



Revision & Doubt Clearing Session

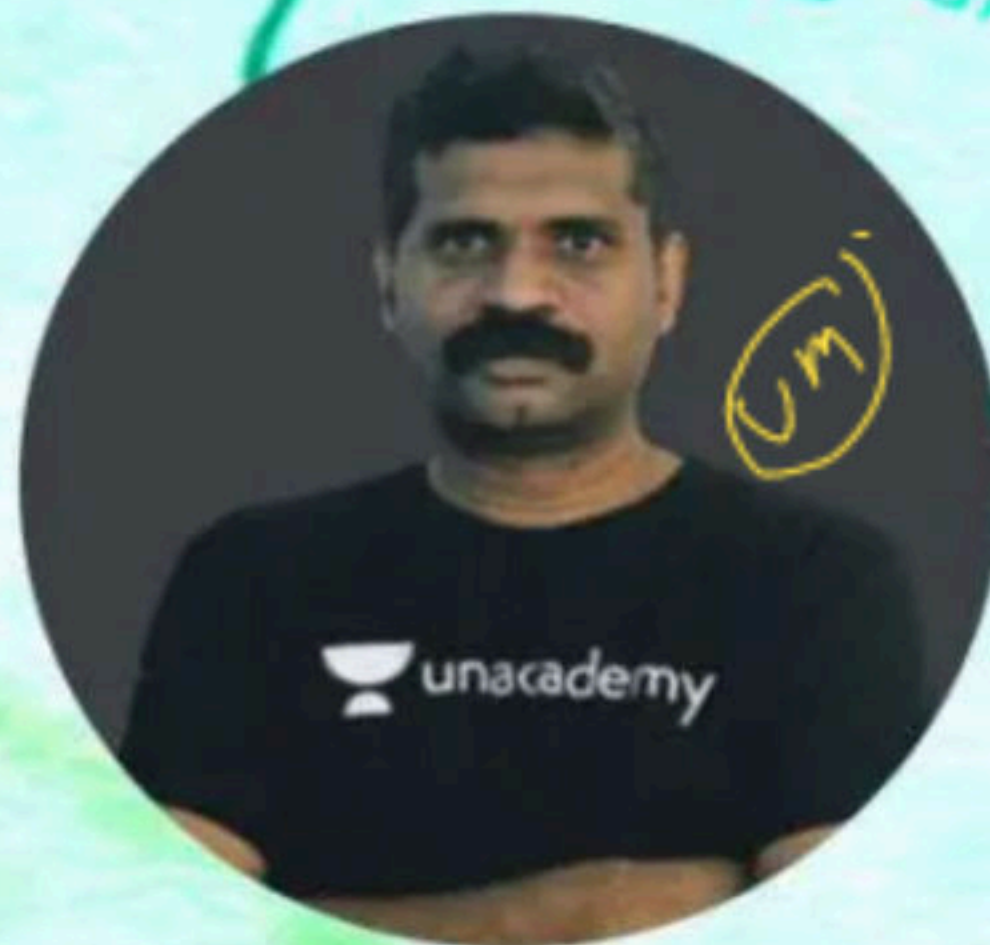
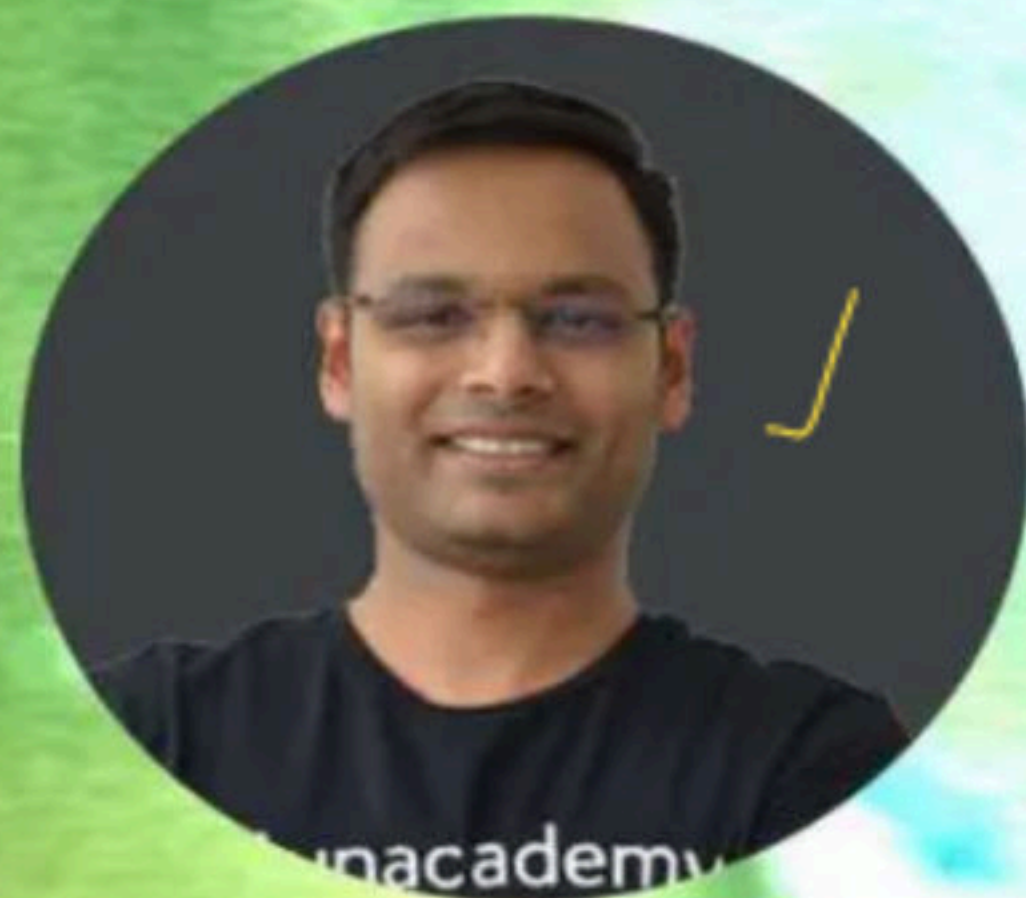
Complete Course on Computer Networks - Part III

My philosophy

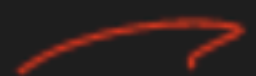
TEACHING IS WORSHIP
STUDENTS ARE GODS

*Thank you
for
trusting me*





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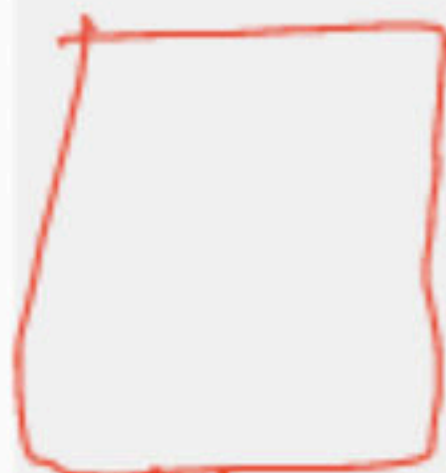
COMMUNITY

CHANNELS

ABOUT



Upcoming live streams



Algorithm
5 PM



Inheritance in Java | Method Overriding | IS-A, HAS-A...

Scheduled for 4/16/21, 6:00 PM

SET REMINDER



Live Coding with RBR | Song Randomizer | How Spotify...

Scheduled for 4/16/21, 7:00 PM

SET REMINDER



Creating a Git Repo | Committing Changes |...

Scheduled for 4/16/21, 8:00 PM

SET REMINDER

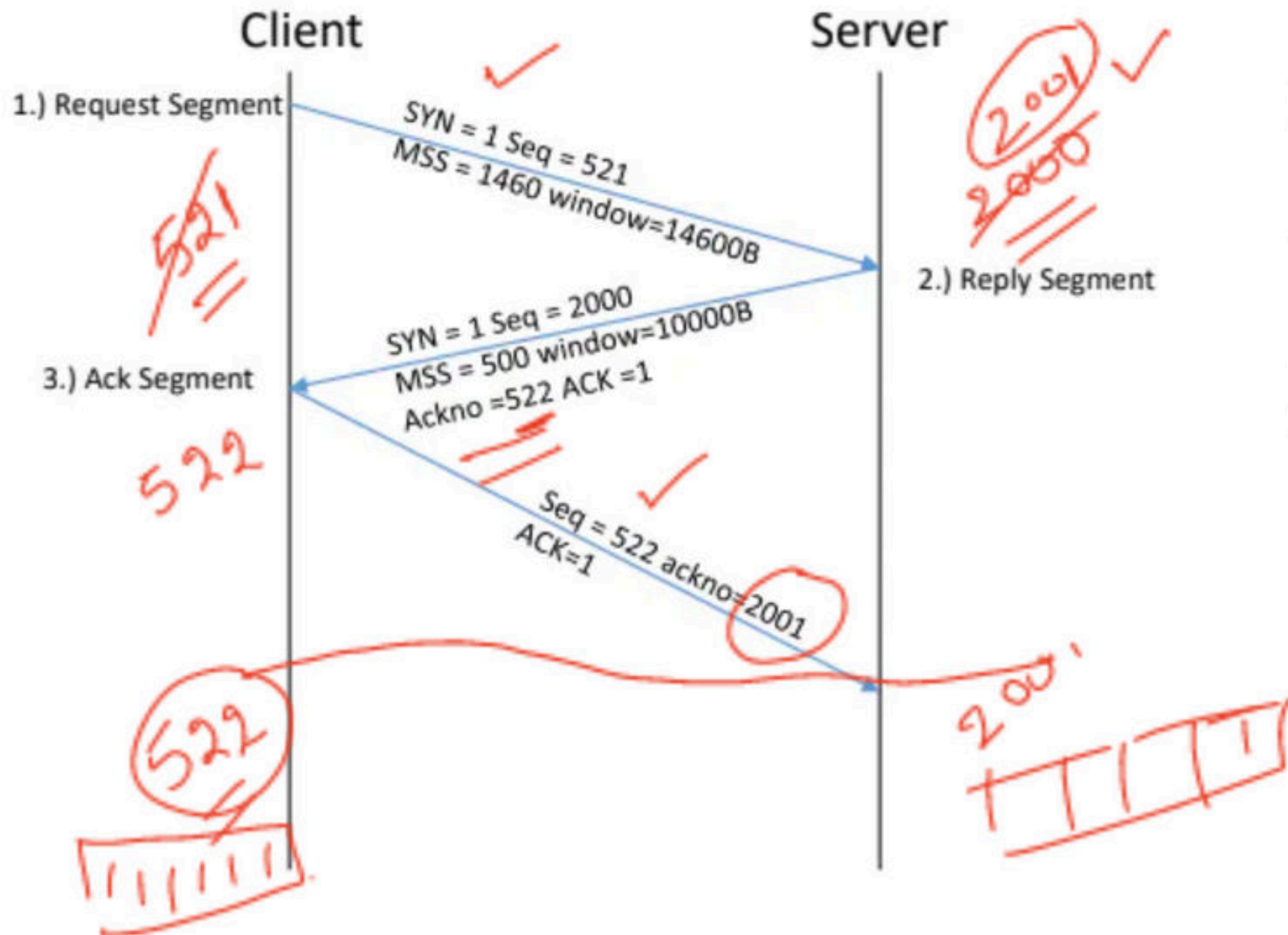


How to Launch your own YouTube channel for GATE -...

