SHIVANI PATEL(COMPUTER NETWORK)

NOTES

AT INTERVIEW TIME

SNO.	TOPICS
1.	TCP/IP
2.	OSI MODEL
3.	ROUTERS
4.	SWITCH
5.	DELAYS
6.	TCP VS UDP AND PUBLIC VS PRIVATE IP
7.	3-WAY HANDSHAKE
8.	CRYPTOGRAPHY
9.	DNS(DOMAIN NAME SYSTEM)
10.	LOAD BALANCING
11.	PORTS
12.	HTTP AND HTTPS
13.	TLS(TRANSPORT LAYER SECURITY)

Notes

TCP/IP (COMPUTER NETWORKS)

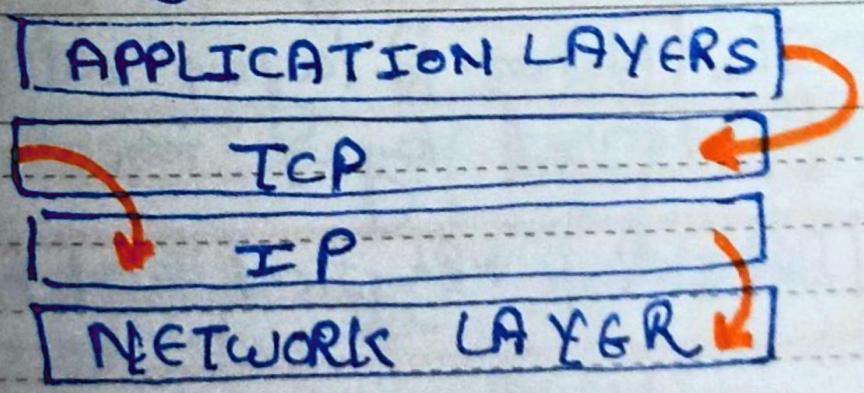
TCP stands for **Transmission Control Protocol**

IP stands for **Internet Protocol**

TCP — What is ??

It is one of the **main** protocols of the **internet** protocol suite.

It **lies** b/w **Application** and **network** layers.



Remarks

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TCP/IP

5-layer

- Application
- Transport
- Network
- Data link
- Physical layer

4-layer

- Application
- Transport
- Internet
- Network Access layer

Difference in 5-layer Vs 4-layer

⇒ The Network layer called Internet layer in 4-layer.

Remarks

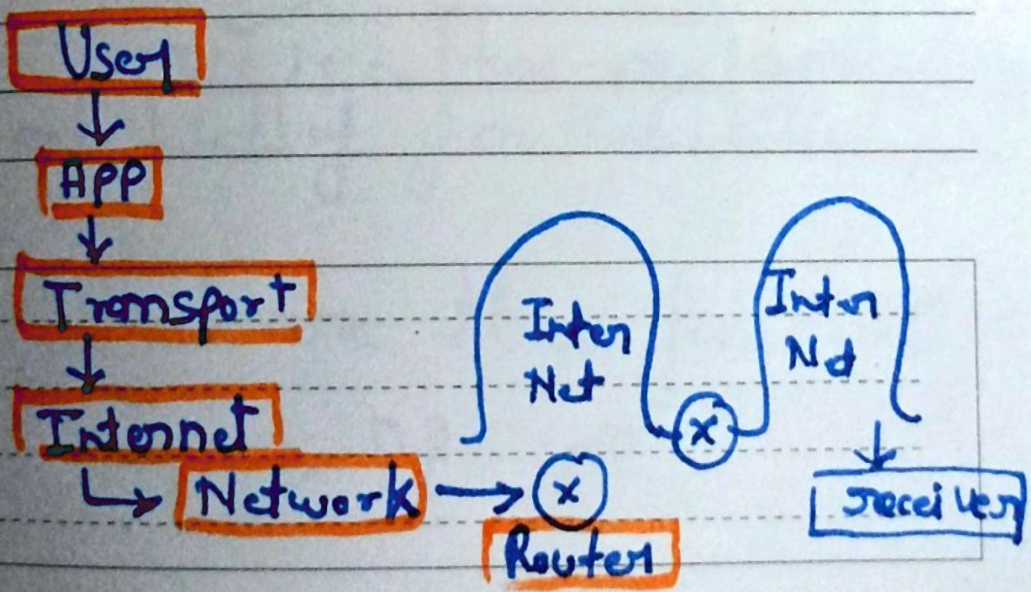
⇒ Data link + Physical = Network Access layer

TCP/IP Protocol Suit or Internet Protocol developed by ARPANET. It is fully implemented model.

⇒ Support → Client - Server and peer to peer

⇒ It is practical approach.

Working → like User generate data then it goes to



Remarks

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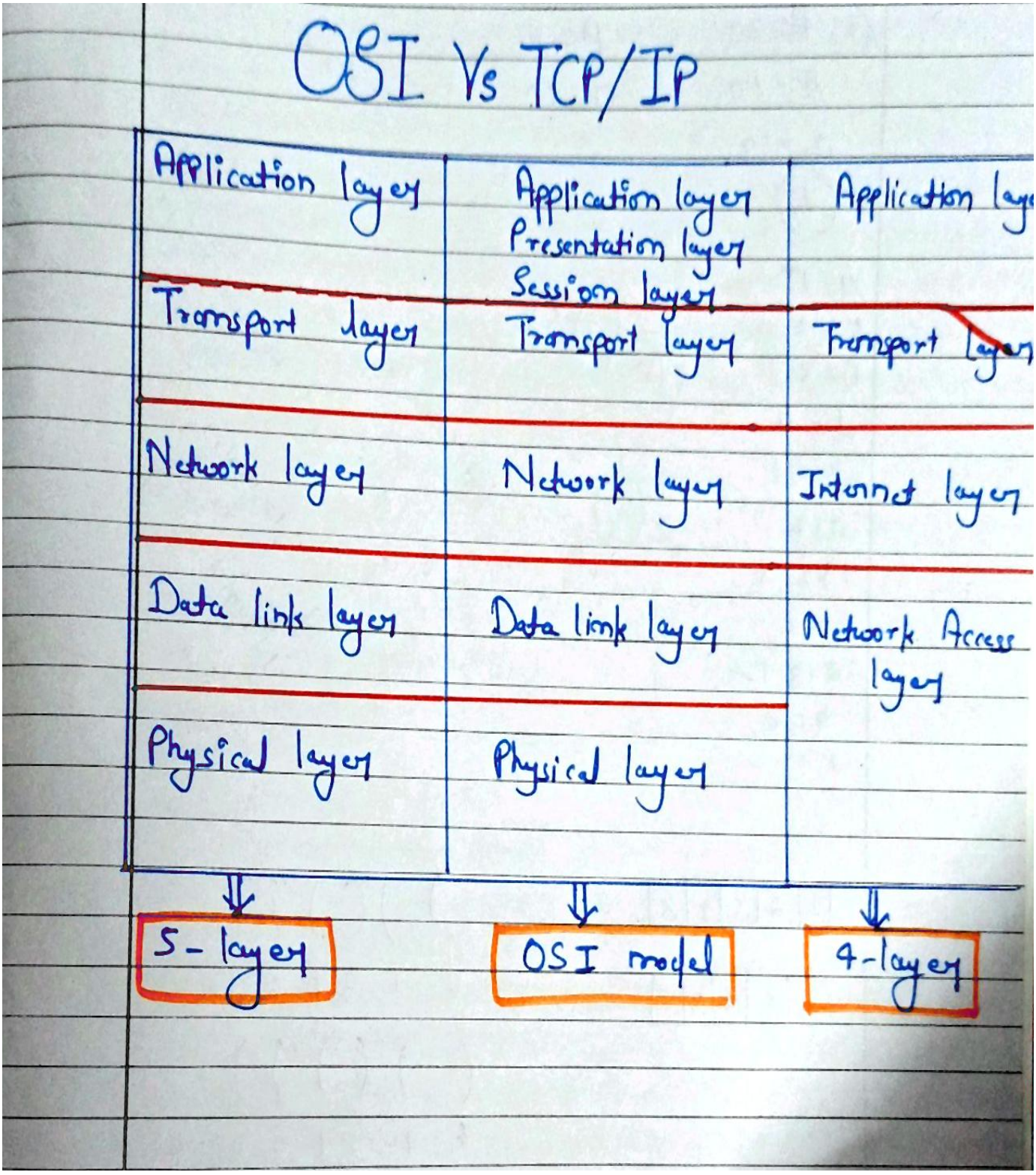
In TCP/IP all process will be done with the help of Internet / Network layer.

