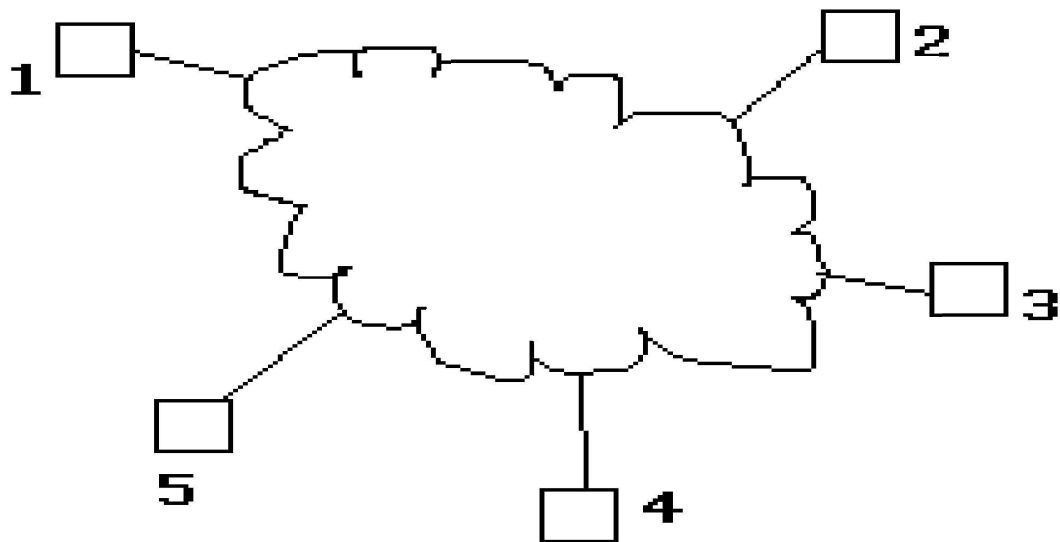


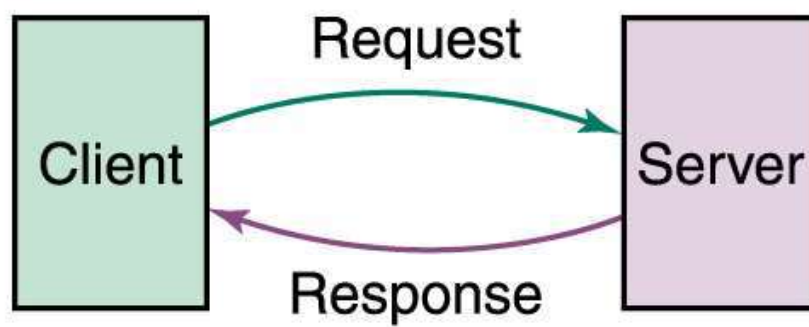
Introduction to Networks

- *A Network:* A group of devices that can communicate with each other over links.
- *Each device is called a host. Each host has a unique address.*



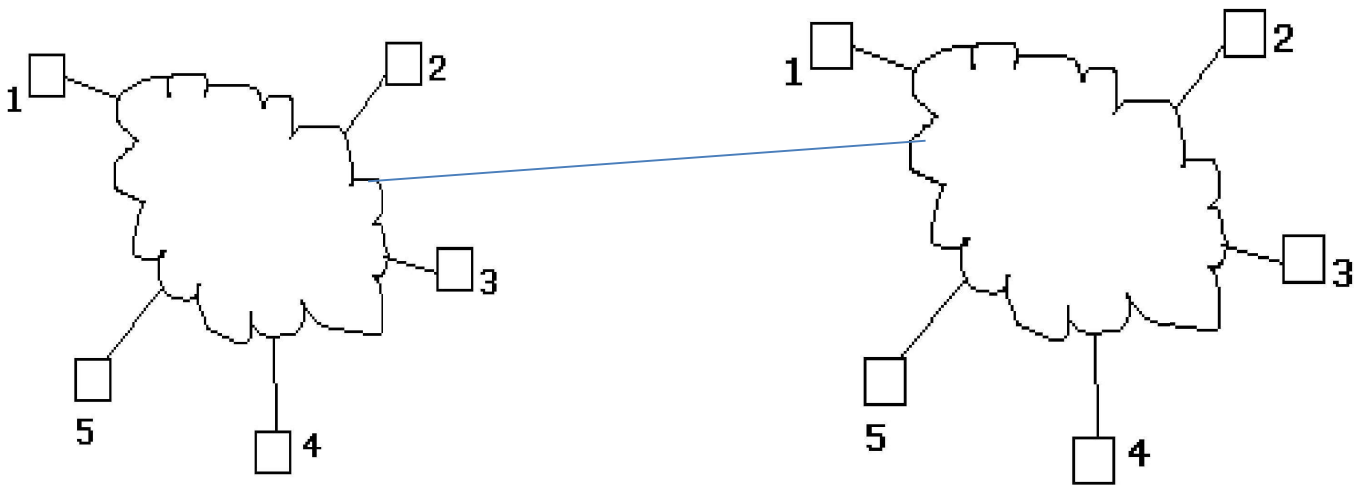
- **Network** is a connection between two or more devices.
- Which is connected by a communication links.
- A node can be computer, printer or any other devices which is capable of sending and receiving information at each other.

