Information Technology Module

Year 2018/2019

TELECOMMUNICATIONS, THE INTERNET, AND WIRELESS TECHNOLOGY

Laudon K; Laudon, J. (2015) Management Information Systems – Managing the Digital Firm. Global Edition. Pearson.

CHAPTER 7: TELECOMMUNICATIONS, THE INTERNET, AND WIRELESS TECHNOLOGY

Learning Objectives

- **What are the principal components of telecommunications networks and key networking technologies?**

- **What are the main telecommunications transmission media and types of networks?**

- **How does the Internet and Internet technology work and how do they support communication and e-business?**

- **What are the principal technologies and standards for wireless networking, communication, and Internet access?**

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
    - E.g. cable companies providing voice service

  - **Broadband:**
    - More than 74% 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

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

  - **Routers**
    - Device used to route packets of data through different networks, ensuring that data sent gets to the correct address

Telecommunications and Networking in Today's Business World

- **Components of networks in large companies**
  - **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**

Telecommunications and Networking in Today's Business World

PACKED-SWITCHED NETWORKS AND PACKET COMMUNICATIONS
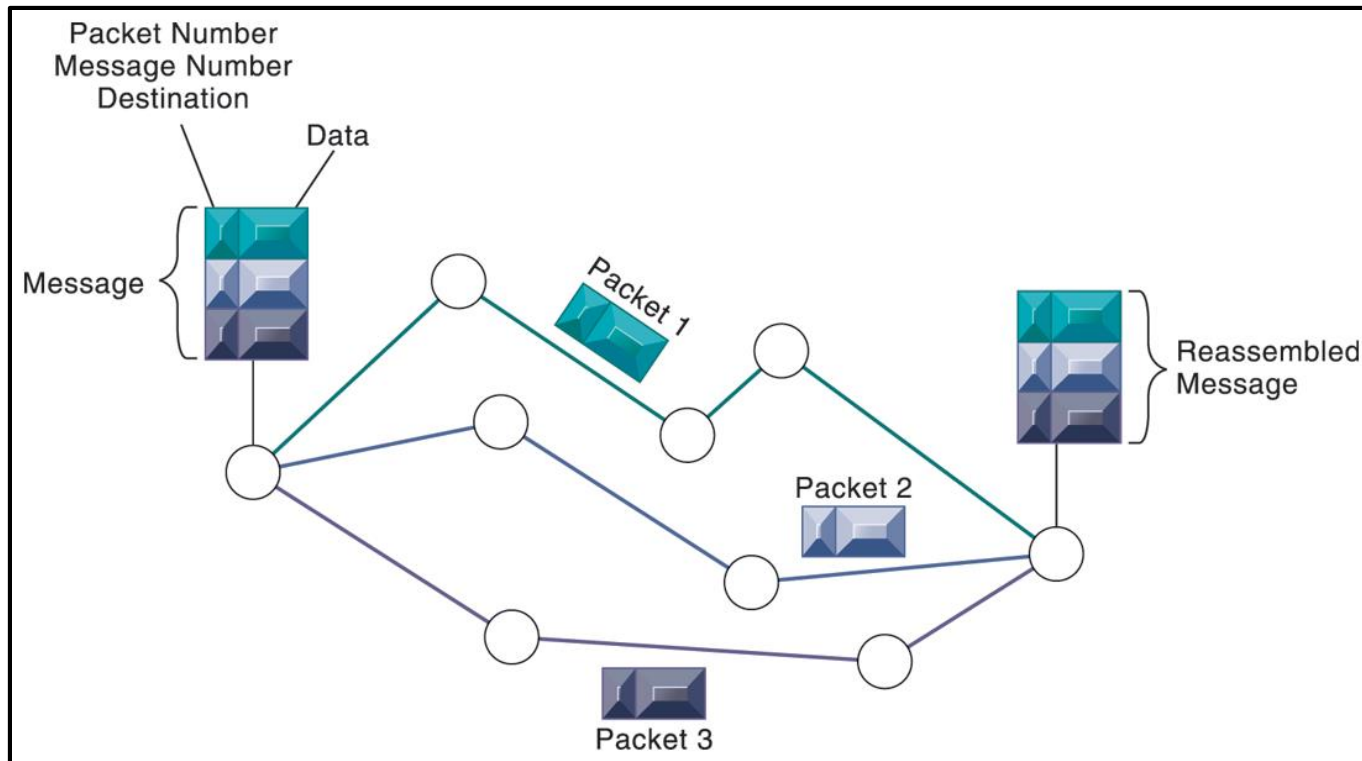
Data are grouped into small packets, which are transmitted independently over various communications channels and reassembled at their final destination.

