NETWORKS: MOBILE BUSINESS

CHAPTER OVERVIEW

- **SECTION 7.1 – Connectivity: The Business Value of a Networked World**
  - Overview of a Connected World
  - Benefits of a Connected World
  - Challenges of a Connected World
- **SECTION 7.2 – Mobility: The Business Value of a Wireless World**
  - Wireless Network Categories
  - Business Applications of Wireless Networks
  - Benefits of Business Mobility
  - Challenges of Business Mobility

- **CONNECTIVITY**

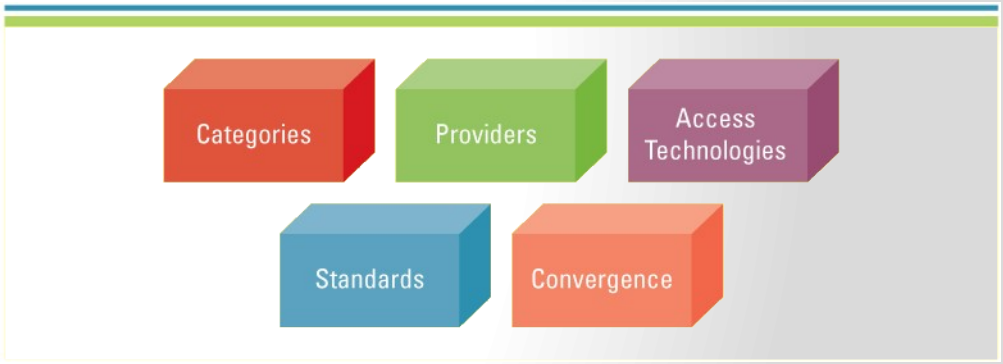
LEARNING OUTCOMES

1. Explain the five different networking elements creating a connected world.
2. Identify the benefits of a connected world
3. Identify the challenges of a connected world

OVERVIEW OF A CONNECTED WORLD

Networking Elements Creating a Connected World

FIGURE 7.1
Networking Elements Creating a Connected World



Clip: http://computer.howstuffworks.com/internet/basics/internet-infrastructure1.htm

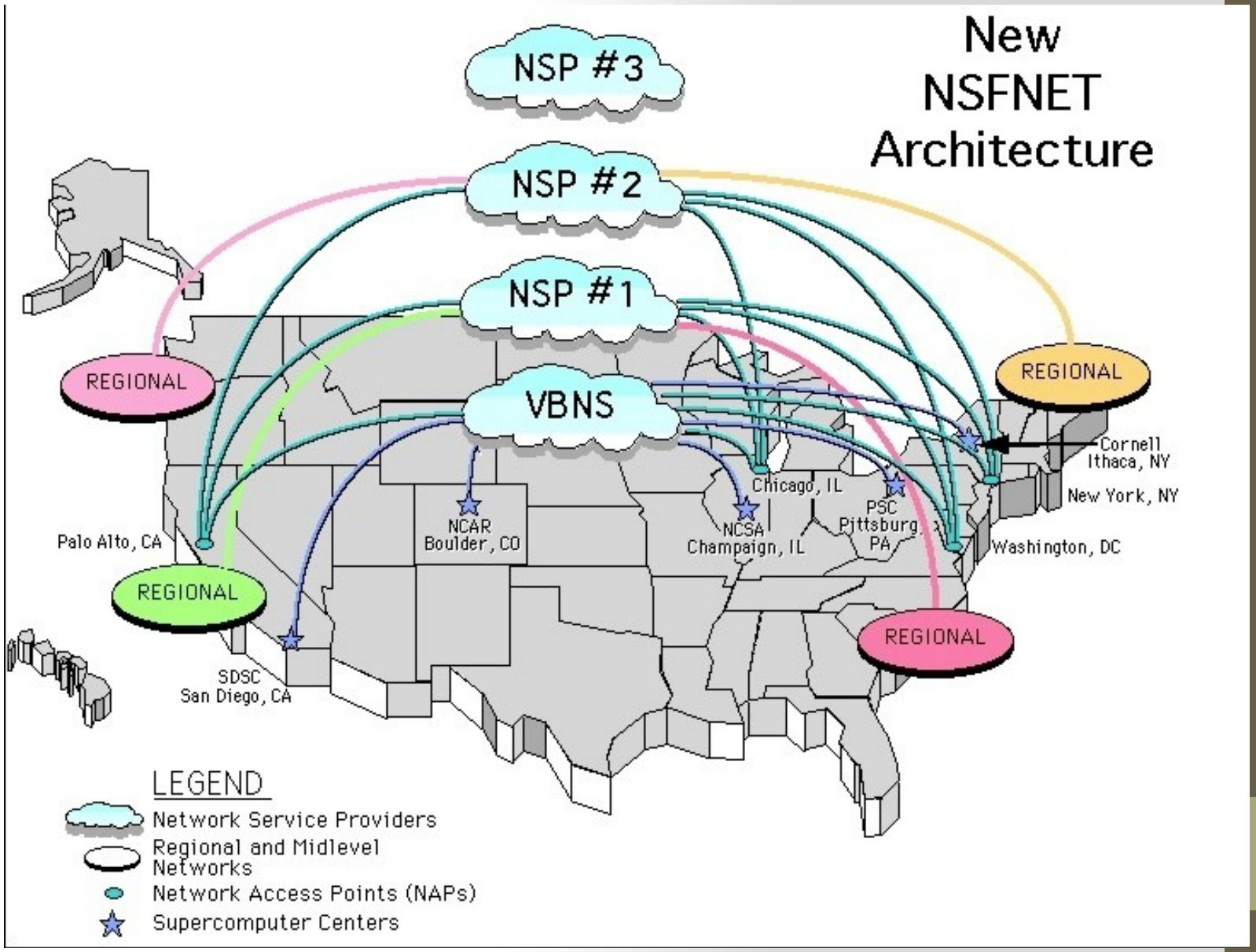
NETWORK CATEGORIES

- **Local area network (LAN)** - Connects a group of computers in close proximity, such as in an office building, school, or home
- **Wide area network (WAN)** - Spans a large geographic area such as a state, province, or country
- **Metropolitan area network (MAN)** - A large computer network usually spanning a city



