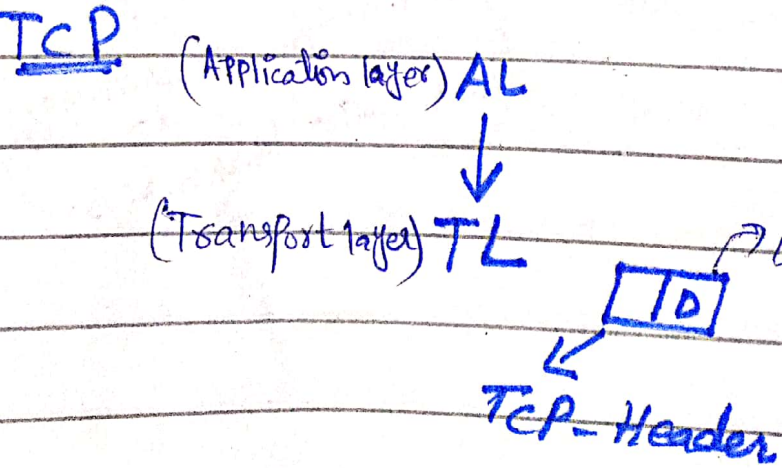
Chapter #6 TCP and UDP

TCP
(Transmission Control Protocol)

In transport layer there are two protocols which are majorly used:
That is TCP & UDP

Header:-
Whenever we send the data through TCP, TCP adds the header along with the data, so header provides lots of functionalites to send the data properly to receiver.



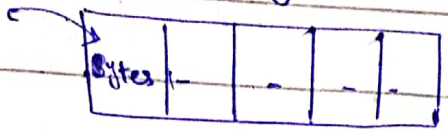
(Mandatory fields)

i- Byte streaming:

TCP is a Byte streaming Protocal, from the application layer Conituous Data comes. without there is any limitation.

Bytes — collection of Bits.

TCP



TCP functionality:

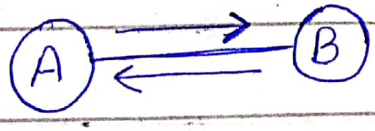
- Segmentation (collection of Bytes)

ii- Connection oriented:

TCP is a connection oriented Protocol.

- Relaibility (Three-way handshaking)

iii- Full Duplex:

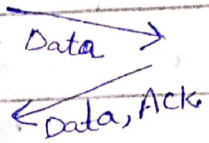


Both can transmit the data at a same time. So this is

called full duplex Network.

iv- Piggybacking:

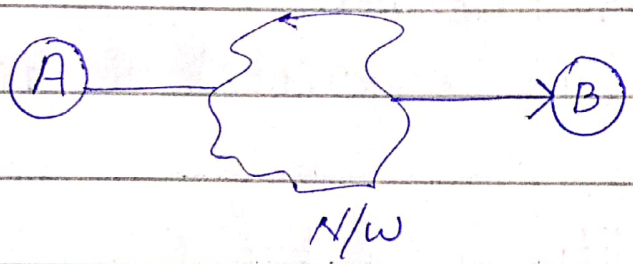
Whenever we receive the data, we have to send the acknowladgment.



