

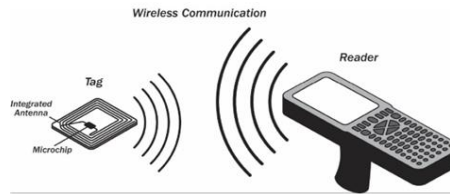
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**Telecommunications,
the Internet, and
Wireless Technology**

RFID and Wireless Technology Speed Up Production at Continental Tires

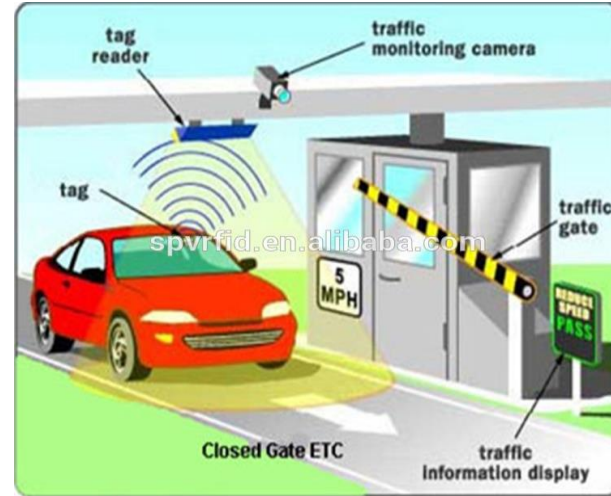
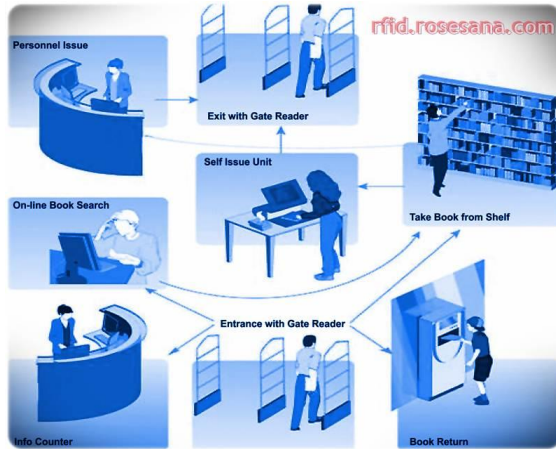
- **Problem:** Inefficient manual processes; large production environment
- **Solutions:** Track components in real time, optimize transportation, and expedite communication

- Wi-Fi networks
- RFID technologies
- Mobile handhelds
- Material inventory tracking software

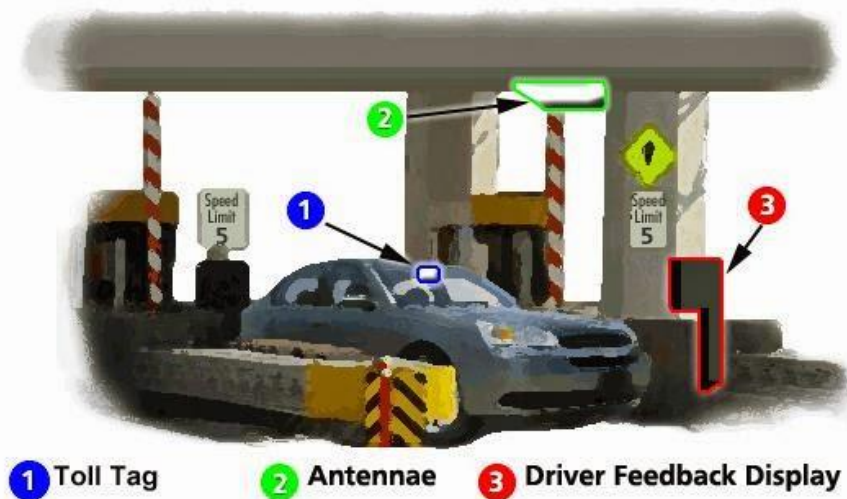
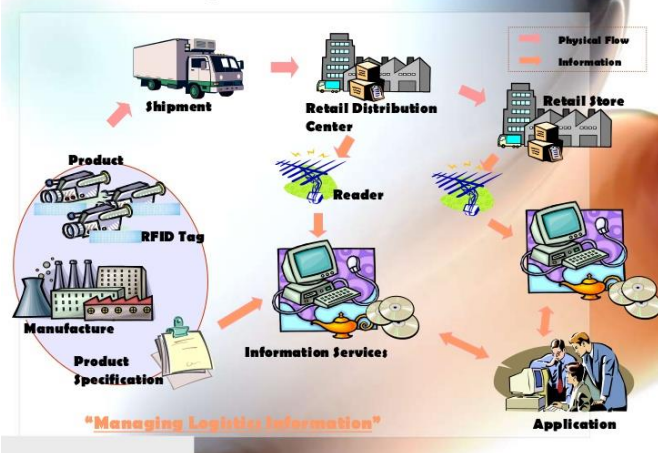


- Demonstrates use of technology in production and supply chain to increase efficiency and lower costs

Various Applications of RFID Technology



RFID-based Logistics Environment



- **Networking and Communication Trends**

- **Convergence:**

- Telephone networks and computer networks converging into single digital network using Internet standards

- **Broadband** (akses internet dengan jangkauan frekuensi lebih luas dan transfer data lebih cepat) :

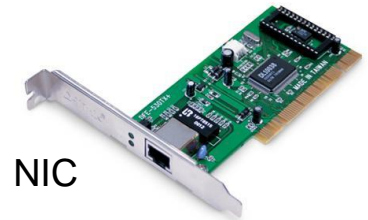
- More than 68% U.S. Internet users have broadband access

- **Broadband wireless:**

- Voice, data communication are increasingly taking place over broadband wireless platforms

- **Computer network**

- **Two or more connected computers**
- **Major components in simple network**
 - Client and server computers
 - Network interfaces (NICs)
 - Connection medium
 - Network operating system
 - Hubs, switches, routers



