CS & IT ENGINEERING

COMPUTER NETWORKS

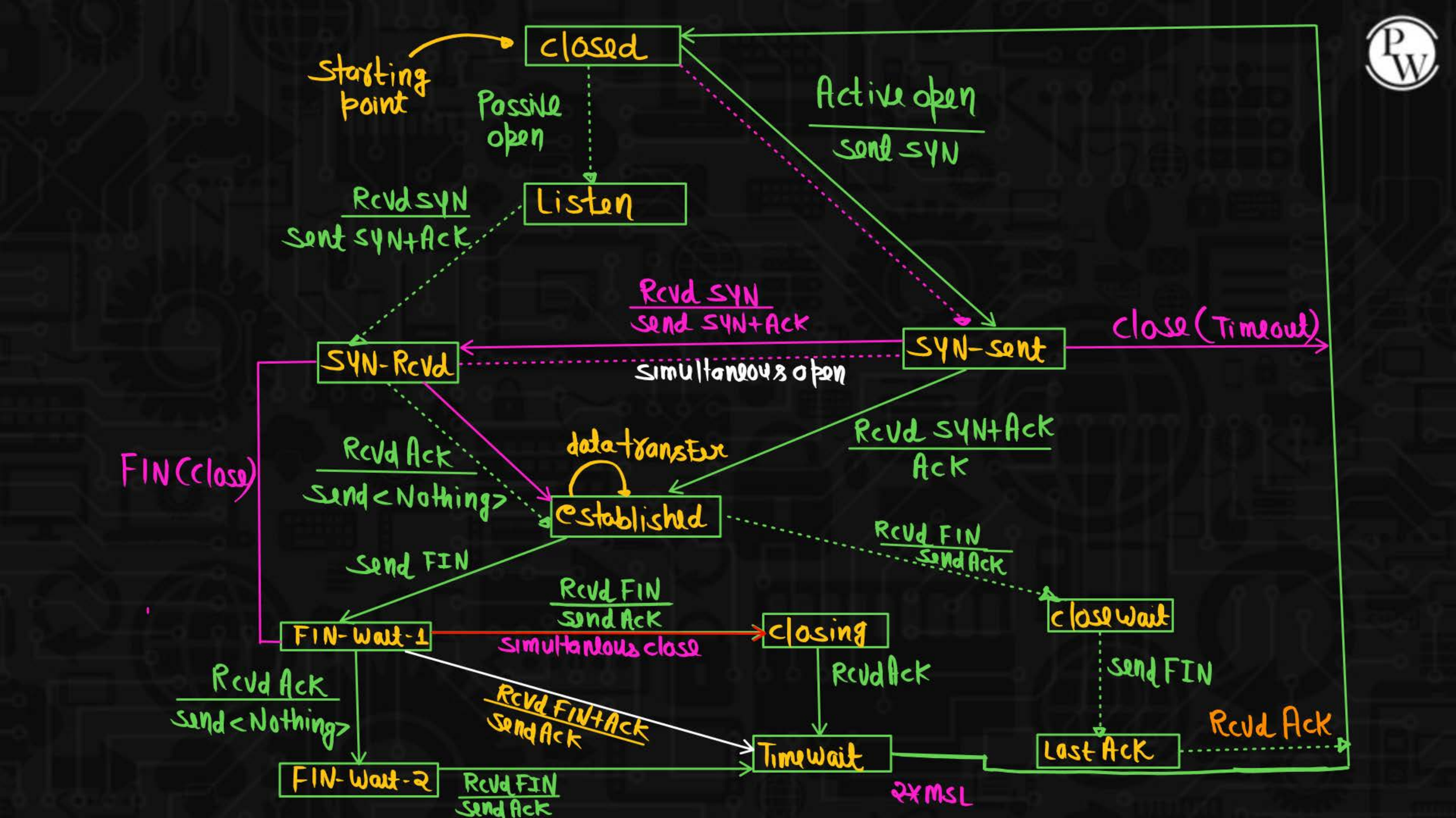
TCP & UDP

Lecture No-5

By- Ankit Doyla Sir

TCP State Transition Diagram

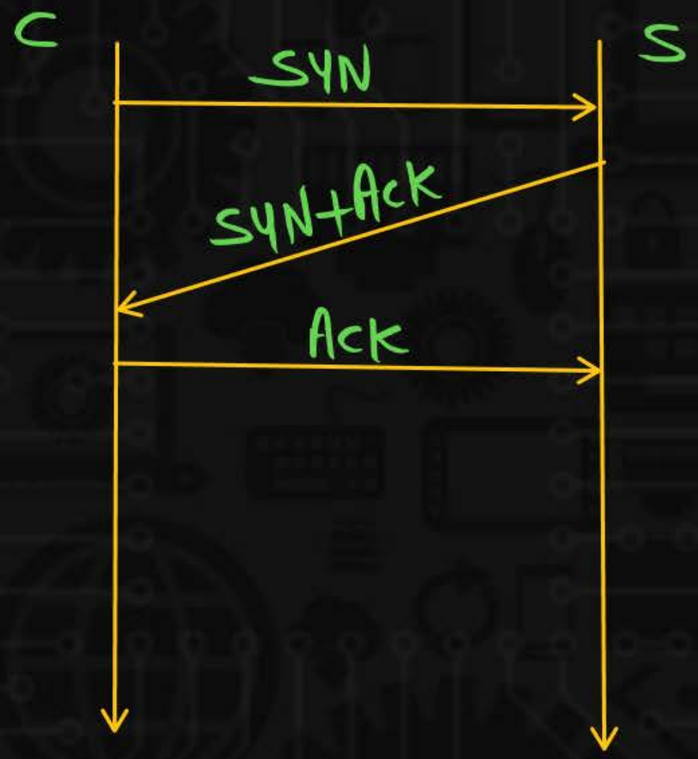
TCP State Transition Diagram


closed
Starting point
Passive open
Active open
send SYN
Listen
Rcvd SYN
Sent SYN+Ack
Rcvd SYN
send SYN+Ack
SYN-Rcvd
SYN-sent
close (Timeout)
simultaneous open
Rcvd SYN+Ack
Ack
data transfer
Rcvd Ack
Send <Nothing>
FIN (close)
established
Send FIN
Rcvd FIN
send Ack
close wait
Rcvd FIN
send Ack
FIN-Wait-1
closing
simultaneous close
Rcvd Ack
Send <Nothing>
Rcvd FIN+Ack
send Ack
Rcvd Ack
send FIN
Rcvd Ack
Time wait
Last Ack
FIN-Wait-2
Rcvd FIN
send Ack
2*MSL

