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.

APPLICATION LAYERS

TCP

IP

NETWORK LAYER

Remarks

Scanned by Scanner Go

Date__/__/_____

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**

Scanned by Scanner Go

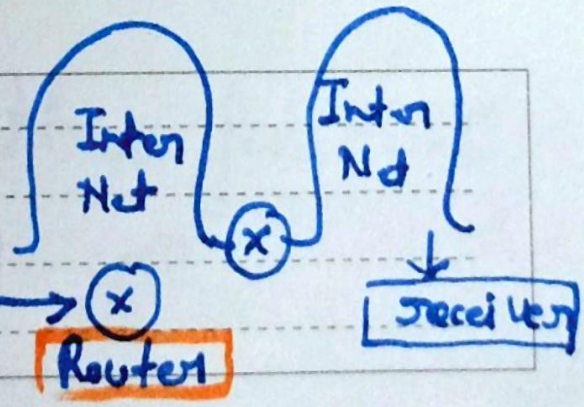
TCP/IP Protocol Suit or Internet Protocol developed by ARPANET. It is fully implemented model.

⇒ Support → Client - Server and peer to peer

⇒ It is practical approach.

Working → like User generate data then it goes to

User
↓
APP
↓
Transport
↓
Internet
↳ Network → (x) Router



Remarks

Scanned by Scanner Go

Date__/__/_____

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

Remarks

Scanned by Scanner Go

OSI Vs TCP/IP

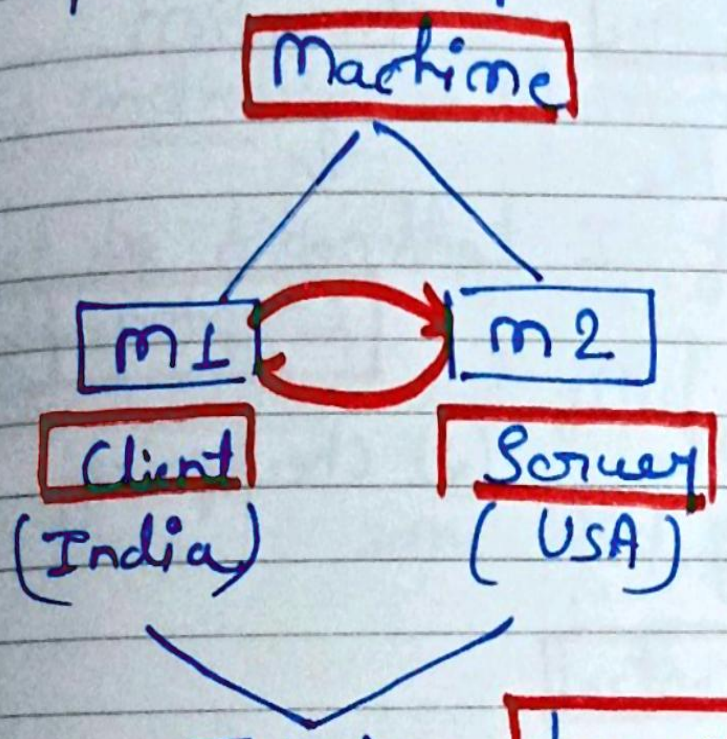
Application layer	Application layer Presentation layer Session layer	Application layer
Transport layer	Transport layer	Transport layer
Network layer	Network layer	Internet layer
Data link layer	Data link layer	Network Access layer
Physical layer	Physical layer	
⇓	⇓	⇓
5-layer	OSI model	4-layer

Scanned by Scanner Go

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

⟶ ??

Scanned by Scanner Go

Date__/__/_____

Notes

Functionalities

more than 70 functionalities

Mandatory

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

what are the mandatory f^n ??

(1) Error Control

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

Optional

(1) Encryption / decryption

known as cryptography.

(2) checkpoint

Remarks

Scanned by Scanner Go

(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

↓

uses then network work properly.