Remarks _____

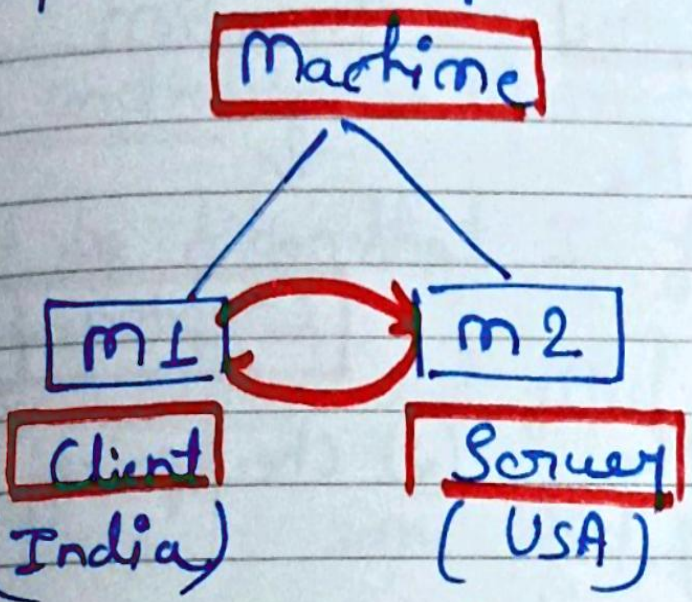
OSI Vs TCP/IP



OSI Model
(COMPUTER NETWORKS)

Open System Interconnection → OSI

⇒ take an example :



This is a two-way communication and lot of functionalities uses

Remarks: What are these functionalities → ??

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Notes

Functionalities

more than 10 functionalities

Mandatory

Optional

whenever my client machine is sending some data or request to the server.

what are the mandatory fn ??

(1) Error Control

if we send M then receiver send M if it receives ML means error.

(1) Encryption / decryption

known as cryptography.

(2) checkpoint

Remarks

(2) Flow control (Amount of data)

↓

means as a sender I am sending data to the receiver and I filled the whole network with data....

No there is some kind of flow control ⟶ Means It should not be like that I filled the whole buffer and filled it all memory

⟶ their is some kind of constraint

↓

Use then network work properly.

Remarks

(3) Multiplexing / Demultiplexing

⇒ lot of machine there but

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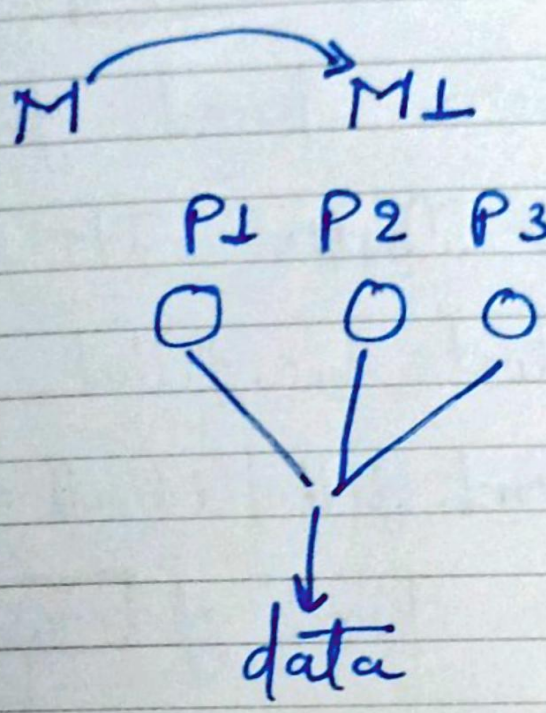
Note

which one provide data then we need multiplexing and demultiplexing



What is the need of OSI model why we made this model ??

Remarks

→ Big question.

The reason behind that model is this .... that all these functionalities that we are providing → we decided to put in a model

When we send/receive the data first it passes through all the protocols that is present in our model.

⇒ So, for that we made a model that is OSI model.

Convert all fn

layers

Remarks

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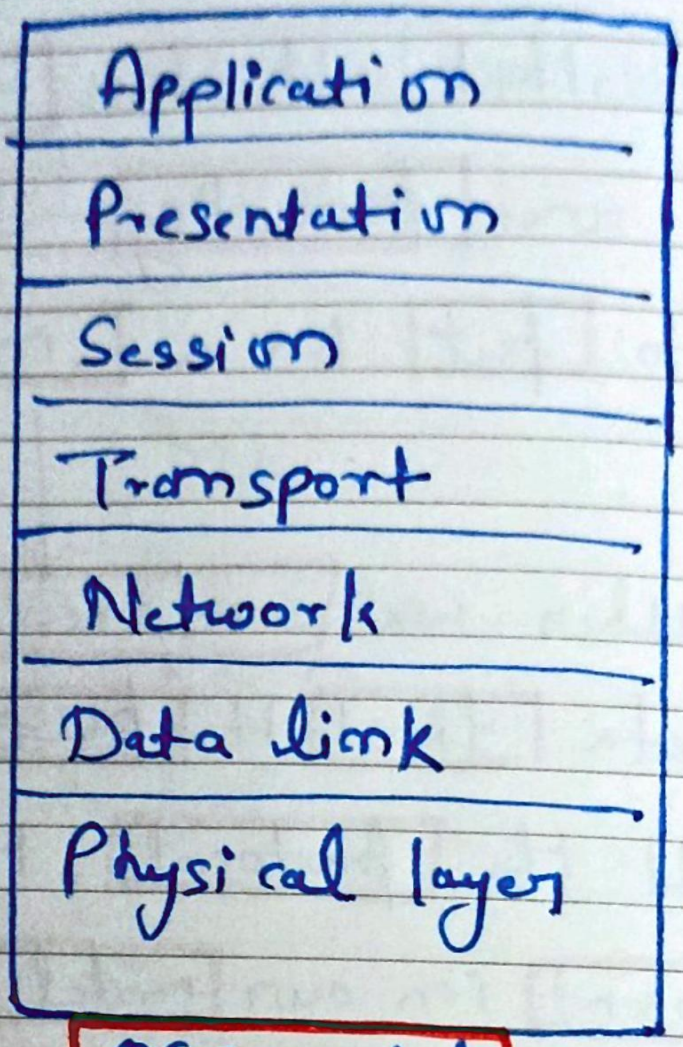
Notes

functionalities



OSI model

↓

whenever we pass our message first it passes from all the seven layer that is concept of OSI model

Remarks

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Routers In Computer Networks)

It is a networking device that forwards data packets b/w computer networks.

Router has a number of interfaces by which it can connect to a number of host system.

⇒ Whenever we talk about routers that means talk about internet.

Router work on 3-layers

- Physical
- Data link
- Network

Remarks

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Notes

Router working on 3-layer means → ??

↓

Router check MAC address as well as IP address also.