Coaxial Cable



Unshielded Twisted Pair



Shielded Twisted Pair



Fiber Optic Cable



Hub : menghubungkan dan mengirimkan paket data ke perangkat yang terhubung

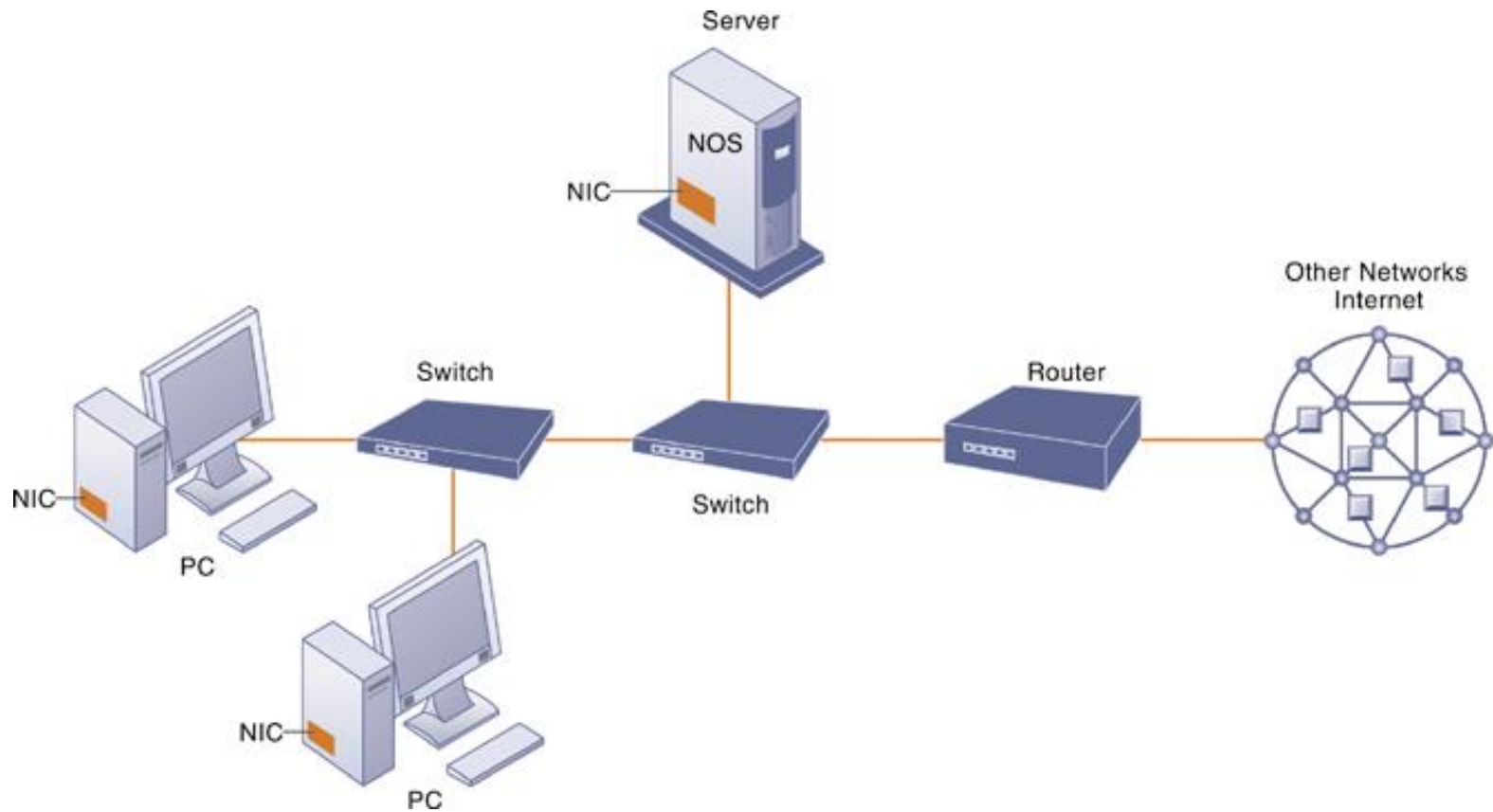
Switch : seperti hub tetapi dapat menyaring serta meneruskan data ke alamat tujuan

Router : memandu perjalanan paket data dan memastikan bahwa data sampai pada alamat yang benar

Tugas utama router untuk menyambungkan dua jaringan yang berbeda (jaringan internet dan jaringan lokal)

Telecommunications and Networking in Today's Business World

Components of a Simple Computer Network



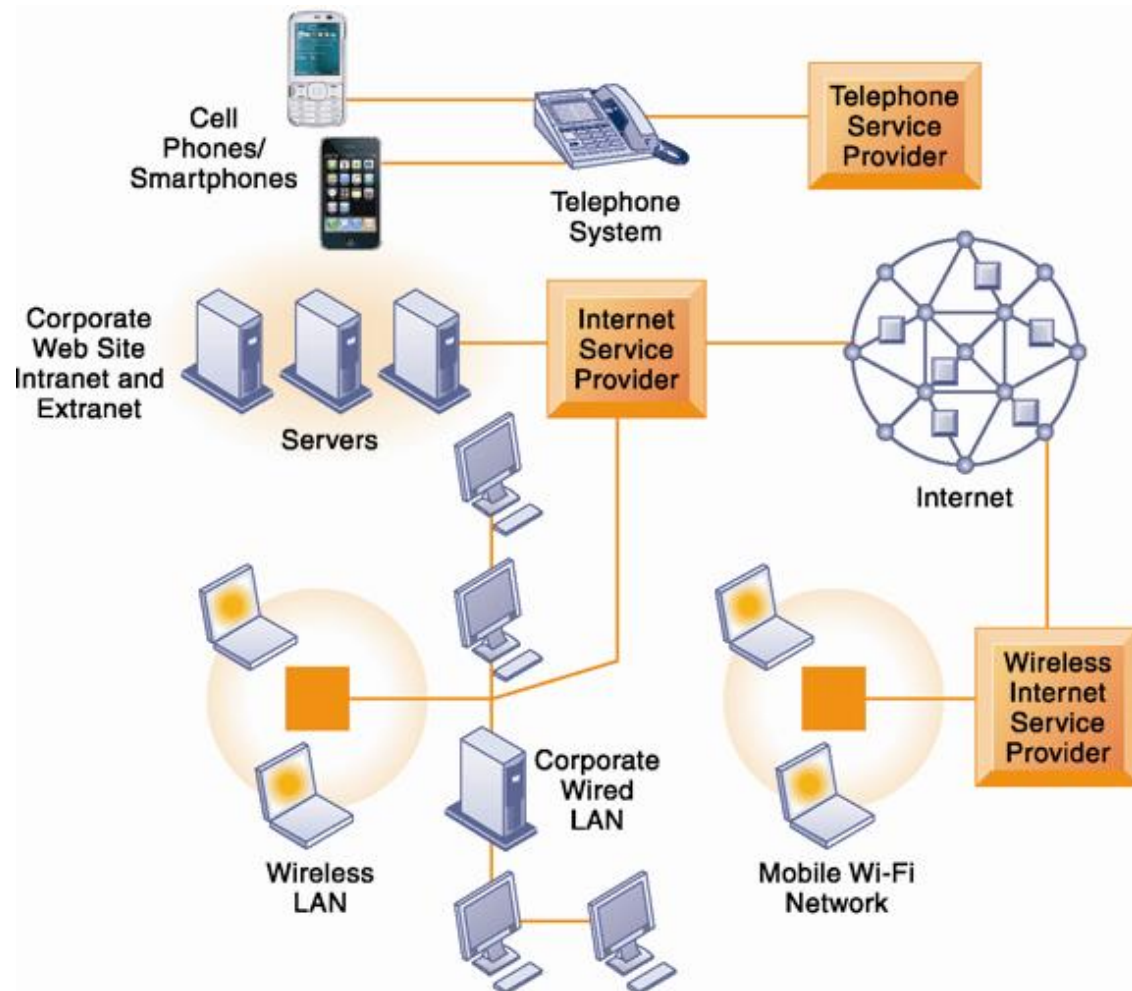
Illustrated here is a very simple computer network, consisting of computers, a network operating system residing on a dedicated server computer, cabling (wiring) connecting the devices, network interface cards (NIC), switches, and a router.

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

Telecommunications and Networking in Today's Business World

Corporate Network Infrastructure

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.



