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Lab 3: VLAN - October 30, Station 5, no partners

1. ***Explain briefly what the VLANs can do and what value they add?***
VLAN enables an organization to configure multiple LAN facilities in software, rather than having to modify wiring runs in order to reconfigure. This separation is often necessary anyway for security, performance, and organizational concerns, but the capability of reconfiguring in software saves money and time.

2. ***Answer the questions above. (Section C)***
Check and record the MAC address tables for Switch 1 and Switch 2.
There were no addresses listed for Switch 1 (port 2600). (There was summary information that I don't show here.)
The address table for Switch 2 (port 2700) was (without the summary information):

```
Destination Address  Address Type  VLAN  Destination Port
-------------------  ------------  ----  --------------------
0030.8016.1c82       Dynamic          1  FastEthernet0/2
0030.8016.1c83       Dynamic          1  FastEthernet0/3
```

Check the connectivity between all computers by the **ping** command. Are they all connected? Yes.

Check and record again the MAC address tables in the switches again. How do the tables differ from above? How do the MAC addresses relate to the computer interfaces and the ports of the switches?
Switch 1 (port 2600):

```
Destination Address  Address Type  VLAN  Destination Port
-------------------  ------------  ----  --------------------
0050.fc55.e3b9       Dynamic          1  FastEthernet0/2
0050.fc57.87c2       Dynamic          1  FastEthernet0/2
0050.fc57.87c4       Dynamic          1  FastEthernet0/1
0050.fc57.87d1       Dynamic          1  FastEthernet0/1
```

Switch 2 (port 2700):

```
Destination Address  Address Type  VLAN  Destination Port
-------------------  ------------  ----  --------------------
0030.8016.1c82       Dynamic          1  FastEthernet0/2
0030.8016.1c83       Dynamic          1  FastEthernet0/3
0050.fc55.e3b9       Dynamic          1  FastEthernet0/3
0050.fc57.87c4       Dynamic          1  FastEthernet0/3
0050.fc57.87d1       Dynamic          1  FastEthernet0/3
```

Every host MAC address is now mapped in each switch, except computer D is not mapped in Switch 2. Note: c4 is computer A, d1 is computer B, b9 is computer C, c2 is computer D. Switch 1 has A and B mapped to Port 1, C and D mapped to Port 2. Switch B has all hosts mapped to its Port 3, which is connected to Switch 1.

My setup was * SUPPOSED TO BE LIKE THIS *:

```
    A -------- (Port 1)[Switch 1](Port 2) --------- D
                       (Port 3)
                       (Port 3)
    B ---------(Port 1)[Switch 2](Port 2)---------- C
```

There is no way packets can reach B through Port 1 of Switch 1 with this setup. *The answer*: At the time of the screen shot, I had the hub mis-configured. There was a hard connection between A and B, and between C and D. So my screen shots at this time were not valid. Unfortunately I did not re-take the screen shots for this ping event after fixing the setup. (I could have saved time by noticing the problem at this point instead of later.)

Show and record the vlan status in each switch.
Switch 1 and 2 both give summary data. More interesting was `show vlan`, and I did this but did not get a screen shot for each switch at this point. It showed all the active ports to be on the same "VLAN0002".

Prepare the **ethereal** to monitor the traffic on eth2 interface of stations B, C, and D to capture packets. Then send 2 pings from A to B. Monitor and record the packets on panel 1 of the ethereal displays of each computer. How do they differ? Explain your observation. The ICMP packets were all received at each computer. The packet contents were identical; only the arrival times differed in the millisecond range. The computers are all on the same LAN, so they each have access to the same traffic.

(After configuring VLANs) .. Show and record the VLAN status …
Switch 1 (relevant information only):

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
4    VLAN0004                         active    Fa0/1, Fa0/3
5    VLAN0005                         active    Fa0/2, Fa0/4
```

Switch 2 (essential lines only):

```
---- -------------------------------- --------- -------------------------------
4    VLAN0004                         active    Fa0/2, Fa0/3
5    VLAN0005                         active    Fa0/1, Fa0/4
```

This reflects the assignment of computers A (switch 1 port 1) and C (switch 2 port 2) to VLAN4, and the assignment of computers B (switch 2 port 1) and D (switch 1 port 2) to VLAN5. (Note: these assignments were made according to the paragraph text in the lab procedure handout.) It also shows the assignment of the connections between switches to their respective VLANs.

Check the connectivity between all computers by the ping command.
Ping from C to A:

