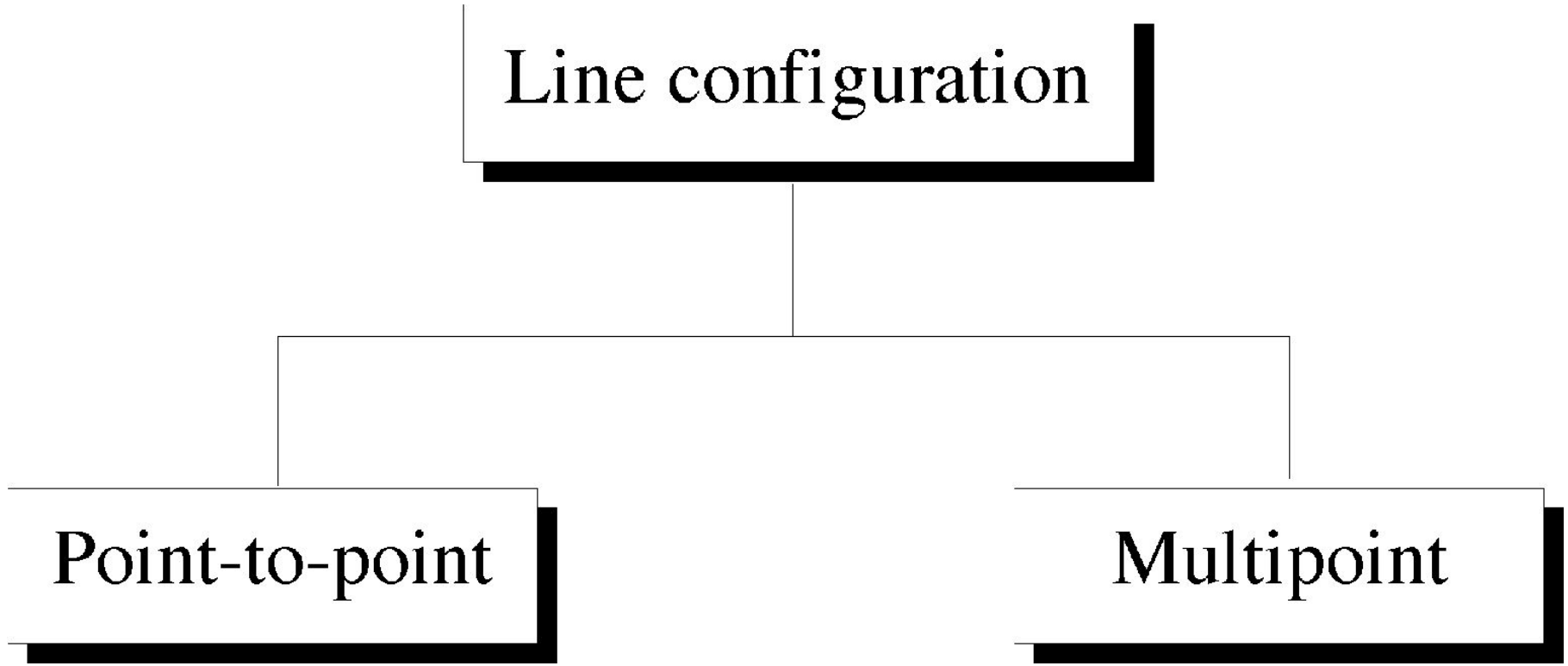
Unit 2

Network Topologies and Networking Standard

- **Line Configuration**
- **Topology**
- **IEEE networking standards**


Line configuration
Point-to-point
Multipoint

Line Configuration in Computer Networks

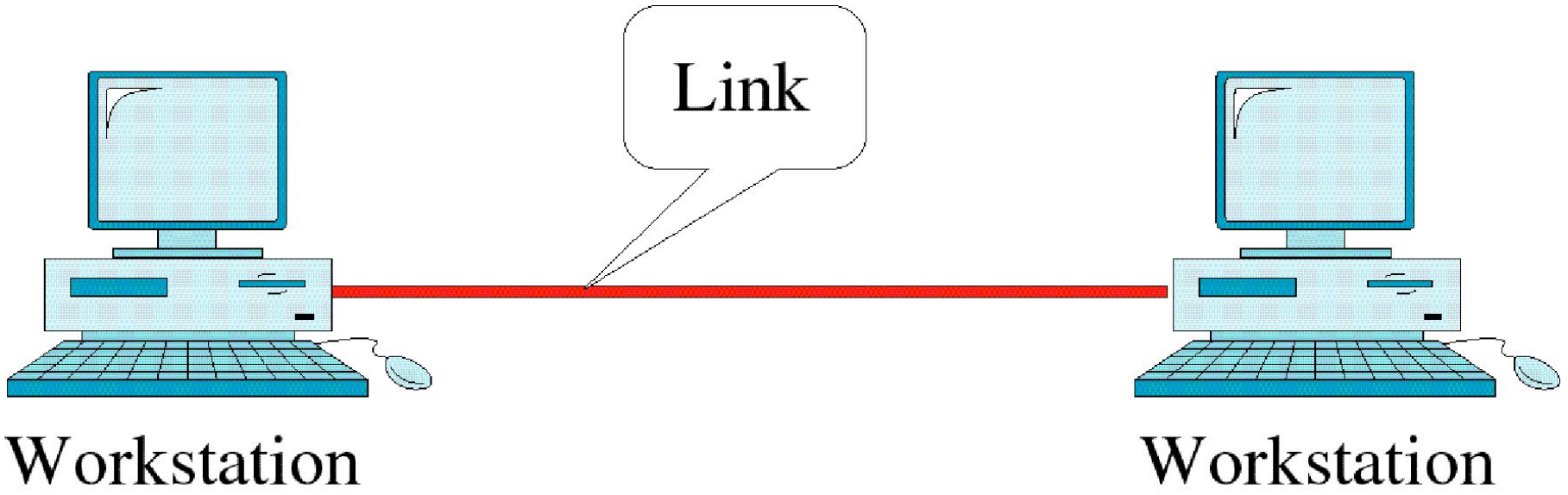
- A network is two or more devices connected through a link. A link is a communication pathway that transfer data from one device to another. Devices can be a computer, printer or any other device that is capable to send and receive data. For visualization purpose, imagine any link as a line drawn between two points. 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:
- **Point-to-Point Connection**
- **Multipoint Connection**

Point-to-Point Connection :

- A point-to-point connection provides a dedicated link between two devices.
- The entire capacity of the link is reserved for transmission between those two devices.
- Most point-to-point connections use a actual length of wire or cable to connect the two end, but other options such as microwave or satellite links are also possible.
- Point to point network topology is considered to be one of the easiest and most conventional network topologies.
- It is also the simplest to establish and understand.