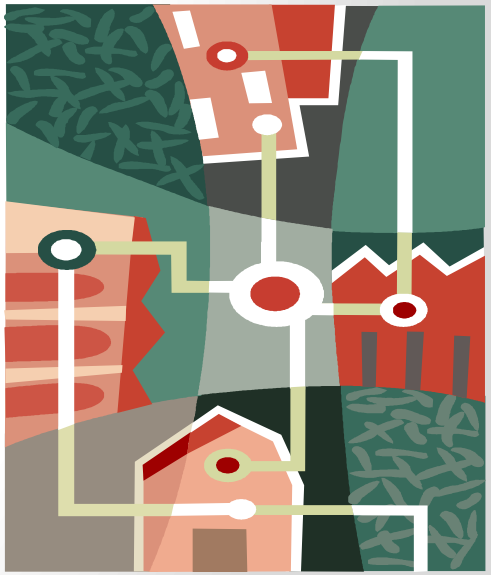
NETWORK PROVIDERS

- **National service providers (NSPs) -** Private companies that own/maintain the worldwide backbone that supports the Internet (MCI) (aka backbone providers) they also sell bandwidth
- **Network access points (NAPs) -** Traffic exchange points in the routing hierarchy of the Internet that connects NSPs
- **Regional service providers (RSPs) -** Offer Internet service by connecting to NSPs, but they also can connect directly to each other


New NSFNET Architecture
NSP #3
NSP #2
NSP #1
VBNS
REGIONAL
REGIONAL
REGIONAL
REGIONAL
Cornell Ithaca, NY
New York, NY
Washington, DC
Chicago, IL
PSC Pittsburg, PA
NCSA Champaign, IL
NCAR Boulder, CO
Palo Alto, CA
SDSC San Diego, CA
LEGEND
Network Service Providers
Regional and Midlevel Networks
Network Access Points (NAPs)
Supercomputer Centers

NETWORK ACCESS TECHNOLOGIES

- **Bandwidth** - The maximum amount of data that can pass from one point to another in a unit of time
  - **Bit**
  - **Bit rate**
  - **Modem**



NETWORK ACCESS TECHNOLOGIES

- **Broadband –** A high-speed Internet connection that is always connected
  - **Digital Subscriber Line (DSL)**
  - **Internet cable connection**
  - **T1 lines**



NETWORK PROTOCOLS

- **Protocol** - A standard that specifies the format of data as well as the rules to be followed during transmission



- **Transmission control protocol/Internet protocol (TCP/IP) -** Provides the technical foundation for the public Internet as well as for large numbers of private networks

  - The link layer (commonly Ethernet) contains communication technologies for a local network.
  - The internet layer (IP) connects local networks, thus establishing internetworking.
  - The transport layer (TCP) handles host-to-host communication.
  - The application layer (for example HTTP) contains all protocols for specific data communications services on a process-to-process level (for example how a web browser communicates with a web server).

NETWORK PROTOCOLS

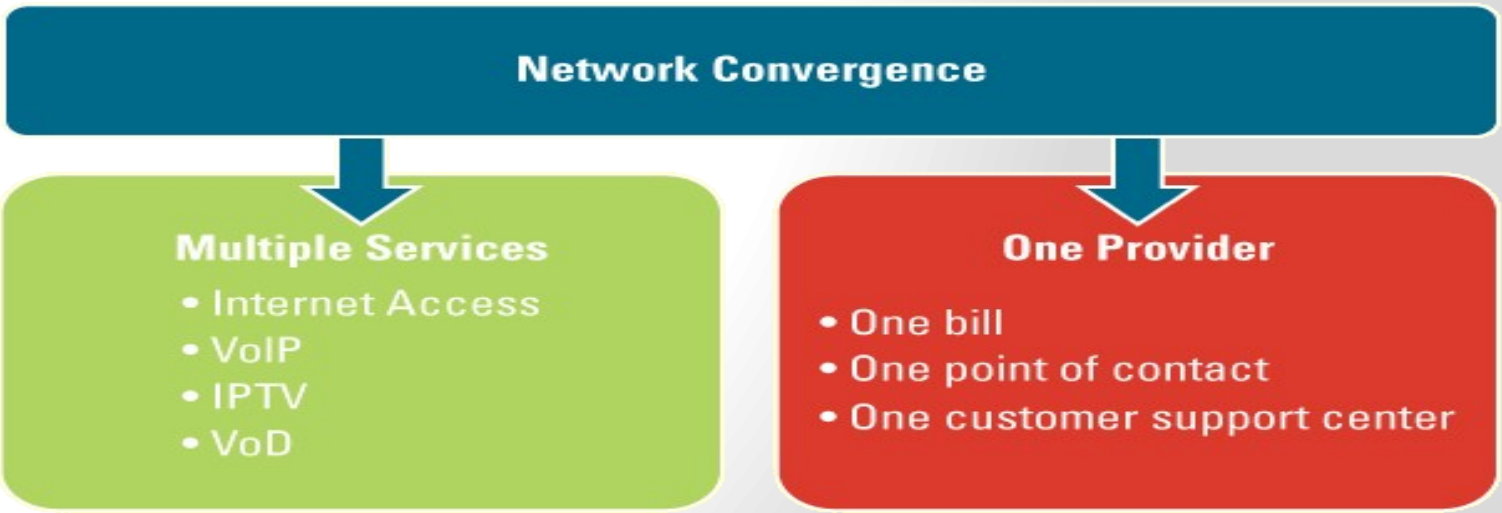
- **Domain name system** – Converts IP addresses into domains

Internet Domains

Domain Name	Use
.biz	reserved for businesses
.com	reserved for commercial organizations and businesses
.edu	reserved for accredited postsecondary institutions
.gov	reserved for U.S. government agencies
.info	open to any person or entity, but intended for information providers
.mil	reserved for U.S. military
.net	open any person or entity
.org	reserved for nonprofit organizations

NETWORK CONVERGENCE

- **Network convergence -** The efficient coexistence of telephone, video, and data communication within a single network, offering convenience and flexibility not possible with separate infrastructures