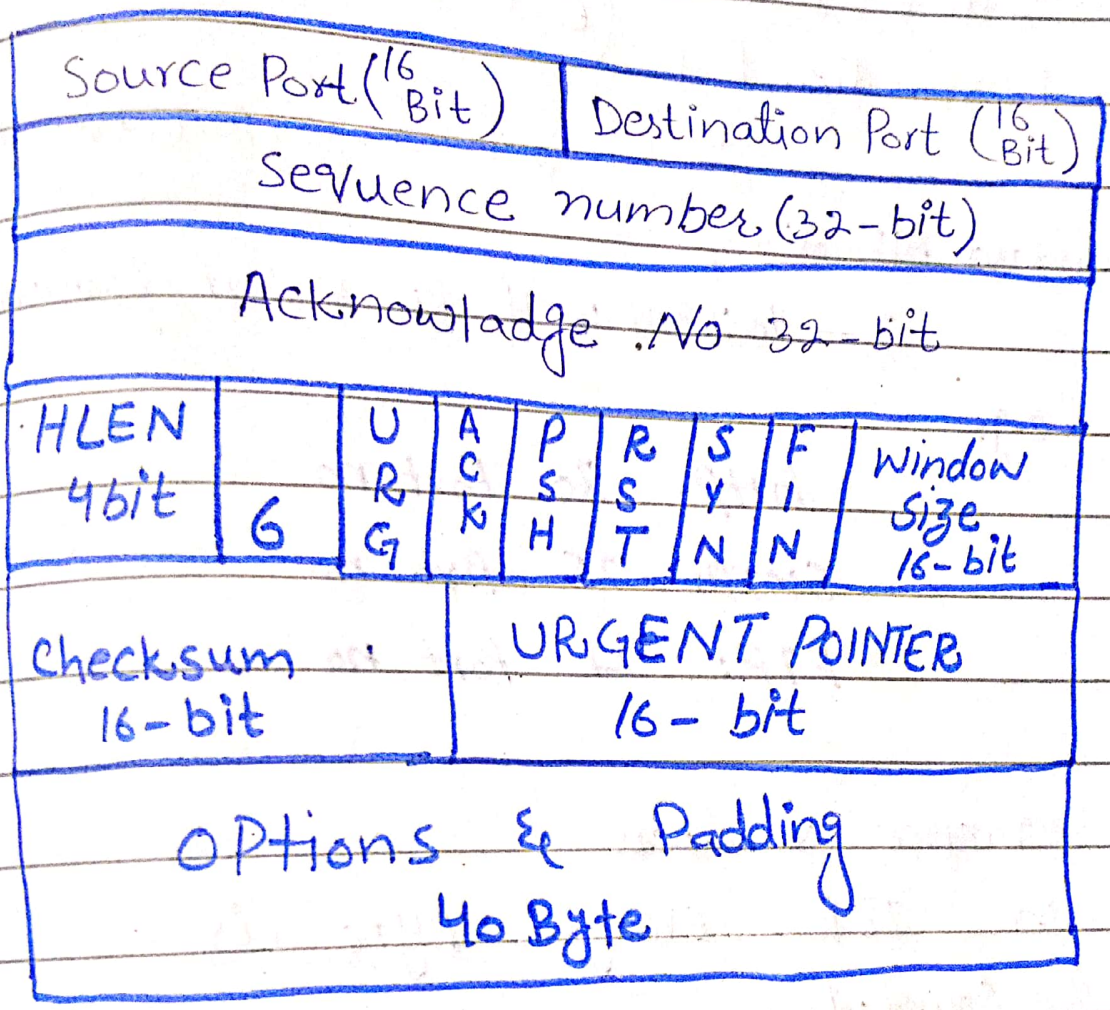
v- Error Control:

vi- Flow Control:

vii- Congestion Control:



TCP Header (20 – 60 B)



i- Source Port
ii- Destination Port (End-to-End Delivery)

2^{16} = 0 - 65535 (Port numbers)

Standard Applications

0 - 1023 (Well known Port numbers)

e.g:

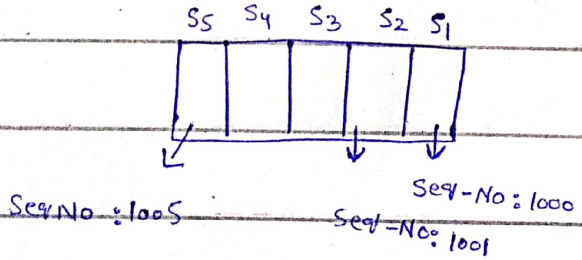
http: 80 Port no

SMTP: 25 Port no

FTP: 21 Port no

iii- Sequence Number:

In TCP every Byte is Counted.



* Generally TCP uses Random Sequence numbers.

iv- Acknowladge No.

Next Expected Byte number.

