

## [Ch-02] Computer Network

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① Computer Network → It is a group of computers connected together for the purpose of sharing some data.

② Network Goals →

① Authentication → proving your identity to get access to something.  
eg:- username, password, biometrics.

② Authorization → Imposes a restriction on what level of access is to be granted to a user.

③ Availability :- Resources should be available 24x7.

④ Encryption :- converting the plain text to cipher text / coded text.

eg:- Caesar cipher

① P.T = WELCOME

EFGHI

(Key +4) C.T = AIPGHSJI

LMNOP

② P.T = LOVELY UNIVERSITY

(key +3) C.T = ORYHOB XSLXHUVLWB

③ P.T = KHOOR

(key -4) C.T = HELLO.

## # effectiveness of data communication

- ① delivery.
- ② Accuracy.
- ③ Timelines.
- ④ Jitter → variation in packet arrival time.

5-components → message, sender, Receiver, Transmission medium, protocol.

- ① → 31 sec ] Jitter ✗
- ② → 31 sec ]
- ③ → 32 sec ] Jitter ✓

- ⑤ Protocols :- Set of Rules or guidelines that governs data communication.

## \* # social issues

- ① Network neutrality :- It is the principle that all ISP must treat all the internet communication equally; offering them constant rate irrespective of websites, platforms, background etc.
- ② Digital Millennium Copyright Act :- This is designed to protect copyright holders from online theft.
- ③ profiling users :- process of Grouping some websites or customers into specific groups based on some matrix.

(iii) Phishing → unauthorized attempt to get personal details of a victim like UN, password, OTP over e-mail.

Smishing → do → over SMS.

Vishing → do → over phone call.

⑥ delay :- Amount of time required to go for one packet to go from the source to its destination.

⑦ Throughput :- Volume of data that passes through the network in a given time.

## \* No. Types of Network

① Personal Area Network :- (PAN)

- ⓐ shorter distance, less than 15-20 meters.
- ⓑ less users.
- ⓒ transmission of data between PC, laptop etc.
- ⓓ secured using encryption and authentication protocols.

② Local Area Networks :- (LAN)

- ⓐ Group of computers connected in a limited area for example → Home, office, building etc.

- (b) widely used Network after Internet.
- (c) private Network
- (d) higher speed than WAN, MAN but less than PAN.
- (e) if device or server crashes it affects the whole Network.

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

- (a) covers college, campus, town, etc.
- (b) covers larger area than LAN; but less than WAN.
- (c) data transferred using fibre optic cables.
- (d) can be used by ISP's for multiple customers.
- (e) costly, requires more cables.

### ④ Wide Area Network :- (WAN)

- (a) covers cities, state, countries etc.
- (b) largest and most expensive type of network.
- (c) slow speed and less secured.
- (d) High cost.
- (e) More delay.

Note  
in

Refer to table from ppt.

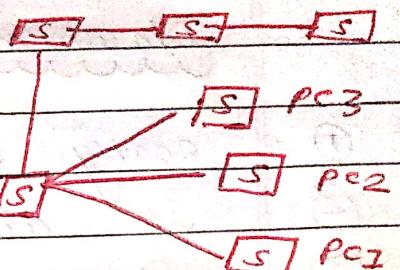
## No Topologies

- ① Mesh
- ② star
- ③ Ring
- ④ bus
- ⑤ Tree
- ⑥ Hybrid.

⑥ Tree = bus + star first 4 from opt.

