Introduction : DATA COMMUNICATIONS

Q1: What are the four fundamental Characteristics of Data Communication?

On which effectiveness of data communication is depended?

And: The effectiveness of any data communications system depends upon

The following four fundamental characteristics:

1. **Delivery**: The data should be delivered to the correct destination and correct user.
2. **Accuracy**: The communication system should deliver the data accurately, without introducing any errors. The data may get corrupted during transmission affecting the accuracy of the delivered data.
3. **Timeliness**: Audio and Video data has to be delivered in a timely manner without any delay; such a data delivery is called real time transmission of data.
4. **Jitter:** It is the variation in the packet arrival time. Uneven Jitter may affect the timeliness of data being transmitted.

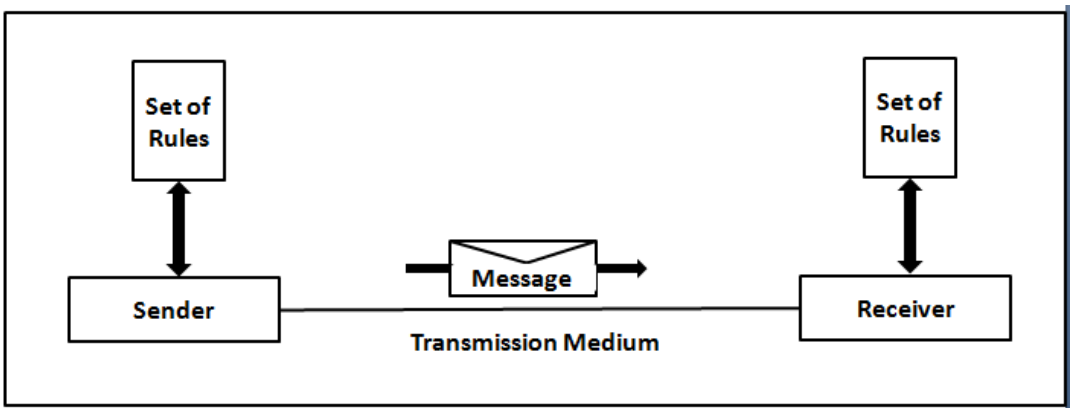
Q2: Define data communication? List and explain five Components of Data Communication?

Ans: 1:Data Communication is a process of exchanging data or Information.

2:In case of computer networks this exchange isdone between two devices over a transmission medium.

3:This process involves a communication system which is made up of hardware and software. The hardware part involves the sender and receiver devices and the intermediate devices through which the data passes. The software part involves certain rules which specify what is to be communicated, how it is to be communicated and when. It is also called as a Protocol.

Fig. Components of a Data Communication System



A Data Communication system has five components as

1. **Message** : Message is the information to be communicated by the sender to the receiver.

2**. Sender** :The sender is any device that is capable of sending the data (message).

3. **Receiver** :The receiver is a device that the sender wants to communicate the data (message).

4:**Transmission Medium**: It is the path by which the message travels. from sender to receiver. It can be wired or wireless and many subtypes in both

5**: Protocol** :It is a set of rules used by the sender and receiver to communicate data.
A protocol is a set of rules that governs data communication.
A Protocol is a necessity in data communications without which the communicating are like two persons trying to talk to each other in a different language without know the other language.

Q3: Explain the different modes of data flow?

Ans: The different modes of data flow are

(A)Simplex
(B).Half Duplex
(C).Full Duplex

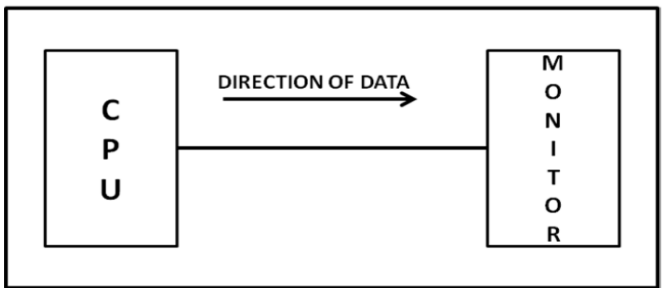


Figure: Simplex mode of communication

(A).Simplex

1:In Simplex, communication is in one directional

2:Only one of the devices sends the data and the other one only receives the data.

