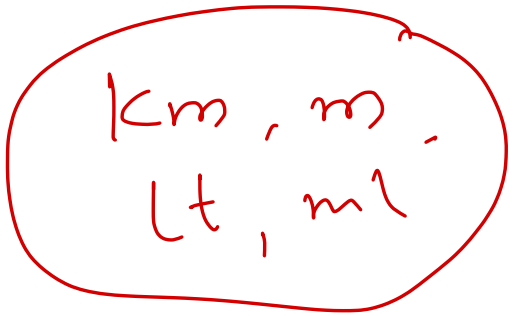
Computer Network

- Computer Networking –(5 Marks)
- Computer Networking
  - Network
    - Centralized Computing, Decentralized Computing
    - Server-client, Cloud computing
  - Types of Network
    - LAN, WAN, WLAN, MAN, SAN,CAN
    - Mac Address
    - Switch and Router
    - Ethernet and Token Ring
    - Port Number
  - OSI Model — 7 layers.
  - IP Addressing



Computer Network

- Common Protocols
  - ARP (Address Resolution Protocol)
  - IP (Internet Protocol)
  - TCP (Transmission Control Protocol)
  - UDP (User Datagram Protocol)
  - FTP (File Transfer Protocol)
  - DNS (Domain Name System)
  - HTTP (Hypertext Transfer Protocol)

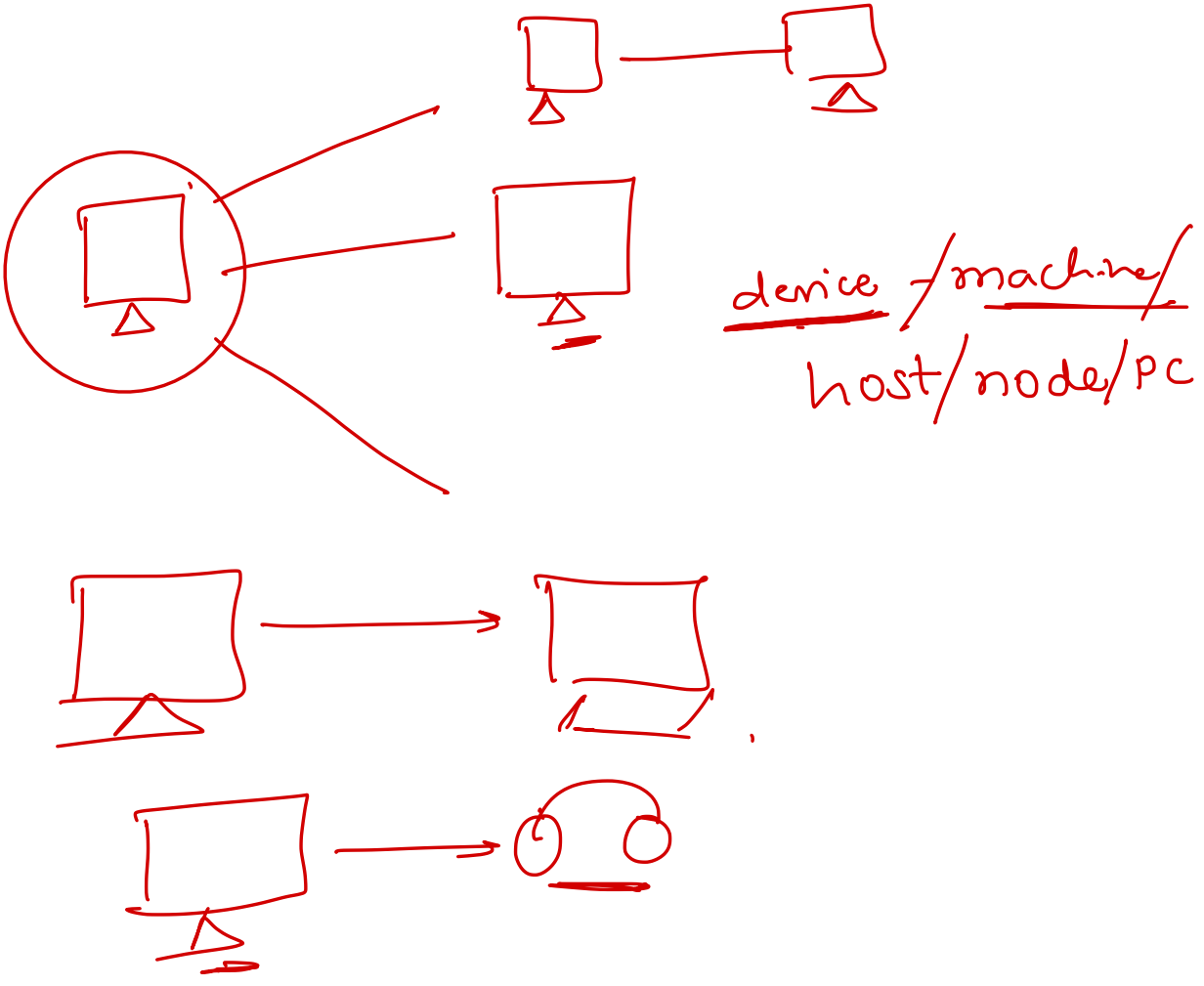
Books

1. P.K. Sinha.
2. forouzan. →

git

1. Notes/ppt
2. Diagram.
3. Question.

DCN_1.
DCN_2
module.


