VLAN Experiments

A. Objective

1. Learn how vlan mechanism partitions a LAN and a big broadcast domain
2. Learn basics of VLAN and its configuration.
3. Understand what a VLAN can do.

B. General Setup

1. Use the four computers in a work area for this experiment. It is recommended that you work in a group of two or three per work area.
   a. Use the Cisco 2900 for the Layer 2 switch (or bridge). For the VLAN configuration of Cisco 2900, refer to the ITL Lab Manual, the Datalink Layer section at: http://www.cs.sonoma.edu/itl/manual/datalink.html#vlan_cisco2900
   a. Configure the eth2 interface for each computer with the IP address shown in the diagram. Note that these addresses are for Work Area 1. For other work areas the last number in the address will be different as discussed previously.
   b. Record the MAC and IP addresses of each computer.

C. Procedure

1. This section deals with a LAN without VLAN partitioning. So there is one LAN with one partition.
2. Connect a network as shown in Figure 1.

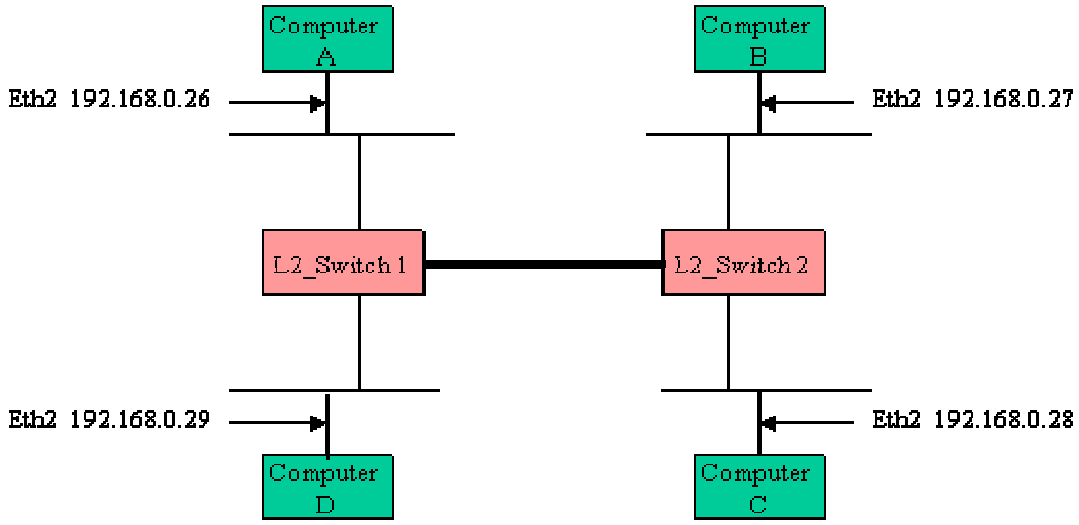

Figure 1. LAN with two switches, without VLAN.
IP addresses are for Work Area 1

3. Configure the switches and make sure that the switches run the **spanning tree protocol** as explained in the STP lab.
4. Before you ping any of the computers, check and record the MAC address table for Switch 1 and Switch 2 using the "**sh mac-address-table**" command.

5. Check the connectivity between all computers by the **ping** command. Are they all connected?
6. Check and record again the MAC address tables in the switches again. Note that the entries are built in the MAC address tables after you ping. How do the tables differ from those in step 4 above? How do the MAC addresses relate to the computer interfaces and the ports of the switches?
7. Show and record the vlan status in each switch using
   switch# **show vtp status**
8. 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.
9. The next section deals with VLAN. We would like to configure the switches such that the segments are separated in the two VLANs as shown in Figure 2. VLAN 4 consists of computers A and C, and VLAN 5 consists of B and D. The simplest way for the Cisco switches 2900 is to use two Ethernet cables between the switches.