- **Key digital networking technologies**

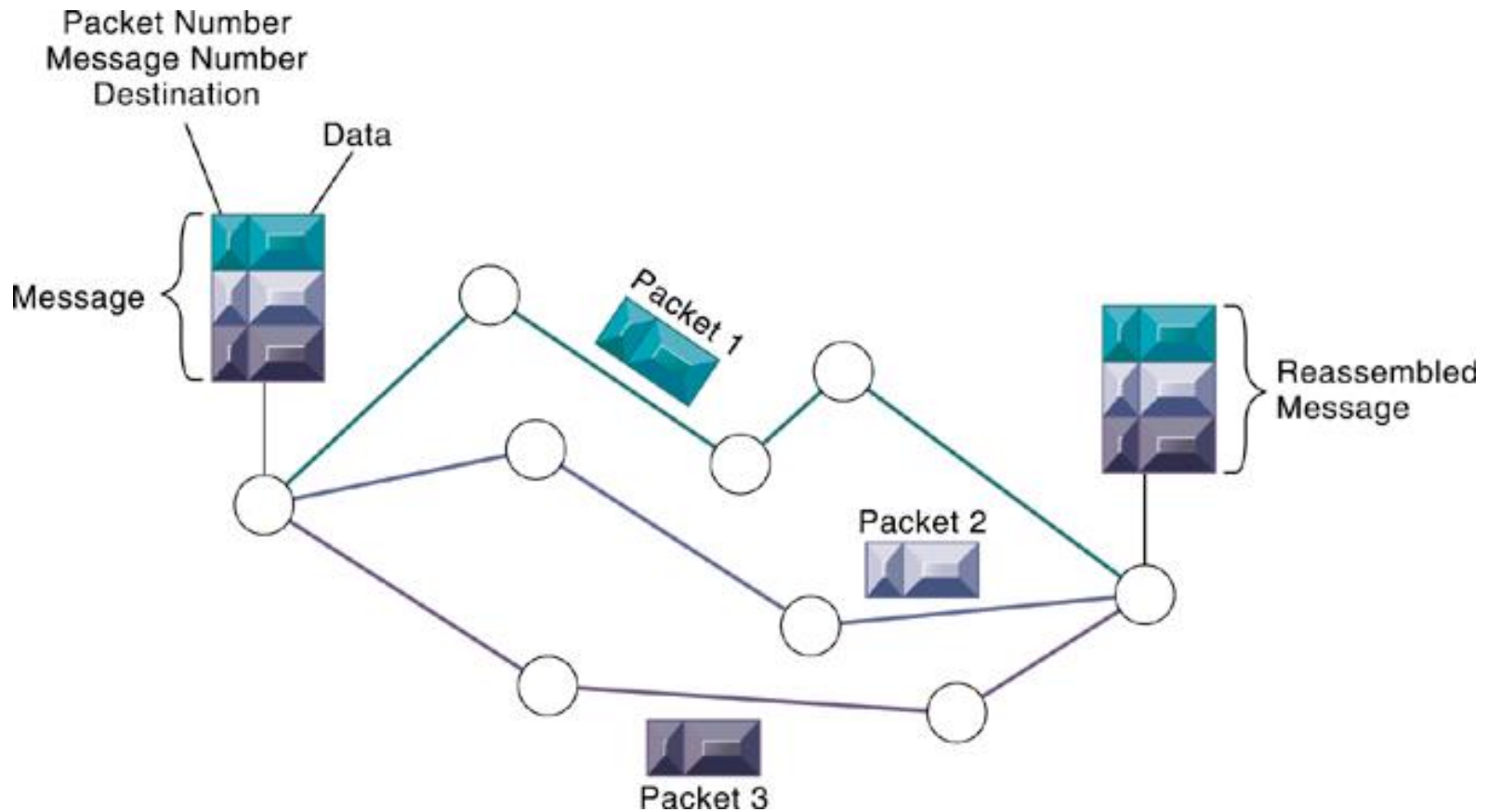
- **Client/server computing**

- 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

- **Key digital networking technologies (cont.)**
 - **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

Telecommunications and Networking in Today's Business World

Packet-Switched Networks and Packet Communications



Data are grouped into small packets, which are transmitted independently over various communications channels and reassembled at their final destination.

- **Key digital networking technologies (cont.)**
 - **TCP/IP and connectivity**
 - **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

Telecommunications and Networking in Today's Business World

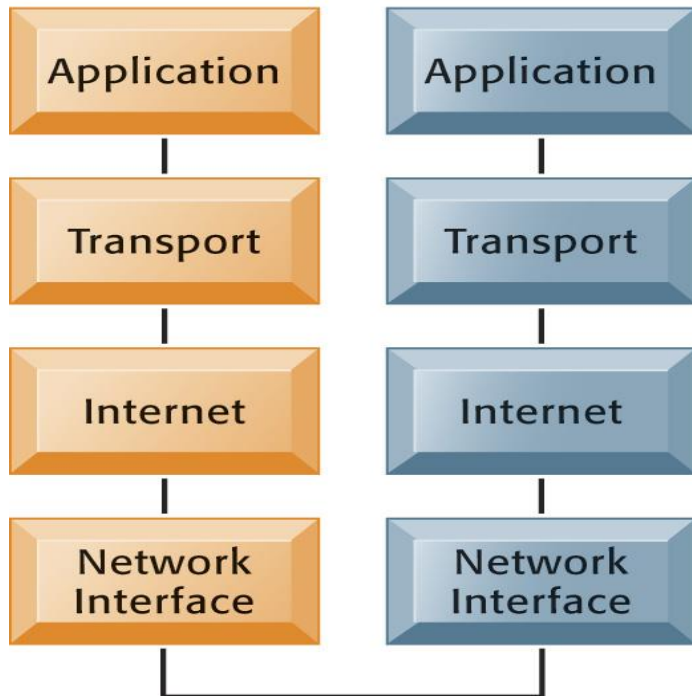
The Transmission Control Protocol/Internet Protocol (TCP/IP) Reference Model

This figure illustrates the four layers of the TCP/IP reference model for communications.

Figure 7-4

Computer A

Computer B



Layer Physical : Berfungsi menangani koneksi fisik jaringan dan prosedur-prosedur teknis yang berhubungan langsung dengan media transmisi fisik

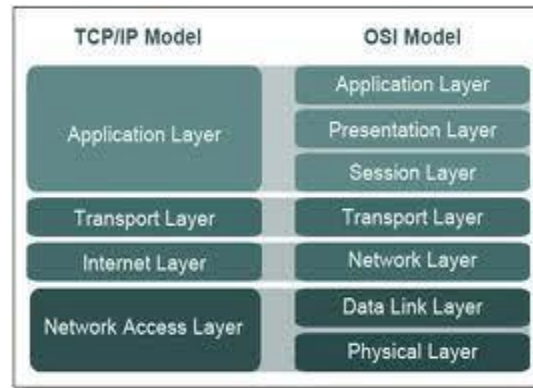
Layer Data Link : Berfungsi untuk mengendalikan lapisan fisik, mendeteksi serta mengoreksi kesalahan yang berupa gangguan sinyal pada media transmisi fisik.

Layer Network : Berfungsi untuk menyediakan routing fisik, menentukan rute yang akan ditempuh.

Layer Transport : Berfungsi menginisialisasi, memelihara, serta mengakhiri komunikasi antar komputer, selain itu juga memastikan data yang dikirim benar serta memperbaiki apabila terjadi kesalahan.

Layer Session : Berfungsi mensinkronisasikan pertukaran data antar proses aplikasi dan mengkoordinasikan komunikasi antar aplikasi yang berbeda.

Layer Presentation : Berfungsi mengubah data dari layer di atasnya menjadi data yang bisa dipahami oleh semua jenis hardware dalam jaringan.



Layer Application : di layer inilah aplikasi-aplikasi jaringan berada seperti e-mail, ftp, http, dan lain sebagainya. Tujuan dari layer ini adalah menampilkan data dari layer dibawahnya kepada pengguna.