NETWORK CONVERGENCE

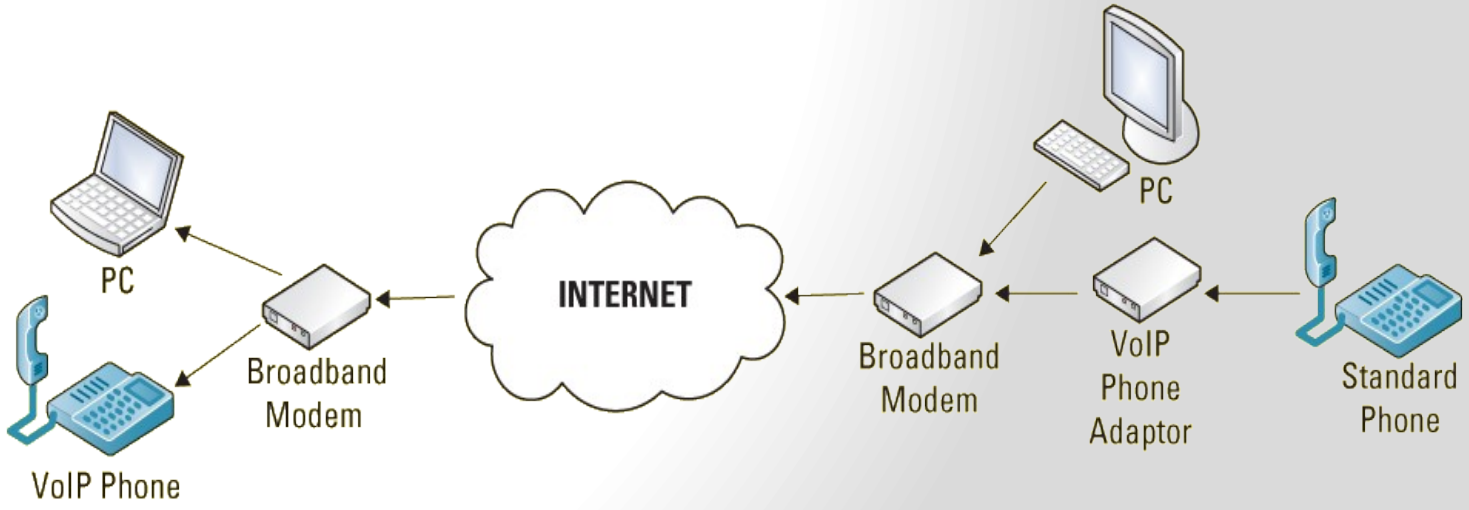
- **Unified communication (UC) -** The integration of communication channels into a single service (ie. A 3G system, and LTE networks both handle IP and voice on one channel)

- **Peer-to-peer (P2P) –** A computer network that relies on the computing power and bandwidth of the participants in the network rather than a centralized server



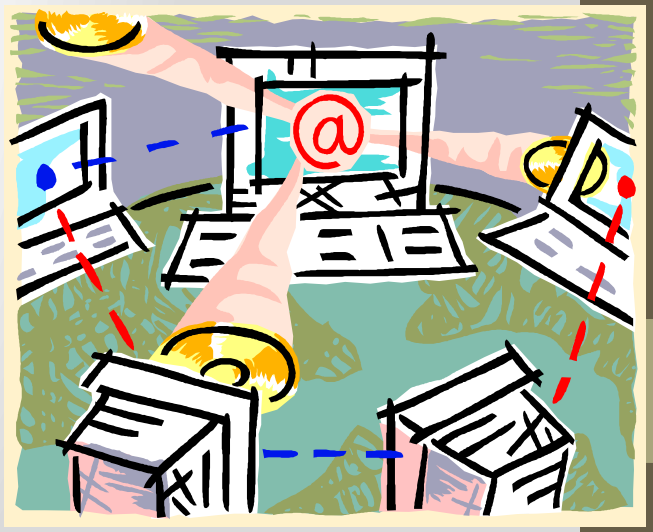
NETWORK CONVERGENCE

- **Voice over IP (VoIP)** - Uses IP technology to transmit telephone calls
- **Internet Protocol TV (IPTV) -** Distributes digital video content using IP across the Internet and private IP networks



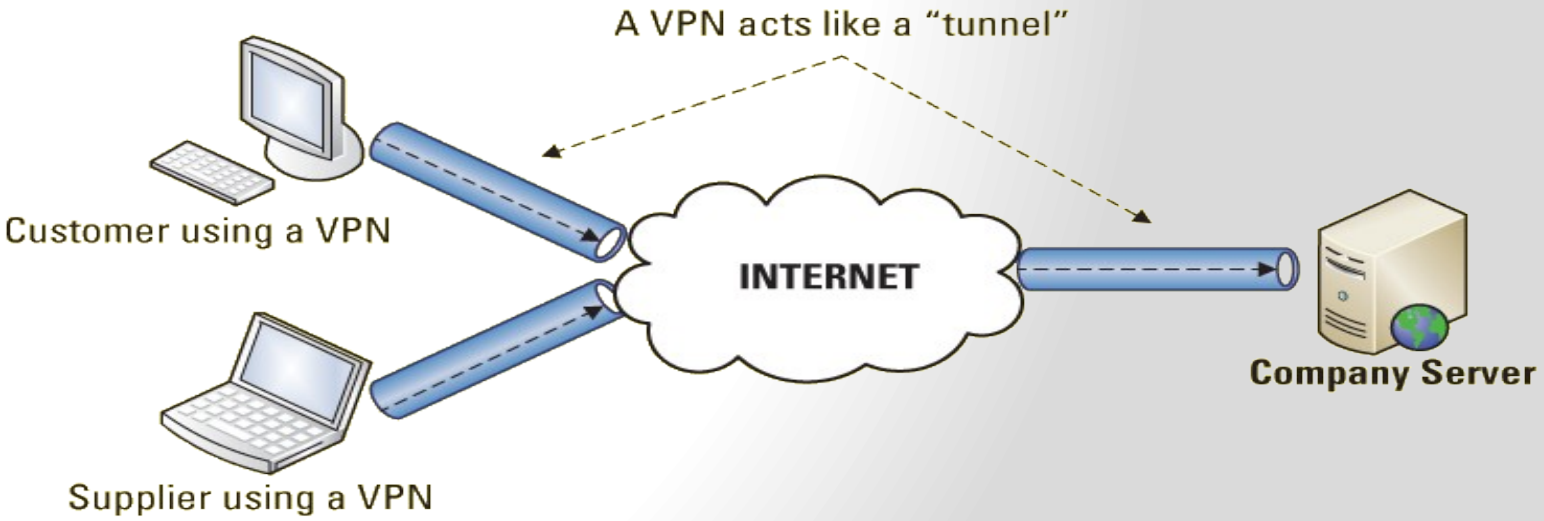
BENEFITS OF A CONNECTED WORLD

- Networks offer many advantages for a business including
  - Sharing resources
  - Reducing travel
  - Opportunities



SHARING RESOURCES

- The primary resources for sharing include
  - Intranet
  - Extranet
  - Virtual private network



