RANADA PRASAD SHAHA UNIVERSITY
CSE 311
PHYSICAL STRUCTURES

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DEPT. OF CSE

PHYSICAL STRUCTURES

Before discussing networks, we need to define some network attributes:

- **Types of Connections**
- **Physical Topology**

TYPES OF CONNECTIONS

- A network is two or more devices connected through links. A link is a communications pathway that transfers data from one device to another.
- For communication to occur, two devices must be connected in some way to the same link at the same time. There are **TWO** possible types of connections:

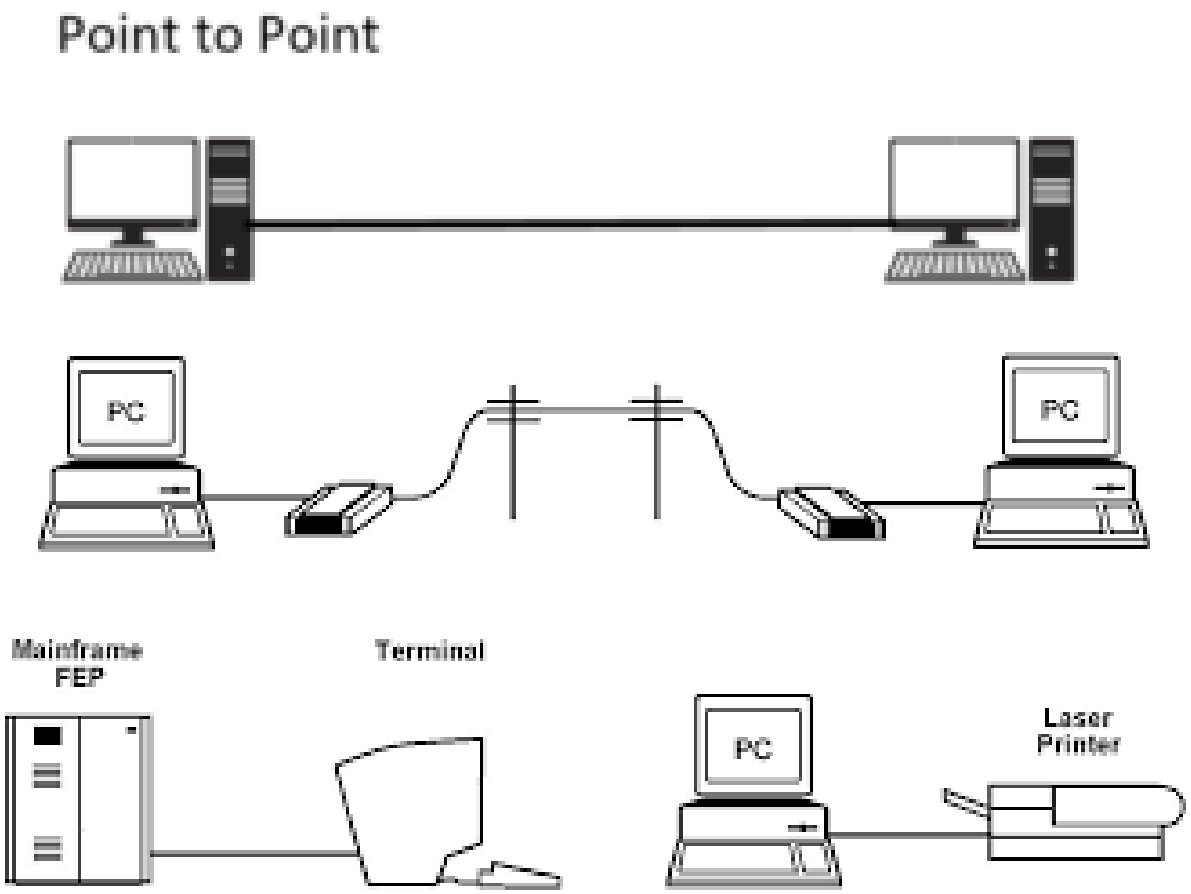
1. **Point-to-Point**
2. **Multipoint.**

TYPES OF CONNECTIONS: **POINT-TO-POINT**

"A point-to-point connection provides a dedicated link between two devices"

- Most point-to-point connections use an actual length of wire or cable to connect the two ends. But other options, such as microwave or satellite links, are also possible.
- The entire capacity of the link is reserved for transmission between those two devices.
- Example: When we change television channels by infrared remote control, you are establishing a point-to-point connection between the remote control and the television's control system.