device / machine /
host / node / PC

Introduction

Computer Network

- A computer network is a system that connects two or more computing devices(node/ hosts/pc/machine) for transmitting and sharing information.
- The connections between computers in a network are made using physical wires or cables

Node

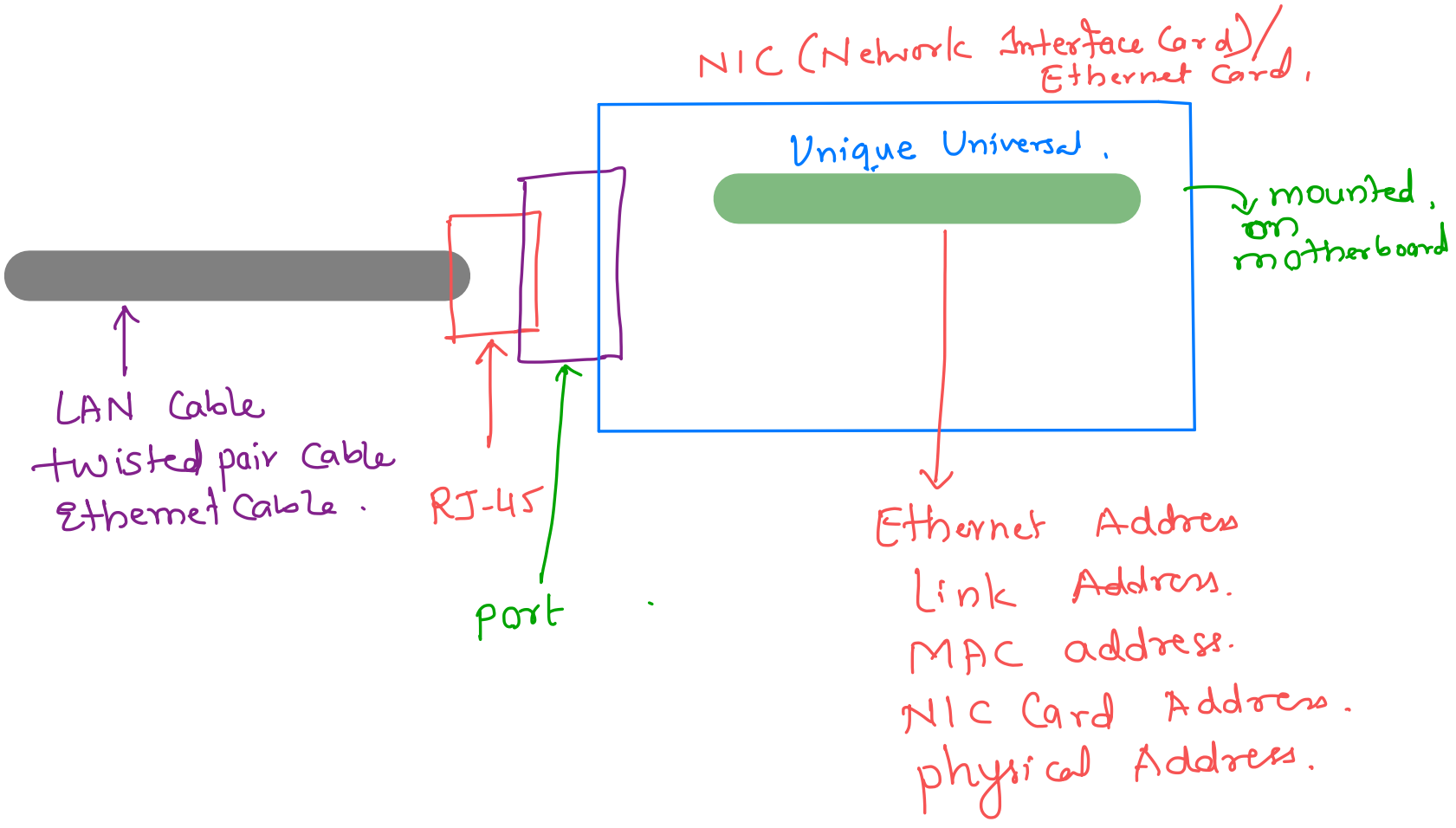
- Any devices connected to the network (a computer, a printer etc)