CHALLENGES OF A CONNECTED WORLD

- Even though networks provide many business advantages, they also create increased challenges in
  - Security
  - Social, ethical, and political issues



SECURITY

- **SSL Certificate** - An electronic document that confirms the identity of a website or server and verifies that a public key belongs to a trustworthy individual or company



- **Secure hypertext transfer protocol (SHTTP or HTTPS)** - A combination of HTTP and SSL to provide encryption and secure identification of an Internet

SOCIAL, ETHICAL, AND POLITICAL ISSUES

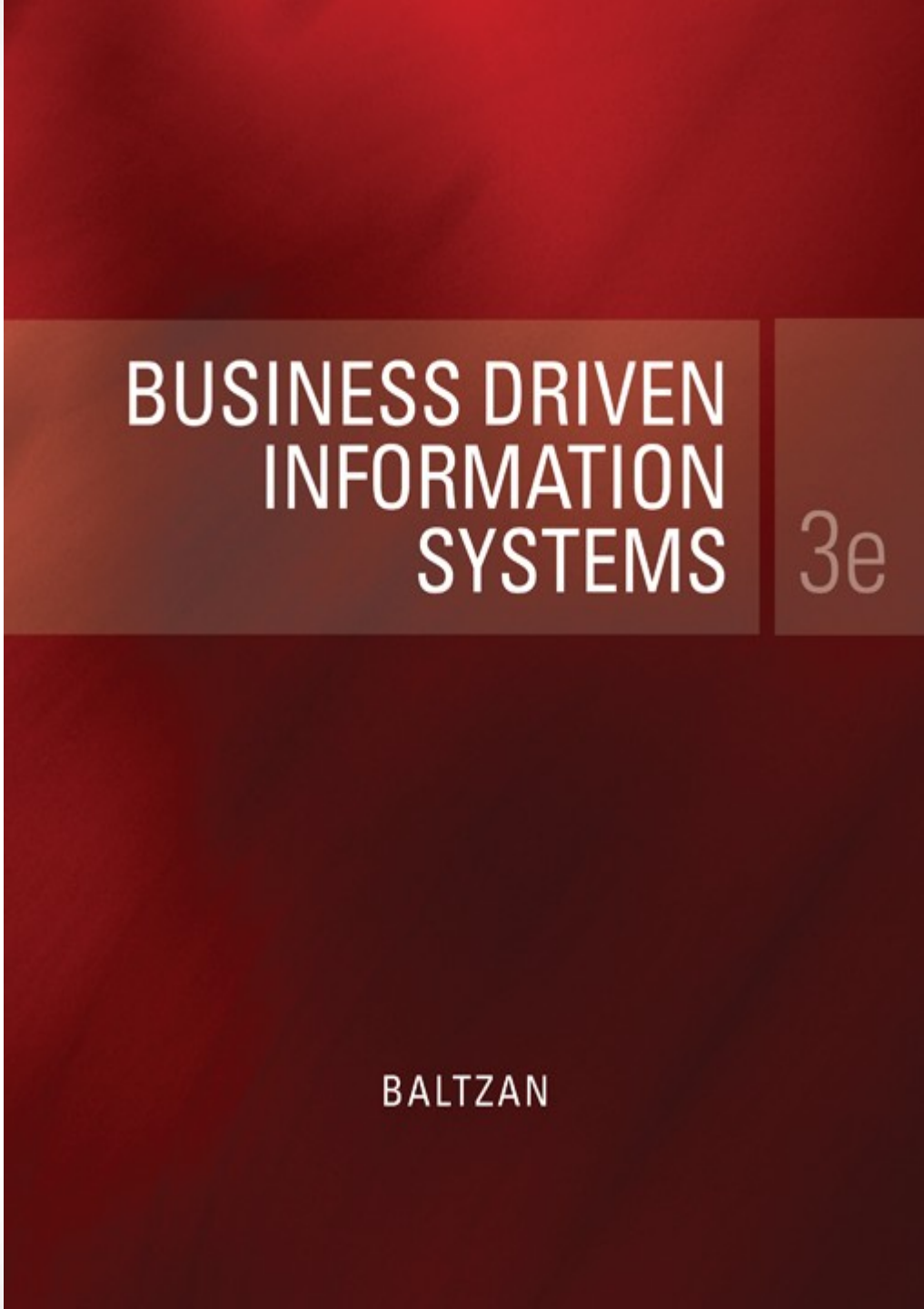
- **Digital divide -** A worldwide gap giving advantage to those with access to technology (poverty)

- Organizations such as Boston Digital Bridge Foundation work towards bridging the divide



SECTION 7.2

MOBILITY



LEARNING OUTCOMES

4. Explain the different wireless network categories
5. Explain the different wireless network business applications
6. Identify the benefits of business mobility
7. Identify the challenges of business mobility