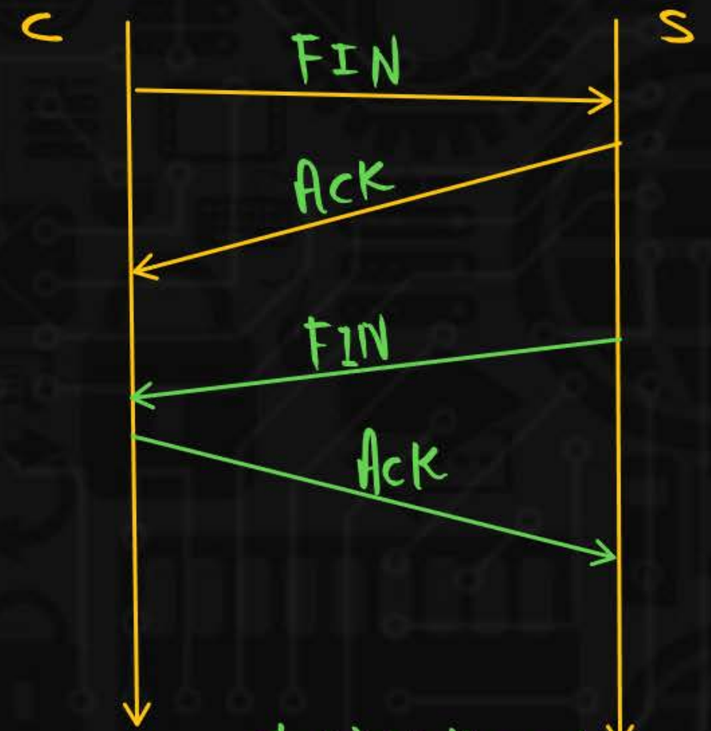
→ client

⇢ server

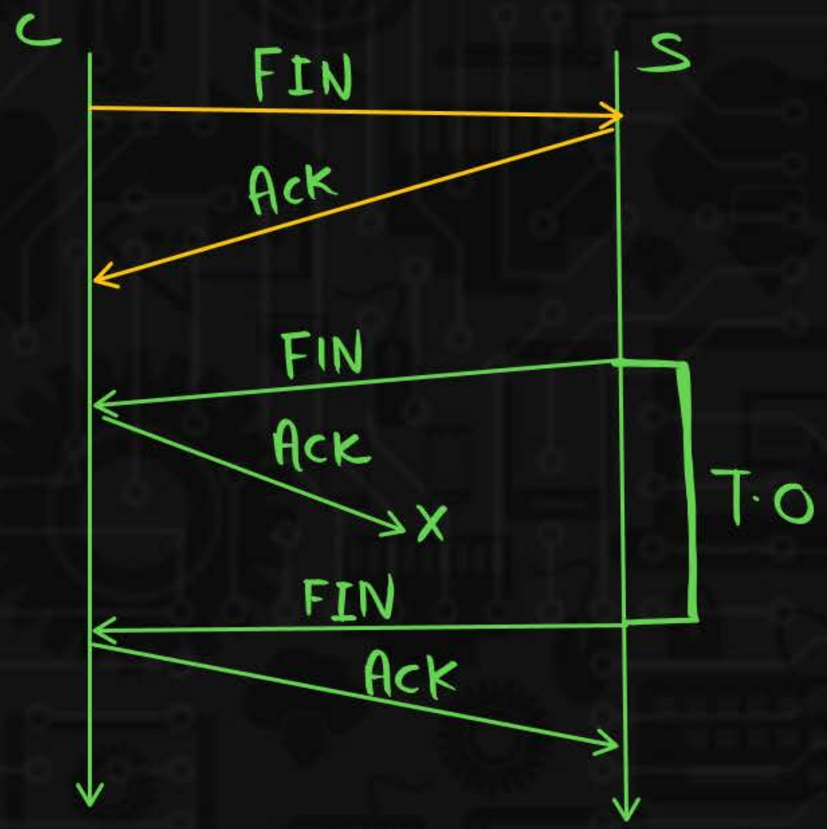
Connection establishment



1st (way) connection termination

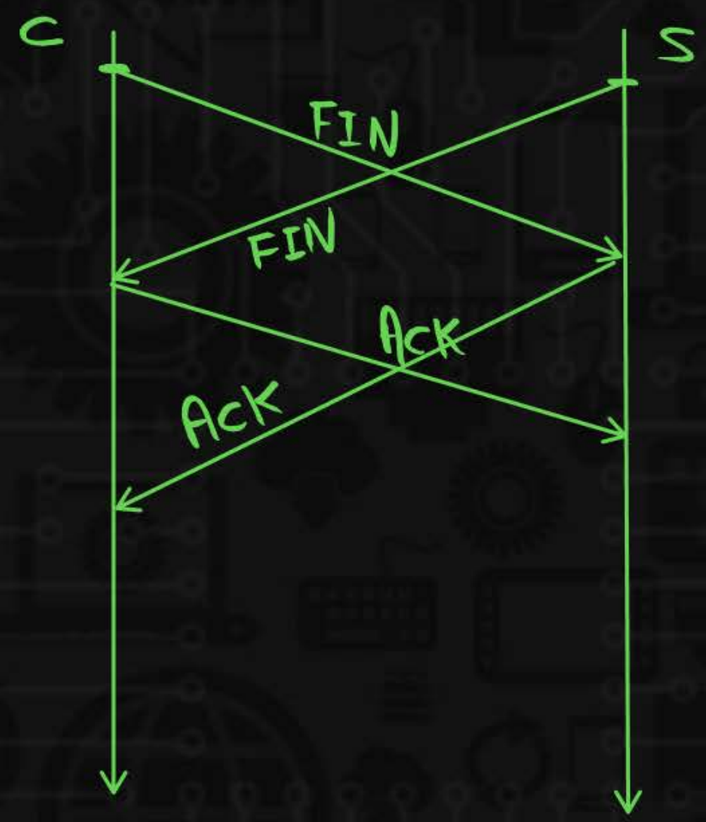


4-way Handshaking


C
S
FIN
Ack
FIN
Ack
X
T·O
FIN
Ack

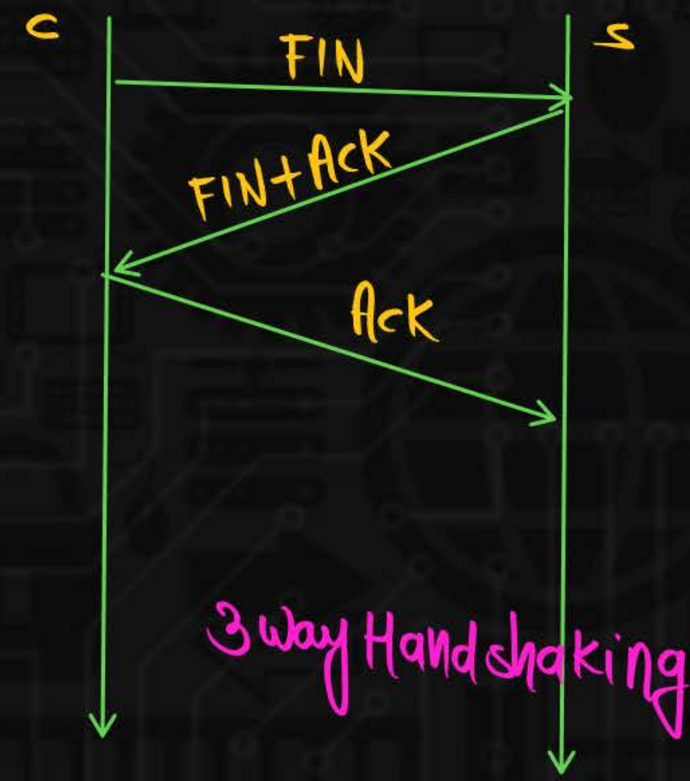
2nd way

Connection termination

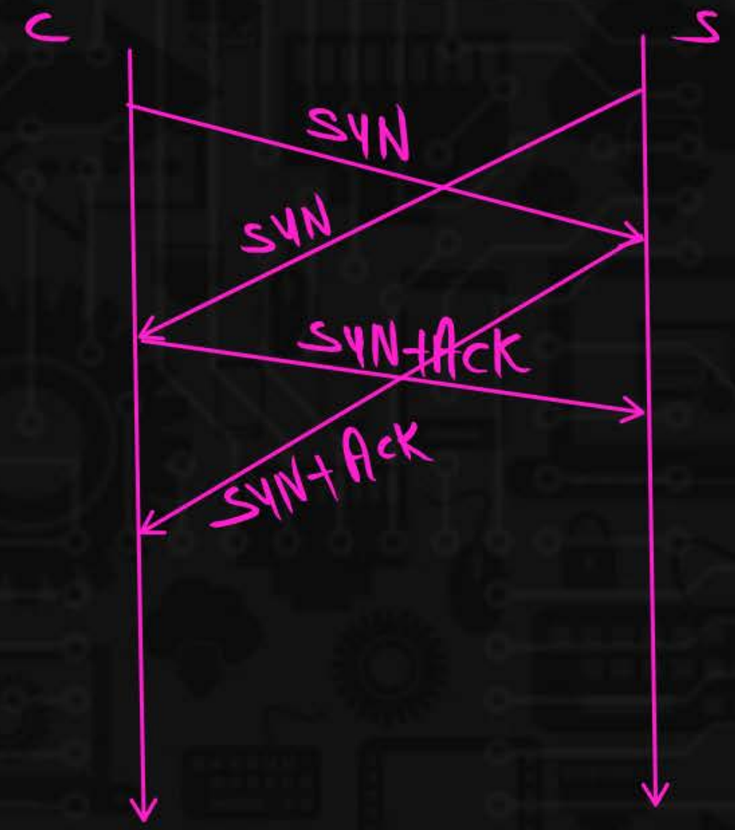


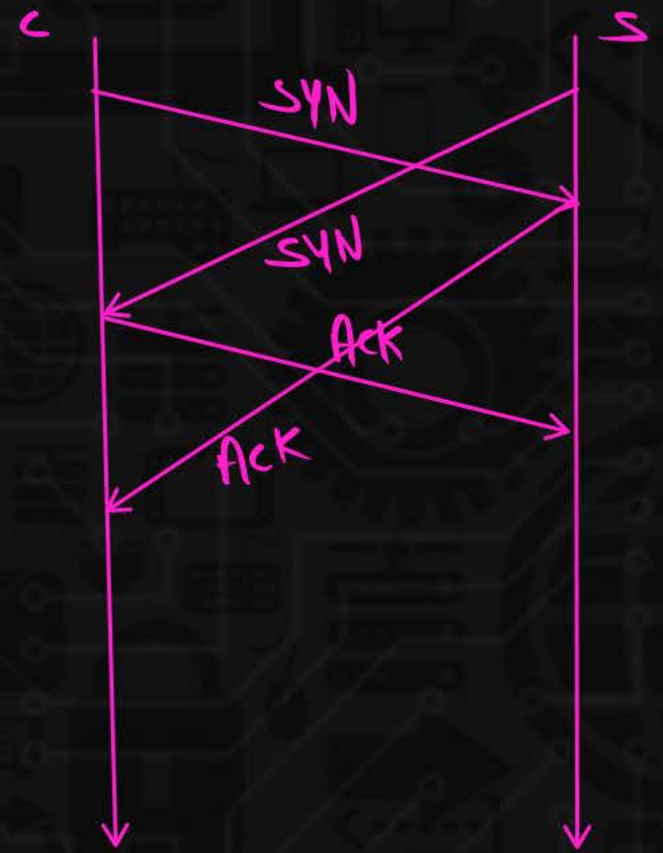
3rd way

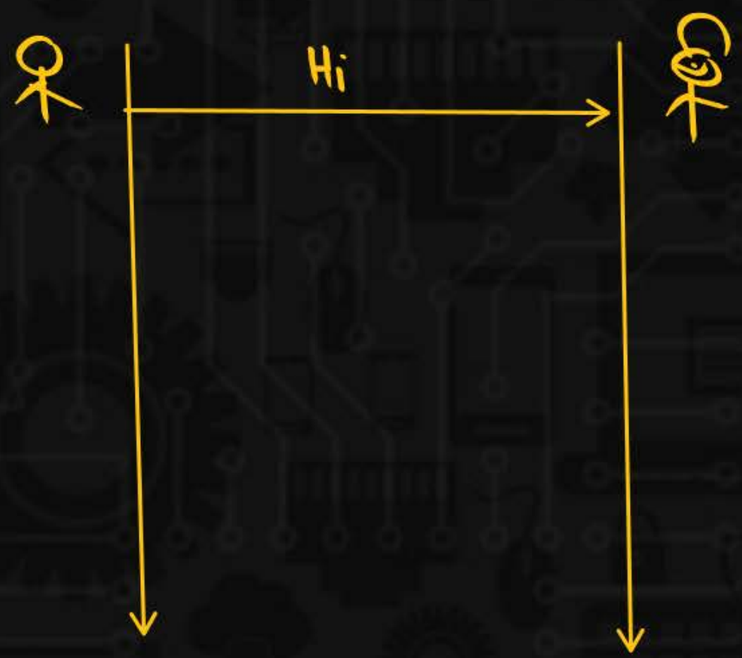
Connection termination

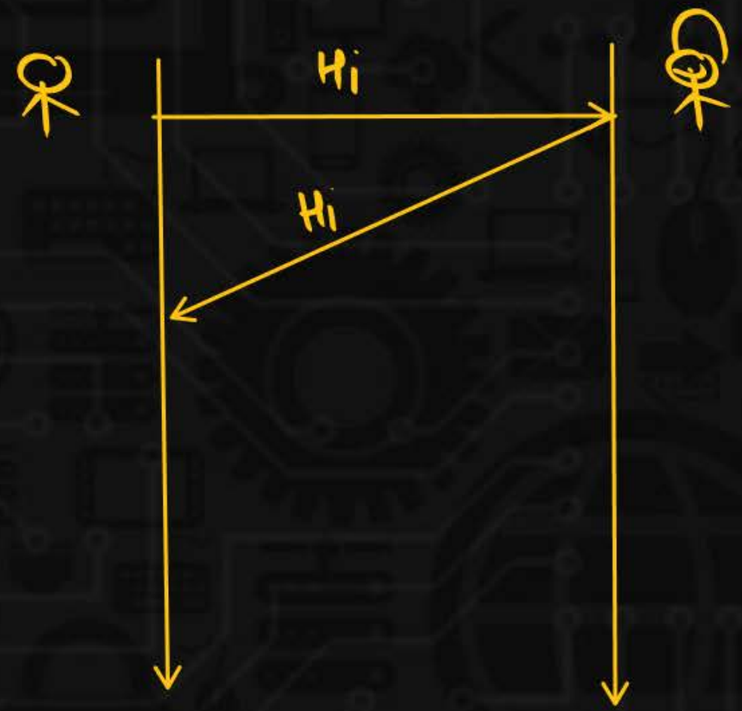


3 way Handshaking


C
S
