

**Εθνικό Μετσόβιο Πολυτεχνείο**  
**Σχολή Ηλεκτρολόγων Μηχανικών & Μηχανικών Υπολογιστών**



**Μεταπτυχιακό Πρόγραμμα**  
**Τεχνο-οικονομικά Συστήματα**

**ΜΑΘΗΜΑ: Ηλεκτρονικές Συναλλαγές**

**ΣΥΝΑΛΛΑΓΕΣ ΚΑΙ ΚΙΝΗΤΕΣ ΣΥΣΚΕΥΕΣ**

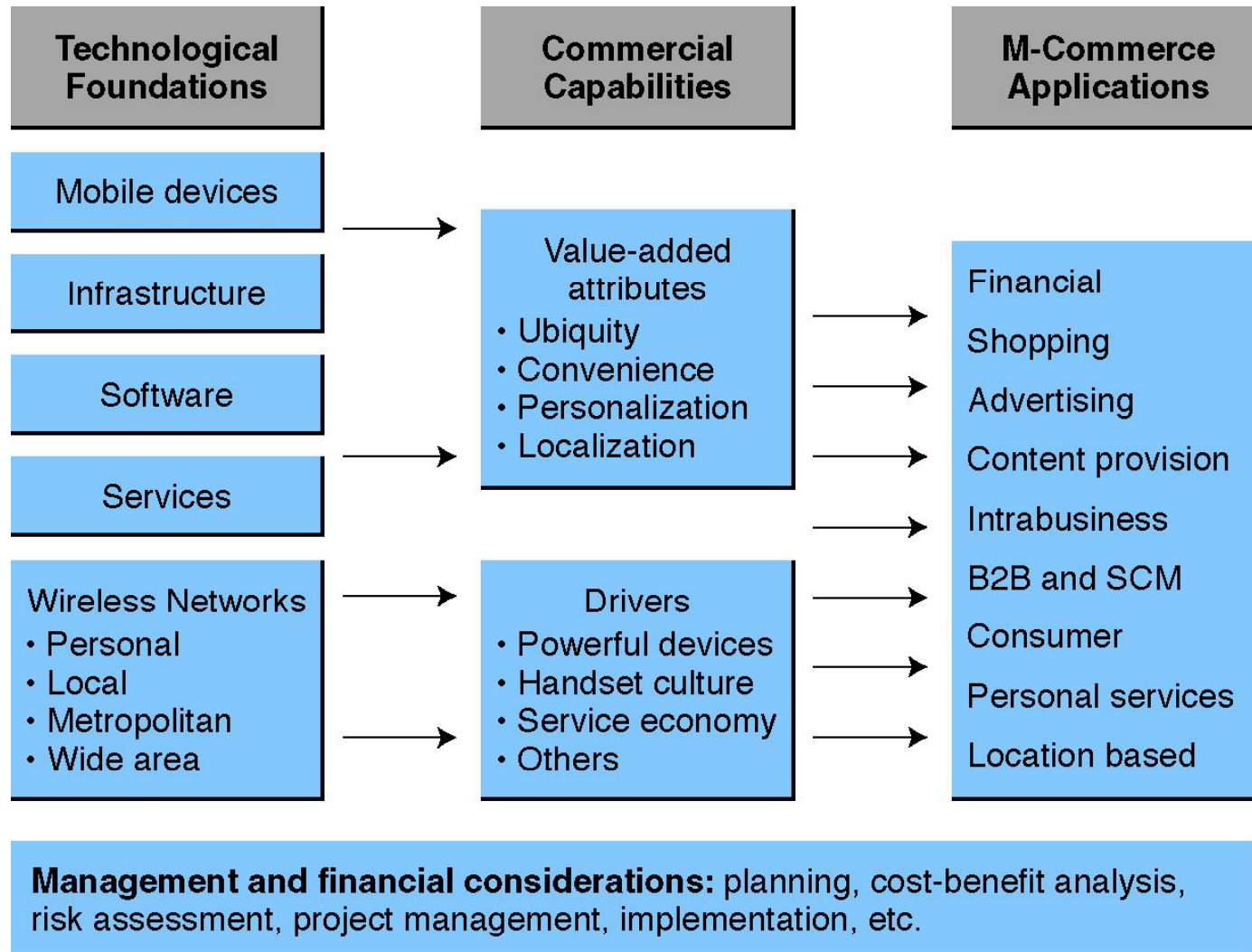
Διδάσκοντες:

*Επικ. Καθηγήτῆς Δ. Ασκούνῆς, Δρ. Ι. Χαραλαμπίδης*

# Mobile Computing

- Overview of Mobile Commerce
  - mobile commerce (m-commerce, m-business)**
  - Any business activity conducted over a wireless telecommunications network

# The Mobile Commerce Landscape



# Mobile Computing

- Mobile Computing Devices

- personal digital assistant (PDA)**

- A handheld computer principally used for personal information management

- smartphone**

- Internet-enabled cell phones that can support mobile applications

- blackberry**

- A handheld device principally used for e-mail

# Mobile Computing

- Mobile Computing Devices

- wireless mobile computing (mobile computing)**

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

- synchronization**

- The exchange of updated information with other computing devices

# The Wireless Mobile Environment

<b>Mobile</b>	<b>Wired</b>	Laptop computer PDA
	<b>Wireless</b>	Cellular phone Wireless laptop or PDA Blackberry, smartphone, Ogo, etc.
<b>Fixed</b>	<b>Wired</b>	Desktop computer Landline phone Cable television
	<b>Wireless</b>	Free-to-air television Amateur radio Commercial radio

# Mobile Computing

- Mobile Computing Software

- microbrowser**

- 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 WAPreadable files on an Internet-connected Web server

# Mobile Computing

## **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

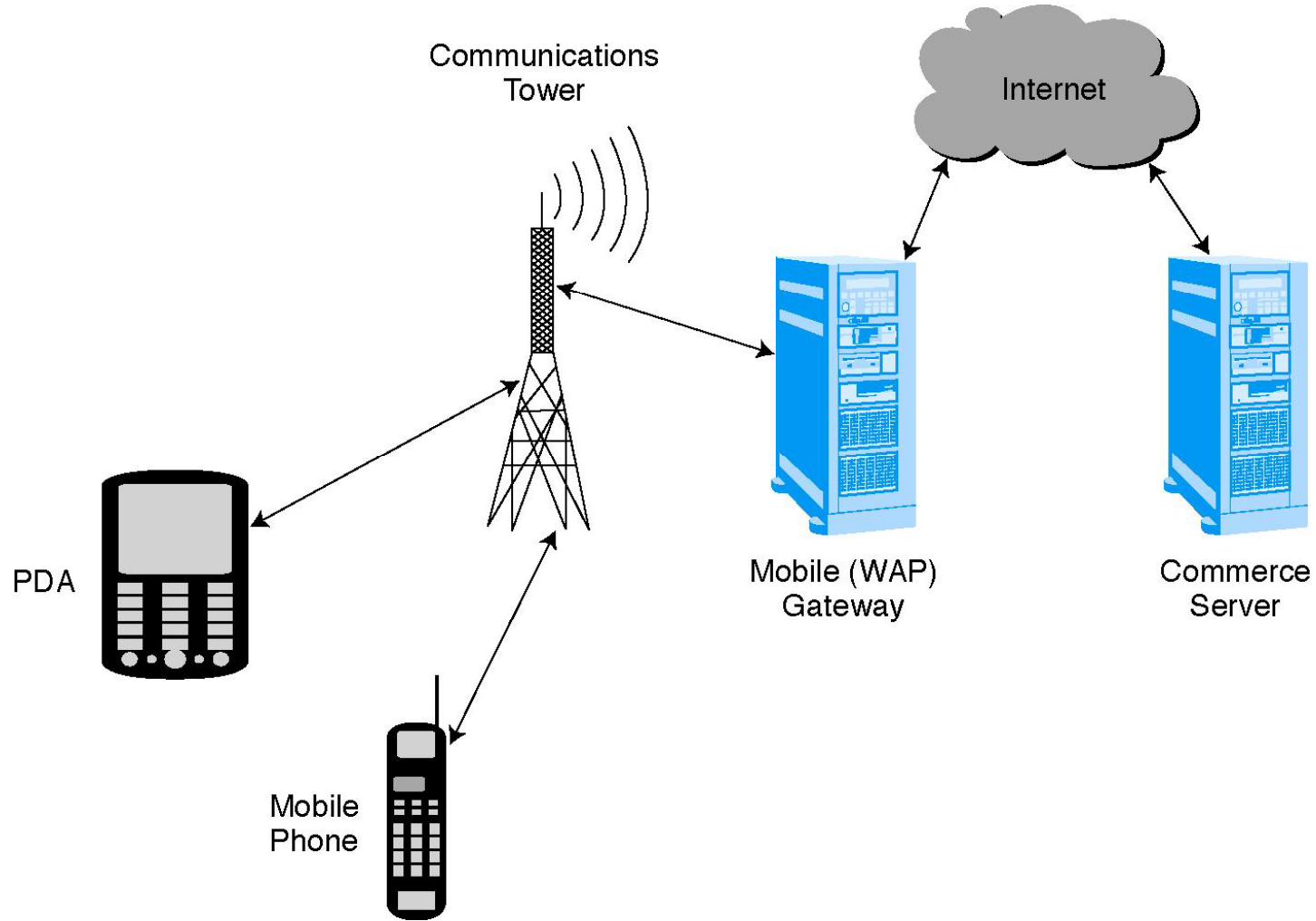
## **Extensible Hypertext Markup Language (xHTML)**