Scheduled for 4/18/21, 1:00 PM

SET REMINDER

Three Way Handshake is a process used for establishing a TCP connection.



Step-03: ACK-

After receiving the reply segment,

- Client acknowledges the response of server.
- It acknowledges the server by sending a pure acknowledgement.

Imagine this scenario for connection
Establishment

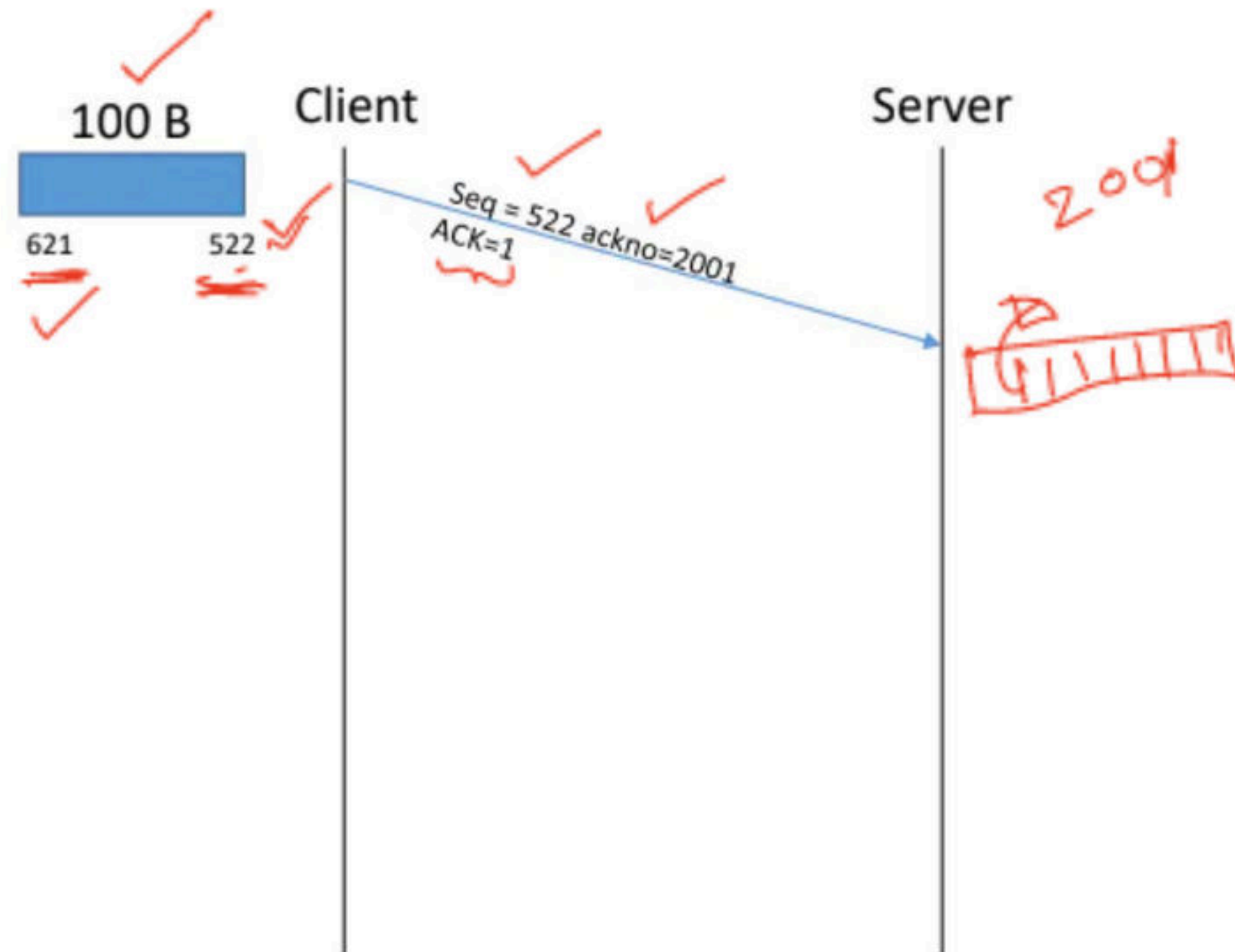
In any TCP segment,

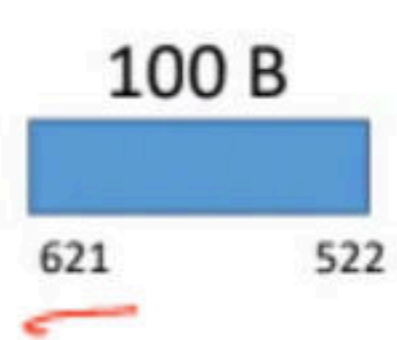
1. If SYN bit = 1 and ACK bit = 0, then it must be the request segment.
2. If SYN bit = 1 and ACK bit = 1, then it must be the reply segment.
3. If SYN bit = 0 and ACK bit = 1, then it can be the pure ACK or segment meant for data transfer.
4. If SYN bit = 0 and ACK bit = 0, then this combination is not possible.

①



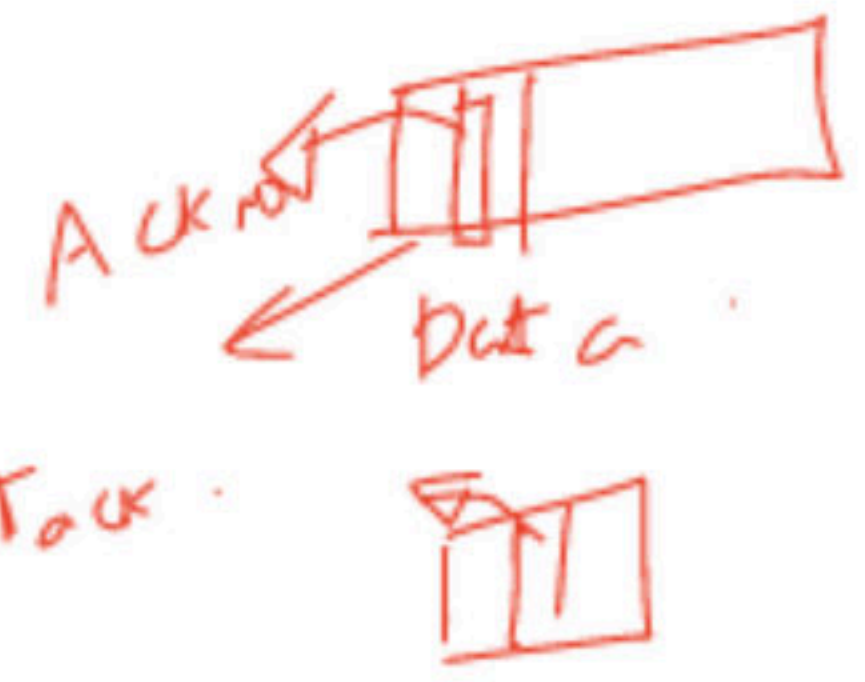
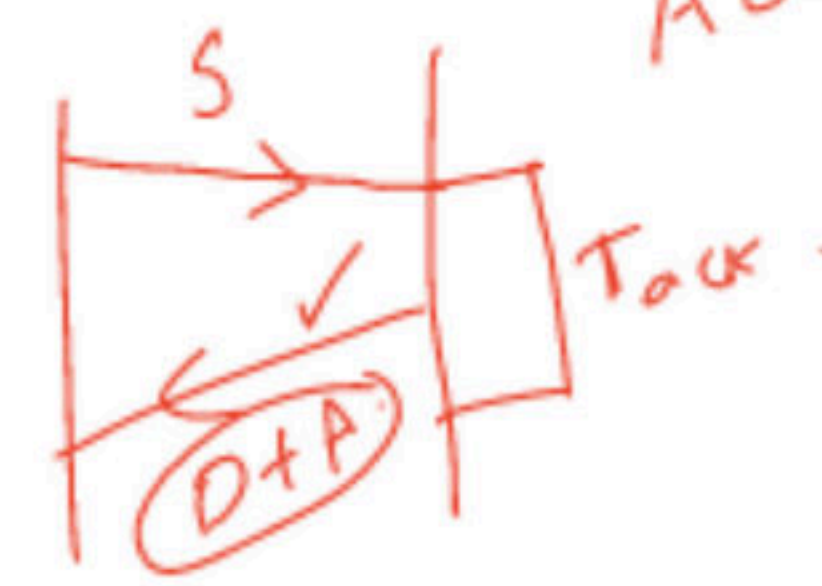
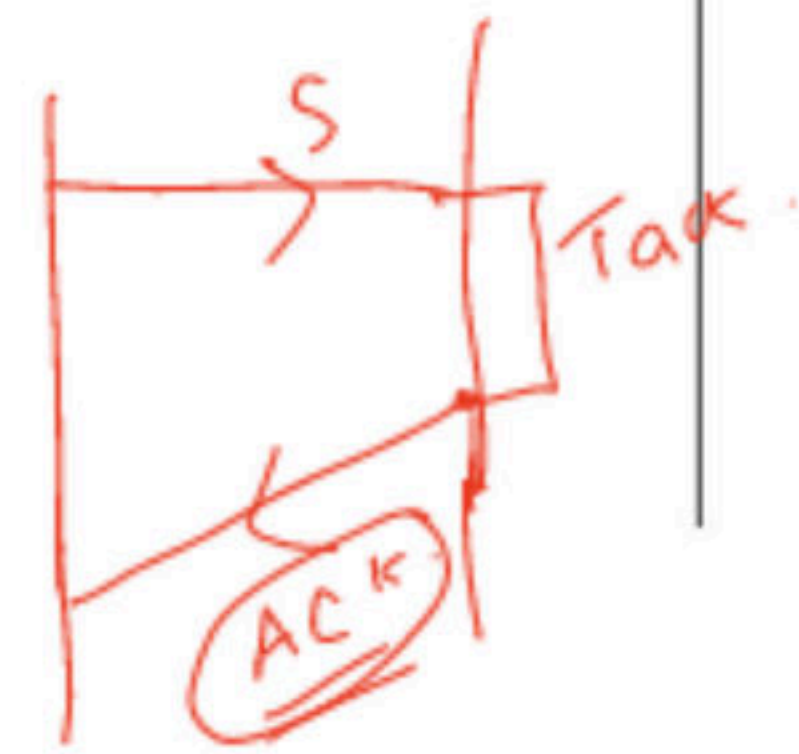
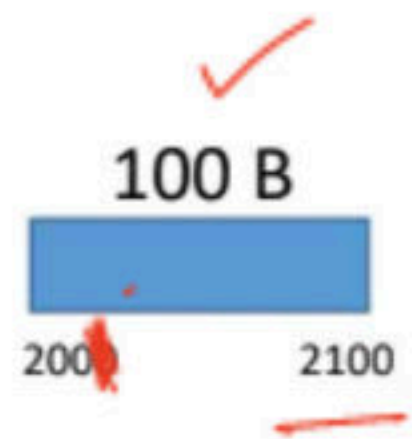
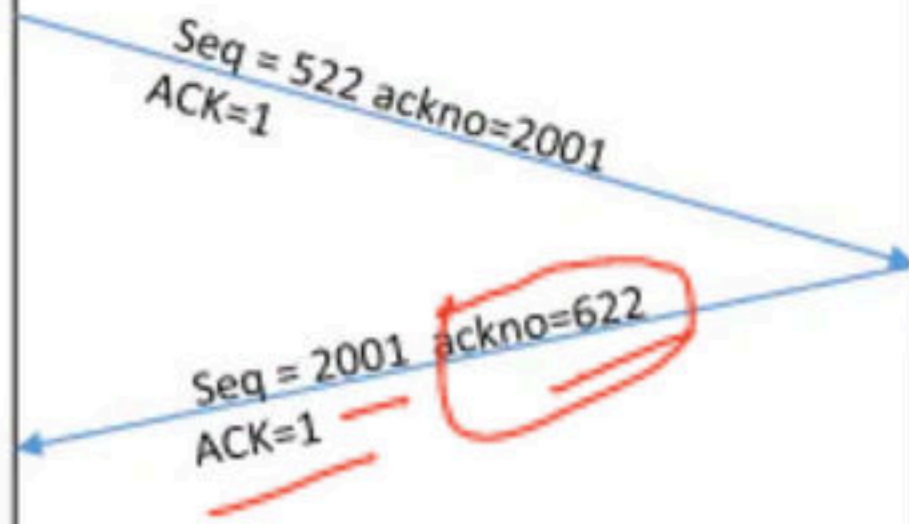
DATA TRANSMISSION