Telecommunications and Networking in Today's Business World

- **Signals: Digital versus analog**

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

- **Types of networks**

  - **Local area networks (LANs)**

    - Ethernet
    - Client/server vs. peer-to-peer

  - **Wide area networks (WANs)**

  - **Metropolitan area networks (MANs)**

  - **Campus area networks (CANs)**

Telecommunications and Networking in Today's Business World
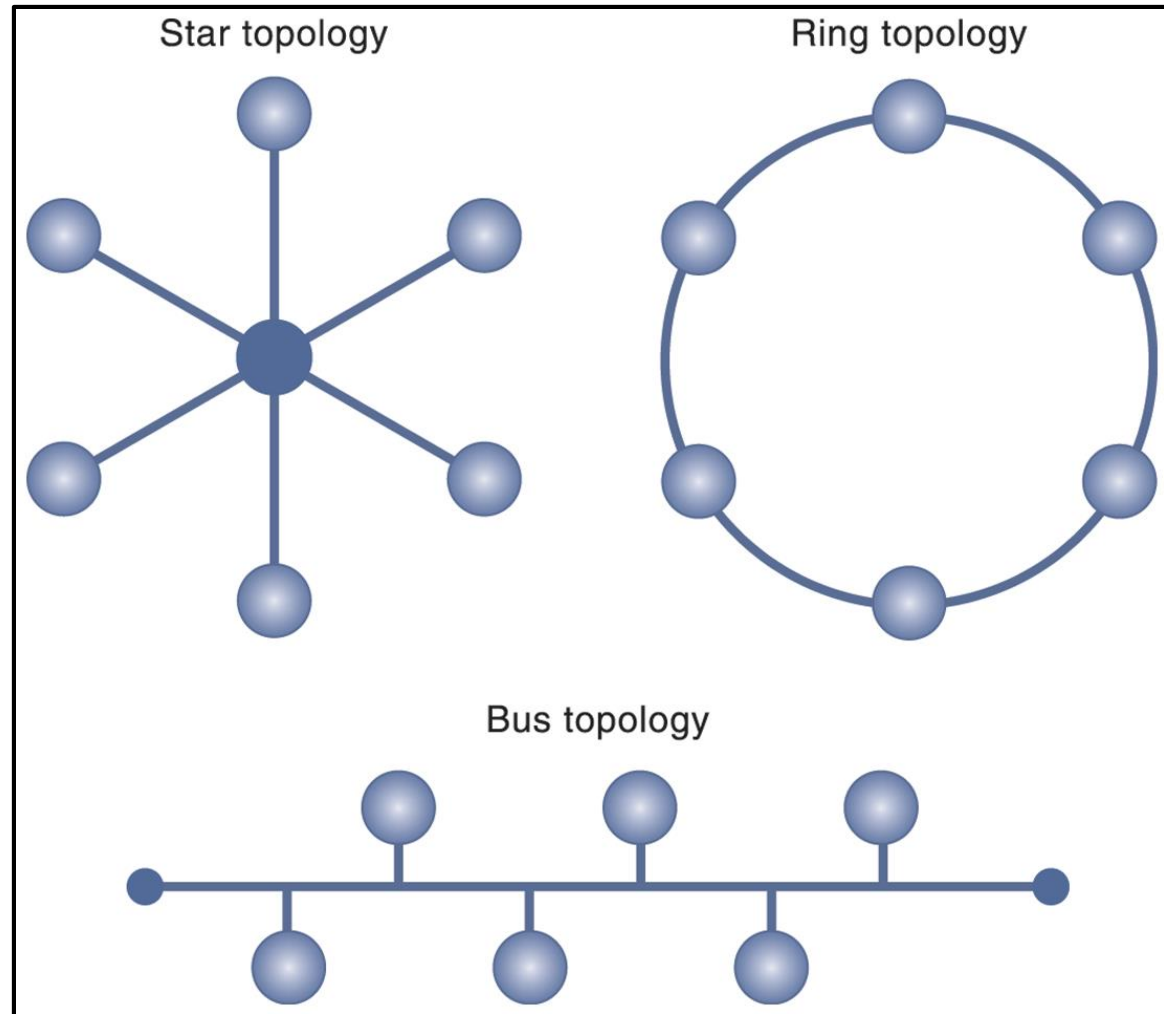
FUNCTIONS OF THE MODEM
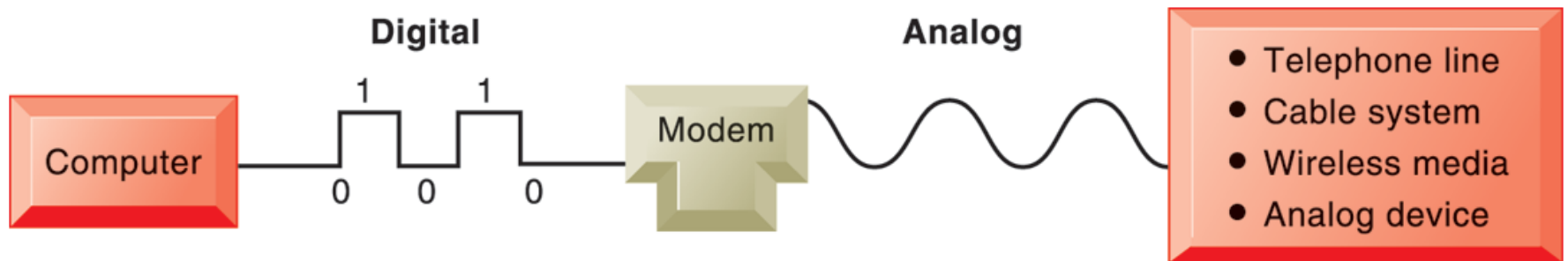
A modem is a device that translates digital signals into analog form (and vice versa) so that computers can transmit data over analog networks such as telephone and cable networks.

