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SKU: 9780357118283-SOLUTIONS

Chapter 1 Solutions

Review Questions

1. Which of the following is one of the three basic functions a computer performs? (Choose three.)
   - **a. Processing**
   - b. Internet access
   - **c. Input**
   - d. Graphics
   - **e. Output**
   - f. E-mail

ANSWER: a, c, e
REFERENCES:

2. Which computer component executes instructions provided by computer programs?
   - **a. CPU**
   - b. NIC
   - c. Hard drive
   - d. USB

ANSWER: a
REFERENCES:

3. What do you call each of the processors inside a CPU?
   - a. I/O
   - **b. Core**
   - c. OS
   - d. Flash

ANSWER: b
REFERENCES:

4. Which of the following is considered long-term storage? (Choose two.)
   - **a. USB or flash drive**
   - b. RAM
   - c. Working storage
   - **d. Hard drive**

ANSWER: a, d
REFERENCES:

5. Which motherboard component controls data transfers between memory, expansion slots, I/O devices, and the CPU?
   - a. RAM slots
   - b. IDE connectors
   - **c. Chipset**
   - d. PCI Express

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ANSWER: c
REFERENCES:

6. You want to purchase a high-performance graphics card for your computer. Which type of connector should it have?

   a. PCI

   b. SATA

   c. IDE

   d. PCI Express

ANSWER: d
REFERENCES:

7. What is the term for the time it takes for read/write heads to move to the correct spot on the hard disk platter?

   a. Rotational delay

   b. Seek time

   c. Transfer time

   d. Access time

ANSWER: b
REFERENCES:

8. Which of the following is a task usually performed by the firmware? (Choose two.)

   a. Perform a POST.

   b. Create an interrupt.

   c. Store the operating system.

   d. Begin the boot procedure.

ANSWER: a, d
REFERENCES:

9. Which of the following is the correct order of the steps of the boot procedure?

   1. The OS is loaded into RAM.
   2. CPU starts.
   3. OS services are started.
   4. Power is applied.
   5. The POST is executed.
   6. Boot devices are searched.

   a. 2, 4, 6, 1, 3, 5

   b. 1, 5, 2, 4, 3, 6

   c. 4, 2, 5, 6, 1, 3

   d. 5, 4, 1, 3, 2, 6

ANSWER: c
REFERENCES:

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10. You have just installed a new NIC in your PC to replace the old one that had started malfunctioning. What additional software must be installed to allow the OS to communicate with the new NIC?

    a. Network application

    b. Device driver

    c. BIOS

    d. Protocol

ANSWER: b
REFERENCES:

11. Which of the following requests information stored on another computer?

    a. NIC

    b. Network client

    c. Network server

    d. Network protocol

    e. Device driver

ANSWER: b
REFERENCES:

12. Choose the correct order for the process of a user attempting to access network resources:

1. Network protocol
2. Application
3. Network client
4. NIC driver

    a. 4, 2, 1, 3

    b. 3, 2, 1, 4

    c. 1, 4, 2, 3

    d. 2, 3, 1, 4

    e. 3, 1, 2, 4

ANSWER: d
REFERENCES:

13. TCP/IP is an example of which of the following?

    a. NIC

    b. Network client

    c. Network server

    d. Network protocol

    e. Device driver

ANSWER: d
REFERENCES:

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14. In network communication, what type of address is used to deliver a frame to the correct computer on the network? (Choose two.)

    a. MAC

    b. Logical

    c. IP

    d. Physical

ANSWER: a, d
REFERENCES:

15. What type of message is used to determine whether a computer is listening on the network?

    a. MAC

    b. Ping

    c. IP

    d. TCP

ANSWER: b
REFERENCES:

16. What does TCP/IP use to look up a computer's IP address, given its name?

    a. DNS

    b. Ping

    c. MAC

    d. TCP

ANSWER: a
REFERENCES:

17. What is the unit of information containing MAC addresses and an error-checking code that's processed by the network interface layer?

    a. Packet

    b. Ping

    c. Frame

    d. Chunk

ANSWER: c
REFERENCES:

