Computer Network Fundamentals

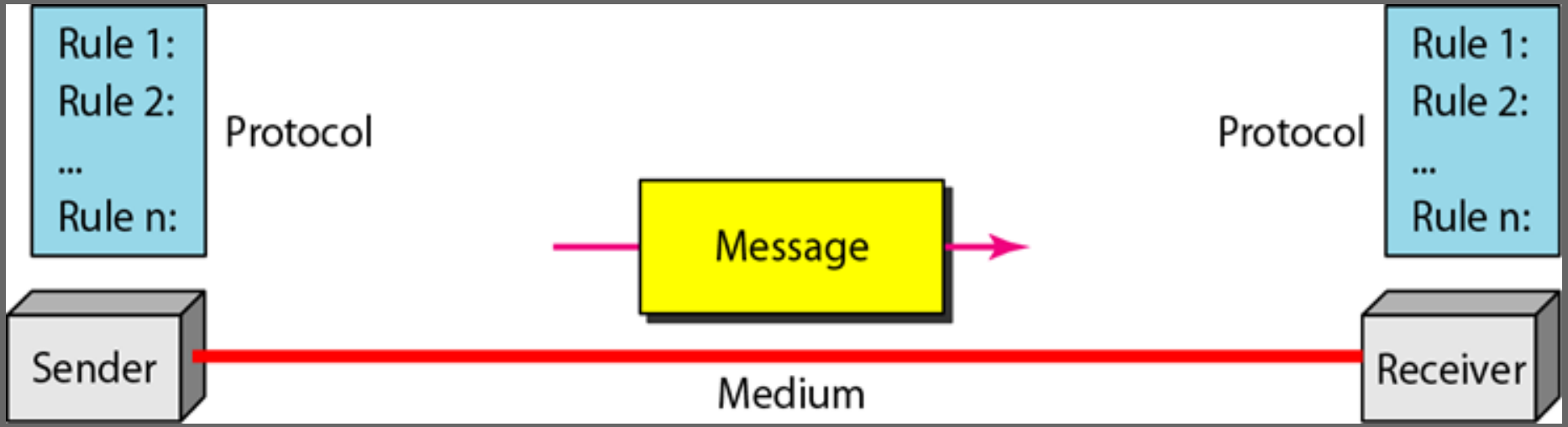
Use of Computer Network

- Simultaneous access to programs and data.
- Sharing peripheral devices like printers, scanners etc.
- Personal communications using email.
- Making backup of information.
- Aiding communication by teleconferencing and videoconferencing.
- Protecting information by account name and password

DATA COMMUNICATIONS

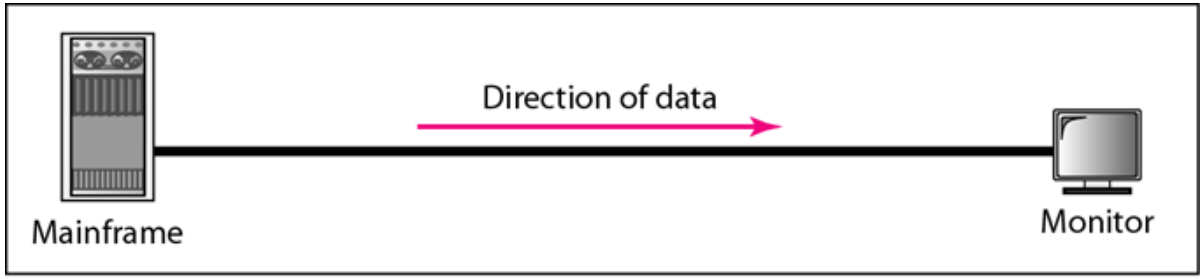
The term telecommunication means communication at a distance. The word data refers to information presented in whatever form is agreed upon by the parties creating and using the data. Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable.

