Chapter 7: Local Area Networks

**Answers to End-of-Chapter Questions**

1. Define local area network.

2. What are the distinguishing features of a LAN?

3. What are two reasons for developing LANs?

4. What is the function of LAN metering software?

5. Discuss the legal issue of using single-computer license software on networks.

6. Discuss why it is important for organizations to enforce policies restricting use of employee-owned hardware and software and unauthorized copies of software.

7. In some LANs, most of the computers talk with the server, but others use no server. What are these two approaches called?

8. Describe at least three types of servers.

9. What is a NIC? What is a hub?

10. What media do LANs normally use?

11. What is the purpose of a BALUN? (See Balanced and Unbalanced in the Glossary.)

12. Compare and contrast category 3 UTP, category 5 UTP, and category 5 STP.

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>Max. Data Rate (Mbps)</th>
<th>Max. Distance (Meters)</th>
<th>Often Used By</th>
<th>Cost ($/foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>UTP</td>
<td>10</td>
<td>100</td>
<td>10Base-T Ethernet</td>
<td>.06</td>
</tr>
<tr>
<td>5</td>
<td>UTP</td>
<td>100</td>
<td>200</td>
<td>100Base-T Ethernet</td>
<td>.15</td>
</tr>
<tr>
<td>5</td>
<td>STP</td>
<td>100</td>
<td>200</td>
<td>100Base-T Ethernet</td>
<td>.27</td>
</tr>
</tbody>
</table>

13. What is a cable plan and why would you want one?

14. Discuss the primary advantages and disadvantage of wireless LANs. Why would you want or not want it?

15. What does a NOS do? What are the major software parts of a NOS?
Local Area Networks

16. What is the most important characteristic of a NOS?

17. What is a network profile?

18. What is ethernet? How does it work?

19. What is the difference between thicknet and cheapnet?

20. What are the commonly used LAN topologies? How are they the same? How are they different?

21. How does baseband differ from broadband?

22. Compare and contrast ethernet and token ring in terms of media access control.

23. Briefly describe CSMA, CD, and CA.

24. Why should CSMA/CD networks be built so that no more than 50 percent of their capacity is dedicated to actual network traffic?

25. Explain the terms 10Base-2, 10Base-5, 10Broad-36, and 10Base-T.

26. What is token ring? How does it work?

27. How does a token passing network operate?

28. What are the primary advantages and disadvantages of infrared wireless LANs?

29. What are the primary advantages and disadvantages of radio wireless LANs?

30. How do direct-sequence spread-spectrum (DSSS) radio LANs differ from frequency-hopping spread-spectrum (FHSS) radio LANs?

31. Describe four important issues when installing a LAN.

32. What is a bottleneck and how can you locate one?

33. Describe four ways to improve network performance on the server.

34. Describe four ways to improve network performance on the circuit.

35. What are disk caching and disk elevatoring and why are they useful?

36. Why does network segmentation improve LAN performance?
37. Should you select a network because of its protocol or its performance characteristics? Explain.

38. Discuss what makes LAN selection so difficult.

39. It is said that hooking some computers together with a cable does not make a network. Why?

40. Assume you want to install a LAN but are concerned about its cost. Realizing there are both inexpensive and expensive LANs, what features should you compare to help in the decision?

41. This chapter discusses a number of key issues that must be considered when selecting a LAN. Explain six of them.

**TRUE/FALSE**

The following are possible True/False questions for tests. The statement is given and the answer is provided in square brackets. The level of difficulty (easy, moderate, difficult) is also furnished.

