CS & IT ENGINEERING

Computer Networks

TCP & UDP

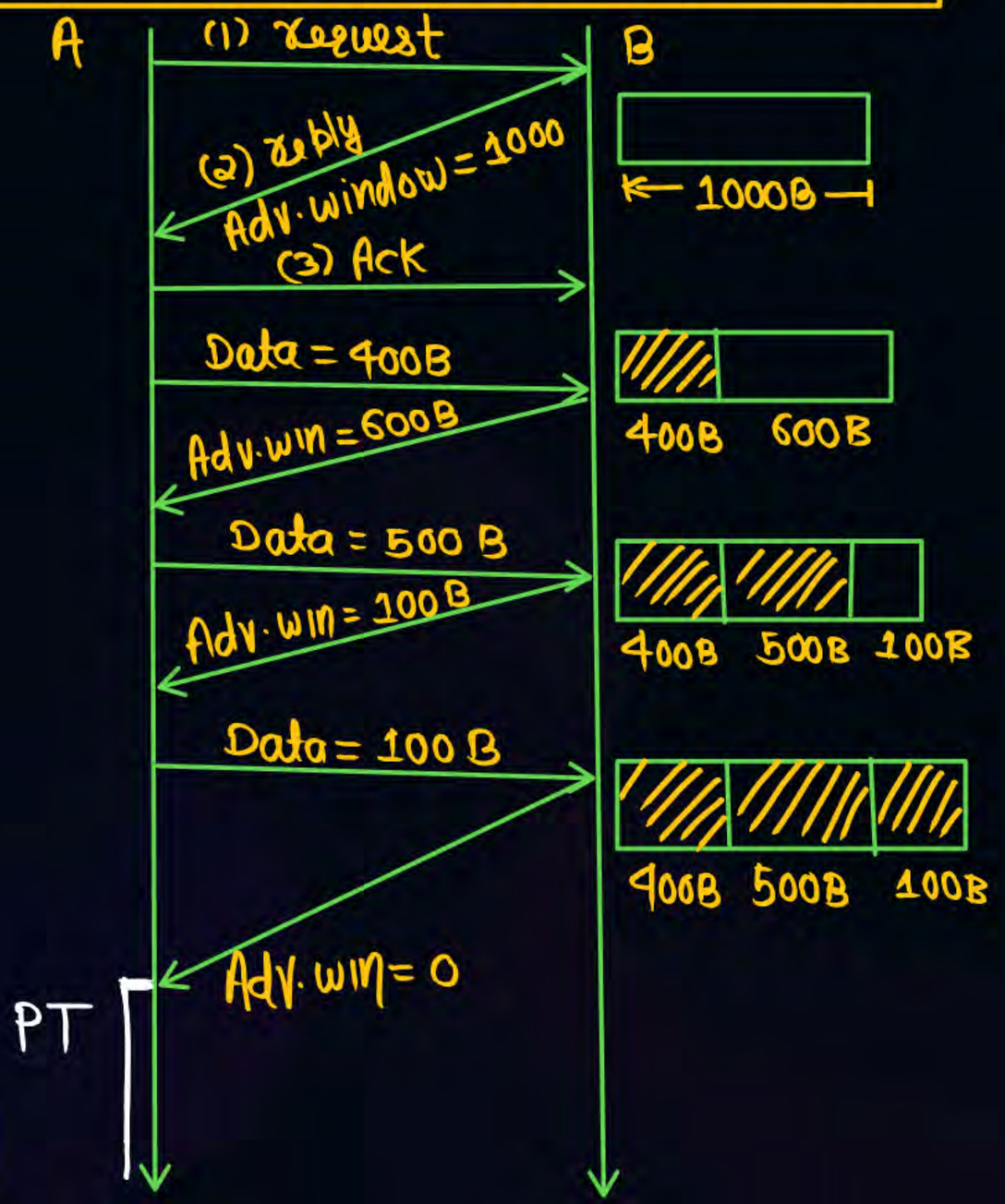
Lecture No.- 07

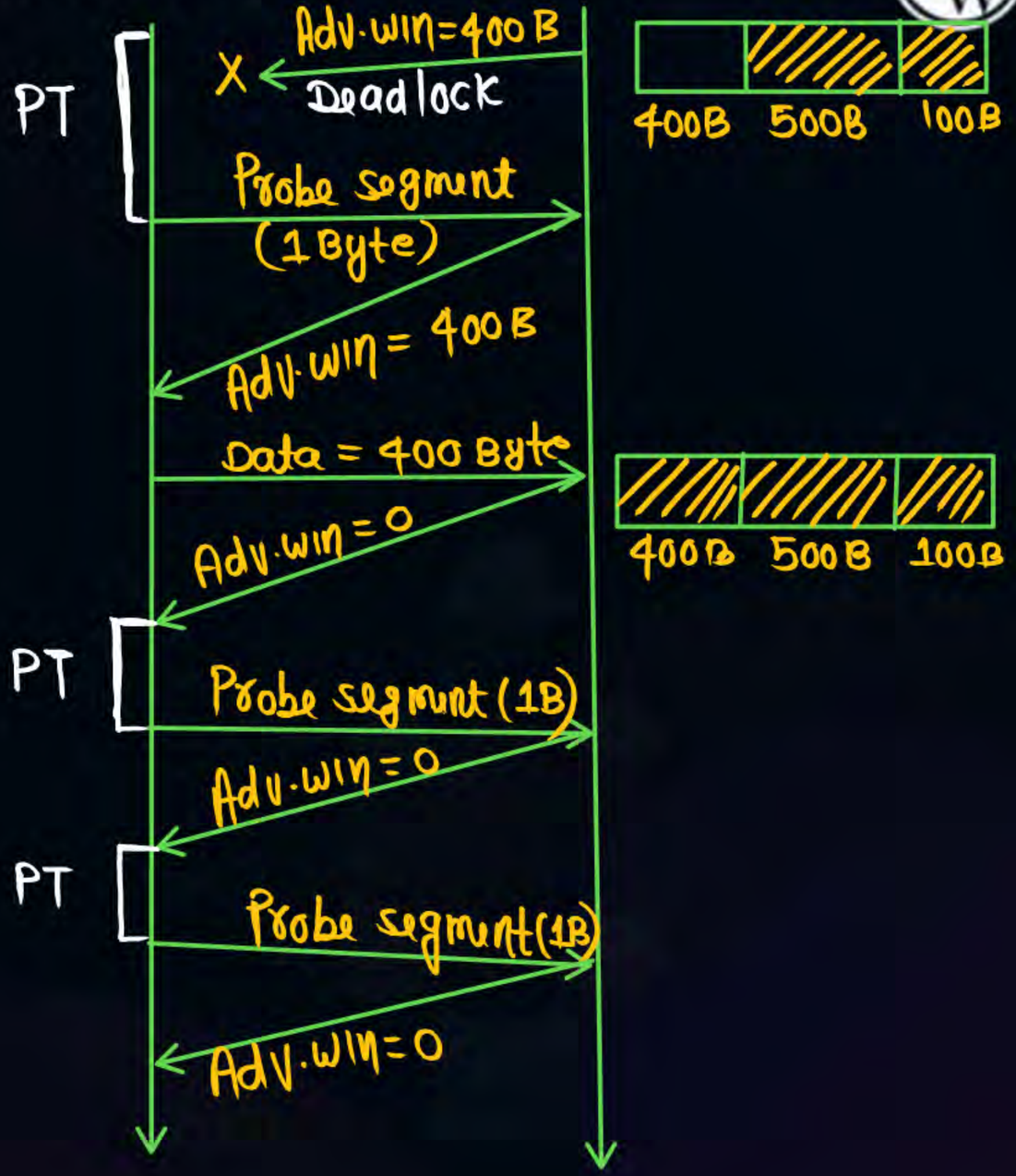
By- Ankit Doyla Sir

(1) Flow control in TCP

(2) Error control in TCP

Window Size or Advertising Window (16bits) [Used For Flow Control]:

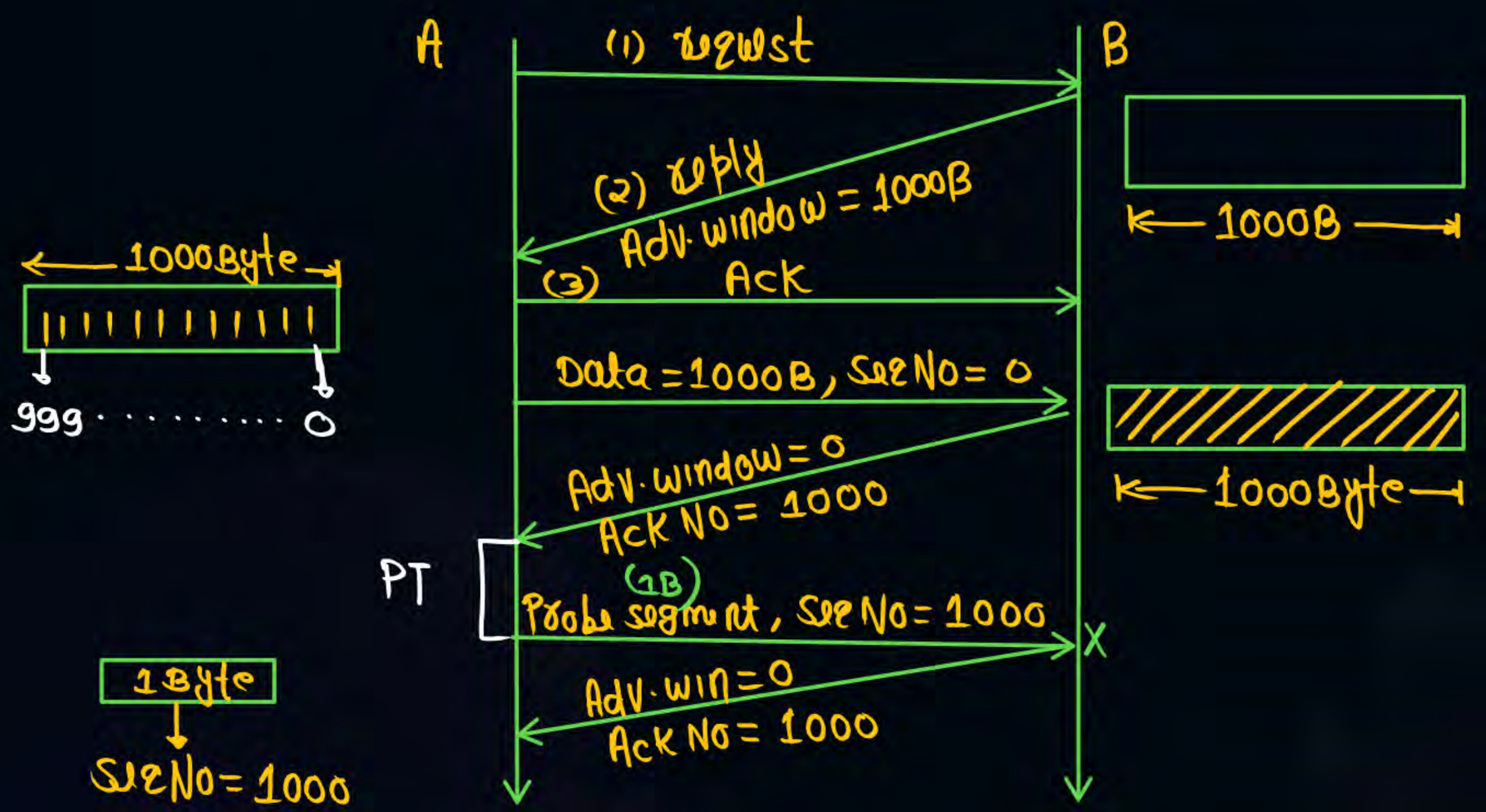




Slide 2

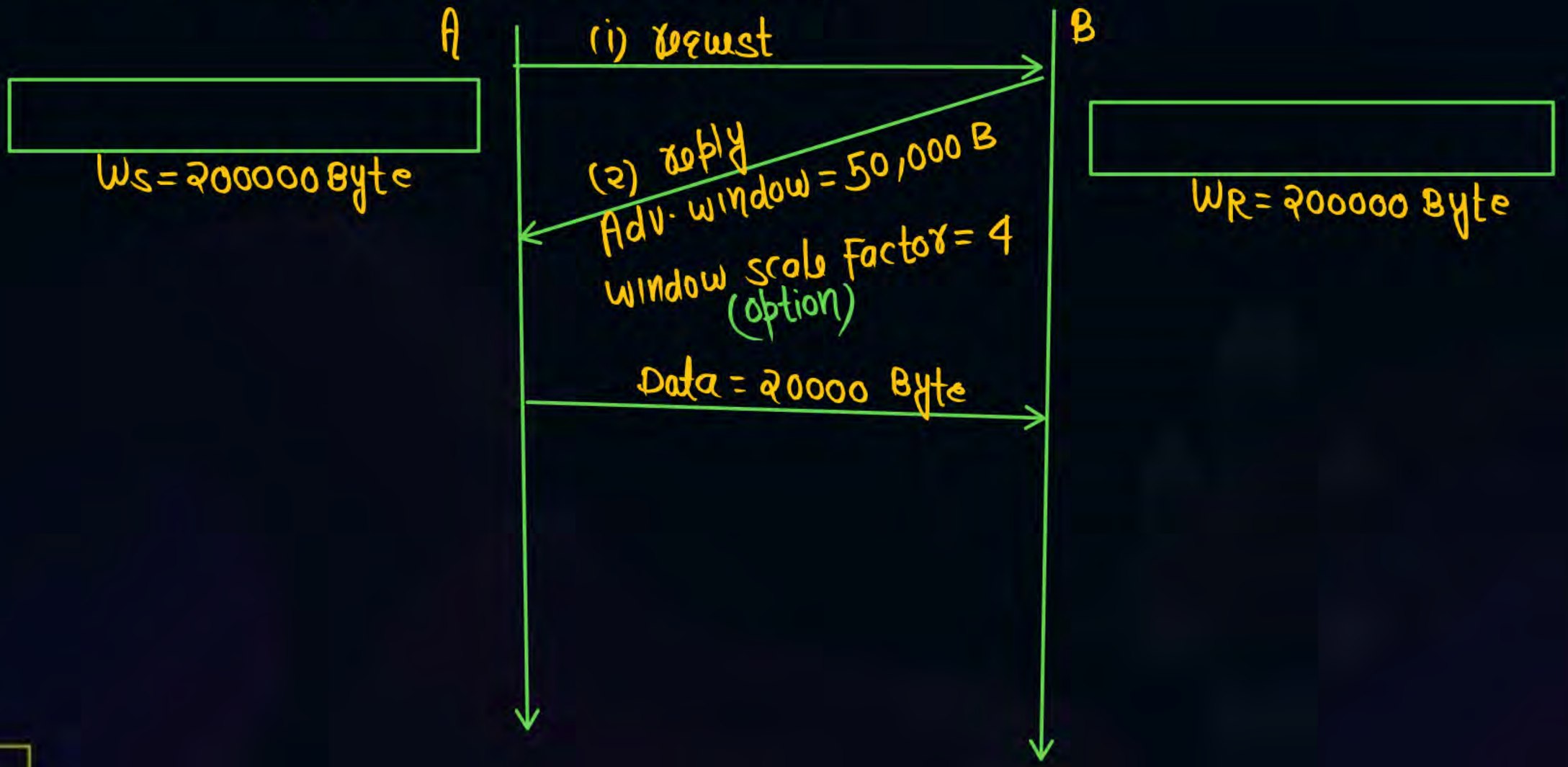
Persistent Timer:

- Whenever receiver announce that my receiving capacity is zero then sender should stop the transmission this might be lead to Deadlock.
- To correct the deadlock problem, TCP uses a persistent timer. When the sender receive an acknowledgment with a window size zero, it start a persistent timer.
- When the persistent timer goes off, the sender send a special segment called as Probe segment.
- This segment contain only one Byte of data. It has a sequence number, but its sequence number is never acknowledged.
- It is even ignored in calculating the sequence number for the rest of the data.