Remarks

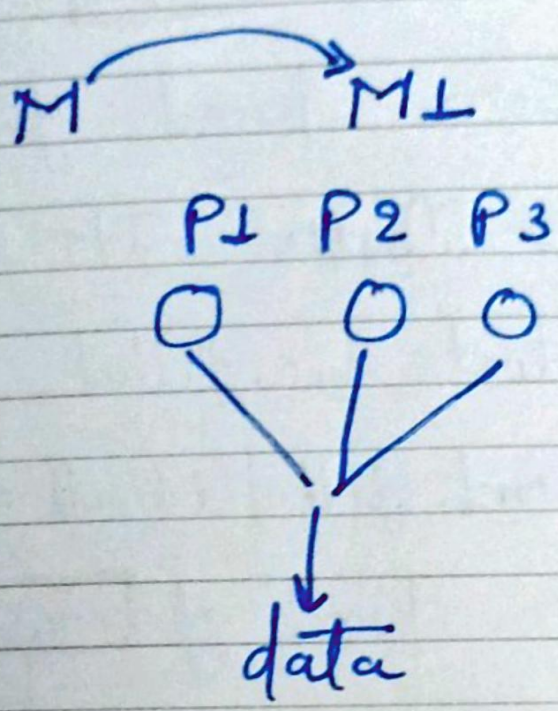
(3) Multiplexing / Demultiplexing

⇒ lot of machine there but

Scanned by Scanner Go

Date__/__/_____

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.