1. The four layers of a network model are required for a typical network, including a local area network.  
   Moderate

2. Two LAN standards, ethernet and token ring, account for almost 95 percent of all LANs installed today.  
   Easy

3. LANs are made up of microcomputers and can never provide access to an organization’s mainframe computer.  
   Easy

4. On a network, it is always legal to purchase one copy of software, such as a word processing package, that multiple users use simultaneously.  
   Easy

5. LAN metering software can be used to prohibit using more copies of a package than there are installed licenses.  
   Easy

6. Software Publishers Association has embarked upon an aggressive software audit program to check the number of illegal software copies on LANs  
   Easy

7. LANs can be categorized as either dedicated (with a dedicated server) or peer-to-peer (without a dedicated server).  
   Easy
8. A Network Operating System (NOS), such as Novell or Windows NT, substitutes or replaces the ‘normal’ operating system, such as Windows, on a server in a dedicated server LAN.  
*Easy*

9. By offloading printing tasks from the main LAN server, a print server decreases network efficiency  
*Easy*

10. The Network Interface Card (NIC) permits a computer to be physically connected to a network’s cable, which provides the network layer connection among the computers in the network.  
*Moderate*

11. Some computers have a special port that enables network cards to be installed without physically opening them (PCMCIA slots)  
*Easy*

12. LANs that run on infrared or radio frequencies would be using a type of radiated media.  
*Moderate*

13. Fiber optic cable is thicker and heavier than unshielded twisted pair.  
*Easy*

14. A BALUN (Balanced Unbalanced) device permits different types of cabling (twisted pair and coax cable) to be connected together  
*Easy*

15. Many network hubs incorporate repeaters or amplifiers to regenerate signals so that attenuation of the signal does not occur.  
*Moderate*

16. A “smart” hub can detect and respond to network problems.  
*Easy*

17. Because the NOS server software usually replaces the normal operating system of the server, it provides slower response time.  
*Moderate*

18. The NOS software for the client computer provides the data link and network layer functions.  
*Moderate*

19. Most LANs keep audit files to track who uses which resource  
*Easy*
20. For security purposes, a user profile, which designates levels of access for specific
devices/resources for each user of the LAN, should be developed.

*Easy*

21. The Ethernet standard was developed first by the IEEE.

*Moderate*

22. Topology refers to the geometric layout of the network and describes how the computers are
interconnected.

*Easy*

23. A collision on a bus circuit means that two computers on that circuit have transmitted at the
same time.

*Moderate*

24. In general, data throughput remains steady and predictable at the maximum rate in a
contention approach (CSMA/CD) type of network in a large network that has high usage.

*Difficult*

25. Two forms of token ring are Token-ring-4 (operates at 4 Mbps on UTP) and Token-ring-16
(operates at 16 Mbps on higher quality twisted pair)

*Easy*

**MULTIPLE CHOICE**

The following are possible multiple choice questions for tests. The question is posed and the
answer is provided under the choices. The level of difficulty (easy, moderate, difficult) is also
furnished.

1. ___________ refers to having users who access the same data files, exchange information
via electronic mail, or search the Internet for information.
   a. Resource sharing
   b. User grouping
   c. User profiling
   d. Information sharing
   e. Data pirating

2. ___________ refers to one computer legally sharing a software package, such as
Microsoft Word, with other computers on the network to save costs.
   a. Resource sharing
   b. Software licensing
   c. Information sharing
   d. Software pirating
   e. Network routing
Local Area Networks

3. A dedicated server LAN:
   a. is limited to handling small databases
   b. uses simple LAN software
   c. can not connect with other networks
   d. has one or more permanently assigned servers that can enable users to share files, for example
   e. is limited to handling small files

4. Which of the following is not a critical software component in a dedicated server LAN?
   a. application software on server computers
   b. network operating system in the dedicated server
   c. network communication software on the client
   d. front end database interfaces software, such as Powerbuilder
   e. application software on client computers

5. A(n) __________ is not a common type of dedicated server.
   a. file server
   b. print server
   c. communications server
   d. user server
   e. access server

6. A(n) __________ can permit users calling into a LAN remotely to retrieve their email, for example.
   a. print server
   b. communications server
   c. file server
   d. provider server
   e. access server

7. A peer-to-peer LAN:
   a. has more capability than a dedicated server
   b. supports a higher number of computers than a dedicated server
   c. is generally cheaper in hardware and software than a dedicated server
   d. is not appropriate for sharing resources in a small LAN
   e. is much faster than dedicated server networks