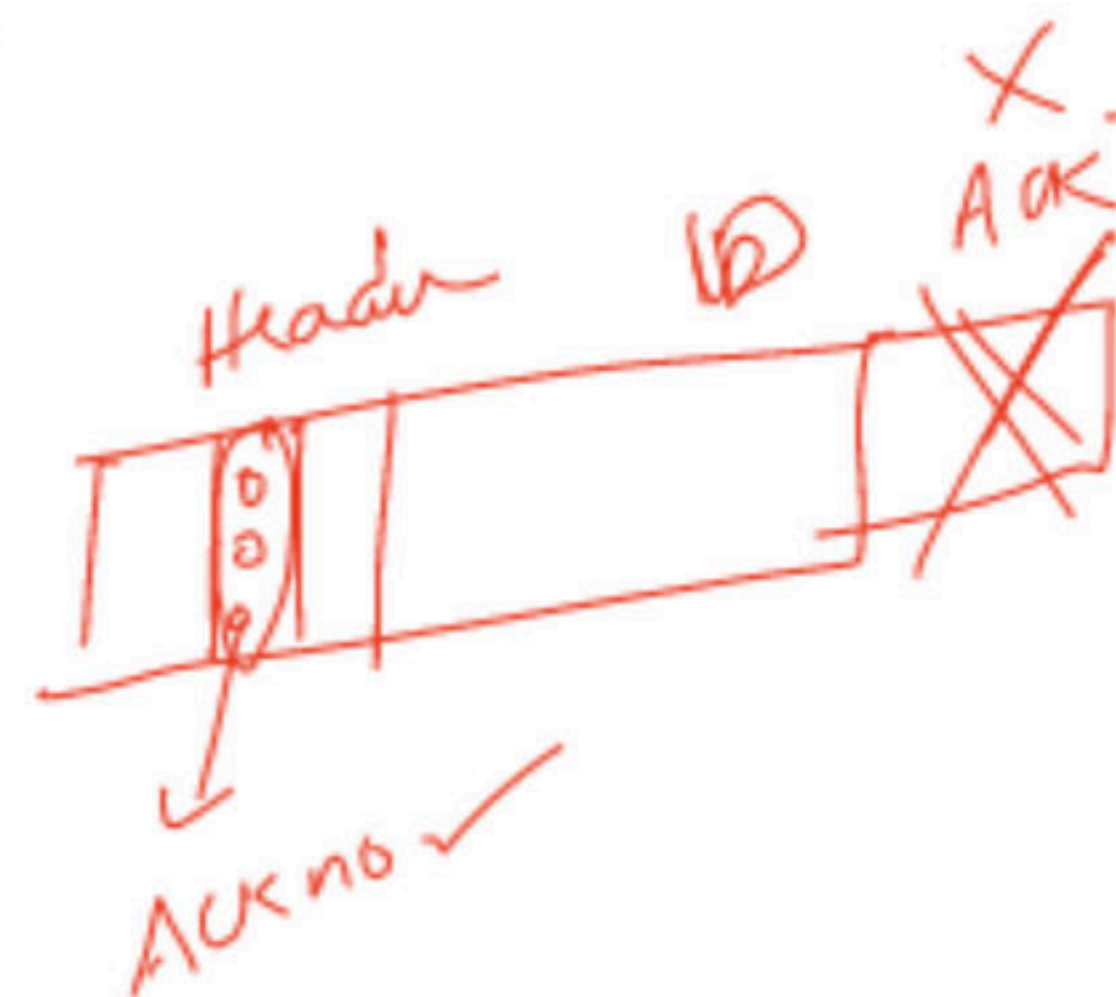
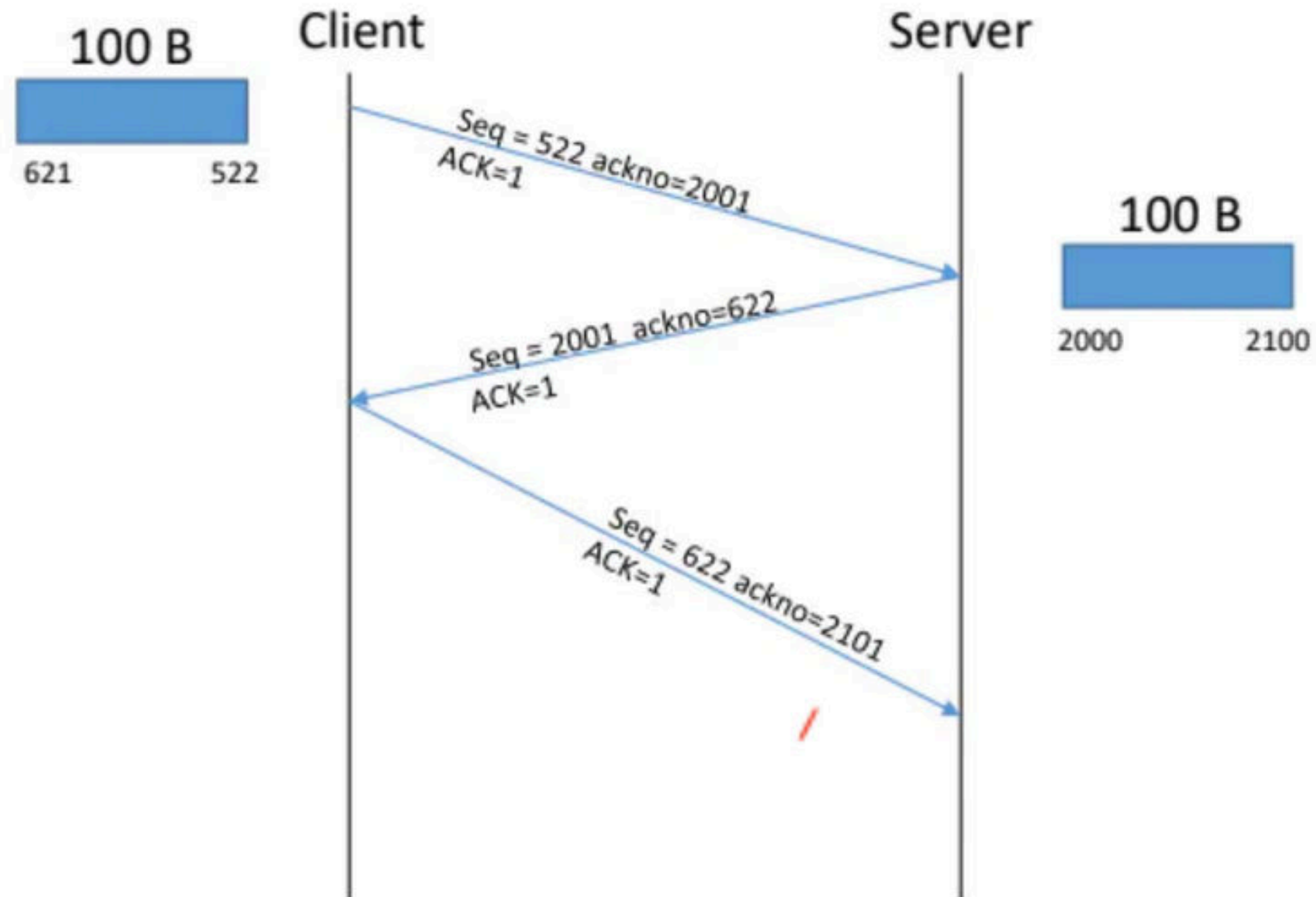