3:Example: in the above diagram: a cpu send data while a monitor only receives data

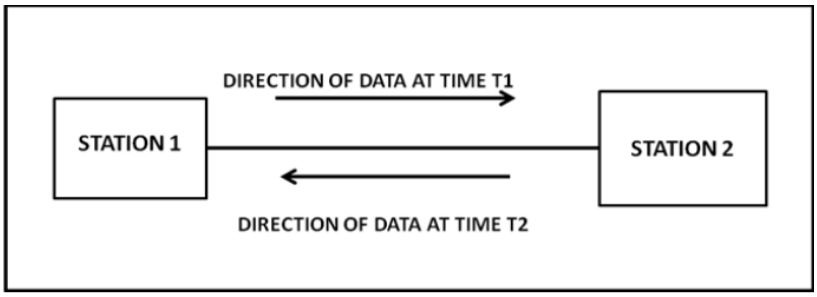


Figure: Half Duplex Mode of Communication

(B): Half Duplex:

1: In half duplex both the stations can transmit as well as receive but not at the same time.
2: When one device is sending other can only receive and vice-versa (as shown in figure above.)
3: Example: A walkie-talkie.

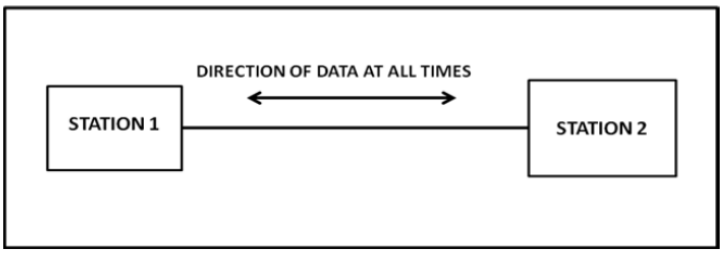


Figure: Full Duplex Mode of Communication

(C): Full Duplex :

1: In Full duplex mode, both stations can transmit and receive at the same time.
2:Example: mobile phones.

Q4: List and explain the basic network criteria?

Ans: The basic network criteria are

1. PERFORMANCE
2. RELIABILITY

3. SECURITY

PERFORMANCE

- While designing a network, it is necessary to consider the need of building the network.
- The network should provide the desired performance.
- It may need to upgrade their networks as per the new techniques.
- Hence, it is important that the network should not be permanent, it has to be flexible.
- The network should be designed in such a way that it is possible to expand or upgrade the network systems in future.

RELIABILITY

- Network reliability plays a major role in developing network functionality.
- The network monitoring systems and network devices are necessary for making the network reliable
- The network monitoring systems detects and identifies the network problems.
- The network devices ensure that the data reaches the appropriate destination.
- The reliability of the network is measured by following factors:
  Frequency of failure :Determines how frequently the network fails
  Recovery time: It is the time taken by a device or network to recover from the failure.

SECURITY

- Security of the network is considered as the important aspect for improving the network performance.
- The network security may be affected due to viruses and unauthorized access of other users.
- To provide network security:Avoid opening unknown e-mail attachments which may contain virus.Use anti-virus software for securing the systems from virus.
- Firewalls can be implemented for detecting and preventing unauthorized access of other users in the network.
- Use backup tools to store the important data on removable media like CD or ZIP disks. This helps to secure your data.

