Chapter 5:
Data Networks

Computer Communications

- Process in which one computer transfers data, instructions, and information to another computer(s)

Communications system contains many types of devices

(a) Personal computers

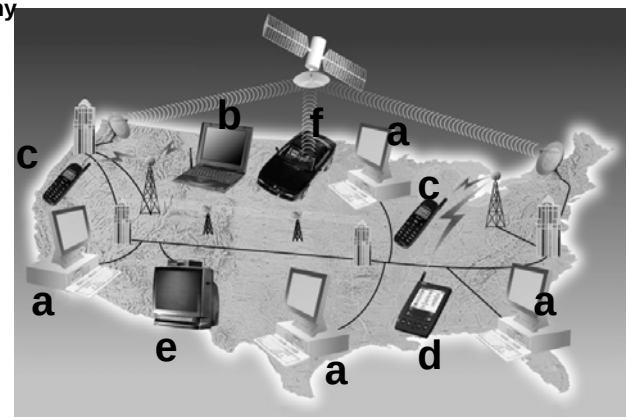
(b) Notebook computers

(c) Web-enabled cellular telephones

(d) Web-enabled handheld computers

(e) WebTV™

(f) GPS receivers



Communications Technology

- **Communications Technology** is the activity of designing and constructing and maintaining communication systems.

Network

- A **Network** (also called Data Networks / Communication Network) is a communications system on which computers transfer and share data and resources.
- It is a collection of computers and devices connected together via communications devices such as modems, cables, telephone lines and satellites that allow user to share resources.

Local Area Network (LAN)

- **Local Area Network** (LAN) is a "Cluster" of interconnected microcomputers forming a network.
- Usually carry data at high speeds & owned by one organization
- Originated as a description of size
- Cover a small local area

Facilities of LAN

- A variety of facilities are required to enable networks to function.
  - File Server
  - Print Server
  - Communications Server

Facilities of LAN – File Server

- Facilitates the storage of documents which can be retrieved and updated as necessary.
- Enable network users to access application software install in one file server
- Enable user access control

Facilities of LAN – Print Server

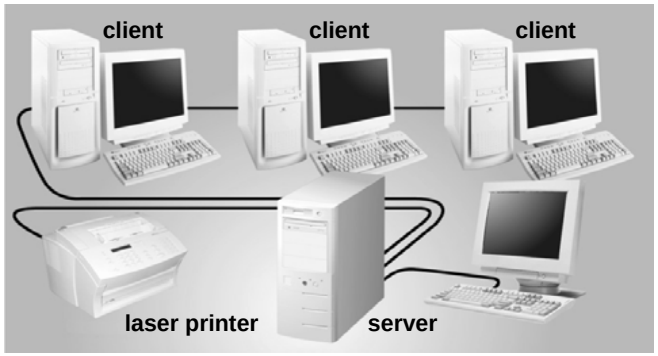
- Provides each network user with high-speed printing facilities.

Facilities of LAN – Communications Server

- Links network users to a variety of communication devices by telephone line connections.

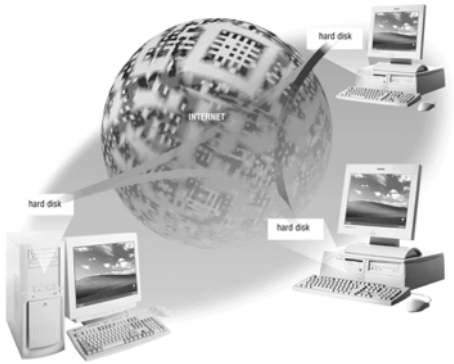
Client/Server LAN

- Network in which one or more computers act as a server and other computers on the network can request services from server



Internet use of Peer-to-Peer (P2P)

- Enables users with same networking software to connect to each other's hard disks and exchange files directly



Advantages of Data Networks

- The advantages of networks are as follow:
  - Sharing Hardware
  - Sharing Software
  - Sharing Data
  - Electronic Mail

Advantages of Data Networks – Sharing Hardware

- Networking several microcomputers together along with one printer, for example, can allow all the computers to use the one printer.
- Since few users have to use the printer all of the time, this represents a more efficient method of employing this resource.

Advantages of Data Networks – Sharing Software

- A network of computers can allow several users to make use of applications software which is stored on one of the machines.
- When this method is employed, the machine which holds the software is called a fileserver.

Advantages of Data Networks – Sharing Data

- Similar use can be made of the data files created by the users.
- This can eliminate the requirement for multiple copies of the data files to be maintained, thereby improving data integrity.

Advantages of Data Networks – Electronic Mail

- This facility is only possible in a network configuration.

Wide Area Network (WAN)

- **Wide Area Network** (WAN) serves a wide geographic area and may in fact embrace a whole country or even the world.
- Whereas a local area network serves the requirements of an organization for interdepartmental communications, a wide area network serves a wide geographic area and may in fact embrace a whole country or even the world.
- The IEEE (Institute of Electrical and Electronics Engineers) formally recognizes as local networks those networks having a maximum total length of 6000 feet. Beyond that length, networks are classified as WANs.
- Another definition of WANs is that they simply connect two or more LANs together.

What is Internet?

- **Internet** is an electronic communications network that connects computer networks and organizational computer facilities around the world.
- It is a network of computers that links Businesses, Government agencies, Institutions and Individual users together to provide products services, and information.

