



# CHAPTER: 02-MOBILE COMPUTING

MOBILE COMPUTING AND COMMERCE AND  
PERVASIVE COMPUTING

# LEARNING OBJECTIVES

1. Describe the mobile computing environment that supports m-commerce (devices, software, services).
2. Describe the four major types of wireless telecommunications networks.
3. Define mobile commerce and understand its relationship to e-commerce.
4. Discuss the value-added attributes, benefits, and fundamental drivers of m-commerce.
5. Discuss m-commerce applications in finance, shopping, advertising, and provision of content.
6. Describe the application of m-commerce within organizations.

# LEARNING OBJECTIVES

7. Understand B2B and supply chain management applications of m-commerce.
8. Describe consumer and personal applications of m-commerce.
9. Understand the technologies and potential application of location-based m-commerce.
10. Describe the major inhibitors and barriers of m-commerce.
11. Discuss the key characteristics and current uses of pervasive computing.

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ **New Computing Environment: Mobile Computing**

### ■ **Mobile devices**

#### ■ **personal digital assistant (PDA)**

A handheld computer principally used for personal information management

#### ■ **smartphone**

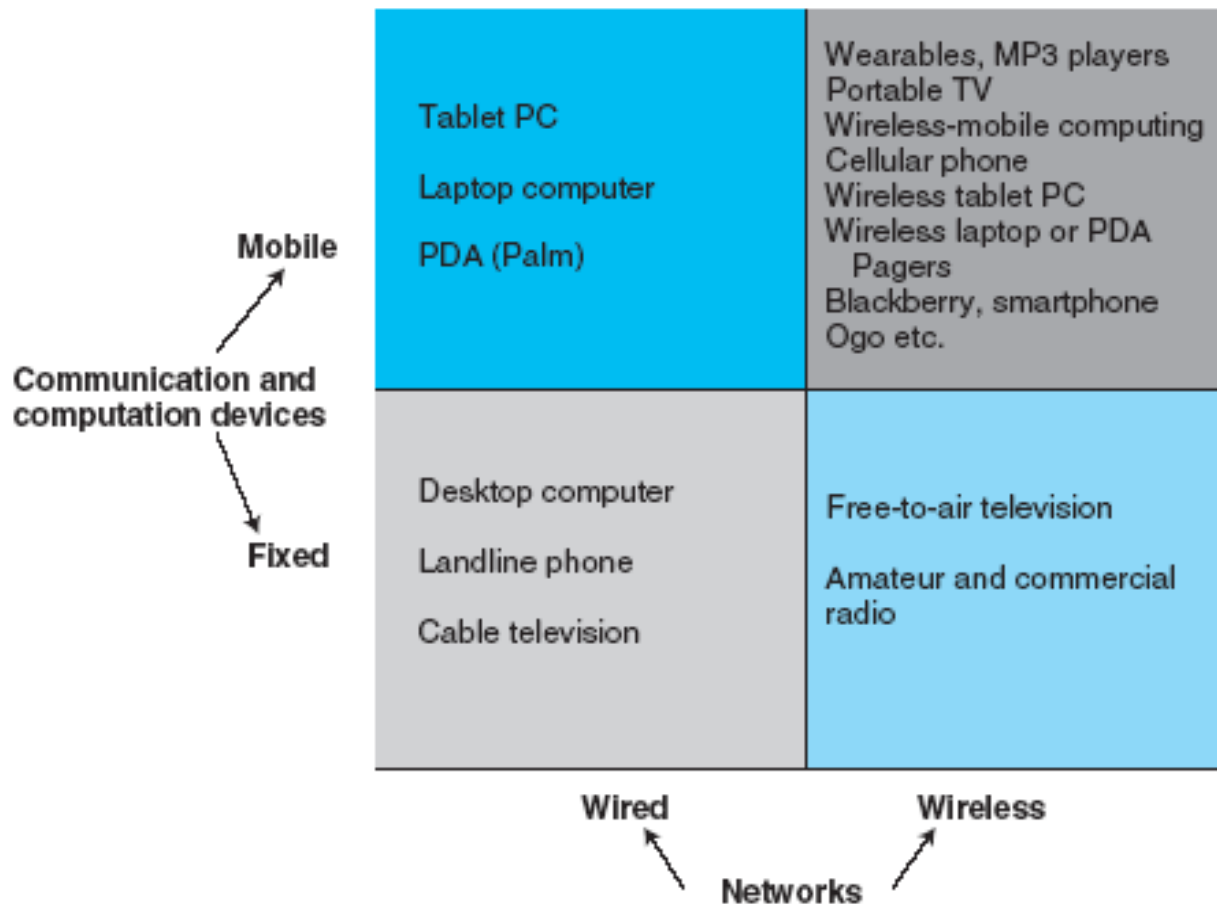
Internet-enabled cell phone that can support mobile applications