8. Which of the following is not a basic LAN component?
   a. client
   b. gateway
   c. server
   d. network interface card
   e. network operating system
9. Which of the following is not a purpose for using hubs in a network?
   a. to act as a communications server
   b. to connect network cables
   c. to support network expansion
   d. to prevent attenuation
   e. to act as a junction box

10. Which of the following is not an advantage of using twisted pair for cabling LANs?
    a. cost
    b. availability
    c. weight/thickness
    d. flexibility
    e. security

11. _________ is not true with respect to network hubs.
    a. A multistation access unit is one term that can be used for network hubs
    b. A good network plan includes hubs in areas in which a network may expand
    c. Simple hubs are commonly available in 4-, 8-, and 16-port sizes
    d. Many hubs act as repeaters or amplifiers
    e. Hubs provide a complicated way to connect network cables

12. The server version of the Network Operating System does not:
    a. provide the software that performs the functions associated with the physical layer
    b. provide the software that performs the functions associated with the data link layer
    c. provide the software that performs the functions associated with the application layer
    d. provide the software that performs the functions associated with the network layer
    e. usually provide the software that performs the functions associated with the computer’s own operating system

13. A __________ indicates what resources on each server are available on the network for use by other computers and what people are allowed what access to the network.
    a. user profile
    b. user access log
    c. network profile
    d. network operating system
    e. server allocation list

14. The cheapest time to install network cabling is:
    a. during the construction of the building
    b. as soon as the building is completed
    c. as soon as the building is occupied
    d. about five years after the building is occupied so that the exact office locations for each network computer is known
    e. any time that a network needs to be installed
15. Most buildings under construction today have a separate:
   a. LAN cabling plan
   b. telephone cabling plan
   c. electrical cabling plan
   d. all of the above
   e. none of the above

16. When installing cables, it is good practice to:
   a. obtain a copy of the local city fire codes and follow them
   b. conceal the cables as much as possible to protect them from damage and for security reasons
   c. properly number and mark both ends of all cable installations as you install them
   d. all of the above
   e. none of the above

17. The primary advantage of a wireless LAN is that:
   a. extremely high speed data transmissions can be achieved
   b. no cabling need be installed
   c. it is very secure from eavesdropping
   d. there is much less opportunity to disrupt transmissions
   e. it is a new technology so it provides leading edge ‘prestige’ for the organization that uses it

18. Ethernet LAN was developed by:
   a. IBM
   b. ARPANET
   c. DEC, Xerox, and Intel
   d. University of Minnesota
   e. CERN laboratory in Geneva

19. The type of logical topology that Ethernet uses is a:
   a. ring
   b. bus
   c. star
   d. mesh
   e. interconnected

20. A bus topology:
   a. is always used by token ring protocol LANs
   b. has all computers connected to each other in a point-to-point connection
   c. is limited to short distances since devices like a hub or repeater cannot be used with this type of topology
   d. permits every message to be received by every computer on the bus, even when those messages are intended for other computers
   e. has a central control device, such as a mainframe
21. Which of the following is not true about CSMA/CD?
   a. The acronym refers to Carrier Sense Multiple Access with Collision Detection
   b. It is used in token ring protocol LANs
   c. It is a contention-based media access control technique
   d. When a collision has occurred, the computers that wish to transmit wait a random amount of time after a colliding message before attempting to retransmit
   e. Computers on the circuit ‘listen’ while transmitting

22. _________ is not a type of ethernet specification.
   a. Thinnet
   b. Thicknet
   c. Cheapnet
   d. 10Base-T
   e. Securenet

23. 10Base-5:
   a. supports at least 10 Mbps data rate using baseband signaling
   b. was the original ethernet standard
   c. is known as Thick Ethernet
   d. all of the above
   e. none of the above

24. Which of the following is most commonly used in backbone networks?
   a. 10Base-2
   b. 10Base-5
   c. 10Broad-36
   d. 10Base-T
   e. 10Base-55

25. The IEEE 802.5 standard refers to:
   a. Ethernet
   b. Token Ring
   c. Transfer Bus
   d. AppleTalk
   e. Control Access