Figure 2-2

Point-to-Point Line Configuration

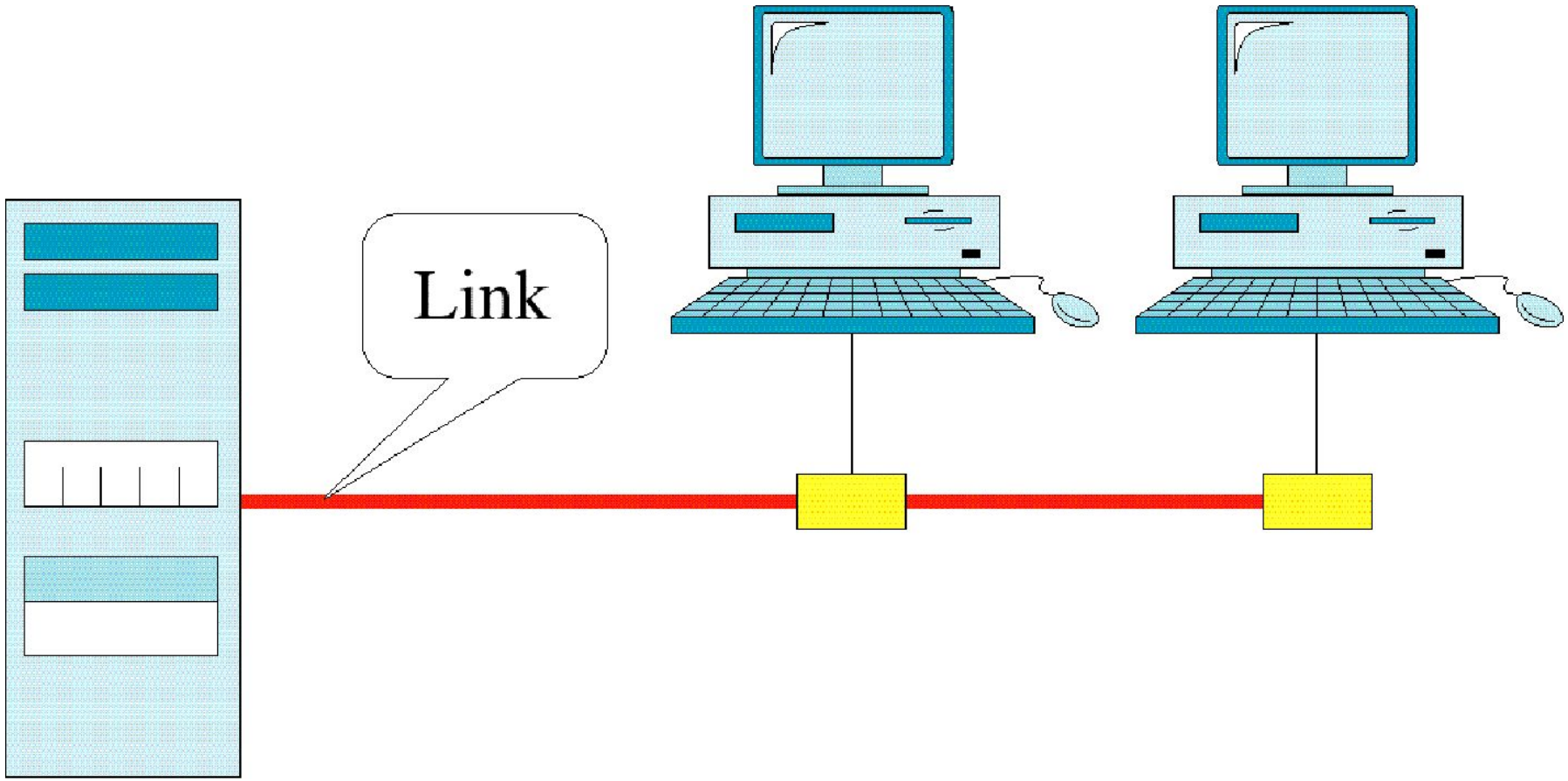


MultiPoint Connection

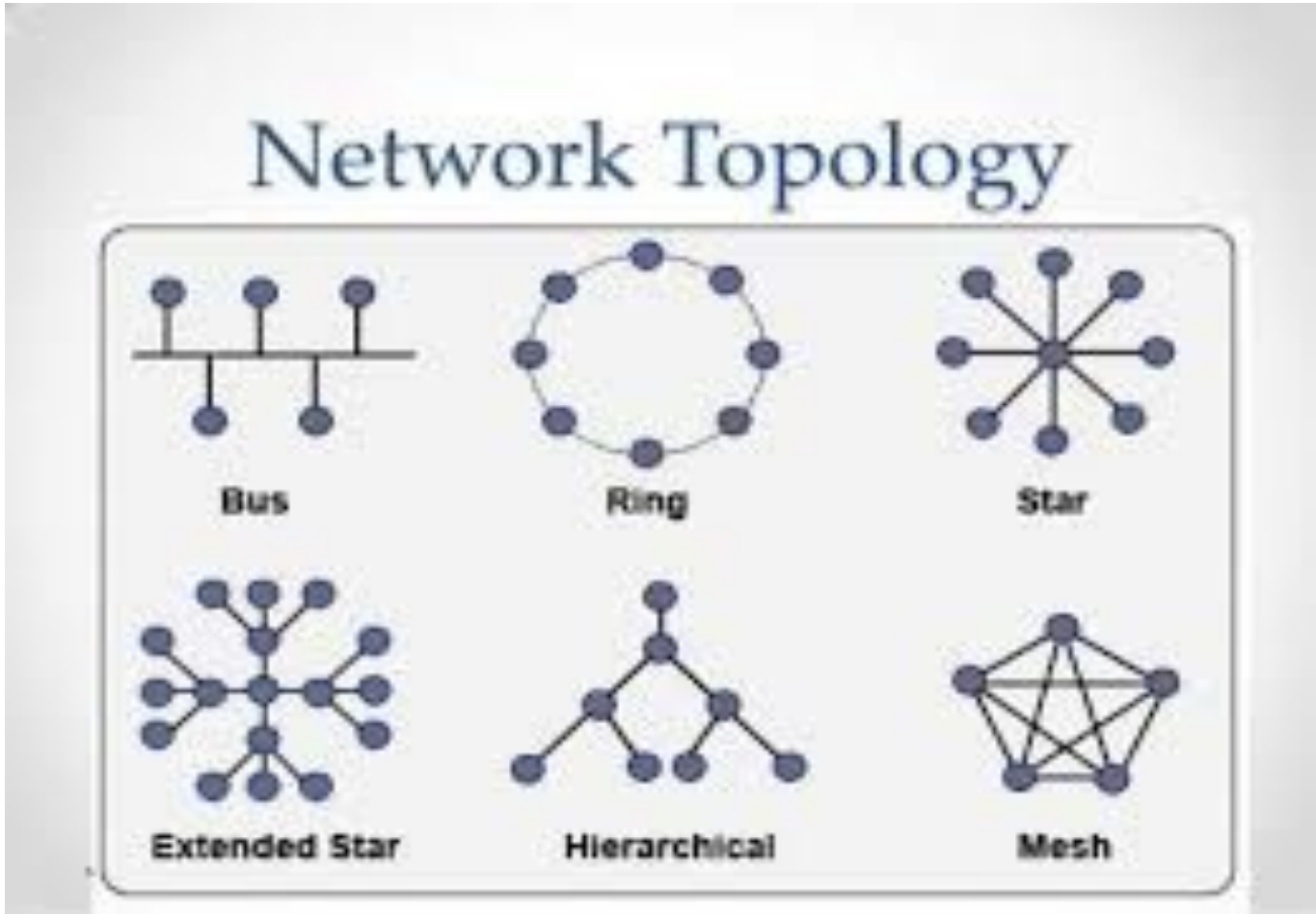
- It is also called Multidrop configuration. In this connection two or more devices share a single link.
- There are two kinds of Multipoint Connections :
- If the links are used simultaneously between many devices, then it is spatially shared line configuration.
- If user takes turns while using the link, then it is time shared (temporal) line configuration.