WIRELESS NETWORK CATEGORIES

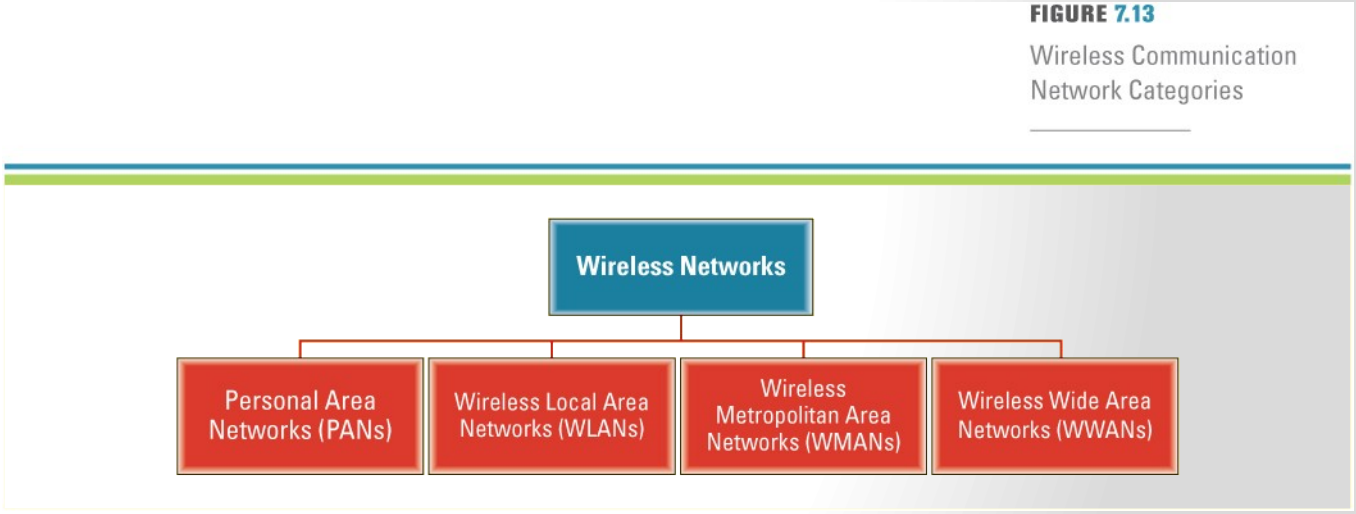


FIGURE 7.13
Wireless Communication Network Categories

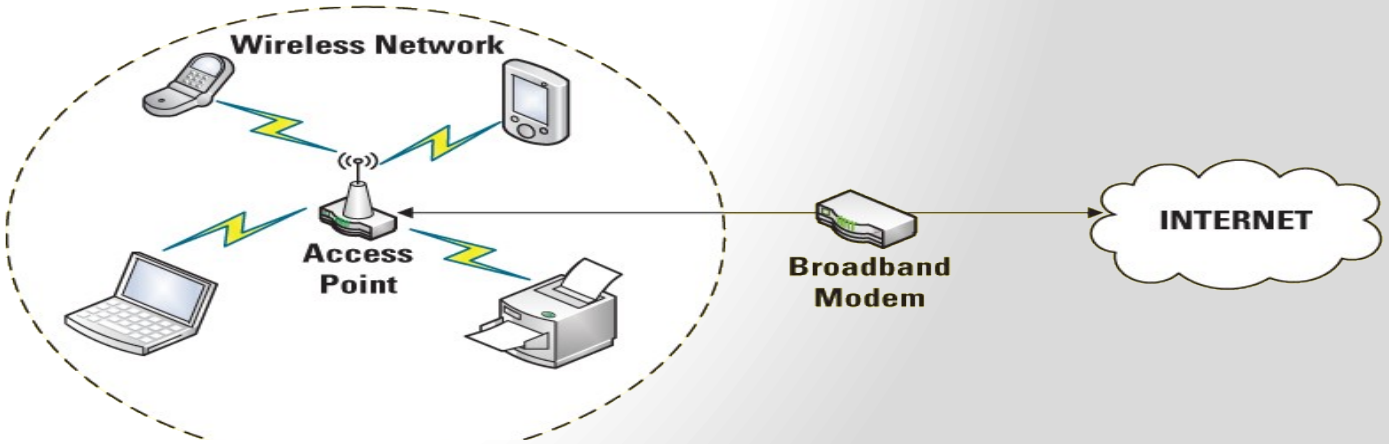
PERSONAL AREA NETWORK

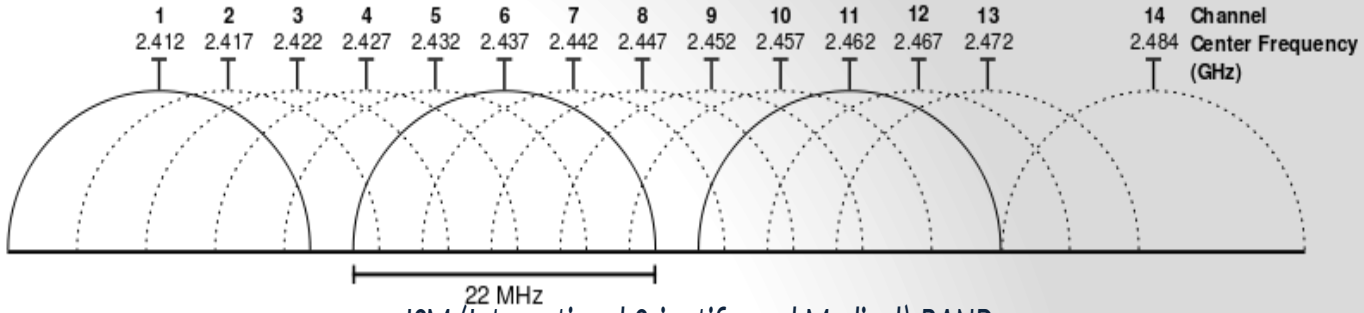
- **Personal area networks (PAN)** - Provide communication over a short distance that is intended for use with devices that are owned and operated by a single user
- **Bluetooth** - Wireless PAN technology that transmits signals over short distances between cell phones, computers, and other devices



WIRELESS LAN

- **Wireless LAN (WLAN) -** A local area network that uses radio signals to transmit and receive data over distances of a few hundred feet
- **Wireless fidelity (Wi-Fi) -** A means by which portable devices can connect wirelessly to a local area network, using access points that send and receive data via radio waves (802.11)

