

Internet & Intranet Engineering

B.Tech: 8th Semester

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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.

The Effectiveness of data communication depends upon 4 components-

- Delivery*
- Accuracy*
- Timeliness*
- Jitter*

Components of Data Communication

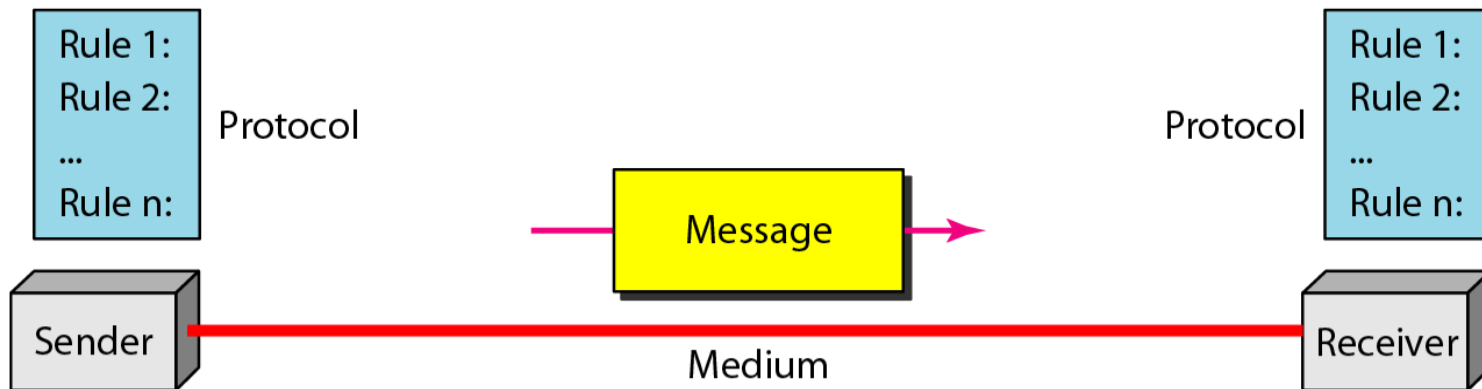


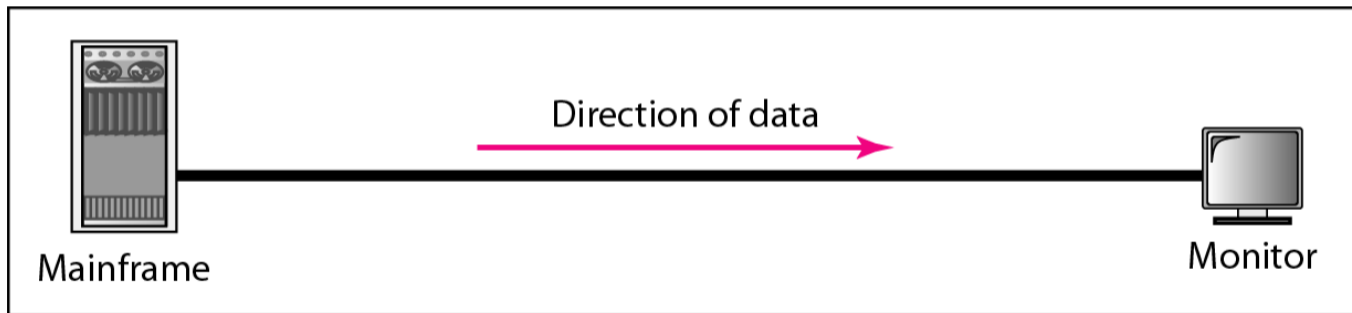
Figure : *Five components of data communication*

Data Representation

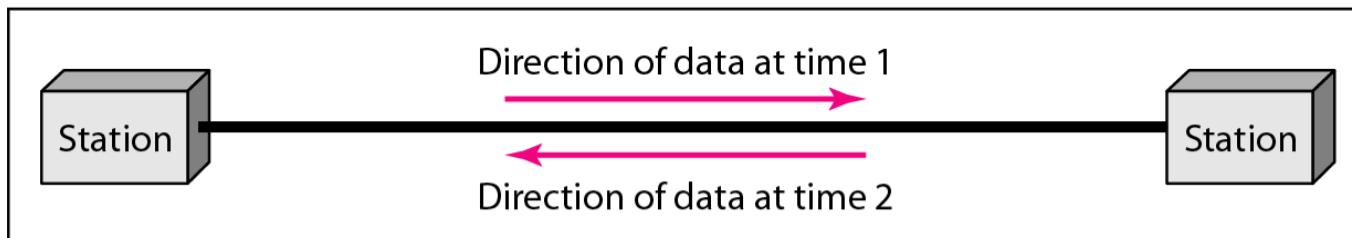
Information can be in the following form-

- Text
- Numbers
- Image
- Audio
- Video

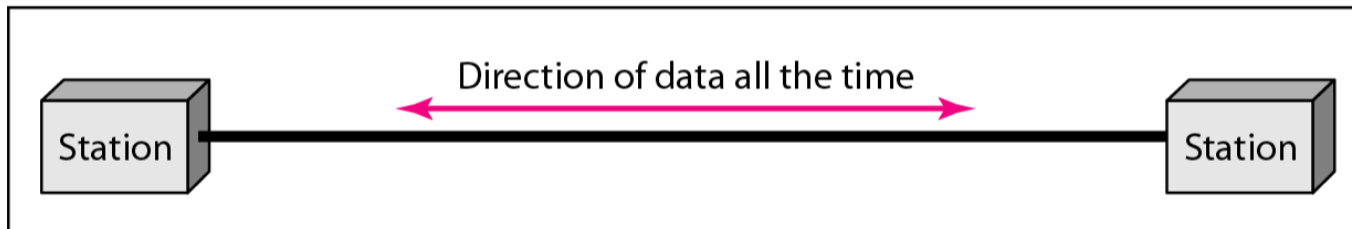
Data flow



a. Simplex



b. Half-duplex



c. Full-duplex

Figure : Data flow (simplex, half-duplex, and full-duplex)