International Organization for Standardization (OSI)

- **Signals: Digital versus analog**

- **Modem: translates digital signals into analog form (and vice versa)**

- **Types of networks**

- **Local-area networks (LANs)**

- Ethernet
- Client/server

- **Wide-area networks (WANs)**

- **Metropolitan-area networks (MANs)**

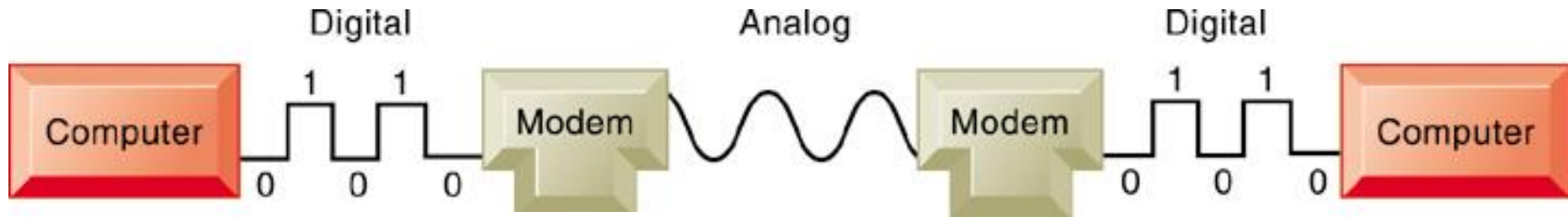
- **Campus area networks (CANs)**

Types of Computer Networks



Communications Networks

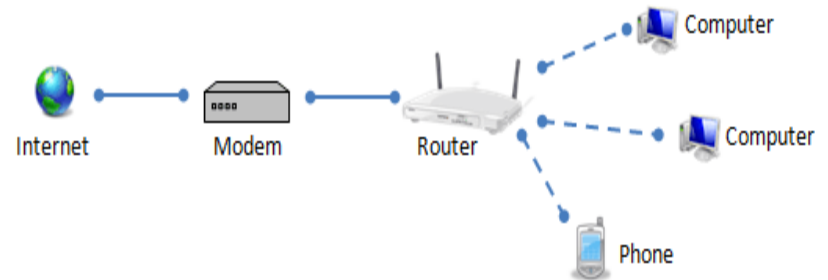
Functions of the Modem



External modem



Internal modem



Router berfungsi sebagai penghubung antar dua atau lebih jaringan untuk meneruskan data dari satu jaringan ke jaringan lainnya.

A modem is a device that translates digital signals into analog form (and vice versa) so that computers can transmit data over analog networks such as telephone and cable networks.

- **Physical transmission media**

- Twisted pair wire (CAT5)
- Coaxial cable
- Fiber optics cable
- Wireless transmission media and devices
 - Satellites
 - Cellular systems

TRANSMISSION MEDIUM	DESCRIPTION	SPEED
Twisted pair wire (CAT 5)	Strands of copper wire twisted in pairs for voice and data communications. CAT 5 is the most common 10 Mbps LAN cable. Maximum recommended run of 100 meters.	10 Mbps to 1 Gbps
Coaxial cable	Thickly insulated copper wire, which is capable of high-speed data transmission and less subject to interference than twisted wire. Currently used for cable TV and for networks with longer runs (more than 100 meters).	Up to 1 Gbps
Fiber optic cable	Strands of clear glass fiber, transmitting data as pulses of light generated by lasers. Useful for high-speed transmission of large quantities of data. More expensive than other physical transmission media and harder to install; often used for network backbone.	500 Kbps to 6+Tbps
Wireless transmission media	Based on radio signals of various frequencies and includes both terrestrial and satellite microwave systems and cellular networks. Used for long-distance, wireless communication and Internet access.	Up to 600+ Mbps

- **Transmission speed**

- Bits per second (bps)
- Hertz
- Bandwidth

Bandwidth (Lebar **Pita**) adalah perbedaan antara frekuensi terendah dan frekuensi tertinggi dalam rentang tertentu.

Bandwidth sinonim untuk data transfer rate yaitu jumlah data yang dapat dibawa dari sebuah titik ke titik lain dalam jangka waktu tertentu (pada umumnya dalam detik), biasanya diukur dalam bps (bits per second)

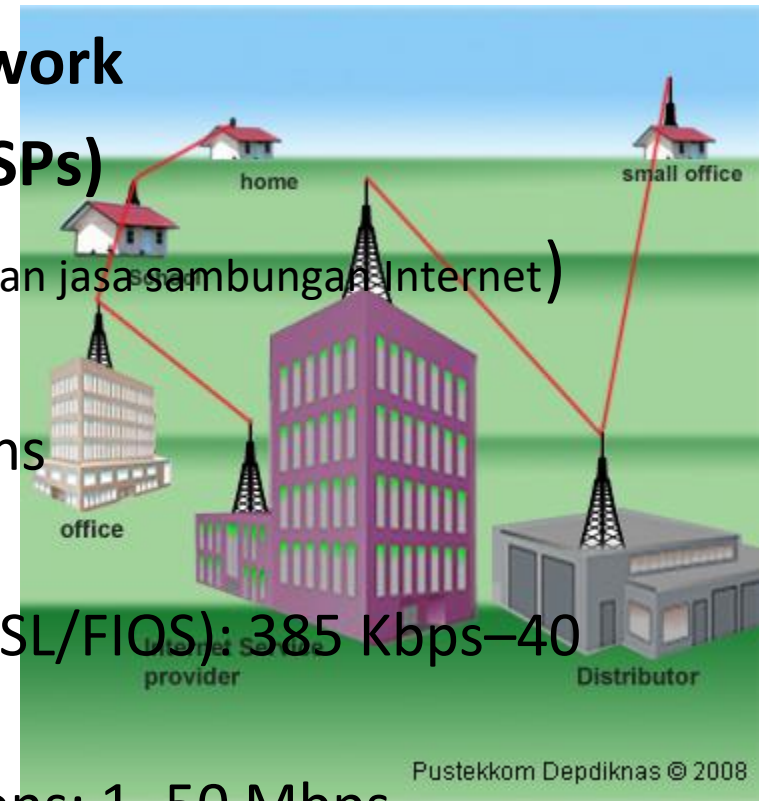
Bandwidth juga diukur dengan putaran perdetik (cycles per second), atau hertz (Hz), yaitu perbedaan antara frekuensi terendah dan tertinggi yang dapat ditransmisikan

- **The Internet**

- **World's most extensive network**
- **Internet service providers (ISPs)**

(perusahaan atau badan yang menyediakan jasa sambungan Internet)

- Provide connections
- Types of Internet connections
 - Dial-up: 56.6 Kbps
 - Digital subscriber line (DSL/FIOS): 385 Kbps–40 Mbps
 - Cable Internet connections: 1–50 Mbps
 - Satellite