Scanned by Scanner Go

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 f^n

⇓

layers

Remarks

Scanned by Scanner Go

Date__/__/_____ Notes

functionalities

Application
Presentation
Session
Transport
Network
Data link
Physical layer

OSI model

↓

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

Remarks

Scanned by Scanner Go

Date__/__/_____

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

Scanned by Scanner Go

Date__/__/_____

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

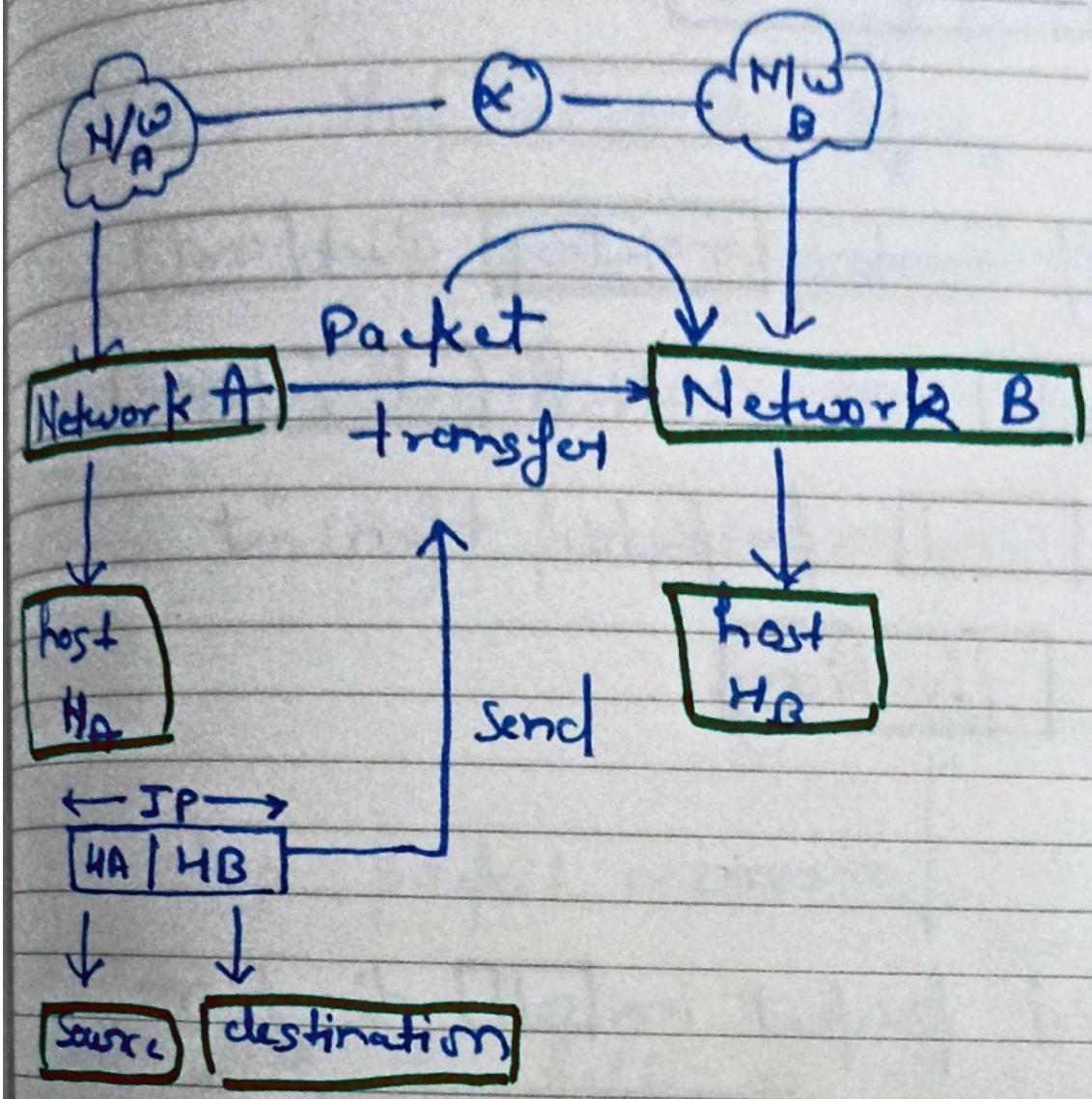
↓

two major functions

Remarks

Scanned by Scanner Go

Date__/__/_____



Router uses → Routing table

means

after checking with routing table → which direction packet should be sent.

it maintains which type of network is it connected.

Remarks

Scanned by Scanner Go

Date__/__/_____

Key point:

↓

If ~~rotel~~ **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

Scanned by Scanner Go

otes Date__/__/_____

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

Scanned by Scanner Go

Date__/__/_____ Notes

Point:

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

Remarks

Scanned by Scanner Go

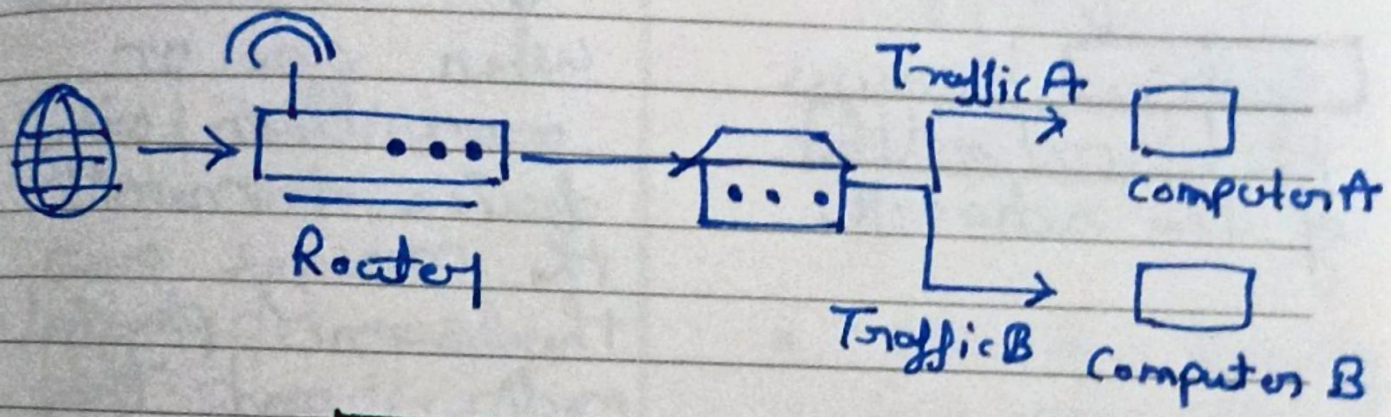
otes

Date__/__/_____

Switch (COMPUTER NETWORK)

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

(LAN)
local Area Network



Switch

- **2 layer** → forward data based on **MAC** address
- **3-layer** → forward data based on **IP** address.

Remarks

Scanned by Scanner Go

Date__/__/_____ Notes

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

Scanned by Scanner Go

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

Scanned by Scanner Go

Date__/__/_____ Notes

Delays in Computer Networks -

means — ??

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

Types

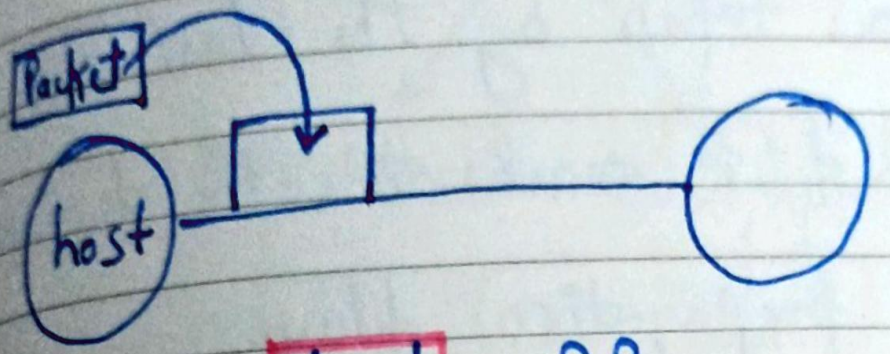
- Processing delay
- Queueing delay
- Transmission delay
- Propagation delay

