# Fundamentals of Information Systems, Seventh Edition

*Chapter 4*
*Telecommunications, the Internet, Intranets, and Extranets*

# Principles and Learning Objectives

A telecommunications system has many fundamental components that must be carefully selected and work together effectively to enable people to meet personal and organization objectives

- Identify and describe the fundamental components of a telecommunications system
- Identify several network types and describe the uses and limitations of each
- Name three basic processing alternatives for organizations that require two or more computer systems and discuss their fundamental features

# Principles and Learning Objectives (continued)

- The Internet provides a critical infrastructure for delivering and accessing information and services
  - Briefly describe how the Internet works, including alternatives for connecting to it and the role of Internet service providers

# Principles and Learning Objectives (continued)

- Originally developed as a document-management system, the World Wide Web has grown to become a primary source of news and information, an indispensible conduit for commerce, and a popular hub for social interaction, entertainment, and communication
  - Describe how the World Wide Web works and the use of Web browsers, search engines, and other Web tools

# Principles and Learning Objectives (continued)

- The Internet and Web provide numerous resources for finding information, communicating and collaborating, socializing, conducting business and shopping, and being entertained
  - Identify and briefly describe several applications associated with the Internet and the Web
  - Outline a process and identify tools used to create Web content

# Principles and Learning Objectives (continued)

- Popular Internet and Web technologies have been applied to business networks in the form of intranets and extranets
  - Define the terms intranet and extranet and discuss how organizations are using them
  - Identify several issues associated with the use of networks

# Why Learn About Telecommunications and Networks?

- Among all business functions:
  - Supply chain management might use telecommunications and networks the most
- Regardless of your chosen career field:
  - You will need the communications capabilities provided by telecommunications and networks

# An Overview of Telecommunications

- Telecommunications:
  - Electronic transmission of signals for communications
- Telecommunications medium:
  - Any material substance that carries an electronic signal to support communications between a sending and receiving device

