URL

DEVOPS

INTERNET

PROTOCOL

W.W.W

OOP

PACKETS

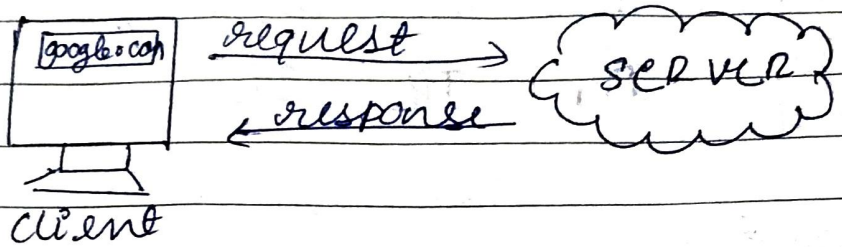
OSI

computer networking

ARPANET

→ Internet is the collection of computer networks.

→ When you type google.com in your computer you sends request to the website server and the server gives you a response

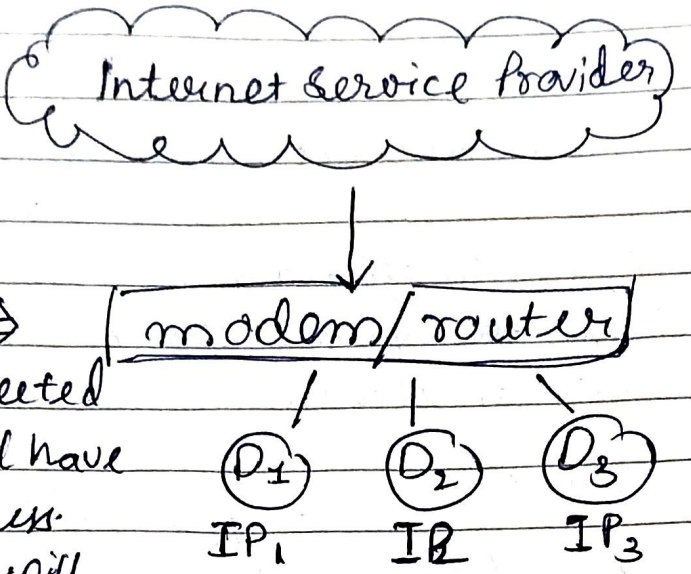


→ TCP (Transmission control protocal)
When the complete data we have to send without any loss of data on the way we use tCP (connection oriented transportation).

→ UDP (user data gram protocal) (faster)
When you do not care if 100% data is reaching or not is called UDP for eg video (connection less oriented transmission) call.

→ HTTP (Hyper text transfer protocal)
It defines the format of the data which is transferred

→ Every single device on the internet that can talk to each other have their IP adress



Global IP adress ⇒ every device connected to this router will have the same IP adress. but modem will give IP adress to every device connected called local IP adress

D_1 → Device 1
D_2 → Device 2
" → "

→ modem assigns the IP adresses to the devices connected using DHCP

Dynamic Host configuration Protocol.

→ Let's say if Device 1 makes a request to google.com, the google we see the Global IP adress and when the response comes from google.com then the modem/router will decied ~~[illegible]~~ that which device had the request using NAT (Network access translator)

→ PN (Port number) : It will be denoting which application you are using to communicate.

→ Total PN ⇒ $2^{16} \approx 65,000$

→ All the HTTP stuff that you do happens in port 80.

→ mango DB = 27017.

→ SQL = 1433.

0 - 1023 (reserved Ports)

1024 - 49152 (~~Logg~~ applications).

remaining PN you can use.

⇒ ~~port 1mb~~

→ 1mbps = 1000000 bits/s
1gbps = 10^9 bits/s
1kbps = 1000 bits/s

Physically → optical ~~fiber~~ fiber cables, coaxial cables

wireless → bluetooth, ~~wifi~~ wifi

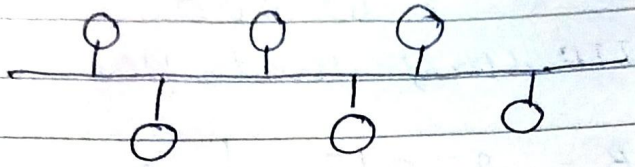
→ LAN : Small ~~s~~ house, office.

