

Wireless, Mobile Computing, and Mobile Commerce

- 1. Wireless Technologies
- 2. Wireless Computer Networks and Internet Access
- 3. Mobile Computing and Mobile Commerce
- 4. Pervasive Computing
- 5. Wireless Security



- 1. Identify advantages and disadvantages of each of the four main types of wireless transmission media.
- 2. Explain how businesses can use short-range, medium-range, and long-range wireless networks, respectively.
- 3. Provide a specific example of how each of the five major m-commerce applications can benefit a business.



- 4. Describe technologies that underlie pervasive computing, providing examples of how businesses can utilize each one.
- 5. Explain how the four major threats to wireless networks can damage a business.

OPENING





Mobile Commerce via Telemedicine at the Miami Children's Hospital

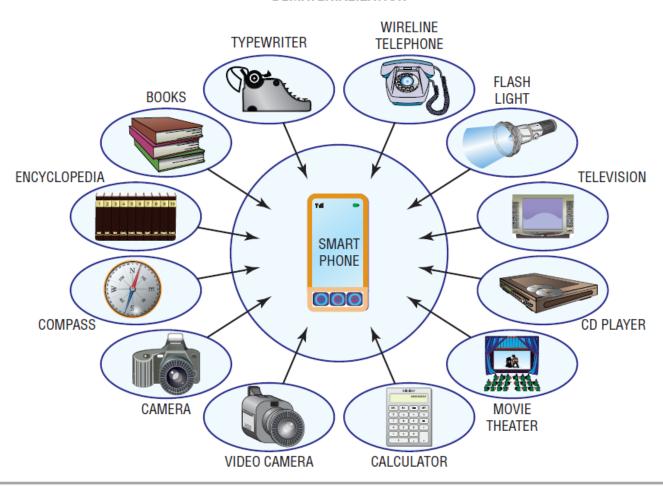
- 1. Describe the advantages and the disadvantages of the iPad mobile app for patients. Do the same thing for medical carts and medical kiosks.
- 2. Describe the advantages and the disadvantages of the iPad mobile app for Miami Children's Hospital. Do the same thing for medical carts and medical kiosks.

10.1 Wireless Technologies

- Wireless Devices
 - Dematerialization
- Wireless Transmission Media

Figure 10.1: Dematerialization with Smartphones

DEMATERIALIZATION



Wireless Devices

Wireless Devices Provide Three Major Advantages:

- 1. Small enough to easily carry or wear
- 2. Sufficient computing power to perform productive tasks.
- 3. Can communicate wirelessly with the Internet and other devices.

Table 10.1 Advantages & Disadvantages of Wireless Media

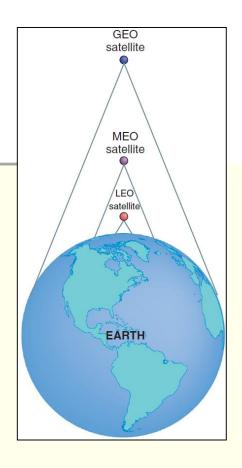
Channel	Advantages	Disadvantages	
Microwave	High bandwidth Relatively inexpensive	Must have unobstructed line of sight Susceptible to environmental interference	
Satellite	High bandwidth Large coverage area	Expensive Must have unobstructed line of sight Signals experience propagation delay Must use encryption for security	
Radio	High bandwidth Signals pass through walls Inexpensive and easy to install	Creates electrical interference problems Susceptible to snooping unless encrypted	
Infrared	Low to medium bandwidth	Must have unobstructed line of sight Used only for short distances	

Wireless Transmission Media: **Microwave**

- Advantages of Microware
 - High bandwidth
 - Relatively inexpensive
- Disadvantages of Microwave
 - Must have unobstructed line of sight
 - Susceptible to environmental
 - interference