Figure 2-3

Multipoint Line Configuration



Network topology



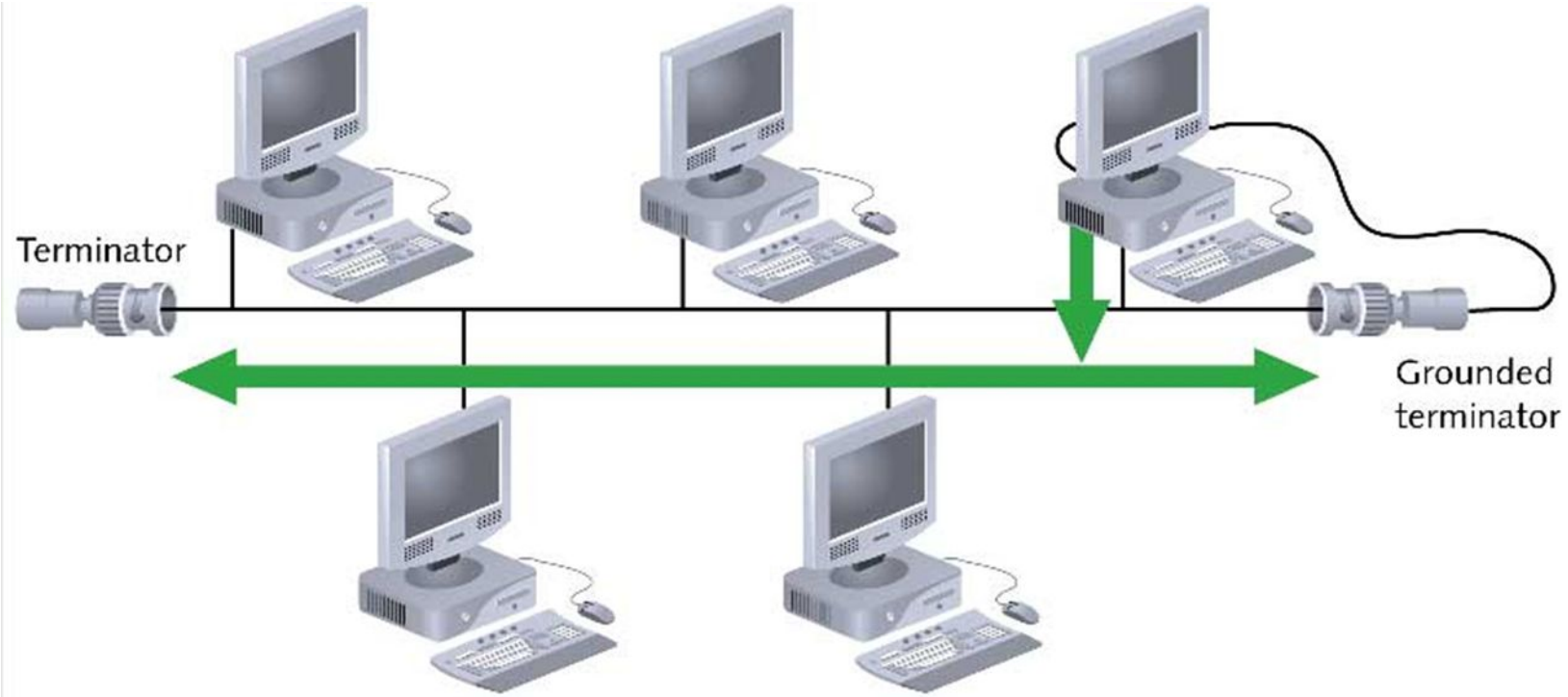
Network topology

- The arrangement of a network which comprises of nodes and connecting lines via sender and receiver is referred as network topology. The various network topologies are :
  a. Bus Topology
  b. Star Topology
  c. Ring Topology
  d. Mesh Topology
  e. Hierarchical Topology