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

## **Voice XML (VXML)**

An extension of XML designed to accommodate voice

# WAP Architecture



# Mobile Computing

- 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

- **Multimedia Messaging Service (MMS)**

- The next generation of wireless messaging; MMS will be able to deliver rich media

# Mobile Computing

- Mobile Computing Services

## **micropayments**

Electronic payments for small-purchase amounts (generally less than \$10)

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

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

# Mobile Computing

- Mobile Computing Services

**interactive voice response (IVR)**

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

**voice portal**

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

# Wireless Telecommunications Networks

- Personal Area Networks

- personal area network (PAN)**

- A wireless telecommunications network for device-to-device connections within a small 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**

- wireless local area network (WLAN)**

- A telecommunications network that enables users to make medium-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

- **Wireless Local Area 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 Local Area Networks**

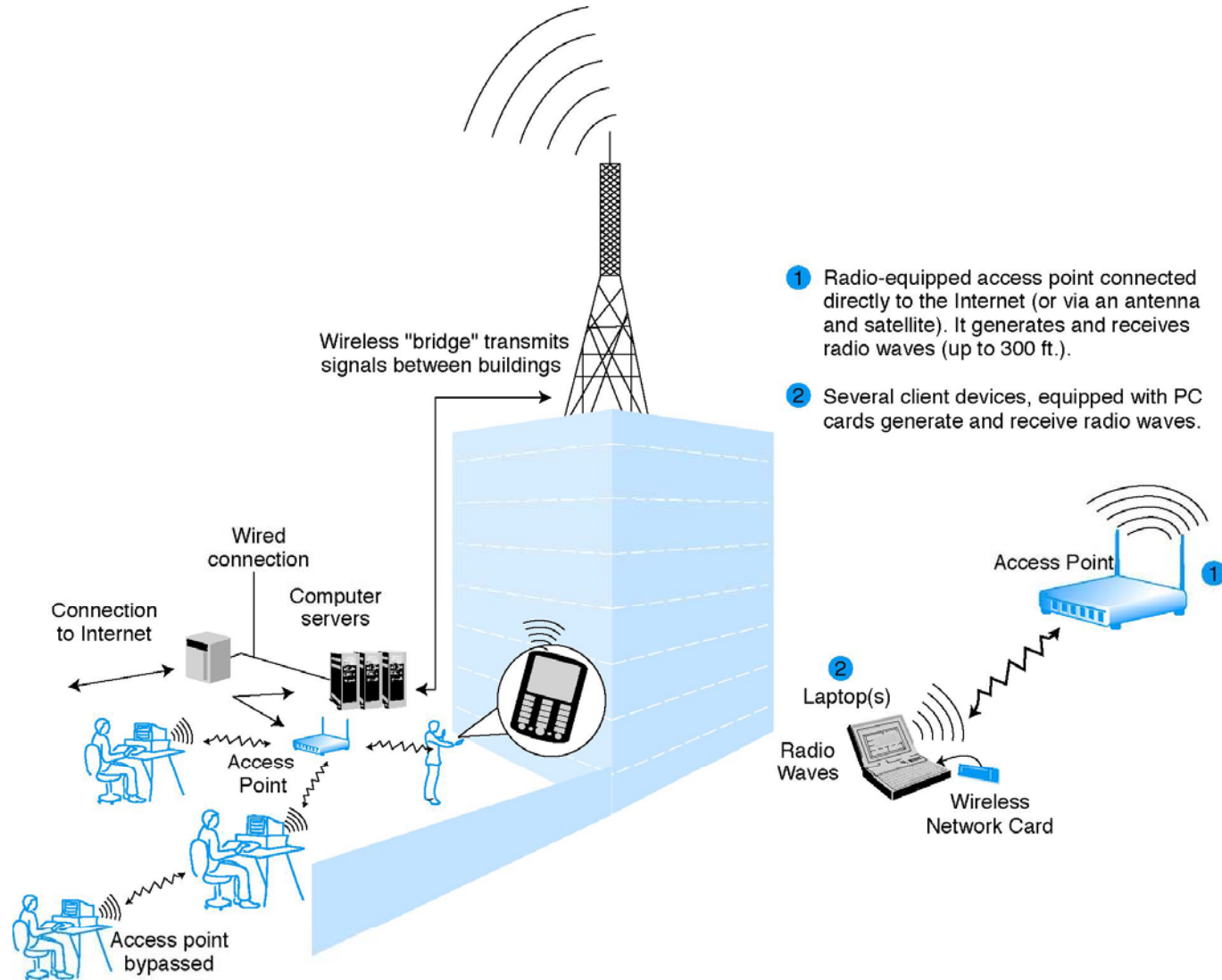
- wireless access point**

- An antenna that connects a mobile device to a wired LAN

- hotspot**

- An area or point where a wireless laptop or PDA can make a connection to a wireless local area network

# How Wi-Fi Works



# Wireless Telecommunications Networks

- Wireless Metropolitan Area Networks

## **WiMax**

A wireless standard (IEEE 802.16) for making broadband network connections over a large area

