


Chapter 4

Telecommunications, the Internet, and Wireless Technology

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7.1




Management Information Systems

Chapter 7 Telecommunications, the Internet, and Wireless Technology

LEARNING OBJECTIVES

- **Identify** the principal components of telecommunications networks and key networking technologies.
- **Describe** the main telecommunications transmission media and types of networks.
- **Explain** how the Internet and Internet technology work and how they support communication and e-business.
- **Identify** the principal technologies and standards for wireless networking, communication, and Internet access.
- **Assess** the value to business of radio frequency identification (RFID) and wireless sensor networks.

7.2




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Virgin Megastores Keeps Spinning with Unified Communications

- **Problem:** 1400 employees in 11 retail locations; slow resolutions of business issues because of cost of conference calls
- **Solutions:** Implement unified communications to integrate voice mail, e-mail, conference calling, instant messaging
- **Microsoft's Office Communication Server, Office Communicator, RoundTable conferencing and collaboration tools**
- **Demonstrates IT's role in hastening communication and flow of information**

7.3



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Telecommunications and Networking in Today's Business World

- **Networking and communication trends**
 - **Convergence:**
 - Telephone networks and computer networks converging into single digital network using Internet standards
 - Cable companies providing voice service
 - **Broadband:**
 - More than 60% of U.S. Internet users have broadband access
 - **Broadband wireless:**
 - Voice and data communication as well as Internet access are increasingly taking place over broadband wireless platforms

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Telecommunications and Networking in Today's Business World

- **What is a computer network?**
 - Two or more connected computers
 - Major components in simple network
 - Client computer
 - Server computer
 - Network interfaces (NICs)
 - Connection medium
 - Network operating system
 - Hub or switch
 - Router

7.5

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Telecommunications and Networking in Today's Business World

Components of Information Network

The diagram illustrates the components of an information network. At the center is a cylinder labeled 'easy2 Server'. To its left, under the heading '1 Member Management Interface', is a document icon labeled 'WWW'. Below that, under the heading '2 Web Services Stored Procedures', are two server icons labeled 'First Provider's Server' and 'Second Provider's Server'. Above the central server is a box labeled 'Server' containing a list: 'Database', 'Function', and 'Form'. To the right of the central server are three groups of devices: 'PC Devices' (laptop and desktop), 'Consumer Devices' (television), and 'Mobile Devices' (two mobile phones). Arrows indicate data flow: from WWW to the central server; from the central server to the WWW; from the central server to the PC, Consumer, and Mobile devices; and from the First and Second Provider's Servers to the central server.

7.6

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Telecommunications and Networking in Today's Business World

Components of a Simple Computer Network

Illustrated here is a very simple computer network, consisting of computers, a network operating system residing on a dedicated server computer, cabling (wiring) connecting the devices, network interface cards (NIC), switches, and a router.

Figure 7-1

7.7

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Telecommunications and Networking in Today's Business World

- **Networks in large companies**
- **Components can include:**
 - Hundreds of local area networks (LANs) linked to firmwide corporate network
 - Various powerful servers
 - Web site
 - Corporate intranet, extranet
 - Backend systems
 - Mobile wireless LANs (Wi-Fi networks)
 - Videoconferencing system
 - Telephone network
 - Wireless cell phones

7.8

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Telecommunications and Networking in Today's Business World

Corporate Network Infrastructure

Figure 7-2
Today's corporate network infrastructure is a collection of many different networks from the public switched telephone network, to the Internet, to corporate local area networks linking workgroups, departments, or office floors.

