

CHN

- BIOS
- components of motherboard
- SMPs
- Processors
- memory, mass storage devices, I/O

(8-10 marks)

→ (1-2) marks

### Networking:

- \* classification of networks : LAN, MAN, WAN, PAN
- ① \* Network topologies - Bus, Ring, star, mesh, hybrid
- ② \* OSI reference model
  - TCP/IP model
  - CAN components (1 m)
- ③ \* Transmission media : co-axial, optical fibre, Twisted pair cables
- ④ \* LAN devices, Repeaters, Hubs, Bridges, switches, gateways, NIC, modem, routers etc
  - Protocols : HTTP, FTP, SMTP, Telnet (1 m)
- \* TCP/IP addressing scheme, IP address classes, subnetting (1-2 m)

computer network : A computer network is a set of communication elements connected by a communication links

→ communication resources → computers, printers, mobiles, routers, switches etc.

→ communication links → coaxial, optical fiber, radio wave

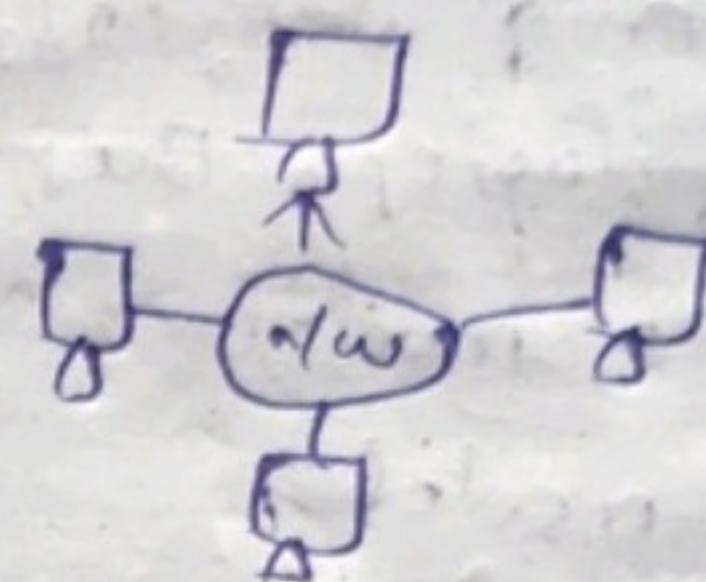
→ A computer network is a system in which multiple computers are connected to each other to share info. & resources.

uses : Business applications

→ Home appliances

→ mobile users

→ social issues



### classification of Network

1) LAN (Local Area Network) : It connects computers through a common communication path contained within a limited area

ex: Home, schools, buildings, offices etc.

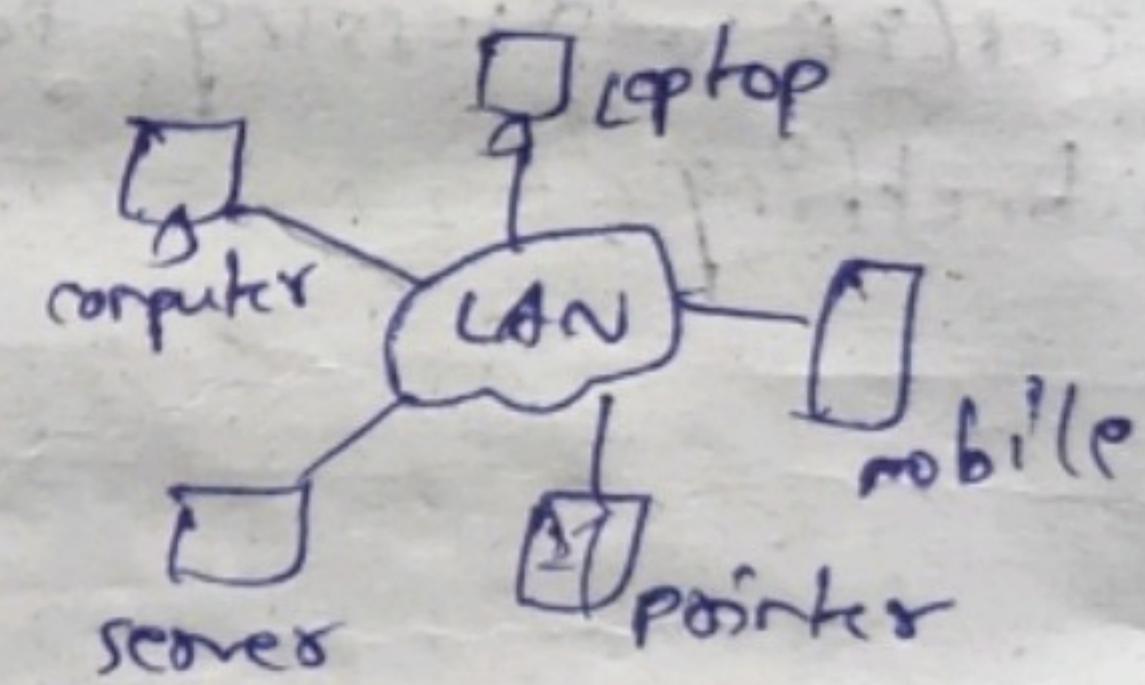
→ Encompasses 2 or more computers connected over a network

→ Technologies used : Ethernet, wifi

→ Range upto 2 KM

→ Transmission speed is very high

→ easy maintenance & low cost



2) PAN (Personal Area Network)

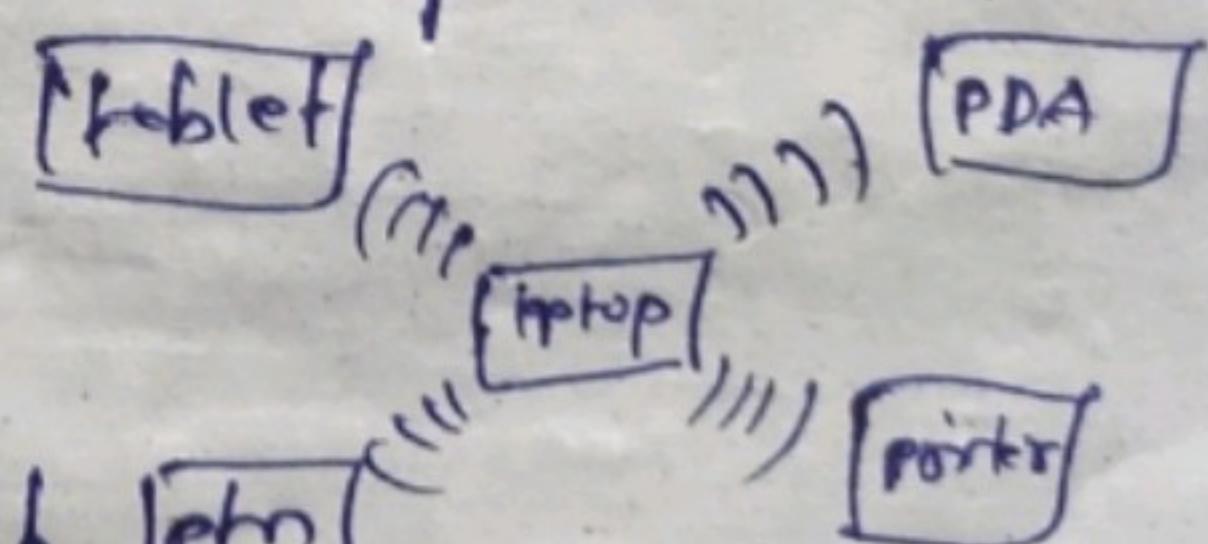
→ It restricted to a single person i.e., communication b/w computer devices is centered only on individuals workspace

→ ex: phones, PDA, tablet etc

→ Range upto 2 to 100 meters

→ Transmission speed is very high

→ Technologies used : Bluetooth & zinger etc.



set of  
action links  
routers,  
radio waves,  
optical  
fibre

through

a

or a receiver

mobile  
or

on

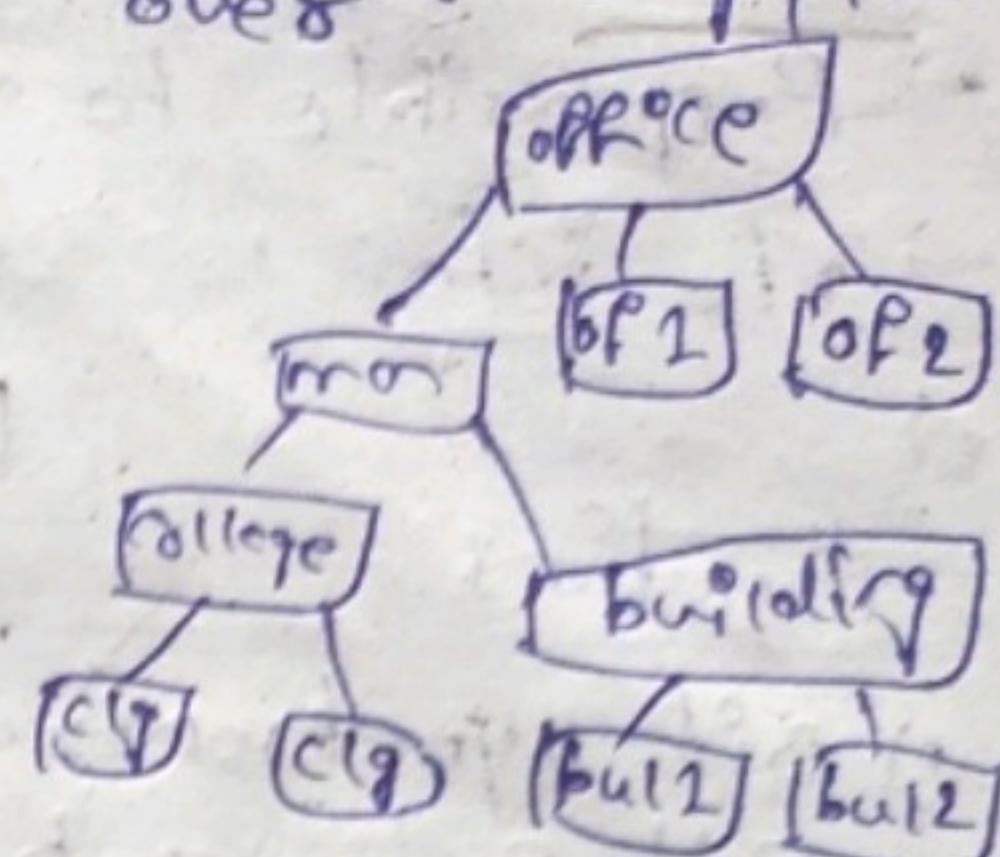
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1/10