- Probe segment alters the receiving TCP that ACK was lost and should be resent
- The value of the persistent timer is set to the value of retransmission timer. How ever if a response is not received from the receiver; another probe segment is sent and the value of persistent timer will be doubled and reset.

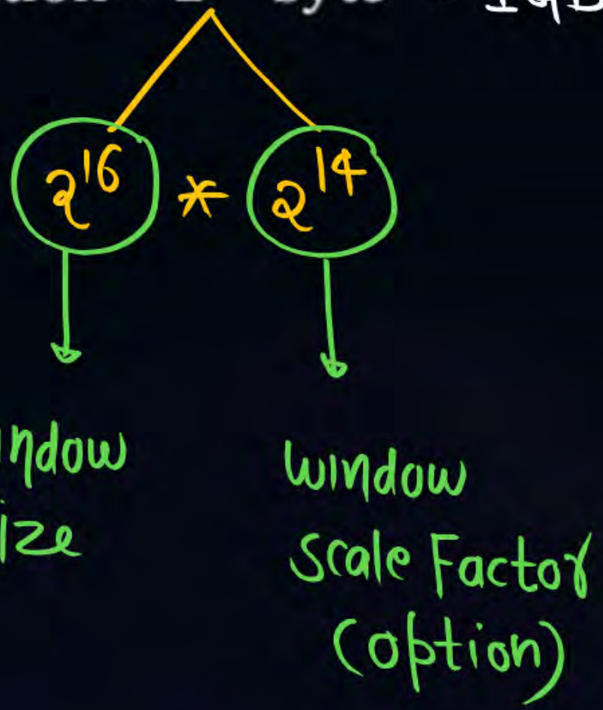

A
B
(1) Request
(2) Reply
Adv. window = 1000B
(3) Ack
1000B
1000Byte
999 0
Data = 1000B, Seq No = 0
Adv. window = 0
Ack No = 1000
1000Byte
PT
(1B)
Probe segment, Seq No = 1000
X
Adv. win = 0
Ack No = 1000
1Byte
Seq No = 1000

Window size = 16 bit

Maximum No. possible $= 2^{16} - 1 = 65,535$



Note: According to RFC – 1312 the maximum window size by using window scale option = 2^{30} byte = 1GB