⑤ Tree :- Advantages :-

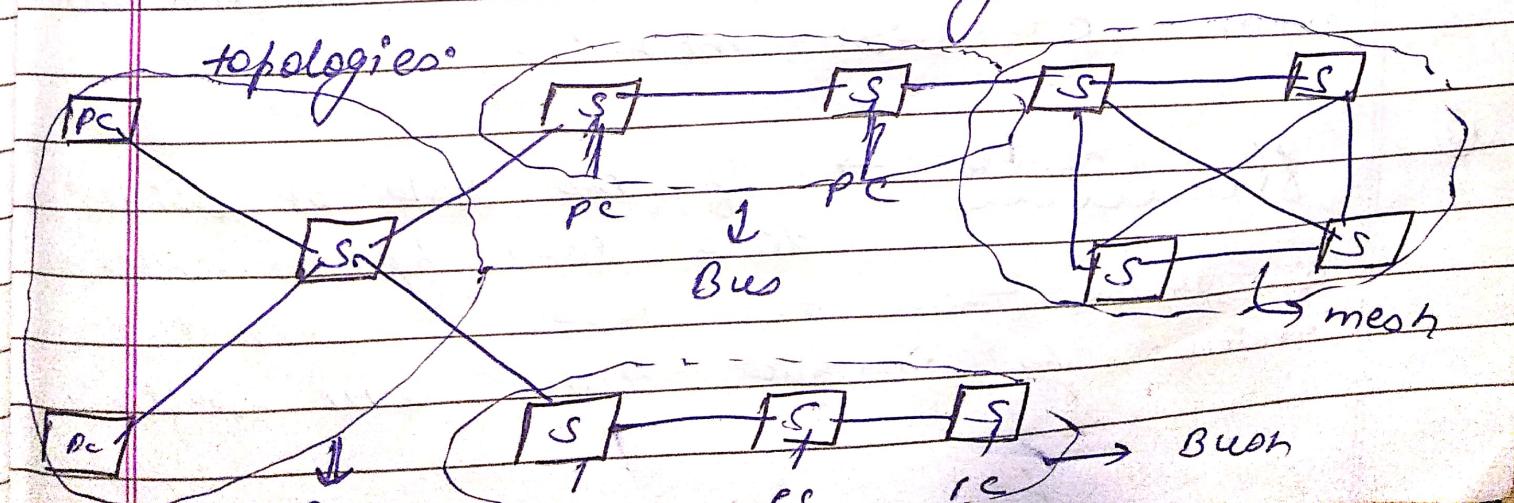
- ① Easy fault detection
- ② used for large networks
- ③ Easy to add devices.



disadvantages :-

- ① difficult to install because it is a combination of two - two topologies.
- ② failure in the backbone or central hub can affect entire network.
- ③ costly because of more cables.
- ④ difficult to maintain.

⑥ Hybrid Topology :- It is combination of only 2 or more topologies.



## Advantages :-

- ① Benefit of multiple topologies in one.
- ② we can modify as per our requirements.
- ③ can be used for very large networks.
- ④ can handle very large volume of data.

## Disadvantages :-

- ① costly because more h/w & cable are used.
- ② It will be complex.
- ③ difficult to install and maintain.

## The design issues for the layers

- ① Addressing or Naming :- At one time multiple messages are exchanged between S (senders) & R (receivers). So, there must exist a naming system which allows each layer to identify S and R of messages.
- ② Error Control → Layers must have a common error detection and error correction method.
- ③ flow control → If the rate at which data send by the sender is greater than the rate at which data received by receiver data will overflow.

Statistical Multiplexing :- It is not possible to assign a dedicated path to each message, so the data channel must be multiplexed.

Routing → If we have multiple paths to reach the destination, choosing the best path in terms of time and cost is called Routing.

Scalable :- easy to add or remove devices.

QoS :- (Quality of service) :- It is a capability of a network to provide high quality services to the user.

Reliability :- Time taken to recover from failure.

Security → protecting against Eavesdropping and data alteration.  
(Authentication, Authorisation, Encryption).

Eavesdropping → silently listening to something.

## No Connection Control

		No Connection Control	
①	connection oriented (CO) .		
②	connection less (CL) .		
	connection oriented	connection less	
①	uses TCP	① uses UDP	
	Transmission Control protocol.	use datagram protocol	
②	It requires Authentication.	② don't Reg. Authentication.	
③	seq of packets.	③ No seq. of packets.	
④	slow.	④ fast.	
⑤	Retransmission in case of lost packets.	⑤ No retransmission.	
⑥	Ensures delivery of packets.	⑥ don't ensures delivery	
⑦	packets arrive in order.	⑦ No order.	
⑧	Less data loss.	⑧ No. data loss.	
⑨	No broadcasting.	⑨ broadcasting.	
⑩	Acknowledgement	⑩ No Acknowledgement.	

(CO)

Date :  
8/10/21

{No Connection Oriented}

(TCP)

- ① connection is stabilised.
- ② data is sent.
- ③ connection is terminated.

{No Application of CO} :-

- ① E-mail and text messaging.
- ② streaming of pre-recorded content on netflix, Amazon prime; etc.

{No connection less} (UDP) (C.L)

⇒ Data is transferred in one direction from S to R without even taking receive permission. eg video call, VoIP.