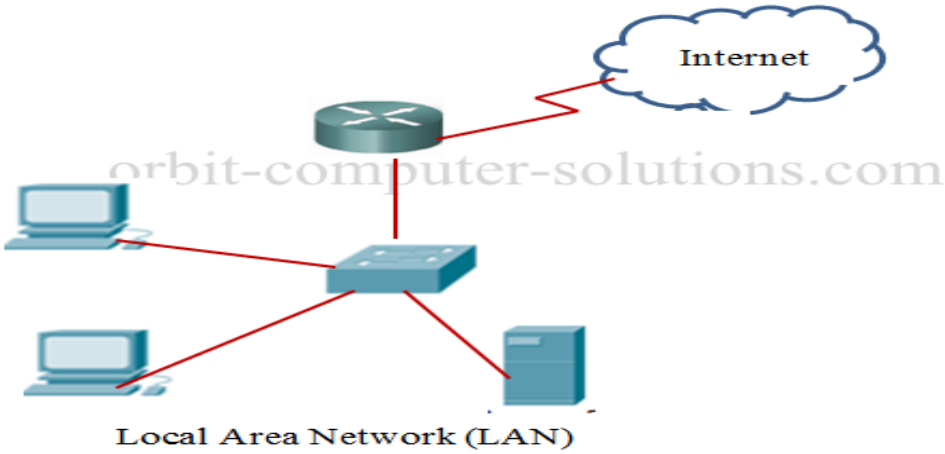
Q5: Define network? what are the basic network categories?
Ans:

- When you have two or more computers connected to each other, you have a network.
- The purpose of a network is to enable the sharing of files and information between multiple systems. The Internet could be described as a global network of networks.
- The basic network categories areas follow
  1. L.A.N(Local Area Network)

2. W.A.N(Wide Area Network)
3. M.A.N(Metropolitan Area Network)

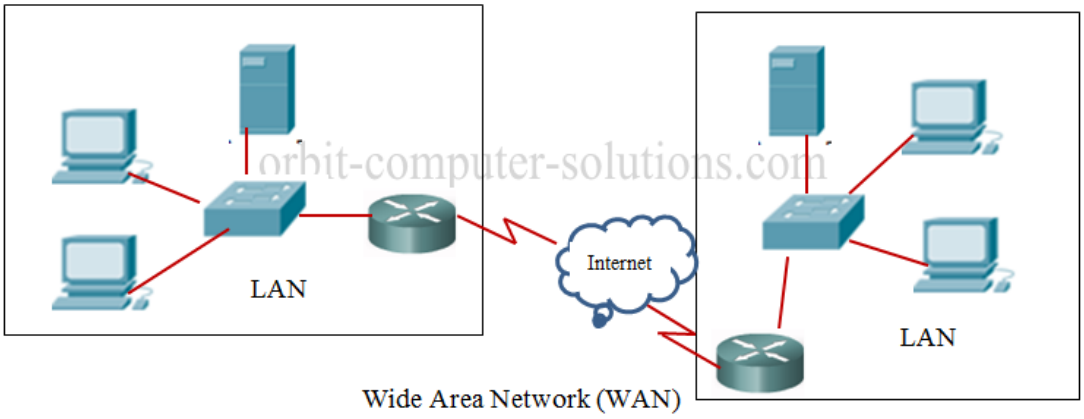
L.A.N(Local Area Network)

- A local area network (LAN) is a computer network that interconnects computers within a limited area such as a home, school, computer laboratory, or office building
- Using network media. (LAN) is usually limited to a few kilometers of area.
- It may be privately owned and could be a network inside an office on one of the floor of a building or a LAN could be a network consisting of the computers in a entire building.



W.A.N(Wide Area Network)

