

Mobile Commerce  
and Ubiquitous Computing

# Chapter 6

# Learning Objectives

1. Discuss the value-added attributes, benefits, and fundamental drivers of m-commerce.
2. Describe the mobile computing infrastructure that supports m-commerce (devices, software, services).
3. Describe the four major types of wireless telecommunications networks.
4. Discuss m-commerce applications in banking and financial services.
5. Describe enterprise applications.

# Learning Objectives

6. Describe consumer and personal applications of m-commerce including entertainment.
7. Understand the technologies and potential applications of location-based m-commerce.
8. Define and describe ubiquitous computing and sensory networks.
9. Describe the major implementation issues from security and privacy to barriers of m-commerce.

# Mobile Commerce: Concepts, Landscape, Attributes, Drivers, Applications, and Benefits

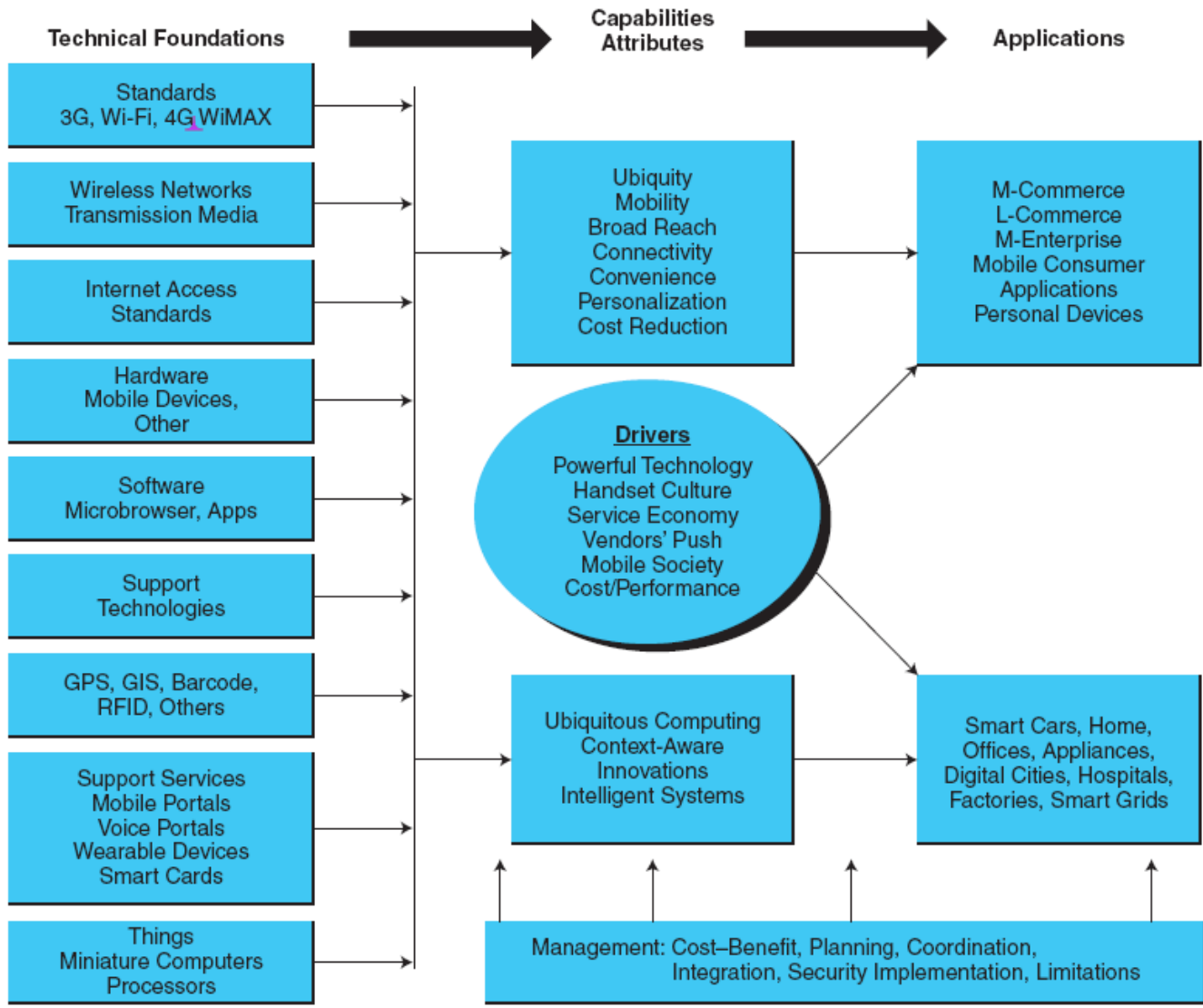
- **mobile commerce (m-commerce; m-business)**

