

# Lab Session 01

## OBJECT

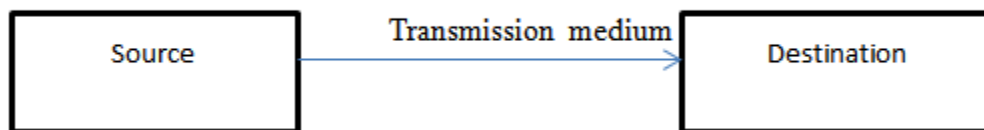
*To Study about basics of :*

- \* Data Communication*
- \* Networking and its topologies*
- \*Types of Network*

## THEORY

### Data Communication:

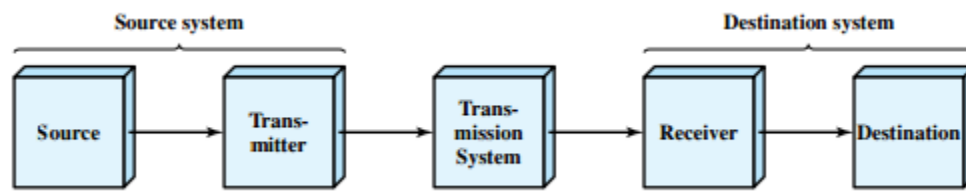
Data communications are the exchange of data between two devices via some form of physical medium (transmission medium) such as a wire cable. The word data refers to information presented in whatever form text representation (text, number, images, audio, video etc.).



### Data Communication Model:

The fundamental purpose of a data communications system is the exchange of data between two parties. This device generates the data to be transmitted; examples are telephones and personal computers.

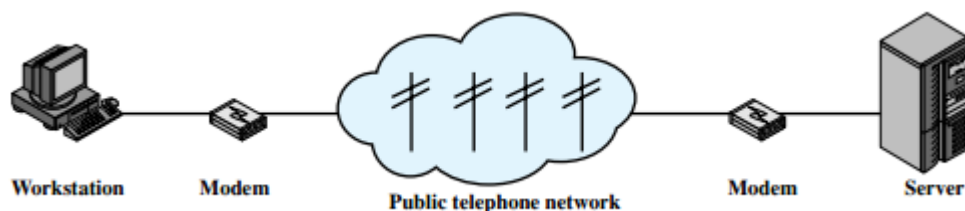
**Key Elements of the model:**



- **Source.** This device generates the data to be transmitted; examples are telephones and personal computers.
- **Transmitter:** Usually, the data generated by a source system are not transmitted directly in the form in which they were generated. Rather, a transmitter transforms and encodes the information in such a way as to produce electromagnetic signals that can be transmitted across some sort of transmission system. For example, a modem takes a digital bit stream from an attached device such as a personal computer and transforms that bit stream into an analog signal that can be handled by the telephone network.
- **Transmission system:** This can be a single transmission line or a complex network connecting source and destination.
- **Receiver:** The receiver accepts the signal from the transmission system and converts it into a form that can be handled by the destination device. For example, a modem will accept an analog signal coming from a network or transmission line and convert it into a digital bit stream.
- **Destination:** Takes the incoming data from the receiver.

### Example :

Communication between a workstation (A node or stand-alone PC that is connected with network is called Workstation. A workstation is generally a client) and a server over a public telephone network.



## **Computer Network:**

A computer network is a set of computers connected together for the purpose of sharing resources.



## **Computer Networking:**

Computer networking is an engineering discipline that aims to study and analyze the communication process among various computing devices or computer systems that are linked, or networked, together to exchange information and share resources.

## **Network Topology:**

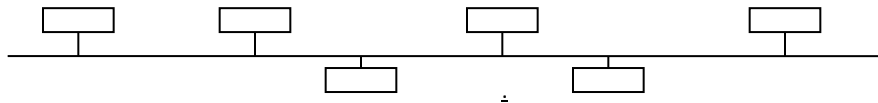
A network topology is a pattern in which nodes (e.g. printer, computer, router or other devices) are connected to a Local Area Network (LAN) or other networks via a link (e.g. twisted pair, copper wire cable or optical fiber cable).

## **Main Types of Network Topologies:**

The following sections discuss the physical topologies used in networks and other related topics.

- Linear Bus
- Star
- Ring
- Mesh

### **Linear Bus:**



Bus topology is a network type in where every computer and network device is connected to single cable.

In the bus network topology, every work station is connected to a main cable called the bus. Therefore, in effect, each workstation is directly connected to every other workstation in the network.

