Theory of automata

Regix 101

Resources → Dr-masoom → VU → professor

C-Networking

Network

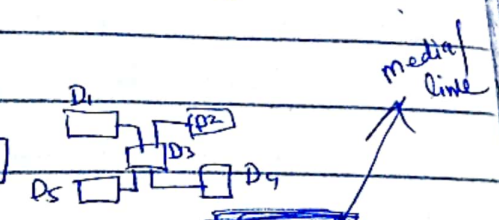
D_1 —— D_2

Connect more than 1 devices through any Communication medium

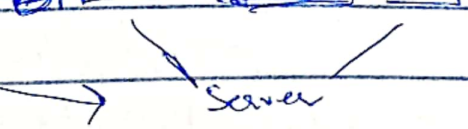
↓ Sum of these

Networking

Independent devices Connection → Internet



Edge of network / Host / Endsystem / Client / Server →



Host

↳ Jo Internet ki Chezain/app ko Chla Saky → like → Browser

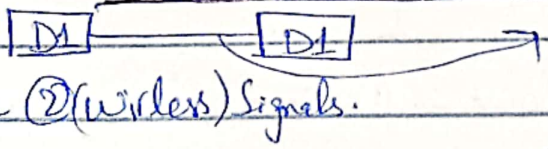
Client

↳ request data

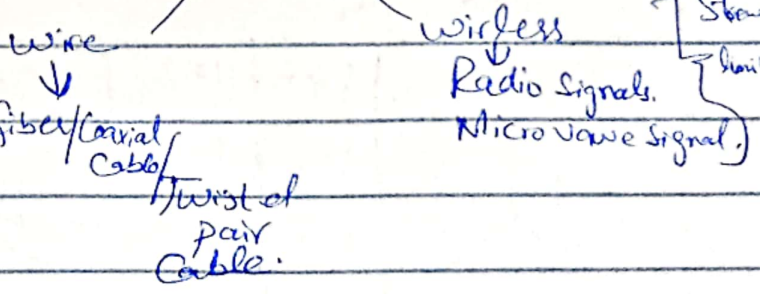
Server

↳ Having Collection of data.

→ Devices Require to make Network-



① wire ② (wirless) Signals.



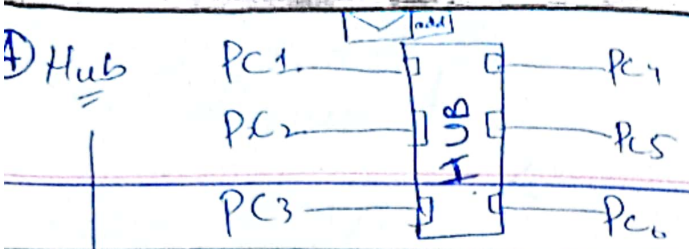
① Technology?

② working?

Devices used In C-Medium:-

① Hub, Switch, Bridge, Gateways, Repeter, Aplifies Routers, ISP, stelite Station.

(A) Hub



Hub ← Passive device.

(1) Transfer signal only, not knows who is Sender Reciever

(2) Work on Broadcast → have also R-ID → ip to related.

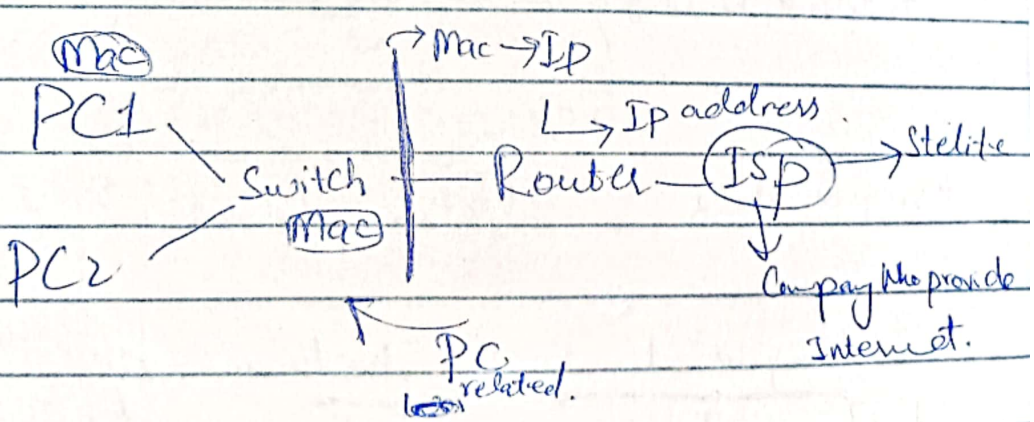
Condition with message.