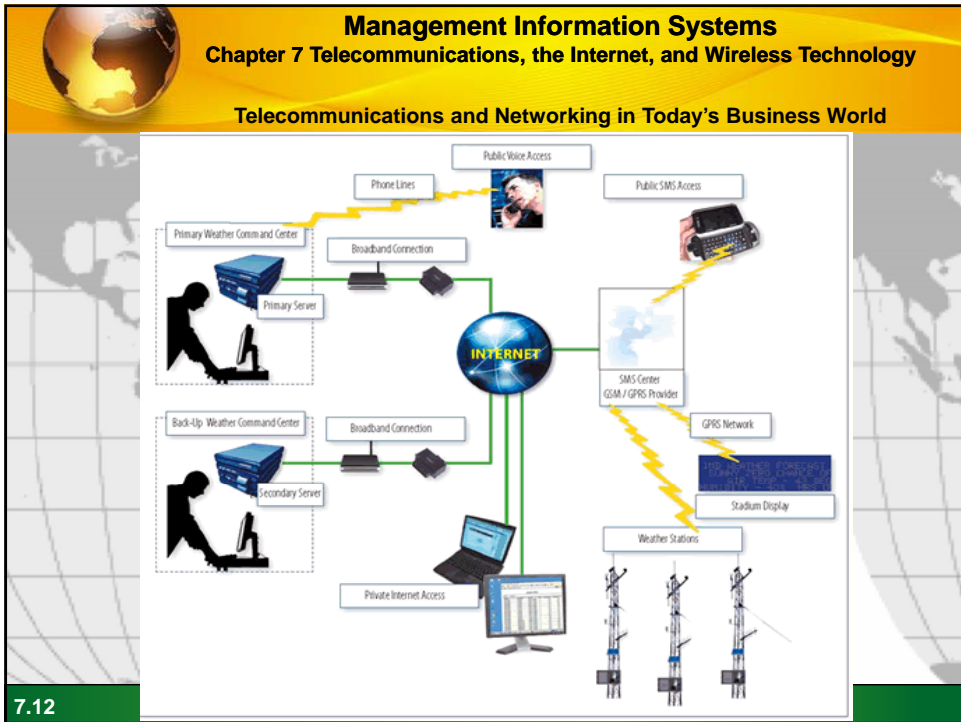
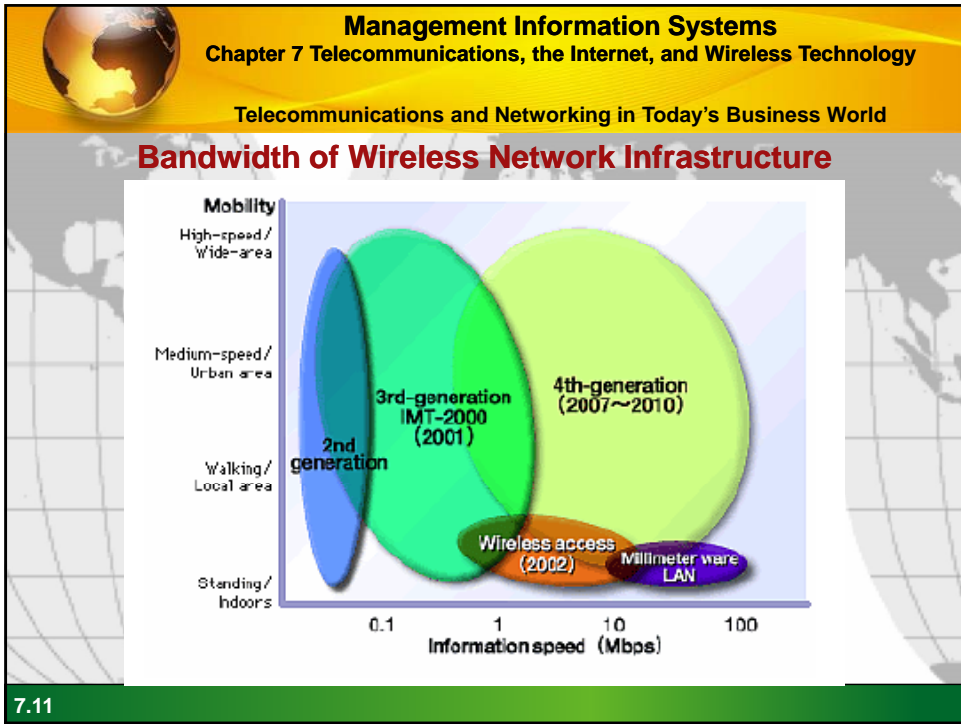
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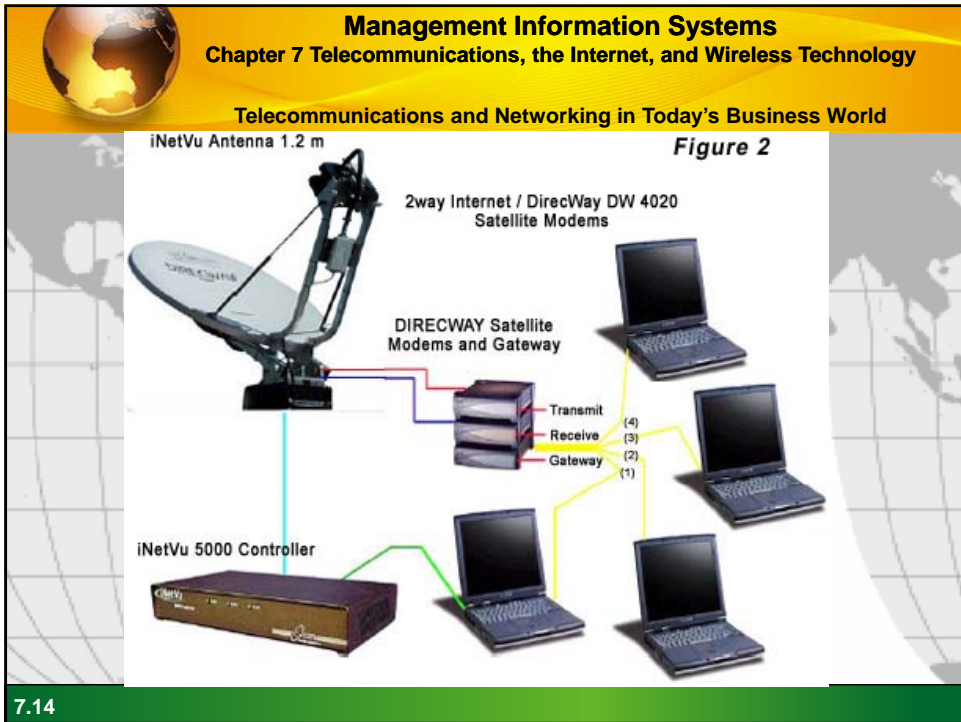
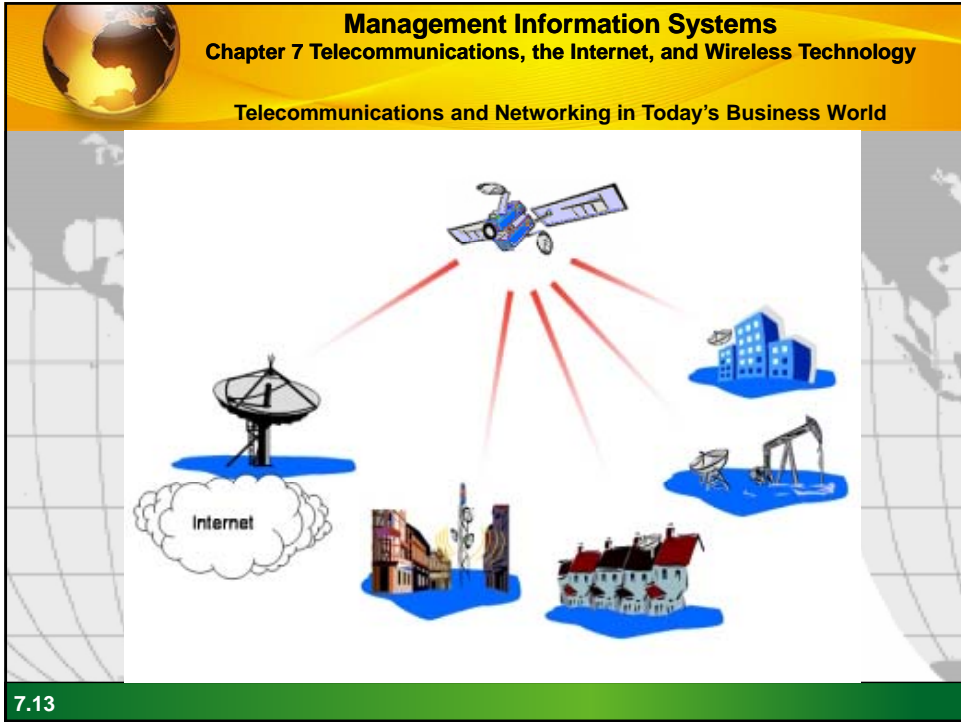
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Telecommunications and Networking in Today's Business World

GSM / GPS Network Infrastructure

7.10





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Telecommunications and Networking in Today's Business World