#### ■ **Blackberry**

A handheld device principally used for e-mail

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## EXHIBIT 9.1 The Wireless Mobile Environment



# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ **Conversion of devices**

These handheld devices blend blogging, Instant Messages, SMS, and other forms of social networking in which Web browsing is easy, especially with a full keyboard

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ **Enabling Technologies for Mobile Computing**

- Hardware and software infrastructures that support the wireless connection include:
  - Network access points
  - Mobile communications server switches
  - Cellular transmitters and receivers

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ Mobile Computing Software

- Mobile operating system
- Mobile application user interface
- **micro browser**

Wireless Web browser designed to operate with small screens and limited bandwidth and memory requirements

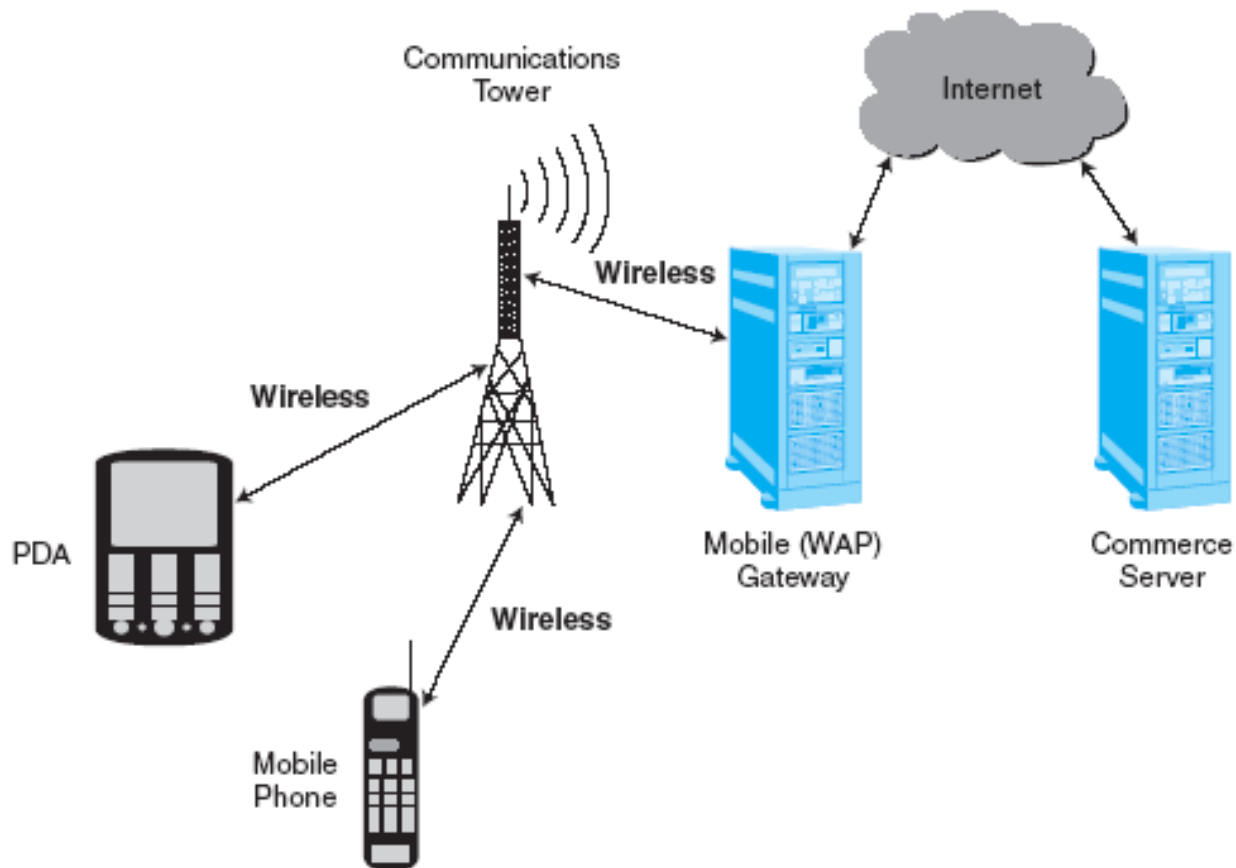
## ■ **Wireless Application Protocol (WAP)**