Remarks Explain all ⇒

Scanned by Scanner Go

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

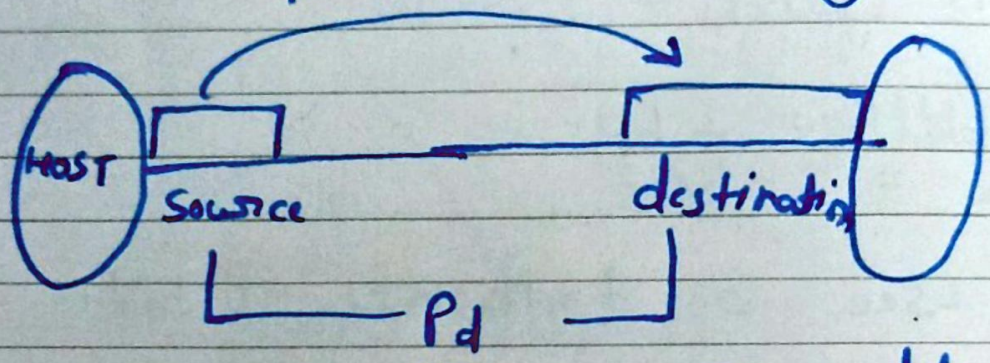
if BW is high then T_t is less.

Scanned by Scanner Go

Date__/__/_____ Notes

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.

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

Remarks

where $v = 3 \times 10^8$

Scanned by Scanner Go

Notes

Date__/__/_____

In case of optical fibre

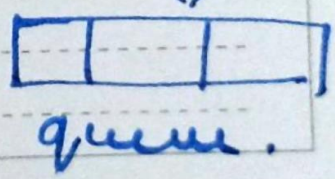
$V = 3 \times 10^8 \times 0.7$
$= 2.1 \times 10^8$ m/s

factor affection T_p →

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

Queueing delay —

Packet → recieved → destina.



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

Remarks

Scanned by Scanner Go

Date__/__/_____ Notes

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

Scanned by Scanner Go

Date __/__/_____

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

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

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

Remarks

Scanned by Scanner Go

PAGE NO.
DATE : / /

TCP Vs UDP

TCP

Transmission Control Protocol

↓

Internet protocol that connect a server and a client.

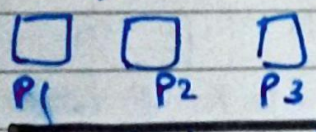
↓

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

↓

Reliability
(Means: notify the sender wheather data is received OR not)

↓



reach in order

UDP

User Datagram protocol

↓

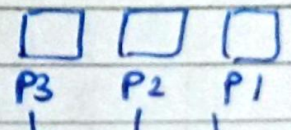
a communications protocol that facilitates the exchange of messages b/w computing devices in a network.

↓

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.

Scanned by Scanner Go

PAGE NO.
DATE : / /

TCP Vs UDP

TCP	UDP
Error Control is mandatory. { Here, use checksum to check error }	Error Control is optional. { UDP header also have checksum but only difference is this error control is optional }
Slow transmission (here data travel only on one network)	Fast transmission (here data travel from multiple network)
More overhead (Means: TCP header 20-60 Byte	less overhead (8 Byte)
Flow Control, Congestion Control { Check for capacity of data } help in finding packet of loss.	No flow Control and congestion control. No help in finding packet of loss.