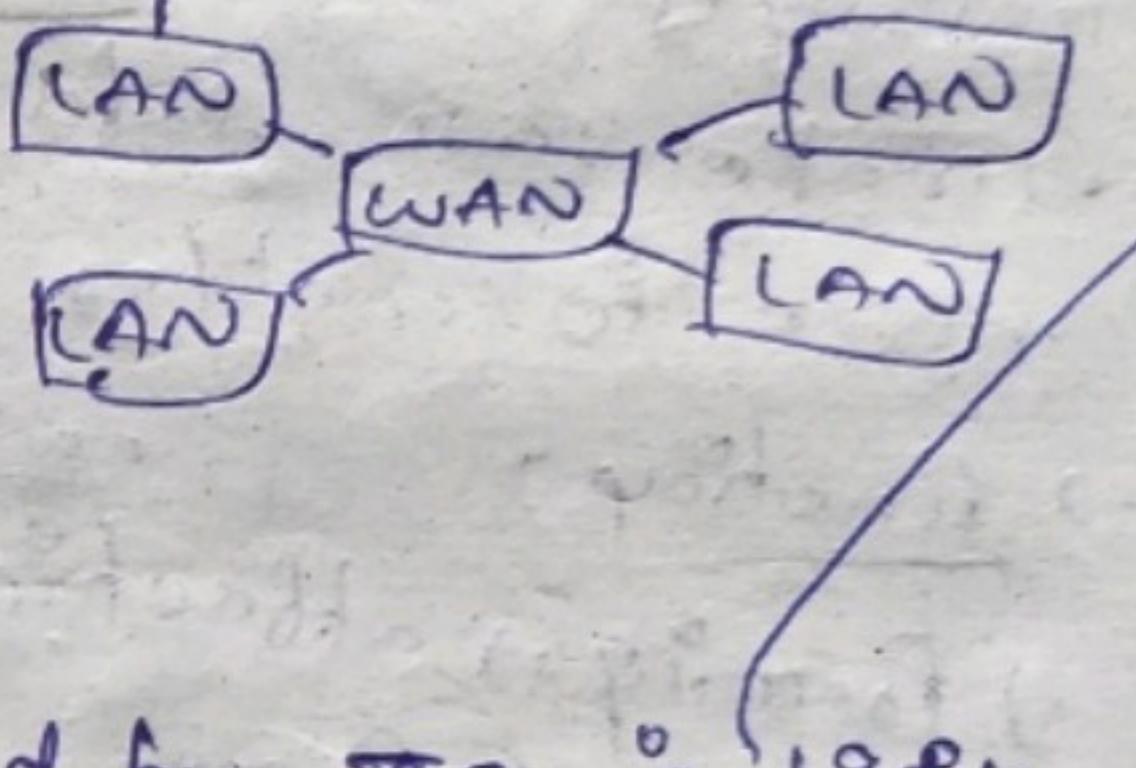
### 3) MAN (Metropolitan Area Network):

- It connects computers over a geographical distance through a shared communication path over a city/town.
- Range from 5 to 50 km wide.
- Data transmission speed is average.
- Difficult to maintain & high cost.
- Technologies used: FDDI, CDDI etc.



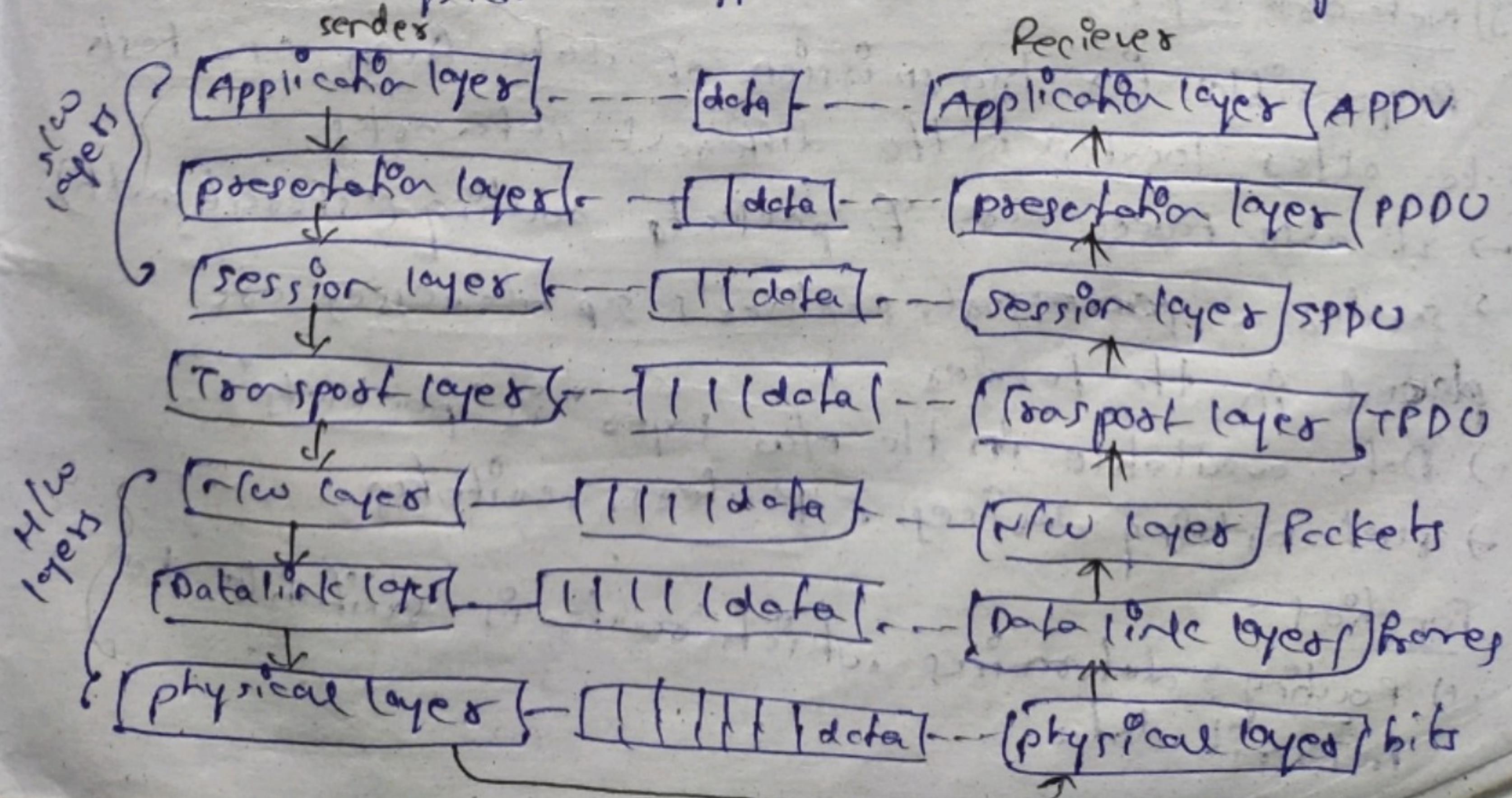
### 4) WAN (Wide Area Network):

- It connects computers over a large geographical distance through a shared communication path e.g. Internet.
- It is not restricted to a single person, extends upto many locations.
- Technologies used: Leased line, Dial-up etc.
- Data transmission speed is low.
- High maintenance cost.



### OSI Reference Model

- Open System Interconnection developed by ISO in 1984.
- It is a reference framework that explains the process of transmitting data between computers.
- It is divided into 7 layers that work together to carry out specialised new functions, allowing for a more systematic approach to networking.



### 1) physical layer:

- lowest layer of OSI model
- Responsible to establish physical connection b/w nodes
- the info. is available in the form of bits

⇒

110	0110	1011	
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#### functions

- 1) Bit synchronization → Bits transmitted with help of clock
  - 2) Bit rate control
  - 3) physical topologies
    - Simplex → only one side  $A \rightarrow B / B \rightarrow A$
  - 4) transmission mode
    - Half-duplex → both sides but not at same time  $A \rightarrow B / B \rightarrow A$
    - Full-duplex → both sides  $A \leftrightarrow B$  at same time
- 2) Data link layer:  
It is responsible for node to node delivery of messages
- 1) make sure data transfer is error-free from one node to another.
  - 2) PPP (Point-to-point protocol) → It allows node to node delivery of msgs
  - 3) framing → attaching special bit patterns beginning & ending of frame
  - 4) physical addressing → MAC address of sender/receiver
  - 5) flow control
  - 6) error control
  - 7) Access control
- Switches, Bridges are Data link layer devices

### 3) Network layer:

- Responsible for transmission of data from one host to other located in the different networks
- It also takes care of packet routing (shortest path)
- Sender & receiver's IP addresses are placed in the header
- Data available in the n/w layer is "packets"
- Networking devices → Routers, switches

#### Functions:

- 1) Routing → determines which route is suitable to transmit data

9) logical addressing : To identify each device on internet uniquely

### a) Transport layer:

- Responsible for end to end delivery of messages
- Also provides acknowledgement of successful data transmission & retransmit the data if error is found
- Data in the transport layer is called "segments"
- Also adds source & destination port no's in its header & forwards the segmented data to the n/w layer
- functions:
  - i) Segmentation & Reassembly
  - ii) protocols: TCP, UDP (unsegmented)
- 3) Service point addressing user datagram protocol

### b) Session layer:

- It is responsible for the establishment & termination, maintenance of sessions & authentication, & ensures security.

#### → functions:

- 1) Session establishment, maintenance, termination
- 2) Synchronization → allows a process to add checkpoints that are considered synchronization points used to identify the errors.

- 3) Dialog controlled : determines which device has to communicate first

### c) Presentation layer (Translation layer):

- Data from the application layer is extracted & manipulated as per the required format to transmit over the n/w.