Mobile Satellite Internet System

Roof-Mounted Satellite Dish Antenna

Hi-Speed Modem

Antenna Control Software on Your PC

Antenna Positioning Controller

7.15

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- **Key digital networking technologies**
 - **Client/server computing**
 - Distributed computing model
 - Clients linked through network controlled by network server computer
 - Server sets rules of communication for network and provides every client with an address so others can find it on the network
 - Has largely replaced centralized mainframe computing
 - **The Internet:** Largest implementation of client/server computing

7.16

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Telecommunications and Networking in Today's Business World

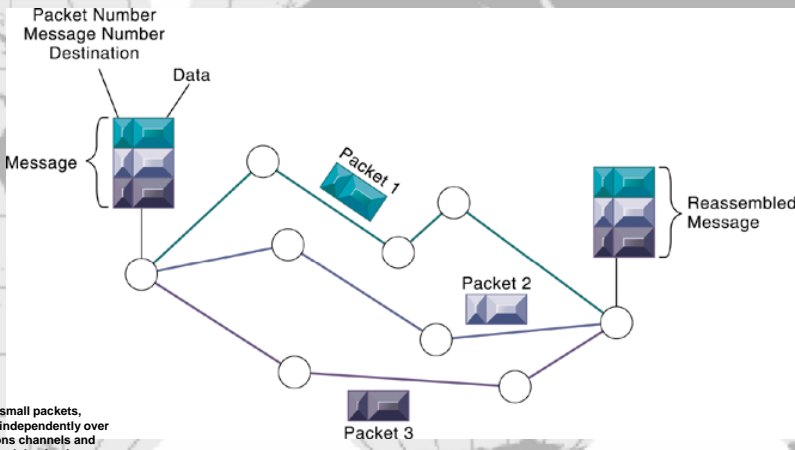
- **Packet switching**
 - Method of slicing digital messages into parcels (packets), sending packets along different communication paths as they become available, and then reassembling packets at destination
 - Previous circuit-switched networks required assembly of complete point-to-point circuit
 - Packet switching more efficient use of network's communications capacity

7.17

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Telecommunications and Networking in Today's Business World

Packet-Switched Networks and Packet Communications



The diagram illustrates the packet-switching process. On the left, a 'Message' is shown as a stack of four data blocks. Each block is labeled with 'Packet Number', 'Message Number', and 'Destination'. The top block is labeled 'Data'. The message is then divided into three packets: 'Packet 1', 'Packet 2', and 'Packet 3'. These packets travel along different paths through a network of nodes (represented by circles) to reach a destination. On the right, the packets are reassembled into a 'Reassembled Message'.

Figure 7-3
Data are grouped into small packets, which are transmitted independently over various Communications channels and reassembled at their final destination.

7.18

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Telecommunications and Networking in Today's Business World

- **TCP/IP and connectivity**
 - **Connectivity between computers enabled by protocols**
 - **Protocols:** Rules that govern transmission of information between two points
 - **Transmission Control Protocol/Internet Protocol (TCP/IP)**
 - Common worldwide standard that is basis for Internet
 - **Department of Defense reference model for TCP/IP**
 - **Four layers**
 - Application layer
 - Transport layer
 - Internet layer
 - Network interface layer

7.19

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Telecommunications and Networking in Today's Business World

The Transmission Control Protocol/Internet Protocol (TCP/IP) Reference Model

The diagram illustrates the four layers of the TCP/IP reference model for communications. It shows two vertical columns representing Computer A and Computer B. Each column contains four stacked boxes representing the layers: Application (top), Transport, Internet, and Network Interface (bottom). Vertical lines connect the boxes within each column, and horizontal lines connect the corresponding boxes between Computer A and Computer B. A bracket at the bottom indicates that the Network Interface layers of both computers are connected to each other.

Figure 7-4
This figure illustrates the four layers of the TCP/IP reference model for communications.

7.20

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Communications Networks

- **Signals: digital vs. analog**
 - Modem: Translates digital signals into analog form
- **Types of networks**
 - Local-area networks (LANs)
 - Client/server or peer-to-peer
 - Ethernet – physical network standard
 - Topologies: star, bus, ring
 - Campus-area networks (CANs)
 - Wide-area networks (WANs)
 - Metropolitan-area networks (MANs)

7.21

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Communications Networks

Functions of the Modem

The diagram illustrates the process of data transmission. On the left, a red box labeled 'Computer' is connected to a digital signal waveform. Above the waveform are the labels 'Digital' and '1 1 0'. This signal enters a green box labeled 'Modem'. A wavy line representing an analog signal connects this modem to a second green box labeled 'Modem'. Above this wavy line is the label 'Analog'. The second modem is connected to another digital signal waveform, which is then connected to a final red box labeled 'Computer'. Above this second waveform are the labels 'Digital' and '1 1 0'.

A modem is a device that translates digital signals from a computer into analog form so that they can be transmitted over analog telephone lines. The modem also translates analog signals back into digital form for the receiving computer.

Figure 7-5

7.22

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Communications Networks

Network Topologies

The diagram illustrates three basic network topologies. **Star topology** shows a central node connected to six peripheral nodes. **Ring topology** shows seven nodes connected in a closed circular loop. **Bus topology** shows a central horizontal line with six nodes connected to it from both above and below.

Figure 7-6
The three basic network topologies are the bus, star, and ring.

7.23

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Communications Networks

- **Physical transmission media**
 - Twisted wire (modems)
 - Coaxial cable
 - Fiber optics and optical networks
- **Wireless transmission media and devices**
 - Microwave
 - Satellites
 - Cellular telephones
- **Transmission speed**
 - Hertz
 - Bandwidth

7.24

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Communications Networks

BP Amoco's Satellite Transmission System

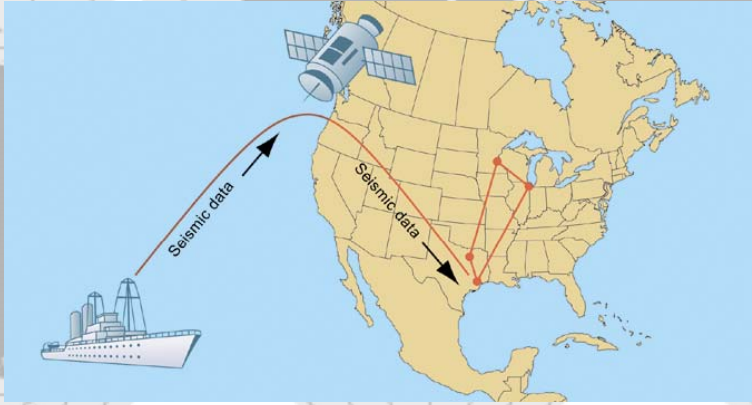


Figure 7-7
Communication satellites help BP Amoco transfer seismic data between oil exploration ships and research centers in the United States.