Mac address.

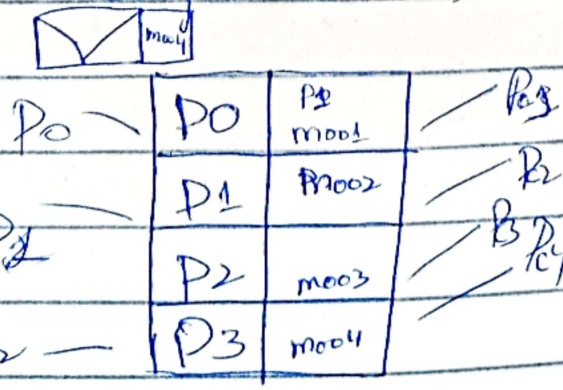
(B) Switch → advance than Hub

MAC Address / physical address. → Provide by Manufacturer

Ip Address / logical address / ISP → Provide by Internet



Switch intelligence device → Maitain → Mac table.



Router 2' working

① take data from switch and provide to next.

② Routing → Optimal path. (define)

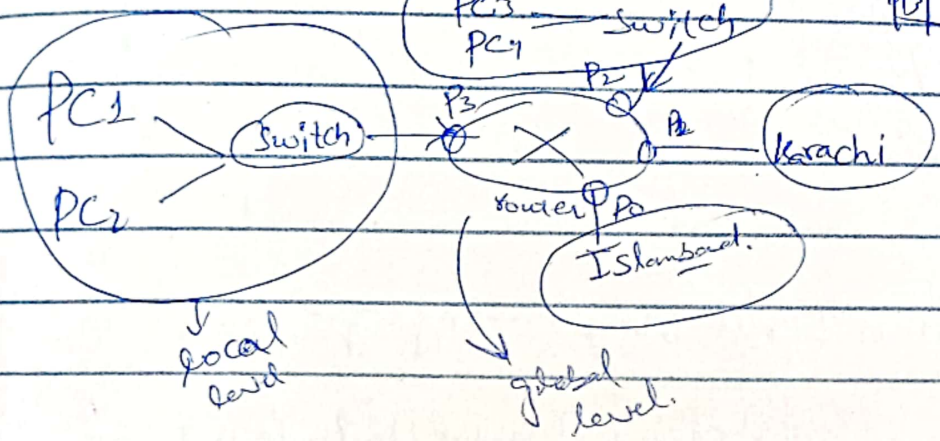
→ data from network → packet → send to relevant path. (Convert it)

→ use IP address.

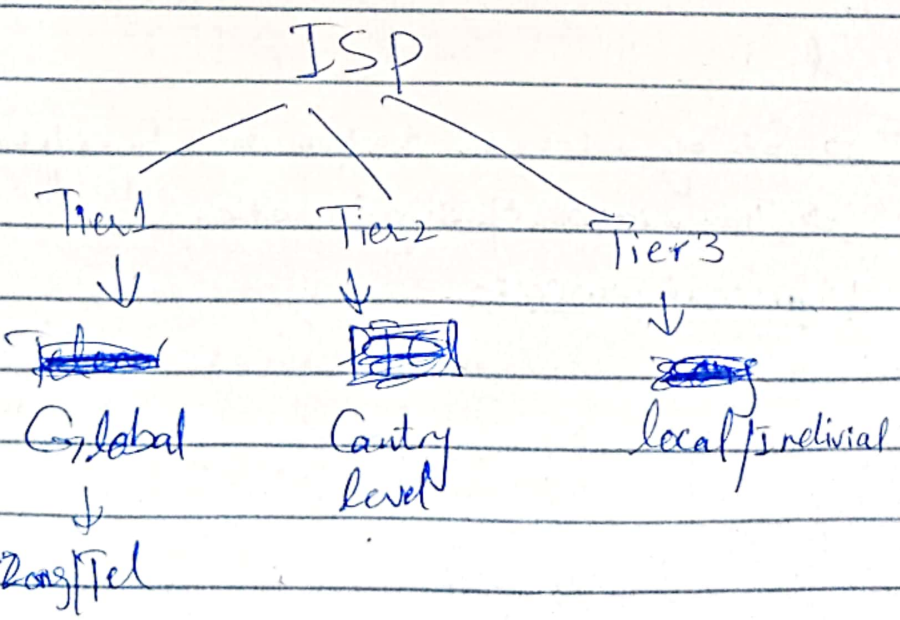
→ It maintain IP address table.