#### → functions:

- 1) Translation

- 2) Encryption/decryption

- 3) Compression → reduces the no. of bits to transmit over the n/w

7) Application (yes & Desktop yes)

7) Application: It is a window for the application services to act as a媒介 between the user and the system. It receives info from the user and sends info to the system. Examples: MS Word, Excel, etc.

functions

- 1) Network virtual terminal → allows a user to log on to another host

2) FTAM → file Transfer Access Manager

3) mail service

ii) Directory services

Protocols used: SMTP, FTP, HTTP, telnet, HTTPS  
mail services  
smok new protocol

## TCP/IP Model

→ It was developed by US DoD in 1980's based on standard protocols

→ It is a 4-cycled architecture

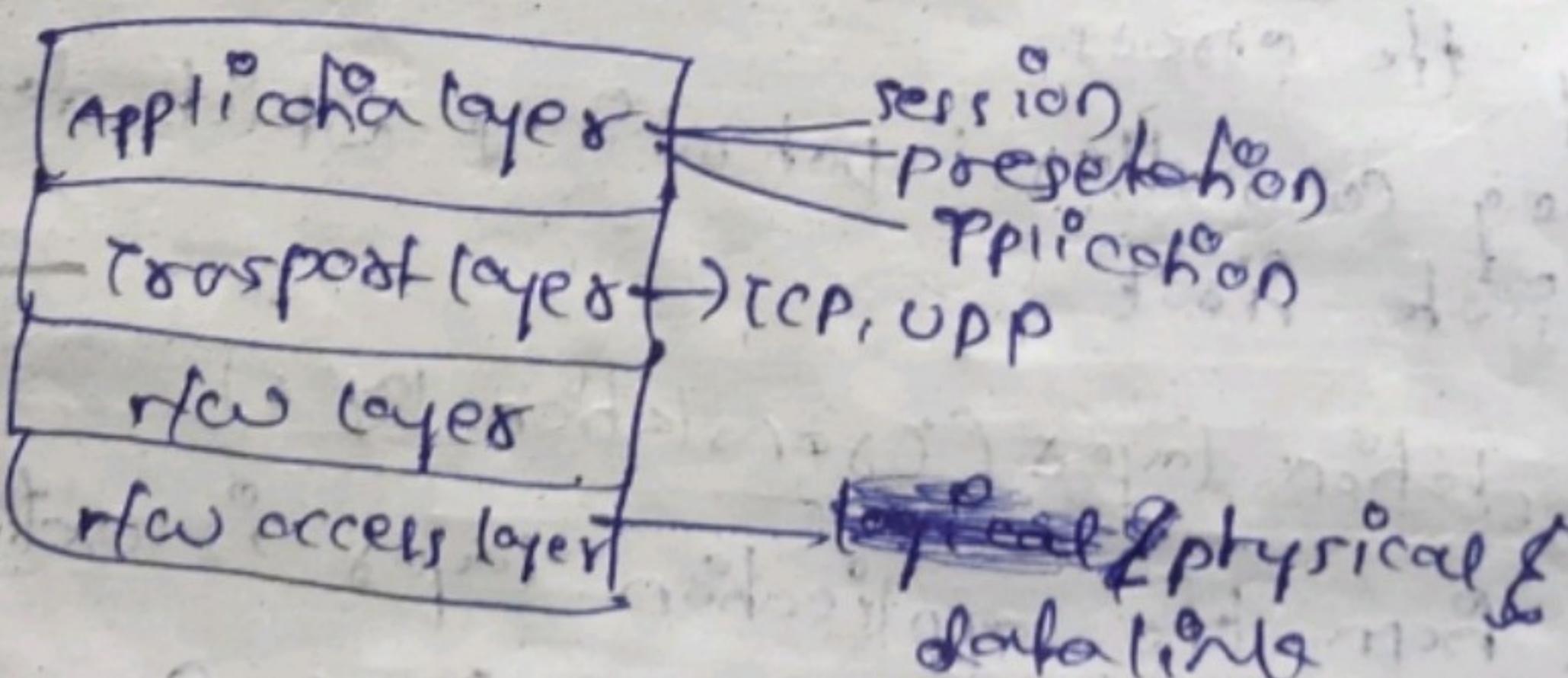
- It is a 4-wire.
- used to transfer the data of a computer from one device to another.

→ Data transmission is reliable & accurate

→ TCP is used to send, receive mails

→ IP finds the despiration of the mails

→ UDP doesn't require IP to transmit data



HAPPANGET

i) Network Access layer (Physical & Data Link layers)

→ responsible for georectifying the data & requesting  
corrections

→ Bit conversions, Good control, Access control,  
flow control

## ~~Layer~~ Network Layer : ~~Independent Layer~~

- Allows host to request inject packets into NW
- IP & ICMP protocols were used.
- IP is used for proper delivery of packets to the destination → Internet control msg protocol
- ICMP is used for error reporting
- ARP is used to find the MAC address of a host from a known IP address → Address resolution protocol

## 3) Transport Layer :

- used to exchange data receipt acknowledgement & retransmit missing packets, to ensure that packets arrive in order & without error
- end to end communication is achieved using TCP & UDP
- Provides multiplexing & De Multiplexing

## 4) Application Layer :

- It provides interface to the user
- Present the data into a user readable format
- Data encapsulation, encryption, Decryption etc
- Protocols used : HTTP, FTP, SMTP, NTP  
↓  
back to research

## Transmission Media

- It is a physical path b/w the transmitter & receiver
- It is the ~~channel~~ through which data sent from one place to another

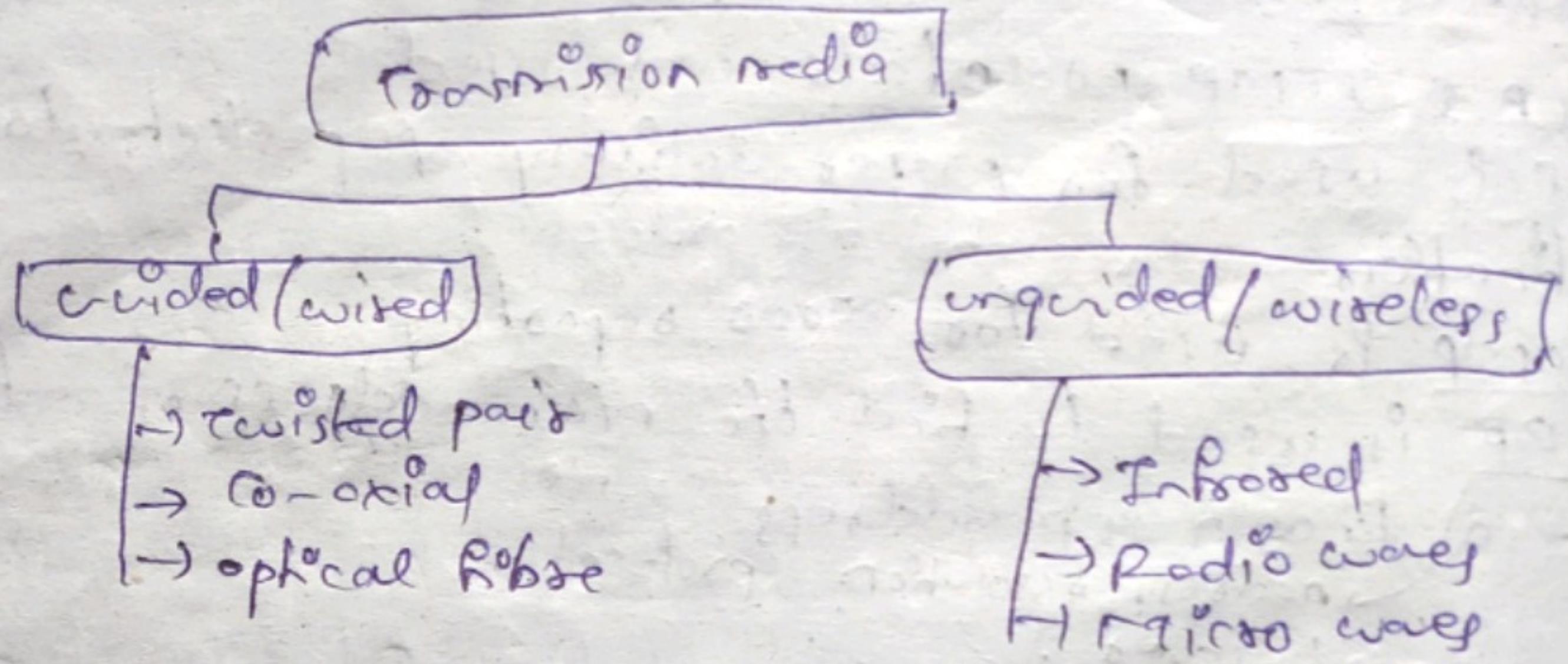
## Guided Media (wired/bounded)

- Signals being transmitted are directed & confined in a narrow pathway by using physical links
- High speed, Secure, used for short distances

## Unguided Media (wireless/unbounded)

- No physical medium is required for the transmission of electromagnetic signals.

- signals is broadcasted through air
- less secure
- used for longer distance



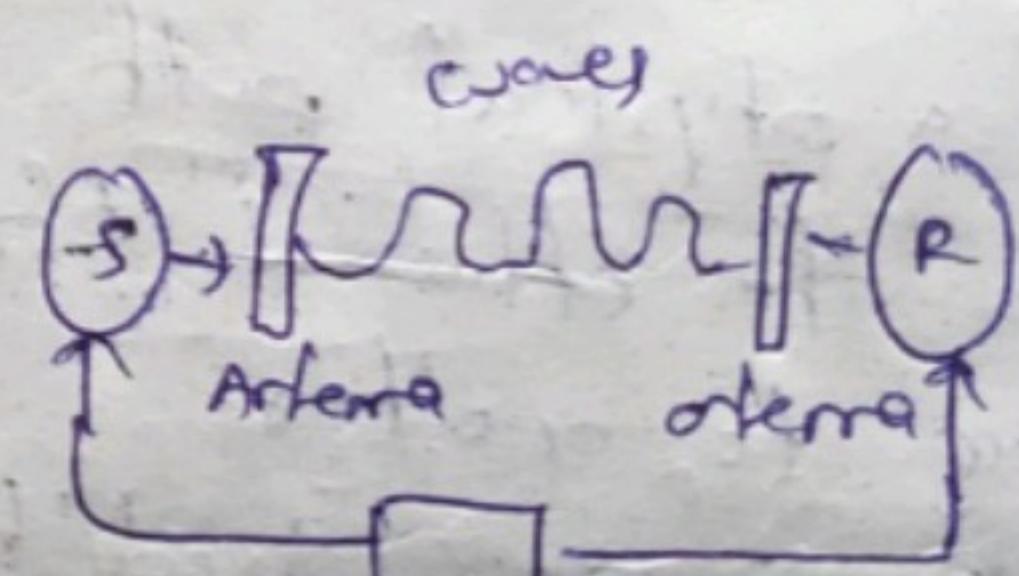
### unguided transmission Media

#### 1) Radio waves:

- they are easy to generate, can penetrate through walls/buildings
- the sending & receiving antennas need not be aligned
- frequency range: 3 kHz to 1 GHz
- ∞ : AM, FM radios, Cordless phones

#### 2) Micro Waves:

- it is a line of sight transmission
- the sending & receiving antennas need to be properly aligned with each other
- the distance covered by the signal is directly proportional to the height of the antenna
- frequency range: 2 GHz - 300 GHz
- ∞ : mobiles, telephones



#### 3) Infrared waves

- used for short distance communication
- can't penetrate through obstacles/walls
- frequency range = 300 GHz - 400 THz
- ∞ : TV Remote, wireless mouse, wireless keyboard



## Guided Transmission Media

### i) Twisted pair cable:

→ It consists of 2 separately insulated conductor wires wound each other. Several such pairs are bonded together in a protective sheath.

