Jason Loo

ECPE 177

Homework 1

Problem 1 (20 points). Regarding Internet protocol stack:

1. specify the principal responsibilities of each layer. (10 points) \*\*\*
   1. **Application layer**
      1. Like HTTP, they are used to send data over multiple systems
   2. **Transport layer**
      1. UDP/TCP help to transfer contents between 2 points
   3. **Network layer**
      1. Move packets between hosts in the network
   4. **Data link layer**
      1. Move packets from one node to the next another node
   5. **Physical layer**
      1. Transfers individual bits from one node to the next

(b) how an end system (host), a router, a switch, and a hub differ according to the layered architecture?

(5 points)

A **Hub** is used to connect segments of LAN and when packets arrive at one port, it is copied to other ports, like a common connector. A **switch** is used at the data link layer and is responsible to knowing addresses and sending the data forward to specific ones. A **Router** is used to handle network traffic and is known for connecting to other routers and sends data and communicates through different protocols. An **End System** is a computer connected to a network of devices, they are called end because they are sitting at the edge of the network

1. name at least one protocol corresponding to each layer (except for the physical layer). (5 points)
   1. Application layer
      1. HTTP, DNS
   2. Transport layer
      1. TCP
   3. Network layer
      1. IP
   4. Data link layer
      1. Ethernet

Problem 2 (20 points). Consider the wired LAN depicted in Figure 1. S sends an Ethernet frame where

the source MAC address is S’s Ethernet interface address and the destination MAC address is C’s Ethernet interface address.

1. If ‘Device’ is a hub, which interface(s) will receive this frame?
   1. A, B and C will receive this frame
2. If ‘Device’ is a switch with a complete forwarding table, which interface(s) will receive this frame?
   1. After checking what destination MAC address it needs to go to, will send it to one of the ports, A, B or C, the others wont receive anything
3. If ‘Device’ is a switch with the following forwarding table, which interface(s) will receive this frame?
   1. Since the switch is sending a signal *S* and the only other address on this table is B’s MAC address, it will likely go to B
4. If ‘Device’ is a switch with the following forwarding table, which interface(s) will receive this frame?
   1. The frame will go to either A or C but not both since they usually are MAC address specific

Problem 3 (10 points). In the internet depicted in Figure 2, identify all the LANs.

1. LAN refers to a local network, that may contain 1 or many computers, but the key term is to remember they have to be on the same network. Here we see 8, some of them are connected in the same network

Problem 4 (10 points). Specify whether the following MAC addresses are unicast, multicast, or broadcast.

Why?

1. ff:ff:ff:ff:ff:ff
   1. This address refers to a broadcast because there is only one universal broadcast address and it consists of F
2. 52:54:00:ac:f2:02
   1. One tell of Multicast signals is that it has a 1 in the MSB of the significant byte. So here we have 5 and 5 in binary is 0101. Since it is a 0 it is unicast
3. b9:31:9a:82:6b:51
   1. 1011 is b in binary, since MSB is 1 it is multicast
4. 37:7a:ff:61:9c:42
   1. 0011 is 3 in binary, 0 is in the MSB so it is unicast
5. 46:69:29:1a:fe:ee
   1. 0100 is 4 in binary and with a 0 in MSB it is unicast

Problem 5 (10 points). Specify whether the following MAC addresses are locally administered or

globally unique. Why?

1. 52:54:00:ac:f2:02
   1. Locally administered, if we look at 2 in 52, it is 0010 and that second LSB is a 1. If it were 0 it would be universally administered
2. b9:31:9a:82:6b:51
   1. since the 9 in binary is 1001, the 2nd LSB from the right is a 0 so globally unique
3. 37:7a:ff:61:9c:42
   1. Since 7 in 37 is 0111, the 2nd LSB is a 1 so is locally administered
4. 46:69:29:1a:fe:ee
   1. Since 6 is 0110, and the 2nd LSB is a 1 it is locally administered
5. 65:ea:4f:48:00:01
   1. 0101 is the binary of 5 in 65 so it is globally unique because of the 0 in the 2nd LSB

Problem 6 (20 points). Consider the LAN depicted in Figure 3.

Assume that initially all switch tables are empty. The following Ethernet frames are communicated in order in the LAN.

1. F1: Source: D, Destination: H

2. F2: Source: F, Destination: B

3. F3: Source: G, Destination: D

1. Specify how does the switch forwarding table change for S2 upon communicating F1, F2, and F3.
   1. The table learns where H is by taking a look at the mac address. In other words, we are trying to make our way from D to H, so D passes through S3 and reaches S2, however it knows through the mac address to use init2 to reach init1 on S4 because S4 is connected to H through init2.
2. For each frame F1, F2, and F3, specify which hosts will be able to receive that frame.
   1. F1: S3 -> S2 ->S4
   2. F2: S4 ->S2->S1
   3. F3: S4->S2->S3

Problem 7 (10 points). Consider the following extended service set. Suppose A wants to send a frame to B. Specify all addressing fields in each step (depicted by an arrow) of communication.

1. A has to specify a destination address, then sends this information over to a switch to help
2. The Switch then send this frame to an access point, the MAC address given here is likely the BSSID used as an identifier
3. Since this is a ESS, these 2 access points are probably in the same ESS so the one access point will send over the frame to the next access point the device B is at.
4. There is a destination switch that the access point then sends the frame since it knows the port the destination address is on
5. The final destination is B