Components of a data communication system

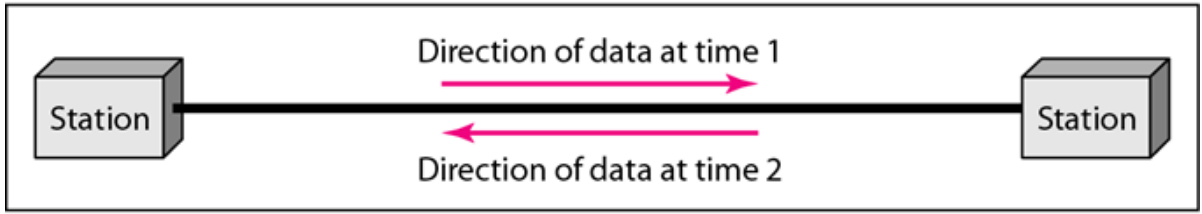


Data flow:

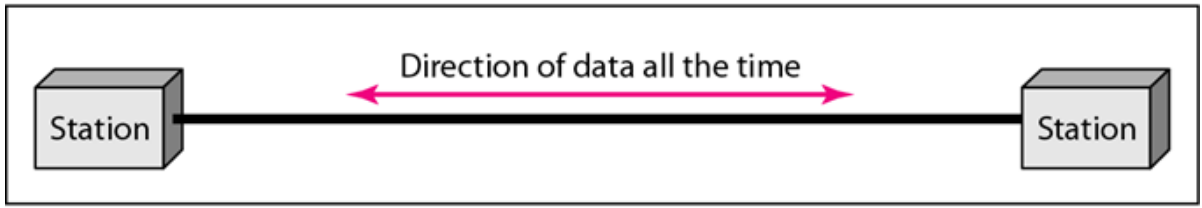
- simplex,
- half-duplex, and
- full-duplex



a. Simplex



b. Half-duplex



c. Full-duplex

Data flow

- **Simplex:**
  - **Communication is unidirectional**
  - **Only one of the two can transmit, the other can only receive**
  - **Example: Keyboard(input) and traditional monitors(accept output)**
- **Half-duplex:**
  - **Each station can both transmit and receive, but not at the same time**
  - **Examples: Walkie-talkies**
- **Full-duplex:**
  - **Both station can transmit and receive simultaneously**
  - **Examples: Telephone networks**

A computer network is a system in which multiple computers are connected to each other to share information and resources.

By the simplest definition in the data world, a computer network is a means to connect two or more computers to share information.

The computers can be geographically located anywhere.