Bus Topology

- Single cable connects all network nodes without intervening connectivity devices
- Devices share responsibility for getting data from one point to another
- Terminators stop signals after reaching end of wire
  - Prevent signal bounce
- Inexpensive, not very scalable
- Difficult to troubleshoot, not fault-tolerant

Fig: Bus Topology



Advantages & Disadvantages of Bus Topology

Advantages

- Works well for small networks
- Relatively inexpensive to implement
- Easy to add to it

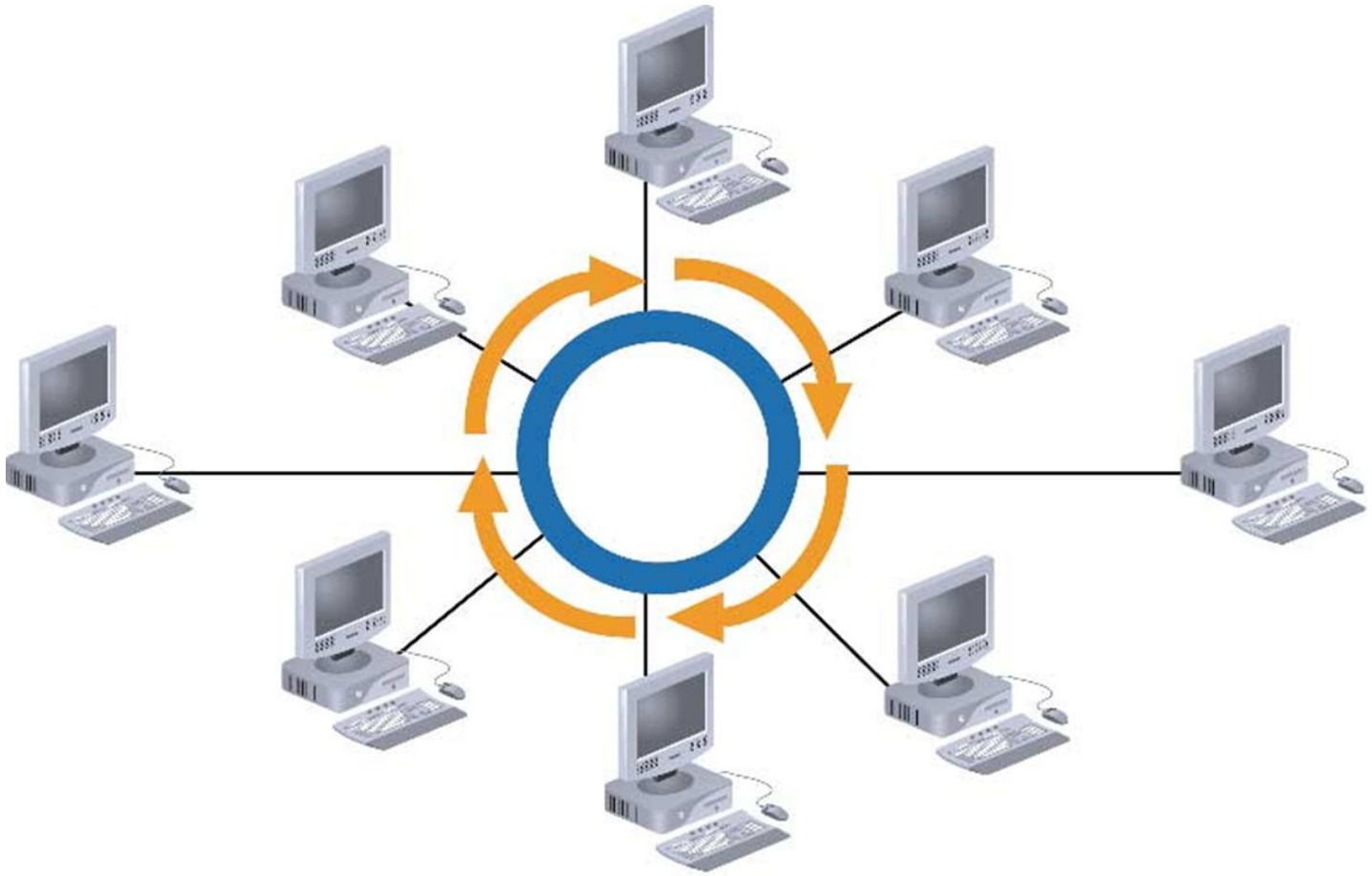
Disadvantages

- Management costs can be high
- Potential for congestion with network traffic
- If cable fails whole network goes down.