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

- **THE ATTRIBUTES OF M-COMMERCE**

- Ubiquity
- Convenience
- Interactivity
- Personalization
- Localization

# EXHIBIT 6.1 The Landscape of Mobile Computing and M-Commerce



# Mobile Commerce: Concepts, Landscape, Attributes, Drivers, Applications, and Benefits

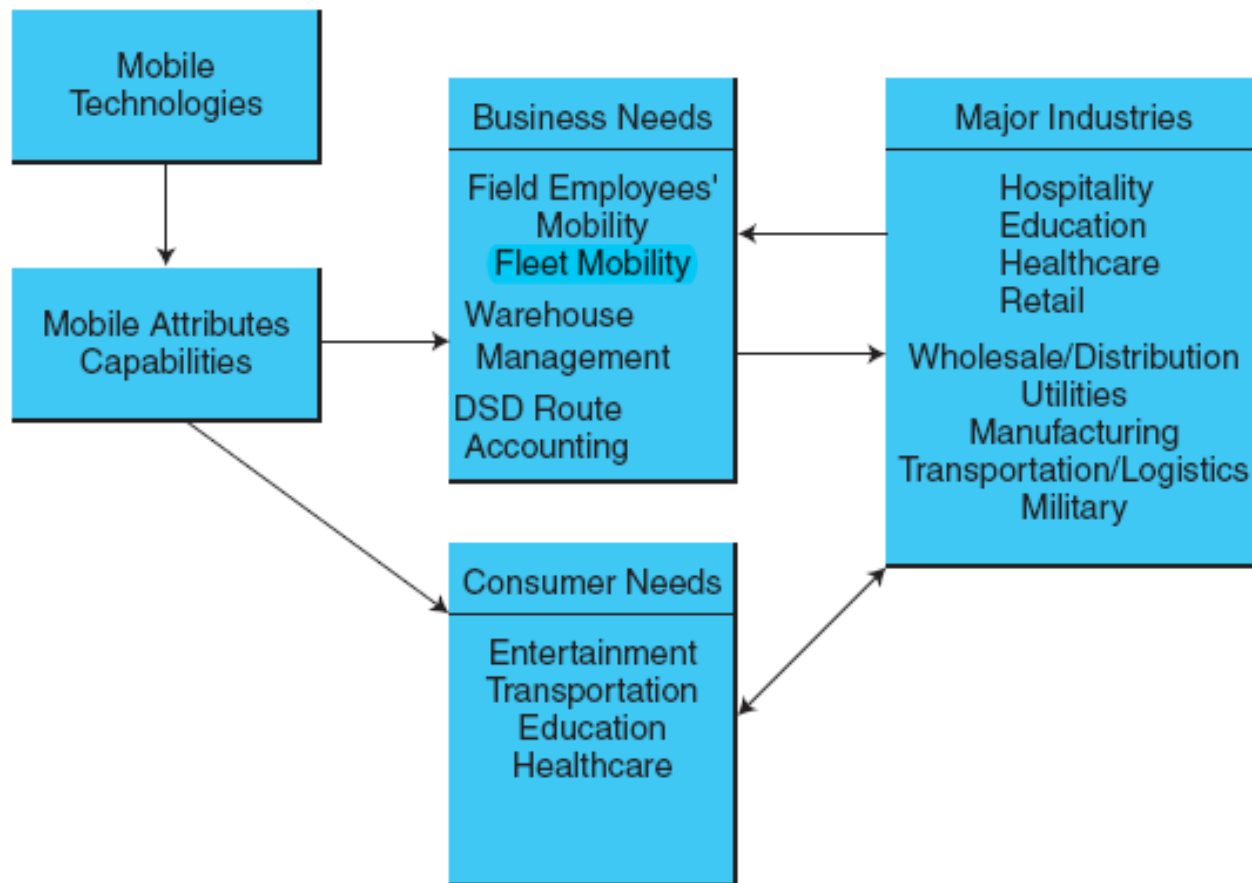
- **DRIVERS OF M-COMMERCE**
  - Widespread availability of more powerful mobile devices
  - The handset culture
  - The service economy
  - Vendor's push
  - The mobile workforce and mobile enterprise
  - Improved price/performance
  - Improving bandwidth

# Mobile Commerce: Concepts, Landscape, Attributes, Drivers, Applications, and Benefits

- **AN OVERVIEW OF THE APPLICATIONS OF M-COMMERCE**
  1. Field mobility
  2. Fleet mobility
  3. Warehouse management
  4. Direct store delivery (DSD) route accounting

EXHIBIT 6.2

# M-Commerce Applications and Their Classifications





# Mobile Commerce: Concepts, Landscape, Attributes, Drivers, Applications, and Benefits

- **THE BENEFITS OF M-COMMERCE**
  - **Benefits for Organizations**
  - **Benefits for Individuals and Customers**
  - **Other Benefits**

# Technical Infrastructure: Components and Services of Mobile Computing

- **OVERVIEW OF MOBILE COMPUTING**

- **wireless mobile computing (mobile computing)**

- Computing that connects a mobile device to a network or another computing device, anytime, anywhere

## EXHIBIT 6.3

# Mobile Computing Basic Terminology

**Bluetooth.** A chip technology wireless standard designed for temporary, short-range connection (data and voice) among mobile devices and/or other devices (see *bluetooth.org*).