NETWORKS

*A **network** is a set of devices (often referred to as **nodes**) connected by communication **links**. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.*

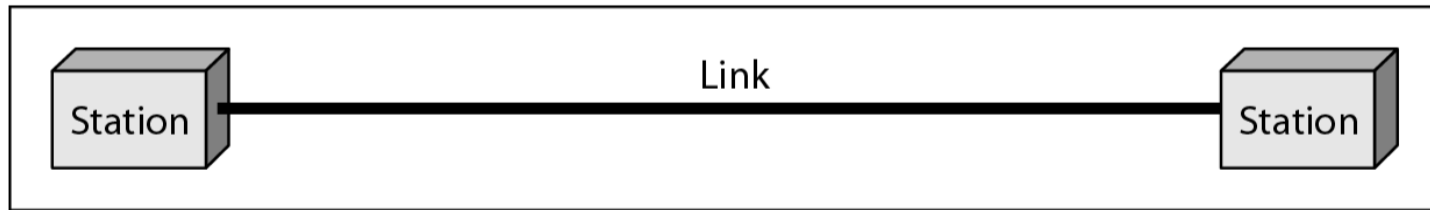
Most networks use Distributed Processing.

NETWORK CRITERIA

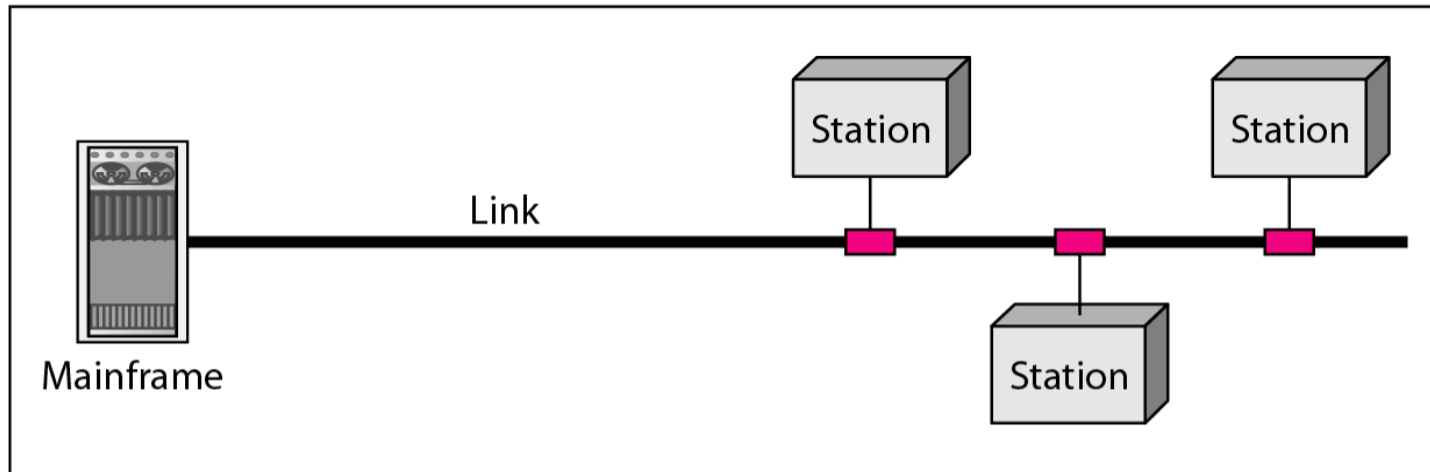
A **network** must be able to meet following criteria-