Ring Topology

- Ring topology
  - Each node is connected to the two nearest nodes so the entire network forms a circle
  - One method for passing data on ring networks is **token passing**

Ring Topology



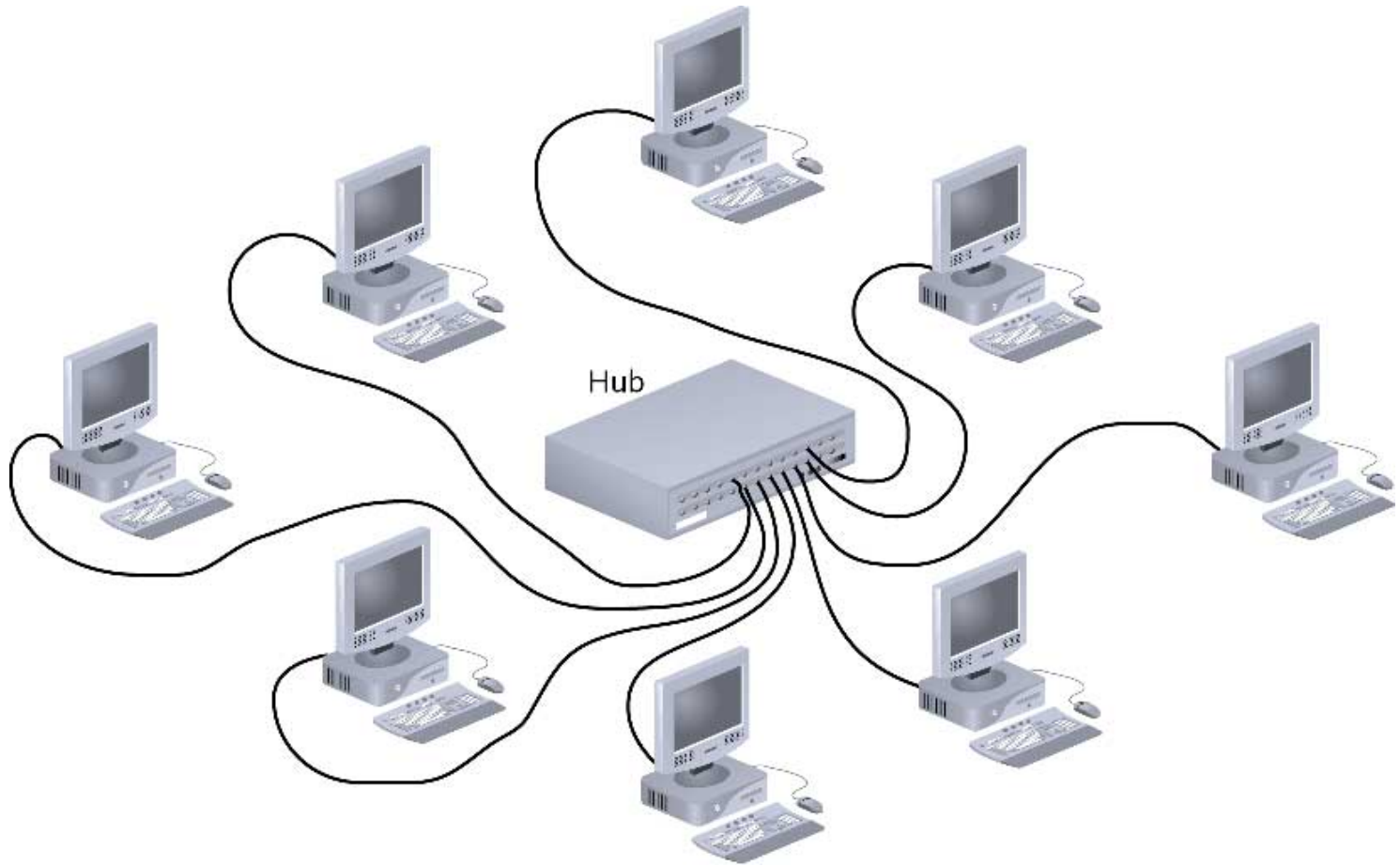
Advantages of Ring Topology

- Easier to manage; easier to locate a defective node or cable problem.
- Well-suited for transmitting signals over long distances on a LAN
- Handles high-volume network traffic
- Enables reliable communication

