

11.4 Data communication devices: It acts as an interface between computer and the communication channel

11.4.1 Network Interface Card (NIC): This device enables a computer to connect to a network and transmit information.

11.4.2 Hub: It is a small, simple and inexpensive device used to connect computers(devices) to a network. If a computer wants to transmit data to another computer. First it sends to the hub, the hub retransmits this data to all other computers. Each and every computer gets the data and check whether it is for them or not. It increases the network traffic and hence the transmission speed is low.

11.4.3 Switch : It is an expensive device used to connect computers(devices) to a network. Unlike hub, switch transmit data not to all computers, it retransmits data only to the intended computer. So the traffic is less and speed is high

11.4.4 Repeater - It is a device used to strengthen weak signals on the network.

11.4.5 Bridge - It is a device used to link same type of networks.

11.4.6 Router - It is similar to a bridge, but it can connect two networks with different protocols.

11.4.7 Gateway - It is used to connect two different networks with different protocols.

11.5 Data terminal equipments : This devices are used to control data flow to and from a computer

11.5.1 Modem - It is a device used to connect the computer to the internet. It converts digital signal into analog signal (modulation) and vice versa (De modulation)

2. Multiplexer - It combines the inputs from different channels of a medium and produces one output.

11.6 Network topologies : Physical or logical arrangement of computers on a network is called structure or topology. It is the geometrical arrangement of computers in a network. The major topologies developed are star, bus, ring, tree and mesh.

1) **Star Topology :** A star topology has a server all other computers are connected to it. If computer A wants to transmit a message to computer B. Then computer A first transmit the message to the server then the server retransmits the message to the computer B. That means all the messages are transmitted through the server. Advantages are add or remove workstations to a star network is easy and the failure of a workstation will not effect the other. The disadvantage is that if the server fails the entire network will fail.

2) **Bus Topology :** Here all the computers are attached to a single cable called bus. Here one computer transmits all other computers listen.

Therefore it is called broadcast bus. The transmission from any station will travel in both the direction. The connected computers can hear the message and check whether it is for them or not.

Advantages are add or remove computer is very easy. It requires less cable length and the installation cost is less. Disadvantage is fault detection is very difficult because of no central computer.

- 3) **Ring Topology** : Here all the computers are connected in the shape of a ring and it is a closed loop. Here also there is no central computer. Here a computer transmits a message, which is tagged along with its destination computer's address. The message travels in one direction and each node check whether the message is for them. If not, it passes to the next node. It requires only short cable length. If a single node fails, at least a portion of the network will fail. To add a node is very difficult.
- 4) **Hybrid Topology** : It is a combination of any two or more network topologies. Tree topology and mesh topology can be considered as hybrid topology.
 - a) **Tree Topology** : The structure of a tree topology is the shape of an inverted tree with a central node and branches as nodes. It is a variation of bus topology. The data transmission takes place in the way as in bus topology. The disadvantage is that if one node fails, the entire portion will fail.
 - b) **Mesh Topology** : In this topology each node is connected to more than one node. It is just like a mesh (net). There are multiple paths between computers. If one path fails, we can transmit data through another path.

11.7 Types of networks

The networks are classified into the following based upon the amount of geographical area that covers.

- i) **Personal Area Network(PAN)** : It is used to connect devices situated in a small radius by using guided media or unguided media
- ii) **Local Area Network (LAN)**
This is used to connect computers in a single room, rooms within a building or buildings of one location by using twisted pair wire or coaxial cable. Here the computers can share Hardware and software. Data transfer rate is high and error rate is less. eg:- The computers connected in a school lab.
- iii) **Metropolitan Area Network (MAN)**
A Metropolitan Area Network is a network spread over a city. For example a Cable TV network. MAN have lesser speed than LAN and the error rate is less. Here optical fiber cable is used.
- iv) **Wide Area Network (WAN)**
This is used to connect computers over a large geographical area. It is a network of networks.

Here the computers are connected using telephone lines or Micro Wave station or Satellites. Internet is an example for this. LAN and MAN are owned by a single organization but WAN is owned by multiple organization. The error rate in data transmission is high.