

Roll No. 02

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ASHOKA

DCCV

Assignment-1

Q1:- Explain the term Data communication and its characteristics?

Ans:- Data Communication :-

Data communication refers to the process of exchanging information between two or more devices through a transmission medium such as cables or wireless signals. For a successful communication, several elements must work together. The sender, the receiver, the message, the medium, and the protocol.

A data communication system must have the following five fundamental components:-

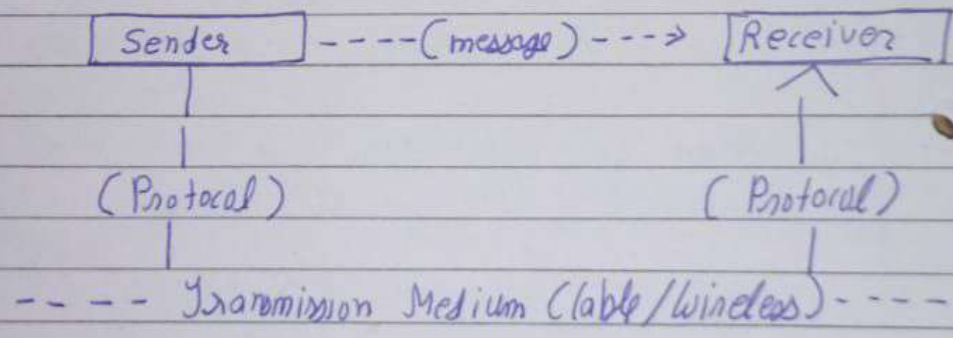
1 → Message:- The actual information or data to be transmitted, such as text, images, audio, or video.

2 → Sender:- The device or source that generates the message and transmits it.

Exple:- include computers, smartphones, & sensors.

- 3→ Receiver:- The device that receives the message from the sender. Examples include monitors, smartphones, and sensors.
- 4→ Medium:- The physical path or channel over which data travels, such as coaxial cable, fiber optics, or radio waves.
- 5→ Protocol:- A set of rules that define how data is transmitted by both sender & receiver.

Diagram:-



→ Characteristics of Data Communication

For communication to be effective, it must satisfy the following:

(i) Delivery:-

- Data should be delivered to the correct destination.
- Example: If a teacher sends attendance data to the server, it must go to a student's device.

(ii) Accuracy:-

- The received data must be identical to the transmitted data.
- Errors must be detected & corrected using error detection codes like parity, check, CRC.

(iii) Timeliness:-

- Data must be delivered in a proper time frame.
- Late delivery is useless in real-time applications.
- Example:- A delay in live cricket scores makes communication meaningless.

(iv) Jitter:-

- Refers to the variation in arrival time of data pack.
- Example:- In a video-call, if frames arrive unevenly, the video looks jerky.

★→ Importance of Data Communication

- Enables global connectivity
- Facilitates business and e-commerce
- Powers IoT, where devices communicate automatically.
- Essential in military and defense for secure operations
- Basis of cloud computing and online storage.

★→ Conclusion:- Data Communication is the backbone of modern society. Without its characteristics - delivery, accuracy, timeliness, jitter control, and security - our world would face miscommunication, delays, and security risks.

Q2 What are various data flow modes?

Ans:- Introduction - In a communication system, the direction of data flow determines how devices exchange information. This is known as Transmission Mode or Data Flow Mode.

• There are 3 major modes:

- 1 Simplex
- 2 Half Duplex
- 3 Full Duplex

• Modes of Data Communication:-

(i) Simplex Mode:-

- One-way communication only
- The sender transmits, the receiver only receives.
- Example:- Keyboard → CPU [Keyboard only sends input]
TV broadcasting → station sends].

o Advantages:-

- Simple and cost-efficient.
- Full channel capacity used for transmission.

o Diagram:- [Sender] ---> [Receiver]

- o Dis-advantages:-
 - No feedback possible
 - Not suitable for interactive communication.

(ii) Half Duplex Mode:-

- Communication is two-way, but not at the same time.
- Devices can send and receive, but only one at a time.
- Example:- Walkie-talkie
 - Police radios.

o Advantages:-

- Efficient use of resources compared to simplex.
- Less costly than Full Duplex.

o Dis-advantages:-

- Delay due to switching
- Not suitable for real-time fast communication.

o Diagram:- [Device A] <--- OR ---> [Device B]
[One direction at a time]

(iii) Full-Duplex Mode:-

- Communication is 2-way and simultaneous.
- Sender and Receiver can exchange data at the same time.
- Example:- Telephone Call.
- Video Conferencing

o Advantages:-

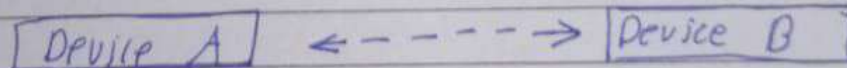
- Fastest and most efficient.
- No waiting or switching.

o Dis-advantages:-

- More complex and costly.
- Requires advanced hardware.