LAN vs. WAN

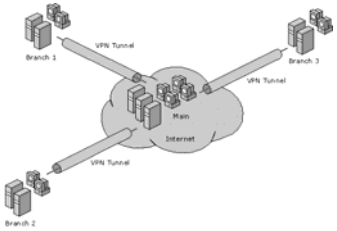
- A Local Area Network (LAN) is a computer network limited to the immediate area, usually the same building or floor of a building. LANs are capable of transmitting data at very fast rates, much faster than the data that is transmitted to you over the Internet.
- A Wide Area Network (WAN) is a computer network covering a wide geographical area, involving a vast array of computers.
- This is different from LANs that are usually limited to a room, building or campus. The most well-known example of a WAN is the Internet.

Public Industry Network

- Public Industry Network is a telecommunications network designed for open, public access.
- Generically, it is a network operated by common carriers or telecommunications administrations for the provision of circuit-switched, packet-switched, and leased-line circuits to the public.
- Internet is a interconnecting global public network made by connecting smaller shared public networks.

Virtual Private Network (VPN)

- **Virtual Private Network (VPN)** is a data network that uses the public telecommunications infrastructure, but maintains privacy through the use of a tunneling protocol and security procedures.
- A VPN gives a company the same capabilities as a system of owned or leased lines to which that company has exclusive access. But costs are much lower because the VPN uses the shared public infrastructure rather than exclusive line access.



Value Added Network (VAN)

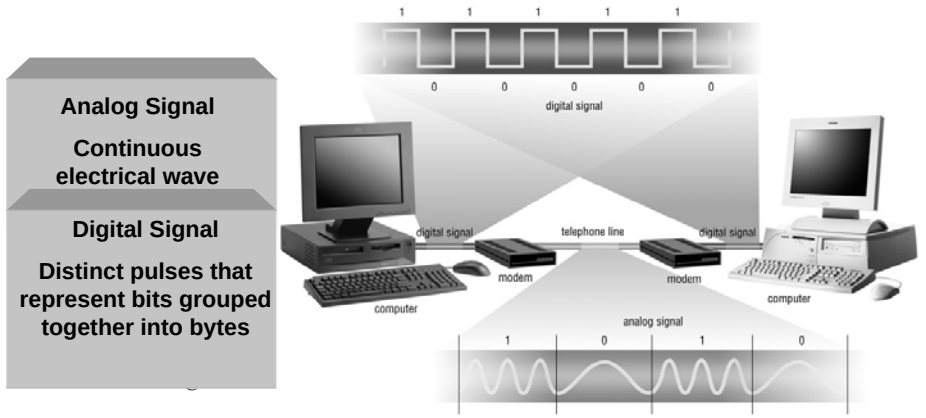
- **Value-Added network** (VAN) vendors are organizations that provide service to the public over common carrier facilities.
- A good example of a service provided by VANs is environmental information retrieval.
- This is a service which executives of corporations are most interested in.
- It is also one they cannot get from their in-house systems.

Example of VAN Services

- Value-Added Network (VAN) vendors are organizations that provide service to the public over common carrier facilities.
- A good example of a service provided by VAN is environmental information retrieval.
  - There are also information retrieval firms that specialize in certain types of market data in specific industries.
  - A corporation may subscribe to one more of these services in order that employees such as marketing managers and sales forecasters may obtain up-to-date industry information.

Primary Function of a Communications Device

- To convert digital signals to analog signals or analog signals to digital signals



Factors to Consider in LAN

- When considering a Local Area Network (LAN), there are several factors to consider.
- This will result in a better configuration and a better utilization of the network capabilities.
  - Utilization
  - Performance
  - Flexibility

Factors to Consider – Utilization

- The number of current and future users must be known or estimated.
- Different choices in cabling, structure (topology) and hardware will determine the performance levels given certain number of users.
- If there are too many users relative to the capabilities of the LAN, then the performance will deteriorate.

Factors to Consider – Performance

- The expected response time and storage capacity must be determined in order to be able to specify the correct components and its true cost.

Factors to Consider – Flexibility

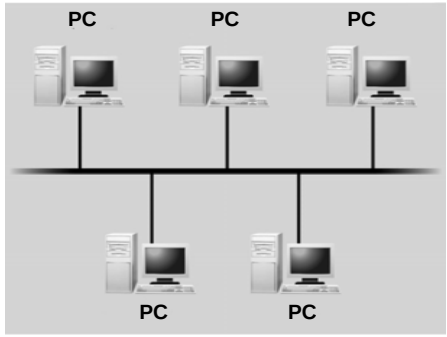
- The ease with which new users can be added or removed from a system is important to the organization.
- Certain configurations allow for a limited number of new PCs to be added, after which costly expansion work has to be done.

Network Topology

- Configuration, or physical arrangement, of devices in a communications network
- Networks usually use combinations of three topologies
  - Bus Network
  - Ring Network
  - Star Network

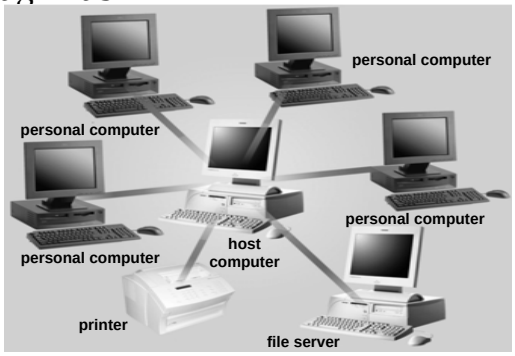
Bus Network

- Consists of a single central cable, to which all computers and other devices connect
- Bus is physical cable or backbone
- Inexpensive and easy to install



Star Network

- All devices connect to a central computer, called the hub
- All data transferred from one computer to another passes through hub



Ring Network

- Cable forms closed ring, or loop, with all computers and devices arranged along ring
- Data travels from device to device around entire ring, in one direction