# An Overview of Telecommunications (continued)

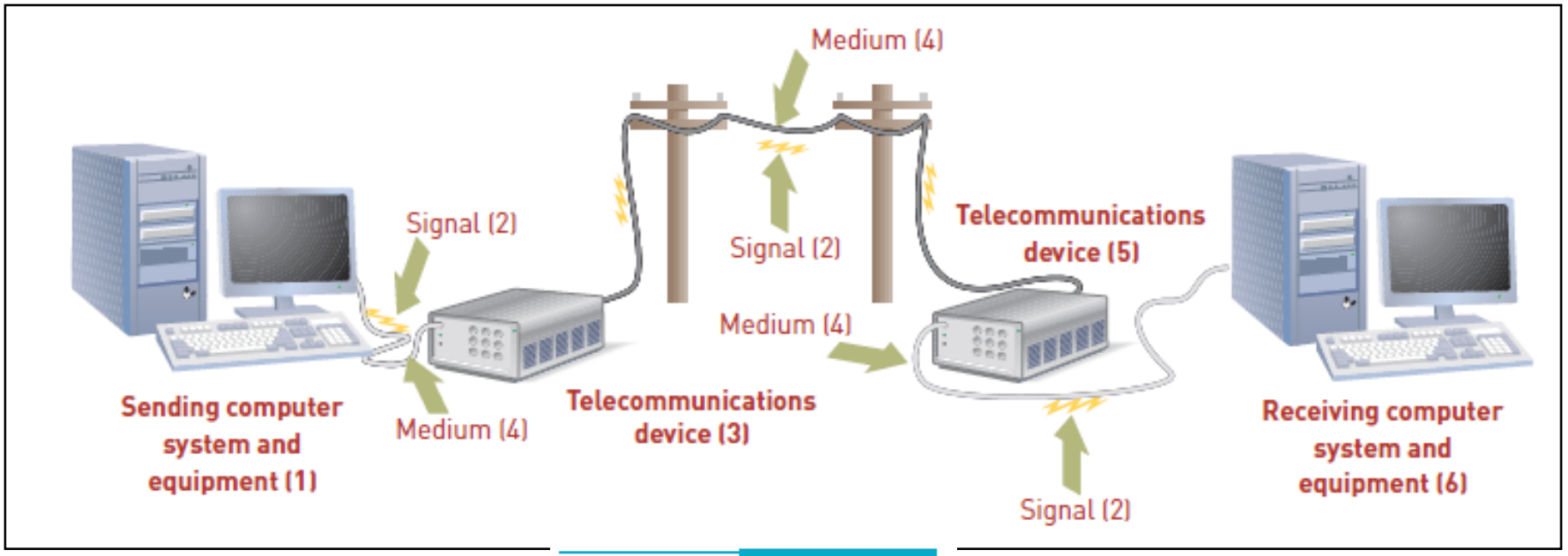


**Figure 4.1**

Elements of a Telecommunications System

Telecommunications devices relay signals between computer systems and transmission media.

# Channel Bandwidth

  - Rate at which data is exchanged
- Broadband communications:
  - Telecommunications system that can exchange data very quickly

# Communications Media

- Guided transmission media types:
  - Available in many types
- Wireless technologies:
  - Wireless telecommunications involves the broadcast of communications in one of three frequency ranges:
    - Microwave, radio, and infrared
- Microwave transmission:
  - Microwave is a high-frequency (300 MHz–300 GHz) signal sent through the air

# Communications Media (continued)

| Media Type | Description | Advantages | Disadvantages |
|---|---|---|---|
| Twisted-pair wire | Twisted pairs of copper wire, shielded or unshielded | Used for telephone service; widely available | Transmission speed and distance limitations |
| Coaxial cable | Inner conductor wire surrounded by insulation | Cleaner and faster data transmission than twisted-pair wire | More expensive than twisted-pair wire |
| Fiber-optic cable | Many extremely thin strands of glass bound together in a sheathing; uses light beams to transmit signals | Diameter of cable is much smaller than coaxial; less distortion of signal; capable of high transmission rates | Expensive to purchase and install |
| Broadband over power lines | Data is transmitted over standard high-voltage power lines | Can provide Internet service to rural areas where cable and phone service may be nonexistent | Can be expensive and may interfere with ham radios and police and fire communications |

**Table 4.1**

Guided Transmission Media Types

# Communications Media (continued)

- 3G wireless communications:
  - Supports wireless voice and broadband speed data communications in a mobile environment
- 4G wireless communications:
  - 4G will also provide increased data transmission rates in the 20–40 Mbps range
- Worldwide interoperability for microwave access (WiMAX)
  - Operates like Wi-Fi, only over greater distances and at faster transmission speeds

# Telecommunications Hardware

- Smartphones:
  - Combine the functionality of a mobile phone, camera, Web browser, e-mail tool, MP3 player, and other devices
  - Have their own software operating systems
  - Applications are developed by:
    - The manufacturers of the handheld device
    - The operators of the communications network on which they operate
    - Third-party software developers

| Device | Function |
|---|---|
| Modem | Translates data from a digital form (as it is stored in the computer) into an analog signal that can be transmitted over ordinary telephone lines. |
| Fax modem | Facsimile devices, commonly called fax devices, allow businesses to transmit text, graphs, photographs, and other digital files via standard telephone lines. A fax modem is a very popular device that combines a fax with a modem, giving users a powerful communications tool. |
| Multiplexer | Allows several telecommunications signals to be transmitted over a single communications medium at the same time, thus saving expensive long-distance communications costs. |
| PBX | A communications system that manages both voice and data transfer within a building and to outside lines. In a PBX system, switching PBXs can be used to connect hundreds of internal phone lines to a few phone company lines. |
| Front-end processor | Special-purpose computer that manages communications to and from a computer system serving many people. |
| Switch | Uses the physical device address in each incoming message on the network to determine which output port it should forward the message to in order to reach another device on the same network |
| Bridge | Connects one LAN to another LAN that uses the same telecommunications protocol. |
| Router | Forwards data packets across two or more distinct networks toward their destinations through a process known as routing. Often an Internet service provider (ISP) installs a router in a subscriber's home that connects the ISP's network to the network within the home |
| Bridge | Connects one LAN to another LAN that uses the same telecommunications protocol. |

**Table 4.4**

Common Telecommunications Devices

# Networks and Distributed Processing

- Computer network:
  - Consists of communications media, devices, and software needed to connect two or more computer systems or devices
  - Can transmit and receive information to improve organizational effectiveness and efficiency