Example:



INTERNET

- **An internet:** A network of networks or connection between two or more Networks is also known as internet. each host has an address of the form **n/h** where **n** is the network number and **h** is the number of the host on network **n** .



Uses of Network

- It is Used for
 - i) Business Application
 - ii) Home Application
 - iii) Mobile Users
 - iv) E-Mail

Categories or Types of Network

- **There are Three Types:**
 - 1. LAN - Local Area Network**
 - 2. MAN - Metropolitan Area Network**
 - 3. WAN – Wide Area Network**

1. LAN - Local Area Network

A LAN is Designed by Local Area Connections such as:

- i) within Building
- ii) within office
- iii) within Campus
- iv) within Specific



Advantages :

- 1) Sharing of Files.**
- 2) Sharing of Programs.**
- 3) Communication Exchange.**

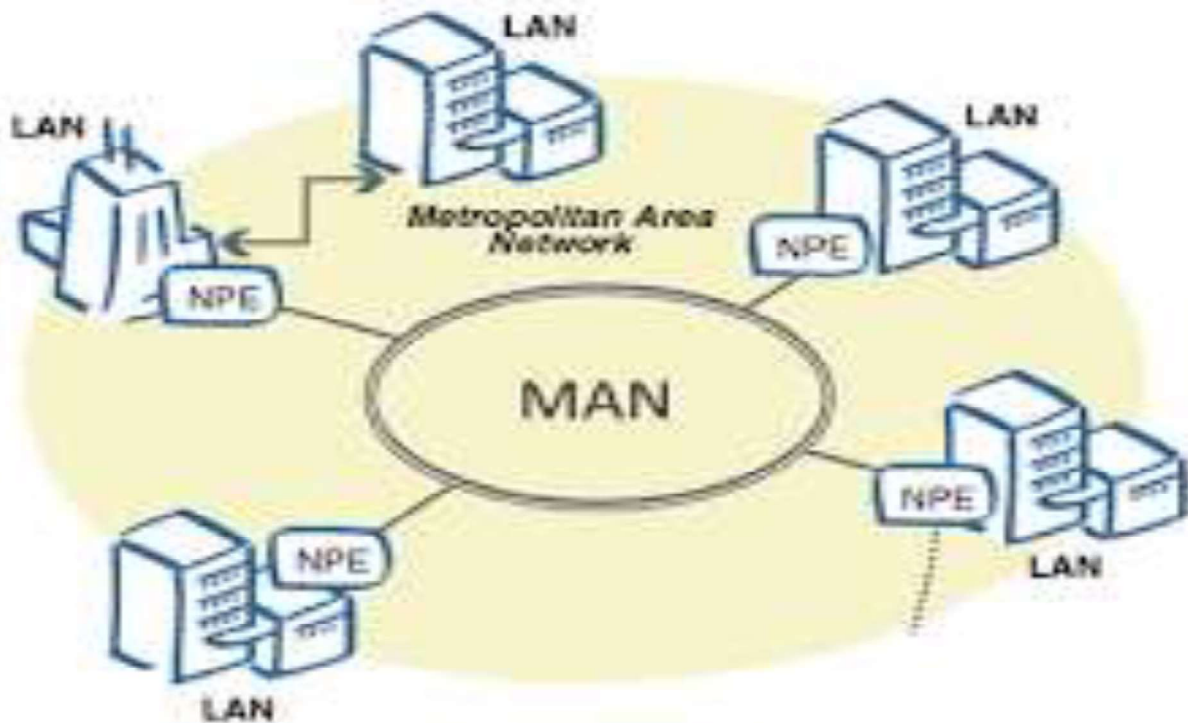
Disadvantages :

- 1) Reliability.**
- 2) Capacity.**
- 3) High Cost.**

2. MAN - Metropolitan Area Network

A Metropolitan Area Network (**MAN**) is a network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN).