Disadvantages of Ring Topology

- Expensive
- If cable break whole network goes down.
- Requires more cable and network equipment at the start
- Not used as widely as bus topology
  - Fewer equipment options
  - Fewer options for expansion to high-speed communication

Star topology



Star topology

- Every node on the network is connected through a central device
- Any single cable connects only two devices
- Requires more cabling than ring or bus networks
  - More fault-tolerant
- Easily moved, isolated, or interconnected with other networks
  - Scalable

Advantages & Disadvantages of Star Topology

Advantages

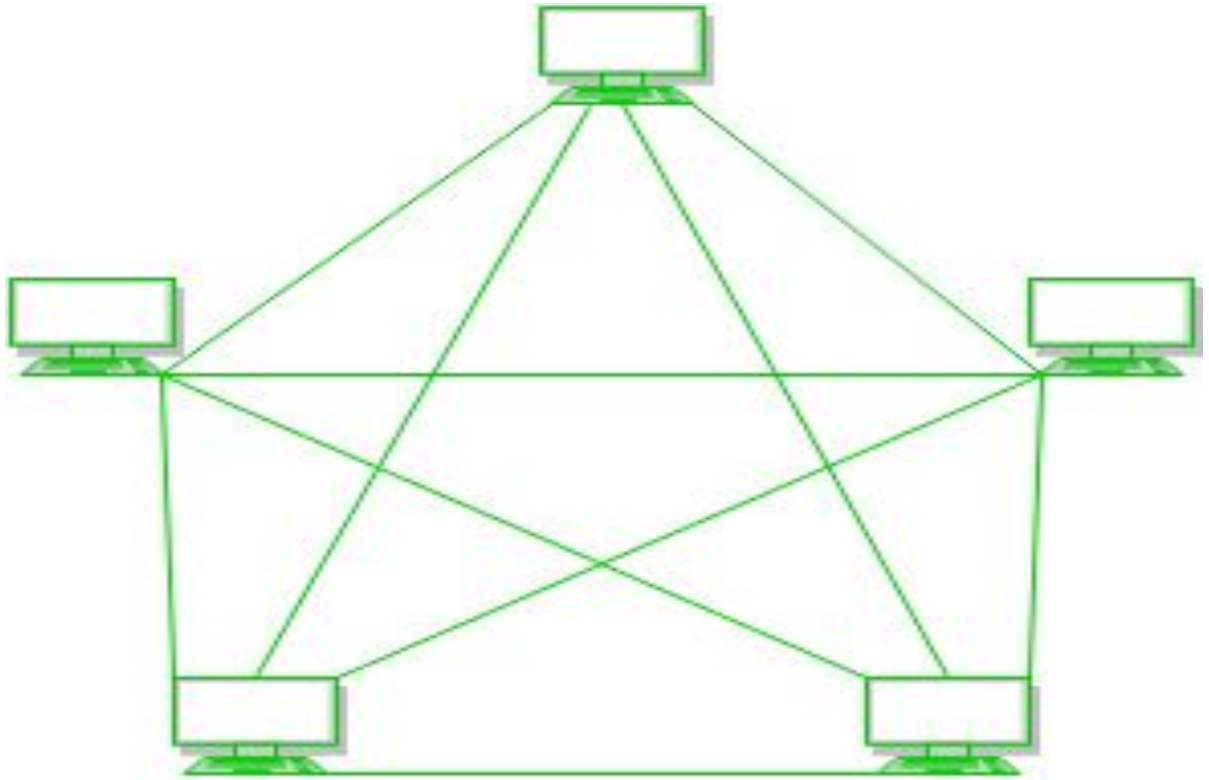
- Good option for modern networks
- Easy to manage
- Offers opportunities for expansion
- Most popular topology in use; wide variety of equipment available

Disadvantages

- Hub is a single point of failure
- Requires more cable than the bus

Mesh Topology

Figure 1 : Every device is connected with another via dedicated channels. These channels are known as links.