Received: 1005 ← x

1006 x+1

v- HLEN: (Header length)

4-bit

→ Scale of 4

1000 = 8 → 8 × 4 = 32 (Byte)

vi- 6 →

Reserved for future use

• Flags: (Flag is just for Notification)

Urgent (URG):

For urgent data Put 1:

• Acknowladgment (Ack):

For Ack Put 1

• Push (PSH):

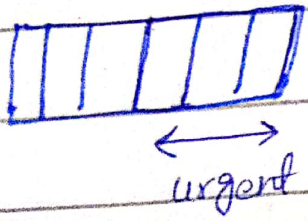
= 1

- Reset (RST):
  uses for Connection Reset.
- SYNchronization (SYN):
  gt is used for Synchronization
- FINISH (FIN): (1)
  uses For Connection Terminating.

vii- Window Size (16-bit)
for receiving window. (capacity)
Manages Flow control by using the window size

viii- Checksum:
(16-bit)
Checksum is used for Error Control.
- Transport layer → Checksum.
- Data link layer → CRC.

xi- URGENT Pointer:
(Range)
urgent data Range



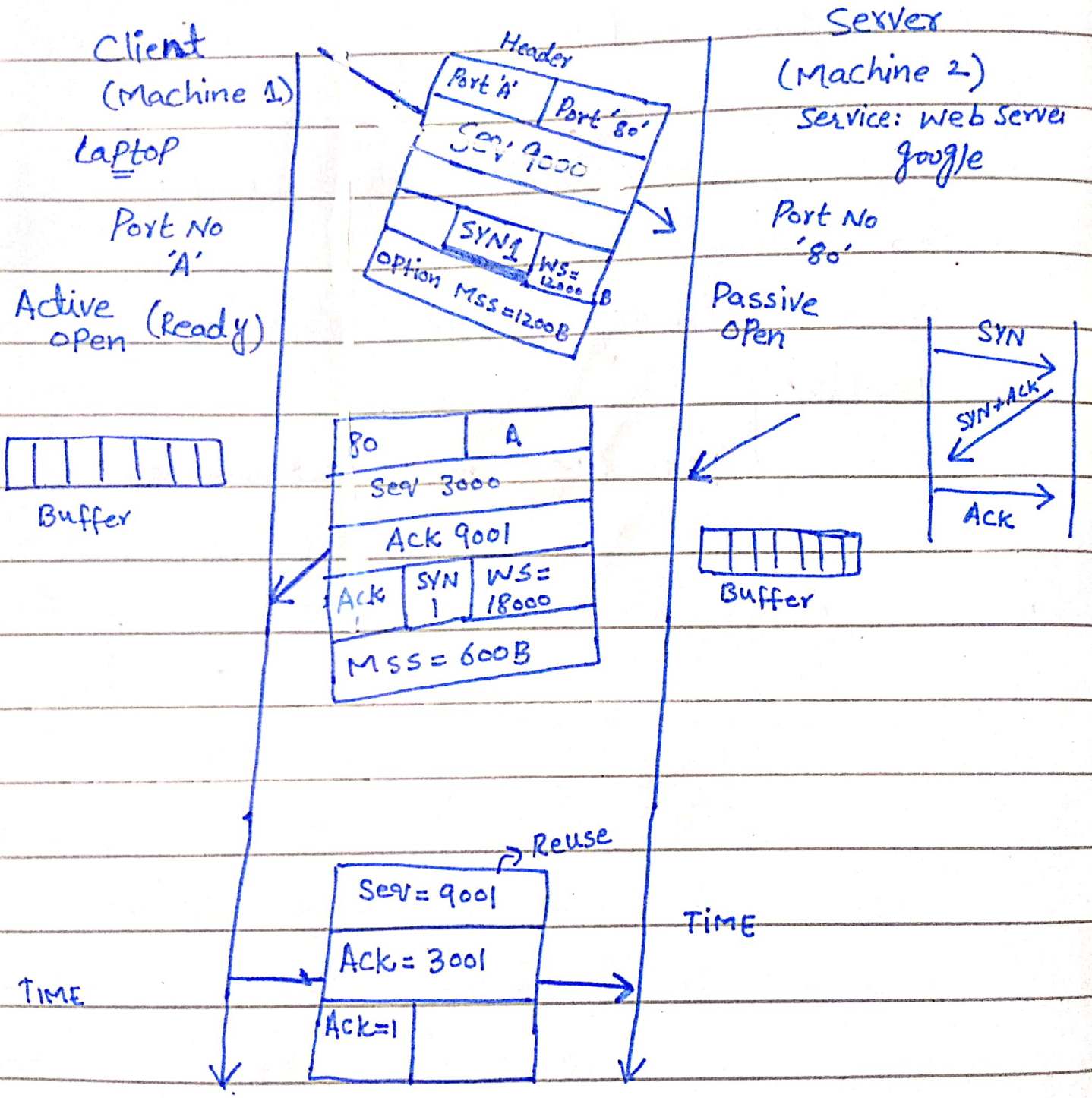
X- Options & Padding:-

(Extra bit)