- o It is a very fast and useful and no delay in the communication.

o Diagram:-



[Both Directions Simultaneously]

→ Comparison Table :-

Feature	Simplex	Half-Duplex	Full-Duplex
Direction	One-way	Two-way	Two-way
Example	TV, keyboard	Walkie-talkie	Telephone
Cost	Cheapest	Moderate	Costly
Efficiency	Low	Medium	High
Feedback	Not possible	Possible, but delayed	Instant

→ Conclusion :-

The choice of transmission mode depends on application:

- Simplex → one-way broadcasting.
- Half-duplex → two-way but alternate
- Full duplex → Modern networks requiring real-time exchange.

Q3:- Explain Various Network Topologies

Ans:- Introduction:- A network topology is the physical or logical arrangement of devices, cables, and connections in a network. It defines how devices communicate with each other.

★ Types of Topologies:-

(i) Bus Topology:-

- All devices share a single backbone cable.
- Data travels in both directions until it reaches its destination.

○ Advantages:-

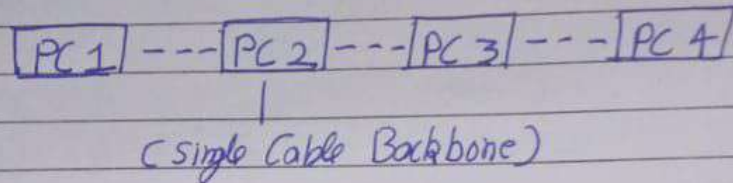
- Easy to set up
- Requires less cable.

○ Dis-advantages:-

- Backbone failure = network failure
- Limited cable length, poor performance with many devices

★ Example :- Early LANs.

★ Diagram :-



(ii) Star Topology :-

- All devices connect to a central hub/switch.
- Communication passes through the hub.

○ Advantages :-

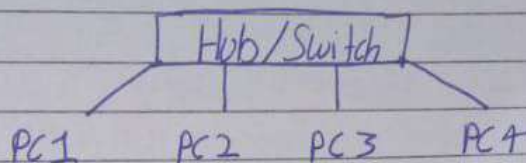
- Easy to troubleshoot.
- Adding / removing devices is simple.

○ Dis-advantages :-

- Hub is a single point of failure
- More cabling needed

★ Example :- Modern offices, schools.

Diagram :-



(iii) Ring Topology:-

- Each device connects to 2 others, forming a circle.
- Data passes in one direction until it reaches the receiver.

o Advantages:-

- Predictable performance
- Each device has equal access.

o Dis-advantages:-

- Single device failure can crash the network.
- Difficult to re-configure

★ Example:- Token ring networks.

→ Diagram :-

PC1 --- PC2 --- PC3 --- PC4 --- PC1

(v) Mesh Topology :-

- Each device ~~can~~ connects to every other device.
- Provides multiple redundant paths.

o Advantages :-

- Highly reliable and fault-tolerant
- Data can take alternate routes.

o Dis-advantages :-

- Expensive
- Complex to install

A- Example :- Internet backbone, military network

→ Diagram :-

```

    PC1 ----- PC2
      |         |
      |         |
      |         |
    PC3 ----- PC4
  
```

(v) Tree topology :-

- A combination of Star + Bus
- Devices grouped in star topologies connected via a backbone.

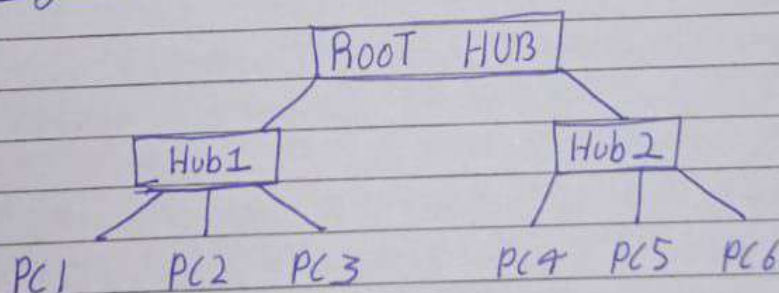
o Advantages :-

- Scalable
- Suitable for large organizations.

o Dis-advantages :-

- Backbone failure disrupts communication
- Complex to manage.

→ Diagram :-



iv) Hybrid Topology:-

- Mixture of 2 or more topologies.
- Designed as per organizational needs.

o Advantages:-

- Flexible.
- can be optimized for performance.

o Disadvantages:-

- Expensive and complex.

→ Example :- Universities, corporate networks.

→ Diagram:-

