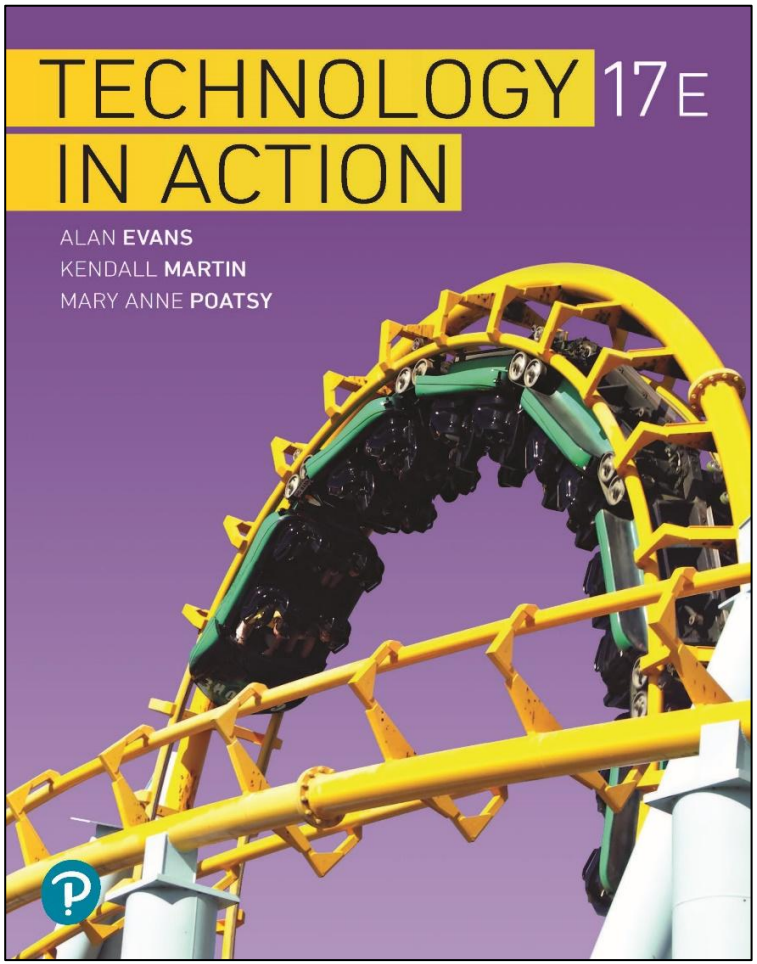
Technology in Action

Seventeenth Edition



Chapter 7

Networking: Connecting Computing Devices

Learning Objectives (1 of 2)

7.1 Describe computer networks and their pros and cons.

7.2 Explain the different ways networks are defined.

7.3 Describe the types of transmission media used in networks.

7.4 Describe the basic hardware devices necessary for networks.

7.5 Describe the type of software necessary for networks.

7.6 Summarize the broadband options available to access the Internet.

Learning Objectives (2 of 2)

7.7 Summarize how to access the Internet wirelessly.

7.8 Explain what should be considered before creating a home network.

7.9 Describe how to set up a home network.

7.10 Describe the potential problems with wireless networks and the means to avoid them.

7.11 Describe how to secure wireless home networks.

Networking Fundamentals (1 of 3)

Understanding Networks (Objective 7.1)

- Computer network
- Node
  - Computer
  - Peripheral
  - Network device

Networking Fundamentals (2 of 3)

Understanding Networks (Objective 7.1)

- Benefits of networks
  - Sharing a high-speed Internet connection
  - Sharing printers and peripheral devices
  - Sharing files
  - Common communications
- Disadvantage of networks
  - Setup and administration

Networking Fundamentals (3 of 3)