A suite of network protocols designed to enable different kinds of wireless devices to access WAP readable files on an Internet-connected Web server



# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

**EXHIBIT 9.3 WAP Architecture**



# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

- Markup languages

- **Wireless Markup Language (WML)**

- A scripting language used to create content in the WAP environment; based on XML, minus unnecessary content to increase speed

- **Compact Hypertext Markup Language (cHTML)**

- A scripting language used to create content in i-mode

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

- **Extensible Hypertext Markup Language (xHTML)**

A general scripting language; compatible with HTML; a standard set by W3 Consortium

- **voice XML (VXML)**

An extension of XML designed to accommodate voice

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

- Supporting devices

- **synchronization**

- The exchange of updated information with other computing devices

- Docking stations

- Attachable keyboards

- Batteries

- Media players

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ Mobile Computing Services

### ■ Short Message Service (SMS)

A service that supports the sending and receiving of short text messages on mobile phones

### ■ Enhanced Messaging Service (EMS)

An extension of SMS that can send simple animation, tiny pictures, sounds, and formatted text

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ **Multimedia Messaging Service (MMS)**

The emerging generation of wireless messaging; MMS is able to deliver rich media

## ■ **E-payments**

Electronic payments for purchase amounts.

# MOBILE COMPUTING: CONTENT, INFRASTRUCTURE, AND SERVICES

## ■ Location-based services

### ■ **global positioning system (GPS)**

A worldwide satellite-based tracking system that enables users to determine their position anywhere on the earth

## ■ Voice-support services

### ■ **interactive voice response (IVR)**

A voice system that enables users to request and receive information and to enter and change data through a telephone to a computerized system

### ■ **voice portal**

A Web site with an audio interface that can be accessed through a telephone call

# WIRELESS TELECOMMUNICATIONS NETWORKS

- **personal area network (PAN)**

A wireless telecommunications network for device-to-device connections within a very short range

- **Bluetooth**

A set of telecommunications standards that enables wireless devices to communicate with each other over short distances



# WIRELESS TELECOMMUNICATIONS NETWORKS

## ■ **Wireless Local Area Networks and Wi-fi**

### ■ **wireless local area network (WLAN)**

A telecommunications network that enables users to make short-range wireless connections to the Internet or another network

### ■ **Wi-Fi (wireless fidelity)**

The common name used to describe the IEEE 802.11 standard used on most WLANs

# WIRELESS TELECOMMUNICATIONS NETWORKS

## ■ 802.11b

The most popular Wi-Fi standard; it is inexpensive and offers sufficient speed for most devices; however, interference can be a problem

