



Data Communication (CSX-208) Dr Samayveer Singh

Overview of Networks

Questions



- › Why networks?
- › What is the motive of networks?
- › Components of Networks?

Data Communication Model



- Basically, it is used to exchange the data between two devices via some form of transmission medium.
- The data is exchanged in the form of a bit stream or signal.
- Data Communication has two types- Local and Remote
- Fundamental characteristics are:
 - Accuracy
 - Delivery
 - Timelines

Components of a data communication system

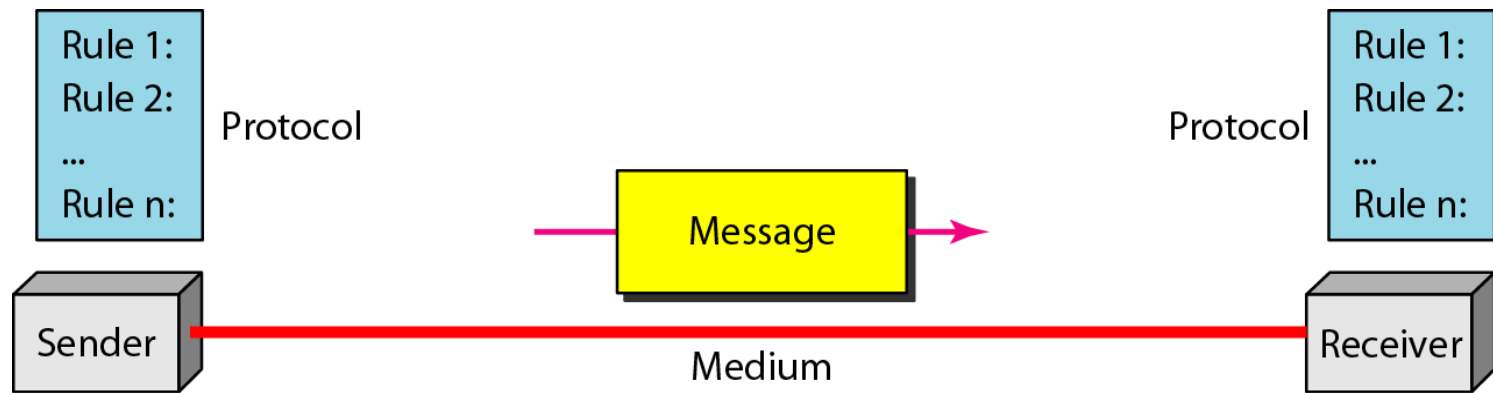
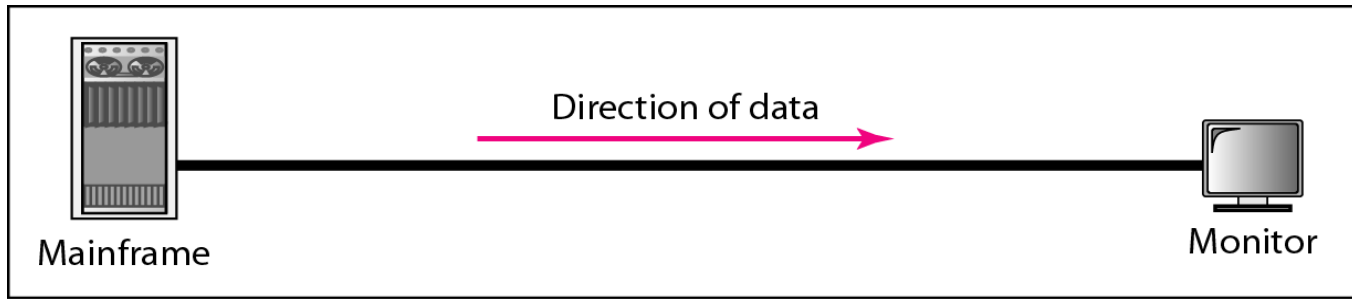
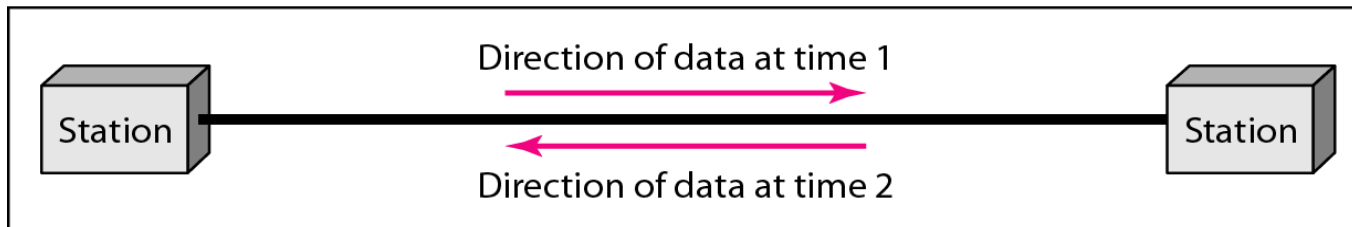