R1	192.168.1.5	
R2	1,	11
R3	11	111

Router Symbol



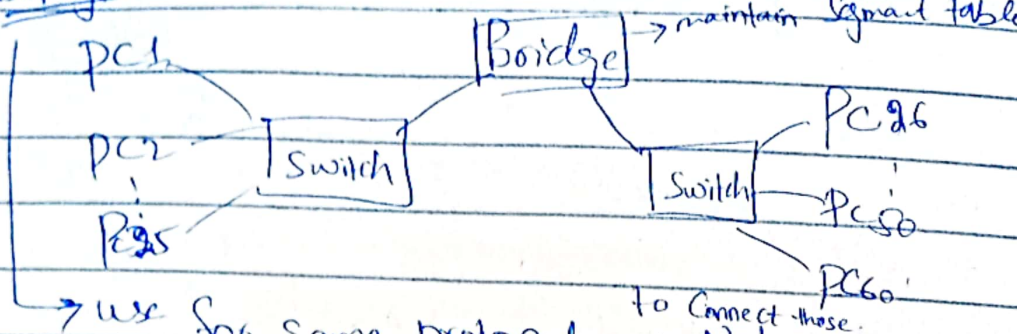
ISP



(To increase services of Internet. We use Bridge, Gateway, Repeater, Amplifier.

maintain pc Counting on each side

Bridge



to Connect these.

→ use for same protocal → Networks.

for different protocal → use Gateways

Repeater

↳ maitain Signal Strength → by regenerating.

Amplifier increase strength of signal but do not regenerate.

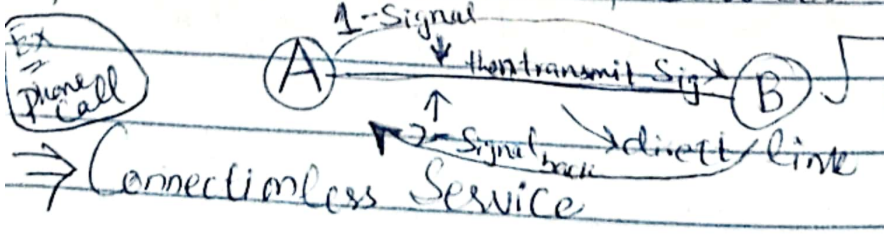
Protocal

⇒ Set of rules to tranfer data towards internet by Some devices.

⇒ Transmissions of signals e.t.c.

Phagsical Services:-

⇒ Connection Oriented Services:- protocol. work on Hand Shaking method

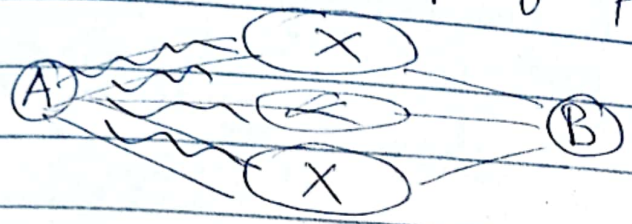


if B respond to A then Signal tras ↓ receive path

⇒ Connectionless Service

→ It does not use specific path

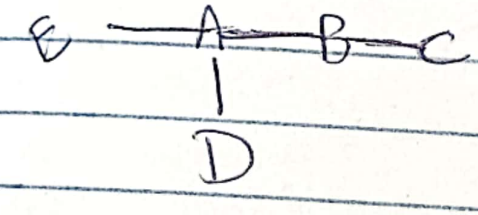
It Can use more than one path. to tranit data.
Ex Internet. ↳ No Consern how data tranmit to destination
It do not reserve specific path.



Device which reserve path/device that is Costly

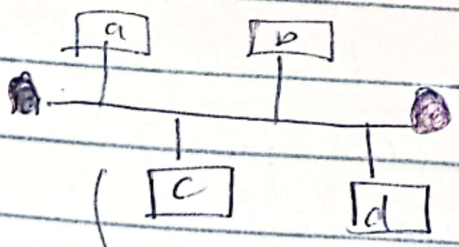
Point to point Connection:-

→ direct point to point Connect b/w nodes there is no extra device b/w link.



jis ko signal bhejna hota hai un k darmiyan direct Connection hota.