MAN : across the city

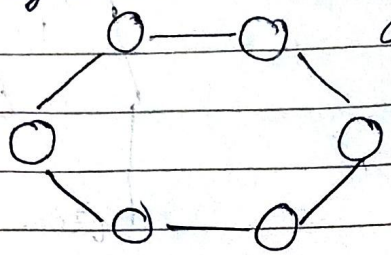
WAN : ~~or~~ across countries

→ Topologies:

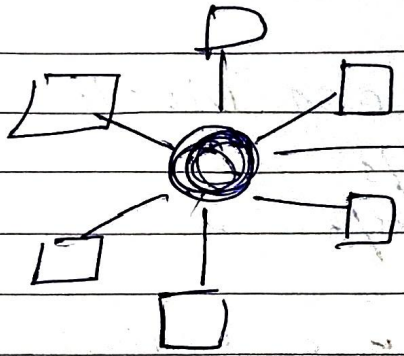
① BUS



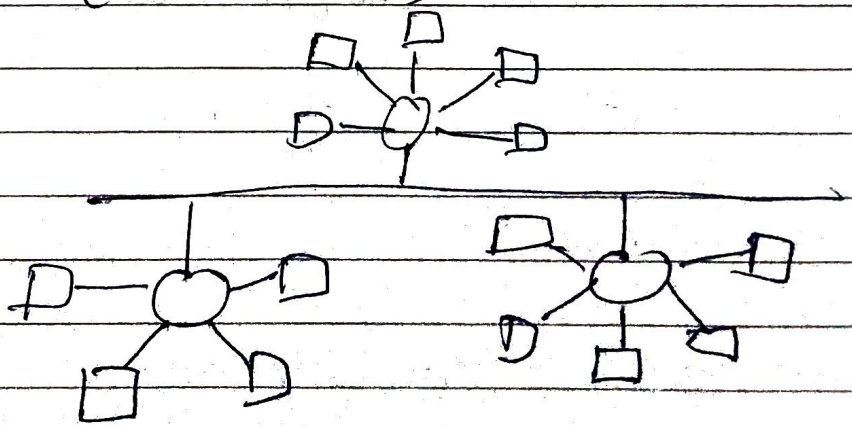
② RING : every system communicates to one another.



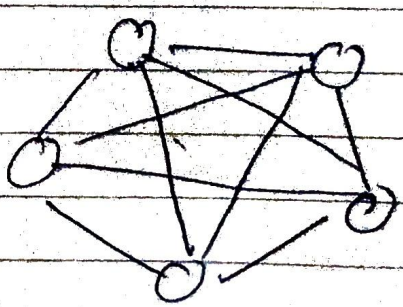
③ STAR



④ TREE (BUS + Star)

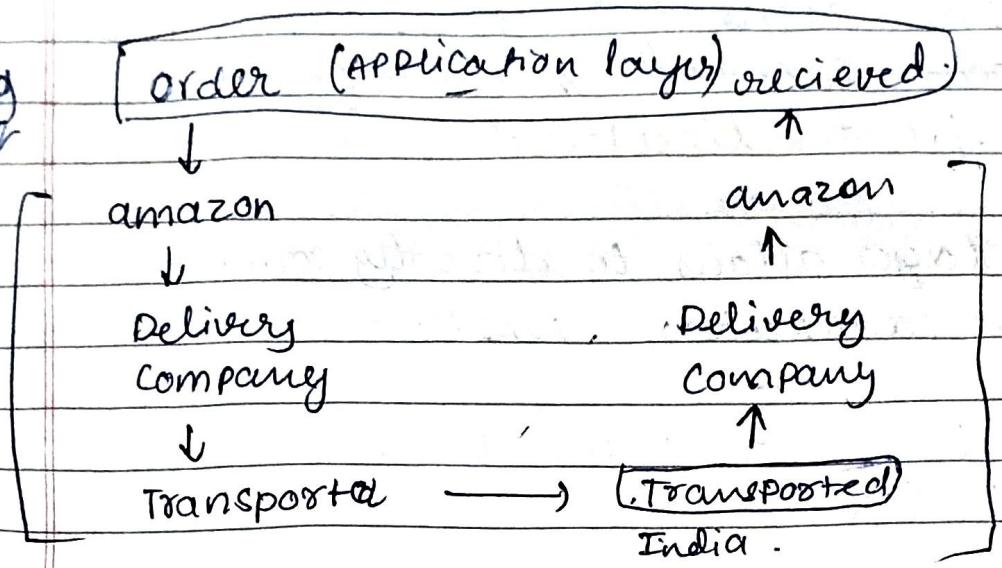


⑤ MESH



Expensive
& scalability issue

→ STRUCTURE OF THE NETWORK.