```
[student@SSU37809 lab03]$ ping -c2 192.168.0.90
PING 192.168.0.90 (192.168.0.90) from 192.168.0.92 : 56(84) bytes of data.
Warning: time of day goes back, taking countermeasures.
64 bytes from 192.168.0.90: icmp_seq=0 ttl=255 time=882 usec
64 bytes from 192.168.0.90: icmp_seq=1 ttl=255 time=563 usec

--- 192.168.0.90 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.563/0.722/0.882/0.161 ms
```

Ping from B to D:

```
[student@SSU37802 lab03]$ ping -c2 192.168.0.93
PING 192.168.0.93 (192.168.0.93) from 192.168.0.91 : 56(84) bytes of data.
Warning: time of day goes back, taking countermeasures.
64 bytes from 192.168.0.93: icmp_seq=0 ttl=255 time=3.444 msec
64 bytes from 192.168.0.93: icmp_seq=1 ttl=255 time=577 usec

--- 192.168.0.93 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.577/2.010/3.444/1.434 ms
```

Ping from C to B:

```
[student@SSU37809 lab03]$ ping -c2 192.168.0.91
PING 192.168.0.91 (192.168.0.91) from 192.168.0.92 : 56(84) bytes of data.
From 192.168.0.92: Destination Host Unreachable
From 192.168.0.92: Destination Host Unreachable
```

These results reflect the separation of VLAN4 (A and C) from VLAN5 (B and D).

For each switch, observe how the ports are associated by vlans using `show running-config`.
Switch 1 (port 2600) returned lots of information including:

```
interface FastEthernet0/1
 switchport access vlan 4
 no cdp enable
!
interface FastEthernet0/2
 switchport access vlan 5
 no cdp enable
!
interface FastEthernet0/3
 switchport access vlan 4
 no cdp enable
!
interface FastEthernet0/4
 switchport access vlan 5
 no cdp enable
```

Note that this is the same information given by the `show vlan` command, displayed above. The switch ports that are being used are Ports 1 through 4. Switch 2 returned similar information, showing the same port assignments as did `show vlan`.

Show and record the MAC address tables.

Switch 1:

```
Destination Address  Address Type  VLAN  Destination Port
-------------------  ------------  ----  --------------------
0050.fc57.87c2       Dynamic          5  FastEthernet0/2
0050.fc57.87d1       Dynamic          5  FastEthernet0/4
```

Switch 2:

```
-------------------  ------------  ----  --------------------
0030.8016.1c83       Dynamic          4  FastEthernet0/3
0030.8016.1c84       Dynamic          5  FastEthernet0/4
0050.fc57.87c2       Dynamic          5  FastEthernet0/4
0050.fc57.87d1       Dynamic          5  FastEthernet0/1
```

I don't know why both tables show entries only for computers B and D. It looks like the ping traffic between A and C was not picked up by the MAC table for some reason, although the ping traffic was definitely received over VLAN4 as shown earlier.(I may have turned off the spanning-tree and then turned it on again, for some reason.)
D is mapped on Switch 1, port 2 as expected from the wiring setup. B is assigned to port 4 on Switch 1, which is the VLAN5 connection between the switches.
Switch 2 sees the internal Ethernet address of Switch 1, port 4 (mapped on Switch 2, port 4). Switch 2 also sees the internal Ethernet address of Switch 1, port 3 (mapped on Switch 2, port 3) – which is the VLAN4 connection between the switches. Switch 2 sees D coming in over the VLAN5 link on its own port 4. Switch 2 also sees B mapped on its own port 1, as expected from the wiring setup.

Use ethereal to monitor eth2 of B, C, D, and send 2 ping packets from A to C. Record the packets. Discuss your observation. The packets were only registered at C. The ethereal panels of B and D were empty. This is because A and C are connected by VLAN4. B and D are on a different LAN.

(After configuring VTP) … `show vtp-status` gave a table similar to the one above, not very interesting.
`show vlan` (portions that show the relevant information):

Switch 1:

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
4    VLAN0004                         active    Fa0/1
5    VLAN0005                         active    Fa0/2
```

Switch 2:

```
---- -------------------------------- --------- -------------------------------
4    VLAN0004                         active    Fa0/2
5    VLAN0005                         active    Fa0/1
```

Check the connectivity between all computers by the ping command.