TYPES OF CONNECTIONS: **POINT-TO-POINT**

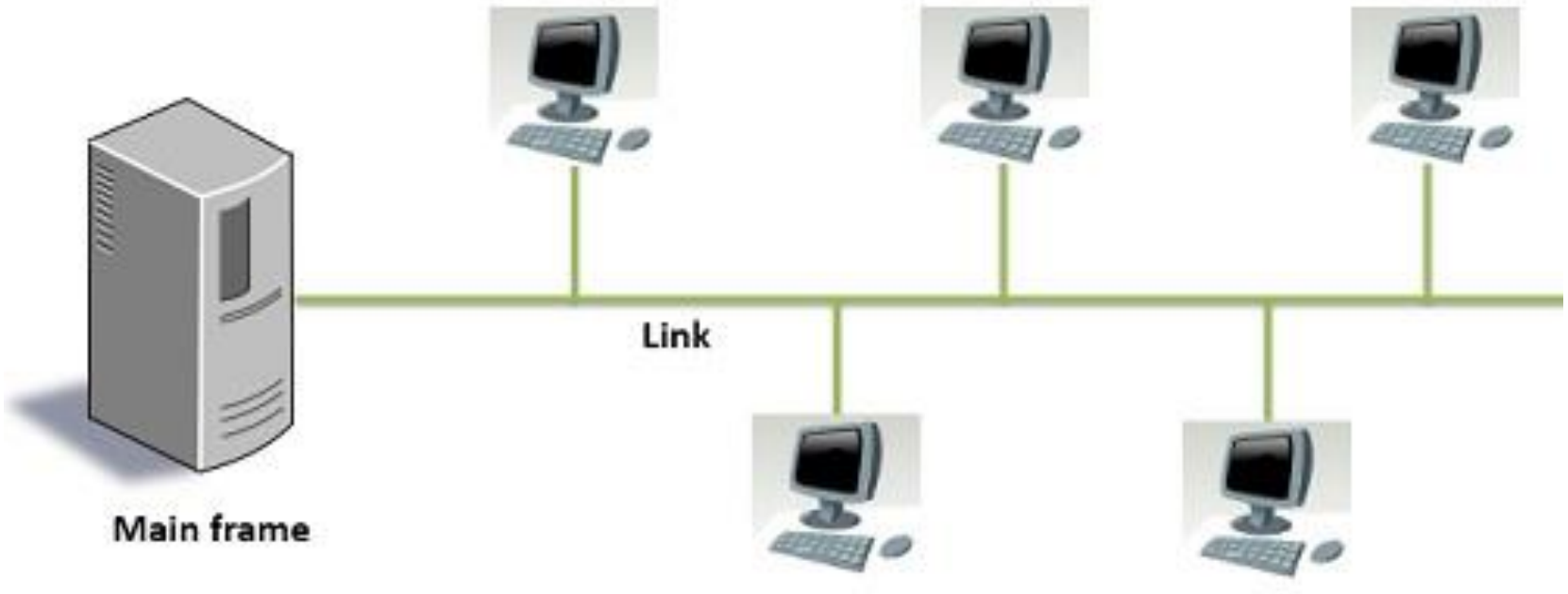


TYPES OF CONNECTIONS: **MULTIPOINT**

"A multipoint connection is one in which more than two specific devices share a single link"

- In a multipoint environment, the capacity of the channel is shared, either spatially or temporally.
- If several devices can use the link simultaneously, it is a ***spatially*** *shared* connection.
- If users must take turns, it is a ***timeshared*** connection.