# Network Types

- Personal area networks:
  - Support interconnection of information technology within a range of about 33 feet
- Local area networks:
  - Connect computer systems and devices within a small area (e.g., office or home)
- Metropolitan area networks:
  - Connect users and their devices in a geographical area that spans a campus or city
- Wide area networks:
  - Connect large geographic regions

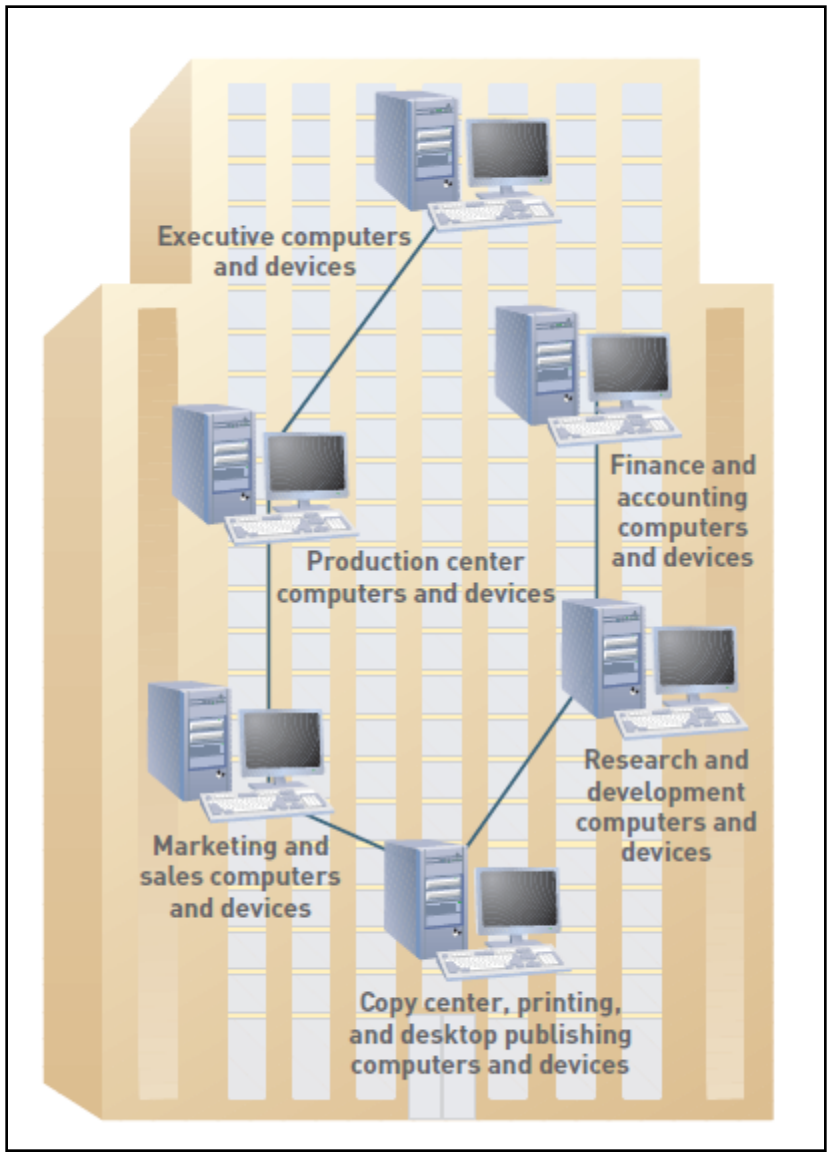


**Figure 4.5**

Typical LAN

All network users within an office building can connect to each other's devices for rapid communication. For instance, a user in research and development could send a document from her computer to be printed at a printer located in the desktop publishing center.