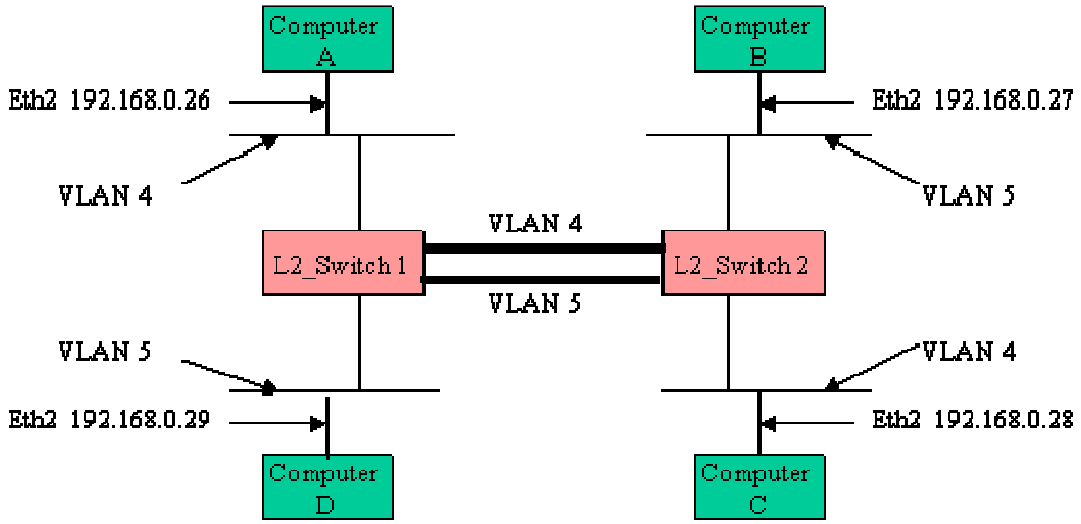

Figure 2. VLAN separate interfaces between the switches

IP addresses are for Work Area 1 only

10. For each switch, enter the vlan database mode to configure VLAN 4 and VLAN 5 in your network:
    a. Issue the"vlan database" command
       switch # **vlan database**
       switch (vlan)#
    b. To create a vlan, VLAN n, use the command:
       switch (vlan) # **VLAN n**
       switch (vlan) # **exit**

11. To add a port y at slot x to VLAN n (e.g., the port connecting the switch to the hub) using the "static-access" mode:
    switch(config) # **interface fastEthernet x/y**
    switch(config-if)# **switchport mode access**
    switch(config-if)# **switchport access vlan n**
    switch(config-if)# **^Z** (to exit)
12. Check if the layer 2 switches have the correct vlans as you configured them by:
    switch # **show vlan**
13. Show and record the vlan status in each switch by "**switch# show vtp status**".
14. Check the connectivity between all computers by the ping command, and record your data.
15. For each switch, observe how the ports are associated by vlans using
    switch # **show running-config**
16. Record the configuration for the switch ports 1 through 5.
17. Show and record the MAC address table for switches 1 and 2 using the "**sh mac-address-table**" command. How do the MAC addresses relate to the computer interfaces, vlans, and the ports of the switches?
18. Use **ethereal** to monitor the traffic on eth2 interface of stations B, C, and D and send 2 **ping** packets from A to C.
19. Record the packets from panel 1 for each computer. Discuss your observation.
20. Next we want to use only one cable between the switches as shown in Figure 3.

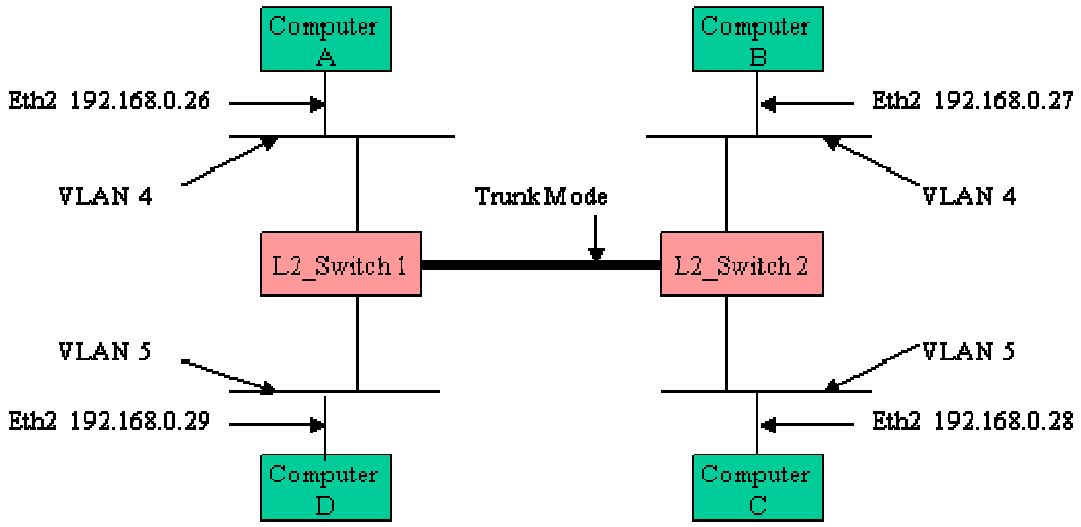

Figure 3. VLAN with a common interface between the switches

IP addresses are for Work Area 1 only

21. First, as you remove one of the Ethernet cables between the switches, you need to remove the corresponding entries that you configured in the switches by simply using "no" in front of the command for each interface x/y. E.g.,
    switch(config) # **interface fastEthernet x/y**
    switch(config-if)# **no switchport mode access**

switch(config-if)# **no switchport access vlan n**
switch(config-if)# **^Z** (to exit)

22. To transport frames that belong to more than one vlan over the same cable, Cisco provides the "VTP (**VLAN Trunk Protocol)**" mode, whereby switches that are physically connected can exchange information about their VLANs and thereby maintain some consistency among them. VTP basically encapsulates the vlans over the port. We use the IEEE 802.1Q encapsulation here to make a trunk port x/y that transports several vlans:

    switch(config) # **interface fastEthernet x/y**
    switch(config-if)# **switchport mode trunk**
    switch(config-if)# **switchport trunk encapsulation dot1q**
    switch(config-if)# **^Z** (to exit)

23. Repeat steps 12 to 19 above. Make sure that the ports on the switches have the intended configurations.

D. Report

1. Explain briefly what the vlans can do and what value they add?
2. Respond to all questions above.
3. Explain why we needed to use the 802.1D encapsulation for the configuration in Figure 3, while there was no need to encapsulate the frames when we use the configuration in Figure 2.
4. What are the advantages of using one versus the other configuration?