SYN
SYN
SYN+Ack
SYN+Ack


C
S
SYN
SYN
Ack
Ack


Hi


Hi
Hi

State	Description
CLOSED	No connection exists
LISTEN	Passive open received; waiting for SYN
SYN-SENT	SYN sent; waiting for ACK
SYN-RCVD	SYN + ACK sent; waiting for ACK
Established	Connection established; data transfer in progress
FIN-WAIT – 1	First FIN sent; waiting for ACK
FIN-WAIT – 2	ACK to first FIN received; waiting for second FIN
CLOSE-WAIT	First FIN received, ACK sent; waiting for application to close
TIME – WAIT	Second FIN received, ACK sent; waiting for 2MSL time-out
LAST – ACK	Second FIN sent; waiting for ACK
CLOSING	Both sides decided to close simultaneously

Time wait Timer

The Time wait timer (2 MSL) is used during connection termination. The maximum Segment Life time (MSL) is the amount of time any segment can exist in the Network before being discarded. The implementation needs to choose a value for MSL. Common values are 30 sec, 1 min or even 2 min. The 2 MSL timer is used when TCP performs an Active close and send the Final Ack. The connection must stay open for 2 MSL amount of time to allow TCP to resend the final Ack in case of Ack is lost. This requires that the RTO timer at the other end times out and new FIN and Ack segment are resent.

MCQ

Consider a TCP client and a TCP server running on two different machines. After completing data transfer, the TCP client calls close to terminate the connection and a FIN segment is sent to the TCP server. Server-side TCP responds by sending an ACK. Which is received by the client-side TCP. As per the TCP connection state diagram (RFC 793). In which state does the client-side TCP connection wait for the FIN from the server-side TCP?