**Global Positioning System (GPS).** A satellite-based tracking system that enables the determination of a GPS device's location. (See Section 6.6 for more on GPS.)

**Personal Digital Assistant (PDA).** A small portable computer, such as BlackBerry handhelds and the pocket PC devices from companies like Research In Motion or Palm.

**Short Messaging Service (SMS).** A technology for sending short text messages (up to 160 characters) on cell phones. SMS messages can be sent or received concurrently, even during a voice or data call. Used by hundreds of millions of users, SMS is known as "the e-mail of m-commerce." Some companies offer multilanguage text creation.

**Smartphones.** Internet-enabled cell phones that can support mobile applications. These "phones with a brain" are becoming standard devices. They include WAP microprocessors for Internet access and the capabilities of PDAs as well. The iPhone is the most popular example of a smartphone.

**WiMAX.** A wireless technology based on the IEEE 802.16-2004 standard, designed to provide Internet access across metro areas to fixed (not moving) users. It is considered wireless broadband technology.

**Wireless Application Protocol (WAP).** A technology that offers Internet browsing from wireless devices.

**Wireless Local Area Network (WLAN).** A broad term for all 802.11 standards. Basically, it is a wireless version of the Ethernet networking standard.

For an extensive list of other terms, see *harvest.cals.ncsu.edu/index.cfm?showpage=291* and *webopedia.com/Mobile\_Computing*.

# Technical Infrastructure: Components and Services of Mobile Computing

- **MOBILE DEVICES**

- **personal digital assistant (PDA)**

- A stand-alone handheld computer principally used for personal information management

- **smartphone**

- A mobile phone with PC-like capabilities

- **Tablets**

# Technical Infrastructure: Components and Services of Mobile Computing

## Other Mobile Devices

- Smartbooks
- Wearable devices
- Screen
- Camera
- Touch-panel display
- Keyboard
- Speech translator
- Watch-like device
- RFID (radio frequency identification)
- Scanners
- **mobile browser (microbrowser)**  
Web browser designed for use on a mobile device optimized to display Web content most effectively for small screens on portable devices
- **Dashtop mobile**

# Technical Infrastructure: Components and Services of Mobile Computing

- **MOBILE COMPUTING SOFTWARE AND SERVICES**

- **mobile portal**

A gateway to the Internet optimized for mobility that aggregates and provides content and services for mobile users

- **Content providers**

- **short message service (SMS)**

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

# Technical Infrastructure: Components and Services of Mobile Computing

- **multimedia messaging service (MMS)**

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

- **Location-Based Services**

- **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 website with an audio interface that can be accessed through a telephone call