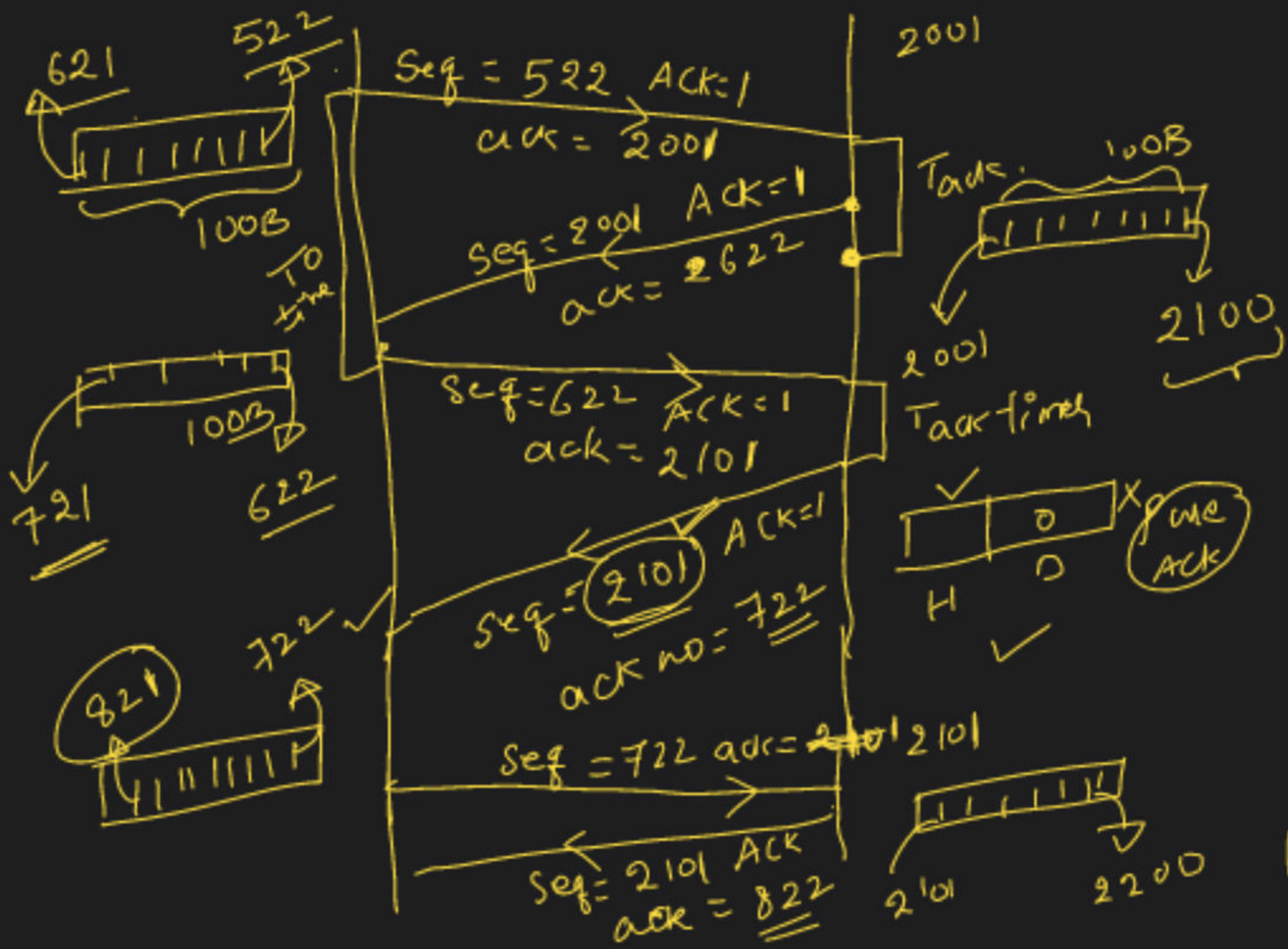


Client

Server



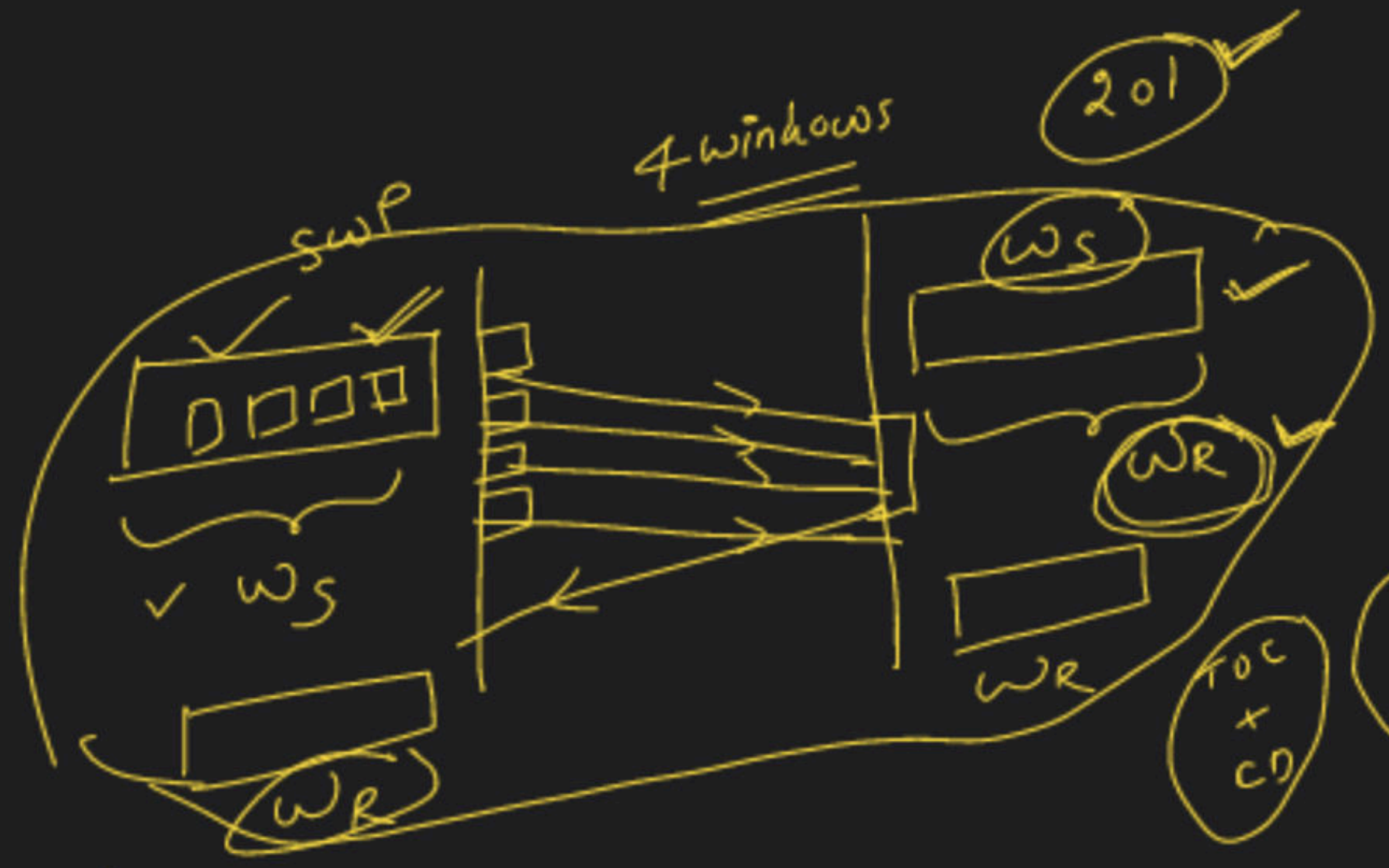
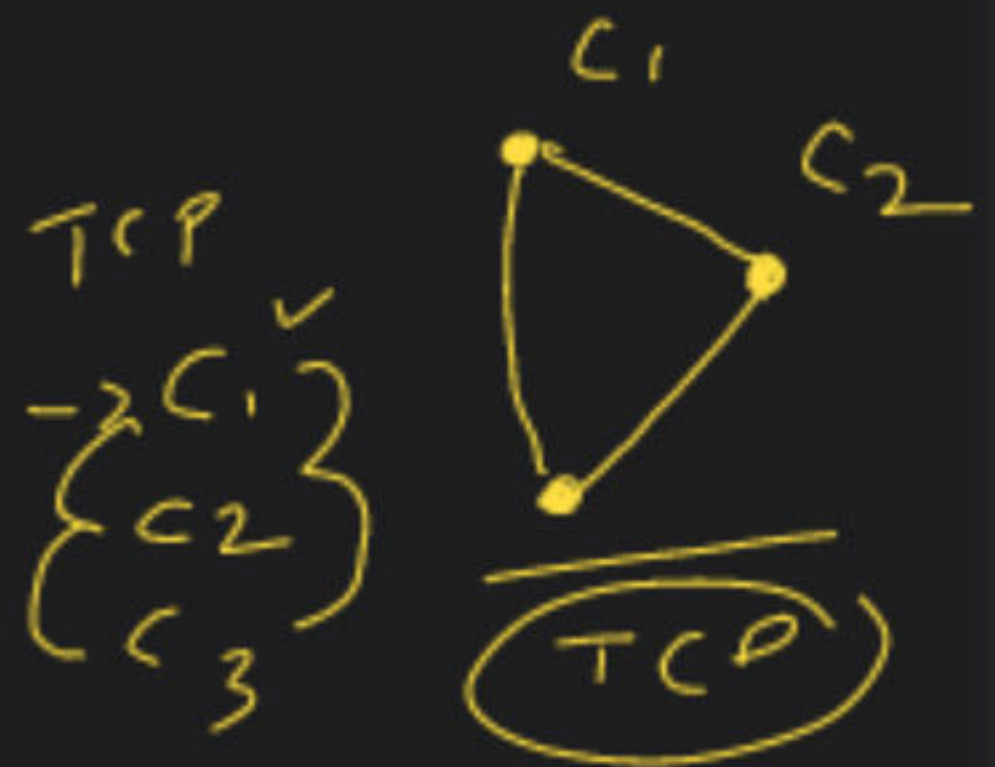
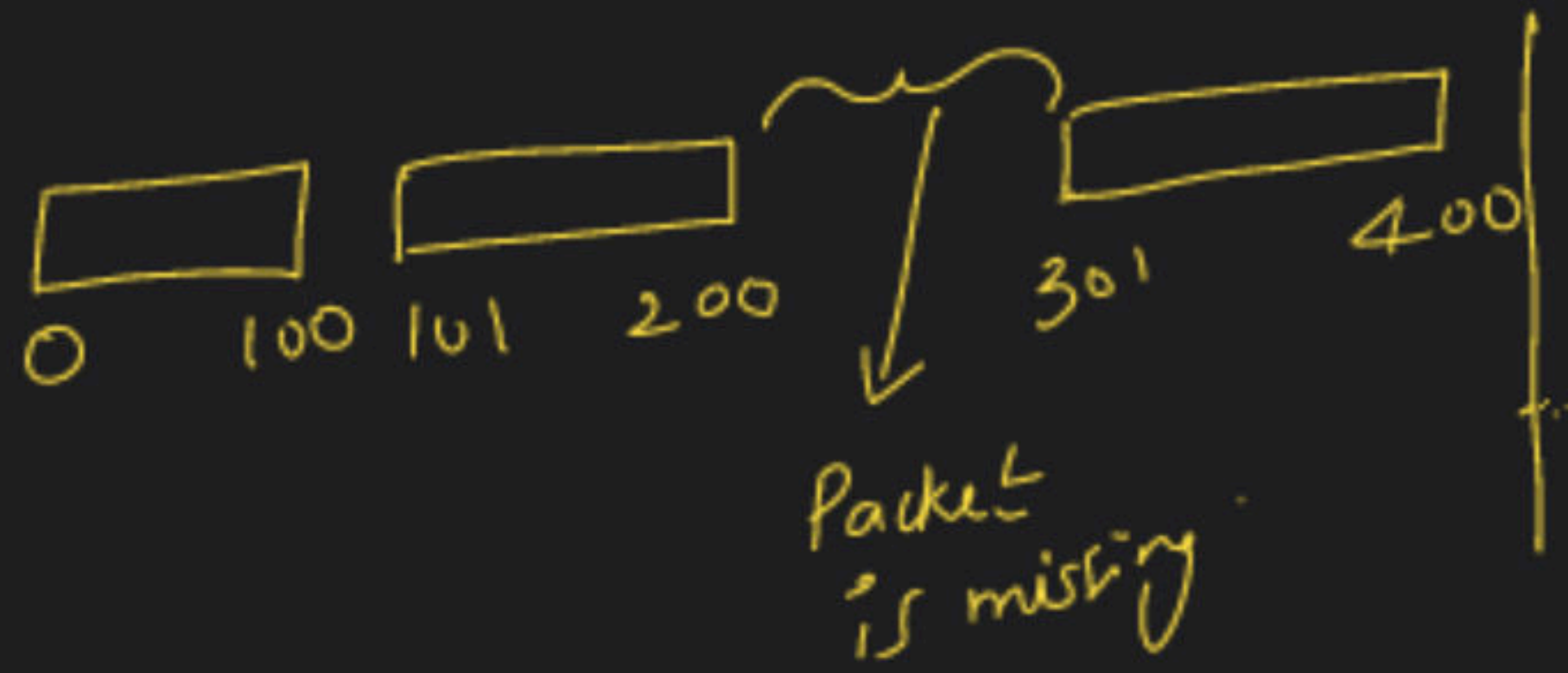




