Chapter 12 Networks and Data Communications An Overview

1) The sender and receiver end points, in a communications system, are referred to as

a) hosts.

b) end-users.

c) edge devices.

d) interface devices.

2) Since data communication is predominantly serial, we usually describe the data as a

a) bit flow.

b) bit surge.

c) byte flow.

d) byte stream.

3) To solve the related problems of channel availability and maximum utilization, there must be a way to break long messages into smaller units. These units are called

a) boxes.

b) packets.

c) envelopes.

d) containers.

4) A \_\_\_\_\_\_\_\_\_is equivalent to an envelope containing pages of data.

a) packet

b) message

c) segment

d) container

5) A direct USB connection between a smartphone and a personal computer is an example of

a) multicast.

b) broadcast.

c) one-to-many connection.

d) point-to-point connection.

6) The typical communication channel is actually divided into segments; connections along the segments are called

a) links.

b) routes.

c) dedicated paths.

d) transmission paths.

7) The rate of speed with which data can be moved successfully through the channel is usually measured as a

a) bit rate.

b) file rate.

c) block rate.

d) CPU cycle rate.

8) Which is *not* an example of an unguided medium?

a) microwave

b) cellular phone

c) broadcast radio

d) USB connection from computer to smartphone

9) Some channel characteristics are determined innately by the medium. For example, unguided messaging must be carried by an analog signal known as a

a) shipping signal.

b) carrier signal.

c) delivery signal.

d) transport signal.

10) Channels that carry messages in only one direction are known as

a) one-way channels.

b) simplex channels.

c) full duplex channels.

d) half-duplex channels.

11) Channels that carry messages in both directions, but only one direction at a time, are called

a) simplex channels.

b) one-way channels.

c) full-duplex channels.

d) half-duplex channels.

12) Channels that carry signals simultaneously in both directions are called

a) simplex channels.

b) one-way channels.

c) full-duplex channels.

d) half-duplex channels.

13) A relatively small number of standard protocols, consisting primarily of the \_\_\_\_\_\_\_\_\_\_\_\_\_ protocol suites, satisfy nearly all of the communication requirements for modern data communication networks.

a) TCP/IP and UDP

b) TCP/IP and BGP

c) TCP/IP and ATM

d) TCP/IP and Ethernet

14) In a \_\_\_\_\_\_\_\_\_\_ topology each computer node gets every message, but processes only those addressed to that node. There is no central hub in this topology.

a) star

b) bus

c) ring

d) mesh

15) Which of the following topologies is used primarily for local area networks; all nodes are connected point-to-point to a central device that uses switching technology to connect pairs of nodes together?

a) star

b) bus

c) ring

d) mesh

16) Which of the following topologies consists of point-to-point connections from each node on the network to the next node; the last node on the network is connected back to the first and there is no central hub?

a) star

b) bus

c) ring

d) mesh

17) Which type of topology describes the actual layout of the wiring for the network?

a) virtual

b) logical

c) tangible

d) physical

18) Which type of topology defines the operational relationship between the various network components?

a) virtual

b) logical

c) physical

d) tangible

19) Which type of network connects computers and other supporting devices over a relatively small localized area, typically a room, the floor of a building, a building, or multiple buildings within close range of each other?

a) LAN

b) CAN

c) WAN

d) Intranet

20) The most familiar, and often most practical and useful, way to categorize networks is by their

a) geographical range of service.

b) medium used (coaxial cable, wireless, fiber).

c) standard specification number (802.3, 802.11, X.25).

d) usage (Web server, database server, peer-to-peer, storage area network).

21) In a(n) \_\_\_\_\_\_\_\_\_\_\_ hub, all of the connections at the hub are simply tied together inside the hub and the hub performs no operation or modification of the signals as they arrive at the hub.

a) active

b) layer 3

c) passive

d) intelligent

22) Which Ethernet technology uses radio-based signals to communicate to devices connected on the local area network?

a) Wi-Fi

b) ring Ethernet

c) mesh Ethernet

d) hub-based Ethernet

23) Which Ethernet type is based logically on a star topology and when one node on the network wishes to communicate with another node, the switch sets up a direct connection between the two?

a) Star Ethernet

b) Ring Ethernet

c) Mesh Ethernet

d) Switched Ethernet

24) Each wireless unit is connected by radio to a base station \_\_\_\_\_\_\_\_\_\_\_\_\_ that is somewhat equivalent to a hub.

a) media site

b) access site

c) media point

d) access point

25) Which type of network is used to interconnect local area networks? The primary motivation for this type of network is to improve overall performance of a larger network by creating separate local area networks for groups of users who communicate primarily with each other.

a) link networks

b) extended networks

c) connected networks

d) backbone networks

26) In a wireless network where the access points are connected by radio, the mesh points operate at the \_\_\_\_\_\_\_\_\_\_\_ and are essentially invisible to the upper layers of the network.

a) physical layer (layer 1)

b) transport layer (layer 4)

c) session layer 5 (layer 5)

d) media access control layer (layer 2)

27) Operation of a metropolitan area network (MAN) generally requires

a) access servers.

b) peering agreements.

c) right of way access.

d) fiber optic transmission.