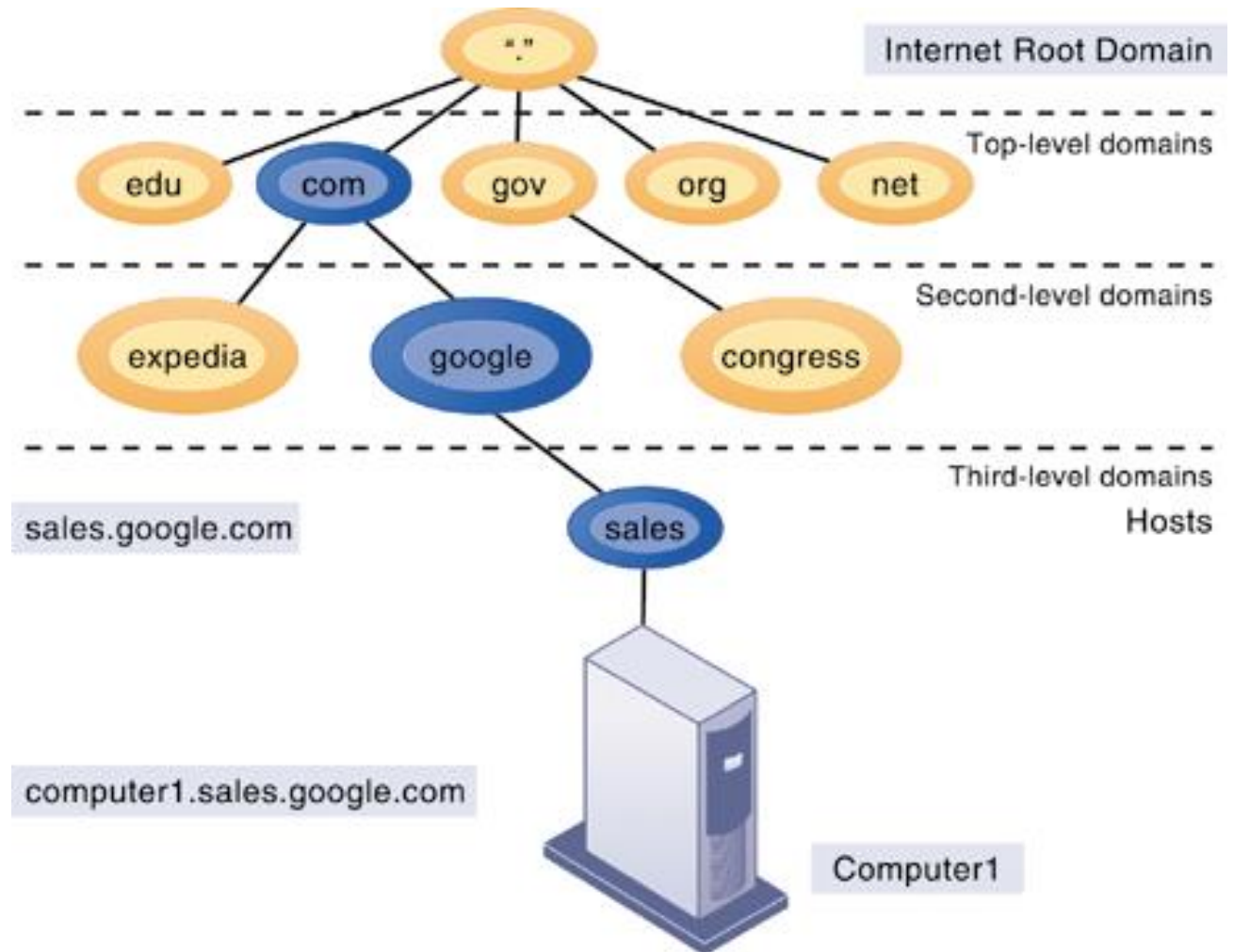


- **Internet addressing and architecture**
 - IP addresses
- **The Domain name system (DNS)**
 - Converts IP addresses to domain names
 - Hierarchical structure
 - Top-level domains

The Global Internet

The Domain Name System

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.



The Battle over Net Neutrality

- 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 impacts 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?

- **Internet services**

- **E-mail**

- **Chatting and instant messaging**

- **Electronic discussion groups / newsgroups**

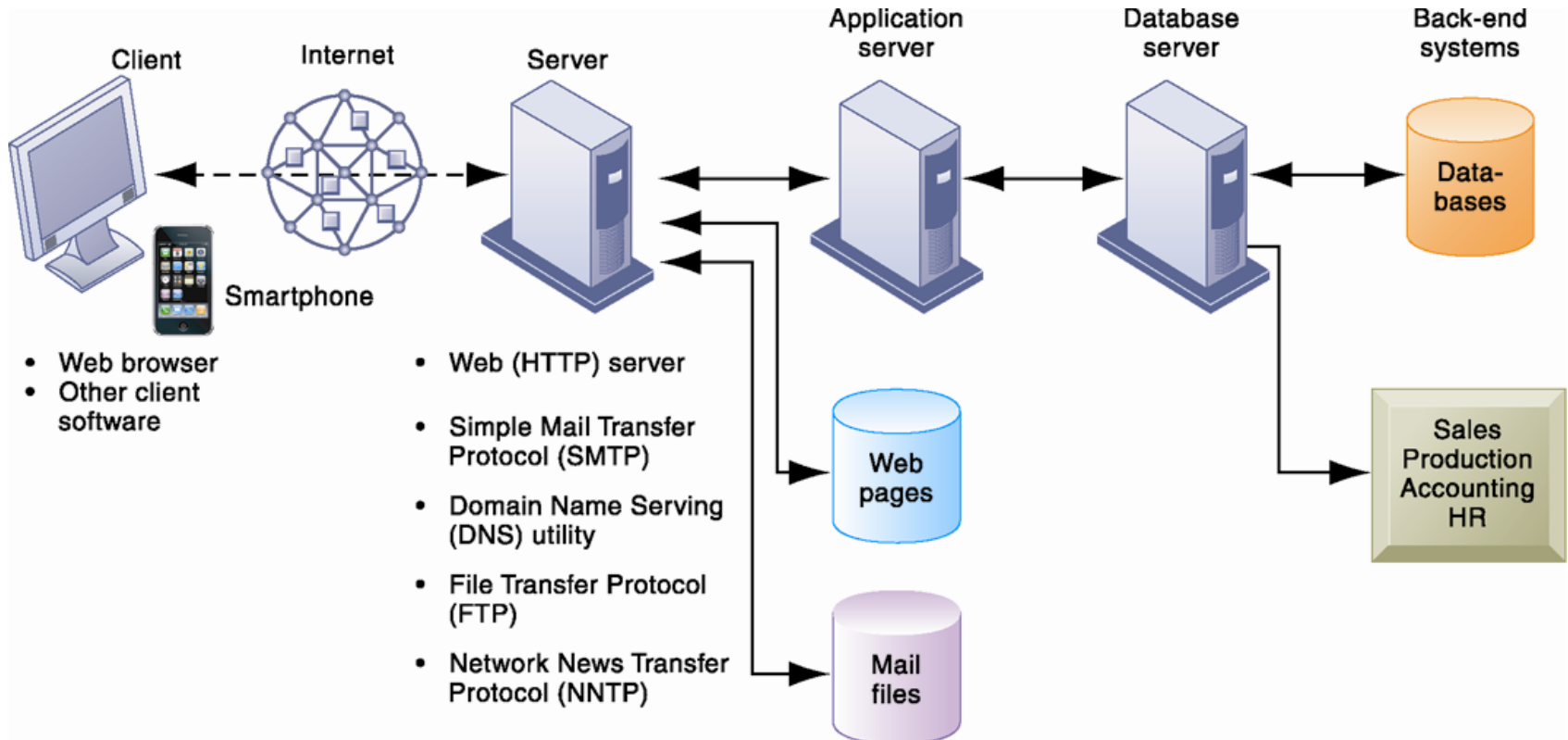
- **Telnet** (*Telecommunications Network Protocol*), merupakan remote login yang terjadi pada jaringan internet disebabkan karena adanya service dari protocol Telnet. Dengan adanya Telnet dapat memungkinkan pengguna dapat mengakses komputer lain secara remote melalui jaringan internet

- **File Transfer Protocol (FTP)**

- **World Wide Web**

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Client/Server Computing on the Internet



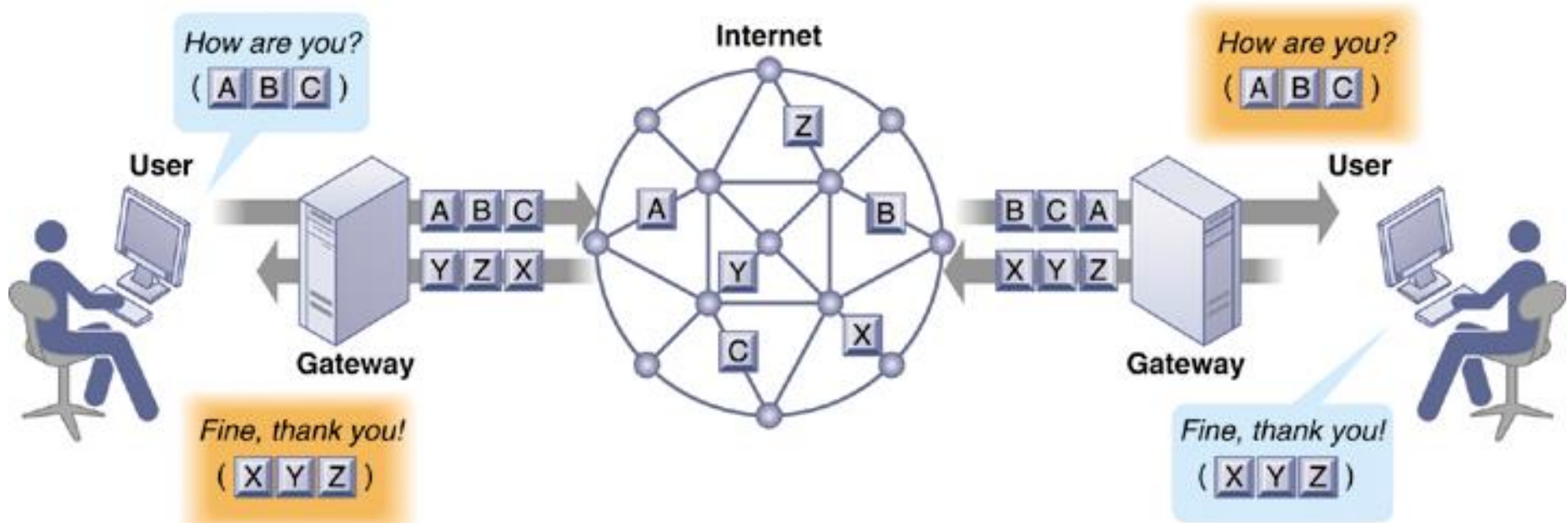
Client computers running Web browser and other software can access an array of services on servers over the Internet. These services may all run on a single server or on multiple specialized servers.