26. Which of the following is not true with respect to token ring?
   a. The token moves between the computers on the network in a predetermined sequence (much like roll call polling)
   b. A computer with a message to transmit waits until it receives what is called a free token
   c. When the token and message arrives at the destination computer, the destination computer copies the data in the message and acknowledges receipt (or indicates if there was an error in transmission)
Local Area Networks

d. Once an NAK or ACK is set by the destination computer, the message continues around the ring, making a complete round trip back to the transmitting computer.

e. Token Ring uses a carrier sense multiple access/collision avoidance media access control technique

27. The Token Ring protocol was developed originally by:
   a. DEC, Xerox, and Intel
   b. ISO
   c. IBM
   d. IEEE
   e. CERN laboratory in Geneva

28. The type of logical topology that Token Ring uses is a:
   a. ring
   b. bus
   c. star
   d. mesh
   e. interconnected

29. Which of the following is not true about token ring LANs?
   a. Messages pass around the ring in one direction to each computer in turn
   b. Each computer is connected to every other computer in a point-to-point configuration
   c. Because most token ring LANs are set up using a hub (MAU), the physical topology appears to be a star.
   d. The media access control is a controlled-accessed technique
   e. They use a token, which is a short electronic message that circulates through the network

30. A(n) __________ generates a new token if the token is lost.
   a. ring server
   b. ACK indicator
   c. NAK indicator
   d. host computer
   e. token monitor

31. __________ is an older LAN protocol that is fading from use.
   a. Ethernet
   b. AppleTalk
   c. ACKtalk
   d. Sprintnet
   e. ATM

32. Which of the following is a correct statement about Apple LocalTalk?
   a. LocalTalk uses a carrier sense multiple access (CSMA) scheme to put packets on the network
b. LocalTalk uses a token ring scheme to put packets on the network
c. LocalTalk uses an asynchronous transfer mode scheme to put packets on the network
d. LocalTalk uses a fiber distributed data interchange scheme to put packets on the network
e. LocalTalk uses hub polling to put packets on the network

33. The major problems with Apple LocalTalk are its:
   a. token ring scheme to put packets on the network and need for excessive wiring control
   b. very slow data transmission rate and its use of non-standard protocols
   c. 53-byte packet size
   d. mesh topology
   e. 1000-foot cable length and 32 computer support limitations

34. With _____, if the NIC detects any signal other than its own when attempting to transmit, it sends a jamming signal and than all computers stop transmitting and wait for the circuit to become free before trying to retransmit.
   a. Multiple Accessing
   b. Collision Detection
   c. Collision Jamming
   d. Fast Frame Relay
   e. Ping Pinging

35. Baseband ethernet uses:
   a. digital signaling, treating the cable as one single channel, so the cable carries only a single transmission at any one moment
   b. direct signaling, treating the cable as a reflexed channel, so the cable carries data transmission in only one direction at a time
   c. analog signaling and splits the cable into many different channels using frequency division multiplexing
   d. inverse signaling and splits the cable into multiple data streams
   e. none of the above

36. On average, it costs _______ to manage a LAN each year than to initially install one.
   a. much less
   b. a little less
   c. about the same
   d. more
   e. exactly the same

37. LAN bottlenecks are usually found at the:
   a. data entry keyboard and client video monitors
   b. LAN server and network circuit
   c. hub repeaters and transducer circuit modules
   d. client operating system and diskette drive
Local Area Networks

38. Two commonly used techniques used to improve the disk access speed on a LAN server are disk:
   a. sector stripping and disk forward loading
   b. caching and disk elevatoring
   c. cylinder capping and disk leveraging
   d. file allocation table sorting and video card tuning
   e. conversion from database files to sequential access files and permitting duplicate keys

39. Constantly grouping data requests to the server, and processing them so that the disk read/write head travels the minimum distance is called disk:
   a. forward loading
   b. caching
   c. elevatoring
   d. capping
   e. leveraging

40. If your LAN server is overloaded, which of the following should you not consider (to solve the server problem):
   a. adding one or more additional servers
   b. upgrading the server’s CPU with a faster CPU
   c. increasing the amount of memory of the server
   d. increasing the amount of disk capacity of the server
   e. replacing the cable with fiber optic cable