- MAN supports up to 150 Kilometers Distance.
- Example:
 - Telephone Network
 - Cable TV



Advantages :

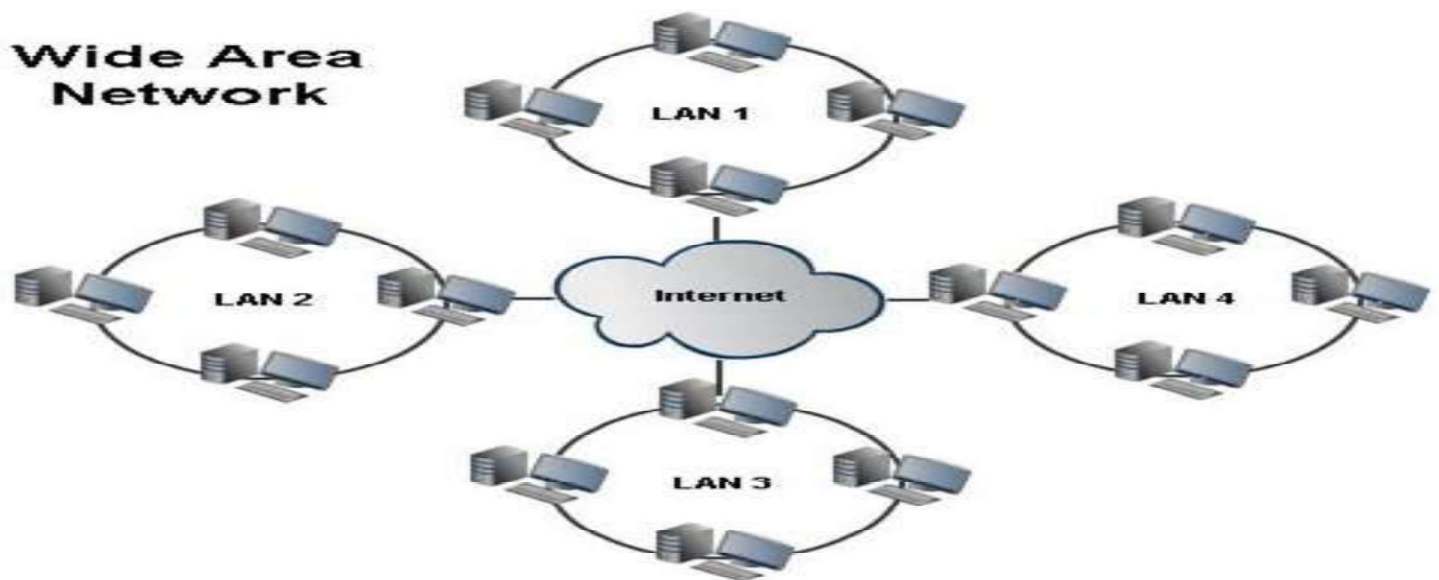
- 1) High Bandwidth.**
- 2) It support Large number of Clients.**
- 3) Reduce the Errors.**

Disadvantages :

- 1) Large Space Requirements.**
- 2) Slower Data Access.**
- 3) High Cost.**

3. WAN – Wide Area Network

- WAN Provide a Long Distance Transmission of Data.
- By Using WAN Exchange the Information from one country to another country.



Components of Network

- 1) **Client** - Which gives the Request.
- 2) **Server** - Which gives the Response.
- 3) **Modems** - It Indicates Modulator / Demodulator.
- 4) **Router** - Which identifies the Path between Client & Server.
- 5) **Channels** - Which overcomes the Traffic problems.

