CHAPTER 13

PRACTICE SET

Questions

Q13-1. The *preamble* is a 56-bit field that provides an alert and timing pulse. It is added to the frame at the physical layer and is not formally part of the frame. SFD is a one-byte field that serves as a flag.

Q13-2. The common Ten-Gigabit Ethernet implementations are *10GBase-SR*, *10GBase-LR*, and *10GBase-EW,* and *10GBase-X4*.

Q13-3. The common Gigabit Ethernet implementations are *1000Base-SX*, *1000Base-LX*, *1000Base-CX*, and *1000Base-T4*.

Q13-4. The rates are as follows:

Standard Ethernet:	**10 Mbps**
Fast Ethernet:	**100 Mbps**
Gigabit Ethernet:	**1 Gbps**
Ten-Gigabit Ethernet:	**10 Gbps**

Q13-5. In a full-duplex Ethernet, each station is connected to the switch and the media is divided into two channels for sending and receiving. No two stations compete to access the channels; each channel is dedicated.

Q13-6. A *multicast address* identifies a group of stations; a *broadcast address* identifies all stations on the network. A *unicast* address identifies one of the addresses in a group.

Q13-7. The common traditional Ethernet implementations are *10Base5*, *10Base2, 10-Base-T*, and *10Base-F.*

Q13-8. A *layer-2 switch* is an N-port bridge with additional sophistication that allows faster handling of packets.

Q13-9. A *bridge* can raise the bandwidth and separate collision domains.

Q13-10. The common Fast Ethernet implementations are *100Base-TX*, *100Base-FX*, and *100Base-T4*.

Problems

P13-1. We interpret each four-bit pattern as a hexadecimal digit. We then group the hexadecimal digits with a colon between the pairs:

5A:81:55:11:AA:1F

P13-2. The bytes are sent from left to right. However, the bits in each byte are sent from the least significant (rightmost) to the most significant (leftmost).

a. The following shows actual bits in the address. We have shown the bits with spaces between bytes for readability, but we should remember that bits are sent without gaps.

```
00011010 00101011 01001100 01001101 01011110 01101110
```

b. The following shows how the bits are actually transmitted from the left to the right.

```
01011000 11010100 00110010 10110010 01111010 01110110
```

P13-3. The smallest Ethernet frame is 64 bytes and carries 46 bytes of data (and possible padding). The ratio is (data size) / (frame size) in percent. The Ratio is 71.9 percent.

P13-4. We can calculate the propagation time as t = (2500 m) / (200,000,000 m/s) = 12.5 μs. To get the total delay, we need to add propagation delay in the equipment (10 μs). This results in T = 22.5 μs.

P13-5. We can calculate the load for each activity (as shown below) and add them together. The total load is 6,833,333 bps or almost 7 Mbps. However, we have not specified how fast we want the files to be downloaded. We have assumed that the employees are so patient to allow the file to be download at the portion of the rate assigned for part a. In real case, the total rate is much higher.

a. If the LAN should handle only this case, we have

$$\text{load} = (\text{all employees}) \times (\text{file size}) \times (\text{number of times per second})$$

$$\text{load} = (150) \times (10{,}000{,}000 \times 8)\ (10 / (8 \times 3600)) \approx 4{,}166{,}667 \text{ bps}$$

b. If the LAN should handle only this case, we have

$$\text{load} = (10\ \text{employees}) \times (\text{rate}) = (10) \times (250\ \text{Kbps}) = 2{,}500{,}000\ \text{bps}$$

c. If the LAN should handle only this case, we have

$$\text{load} = (\text{half}) \times (\text{all employees}) \times (\text{e-mails/hour}) \times (\text{size} \times 8\text{bits}) / (\text{an hour})$$

$$\text{load} = (1/2) \times (150) \times (10) \times (100{,}000 \times 8) / (3600) \approx 166{,}666\ \text{bps}$$

P13-6. In a Gigabit Ethernet network, the data rate is 1 Gbps.

a. There are 1000,000,000 bits on the channel in each second, which means that $(2/1000) \times 1000{,}000{,}000 = 2{,}000{,}000$ bits are affected by the noise.

b. If each packet is 1000 bytes or 8,000 bits (assuming ASCII characters), this means $2000{,}000/8{,}000 = 250$ packets. However, since the noise can start from the beginning or near the end of the first packet, 250 or 251 packets are possibly destroyed.

P13-7. In a Fast Ethernet network, the data rate is 100 Mbps.

a. There are 100,000,000 bits on the channel in each second, which means that $(2/1000) \times 100{,}000{,}000 = 200{,}000$ bits are affected by the noise.

b. If each packet is 1000 bytes or 8,000 bits (assuming ASCII characters), this means $200{,}000/8{,}000 = 25$ packets. However, since the noise can start from the beginning or near the end of the first packet, 25 or 26 packets are possibly affected.

P13-8. In a Standard Ethernet network, the data rate is 10 Mbps.

a. There are 10,000,000 bits on the channel in each second, which means that $(2/1000) \times 10{,}000{,}000 = 20{,}000$ bits are affected by the noise.

b. If each packet is 1000 bytes or 8,000 bits (assuming ASCII characters), this means $20{,}000/8{,}000 = 2.5$ packets. However, since the noise can start from the beginning or near the end of the first packet, 3 or 4 packets are possibly destroyed.

P13-9. The first byte in binary is 0000011<u>1</u>. The least significant bit is 1. This means that the pattern defines a multicast address.

P13-10. The minimum data size in the Standard Ethernet is 46 bytes. Therefore, we need to add 4 bytes of padding to the data $(46 - 42 = 4)$

P13-11. In a 10-Gigabit Ethernet network, the data rate is 10 Gbps.

a. There are 10,000,000,000 bits on the channel in each second, which means that $(2/1000) \times 10{,}000{,}000{,}000 = 20{,}000{,}000$ bits are affected by the noise.

b. If each packet is 1000 bytes or 8,000 bits (assuming ASCII characters), this means $20{,}000{,}000/8{,}000 = 2500$ packets. However, since the noise can start from the beginning or near the end of the first packet, 2500 or 2501 packets are possibly destroyed.