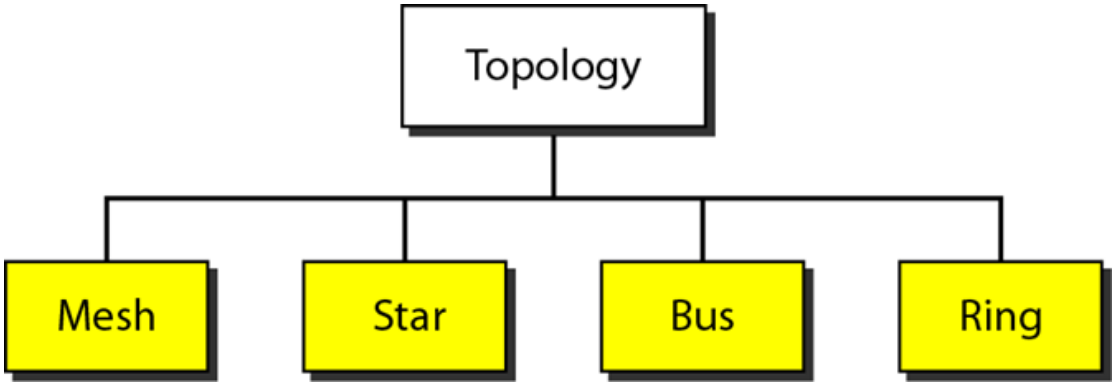
Some network terminologies

- Network topology
- Links
- Media
- Network protocols

Network Topology

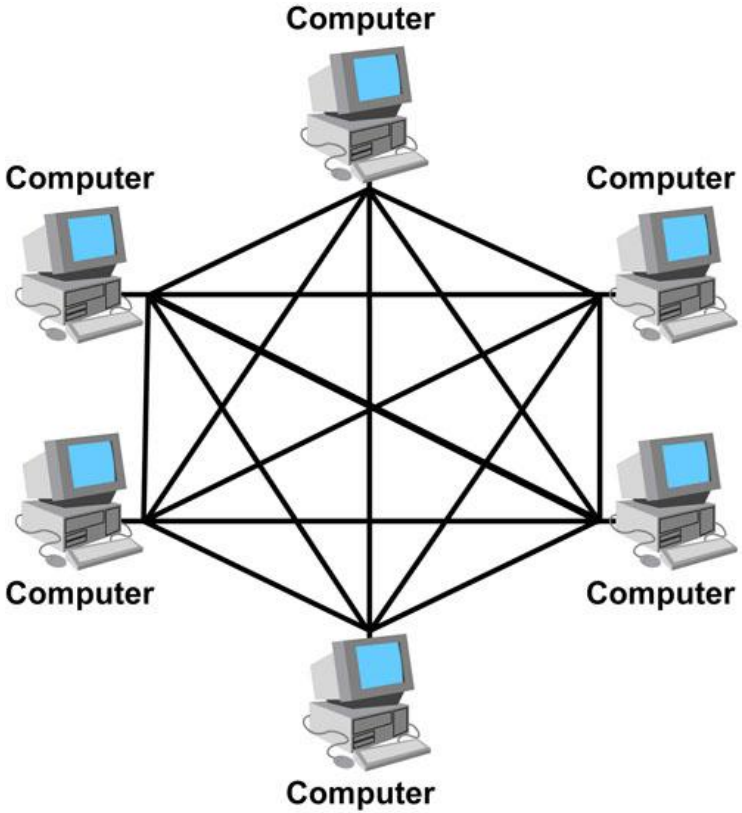
Topology

- The term physical topology refers to the way in which a network is laid out physically. Two or more devices connect to a link; two or more links from a topology.
- The topology of a network is the geometric representation of the relationship of all the links and linking devices(usually called nodes) to one another.
- There are 4 basic topologies possible:
  - Mesh
  - Star
  - Bus
  - Ring



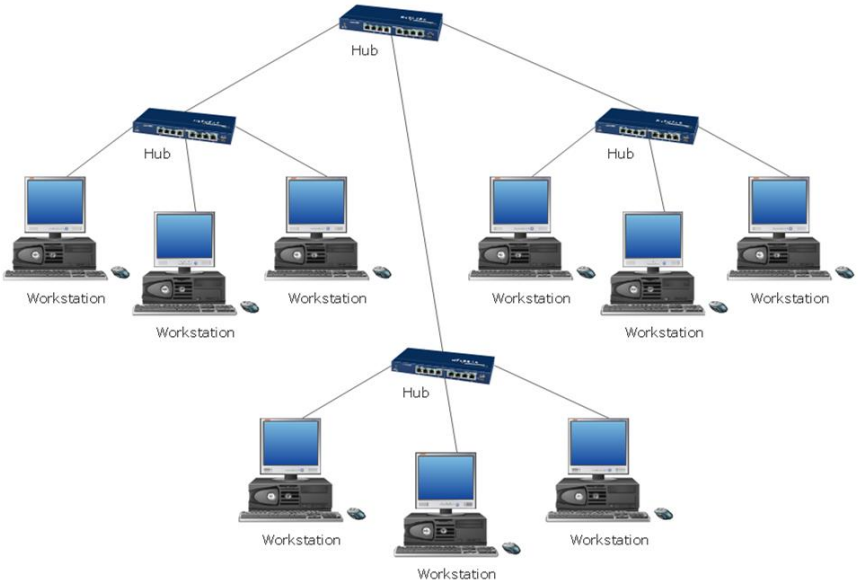
Mesh Topology

- The mesh topology connects all devices (nodes) to each other
- It is used in WANs to interconnect LANs and for mission critical networks like those used by banks and financial institutions.
- Implementing the mesh topology is expensive and difficult.