# Technical Infrastructure: Components and Services of Mobile Computing

- **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



# Technical Infrastructure: Components and Services of Mobile Computing

- **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

# Technical Infrastructure: Components and Services of Mobile Computing

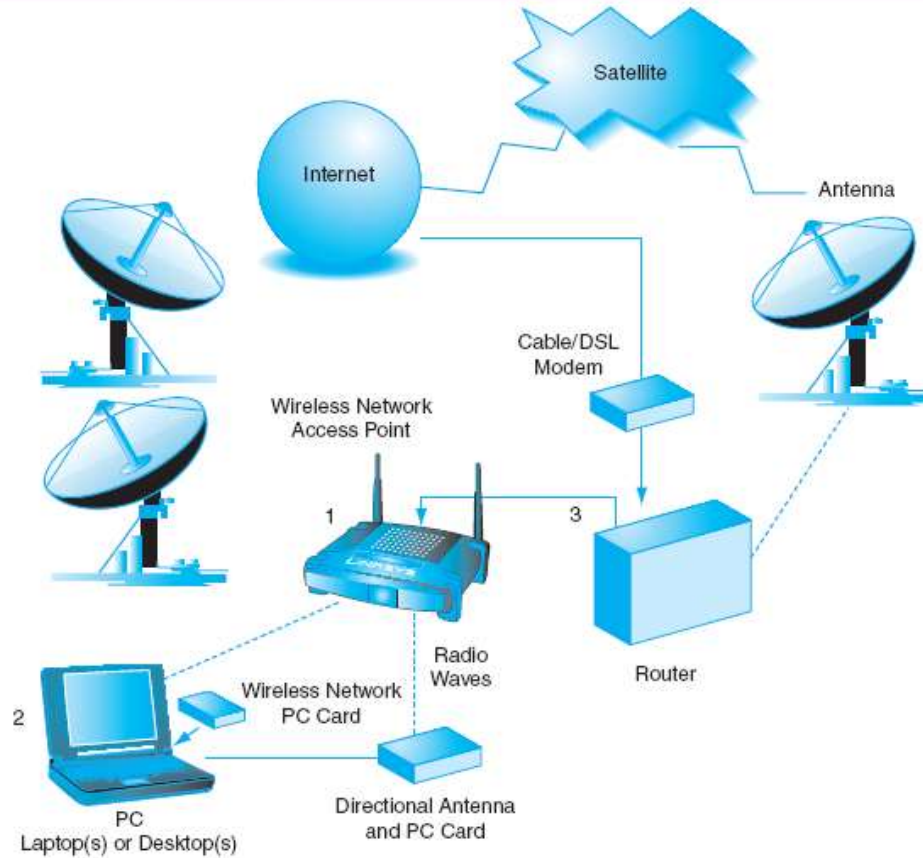
- **WiMAX**

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

- **wireless wide area network (WWAN)**

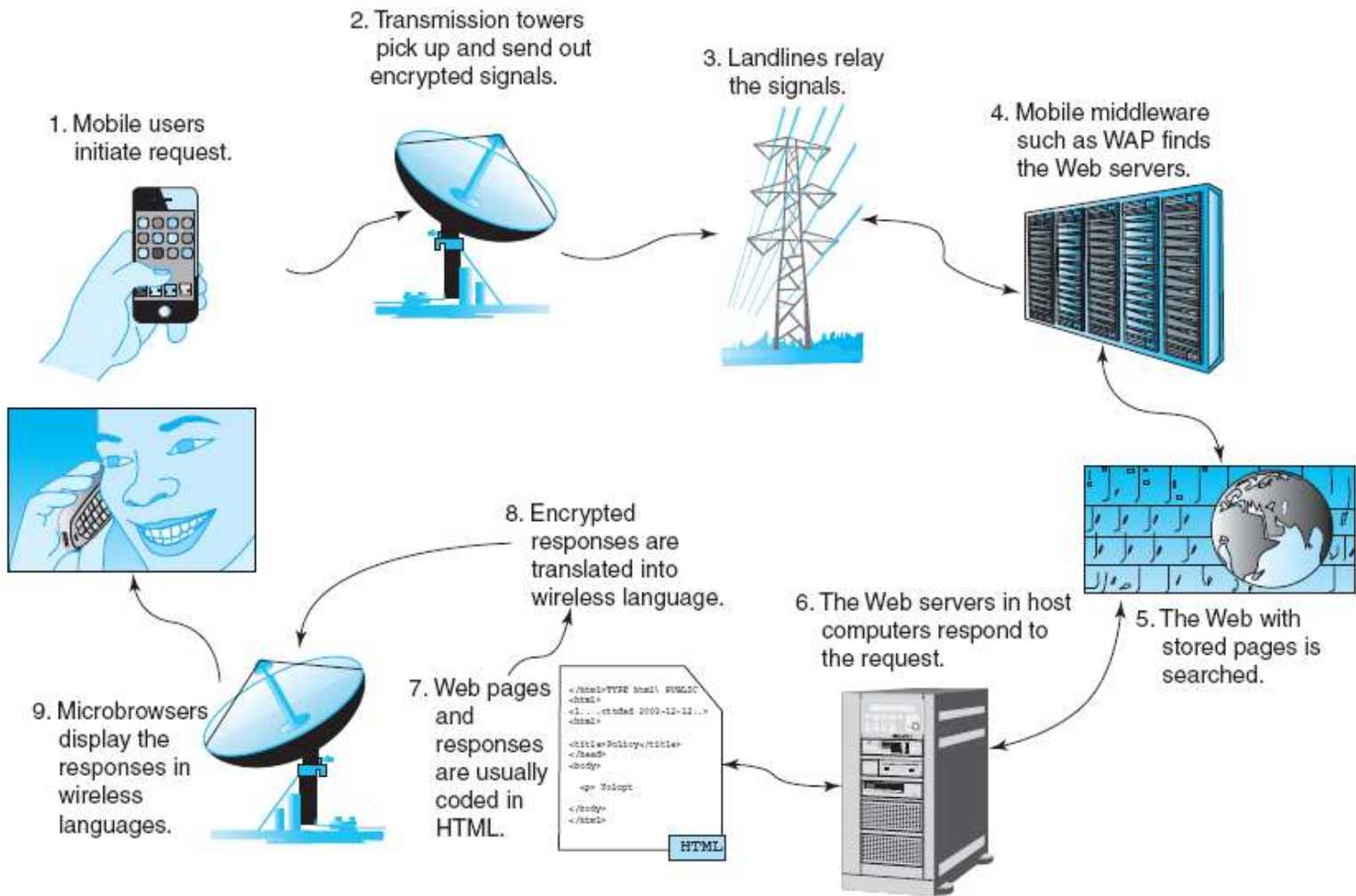
A telecommunications network that offers wireless coverage over a large geographical area, typically over a cellular phone network