* OSI Model (open systems interconnections)

1. Application layer (Software system)
2. Presentation layer
3. Session layer (authentication / authorization)
4. transport layer
5. Network layer (logical addresing)
6. Data link layer
7. Physical layer.

Data that is recieved from the session layer to transport layer is devided into small units called segments and every segment will contain the source and the destination partnumers are sequence neumeer.

↓

It helps to reassemble the segments in the correct order.

1. flow control: controlling the amount of data that is transported.

→ network layer basically works for the transmission of the recieved data segments from one computer to another that is located in the different network. (router livs here)

→ Datalink layer allows to directly communicate with the computers hosts.

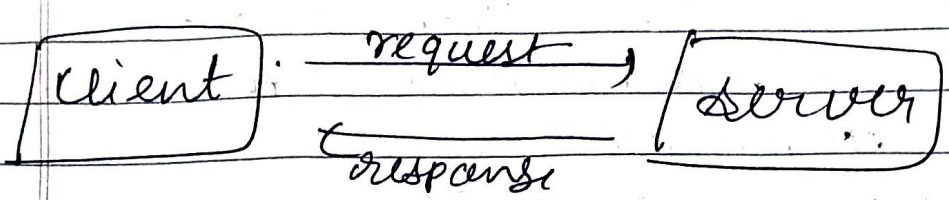
→ Physical layer contains hardware & it transmits bit.

→ TCP/IP Model.

Application layer
↓
Transport layer
↓
Network layer
↓
Datalink layer
↓
Physical layer.

(7) Application layer :

- Main layer where users interact with each other
- It consists of application like web browser
- whatsapp, browsers, etc
- where : Devices.
- Protocols ★ Client - Server - Architecture.



(7)

- P2P Pur to Pur - ⊙

PROTOCOLS:

Web Protocols :

TCP/IP :

- HTTP
- DHCP
- FTP
- SMTP
- POP3/IMAC
- SSH
- VNC
- Telnet : Port 23

→ Sockets
→ Ports (Unique application we are working with)
Ephemeral Ports

→ HTTP (Hyper text transfer protocol)
When a client send a request to the server ~~or~~ is called HTTP request and when server sends response to the client is called HTTP response.
HTTP uses TCP because TCP make sure that all the data ~~so~~ is recieved
TCP is connection oriented.

→ HTTP methods:
1. GET
2. POST
3. PUT
4. DELETE

Status codes:
1) Informational (100-199)
2) Successful (200-299)
3) Redirectional (300-399)
4) client error (400-499)
5) Server error (500-599)

* COOKIES (unique string) → Third Party cookies → cookies that are set for the urls that you do not visit.

Stored in our browser
These are small pieces of text sent to your browser by a website you visit

→ HOW EMAIL WORKS ??

* SMTP (simple mail transfer protocol)
* POP3 (to recieve email.
* IMAP (internet message access protocol)

Sender is going to send the email to the senders SMTP server, it will then make connection with the recievers SMTP servers. After the connection is established this mails is transferred.

If both sender and reciever uses different gmail for eg: one uses gmail & other uses yahoo.

- If both sender and recievers uses same mail then it does not make connection it directly transfers.

* POP (Postoffice protocal)
↳ you first connect the client connects to the pop server (Port 110) then you authorize it & then you transact all the emails.

