

## **Network Hardware:**

In general there are two dimension stand out as important to classify Network:

*Transmission Technology* and *Scale*

### **Transmission Technology**

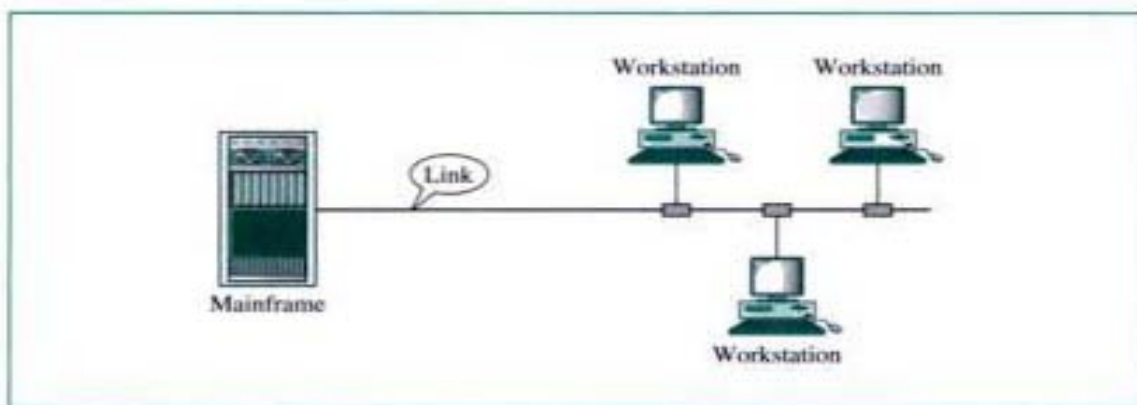
Broadly speaking, there are two types of transmission Technology:

#### **1- Broadcast links (multipoint)**

It is the network that have a single communication channel that is shared by all the machines on the network. In multipoint environment. The capacity of the channel is shared, either spatially or temporally. If several devices can use the link simultaneously, it is spatially shared. If user must take turn, it is a time shared line Configuration.

In Broadcast, short messages, called packets, sent by one machine are received by all the others. An address filed within the packet specifies the intended recipient.

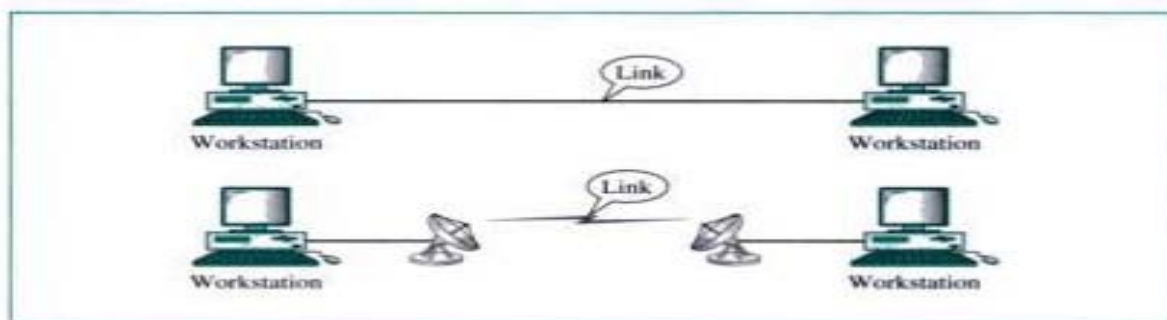
**Figure 1.6** *Multipoint connection*



#### **2- Point – to – Point Network:**

A point – to – point line configuration provides a dedicated link between two devices. The entire capacity of the channel is reserved for transmission between those two devices. Most point – to – point line configuration use an actual length or wire or cable

to connect. The two ends, but other options such as a microwave or satellite links are also possible.



An alternative for classifying network is their scale:-

	Interprocessor distance	processor located in same
Personal Area N.W	1M	Square meter
LAN	10 M	Room
	100M	Building
	1 km	Campus
MAN	10 km	City
WAN	100 km	Country
	1000km	Continent
	10,000km	Planet
The internet		

- The personal Area Network it networks that meant for person. Ex (mouse to computer / wireless).
- Longer range networks can be divided into local, Metropolitans, and wide area Network.
- The connection of two or more networks is called internet work. Ex (Internet).