18. Data is processed from the time an application creates it to the time it reaches the network medium. This process includes adding information such as addresses and is called which of the following?

    a. Packetization

    b. Encapsulation

    c. Deencapsulation

    d. Layering

ANSWER: b
REFERENCES:

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19. You're the network administrator for a company that has just expanded from one floor to two floors of a large building, and the number of workstations you need has doubled from 50 to 100. You're concerned that network performance will suffer if you add computers to the existing LAN. In addition, new users will be working in a separate business unit, and there are reasons to logically separate the two groups of computers. What type of network should you configure?

    a. WAN

    b. MAN

    c. Internetwork

    d. Extended LAN

ANSWER: c
REFERENCES:

20. Which of the following best describes a client?

    a. A computer's primary role in the network is to give other computers access to network resources and services.

    b. A computer's primary role in the network is to run user applications and access network resources.

    c. It's the software that responds to requests for network resources.

    d. The OS installed on a computer is designed mainly to share network resources.

ANSWER: b
REFERENCES:

21. You work for a small company with four users who need to share information on their computers. The budget is tight, so the network must be as inexpensive as possible. What type of network should you install?

    a. Server-based network

    b. Peer-to-peer network

    c. Wide area network

    d. Storage area network

ANSWER: b
REFERENCES:

22. Which of the following characteristics is associated with a peer-to-peer network? (Choose three.)

    a. Decentralized data storage

    b. Inexpensive

    c. User-managed resources

    d. Centralized control

    e. Uses a directory service

ANSWER: a, b, c
REFERENCES:

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23. A device interconnects five computers and a printer in a single office so that users can share the printer. This configuration is an example of which of the following?

    a. LAN

    b. MAN

    c. WAN

    d. Internetwork

ANSWER: a
REFERENCES:

24. A company has just made an agreement with another organization to share their two networks' resources by using TCP/IP protocols. What best describes this arrangement?

    a. MAN

    b. LAN

    c. Intranet

    d. Extranet

ANSWER: d
REFERENCES:

25. You have installed Windows Server on a new server and want to centralize user logons and security policies. What type of software should you install and configure on this server?

    a. Naming services

    b. Application services

    c. Communication services

    d. Directory services

ANSWER: d
REFERENCES:

26. A network interface can transfer data at 1 Gbps. Approximately how many bytes can the interface transfer per second?

    a. 1 billion

    b. 125 million

    c. 100,000

    d. 8 billion

ANSWER: b
REFERENCES:

Hands-On Projects

Hands-On Project 1-1

Step 2: Steps of the boot procedure:

1. Power is applied to the motherboard.
2. CPU starts.
3. CPU carries out BIOS startup routines, including the POST.

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Step 5: Final steps of the boot procedure:

4. Boot devices are searched for an OS.
5. The OS is loaded into RAM.
6. OS services are started.

Hands-On Project 1-3

Step 5:

- Word-processing program: User application
- NIC displayed in the "Connect using" text box: Network interface
- Client for Microsoft Networks: Network software
- File and Printer Sharing for Microsoft Networks: Network software
- Internet Protocol Version 4: Network protocol

Hands-On Project 1-5

Step 2: workgroup, peer-to-peer

Hands-On Project 1-6

Step 9: peer-to-peer

Critical Thinking

Case Project 1-1

A server-based network is the best choice. A peer-to-peer network might work for now, but when new employees are hired, a peer-to-peer network would be too difficult to manage. The key is that easy backup and centralized storage for files point to a server-based network.

Case Project 1-2

Because employees must be able to control access to their own resources, a peer-to-peer model works best. Supplies will likely include NICs, cabling, and a switch. Students should state they need to configure file shares and possibly create user accounts on the computers to allow access by other users. They might also need to configure IP address settings.

Case Project 1-3

An internetwork is called for because LANs in the same building are being connected. A router is probably needed for communication between LANs on the two floors.

Case Project 1-4

Answers will vary.