Client	authorize → ← transact	POP Server

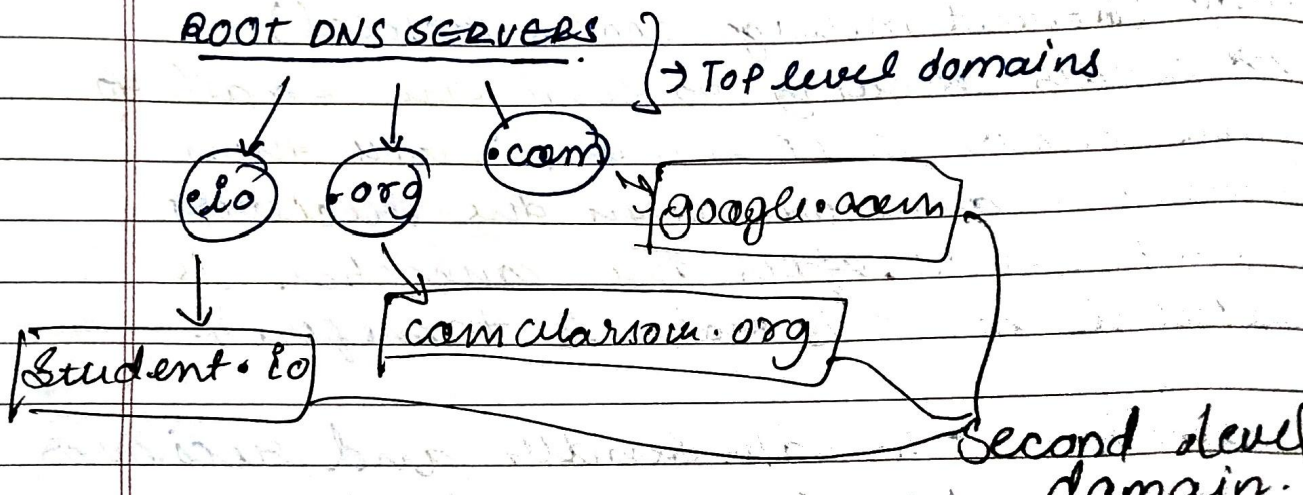
when you enter google.com it will use DNS to find the IP addresses of googles servers.

~~★ HTTP (Internet message access protocol)~~

★ DNS : Domain Name System.

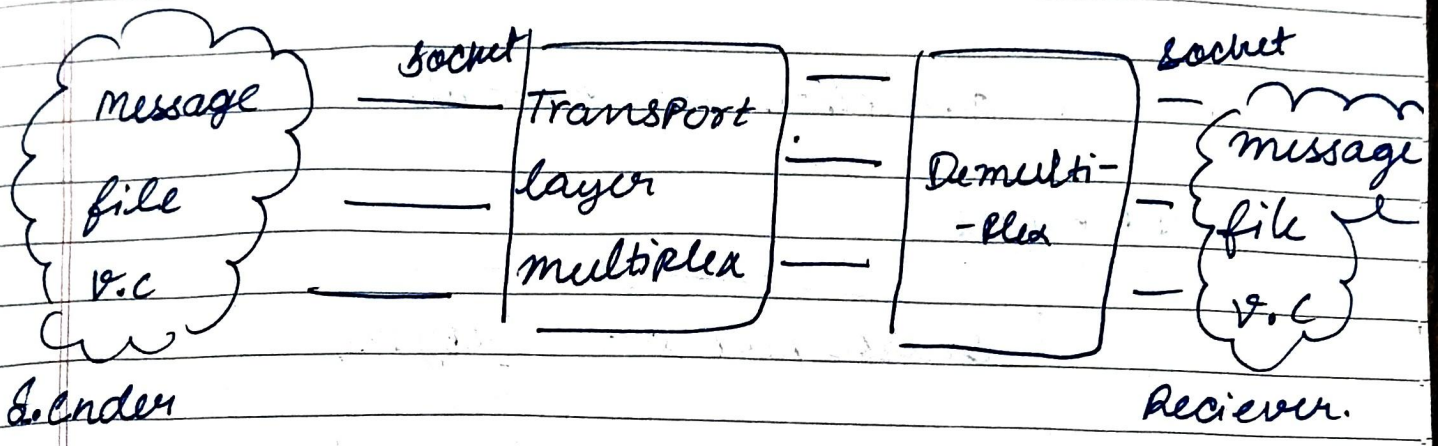
→ Database system.

mail.google.com → Top level domain.
↓ second level domain
Sub domain



☆ TRANSPORT LAYER

The role of the transport layer is to take the information and deliver it from the network to the application.



* Data travels in Packets
  → Transport layer will attach these Socket Port numbers
* Transport layer also takes care of conjessian control.
* Conjession control algorithms build in TCP.