### **Topology:**

- The term topology refers to the way a network is laid out, either physically or logically.
- Two or more devices connect to a link, two or more links form a topology.
- The topology of a network is the geometric representation of the relationship of all the links and linking devices to each other.
- The topology describe how the devices in a network are interconnected rather than their physical arrangement. For example, having a star topology dosent mean that all of the computer in the network must be places physically around a hub in a star shape. A consideration when choosing a topology is the relative statues of the devices to be linked.

There are four basic topologies possible:-

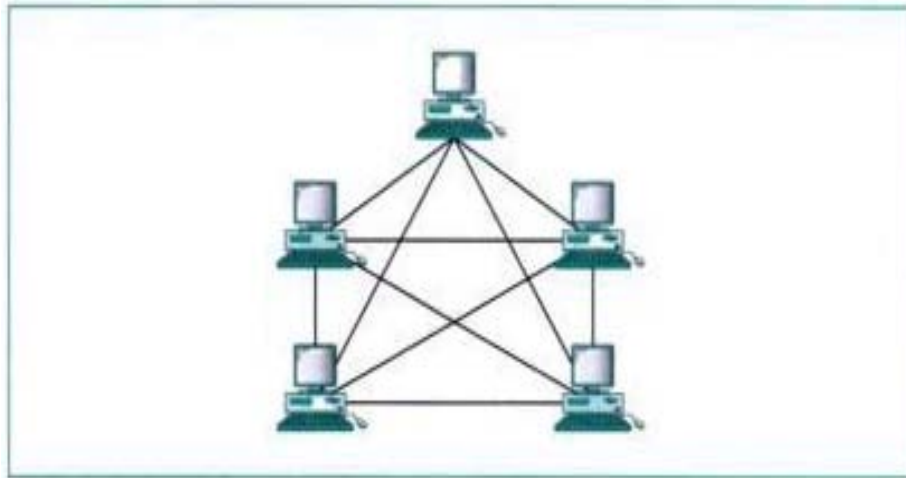
Mesh, Star, Ring, Bus

#### **1- Mesh Topology:**

In a mesh topology, every device has a dedicated point – to point link to every other devices. The term dedicated means that the link carries traffic only between the two devices it connects.

- ❖ A fully connected mesh network therefore has  $(n(n-1)/2)$  physical channels to link  $n$  devices.
- ❖ Every device on the network must have  $n-1$  input / output port.
- ❖ Advantage of mesh topology
  1. Eliminating the traffic problems that can occur when links must be shared by multiple devices.
  2. A mesh topology is robust, if one like becomes unusable, it dose not incapacitate the entire system.

3. Security, when every message sent travels along a dedicated line, only the intended recipient sees it.
4. Point – to – point links make fault identification and fault isolation easy.



*A fully connected mesh topology (five devices)*

The main disadvantages of mesh are related to the amount of cabling and the number of I/O ports required.

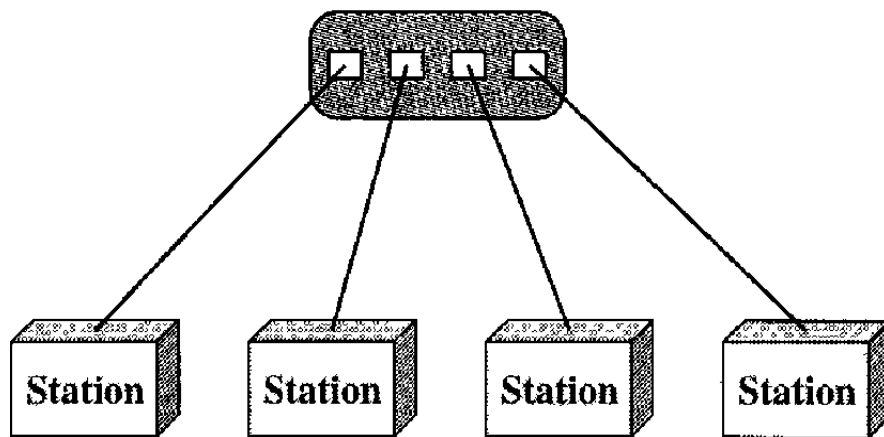
- 1- Because every device must be connected to every other device, installation and reconfiguration are difficult.
- 2- The sheer bulk of the wiring can be greater than the available space can accommodate.
- 3- The hardware required to connect each link (I/O ports and cable) can be expensive. For these reasons, a mesh topology is usually implemented in a limited fashion.

