NEW PERSPECTIVES

Chapter 5
Local Area Networks

Computer Concepts 2014

5 Chapter Contents

- Section A: Network Building Blocks
- Section B: Wired and Wireless Technologies
- Section C: Network Setup
- Section D: Sharing Files
- Section E: Wireless Security

5 FastPoll True/False Questions
Answer A for True and B for False

- 050100 The networks typically installed by individuals in homes are classified as LANs.
- 050200 High bandwidth networks, such as cable TV and DSL are referred to as broadband.
- 050300 When you send an e-mail message over a network, it is chopped up into packets.
- 050400 The IP address assigned to your computer on the Internet is derived from your computer's MAC address.
- 050500 Wired network connections can offer higher speeds than wireless connections.

5 FastPoll True/False Questions
Answer A for True and B for False

- 050600 The most popular type of wired connection is Ethernet.
- 050700 Network speeds are measured in megabytes and gigabytes.
- 050800 Many wireless connections use radio waves to transmit data.
- 050900 Bluetooth is a wireless technology used for WANs.

5 FastPoll True/False Questions
Answer A for True and B for False

- 051000 A wireless infrastructure network uses a centralized broadcasting device, such as a wireless access point or router.
- 051100 Wireless connections are less secure than wired networks.
- 051200 A hub can be used to extend a network by adding additional wired devices.
- 051300 To configure a router, you usually have to start a browser and enter the router's IP address.

5 FastPoll True/False Questions
Answer A for True and B for False

- 051400 A homegroup is a temporary network of handheld computers.
- 051500 Public key encryption uses a public key to encrypt messages, but a private key is required to decrypt messages.

5 Section A: Network Building Blocks

- Network Classifications
- LAN Advantages and Disadvantages
- Network Devices
- Network Links
- Communications Protocols

5 Question

- 052100 Networks come in many sizes and use many different technologies, yet they all need to communicate with each other. What is the key to network intercommunication?
  - A. Circuit switching
  - B. Network protocols
  - C. Network topology
  - D. Peer-to-peer technology

5 Network Classifications

- Personal Area Network (PAN) – interconnection of personal digital devices or consumer electronics
- Local Area Network (LAN) – connects computers in a limited geographical area
- Metropolitan Area Network (MAN) – public high-speed network with range of about 50 miles
- Wide Area Network (WAN) – covers a large geographical area and typically consists of several smaller networks

5 LAN Advantages and Disadvantages

- LANs enable people to work together
- Sharing networked software can reduce costs
- Sharing data on a LAN can increase productivity
- Sharing networked hardware can reduce costs
- Sharing an Internet connection can be cost-effective and convenient
- Sharing networked hardware can provide access to a wide range of services and specialized peripheral devices

5 LAN Advantages and Disadvantages

- One disadvantage of LANs is that when a network malfunctions, all the resources you're accustomed to accessing are unavailable until the network is repaired
- LANs are vulnerable to unauthorized access
- LANs are vulnerable to malicious code

5 Network Devices

- Each connection point on a network is a node
- To connect to a LAN, a computer requires network circuitry, sometimes referred to as a network interface card (NIC)
- A networked peripheral, or network-enabled peripheral, is any device that contains network circuitry to directly connect to a network
- A storage device that directly connects to a network is called network attached storage (NAS)
- A network device, or network appliance, is any electronic device that broadcasts network data, boosts signals, or routes data to its destination

5 Network Devices

5 Network Links

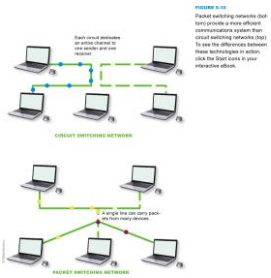
- A communications channel, or link, is a physical path or frequency for signal transmissions
- Bandwidth is the transmission capacity of a communications channel
  - Broadband
  - Narrowband

5 Communications Protocols

- Rules for efficiently transmitting data from one network node to another:
  - Divide messages into packets
  - Affix addresses to packets
  - Initiate transmission
  - Regulate flow of data
  - Check for transmission errors
  - Acknowledge receipt of transmitted data

5 Communications Protocols

- A packet is a “parcel” of data that is sent across a computer network
  - Circuit-switching technology vs. packet switching technology



5 Communications Protocols

- Every packet that travels over a network includes the address of its destination device
- A MAC address is a unique number assigned to a network interface card when it is manufactured
- An IP address is a series of numbers used to identify a network device
- IP addresses can be obtained through DHCP