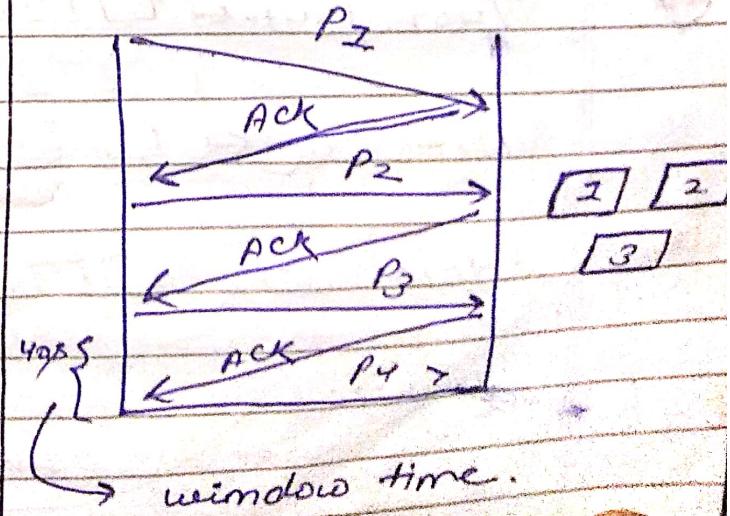
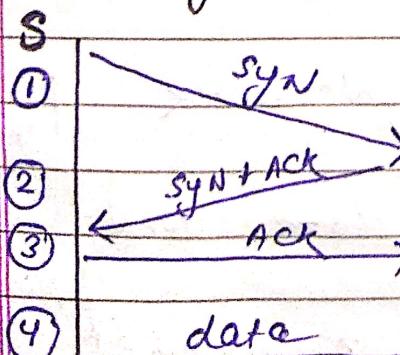
{No Application} :-

- ① live streaming.

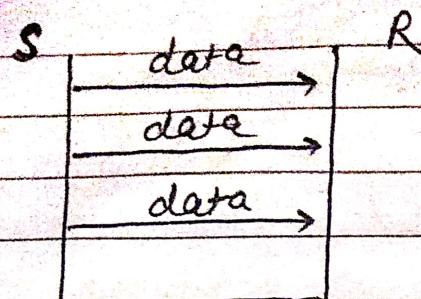
No TCP

No TCP

- ① 3-way Handshake.



## # UDP



## # OSI Model

→ open system interconnection

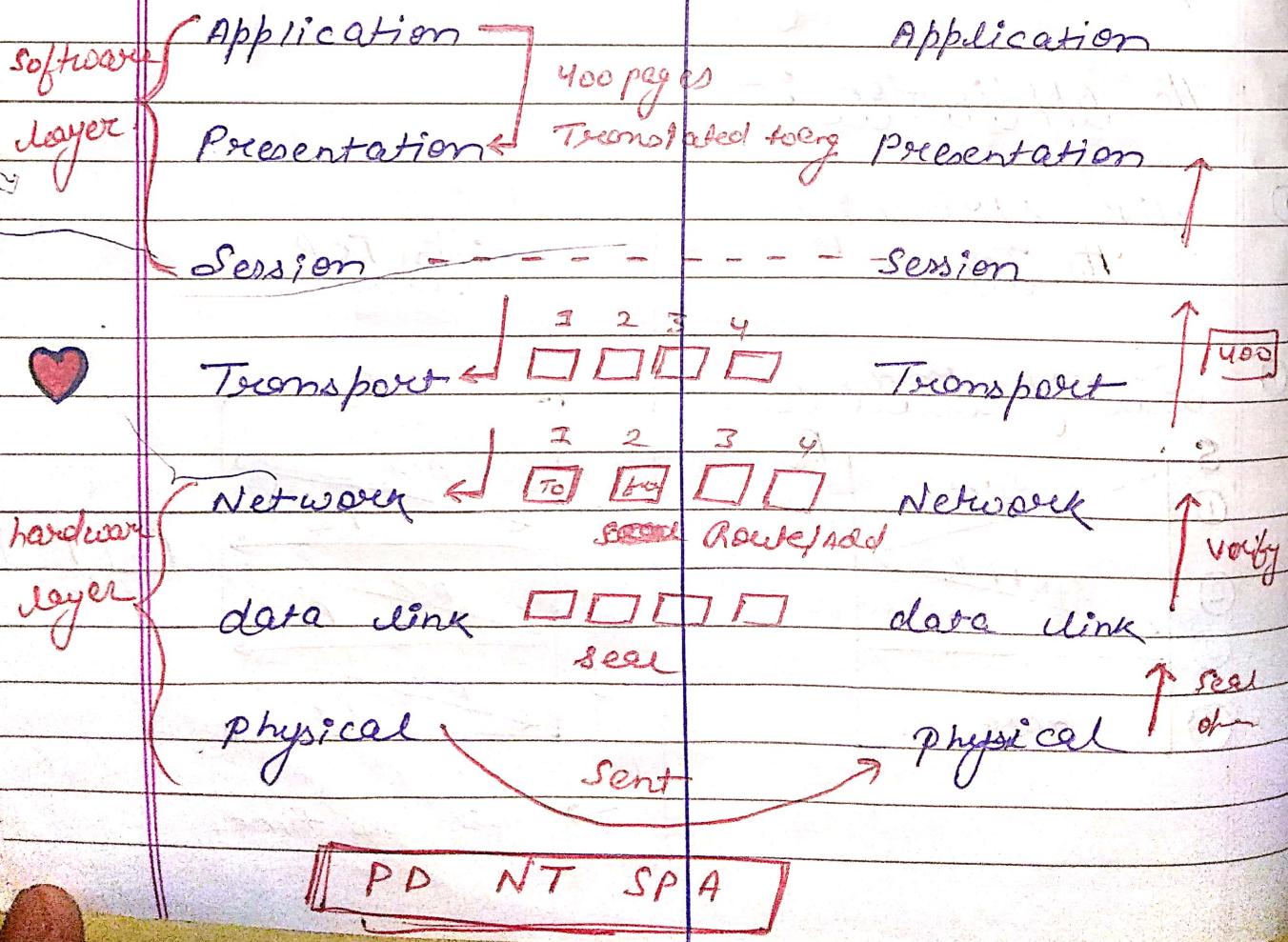
→ It is a reference model given by I.S.O.