↓

whenever talk about 'IP' means talk about internet.

functions of Routers

↳ forwarding

↳ Routing

↓

two major functions

Remarks

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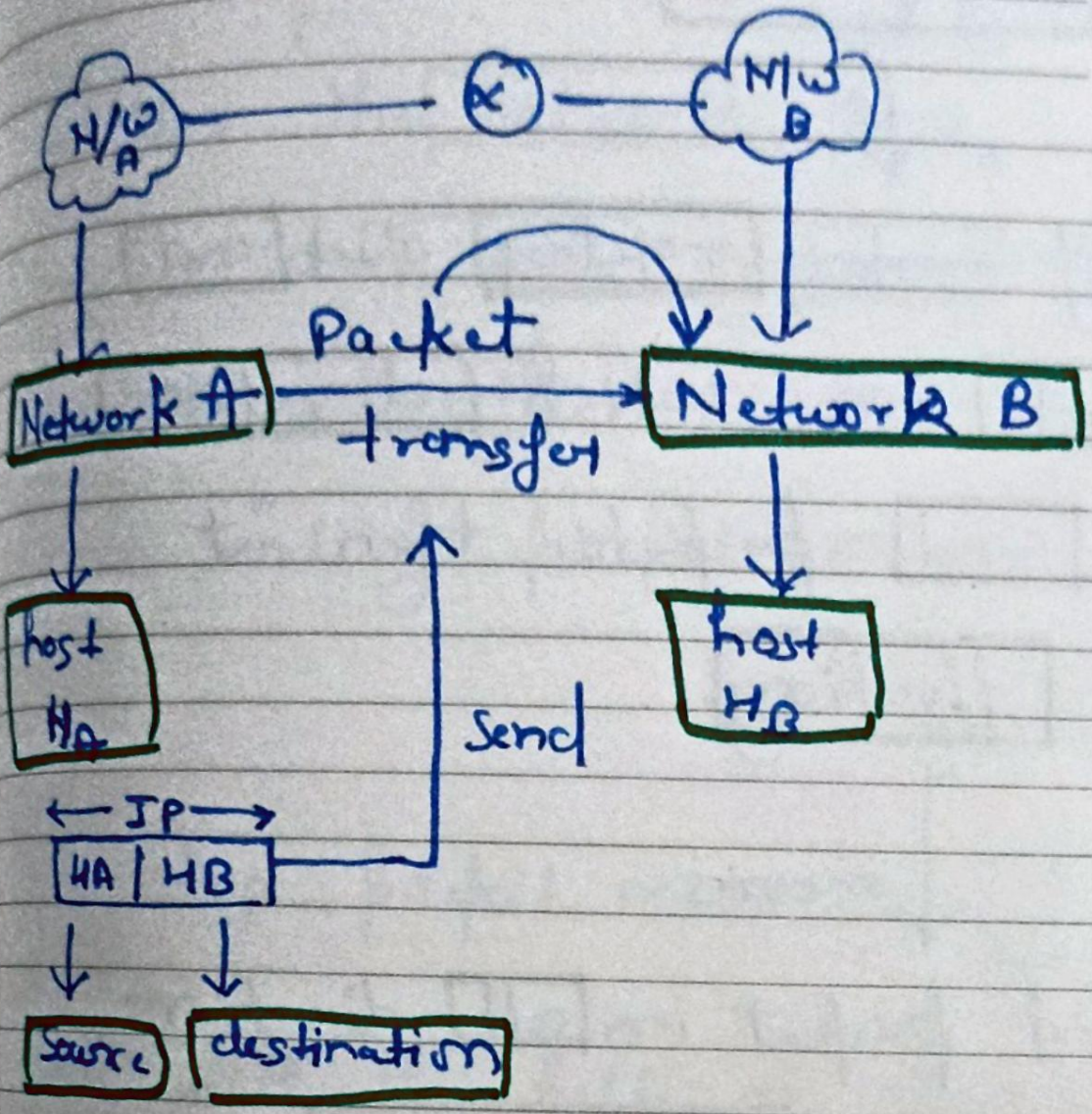

Router uses → Routing table

Routing table means

it maintains which type of network is it connected.

after checking with routing table

which direction packet should be sent.

Remarks

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Key point:

If ~~router~~ router did not decide in which direction it send packets then it do flooding.

means

send packet in all directions, a kind of broadcasting.

⇒ Filtering ?? How in Routing

Remarks: by using ARP request, we check → IP address, MAC address

otes

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ARP requests works only within the network, here, router can decide to send this packet or not

→ sending packets means → forwarding

→ stop packet means → filtering

So, with the help of routing table we decide to send packets or not.

Routing table Uses

- RIP protocol
- distance Vector routing.

Remarks

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Notes

Point:

Inside router packet did not collide, another packet come then it store inside memory because router uses store and forward concept.

Remarks

otes

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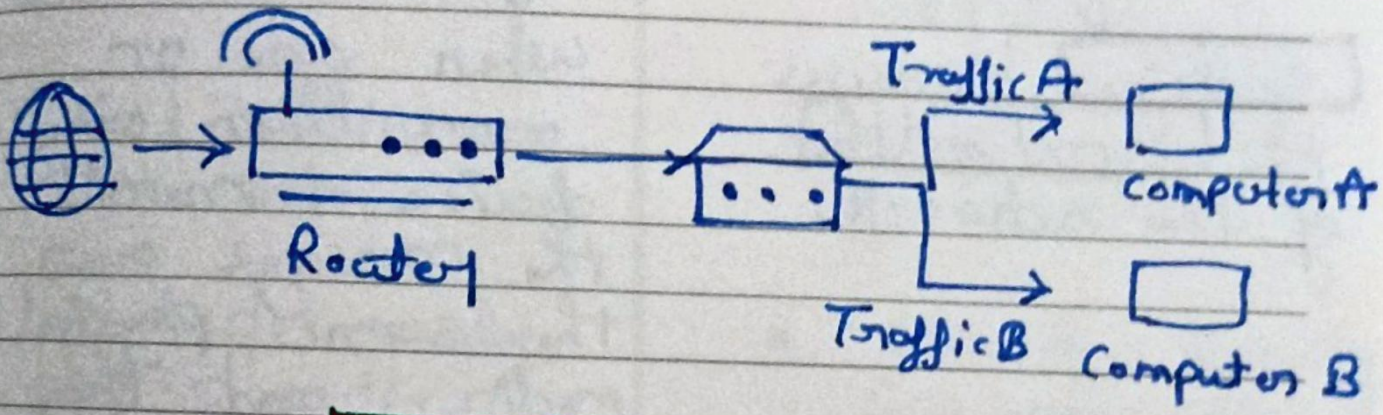
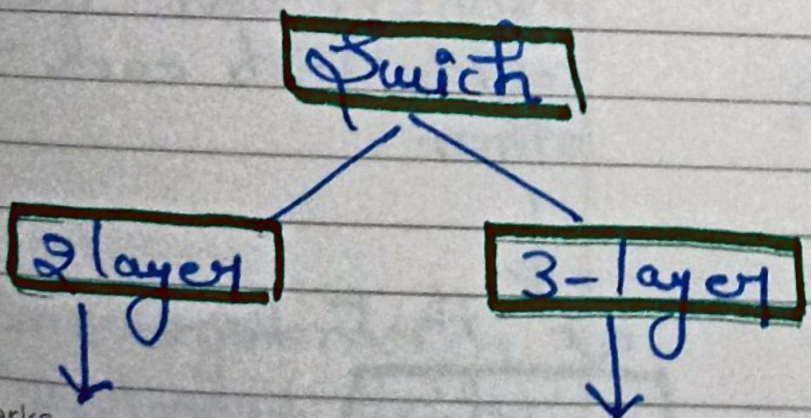
Switch (COMPUTER NETWORK)

connect devices within a **network** and **forward** data **packets** to those devices.

(LAN)
local Area Network





Remarks

forward data based on **MAC** address

forward data based on **IP** address.

Date__/__/_____ Note

Why switching concept required ??

two reasons!

- **Bandwidth** → switches increases the bandwidth of the network.
- **Collision** → when one or more than one device transmit the message over the same physical media, and they collide with each other.