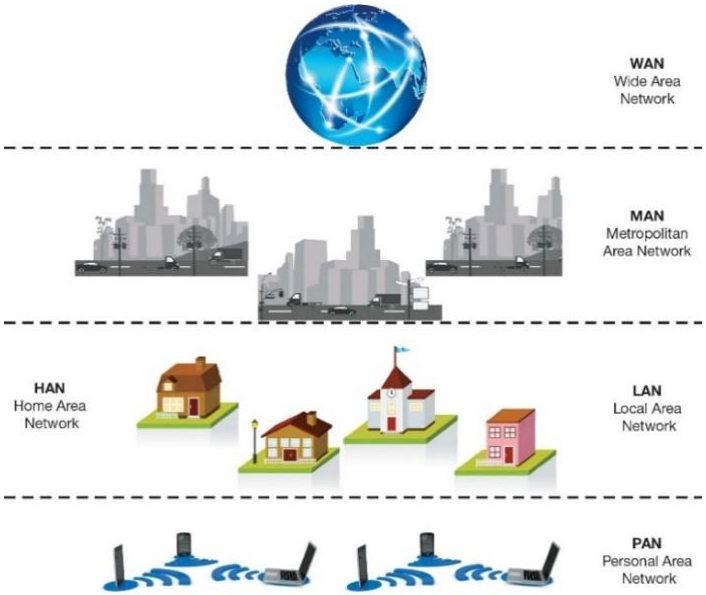
Understanding Networks (Objective 7.1)

- How data moves through networks
  - Data transfer rate (bandwidth) is the maximum speed data can be transmitted
  - Throughput is the actual speed data is transferred
  - Measured in megabits per second (Mbps) or gigabits per second (Gbps)

Network Architectures (1 of 4)

Network Designs (Objective 7.2)

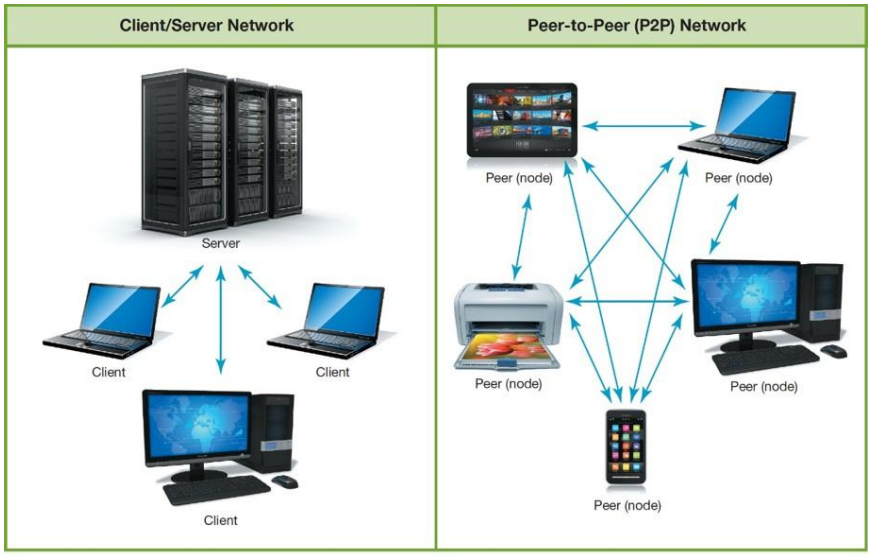
- Networks can be classified by distance
  - Personal area network
  - Local area network
  - Home area network
  - Metropolitan area network
  - Wide area network



Network Architectures (2 of 4)

Network Designs (Objective 7.2)

- Networks can be classified by levels of administration
  - Client/server network
  - Peer-to-peer network



Network Architectures (3 of 4)

Network Designs (Objective 7.2)

- Classifying networks by protocols
  - Ethernet
    - Developed by the Institute of Electrical and Electronics Engineers
    - Wired networks (gigabit Ethernet [GbE])
  - Backward compatibility

Network Architectures (4 of 4)

Network Designs (Objective 7.2)