## EXHIBIT 6.4 How Wi-Fi Works



- 1 Radio-equipped access point connected to the Internet (or via a router). It generates and receives radio waves (up to 400 feet).
- 2 Several client devices, equipped with PC cards, generate and receive radio waves.
- 3 Router is connected to the Internet via a cable or DSL modem or connected via a satellite.

## EXHIBIT 6.5 An M-Commerce System at Work



# Mobile Financial Applications

- **mobile banking**

Performing banking activities such as balance checks, account transactions, payments, credit applications, etc., via a mobile device

- **OTHER FINANCIAL-RELATED MOBILE APPLICATIONS**

- **Mobile Stock Trading**
- **Real Estate**

# Mobile Enterprise Solutions

- **DEFINING MOBILE ENTERPRISE**

- **mobile enterprise**

- Application of mobile computing inside the enterprise (e.g., for improved communication among employees)

- **THE FRAMEWORK AND CONTENT OF MOBILE ENTERPRISE APPLICATIONS**

- **The sales application**

- **The support application**

- **The service application**

- **mobile worker**

- Any employee who is away from his or her primary work space at least 10 hours a week or 25 percent of the time

# Mobile Enterprise Solutions

## Benefits of Mobile Workforce Support

- Sales force automation
- Field force automation
- Mobile office applications
- Mobile CRM (e-CRM) and PRM

## Challenges of Mobile Workforce Support

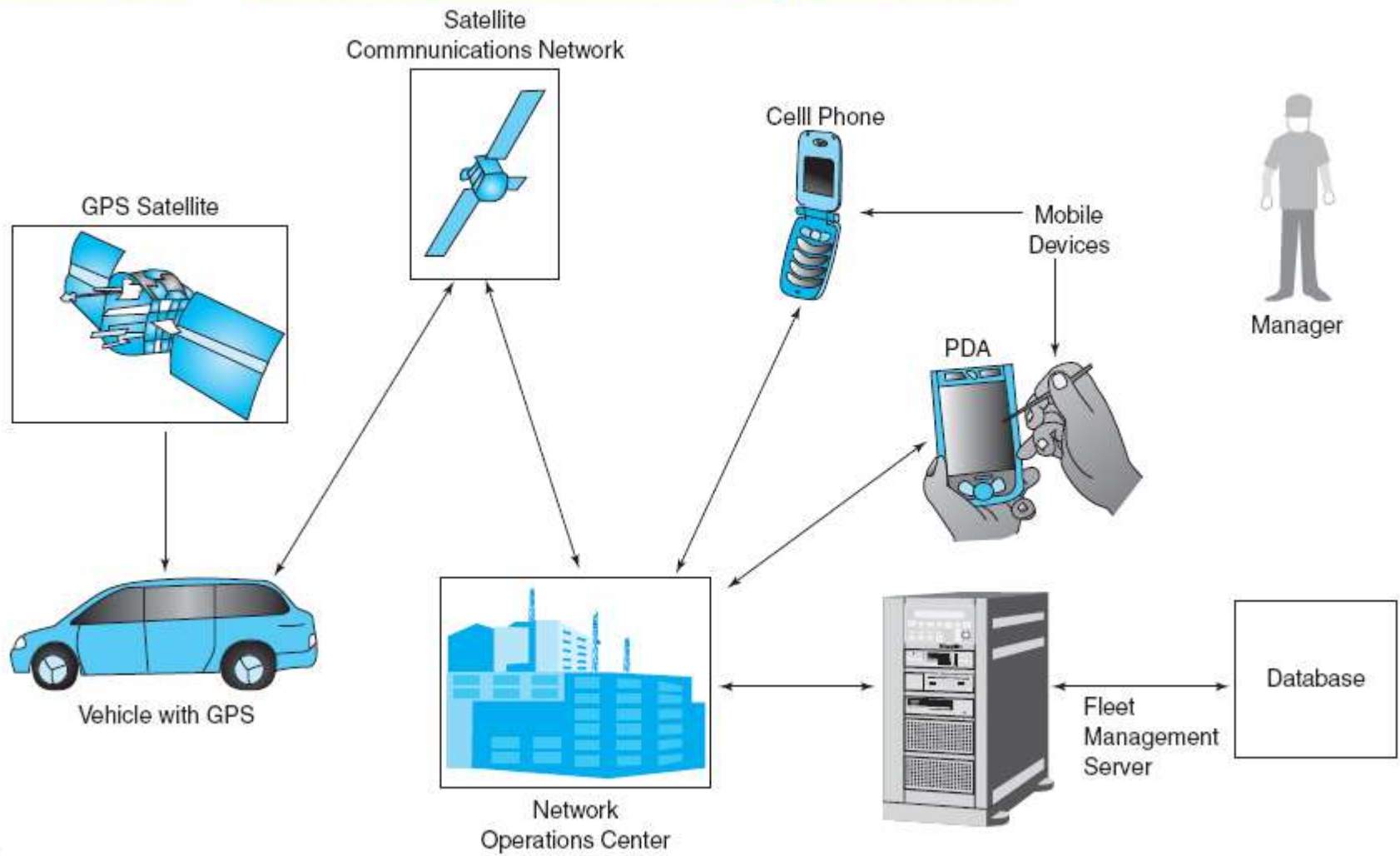
- Network coverage gaps and interruptions
- Internetwork roaming
- Device and network management
- Bandwidth management