→ (International standard organisation.)

→ There are 7 layers of O.S.I.

(S)

(R)



Sender → layer 1 → Application.  
 Receiver → layer 1 → physical.

PD	NT	SPA
12	34	567



To various layers of OSI

\* → Major Responsibilities

To physical layer

Type of Transmission media :- wired/wireless.

Representation of bits :- how 0's and 1's are converted into signals.

Data Rates :- Tells the duration of bits.

Synchronization of bits :- S & R clocks must be synchronised.

Line configuration :- point to point or point to multipoint.

Topology :- explain how devices are basically connected star, ring, bus, mesh etc.

Transmission Nodes :- ① simplex

② Half duplex

③ full duplex

## No. Data link layer

- ① framing :- dividing stream of bits into manageable units called frames.
- ② physical addressing :- Assigning MAC to devices.
- ③ flow control :- Rate at which sender sends and receiver receives should be controlled.
- \* ④ Error control :- layers must have a common error detection and error correction technique.
- ⑤ Access control :- enables us to manage who is authorised to view data and to which extent.

## No Network layer

- ① logical addressing :- Assigning IP addresses.
- \* ② Routing :- choosing best route.

## No Transport layer

- ① Service point addressing.
- \* ② (S) (R)  
Segmentation and Reassembly :-  
Segmentation :- Segmentation is process of breaking down 1 bigger packet into smaller multiple packets.  
(sender side)

Reassembly → Reassembly is process of combining multiple small packets to one original packet.  
(Receiver)

connection control → ① connection oriented.  
② connection less.  
③ flow control ④ error control.

~~No session layer~~

dialog Control → Session layer allows two packets to enter into a dialog state. (either half duplex or full duplex).  
(turn to transmit).

synchronisation → It uses check points to perform end-to-end communication.

~~No presentation layer~~

Translation → changing format into receiver readable format.

Encryption → converting plain text to cipher text.

Compression → Reducing the number of bits of data. eg. image, audio, video.

## No Application layer

- ① Provides interface to user.
- ② provides services like e-mails, shared database, remote access.
- ③ Network virtual terminal (Remote Access).

## No TCP vs OSI Model

### TCP / IP

### O.S.I

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>① Given by DOD → depart. of defense.</li><li>② Actual implemented model.</li><li>③ It has 4 layers.</li><li>④ Transmission Control protocol / Internet protocol.</li></ul> | <ul style="list-style-type: none"><li>① Given by I.S.O.</li><li>② It is a reference Model.</li><li>③ OSI has 7 layers.</li><li>④ open system interconnection.</li></ul> |
|--|---|

## No TCP / IP

- ① Physical layer / Layer → Do!
- ② Network layer / Internet layer → Do!  
ICMP, IP, IGMP, ARP, RARP.
- ③ Transport :- SCTP, TCP, UDP

Application layer :-  
WWW etc

combination of ( Application + present + session )  
of O.S.I.

Data is formatted translated encrypted decrypted  
etc.

SNTP, FTP, HTTP, DNS, SNMP.