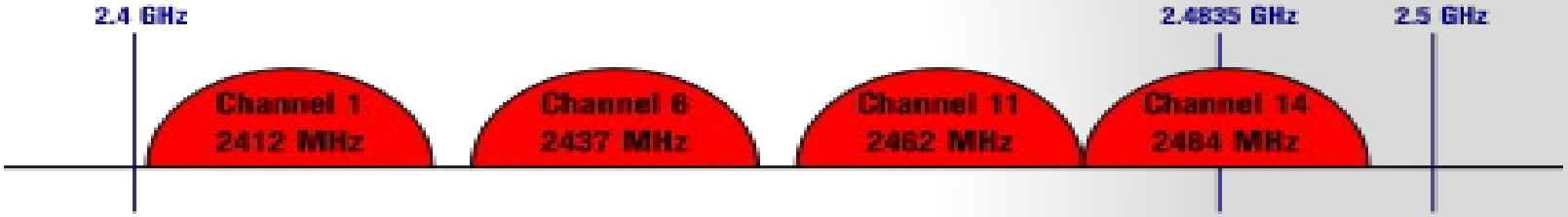




ISM (International Scientific and Medical) BAND

Non-Overlapping Channels for 2.4 GHz WLAN

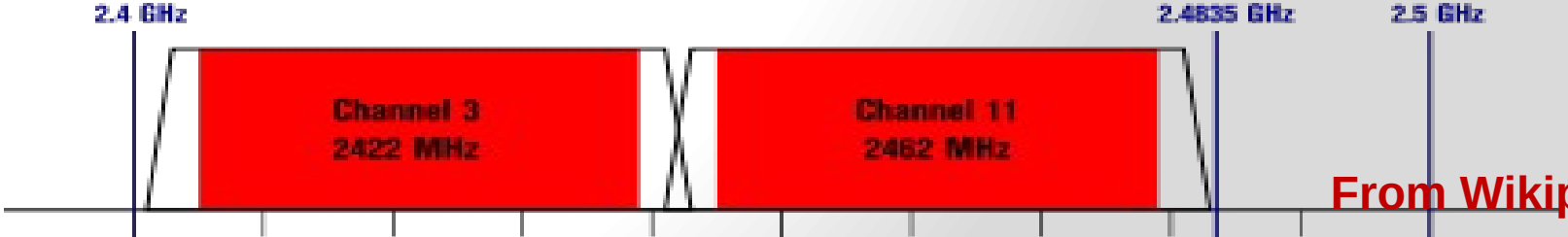
802.11b (DSSS) channel width 22 MHz



802.11g/n (OFDM) 20 MHz ch. width – 16.25 MHz used by sub-carriers



802.11n (OFDM) 40 MHz ch. width – 33.75 MHz used by sub-carriers



From Wikipedia

802.11 network standards										
802.11 protocol	Release[7]	Freq. (GHz)	Bandwidth (MHz)	Data rate per stream (Mbit/s)[8]	Allowable MIMO streams	Modulation	Approximate indoor range		Approximate outdoor range	
							(m)	(ft)	(m)	(ft)
—	Jun 1997	2.4	20	1, 2	1	DSSS, FHSS	20	66	100	330
a	Sep 1999	5	20	6, 9, 12, 18, 24, 36, 48, 54	1	OFDM	35	115	120	390
		3.7[A]					—	—	5,000	16,000[A]
b	Sep 1999	2.4	20	5.5, 11	1	DSSS	38	115	140	460
g	Jun 2003	2.4	20	6, 9, 12, 18, 24, 36, 48, 54	1	OFDM, DSSS	38	125	140	460
n	Oct 2009	2.4/5	20	7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2[B]	4	OFDM	70	230	250	820[9]
			40	15, 30, 45, 60, 90, 120, 135, 150[B]			70	230	250	820[9]

- [A1] [A2] IEEE 802.11y-2008 extended operation of 802.11a to the licensed 3.7 GHz band. Increased power limits allow a range up to 5,000 m. As of 2009[update], it is only being licensed in the United States by the FCC.
- [B1] [B2] Assumes short guard interval (SGI) enabled otherwise reduces each data rate by 10%.

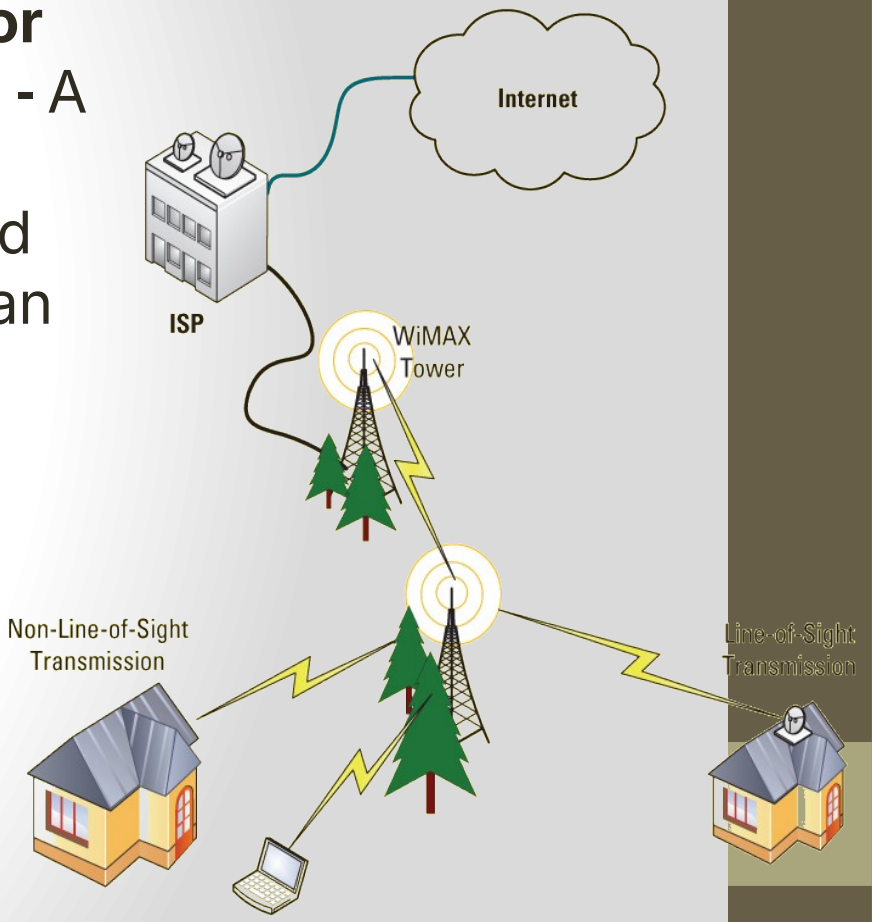
WIRELESS MAN

- **Wireless MAN (WMAN) -** A metropolitan area network that uses radio signals to transmit and receive data