Data communication

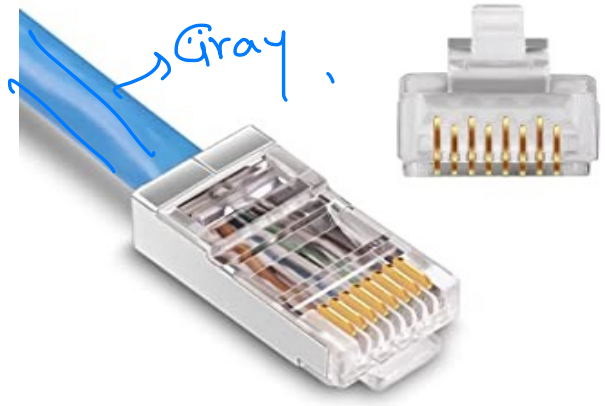
- Data communications are the exchange of data between two nodes via same form of link(transmission medium) such as a cable.
- Data/Message/Packet/Frame/Information/Bits and Bytes

NIC- Network Interface card

- NIC is the circuit board that is used to connect computers to the network.
- In most cases, this is an *Ethernet* card plugged in a computer's motherboard

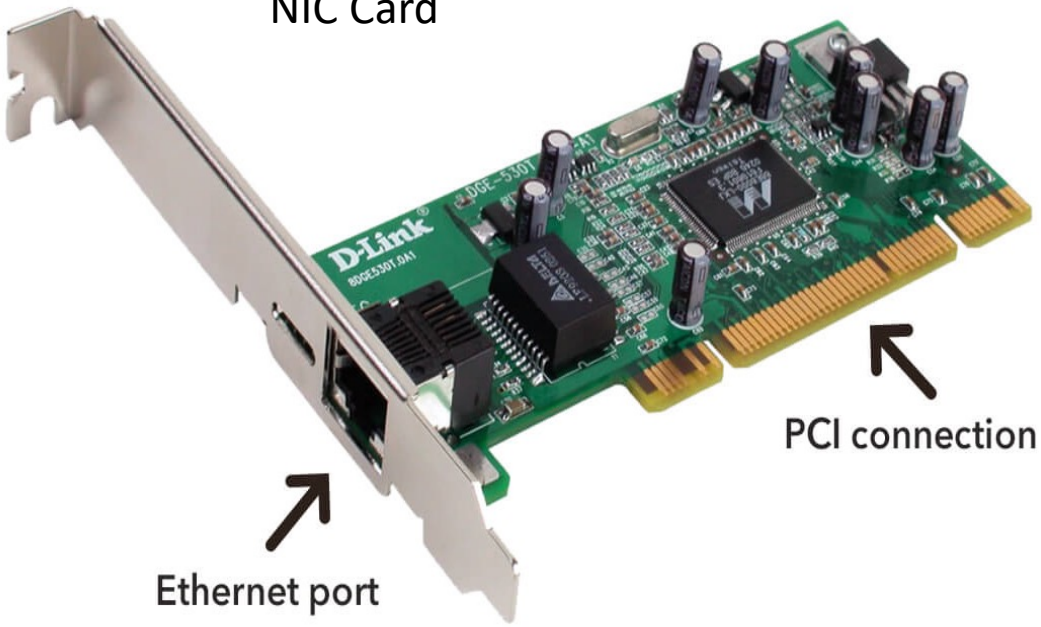

NIC (Network Interface Card)/
Ethernet Card.
Unique Universal.
mounted on motherboard
LAN Cable
twisted pair Cable
Ethernet Cable.
RJ-45
port
Ethernet Address
Link Address.
MAC address.
NIC Card Address.
physical Address.