- Performance
- Reliability
- Security

Types of connections: point-to-point and multipoint



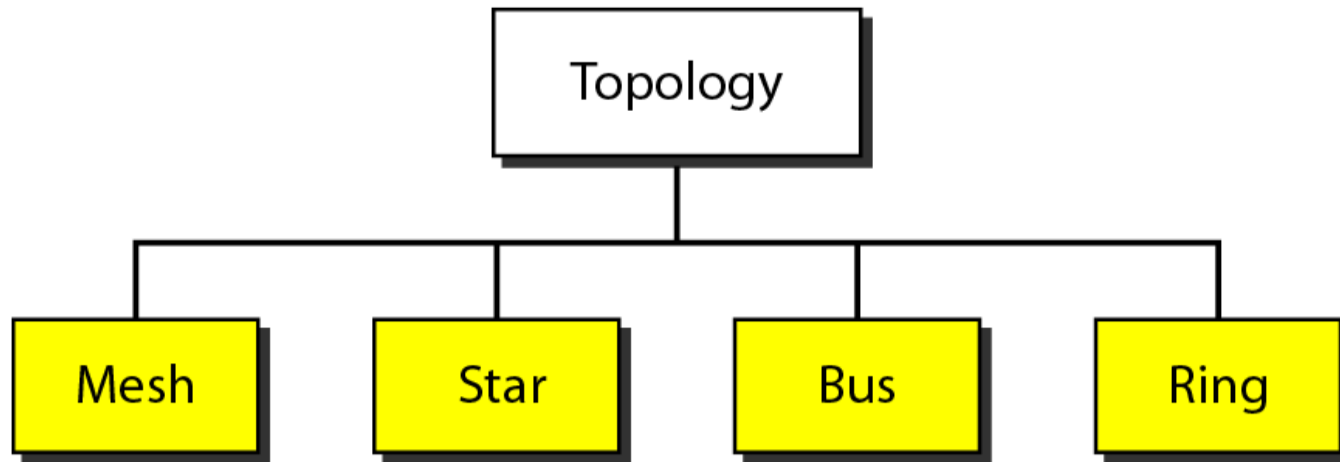
a. Point-to-point



b. Multipoint

Figure : *Types of connections: point-to-point and multipoint*

PHYSICAL TOPOLOGY



Mesh Topology

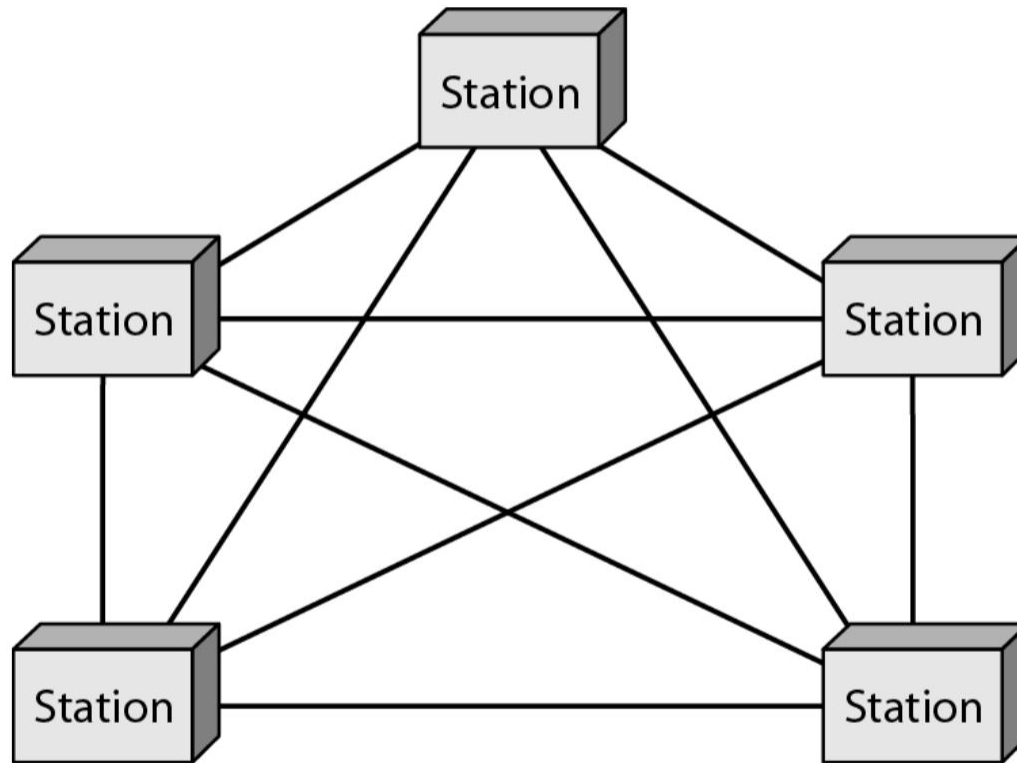


Figure : *A fully connected mesh topology (five devices)*

Mesh Topology

- Every device has dedicated point to point link to every other device.
- Number of physical links for fully connected mesh network is $n(n-1)/2$ (full duplex mode).
- Every device must have $(n-1)$ I/O ports.

- Each connection carry its own data load so avoids traffic problem.
- If one link fails, system does not fail.
- Privacy and security is there.
- Fault identification/isolation is easy.

- Amount of cabling and number of i/o ports are disadvantage.
- Costly.