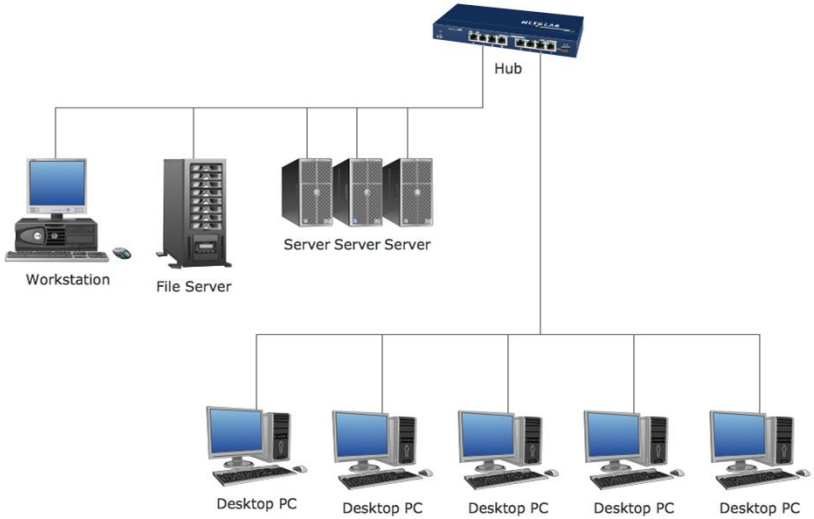
Star Topology

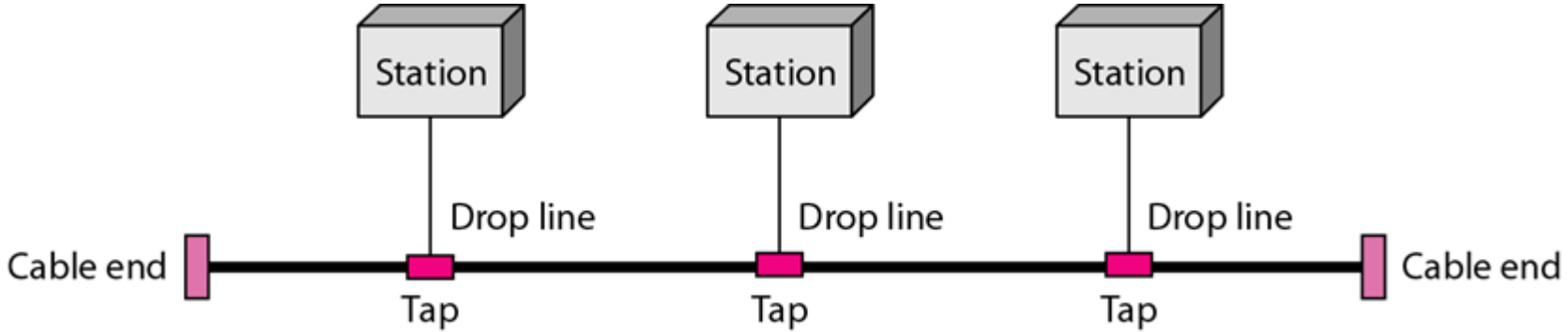
- The star topology is the most commonly used architecture in Ethernet LANs.
- Larger networks use the extended star topology also called tree topology. When used with network devices that filter frames or packets, like bridges, switches, and routers, this topology significantly reduces the traffic on the wires by sending packets only to the wires of the destination host.