Communication Model

- Data communications are exchange of data between **two devices via some transmission medium.**
- It should be done in two ways
 - i) Local** - It takes LAN Connection.
 - ii) Remote** - It takes Long distance like MAN & WAN.
- Data should be Transferred in the form of **0's and 1's**

Block Diagram for Communication Model:



Characteristics of Communication Model :

- 1) **Delivery** - The System must deliver the data to the correct Destination.
- 2) **Accuracy** - The System must deliver the data at Accurate way.

3) Timeline - The System must deliver the data at **Exact Time**.

4) Jitter - It refers to the variable in the **Perfect Arrival Time**.

Components of Communication Model :

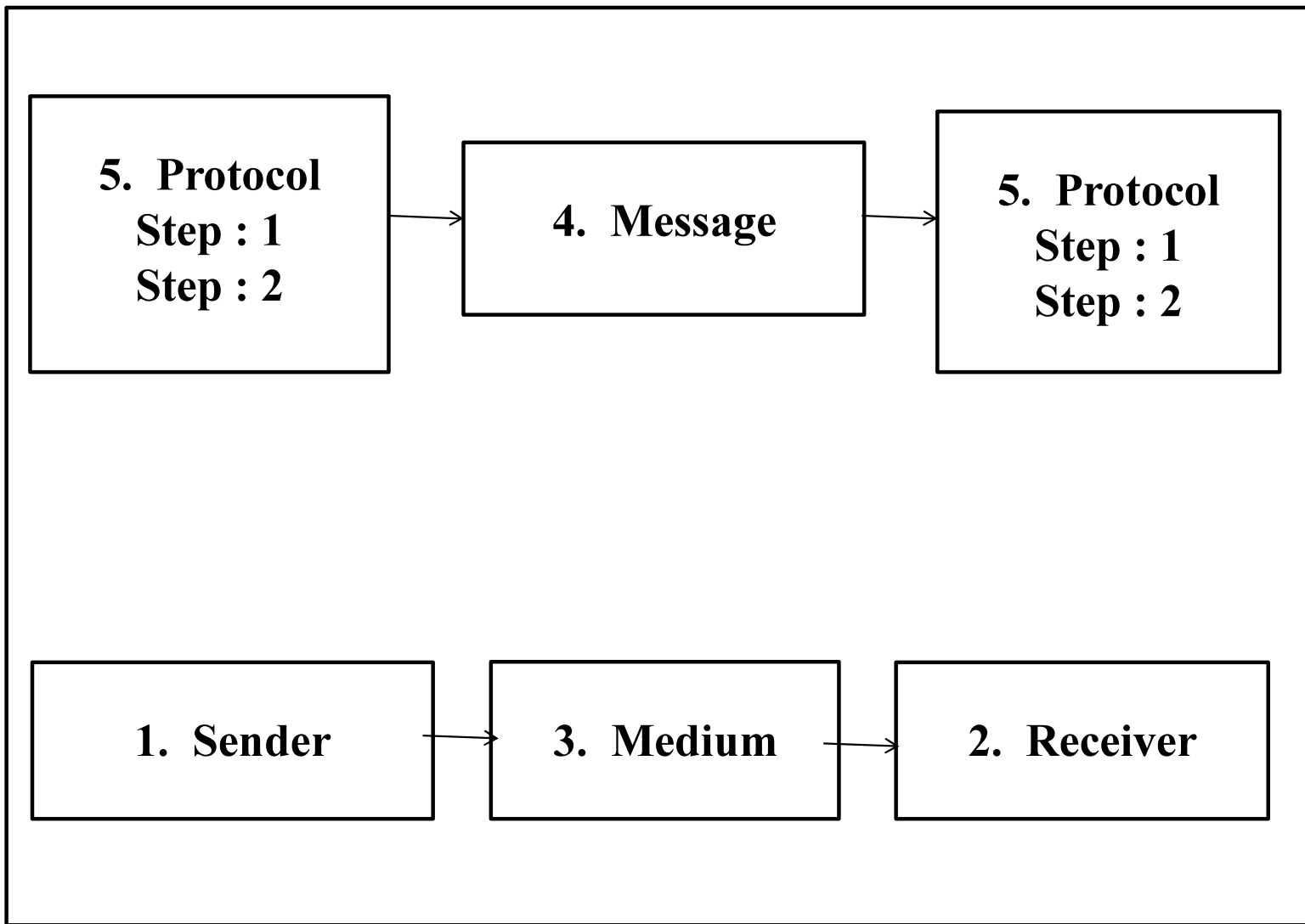
i) Sender

iv) Message

ii) Receiver

v) Protocol

iii) Medium



- 1. Sender** : It is a device , that Sends the information to the Receiver.
- 2. Receiver** : It is a device , that Receives the information from the Sender.
- 3. Medium** : It is the physical path between Sender to Receiver.
- 4. Message** : This is the passing Informations.
- 5. Protocol** : It is a set of rules and regulations that “ Governed “ from data communication.