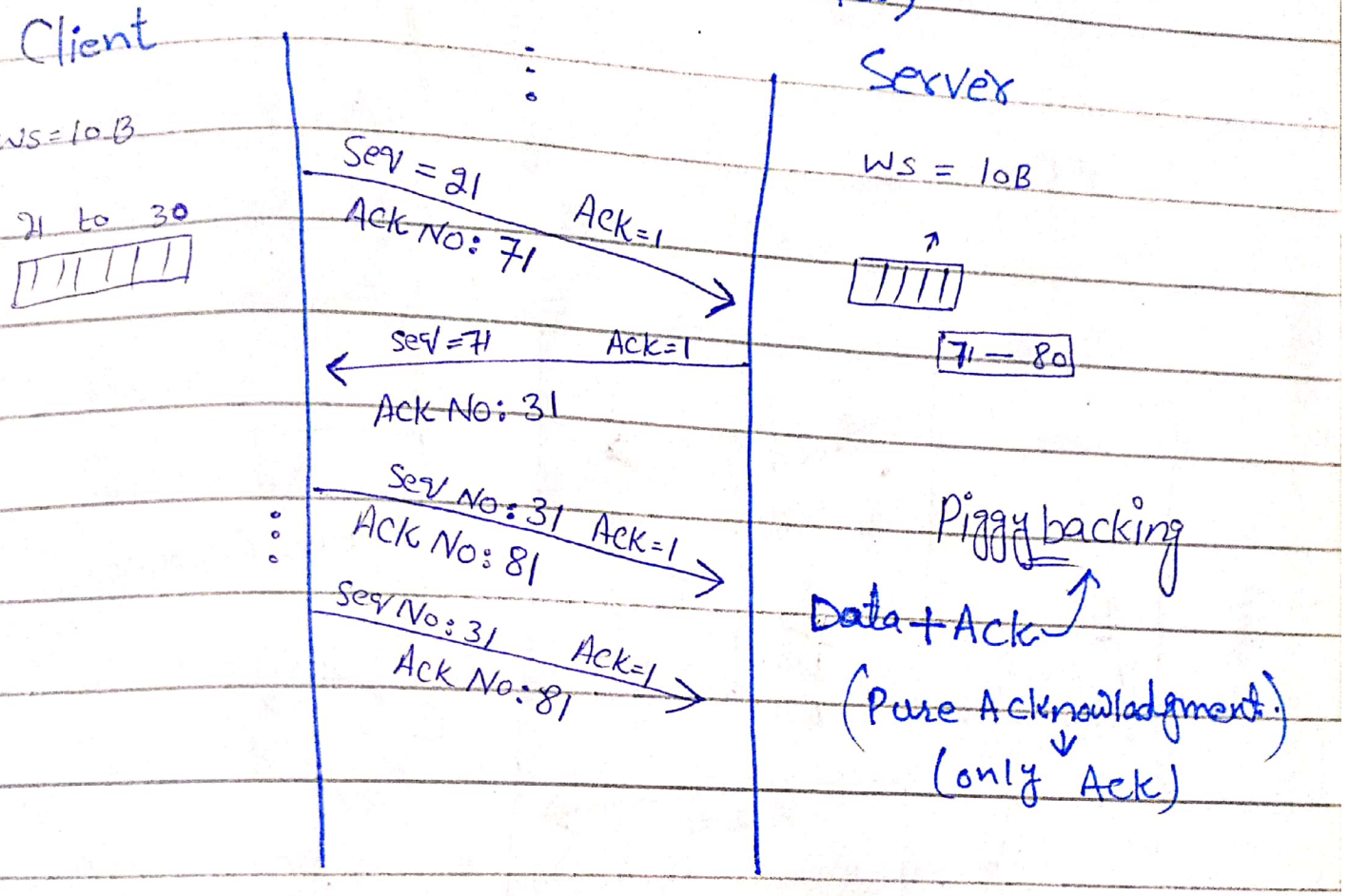
Extra Data If we want to send then we can send through the Options & Padding

MSS (Maximum segment size)