5 Section B: Wired and Wireless Technologies

- Wired Basics
- Ethernet
- Wireless Basics
- Bluetooth
- Wi-Fi

5 Question

- 052200 Suppose your friend has a home office and usually does most work on a desktop computer. Your friend also has a smartphone and tablet computer that could benefit from Internet access. What kind of network would you recommend?
  - A. A network that has a wireless router that provides wireless and wired connections as well as Internet access
  - B. A cloud network that can be accessed from a bridge device
  - C. A file server
  - D. A 100 gigabit Ethernet network

5 Wired Basics

- A wired network uses cables to connect network devices
- Wired networks are fast, secure, and simple to configure
- Wired connections are more secure than their wireless counterparts
- Devices tethered to cables have limited mobility

FIGURE 5-11
Discerning multiplayer game players prefer a fast wired connection when playing head to head on a LAN.

5 Ethernet

- Ethernet is a wired network technology that is defined by IEEE 802.3 standards
- Simultaneously broadcasts data packets to all network devices
  - Vary in speed from 10Mbps to 100Gbps

Ethernet Standard	IEEE Designation	Speed
10BaseT Ethernet	IEEE 802.3i	10 Mbps
Fast Ethernet	IEEE 802.3u	100 Mbps
Gigabit Ethernet	IEEE 802.3z	1,000 Mbps
10 Gigabit Ethernet	IEEE 802.3ae	10 Gbps
40/100 Gigabit Ethernet	IEEE 802.3ba	40 or 100 Gbps

FIGURE 5-13
Ethernet Standards

5 Ethernet

FIGURE 5-14
Many computers have a built-in Ethernet port.

Ethernet adapter for USB port

Ethernet adapter for expansion slot

FIGURE 5-15
Ethernet Adapters

5 Wireless Basics

- Wireless network technology transports data from one device to another without cables or wires
  - RF signals
    - Transceiver
  - Microwaves
  - Infrared light
- Slower than wired networks
- Security concerns

FIGURE 5-16
Wireless equipment often sports an antenna for transmitting and receiving data signals. The antenna is not always visible; it can be incorporated within the body of the device.

5 Bluetooth

- Bluetooth is a short-range, wireless network technology designed to make its own connections between two devices

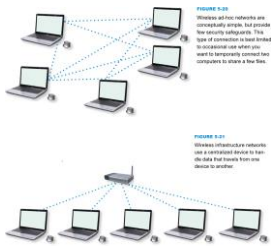
FIGURE 5-18
Bluetooth technology is used for wireless keyboards and mice, but it is also the technology used for wireless headsets and devices like Motorola's Bluetooth headset, which clips to a motorcycle helmet so you don't miss important cell phone calls.

FIGURE 5-19
Bluetooth status icons appear on an iMac's menu bar at the top of the screen.

5 Wi-Fi

- Wi-Fi refers to a set of wireless networking technologies defined by IEEE 802.11 standards
  - Wireless ad-hoc protocol
  - Wireless infrastructure protocol

5 Wi-Fi



5 Section C: Network Setup

- Setup Overview
- Router Installation
- Router Configuration
- Internet Connection
- Device Connection

5 Question

- 052300 When you're setting up a wireless network, you see an option asking if you want to broadcast the network SSID. You should:
  - A. Change the default SSID and broadcast it.
  - B. Turn SSID broadcasting off so that hackers don't know the network's encryption key.
  - C. Make sure SSID is broadcasting so that your network is protected by strong encryption.
  - D. Activate SSID broadcasting or else the network devices won't be able to send data to the router.

5 Setup Overview

- Plug in the router
- Connect the router to a computer
- Configure the router
- Access the router setup utility
- Create a new router password

5 Setup Overview

- Enter an SSID for the network
- Activate WEP, WPA, or PSK and create an encryption key
- Connect an Internet access device
- Set up the wireless workstations

5 Router Installation

- Look for a Wireless-N router that includes a Gigabit Ethernet switch
  - Wired and wireless connections
- Make sure the number of Ethernet ports is sufficient for the number of wired devices that you intend to connect

FIGURE 5-25
Most wireless routers (note the antenna) also include ports for wired Ethernet connections. Take a look at the key features of a router.

5 Router Installation

FIGURE 5-26
Network devices serve different purposes.

Network Device	Purpose	
Hub	Extends a wired network by adding additional ports	
Switch	Intelligently facilitates communication among multiple devices on a network	
Gateway	Joins two different types of networks, such as your home network and the Internet	
Bridge	Connects two similar networks	
Repeater	Extends the range of a network by restoring signals to maximum strength and retransmitting them	
Wireless access point (WAP)	Allows wireless devices to connect to a wired network	

5 Router Configuration

- Before using your network, you should adjust the router's configuration settings to make sure your network is secure
  - Stored in router's EEPROM
  - You must connect a computer to the router
  - You can use your computer's browser to access the router configuration utility

5 Router Configuration

FIGURE 5-29
Change the default password for your router when you install a wireless network. Your digital textbook shows you how to access router settings and change the default password.