#### i) Unshielded twisted pair cable

→ consists of 2 insulated copper wires twisted around one another.

→ It has the ability to block interference & doesn't depend on a physical shield for this purpose.

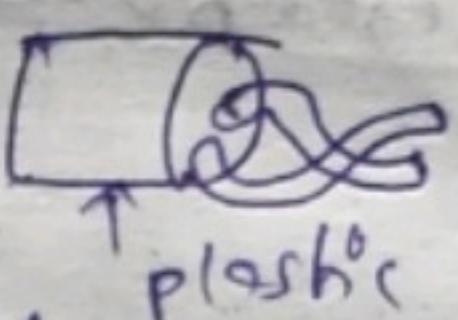
→ used in telephonic applications

#### Advantages

→ least expensive

→ easy to install

+ high speed capability



plastic cover

#### Disadvantages

→ short distance communication due to degradation

↓  
degradation in signal strength

→ slower capacity & performance

→ susceptible to external interference

#### ii) shielded twisted pair cable

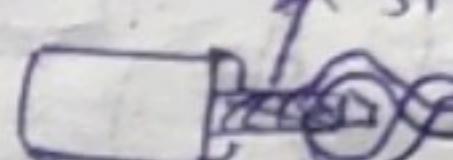
→ it consists special jacket (foil shield/copper braid) to block external interference.

→ used in fast data rate ethernet, voice data channels & telephone lines.

#### Advantages

→ Better performance

→ higher data rate



metalllic  
shield

→ eliminates cross talk plastic cover

#### Disadvantages

→ Difficult to install & manufacture

→ more expensive

## Coaxial cable:

→ It has a outer plastic cover containing an insulation layer made of teflon & 2 parallel conductors. Each having a separate insulated protection cover.

→ It transmit data in a coax

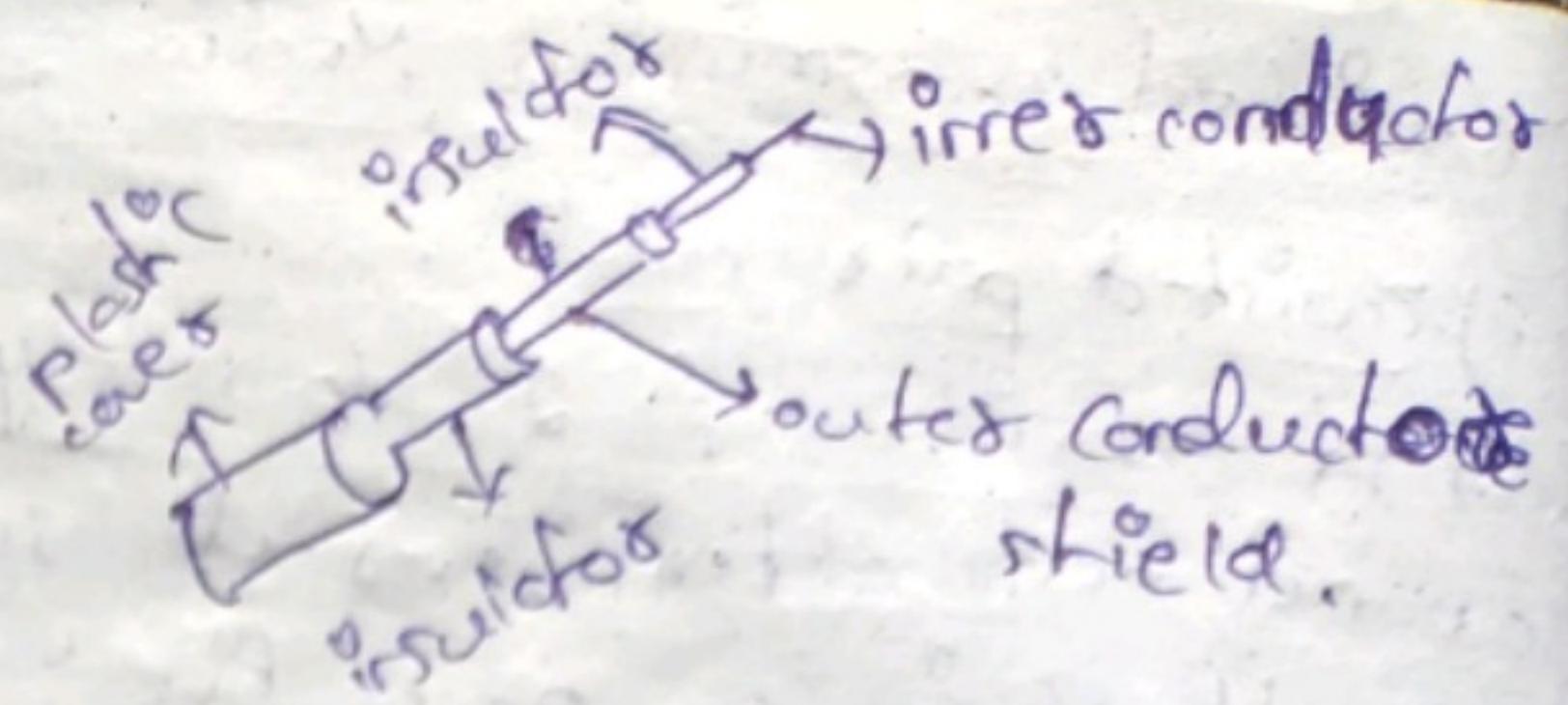
i) Baseband mode (dedicated cable bandwidth)

ii) Broadband mode (cable bandwidth is split into separate signals)

ex: cable tv's, analog tv (VHF, Radio frequency signals, digital audio, computer network (Ethernet))

### Advantages

- 1) High bandwidth
- 2) Better noise immunity
- 3) Easy to install & expand
- 4) Inexpensive



### Disadvantages

- Single cable failure can disrupt the entire network

### Optical Fibre cable

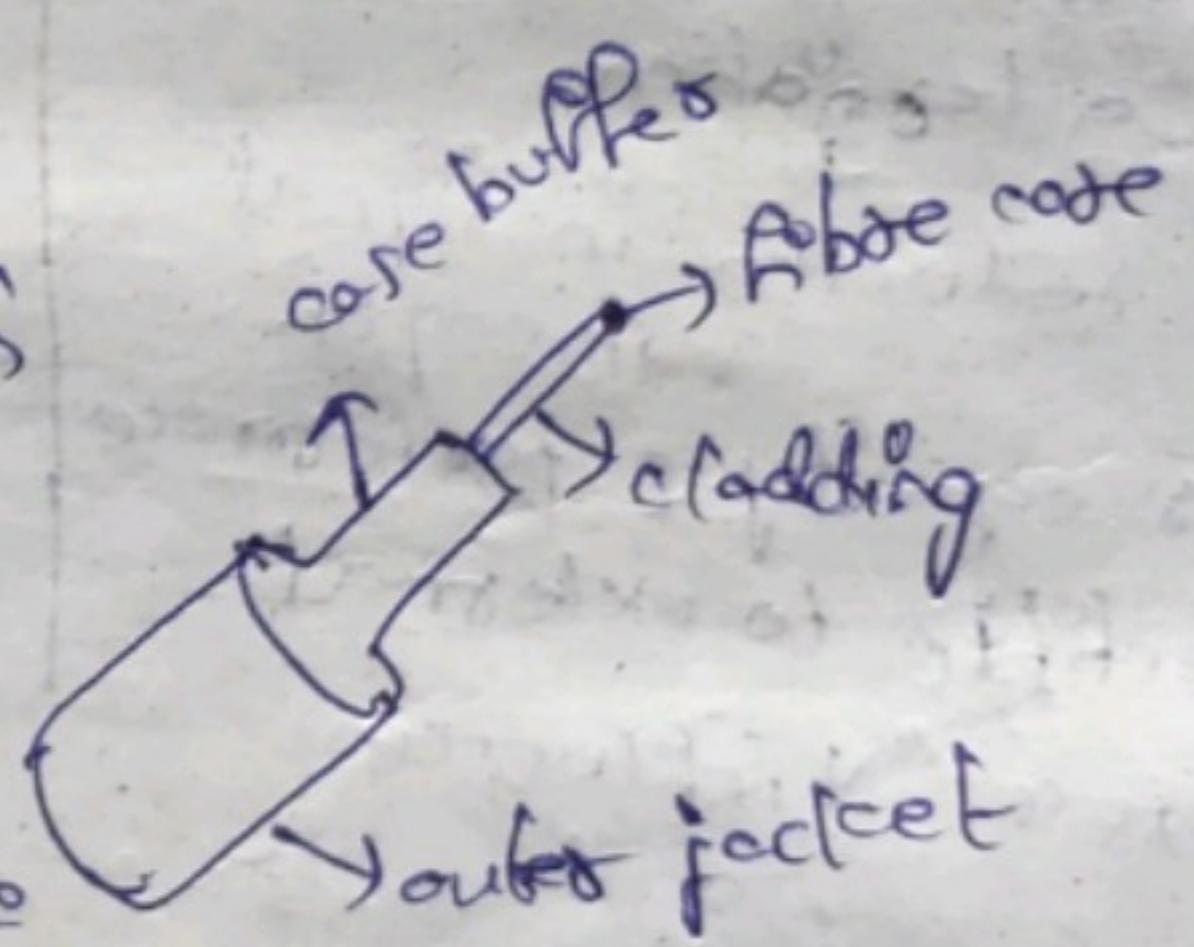
- uses the concept of reflection of light through a core made up of glass/plastic
- the core is surrounded by a less dense glass/plastic covering called cladding
- used to transmit large volume of data
- cable can be unidirectional/bidirectional

### Applications:

- medical instruments
- used in aerospace
- lighting & safety purpose in designing automobiles
- formation of internet cables

### Advantages

- increased capacity & bandwidth
- light weight
- less signal attenuation
- Immunity to electromagnetic interferences
- Resistant to corrosive materials
- damage to living tissues