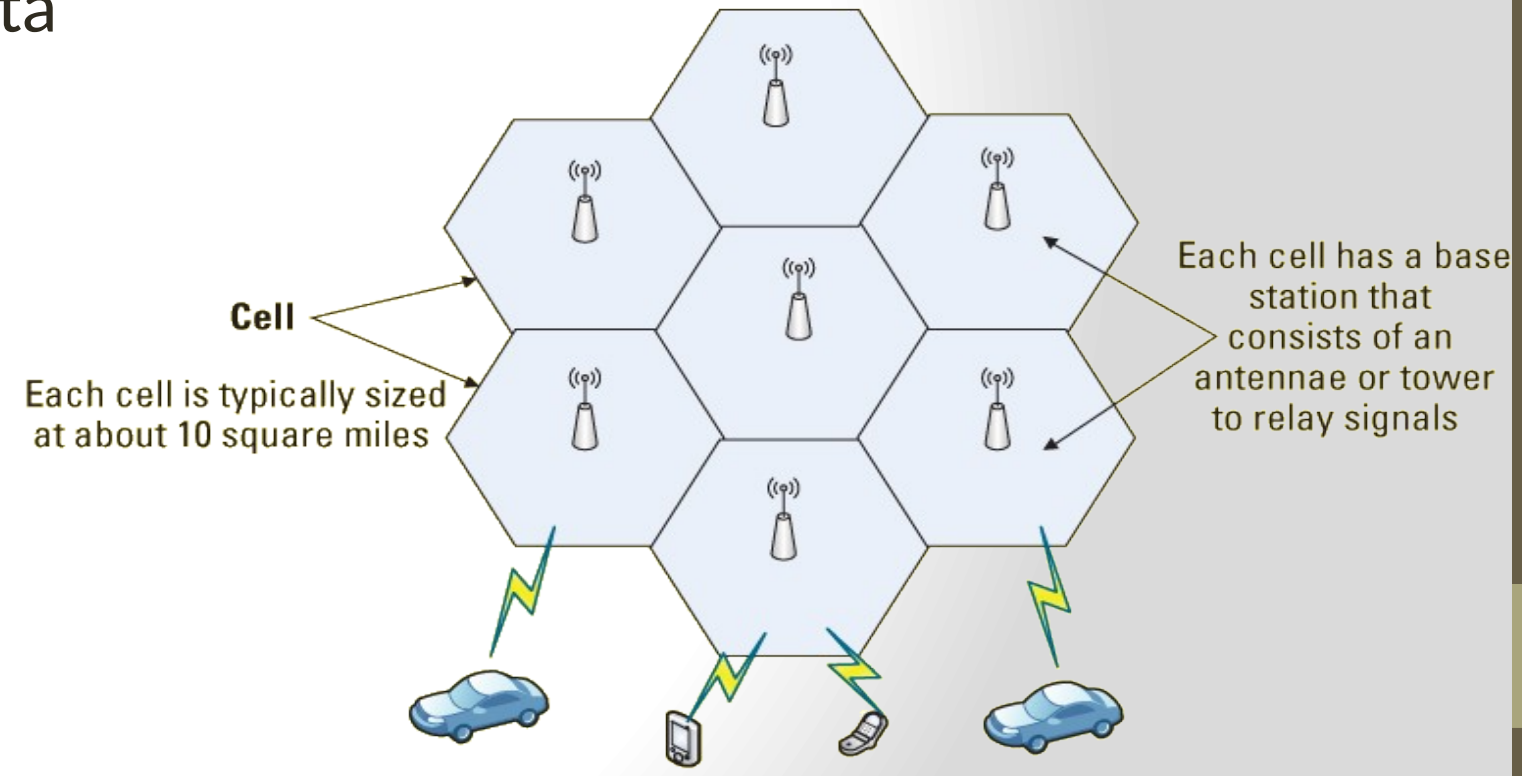
WIRELESS MAN

- **Worldwide Interoperability for Microwave Access (WiMAX) -** A communications technology aimed at providing high-speed wireless data over metropolitan area networks



WIRELESS WAN - CELLULAR

- **Wireless WAN (WWAN) -** A wide area network that uses radio signals to transmit and receive data



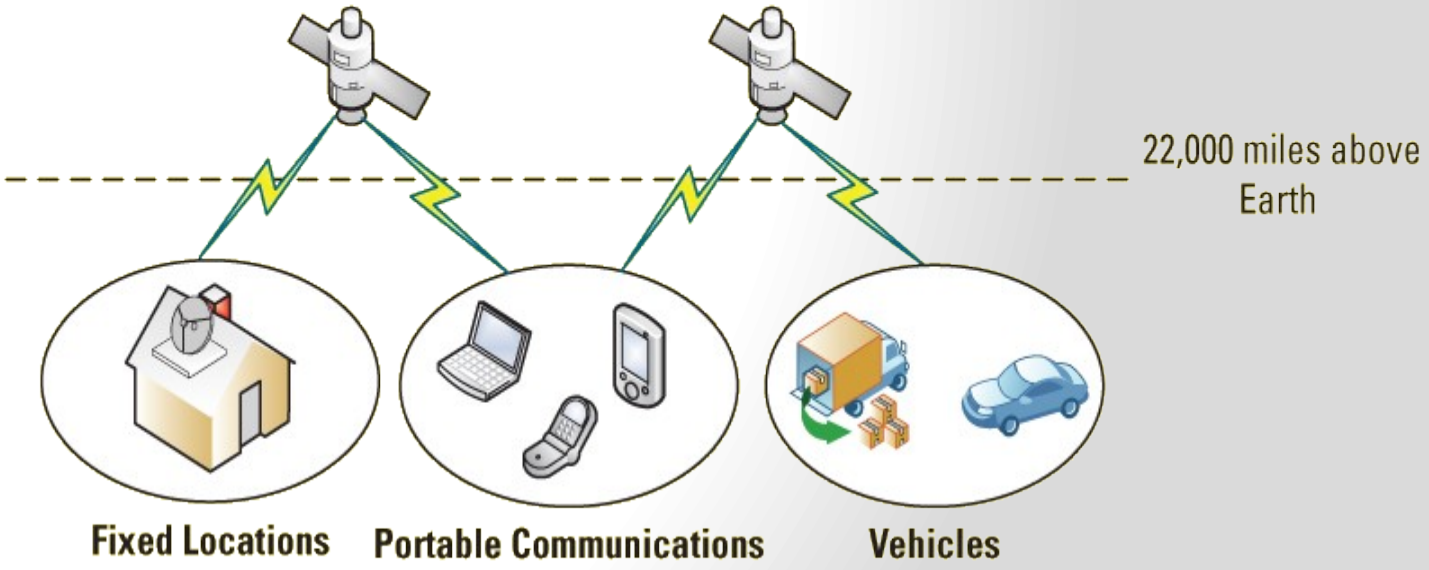
WIRELESS WAN - CELLULAR

- **Smart phone -** Offer more advanced computing ability and connectivity than basic cell phones
- **3G** - A service that brings wireless broadband to mobile phones
- **Streaming** – A method of sending audio and video files over the Internet



WIRELESS WAN - SATELLITE

- **Satellite -** A space station that orbits the Earth receiving and transmitting signals from Earth-based stations over a wide area