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Chapter 1

Introduction to Computer Networks

At a Glance

Instructor's Manual Table of Contents

- Overview
- Objectives
- Teaching Tips
- Quick Quizzes
- Class Discussion Topics
- Additional Projects
- Additional Resources
- Key Terms
- Technical Notes for Hands-On Projects

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Lecture Notes

Overview

Chapter 1 offers an introduction to basic computer components and operation. Students learn about the fundamental reasons for networking, as well as how to identify essential network components. They also learn to compare different types of networks. Students will examine the components of a network and the fundamentals of communication between computers. Many new terms are introduced and defined, and the varied types of networks students might encounter are described.

Objectives

- Describe basic computer components and operation
- Explain the fundamentals of network communication
- Define common networking terms
- Compare different network models

Teaching Tips

An Overview of Computer Concepts

1. Provide a brief introduction to networking and why it is so important to have a basic understanding of computer concepts and terminology.

Basic Functions of a Computer

1. Introduce students to the three basic tasks that all computers perform.
   a. Input
   b. Processing
   c. Output

2. Give students an idea of where each of the three basic tasks is utilized. For example, a keyboard would be used for input, a screen would be used for output. Discuss the different components of each task group.

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Teaching Tip	Students can view a basic breakdown of a computer's parts and functions at http://www.howstuffworks.com/pc.htm.

Storage Components

1. Explain the differences between short-term storage (RAM) and long-term storage.

2. Describe how data is stored in bits. Point out that a byte is represented by a collection of 8 bits.

3. Use Table 1-2 to review the prefixes used for expressing bits and bytes.

Personal Computer Hardware

1. Introduce students to the four major PC components
    a. Motherboard
    b. Hard drive
    c. RAM
    d. Firmware

2. Use Figure 1-1 and Table 1-3 to discuss the key components of a motherboard.

3. Define the term bus as a collection of wires carrying data from one place to another on the computer. Point out that bus expansion slots are a component of a motherboard.

4. Use Figure 1-2 to discuss the components of a hard disk drive.

5. Point out that solid state drives (SSDs) are used in place of hard drives in many systems because of their speed and reliability. Discuss how an SSD uses flash memory that contains no moving parts.

6. Explain that RAM is a short-term storage component on a computer. Point out that RAM requires no power to store data, so it is sometimes referred to as “volatile memory.”

7. Describe firmware as a set of instructions located in a chip on the motherboard. Explain that firmware is stored in nonvolatile memory that maintains its data after power is removed.

8. Discuss the importance of the basic input/output system (BIOS) or Unified Extensible Firmware interface (UEFI) in a computer’s boot process.

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9. Explain to students that the firmware program offers the user an opportunity to run the setup utility to configure hardware components. Mention that this configuration data is stored in complementary metal oxide semiconductor (CMOS) memory.

Computer Boot Procedure

1. Describe the six steps in the typical computer boot procedure:
   a. Power is applied to the motherboard
   b. The CPU starts
   c. The CPU carries out the firmware startup routines, including the POST
   d. Boot devices, as specified in the firmware configuration, are searched for an OS
   e. The OS is loaded into RAM
   f. OS services are started

2. Explain the critical services provided by a computer's OS. Point out that the services an OS starts can vary greatly, depending on which OS is loaded and how it's configured.

The Fundamentals of Network Communication

1. Describe the most basic network as two or more computers connected by some kind of transmission media.

Network Components

1. Discuss the three components needed in order to "network" a stand-alone computer:
   - Network interface card
   - Network medium
   - Interconnecting device

Teaching Tip	Read an article that takes a look at different network media types by clicking the following link: https://www.techwalla.com/articles/types-of-media-used-in-computer-networking

2. Explain to students that network software can divided into the following categories:
   - Network clients and servers
   - Protocols
   - NIC driver

Steps of Network Communication

1. Discuss the basic steps of a user accessing a network resource.

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2. Point out that the steps taken on the server side are essentially the reverse of those on the client side. Review those steps with your students.

Layers of the Network Communication Process

1. Explain how the steps of network communication are referred to layers, and the two different models used to describe this process: OSI and TCP/IP models, which are discussed in later chapters.

