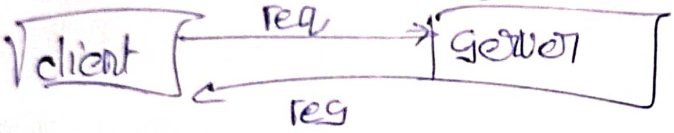
Another model

- TCP/IP model.

contains five layers.

Application
Transport
Network
Data link
physical layer.

⇒ Application layer where user interacts with applications have some protocols and client-server architecture.



We have lot of servers, because of scalability.

* Data-centre → contain computers with high speed of data
Every packet of 64 bytes.
* ping time is Req+res time.

② Peer to peer connection :- P2P
Every computer is server and client itself for others.
⇒ Example bit-torrent.

Devices

i) Repeater in physical layer ⇒ modifies & regenerate it at original strength, it is 2 port device.
they won't amplify, when signal become weak, copy bit by bit and regenerate original.

② Hub :- Multiport repeater, it cannot filter, it sends data to all devices.

Active hub :- clean, boost, own power supply

passive :- Not clean, depend on active hub for supply.

③ Bridge :- Datalink-layer, it is type of repeater with filtering option to specific port

④ Switch :- Error checking in data-link layer.

⑤ Router

⑥ Gateway :- passage to connect to different networks.

⑦ Brouter (Bridge + router)

Protocols :-

Web protocols :-

TCP/IP :-

* HTTP
* DHCP
* FTP
* SMTP
* POP3 & IMAC
* SSH
* VNC
* TelNet : Port 23.
* UDP

A program has running instance is process.

Thread is doing single job.

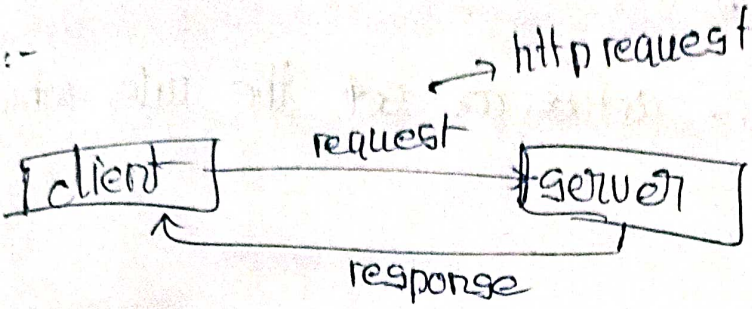
Sockets :- software interface between process and internet

ports :- which application we are using.

but which process of application.

Ephemeral ports

HTTP :-



For every Application layer protocol need transport protocol.

HTTP uses TCP → Transport layer.

↳ stateless.

HTTP methods :-

What to do server.

① Get :- Requesting something.
② Post :- Giving something to server.
③ Put :- Put some data
④ Delete :- Delete request.

keep-alive :- upto some time for accepting response

status codes :-

for request, we want to know status.

200 → success.
400 → bad.

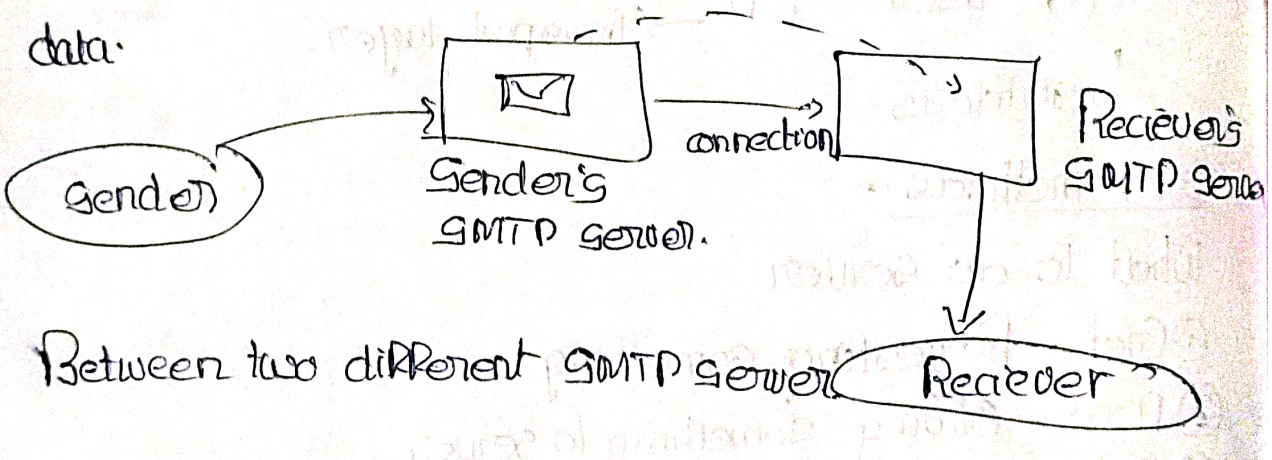
1xx → informational codes.
2xx → success
3xx → Redirecting.
4xx → client error codes.
5xx → Server errors.