## **2- Star Topology:**

in a star topology, each device has a dedicated point – to – point link only to a central controller usually called a Hub.

- Devices are not linked to each other.

- Star topology doesn't allow direct traffic between devices.
- The controller acts as an exchanger: If one device wants to send data to another, it sends to the controller which then relays the data to the other connected devices.
- A star topology is less expensive than mesh topology and easier to install and reconfigure.
- Star topology is robust, such that if one link fails. Only that link is affected, all other links remain active.
- Easy fault identification and isolation.



*A star topology connecting four stations*

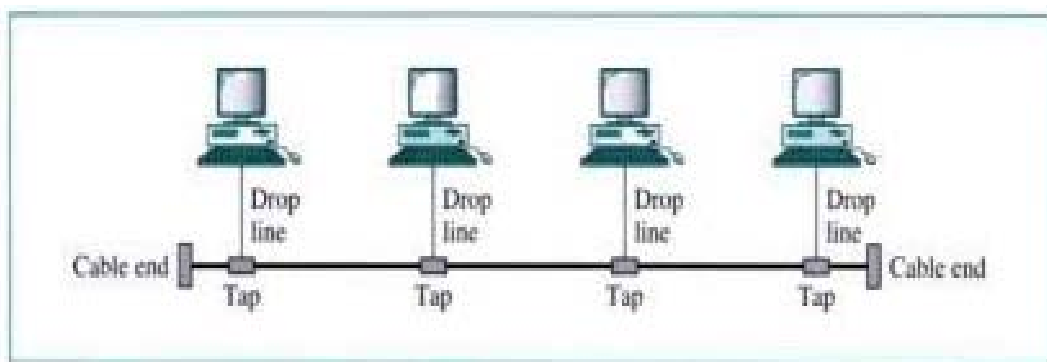
One big disadvantage of a star topology is the dependency of the whole topology on one single point, the hub. If the hub goes down, the whole system is dead.

Although a star requires far less cable than a mesh, each node must be linked to a central hub. For this reason, often more cabling is required in a star than in some other topologies (such as ring or bus).

The star topology is used in local-area networks (LANs), as we will see in High-speed LANs often use a star topology with a central hub.

### 3- Bus Topology:

- A bus topology is a multipoint.
- One long cable acts as a backbone to link all the devices in the network.



Bus Topology

- 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.
- As a signals travels along the backbone, some of its energy is transformed into heat. Therefore, it becomes weaker and weaker the farther it has to travel. For this reason there is a limit on the number of taps a bus can support and on distance between those taps.
- Both ends of the bus must be terminated with a resistive load Known as a terminating resistor. These resistors serve to prevent signal bounce.

- Advantages of a bus topology include:-

- 1- ease of installation.
- 2- Bus using less cabling than mesh, star, tree topologies.

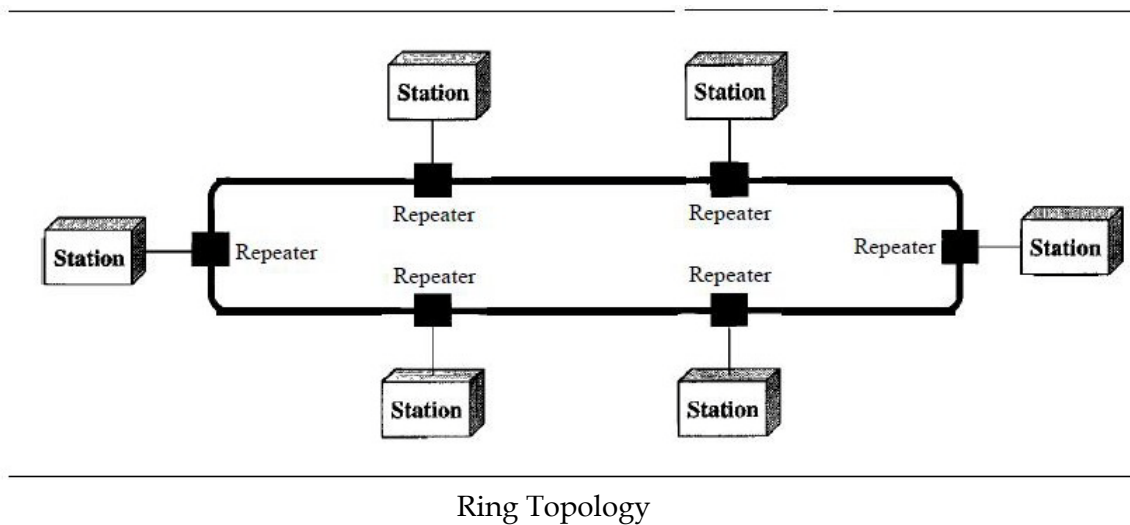
- Disadvantages of bus topology include:-