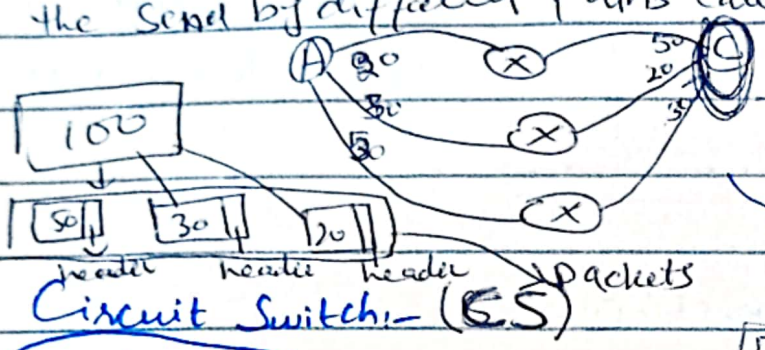
Multipoint Connection:



broadCasting ← message goes to every one but recive that who have same address

Types of Connections in Context of message transmission

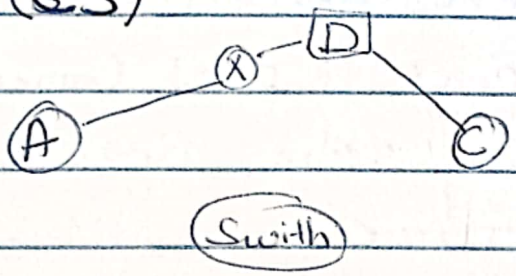
Packet Switch:- Divide our message in parts the send by different paths called packet. → Fastly move



When recive by receiver it receive in form of orginal information

→ It do not use that path which is already reseve by other

Circuit Switch:- (CS)



CS (1)

MS (2)

PS (3)

(1) resewe a path (2) after building connection which called circuit. **Ex: phone call**

(2) After Communicat it free that path

FDM Frequency division Multiplexing:- divide a path in different frequency Singnal path create on relavent frequency.

FM1 :- 50 — R1

FM2 — 70 — R2

FM3 — 30 — R3

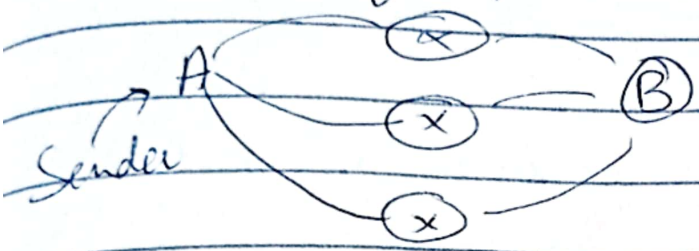
Recievers

TDM

Message Switch

It do not receive any path whole till end.

It see the free path, by free paths it goes to end



No direct path.

Bandwidth → storage of network like downloading/uploading data speed 30bits/sec.

Network Speed → data transfer or incoming.

Network > Band

Transmission time in Circuit Switch Network.

data = 2000 bits/s

Bandwith = 30 bits/s

Ans → Transmission time = $\frac{2000}{30} = 1.7$ Sec

Total transmission time

TT = Setup time + Transmission time + Propagation delay + Tear down time

① Setup time = Connection building time → given.

② Transmission time = data / Bandwidth. → time to put data on Communication medium.
delay

③ Propagation delay:

↳ time require to reach message from A to B

A ⟶ B

P_delay = distance / N_speed. = speed of Communication medium
↕
time

④ Tear down time

time require to release the reserved medium.

↓

given.

⟷

Packet Switch Network:-

TT = n (Transmission time) + propagation delay

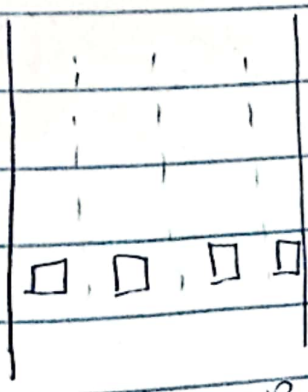
↓
no of nodes.

Bandwidth

↳ Transmission Rate.

per sec data transfer

in a medium.



No of lane = Bandwidth

Network Speed → Speed of Communication medium.

Network Speed

Frequency division Multiplexing ⇐ Circuit Switching

Transmission Rate = 1536 bits/s

M-size = 64000 bits

No. of slots = 24

Set up time = 500 sec.