# Mobile Enterprise Solutions

- **FLEET AND TRANSPORTATION MANAGEMENT**
  - Fleet Maintenance
  - Tracking People and Vehicles
  - Transportation Management



## EXHIBIT 6.6 The Process of Locating Vehicles



# Mobile Enterprise Solutions

- **MOBILE APPLICATIONS IN WAREHOUSES**
  - **Typical Mobile Devices Used in Warehouses**
    - Vehicle mount solutions
    - Handheld solutions
    - Hands-free and voice solutions
    - Other solutions
- **OTHER ENTERPRISE MOBILE APPLICATIONS**
  - iPad in the Enterprise

# Mobile Entertainment and Other Consumer Services

- **mobile entertainment**

Any type of leisure activity that utilizes wireless telecommunication networks, interacts with service providers, and incurs a cost upon usage

- **MOBILE MUSIC AND VIDEO PROVIDERS**

- **MOBILE GAMES**

- Hurdles for Growth

- **MOBILE GAMBLING**

- **MOBILITY AND SPORTS**

# Mobile Entertainment and Other Consumer Services

- **SERVICE INDUSTRY CONSUMER APPLICATIONS**
  - Health Care
  - Hospitality Management
  - Public Safety and Crime Prevention
  - Other Industries

# 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

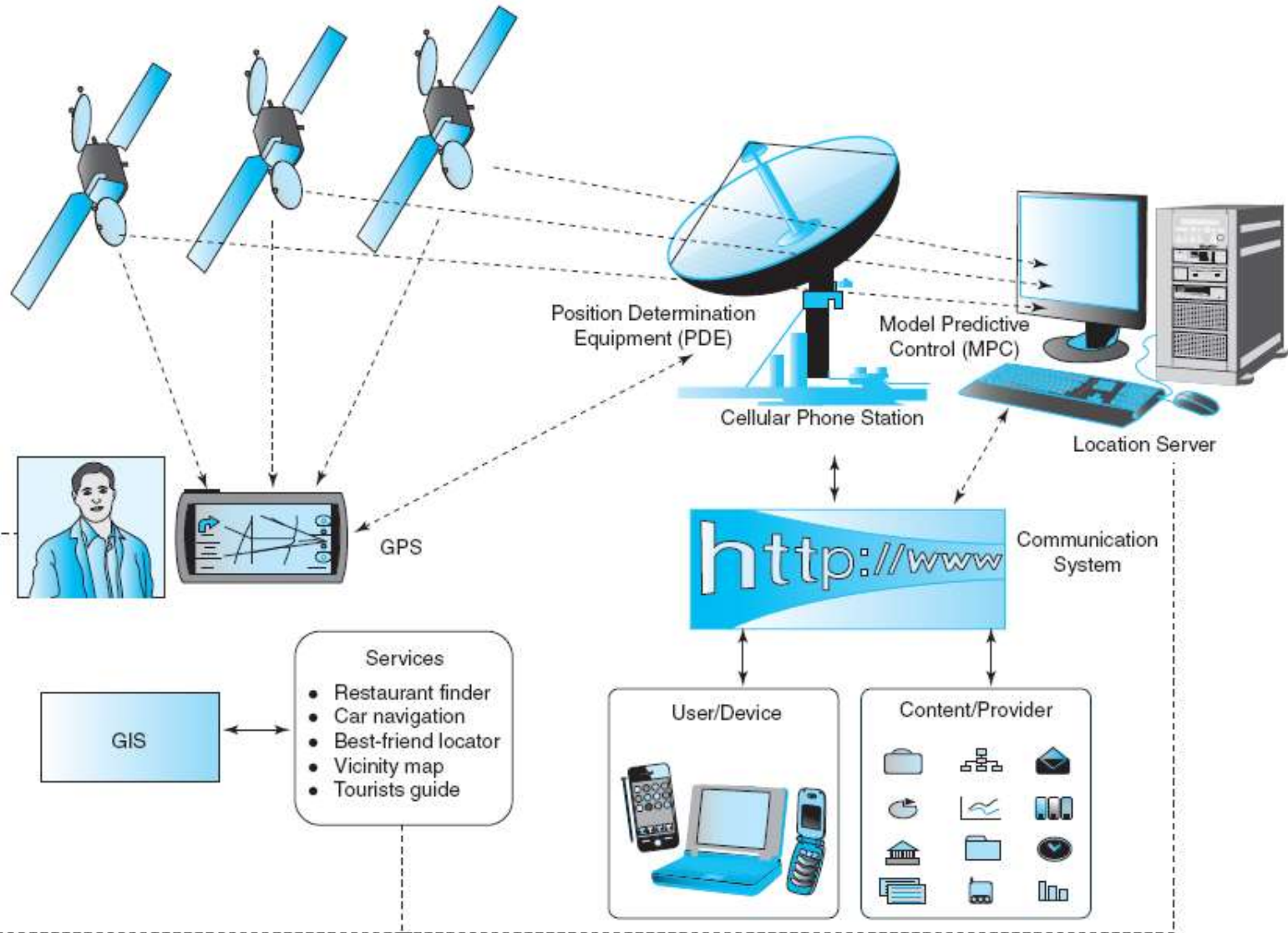
- **real-time location system (RTLS)**

Systems used to track and identify the location of objects in real time

# Location-Based Mobile Commerce

- **L-COMMERCE INFRASTRUCTURE**
  - Mobile devices
  - Communication network
  - Positioning component
  - Service or application provider
  - Data or content provider

# EXHIBIT 6.7 LBS Components Creating a System



# Location-Based Mobile Commerce

- **geolocation**

The process of automatically identifying a Web user's physical location without that user having to provide any information

- **network-based positioning**

Relies on base stations to find the location of a mobile device sending a signal or sensed by the network



# Location-Based Mobile Commerce

- **terminal-based positioning**