# Distributed Processing

- Centralized processing:
  - All processing occurs in a single location or facility
- Decentralized processing:
  - Processing devices are placed at various remote locations
- Distributed processing:
  - Processing devices are placed at remote locations but are connected to each other via a network

# Client/Server Systems

- Client/server architecture:
  - Multiple computer platforms are dedicated to special functions
- Server:
  - Distributes programs and data to the other computers (clients) on the network as they request them

# Telecommunications Software

- Network operating system (NOS):
  - Systems software that controls the computer systems and devices on a network
- Network management software:
  - Protects software from being copied, modified, or downloaded illegally
  - Locates telecommunications errors and potential network problems

# Use and Functioning of the Internet

- ARPANET:
  - Ancestor of the Internet
  - Project started by the U.S. Department of Defense (DoD) in 1969
- Internet Protocol (IP):
  - Enables computers to route communications traffic from one network to another

# How the Internet Works

- IP protocol:
  - Set of rules used to pass packets from one host to another
- IP address:
  - 64-bit number that identifies a computer on the Internet
- Uniform Resource Locator (URL):
  - Web address that specifies the exact location of a Web page

# How the Internet Works (continued)

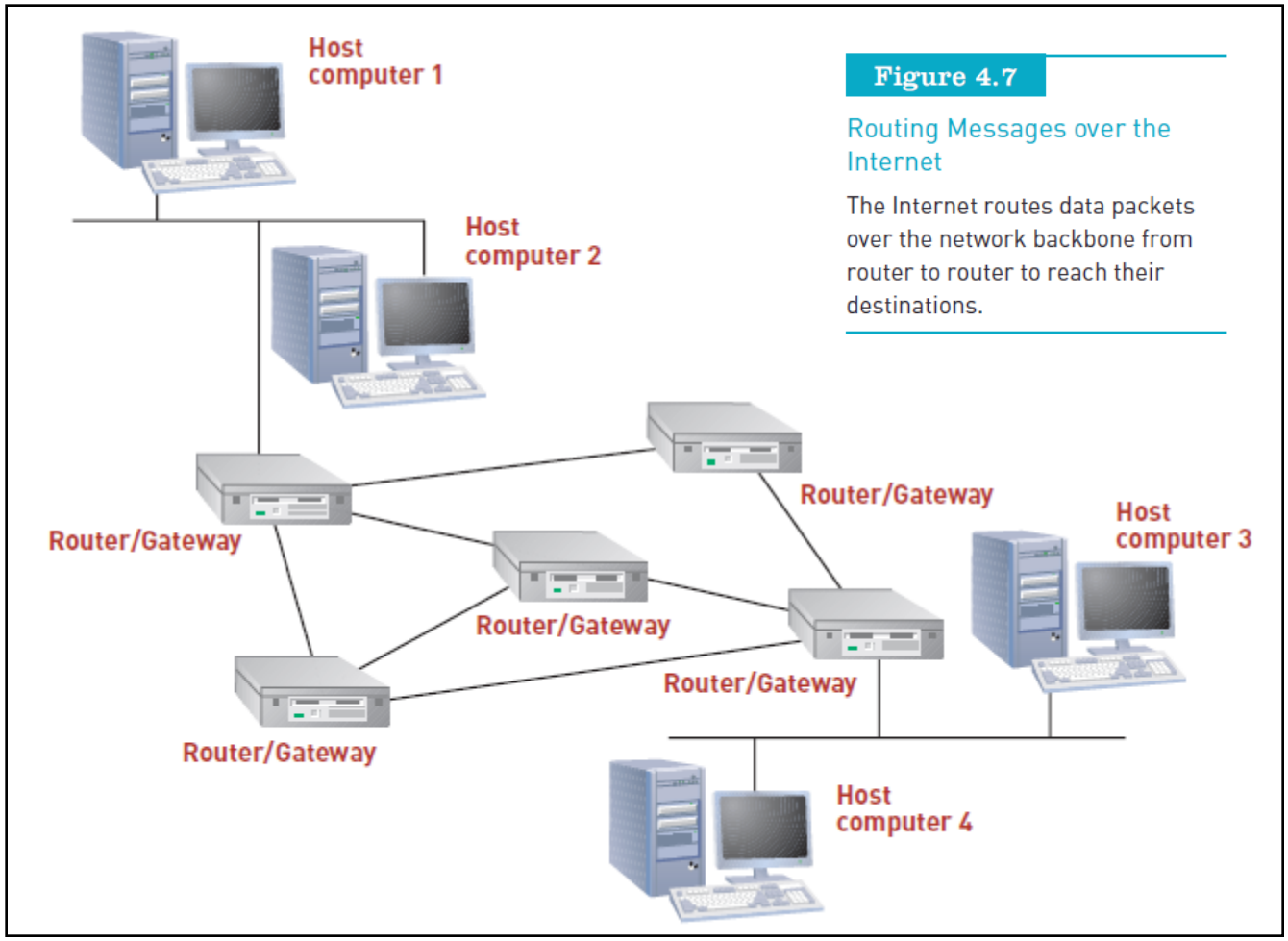


**Figure 4.7**

Routing Messages over the Internet

The Internet routes data packets over the network backbone from router to router to reach their destinations.