5 Router Configuration

- An SSID (service set identifier) is the name of a wireless network
- Use the router configuration software to change the default SSID

FIGURE 5-30
Create an SSID for your network so that it can be differentiated from other nearby networks.

5 Router Configuration

- Each workstation requires a unique address for sending and receiving data

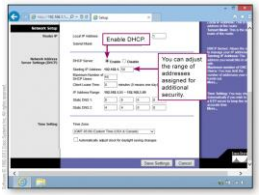


FIGURE 5-31
Enable DHCP so that the router automatically assigns an IP address to each workstation.

5 Router Configuration

- Wireless encryption scrambles the data transmitted between wireless devices and then unscrambles the data only on devices that have a valid encryption key
  - WEP
  - WPA
  - PSK

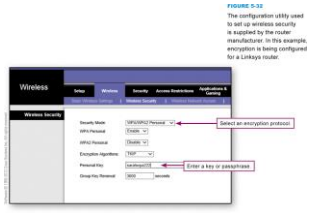


FIGURE 5-32
The configuration utility used to set up wireless security is supplied by the router manufacturer. In this example, encryption is being configured for a Linksys router.

5 Internet Connection

- Your Internet service provider supplies a device called a modem that is designed to carry data to and from the Internet
  - This device typically has a standard Ethernet port that can be connected to a router
  - Most routers supply a WAN port designed for an Internet connection
  - Plug a standard network cable into the router's WAN port and connect the other end of the cable into the Internet modem

5 Internet Connection

FIGURE 5-33
Your Internet modem should have one or more Ethernet ports.

FIGURE 5-34
Look for a port labeled "WAN" or "Internet" on your router. If one does not exist, then use any of the other Ethernet ports.

5 Device Connection

- Simply turn on any Windows computer with wireless capability and make sure that it is in range of your router

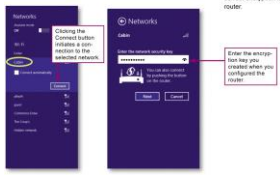


FIGURE 5-36
Windows automatically senses nearby networks and displays their SSIDs. If you choose to connect, you must enter the correct encryption key for the router.

5 Device Connection

- Macs automatically sense available networks and give you the option of connecting to them

FIGURE 5-37
To make sure Wi-Fi is on, click the Apple icon, select System Preferences, and then select Network. You can connect to a network from this window or by clicking the Wi-Fi icon on the desktop menu bar.

5 Device Connection

- Any device that has Wi-Fi capability should be able to connect to your network

FIGURE 5-38
On an iPhone, use the Settings icon to make sure Wi-Fi is enabled. When your phone is within range of a network, you'll see the SSID and can enter the encryption key to join.

5 Device Connection

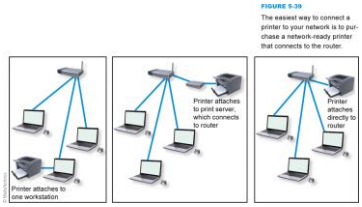


FIGURE 5-39
The easiest way to connect a printer to your network is to purchase a network-ready printer that connects to the router.

5 Section D: Sharing Files

- File Sharing Basics
- Accessing Shared Files
- Sharing Your Files
- File Servers
- Network Troubleshooting

5 Question

- 052400 There are many ways to share files among the computers on a network. Which one of the following is the LEAST secure way to share files?
  - A. Use a file server.
  - B. Activate file sharing for the root directory of all the computers in the network.
  - C. Designate specific folders on your computer as shared.
  - D. Put files you want to share in the Public folder.

5 File Sharing Basics

- File sharing allows files containing documents, photos, music, and other data to be accessed from computers other than the one on which they are stored
- Once your network gives you access to other computers on the network, you can view a list of files stored there

5 Accessing Shared Files

- To see a list of devices on your network, you can use your operating system's file management utility
- **Network discovery** is a setting that affects whether your computer can see other computers on a network, and whether your computer can be seen by others

5 Accessing Shared Files

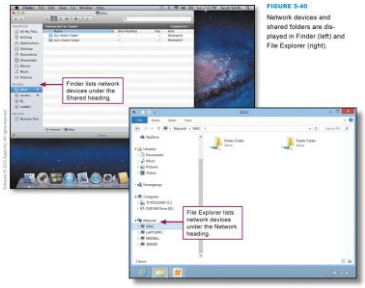


FIGURE 5-40
Network devices and shared folders are displayed in Finder (left) and File Explorer (right).

