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INTERNEWORKING

802.1Q, VTP, VLANs, and STP

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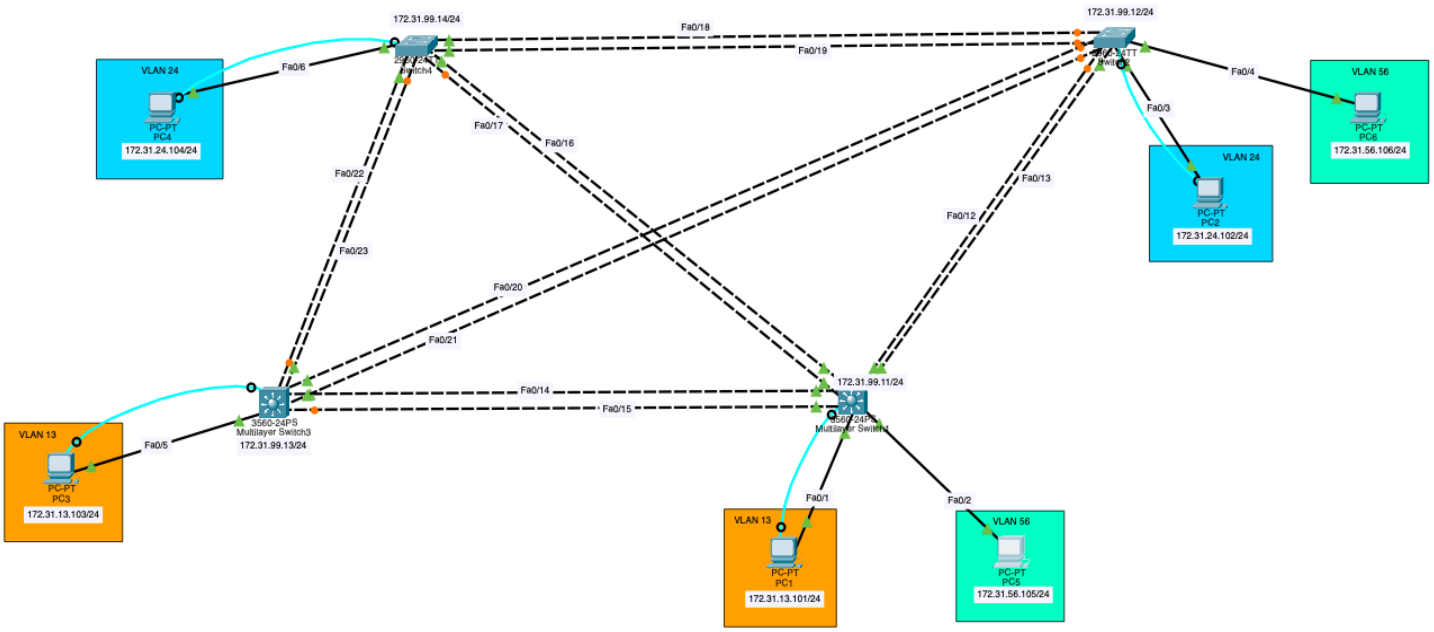
DESCRIPTION

Brief Description of what topic or technology you are concentrating on within this lab.

In this lab, I configured four switches and created three VLANs (13, 24, and 56) to provide network segmentation and isolation. I established VTP in server and client modes to synchronize VLAN information across multiple switches. I configured Spanning Tree Protocol (STP) to prevent network loops and designated Switch1 as the root bridge. Additionally, I implemented IEEE 802.1Q trunking on inter-switch links to allow VLAN traffic to communicate between switches.

TOPOLOGY

Take the original topology you created within Cisco Packet Tracer and take a screenshot of the topology. Paste this into your Document. **Please do not submit a screen capture of your entire screen or window. This should ONLY be of the topology.** Make sure you include IP Addresses in your topology with the interfaces showing.



SYNTAX

Table of Command Syntax and the associated description **(ie: If you issued a cli command within the Cisco IOS or within the Windows CMD prompt, list it here and write a description as to what it does in your own words)** – please make sure this is written in a nice, easy-to-read table format. (CLI Command on the left, description on the right, and (optionally) add another column for what mode of Cisco IOS you are in when issuing the CLI command.)