1. Difficult reconfiguration and fault isolation.
2. Difficult to add new devices. Adding new devices may therefore require modification or replacement of the backbone.
3. A fault or break in the bus cable stops all transmission, even between devices on the same side of the problem.
4. Bus topology was the one of the first topologies used in the design of early local area networks. Ethernet LANs can use a bus topology, but they are less popular now.

#### 4- Ring Topology:

In a ring topology, each device has a dedicated point – to – point line configuration only with 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.
- When a device receives a signal intended for another device, it repeats, regenerates the bits and passes them along.



#### - Advantages of Ring Topology:

- Ring is relatively easy to install and reconfigure.
- Fault isolation is simplified. Generally in a ring a signal is circulating at all times. If one device doesn't receive a signal within a specified period, it can issue an alarm.

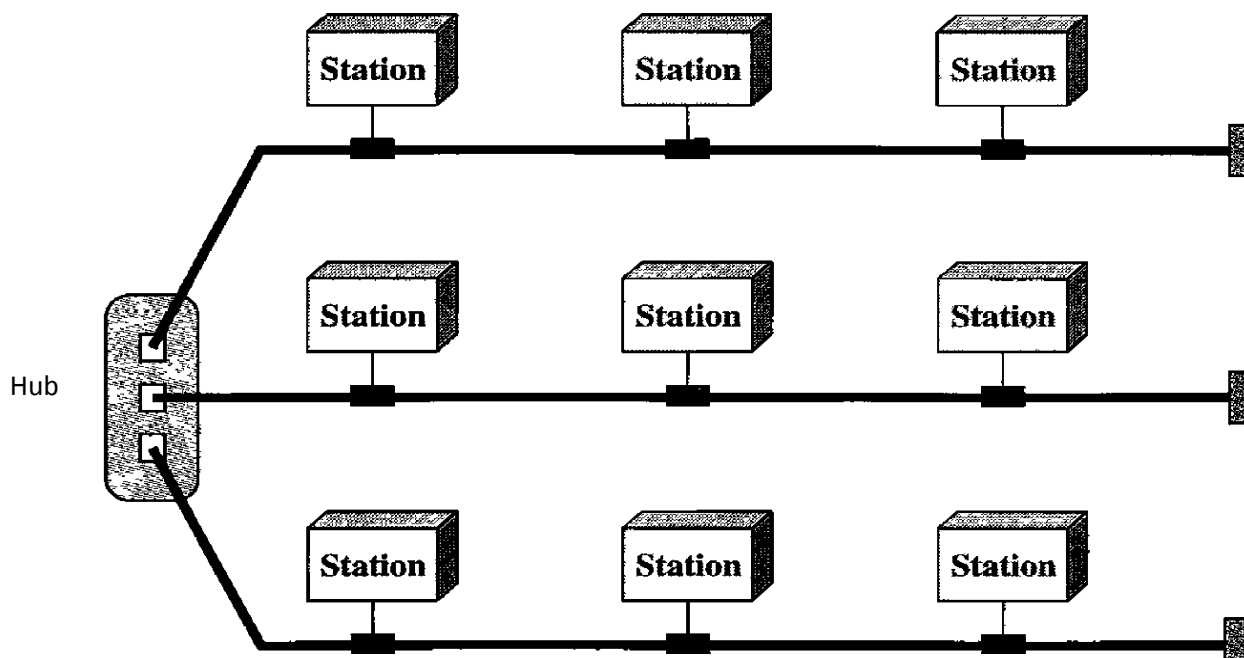
The alarm alerts the network operator to the problem and its location.

Disadvantages:

Unidirectional traffic. In a simple ring, a break in the ring can disable the entire network. This weakness can be solved by using a dual ring.

### ***5- Hybrid Topology***

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



Hybrid Topology