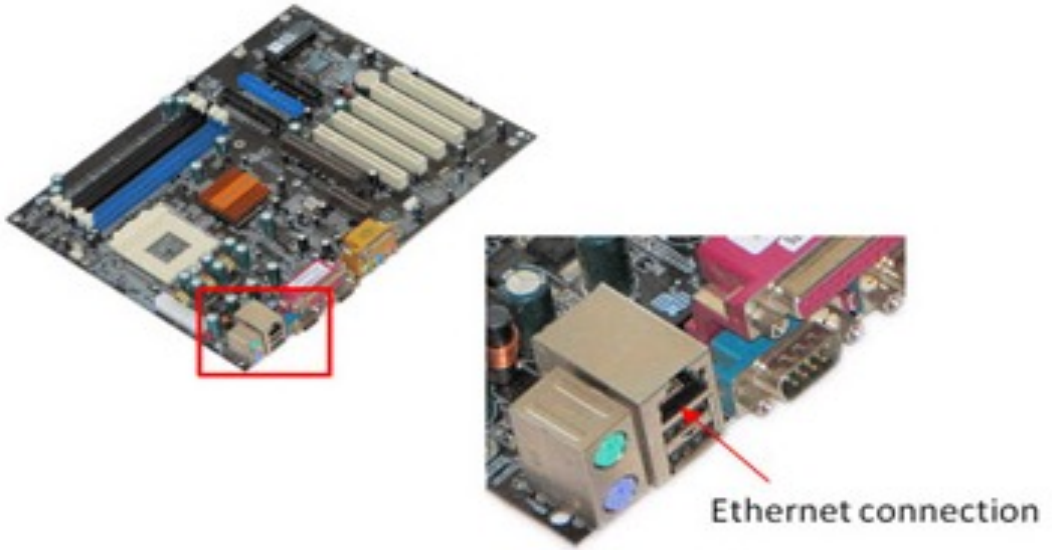
Computer Network



RJ-45 connector

NIC Card





Introduction

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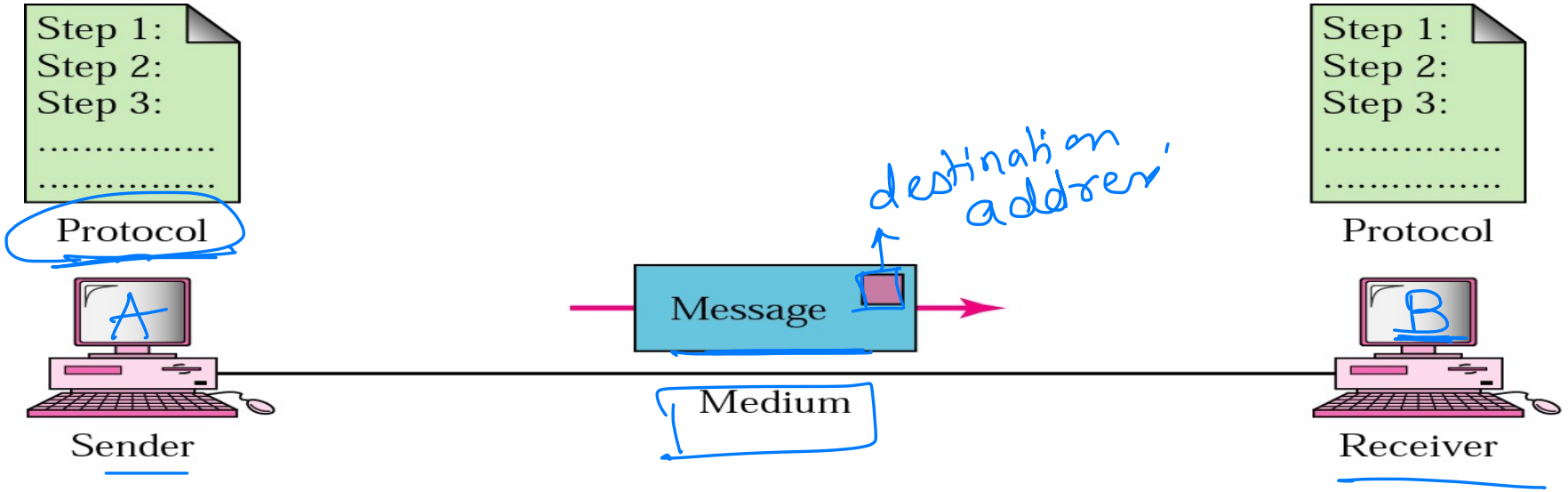
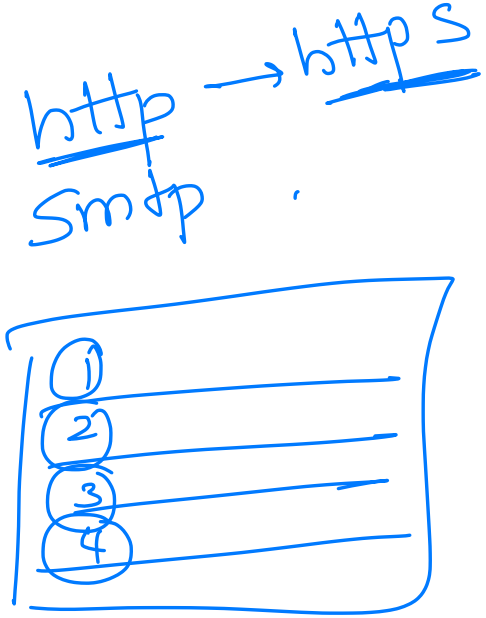
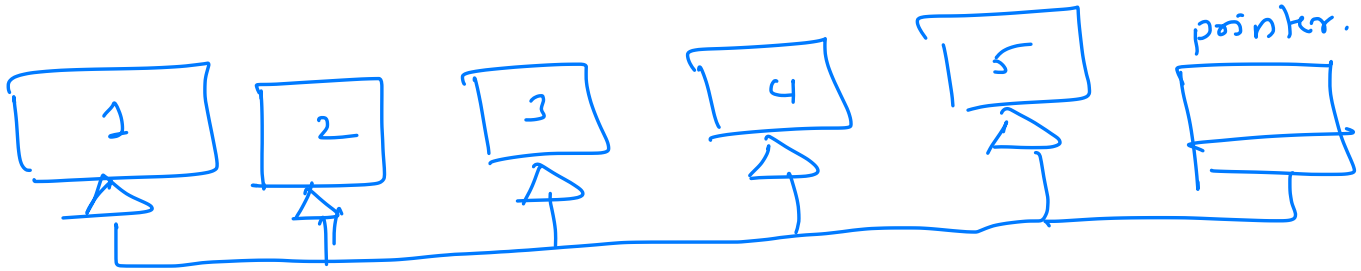