→ at that time **switching** technology is **implemented**.

Remarks

otes

Date__/__/_____

Switch Vs Router

Switch	Router
• connect multiple network device.	• connect multiple switches.
• work on data link layer of OSI model.	• work on network layer of OSI model.
• Used within a LAN.	• Used in LAN or MAN
• provides only port-security.	• provides security measures to protect the network from security threats.
• Send information from one device to another in the form of frames.	• Send information from one network to another network in form of packets.

Remarks

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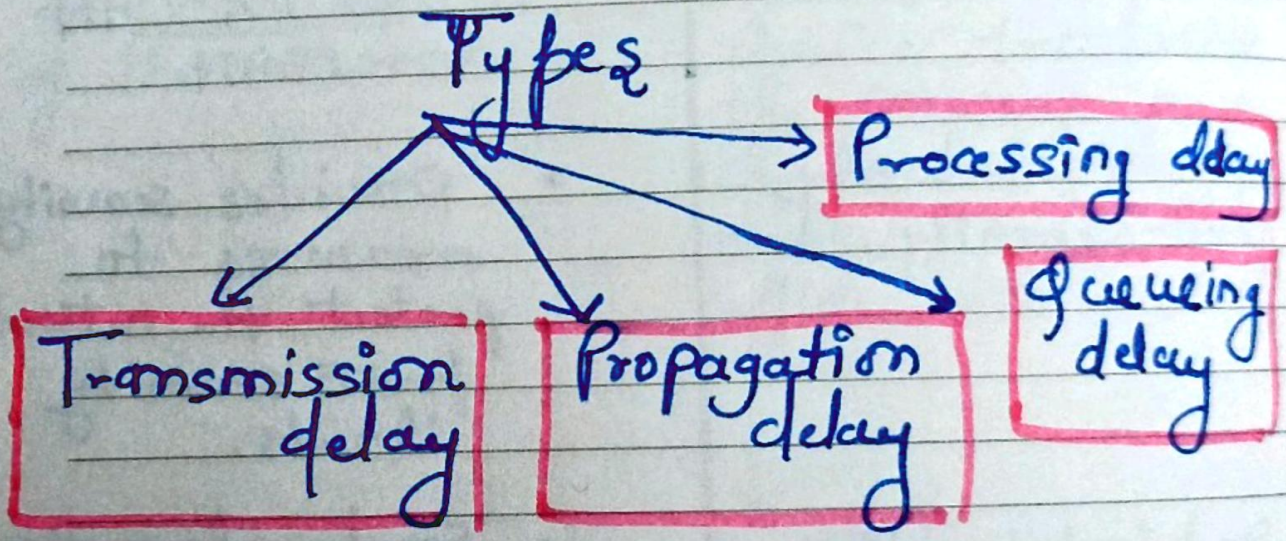
Delays in Computer Networks -

means — ??

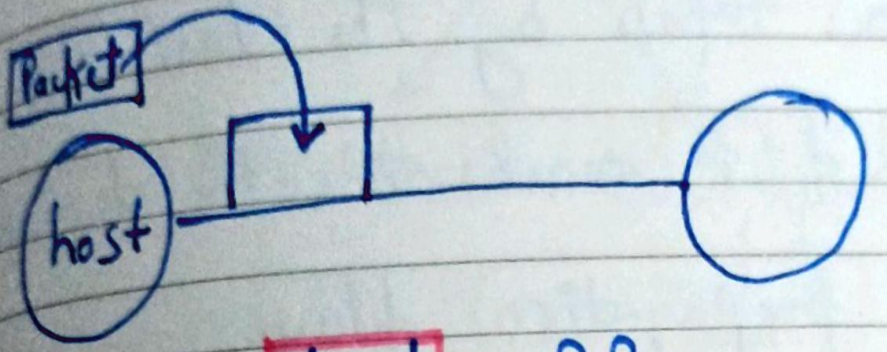
the **time** for which the **processing** of a **particular packet** take place.



Remarks: Explain all ⇒

Transmission delay –

Time to transmit a packet from host to the transmission medium is called transmission delay.



How to find = ??

Bandwidth = 1 bps
data = 10 bits

→ in 1 sec we transmit 1 bit

$$T_t = \frac{L \text{ (bits)}}{B \text{ (bits per sec)}}$$

Remarks

If BW is high then T_t is less.

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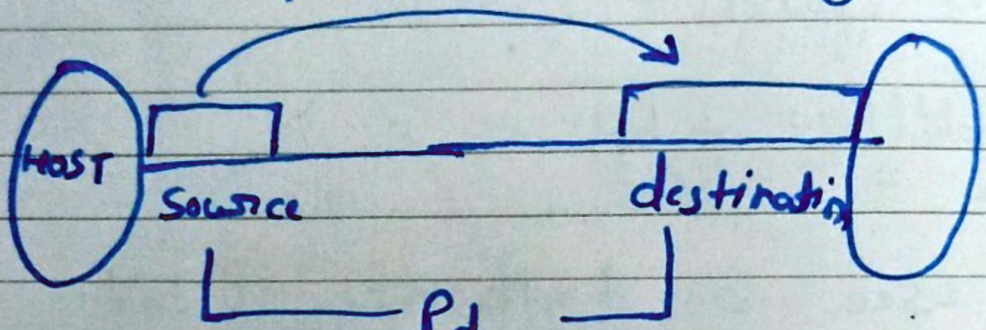
Propagation delay –

After the packet is transmitted to the transmission medium, it go through the medium to destination. The time taken by the last bit of packet to reach to the destination is called propagation delay.



↳ propagation delay.

$$T_p = \frac{d \text{ (distance)}}{v \text{ (velocity)}}$$

where $V = 3 \times 10^8$

Remarks .....

Date__/__/_____

In case of optical fibre

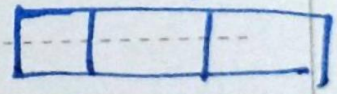
$V = 3 \times 10^8 \times 0.7$
$= 2.1 \times 10^8$ m/s

factor affection T_p →

- Distance
  - take more time to reach the destination, d ↑
- Velocity
  - velocity ↑ then Packet will recieve faster.

Queuing delay —

Packet → recieved → destina.



Packet wait in queue for sometime called buffer. ← queue.

Remarks

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delay depends on following factors —

Size of queue is ↑ (increases)
queue delay ↑ (increases)

Processing delay —

Time taken to process the data packet by the processor that is the time required by routers to decide

to forward packets,
update TTL, header, checksum.

Remarks

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It does not have any formula → depend on speed of the processor.

$T_{total} = T_f + T_p + T_q + T_{pro}$

$T_{total} = T_f + T_p$ (T_q and T_{pro} equal to 0)

Remarks

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TCP Vs UDP

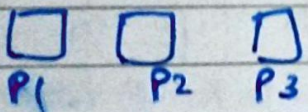
TCP

Transmission Control Protocol

Internet protocol that connect a server and a client.

Connection oriented
(Means: It first establish the connection then transfer the data)

Reliability
(Means: Notify the sender whether data is received OR not)



reach in order

UDP

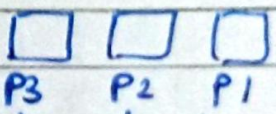
User Datagram protocol

a communications protocol that facilitates the exchange of messages b/w computing devices in a network.

connection less
(Means: does not care about connection, whenever it give data from an application → start transmission of data.

less Reliability
(Not sure about get data)

↳ like



not reach in order.

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TCP Vs UDP

TCP

- Error Control is mandatory.
  - { Here, use checksum to check error }
- Slow transmission (here data travel only on one network)
- More overhead (Means: Tcp header 20-60 Byte)
- Flow Control, Congestion Control
  - { Check for capacity of data }
- help in finding packet of loss.

UDP

- Error Control is optional.
  - { UDP header also have checksum but only difference is this error control is optional }
- Fast transmission (here data travel from multiple network)
- less overhead (8 Byte)
- No flow Control and congestion control.
- No help in finding packet of loss.

