**EC312 Homework 25**

Name:

1. . What is the unit of data sent or received at each of the following layers?

A. Application layer- Message

B. Network layer – Datagram ( or packet)

C. Datalink layer - Frame

2. Which of the following data units is encapsulated in a frame?

b. a datagram (not the user datagram which is another name for a segment)

3. Which of the following data units is decapsulated from a user datagram?

c. a message

4. Five protocol layers. 100 byte message. 10 bytes header added at each layer

(including 1st and 5th). What is the efficiency?

100 bytes + 5(10 bytes) = 150 bytes

5. Match the following to one or more layers of the TCP/IP suite

A. Route determination - Network Layer

B. Connection to the Transmission Media - Physical Layer

C. Providing services for the end user - Application Layer

6. Match the following to one or more layers of the TCP/IP suite

A. Creating user datagrams - Transport Layer

B. Responsible for handling frames - Datalink Layer

between adjacent nodes

C. Transforming bits to electromagnetic - Physical Layer

signals

7. (a) Suppose an application entity sends an *m*-byte message to its peer entity. The layers in the TCP/IP model add a total of 58 bytes of overhead (header and trailer). What percentage of the total layer bits corresponds to the application message if *m* = 100 bytes.

(b) Repeat part (a) for *m* = 1000 bytes.

8. What are the advantages of dividing an Ethernet LAN with a bridge?

1. They raise the bandwidth.

2. They separate collision domains

9. What is the relationship between a switch and a bridge?

A switch is an N-port bridge where N is the number of station on the LAN. This way, the bandwidth is only shared between the station and switch and the collision domain is divided into N domains.

10 An Ethernet MAC sublayer receives 42 bytes of data from the upper layer. How many bytes of padding must be added to the data?

The minimum length of an Ethernet frame is 64 bytes.

18 bytes are used for the header (6 bytes of source address, 6 bytes of destination address, 2 bytes of length or type and 4 bytes of CRC)

Therefore the minimum length of data from the upper layer is (64 bytes – 18 bytes) 46 bytes. **You must add (46 bytes – 42 bytes) 4 bytes of padding to the data.**

11 What is the ratio of useful data to the entire packet for the smallest Ethernet frame?

The minimum length of an Ethernet frame is 64 bytes. The useful data in that Ethernet frame is 46 bytes. The ratio is (46 bytes/64 bytes) = **0.71875**

12 In a Standard Ethernet LAN, the average size of a frame is 1000 bytes.

If a noise of 2 ms occurs on the LAN, how many frames are destroyed?

The data rate for a Standard Ethernet is 10Mbps. Mbps stands for mega-bits per second.

Therefore convert mega-bits per second to mega-bytes per second

by dividing10Mbps by 8 bits/byte.

Therefore your data rate is 1.25MBps (aka 1.25 mega-bytes per second).

1.25 MBps is the same as 1,250,000 bytes per second.

Therefore if you lose all the bytes transmitted for 2 ms (aka. 0.002 seconds) because of noise,

you will lose (1,250,000 MBps x 0.002 seconds) 2500 bytes.

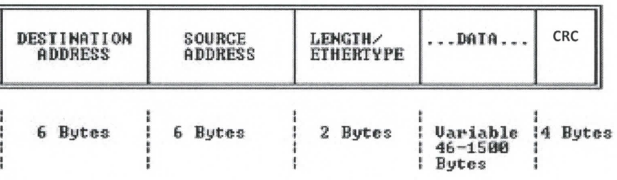
You lose (2500/1000) 2.5 frames, but since you can’t transmit partial frames, if you lose any part of a frame you lose the entire frame, **3 frames were destroyed**.

13. Sketch the Ethernet packet required to send the text string “Hello World” from Alice (whose MAC address is 11:22:33:44:55:66) to Bob (whose MAC address is AA:BB:CC:DD:EE:FF).

Your error correction bits are 0101 1100 1010 1010 1111 1110 1011 1101.

Assume that any padding bytes consist of all-zeroes, and that the Length/Type field is used as a Length field. You do not need to show the bytes added by the physical layer.

RECALL: **ALL VALUES ARE REPRESENTED IN HEXADECIMAL!**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AABBCCDDEEFF | 112233445566 | 002E | 48656C6C6F20  576F726C6400  000000000000  000000000000  000000000000  000000000000  000000000000  00000000 | 5CAAFEBD |

14. Consider the network below, which shows four 10 Mbps LANs connected by two bridges, labeled B1 and B2. Assume all users (labeled 1 through 7) are very chatty and equally chatty.

(a) What is the effective data rate seen by user 4?

(b) What is the effective data rate seen by user 5?

(b) What is the effective data rate seen by user 6?

(d) What is the effective data rate seen by user 6 if the two bridges are replaced with hubs?

7

6

LAN 4

4

3

2

5

1

B 1 B 2

LAN 1 LAN 2 LAN 3

(a) 10Mbps/4 users = 2.5Mbps

(b) 10Mbps/2 users = 5Mbps

(c) 10Mbps/3 users = 3.33Mbps

(d) 10Mbps/7 users = 1.43Mbps