Total Bandwidth = T-Band width

Bandwidth for this message = 1536 / 24 slots = 64

$TT = \frac{M-L}{\text{Bandwidth}} = \frac{64000}{1536}$

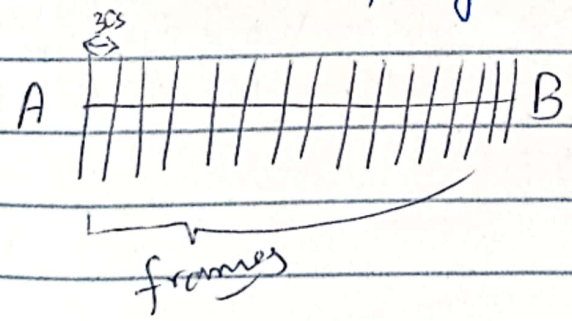
$= \frac{64000}{64} = 1000$

TT = 500 + 1000 + 0 + 0

= 1560/s

in Circuit Switching we do not concern to divide M-size

Time division Multiplexing ⇐ Circuit Switching



Number of bits in each frame = 5

Message length = 64000 bits

~~Transmission rate = 1536 bits.~~

Frame transmission per second = 24 frame at a time.

Bandwidth / T_Rate = frame rate x no. of bits per frame.

= 5 x 24

= 120

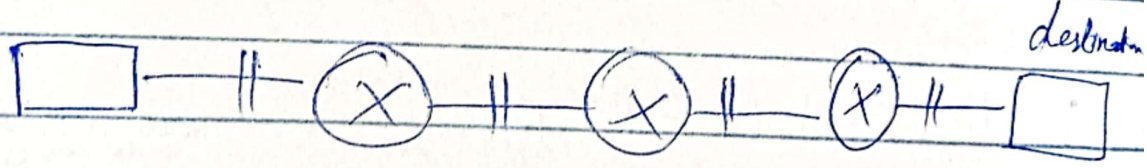
Total Transmission time = 64000 / 120 =

→ Processing delay X.

Switch & Hub do not save data → transfer data only.

Router do save data → Store and forward transmission.

↳ Have processing delay / propagation delay.



Store and forward, path between mediums. Called Hope.

Processing time = No of Hops X processing time at single Hope.

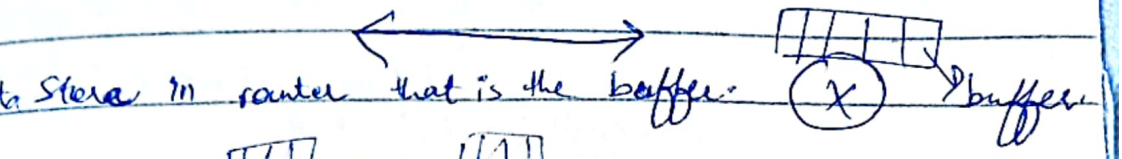
Maximum data can transfer in a sec Called Bandwidth

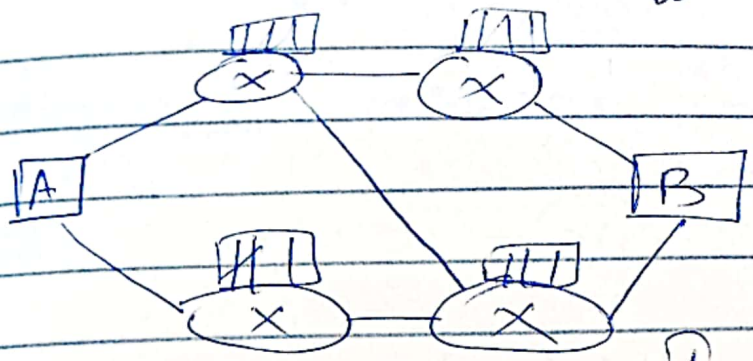
Amount of data transmitted at a time Throughput.

Jitter:- variation in a time delay ⇒ this is due to network traffic

Latency:- Any kind of delay

↳ Total Transmission time = total delay = total latency.





Transmission time?

Bandwidth = 10 Kb/s

File length = 50 bits

Packet Length = 50 bit.