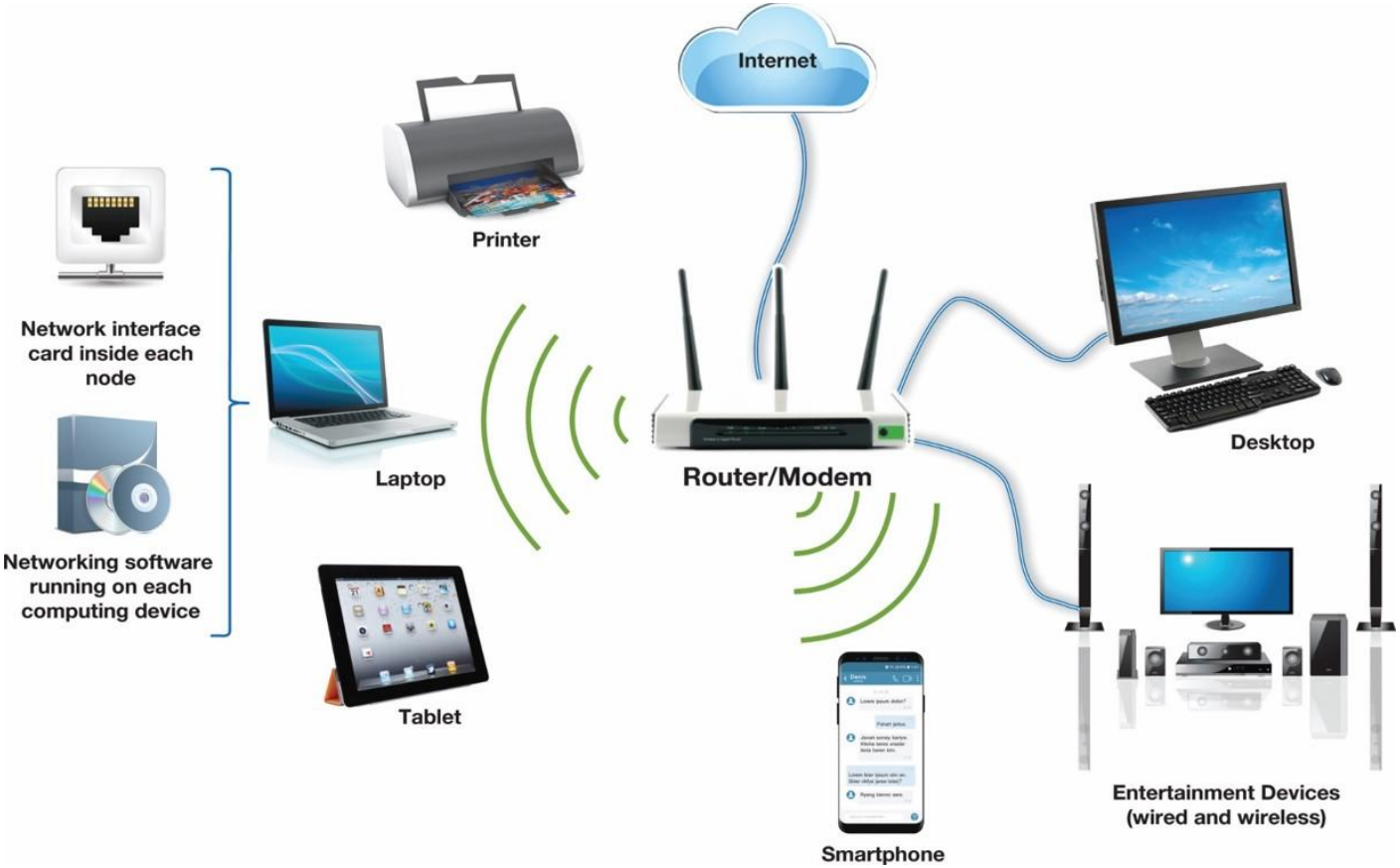
- Classifying networks by protocols
  - Wireless networks (Wi-Fi)
    - Wi-Fi 6
    - WiGig