Data Transmission Concepts and Terminology

- Data Transmission occurs between sender and receiver over some Transmission Medium or Transmission Media.
- Transmission Media may be classified into **Two Types :**
 - i) Guided Media [Wired Technology]**
 - ii) Unguided Media [Wireless Technology]**

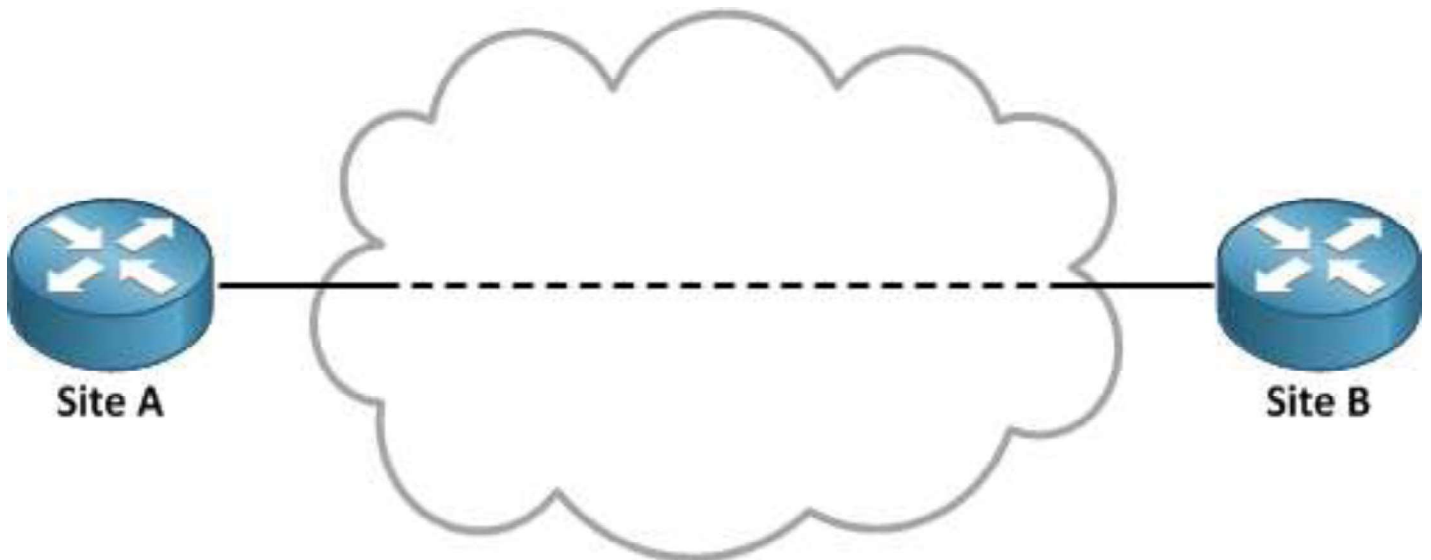
i) Guided Media (Wired Network)

- In Guided Media Signals are Passed in a “ same physical path”
- Example:
 - i) Twisted pair Cable
 - ii) Coaxial Cable
 - iii) Fiber Optic Cable