TCP Three-way Connection Establishment

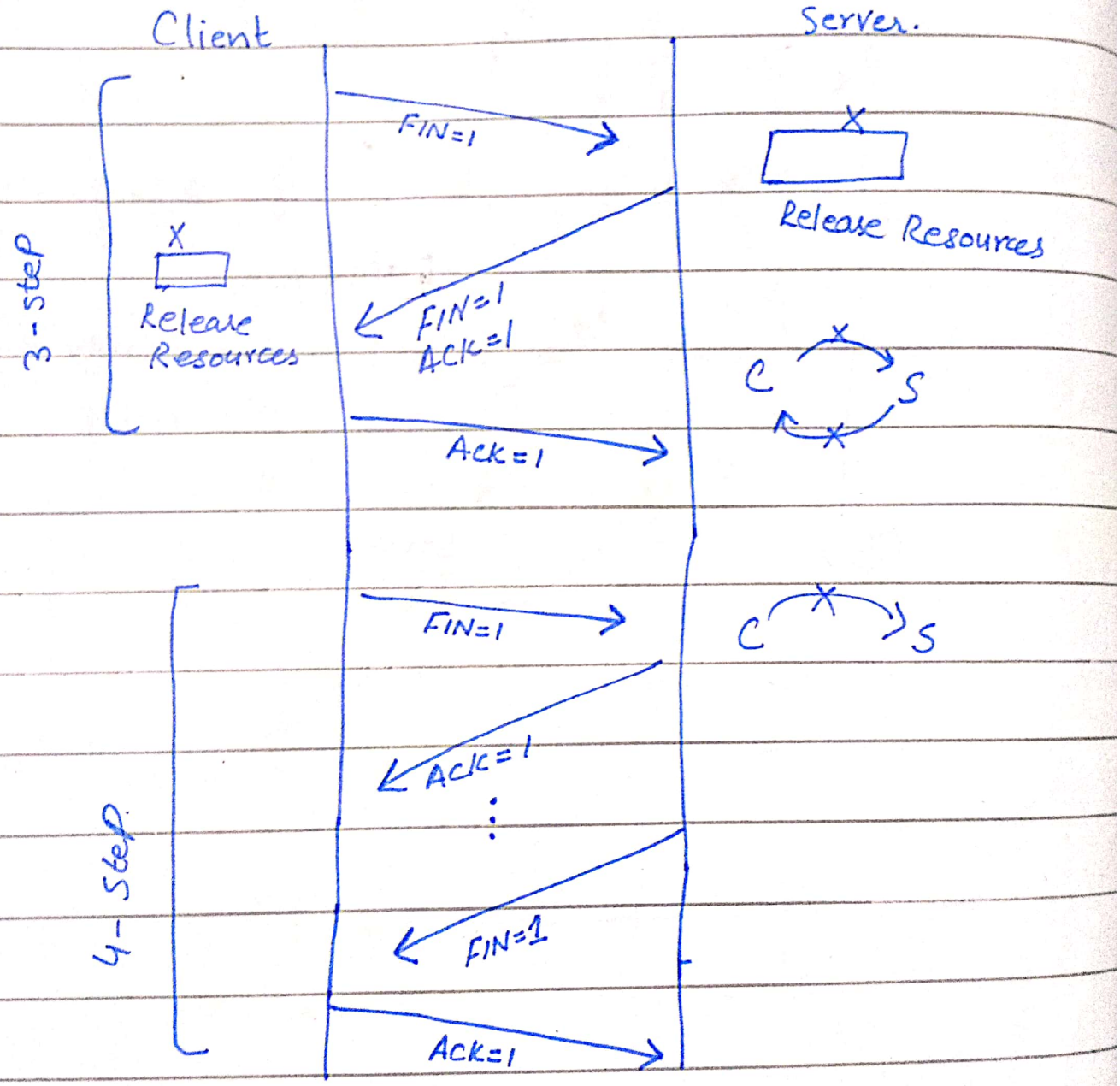


TCP (Data Transfer)



TCP (connection Termination)