The Global Internet

- **Voice over IP (VoIP)** teknologi yang memungkinkan percakapan suara jarak jauh melalui media internet
 - Digital voice communication using IP, packet switching
 - Providers
 - Cable providers
 - Google, Skype, *Neetmeting*
- **Unified communications**
 - Communications systems that integrate voice, data, e-mail, conferencing
- **Virtual private network (VPN)**
 - Secure, encrypted, private network run over Internet
 - PPTP
 - Tunneling

The Global Internet

How Voice over IP Works



A 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.

Monitoring Employees on Networks—Unethical or Good Business?

- 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.
- Should managers inform employees that their Web behavior is being monitored? Or should managers monitor secretly? Why or why not?

- **The Web**

- **Hypertext Markup Language (HTML)**

- **Hypertext Transfer Protocol (HTTP):**

- Communications standard used for transferring Web pages

- **Uniform resource locators (URLs):**

- Addresses of Web pages

- <http://www.megacorp.com/content/features/082602.html>

- **Web servers**

- Software for locating and managing Web pages

The Global Internet

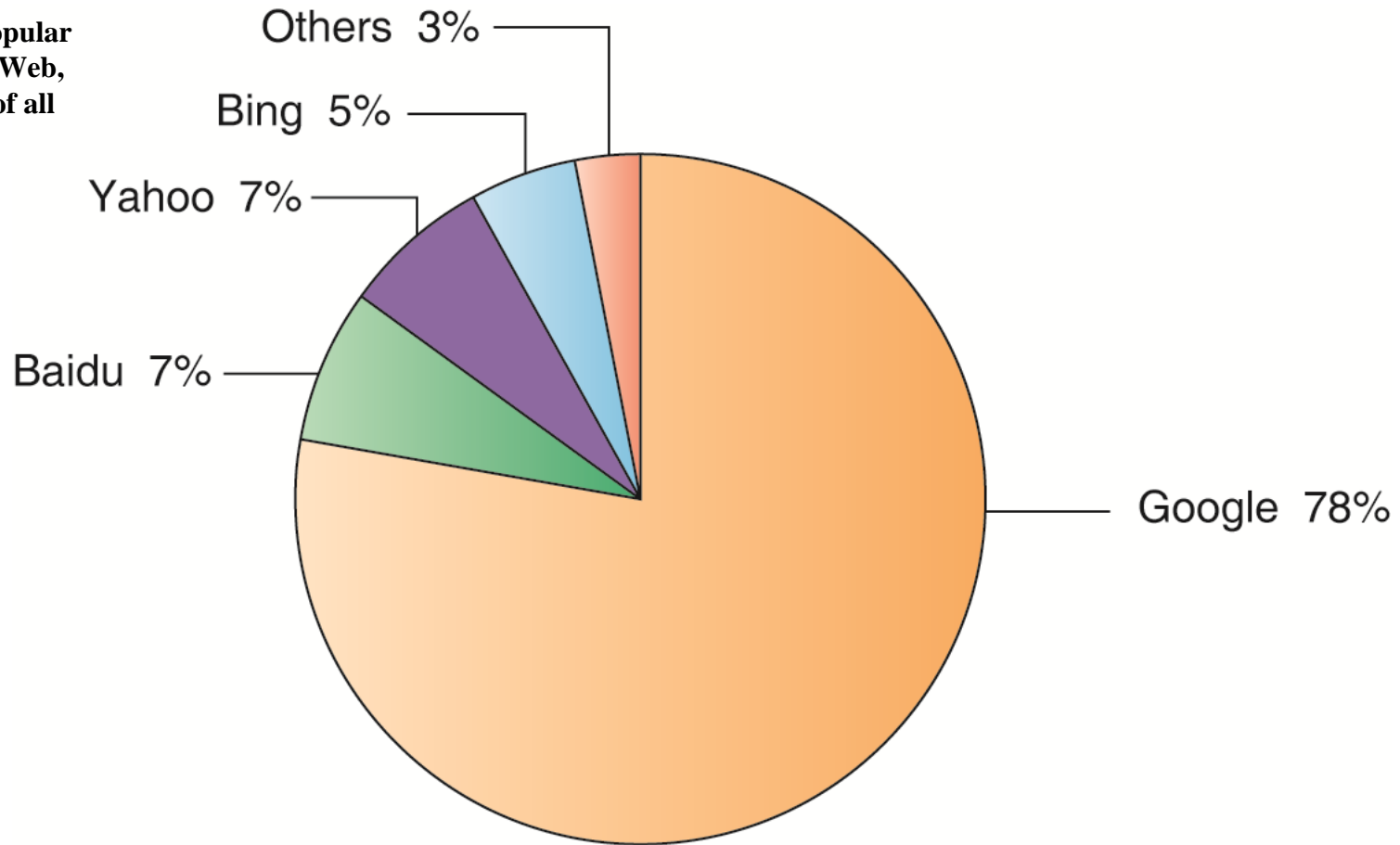
- **Search engines**
 - Started as simpler programs using keyword indexes
 - Google improved indexing and created page ranking system
- **Mobile search: 20% of all searches in 2012**
- **Search engine marketing**
 - Major source of Internet advertising revenue
- **Search engine optimization (SEO)**
 - Adjusting Web site and traffic to improve rankings in search engine results