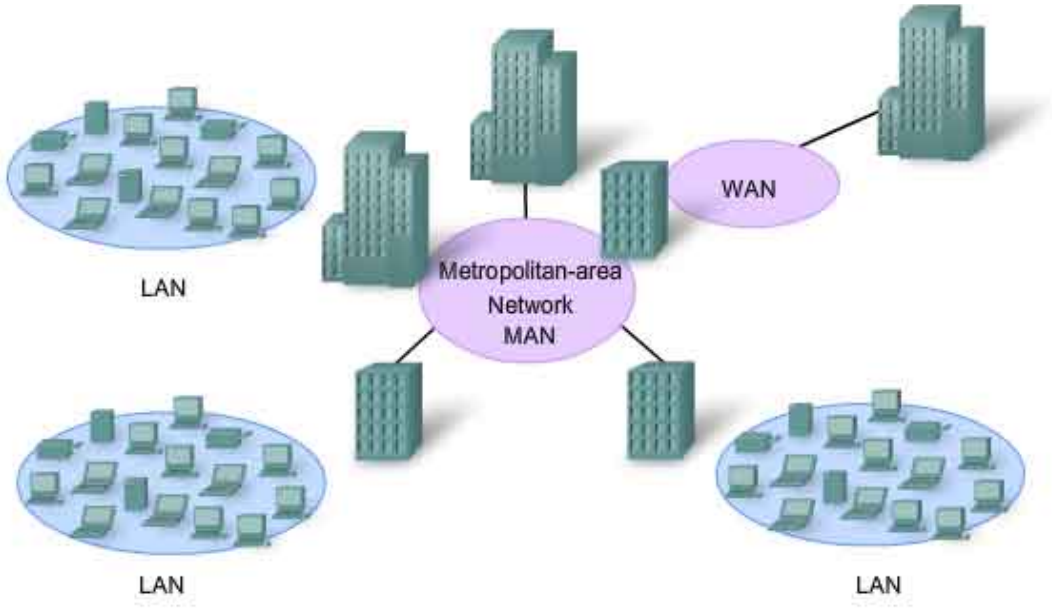
- A wide area network (WAN) is a network that covers a broad area (i.e. any telecommunications network that links across metropolitan ,regional, national or international boundaries).
- Business and government entities use WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations.
- The Internet can be considered a WAN as well, and is used by businesses, governments, organizations, and individuals for almost any purpose imaginable.



M.A.N(Metropolitan Area Network)

- A metropolitan area network (MAN) is similar to a local area network (LAN) but cover's an entire city or campus.
- MANs are formed by connecting multiple LANs. Thus, MANs are larger than LANs but smaller than wide area networks (WAN).

- MANs are extremely efficient and provide fast communication via high-speed carriers, such as fiber optic cables
- Metropolitan limits are determined by local municipal corporations; the larger city, bigger then MAN, the smaller a metro city, smaller the MAN



Q6: Write a note on BUS & RING topology?
Ans :

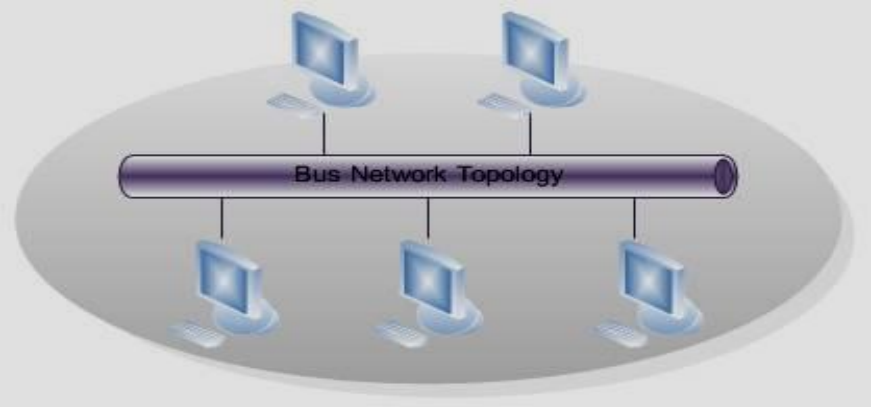
BUS Topology

a. In BUS topology all the devices are connected to a Common shared cable called as backbone of the network

b. The bus is available for each node to send its data to each And every computer node.

c. The backbone cable carries transmission message along The cable .As message arrive at a workstation, it checks Whether the destination address matches to its own or not. If not, it does no and the message goes to next Workstation.

d. The bus cable is terminated at each by placing terminators to prevent signals from reflecting back.



ADVANTAGE :

1. Easy to connect a computer or peripheral to a linear bus.
2. The BUS topology can be extended with sub branches to form another topology.
3. Breakdown of any failure node does not affect other node's communication.

DISADVANTAGE :

1. Entire network shuts down if there is a break in the main cable.
2. Terminators are required at both ends of the backbone cable.
3. Difficult to identify the problem if the entire network shuts down.

RING Topology

a. RING topology is wired in a circle. Each node is connected to its neighbours on either side, and the data transmits along the ring in one direction.
b. Each device incorporates a receiver and a transmitter and serves as a repeater that passes the signal onto the next device in the ring.
c. RING topologies are suited for network that uses token passing access method. The token passes around the ring, and only node that holds the token can transmit data.

