

CS & IT ENGINEERING

COMPUTER NETWORKS

Flow Control

Lecture No-5



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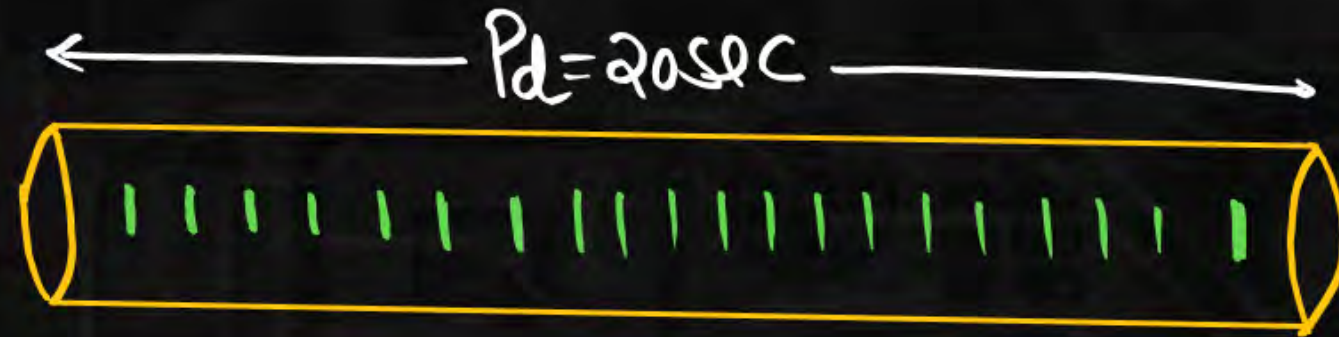


TOPICS TO BE COVERED

stop & wait ARQ

capacity of Link/wire/channel

Capacity of Link/wire/channel

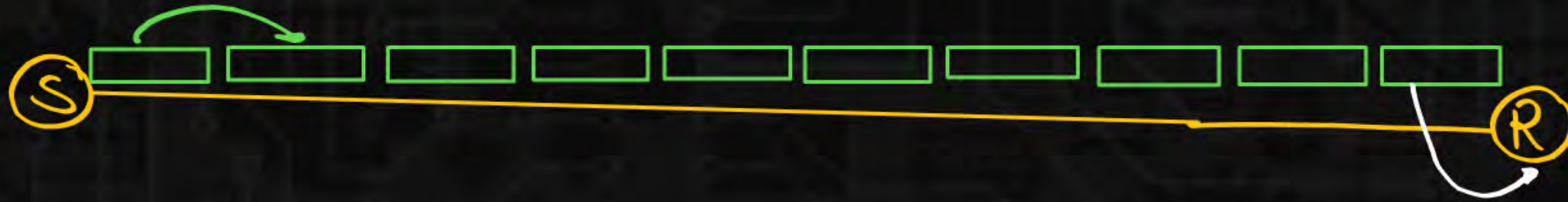


$$B = 1 \text{ bps} = 1 \text{ bits/sec}$$

$$\text{Capacity of Link} = 1 \text{ bits/sec} \times 20 \text{ sec}$$

$$\text{Capacity of Link} = 20 \text{ bits}$$

$$\text{Capacity of Link} = B \times P_d$$



$$B = 1 \text{ bps} = 1 \text{ bits/sec}$$

$$P_d = 10 \text{ sec}$$

$$\begin{aligned} \text{Capacity of Link} &= B \times P_d \\ &= 1 \text{ bits/sec} \times 10 \text{ sec} \end{aligned}$$

$$\text{Capacity of Link} = 10 \text{ bits}$$

Q.1: Bandwidth = 500bps = 500 bits/sec

$$P_d = 1 \text{ sec}$$

capacity of Link = ?

$$\begin{aligned} \text{Soln: capacity of Link} &= B \times P_d \\ &= 500 \text{ bits/sec} \times 1 \text{ sec} \\ &= 500 \text{ bits} \end{aligned}$$

Q.2

$$\text{Bandwidth} = 1\text{Kbps} = 10^3 \text{ bits/sec}$$

$$P_d = 1\text{sec}$$

Capacity of Link = ?

