Answers are in blue.

# For Exercises 1–6, match the word or acronym with the definition or the appropriate blank.

1. **LAN**
2. **WAN**
3. **Gateway**
4. **Bus topology**
5. **Ethernet**
6. **Internet**
   1. The Internet is a(n) . B
   2. The industry standard for LANs. E
   3. A node that handles communication between its LAN and other networks.

C

* 1. A network that connects other networks. B
  2. Star technology is a(n) configuration. A
  3. Ethernet uses . D

# For Exercises 7–15, match the word or acronym with the definition or the appropriate blank.

* + 1. **DLS**
    2. **TCP/IP**
    3. **UDP**
    4. **IP**
    5. **TCP**
    6. **Broadband**

1. The network protocol that breaks messages into packets, reassembles the packets at the destination, and takes care of errors.

E

1. The suite of protocols and programs that supports low-level network communication.

B

1. An alternative to TCP that achieves higher transmission speeds.

C

1. Software that deals with the routing of packets. D
2. has more reliability than UDP. E

# For Exercises 15–20, match the protocol or standard with what it specifies or defines.

* 1. **SMTP**
  2. **FTP**
  3. **Telnet**
  4. **HTTP**
  5. **MIME type**

1. Transfer of electronic mail. A
2. Log into a remote computer system. C
3. Transfer files to and from another computer. B
4. Format of email attachments. E

7. phone line. A

and voice communication can use the same

1. Exchange of World Wide Web documents. D
2. DLS and cable modems are connections. F



**Computer Science Illuminated, Seventh Edition**

Nell Dale, PhD; John Lewis, PhD

**CHAPTER 15**

EXERCISES AND ANSWERS

1. An Internet connection made using a digital signal on regular phone lines.

A

1. Network technologies that generally provide data transfer speeds greater than 25 Mbps.

F

# For Exercises 21–28, mark the answers true and false as follows:

1. **True**
2. **False**
3. A P2P network establishes a single portal through which communication is managed.

B

1. A port is a numeric designation that corresponds to a partic- ular high-level protocol.

A

1. A firewall protects a local-area network from physical damage.

B (it protects it from inappropriate access)

1. Each company can establish its own access control policy. A
2. A TV cable company cannot also be an Internet service provider.

B

1. Some top-level domains are based on the country in which the registering organization is based.

A

1. There are now hundreds of top-level domains in the domain name system.

A

1. Two organizations cannot have the same name for a computer. B

# Exercises 29–68 are problems or short–answer questions.

1. What is a computer network?

A computer network is a collection of computing devices connected so that they can communicate and share resources.

1. How are computers connected together?

The computers in a network can be physically connected by wires or cables or logically connected by radio waves or infra- red signals.

1. To what does the word *node (host)* refer?

A node or host is any addressable device attached to a network.

1. Name and describe two key issues related to computer networks.

Data transfer rate: The speed with which data is moved across the network

Protocol: The set of rules that define how data is formatted and processed across a network

1. What is a synonym for *data transfer rate*? Bandwidth
2. Describe the client/server model and discuss how has it has changed how we think about computing.

The client/server is a model in which resources are spread across the Web. The client makes a request for informa- tion or an action from a server and the server responds. For example, a file server, a computer dedicated to storing and managing files for network users, responds to requests for files. A web server, a computer dedicated to respond- ing to requests for web pages, produces the requested page. Before the client/server model was developed, a user thought of computing within the boundaries of the computer in front of him or her. Now the functions that were provided within one computer are distributed across a network, with separate computers in charge of different functions.

1. What is a P2P network?

A peer-to-peer network is decentralized, with nodes that share both resources and the responsibility for making these resources available to other peers.

1. Just how *local* is a local-area network?

A local-area network connects a relatively small number of machines in a relatively close geographical area, usually within the same room or building, but occasionally a LAN spans a few close buildings.

1. Distinguish between the following LAN topologies: ring, star, and bus.

A ring topology is one in which the nodes are connected in a closed loop. A star topology is one in which the nodes are all connected to a central node. A bus topology is one in which the nodes share a common line.

1. How does the shape of the topology influence message flow through a LAN?

In a ring topology, messages flow in only one direction around the LAN. In a star topology, messages flow through the central node. In a bus topology, messages flow in both directions along the bus.

1. What is a MAN and what makes it different from a LAN and a WAN?

A MAN is a metropolitan-area network. It is a network with some of the features of both a LAN and a WAN. Large met- ropolitan areas have special needs because of the volume of traffic. MANs are collections of smaller networks but are implemented using such techniques as running optical fiber cable through subway tunnels.

1. Distinguish between the Internet backbone and an Internet service provider (ISP).

The Internet backbone is a set of high-speed networks that carry Internet traffic. An ISP is a company that provides access to the Internet, usually for a fee. An ISP connects directly to the Internet backbone or to a larger ISP with a connection to the backbone.

1. Name and describe three technologies for connecting a home computer to the Internet.

The text states that “the three most popular techniques for home connections are a phone modem, a digital subscriber line, or a cable modem.” Other technologies include satellite connections (especially via a satellite television provider) and WiFi hotspots on cellular telephones.

1. What role do ISPs play with the three technologies in Exer- cise 41?

Each of the technologies in Exercise 41 requires the connec- tion to go through an ISP. With a phone modem, you dial up a computer that is permanently connected to the Internet. Once the connection is made, you may transfer data. A DSL line maintains an active connection between your home and the ISP. The communication set up to and from your home using cable goes through an ISP.