### Disadvantages

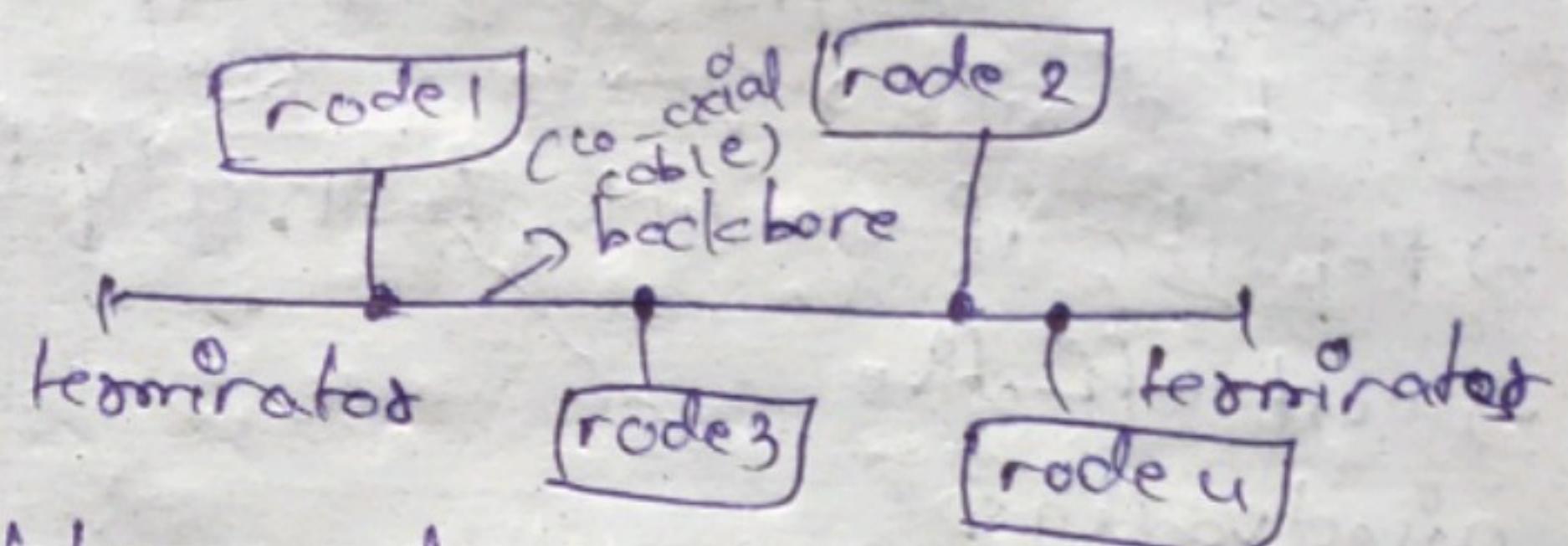
- Difficult to install & maintain
- High cost
- fragile (easily destroyed)

## Topology:

→ the way of arranging the nodes into a nw called topology

### 1) Bus topology:

- every computer & nw device is connected to a single cable
- it is bidirectional & multipoint connection topology
- non-dobust because if the backbone fails the topology crashes.



#### Advantages:

- used to build small nw's
- less cost
- co-axial/twisted pair cables used
- Installation & trouble shooting techniques should be well known

#### Disadvantages:

- If common cable fails, whole system crashes
- Security is low
- adding nw devices to the nw would slow down nw
- if nw traffic is heavy, it increase collision in nw ex: LAN, TV nw's

### 2) Ring topology:

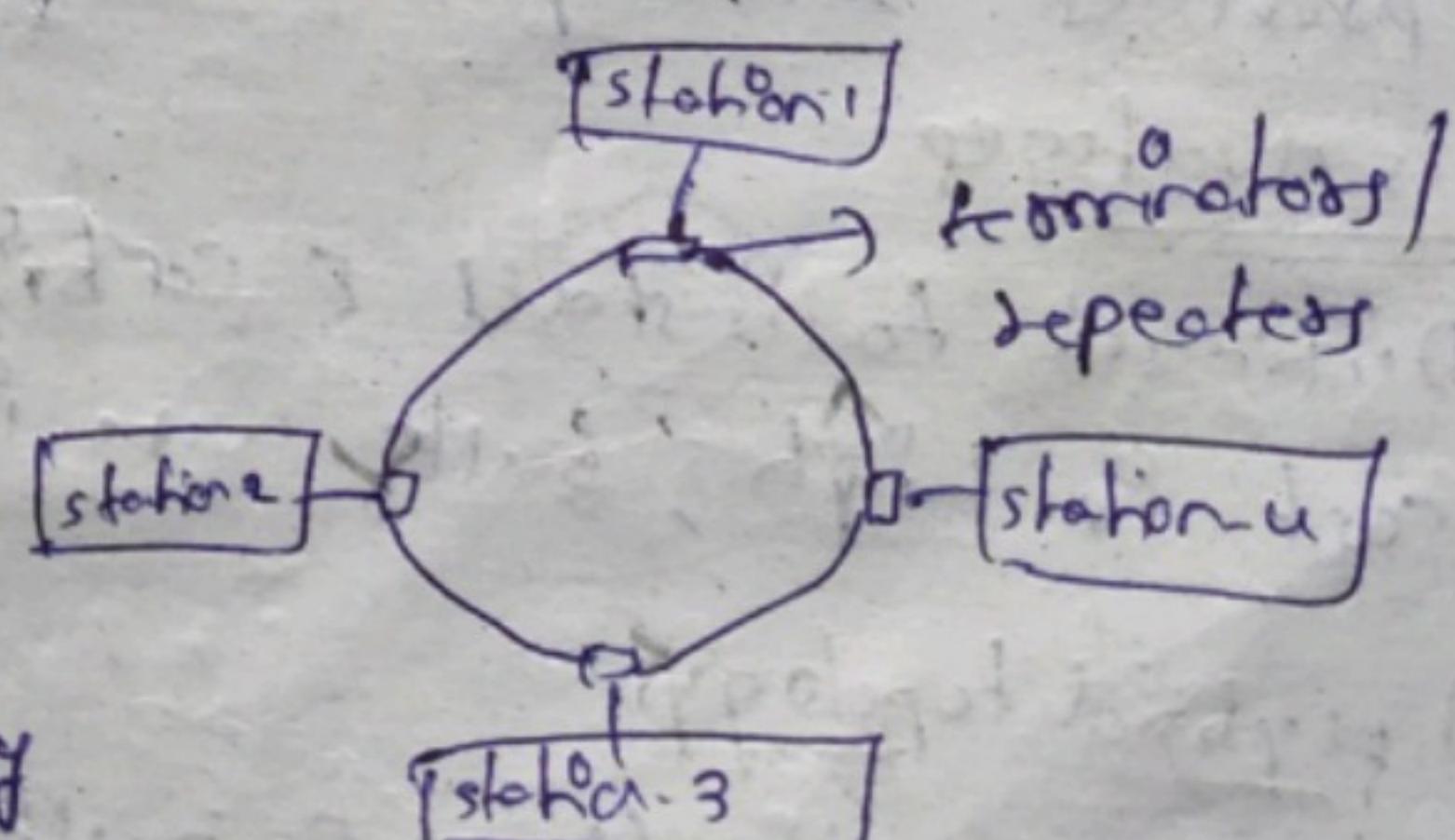
- each computer is connected to the next computer with the last one connected to the first
- no. of repeaters are used to prevent data loss
- data flows unidirectional
- token ring technology is used
  - ↓ It is a frame, circulate around the nw

#### Advantages:

- High speed data transmission
- Collision is minimum
- cheap to install & expand.
- less costly than star topology

#### Disadvantages:

- failure of single nw can cause damage to entire nw
- trouble shooting is difficult
- less reliable
- can't add more nodes



### 3) Star topology:

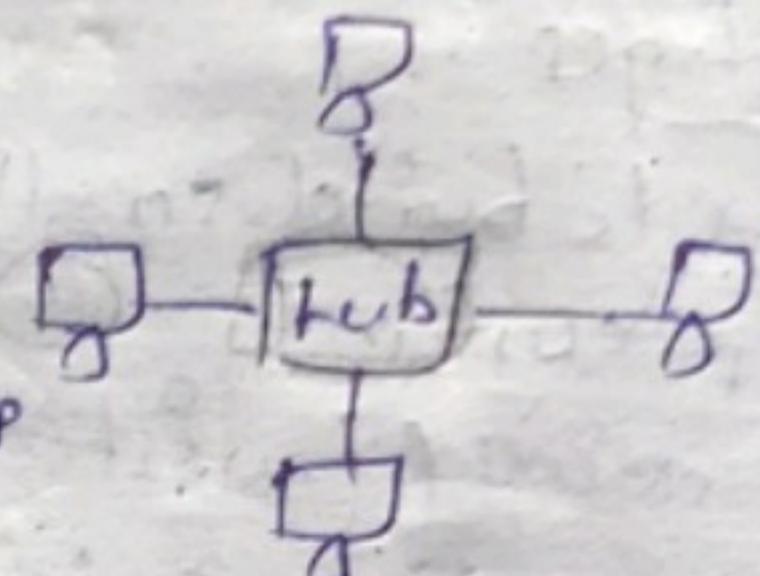
- All devices connected to a single hub (central node)
- Co-axial, RJ-45 connectors are used
- Ethernet protocols: CSMA/CD used  
X carries ~~sends~~ multiple action

#### Advantages:

- Easy to setup n no. of nodes
- each device requires 1 port
- Robust, if one link fails, only that node will affect.
- cost effective

#### Disadvantages:

- If central hub fails, whole network crashes
- Cost of installation is high
- performance is based on hub



Ex: office LAN

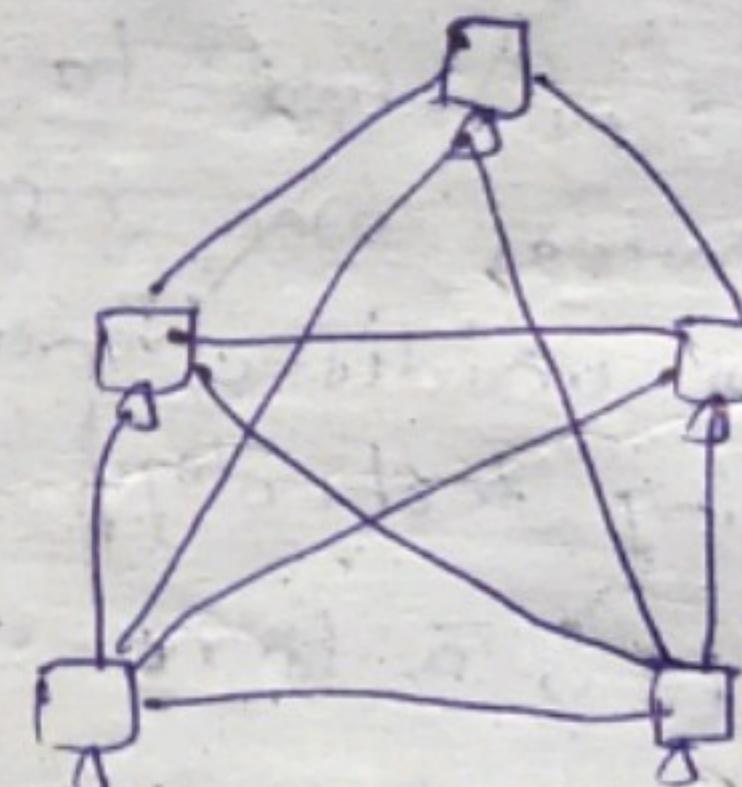
### 4) Mesh topology:

- Each device has connected to every other device via channel.
- Protocol used: DHCP (dynamic host configuration protocol)
- If 'n' devices connected with each other  $(n-1)$  ports are required, total no. of dedicated links are  $n(n-1)/2$

#### Advantages:

- Communication is fast b/w nodes
- Robust
- Fault diagnosed easily
- provides security & privacy

#### Disadvantages:



→ Difficult to install & configure

→ cost is high, bulk wire is required

### 5) Hybrid topology

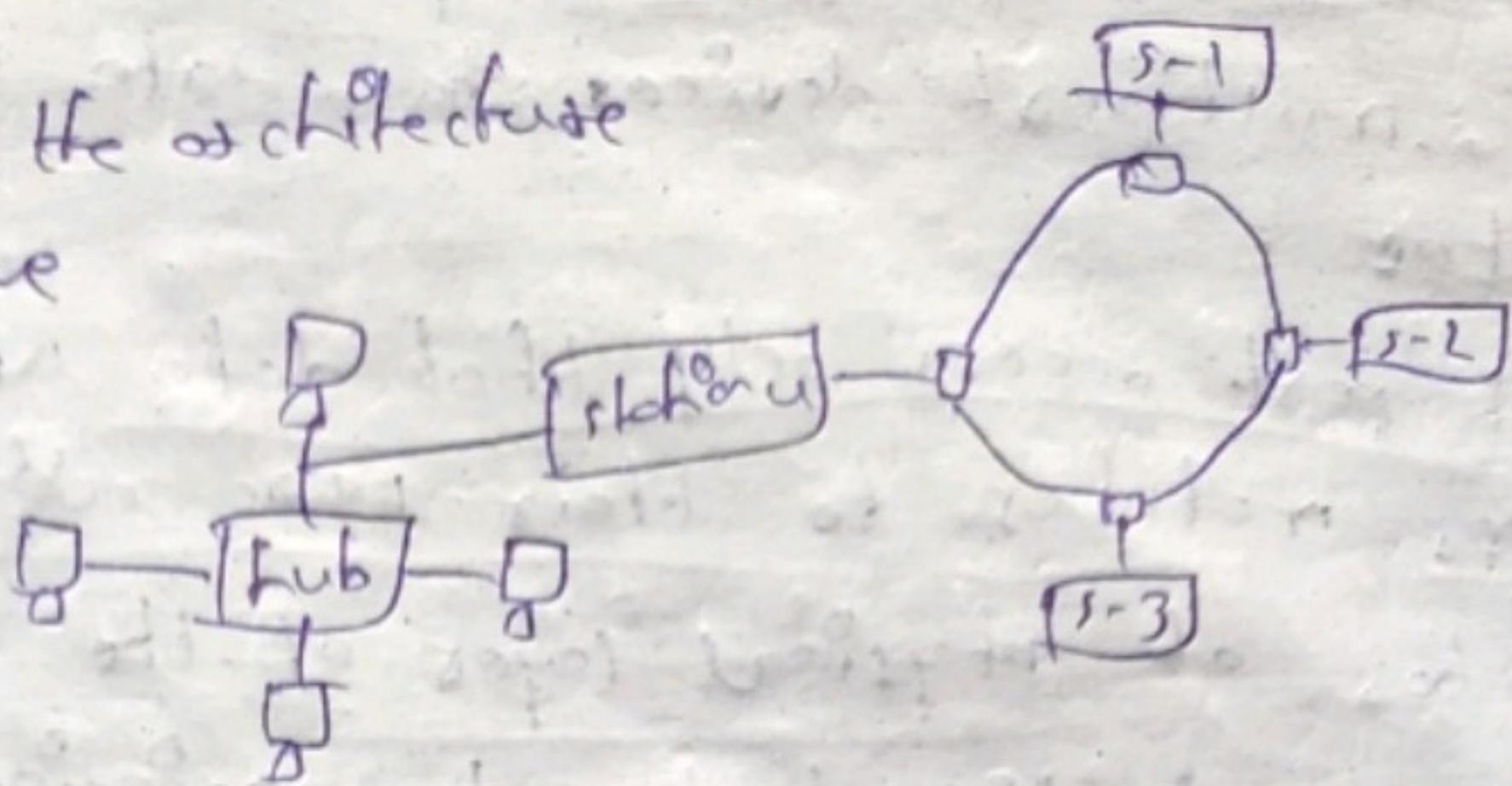
- It is a combination of multiple topologies (Ring, star, bus)
- each individual topology uses their own protocol

#### Advantages:

- flexible
- Adding new devices is easy

### Disadvantages

- challenging to design the architecture
- Hubs are expensive
- cost is high



### Hardware components of computer motherboard

→ North Bridge: it establishes communication with processor

→ controls memory (RAM), PCI, AGP

→ it is in either gold or silver color

→ South Bridge: it is used to control I/O devices

→ it is in black color

→ CMOS Battery (Complementary Metal Oxide Semiconductor)

→ it stores BIOS settings in computer motherboard & also store date & time for longest period of time

→ BIOS (Basic I/O System): it manages the data flow

between operating system to other devices

→ it also makes microprocessor user to get the computer to turn it on

→ ATX (Advanced Technology Extended): this cable

control the power fluctuations.

→ AGP (Accelerated Graphic port)

PS/2 slot → Keyboard & mouse

→ Static RAM: it is made up with transistors

→ used as a cache memory

→ Dynamic RAM

→ it is made up with capacitors

→ used as a main memory

→ PCI slot (Peripheral Component Interconnect)

→ CNR slot (Communication & Networking Riser): used to connect audio, networking & telephonic equipments.

## LAN components / Networking devices

1) Hub : multipoint devices, share data to multipoints all together

→ each port access only that data whose destination address matches to their MAC address

→ operates at physical layer of the OSI model

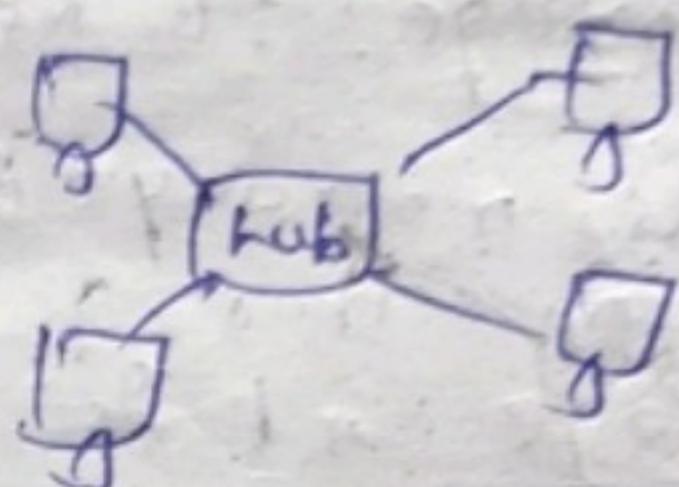
→ supports Half-duplex transmission mode

→ can find the best/shortest route/path to transmit data

→ can't perform data filtering

→ can operate at 10Mbps

→ it's a passive device



2) switch :

→ used to segment the network into different subnetworks

→ responsible for filtering, forwarding the packets b/w LAN segments

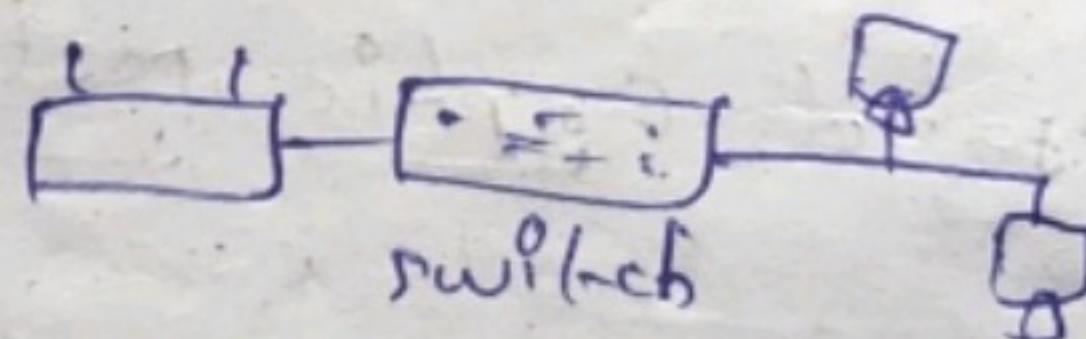
→ switches have many ports, examine destination address, then transmit data

→ operates at DataLink layer of OSI model

→ performs error checking

→ operates in full-duplex transmission mode

→ supports unicast (1-1), multicast (1-N), broadcast (1-all) transmission.