Calculating the location of a mobile device from signals sent by the device to base stations

- **global positioning system (GPS)**

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

# Location-Based Mobile Commerce

- **Location-Based Data**

- Locating
- Navigating
- Searching
- Identifying
- Event checking

- **geographical information system (GIS)**

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

# Location-Based Mobile Commerce

- **location-based service (LBS)**

An information service accessible from and to mobile devices through a mobile network utilizing the ability to make use of the geographical position of the mobile device to deliver a service to the user

- **automatic vehicle location (AVL)**

A means for automatically determining the geographic location of a vehicle and transmitting the information to a request

- **social location-based marketing**

Marketing activities that are related to social behavior and are related to social networking activities

# Location-Based Mobile Commerce

- **BARRIERS TO LOCATION-BASED M-COMMERCE**
  - Lack of GPS in mobile phones
  - Accuracy of devices
  - The cost–benefit justification
  - Limited network bandwidth
  - Invasion of privacy

# Ubiquitous (Pervasive) Computing and Sensory Networks

- **ubiquitous computing (ubicom)**

Computing capabilities that are being embedded into the objects around us, which may be mobile or stationary

- **pervasive computing**

Computing capabilities embedded in the environment but typically not mobile

# Ubiquitous (Pervasive) Computing and Sensory Networks

- **Principles of Pervasive Computing**

- Decentralization
- Diversification
- Connectivity
- Simplicity

- **context-aware computing**

Application's ability to detect and react to a set of environmental variables that is described as context (which can be sensor information or other data including users' attitudes)