The effectiveness of a data communications system depends on four fundamental characteristics:
Delivery, Accuracy , Timeliness , Jitter(delay)

Need of Network/Applications of Network

- Information Sharing/File Sharing
- Enhance Communication
- Share Resources
- Remote Computing



Network Criteria

Performance

- depends on a number of factors, including the number of users, the type of transmission medium, the capabilities of the connected hardware, and the efficiency of the software.
- Measured in terms of Delay and Throughput.

Reliability

- is measured by the frequency of failure, the time it takes a link to recover from a failure
- Measured in terms of availability/robustness

Security

- Data protection against corruption/loss of data due to:
- Errors
- Malicious users /hacks .

Performance

8 → router

→ 2 → router ✓

→ 7 → router

200MBPS internet

System 1

old

i3

2gb ram

100gb HDD.

OS old

System 2 ✓

new

i11

8gb ram

500gb HDD

OS new.

delay and output (throughput).

Reliability

BANK 1 ✓

10 to 4.

11.00 am server went down.

11:30 am server started.

5.30 min server was working

30 min it got recovery.

BANK 2

10 to 4.

11.00 am server went down.

3.00 pm server started.

2hr min server was working

lot of time got recovery

Transmission Medium

Network

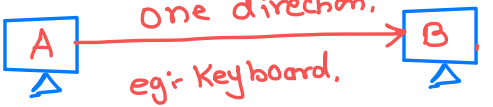
- Wired / Guided
  - Twisted pair cable / Category Cable (CAT)
    - STP
    - UTP
    - → Upto 100m
    - → less costly
    - → easily Install.
    - eg:- landline Telephone.
  - Coaxial Cable.
    - → 1km.
    - → eg. Cable TV.
    - EMF
    - noise
  - Optical fiber
    - → jio fiber, Airtel, Tata.
    - → costly.
    - → long distance.
- Wireless / UnGuided
  - Air.

Cable/wire.

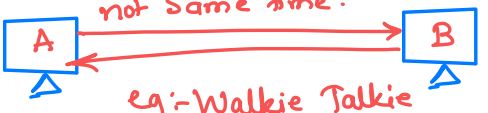
distance
cost
appln

Transmission Mode / Data flow Direction

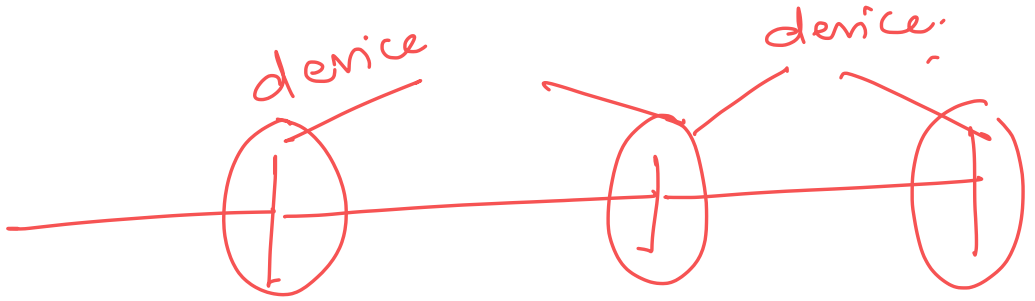
① Simplex Mode



② Half Duplex Mode



③ Full Duplex mode


device
device.