Star Topology

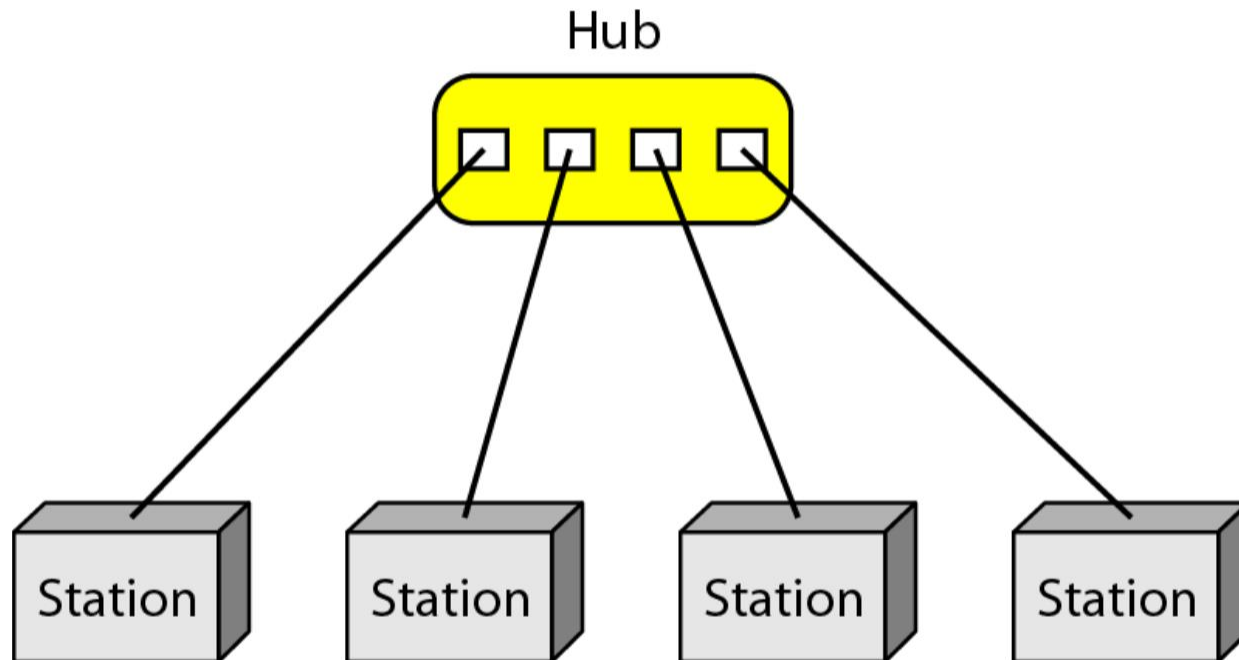


Figure : *A star topology connecting four stations*

Star Topology

- Every device has dedicated point to point link to central controller.
- Does not allow direct traffic between to device.

- Every device requires only 1 I/O ports.
- Less expensive than mesh.
- Additional moves and deletion involves only one connection.
- Robust

- Less cabling than mesh but more than other
- Costly.

Bus Topology

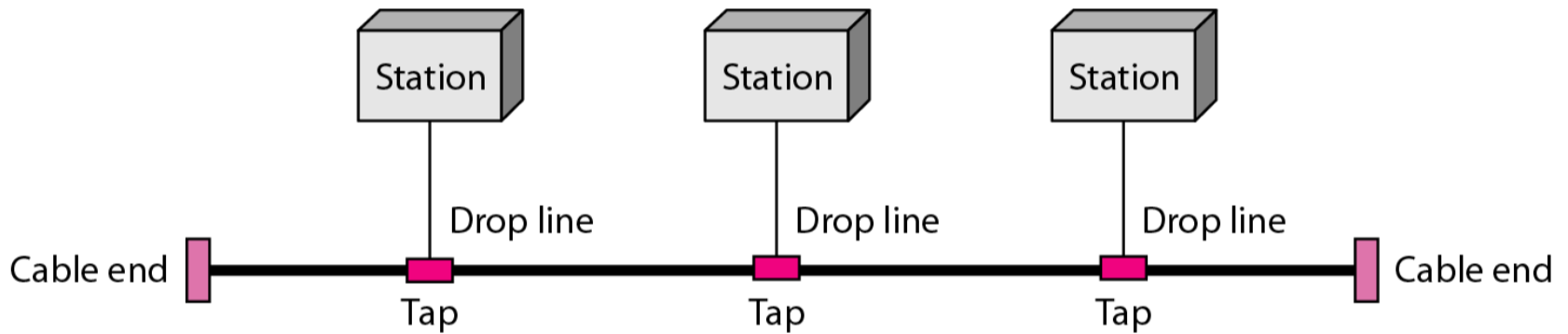


Figure : *A bus topology connecting three stations*

Bus Topology

- Multipoint connection.
- Nodes are connected using drop line and taps.
- There is limit on number of taps and distance between taps.

- Less cabling
- Less cost

- Difficult to add new device.
- A fault or break in bus cable stops all transmission.