Table 7.1 Comparison of Wi-Fi Standards

IEEE Standard	802.11a	802.11b	802.11g	802.11n	802.11ac	802.11ax
New Naming Convention	Wi-Fi 1	Wi-Fi 2	Wi-Fi 3	Wi-Fi 4	Wi-Fi 5	Wi-Fi 6
Frequency	5 GHz	2.4 GHz	2.4 GHz	2.4 GHz & 5 GHz	2.4 GHz & 5 GHz	2.4 GHz & 5 GHz
Maximum Data Rate	54 Mbps	11 Mbps	54 Mbps	600 Mbps	1.3 Gbps	10-12Gbps

Network Components

(Objective 7.3)



Network Components (1 of 2)

Transmission Media (Objective 7.3)

- Transmission media establish a communications channel between the nodes on a network
  - Wireless networks
  - Wired networks

Network Components (2 of 2)

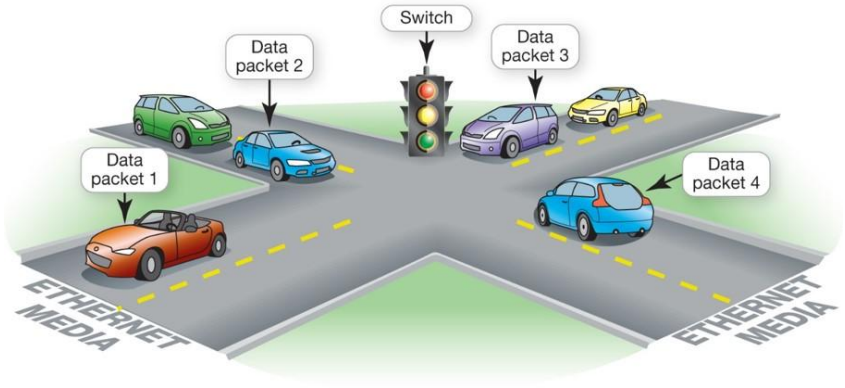
Transmission Media (Objective 7.3)

- Wired
  - UTP cable: twisted copper wires surrounded by a plastic jacket
  - Coaxial cable: single copper wire surrounded by layers of plastic
  - Fiber-optic cable: plastic or glass fibers

Network Components

Basic Network Hardware (Objective 7.4)

- Network adapter
- Network interface card (NIC)
- Modem
- Router
- Switch



Network Components

Network Software (Objective 7.5)

- Operating system for P2P networking
- Client/server network
  - Communicate through centralized server
  - Specialized network operating system(NOS) software

Connecting to the Internet (1 of 2)

Broadband Internet Connections (Objective 7.6)

- Home network
  - Share an Internet connection
- Must purchase Internet access from ISP
  - Specialized providers
  - Companies that provide other services
- Cellular or dial-up

Connecting to the Internet (2 of 2)

Broadband Internet Connections (Objective 7.6)

- Broadband
  - Cable Internet
  - DSL (digital subscriber line)
  - Fiber-optic service
  - Satellite Internet