1. What are the advantages and disadvantages of each of the technologies in Exercise 41?

Phone modems are the cheapest because the phone lines are in place, but transfer speed is very slow because com- puter data must be converted into an analog audio signal for transfer.

DSL service uses regular phone lines to transfer digital data and you do not have to dial in, but you must be within a cer- tain distance of special equipment or the signal degrades.

Cable modems uses service that many people already have, but the signal deteriorates if too many people in the neigh- borhood have the service.

Both DSL and cable modems are broadband connections.

1. Phone modems and digital subscriber lines (DSL) use the same kind of phone line to transfer data. Why is DSL so much faster than phone modems?

Phone modems translate digital signals to analog in order to send them over voice frequencies. DSL sends the digital signals over the same phone line but at a different frequency. Because DSL and voice are at different frequencies, they can share the same phone line.

1. Why do DSL and cable modem suppliers use technology that devotes more speed to download than to upload?

Users spend more time asking for data to be sent to their machines (downloads) than they do sending data to other machines (uploads). Therefore, DSL and cable modem sup- pliers maximize the speed on the most common task.

1. Messages sent across the Internet are divided into packets. What is a packet, and why are messages divided into them? A packet is a unit of data sent across a network. It is more efficient to send uniform-sized messages across the Internet.
2. Explain the term *packet switching.*

Packets that make up a message are sent individually over the Internet and may take different routes to their destina- tion. When all the packets arrive at the destination, they are reassembled into the original message.

1. What is a *router*?

A router is a network device that directs packets between networks towards their final destinations.

1. What is a *repeater*?

A repeater is a network device that strengthens and propa- gates a signal along a lone communication line.

1. What problems arise due to packet switching?

Because packets may take different routes, they may not arrive in order. Thus, they must be reassembled into the right order at the receiving end.

1. What are *proprietary systems* and why do they cause a problem?

A proprietary system is one designed and built by a com- mercial vendor that keeps the technologies used private. If a network’s software is a proprietary system, then it can only communicate with other networks that use the same software.

1. What do we call the ability of software and hardware on multiple platforms from multiple commercial vendors to communicate?

Interoperability

1. What is an *open system* and how does it foster interoperability? An open system is a system based on a common model of network architecture adhering to an accompanying suite of protocols. If all commercial vendors adhere to a common logical architecture and protocols, then networks on multiple platforms from multiple vendors can communicate.
2. Compare and contrast proprietary and open systems.

Both proprietary and open systems can be used to create networks. Networks using the same proprietary systems can communicate with each other, but not with networks that do not use the same system. Networks using open systems can all communicate.

1. What is the seven-layer logical breakdown of network inter- action called?

Open Systems Interconnection (OSI) Reference Model

1. What is a *protocol stack* and why is it layered?

A protocol stack is layers of protocols that build and rely on each other. Protocols are layered so that new protocols can be developed without abandoning fundamental aspects of lower levels.

1. What is a *firewall*, what does it accomplish, and how does it accomplish it?

A firewall is a computer system that protects a network from inappropriate access. A firewall filters incoming traffic, check- ing the validity of incoming messages, and perhaps denying access to messages. For example, a LAN might deny any remote access by refusing all traffic that comes in on port 23 (the port for telnet).

1. What is a *hostname* and how is it composed?

A hostname is a unique identification for a specific computer on the Internet made up of words separated by dots.

1. Why was the IPv6 protocol created for IP addresses?

IPv4 is limited in the number of unique computers it could identify, and was used up by 2011. IPv6 was created as the successor to IPv4, providing many more addresses.

1. What is the primary difference between the IPv4 and IPv6 protocols?

An IPv6 address is bigger (using 128 bits instead of 32), which, in addition to providing more addresses, provides additional features that improve the management of network traffic.

1. What is a *domain name*?

A domain name is that part of the hostname that specifies the organization or group to which the host belongs.

1. What is a top-level domain name?

The last part of a domain name that specifies the type of organization or its country of origin.

1. What is network neutrality?

Network neutrality is the principle that ISPs should deliver data to everyone equally, as fast as the technology allows.

1. How does the current domain name system try to resolve a hostname?

First, a request is sent to a nearby domain name server (a computer that attempts to translate a hostname into an IP address). If that server cannot resolve the hostname, it sends a request to another domain name server. If the second server can’t resolve the hostname, the request continues to propagate until the hostname is resolved or the request expires because it took too much time.

1. What is cloud computing?

Cloud computing is an Internet service through which you can do things such as obtain online storage, synchronize devices, or access particular resources. The idea is that these services are somewhere “in the cloud” of the Internet.

1. Compare cloud computing to an email service such as Gmail. The Gmail email service can be thought of as a particular example of cloud computing. They provide the service of receiving and storing you email messages, which you can then retrieve from wherever you are on any device that can access the Internet.
2. What are the four types of cloud computing services? The four types of cloud computing services are:

* Public cloud: Accessible by any subscriber
* Private cloud: Established for a specific group or organization and limiting access to that group
* Community cloud: Shared among two or more organizations with similar needs
* Hybrid cloud: Some combination of the above cloud types

1. What is Blockchain?

An incorruptible public ledger of economic transactions.