Scanned by Scanner Go

PAGE NO.
DATE: / /

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**

Scanned by Scanner Go

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

1. → **SYN**
2. → **SYN-Ack**
3. → **Ack**

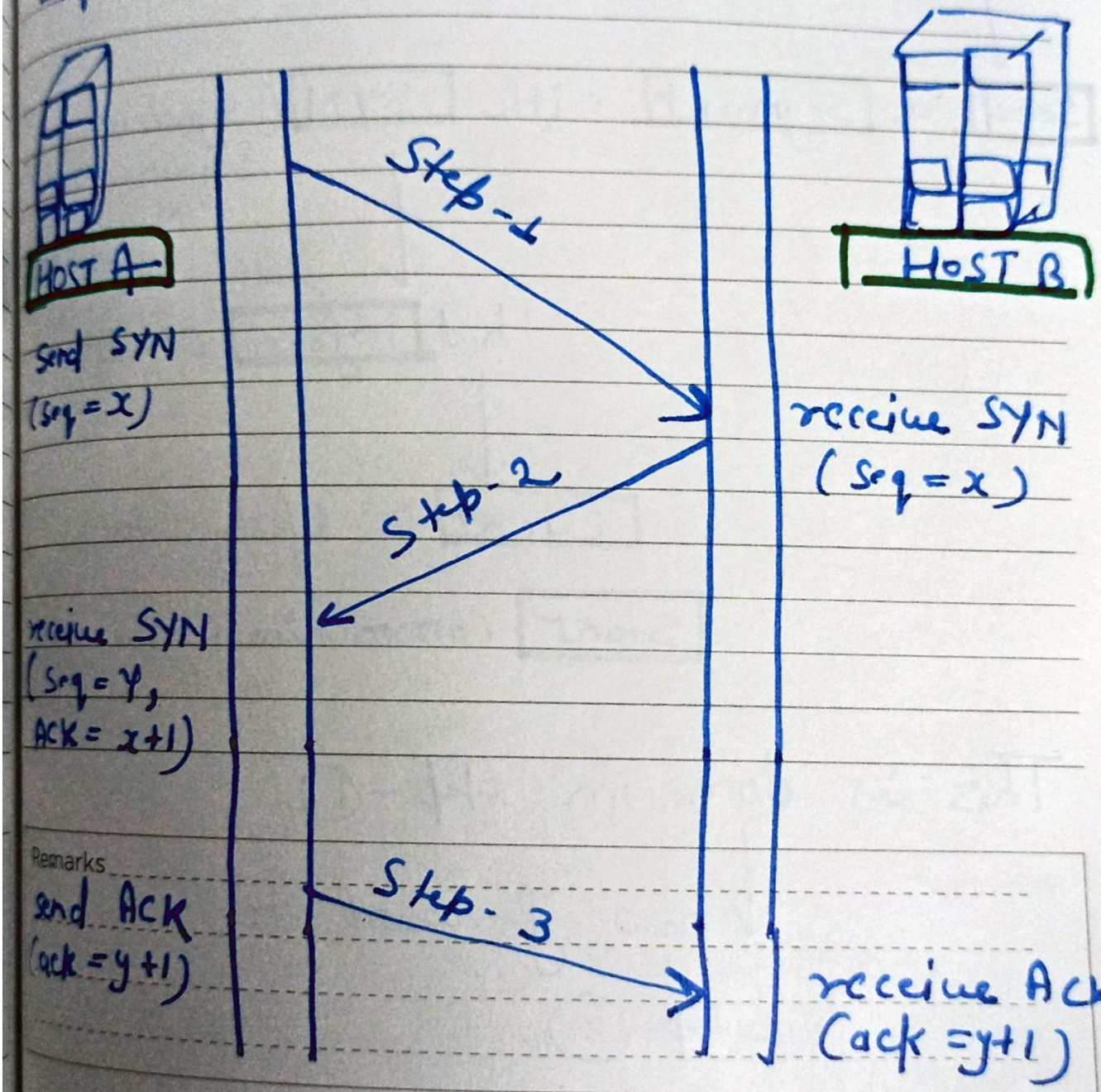
Scanned by Scanner Go

Notes

Date__/__/_____

Explaination of these Steps ——

Step - ①



Remarks

Scanned by Scanner Go

Date__/__/_____ 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

Scanned by Scanner Go

Step - 2 (SYN + ACK):

Server → Client

respond to the Client - request with

↓

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

Scanned by Scanner Go

about the packet, wheather 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

Scanned by Scanner Go

otes Date__/__/_____

Means →

when you send $\boxed{SYN = 1}$

↓

means $\boxed{1 \text{ sequence}}$ number

but when you are sending only $\boxed{ACK = 1}$ → $\boxed{0 \text{ sequence}}$ number.

Remarks

Scanned by Scanner Go

Date__/__/_____ Notes

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 ??

Scanned by Scanner Go

Notes

"To achieve confidentiality".

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

- Confidentiality
- Integrity
- Availability

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

Remarks

Integrity ⇒ to make sure that data has not been modified.