Telecommunications and Networking in Today's Business World

NETWORK TOPOLOGIES

The three basic network topologies are the star, bus, and ring.

Telecommunications and Networking in Today's Business World

- **Physical transmission media**

  - **Twisted wire (modems)**

  - **Coaxial cable**

  - **Fiber optics and optical networks**
    - Dense wavelength division multiplexing (DWDM)

  - **Wireless transmission media and devices**
    - Microwave
    - Satellites
    - Cellular telephones

  - **Transmission speed (hertz, bandwidth)**

Telecommunications and Networking in Today's Business World

BP'S SATELLITE TRANSMISSION SYSTEM
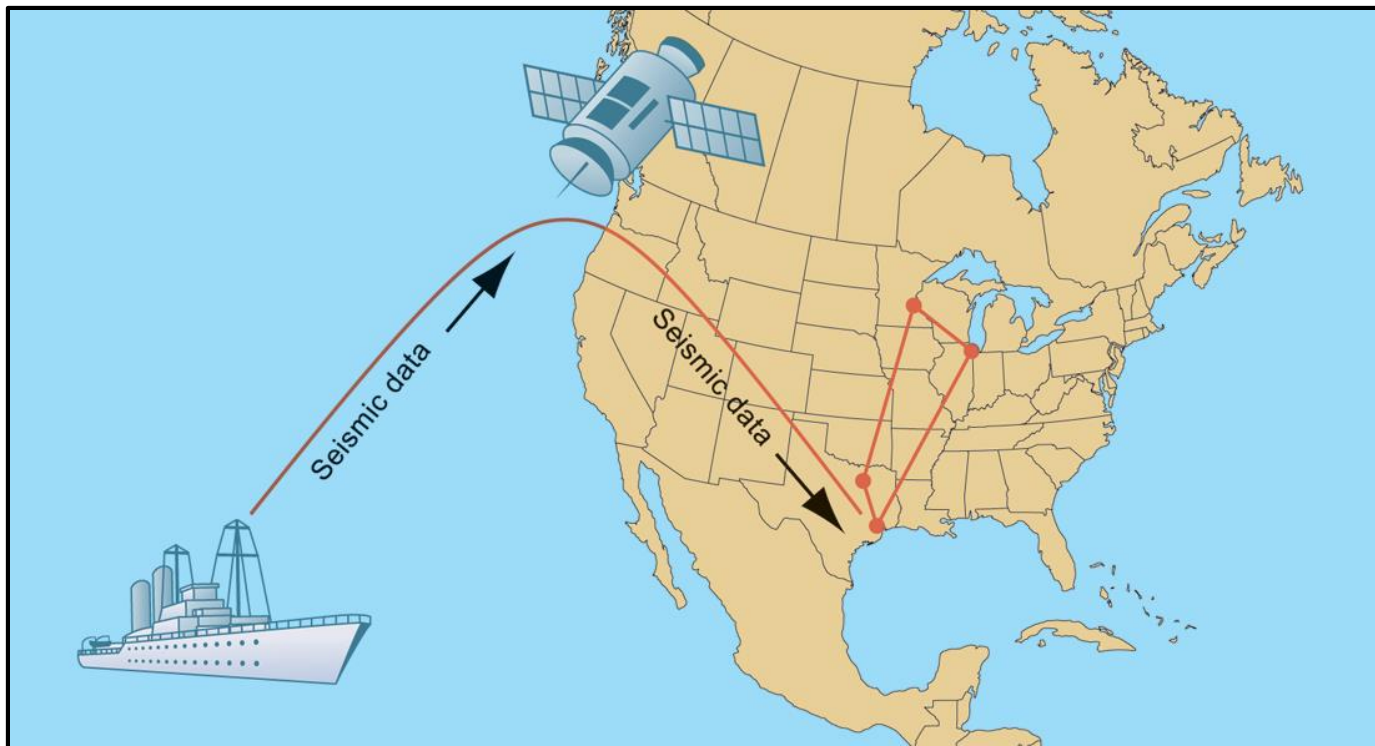
Communication satellites help BP transfer seismic data between oil exploration ships and research centers in the United States.