Bus Topology

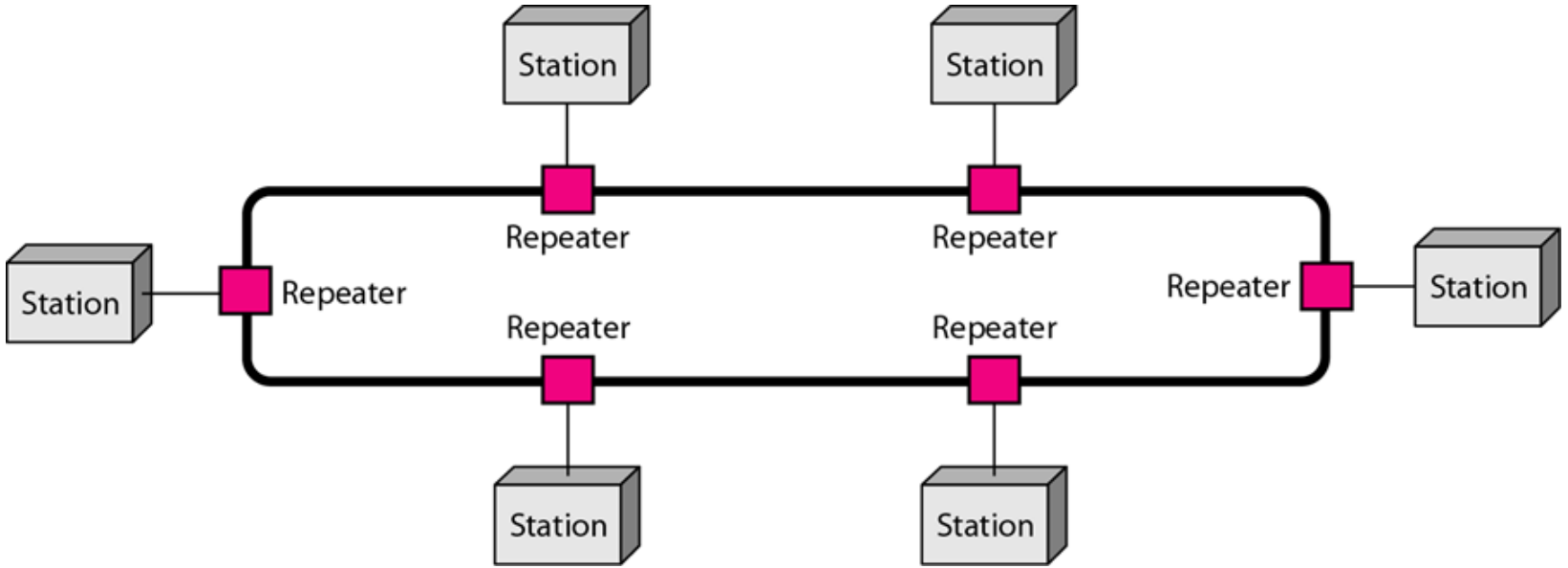
- Commonly referred to as a linear bus, all the devices on a bus topology are connected by one single cable.