- **Internet of Things**

# Ubiquitous (Pervasive) Computing and Sensory Networks

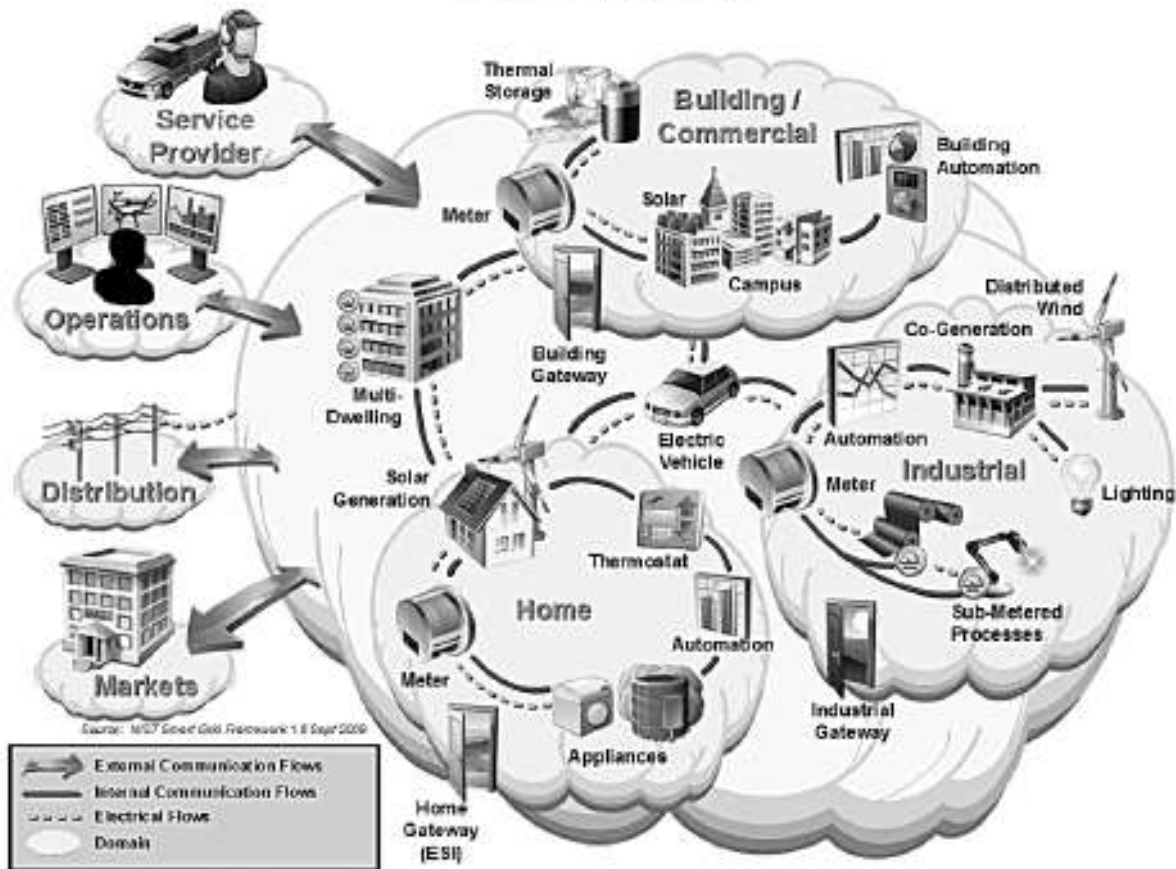
- **SMART APPLICATION: GRID, HOMES, CARS, AND MORE**

- **smart grid**

An electricity network managed by utilizing digital technology

# EXHIBIT 6.9 Smart Grid Environment

## Customer





# Ubiquitous (Pervasive) Computing and Sensory Networks

- **Smart Homes and Appliances**
  - Lighting
  - Energy management
  - Water control
  - Home security and communication
  - Home entertainment
  - Smart appliances
- **Smart and Driverless Cars**

# Ubiquitous (Pervasive) Computing and Sensory Networks

- **radio frequency identification (RFID)**

A short-range radio frequency communication technology for remotely storing and retrieving data using devices called *RFID tags* and *RFID readers*

- **sensor network**

A collection of nodes capable of environmental sensing, local computation, and communication with its peers or with other higher performance nodes

- **Smart Sensor Applications**

- **PRIVACY ISSUES IN UBIQUITOUS COMPUTING**

# Implementation Issues in Mobile Commerce

- **M-COMMERCE SECURITY AND PRIVACY ISSUES**
- **TECHNOLOGICAL BARRIERS TO M-COMMERCE**
- **FAILURES IN MOBILE COMPUTING AND M-COMMERCE**
- **ETHICAL, LEGAL, PRIVACY, AND HEALTH ISSUES IN M-COMMERCE**
- **MOBILITY MANAGEMENT**

# Managerial Issues

1. What is your m-commerce strategy?
2. What is your implementation timetable?
3. Are there any clear technical winners?
4. Which applications should be implemented first?

# Summary

1. M-commerce, its value-added attributes, and fundamental drivers
2. The mobile computing environment that supports m-commerce
3. The type of networks that support mobile devices
4. Financial applications

# Summary

5. Mobile enterprise solutions
6. Consumer and personal applications and mobile entertainment
7. Location-based commerce
8. Ubiquitous computing and sensory systems
9. Security and other implementation issues