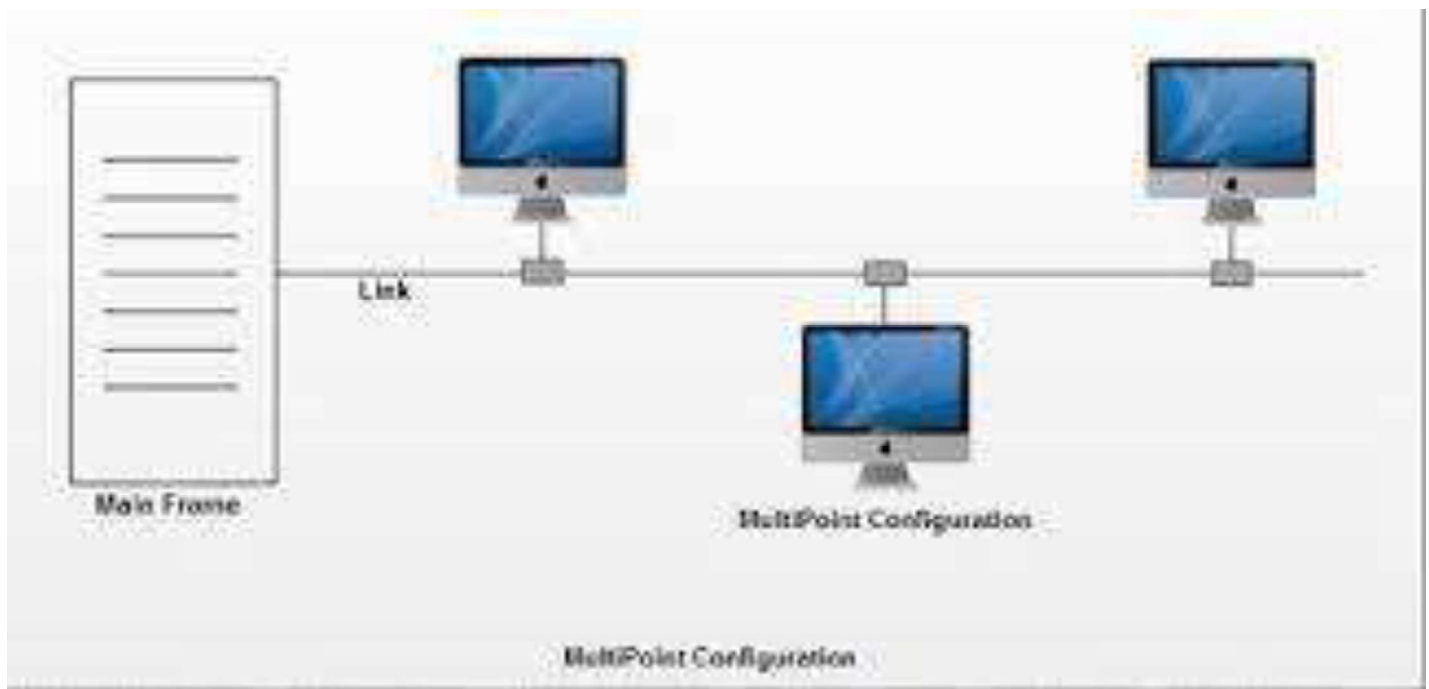
ii) Unguided Media (Wireless Network)

- In Unguided Media Signals are Passed in the form of “ **Electromagnetic Waves**”
- Example :
 - i) Mobile phones
 - ii) Satellite microwave
 - iii) Infrared

- **Point - to - Point Connection** : It **Provides a dedicated links between two devices.**
- For example, a wired system that connects two computers together can be thought of a point-to-point link.



- **Multi - Point Connection** : It is a link between two or more devices. It is also known as Multi-Point configuration. The networks having multipoint configuration are called **Broadcast Networks**.