Ping from A to C:

```
[student@SSU37803 student]$ ping -c2 192.168.0.92
PING 192.168.0.92 (192.168.0.92) from 192.168.0.90 : 56(84) bytes of data.
Warning: time of day goes back, taking countermeasures.
64 bytes from 192.168.0.92: icmp_seq=0 ttl=255 time=1.076 msec
64 bytes from 192.168.0.92: icmp_seq=1 ttl=255 time=604 usec

--- 192.168.0.92 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.604/0.840/1.076/0.236 ms
```

Ping from A to B:

```
[student@SSU37803 student]$ ping -c2 192.168.0.91
PING 192.168.0.91 (192.168.0.91) from 192.168.0.90 : 56(84) bytes of data.
From 192.168.0.90: Destination Host Unreachable
From 192.168.0.90: Destination Host Unreachable

--- 192.168.0.91 ping statistics ---
2 packets transmitted, 0 packets received, +2 errors, 100% packet loss
```

Ping from B to D:

```
[student@SSU37802 lab03]$ ping -c2 192.168.0.93
PING 192.168.0.93 (192.168.0.93) from 192.168.0.91 : 56(84) bytes of data.
64 bytes from 192.168.0.93: icmp_seq=0 ttl=255 time=194 usec
Warning: time of day goes back, taking countermeasures.
```

```
64 bytes from 192.168.0.93: icmp_seq=1 ttl=255 time=669 usec

--- 192.168.0.93 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/mdev = 0.194/0.431/0.669/0.238 ms
```

These results reflect the separation of VLAN4 (A and C) from VLAN5 (B and D).

For each switch, observe how the ports are associated by vlans using `show running-config`.

Switch 1 (port 2600) returned lots of information including:

```
interface FastEthernet0/1
 switchport access vlan 4
 no cdp enable
!
interface FastEthernet0/2
 switchport access vlan 5
 no cdp enable
!
interface FastEthernet0/3
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no cdp enable
```

This shows port 1 connected to A through VLAN4, port 2 connected to D through VLAN5, and port 3 connected to the trunk between the switches.

Switch 2 shows a similar mapping for B (port 1, VLAN5), C(port 2, VLAN4), and the trunk line on port 3.

Show and record the MAC address tables.

Switch 1:

```
Destination Address  Address Type  VLAN  Destination Port
-------------------  ------------  ----  --------------------
0050.fc55.e3b9       Dynamic          4  FastEthernet0/3
0050.fc57.87c2       Dynamic          5  FastEthernet0/2
0050.fc57.87c4       Dynamic          4  FastEthernet0/1
0050.fc57.87d1       Dynamic          5  FastEthernet0/3
```

Switch 2:

```
-------------------  ------------  ----  --------------------
0030.8016.1c83       Dynamic          1  FastEthernet0/3
0030.8016.1c83       Dynamic          2  FastEthernet0/3
0030.8016.1c83       Dynamic          4  FastEthernet0/3
0030.8016.1c83       Dynamic          5  FastEthernet0/3
0050.fc55.e3b9       Dynamic          4  FastEthernet0/2
0050.fc57.87c2       Dynamic          5  FastEthernet0/3
0050.fc57.87d1       Dynamic          5  FastEthernet0/1
```

C is mapped on Switch 1, port 3 (trunk line) and recognized on VLAN4). D is mapped on Switch 1, port 2 (VLAN5) as expected from the wiring setup. A is mapped on Switch 1, port 1 (VLAN4) as expected from the wiring setup. B is mapped on Switch 1, port 3 (trunk line) and recognized on VLAN5).

Switch 2 sees the internal Ethernet address of Switch 1, port 3 (mapped on Switch 2, port 3). Due to 802.1Q encapsulation of the frames transmitted on this line, mappings exist here for all VLANS. Switch 2 has the same host mappings as does Switch 1, with the exception of host A. A was first used to ping all other hosts. I'm not sure why A is not mapped in Switch 2.

Use ethereal to monitor eth2 of B, C, D, and send 2 ping packets from A to C. Record the packets. Discuss your observation. The packets were only registered at C. The ethereal panels of B and D were empty. This is because A and C are connected by VLAN4. B and D are on a different LAN.

3. Explain why we needed to use 802.1Q encapsulation for the VTP setup.

Since there was only one line between the 2 switches, and packets from 2 different LANs are transmitted on this line, there has to be a way to identify which LAN belongs to each packet. This is provided by an extra field in the header, the VLAN identifier. In the standard VLAN setup, two separate physical paths are provided between the switches, one for each VLAN. Since the mappings are internal to the switches, only the switches must be VLAN-aware. The packets need no extra information.

4. What are the advantages of using one versus the other configuration?

If you have a legacy system with no 802.1Q capability, and enough extra cables and switchports, then standard VLAN should work fine. But VTP saves on cabling and configuration, and 802.1Q inclusion will be bundled with high data rate systems like gigabit Ethernet.