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Keypoints :

① TCP uses → HTTP
UDP uses → DNS

② TCP uses → FTP (file transfer Protocol)
UDP uses → BOOTP, DHCP, RIP

Public Vs Private Address (IP)

Public

what is ??

Used to **communicate** **outside** the network.
It is assigned by **ISP** (Internet Service Provider)

divided into 3 classes

- **Class A** → begin 1 to 126
- **Class B** → begin 128 to 191
- **Class C** → begin 192 to 223

Private

what is ??

Used to **communicate** **within** the network.

Using Private IP, **data** or information can be **sent** or **received** within the **same** network.

but if we **don't** want to **connect** with internet but have IP address so for that **Private IP** will **come**

Date__/__/_____ Notes

3- Way handshake (COMPUTER NETWORK)

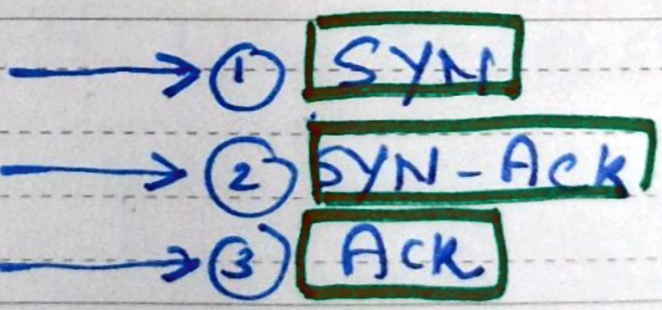
Very Important

What is ??

It is a process which is used in a TCP/IP network to make a connection b/w server and client.

It is a 3-step process that require both the client and server to exchange synchronization and acknowledgement packet.

Remarks



Notes

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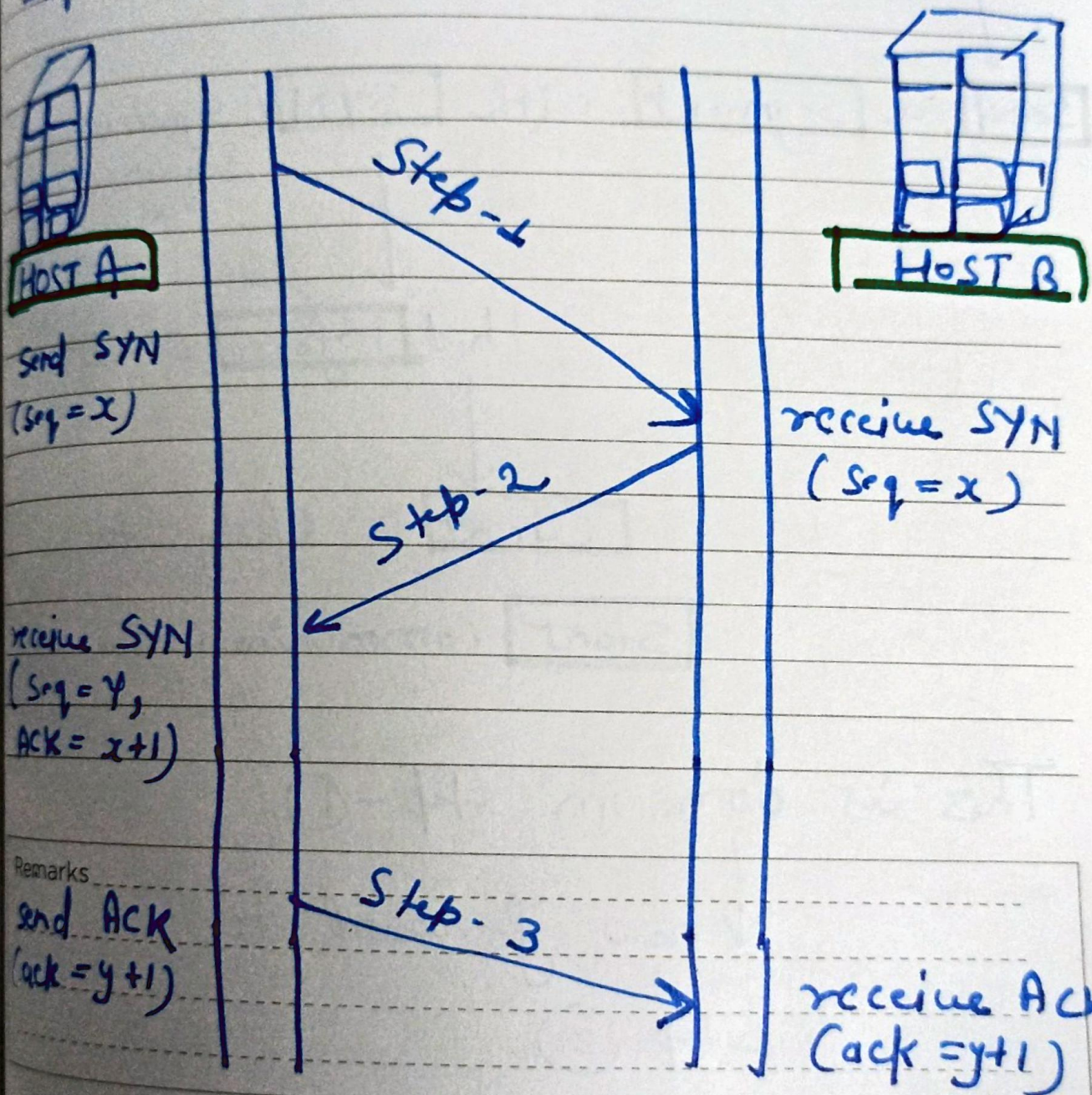
Explaination of these steps ——

Step - (1)



Remarks

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Notes

Step-1 (SYN):

Client —— establish connection —— Server

↓

Send a Segment with SYN (Synchronize Sequence Number)

↓

that inform Server

↓

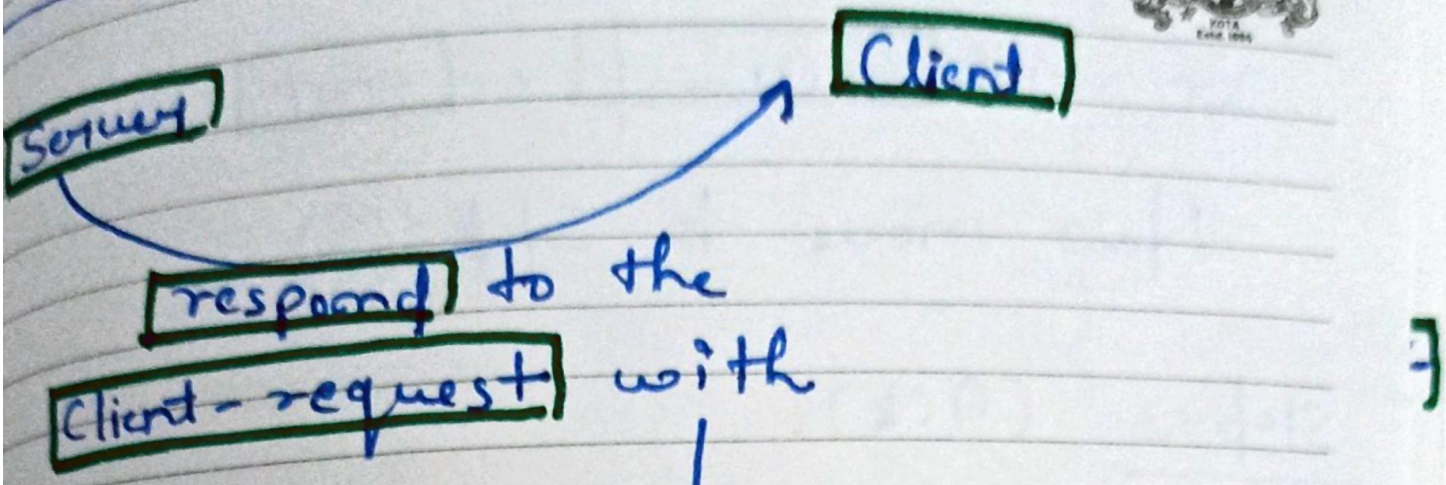
Client is likely to Start communication.