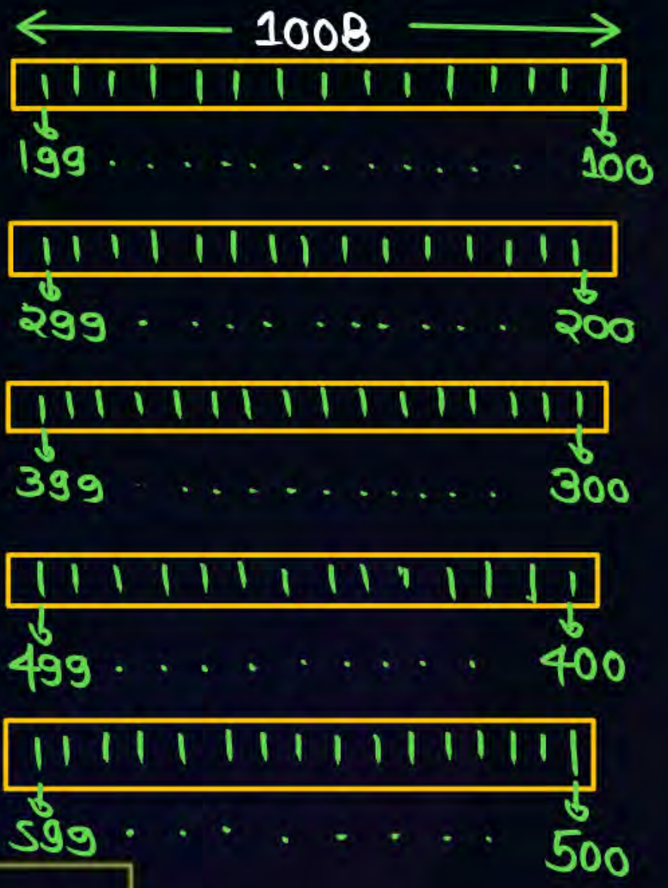
Error Control in TCP

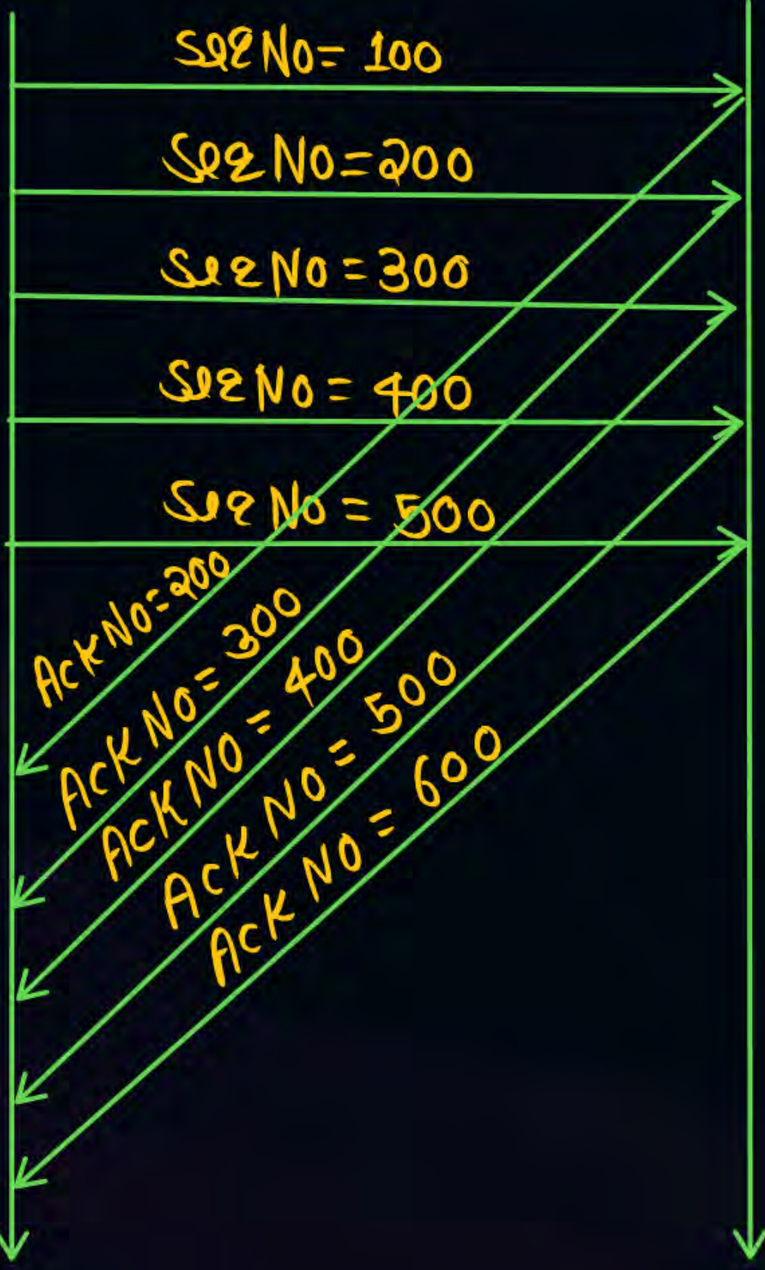
Error control in TCP:

- TCP can use both selective and cumulative acknowledgement.
- Receiver may choose to send independent ACK or cumulative ACK
- TCP uses a combination of selective repeat and GO-Back-N protocol for error control and flow control.
- In TCP sender window size = receiver window size.
- In TCP out of order packets are accepted by the receiver.
- When ever receiver receives an out of order packet ,it accept that packet but send an acknowledgement for the expected packet.
- Out of order segments are never delivered to the process.
- TCP guarantee that data are delivered to process in order.

Selective ACK /Independent ACK:

$W_S = 500$ Byte

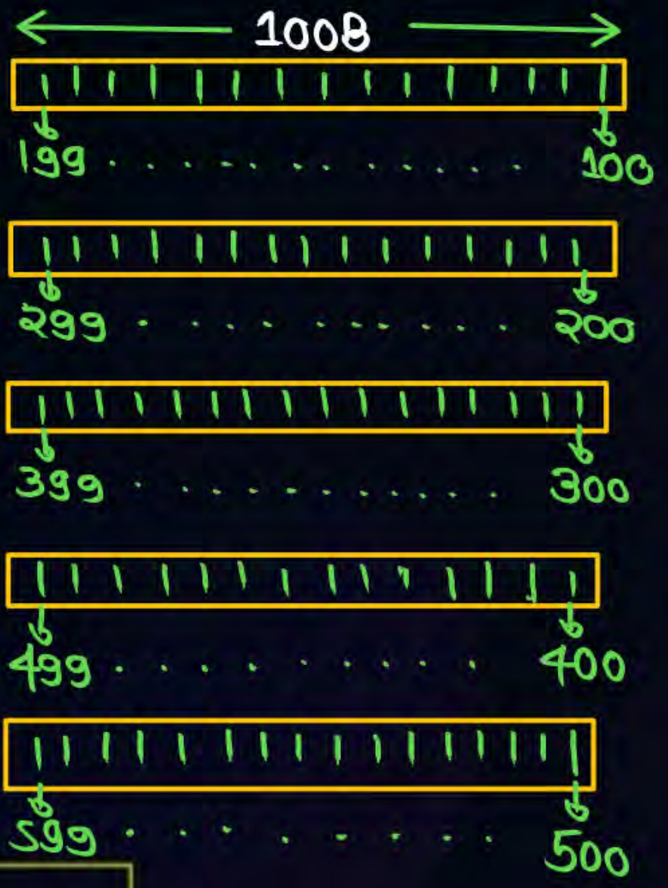


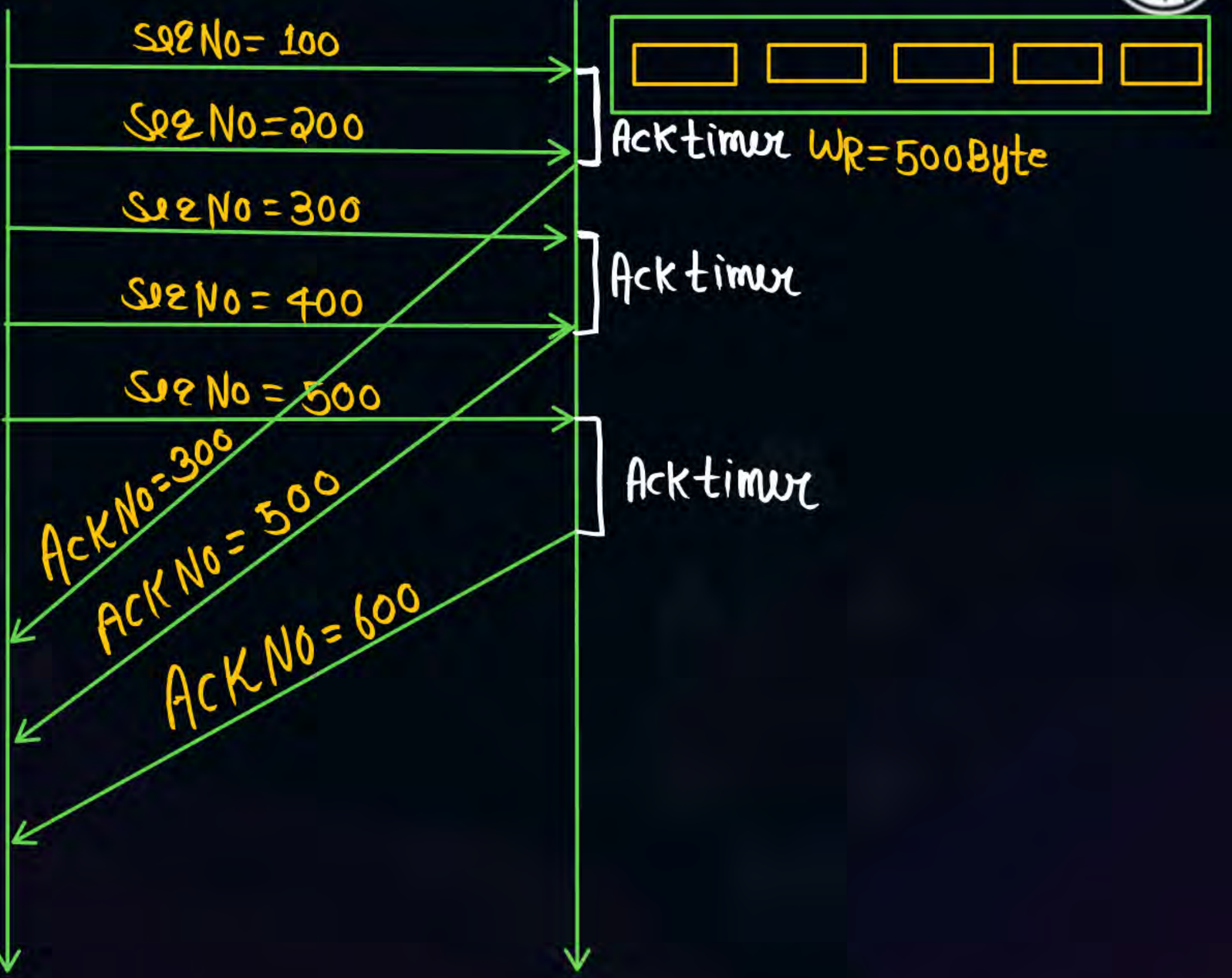


$W_R = 500$ Byte

Cumulative Ack

Ws = 500Byte



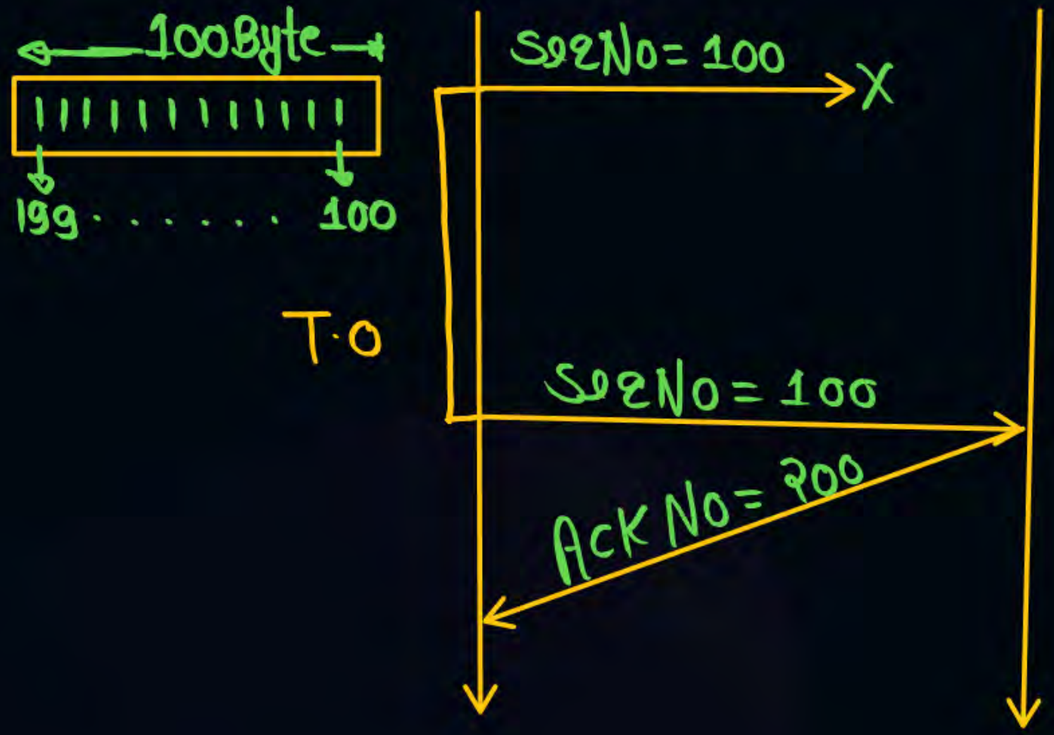


Retransmission in TCP