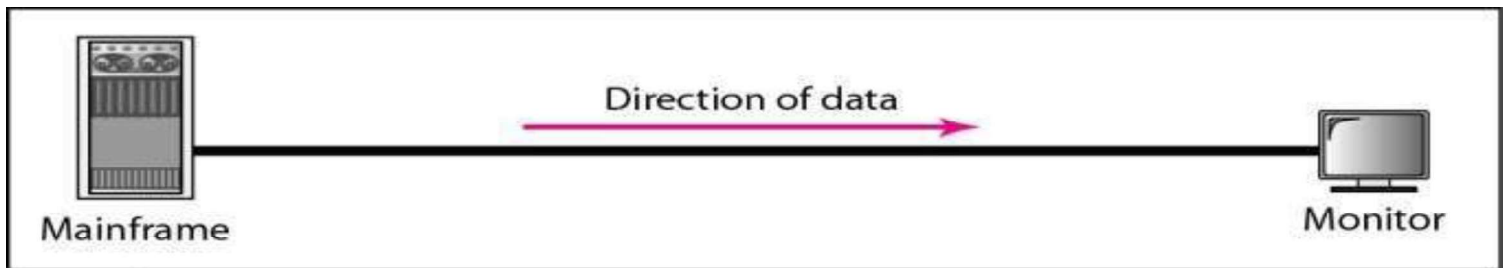


Transmission Mode

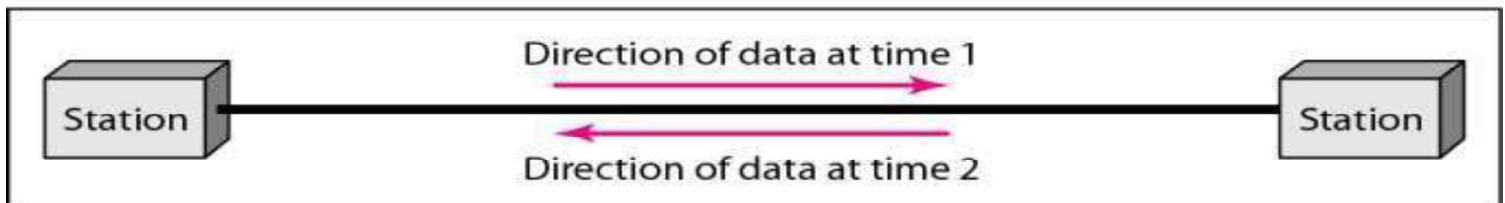
- It refers to the direction of information flow between two devices.
- Data flow is the flow of data between 2 points.
- The direction of the data flow can be described as
 - Simplex Mode
 - Half-Duplex Mode
 - Full-Duplex Mode

- **Simplex:** Data flows in only one direction on the data communication line (medium).
Examples are Radio and Television broadcasts.
- **Half-Duplex:** Data flows in both directions but only one direction at a time on the data communication line.
Ex. Conversation on walkie-talkies.
- **Full-Duplex:** Data flows in both directions simultaneously. Modems are configured to flow data in both directions.
Ex. Phone Conversation

Data Flow



a. Simplex



b. Half-duplex



c. Full-duplex

Figure 1.2 *Data flow (simplex, half-duplex, and full-duplex)*

Protocol Architecture

- It is a layered structure of H/W and S/W that supports exchange of data b/w systems
- It supports distributed applications(E-Mail, File Transfer)
- Each layer of protocol architecture provides some set of rules
- There are 2 widely used protocol architecture

✓ TCP/IP Architecture

✓ OSI Model

Protocol

- Protocol is a set of rules that govern data communication
- It represents **what** is communicated, **when** it is communicated and **how** it is communicated.
- There are 3 key elements
 - ✓ Syntax
 - ✓ Semantics
 - ✓ Timing

Syntax

- It represents **structure**, Format of data the order in which it is presented

Data may contain:

- First 8 bit -> Sender Address
- Second 8 bit -> Receiver Address
- Remaining bits-> message stream

SEMANTICS

- It refers the **meaning** of each section of bit

TIMING

- It refers when data sent and how fast it is sent
(Says Characteristics)
- Ex:100Mbps

Protocol Standards

- It provides **model for the development** of product regardless of individual manufacturer
- It falls in 2 categories

Standards

```
graph TD; Standards[Standards] --> DeFacto["De facto  
(by fact)"]; Standards --> DeJure["De jure  
(by law)"];
```

**De facto
(by fact)**

**De jure
(by law)**

De Facto standard

- Not officially adopted but used widespread
- It has 2 categories
- **Proprietary**->Wholly owned by company
- **Non-Proprietary**->Group or community developed for public

De Jure Standard

- A Standard Legislated by an officially recognized body

Standard Organizations:

- International Standard Organization
- ANSI
- IEEE

The OSI Model

- An ISO (International standard Organization) that covers all aspects of network communications is the **Open System Interconnection (OSI) model**.
- An open system is a model that allows any two different systems to communicate regardless of their underlying architecture (hardware or software).
- The OSI model is not a protocol; it is model for understanding and designing a network architecture that is flexible, robust and interoperable.

- The OSI model is a layered framework for the design of network systems that allows for communication across all types of computer systems.
- The OSI model is built of seven ordered layers:
 1. **(Layer 1) Physical layer**
 2. **(Layer 2) Data link layer**
 3. **(Layer 3) Network layer**
 4. **(Layer 4) Transport layer**
 5. **(Layer 5) Session layer**
 6. **(Layer 6) Presentation layer**
 7. **(Layer 7) Application layer**