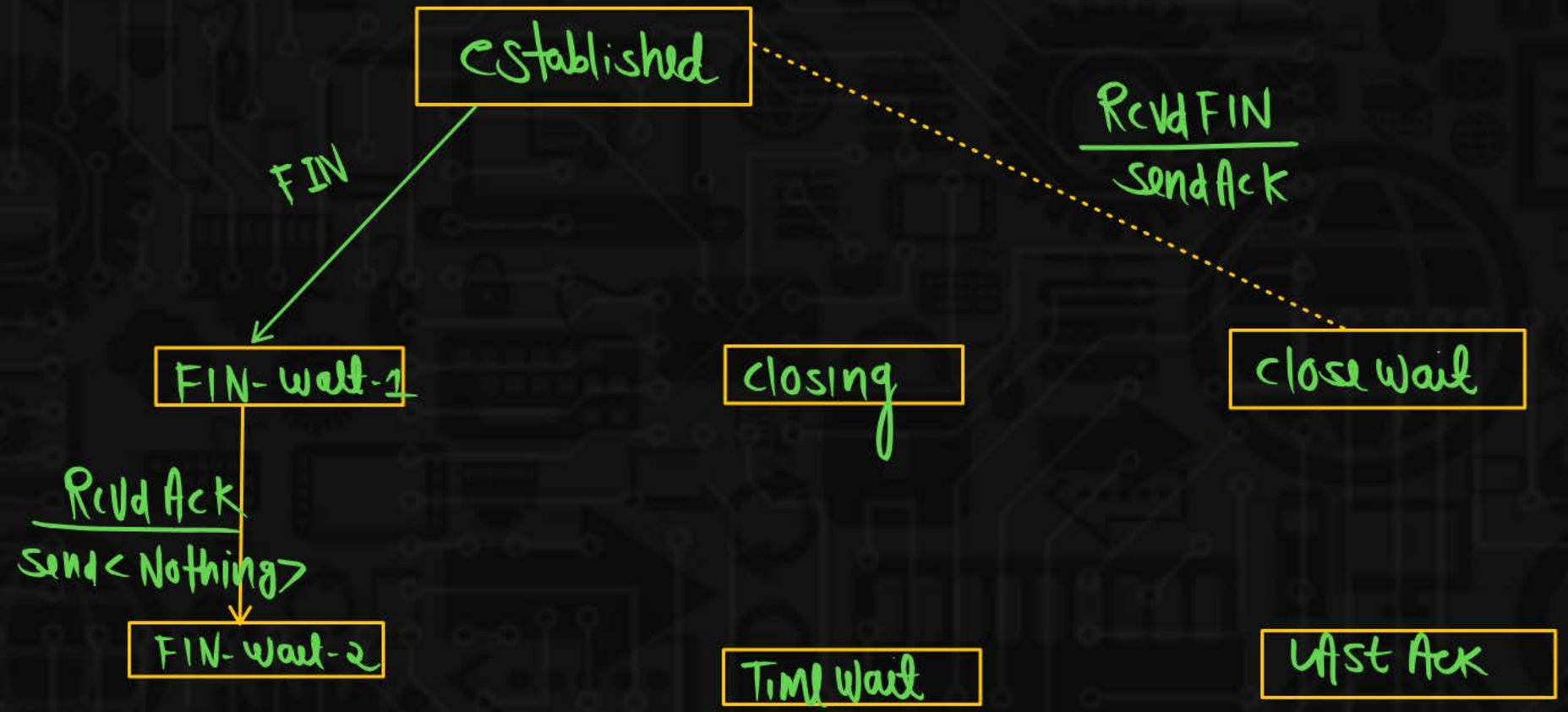
GATE

(A) LAST-ACK

(B) TIME-WAIT

(C) FIN-WAIT-1

(D) FIN-WAIT-2 ✓


Established
FIN
RcVd FIN
send Ack
FIN-Wait-1
closing
close Wait
RcVd Ack
send<Nothing>
FIN-Wait-2
Time Wait
Last Ack

MCQ

Gate

Which of the following statements are TRUE?

S_1 : Loss of SYN + ACK from the server will not establish a connection (T)

S_2 : Loss of ACK from the client cannot establish the connection (F)

S_3 : The server moves LISTEN → SYN_RCVD → SYN_SENT → ESTABLISHED in the state machine on no packet loss (F)