Wireless Transmission Media: **Satellite**

- Advantages of Satellite
 - High bandwidth
 - Large coverage area
- Disadvantages of Satellite
 - Expensive
 - Must have unobstructed line of sight
 - Signals experience propagation delay
 - Must use encryption for security



Satellites

- Three Types of Satellites Circling Earth
 - 1. Geostationary-Earth-Orbit (GEO)
 - 2. Medium-Earth-Orbit (MEO)
 - 3. Low-Earth-Orbit (LEO)
- Footprint
- Propagation Delay
- Internet over Satellite (IoS)

Table 10.2: Three Basic Types of Telecommunications Satellites

Туре	Characteristics	Orbit	Number	Use
GEO	 Satellites stationary relative to point on Earth Few satellites needed for global coverage Transmission delay (approximately 0.25 second) Most expensive to build and launch Longest orbital life (many years) 	22,300 miles	8	TV signal
MEO	 Satellites move relative to point on Earth Moderate number needed for global coverage Requires medium-powered transmitters Negligible transmission delay Less expensive to build and launch Moderate orbital life (6–12 years) 	6,434 miles	10-12	GPS
LEO	 Satellites move rapidly relative to point on Earth Large number needed for global coverage Requires only low-power transmitters Negligible transmission delay Least expensive to build and launch Shortest orbital life (as low as 5 years) 	400–700 miles	Many	Telephone

Satellites: Geostationary-Earth-Orbit (GEO)

- 22,300 miles above earth
- Stationary relative to a point on Earth
- Transmission delay (.25 seconds)
- Longest orbital life (many years)
- Few Needed for Global Coverage
- Used for Television Signals
- Most Expensive to Build and Launch

Satellites: Medium-Earth-Orbit (MEO)

- 6,434 miles above earth
- Satellites moves relative to a point on Earth
- Negligible transmission delay
- Moderate orbital life (6-12 years)
- Moderate number needed for global coverage
- Used for Global Positioning Systems
- Less Expensive to Build and Launch

Satellites: Low-Earth-Orbit (LEO)

- 400-700 miles above earth
- Move rapidly in relation to a point on Earth
- Negligible transmission delay
- Shortest orbital life (low as 5 years)
- Large Number Needed for Global Coverage
- Least Expensive to Build and Launch

'S ABOUT BUSINESS 10.1

Skybox Imaging Provides Commercial Images from Earth's Orbit

- 1. Describe other applications of Skybox Imaging (not mentioned in the case).
- 2. Why might the U.S. government object to Skybox Imaging's business? Provide specific examples in your answer.
- 3. Might other nations object to Skybox Imaging's business? If so, which ones, and why?

Wireless Transmission Media: **Radio**

- Advantages of Radio
 - High bandwidth
 - Signals pass through walls
 - Inexpensive and easy to install
- Disadvantages of Radio
 - Creates electrical interference problems
 - Susceptible to snooping unless encrypted

Wireless Transmission Media: **Infrared**

- Advantages of Infrared
 - Low to medium bandwidth
- Disadvantages of Infrared
 - Must have unobstructed line of sight
 - Used only for short distances

10.2 Wireless Computer Networks and Internet Access

- Short-Range Wireless Networks
- Medium-Range Wireless Networks
- Wide-Area Wireless Networks

Short-Range Wireless Networks

- Bluetooth
 - Bluetooth 1.0
 - Bluetooth 4.0
- Personal Area Network
- Ultra-Wideband
- Near-Field Communications

Medium-Range Wireless Networks

- Wireless Fidelity (Wi-Fi)
- Wireless Mesh Networks

Wireless Fidelity (Wi-Fi)

- Wireless Access Point
- Hotspot
- IEEE Wi-Fi Standards
- Major Benefits of Wi-Fi
- Wi-Fi Direct
- MiFi
- Super Wi-Fi
- Wireless Mesh Networks



IEEE Wi-Fi Standards

- Institute of Electrical and Electronics Engineers (IEEE) WiFI Standards
- 802.11a
- 802.11b
- 802.11g
- 802.11n
- 802.11ac
- 802.11 ad