Packet size = 50/5 = 10 / per packet

or no of packets / file length = 5

$\Rightarrow TT = \frac{\text{Length of a packet}}{\text{Bandwidth}}$

$TT = \frac{50}{10 \times 1000} = 0.005\ b/s$

$5 \times 0.005 = 0.05\ b/s$

1 KByte = 1024 Bytes.

1 MBytes = 1024 kbytes.

1 GB = 1024 Mega bytes.

1 Kbit = 1000 bits.

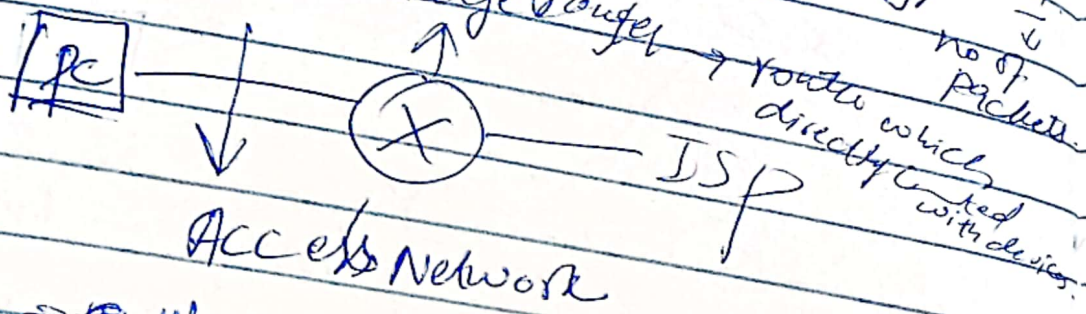
1 Mgbits = 1000 Kbits. = 1000×1000 bits

1 Gbits = 1000 Mbits = $1000 \times 1000 \times 1000$ bits = 10^9 bits.

A packet take a time on a node is called Nodal delay.

All delay are → In packet switching

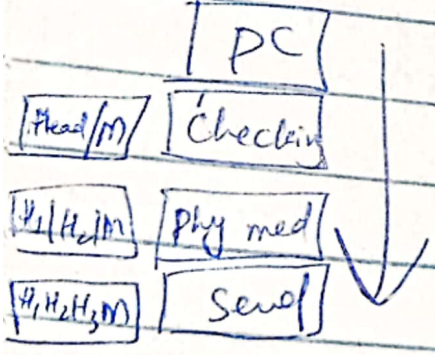
End to End Total delay = (d + Pdelay + Queue delay + propagation delay) × n (no of packets)



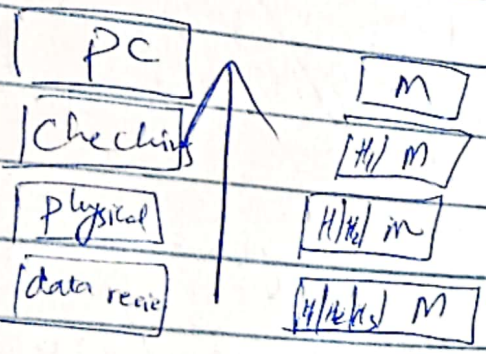
→ Nodes to send/receive data.

Protocal Stack/layer

Send



Reciever



Header → message details How that will go to dest

→ Protocol data units

Layered Architecture

Tcp/ip model

OSI Reference Model:- → ISO reference model

↳ 7 layer → Sender and reciever sides

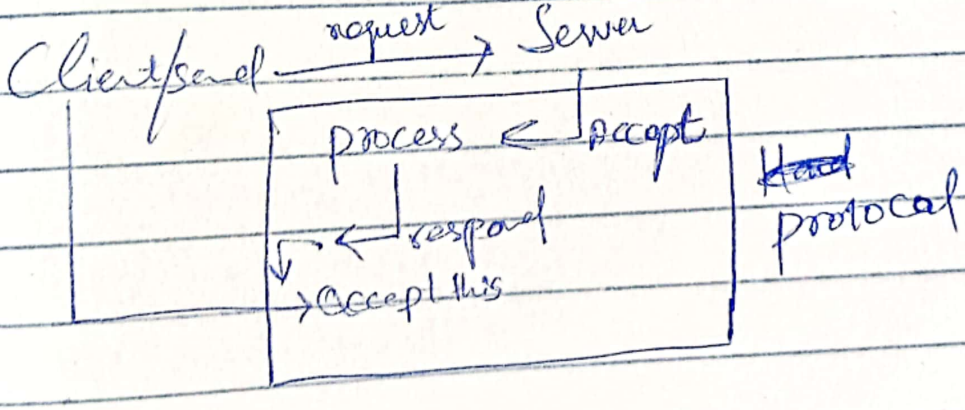
↳ sequence must.

application layer: → use network services

It provide environment to communicate through internet like browser → Chrome, p

upload/download, Email, web access → SMTP, FTP, HTTP, HTT

Hypertext protocal:



HTTPS

Hepertext protocal (Security):

webpage - frontend → Application Layer
backend → TCP.