This is done in step-(1)

↓ now forward to Step-(2)

Remarks

Step - 2 (SYN + ACK):



SYN - ACK

It signifies with what sequence number it is likely to start the segment.

here, Seq = y and ACK = x+1

What is ACK —— ??

It is stands for acknowledgment, means it inform both client and server

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about the packet, whether it will received or not.

Now move to Step-(3)

Step-3 (Ack):

After receiving the reply.

↓

Client acknowledges the response of server.

↓

It acknowledges the server by sending a pure acknowledgement

↓

will not contain any sequence number.

Remarks

otes

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Means →

when you send SYN = 1

↓

means 1 sequence number

but when you are sending only ACK = 1 → 0 sequence number.

Remarks

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Cryptography (COMPUTER NETWORK)

??

technique through which we can **convert** **plain text** to **cipher text**, and convert **cipher** text to **plain** text.

Plain text: A normal message that can **understandable** by **anyone.**

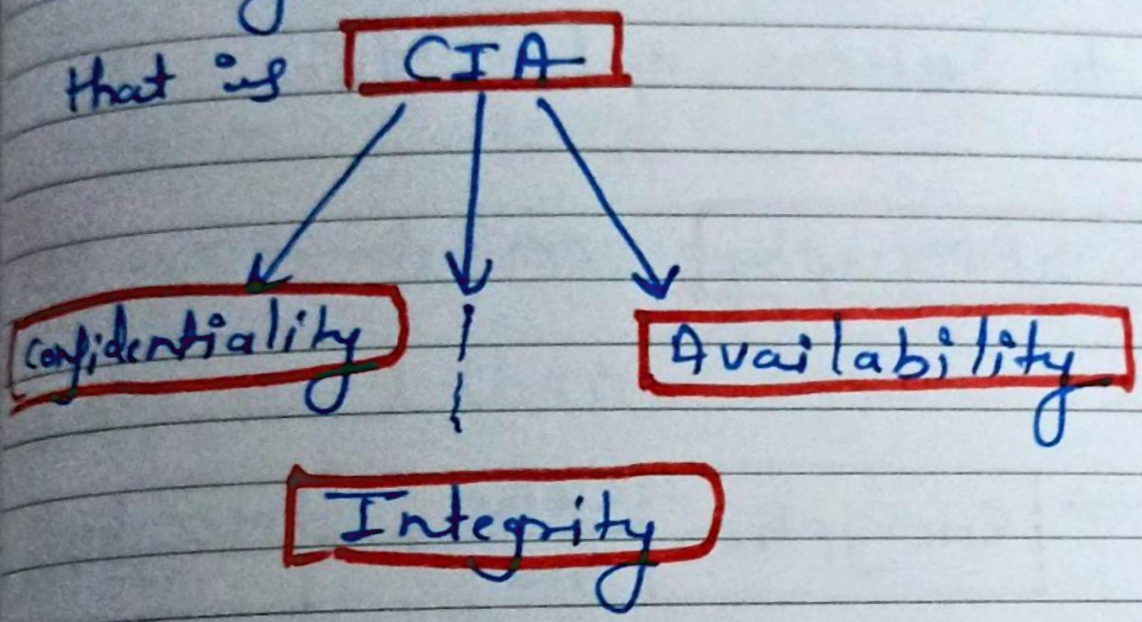
Cipher text: like a **secret** message that can be read by anyone but **cannot** understand.

Remarks

Why we **convert** plain text to cipher text ??

"To achieve confidentiality".

Whenever we talk about network security → One important concept that is CIA



Confidentiality => means that only authorized individuals/ systems can view sensitive or classified information.

Remarks

Integrity => to make sure that data has not been modified.

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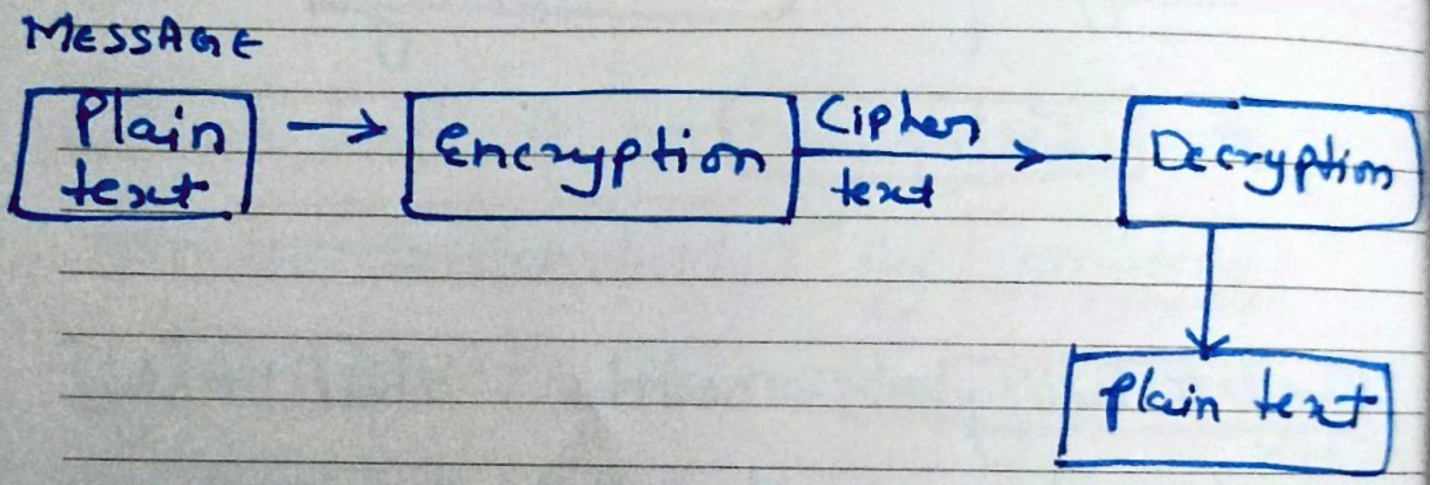
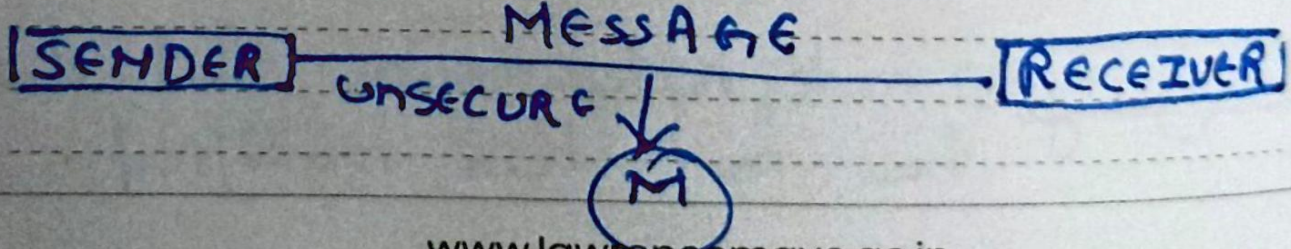
by using hash function.

Availability ⇒ network should be readily available to its users, this applies to systems and to data.

How **Cryptography** works —??



like we **send** message from **India** to **US**



When we send message, don't know which router take our message. So here, anyone can take message → There is no problem of confidentiality. But if we send message in form of plain text then anyone can understand also.

↓

So, for that we use cryptography.

How plain text convert into cipher text = ??

