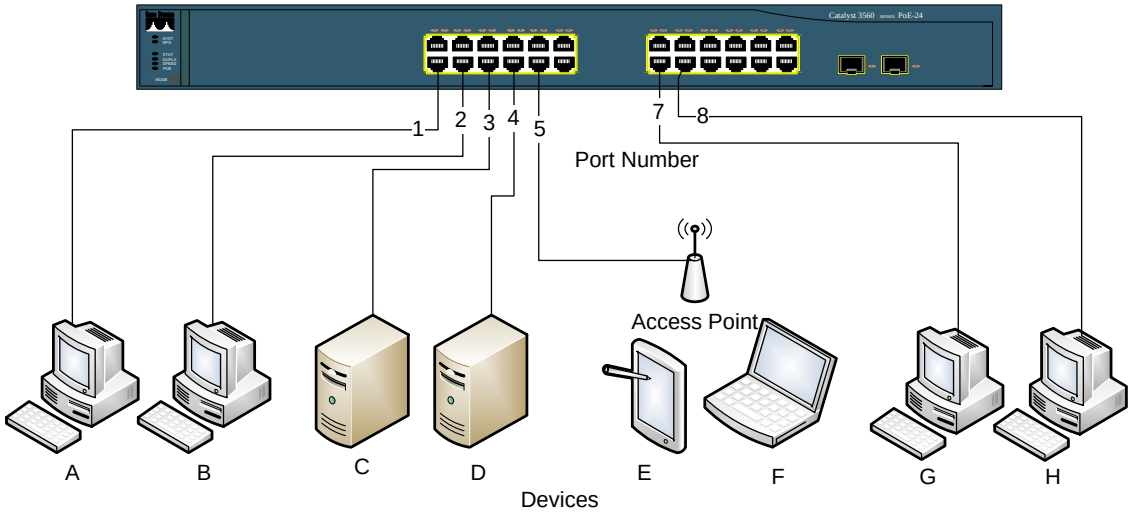
NET 363
Homework #2
Answers

1. Refer to the following diagram, where a switch with ports 1 to 8 is connected to devices with MAC addresses A to H.



Assume that the Switch Forwarding Table **is initially empty** and then the following **sequence** of packet transmissions occurs, one at a time (each is a one-way packet transmission and there is no timeout of Forwarding Table entries during this time):

[1] Device C transmits a frame with Dest MAC = E
[2] Device E transmits a frame with Dest MAC = C
[3] Device F transmits a frame with Dest MAC = Broadcast address (all 1s)
[4] Device H transmits a frame with Dest MAC = B
[5] Device H transmits a frame with Dest MAC = C

For each frame transmissions, the switch will do two things:

a. **It will add the <u>source MAC</u> and <u>incoming port</u> into the Forwarding Table (or update it if it is already in there).**
b. **It will look up the <u>destination MAC</u> in the Forwarding Table. If it is in the Table, then frame is sent out the corresponding port from Forwarding Table. If it is not in the Table, then the frame is broadcast out all active ports except the incoming port.**

So, here is what will happen to each of these 5 frames, assuming the Forwarding Table starts off empty:

-[1]a: Frame [1] comes in Port 3 - switch adds (MAC C, Port 3) to Forwarding Table

-[1]b: Switch looks up MAC E – it is not in Forwarding Table, so frame [1] is <u>broadcast out all active ports except port 3</u>.

-[2]a: Frame [2] comes in Port 5 - switch adds (MAC E, Port 5) to Forwarding Table

-[2]b: Switch looks up MAC C – it finds (MAC C, Port 3) in Forwarding Table (from frame [1]), so it <u>sends frame [2] out port 3</u>.

-[3]a: Frame [3] comes in Port 5 - switch adds (MAC F, Port 5) to Forwarding Table

-[3]b: Frame destination is Broadcast MAC Address, so frame [3] is broadcast out all active ports except port 5.

-[4]a: Frame [4] comes in Port 8 - switch adds (MAC H, Port 8) to Forwarding Table.

-[4]b: Switch looks up MAC B – it is not in Forwarding Table, so frame [4] is broadcast out all ports except port 8.

-[5]a: Frame [5] comes in Port 8 - switch would add (MAC H, Port 8), but it is already in Forwarding Table, so no change.

-[5]b: Switch looks up MAC C – it finds (MAC C, Port 3) in Forwarding Table (from frame [3]), so it sends frame [5] out port 3.

a. (6 pts) For each frame transmission, list all switch port(s) on which the frame is sent out. Note: this will never include the port on which the switch receives the frame. You should do these in order (from [1] to [5]) and keep track of how the Forwarding Table changes with each frame transmission. For example, the Forwarding Table is empty when frame [1] is sent, but then the Forwarding Table is updated from frame [1], so it is not empty when frame [2] is sent, then it is updated from frame [2] before frame [3] is sent, etc.