How Internet Traffic Works (Warriors of the Net)

http://www.youtube.com/watch?v=fmiC5lyc_X4

The Global Internet

- **What is the Internet?**

- **Internet Addressing and Architecture**

  - **The Domain Name System**
    - Hierarchical structure
    - Top-level domains

  - **Internet Architecture and Governance**
    - No formal management: IAB, ICANN, W3C

  - **The Future Internet: IPv6 and Internet2**

The Global Internet

THE DOMAIN NAME SYSTEM

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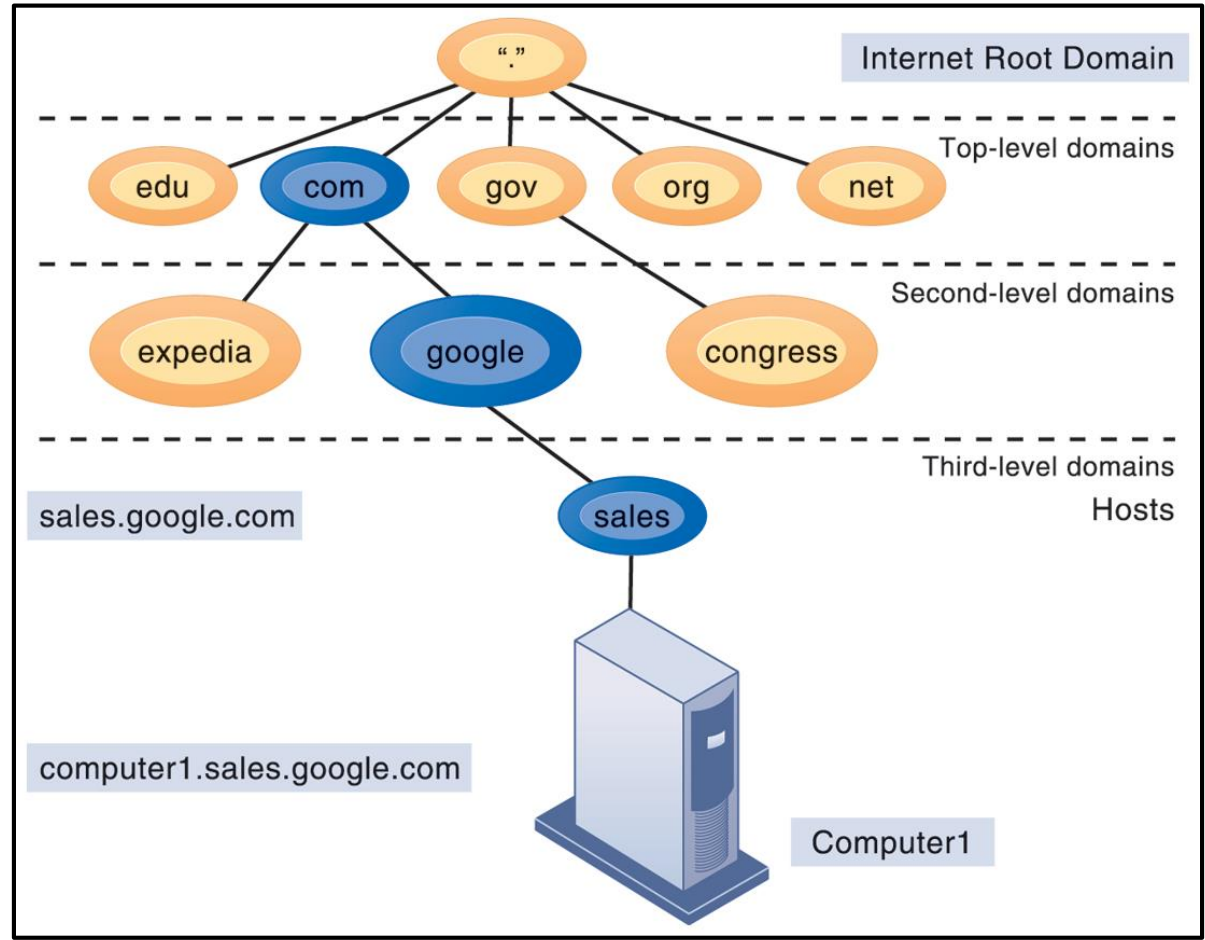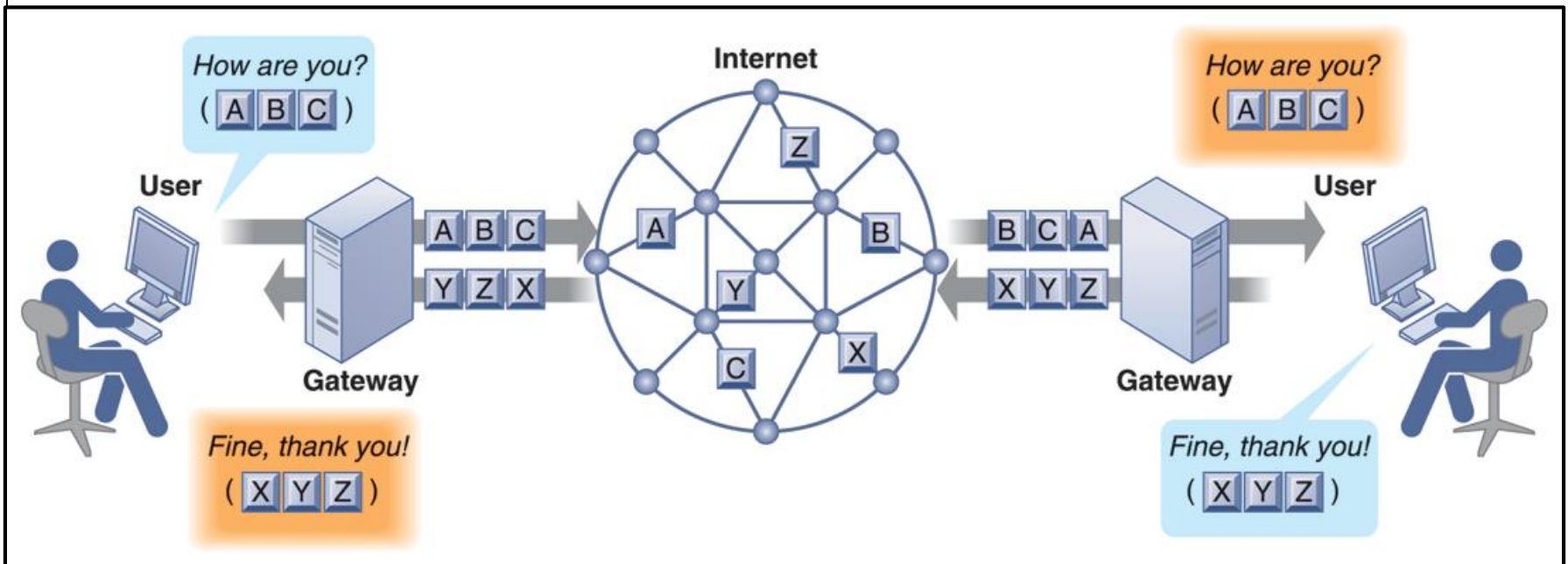
The Global Internet

- **Internet services**
  - **E-mail**
  - **Chatting and instant messaging**
  - **Newsgroups**
  - **Telnet**
  - **File Transfer Protocol (FTP)**
  - **World Wide Web**
  - **VoIP**
  - **Virtual private network (VPN)**

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.