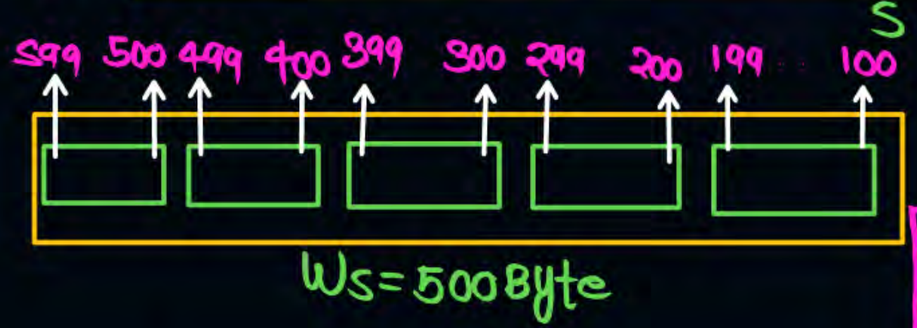
(i) Retransmission after time out timer

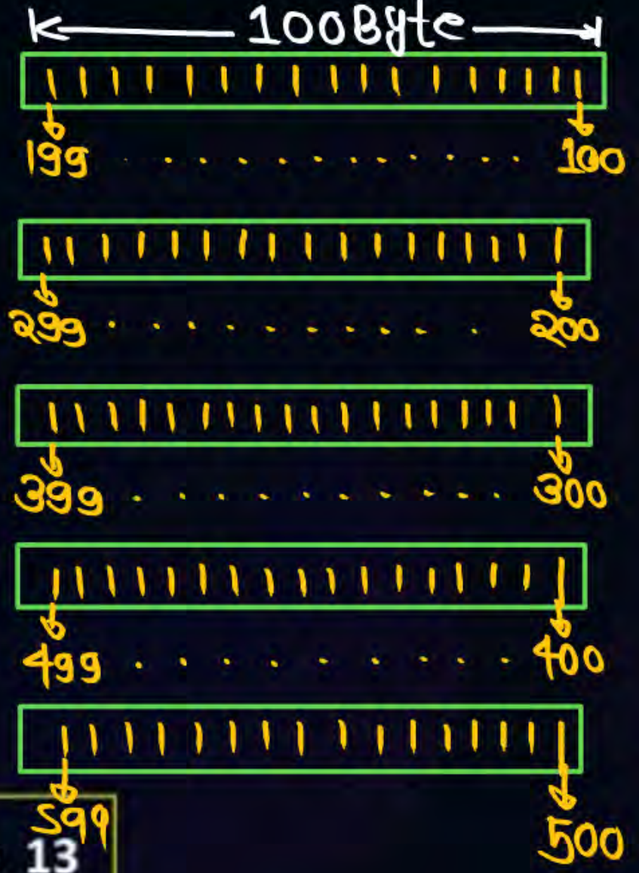
(ii) Retransmission after 3 duplicate ACK

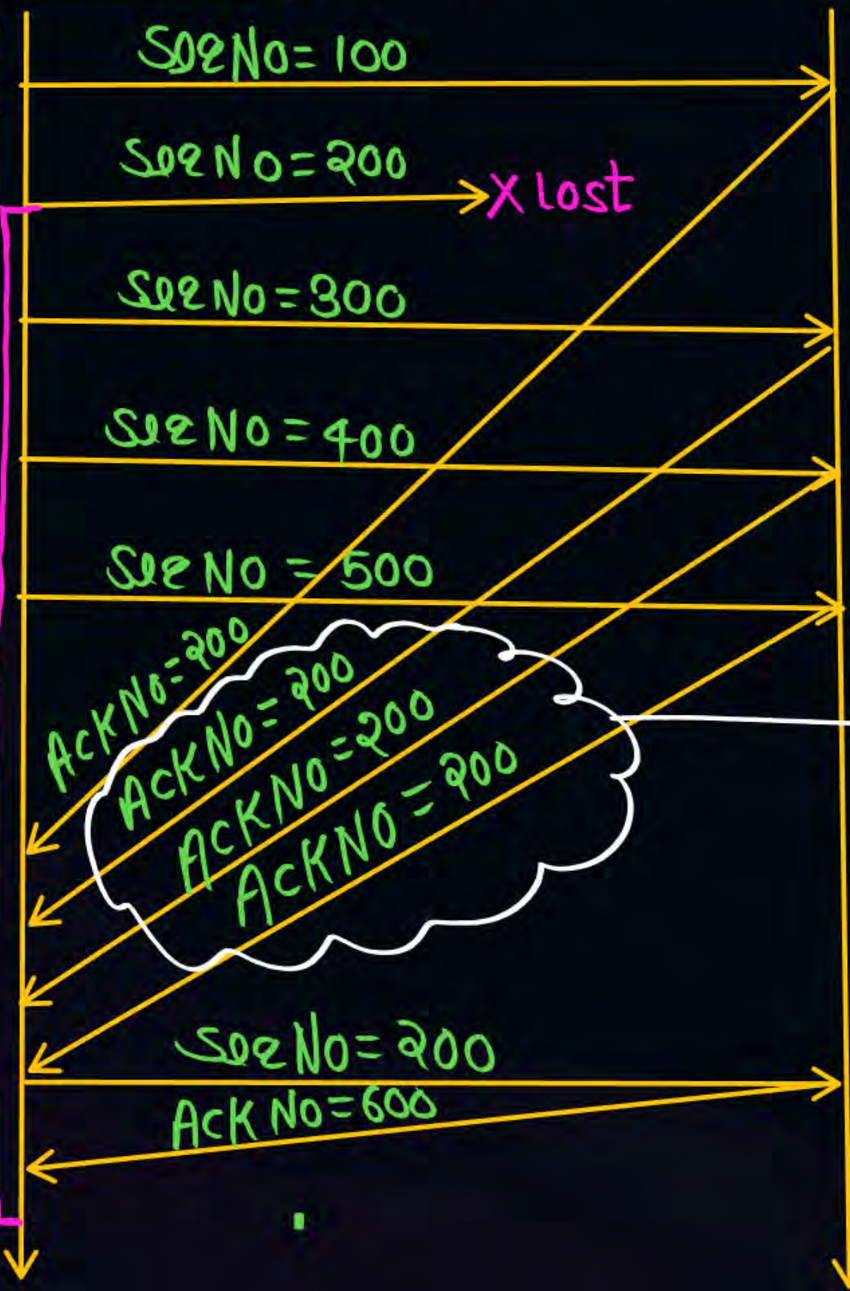
(i) **Retransmission after time out timer:**