Seq \rightarrow Req ✓
 ACK = 1
 Ack no = valid

Seq (circled) ✓

Cumulative ✓



Combination of
 (SR) + (GBN) ✓
 (75%) 25%
 ✓
 (IP) ✓
 (NL) ✓
 (TCP) ✓
 ✓
 Socket prog. ✓
 = 100% ✓

Algo + DS ✓

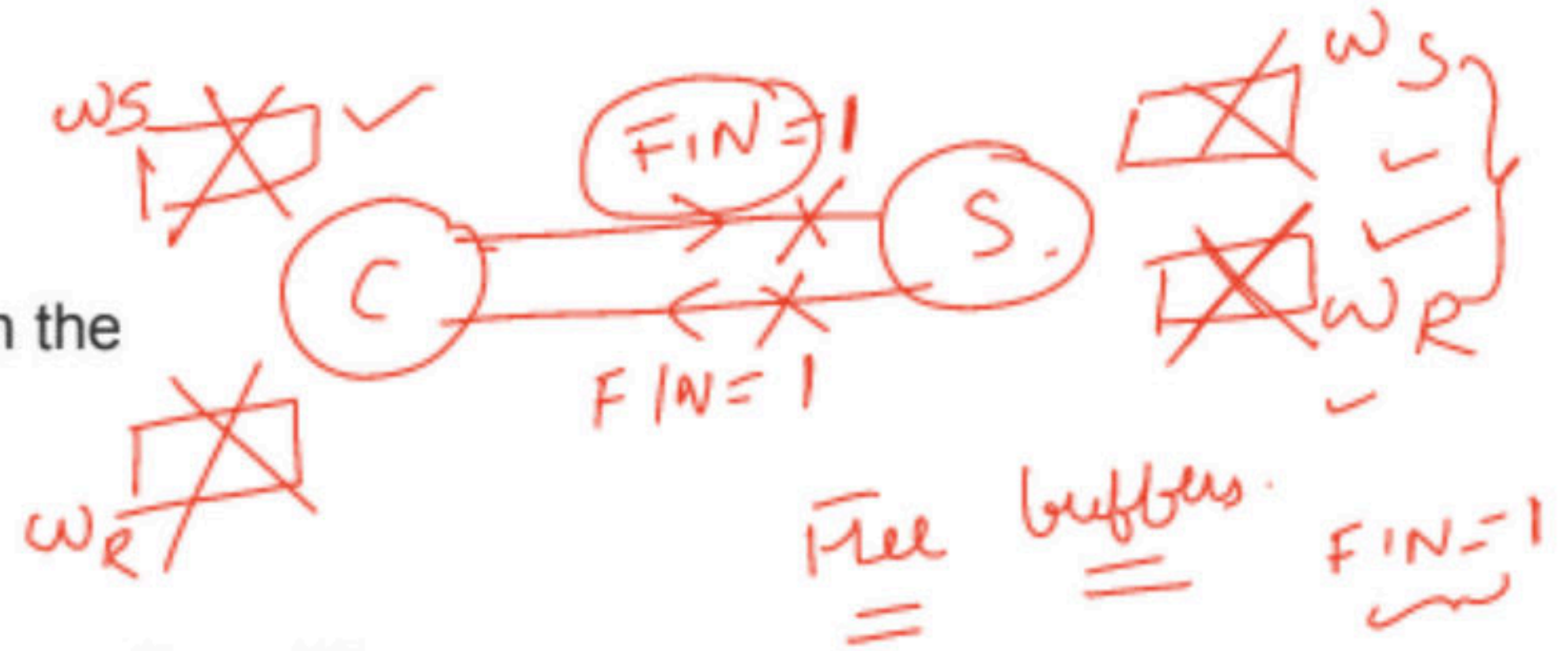
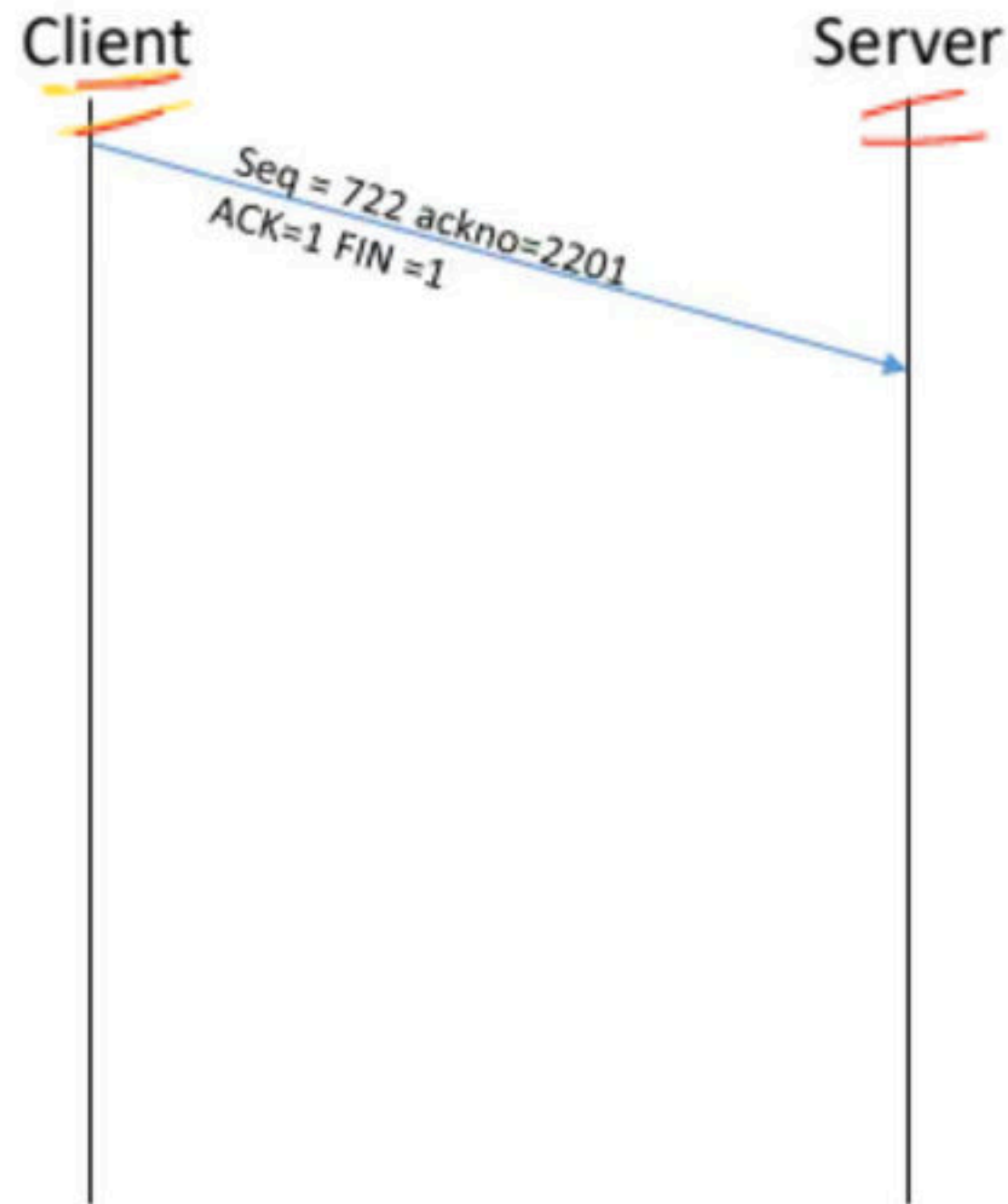


CONNECTION TERMINATION

Consider-

There is a well established TCP connection between the client and server.