- Cookies responsible for state behaviours of http
  are unique string stored in client browser.
  At first time it will set cookies, after every request cookies are set into url.
- Third party cookies :- cookies are set the urls which you are not visit.

How email works :-

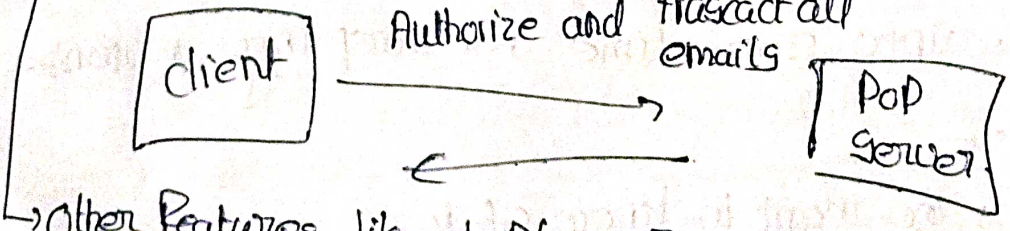
For sending SMTP, For receiving POP3

Which transport protocol we use is TCP, we want entire data.



Between two different SMTP server

POP port 110



→ Other Features like drafts are not work under

IMAP :- Internet Message Access :-

Sync all functions on email.

DNS

Domain Name System:- Mapped to IP address.

http search for DNS data directory for particular IP address.

These databases are divided into classes.

mail.google.com → top-level domain.

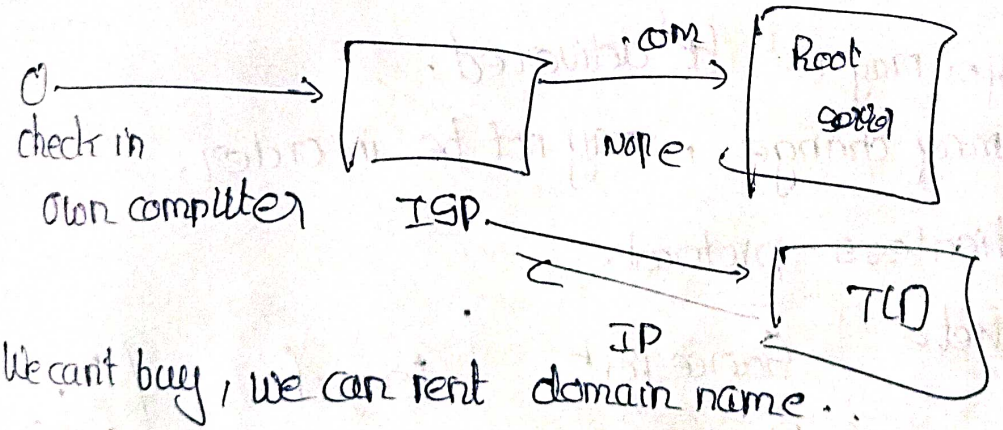
↓ sub-domain. ↓ second-level domain

They are many databases for each domain level.

Root DNS Servers ← Managed by ICANN 73

contain top-level domains.

- .io
- .org
- .com



We can't buy, we can rent domain name.

Transport layer

Frame network to device and device application to network.

Protocols

TCP:- → Acknowledgment.

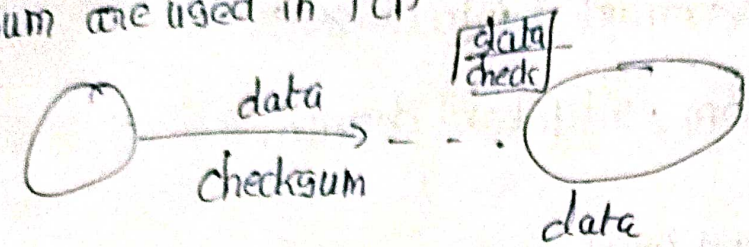
UDP → Not in order, not acknowledgment.

Multiplexing & Demultiplexing.

Transport layer also take care of congestion control.

using TCP.

checksum are used in TCP



Timers

Whether data is received or not.

Timer expire

Retransmission timer.