Major Benefits of Wi-Fi

- Low cost
- Ability to provide simple Internet access

Three Factors Preventing Commercial Wi-Fi Market from Expanding:

- Roaming
- Security
- Cost

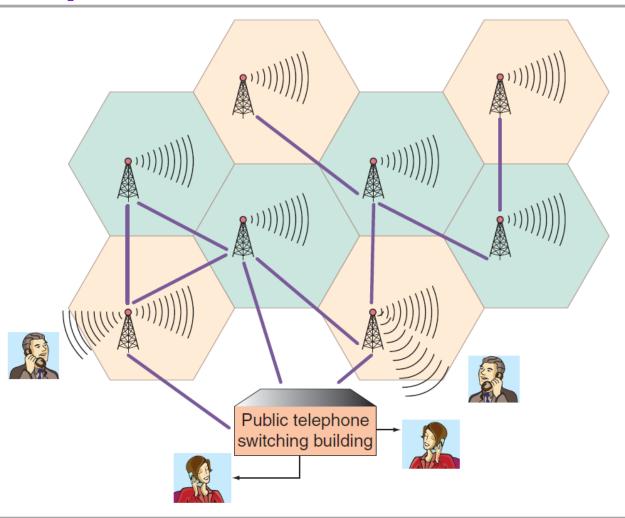
'S ABOUT BUSINESS 10.2

- A Wi-Fi Network Provides Communications at the 2014 Winter Olympic Games
 - 1. Describe why wireless communications were critical to the success of the 2014 Winter Olympic Games. Provide specific examples to support your answer.
 - What other potential problems did Avaya have to consider that were not mentioned in this case? Provide specific examples to support your answer.

Wide-Area Wireless Networks

- Cellular Radio
- Generations of Cellular Technology Evolution
- Wireless Broadband or WiMAX

Figure 10.5: Smart Phone & GPS system



Generations of Cellular Technology Evolution

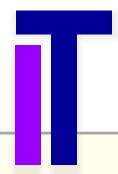
- (1G) First generation
- (2G) Second generation
- 2.5G
- (3G) Third generation
- (4G) Fourth generation
- (5G) Fifth generation

Wireless Broadband or WiMAX

- Worldwide Interoperability for Microwave Access (WiMAX)
- WiMAX = IEEE Standard 802.16
- Wireless access range of up to 31 miles
- Data transfer rate of up to 75 Mbps
- A secure system offering voice and video

'S ABOUT BUSINESS 10.3

- A Tiny Cellular Network for a Remote Tribe in Indonesia
 - 1. Describe several advantages of the network for the villagers.
 - 2. Describe several advantages of the network for the Indonesian government.



Wireless and Mobile

What the GSM3GHSDPA14GLTE???

10.3 Mobile Computing and Mobile Commerce

- Mobile Computing, Mobility, and Broad Reach
- Mobile Commerce
- Mobile Commerce Applications

Mobility and Broad Reach

Mobility and Broad Reach Create Five Value-added Attributes:

- 1. Ubiquity
- 2. Convenience
- 3. Instant connectivity
- 4. Personalization
- 5. Localization of products and services

Mobile Commerce

Development of M-Commerce is Driven by:

- Widespread availability of mobile devices
- Declining prices
- Bandwidth improvement

Mobile Commerce Applications

- Location-Based Applications and Services
- Financial Services
- Intrabusiness Applications
- Accessing Information
- Telemetry Applications

Location-Based Applications and Services

- Location-Based Commerce (L-Commerce)
- Benefits of Location-Based Services for Users
- Benefits of Location-Based Services for Service Providers

Benefits of Location-Based Services for Users:

- Request the nearest business or service
- Receive alerts
- Find a friend
- Locating taxis, service personnel, doctors, and rental equipment

Benefits of Location-Based Services for Service Providers

- Schedule fleets
- Tracking objects such as packages and train boxcars
- Find information such as navigation, weather, traffic, and room schedules
- Targeting advertising
- Automating airport check-ins

'S ABOUT BUSINESS 10.4

Apple's iBeacons

- 1. What other uses for iBeacon can you think of?
- 2. Other than privacy concerns, what are other possible disadvantages of the iBeacon app? Provide specific examples to support your answer.