Figure: Five components of data communication: Protocols, sender unit, receiver unit, medium and message

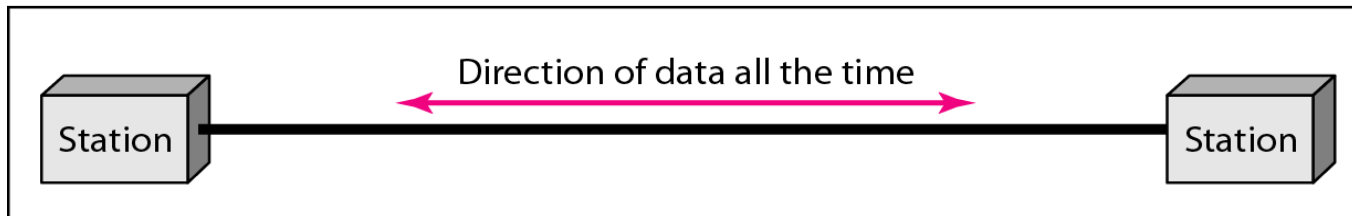
Data flow



a. Simplex



b. Half-duplex



c. Full-duplex

Figure: Three modes of data flow: simplex, half duplex, full duplex

Data flow



➤ Simplex

- Unidirectional flow at all times
- Keyboard and monitor

➤ Half-duplex

- Unidirectional flow at a particular instant of time
- Walkie-Talkie

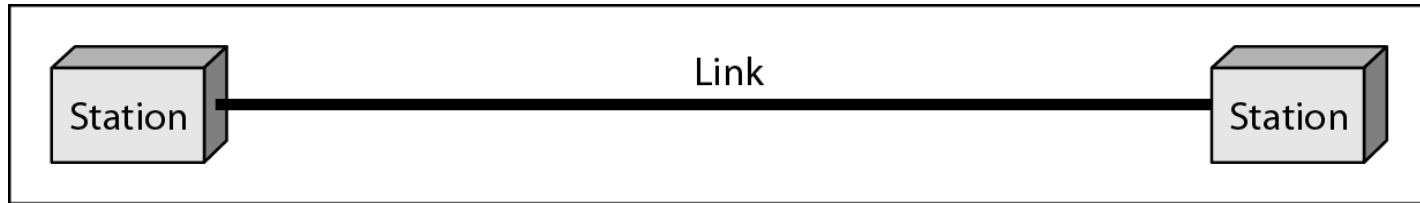
➤ Full-duplex

- Bi-directional flow at all times
- Telephones

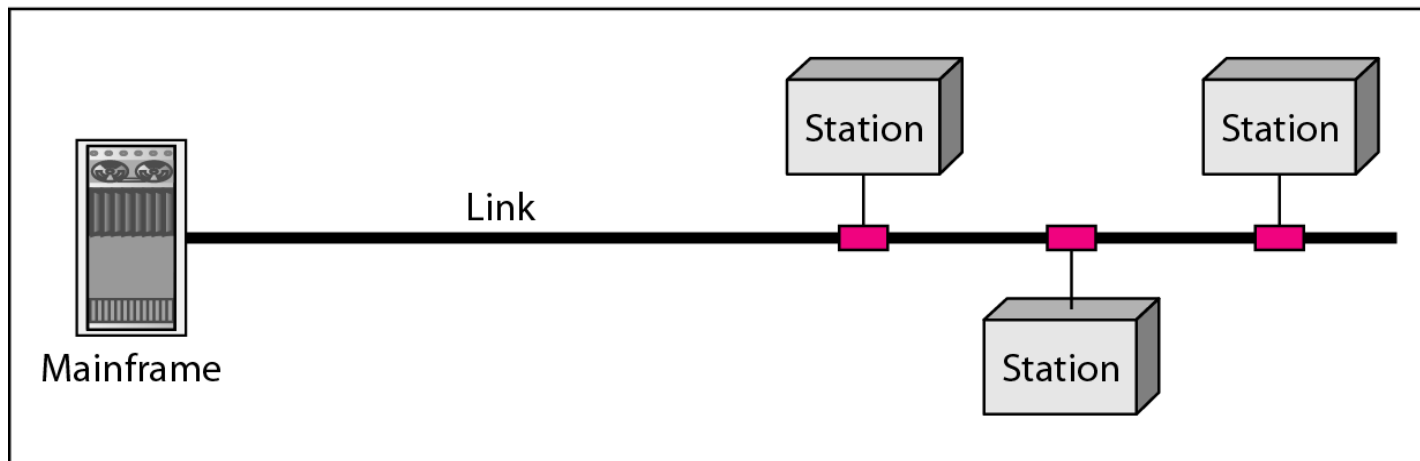
Networks

- A network is the interconnection of a set of devices capable of communication. A device can be computer, laptop, phone etc.
- Network Applications
 - ❖ Resource sharing such as printers and storage devices
 - ❖ Exchange of information by using Web or Internet
 - ❖ Video conferences
 - ❖ Instant messaging
 - ❖ Etc.
- Network criteria are:
 - ❖ Performance
 - ❖ Reliability
 - ❖ Security

Type of Connections



a. Point-to-point



b. Multipoint

Figure: Point-to-point and Multi-point links

Types of links



➤ Point-to-point

- Dedicated link between two points
- Example: IR remote for TV

➤ Multi-point

- More than two devices share the same link
 - Spatial sharing: Several devices use the link simultaneously
 - Time sharing: Devices take turns in time, to share the link

Network topology

- Network Topology is schematic description of a network arrangement, connecting various nodes through lines of connection.