(ii) Retransmission after 3 duplicate ACK [Fast Retransmission]

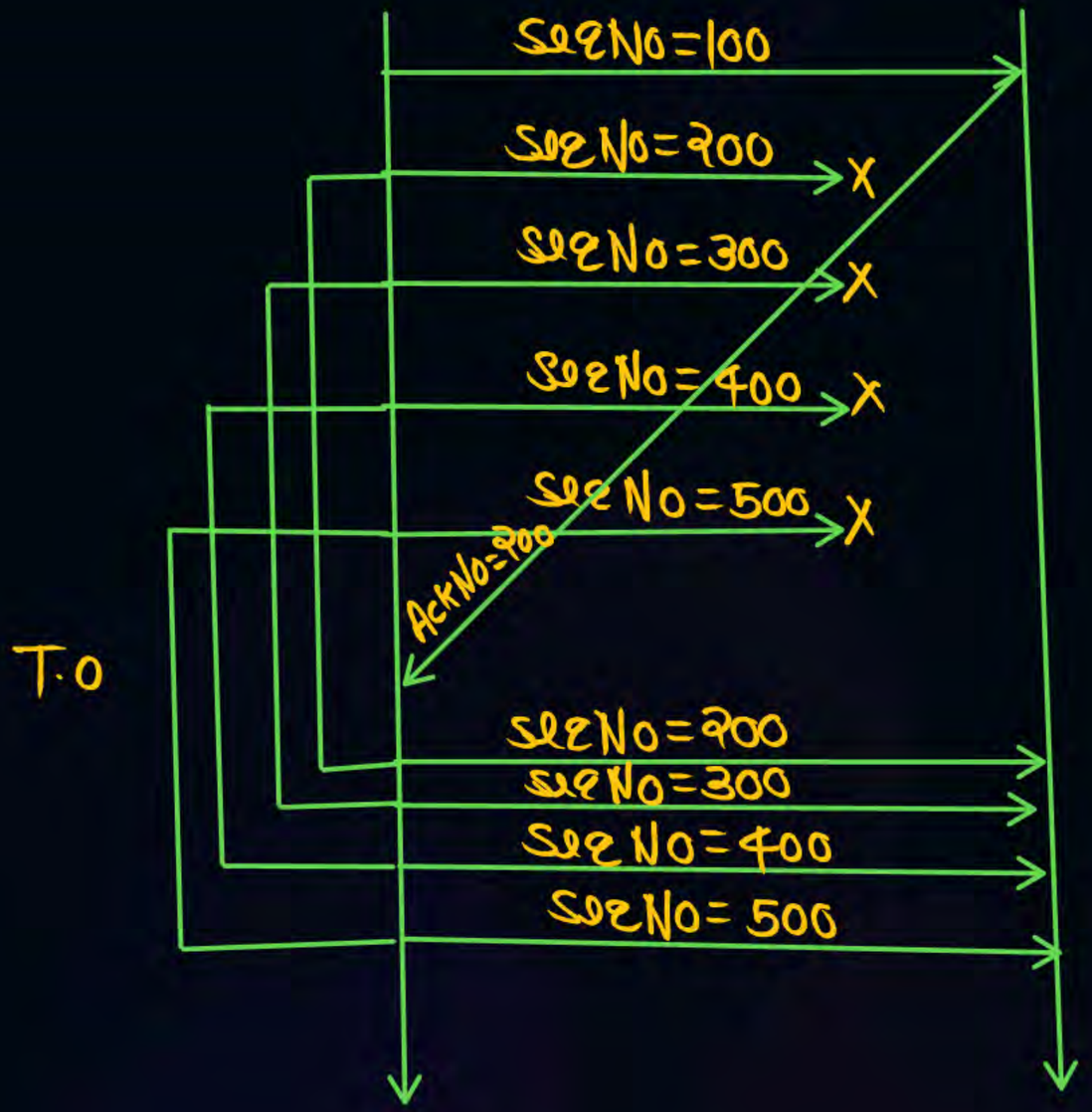






3 duplicate Ack
⇓
Indicate Mild congestion Condition

Slide 13



Note:

(i) If 3 duplicate ACK Not Possible then we use Time Out timer Concept for retransmission the lost packet.