Network Types

Wired

Medium

- Wire / Cable

Cable Types

- co-axial
  - transfers the data in the form of electrical signals
- CAT Cable / Twisted Pair Cable (STP/UTP)
  - transfers the data in the form of electrical signals
- Fiber Optics
  - transfers the data in the form of light
  - Minimum 10gbps

Types

- LAN , MAN , WAN

- cat1 : - [it was used only for telephony network]
- cat2 : 1 mbps
- cat3 : 10 mbps
- cat4 : 16 mbps
- cat5 : 100 mbps
- cat5e: 125 mbps
- cat6 : 1000 mbps ~ 1 gbps
- cat7 : 10000 mbps ~ 10 gbps
- cat8 : 25000 mbps ~ 25 gbps

Wireless

Medium

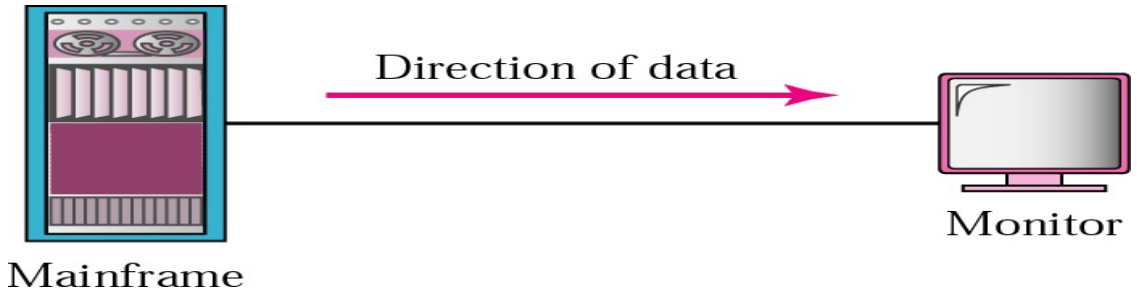
- Air (EM Waves)

Cable Types

- PAN
- WLAN
- WAN (GSM)

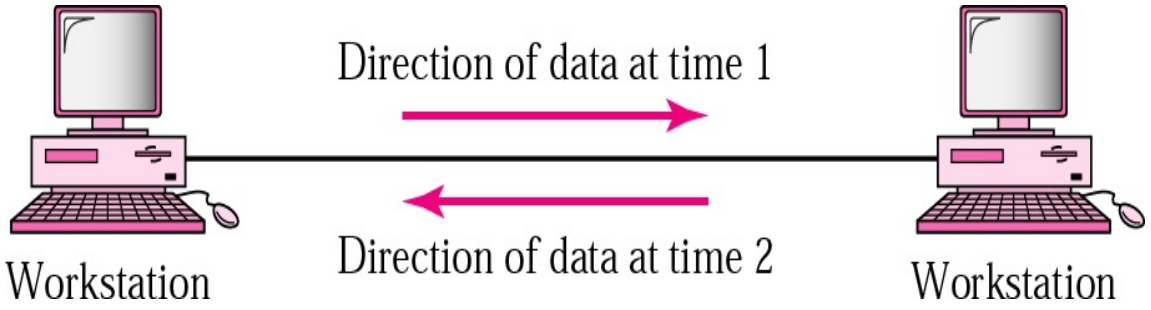
Transmission Medium(Media)

Transmission Modes / Data Flow Direction



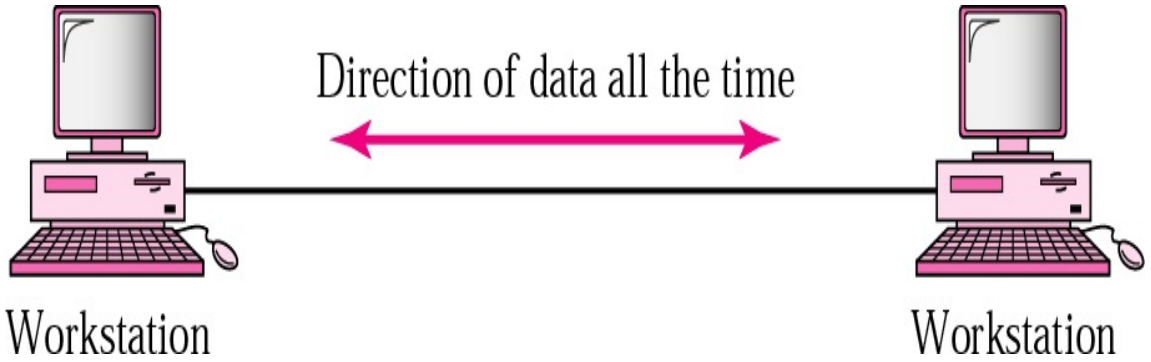
Simplex Mode

- Example: Keyboard and traditional monitors.



Half Duplex Mode

- each station can both transmit and receive, but not at the same time.
- Example: Walkie- talkie



Full Duplex Mode

- Example: Telephone Network there is communication between two persons by a telephone line, through which both can talk and listen at the same time.