Solⁿ

$$\begin{aligned}\text{Capacity of Link} &= B \times P_d \\ &= 10^3 \text{ bits/sec} \times 1 \text{ sec} \\ &= 1000 \text{ bits}\end{aligned}$$

Q.3 Bandwidth = 1mbps and $P_d = 1\text{sec}$ and Packet size = 1000 bits
then How many Packets can be transit at a time?
capacity of Link

Soln

$$\begin{aligned}\text{Capacity of Link} &= B \times P_d \\ &= 10^6 \text{ bits/sec} \times 1 \text{ sec} \\ &= 10^6 \text{ bits}\end{aligned}$$

$$\begin{aligned}\text{Capacity of Link (Packets)} &= \frac{(\text{Capacity of Link}) \text{ bits}}{(\text{Packet size}) \text{ bits}} \\ &= \frac{10^6 \text{ bits}}{1000 \text{ bits}} \\ &= 10^3 \text{ Packets} = 1000 \text{ Packets}\end{aligned}$$

Q.4 GF Bandwidth = 1mbps and Propagation delay is 1msec and Packet size is 100 bits. Find No. of Packets needed to maximally Pack the Link ? capacity of Link

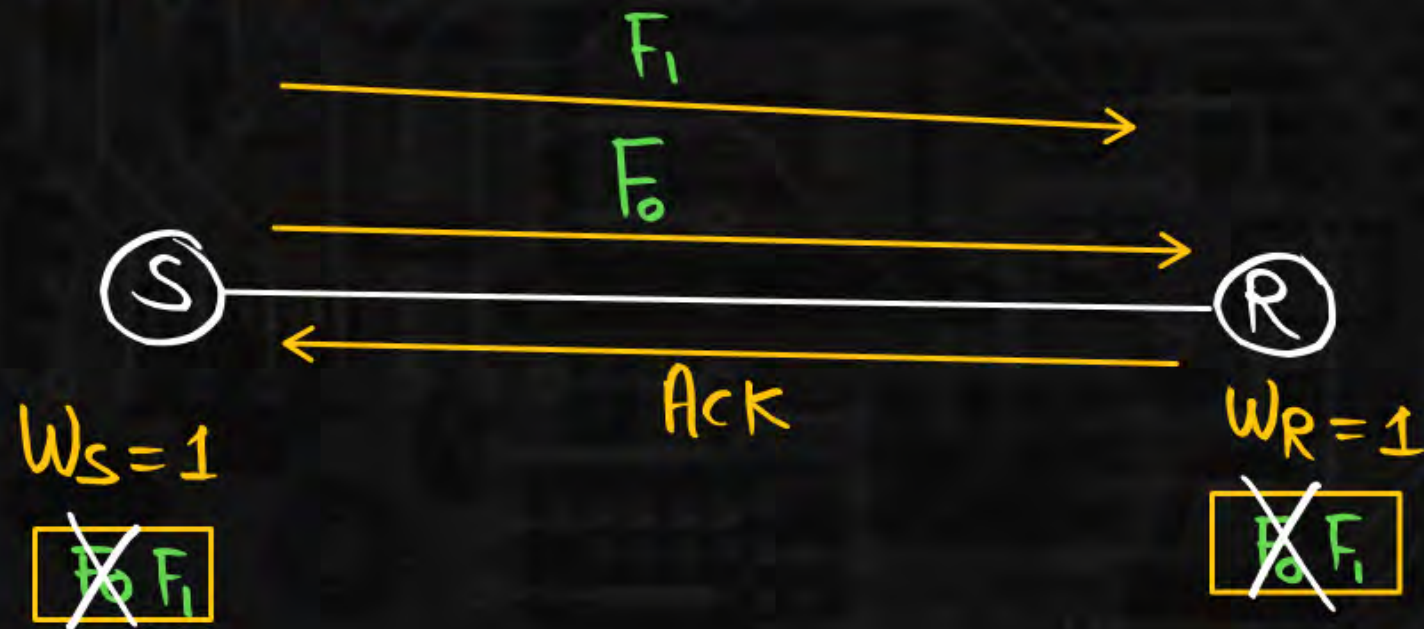
Soln: Capacity of Link = $B \times P_d$
 $= 10^6 \text{ bits/sec} \times 10^{-3} \text{ sec}$
 $= 10^3 \text{ bits}$

Capacity of Link (Packets) = $\frac{10^3 \text{ bits}}{100 \text{ bits}} = 10 \text{ Packets}$