Client wants to terminate the connection.

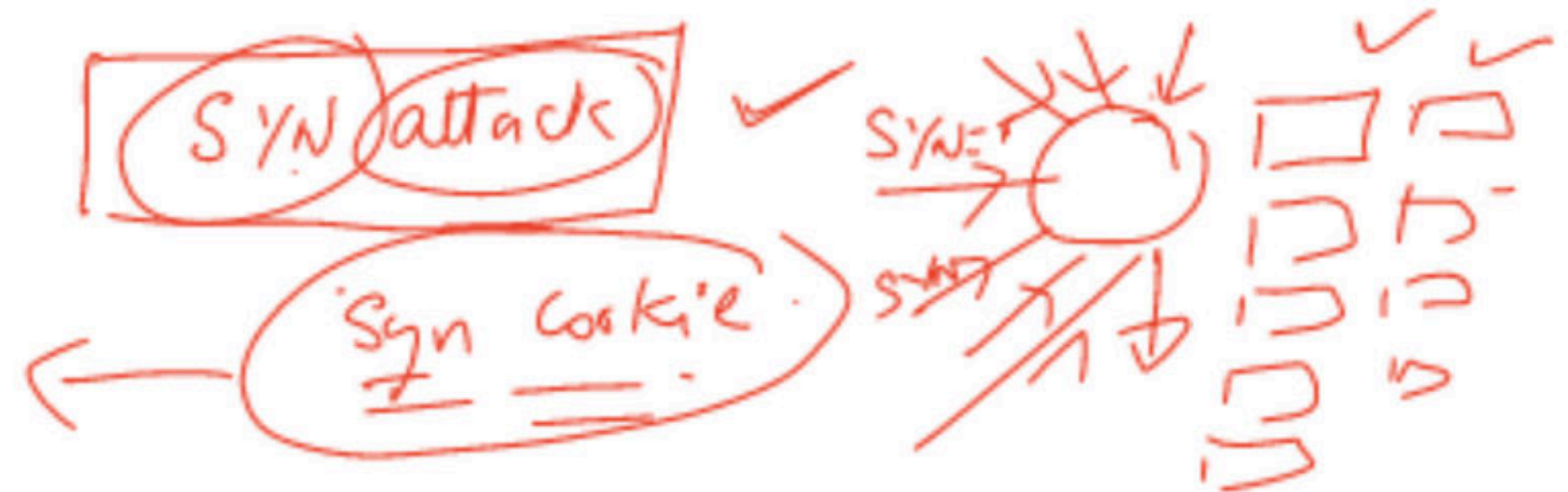


Step-01:

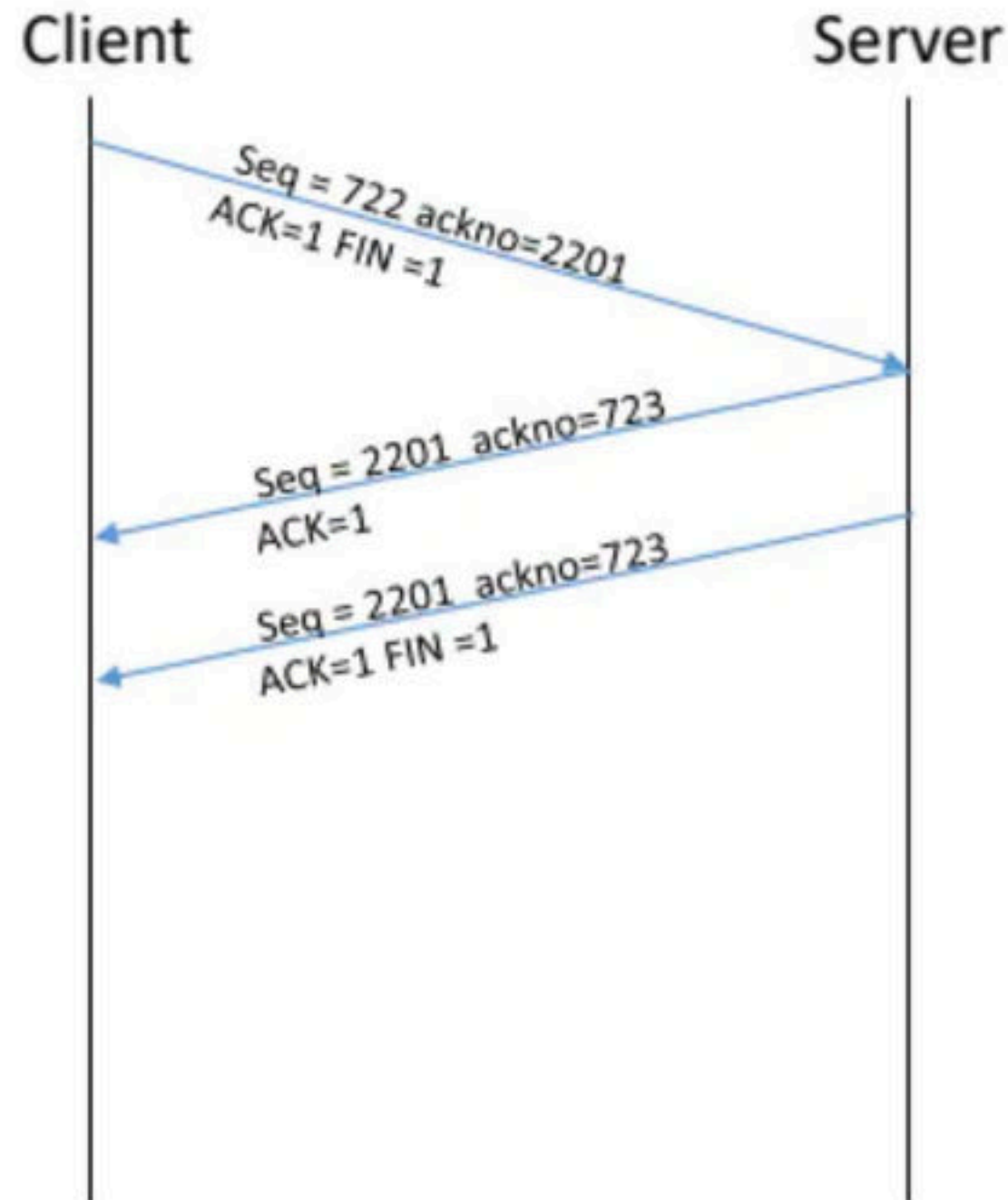
For terminating the connection,

- Client sends a FIN segment to the server with FIN bit set to 1.
- Client enters the **FIN_WAIT_1** state.
- Client waits for an acknowledgement from the server.

5PM-9PM
④
9PM



CONNECTION TERMINATION



Step-02:

After receiving the FIN segment,

- Server frees up its buffers.
- Server sends an acknowledgement to the client.
- Server enters the CLOSE_WAIT state.

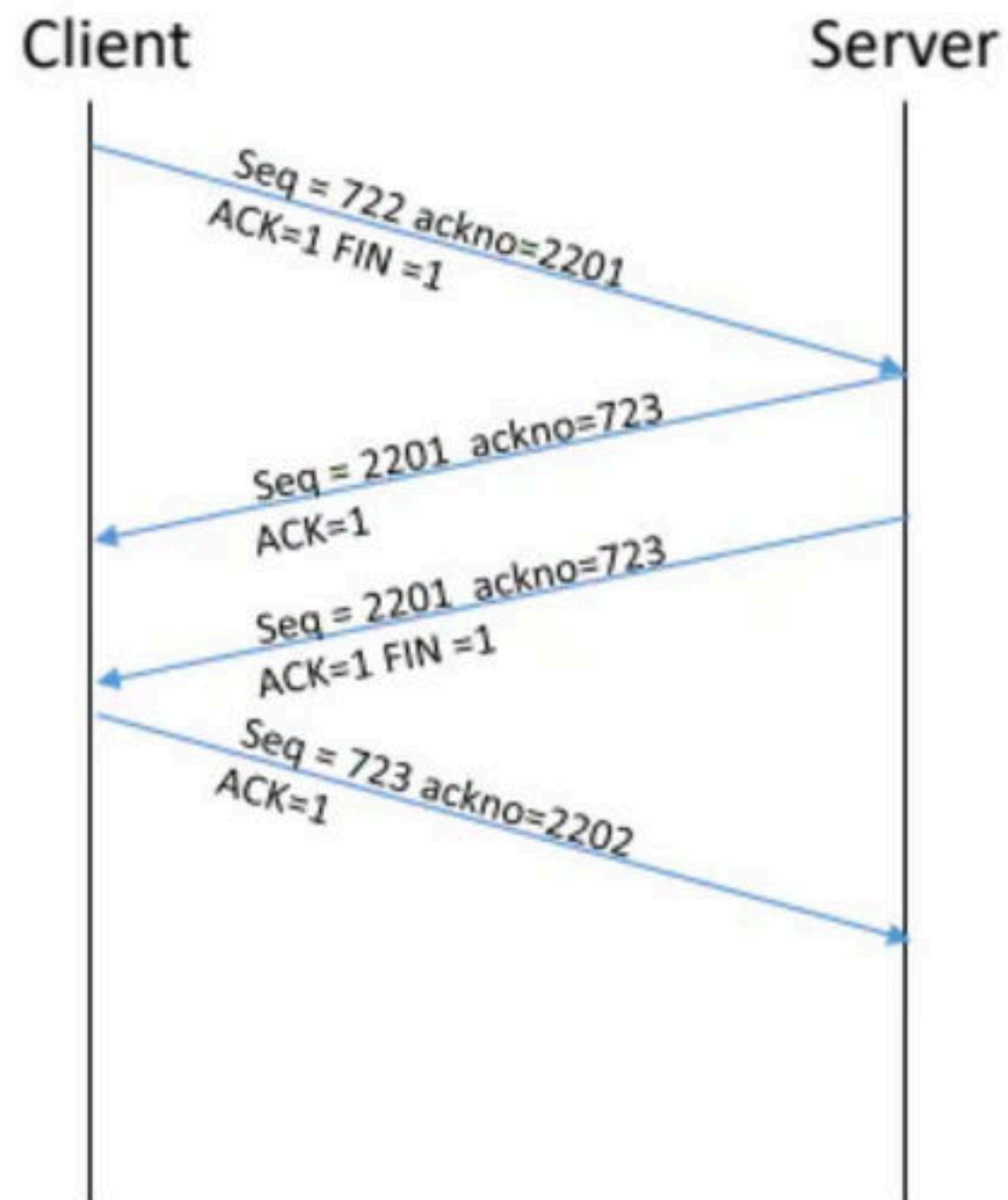
Step-03:

After receiving the acknowledgement, client enters the FIN_WAIT_2 state.