## ■ 802.11a

This Wi-Fi standard is faster than **802.11b** but has a smaller range

## ■ 802.11g

This fast but expensive Wi-Fi standard is mostly used in businesses

# WIRELESS TELECOMMUNICATIONS NETWORKS

- **wireless access point**

An antenna that connects a mobile device to a wired LAN

- **hotspot**

An area or point where a wireless device can make a connection to a wireless local area network (using Wi-Fi)



# WIRELESS TELECOMMUNICATIONS NETWORKS

## ■ **Municipal Wi-Fi Networks**

### ■ **WiMAX**

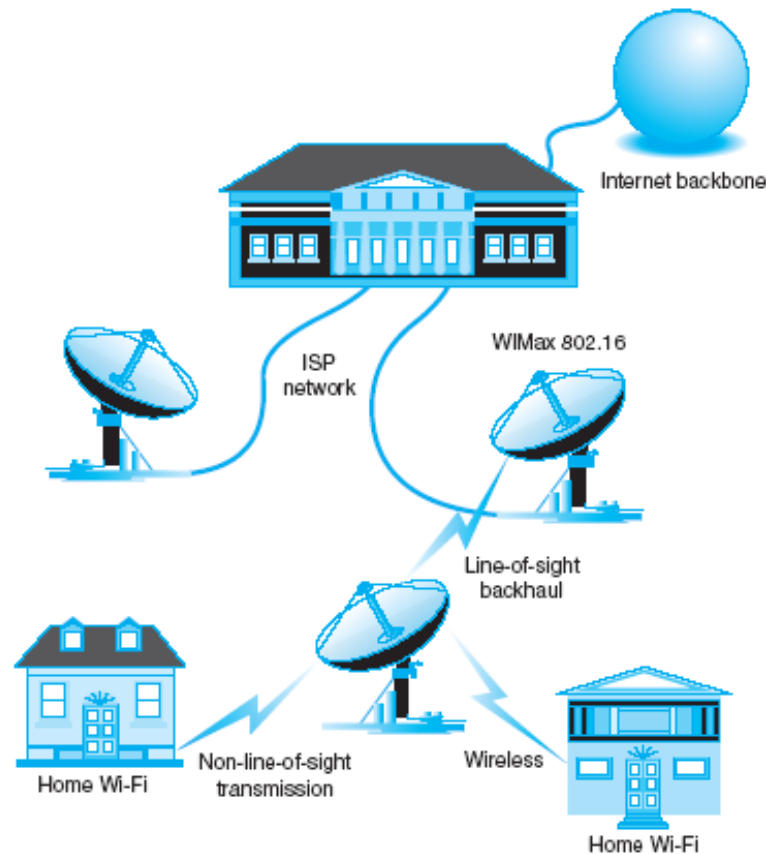
A wireless standard (IEEE 802.16) for making broadband network connections over a medium size area such as a city

### ■ **wireless metropolitan area network (WMAN)**

A telecommunications network that enables users to make medium-range wireless connections to the Internet or another network

# WIRELESS TELECOMMUNICATIONS NETWORKS

EXHIBIT 9.5 **Components of a WiMax Communications Network**



# WIRELESS TELECOMMUNICATIONS NETWORKS

## ■ WIRELESS WIDE AREA NETWORKS

### ■ Wireless wide area network (WWAN)

A telecommunications network that offers wireless coverage over a large geographical area, typically over a cellular phone network

### ■ Physical topology of a WWAN

#### ■ subscriber identification module (SIM) card

An extractable storage card used for identification, customer location information, transaction processing, secure communications, etc.