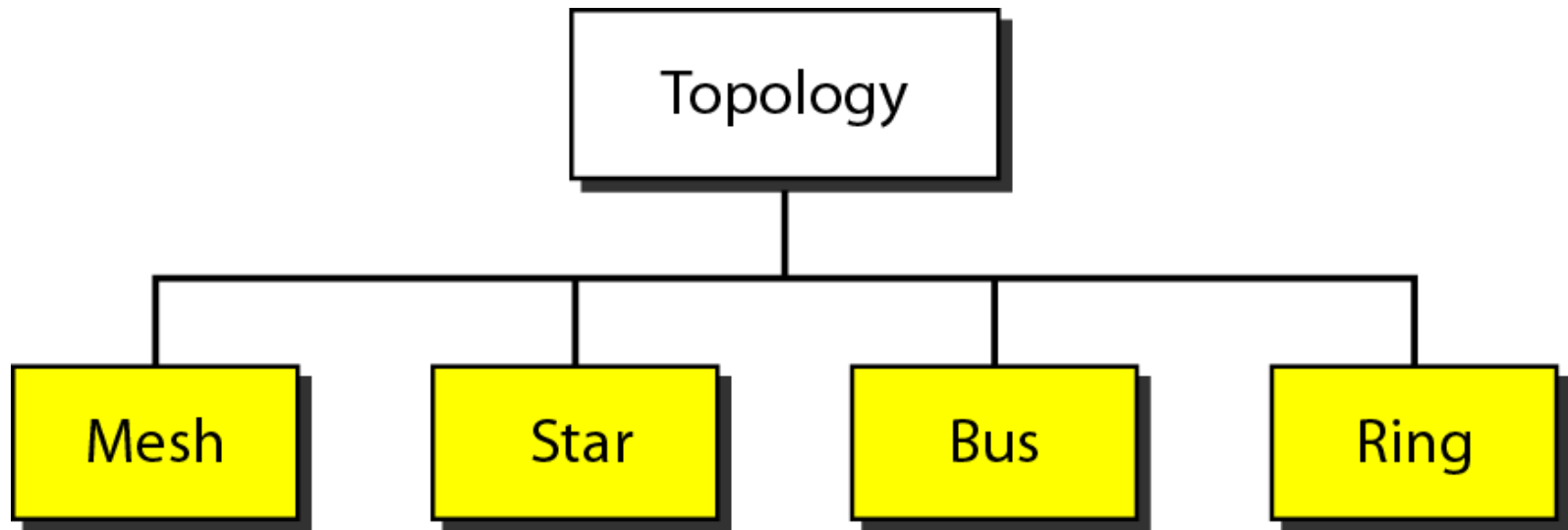
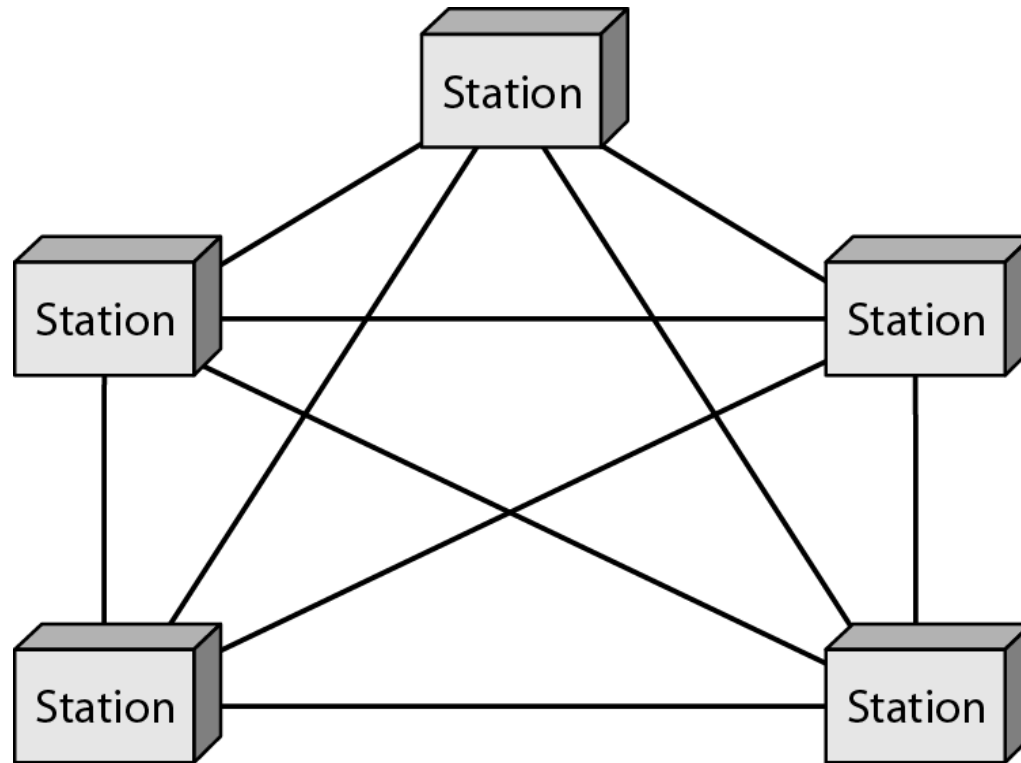