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

The Global Internet

- **The World Wide Web (cont.)**

  - **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

  - **Shopping bots**

    - Use intelligent agent software for searching Internet for shopping information

The Global Internet

TOP U.S. WEB SEARCH ENGINES
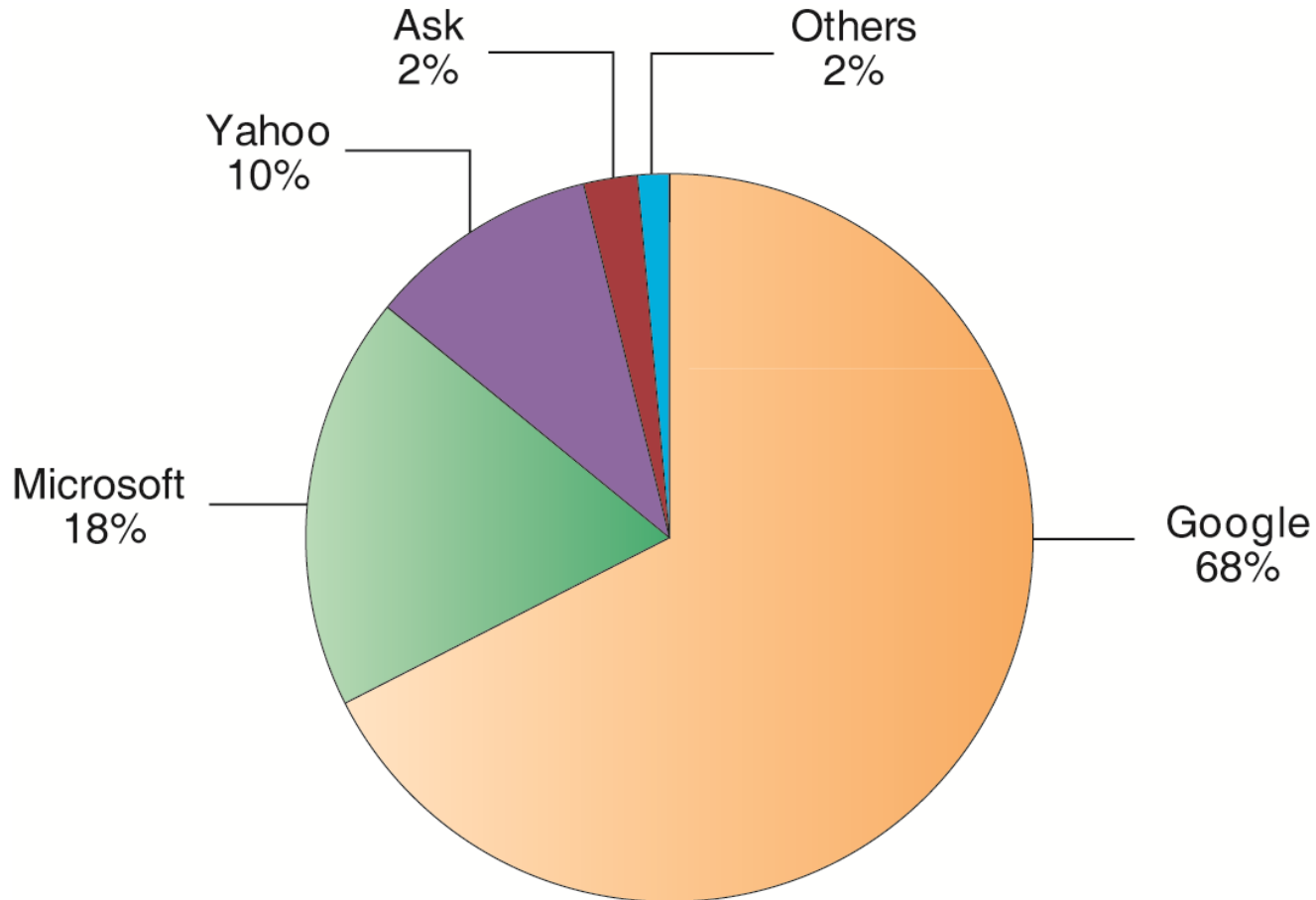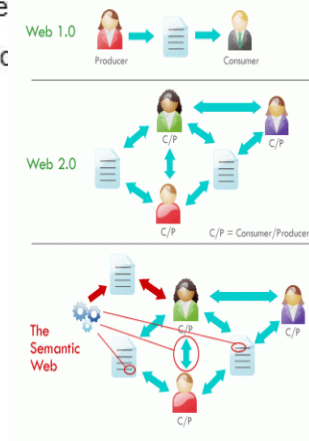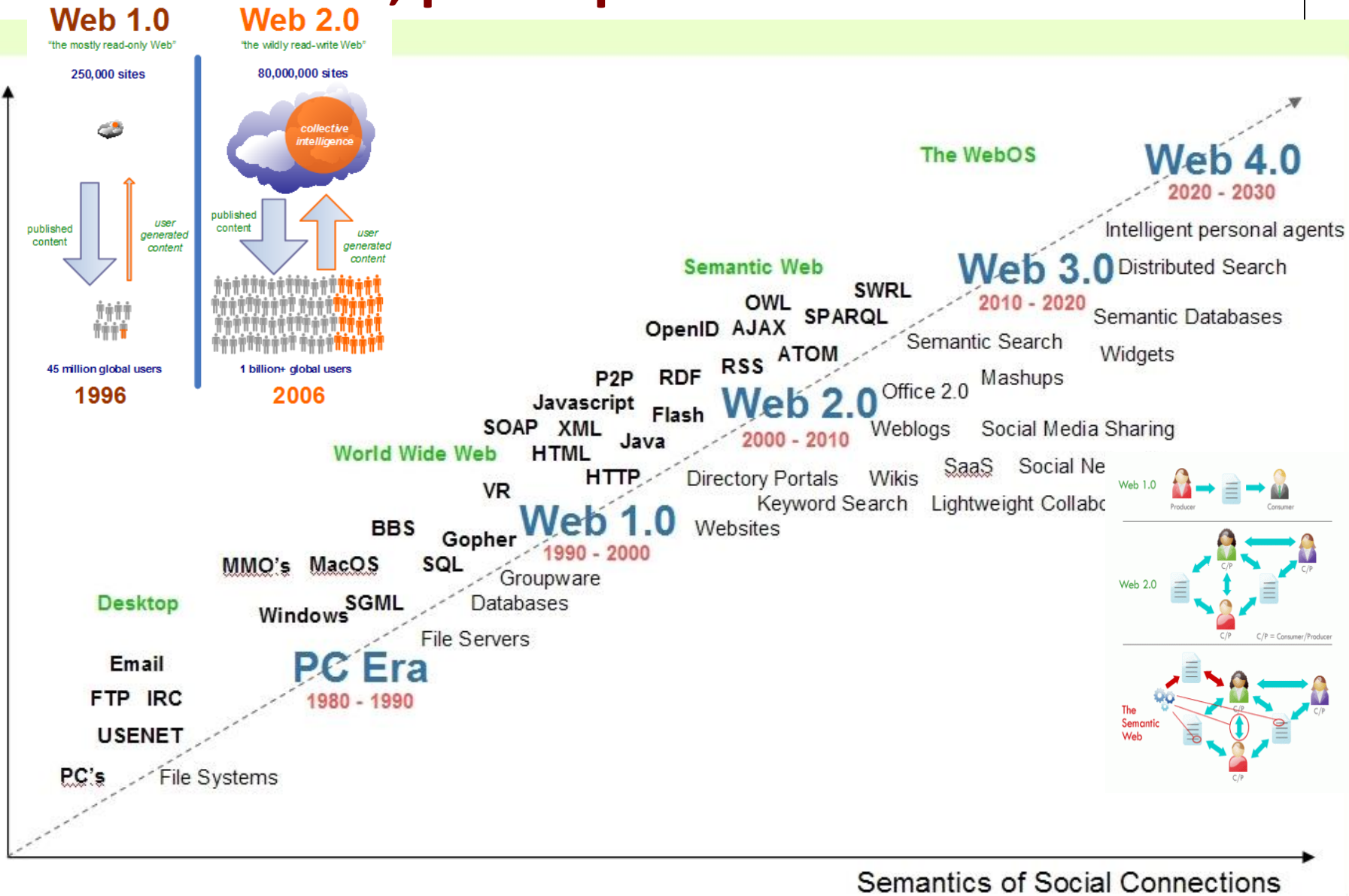
The Global Internet