For terminating the connection,

- Server sends a FIN segment to the client with FIN bit set to 1.
- Server waits for an acknowledgement from the client.

CONNECTION TERMINATION



Step-04:

After receiving the FIN segment,

- Client frees up its buffers.
- Client sends an acknowledgement to the server (not mandatory).
- Client enters the TIME_WAIT state.

Computer Networks

TCP header Part 4

PSH Bit-

PSH bit is used to push the entire buffer immediately to the receiving application.

When PSH bit is set to 1,

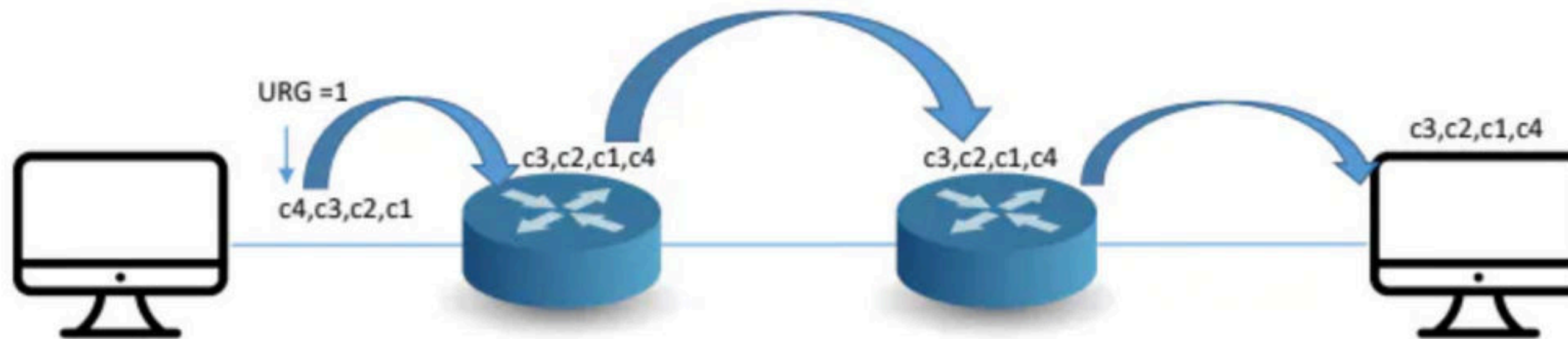
- All the segments in the buffer are immediately pushed to the receiving application.
- No wait is done for filling the entire buffer.
- This makes the entire buffer to free up immediately.

Useful in case of chat applications

URG Bit-

URG bit is used to treat certain data on an urgent basis.

When URG bit is set to 1,
It indicates the receiver that certain amount of data within the current segment is urgent.



Urgent Pointer-

- Urgent pointer is a 16 bit field.
- It indicates how much data in the current segment counting from the first data byte is urgent.
- Urgent pointer added to the sequence number indicates the end of urgent data byte.
- This field is considered valid and evaluated only if the URG bit is set to 1.

Number of urgent bytes = Urgent pointer + 1

End of urgent byte
= Sequence number of the first byte in the segment + Urgent pointer

RST Bit-

RST bit is used to reset the TCP connection.

When RST bit is set to 1,

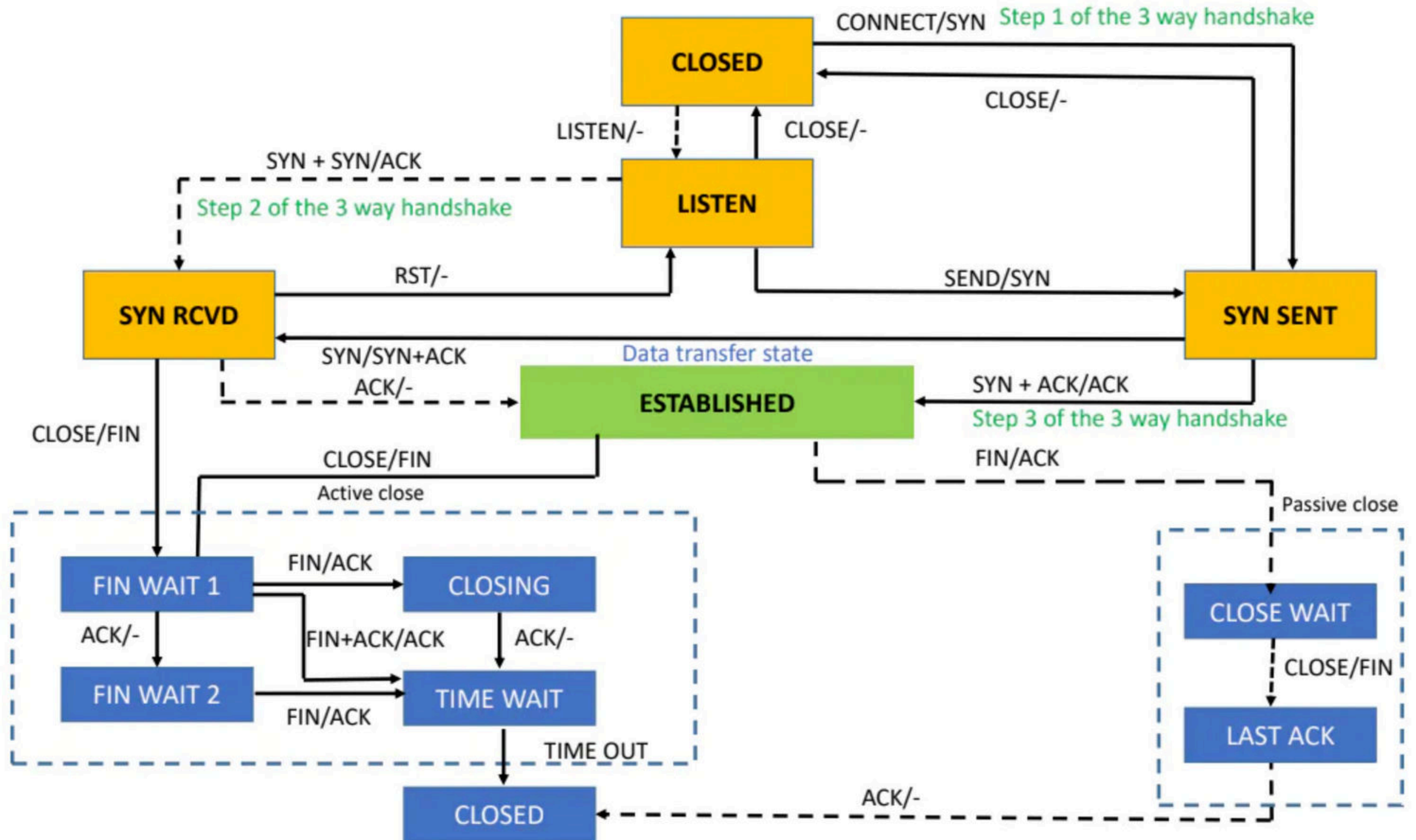
- It indicates the receiver to terminate the connection immediately.
- It causes both the sides to release the connection and all its resources abnormally.
- The transfer of data ceases in both the directions.
- It may result in the loss of data that is in transit.

This is used only when-

- There are unrecoverable errors.
- There is no chance of terminating the TCP connection normally.

State	Description
CLOSED	No connection is active or pending
LISTEN	The server is waiting for an incoming call.
SYN RCVD	A connection request has arrived; wait for ACK
SYN SENT	The application has started to open a connection
ESTABLISHED	The normal data transfer state
FIN WAIT 1	The application has said it is finished
FIN WAIT 2	The other side has arranged to release
TIME WAIT	Wait for all packets to die off
CLOSING	Both sides have tried to close simultaneously
CLOSE WAIT	The other side has initiated the release
LAST ACK	Wait for all packets to die

The states used in TCP connection management finite state machine.