41. To increase the volume of simultaneous messages the LAN circuit can transmit from network clients to the server(s), you can:
   a. increase the CPU of the server
   b. segment the network
   c. increase the number of hard disks on the server
   d. increase the amount of disk capacity of the server
   e. increase the amount of memory of the server

42. In general, controlled approaches, such as token passing, work better than contention approaches, such as CSMA/CD for:
   a. small networks that have low usage
   b. small networks that have moderate usage
   c. large networks that have high usage
   d. networks that have a mesh topology
   e. networks that have an interconnected topology

43. Generally speaking, response time in a token ring network is ________ consistent than that in ethernet networks.
   a. much less
b. a little less

c. equally

d. more

e. about the same level

44. Ethernet is popular because:
   a. it is less costly to install than its token passing counterparts
   b. it is much faster at all times than its token passing counterparts
   c. it is more reliable at all times than its token passing counterparts
   d. it is considered prestigious to own
   e. it has a “catchy” name

45. Breaking a network into smaller parts is called network:
   a. fragmentation
   b. segmentation
   c. localization
   d. allocation
   e. mitigation

46. Which of the following is not an effective way to reduce LAN network demand:
   a. move files to client computers
   b. use disk caching on the client machines
   c. find an application that places a large demand on the network and run it a time when
      the network is lightly loaded
   d. use spread spectrum radio LANs
   e. shift the users’ routines

47. Which of the following would not be a valid consideration in selecting a LAN?
   a. how many users are expected and how much security is needed
   b. how much data will be stored and transmitted
   c. what cabling is needed and how easy it will be to add workstations
   d. how much experience the vendor has
   e. how the color scheme of the building is enhanced with the LAN

**Short Answer Questions**

1. Describe the major components of a LAN and what function each performs.

2. Compare and contrast 10Base-T, 10Base-5, and 10Broad-36.

3. Compare Ethernet and token ring in terms of performance. Under what circumstances does Ethernet lead to better performance?
Local Area Networks

4. You arrive at your new job and your manager asks you to explain two important technical differences between ethernet and token ring LANs. Remember that your manager does not understand technical buzz words; use language your manager will understand.

5. You arrive at your new job and your manager asks you to explain two important technical or business factors we need to consider in choosing between ethernet and token ring LANs for our organization? Don't make a choice (you don't have enough information to make a choice) just discuss two factors that would influence your choice. For example, suppose you decided that the color of the network hubs was important. I would expect you to explain why it was important, and explain how it would affect your choice (e.g., If we have blue carpet, I would buy the blue ones). Remember that your manager does not understand technical buzz words; use language your manager will understand.

6. Compare and contrast radio and infrared wireless LANs. Under what circumstances would you use radio? Under what circumstances would you use infrared?

7. Suppose an ethernet 10BaseT LAN in your office is starting to have slower and slower response time. What would you do?

8. Suppose an ethernet 10BaseT LAN in your office is starting to have slower and slower response time. Describe two specific actions that might improve performance.

9. You arrive at your new job and your manager asks you to explain the role of network segmentation in improving performance. Remember that your manager does not understand technical buzz words; use language your manager will understand.

10. Thought question: IEEE 802.4 is a token bus system that combines some of the features of Ethernet (i.e., the bus) and some of the features of token ring (i.e., the token). Describe how it would send messages.

11. Thought question: Explain the two most important issues in selecting a LAN and justify why they are the most important.

Next Day Air Service Case Study

1. Which is best for the International Service department, a high-end full network, a low-end peer-to-peer LAN? Explain your choice.

2. Draw a configuration for a bus, and ring topology for the LAN. Now you must decide which LAN would be best for NDAS: Ethernet (e.g., 10Base-2, 10Base-T) or token ring. Which do you recommend? Justify your recommendation with three to five reasons.

3. Which do you think would be the most costly items in the LAN?
4. Sally Wong has heard "horror stories" about LAN bottlenecks. Prepare a brief discussion of LAN bottlenecks and what can be done to improve LAN performance.

5. What safeguards do you recommend for NDAS to control illegal copies of software on the LANs?