- **Web 2.0**

  - **Four defining features**
    1. Interactivity
    2. Real-time user control
    3. Social participation
    4. User-generated content

  - **Technologies and services behind these features**
    - Cloud computing
    - Blogs/RSS
    - Mashups & widgets
    - Wikis
    - Social networks

The Global Internet
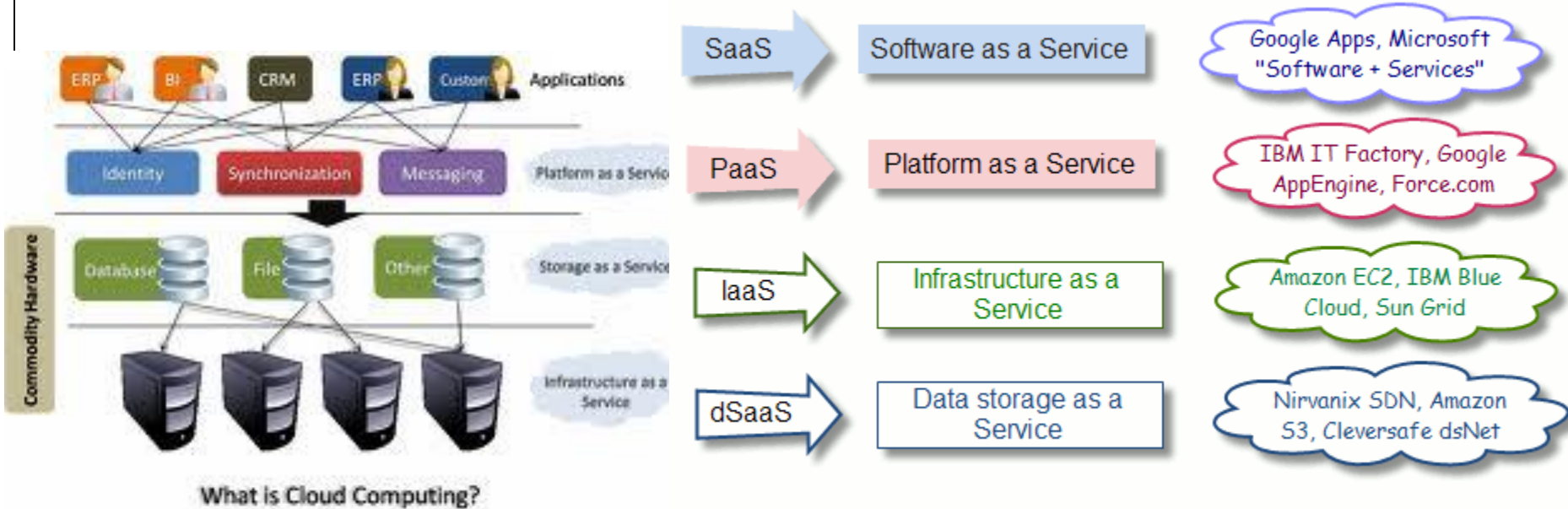
- **Web 3.0 – the Semantic Web**
  - Effort of W3C to add meaning to existing Web
  - Make searching more relevant to user

- **Other visions**
  - More "intelligent" computing
  - 3D Web
  - Pervasive Web
  - Increase in cloud computing, SaaS
  - Ubiquitous connectivity between mobile and other access devices
  - Make Web a more seamless experience

Internet , past… present and future

Cloud - Computing

SaaS → Software as a Service — Google Apps, Microsoft "Software + Services"

PaaS → Platform as a Service — IBM IT Factory, Google AppEngine, Force.com

IaaS → Infrastructure as a Service — Amazon EC2, IBM Blue Cloud, Sun Grid

dSaaS → Data storage as a Service — Nirvanix SDN, Amazon S3, Cleversafe dsNet

What is Cloud Computing?

LinuxAndFriends.com

Cloud computing is Web-based processing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the smart phones.

The Wireless Revolution

- **Cellular systems**

    - **Competing standards for cellular service**
        - CDMA: United States
        - GSM: Rest of world, plus AT&T and T-Mobile

    - **Third-generation (3G) networks**
        - Suitable for broadband Internet access
        - 144 Kbps – 2Mbps

    - **4G networks**
        - Entirely packet-switched
        - 100 Mbps – 1Gbps

The Wireless Revolution

- **Wireless computer networks and Internet access**

  - **Bluetooth (802.15)**

    - Links up to 8 devices in 10-m area
    - Useful for personal networking (PANs) and in business to transmit data from handheld devices to other transmitters

  - **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

The Wireless Revolution

- **Wireless computer networks and Internet access**

  - **Wi-Fi (cont.)**

    - Hotspots: 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 as foundation for 4G networks