Mobile Commerce Applications: Financial Services

- Banking
- Micropayments
- Money Transfers
- Wireless Mobile Wallets (M-Wallets)
- Bill Payment Services

Intrabusiness Applications

Mobile Computing For Employee Support:

- Workflow Applications
- Dispatch Functions

Target Areas for Mobile Delivery and Dispatch Services:

- Employee job assignment
- Transportation
- Utilities
- Field service
- Healthcare
- Security

Accessing Information

- Mobile Portals
- Voice Portals

Mobile Computing Applications: Telemetry

- Identify maintenance problems in equipment
- Monitor medical patients
- Control medical equipment remotely
- Remote vehicle diagnosis & preventive maintenance
- Find My iPhone

10.4 Pervasive Computing

- Radio-Frequency Identification (RFID)
- Wireless Sensor
- Networks
- The Internet of Things



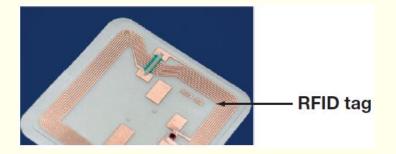
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Radio-Frequency Identification (RFID)

- RFID
- Bar Codes
- QR Codes







RFID

- RFID Systems
- Two Basic Types of RFID Tags
 - Active RFID Tags
 - Passive RFID Tags

Bar Codes

Limitations of Bar Codes:

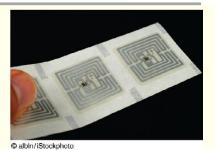
- Requires line of sight from scanning device
- Pose substantial problems in manufacturing plants, warehouses and shipping/receiving docks
- Paper bar codes are easily damaged
- Identifies the manufacturer and product but not the actual item

QR Codes: Advantages Over Bar Codes

- Store more information
- Data types stored include numbers, text, URLs, and even Japanese characters.
- Smaller because they store information both horizontally and vertically.
- Read from any direction or angle
- More resistant to damage

'S ABOUT BUSINESS 10.5

Marks & Spencer Embraces RFID



- 1. Describe how RFID technology can generate increased customer satisfaction.
- 2. What are potential disadvantages to implementing RFID technology in a retailer such as Marks & Spencer?
- 3. Why did Marks & Spencer initially deploy RFID technology on a limited basis? In your opinion, was this the correct strategy? Why or why not? Be specific.

Wireless Sensor Networks

- Motes
- Capability of Wireless Sensor Networks
- Applications of Wireless Sensor Networks

Capability of Wireless Sensor Networks

- If one mote fails the gap is covered by nearby motes
- Provides data on activities from different angles
- Determine direction of movement
- Weight of a vehicle
- Amount of rainfall over a field of crops

Applications of Wireless Sensor Networks

- Digital thermostats for energy efficiency
- Repair alerts on bridges and oil rigs
- Real time operating performance reporting in jet engines
- Warning of produce spoilage
- Improve a city's use of utilities
- Smart/digital water meters
- Smart electrical meters

The Internet of Things (IoT)

- Capabilities of IoT
- Examples of IoT Use

Capabilities of IoT

- Reducing waste, loss, and cost
- Identifying the need for repair, replacement, or recall
- Tracking expiration data on perishable items

Examples of IoT Use

- Coke machines
- A heart monitor implant
- A farm animal with a biochip transmitter
- An automobile tire pressure

10.5 Wireless Security

Four Major Threats to Wireless Networks

- Rogue Access Point (Evil Twin)
- War Driving
- Eavesdropping
- Radio Frequency Jamming