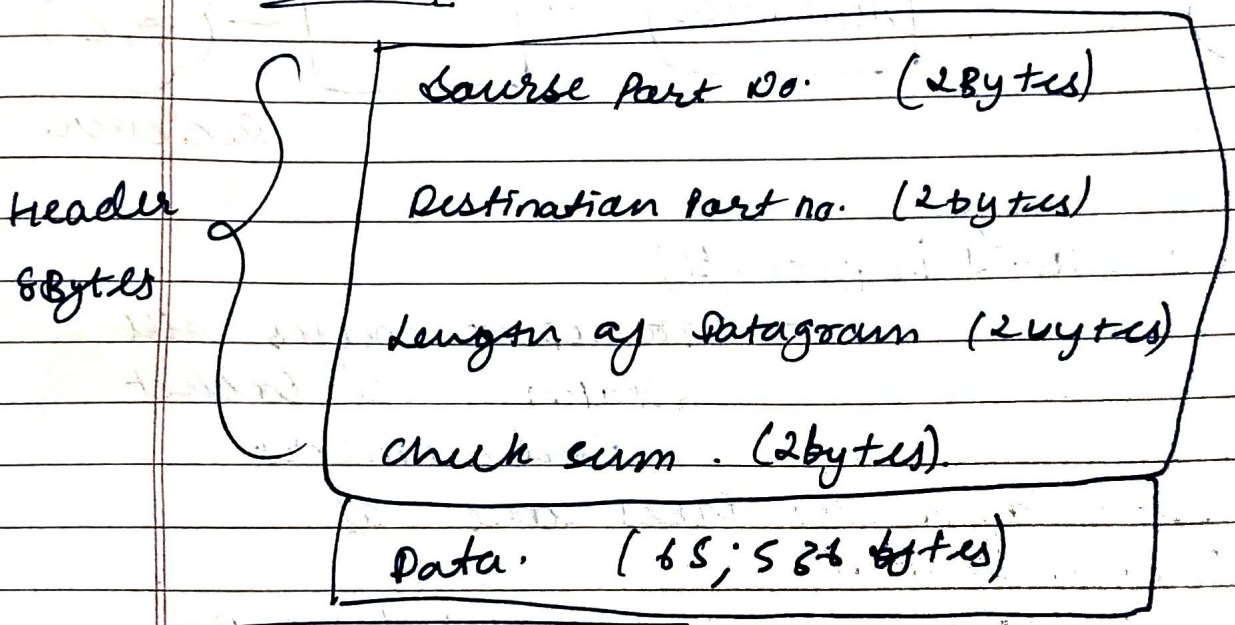
→ Checksums:
It is a string of numbers and letters that act as a finger print for a file against which later comparisons can be made to detect errors in the data. They are important because we use them to check files for integrity

[redacted]

1. UDP (user datagram Protocal)
   - * data may or may not be delivered
   - * data may change
   - * data may not be in order

It is a connection less Protocal.

UDP Packet



total size = 2^{16}

2. use cases:
   1) very fast
   2) video call apps
   3) gaming
   4) DNS.

→ TCP (Transmission control Protocol).

- Transport layer protocal
- Application layer sends lots of raw data TCP segments this data → divide it in chunks, add headers. It may also collect the data from network layer →
- Congestion control
- maintains the order of data using Sequence numbers.

★ features :-

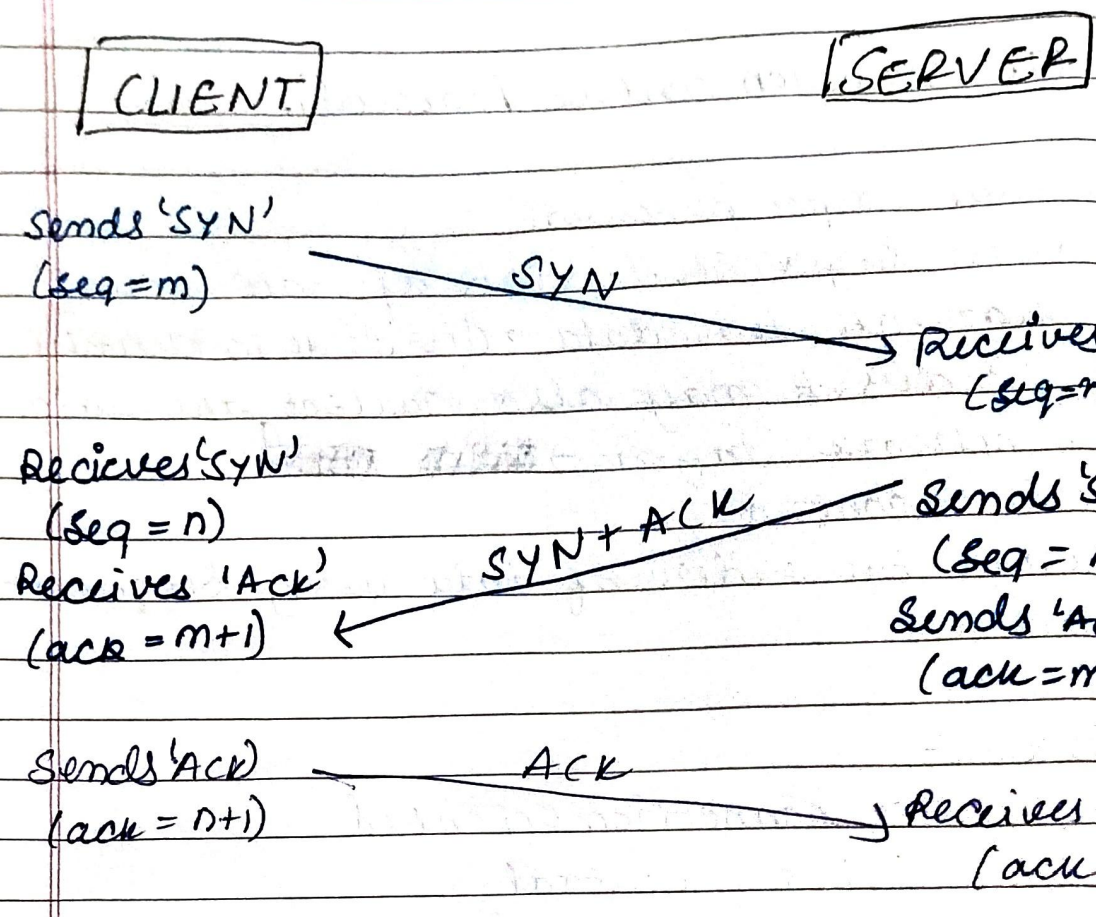
→ connection oriented
→ Error control
→ Congestion control
→ full duplex data transmission.