# MOBILE COMMERCE: ATTRIBUTES, BENEFITS, AND DRIVERS

## ■ **mobile commerce (m-commerce, m-business)**

Any business activity conducted over a wireless telecommunications network or from mobile devices

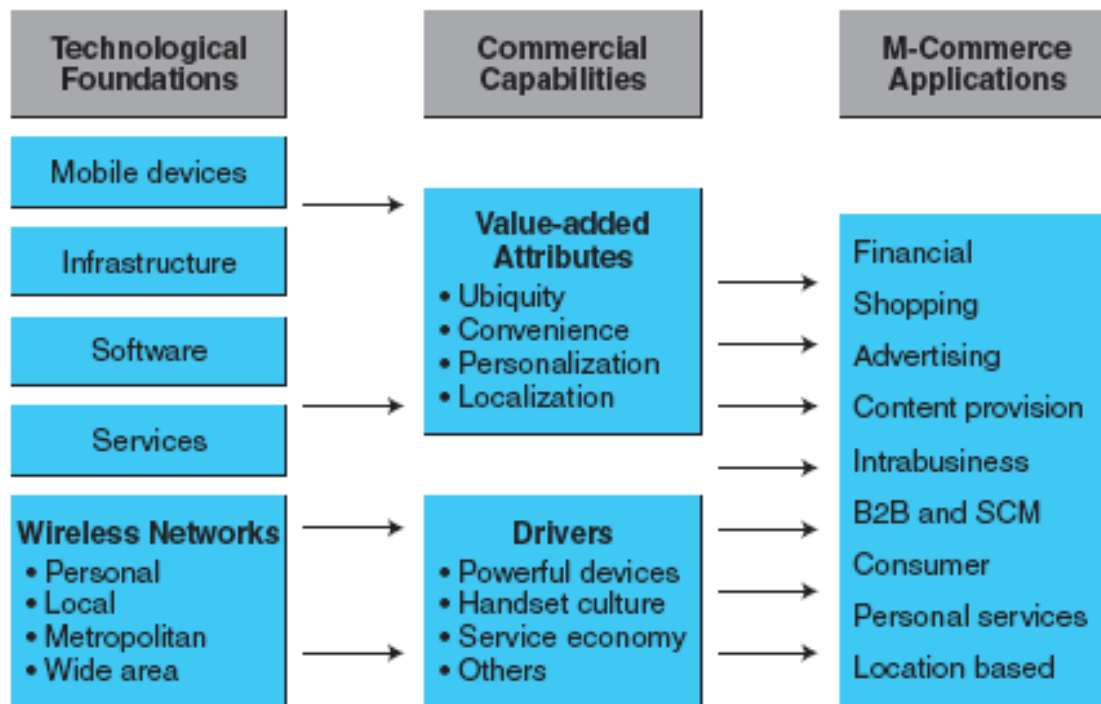
## ■ **Attributes of M-Commerce**

- Ubiquity
- Convenience
- Interactivity
- Personalization
- Localization



# MOBILE COMMERCE: ATTRIBUTES, BENEFITS, AND DRIVERS

**EXHIBIT 9.7 The Mobile Commerce Landscape**



**Management and financial considerations:** planning, cost-benefit analysis, security and privacy risk assessment, project management, implementation, etc.

# MOBILE COMMERCE: ATTRIBUTES, BENEFITS, AND DRIVERS

## ■ Drivers of M-Commerce

- Widespread availability of more powerful devices
- The handset culture
- The service economy
- Vendor's push
- The mobile workforce
- Increased mobility
- Improved price/performance
- Improvement of bandwidth

# MOBILE FINANCIAL APPLICATIONS

## ■ **Mobile Banking and Financial Services**

- Customers can use their mobile handsets to access account balances, pay bills, and transfer funds using SMS