Ring Topology

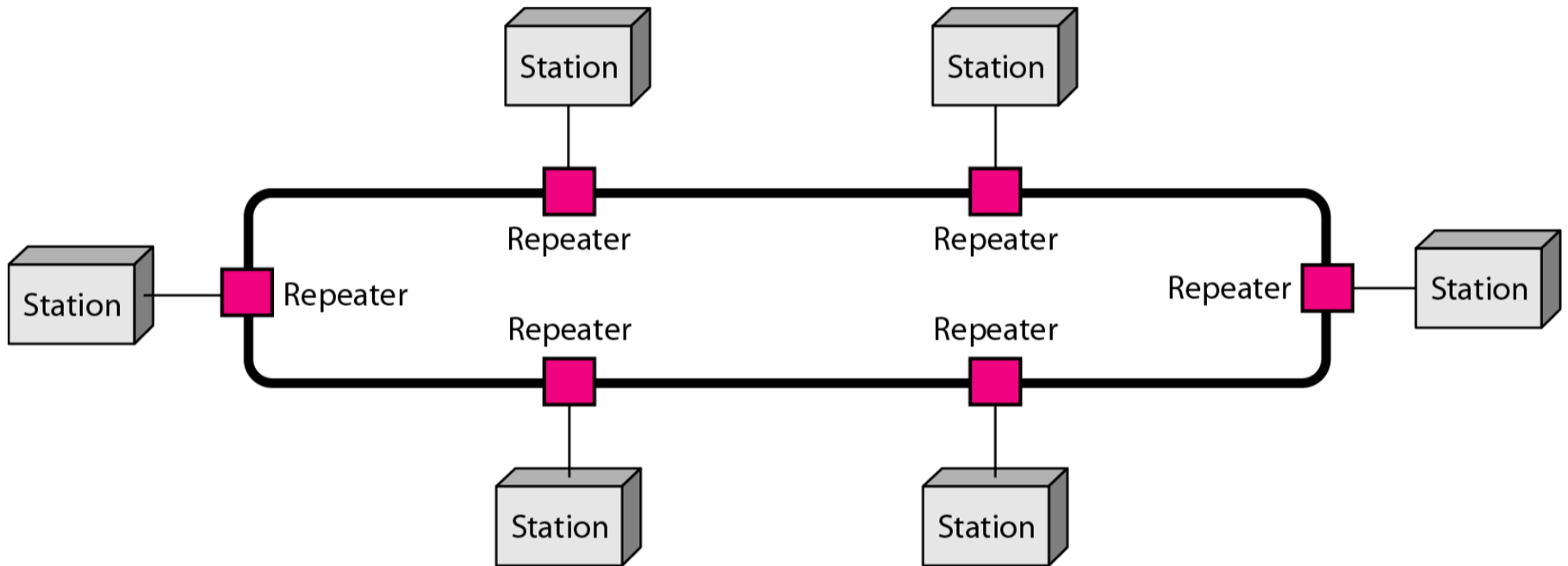


Figure : A ring topology connecting six stations

Ring Topology

- Dedicated point to point connection with two devices.
 - Signal travels in one direction from device to device.
 - Use repeaters.
-
- Relatively easy to reinstall and reconfigure.
 - Fault isolation is easy.
-
- Maximum ring length and number of device is a problem
 - If ring breaks at any point, system will fail.