Scanned by Scanner Go

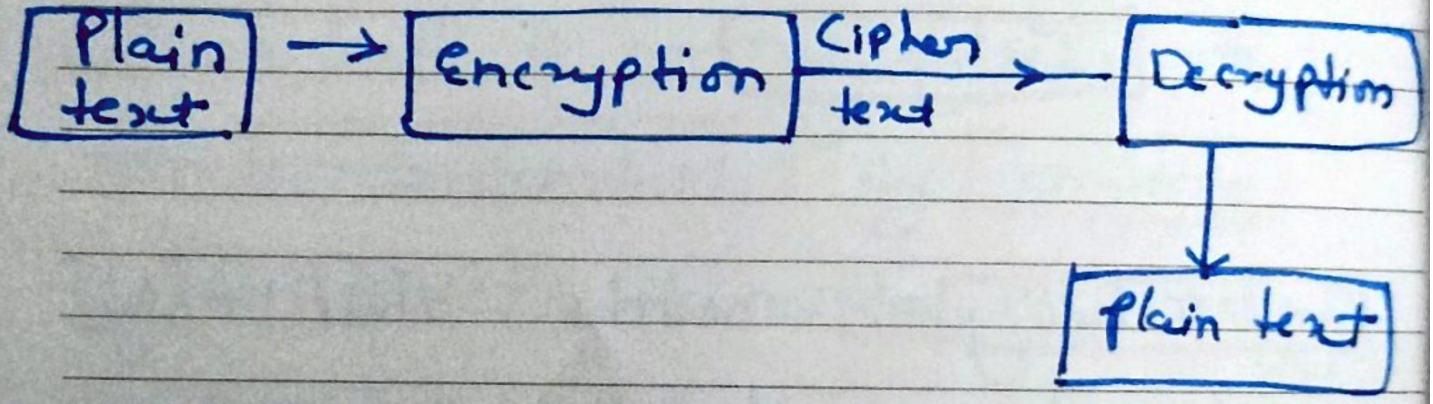
Date__/__/_____ Notes

by using hash function.

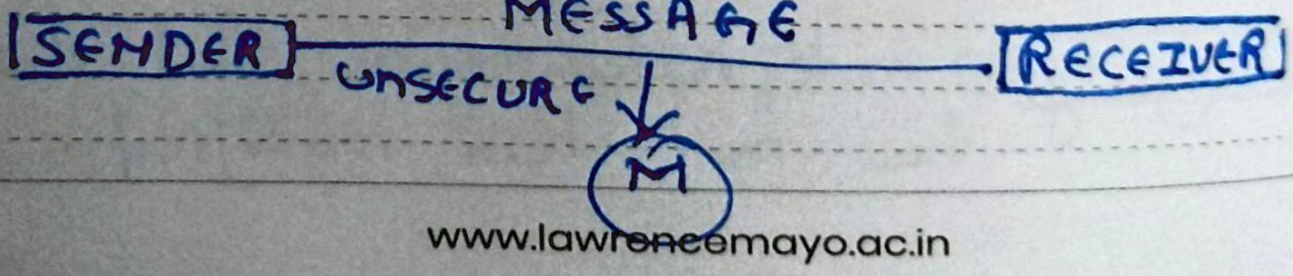
Availability ⇒ network should be readily available to its users, this applies to systems and to data.

How **Cryptography** works —??

MESSAGE



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



Scanned by Scanner Go

When we send message, don't know which rooter take our message. So here, anyone can take message → Their 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 = ??

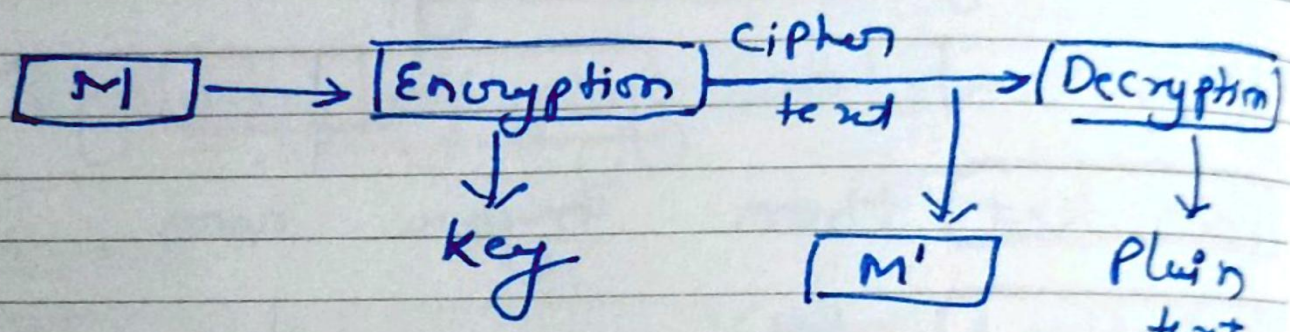
→ → →

Remarks

Scanned by Scanner Go

Date__/__/_____ Notes

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

Scanned by Scanner Go

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

Scanned by Scanner Go

Date__/__/_____ Notes

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 allways remember domain name instead of IP address.