7.25

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The Global Internet

- **What is the Internet?**
- **Connecting to the Internet**
 - **Internet service providers (ISPs)**
 - **Services**
 - DSL, cable, satellite, T lines (T1, T3)
- **Internet addressing and architecture**
 - **IP addresses**
 - **The domain name system**
 - Hierarchical structure
 - Top-level domains

7.26

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The Global Internet

The Domain Name System

Figure 7-8
The Domain Name System is a hierarchical system with a root domain, top-level domains, second-level domains, and host computers at the third level.

7.27

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The Global Internet

- **Internet Architecture**
 - Trunk lines (backbone networks)
 - Regional networks
 - ISPs
- **Internet Governance**
 - No formal management
 - Policies established by professional, government organizations
 - IAB, ICANN, W3C
- **The Future Internet**
 - IPv6
 - Internet2, NGI

7.28

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The Global Internet

Internet Network Architecture

Figure 7-9
The Internet backbone connects to regional networks, which in turn provide access to Internet service providers, large firms, and government institutions. Network access points (NAPs) and metropolitan area exchanges (MAEs) are hubs where the backbone intersects regional and local networks and where backbone owners connect with one another.

7.29

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The Wireless Revolution

Should Network Neutrality Continue?

- Read the Interactive Session: Organization and then discuss the following questions:
 - What is network neutrality? Why has the Internet operated under net neutrality up to this point in time?
 - Who's in favor of network neutrality? Who's opposed? Why?
 - What would be the impact on individual users, businesses, and government if Internet providers switched to a tiered service model?
 - Are you in favor of legislation enforcing network neutrality? Why or why not?

7.30

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The Global Internet

- **Internet services**
 - E-mail
 - Chatting and instant messaging
 - Newsgroups
 - Telnet
 - File Transfer Protocol (FTP)
 - World Wide Web
- Voice over IP (VoIP)
- Unified communications
- Virtual private networks (VPNs)

7.31

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The Global Internet

Client/Server Computing on the Internet

The diagram illustrates the flow of data and services between a client and various servers. On the left, a 'Client' (represented by a computer and a PDA) connects to the 'Internet' (represented by a globe). The 'Internet' connects to a 'Server'. Below the 'Server' are listed services: Web (HTTP) server, Simple mail transfer protocol (SMTP), Domain name serving (DNS) utility, File transfer protocol (FTP), and Network news transfer protocol (NNTP). The 'Server' connects to an 'Application server', which in turn connects to a 'Database server'. The 'Database server' connects to 'Back-end systems', which include 'Data-bases' and 'Sales Production Accounting HR'. Below the 'Application server' are 'Web pages' and 'Mail files'.

Figure 7-10
Client computers running Web browser and other software can access an array of services on servers over the Internet. These services may all run on a single server or on multiple specialized servers.

7.32

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The Global Internet

Monitoring Employees on Networks: Unethical or Good Business?

- Read the Interactive Session: Management and then discuss the following questions:
 - Should managers monitor employee e-mail and Internet usage? Why or why not?
 - Describe an effective e-mail and Web use policy for a company.

7.33

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The Global Internet

How Voice over IP Works

An VoIP phone call digitizes and breaks up a voice message into data packets that may travel along different routes before being reassembled at the final destination. A processor nearest the call's destination, called a gateway, arranges the packets in the proper order and directs them to the telephone number of the receiver or the IP address of the receiving computer.

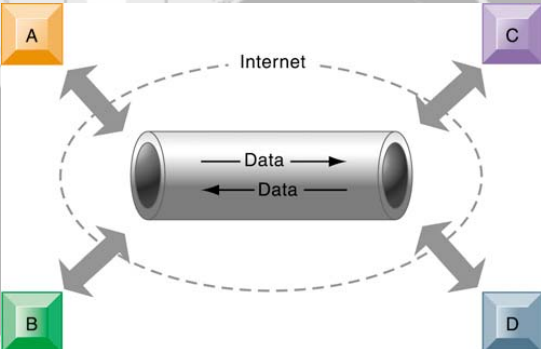
Figure 7-11

7.34

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The Global Internet

A Virtual Private Network Using the Internet



This VPN is a private network of computers linked using a secure "tunnel" connection over the Internet. It protects data transmitted over the public Internet by encoding the data and "wrapping" them within the Internet Protocol (IP). By adding a wrapper around a network message to hide its content, organizations can create a private connection that travels through the public Internet.

Figure 7-12

7.35

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The Global Internet

- **The World Wide Web**
 - **HTML (Hypertext Markup Language):**
 - Formats documents for display on Web
 - **Hypertext Transfer Protocol (HTTP):**
 - Communications standard used for transferring Web pages
 - **Uniform resource locators (URLs):**
 - Addresses of Web pages
 - E.g.,
`http://www.megacorp.com/content/features/082602.html`
 - **Web servers**
 - Software for locating and managing Web pages

7.36

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The Global Internet

- **Search engines**
 - Started in early 1990s as relatively simple software programs using keyword indexes
 - Today, major source of Internet advertising revenue via **search engine marketing**, using complex algorithms and page ranking techniques to locate results
 - Sponsored links vs. organic search results
- **Shopping bots**
 - Use intelligent agent software for searching Internet for shopping information

7.37

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The Global Internet

How Google Works

1. User enters query

2. Google's Web servers receive the request. Google uses an estimated 450,000 PCs linked together and connected to the Internet to handle incoming requests and produce the results

3. Request is sent to Google's index servers that describe which pages contain the keywords matching the query and where those pages are stored on the document servers