Remarks

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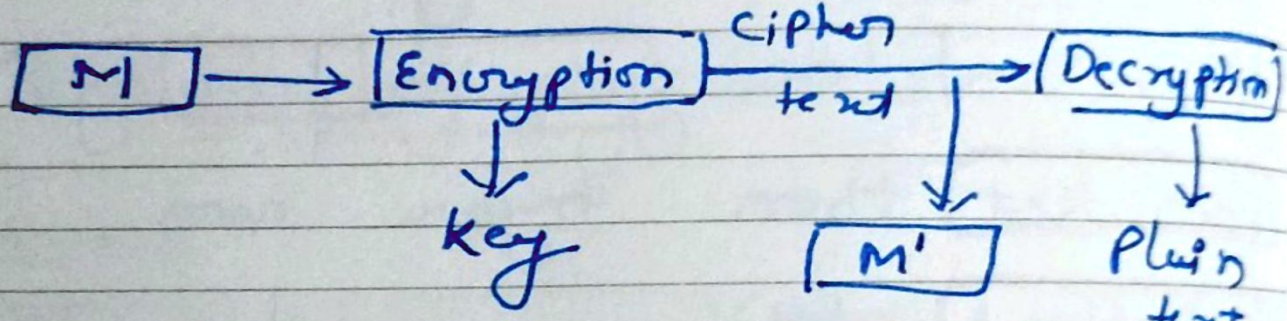
here, is a key → so we use lock that is opened with a key, while applying lock it convert into cypher text.



So here original message = M

But after convert into cipher text it becomes = M'

Remarks Now receiver decrypt mess from M' to M for understanding

Notes

Cryptography.

uses in two ways

- Symmetric key
  - means
  - same key
  - means
  - Use same key for lock and unlock the message.
- Asymmetric key
  - means
  - here we use two keys.
    - lock
    - unlock

Remarks

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DNS (COMPUTER NETWORK)

DOMAIN NAME SYSTEM

↓ Why we use

To map the domain name with the IP address.

↓

take an real life example, we use lot of website when we open → we just enter like google, youtube, whatsapp etc.

↓

we never write IP address, always enter Domain names.

↓

So we always remember domain name instead of IP address.

Remarks

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tes

DNS work like a Phonebook.

⇒ IP address are dynamic.

⇒ We can change IP address of website but cannot change its name.

How it works ——??

www.google.com

↓

Simply write google.com

↓

domain name

↙

first we map IP address to this domain name

→ by using Hierarchical architecture.

Remarks

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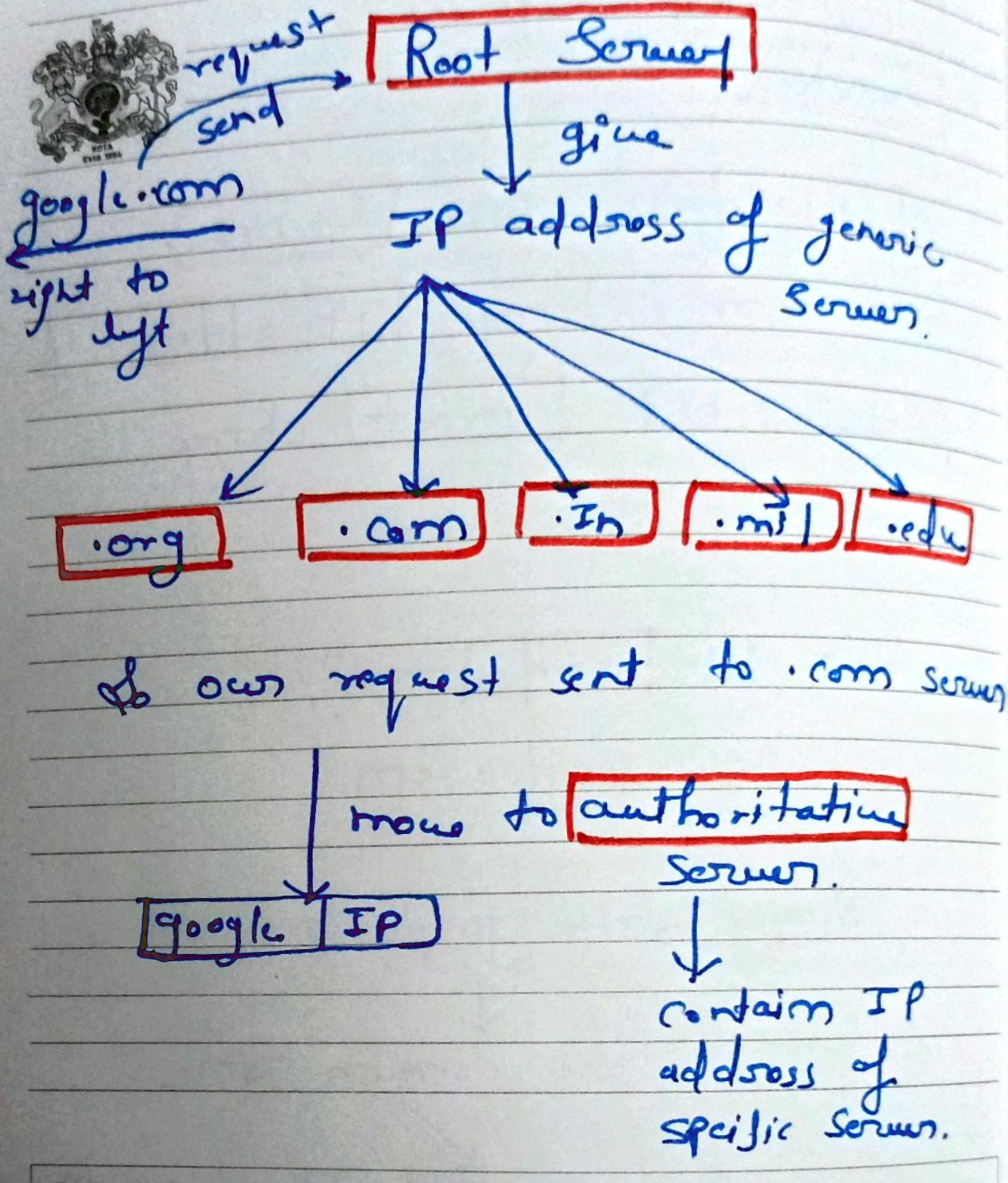