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

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

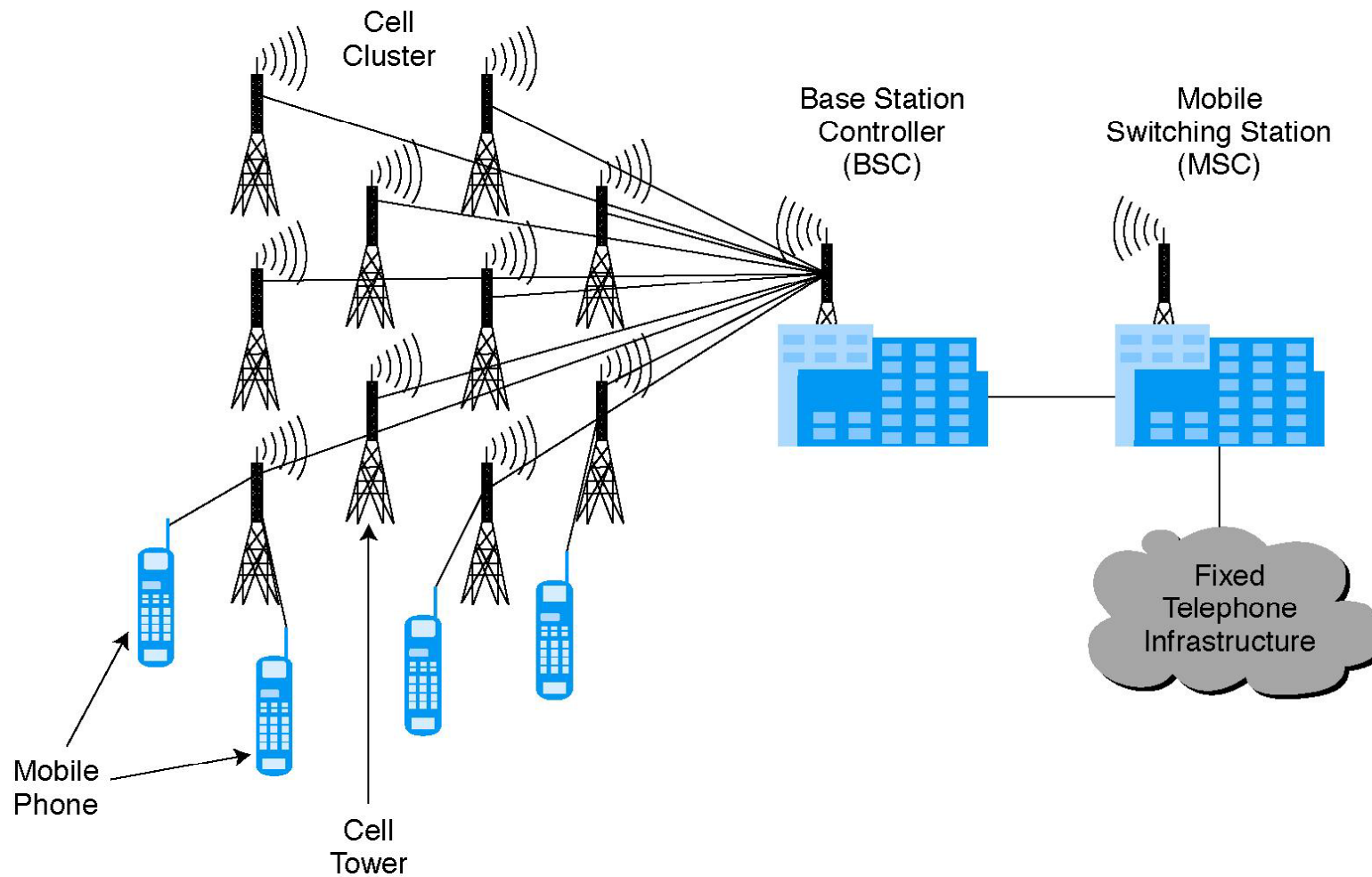
# Wireless Telecommunications Networks

- Wireless Wide Area Networks
  - Physical Topology of a WWAN

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

An extractable storage card used for identification, customer location information, transaction processing, secure communications, and the like

# Cellular Telephone Network



# Wireless Telecommunications Networks

- WWAN Communication Bandwidths
  - **1G.** The first generation of wireless technology, which was analog based
  - **2G.** The second generation of digital wireless technology; accommodates voice and text
  - **2.5G.** An interim wireless technology that can accommodate voice, text, and, limited graphics
  - **3G.** The third generation of digital wireless technology; supports rich media such as video
  - **4G.** The expected next generation of wireless technology that will provide faster display of multimedia

# Wireless Telecommunications Networks

- **Wireless Wide Area Networks**
  - WWAN Communication Protocols
    - Frequency Division Multiple Access (FDMA)
    - Time Division Multiple Access (TDMA)
    - Code Division Multiple Access (CDMA)
  - WWAN Network Systems
    - **Global System for Mobile Communications (GSM)**

An open, nonproprietary standard for mobile voice and data communications

# Mobile Commerce

- Attributes of M-Commerce
  - Ubiquity
  - Convenience
  - Interactivity
  - Personalization
  - Localization

# Mobile Financial Applications

- Mobile Banking
- Wireless Electronic Payment Systems
  - Wireless Wallets
    - m-wallet (mobile wallet)**  
Technologies that enable cardholders to make purchases with a single click from their wireless device
- Wireless Bill Payments
  - A number of companies now provide the option of paying bills directly from a cell phone

# Mobile Shopping, Advertising, and Content Provision

- **Wireless Shopping**
  - An increasing number of online vendors allow customers to shop from wireless devices
  - Enables customers to use cell phones or wireless PDAs to:
    - Perform quick searches
    - Compare prices
    - Use a shopping cart
    - Order
    - View the status of their order

# Mobile Shopping, Advertising, and Content Provision

- Targeted Advertising

- Marketers send user-specific advertising messages to wireless devices
- Location-sensitive advertising informs buyers about shops, malls, and restaurants close to where the mobile device owner is located

## **mobile portal**

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

# Mobile Intrabusiness Applications

- Support of Mobile Employees

- sales force mobilization**

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

- Job Dispatch

- wearable devices**

- Mobile wireless computing devices for employees who work on buildings and other climbable workplaces