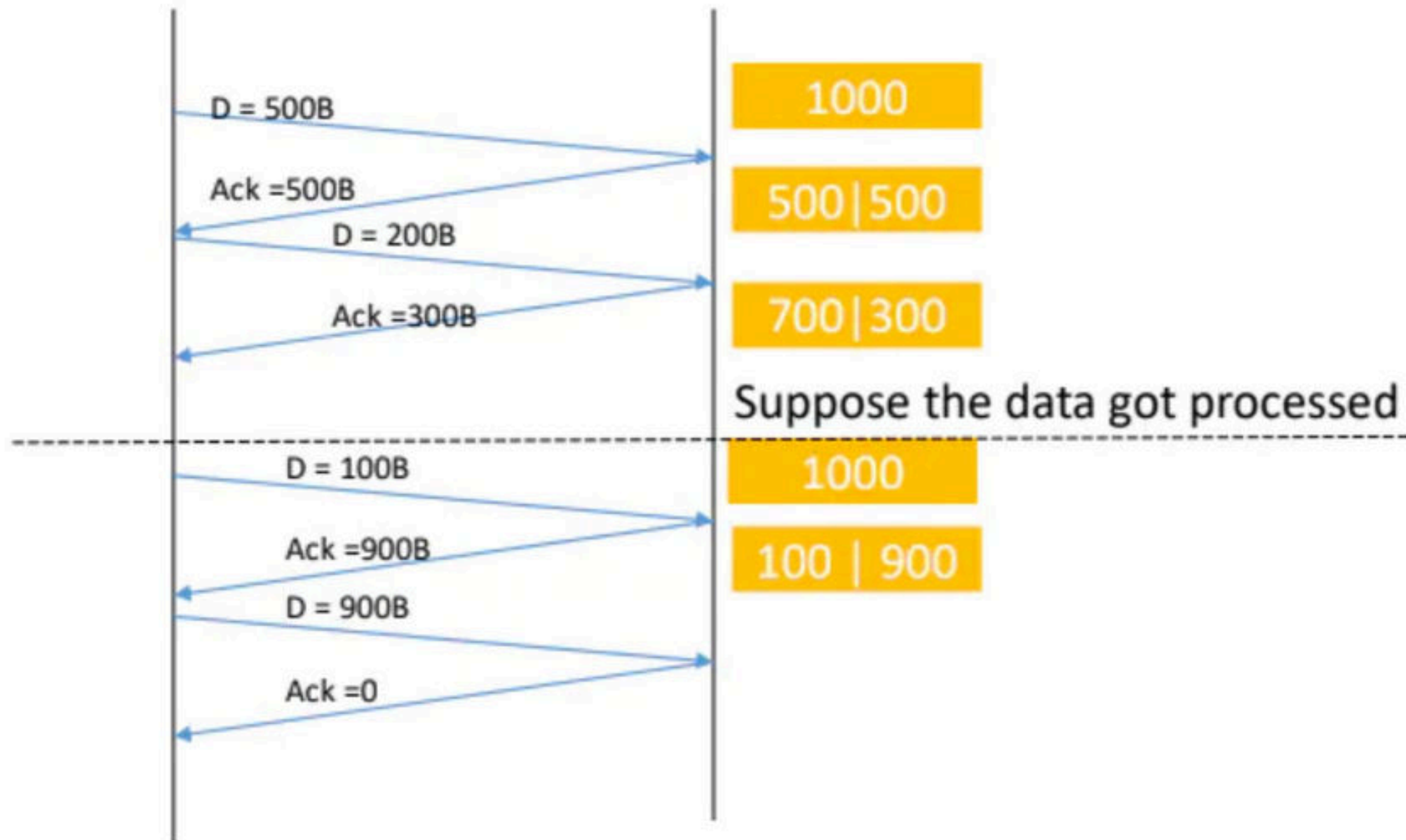


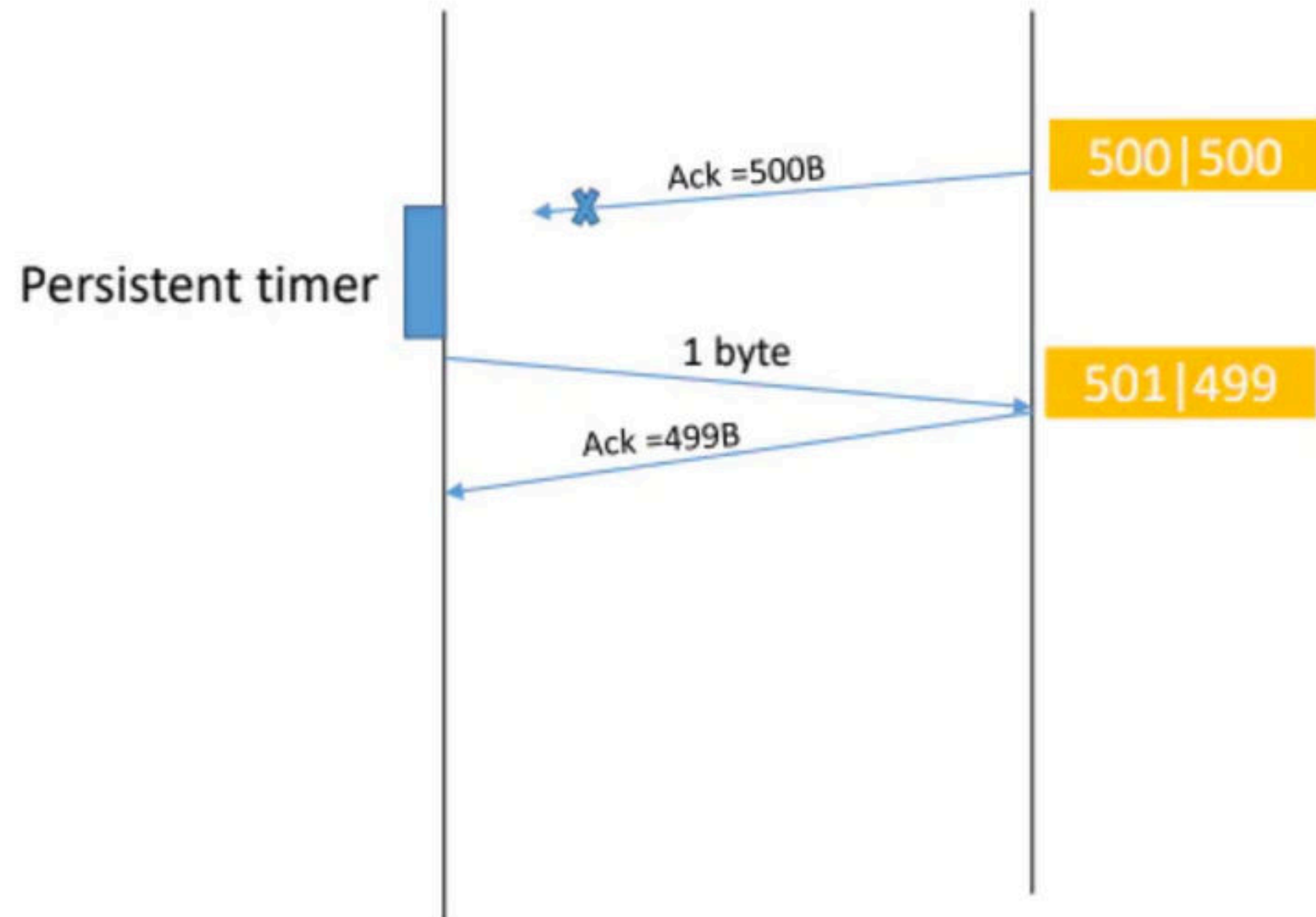
Computer Networks

TCP header part 5

Window Size

- Window size is a 16 bit field.
- It contains the size of the receiving window of the sender.
- It advertises how much data (in bytes) the sender can receive without acknowledgement.
- Thus, window size is used for **Flow Control**.





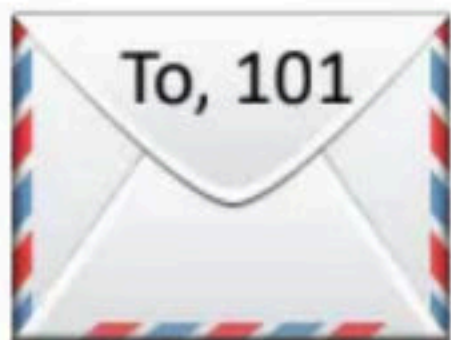
Consider the following situation-
Sender receives an acknowledgment from the receiver with zero window size.
This indicates the sender to wait.
Later, receiver updates the window size to 500B and sends the segment with the update to the sender.
This segment gets lost.
Now, both sender and receiver keeps waiting for each other to do something.
To deal with such a situation, TCP uses a persistent timer.

Checksum

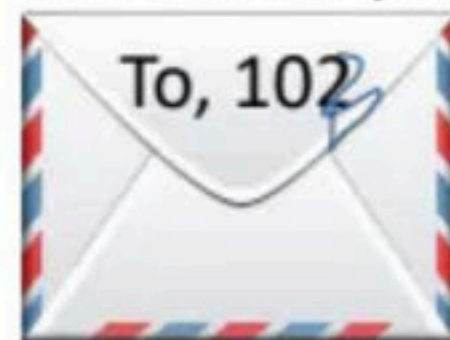
Checksum is a 16 bit field used for error control.
It verifies the integrity of data in the TCP payload.
Sender adds CRC checksum to the checksum field before sending the data.

Receiver rejects the data that fails the CRC check.

Understanding with an example



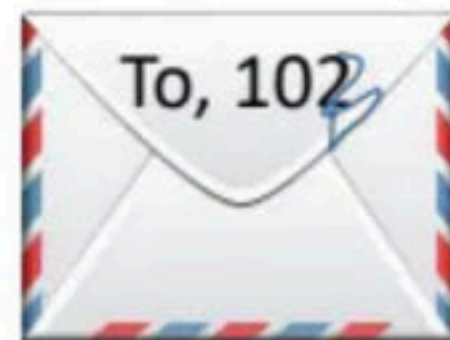
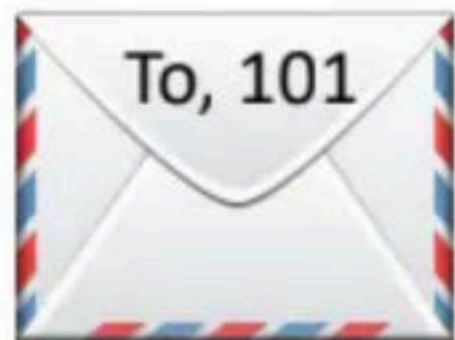
Got damaged
While transporting



Letter delivered to wrong house

Checksum

Checksum is a 16 bit field used for error control.
It verifies the integrity of data in the TCP payload.
Sender adds CRC checksum to the checksum field before sending the data.
Receiver rejects the data that fails the CRC check.



Writing the delivery address
Inside the letter too



Options

Options field is used for several purposes.

The size of options field vary from 0 bytes to 40 bytes.

Options field is generally used for the following purposes-

1. Time stamp
2. Window size extension
3. Parameter negotiation
4. Padding

Time Stamp

When wrap around time is less than life time of a segment, Multiple segments having the same sequence number may appear at the receiver side. This makes it difficult for the receiver to identify the correct segment. If time stamp is used, it marks the age of TCP segments. Based on the time stamp, receiver can identify the correct segment

Window Size Extension

Options field may be used to represent a window size greater than 16 bits. Using window size field of TCP header, window size of only 16 bits can be represented. If the receiver wants to receive more data, it can advertise its greater window size using this field. The extra bits are then appended in Options field.

Parameter Negotiation

Options field is used for parameters negotiation. Example- During connection establishment, Both sender and receiver have to specify their maximum segment size. To specify maximum segment size, there is no special field. So, they specify their maximum segment size using this field and negotiates.

Padding

Addition of dummy data to fill up unused space in the transmission unit and make it conform to the standard size is called as padding. Options field is used for padding.

My philosophy

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STUDENTS ARE GODS

*Thank you
for
trusting me*