The Global Internet

Top U.S. Web Search Engines

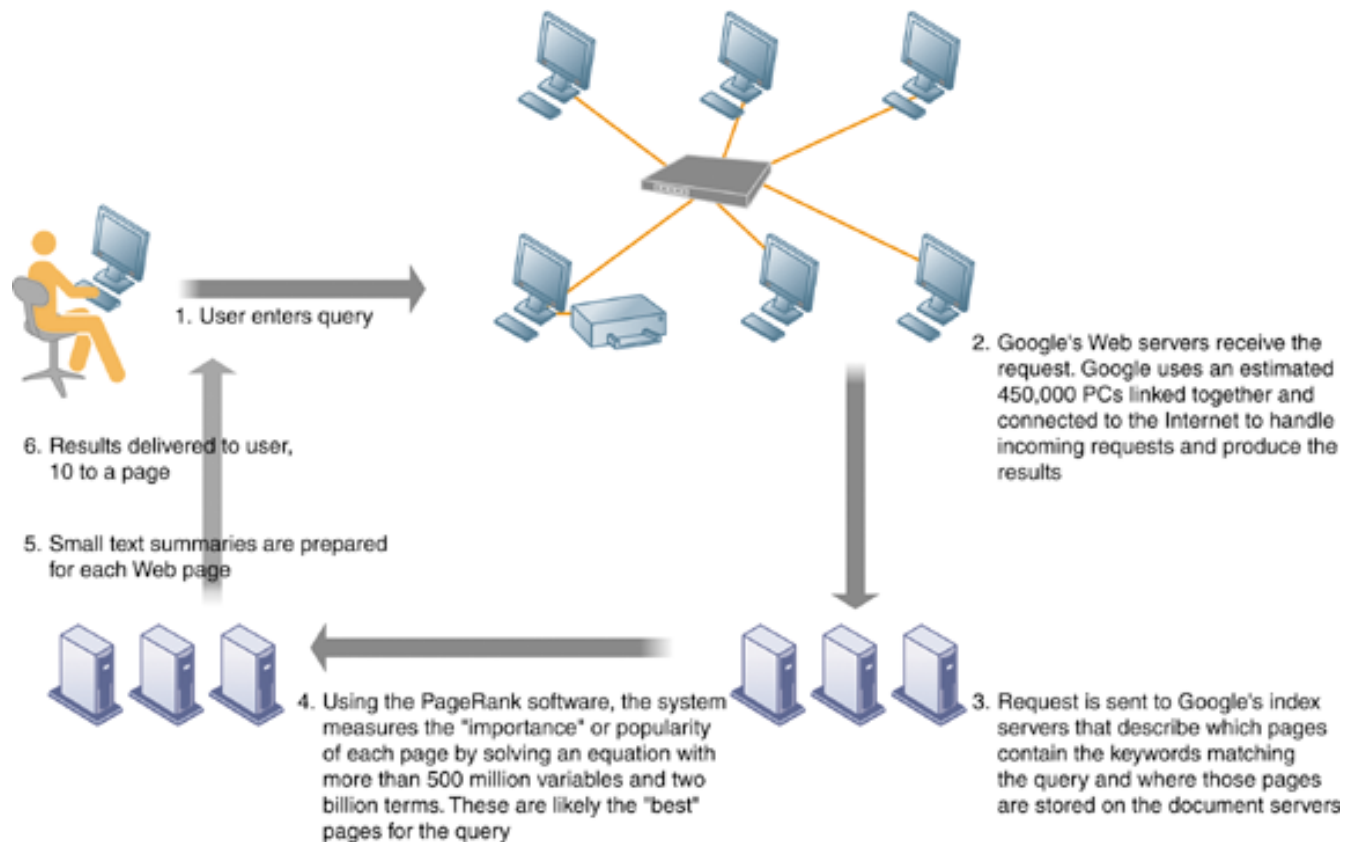
Google is the most popular search engine on the Web, handling 84 percent of all Web searches.



- **Social search**
 - Google +1, Facebook Like
- **Semantic search**
 - Anticipating what users are looking for rather than simply returning millions of links
- **Intelligent agent shopping bots**
 - Use intelligent agent software for searching Internet for shopping information

The Global Internet

How Google Works



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.

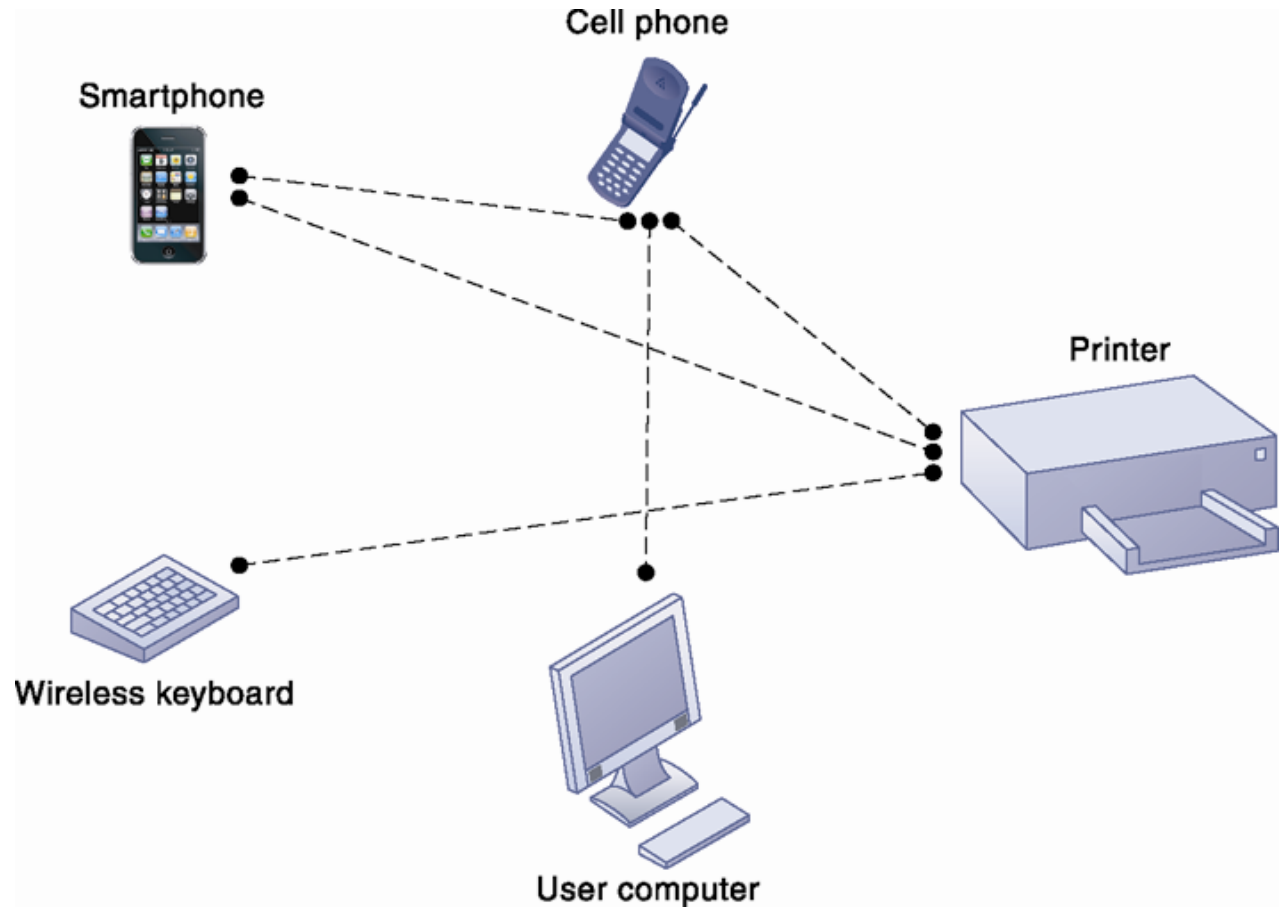
- **Cellular systems**
 - **Competing standards**
 - CDMA: United States only
 - GSM: Rest of world, AT&T, T-Mobile
 - **Third-generation (3G) networks**
 - 144 Kbps
 - Suitable for e-mail access, Web browsing
 - **Fourth-generation (4G) networks**
 - Up to 100 Mbps
 - Suitable for Internet video
 - **Fifth-generation (5G) networks**
 - Peak speed of 20 Gbps
 - Improve the performance of business applications as well as other digital experiences (such as online gaming, videoconferencing, and self-driving cars).

