CHAPTER 6

NETWORKS AND COMMUNICATIONS

FROM ANALOG TO DIGITAL AGE

- Digital: Any system based on discontinuous data or events.
- For computer: Communications signals or information represented in a two-state way using electronic or electromagnetic signals. (0s and 1s).
- Analog: Continuous data varying in strength & quality. e.g: sound, light, temperature and others.
- Why we use digital instead of analog?

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PURPOSE OF MODEM:

- Modem is short for MODULATE/ DEMODULATE.
- Digital ⟶ analog = Modulate
- Analog ⟶ digital = Demodulate
- Our voice is analog. When we record using tape recorder, our analog voice will be recorded into tape. When we copy the voice to the computer, our analog voice will be converted into digital one. This is done by using sound card in the system unit.

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THE PRACTICAL USES OF COMMUNICATIONS

- Many forms of connectivity:
  1. Videoconferencing & Videophones
  2. Workgroup computing & groupware
  3. Telecommuting & virtual offices
  4. Home networks
  5. Smart Television

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1. Videoconferencing &Videophones

- Or Teleconferencing, is the use of television video & sound technology as well as computer networks to enable people in different locations to see, hear & talk with one another.
- 2 types of videoconferencing:
  i. Point-to-point: is a two-person system. They communicate to each other.
  ii. Multipoint: Allows three or more participants in different locations.

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2. Workgroup Computing & Groupware

- Workgroup computing/Collaborative computing: teams of co-workers at different sites/places use networks of microcomputers to share info. & to cooperate on projects.
- Groupware: It is software that allows two or more people on a network to work on the same info. at the same time. E.g. Lotus Notes and MS NetMeeting (supports videoconferencing).

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3. Telecommuting & Virtual Offices

- Telecommuting: Working at home or on the road while in telecommunication with the office. (The concept of SOHO)
- Benefits: Reduced traffic congestion, energy consumption & air pollution, increase productivity (reduce tension), reduce absenteeism.
- Disadvantages: Isolated, difficult to measure employee's productivity.
- Virtual Offices: Nonpermanent & mobile office run with computer & communications technology.
  - They have no physical office but virtual office. They use pocket pagers, portable comp. & others for communications.

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4. Home Networks

- The existence of LAN will lead to the next development which is the networking of home appliances, linking stereos, lights & others that can received command using voice. E.g. Using voice command to turn on the lights or bring up music (Smart Home)

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5. Smart Television: DTV,HDTV,SDTV

- 3 groups to TV:
  i. Interactive TV: Allows us to interact with the show we're watching. E.g. Requesting info. about a product or playing along with a game show.
  ii. Personalized TV: Consists of hard-drive-equipped personal video recorders that allow us not only record shows but also pause, rewind and replay live TV programmes.
  iii. Internet TV: Allows us to read internet text & web pages on our TV set.
- These 3 will probably come together in a single box known as "digital TV".

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5. Smart Television: DTV,HDTV,SDTV

1. Digital TV: Uses a digital signal, or series of 0s and 1s. It is much clearer & less prone to interference than analog TV.
2. High-definition TV (HDTV): It works with digital broadcasting signals & has a wider screen & higher resolution than standard TV. HDTV display screen has 10 times more pixels on a screen – 1920 x 1080 pixels or more.
3. Standard-definition TV (SDTV): Has a lower resolution and a picture quality similar to that required to watch DVD movies.

COMMUNICATIONS MEDIA & TRANSFER RATES

- Comm. media carry signals over a communications path, the route between 2 or more comm. media devices.
- Speed, data transfer rate & how much data can be sent by a signal depend on what type of media and signal that we use.

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Wired Communications Media

- 3 types of wired comm. media:

1. Twisted-pair wire: consists of two strands of insulated copper wire, twisted around each other. It reduce interference (crosstalk) from electrical fields.
   - It is slow & does not protect well against electrical interference but since it has been used since 20-30 years ago, it still no doubt be used for years to come.
2. Coaxial cable: consists of insulated copper wire wrapped in a solid metal shield & then in an external plastic cover.
   - Widely used for cable TV & cable internet connection.
   - It can carry voice & data at faster rate (up to 200 Mbits/second) compared to twisted-pair wire.
3. Fiber-optic cable: consists of hundreds of thin strands of glass or plastic that transmit pulsating beams of light rather than electricity.
   - As thin as human hair, can transmit up to 2 Gbits/second.
   - It lighter & more durable and more secure compared to the other two.

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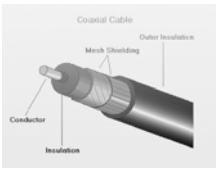
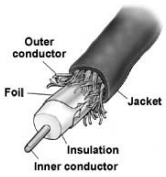
Twisted pair cable

Coaxial Cable





Fiber-optic cable

Wireless Communication Media

- 2 types of wireless media:

1. Microwave radio: transmits voice & data at 45 Mbits/second through the atmosphere as superhigh-frequency radio waves microwaves.
   - It is line-of-sight; they cannot bend around corners or around the earth's curvature. So, they need microwave stations to be placed 25-30 miles of each other without any obstruction in between.
2. Communications satellites: are microwave relay stations in orbit around the earth.
   - It transmits a signal from a ground station to a satellite (uplinking) and the reverse process is downlinking.
   - The major problem of satellite is the bad weather can sometimes block the data flow from the satellite to the ground.

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SHORT-RANGE WIRELESS COMMUNICATION

- 2 types of short-range wireless comm.:

1. Bluetooth: is a short-range wireless digital standard aimed at linking cellphones, PDAs, computers & peripherals up to 30 feet.
   - it replaces cables connecting PCs to printers & PDAs
   - It is more comfortable compared to local high-speed connections such as USB because it does not use cable or wire.

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SHORT-RANGE WIRELESS COMMUNICATION

1. WiFi: short for Wireless fidelity – is a short-range wireless digital standard aimed at helping portable computers to communicate at high speeds & share internet connections at distances up to 300 feet.
   - Inside offices, airports & internet cafe.
   - It is cheaper and 10 times faster than Bluetooth.
   - Supported by Windows XP & most of the today's computers.

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NETWORK

- Also known as communications network: is a system of interconnected computers, telephones or other comm. devices that can communicate with one another & share applications & data.
- Benefits of network:
  i. Sharing of peripheral devices
  ii. Sharing of programs & data
  iii. Better communications
  iv. Security of information
  v. Access to DB

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TYPES OF NETWORKS

1. Wide Area Network: A communications network that covers a wide geographic area such as a country or the world.
2. Metropolitan Area Network: A comm. network covering a city or a suburb.
3. Local Area Network: Connects computers and devices in a limited geographic area such as one office, one building or a group of buildings close together.

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TYPES OF LANs

1. Client/Server LANs: Consists of clients, which are microcomputers that request data & servers; which are computers used to supply data.
2. Peer-to-peer LANs: All microcomputers on the network communicate directly with one another without relying on the server.
   - Less expensive but slow down under heavy use.

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INTRANETS, EXTRANETS & FIREWALLS

1. Intranets: An organization's internal private network that uses the infrastructure & standards or the internet & the web.
   - Provide quicker access to internal info such as employee email address and telephone no., product info. and others.
2. Extranets: Private intranets that connect not only internal personnel but also selected suppliers & other strategic parties.
3. Firewalls: A system of h/w & s/w that blocks unauthorized users inside & outside the organization form entering the intranet.

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