TYPES OF CONNECTIONS: **MULTIPOINT**

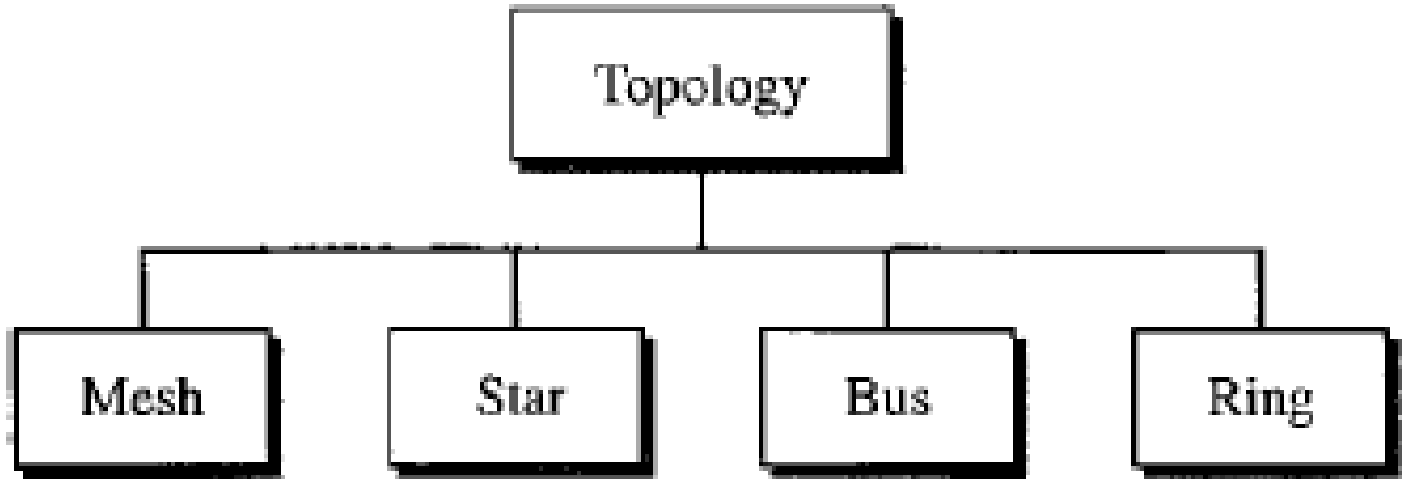


Multipoint Connection

PHYSICAL TOPOLOGY

- The term *physical topology* refers to the way in which a network is laid out physically.
- 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 **four** basic topologies possible:

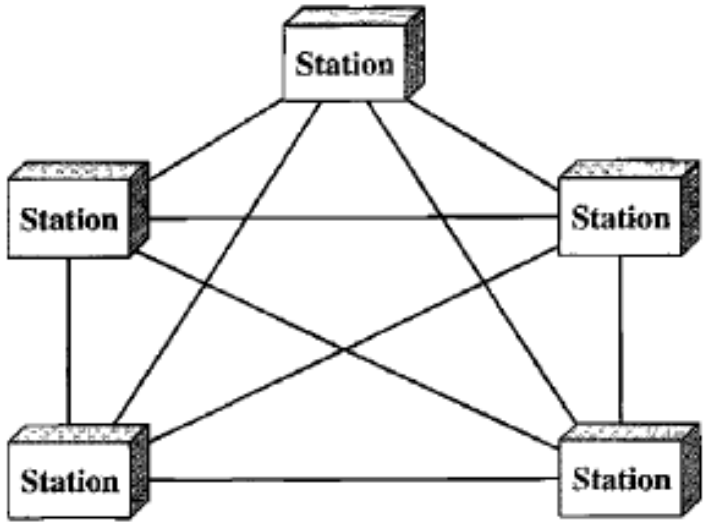
1. **Mesh**
2. **Star**
3. **Bus and**
4. **Ring**