↓

full duplex data transmission means that data can be transmitted in both direction on a signal carrier at the same time.

→ 3 way Handshake.

TCP uses three way handshake to establish a reliable connection. The connection is full duplex, & both sides synchronize (SYN) and acknowledge (ACK) each other. The exchange of these four flags is performed in three steps - SYN, SYN-ACK, & ACK-



→ NETWORK LAYER → (working with routers)

192.168.2.30
- 192.168.2. → network address
- 30 → device address

Transport → Segments
Network → Packets
Datalink → frames

Routing is the process of selecting a path for traffic in a network or between or across multiple networks. Broadly, routing is performed in many types of networks such as public switched telephone network & computer networks

→ CONTROL PLANE:

* Static Routing (mannually)
* Dynamic Routing (Automatic)

→ INTERNET PROTOCOL :-

IPv4 → 32 bit, 4-words

IPv6 → 128 bits

5. 6. 9. 14

00000101

→ class of IP addresses:

A 0.0.0.0 - 127.255.255.255

B 128.0.0.0 - 191.255.255.255

C 192.0.0.0 - 223.255.255.255

D 224.0.0.0 - 239.255.255.255

E 240.0.0.0 - 255.255.255.255

→ 127.0.0.1 is called loopback address. Packets sent to this address never reach as the network but are looped through the network interface card only. This can used for diagnostic purposes to verify that the internal path through the TCP/IP Protocal is working

→ PACKETS → Header is of 20 bytes

IPv, length, identification, flags protocals, checksum, addresses, TTL etc

IPV6

· IPv4: $2^{32} \approx 4.3$ billion.

IPv6: $2^{32 \times 4} \approx 2^{128} = 3.4 \times 10^{38}$

cons: ✱ Not backward compatable
✱ ISP would have to shift
✱ Lot of hardware work

middle boxes:

① firewall → global internet
→ your trusted internet

→ Filter out IP Packets based on various rules
1) Address
2) Port nos
3) Flags
4) Protocals

* Two types of firewall:
  1) Stateless
  2) Stateful.
     ↳ more efficient

→ **DATA LINK LAYER**

Data link layer is the second layer in OSI (Open System interconnection) model & TCP/IP Protocal suite. Its primary function is to provide reliable communication over a physical link, ensuring that data is transmitted accurately between devices on the same local ~~net~~ network segment.

It is divided into two sublayers :-

① Logical link control (LLC) –
→ It is responsible for establishing, maintaining & terminating links between devices
→ It handles flow control, error checking, & frame synchronization.
→ LLC enables multiplexing

② Media access control (MAC).
→ It is responsible for controlling access to physical network medium.
→ MAC employs protocals like Ethernet, wifi to manage how devices on a network access & share the communication medium