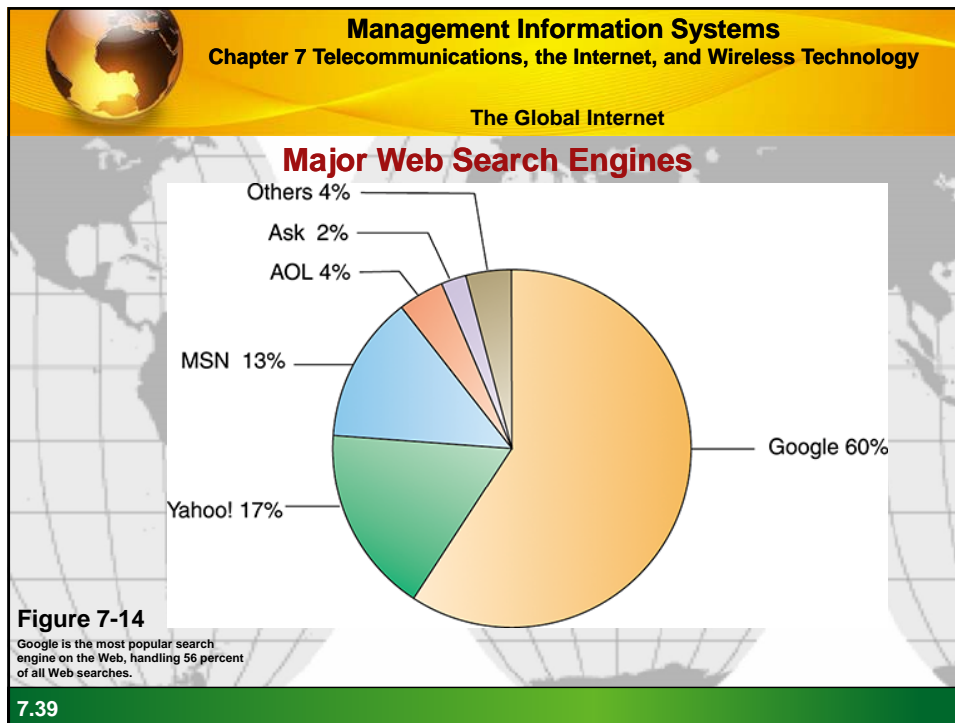
4. Using the PageRank software, the system measures the "importance" or popularity of each page by solving an equation with more than 500 million variables and two billion terms. These are likely the "best" pages for the query

5. Small text summaries are prepared for each Web page

6. Results delivered to user, 10 to a page

Figure 7-13
 The Google search engine is continuously crawling the Web, indexing the content of each page, calculating its popularity, and storing the pages so that it can respond quickly to user requests to see a page. The entire process takes about one-half second.

7.38




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The Global Internet

- **Web 2.0**
 - Second-generation interactive Internet-based services enabling people to collaborate, share information, and create new services online
 - **Cloud computing**
 - **Software mashups and widgets**
 - **Blogs:** Chronological, informal Web sites created by individuals using easy-to-use weblog publishing tools
 - **RSS (Really Simple Syndication):** Syndicates Web content so aggregator software can pull content for use in another setting or viewing later
 - **Wikis:** Collaborative Web sites where visitors can add, delete, or modify content on the site

7.40




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The Global Internet

- **Web 3.0**
 - Current efforts to make using Web more productive
 - Inefficiency of current search engines: Of 330 million search engine queries daily, how many are fruitful?
 - Semantic Web
 - Collaborative effort to add layer of meaning on top of Web, to reduce the amount of human involvement in searching for and processing Web information
 - Other, more modest views of future Web
 - Increase in cloud computing, SaaS
 - Ubiquitous connectivity between mobile and other access devices
 - Make Web a more seamless experience

7.41




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The Global Internet

- **Intranets**
 - Use existing network infrastructure with Internet connectivity standards software developed for the Web
 - Create networked applications that can run on many types of computers
 - Protected by firewalls
- **Extranets**
 - Allow authorized vendors and customers access to an internal intranet
 - Used for collaboration
 - Also subject to firewall protection

7.42




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The Wireless Revolution

- **Wireless devices**
 - PDAs, BlackBerry, smart phones
- **Cellular systems**
 - **Competing standards for cellular service**
 - United States: **CDMA**
 - Most of rest of world: **GSM**
 - **Third-generation (3G) networks**
 - Higher transmission speeds suitable for broadband Internet access

7.43



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The Wireless Revolution

- **Wireless computer networks and Internet access**
 - **Bluetooth (802.15)**
 - Links up to 8 devices in 10-m area using low-power, radio-based communication
 - Useful for personal networking (PANs)
 - **Wi-Fi (802.11)**
 - Set of standards: 802.11a, 802.11b, 802.11g, 802.11n
 - Used for wireless LAN and wireless Internet access
 - Use **access points**: Device with radio receiver/transmitter for connecting wireless devices to a wired LAN

7.44

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The Wireless Revolution

A Bluetooth Network (PAN)

Figure 7-15
 Bluetooth enables a variety of devices, including cell phones, PDAs, wireless keyboards and mice, PCs, and printers, to interact wirelessly with each other within a small 30-foot (10-meter) area. In addition to the links shown, Bluetooth can be used to network similar devices to send data from one PC to another, for example.

7.45


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The Wireless Revolution

An 802.11 Wireless LAN

Figure 7-16
 Mobile laptop computers equipped with wireless network interface cards link to the wired LAN by communicating with the access point. The access point uses radio waves to transmit network signals from the wired network to the client adapters, which convert them into data that the mobile device can understand. The client adapter then transmits the data from the mobile device back to the access point, which forwards the data to the wired network.

7.46




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The Wireless Revolution

- **Wireless computer networks and Internet access**
 - **Wi-Fi (cont.)**
 - **Hotspots:** One or more access points in public place to provide maximum wireless coverage for a specific area
 - **Weak security features**
 - **WiMax (802.16)**
 - Wireless access range of 31 miles
 - Require WiMax antennas
 - Sprint Nextel building WiMax network

7.47



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The Wireless Revolution

- **Radio frequency identification (RFID)**
 - Use tiny tags with embedded microchips containing data about an item and location, and antenna
 - Tags transmit radio signals over short distances to special RFID readers, which send data over network to computer for processing
 - **Active RFID:** Tags have batteries, data can be rewritten, range is hundreds of feet, more expensive
 - **Passive RFID:** Range is shorter, also smaller, less expensive, powered by radio frequency energy

7.48

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The Wireless Revolution

- **Radio frequency identification (RFID)**
 - Common uses:
 - Automated toll-collection
 - Tracking goods in a supply chain
 - Requires companies to have special hardware and software
 - Reduction in cost of tags making RFID viable for many firms

7.49

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The Wireless Revolution

How RFID Works

The diagram illustrates the RFID process. On the left, a 'Tag' is shown with 'Radio waves' emanating from it towards an 'RFID Reader'. An arrow points from the 'RFID Reader' to a 'Host computer' on the right.