3- step
4- step



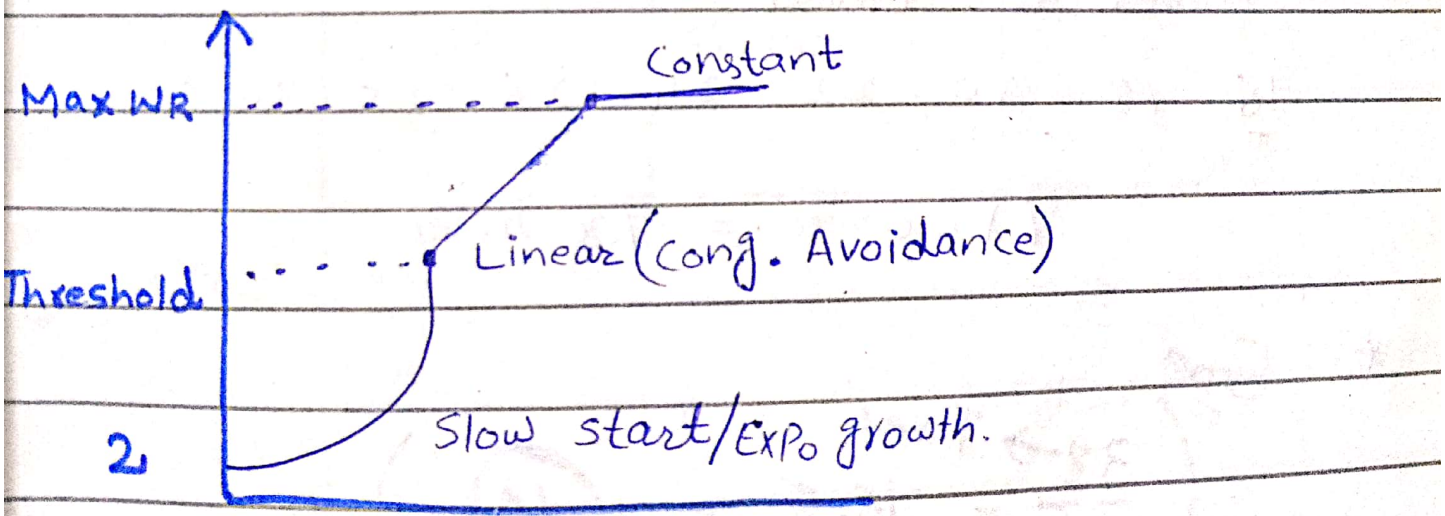
TCP Congestion Control:

*Let the size of congestion window of a TCP Connection in two cases when

Case 1: Timeout occur (severe)

Case 2: 3 Ack Received (light)

is 32 KB. The RTT of a Connection is 100 msec and MSS = 2KB The time taken (msec) by TCP Connection to get back to 32 KB Congestion window is 1200 and 900 respectively.



Case 1: 32 ↑ Timeout

Slow start Phase Threshhold = $\frac{32}{2} = 16$ ↓ window size

2, 4, 8, 16, 18, 20, 22, 24, 26, 28, 30, 32

↑ Slow Start Phase ↑ Threashhold.

linear grow

→ 12 ←

$12 \times 100 = 1200$ msec.

↑ Different segments ↑ round trip time

Case 2:

32 ↑ Congestion detect.

* due to 3 Ack.

Start to Linear

16 18 20 22 24 26 28 30 32

9×100 msec $= 900$ msec.

* Extra

$\left(\frac{33 \rightarrow}{2} = 16.5 = (16)\right)$

UDP (User Datagram Protocol)

Checksum = UDP header + UDP Data + Pseudo header of IP

* Connectionless (unreliable)
* No ordering

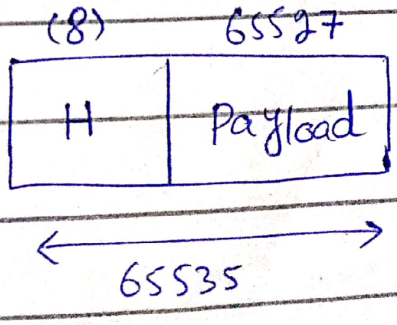
UDP Header

Source Port	Destination Port
16	16
Length	Checksum
16	16

$0 - 2^{16}$

0 - 65535

fixed (8B Header)



Advantages of UDP Protocol over TCP.

i- Query Response Protocol (once Request one Reply) [DNS]

ii- Speed (video games, Voice over IP)

iii- Broadcasting / Multicast

iv- Less overhead

v- Continuous Streaming [Skype, Youtube]

Assignment: Difference between TCP & UDP.