Remarks

Scanned by Scanner Go

Date__/__/_____

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

Scanned by Scanner Go

Date__/__/_____ Notes

google.com → request send → Root Server

↓ give

IP address of generic Server.

right to left

.org | .com | .in | .mil | .edu

So our request sent to .com server

↓ move to authoritative Server.

google | IP

↓

contain IP address of specific Server.

Remarks

This is how DNS work.

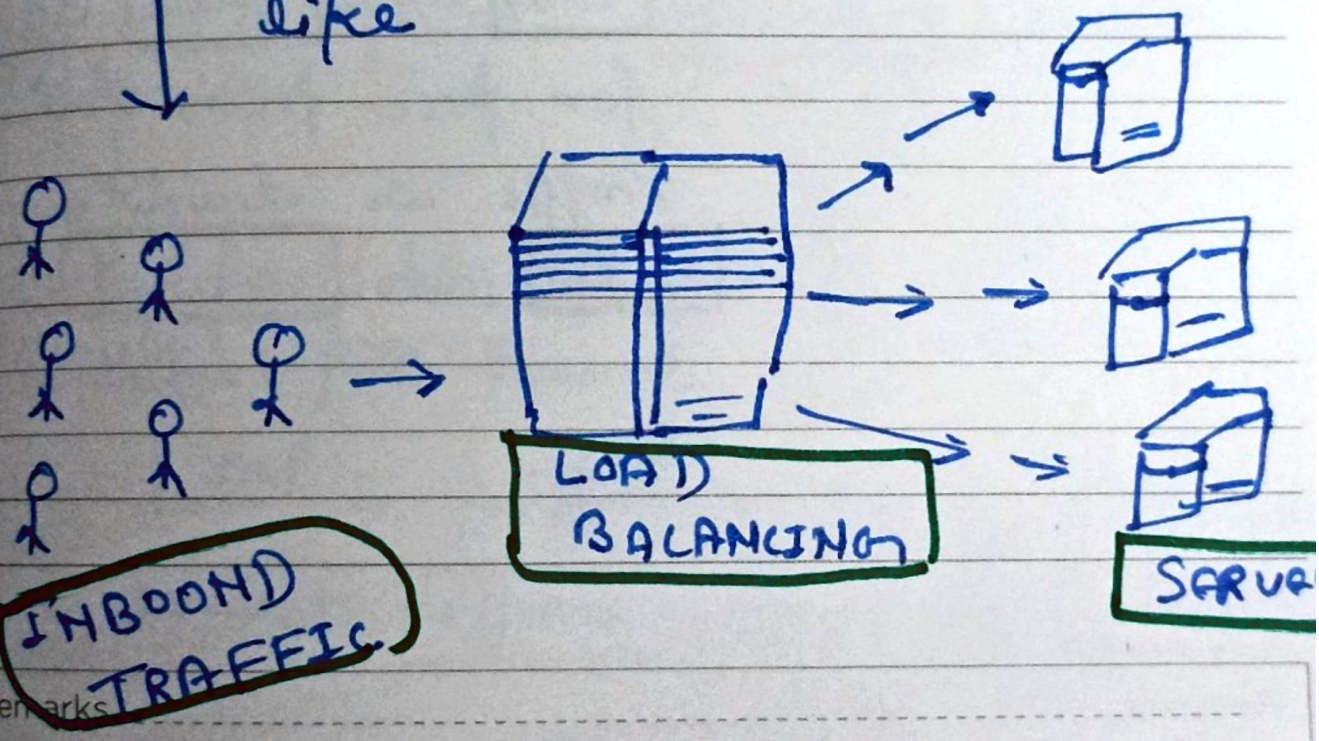
Scanned by Scanner Go

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



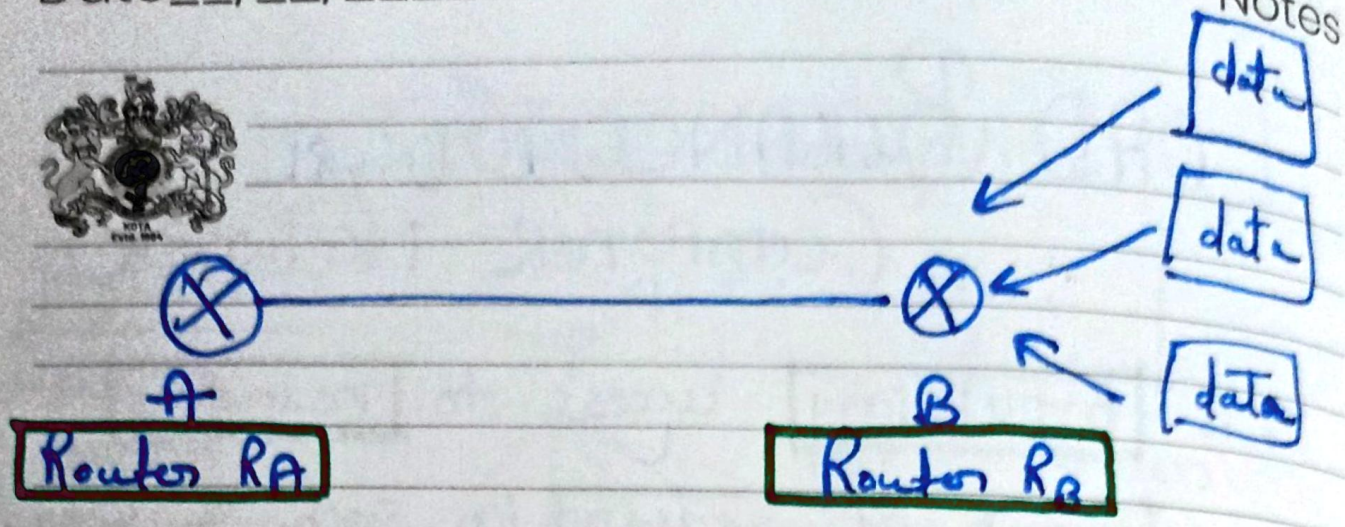
Remarks

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

Scanned by Scanner Go

Date__/__/_____

Notes



Hence 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

Scanned by Scanner Go

Date__/__/_____

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** — ??

Scanned by Scanner Go

Date__/__/_____ Notes

Ports are standerized across all network - connected devices, each port assigned a number that is reserved for that protocol like hypertext 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.

Scanned by Scanner Go

Date__/__/_____

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

Scanned by Scanner Go

Date__/__/_____

Notes

Port 179 → BGP (Border Gateway Protocol)

Port 443 → HTTP secure HTTPs

Port 3389 → Remote desktop protocol. (RDP)

Remarks

Scanned by Scanner Go

PAGE NO.
DATE : / /

HTTP AND HTTPs

HTTP	HTTPs
Hypertext Transfer Protocol.	Hypertext Transfer Protocol secure.
HTTP uses TCP (Transmission Control Protocol)	HTTPs uses TLS (SSL) to encrypt normal HTTP requests and responses.