Tag
A microchip holds data including an identification number. The rest of the tag is an antenna that transmits data to a reader.

RFID Reader
Has an antenna that constantly transmits. When it senses a tag, it wakes it up, interrogates it, and decodes the data. Then it transmits the data to a host system over wired or wireless connections.

Host computer
Processes the data from the tag that have been transmitted by the reader.

RFID uses low-powered radio transmitters to read data stored in a tag at distances ranging from 1 inch to 100 feet. The reader captures the data from the tag and sends them over a network to a host computer for processing.

Figure 7-17

7.50

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The Wireless Revolution

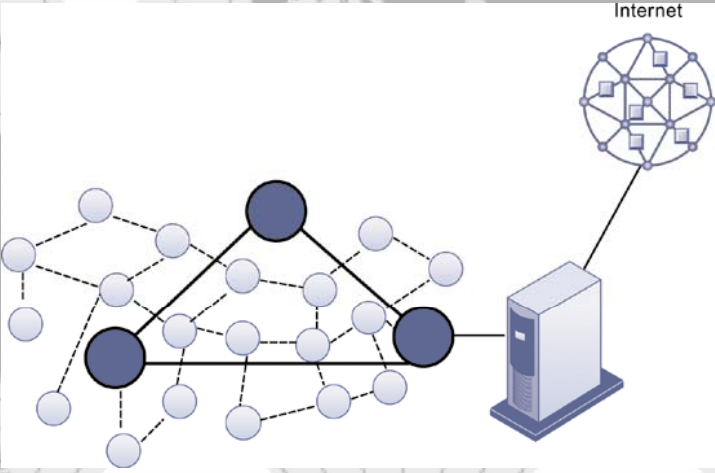
- **Wireless sensor networks**
 - Networks of hundreds or thousands of interconnected wireless devices embedded into physical environment to provide measurements of many points over large spaces
 - Used to monitor building security, detect hazardous substances in air, monitor environmental changes, traffic, or military activity
 - Devices have built-in processing, storage, and radio frequency sensors and antennas
 - Require low-power, long-lasting batteries and ability to endure in the field without maintenance

7.51

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The Wireless Revolution

A Wireless Sensor Network



The diagram illustrates a wireless sensor network. It features a mesh of nodes, with smaller light blue circles representing lower-level nodes and larger dark blue circles representing high-end nodes. These nodes are interconnected with dashed lines. A central node is connected to a server rack, which in turn is connected to a network labeled 'Internet'.

Figure 7-18
The small circles represent lower-level nodes and the larger circles represent high-end nodes. Lower-level nodes forward data to each other or to higher-level nodes, which transmit data more rapidly and speed up network performance.

7.52

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The Wireless Revolution

WiMax 802.16


HOW WiMAX WORKS

7.53

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The Wireless Revolution

WiMax 802.16



- **WiMAX** นี้มีซึ่งมีรัศมีทำการไกลสูงสุดที่ 30 ไมล์ หรือเป็นระยะทางประมาณ 48 กิโลเมตร มีอัตราความเร็วในการส่งผ่านข้อมูลสูงสุดถึง 75 เมกะบิตต่อวินาที (Mbps) มีความสามารถในการรองรับการใช้งานแบนด์วิดท์, ช่องสัญญาณ สำหรับการสื่อสารได้ด้วยความยืดหยุ่น โดยสามารถปรับให้สอดคล้องกับแผนการติดตั้งเซลล์ในย่านความถี่ที่ต้องจ่ายค่าลิขสิทธิ์
- มาตรฐาน **WiMAX** แบบ **IEEE 802.16e** เป็นมาตรฐานที่ออกแบบมาให้สนับสนุนการใช้งานร่วมกับอุปกรณ์พกพาประเภทต่างๆ เช่น อุปกรณ์พีดีเอ โน้ตบุ๊ก เป็นต้น โดยให้รัศมีทำงานที่ 1.6 – 4.8 กิโลเมตร มีระบบที่ช่วยช่วยให้ผู้ใช้งานยังสามารถสื่อสารได้โดยให้คุณภาพในการสื่อสารที่ดีและมีเสถียรภาพขณะใช้งาน แม้จะมีการเคลื่อนที่อยู่ตลอดเวลา

7.54

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The Wireless Revolution

WiMax 802.16

7.55

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The Wireless Revolution

WiMax 802.16

รูปแบบการเชื่อมต่อของ **WIMAX** ที่มีหลากหลายการเชื่อมต่อ ลองมาดูสิว่าแบบไหนเหมาะสมกับเรามากที่สุด?

1. รูปแบบการเชื่อมต่อแบบ **PTP (Point to Point)**
เป็นการเชื่อมต่อโดยตรงระหว่างสถานีฐานกับลูกข่าย
2. รูปแบบการเชื่อมต่อแบบ **PMP (Point to Multipoint)**
เป็นการเชื่อมระหว่างสถานีฐานกับหลายๆ สถานีลูกข่ายพร้อมกัน
3. รูปแบบการเชื่อมต่อแบบ **Mesh Topology**
เป็นการเชื่อมในแบบในลักษณะใยแมงมุม โดยสถานีฐานติดต่อกับสถานีฐานได้โดยตรง สถานีฐานติดต่อกับลูกข่ายได้ ลูกข่ายยังสามารถติดต่อกันได้เองด้วย

7.56

Management Information Systems
Chapter 7 Telecommunications, the Internet, and Wireless Technology

The Wireless Revolution

WiMax 802.16

ศักยภาพในการให้บริการของ **WIMAX**

ศักยภาพในการให้บริการสื่อสารข้อมูล ของ **WiMAX** หมายถึงขอบเขตการให้บริการในพื้นที่การให้บริการและอัตราความเร็วในส่งข้อมูล ทั้งนี้ในปัจจุบันสถานี **WIMAX** แต่ละแห่งสามารถให้บริการแบบ **NLOS** ได้ในรัศมีทำการตั้งแต่ **4 – 9** กิโลเมตร รองรับการสื่อสารด้วยอัตราเร็วสูงสุดในช่วง **8 – 11.3** เมกะบิตต่อวินาที ทั้งในช่วงการส่งสัญญาณจากเครื่องลูกข่ายไปยังสถานีฐาน และจากสถานีฐานไปสู่เครื่องลูกข่าย