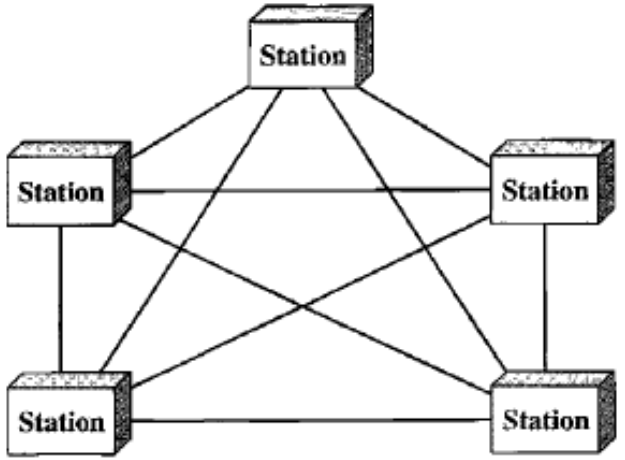
CATEGORIES OF TOPOLOGY: *MESH*

- In a mesh topology, every device has a dedicated point-to-point link to every other device.
- *Dedicated* means that the link carries traffic only between the two devices when it connects.
- In mesh topology, we need,

n(n-1)/2, duplex-mode links



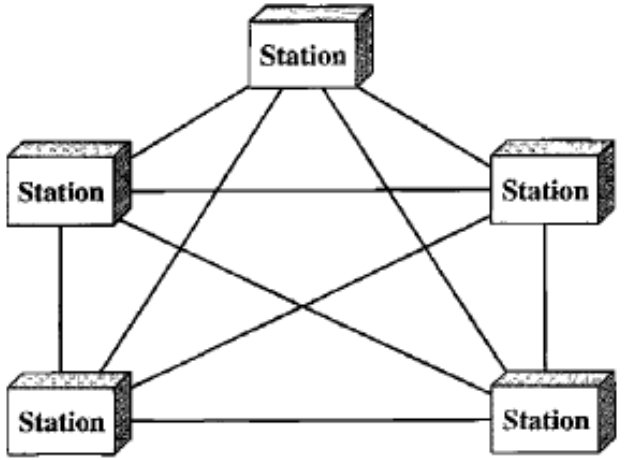
CATEGORIES OF TOPOLOGY: *MESH*



- **Advantages**:

1. The use of dedicated links guarantees that each connection can carry its own data load, thus eliminating the traffic problems that can occur when links must be shared by multiple devices.
2. A mesh topology is robust. If one link becomes unusable, it does not incapacitate the entire system.
3. Privacy or security: When every message travels along a dedicated line, only the intended recipient sees it.
4. Point-to-point links make fault identification and fault isolation easy. Traffic can be routed to avoid links with suspected problems.

CATEGORIES OF TOPOLOGY: *MESH*



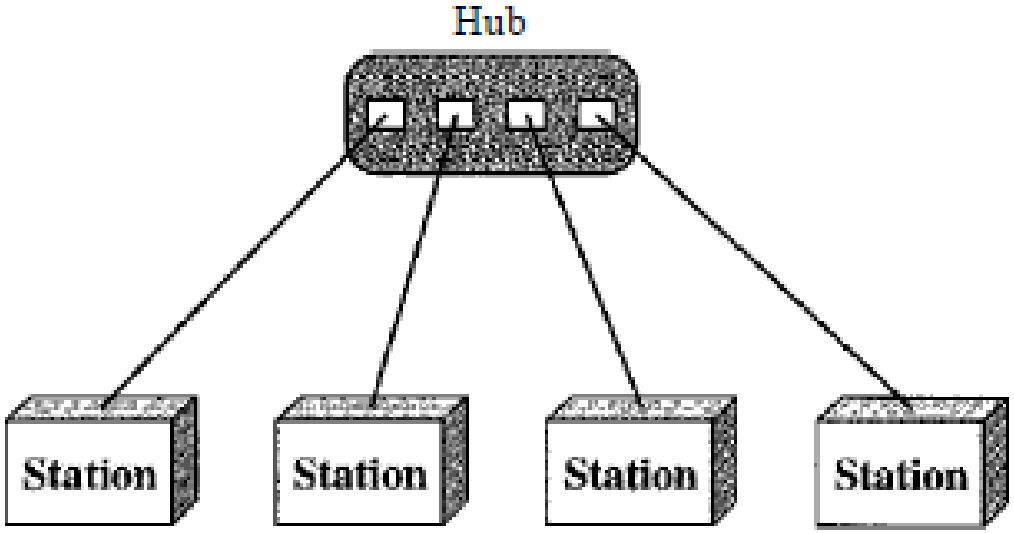
- **Disadvantages**: The main disadvantages of a mesh are related to the amount of cabling and the number of I/O ports required.