Ring Topology

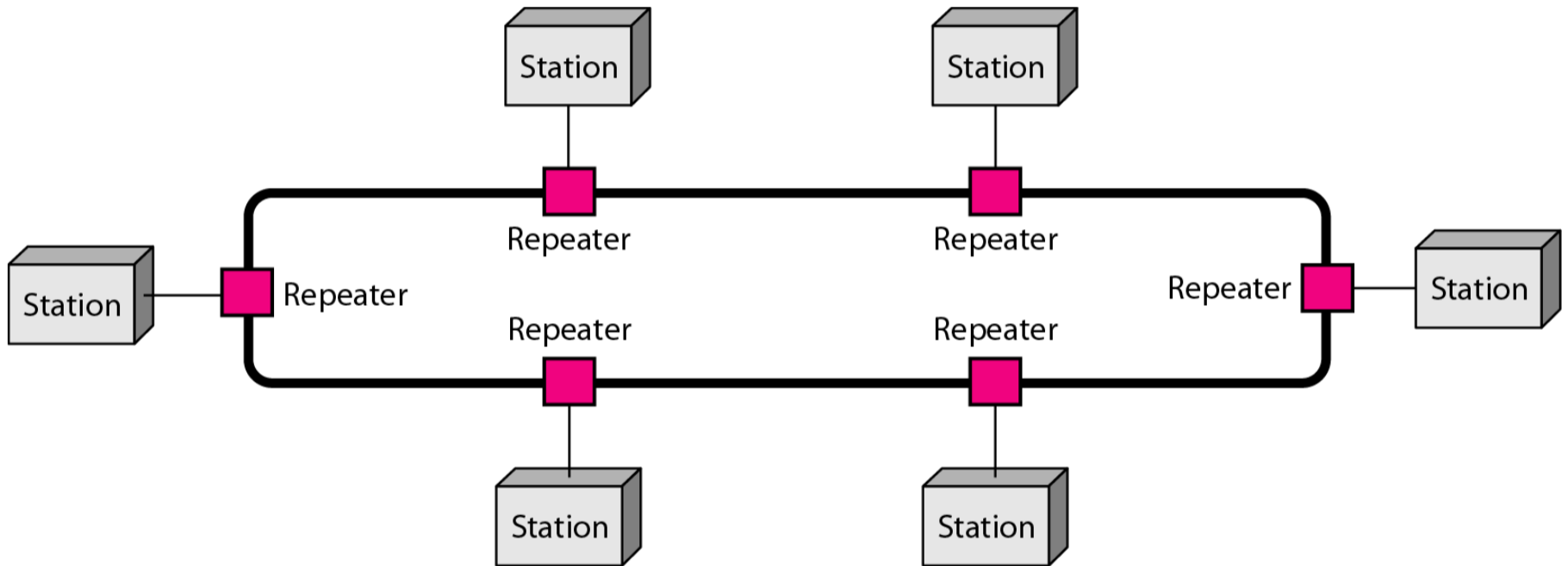


Figure : A ring topology connecting six stations

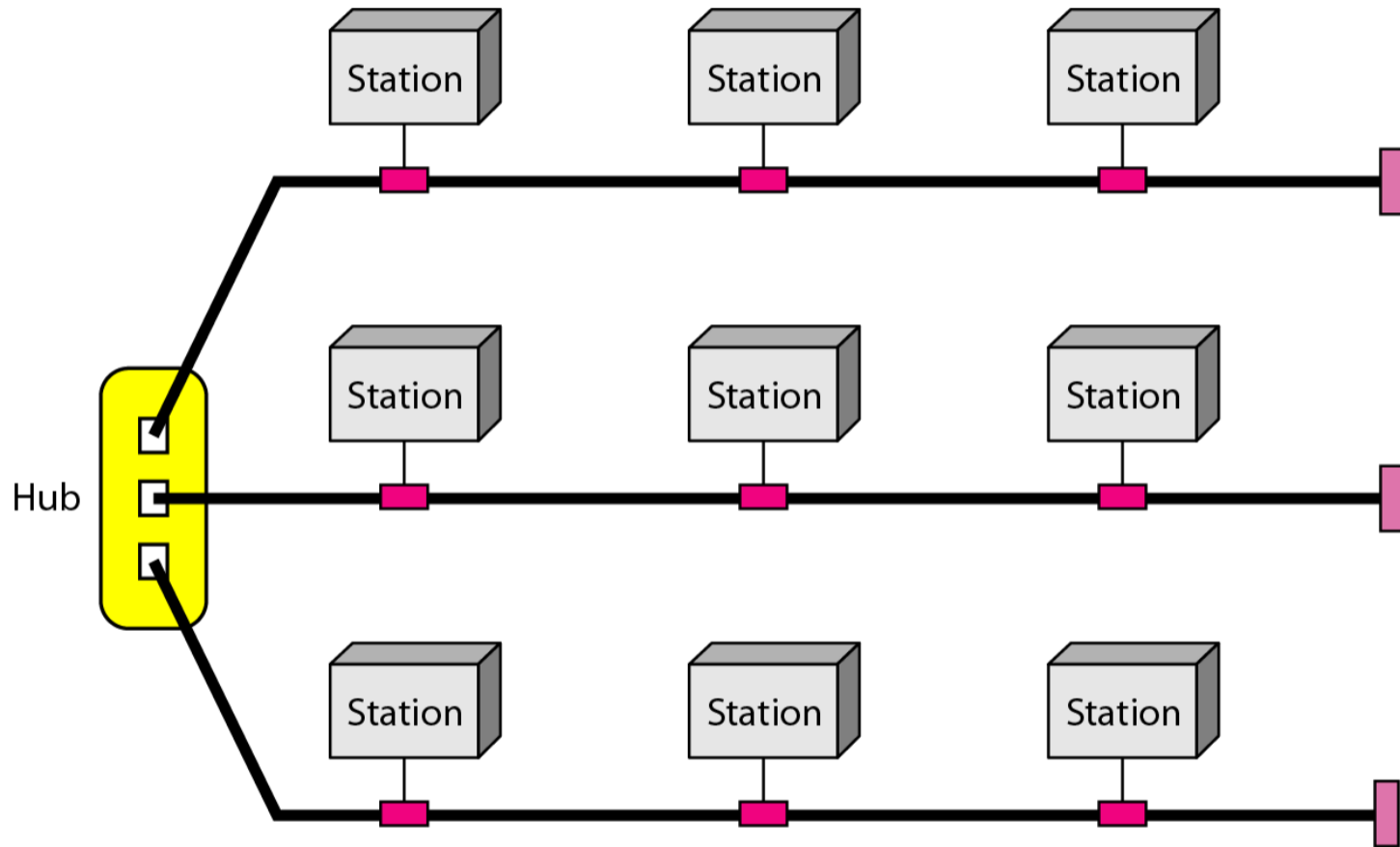


Figure : *A hybrid topology: a star backbone with three bus networks*

Categories of Network

- LAN and WAN
- LAN is usually privately owned and links the devices in a single office, building/campus.