## ■ **Wireless Electronic Payment Systems**

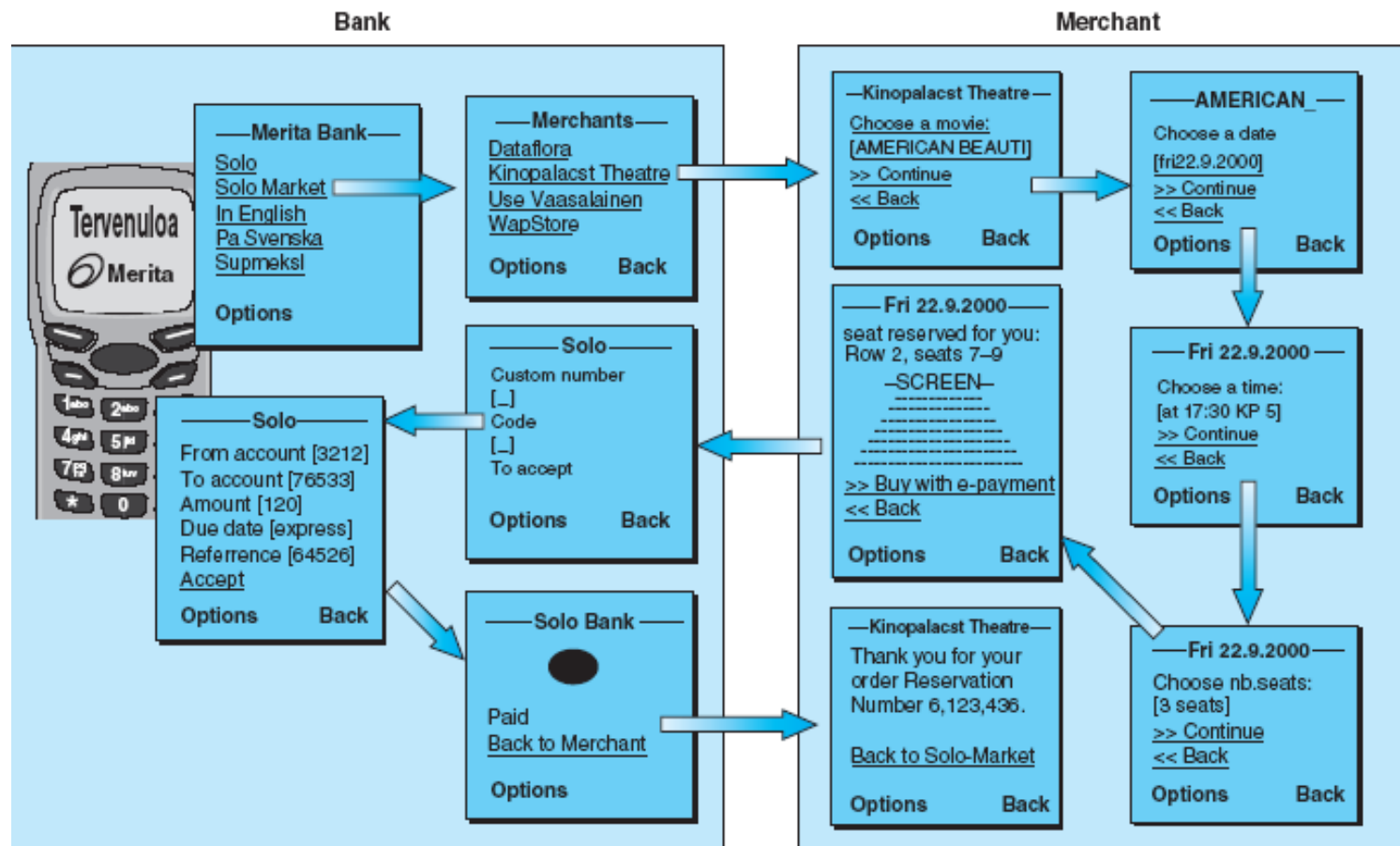
- Wireless payment systems transform mobile phones into secure, self-contained purchasing support tools capable of instantly authorizing payments over the cellular network

### ■ **m-wallet (mobile wallet)**

Technologies that enable cardholders to make purchases with a single click from their wireless device

# MOBILE FINANCIAL APPLICATIONS

**EXHIBIT 9.8 Purchasing Movie Tickets with WAP Solo**



# MOBILE FINANCIAL APPLICATIONS

## ■ **Wireless Bill Payments**

- A number of companies are now providing their customers with the option of paying their bills directly from a cell phone
- Closing the digital divide
  - Using WWANs, mobile devices, and even regular cell phones, are closing the digital divide in developing countries such as China, India, and the Philippines