1. Installation and reconnection are difficult.
2. The sheer bulk of the wiring can be greater than the available space (in walls, ceilings, or floors) can accommodate.
3. The hardware required to connect each link (I/O ports and cable) can be prohibitively expensive.

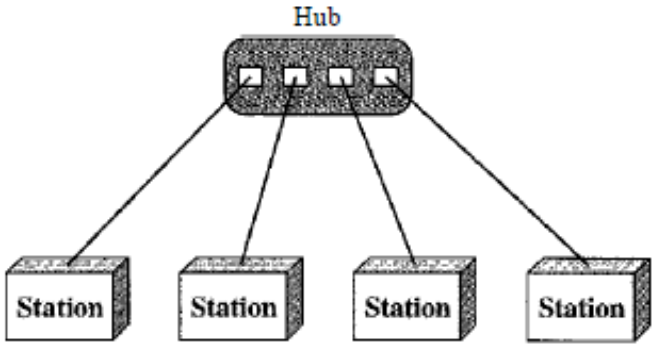
- One practical example of a mesh topology is the connection of telephone regional offices in which each regional office needs to be connected to every other regional office.

CATEGORIES OF TOPOLOGY: *STAR*

- In a star topology, each device has a dedicated point-to-point link only to a central controller, usually called a hub.
- Not directly connected to one another. So, direct traffic between devices.
- The star topology is used in local-area networks.



CATEGORIES OF TOPOLOGY: *STAR*



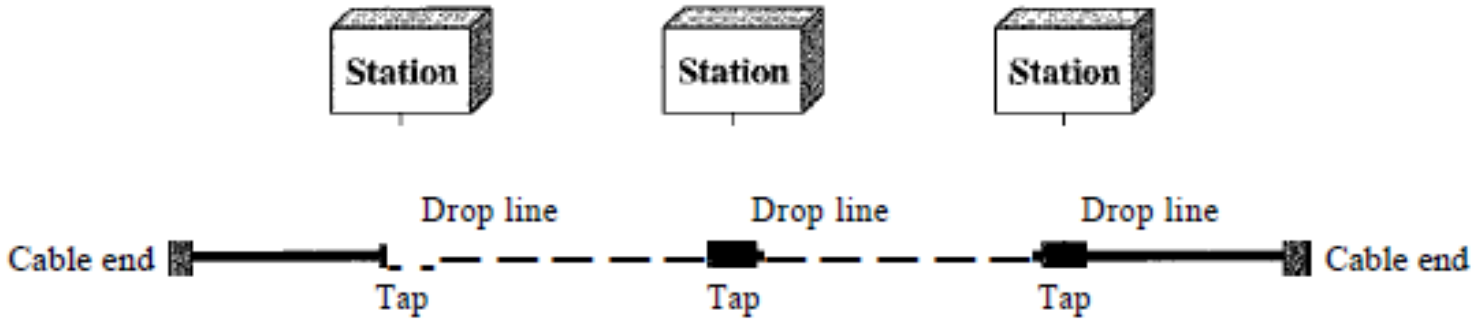
- **Advantages:**

1. Less expensive than mesh topology.
2. Easy to install and reconfigure.
3. Far less cabling needs to be housed, and additions, moves, and deletions involve only one connection: between that device and the hub.
4. Robustness: If one link fails, only that link is affected. All other links remain active. This factor also lends itself to easy fault identification and fault isolation.