2. Use Table 1-4 to take a look at an example of how layers can help describe the network communication process.

Teaching Tip	Microsoft has an article on the OSI model that will help explain the workings of a layered network: http://support.microsoft.com/kb/103884

How Two Computers Communicate on a LAN: Some Details

1. Introduce students to idea of a computer's logical and physical address.

2. Use a street address and zip code to help explain the difference between a computer's two addresses.

3. Use Figure 1-8 to describe the steps of the communication process between two computers.

4. Review Table 1-5, which describes the steps of saving a file with the network communication process.

Quick Quiz 1

1. Name the three basic tasks all computer perform:
   Answer: Input, Processing, Output.

2. True or False: Random access memory (RAM) is considered long-term storage.
   Answer: False – RAM is considered short-term storage because when power to the computer is turned off, RAM's contents are gone.

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3. Which of the following components provides a number of critical services, including a user interface, memory management, a file system, multitasking, and the interface to hardware devices?
   a. RAM
   b. Operating system (OS)
   c. BIOS
   d. Hard drive
   Answer: B

4. What is the name given to software that provides the interface between the OS and computer hardware?
   Answer: device driver

5. What is the physical address assigned to NICs called?
   a. Media Address Control
   b. Physical Address Control
   c. Media Access Control
   d. Media Control Access
   Answer: C

Network Terms Explained

1. Explain the importance of learning the "language" of computer networking.

LANs, Internetworks, WANs, and MANs

1. Use Figure 1-14 to show the components of a basic LAN consisting of computers interconnected by a hub.

2. Discuss the differences between a LAN, WAN, and a MAN. Give an example of each type of network, using Figure 1-15 through 1-19.

3. Review the reasons listed in the text that discuss why internetworks are usually created.

Internet, Intranet, and Extranet

1. Students should be familiar with the "Internet". Point out that an intranet is a private network, available only to users connected to the internal network.

2. Explain that an extranet sits somewhere between the Internet and an intranet. Mention that it allows limited and controlled access to internal network resources by outside users.

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Teaching Tip	For more information on types of networks and their scopes, see http://compnetworking.about.com/od/basicnetworkingconcepts/a/network_types.htm

Packets and Frames

1. Explain that when computers transfer information across a network, they do so in short bursts (chunks) of data and that each chunk of data has the same basic structure.

2. Mention to students that after each chunk of data is sent, the computer pauses momentarily. Discuss some of the reasons why the pause is necessary.

3. Briefly discuss how data is segmented into packets, and then encapsulated into frames for transmission
    a. IP addressing information exists in packets
    b. MAC addressing added in frames

4. Define encapsulation as the process of adding IP addresses and MAC addresses to chunks of data. Point out that information added at the front of data is called a header, and information added at the end of data is called a trailer.

5. Use Figures 1-20 through 1-22 to demonstrate how data is divided into several packets and then broken down into frames to be ready for delivery.

Clients and Servers

1. Explain the different uses of the term client in relation to OS / computer / software.

2. The term “Server” can also be ambiguous. Discuss different definitions in relation to service based server operating systems, server computers, and server software.

Network Models

1. Discuss the two major types of network models: peer-to-peer and server-based.

Peer-to-Peer/Workgroup Model

1. Describe the peer-to-peer networking model as it relates to client PC's
    a. Cover the benefits (simplicity and cost) of a peer-to-peer network model versus the disadvantages (data organization and scalability).
    b. Members are all simultaneously servers and clients for whichever resources they may host

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Server/Domain-Based Model

1. Explain what it means to be a part of a domain based network architecture, and how it affects user accounts and resource access
    a. Advantages in relation to peer-to-peer (centralization, scalability)
    b. Services that are related and most likely part of a domain architecture should also be mentioned, such as naming services, or e-mail services.

2. Use Table 1-6 to summarize the differences of the two networking models, as it relates to resource access, security, performance, and cost. Be sure to point out that because both models have advantages, using a combination of the two models isn't uncommon.