Cisco IOS

CLI Command	Description	Mode
en	Enter privileged EXEC mode	User EXEC
config t	Enter global configuration mode	Privileged EXEC
hostname [switch1/switch2/switch3/switch4]	Set device hostname	Global Configuration
en password cisco	Set unencrypted privileged EXEC password	Global Configuration
int vlan1	Enter VLAN 1 interface configuration	Global Configuration
ip address [IP] [Subnet]	Assign IP address and subnet mask to VLAN 1	Interface Configuration
no shutdown	Enable the interface	Interface Configuration
ex	Exit current configuration mode	Any
line con 0	Enter console line configuration	Global Configuration
en password cisco	Set password on console or VTY line	Line Configuration
logging synch	Prevent console message interruptions	Line Configuration
login	Enable login password prompt	Line Configuration
line vty 0 15	Enter VTY lines 0 to 15 configuration (Switch1)	Global Configuration
line vty 0 4	Enter VTY lines 0 to 4 configuration (Switch2-4)	Global Configuration

`transport input all`	Enable all transport protocols on VTY (telnet, ssh, etc.)	Line Configuration
`vtp domain INETLAB`	Set VTP domain name	Global Configuration
`vtp mode server`	Set switch as VTP server	Global Configuration
`vtp mode client`	Set switch as VTP client	Global Configuration
`vtp password cisco`	Set VTP password	Global Configuration
`vlan 13`	Create VLAN 13	Global Configuration
`name [PC1+PC3]`	Name VLAN 13	VLAN Configuration
`vlan 24`	Create VLAN 24	Global Configuration
`name [PC2+PC4]`	Name VLAN 24	VLAN Configuration
`vlan 56`	Create VLAN 56	Global Configuration
`name [PC5+PC6]`	Name VLAN 56	VLAN Configuration
`int fa0/[1-6]`	FastEthernet for #'s interface configuration	Global Configuration
`switchport mode access`	Configure interface as access port	Interface Configuration
`switchport access vlan [13/24/56]`	Assign interface to VLAN 13, 24, or 56	Interface Configuration
`int range [fa0/12-23]`	The range configuration for FastEthernet interfaces	Global Configuration
`switchport trunk encapsulation dot1q`	Set trunk encapsulation to IEEE 802.1Q	Interface Configuration
`switchport mode trunk`	Configure interface as trunk port	Interface Configuration
`spanning-tree vlan 13,24,56 root primary`	Set switch as STP root bridge for VLANs 13, 24, 56	Global Configuration
`spanning-tree vlan 13,24,56 root secondary`	Set switch as STP secondary root bridge if primary fails	Global Configuration
`copy running-config startup-config`	Save running configuration to startup configuration	Privileged EXEC

`do sh vlan`	Display VLAN information	Privileged EXEC
`sh ip interface brief`	Display brief IP address and interface status	Privileged EXEC
`sh spanning-tree`	Display STP status and root bridge info	Privileged EXEC
`sh vtp status`	Display VTP domain, mode, and config revision info	Privileged EXEC
`ping [the switch IPs]`	Sends an echo to test both connectivity and availability.	Global Configuration

Windows CMD Prompt

CLI Command	Description	Mode
`ipconfig`	Displays the IP address and Subnet mask of the device.	CMD

VERIFICATION

This is **screenshot-based**. You will be asked to provide screenshots to verify that you have completed the assignment correctly. Please only include the screenshots I ask of you. Nothing more. When taking a screenshot, please do not submit a screen capture of the entire screen or application window. Only provide a screenshot of the device window. **Provide a screenshot capture for each of the following outputs:**

f) Verify each PC is able reach the other PCs within the same VLAN using the Windows CLI commands you learned in class. Provide screenshot captures of the output within your lab report for the verification.

VLAN 13 (PC1 & PC3)

PC1 to PC3

```
Pinging 172.31.13.103 with 32 bytes of data:

Reply from 172.31.13.103: bytes=32 time<1ms TTL=128
Reply from 172.31.13.103: bytes=32 time<1ms TTL=128
Reply from 172.31.13.103: bytes=32 time<1ms TTL=128
Reply from 172.31.13.103: bytes=32 time=9ms TTL=128

Ping statistics for 172.31.13.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 9ms, Average = 2ms
```

PC3 to PC1

```
C:\>ping 172.31.13.101

Pinging 172.31.13.101 with 32 bytes of data:

Reply from 172.31.13.101: bytes=32 time<1ms TTL=128
Reply from 172.31.13.101: bytes=32 time<1ms TTL=128
Reply from 172.31.13.101: bytes=32 time<1ms TTL=128
Reply from 172.31.13.101: bytes=32 time=12ms TTL=128

Ping statistics for 172.31.13.101:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 12ms, Average = 3ms
```

VLAN 24 (PC2 & PC4)

PC2 to PC4

```
Pinging 172.31.24.104 with 32 bytes of data:

Reply from 172.31.24.104: bytes=32 time<1ms TTL=128
Reply from 172.31.24.104: bytes=32 time<1ms TTL=128
Reply from 172.31.24.104: bytes=32 time<1ms TTL=128
Reply from 172.31.24.104: bytes=32 time<1ms TTL=128

Ping statistics for 172.31.24.104:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC4 to PC2

```
C:\>ping 172.31.24.102

Pinging 172.31.24.102 with 32 bytes of data:

Reply from 172.31.24.102: bytes=32 time=1ms TTL=128
Reply from 172.31.24.102: bytes=32 time<1ms TTL=128
Reply from 172.31.24.102: bytes=32 time<1ms TTL=128
Reply from 172.31.24.102: bytes=32 time<1ms TTL=128

Ping statistics for 172.31.24.102:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

VLAN 56 (PC5 & PC6)

PC5 to PC6

```
C:\>ping 172.31.56.106

Pinging 172.31.56.106 with 32 bytes of data:

Reply from 172.31.56.106: bytes=32 time<1ms TTL=128
Reply from 172.31.56.106: bytes=32 time<1ms TTL=128
Reply from 172.31.56.106: bytes=32 time<1ms TTL=128
Reply from 172.31.56.106: bytes=32 time<1ms TTL=128

Ping statistics for 172.31.56.106:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PC6 to PC5

```
Pinging 172.31.56.105 with 32 bytes of data:

Reply from 172.31.56.105: bytes=32 time=17ms TTL=128
Reply from 172.31.56.105: bytes=32 time=11ms TTL=128
Reply from 172.31.56.105: bytes=32 time<1ms TTL=128
Reply from 172.31.56.105: bytes=32 time<1ms TTL=128

Ping statistics for 172.31.56.105:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 17ms, Average = 7ms
```

g) Verify each Switch is able to reach the other Switches within in the topology using the Cisco IOS CLI commands you learned in class. Provide screenshot captures of the output within your lab report for the verification.

Switch 1

```
Switch1#ping 172.31.99.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.12, timeout is 2
seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/0
ms

Switch1#ping 172.31.99.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.13, timeout is 2
seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0
ms

Switch1#ping 172.31.99.14

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.14, timeout is 2
seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/0
ms
```

Switch 2

```
Switch2#ping 172.31.99.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.11, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
0/3/19 ms

Switch2#ping 172.31.99.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.13, timeout is 2
seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1
ms

Switch2#ping 172.31.99.14

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.14, timeout is 2
seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/0
ms
```

Switch 3

```
Switch3#ping 172.31.99.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.11, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0
ms

Switch3#ping 172.31.99.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.12, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0
ms

Switch3#ping 172.31.99.14

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.14, timeout is 2
seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/0
ms
```

Switch 4

```
Switch4#ping 172.31.99.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.11, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max =
0/3/19 ms

Switch4#ping 172.31.99.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.12, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0
ms

Switch4#ping 172.31.99.13

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.31.99.13, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0
ms
```

h) Display the status of STP and highlight the portion of the screenshot displaying the switch that is the root bridge. Provide a screenshot capture of the output.

STP

```
Switch1#sh spanning
Switch1#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    24577
              Address     0002.4A44.425D
              This bridge is the root
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    24577  (priority 24576 sys-id-ext 1)
              Address     0002.4A44.425D
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/16           Desg FWD 19        128.16   P2p
Fa0/17           Desg FWD 19        128.17   P2p
Fa0/12           Desg FWD 19        128.12   P2p
Fa0/13           Desg FWD 19        128.13   P2p
Fa0/14           Desg FWD 19        128.14   P2p
Fa0/15           Desg FWD 19        128.15   P2p

VLAN0013
  Spanning tree enabled protocol ieee
  Root ID     Priority    24589
              Address     0002.4A44.425D
              This bridge is the root
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    24589  (priority 24576 sys-id-ext 13)
              Address     0002.4A44.425D
              Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  20

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/1            Desg FWD 19        128.1    P2p
Fa0/16           Desg FWD 19        128.16   P2p
Fa0/17           Desg FWD 19        128.17   P2p
Fa0/12           Desg FWD 19        128.12   P2p
Fa0/13           Desg FWD 19        128.13   P2p
Fa0/14           Desg FWD 19        128.14   P2p
Fa0/15           Desg FWD 19        128.15   P2p

VLAN0024
  Spanning tree enabled protocol ieee
  Root ID     Priority    24600
```

CONCLUSION

Wrap up your lab report with a short conclusion. If something did not work, state it. If everything did work successfully, state that as well.

Throughout the configuration process, I encountered several challenges that enhanced my learning. Initially, I struggled with interface configuration, attempting to use GigabitEthernet labeling (g/1/x) in the Cisco CLI, which resulted in errors. I realized the issue stemmed from using FastEthernet connections in Packet Tracer, and corrected my syntax accordingly. I also needed to clarify the proper command for saving configurations from RAM to NVRAM. I initially assumed the command was simply "save," but through research discovered the correct command was "copy running-config startup-config." Additionally, I researched whether to configure the backup root bridge as primary or secondary for STP. I learned that using "root secondary" was appropriate to prevent both switches from competing for root bridge status, ensuring Switch3 would serve as a backup only in case of Switch1 failure. Through troubleshooting and careful verification using show commands, I successfully completed all switch configurations. All required configurations were completed successfully, and I verified VLAN assignments, STP root bridge status, and inter-switch connectivity