28) An access router that is located between the public Internet and the internal LAN is called (a)n

a) edge router.

b) border router.

c) exchange router.

d) perimeter router.

29) Which type of network is designed to facilitate communications between users and applications over large distances—between the various corporate offices of an international organization that are located in cities all over the world, for example.

a) LAN

b) WAN

c) CAN

d) MAN

30) Which type of network has ranges of only thirty feet or less, but is sufficient for an individual to interconnect his personal computing devices?

a) PAN

b) LAN

c) WAN

d) CAN

31) How might a LAN be designed in a business setting to minimize extraneous traffic where possible?

a) Create separate LANs for each floor.

b) Create separate LANs for each manager.

c) Create separate LANs for each department.

d) Create separate LANs for each district or territory.

32) What makes virtual circuits more efficient in the use of transmission resources than traditional circuit switching?

a) Links and intermediate nodes are shared with other connections.

b) A virtual circuit uses multiple links to send data over possibly different channel paths.

c) There is a dedicated path for the exclusive use of the sender-receiver pair for the entire time of the connection.

d) There is a virtual path for the exclusive use of the sender-receiver pair for the entire time of the connection.

33) Which of the following is *not* true about datagram switching?

a) TCP/IP rarely uses datagram switching.

b) Each packet is routed from node to node independently.

c) A routing decision can be based on shortest path to next node.

d) A routing decision can be based on traffic conditions at the time of packet arrival.

34) How do routers and gateways differ?

a) Routers are used in ISPs; gateways are used in WANs.

b) There are no differences between routers and gateways.

c) Routers interconnect dissimilar networks together; gateways connect similar networks.

d) Routers connect similar networks together; gateways interconnect dissimilar networks.

35) Which of the following is *not* a major organization that participates in the creation of standards for data communications, networks, and internetworks?

a) Internet Engineering Task Force (IETF)

b) Association for Computing Machinery (ACM)

c) International Organization for Standardization (ISO)

d) International Telecommunications Union Telecommunications Group (ITU-T)

Discussion questions

1) How is the word "data" used in this chapter?  
Sol:

From the text: "Note that we use the word “data” in the broadest possible sense of the word, to include programs, as well as traditional data, e-mail, music, streaming video, instant messaging, cell phone texts, network-based telephony—indeed, anything that can be communicated with bits and bytes."

2) What types of interpersonal communication do networks enable?

Sol:

From the text: "…texting, e-mail, instant messaging (IM), social networking, voice-over-IP Internet telephony, Internet multiplayer games, collaborative work tools, real-time video conferencing,…. "

3) What are the three essential ingredients for data communication?

Sol:

From the text: "first, the data being passed between sender and receiver represents messages that are to be shared among the parties to the communications, second, there must be a communication channel that can capably and reliably transport the messages, and third, there must exist protocols that establish accurate and appropriate meaning to the messages that are understood by both senders and receivers. The second example also raises the issues of connectivity methods and addressing."

4) Why is it important to limit the length of a message sent over a communications channel?

Sol:

Without some form of control, very large messages (i.e., streaming video download) could tie up a communication channel indefinitely. This would prohibit the use of the channel for other messages sharing the channel.

5) Give a general description of the types of information contained in a "packet."

Sol:

Answers will vary. But generally, as described in subsection Packets under section 12.3, a packet consists of the message content enclosed with information about receiver and sender address, error-checking, and information about the enclosed content (i.e. length of the content message), etc. Also, a packet number if the packet was part of a larger message and needs to be reassembled.

6) What are the important advantages of using packets in data communications? There are at least 7 advantages listed in the text, here are 3 to get started:

1) Packets simplify operations and increase communication efficiency. Packets reduce communication overhead by making it possible to transmit a large block of data while requiring only a single block of overhead information to identify the destination and meaning of the enclosed data.

2) Packets also present an opportunity to check and fix errors in individual packets as the message is being sent, rather than having to resend the entire message.

3) A packet represents a reasonable unit for the routing of data. This factor is particularly important in wide area networks, where a packet of data may be passed through many different networks and communication channels before it reaches its destination.

Sol:

4) Packets offer an alternative to dedicating a channel for the entire length of a message. This increases utilization and availability of a channel by allowing packets from several sources to access and share a single channel.

5) The use of packets presents a productive way to use a communication channel. A channel can be switched to route data packets to different destinations in such a way that each sender-receiver pair appears to have a channel to itself.

6) The receiving computer is able to process a block of data all at once, instead of a character or a byte at a time. Furthermore, it is usually easier to organize the data, since there are fewer individual blocks of data to deal with.