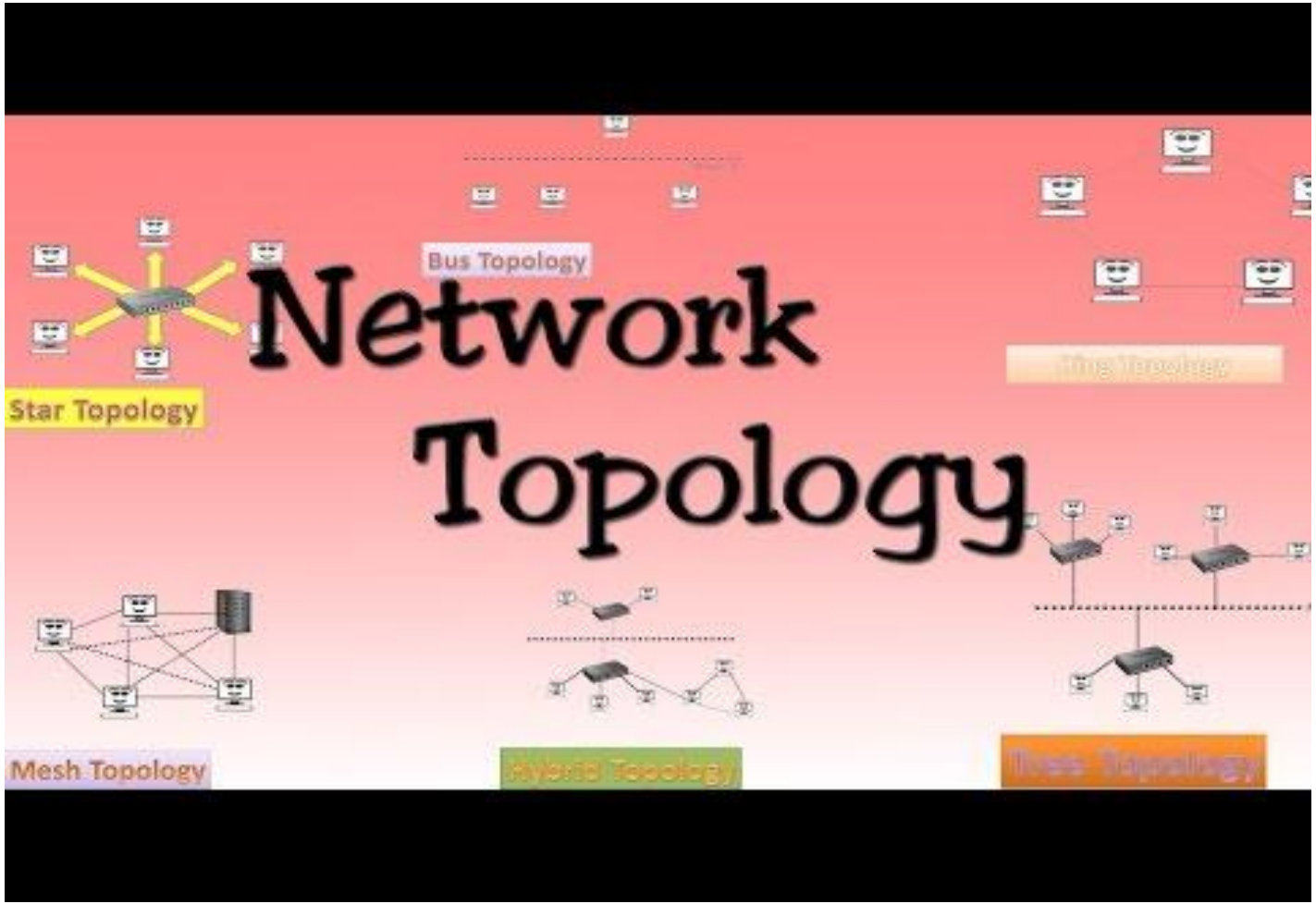




Ring Topology

- Each device has a dedicated point to point connection with only the two devices on either site of it. A signal is passed along the ring in one direction, from device to device until it reach to its destination.




Bus Topology
Network
Topology
Star Topology
Mesh Topology

Part: 2

Categories of Network

Categories of Network

Computer network can be classified according to their geographical area and their uses.

- Depending upon the **geographical area** covered by a network, it is classified as:
  - **Local area network(LAN)**
  - **Wide area network(WAN)**
  - **Personal area network(PAN)**
  - **Metropolitan area network(MAN)**
  - **Campus Area Network (CAN)**
  - **Home Area Network(HAN)**
- Depending upon the purpose by a network, it is classified as:
  - **Storage area network(SAN)**
  - **Enterprise private network(EPN)**
  - **Virtual private network(VPN)**

Local Area Network(LAN)

A LAN is a small and privately owned network to provide local connectivity within a small region. "A region" refers to the same office, the same building, the same company and in the same schools.

Characteristics of a LAN include:

- Limited geographic operation up to 10 Km
- High-speed data transfer rates
- Channels are of relatively high capacity (Mbps, Gbps)
- Generally lower in cost than a WAN
- It uses mainly bus, ring, and star topology
- Requires little wiring, typically a single cable connecting to each device
- Channels are relatively error-free (generally 1 error in 1000000000 bits)

Local Area Network(LAN)