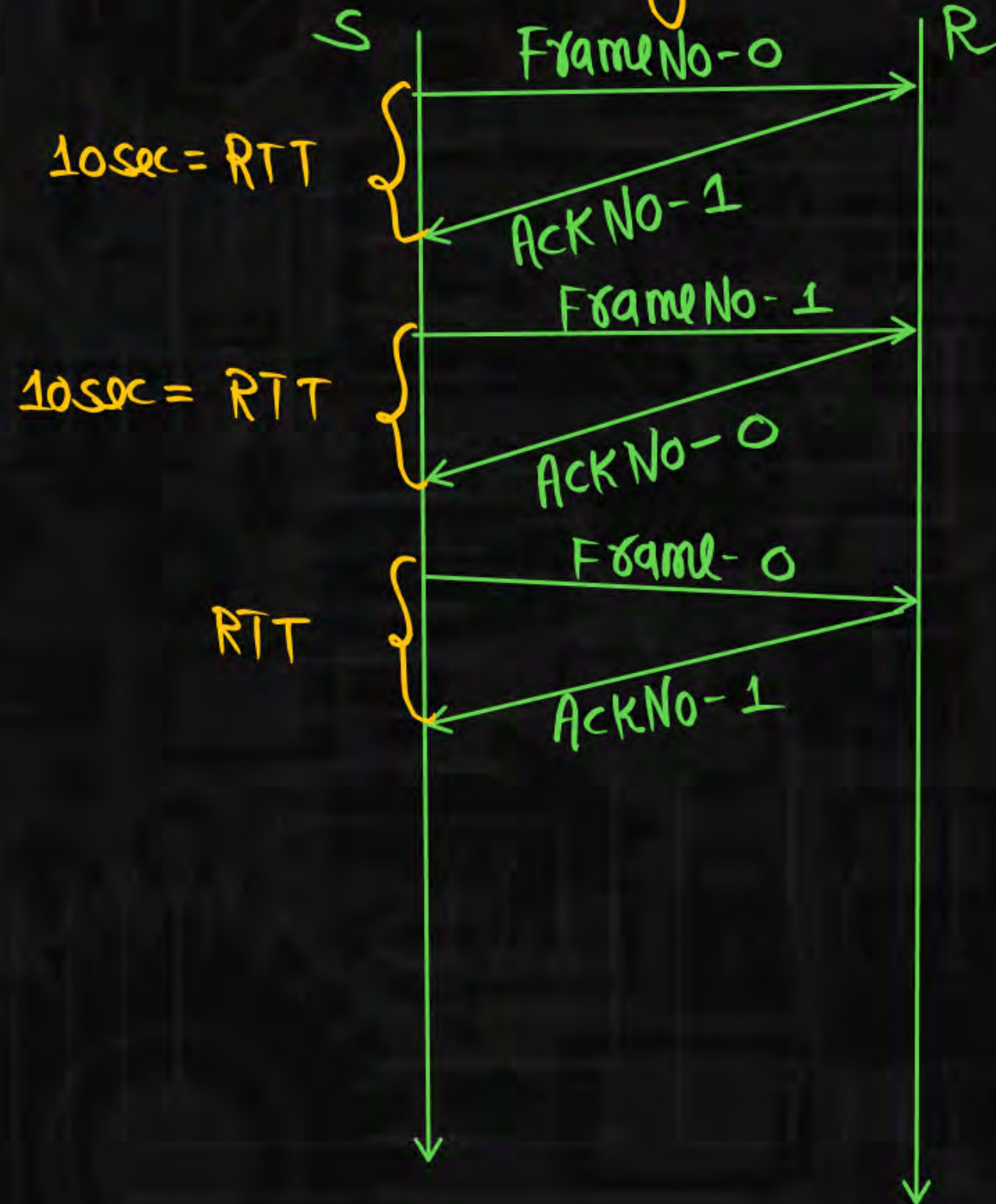
Important points About stop & wait Protocol



- ① stop & wait Protocol is a special category of Protocol where window size = 1 Always



(2) stop & wait Protocol uses two sequence Number (0 & 1) irrespective of no. of packet sender is Having



