**Worksheet 18**

1. Link-layer services and Ethernet. Slide 6-6 and Slide 6-7 list a number of different services that a link layer can potentially provide to the network layer. These services include:

a) framing, b) medium access, c) reliable delivery, d) flow control,

e) error detection, f) error correction, g) full-duplex and half-duplex.

For each of these services, discuss how or how not Ethernet provides the service.

1. Framing
   1. Get datagram. Encapsulate the payload(such as IP datagram) in an ethernet frame. It includes the header, preamble, source MAC address, dest MAC address, and CRC.
2. Medium Access
   1. CSMA/CD: protocol used for ethernet.
      1. Carrier sense multiple access/collision detection
3. Reliable delivery
   1. Does not provide reliable delivery because there is no handshake.
   2. When an error is detected, it will drop the frame. Higher level protocol (TCP) will deal with it.
4. Flow Control
   1. Does not provide.
5. Error Detection
   1. CRC checks for errors. Then drops errors.
6. Error Correction
   1. Does not provide.
7. Full-Duplex
   1. If all nodes are connected through a full-duplex switch then the ethernet is full-duplex.
8. Half-Duplex
   1. CSMA/CD : packets collide if transmitted at the same time.

2. List two protocols that require Ethernet to use broadcast frames. Explain.

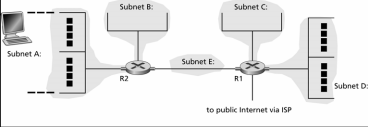
1. ARP - encapsulated in ethernet broadcast frame. However, the response is sent in a unique frame.
2. DHCP - discover message is sent in ethernet broadcast frame after it is encapsulated in an IP datagram.

3. What is the maximum number of VLANs that can be configured on a switch supporting the 802.1Q protocol? Why?

2^12 = 4096

There are 12 bits in the VLAN ID field. The number of VLANs is determined by the number of tags.

4. Consider the network shown below. Each of the subnets A-D contains at most 31 hosts; subnet E connects routers R1 and R2.

a. Assign network addresses to the five subnets shown above (that is, write down the addresses you have assigned).

5bits to identify 31 hosts

27 bits left for subnet

A: x.y.z.000xxxxx/27

B: x.y.z.001xxxxx/27

C: x.y.x.010xxxxx/27

D: x.y.z.011xxxxx/27

E: x.y.z.100xxxxx/27

b. Assign (write down) a full (32-bit) IP address for each the two hosts shown in subnets A and D.

A: x.y.z.000xxxxx/27 (Any address in this range)

X.y.z.00000000

D: x.y.z.011xxxxx/27 (any address in this range)

X.y.z.01100000

c. Assign (write down) a full IP address to the router interface on subnet E.

x.y.z.100xxxxx/27

x.y.z.10000000

d. What is the network prefix advertised by router R1 to the public Internet?

\*Cumulative of all subnets

**x.y.z./24**

e. Assign (write down) a MAC address to D.

\*MAC Address is 48 bits

\*Any 48 bits address works

f. Does the host in A ever need to know the MAC address of the R1’s interface in subnet E in order to send an IP packet to the host in D? Explain your answer in one or two sentences.

Now suppose that router R2 above is replaced by an Ethernet switch, S2 (Router R1 remains a router).

No. The host in subnet A only needs the address of the link-layer frame of the router R2 interface address.

A connects to R2. R2 handles outside transmission. R2 would have to know R1.

g. Are the interfaces that previously were in subnets A, B, and E still in the same separate three IP subnets now that R2 is replaced by S2? Explain your answer in a few sentences.

\*R2 is replaced by a switch(S2)

No. They are all now in the same subnet since a switch is being used.

h. In order to send an IP packet to the host in D, does the host in A ever need to know the MAC address of the R1’s left interface now that R2 is replaced by S2?

If so, how does it get the MAC address of R1’s left interface?

Explain your answer in one or two sentences.

Yes.

R1 broadcasts with ARP protocol its MAC address.