5 Sharing Your Files

FIGURE 5-41
If you want to share files, make sure that the global file sharing setting is turned on.

5 Sharing Your Files

- When you activate file sharing, files in Public folders can be accessed by other network users
- You also can make specific files shareable
- If you want the convenience of sharing files, limit what you share and who you share it with:
  - Assign permissions to files
  - Limit sharing to specific people
  - Remove sharing from files you no longer want to share
  - Use a homegroup if your network is composed of Windows computers
    - A homegroup is a collection of trusted Windows computers that automatically share files and folders

5 Sharing Your Files

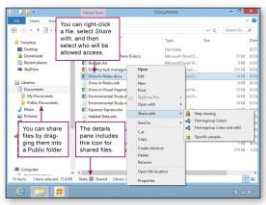


FIGURE 5-42
You can share files in your Public folders, or designate specific files that you want to share.

5 Sharing Your Files

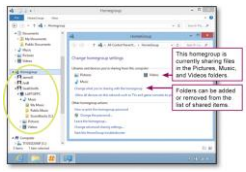


FIGURE 5-44
Right-clicking the Homegroup link takes you to settings. Your digital textbook shows you how to set up a homegroup.

5 File Servers

- A file server is a computer whose primary purpose is to be a repository for files that can be accessed by network workstations

FIGURE 5-45
Servers are sold as tower units (left) or as rack-mountable units (right), typically used for business applications.

5 Network Troubleshooting

- Network problems can stem from a variety of sources
  - Cables
  - Security
  - Interference
  - Settings
  - Switches
  - Signal strength
  - Network devices

FIGURE 5-47
To find the Network Utility, open your Applications folder, and then open the Utility folder. The Network Utility provides lots of handy information about your LAN. Explore the Network Utility in your interactive eBook.

5

Section E: Wireless Security

- Wi-Fi Security
- Encryption

5

Question

- 052500 How can you tell if someone is hacking your network?
  - A. Assign an IP address to each network device.
  - B. Scan your router for viruses that might have been left by hackers.
  - C. Set up your router software to maintain a log of network activity.
  - D. Disable the SSID.

5

Wi-Fi Security

- Networks with wired or wireless connections are vulnerable to a variety of threats
- Wireless signals are broadcast through the air; and like the signals from a radio station, they can be picked up by any device equipped with a receiver tuned to the right frequency

FIGURE 5-50
Any Wi-Fi enabled device can detect wireless connections.

5

Wi-Fi Security

FIGURE 5-51
Software tools such as inSSIDer help locate and identify secured and unsecured networks. Once logged on to an unsecured wireless network, hackers are free to do anything from stealing the network owner's credit card or bank information to attacking computers in other networks.

5

Wi-Fi Security

- Your network router maintains a list of clients that are accessing your network using wired or wireless connections

FIGURE 5-52
Router software keeps track of everyone who is accessing a network, and it can be used to uncover intrusions.

5

Encryption

- Encryption transforms a message so that its contents are hidden from unauthorized readers
  - Plaintext has not yet been encrypted
  - An encrypted message is referred to as ciphertext
- Decryption is the opposite of encryption
  - Cryptographic algorithm
  - Cryptographic key

5 Encryption

- Weak vs. strong encryption
- AES (Advanced Encryption Standard)
- Encryption methods can be broken by the use of expensive, specialized, code-breaking computers

5 Encryption

- Public key encryption (PKE) eliminates key-distribution problem, by using one key to encrypt a message and another key to decrypt the message

FIGURE 5-56
Public key encryption uses two keys. A public key can only encrypt a message. A private key is required to decrypt the message.

5 Encryption

- When personal computer users want to encrypt e-mail or other documents, they turn to public key encryption software such as PGP (Pretty Good Privacy), GnuPG, or AxCrypt

FIGURE 5-57
PGP software generates a huge public key. Each person's public key is unique. You can e-mail this key to anyone who might want to send you an encrypted message.

5 What Do You Think?

- 053100 Do you worry about behavioral tracking based on your Internet use?
  - A. Yes B. No C. Not sure
- 053200 Do you have a device that can track your physical location?
  - A. Yes B. No C. Not sure
- 053300 Do you support efforts to institute Do Not Track?
  - A. Yes B. No C. Not sure

NEW PERSPECTIVES

Chapter 5 Complete

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