- **Disadvantage:** One big disadvantage of a star topology is the dependency of the whole topology on one single point, the hub. If the hub goes down, the whole system is dead.

CATEGORIES OF TOPOLOGY: *BUS*

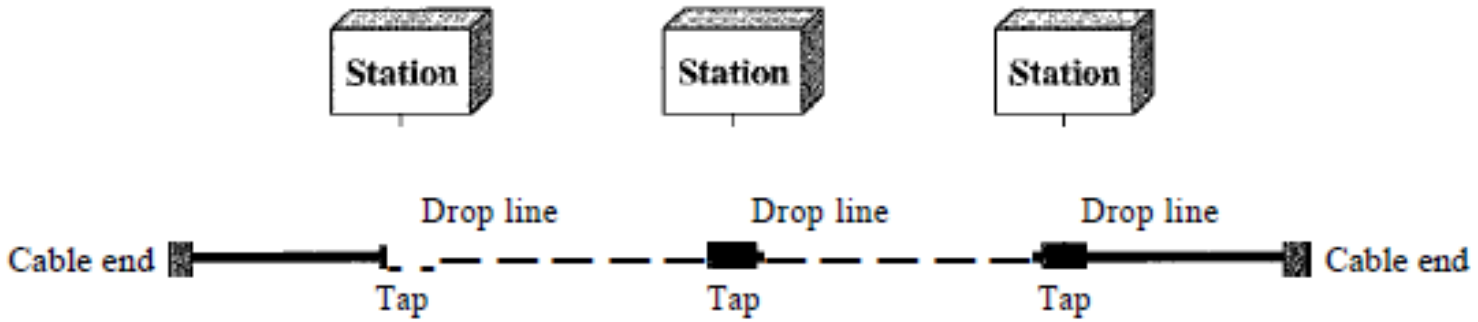
- A bus topology, is multipoint, one long cable acts as a backbone to link all the devices in a network.
- Nodes are connected to the bus cable by drop lines and taps. A drop line is a connection running between the device and the main cable.
- A tap is a connector that either splices into the main cable or punctures the sheathing of a cable to create a contact with the metallic core. As a signal travels along the backbone, some of its energy is transformed into heat.