7) It simplifies synchronization of the sending and receiving systems. Packets provide a clearly delineated burst of data, with an identifiable start and stop point.

7) What are "links" in a communications channel?

Sol: From the text: "the communication channel is actually divided into segments, called links, with intermediate nodes between the links that forward packets from one link to the next."

8) Each individual link channel is characterized by a number of different properties. Some of them are a) type of medium, b) signaling method, c) directionality of signals, d) nature of the interfaces with the end nodes and with other links. What are the other properties?

Sol:

e) link bandwidth

f) restrictions on the length of the channel

g) the time delay between the time the channel receives data from its incoming node and the time it releases the data to its outgoing node

h) the number of connections sharing the channel

i) the noise characteristics of the channel

j) guided or unguided

k) the electrical or optical properties of the channel

9) How many connections are required for 30 nodes to be connected in a full mesh topology?

Sol: The formula is

Number of connections = (Nodes)(Nodes-1)/2

30\*29/2 = 435

10) With a bus topology, each node is tapped into the bus. To communicate, a sending node “broadcasts” a message that travels along the bus. How does the recipient node know the message is intended for that node?

Sol: Since every node receives the message, each node must compare its address to the message destination address. If the destination address is different, the message is ignored. If the destination address matches, the node processes the message.

11) What is the difference between physical and logical topology?

Sol: From the text: "…it is important to understand that there is a difference between physical topology and logical topology. Physical topology describes the actual layout of the wiring for the network. Logical topology defines the operational relationship between the various network components."

12) What is the difference between a "passive" and "active" hub?

Sol:

From the text, "The word “passive” means that the hub performs no operation or modification of the signals as they arrive at the hub. In contrast, an active hub recreates the arriving signals."

13) How do backbone networks improve the efficiency of very large LANs?

Sol:

Backbone networks interconnect separate LANs. Separate LANs can be provided to localized groups of users, such as an HR department, library, dormitory areas, dining halls etc. This isolates the traffic within areas of common usage. A backbone network would provide the interconnections between all of these LANs, thus making it possible to extend the overall range of the combined networks well beyond that of a single LAN.

14) What is an intranet? And what are the limitations due to geographic considerations?

Sol: From the text: "An intranet is an organizational network where the user interfaces and applications are based primarily on Web services. Its use is restricted to authorized users within the organization. Some network practitioners refer to it as a 'private Internet'."

15) The Internet is just a gigantic network of interconnected networks, connecting a high percentage of all the computers in the world. In practice, though, the number of intermediate nodes, measured as hops between nodes, would make this scheme impractical. How is the number of "hops" reduced on the Internet?

Sol: Fast connections between distant points are used to reduce the time it takes to traverse long distances, to reduce the number of hops to just a few, and to reduce the traffic on the local connections.

Solutions

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| Problem | Answer | Section in text / comments |
| 1 | a | Section 12.2 A Simple View of Data Communications |
| 2 | d | Section 12.3 Basic Data Communication Concepts |
| 3 | b | Section 12.3 Basic Data Communication Concepts |
| 4 | a | Section 12.3 Basic Data Communication Concepts |
| 5 | d | Section 12.3 Basic Data Communication Concepts |
| 6 | a | Section 12.3 Basic Data Communication Concepts |
| 7 | a | Section 12.3 Basic Data Communication Concepts |
| 8 | d | Section 12.3 Basic Data Communication Concepts |
| 9 | b | Section 12.3 Basic Data Communication Concepts |
| 10 | b | Section 12.3 Basic Data Communication Concepts |
| 11 | d | Section 12.3 Basic Data Communication Concepts |
| 12 | c | Section 12.3 Basic Data Communication Concepts |
| 13 | d | Section 12.3 Basic Data Communication Concepts |
| 14 | b | Section 12.4 Networks |
| 15 | a | Section 12.4 Networks |
| 16 | c | Section 12.4 Networks |
| 17 | d | Section 12.4 Networks |
| 18 | b | Section 12.4 Networks |
| 19 | a | Section 12.4 Networks |
| 20 | a | Section 12.4 Networks |
| 21 | c | Section 12.4 Networks |
| 22 | a | Section 12.4 Networks |
| 23 | d | Section 12.4 Networks |
| 24 | d | Section 12.4 Networks |
| 25 | d | Section 12.4 Networks |
| 26 | d | Section 12.4 Networks |
| 27 | c | Section 12.4 Networks |
| 28 | a | Section 12.4 Networks |
| 29 | b | Section 12.4 Networks |
| 30 | a | Section 12.4 Networks |
| 31 | c | Section 12.4 Networks |
| 32 | a | Section 12.4 Networks |
| 33 | a | Section 12.4 Networks |
| 34 | d | Section 12.4 Networks |
| 35 | b | Section 12.5 Standards |