Mesh topology

- In mesh topology, every device is connected to another device via particular channel.
- If suppose, N number of devices are connected with each other in mesh topology, then total number of ports that is required by each device is ,N-1. In the Figure 1, there are 5 devices connected to each other, hence total number of ports required is 4.
- If suppose, N number of devices are connected with each other in mesh topology, then total number of dedicated links required to connect them is N(N-1)/2. In the Figure 1, there are 5 devices connected to each other, hence total number of links required is 5*4/2 = 10.

Advantages & Disadvantages of Mesh Topology

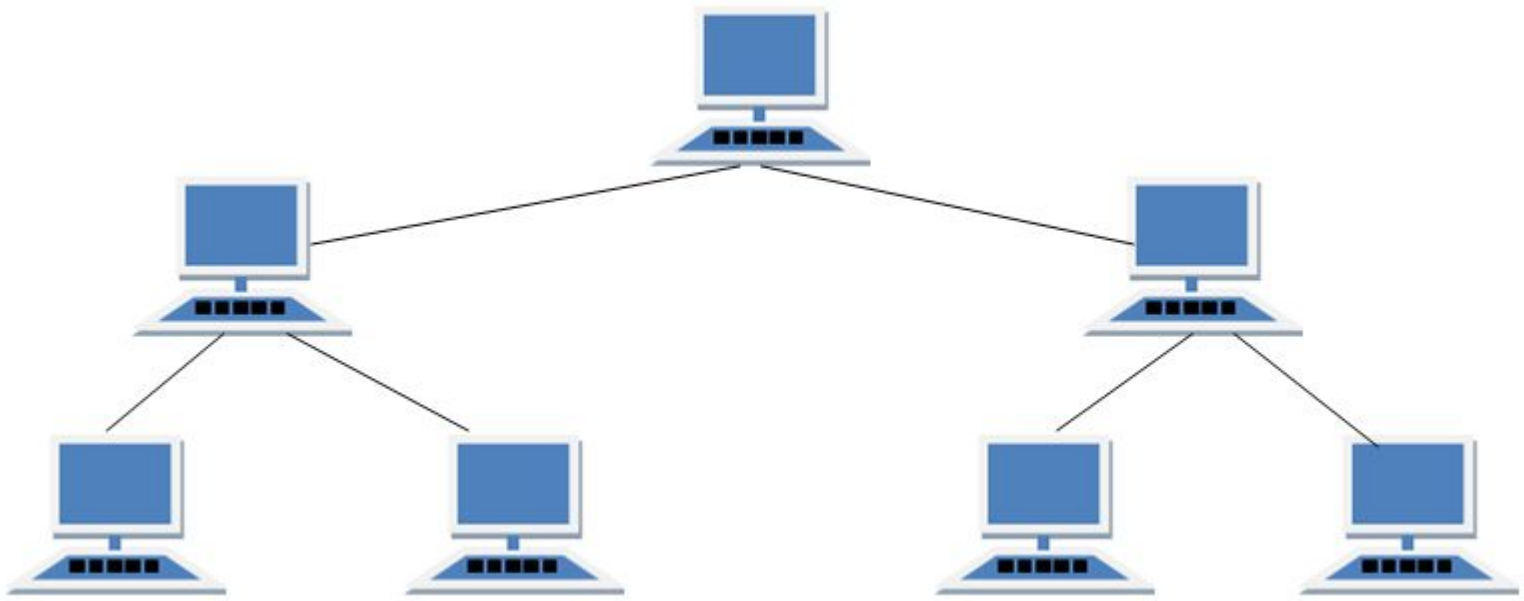
Advantages:

- It is robust.
- Fault is diagnosed easily. Data is reliable because data is transferred among the devices through dedicated channels or links.
- Provides security and privacy.

Disadvantages:

- Installation and configuration is difficult.
- Cost of cables are high as bulk wiring is required, hence suitable for less number of devices.
- Cost of maintenance is high.

Hierarchical Topology



Hierarchical Topology

- **The hierarchical topology is also known as tree topology, which is divided into different levels connected with the help of twisted pair, coaxial cable or fiber optics**
- This type of topology is arranged in the form of a tree structure in which top level contains parent node (root node), which is connected with the child nodes in the second level of hierarchy with point-to-point link.
- The second level nodes are connected to the third level nodes, which in turn are connected to the fourth level nodes and so on. Except the top-level nodes, each level node has a parent node.

Advantages & Disadvantages of hierarchical Topology

Advantages of hierarchical topology are:

- The hierarchical topology is generally supported by most hardware and software.
- In the hierarchical topology, data is received by all the nodes efficiently because of point-to-point link.

Disadvantages of hierarchical topology:

- In the hierarchical topology, when the root node fails, the whole network crashes.
- The hierarchical topology is difficult to configure.