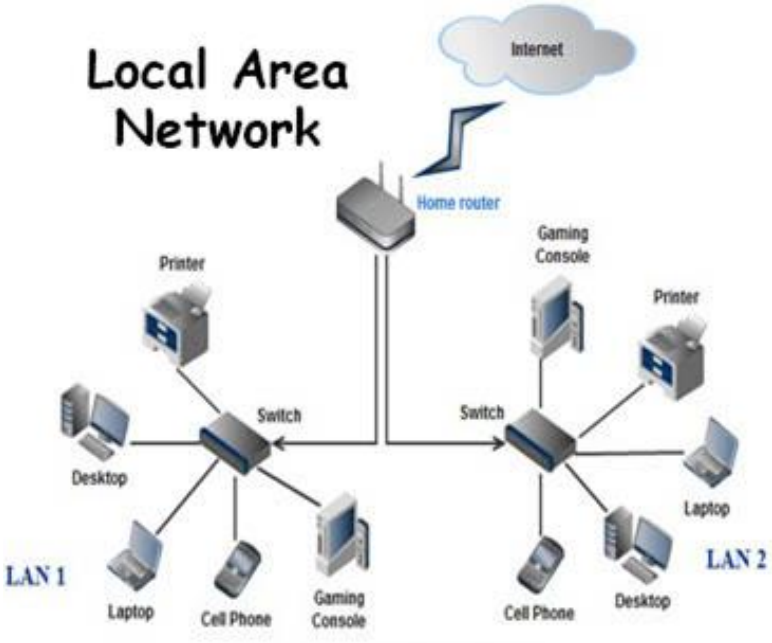
Advantages and Disadvantages of LAN

Advantages

- Lower in cost
- Sharing of Resources
- High Speed
- Security

Disadvantages

- When number of nodes became increases the performance became decrease.
- Area covered is limited.



Metropolitan Area Network (MAN)

MAN or Metropolitan area Network covers a larger area than that of a LAN and smaller area as compared to WAN. It connects two or more computers that are apart but resides in the same or different cities.

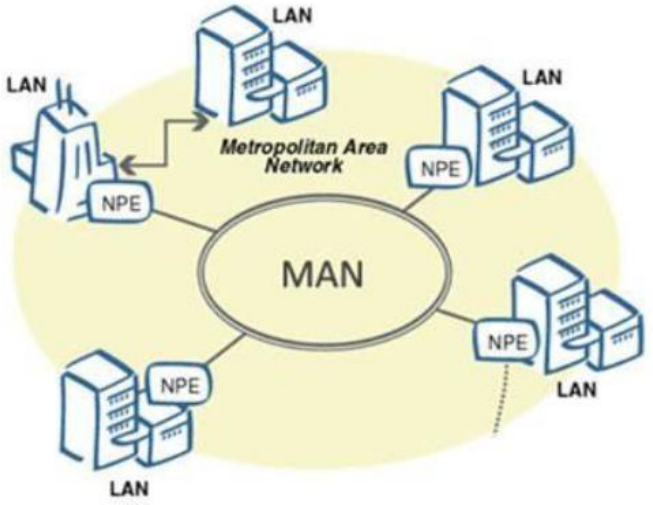
Advantages and Disadvantages of LAN

Advantages

- Sharing of the internet
- Less Expensive
- High Speed than WAN
- Security

Disadvantages

- Difficult to manage
- Internet speed difference
- Hackers attack
- More wires required



Wide Area Network(WAN)

A WAN is used to transmit data and information over large geographical distances which may even span entire countries and continents. A WAN can contain multiple smaller networks, such as LANs or MANs. The Internet is a WAN and connects computers all around the world together. Communication between networks is called internetworking.

Characteristics of a LAN include:

- Multiple computers are connected together
- Computers are spread over a wide geographical area
- A WAN usually interconnects multiple LANs
- Links are of low capacity(Low data rate)
- Bit error rate is higher(1 in 100000) compared to that of LAN

Wide Area Network(WAN)

Advantages and Disadvantages of WAN

Advantages

- large geographical area

Disadvantages

- Complicated and complex
- High cost
- Required high performance devices
- low security
- WANs use very expensive network equipment.

THANK YOU VERY MUCH FOR LISTENING

For Contacting
Email:
adiba.stu2016@juniv.edu
Phone:01771182305