CATEGORIES OF TOPOLOGY: ***BUS***

- **Advantages:**

1. Ease of installation
2. Less cabling than mesh or star topologies
3. Redundancy is eliminated

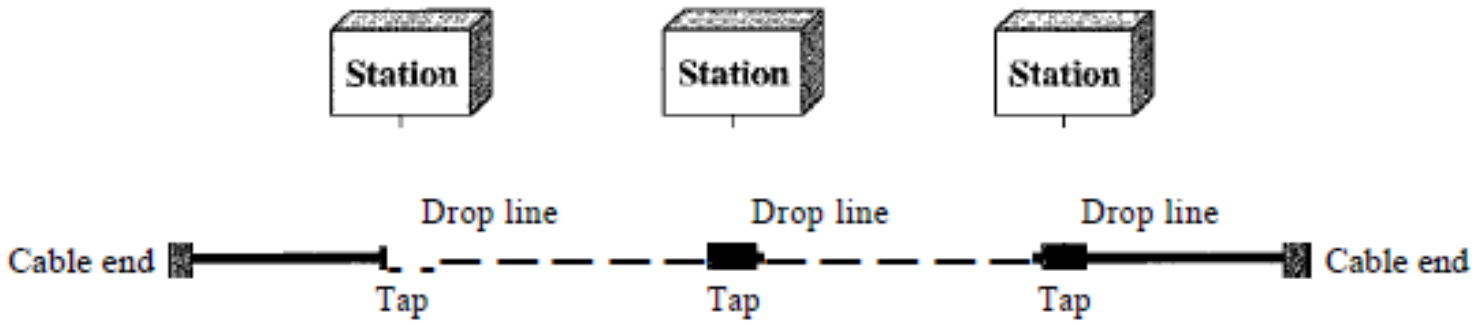


CATEGORIES OF TOPOLOGY: *BUS*

- **Disadvantages:**

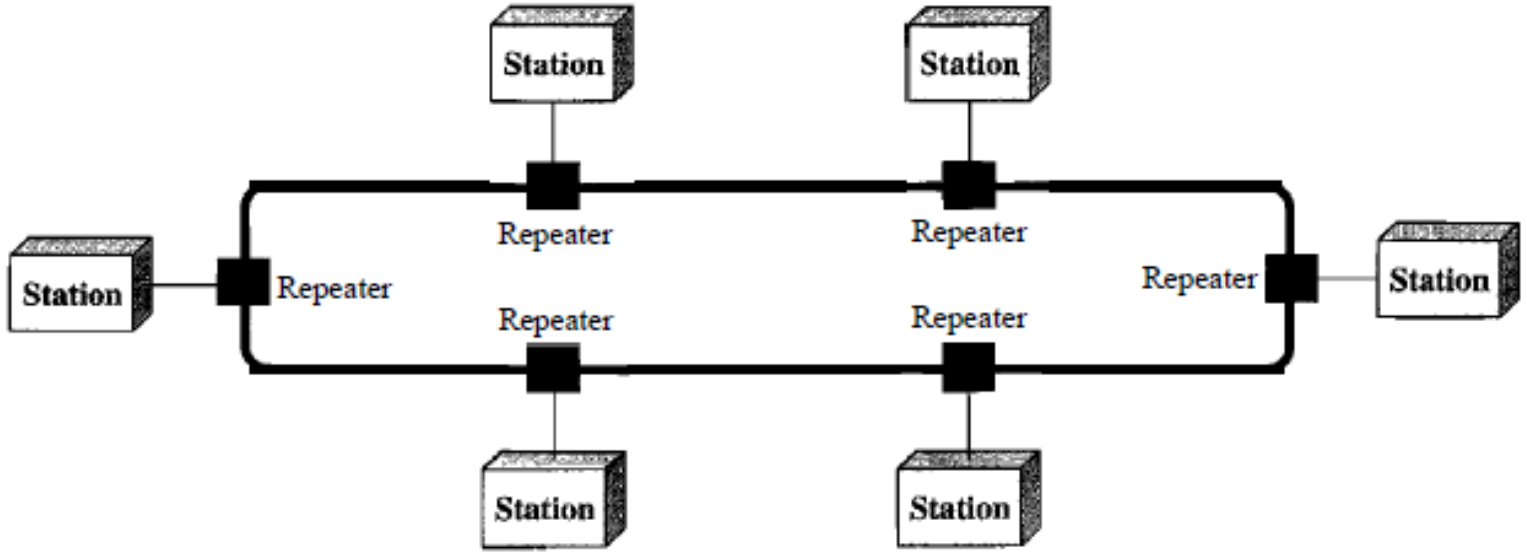
1. Difficult reconnection and fault isolation.
2. Signal reflection at the taps can cause degradation in quality.
3. A fault or break in the bus cable stops all transmission.

- First topologies used in the design of early local area networks.