# How the Internet Works (continued)

- Internet Corporation for Assigned Names and Numbers (ICANN):
  - Responsible for managing IP addresses and Internet domain names
  - Has authority to resolve domain name disputes

# How the Internet Works (continued)

| Affiliation ID | Affiliation |
|---|---|
| com | Business sites |
| edu | Educational sites |
| gov | Government sites |
| net | Networking sites |
| org | Nonprofit organization sites |
| mobi | Mobile-compatible sites for smartphones |

**Table 4.5**

U.S. Top-Level Domain Affiliations

# How the Internet Works (continued)

- Accessing the Internet:
  - Access method determined by the size and capability of your organization or system
- Connect via LAN server:
  - Business LAN servers are typically connected to the Internet at very fast data rates
- Connecting via Internet service providers:
  - An ISP is any organization that provides Internet access to people

# Cloud Computing

- Computing environment in which:
  - Software and storage are provided as an Internet service and accessed with a Web browser
- Extremely scalable and often takes advantage of virtualization technologies
- Advantages to businesses:
  - Businesses can save on system design, installation, and maintenance
  - Employees can access corporate systems from any Internet-connected computer

# The World Wide Web

- Developed by Tim Berners-Lee at CERN
- Originally conceived of as an internal document-management system
- The Web has grown to become:
  - A primary source of news and information
  - An indispensible conduit for commerce
  - A popular hub for social interaction, entertainment, and communication

# How the Web Works

- The Internet:
  - Made up of computers, network hardware such as routers and fiber-optic cables, software, and the TCP/IP protocols
- The Web:
  - Consists of server and client software, the hypertext transfer protocol (http), standards, and mark-up languages that combine to deliver information and services over the Internet

# How the Web Works (continued)

- Hyperlink:
  - Highlighted text or graphics in a Web document that, when clicked, opens a new Web page
- Web browser:
  - Web client software such as Internet Explorer, Firefox, and Safari used to view Web pages
- Hypertext Markup Language (HTML):
  - Standard page description language for Web pages

# How the Web Works (continued)

- HTML tags:
  - Tell the Web browser how to format text
- Extensible Markup Language (XML):
  - Markup language for Web documents containing structured information
- Cascading Style Sheet (CSS):
  - Markup language that defines the visual appearance of content in a Web page

# Web Programming Languages

- Java:
  - Object-oriented programming language from Sun Microsystems based on C++
  - Allows small programs (applets) to be embedded within an HTML document
- Other languages:
  - JavaScript, VBScript, and ActiveX
  - Hypertext Preprocessor (PHP)

# Web Services

- Standards and tools that streamline and simplify communication among Web sites
- XML:
  - The key to Web services

# Developing Web Content

- Web publishing tools:
  - .NET, Bubbler, Homestead QuickSites, and JobSpot
- Mashup:
  - Named for the process of mixing two or more hip-hop songs into one song

# Internet and Web Applications

- Popular uses for the Internet and Web:
  - Publishing information
  - Assisting users in finding information
  - Supporting communication and collaboration
  - Building online community
  - Providing software applications
  - Providing a platform for expressing ideas
  - Delivering media of all types
  - Providing a platform for commerce
  - Supporting travel and navigation

# Online Information Sources

- News and opinion:
  - The Web is a powerful tool for keeping informed about local, state, national, and global news
- Education and training:
  - Web is ideally suited:
    - As a tool for sharing information and a primary repository of information on all subjects
  - Distance education:
    - Conducting classes over the Web with no physical class meetings

# Online Information Sources (continued)

- Business information:
  - Businesses often use Internet and Web-based systems for knowledge management
- Personal and professional advice and support:
  - Medical and health Web sites assist in diagnosing health problems and advising on treatments
  - The Web is an excellent source of job-related information