From the work shown above, the answers are:

i. **Frame [1] is sent out Ports 1, 2, 4, 5, 7, 8. (all active ports except Port 3)**
ii. **Frame [2] is sent out Port 3.**
iii. **Frame [3] is sent out Ports 1, 2, 3, 4, 7, 8. (all active ports except Port 5)**
iv. **Frame [4] is sent out Port 1, 2, 3, 4, 5, 7. (all active ports except Port 8)**
v. **Frame [5] is sent out Port 3.**

b. (5 pts) Show the final contents of the Forwarding Table after all five frame transmissions are complete. Each line of the Forwarding Table will have a MAC Address (A-H) and a Port (1-8).

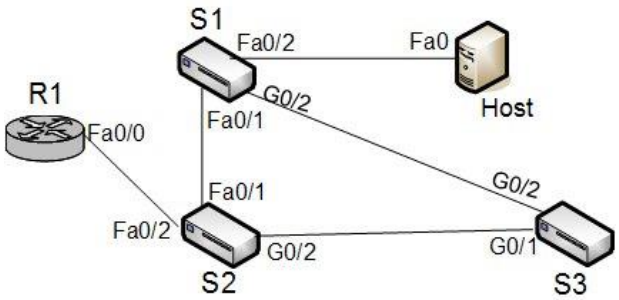
From the work shown above, the Table contains (in any order):

MAC Address (A-H)	Port (1-8)
C	**3**
E	**5**
F	**5**
H	**8**

2. (5 points) Explain an advantage of Router-on-a-Stick Inter-VLAN Routing as compared with Legacy Inter-VLAN Routing.

   Router-on-a-Stick uses only 1 physical router interface to route all VLANs (using subinterfaces on the router), while Legacy Inter-VLAN Routing uses 1 physical router interface per VLAN. Thus, Router-on-a-Stick requires fewer router interfaces and fewer switch interfaces and fewer data cables, which saves money, equipment, space and cabling.

3. Consider this switched network. Assume that Spanning Tree Protocol (STP) is running on this network. Fa interfaces run at 100 Mbps and G interfaces run at 1 Gbps. The table below shows the Bridge ID (BID) value for each switch, split into Priority and MAC Address parts. All ports are on VLAN 1. Assume that all links have default costs.



Switch	Priority	MAC Address
S1	32769	0010.2222.EE07
S2	28673	0020.1111.ABCD
S3	32769	0030.4444.3511

a. (5 points) When STP protocol is run, which switch (S1, S2 or S3) will become the Root Switch for this network? Why?

Switch S2 will become the Root Switch because it has the lowest Priority value, which gives it the lowest overall Bridge ID Value.

b. (7 points) For each of the following ports, tell me its Port Role. Each of your answers should be either "Root Port", "Designated Port" or "Alternate Port".

i. S1 Fa0/1: **Alternate Port**
ii. S1 G0/2: **Root Port**
iii. S2 Fa0/1: **Designated Port**
iv. S2 G0/2: **Designated Port**
v. S3 G0/1: **Root Port**
vi. S3 G0/2: **Designated Port**

c. (4 points) Which ports in this network will be placed into the Blocking State?

Switch S1 Port Fa0/1 will be placed into the Blocking State because its Port role is Alternate Port.

d. (5 points) What is the Root Path Cost for switch S1? That is, what is the Path Cost from S1 to the Root Switch?

The Root Path Cost for Switch S2 is 8 because the least-cost path from S1 to S2 goes over S1-S3 Gigabit link (cost = 4) and S3-S2 Gigabit link (cost = 4). This is a lower-cost path than the path from S1 to S2 over the S1-S2 FastEthernet link (cost = 19).

e. Assume that the Host MAC address is 11:22:33:44:55:66. After STP has determined port roles, the Host sends out a broadcast, so that its MAC address is added to the Forwarding Table on each of the 3 switches.

i. (4 points) What is the S2 port (either Fa0/1, Fa0/2 or G0/2) associated with 11:22:33:44:55:66 in the S2 Forwarding Table?

Switch S2 Forwarding Table

MAC Address	Port
11:22:33:44:55:66	**G0/2**

Why is it G0/2? Because any packet broadcast from Host (like ARP or DHCP broadcast) will come into Switch S2 on the G0/2 port (it will not come into S2 on the Fa0/1 port, because S1 Fa0/1 is blocked). So the Switch S2 associates Host MAC (source MAC) of the packet with incoming port G0/2.

ii. (4 points) What is the S3 port associated with 11:22:33:44:55:66 in the S3 Forwarding Table?

Switch S3 Forwarding Table

MAC Address	Port
11:22:33:44:55:66	**G0/2**

Why is it G0/2? Because any packet broadcast from Host (like ARP or DHCP broadcast) will come into Switch S3 on the G0/2 port (it will not come into S3 on the G0/1 port, because S1 Fa0/1 is blocked). So the Switch S3 associates Host MAC (source MAC) of the packet with incoming port G0/2.

f. (5 points) Now you want Switch S3 to become the new Root Switch. What command could you type on the Switch S3 CLI to make this happen?

Any of the following commands would work in global configuration mode:

a) spanning-tree vlan 1 root primary (best choice)

b) spanning-tree vlan 1 root secondary

c) spanning-tree vlan 1 priority X

(where X is any multiple of 4096 that is less than 32768)