3) Router :

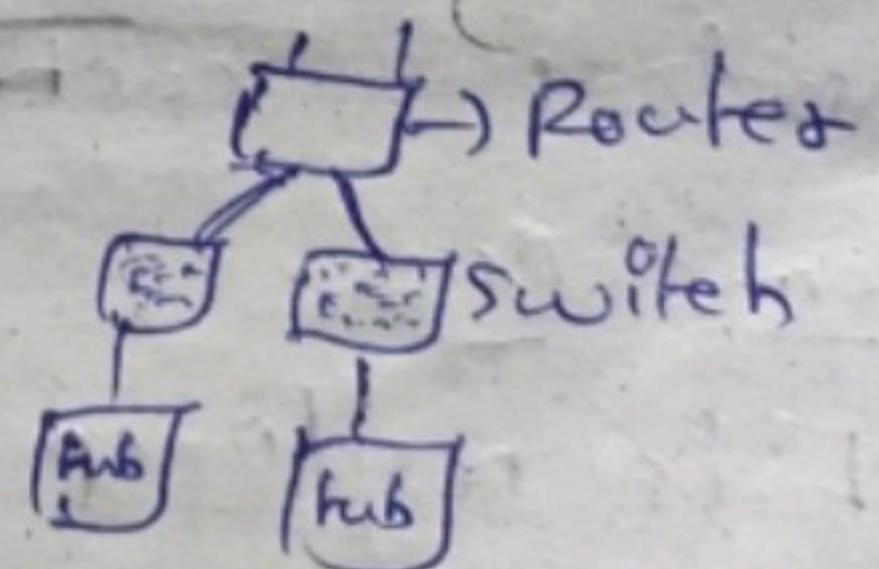
→ forwards data packets b/w networks based on their IP addresses

→ it is a network layer device

→ connects LAN's & WAN's

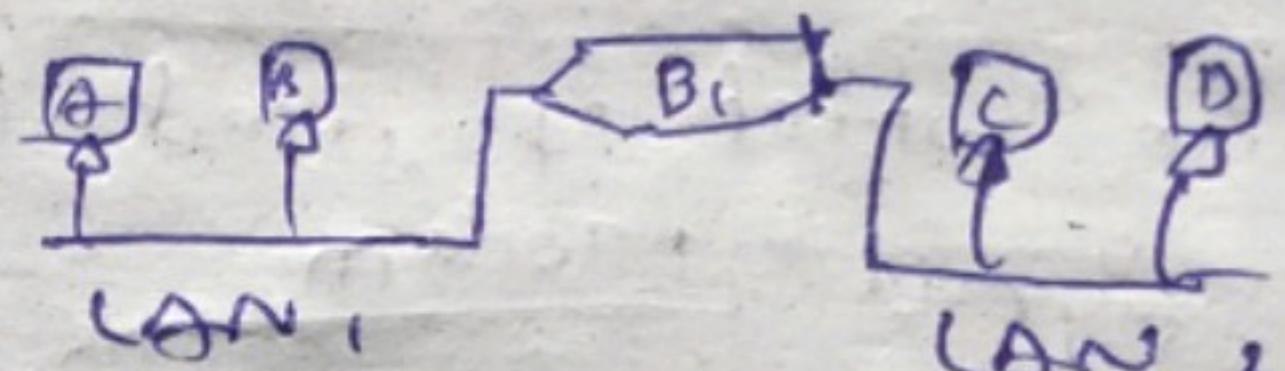
→ filters packets of data

→ use NAT (Network Address Translation) to map multiple of private IP address into one public IP address



#### 4) Bridge:

- used to connect multiple LAN's together with a larger LAN
- operates at Datalink layer of OSI model
- used to examine the incoming traffic & determine whether to filter/forward it
- used to divide the LAN's into multiple segments
- used to simple installation, no requirements of extra s/w or n/w
- can use as a network extension, they can connect 2 nw topologies together



#### 5) Gateways:

- It provides an interface b/w 2 applications/networks that use different protocols
- used to provide internet connection
- Examines the data packet then passes it to the other nw
- helps in connecting 2 different nw's
- provide security from ~~external~~ attacks

#### 6) Repeater

- It is used to amplify & generate the incoming signal
- It operates at physical layer of OSI model
- used to increase the networking distance by increasing the strength & quality of degraded signals
- used to reduce the error, loss & data, provides with delivery of data at specified locations only

#### 7) NIC (Network Interface card) / Ethernet card / LAN card

- used to connect to the internet to computers/laptops with the help of LAN cable & RJ-45 connector/USB connector.

#### 8) modem

## LAN Components

→ A LAN is a network of computers & other components located relatively close together in a limited area.

### Components

#### Computers

- 1) PC's
- 2) Servers

#### Interconnection

- 1) NIC
- 2) Transmission media

#### Networking devices

- 1) Hub
- 2) Switch
- 3) Bridge etc

#### Protocols

- 1) IP
- 2) ARP
- 3) DHCP

- → A device which is used to convert analog to digital signal. Modem

## Application Layer protocols

### 1) DNS (Domain Name System):

→ works in client-server model

→ It is an internet service that translates domain names into IP addresses

www.gmail.com → 198.24.26.81

### 2) SMTP (Simple Mail Transfer protocol):

→ It is an internet standard protocol for email transmission

→ SMTP connections are secured with SSL (Secure socket layer)

→ In SMTP the messages are stored & then forwarded to the destination

→ SMTP uses port no 25 of TCP

### 3) FTP (File Transfer protocol):

→ used to exchange the files on the internet

→ It can be invoked from command prompt or GUI mode

→ most commonly used to upload & download files from/to the internet

→ It uses reserve port no 21

### HTTP (Hypertext transfer protocol)

- it is used to access the data on the web
- Data is transferred b/w client & server
- uses the services of TCP on port no (80)
- HTTP delivers the messages immediately

### ARPANET (Advanced Research project Agency network)

- Basis of the internet
- Developed by US DOD in 1969
- It was expanded in 1970 with the help of TCP/IP

### ISP (Internet service provider)

- company that provides internet access to the customers
- Data may be transmitted using several technologies including dialup, DSL, cable modem, wireless or high speed interconnections

### WiFi (wireless fidelity)

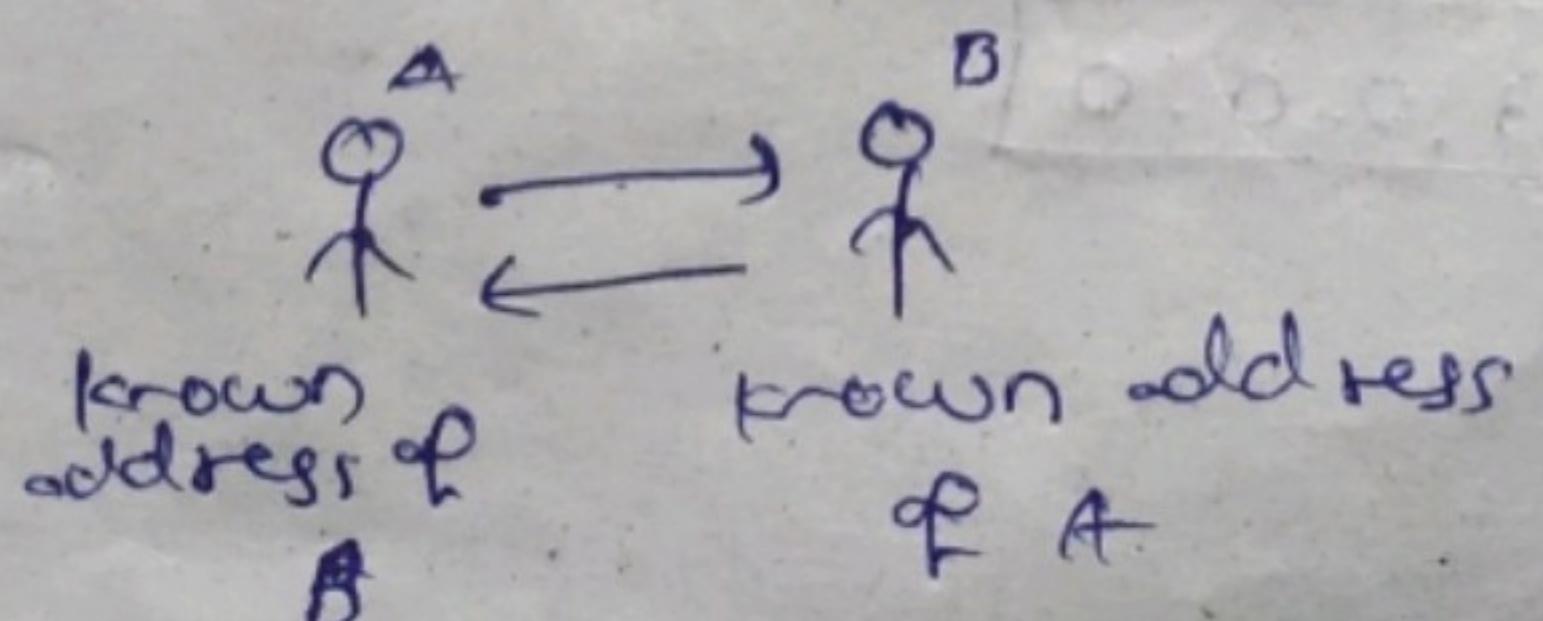
- uses wireless signals b/w antennas of the medium rather than cabling
- most of the wireless protocols in use today are based on 802.11 standard.
- The four main protocols are :

802.11 a	802.11 b	802.11 g	802.11 n
↓ 54mbps	↓ 11mbps	↓ 54mbps	↓ 150mbps
shorter distance ↓ high speed	lower speed ↓ higher reliability	longer distance	

