11/09/2023 # COMPUTER NETWORKS:

NIC → Network Interface Card.

Hardware → systems, cables and NIC, topology are required to form CN

CN is an interconnection of computers.

→ Layout of system is called Topology

→ central device: switch | Hub

* Star, Mesh, Bus, Ring, Extended Star, Hybrid (combination) Topologies.

Software: Operating System, Communication software (Protocol Stack)

→ Flow control is done when there is a communication b/w server & client.

* Flow control also have protocols.

→ Communication takes place due to IP address.

→ Types of Communication:
- Simplex (One way)
- Half Duplex (2 way not simultaneous)
- Full Duplex (2 way & simultaneous)

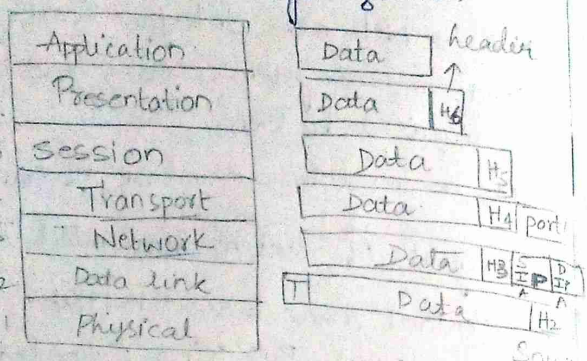
→ Protocols: Set of rules.

* Protocols are required so as to interpret or translate the data from one form to other understandable form.

* ISO OSI MODEL

International Standard Organization.

Open System Interconnection



→ Each layer provides a certain task and is independent of other layers.

12/09/2023

→ Types of networks

- → Local area Network (LAN) Bus, Star, Mesh, etc
- → Wide area Network (WAN)
- → Metropolitan area Network (MAN)

etc.

TCP/IP, protocol stack example of ISO OSI model

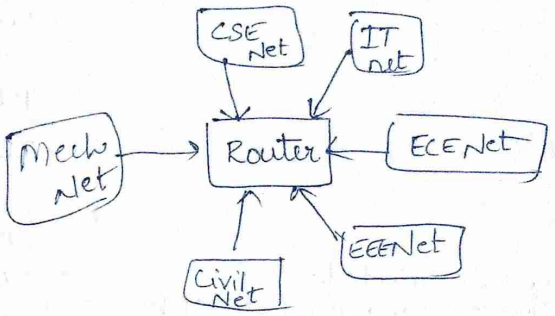
* Network layer determines the path.

Data translation
Data compression
Encryption
} Actions provided by presentation layer

→ Session layer establishes session for exchange data and then terminates

→ Transport layer provides error control, flow control, fragmentation and reassembly, multiplexing and demultiplexing. (checks if dest. is ready to accept the data)

→ Router is used to connect to the external network; so as to guide a packet to reach an external network.



→ More than one network can be connected to a single router

→ Router table helps in finding the destination which is a database in router

Intranet: Private (single organization)
Internet: Public

Interconnection of LAN.

→ Data link layer consists of switches.

14/09/2023

*Comparison of ISO OSI and TCP/IP models:

TCP/IP: first protocol then model

ISO OSI: first model then protocol.

ISO OSI

Application
Presentation
Session
Transport
Network
Data link
Physical

TCP/IP

Application	HTTP, DNS, FTP, TFTP, SNMP, SMTP
Transport	TCP, UDP
Internet	IP, ICMP, IGMP, ARP
Network Access	Ethernet, token ring, ISDN, ATM

→ connection oriented.

* TCP: Slower compared to UDP. and reliable but acknowledgement is required.

UDP: faster and not that reliable; connectionless. acknowledgement is not required.

→ PING: network to network.

* ICMP supports ping operations.

↳ Internet Control message protocol

ISDN → Integrated Service Digital Network.

* Types of networking:

→ Unicasting: one to one

→ Multicasting: one to many

→ Broadcasting: many to many

RARP: Reverse Address Resolution Protocol (32bits)

ARP: Address Resolution protocol: converts physical address to mac address (Media Access Control) (48bits)

→ Switch is part of data link layer.

→ Hub is part of physical layer.