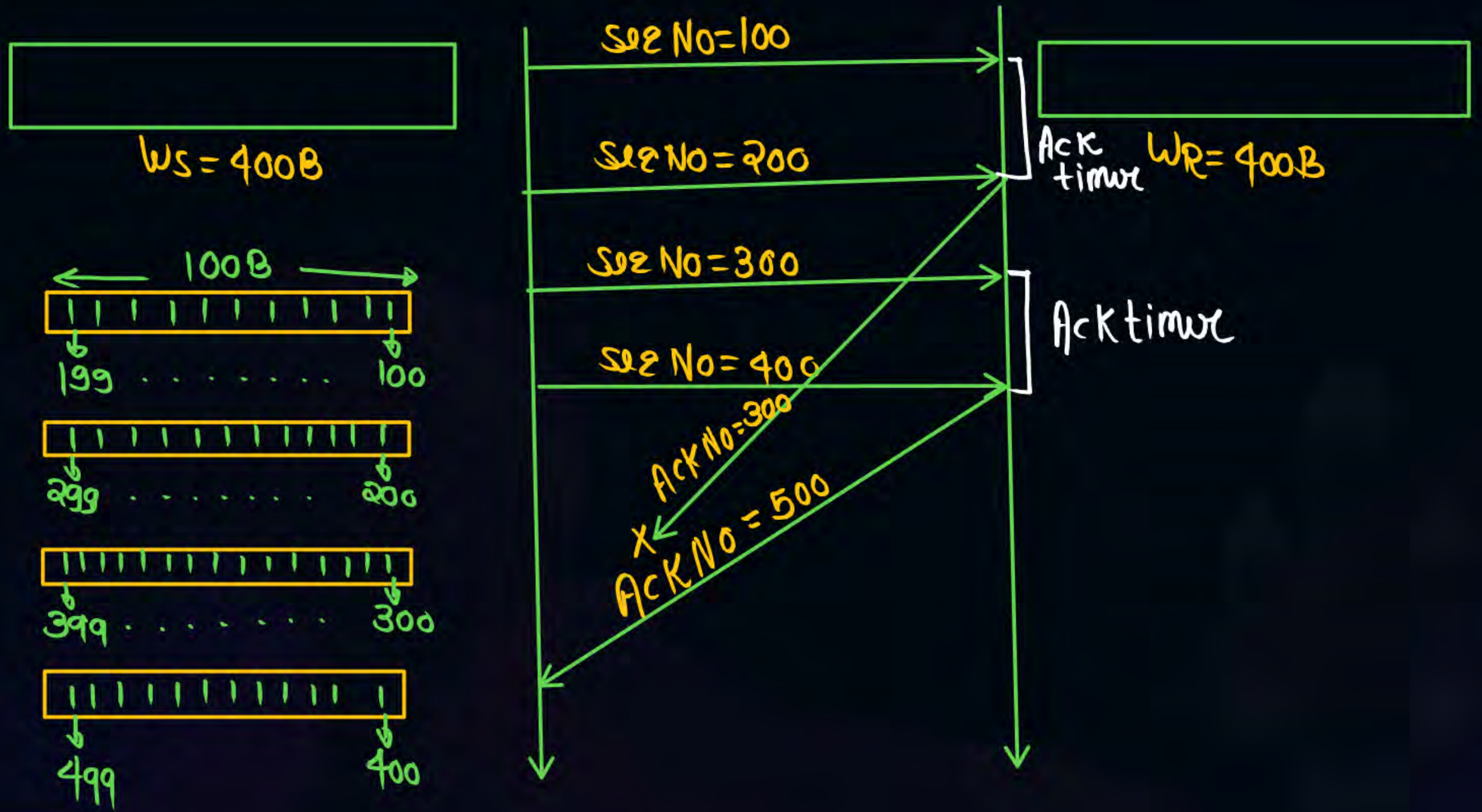
(ii) Time Out timer indicate server congestion condition

Lost Acknowledgment:

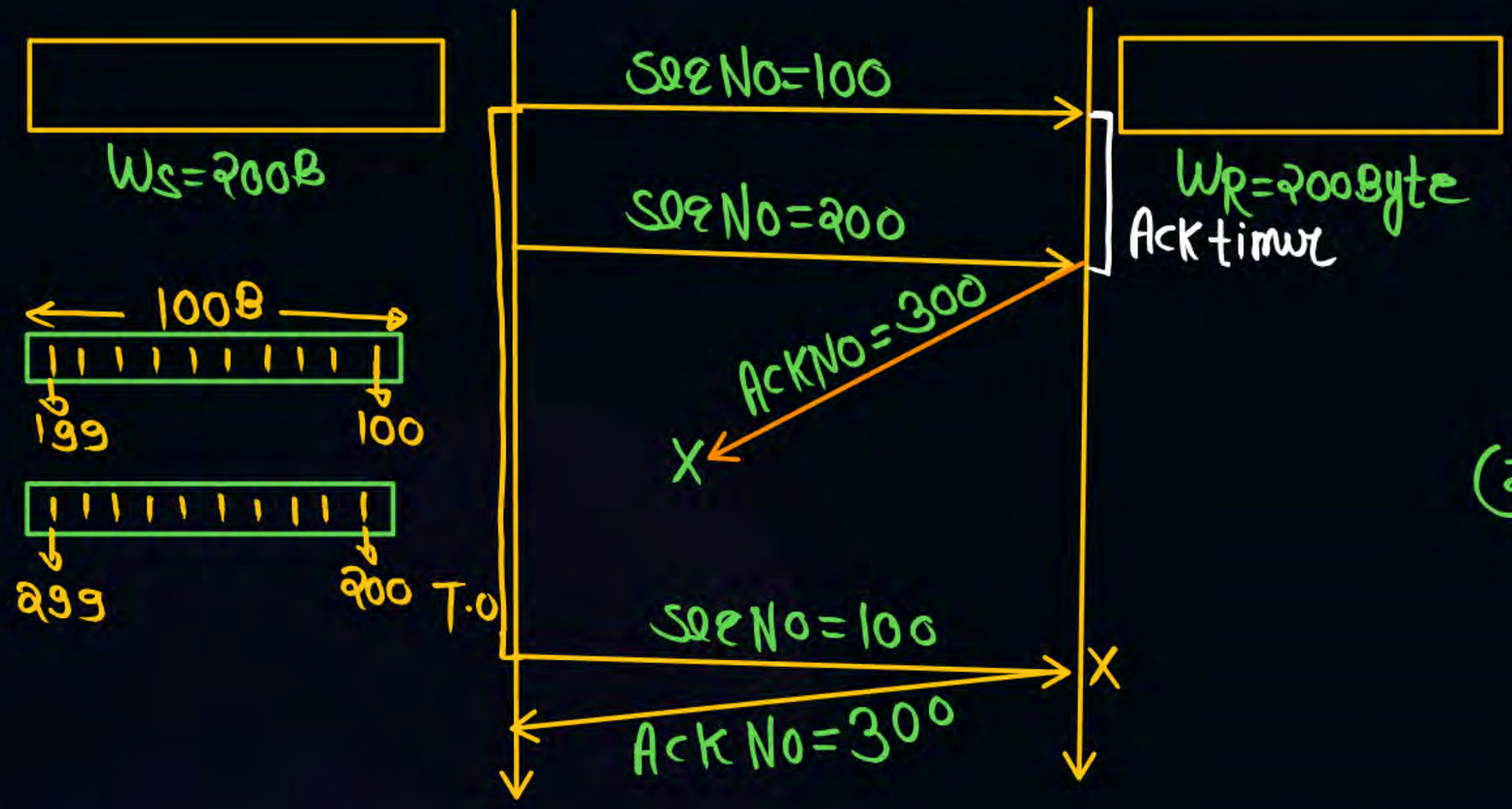
(i) Automatically corrected lost ACK

(ii) Lost Acknowledgment corrected by resending a segment

(i) **Automatically corrected lost ACK**



(ii) Lost Acknowledgment corrected by resending a segment



Note:

Only one segment is retransmitted although two segment are not Acknowledged when sender receive the retransmitted ACK, it knows that both segments are safe because the acknowledgment is cumulative.

THANK - YOU