- **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: 802.11
 - Used for wireless LAN and wireless Internet access
 - Use access points: device with radio receiver/transmitter for connecting wireless devices to a wired LAN

The Wireless Revolution

A Bluetooth Network (PAN)

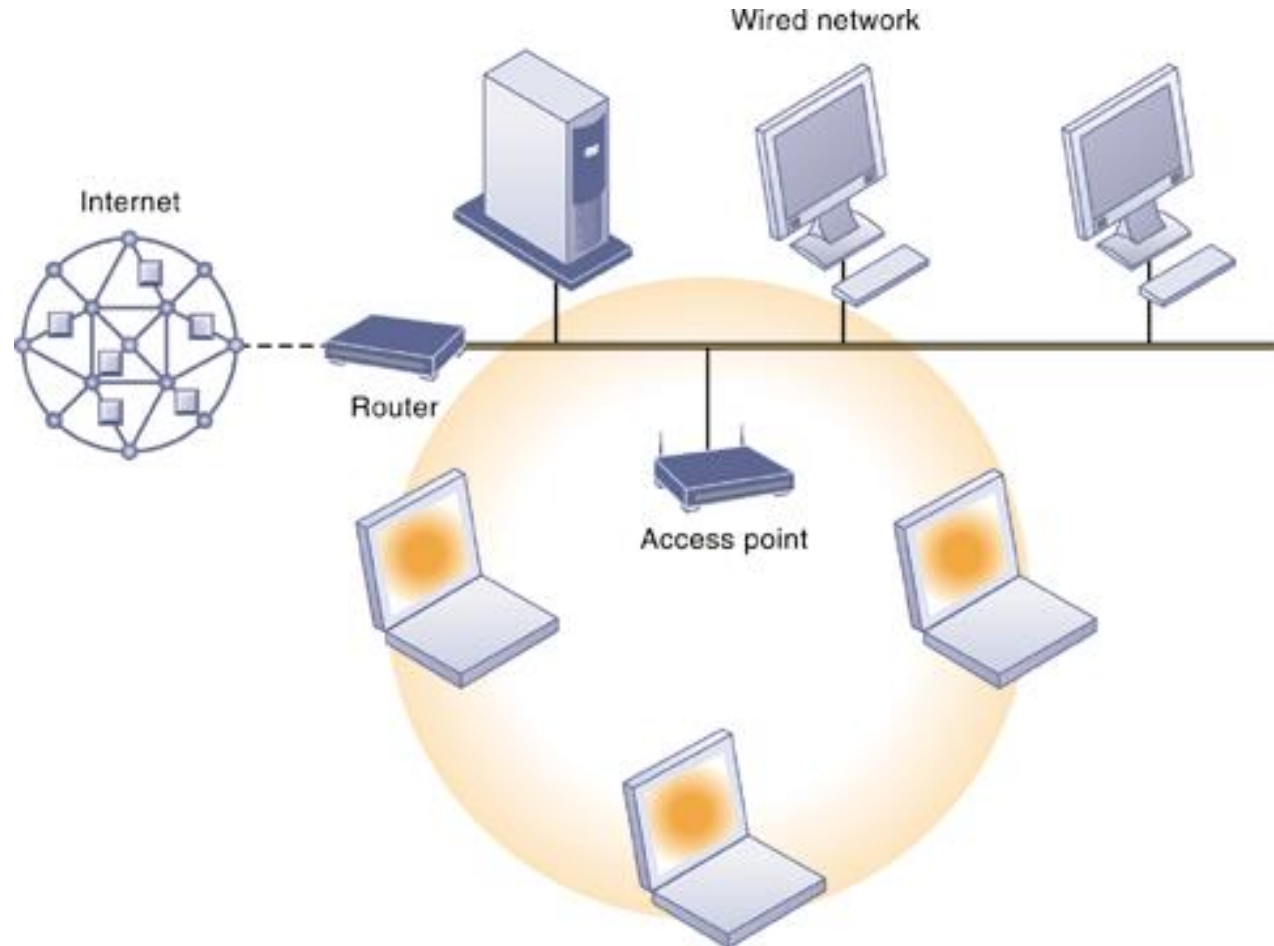
Bluetooth enables a variety of devices, including cell phones, PDAs, wireless keyboards and mice, PCs, and printers, to interact wirelessly with each other within a small 30-foot (10-meter) area. In addition to the links shown, Bluetooth can be used to network similar devices to send data from one PC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



The Wireless Revolution

An 802.11 Wireless LAN

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 forward the data to the wired network.



- **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

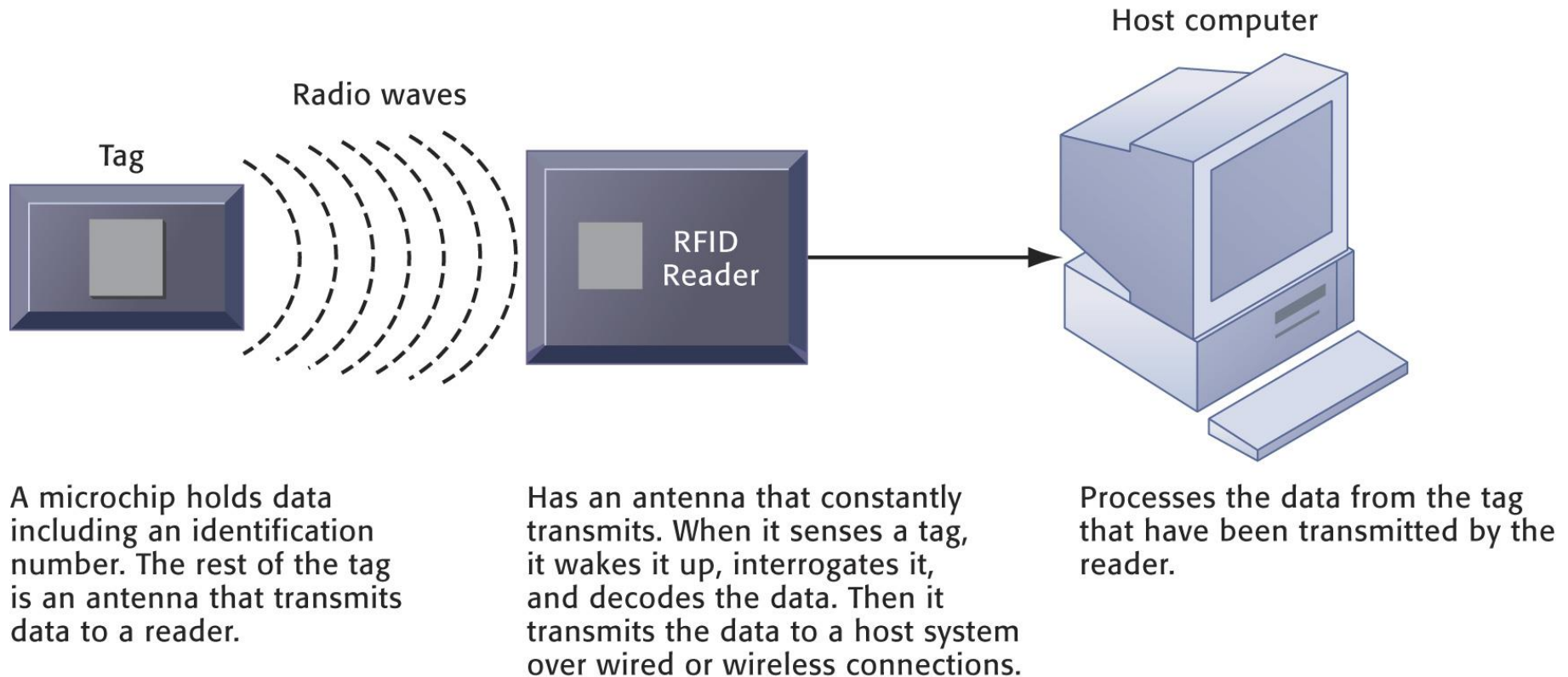
- **Radio frequency identification (RFID)**
 - **RFID tags:**
 - Tiny tags with embedded microchips contain data about an item and location
 - Transmit radio signals over short distances to RFID readers
 - **RFID readers:**
 - Send data over network to computer for processing
 - **Active RFID:**
 - Tags have batteries
 - Data can be rewritten
 - Range is hundreds of feet

The Wireless Revolution

- **RFID (cont.)**
 - **Passive RFID:**
 - Range is shorter
 - Smaller, less expensive
 - Powered by radio frequency energy
 - **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**

The Wireless Revolution

How RFID Works



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.

- **Wireless sensor networks (WSNs)**
 - **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**

The Wireless Revolution

A Wireless Sensor Network

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.