Figure : RING topology

ADVANTAGE :

1. The data being transmitted between two nodes passes through all the intermediate nodes. A central server is not required for the management of this topology.
2. The adding or removing of network nodes is easy, as the process requires changing only two connections
3. The configuration makes it easy to identify faults in network nodes.

DISADVANTAGE :

1. The failure of a single node in the network can cause the entire network to fail.
2. Data sent from one node to another has to pass through all the intermediate nodes. This makes the transmission slower.
3. In order for all computers to communicate with each other,

all computers must be turned on.

Q7: similarity and difference between star and mesh topology?
Ans: similarity

1. If one link fails, only that link is affected.
2. Point to point link connection is done in this topology.
3. Fault identification and fault isolation and easy

Difference is as follow

Star topology	Mesh topology
Each device has a dedicated point-to-point link only to a central controller	Each device has a dedicated point-to-point link to each other
Installation and reconnection are eassy	installation and reconnection are difficult
Star requires far less cable	star requires far more cable
Star topology is less expensive than a mesh topology	Mesh topology is more expensive than a star topology
If one device wants to send data to another, it sends the data to the controller then the control send it to the other connected device	If one device wants to send data to another, it directly send to the device

Q8. Differences between LAN and WAN?

	LAN (Local Area Network)	WAN(Wide Area Network)
1.	A LAN is a group of computer interconnected within a small area as room, building or a campus.	A WAN is the interconnection of LAN or MAN can be located entirely within a state, country or around the world.
2.	Data transfer speed is comparatively high such thousand bits per second to.	Data transfer rate is comparatively slower such as Kbits/sec.
3.	Co-axial cables are generally used to connect the computer and other device.	In WAN, links may be established by using telephone cable or microwaves towers or satellite.
4.	Due to short distance, short circuit errors or other noise errors are minimum.	In this networks short-circuit error, noise error, atmospheric error are higher than any other networks.
5.	For example: pager, Internet.	For example: Acomputer lab in a college.

Q9 What is Internet? Explain the hierarchy of internet service providers?
Ans:

- The Internet is a large group of computers that are connected to each other.
- The Internet is used to send information quickly between computers around the world.

The different type of Internet service providers are as follow

1. International Internet Service Providers(I.I.S.P)
2. National Internet Service Providers(N.I.S.P)
3. Regional Internet Service Providers(R.I.S.P)
4. Local Internet Service Providers(L.I.S.P)

International Internet Service Providers (I.I.S.P)

- At the top of the hierarchy are the international service providers that connect nations together.
- Which connected all the nations or countries to countries

National Internet Service Providers

- The national Internet service providers connected state to state.
- The national Internet service providers are backbone networks created and maintained by specialized companies.
- To provide connectivity between the end users, these backbone networks are connected by complex switching stations (normally run by a third party) called network access points (NAPs).
- Some national ISP Networks are also connected to one another by private switching Stations called *peering points.*
- These normally operate at a high Data rate (up to 600 Mbps).

Regional Internet Service Providers

- Regional internet service providers or regional ISPs are smaller ISPs that are connected to one or more national ISPs.
- They are at the third level of the hierarchy with a smaller data rate.

Local Internet Service Providers

- Local Internet service Providers provide direct service to the end users.
- The local ISPs can be connected to regional ISPs or directly to national ISPs. Most end users are connected to the local ISPs.

Q10 : Define protocol ?explain the Key element of protocol?

Ans: Protocol is defined as an agreement between Communication particle for how communication should Be proceed.

OR

protocols are rules by which computer communicates

There are three key elements of a protocol:

A. Syntax

- It means the structure or format of the data.
- It is the arrangement of data in a particular order.

B. Semantics

- It tells the meaning of each section of bits and indicates the interpretation of each section.
- It also tells what action/decision is to be taken based on the interpretation.

C. Timing

- It tells the sender about the readiness of the receiver to receive the data.
- It tells the sender at what rate the data should be sent to the receiver to avoid overwhelming the receiver.