Sequence number

For finding Unique data packets

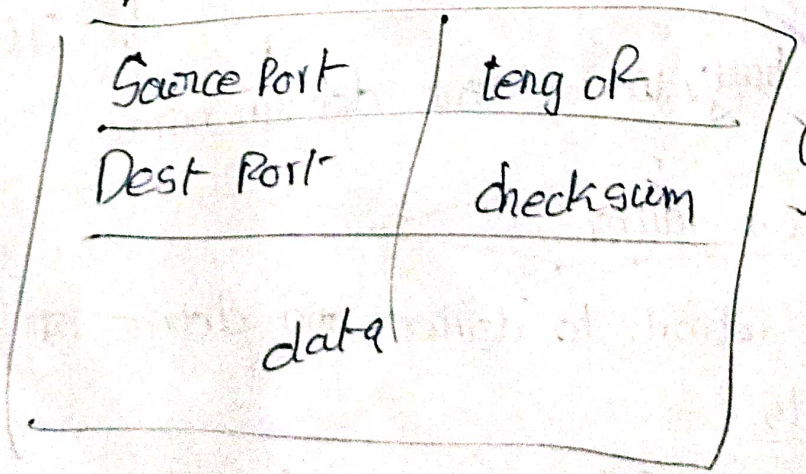
UDP User datagram protocol.

Data may or may not be delivered.

Data may change, may not be in order.

Connectionless protocol.

UDP packet



Total size

$\Rightarrow 2^{16}$.

$\Rightarrow 2^{16} - 8$

data

DNS, Gaming uses UDP protocol.

TCP :-

Transmission Control protocol.

uses in http.

Usecase :-

Transport layer protocol

1) divide raw data into chuncks and headers

2) congestion control.

Take care of two things → 1) When data not arrive.
2) Maintains order of data.

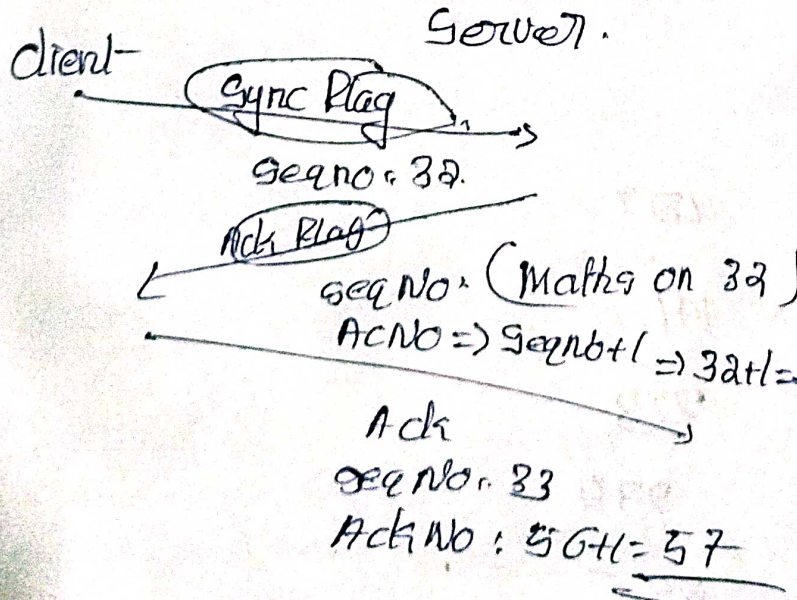
1) connection oriented.

2) Error control.

3) Full duplex.

TCP connection blw two computers.

Three way handshake :-



Network layer

Routers packet is data unit.

↳ Routing table
Forwarding table

192.168.1.30
network address ↘ device address

Control plane:- Maintains Routing table in Routers

Routers → Nodes
links → Edges.

① Static Routing. or manually. (Not adaptive)
② Dynamic Routing. (BellmanFord, dijkstra & etc)

IP ⇒ Internet protocol:-

IPV4 → 32 bit, 4 words.
IPV6 → 128 bits.

Classes

A	0	to	127
B	128	to	191
C	192	to	223
D	224	to	239
E	240	to	255

Reserved address

127.0.0.0 /8

Loopback address ⇒ 127.0.0.1

Header of 20 bytes

IP version, length, identification, flags, protocols, checksum, addresses, TTL etc.

DHCP Allocates IP address to new device from it pool of ip addresses

IPV6 :- $2^{32 \times 4} = 2^{128} = 3.4 \times 10^{38}$

No backward compatible.

a:a:a:a:a:a:a:a

↓

16 bits

Middleboxes

1) Firewall → Global

→ your own trusted.

Stateful and stateless Firewall

↳ More efficient

Network address translation : between private and Internet.

Datalink layer :- MAC Address

ARP protocol