COMP90007 Internet Technologies
Due: 30th April, 2018 at 5:00pm
Assignment 2

This assignment is worth 5% of the total marks for the subject. This assignment has 4 questions. The weighting of each question is shown beside the Question. **Answers must be submitted as a PDF file via the COMP90007 Assignment 1 submission form in the LMS by 5:00pm, 30/04/2018. Late submissions will attract a penalty of 10% per day (or part thereof). Please ensure your name and user name are clearly presented. Submission should only contain the question number and the answer (do not repeat the text of questions in your submission).** Please present all steps for questions involving calculations and/or derivations otherwise relevant penalties will be imposed.

Each question can be answered in a few sentences. Excessively long answers will be penalized.

All questions can be answered by studying the material from the textbook. You can discuss the assignment topics with your friends, however, all work presented should be your original work. There will be a discussion forum thread for the assignment and any instructions provided in the forum are also part of the specification

1. Sixteen stations, numbered 1 through 16, are contending for the use of a shared channel by using the adaptive tree walk protocol. If the stations with addresses 1; 4; 8; 11; 15 suddenly became ready at once, how many bit slots are needed to resolve the contention? (No need to draw the diagram) [1 mark]

Ans. *In total, 9 slots will be there.*

Slot 1: 1, 4, 8, 11, 15
Slot 2: 1, 4, 8
Slot 3: 1, 4
Slot 4: 1
Slot 5: 4
Slot 6: 8
Slot 7: 11, 15
Slot 8: 11
Slot 9: 15

2. Refer to the Ethernet frame format in Figure 4.14 [1 mark]

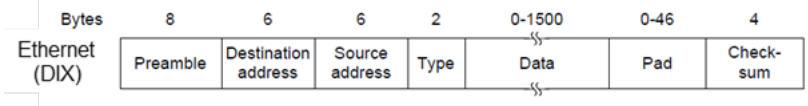


Fig 4.14. Frame formats. (a) Ethernet. (b) IEEE m802.3

a. Explain why padding is required in classic Ethernet frame structure?

Ans. *When a station starts a frame, the transmission should continue more than 2\tau time units, where \tau is the propagation time for a bit to reach the end of the Ethernet. This gives a*

lower bound on the size of the frame which works out to be about 64 bytes for a 10Mbps LAN with maximum length 2500 meters. Any answer similar to this accepted. Please read the discussion Page 284-285 of the textbook (5th Edition).

b. An IP packet to be transmitted by Ethernet is 47 bytes long, including all its headers. If LLC is not in use, is padding needed in the Ethernet frame, and if so, how many bytes? Briefly justify your answer.

Ans. *No padding is used, because the minimum Ethernet frame is 64 bytes, including both addresses in the Ethernet frame header, the type/length field, and the checksum. From the figure it clear that the header fields occupy 18 bytes and the packet is 47 bytes, so the total frame size is 65 bytes which is more than the minimum frame size.*

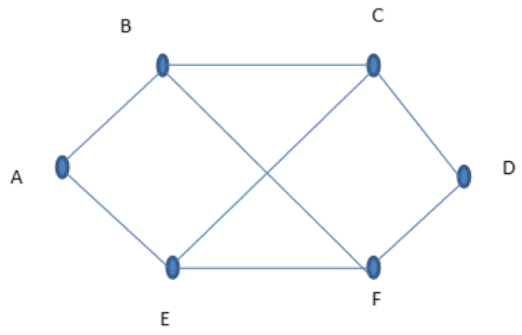
3. Consider the subnet of the following figure. Distance vector routing is used, and the following vectors have just come in to router C:

From B: (2,0,8,12,6,2);
From D:(14,12,6,0,9,10); and
From E: (7,6,3,9,0,4).
The measured delays to B,D,E are 8, 2, and 5 respectively. What is C's new routing table? Give both the outgoing line to use and the expected delay. [1 mark]

Going via B gives (10, 8, 16,20,14,10).
Going via D gives (16, 14, 8, 2, 11,12).
Going via E gives (12, 11, 8, 14, 5, 9)

By taking the minimum distance for each destination except C gives the vector: (10, 8, -, 2, 5, 9)

The outgoing lines are (B, B, -, D, E, E).



4.a. If a class B network uses a subnet mask 255.255.240.0, how many subnets are allowed?
b. A large number of consecutive IP addresses are available starting at 128.14.0.0. Suppose that four organizations A,B,C and D request 1000, 512, 2000, and 8000 addresses respectively, and *in that order*. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the **w.x.y.z/s** notation and **not /s**. (do not remove all 0's and 1's in your allocation) [2 marks]

a. A class B network provides 16 bits for the host address. The subnet mask corresponds to 11110000 00000000 over these 16 bits. This means that the mask reserves 4 bits for the subnet id, i.e., 2^4 = 16 subnets.

If the student has subtracted 2 (all 0's and all 1's) then its acceptable (14 subnets).

b.
The IP Address given is 128.14.0.0, which is a class B address. In this, A wants 1000 addresses so we can write as:
Starting Address: 128.14.0.0 -> 128.14. 00000000. 00000000
In order to allocate 1000 addresses we now follow the multiples of 2 to figure out the number of masked bits (bits required to find hosts) required to allocate IP Addresses for 1000 hosts. Which is equal to 10 bits, thus giving us about 1024 addresses to use. So, we can write the last Address as:
Last IP Address: 128.14. 00000011. 11111111 -> 128.14.3.255
Mask: 128.14.0.0/22

Similarly, B needs 512 addresses. For that we start at the IP Address -> 128.14.4.0 , as all the Addresses before this are already allocated to A, so we shift to the next multiple of 2.

Starting Address: 128.14. 00000100. 00000000 -> 128.14.4.0
So, in order to allocate 512 Addresses to B, we need to look at the number of masked bits required in order to accommodate 512 hosts. This will be 9 bits, thus giving us about 512 addresses to use. So, we can write the last address as:
Last IP Address: 128.14. 00000101. 11111111 -> 128.14.5.255
Mask: 128.14.4.0/23

Similarly, C needs 2000 Addresses. For that we start at the IP Address
Starting Address: 128.14. 00001000. 00000000 -> 128.14.8.0

In order to allocate 2000 Addresses to C, we need to look at the number of masked bits required in order to accommodate 2000 hosts. This will be 11 bits, thus giving us about 2048 addresses to use. So, we can write the last address as:
Last IP Address: 128.16. 00001111. 11111111 -> 128.14.15.255
Mask: 128.14.8.0/21

Finally, D needs 8000 Addresses. The starting address of D will be from the next multiple of 2 in the third octet of the Address.

Starting Address: 128.14. 00100000. 00000000 -> 128.14.32.0
The ending address can be found by looking at the masked bits required to accommodate 8000 hosts. This will be 13 bits, thus giving us about 8192 addresses to use. So, we can write the last address as:
Last IP Address: 128.14. 00111111. 11111111 -> 128.14.63.255
Mask: 128.14.32.0/19