* Intermediate devices does not have access to transport layer.

* End devices only have access to transport layer.

* 3 concepts are central to the OSI model.

- Services
- Interfaces
- Protocols.

→ For mesh topology $\frac{n(n-1)}{2}$ connections are required. (n → length of wire required)

→ IP, port, MAC addresses are application addresses.

→ ~~IP~~ IP address (decimal format)

→ MAC address (hexadecimal format)

↳ Had be added at data link layer

↳ ARP is used to get this MAC addr

port: determine each application uniquely

IP: device address (logical) communicate effectively

MAC: standard

→ SNMP: Simple Network Management Protocol

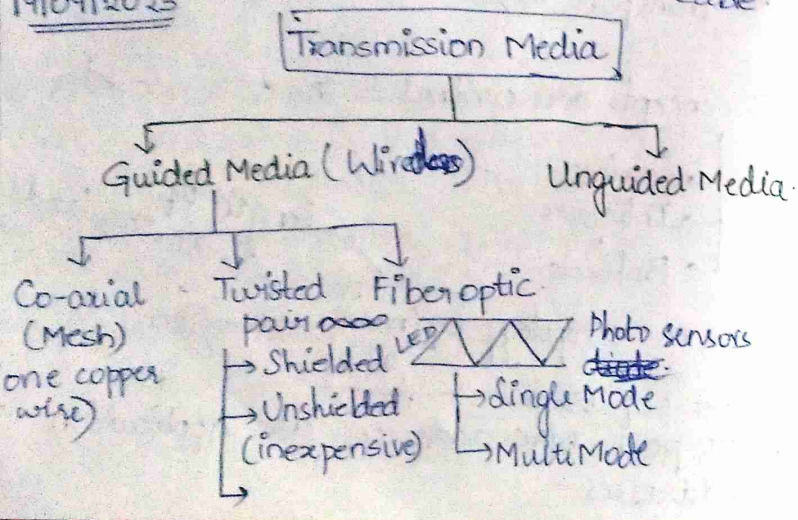
→ SMTP (P-25): Simple Mail Transfer Protocol

15/09/2023

* Transmission Media:

Co-axial cable, twisted-pair cable, fibre optic cable

19/09/2023

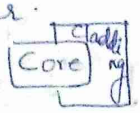


→ Guided media: copper wire is used which is covered by plastic cover which is useful for to stop avoid the effect of EMW

RFI
EMI

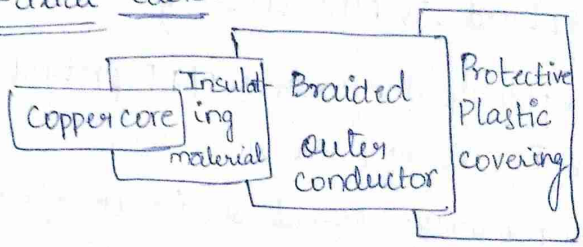
→ In Fibre optic; we use LEDs instead of copper wire ~~in a vacuum~~ and transmission takes place in vacuum

* Error free
* Data transmission takes place along longer distances
* ~~Bandwidth~~ Bandwidth is larger.



* Wireless media: LF - UHF
300Hz - 300GHz

* Co-axial cable:



→ In twisted pair ~~cab~~ transmission; we can avoid cross talk/external effects.

→ Twisted cables are at equal intervals.

* Fiber cables.

* Wireless Transmissions

- Electromagnetic spectrum
- Microwave transmission
- Infrared Transmission
- Light Transmission

21/09/2023

Data link layer

- LLC : Logical Link Control layer
- MAC : Media Access Control layer

→ Any layer 'n' in the ISO-OSI model takes services from (n-1) layers and provides services to (n+1) layers.

→ MAC : Software + hardware.
  ↳ placed in NIC circuitry.

→ LLC:
  ↳ placed alongwith TCP/IP protocol suit.

* Design Issues of data link layer:

1) Providing a well-defined service interface to the network layer
2) Dealing with transmission errors.

→ Types of services:

1) Unacknowledged connectionless service.
2) Acknowledged connectionless service.
3) Acknowledged connection-oriented service.

→