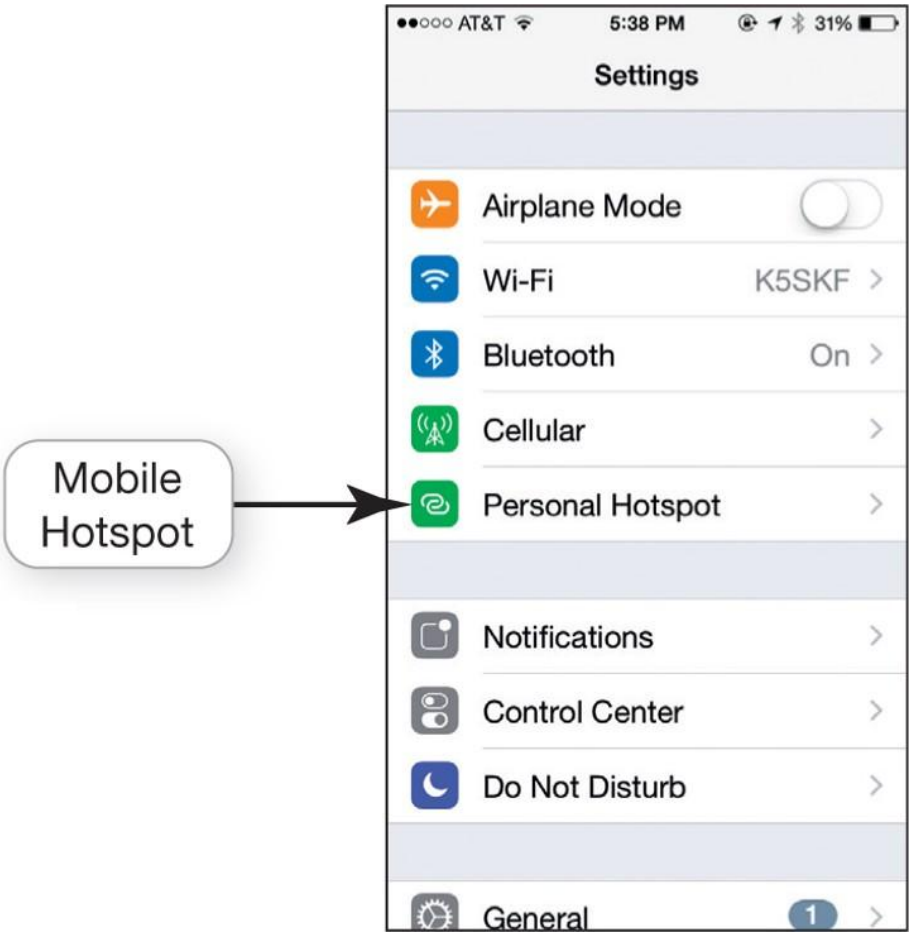
Table 7.3 Comparing Common Wired Broadband Internet Connection Options

Broadband Type	Transmission Medium	Speed Considerations	Average and Maximum Download Speeds
Fiber-optic	Strands of optically pure glass or plastic	Transmits data by light signals, which do not degrade over long distances	Average speed of 250 Mbps, with maximum of 1,000 Mbps
Cable	Coaxial cable, similar to cable TV wire	Cable connections are shared, so speed can drop during high-usage periods	Average speed of 10 Mbps, with maximum of 500 Mbps
DSL (digital subscriber line)	Copper wire phone line	Speed drops as distance from the main signal source increases	Average speed of 5 Mbps, with maximum of 35 Mbps
Satellite	Wireless signals from orbiting satellites	Speed depends on clear line of sight between receiving satellite dish and orbiting satellite; weather can also disrupt of affect service	Average speed of 500 Kbps, with maximum of 100 Mbps

Connecting to the Internet

Wireless Internet Access (Objective 7.7)

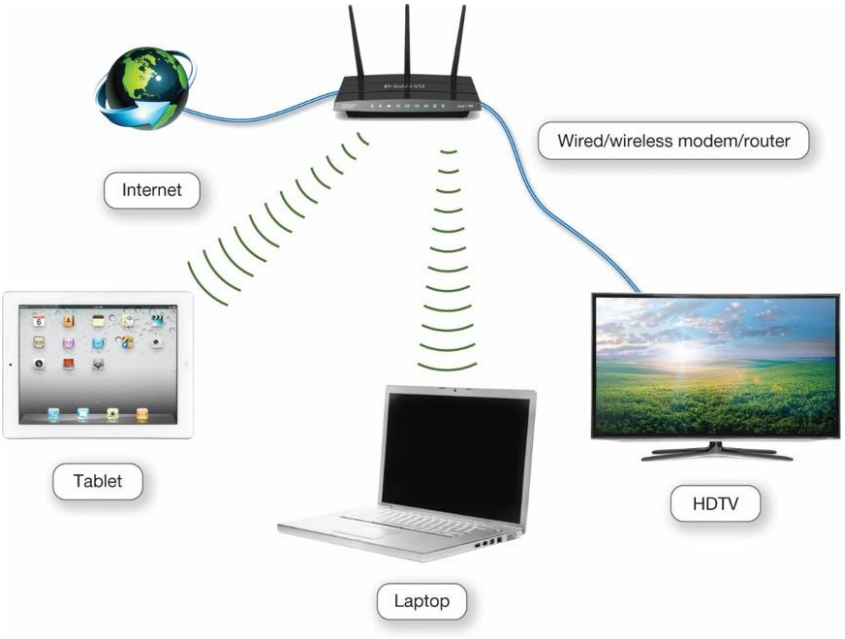
- Mobile broadband
  - Wireless Internet at home
  - Mobile hotspot
  - Wireless ISP
  - Data plan