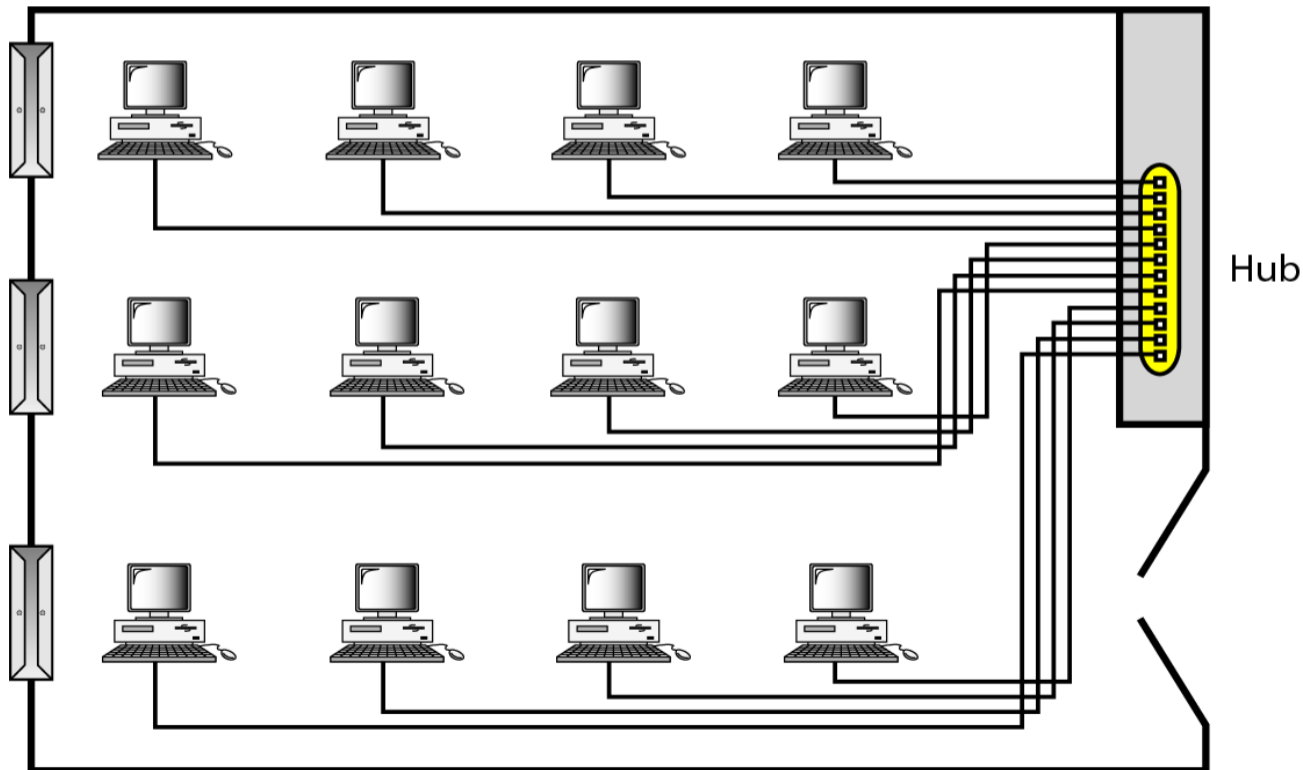


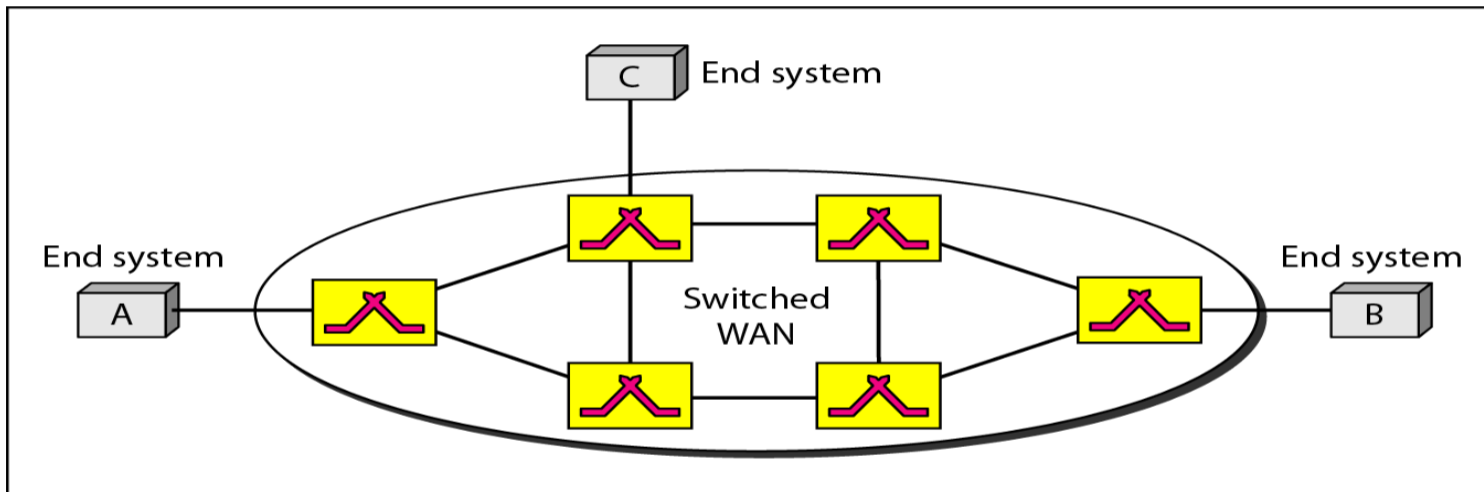
Figure : *A LAN connecting 12 computers to a hub*

LAN

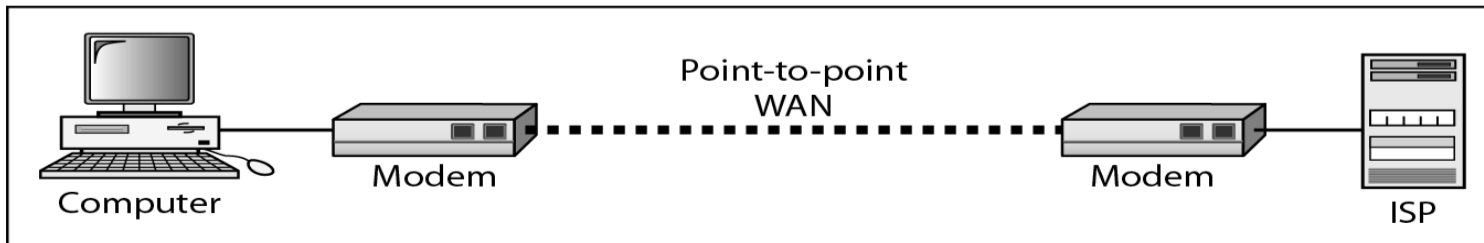
- LANs are designed to allow resources to be shared between PCs.
- LAN size is limited to a few KM.
- One of the computer may be given large capacity disk drive and becomes server to clients.
- A given LAN uses only one type of transmission medium.
- Mainly 4 topology and data rate is upto 1000 Mbps.

WAN

- WAN provides long distance transmission of information.
- WAN may be switched WAN or point to point WAN.



a. Switched WAN



b. Point-to-point WAN

Figure WANs: a switched WAN and a point-to-point WAN

Internetwork

- When two or more networks are connected they become an internetwork or internet.