CATEGORIES OF TOPOLOGY: *RING*

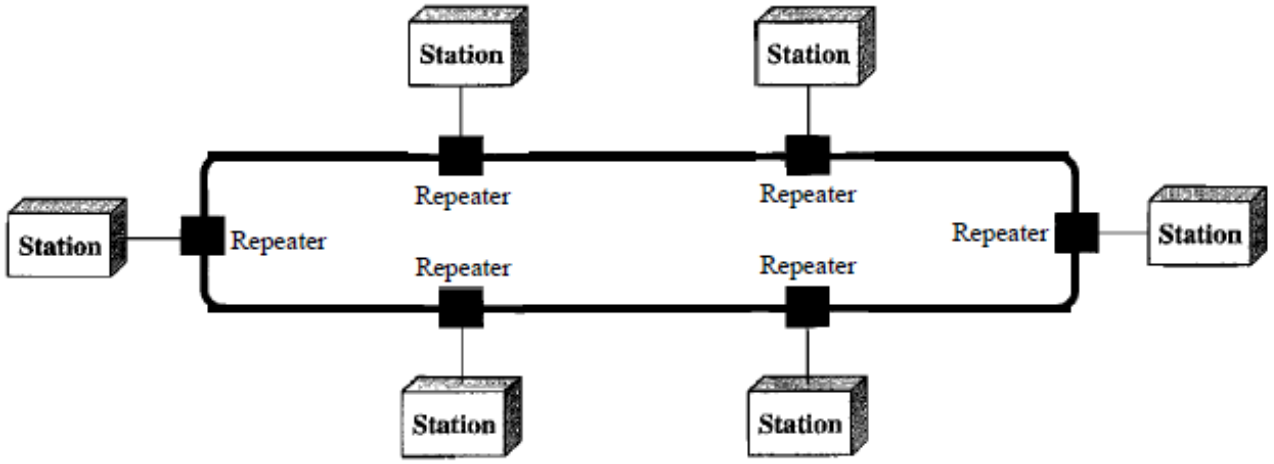
- Each device has a dedicated point-to-point connection with only the two devices on either side of it.
- A signal is passed along the ring in one direction, from device to device, until it reaches its destination. Each device in the ring incorporates a repeater.



CATEGORIES OF TOPOLOGY: *RING*

- **Advantages:**

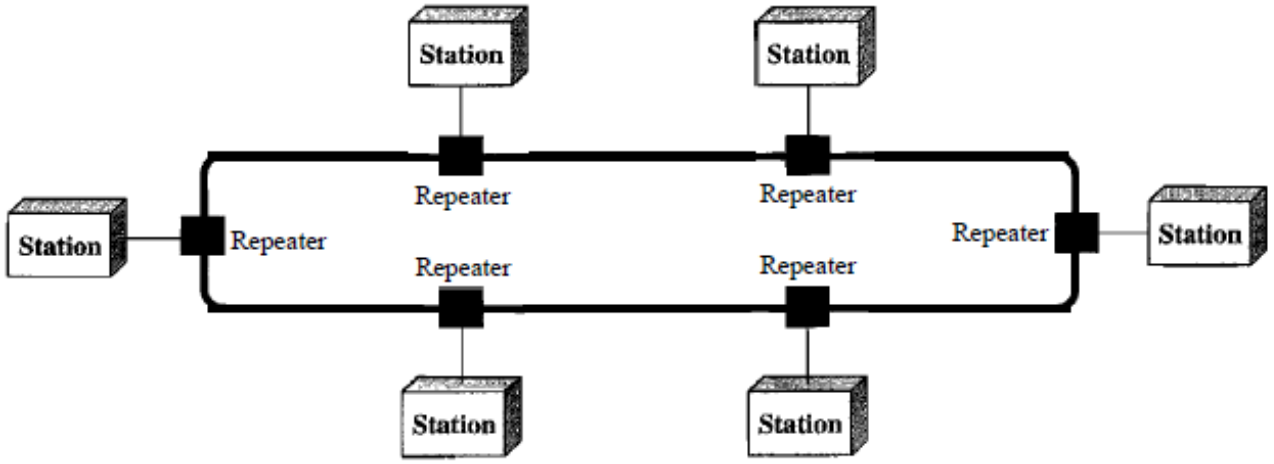
1. Easy to install and reconfigure. Each device is linked to only its immediate neighbors. To add or delete a device requires changing only two connections.
2. Fault isolation is simplified. A signal is circulating at all times. So if one device does not receive a signal then a alarm alerts the network operator about the problem and location.



CATEGORIES OF TOPOLOGY: *RING*

- **Disadvantages:**

1. Unidirectional traffic.
2. In a simple ring, a break in the ring (such as a disabled station) can disable the entire network.



CATEGORIES OF TOPOLOGY: *HYBRID*

- A network can be hybrid. For example, we can have a main star topology with each branch connecting several stations in a bus topology.