Figure: 4 basic network topologies

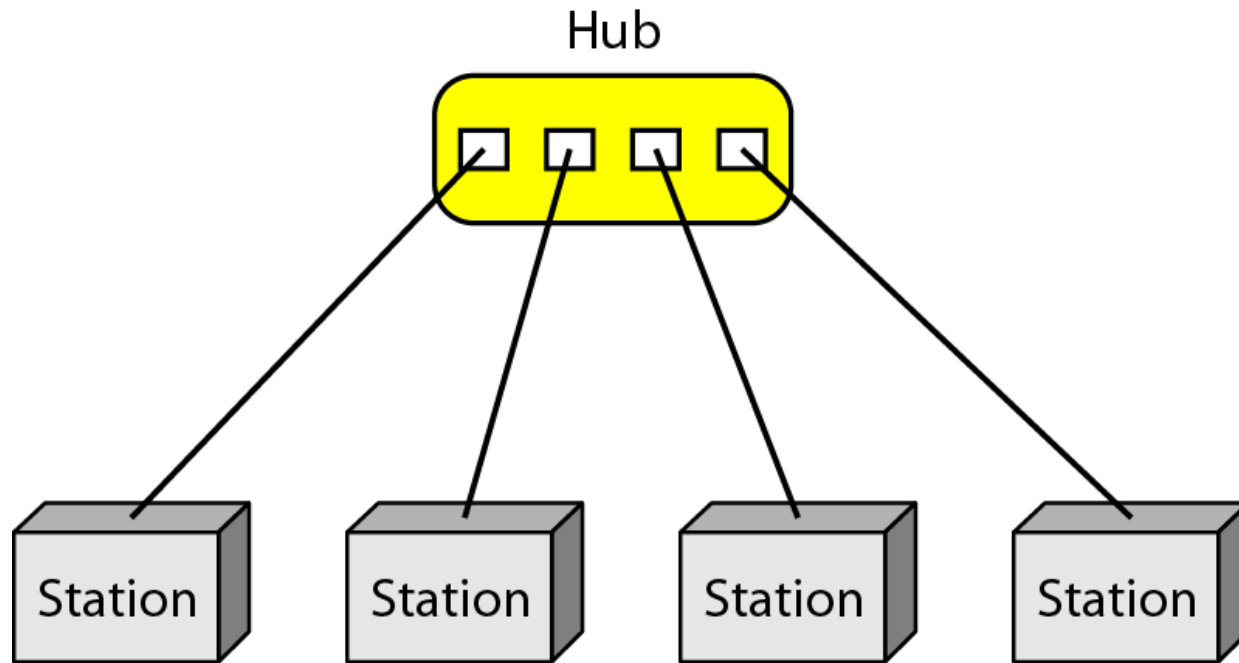
A fully connected mesh topology (five devices)



Mesh

- In this every device has a dedicated p-2-p link to every device.
- We need $n(n-1)/2$ duplex mode links.
- Each device on network must have $(n - 1)$ I/O ports.
- It eliminates the traffic problem.
- Mesh topology is robust. Even if one link is unusable , it does not effect the entire network.
- The system has advantage of privacy & security.
- Easy fault identification & correction
- The main disadvantage is more cabling & large no. of I/O ports required.

A star topology connecting four stations

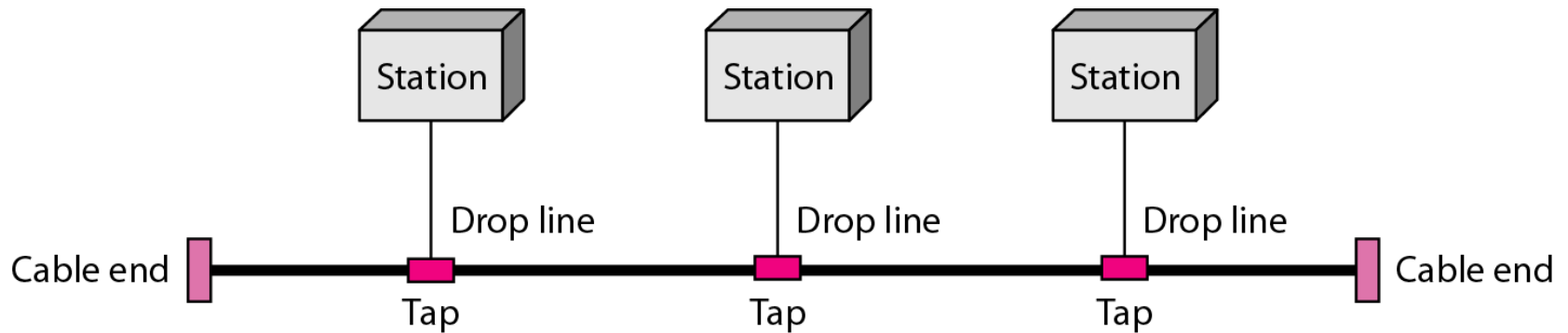


Star



- Each device has a dedicated P-2-P link only to central controller called as hub.
- It does not allow direct traffic between devices. The controller acts as an exchanger.
- If one sends data to another, it sends data to the controller, which then relay the data to another connected device.
- In this each device needs only 1 I/O port.
- The main disadvantage is that if the hub goes down then the entire network is dead.