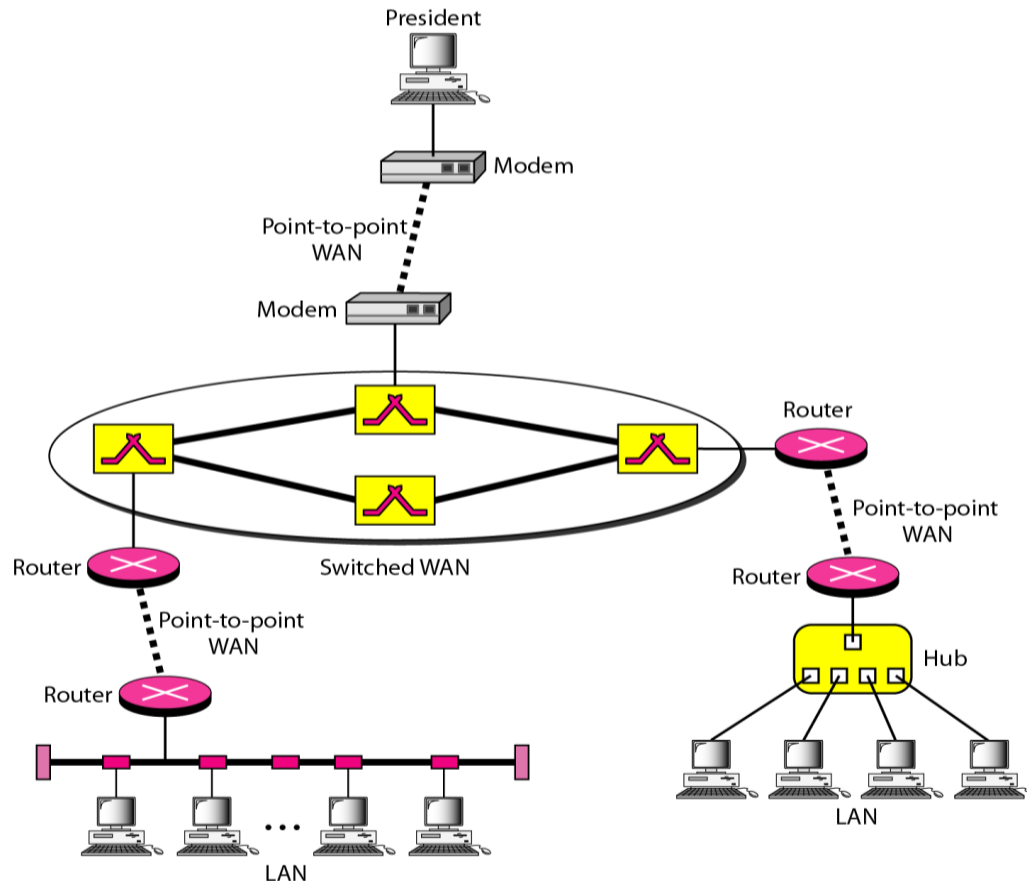
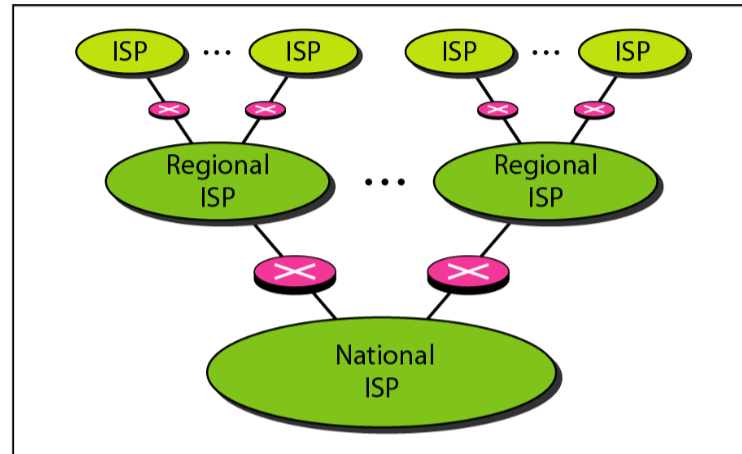


Figure : *A heterogeneous network made of four WANs and two LANs*

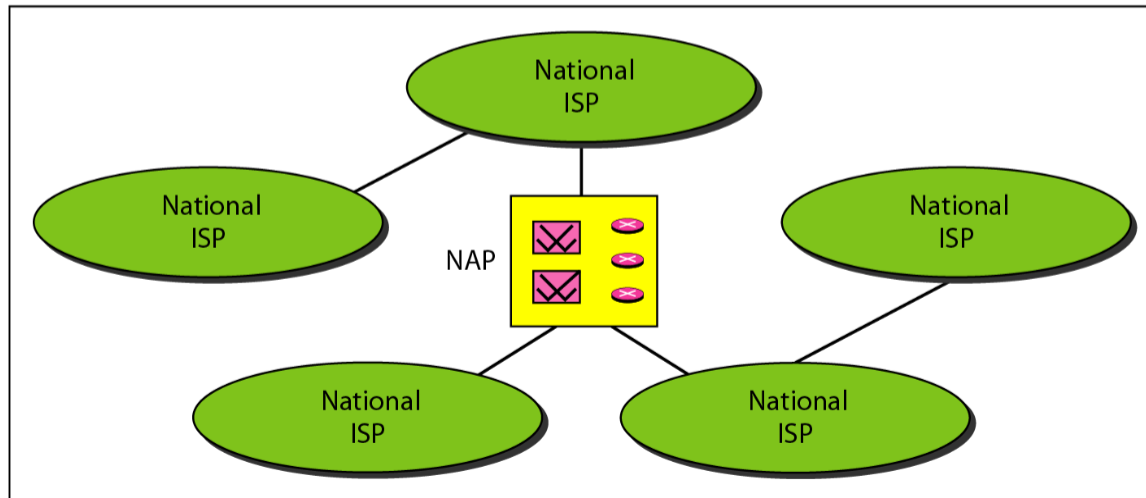
THE INTERNET

The Internet has revolutionized many aspects of our daily lives. It has affected the way we do business as well as the way we spend our leisure time. The Internet is a communication system that has brought a wealth of information to our fingertips and organized it for our use.

Figure : Hierarchical organization of the Internet



a. Structure of a national ISP



b. Interconnection of national ISPs

Question

- What are the two type of line configuration?
- For n devices what is the number of cables requires for mesh, star, bus and ring topology?
- A color image uses 16 bit to represent a pixel. What is the maximum number of different colors that can be represented?

For each of the following four networks, discuss the consequences if a connection fails.

- a. Five devices arranged in a mesh topology
- b. Five devices arranged in a star topology (not counting the hub)
- c. Five devices arranged in a bus topology
- d. Five devices arranged in a ring topology

Performance is inversely related to delay. When you use the Internet, which of the following applications are more sensitive to delay?

- a. Sending an e-mail
- b. Copying a file
- c. Surfing the Internet