สำหรับการใช้ **WiMAX** ในงานสื่อสารระยะทางไกลในรูปแบบการส่งสัญญาณแบบ **LOS** จะสามารถส่งสัญญาณได้ในระยะทางถึง **30 – 50** กิโลเมตร ทั้งนี้ได้มีการกำหนดย่านความถี่สำหรับการใช้งานในเขตพื้นที่ต่างๆ ทั่วโลก ดังนี้

- ทวีปอเมริกาเหนือ กำหนดให้ใช้ย่าน **2.5** และ **5.8** เมกะเฮิรตซ์
- ทวีปอเมริกาใต้ กำหนดให้ใช้ย่าน **2.5 3.5** และ **5.8** เมกะเฮิรตซ์
- ทวีปยุโรป และเอเชีย กำหนดให้ใช้ย่าน **3.5** และ **5.8** เมกะเฮิรตซ์

7.57

Management Information Systems
Chapter 7 Telecommunications, the Internet, and Wireless Technology

The Wireless Revolution

WiMax 802.16

The diagram illustrates the WiMax 802.16 network architecture. A central tower labeled "802.16-2004" is connected via dashed lines to four different access scenarios:

- Business Access & Backhaul:** Shows a tower connected to a building with a "WIFI" icon.
- Consumer Broadband Access:** Shows a tower connected to a house with a "WIFI" icon.
- Portable Broadband Access:** Shows a tower connected to a person sitting at a desk with a laptop and a "WIFI" icon.
- Hotspot Backhaul:** Shows a tower connected to a "Cafe" with a "WIFI" icon.

Below the Hotspot Backhaul, the text "802.16e Portable, Mobile" is displayed.

7.58

Management Information Systems
 Chapter 7 Telecommunications, the Internet, and Wireless Technology

The Wireless Revolution

WiMAX 802.16m

Mobile WiMAX™ Roadmap

 Mobile WiMAX Rel 1.0 (802.16e) Mobile Broadband 70+ Mbps 2008	 Mobile WiMAX Rel 1.5 (802.16e Rev2) Mobile Broadband 125+ Mbps 2009 / 2010	 Mobile WiMAX Rel 2.0 (802.16m) Mobile Broadband 300+ Mbps 2010 / 2011
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7.59

Management Information Systems
 Chapter 7 Telecommunications, the Internet, and Wireless Technology

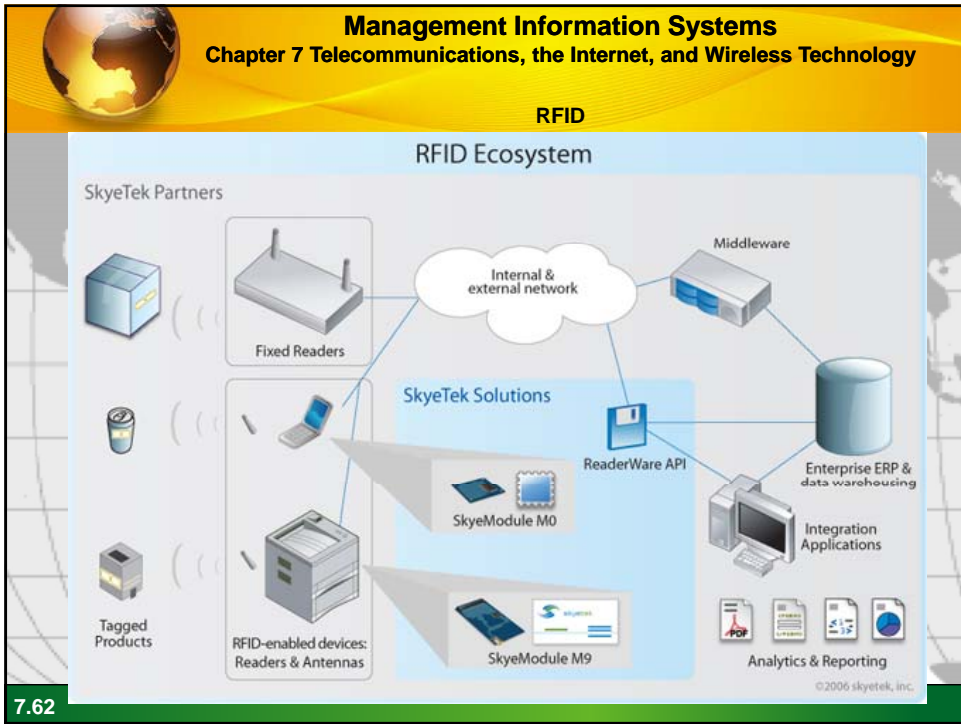
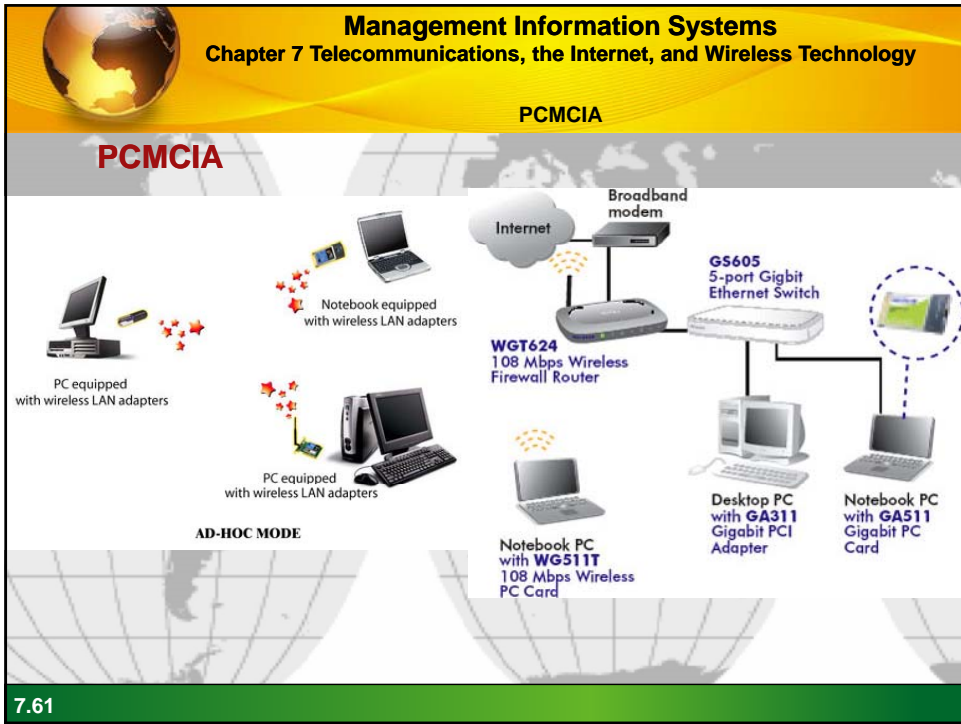
PCMCIA