Teaching Tip	Microsoft Active Directory hasn't always been the only directory services product. Take a look at Novell's older solution, eDirectory: https://www.netiq.com/products/edirectory/

Quick Quiz 2

1. Which term is used to describe a networked collection of LANs tied together by devices such as routers?
    a. server-based
    b. Workgroup
    c. intranet
    d. internetwork

    Answer: D

2. What is the more well-known term for chunks of data sent across the network?
    Answer: Packet (Frame is another term that is often used)

3. What is the difference between a client and a server, in networking terms?
    Answer: A client can be a workstation that requests network resources from a server. A server provides a network service to client computers.

4. The client/server networking model may also be known by which of the following terms?
    a. Server-based
    b. Peer-to-peer
    c. Workgroup
    d. Intranet

    Answer: A

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5. On a Windows-based peer to peer network, all computers are members of a:
   a. Domain
   b. Workgroup
   c. Server network
   d. WAN

   Answer: B

Class Discussion Topics

1. Have any of the students installed/configured a LAN before? If so, ask them to briefly discuss their experiences.

2. Do students have previous experience with PC repair and maintenance? If so, ask them to briefly discuss their experiences.

Additional Projects

1. Students should research a list of operating systems (client or server) and detail their hardware requirements. Have them look at Microsoft and non-Microsoft solutions, and compare benefits of either solution in relation to hardware requirements.

2. Give students the chance to look at network comparisons of small, home peer-to-peer networks versus a larger domain-based server network. Ask them to identify what services they have in common (DHCP, DNS)

Additional Resources

1. Computer Networking Basics:
   https://www.geeksforgeeks.org/basics-computer-networking/

2. Basic Network Components:
   https://www.techwalla.com/articles/six-basic-computer-network-components

3. Networking Glossary:
   https://www.savvius.com/networking-glossary/glossary-network-terms/

4. Introduction to Client-Server Networks:
   http://compnetworking.about.com/od/basicnetworkingfaqs/a/client-server.htm

5. How Home Networking Works:
   http://computer.howstuffworks.com/home-network.htm

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Key Terms

For explanations of key terms, see the Glossary for this text.

- **Active Directory**
- **basic input/output system**
- **(BIOS)**
- **binary digit**
- **bit**
- **bus**
- **byte**
- **chipset**
- **client**
- **complementary metal oxide**
- **semiconductor (CMOS)**
- **memory**
- **core**
- **credentials**
- **directory service**
- **domain**
- **domain controller**
- **encapsulation**
- **extranet**
- **firmware**
- **frame**
- **header**
- **Internet**
- **Internet of Things (IoT)**
- **internetwork**
- **intranet**
- **local area network (LAN)**
- **metropolitan area network**
- **(MAN)**
- **multicore CPU**
- **name server**
- **network**
- **network client software**
- **network model**
- **network protocols**
- **network server software**
- **nonvolatile memory**
- **packet**
- **peer-to-peer network**
- **server**
- **server-based network**
- **stand-alone computer**
- **trailer**

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- **Unified Extensible**
- **Firmware Interface (UEFI)**
- **volatile memory**
- **wide area networks (WANs)**

Technical Notes for Hands-On Projects

Table 1-1 Hands-on project requirements

Hands-on project	Requirements	Time required	Notes
Hands-On Project 1-1: Examining a Computer's Boot Procedure	Net-*XX*	10 minutes	A Windows 10 computer configured as described in "Before You Begin" The ability to access the firmware setup screen
Hands-On Project 1-2: Upgrading a Stand-alone Computer to a Networked Computer	Net-*XX*, a NIC, a patch cable, and a hub or switch	30 minutes	A lab computer set up as described in "Before You Begin"
Hands-On Project 1-3: Viewing Network Software Layers	Net-*XX*	10 minutes	
Hands-On Project 1-4: Using `ipconfig`, `ping`, and `arp`	Net-*XX*	15 minutes	
Hands-On Project 1-5: Exploring Peer-to-Peer Networking	Net-*XX*	15 minutes	
Hands-On Project 1-6: Creating a Shared Folder	Net-*XX*	15 minutes	
Hands-On Project 1-7: Transferring a Document to Another Computer	Net-*XX*	15 minutes	A share named NetDocs on the instructor's computer (Net-Instr)
Hands-On Project 1-8: Looking Up Computer and Networking Acronyms	A computer with Internet access	20 minutes	Internet access

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