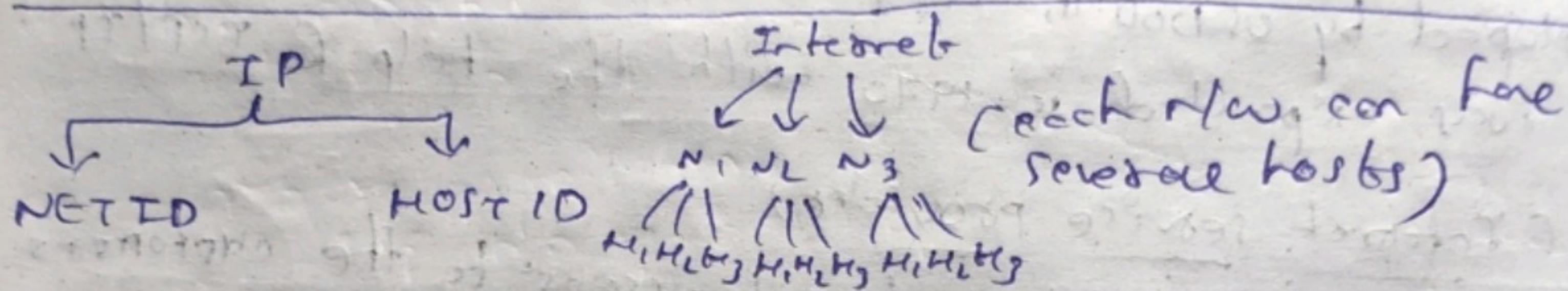
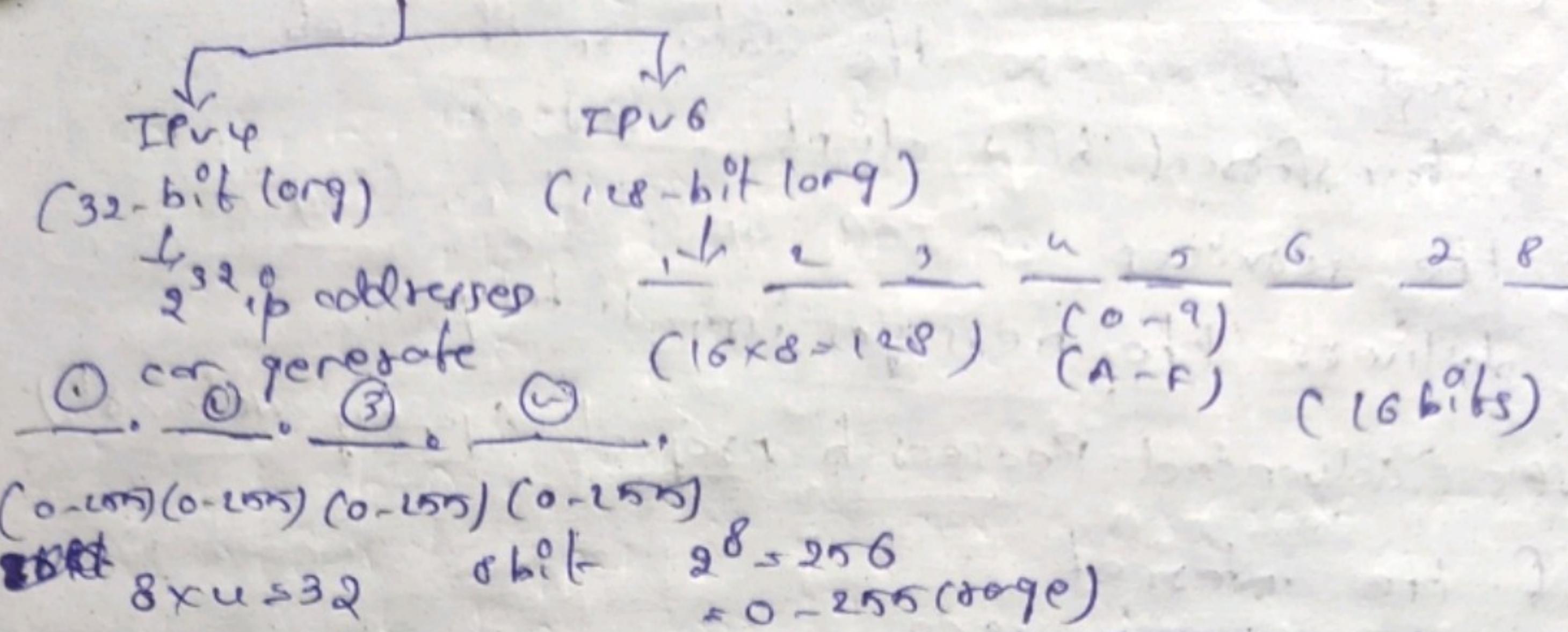
### IP Address

what → address of identifier for the device

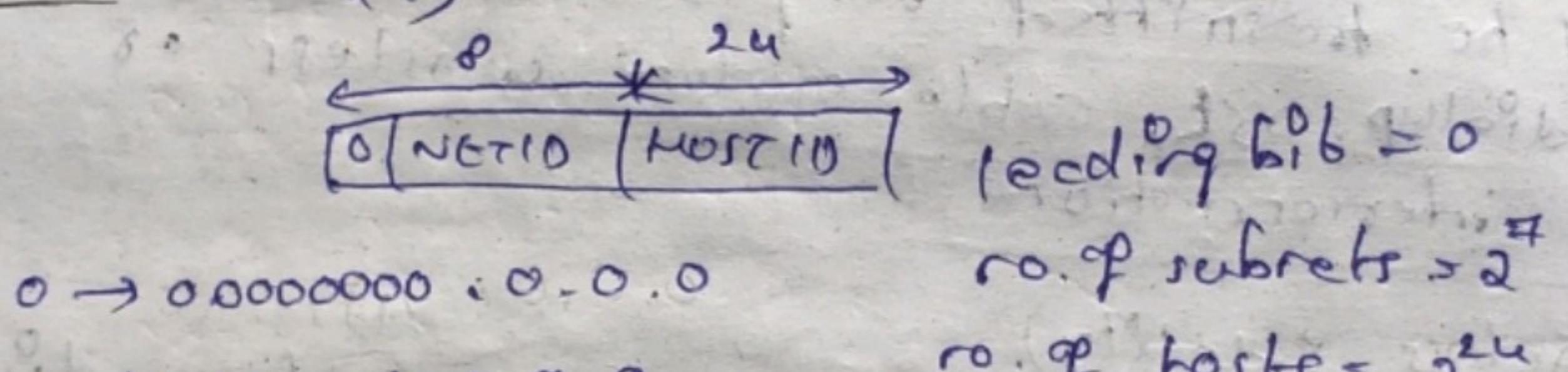
why → communicate with other devices over LAN/WAN



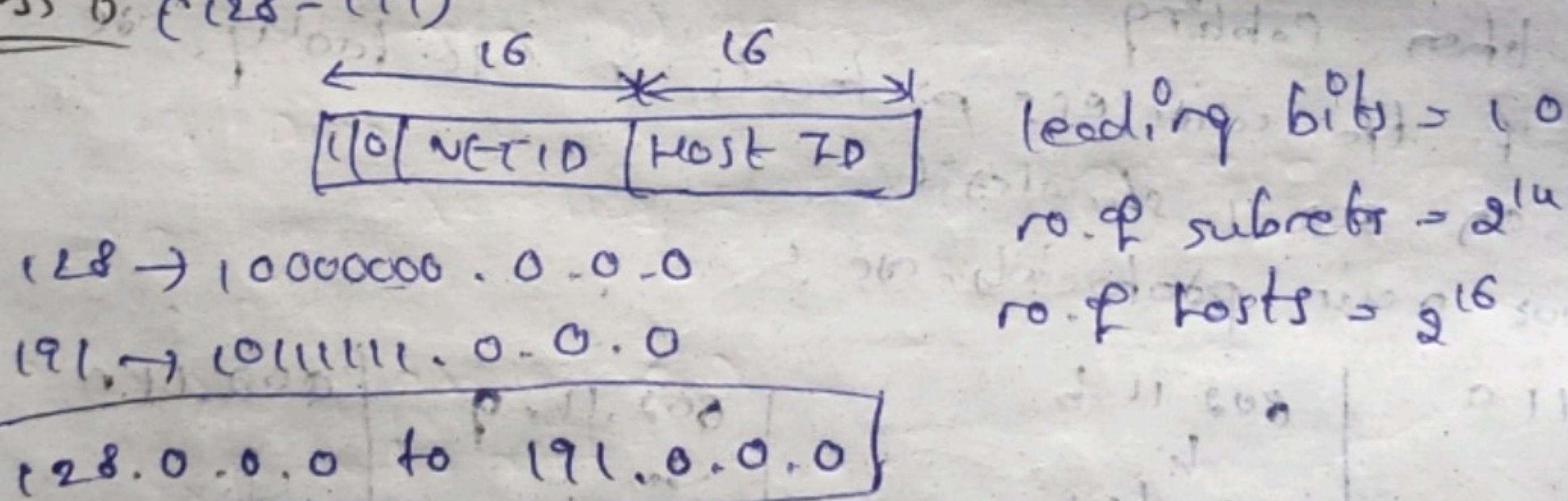
## IP → Internet protocol



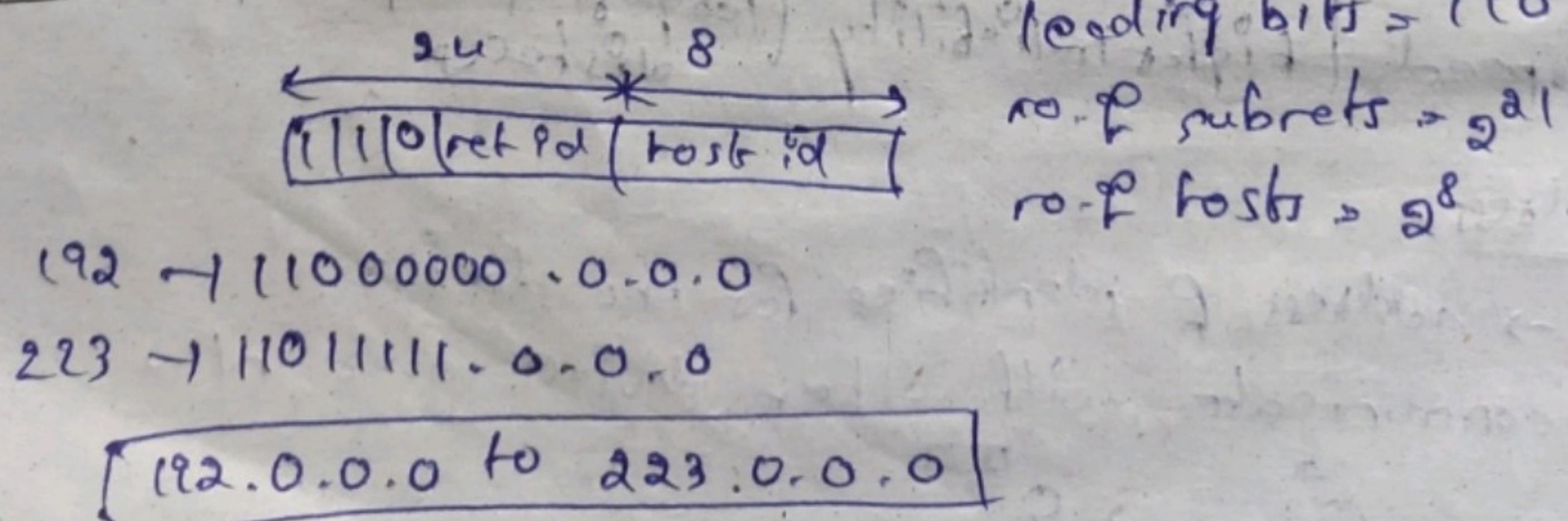
class A (0 - 127)



class B (128 - 191)



class C (192 - 223)



class D (224-239)

11110 netid | leading bit = 1110

224 → 1110 0000.0.0.0

239 → 1110 1111.0.0.0

[224.0.0.0 to 239.0.0.0]

class E (240-255)

11111 netid | leading bits = 1111

240 → 1111 0000.0.0.0

255 → 1111 1111.0.0.0

[240.0.0.0 to 255.0.0.0]

class	range	net id	host id	leading bits
A	0 - 127	8	24	0
B	128 - 191	16	16	10
C	192 - 223	24	8	110
D	224 - 239	multicast		1110
E	240 - 255	reserved		1111

subnet mask

class A : NET ID → 8 bits

1111111.0.0.0

[255.0.0.0]

class B : NET ID → 16 bits

[255.255.0.0]

class C : NET ID → 24 bits

[255.255.255.0]