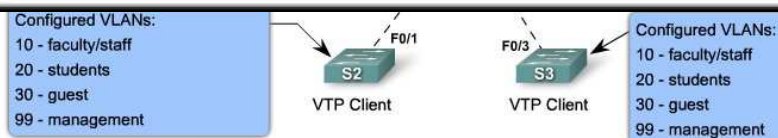Not updated

S4
Domain = cisco1
VTP Client

Troubleshooting VTP Configurations

All switches set to Client mode.

The network manager mistakenly

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`

Configured VLANs:
10 - faculty/staff
20 - students
30 - guest
99 - management

F0/1
S2
VTP Client

F0/3
S3
VTP Client

Configured VLANs:
10 - faculty/staff
20 - students
30 - guest
99 - management

On a reboot, all VLAN configurations are lost. VTP clients do not store the configuration in NVRAM.
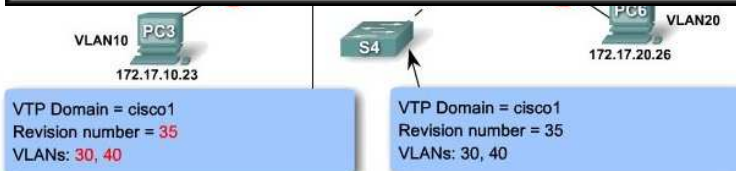
Troubleshooting VTP Configurations

Incorrect Revision Number

```
S4#configure terminal
S4(config)#vtp domain test
Changing VTP domain name from cisco1 to test
S4(config)#vtp domain cisco1
Changing VTP domain name from test to cisco1
S4(config)#exit
```

VLAN10 PC3
172.17.10.23

S4

PC6 VLAN20
172.17.20.26

VTP Domain = cisco1
Revision number = 35
VLANs: 30, 40

VTP Domain = cisco1
Revision number = 35
VLANs: 30, 40

Managing VLANs on a VTP Server

```
S2#show interfaces trunk
Port      Mode        Encapsulation     Status       Native vlan
Fa0/1     on          802.1q trunking   1

Port      Vlans allowed on trunk
Fa0/1     1-1005

Port      Vlans allowed and active in management domain
Fa0/1     1,10,20,30,1002,1003,1004,1005

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     1,10,20,30,1002,1003,1004,1005
S2#
 S1#
```