CHAPTER 12

Local Area Networks

12.1 REVIEW QUESTIONS

1. The data link layer is divided into two sublayers. The LLC is non-architecture specific and is the same for all IEEE-defined LANs. The logical link control protocol handles the end user portion of the HDLC frame: logical address, control information and data. The MAC layer contains a number of distinct modules; each carries information specific to the LAN product used and resolves the contention for the shared media.
3. The DSAP is the address of the destination service access point and the SSAP is the address of the source service access point. Both addresses identify the protocol stacks that are generating and using the data. The MAC frame on the other hand contains the physical address of the packet's next destination (DA) and the physical address of the last device that forwarded he packet.
5. The 802 model defines some of the physical specifications for each of the protocols defined in the MAC layer. It defines types of cable, connections and signals used for the specific type of LAN.
7. They are almost the same. The control field is moved to the LLC layer. The addresses are divided into two source and destination addresses. The type field is added to define the upper layer protocol using the frame. The frame status and access control fields are added to manage the token.
9. In 10Base5, the transceiver is placed onto the cable and connects the station NIC to the link via an AUI cable. In 10Base2, the transceiver circuit is in the NIC. In 10Base-T, instead of an individual transceiver, all of the networking operations are placed into an intelligent hub that has a port for every station.
11. The data rate on FDDI is about 100 Mbps whereas a Token Ring supports only 4 or 16 Mbps. FDDI used fiber optic cable, which is free of EMI, while Token Ring uses shielded twisted pair cable, which is more susceptible to noise. The distance over which a FDDI network can cover is much greater than that of a Token Ring network.

13. A SAS only has one MIC and can therefore connect only to one ring. SASs are connected to intermediate nodes (DACs) rather than to the FDDI ring directly. The concentrator provides the connection to the dual ring.
15. The LANs discussed in this text use twisted-pair cable, coaxial cable, and fiber-optic cable.
17. The station on the CSMA/CD LAN probably waits longer before it can send collision-free data.
19. If the data rate is increased by a factor of x, the collision domain is decreased by the same factor.
21. Traditional Ethernet: 10 Mbps; Fast Ethernet:100 Mbps; and Gigabit Ethernet:1 Gbps

12.2 MULTIPLE CHOICE QUESTIONS

23. b 25. c 27. c 29. c 31. b 33. b 35. c 37. c 39. a 41. b
43. b 45. a 47. d 49. b 51. b 53. b 55. b 57. b

12.3 EXERCISES

59. Smallest Token Ring data frame: 22 bytes (21 byte header + 1 byte of data)
Largest Token Ring data frame: 4,521 bytes (21 byte header + 4,500 bytes of data)
Or, if we consider the token:
Smallest Token Ring frame: 3 bytes (the token)
Largest Token Ring frame: 4,521 bytes (21 byte header + 4,500 bytes of data)
61. Ratio for smallest Token Ring data frame: 1 / 22 or 0.045
Ratio for largest Token Ring data frame: 4500 / 4521 or 0.995.
Average ratio: (1 / 22 + 4500 / 4521) / 2 or 0.520.
Or, if we consider the token:
Ratio for smallest Token Ring frame: 0 / 3 or 0.00
Ratio for largest Token Ring frame: 4500 / 4521 or 0.995.
Average ratio: (0 / 3 + 4500 / 4521) / 2 or 0.498.
63. Speed of propagation: 300,000,000 mps $\times$ 60 % = 180,000,000 mps
2500 meters / 180,000,000 mps = 13.89 microseconds
It would take a bit 13.89 microseconds to travel 2500 meters.
65. The minimum frame size is 72 bytes.
72 bytes $\times$ 8 bits / byte = 576 bits.
If the data rate is 10 Mbps, 576 bits can be generated in:
576 bits / 10,000,000 bits/second = 57.6 microseconds

67. Speed of propagation: 300,000,000 mps × 60% = 180 000,000 mps
    1000 meters / 180,000,000 mps = 5.55 microseconds
    It would take a bit 5.55 microseconds to travel once around the ring.
69. If we call the minimum length of the ring L:
    L meters / 180,000,000 meters/second = 0.0000015 seconds
    L = 180,000,000 × 0.0000015 = 270 meters
    The ring should be greater than 270 meters in length for the token passing method to work properly.
71. 1/5 = 20 %