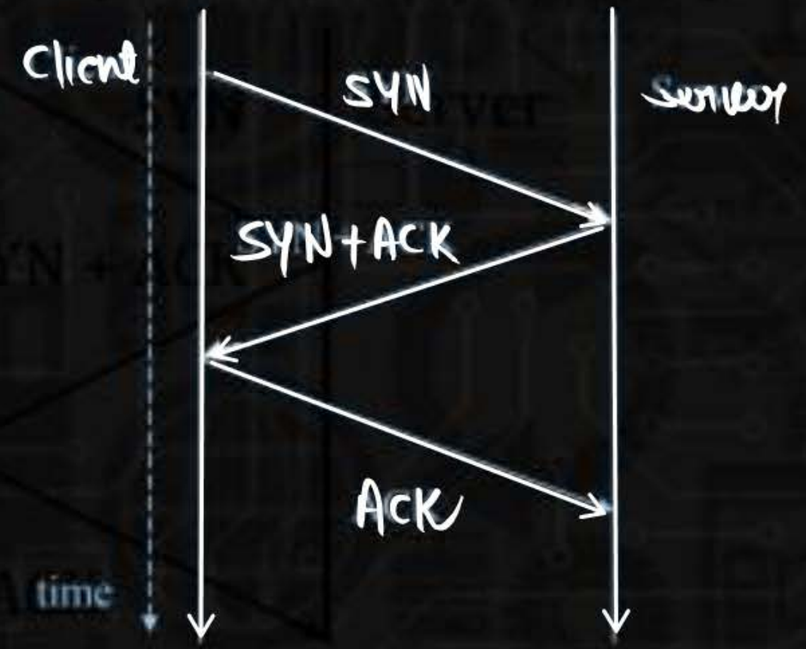
S_4 : The server moves LISTEN → SYN_RCVD → ESTABLISHED in the state machine on no packet loss. (T)

A S_2 and S_3 only

B S_1 and S_4 only

C S_1 and S_3 only

D S_2 and S_4 only



Q.3

Consider a TCP server is in close wait state in TCP state transition diagram , which state TCP server moves after sending FIN segment to TCP client ?

GATE

A LAST-ACK

B TIME-WAIT

C FIN-WAIT-1

D FIN-WAIT-2

established

FIN-wait-1

closing

close wait

sent FIN

FIN-wait-2

Time wait

Last Ack


THANK YOU
GW
SOLDIERS !