Suggested Answers for Week 1 Homeworks

Homeworks 1 and 2

50.012 Networks, 2018

Homework 1

1. What are two advantages and two disadvantages of having international standards for network protocols?

   Answer:
   Advantages

   - Enables interoperability between devices from different manufacturers globally
   - Enables software developers to collaborate towards common target
   - Allows layered development of software
   - Permits development of reliable and interoperable networking products

   Disadvantages: -

   - Permits intruders and malicious agents to attack networks and hosts
   - Disincentive to innovate, since large market has already subscribed to standard which may be sub-optimal
   - If there is an error or deficiency in the standard it will proliferate globally

2. (a) Assume a host sends out a ping request using ICMP. The ICMP default payload size is 32 bytes. Assume an ICMP header of 8 bytes and an IP header of 20bytes and an Ethernet header of size 14 bytes, What is the size of a frame transmitted on the wire?

   Answer:
   ICMP payload + ICMP hdr + IP hdr + Eth hdr = 32 + 8 + 20 + 14 = 74 bytes

   (b) Assume that with additional ping arguments the ICMP payload becomes the maximum MTU size at IP layer (1500bytes), What is the ICMP payload size? What is the size of the frame transmitted on the wire?
   Answer
   ICMP Payload Size = Max MTU size - (ICMP hdr + IP hdr) = 1500 - (8 + 20) = 1472 bytes
   Size on wire = Max MTU size + Eth hdr = 1514 bytes

   (c) Try to verify your calculations using wireshark.

Homework 2

1. The subnet mask for a particular network is 255.255.31.0 Which of the following pairs of IP addresses could belong to this network ?

   (a) 172.57.88.62 and 172.56.87.23.2

   (b) 10.35.28.2 and 10.35.29.4

   (c) 191.203.31.87 and 191.234.31.88

   (d) 128.8.129.43 and 128.8.161.55

   Answer:
   Given subnet mask is 255.255.31.0, which can be written in binary form as below:
   11111111.11111111.00011111.00000000

   Option (a) and (c) differ in the first two bytes. When AND-ed with the subnet mask bit pattern they will give different results. Therefore, by visual inspection they may be ruled out since they don't belong to same subnet.

Options (b) and (d) agree in the two most significant bytes (MSBs) and are considered further.

(b) We can ignore the two least significant bytes since the subnet mask position is zero and will get masked out. Let us therefore examine the third byte positions of the two IP addresses. These are 28 and 29 and are represented in binary as 00011100 and 00011101. AND-ing these bit patterns with the third byte of the Subnet Mask, i.e. 00011111, both give different results. Thus option (b) is ruled out.

(d) Once again, let us examine the third byte positions, 129 and 161. These are represented in binary as 10000001 and 10100001 AND-ing with the third byte of the Subnet Mask, i.e. 00011111 they give the same result, 00000001. Thus both belong to same network.

Hence (d) is correct option.