# MOBILE SHOPPING, ADVERTISING, AND CONTENT

## ■ **Wireless Shopping**

- An increasing number of online vendors allow customers to shop from wireless devices, especially cell phones and PDAs

## ■ **Mobile and Targeted Advertising**

- Knowing the real-time location of mobile users and their preferences or surfing habits, marketers can send user-specific advertising messages to wireless devices

# MOBILE SHOPPING, ADVERTISING, AND CONTENT

## ■ **mobile portal**

A customer interaction channel that aggregates content and services for mobile users

# MOBILE ENTERPRISE AND SUPPLY CHAIN

## ■ Support of Mobile Employees

- Mobile office

- **sales force mobilization**

The process of equipping sales force employees with wireless Internet-enabled computing devices

- Worker support in retailing

- Support in hospitals

- Support in operations



# MOBILE ENTERPRISE AND SUPPLY CHAIN

- Tracking employees
- Job dispatch
- Maintenance and repair at remote sites
- **wearable devices**

Mobile wireless computing devices, attached to various parts of employees, for employees who work on buildings and other climbable workplaces

# MOBILE ENTERPRISE AND SUPPLY CHAIN

- **Supporting Other Types of Work**
- **Customer and Partner Support**
- **Non-Internet Enterprise Applications**
- **B2B M-Commerce and Supply Chain Management**

# MOBILE PERSONAL AND CONSUMER SERVICE APPLICATIONS

## ■ **Mobile Entertainment**

- Mobile games and gambling
- Hands-free driving

## ■ **Wireless Telemedicine**

## ■ **Other Mobile Computing Services for Consumers**

## ■ **Non-Internet Mobile Applications for Consumers**

# LOCATION-BASED MOBILE COMMERCE

## ■ **location-based m-commerce (l-commerce)**

Delivery of m-commerce transactions to individuals in a specific location, at a specific time

## ■ The services provided through location-based m-commerce focus on five key factors:

1. Location
2. Navigation
3. Tracking
4. Mapping
5. Timing

# LOCATION-BASED MOBILE COMMERCE

## ■ The Technology For L-Commerce

- Global positioning system

- **geographical information system (GIS)**

A computer system capable of integrating, storing, editing, analyzing, sharing, and displaying geographically-referenced (spatial) information

- GPS/GIS applications

# LOCATION-BASED MOBILE COMMERCE

## ■ Location-Based Advertising

## ■ Emergency Response Cell Phone Calls

### ■ wireless 911

In the United States, emergency response system that processes calls from cellular phones

### ■ automatic crash notification (ACN)

Device that automatically sends the police the location of a vehicle that has been involved in a crash

# LOCATION-BASED MOBILE COMMERCE

## ■ Telematics

The integration of computers and wireless communications to improve information flow using the principles of telemetry

## ■ Other Applications of Location-Based Systems

# LOCATION-BASED MOBILE COMMERCE

## ■ Barriers to Location-Based

### M-Commerce

- Accuracy of devices
- The cost-benefit justification
- Limited network bandwidth
- Invasion of privacy



# SECURITY AND OTHER IMPLEMENTATION ISSUES IN M-COMMERCE

## ■ **M-Commerce Security Issues**

- Malicious codes
- Transaction security
- Wireless communication
- Physical security of mobile devices
- Ease of use and poor security
- Security measures

# SECURITY AND OTHER IMPLEMENTATION ISSUES IN M-COMMERCE

## ■ **Technological Barriers to M-Commerce**

- Many Web sites are not designed for viewing by mobile devices
- Current devices have limited usability, particularly with respect to pocket-size screens or data input devices
- Quick and easy navigation of sites is necessary but not always available in the mobile environment