ISO model
↓
Presentation Layer
Transport layer ↔ Session Layer
↘ Transport Layer.

Protocals
↓
① TCP
② UDP

⇒ Line of Code use in App for Connection → Socket
2 parts in protocal → Half → Sender
→ Half → reciever.

⇒ TCP Connection
↓
Client — Server
↓
Hand Shaking

Html — php.
↓
Connection
Socket.

Client — Server
request()
Acknowledgement ← Accept
Show Indication
Ok, I'm sending message
data send →

TCP

(A)

Server → working

Work for each request → server side.

Active

recieve

request.

8080

Comunication.

① Create Socket ⇒
attach port no:
→ bind(8080)

② Listening. Start() → broadCast that on our active

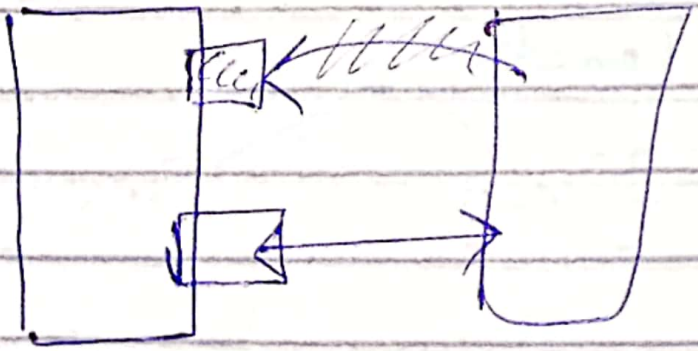
Client Sockets()

③ Create another port for Comunication. → for no. of requests
for specific request.

dedicated Socket..

Creat_Client socket = Server Socket.accept();