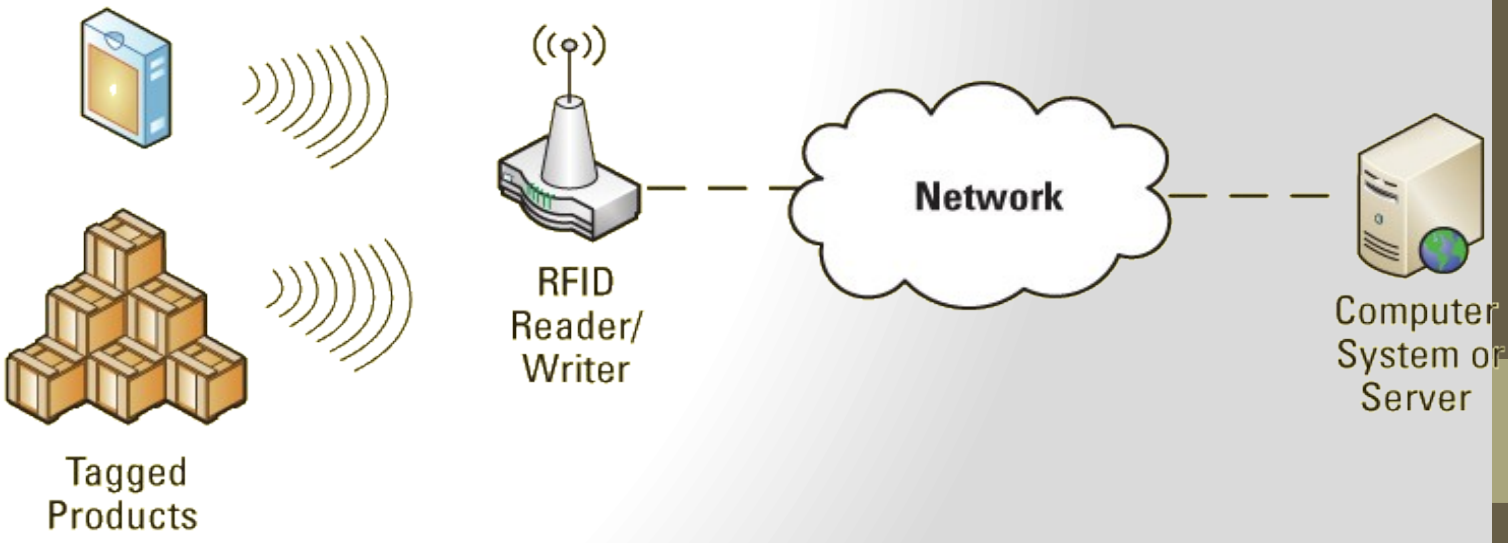
BUSINESS APPLICATIONS OF WIRELESS NETWORKS

- Areas experiencing tremendous growth using wireless technologies include
  - Radio-frequency identification (RFID)
  - Global positioning system
  - Geographic information system
  - Location-based services



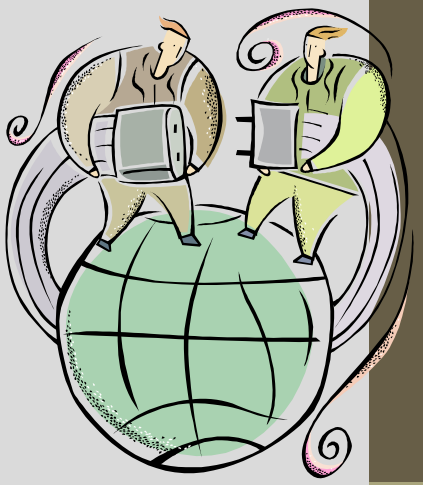
RADIO FREQUENCY IDENTIFICATION (RFID)

- **Radio frequency identification (RFID) -** Uses electronic tags and labels to identify objects wirelessly over short distances



GLOBAL POSITIONING SYSTEM

- **Global positioning system (GPS) -** A satellite-based navigation system providing extremely accurate position, time, and speed information
- Some cell phone providers equip their phones with GPS chips that enable users to be located to within a geographical location about the size of a tennis court



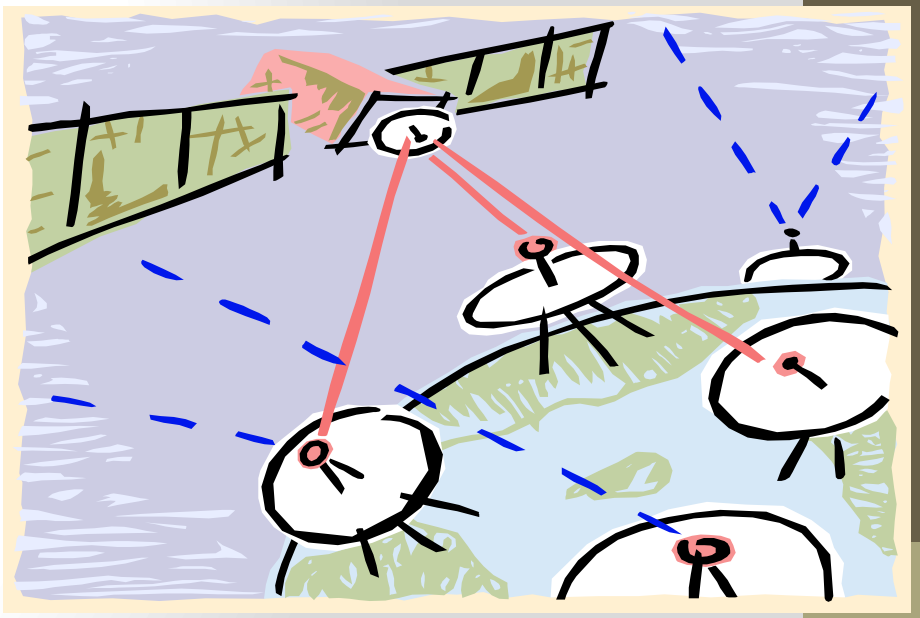
GEOGRAPHIC INFORMATION SYSTEMS (GIS)

- **Geographic information system (GIS) -** Consists of hardware, software, and data that provide location information for display on a multidimensional map (GM offers the OnStar system, which sends a continuous stream of information to the OnStar center about the car's exact location.)



LOCATION-BASED SERVICES

- **Location based services (LBS) -** ***Applications*** that use location information to provide a service
  - examples
    - Google Places
    - Google Latitude
    - MyTracks



BENEFITS OF BUSINESS MOBILITY

- Enhance mobility
- Provides immediate data access
- Increases location and monitoring capability
- Improves work flow
- Provides mobile business opportunities
- Provides alternative to wiring



CHALLENGES OF BUSINESS MOBILITY

- Protecting against theft
- Protecting wireless connections
- Preventing viruses on a mobile device
- Addressing privacy concerns with RFID and LBS



LEARNING OUTCOME REVIEW

- Now that you have finished the chapter please review the learning outcomes in your text