# PERVASIVE COMPUTING

## ■ pervasive computing

Invisible, everywhere computing that is embedded in the objects around us

### ■ Invisible computing

### ■ Principles of pervasive computing

- Decentralization

- Diversification

- Connectivity

- Simplicity

# PERVASIVE COMPUTING

- **contextual computing**

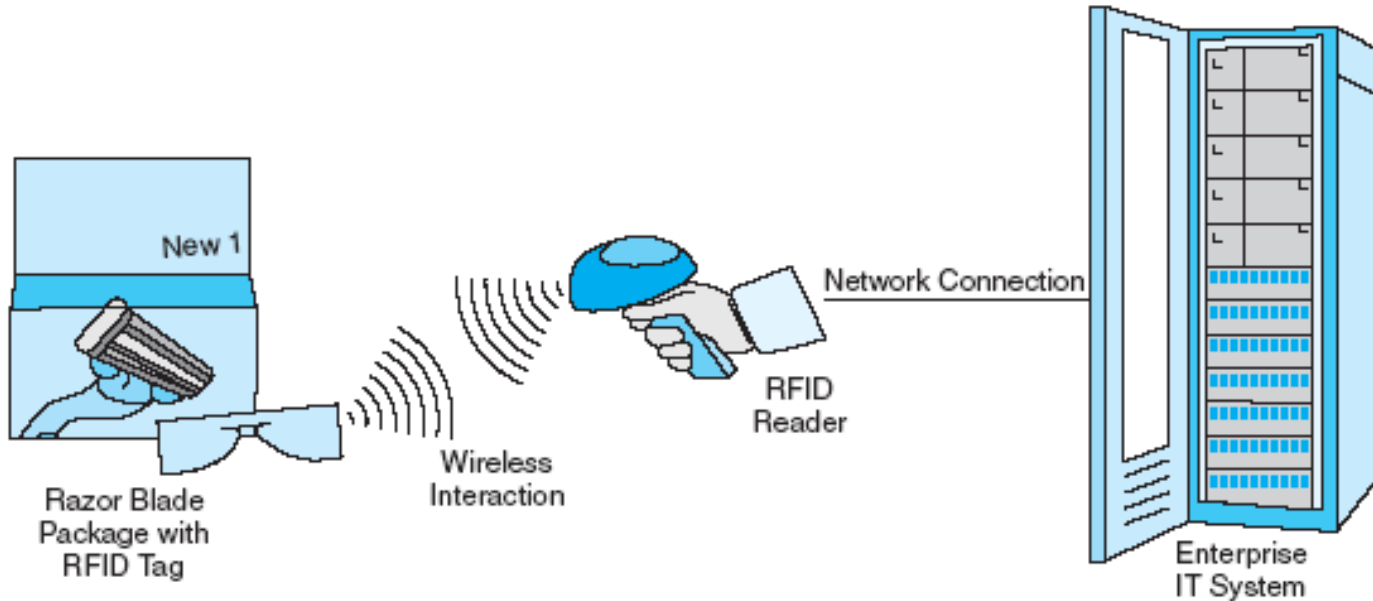
The enhancement of a user's interactions by understanding the user, the context, and the applications and information required

- **radio frequency identification (RFID)**

Technology that uses radio waves to identify items

# PERVASIVE COMPUTING

## EXHIBIT 9.10 How RFID Works



# PERVASIVE COMPUTING

## ■ **RFID Applications**

- Track moving vehicles
- Track people
- Track individual items
- Protect secure areas
- Record transactions

## ■ **Electronic Product Code (EPC)**

An RFID code that identifies the manufacturer, producer, version, and serial number of individual consumer products

# PERVASIVE COMPUTING

## ■ **Smart Applications: Homes, Cars, and More**

### ■ Smart homes

- Lighting

- Energy management

- Water control

- Home security and communications

- Home entertainment

### ■ Smart cars

### ■ sensor network

A series of interconnected sensors that monitor the environment in which they are placed

# PERVASIVE COMPUTING

## ■ **Barriers to Pervasive Computing**

- A number of technological, legal, and ethical issues still need to be fully explored and resolved if the promises of pervasive computing are to be realized



# END OF CHAPTER 2

■ End of Chapter 02