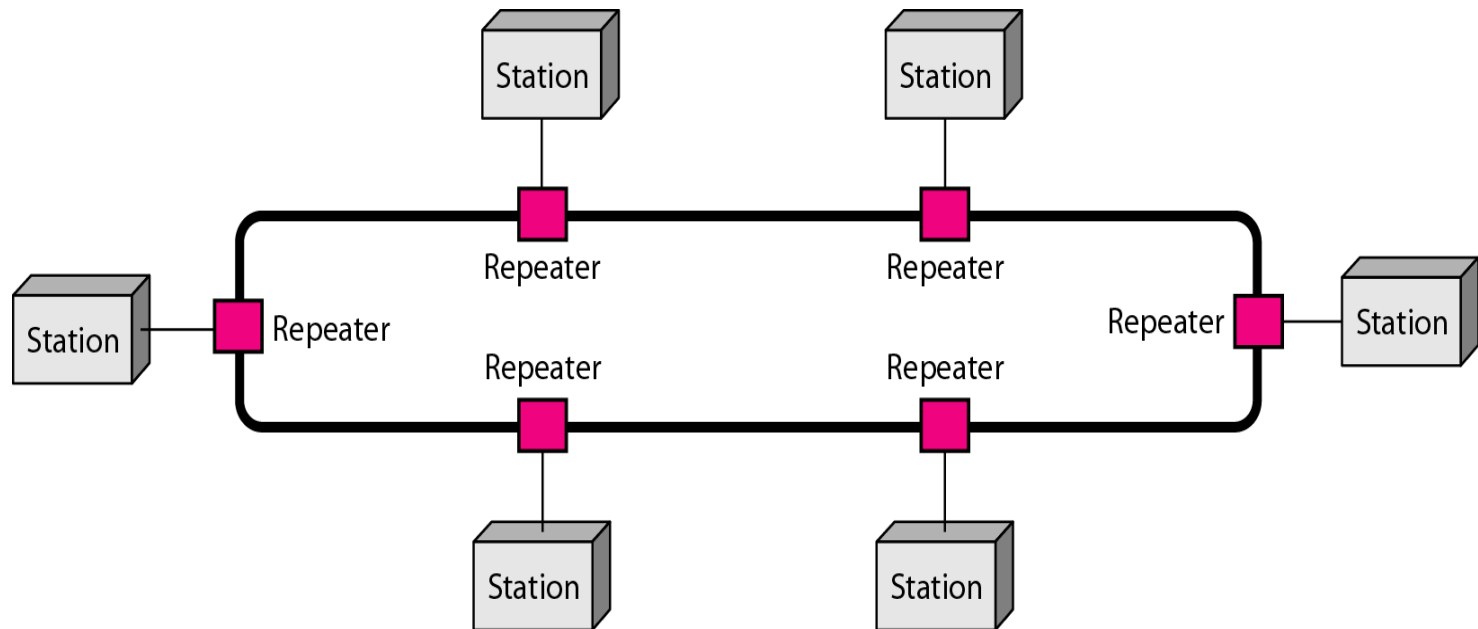
A bus topology connecting three stations



Bus

- It is a multi point communication system.
- One long cable acts as backbone to link all the devices in the network.
- Nodes are connected to bus cable by drop lines and taps.
- Advantage:
 - Nodes can be connected and disconnected with ease
 - Each node requires just one I/O port
- Disadvantage:
 - As the signal travels along bus some of its energy is transformed into heat. So the signal becomes weaker & weaker as it travels farther & farther.
 - It is difficult to fault isolation and reconnection.
 - If there is fault or break in bus line then all the transmission will stop.