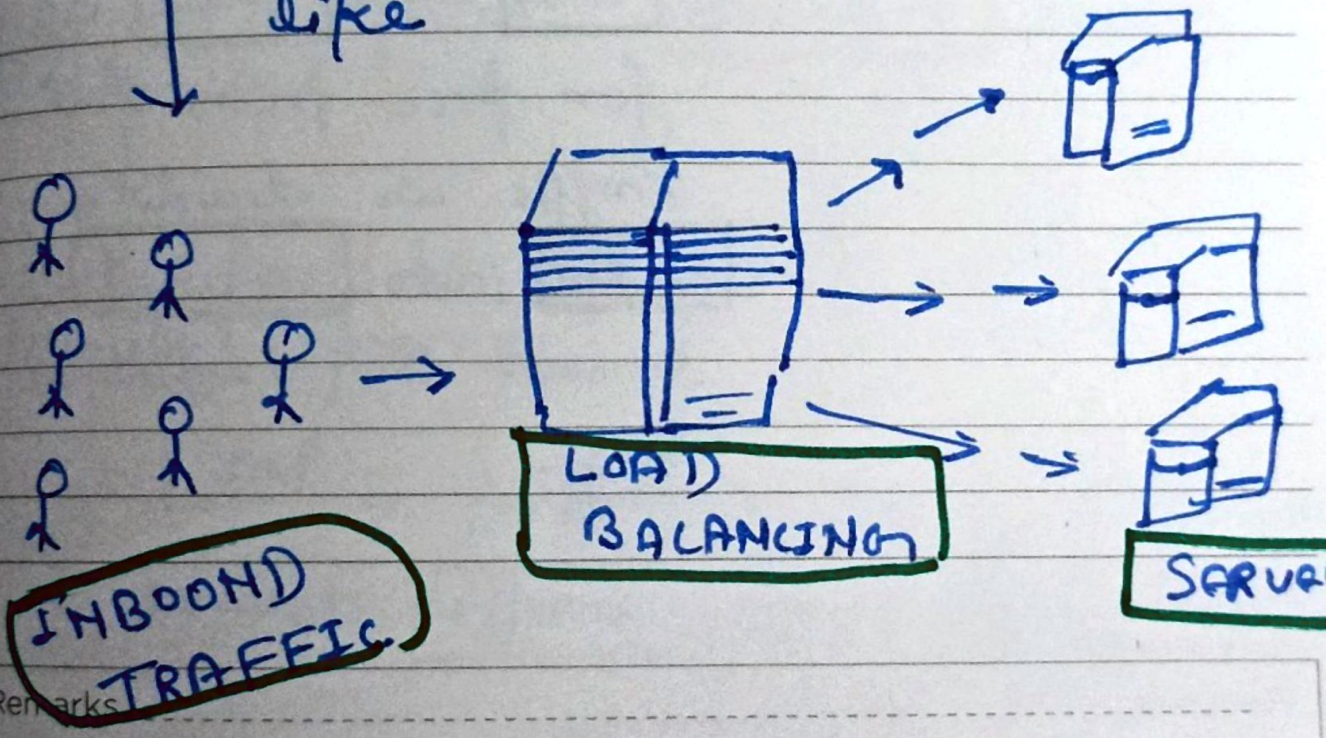
Remarks
This is how DNS work.

Notes

LOAD BALANCING (COMPUTER NETWORK)

It is providing access to resources on a group of servers in such a way that the workload of serving clients is shared among the servers.

like



Remarks

It divide the traffic across several servers by using TCP/IP

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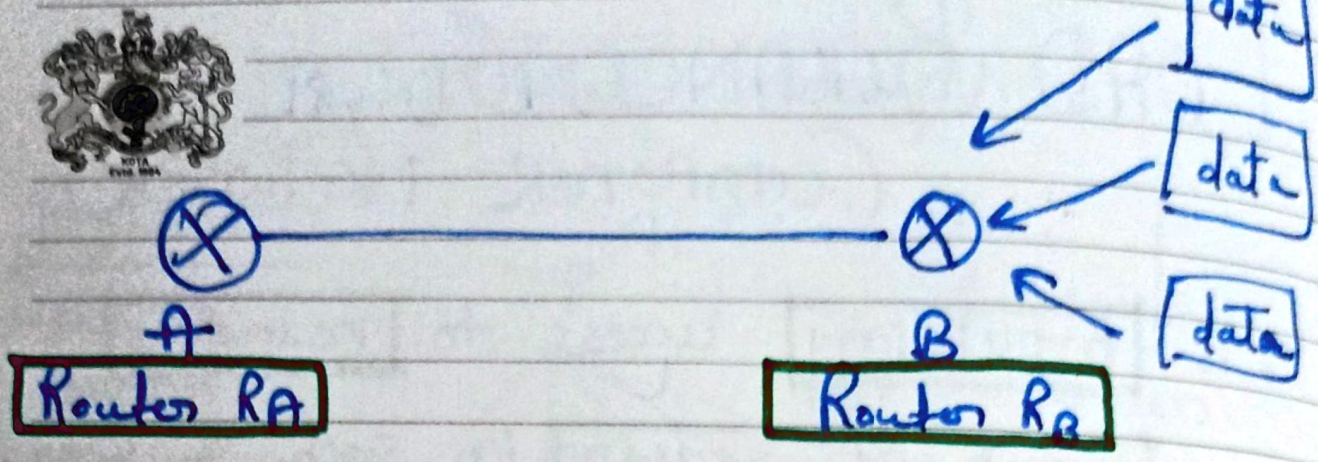
Notes



Here RB has lot of traffic all packet wait in a queue so for free from that traffic we divide our data into several servers so traffic is less.

Remarks

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Ports (COMPUTER NETWORK)

What is ??

It is a **virtual point** where **network** connections **start** and **end.**

Ports are **software** based and managed by a computer's **operating** system.

Each **port** is associated with a **specific** process.

Imp → Ports are **easily** differentiate between **different** kinds of **traffic.**

Remarks

What is **Port Number** — ??

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Ports are standerized across all network - connected devices, each port assigned a number that is reserved for that protocol like hypertxt Transfer protocol → has port number 80.

How ports are efficient —??

different type of data flow to and from a computer over the same network connection.

↓

Remarks use of ports helps computers what to do with the data that they receive

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otes

Key Points:

Ports are a transport layer concept. It is only a layer such as TCP or UDP that indicate which port a packet should go to.

Different type of Port numbers —

⇒ Ports 20 and 21 → FTP

⇒ Port 22 → Secure shell (SSH)

⇒ Port 25 → SMTP (used for mail)

⇒ Port 53 → DNS

marks

⇒ Port 80 → HTTP

⇒ Port 123 → NTP

Date__/__/_____ Notes

Port 179 → BGP (Border Gateway protocol)

Port 443 → HTTP secure HTTPs

Port 3389 → Remote desktop protocol. (RDP)

Remarks _____

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HTTP AND HTTPs

HTTP

- Hypertext Transfer Protocol.
- HTTP uses TCP (Transmission Control Protocol)
- It works at the Application layer.
- Default Port number is 80
- It does not uses certificate.
- There is no encryption and decryption.
- HTTP URLs begin with http://

HTTPs

- Hypertext Transfer Protocol secure.
- HTTPs uses TLS (SSL) to encrypt normal HTTP requests and responses.
- It works at the transport layer
- Default port number is 443.
- Uses SSL certificate.
- There is encryption and decryption.
- HTTPs URLs begin with Https://

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Transport Layer Security (TLS)

(COMPUTER NETWORK)

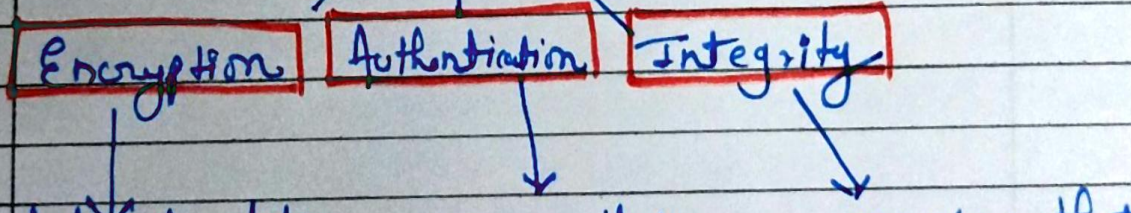
are designed to provide security at the Transport layer.

TLS was derived from a security protocol that is called Secure Socket Layer (SSL).

Primary use case of TLS is encrypting the communication b/w web application and servers.

TLS

three main components



Hides the data being transferred from third parties.

ensure that user claim is to be or not.

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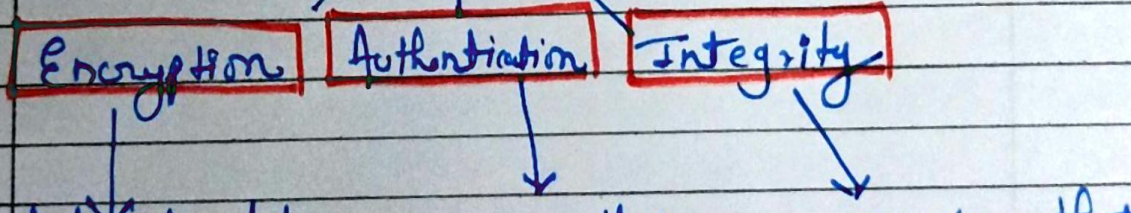

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