Transmission Medium

Types of Transmission Medium

Wired/Guided

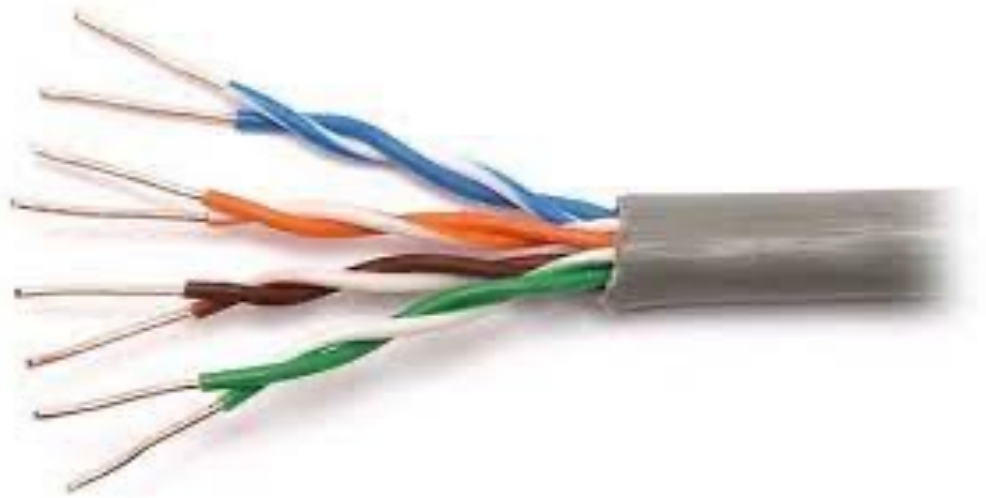
- Transmitted data travels through cabling system that has a fixed path.
- For example, copper wires, fibre optic wires, etc.

Wireless/Unguided

- Transmitted data travels through free space in form of electromagnetic signal.
- For example, radio waves, lasers, etc

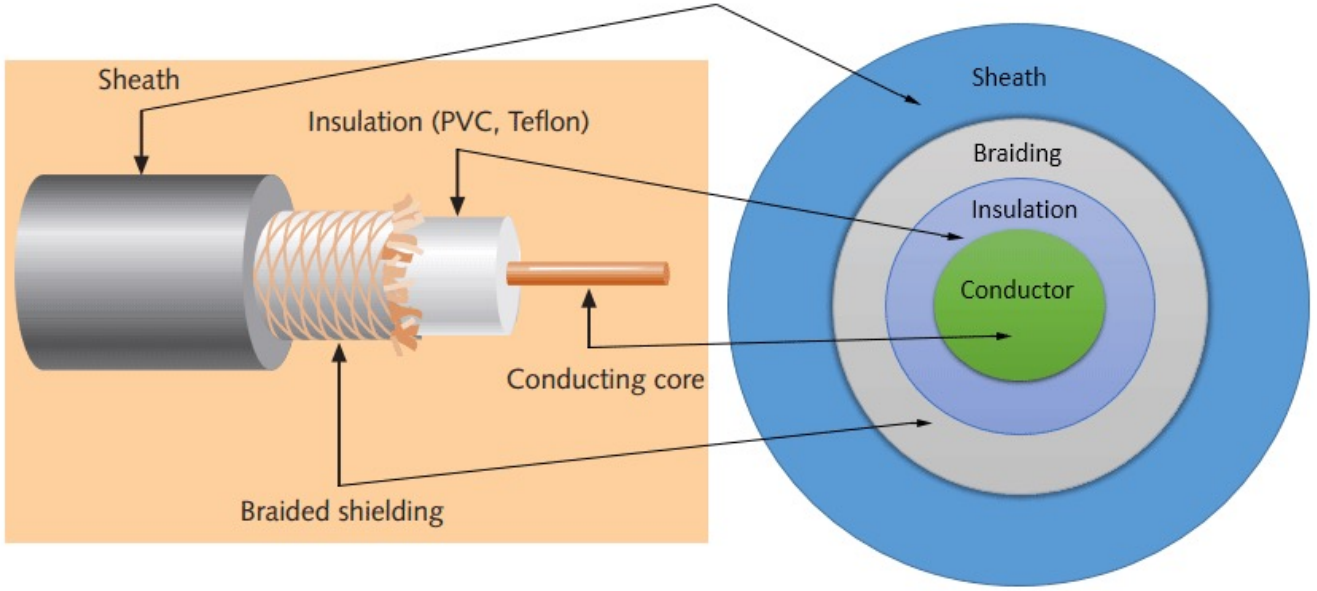
Twisted Pair (maximum length of 100 meter)

- Most common wires used for transmitting signals.
- To reduce this electromagnetic interference, pair of copper wires are twisted together.
- Shielding twisted pair cable
  - To counter the tendency of twisted pair cables to pick up noise signals, wires are shielded .
  - Such twisted pairs are called **shielded twisted pair (STP) cables**.
- The wires that are not shielded but simply bundled together in a protective sheath are called **unshielded twisted pair (UTP) cables**.