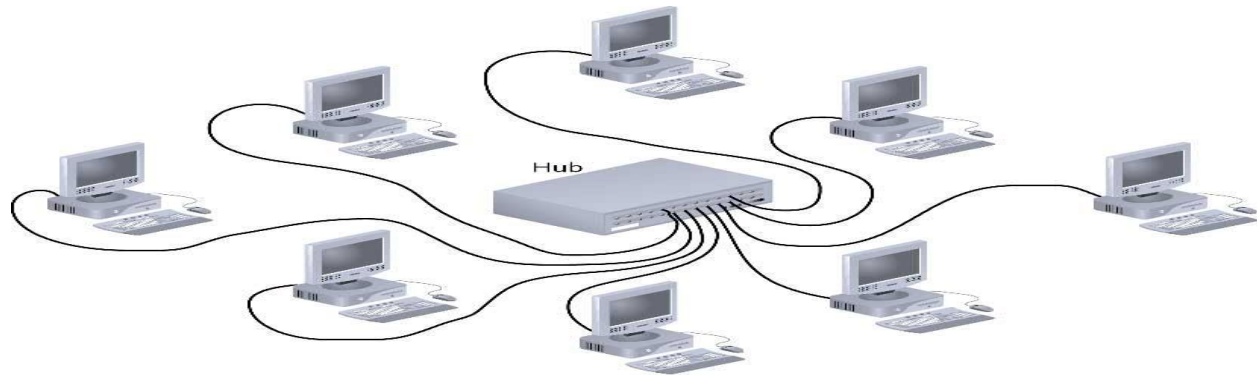
### **Advantages of Linear Bus Topology:**

- It is cost effective.
- Cable required is least compared to other network topology.
- Used in small networks.
- It is easy to understand.
- Easy to expand joining two cables together.

### **Disadvantages of Linear Bus Topology:**

- Cables fails then whole network fails.
- If network traffic is heavy or nodes are more the performance of the network decreases.
- Cable has a limited length.
- It is slower than the ring topology.

## **Star:**



In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node.

## **Advantages of Star Topology:**

- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to setup and modify.
- Only that node is affected which has failed rest of the nodes can work smoothly.

## **Disadvantages of Star Topology:**

- Cost of installation is high.
- Expensive to use.

## **Ring:**

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each cable device.



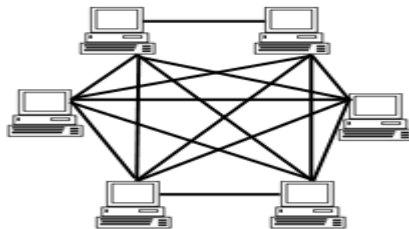
### **Advantages of Ring Topology:**

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand.

### **Disadvantages of Ring Topology:**

- Troubleshooting is difficult in ring topology.
- Adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network.

### **Mesh:**



A network setup where each computer and network device is interconnected with one another.

There are two types of mesh topology network:

- Fully mesh network
- Partially mesh network

### **Advantages of Mesh Topology:**

- each node is connected to several others; when a node fails its neighbors find other routes
- capacity can be added simply by adding nodes

### **Disadvantages of Mesh Topology:**

- There are high chances of redundancy in many of the network connections.
- Expensive.
- Maintenance is difficult.

## Considerations when choosing a Topology:

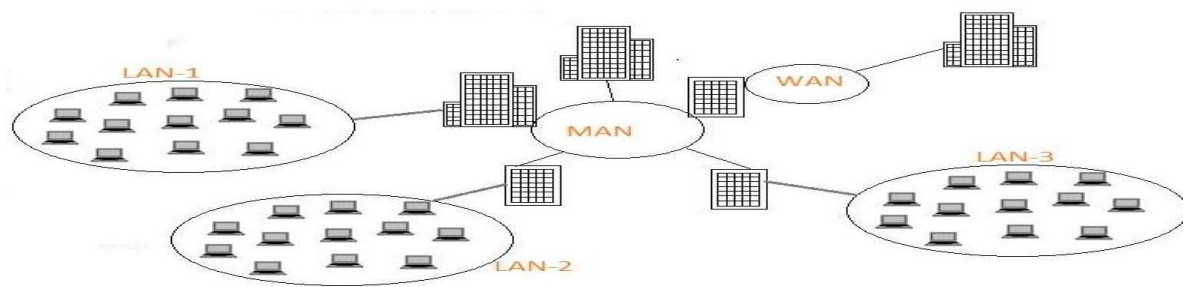
**Money:** A linear bus network may be the least expensive way to install a network; you do not have to purchase concentrators.

**Length of cable needed:** The linear bus network uses shorter lengths of cable.

**Future growth:** With a star topology, expanding a network is easily done by adding another concentrator.

**Cable type:** The most common cable in schools is unshielded twisted pair, which is most often used with star topologies.

## Types of Network:



## LAN

- LAN (Local Area Network) is a group of computers and other network devices which are connected together.
- All the devices that are part of LAN are within a building or multiple building.
- LAN network has very high speed.

## WAN

- WAN (Wide Area Network) is a group of computers and other network devices which are connected together which is not restricted to a geographical location. Internet is WAN
- All the devices that are part of WAN have no geographical boundaries.
- WAN speed varies based on geographical location of the servers. WAN connects several LANs

## MAN

- MAN ((Metropolitan Area Network) is a larger network of computers and other network devices which are connected together usually spans several buildings or large geographical area.
- All the devices that are part of MAN are span across buildings or small town.

### **EXERCISES:**

**Q.1) Difference between network and networking?**

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**Q.2) Components of data communication model?**

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**Q.3) is analogue conversation take place in source as transmitter?**

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**Q.4) Give an example of data communication model?**



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**Q.5) What is Peer-to-Peer network ?**

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**Q.6) What is difference between partial and full mesh topology?**

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**Q.7) Give one example of each types of network ?**

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**Q.8) differentiate between LAN & WAN?**

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