Installing and Configuring Home Networks

Planning Your Home Network (Objective 7.8)

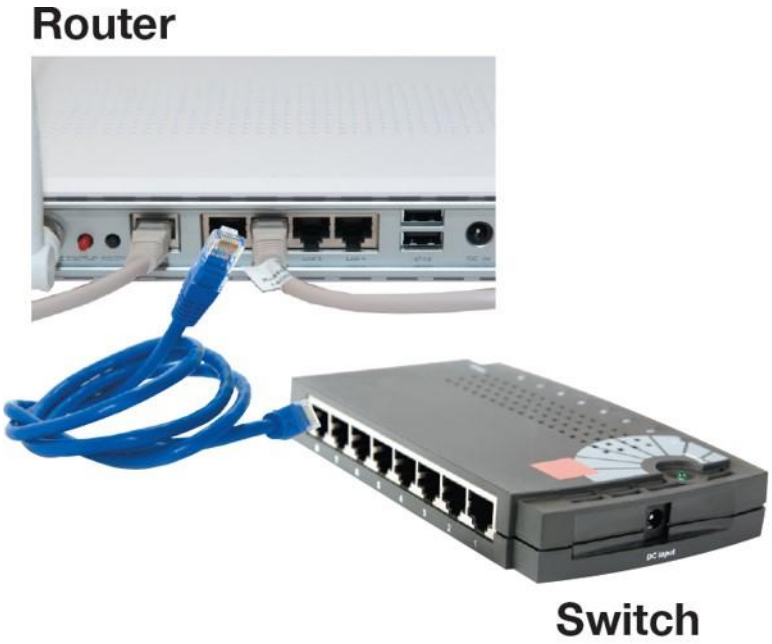
- List all the devices you are using
- Use the latest standard
- Use the newest equipment



Installing and Configuring Home Networks (1 of 2)

Connecting Devices to a Network (Objective 7.9)

- Number of wired devices on a network
- Number of wireless devices on a network



Installing and Configuring Home Networks (2 of 2)

Connecting Devices to a Network (Objective 7.9)

- Specialized home networking devices
  - NAS devices
  - Home network servers
  - Digital entertainment devices

Installing and Configuring Home Networks

Troubleshooting Wireless Network Problems (Objective 7.10)

- Maximum Wi-Fi range is about 350 feet
- Walls, floors, and large metal objects interfere with wireless signals
- Place an access point where the Wi-Fi signal becomes weaker
- A wireless range extender repeats or amplifies wireless router signal

Managing and Securing Wireless Networks (1 of 3)

Securing Wireless Networks (Objective 7.11)

- Piggybacking
- Use encryption and security protocols
- Change network name (SSID)
- Disable SSID broadcast
- Change the default password
- Create a passphrase

Managing and Securing Wireless Networks (2 of 3)

Securing Wireless Networks (Objective 7.11)

- Limit signal range
- Keep router firmware up to date
- Disable remote access

Managing and Securing Wireless Networks (3 of 3)

Securing Wireless Networks (Objective 7.11)