# Search Engines and Web Research

- Search engine:
  - Enables you to find information on the Web by specifying keywords
  - Market is dominated by Google
  - Uses an automated approach that scours the Web with automated programs called spiders
- Wikipedia:
  - Can be used for online research
- Wikimedia:
  - Has wikis for books, news, media, and open learning

# Communication and Collaboration

- E-mail:
  - Internet communication
  - Supports text communication, HTML content, and sharing documents as e-mail attachments
- Instant messaging:
  - Online, real-time communication between two or more people who are connected to the Internet
- Microblogging, status updates, and news feeds:
  - Twitter is a Web application that allows members to report on what they are doing throughout the day

# Communication and Collaboration (continued)

- Conferencing:
  - Internet has made it possible for those involved in teleconferences to share computer desktops
  - Telepresence takes video conferencing to the ultimate level
  - Free software is available to make video chat easy to use for anyone with a computer, Web cam, and a high-speed Internet connection

# Web 2.0 and the Social Web

- Web sites such as YouTube and Flickr allow users to share video and photos
- Epinions and many retail Web sites allow consumers to voice their opinions about products
- Some businesses are including social networking features in their products

# Rich Internet Applications

- Rich Internet application:
  - Software that has the functionality and complexity of traditional application software but does not require local installation and runs in a Web browser
  - The result of continuously improving programming languages and platforms designed for the Web

# Blogging and Podcasting

- Web log:
  - Web site that people can create and use to write about their observations, experiences, and opinions on a wide range of topics
- Blogger:
  - Person who creates a blog
- Blogging:
  - The process of placing entries on a blog site
- Podcast:
  - Audio broadcast over the Internet

# Online Media and Entertainment

- Content streaming:
  - Method of transferring large media files over the Internet so that the data stream of voice and pictures plays continuously as the file is being downloaded
- Music:
  - The Web has had a dramatic impact on the music industry
  - Internet radio is digitally delivered to your computer over the Internet
  - Compressed music formats such as MP3 have made music swapping popular

# Online Media and Entertainment (continued)

- Movies, video, and television:
  - The Web and TV are rapidly merging into a single integrated system
  - Web sites such as Hulu and Internet-based television platforms like Joost provide television programming
  - Motion pictures are also making their way to Internet distribution
  - YouTube supports the online sharing of user-created videos

# Online Media and Entertainment (continued)

- E-books and audio books:
  - An e-book is a book stored digitally
- Online games:
  - Video games have become a huge industry
  - Many video games are available online
  - Game consoles such as the Wii, Xbox, and PlayStation provide multiplayer options for online gaming

# Shopping Online

- E-tail stores:
  - Online versions of retail stores
  - Provide access to many products that may be unavailable in local stores
- Online clearinghouses, Web auctions, and marketplaces:
  - Provide a platform for businesses and individuals to sell their products and belongings
- www.eBay.com:
  - The most popular online auction or marketplace

# Travel, Geolocation, and Navigation

- Businesses that have a strong online presence:
  - Travel agencies
  - Resorts, airlines, cruise lines
  - All businesses associated with travel
- Google Maps:
  - Provides extensive location-specific business information, satellite imagery, up-to-the-minute traffic reports, and Street View

# Intranets and Extranets

- Intranet:
  - Internal corporate network built using Internet and World Wide Web standards and technologies
- Extranet:
  - Network that links selected resources of a company's intranet with its customers, suppliers, or other business partners

# Intranets and Extranets (continued)

| Type | Users | Need User ID and Password? |
|---|---|---|
| Internet | Anyone | No |
| Intranet | Employees and managers | Yes |
| Extranet | Business partners | Yes |

**Table 4.7**

Summary of Internet, Intranet, and Extranet Users

# Summary

- Telecommunications:
  - The electronic transmission of signals for communications, including telephone, radio, and television
- The Internet:
  - Truly international in scope, with users on every continent
- Cloud computing:
  - Computing environment where software and storage are provided as an Internet service and accessed with a Web browser

# Summary (continued)

- The Web:
  - Collection of tens of millions of servers that work together as one in an Internet service
  - Has become the most popular medium for distributing and accessing information
- Web 2.0:
  - The Web as a computing platform that supports software applications and the sharing of information between users