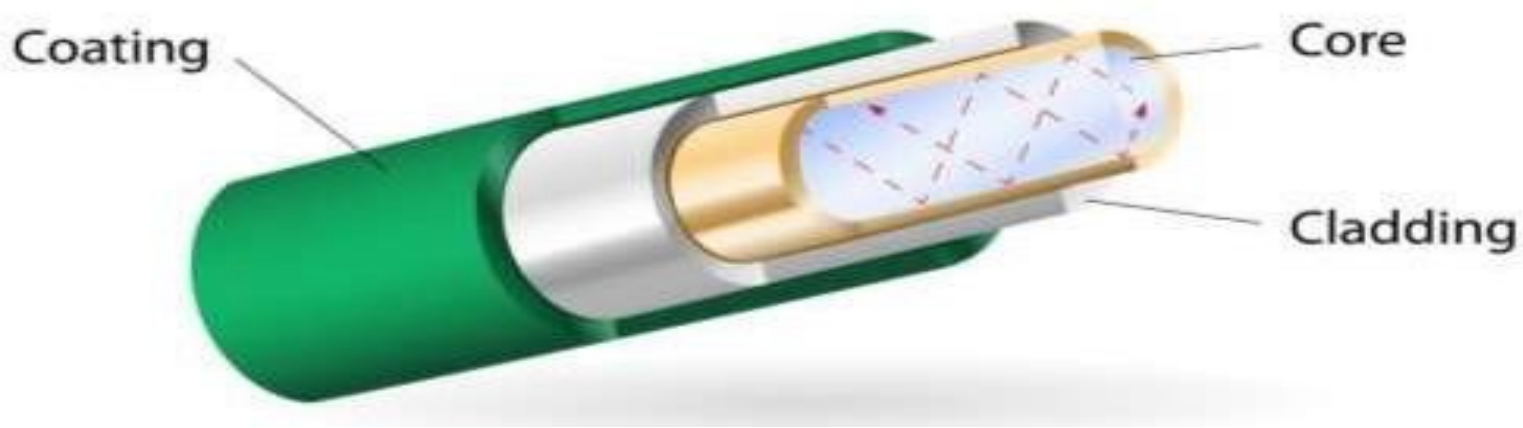
Coaxial Cable

- Coaxial cables are widely used for **cable TV** connections and **LANs**.
- **Coaxial cables** are copper cables with better **shielding** than twisted pair cables.
- Transmitted signals may travel **longer distances** at higher speeds.
  - e.g. 1 to 2 Gbps for 1 Km cable
- Can be used for both analog and digital signals
- Inexpensive as compared to fiber optic cables
- Easy to install and maintain

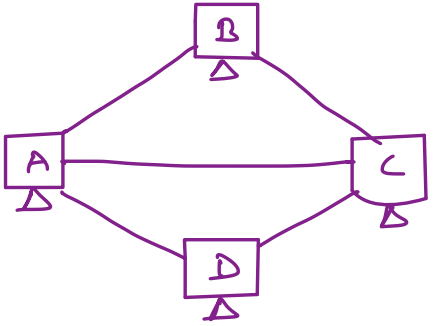


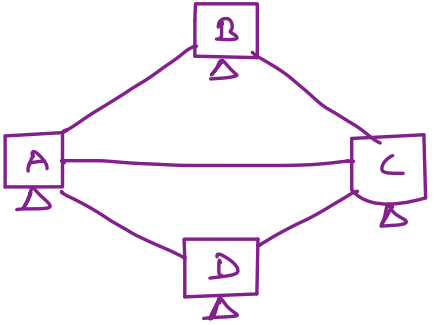
Optical Fiber

- Thin glass or plastic threads used to transmit data **using light waves** are called **optical fiber**.
- Signals carrying data can travel long distances without weakening
- Immune to electromagnetic interference , Suitable for industrial and noisy areas
- Three Layers:
  - **Core** made of high quality **silica glass** or **plastic**
  - **Cladding** made of high quality **silica glass** or **plastic**, with a lower refractive index than the core
- Protective outer covering called **buffer**



Switching





CAM1 → message

C → destination

A → Source

M1 → Message

Switching

- In large networks, there can be multiple paths from sender to receiver.
- The switching technique will decide the best route for data transmission.
- Switching technique is used to connect the systems for making one-to-one communication.
- The mechanism for exchange of information between different computer networks and network segments is called switching in Networking.