It works at the Application layer.	It works at the transport layer
Default Port number is 80	Default port number is 443.
It does not uses certificate.	Uses SSL certificate.
There is no encryption and decryption.	There is encryption and decryption.
HTTP URLs begin with http://.	HTTPs URLs begin with https://.

Scanned by Scanner Go

PAGE NO.
DATE : / /

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

- Encryption
- Authentication
- Integrity

Encryption: hides the data being transferred from third parties.

Authentication: ensure that user claim is to be or not.

Integrity: verifies that the data has not been forged or tampered with.

Scanned by Scanner Go

PAGE NO.
DATE : / /

HTTP AND HTTPs

HTTP	HTTPs
Hypertext Transfer Protocol.	Hypertext Transfer Protocol secure.
HTTP uses TCP (Transmission Control Protocol)	HTTPs uses TLS (SSL) to encrypt normal HTTP requests and responses.
It works at the Application layer.	It works at the transport layer
Default Port number is 80	Default port number is 443.
It does not uses certificate.	Uses SSL certificate.
There is no encryption and decryption.	There is encryption and decryption.
HTTP URLs begin with http://.	HTTPs URLs begin with https://.

Scanned by Scanner Go

PAGE NO.
DATE : / /

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

- Encryption
- Authentication
- Integrity

Encryption: hides the data being transferred from third parties.

Authentication: ensure that user claim is to be or not.

Integrity: verifies that the data has not been forged or tampered with.

Scanned by Scanner Go