A ring topology connecting six stations

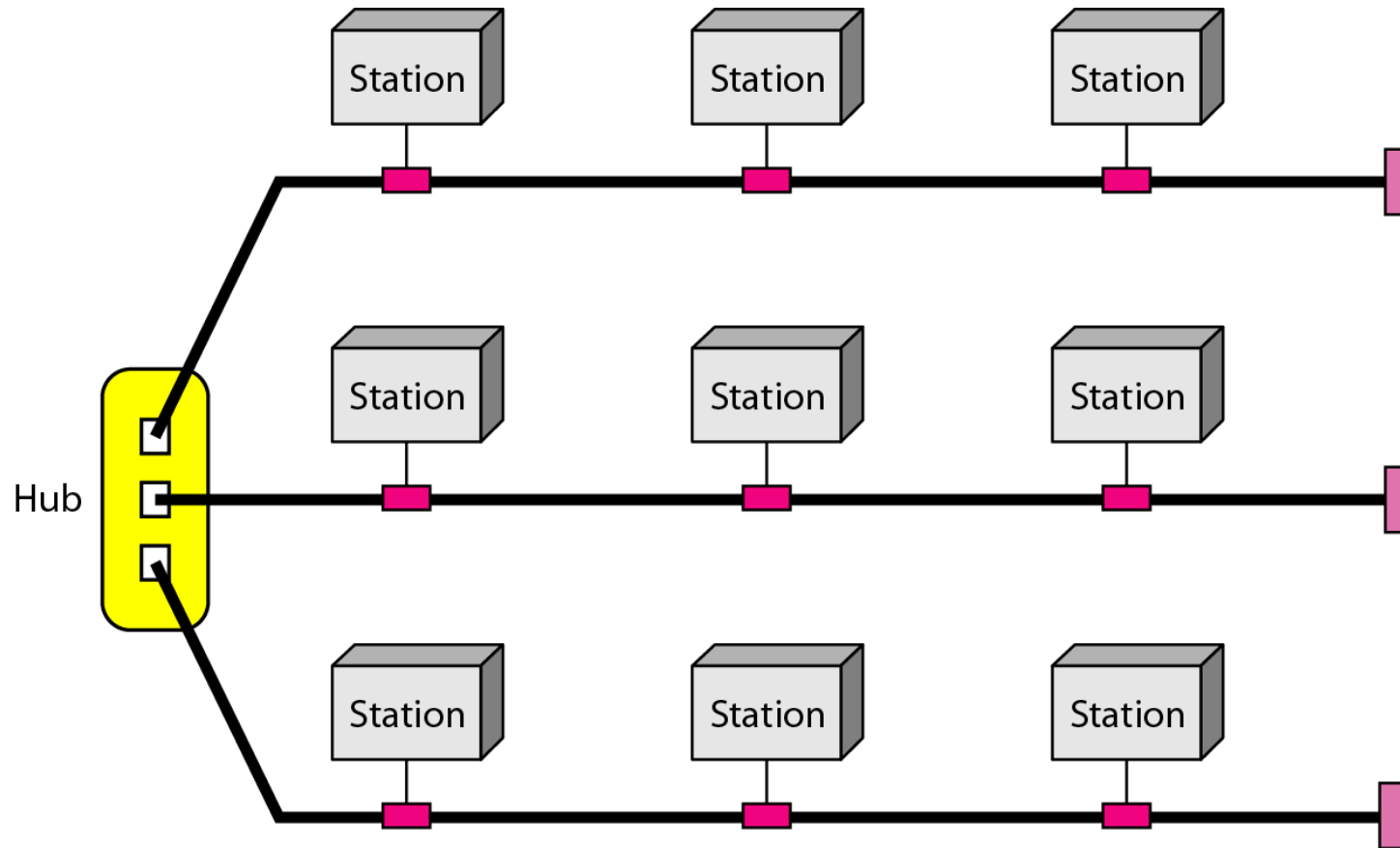


Ring



- Each device has a dedicated P-2-P connection with only two devices on either sides.
- A signal passes along the ring in one direction only, from device to device, until it reaches its final destination.
- In this each device is incorporated with repeater, when a device receives a signal intended for another device, its repeater regenerates the bits and passes them along.
- Unidirectional traffic is a disadvantage, a break in the ring can disable the entire network.

A hybrid topology: a star backbone with three bus networks



Categories of Networks

- Generally, networks are distinguished based on their geographical span.
- Some of the different networks based on size are:
 - ❖ Local area network (LAN)
 - ❖ Metropolitan area network (MAN)
 - ❖ Wide area network (WAN)
 - ❖ Personal area network (PAN)
- Some of the different networks based on their main purpose are:
 - ❖ Storage area network (SAN)
 - ❖ Enterprise private network (EPN)
 - ❖ Virtual private network (VPN)