client



④ Client Socket Close

TCP Client

① CreateSocket = new Socket(IP, port) ← Server

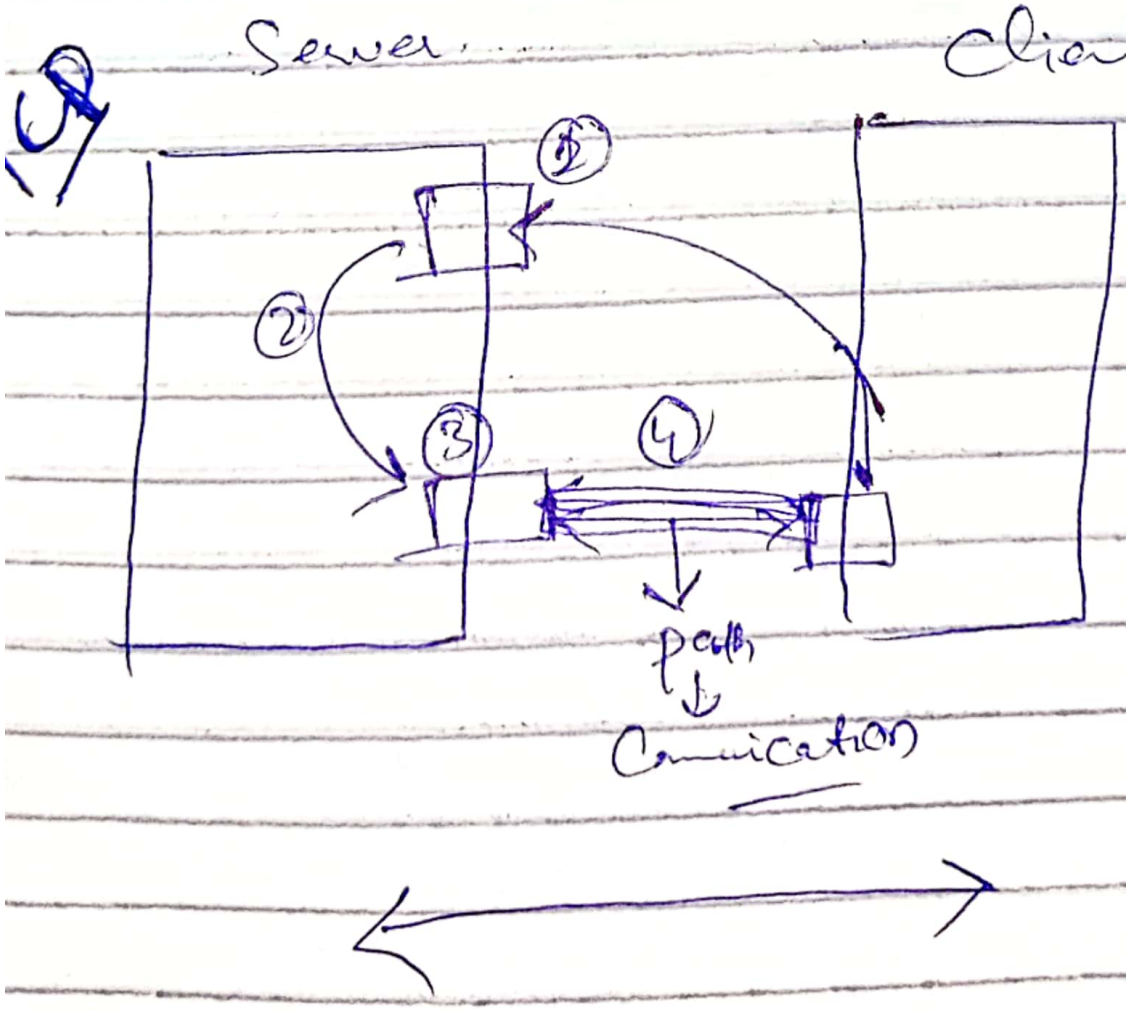
② SocketConnect(Ip port#). → request

"Connect established"

③ send data → Socket.Send(message.encode()).

④ Socket.receive().

⑤ Socket.close().



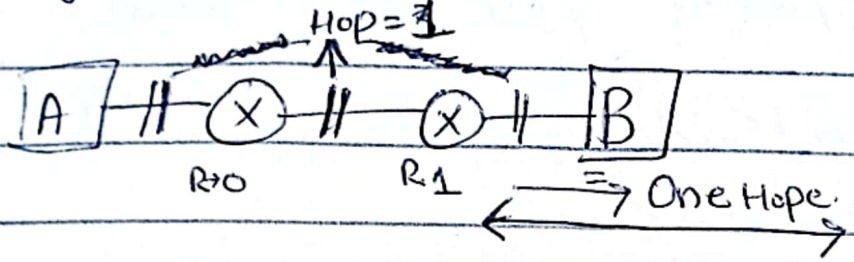
UDP

Connectionless

Sender Send

→ Direct message to Server with IP.

⇒ Hope ≠ Path How many time a packet or message from one router to another jumps to reach until destination.



→ Latency → Any kind of delay.

→ Transmission time → How much time taken for data packet to travel from begining until end of messge transm

→ Bandwidth:- Max ammount of data that can be transmitted over Comication Cannel in one sec.

→ Throughput:- No. of messages transmitted ammount of data at that time

→ Cuse flickering image on Screen.

→ Jitter Time delay due to network traffic

→ Loss : failure of packets to reach Corresponding destinatio

Delays

Bandwidth = Transmission rate

→ Transmission delay: Time taken to put a message or packet on trasmission medium → formula → TD = L of message / Bandwidth.

→ =TT?

→ Propagation delay: Amount of time taken to transfer a message from source to destination → = Distance / Speed

Distance / No of Hopes = PD = Distance / Speed in medium

→ Queueing delay: Amount of time a packet wait in buffer before trasmit. → No formula.

→ Processing delay: Amount of time a router takes in processing a packet bef or transmit → No formula X

→ Nodel delay :- Time taken to process a packet in network node (router, Switch, Hub e.t.c).

→ End to End delay :-

Time taken for a packet ~~attress~~ to be transmitted

EToED = (propagation delay + transmission delay) no of hopes

Line efficiency = $\frac{(L/R)}{t_r + t_{pp} + t_t}$ } delays

TTime ≠ TRate

Network medium efficiency

Network saturity / ~~Network utilization~~ = a = $\frac{\text{Propogation delay}}{\text{Trasmission delay}}$

~~Line utilization~~ = $\frac{1}{1+2a}$.

L = 500 bits

~~Round Trip time~~ = 2 sec

R (Band.) = 50 Mbps

packets → N = 3.

round trip time for 1 packet

round trip time for persistant = 1 time

for non-per = 8 time

Non persistance

Np HTTP client Server

C-Req

respond

HHP

3sec 500 bit

connection close

2 + 2 + 3 = 7

↓

time for 1 packet

7 × 3 → packet = 21

is there is to find TTT add RRT into t_t + RRT

↓

round Trip time if it given

Tcp OSI model

layers