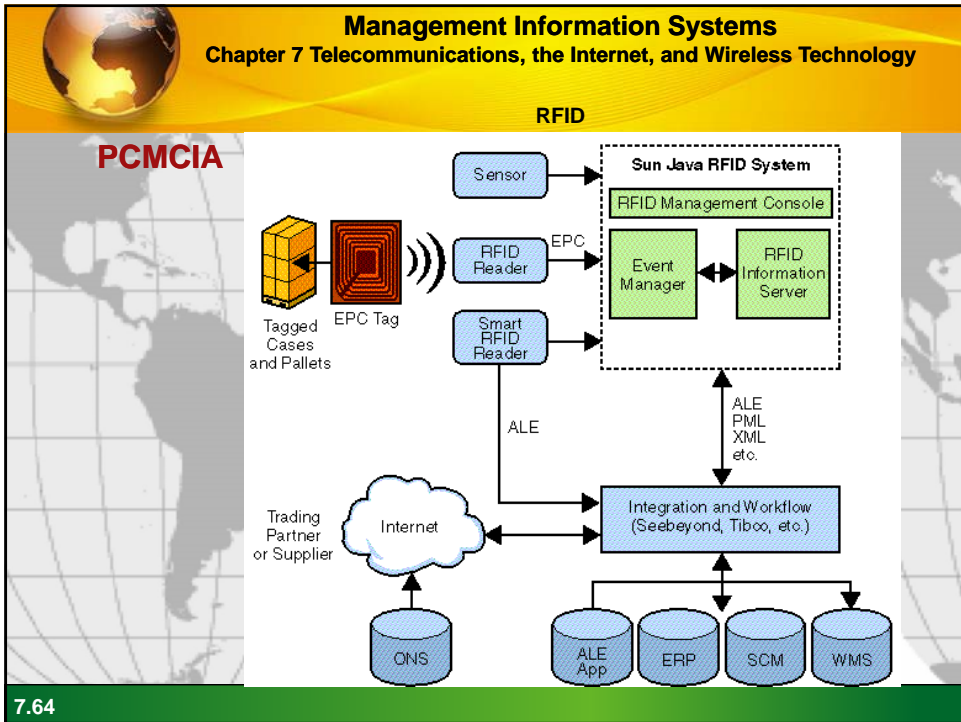
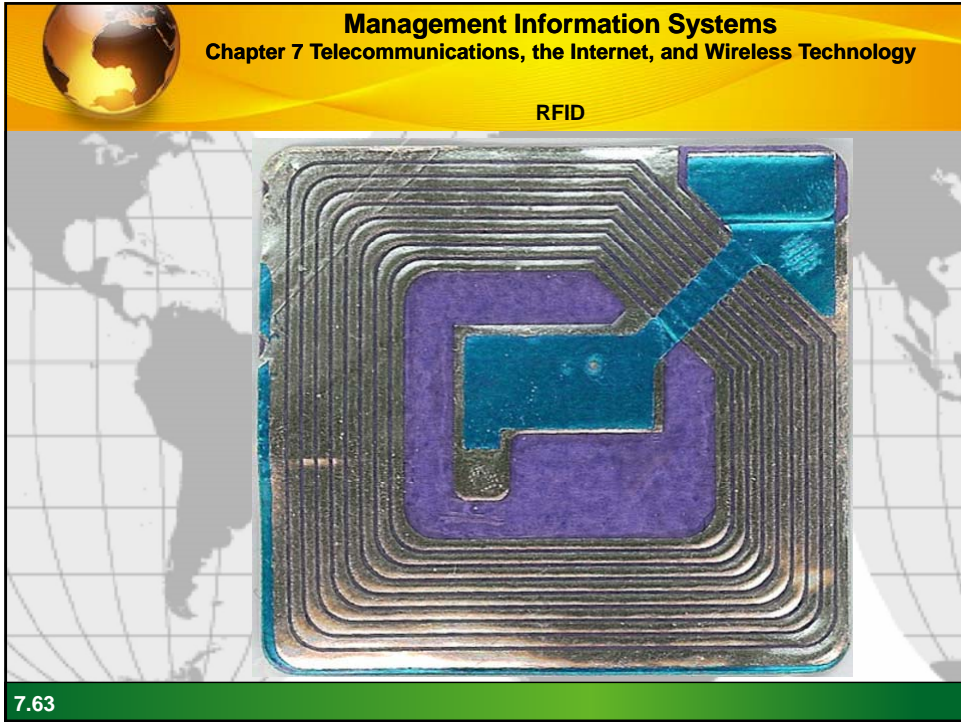
PCMCIA

Personal Computer Memory Card International Association หรือ PCMCIA

- * สามารถทำงานได้ที่สถานะแรงดันต่ำๆ เพียง 3.3 Volt
- * เพิ่มเติมส่วนของฮาร์ดแวร์ Direct Memory Access (DMA)
- * เพิ่มเติมให้การ์ดสามารถทำฟังก์ชั่นได้มากขึ้น
- * ปรับปรุงมาตรฐานการจัดการด้านอินเทอร์เฟซ (APM)
- * มีความสามารถด้านการอินเทอร์เฟซ 32 bit bus (Card bus) ซึ่งมี Throughput ที่สูงมาก

7.60





Management Information Systems
Chapter 7 Telecommunications, the Internet, and Wireless Technology

RFID

RFID Enabled Shipping & Receiving

Order received, then released for picking

Pick & packed into an LPN. RFID tag applied

LPN detected as it passes through dock & ship confirm is processed

Receiving Organization

Shipping Organization

LPN detected as it passes through receiving dock and Receipt processed

7.65

Management Information Systems
Chapter 7 Telecommunications, the Internet, and Wireless Technology

RFID

Video Cases

<http://www.youtube.com/watch?v=asxYJw7wIHE&feature=related>

<http://www.youtube.com/watch?v=xQDGH9JzZtA&feature=related>

7.66