# Mobile Intrabusiness Applications

- Customer Support

Mobile access extends the reach of CRM to both employees and business partners on a 24/7 basis, to any place where recipients are located

# Mobile Intrabusiness Applications

- Non-Internet Intrabusiness Applications
  - Wireless networking, used to pick items out of storage in warehouses
  - Delivery-status updates
  - Collection of data
  - Monthly pay slips sent as SMS messages sent to employees' mobile phones
  - Property adjusters report from the scene of an accident
  - Sales representatives check orders and inventories during their visits to customers

# B2B M-Commerce and Supply Chain Management

- Use of wireless communication to share information along the supply chain and to collaborate with partners
- By integrating the mobile computing device into supply chain communications, it is possible to:
  - Make mobile reservations of goods
  - Remotely check availability of a particular item in the warehouse
  - Order a customized product from the manufacturing department
  - Provide secure access to confidential financial data from a management information system

# Mobile Consumer and Personal Service Applications

- Mobile Games
- Wireless Telemedicine
- Other Mobile Computing Services for Consumers
- Non-Internet Mobile Applications for Consumers

# Location-Based Mobile Commerce

## **location-based m-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 areas:
  - Location
  - Navigation
  - Tracking
  - Mapping
  - Timing

# Location-Based Mobile Commerce

## **Global Positioning System (GPS)**

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

## **geographical information system (GIS)**

An information system that integrates GPS data onto digitized map displays

# Location-Based Mobile Commerce

- Emergency Response Cell Phone Calls

## **wireless 911 (e-911)**

In the United States, emergency response 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

- **Barriers to Location-Based M-Commerce**
  - Accuracy of devices
  - The cost-benefit justification
  - Limited network bandwidth
  - Invasion of privacy

# Security and Other Barriers to Mobile Commerce

- M-Commerce Security Issues
  - Malicious Code
  - Transaction Security
  - Wireless Communication
  - Physical Security of Mobile Devices
  - Ease of Use
- Technological Barriers to M-Commerce
- Ethical, Legal, and Health Issues in M-Commerce

# Security and Other Barriers to Mobile Commerce

- **Project Failures in M-Commerce**
  - Do not start without appropriate infrastructure
  - Do not start a full-scale implementation; use a small pilot for experimentation
  - Pick an appropriate architecture (e.g., some users do not need to be persistently connected)
  - Talk with a range of users, some experienced and some not, about usability issues
  - Users must be involved; hold biweekly meetings if possible
  - Employ wireless experts
  - Wireless is a different medium from other forms of communication. Remember that people are not used to the wireless paradigm

# Pervasive Computing

- Overview of Pervasive Computing

  - **pervasive computing**

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

  - Principles of Pervasive Computing

    - Decentralization
    - Diversification
    - Connectivity
    - Simplicity

# Pervasive Computing

- Overview of Pervasive Computing  
**contextual computing**

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

# Pervasive Computing

- Pervasive Computing Initiatives

## **radio frequency identification (RFID)**

Technology that uses radio waves to identify items

## **electronic product code (EPC)**

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

# Pervasive Computing

- Pervasive Computing Initiatives
  - Smart Homes
    - Lighting
    - Energy management
    - Water control
    - Home security and communications
    - Home entertainment
  - Smart Appliances
  - Smart Cars
  - Smart Clothes

# Pervasive Computing

- Pervasive Computing Initiatives

- **sensor network**

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

- Sensor networks can:

- Protect the environment
        - Public safety
        - Monitor business and agricultural areas

# Pervasive Computing

- **Barriers to Pervasive Computing**
  - For pervasive systems to be widely deployed, it is necessary to overcome many of the technical, ethical, and legal barriers associated with mobile computing

# Managerial Issues

1. What's our timetable?
2. Which applications first?
3. Is it real or just a buzzword?
4. Which system to use?

# Summary

1. What is m-commerce?
2. Characteristics of mobile devices.
3. Wireless software development is difficult.
4. M-commerce support services.
5. Wireless telecommunications networks.
6. Value-added attributes of m-commerce.
7. Drivers of m-commerce.

# Summary

8. Finance, advertising, and content-providing applications.
9. Intrabusiness applications.
10. B2B and SCM applications.
11. Consumer applications.
12. Location-based commerce.
13. Limitations of m-commerce.
14. Pervasive computing.