Bridges and Spanning Tree Experiments

A. **Objective**
   1. Understand the main functions of a bridge: Learning, Forwarding, Spanning-Tree.
   2. Demonstrate how LOOP AVOIDANCE is achieved using the **Spanning Tree Protocol** (STP) as specified in IEEE 802.1D.

B. **Network Setup and Configuration**
   1. Setup the diagram shown in Figure 1 below. It is recommended that the four computers in a work area be used for this experiment. So, the individuals at a work area can work together.
   2. You need to use the eth2 interfaces of your computers for this experiment. So configure the eth2 interface for each computer. In the diagram the IP addresses are for Work Area 1. For other Work Areas the fourth field in the IP address would be different. Refer to the Basics Lab and the "Computer" section of the ITL Lab Manual (http://linux.cs.sonoma.edu/itl/manual/contents.html) for the notations and address allocation. Note that you need to go to the root level for the configuration using the "**su root**" command.
   3. Note down the MAC and IP addresses for eth2 of each computer.
   4. Also read the "Management", "Equipment Enclosure and External Connections and Control" sections of the ITL Manual.
   5. Use the Asante AH2072 for the hubs and the Cisco 2900 or other switches for the bridges. Make sure that the parallel segments of Asante are not connected (Hub 1 and Hub 2 should not be connected directly. The far most LEDs on Asante should be off). Refer to the ITL Lab Manual for this issue.
   6. **Do not connect Hub 2 to Bridge 2 yet so that there would be no chances for any loop. Otherwise you cannot do some of the steps without problems.**
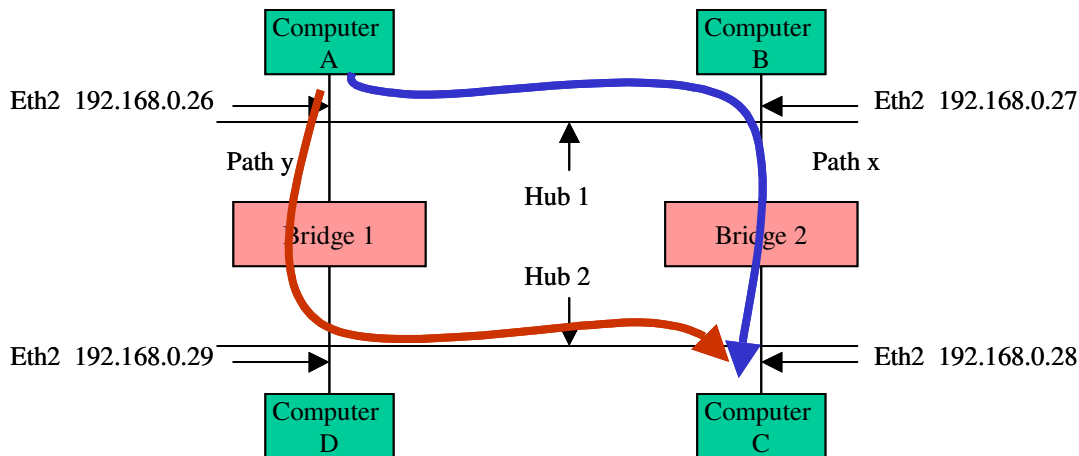

Figure 1. Loop Avoidance by Spanning Tree.

IP addresses are for Work Area 1 only

C. Procedure

1. First make sure that the bridges run the **Spanning Tree Protocol**.
    a. Telnet to **each** bridge/switch. For example, the name (IP address) of the Xyplex terminal server and the port numbers for bridges in **Work Area 1** are:
        Bridge 1: xyplex1 (192.168.200.11) 2600
        Bridge 2: xyplex1 (192.168.200.11) 2700
        You need to use appropriate name / addresses for other work areas. Note that the top and middle bridges are connected to ports 6, and 7 of the Xyplex of each Work Area, respectively. Port 8 is connected to the bottom switch.
    b. Go to the "**enable**" mode (type **enable** and hit **enter**).
    c. Go to the "**configure**" mode (type **configure terminal** and hit **enter**).
    d. Run the **spanning tree** (type **spanning-tree** and hit **enter**) for both bridges.
    e. Observe the spanning-tree status by the "**sh spanning-tree**" command.
    f. Type **"control" z** to get out of the **"config"** mode for each bridge.
    g. Observe the MAC address table for Bridge 1 and Bridge 2 using the "**sh mac-address-table**" command.
    h. Send 2 pings from A and B and observe the MAC address table for bridges.
    i. Repeat step h for pings from A to C and A to D.
2. Prepare **ethereal** to monitor the traffic at eth2 interface of computer B to capture the **ping** packets (**icmp** packets). There is no need to specify the "**count**" in the **ethereal capture preference** Tab, however, you need to stop the count after a few seconds.
    a. Send 2 ping packets from computer A to the eth2 interface of computer B.
    b. Note down your observations including the displays of panel 1 and 2 of the **ethereal** and the source and destinations IP addresses of the ping packets.
    c. Do you observe any misbehavior?
3. Use **ethereal** to monitor eth2 interface of computer C and capture the **ping** packets (**icmp** packets).
    a. Send 2 ping packets from computer A to the eth2 interface of computer B.
    b. Note down your observations including the displays of panel 1 and 2 of the ethereal and the source and destinations IP addresses of the ping packets.
    c. Do you observe any misbehavior?
4. **Now connect Hub2 to Bridge2 to introduce a loop.**
5. Repeat steps 1.h, 1.i, and 1.j above to observe the MAC address tables in the bridges.
6. **Next, we would like to configure the bridges to observe their operation without the spanning tree running.**
7. First, disable the STP by telneting to each bridge and typing "**no spanning-tree**" when you are in the **"config"** mode. Perform **"control z"** to get out of the **"config"** mode for each bridge.
8. Send 10 pings from computer A to eth2 interface of computer C. Note down your observations. Do you observe any misbehavior? You can always reset the misbehavior by typing **"control" z**.
9. Repeat steps 2 above and record the result.

D. Report
1. Explain the differences between a "hub", a "bridge", and a "switch".
2. Answer the questions above.
3. Report you observations for the MAC address tables in steps 1.h to 1.j.
4. In steps 4 and 5, although there is a physical loop, how is the loop behavior avoided?
5. Discuss what you observed in steps 6-8 of the procedure section. Do you think any loop is generated?
6. If so, what is the effect of the loop? You can compare the results in the sections above – with and without the spanning-tree.