Note

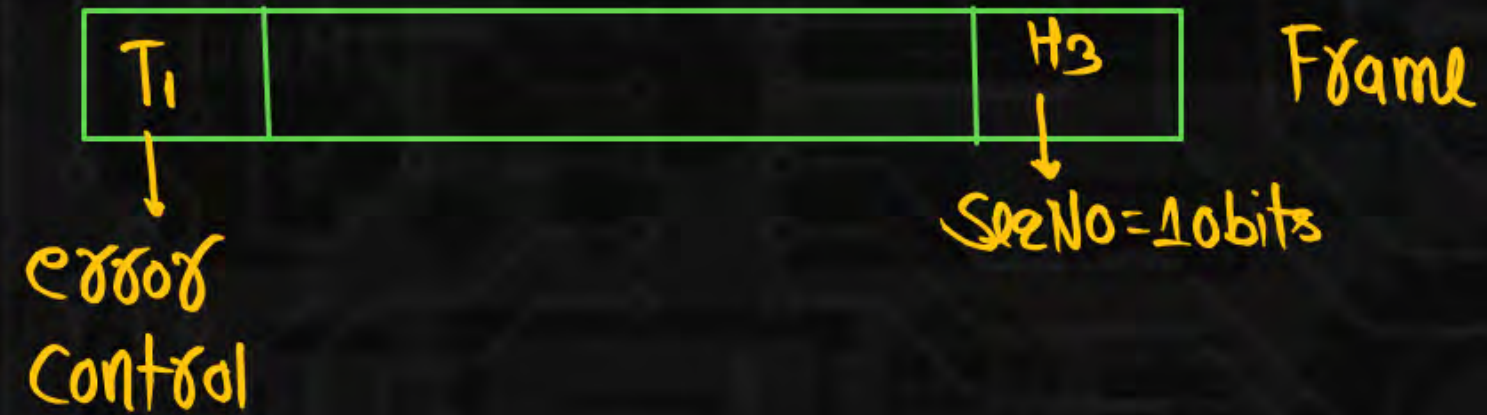
Sender want to send 1000 Frames to Receiver

F_0	F_1	F_2	F_3	F_4	F_5	F_{999}
0	1	2	3	4	5	999

Total seq No required = 1000

No. of bits required in the seq No Field = $\lceil \log_2 1000 \rceil = 10 \text{ bits}$

DLL

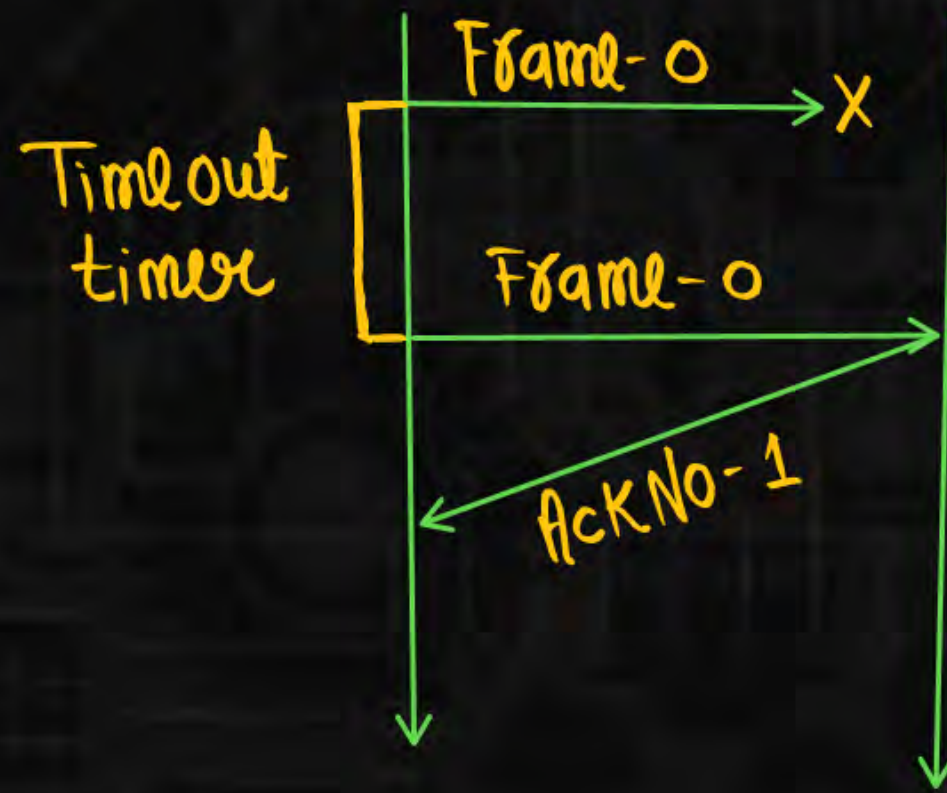


10bit overhead For one Frame . To send 1000 Frame total overhead
 $= 1000 \times 10 = 10,000 \text{ bits}$

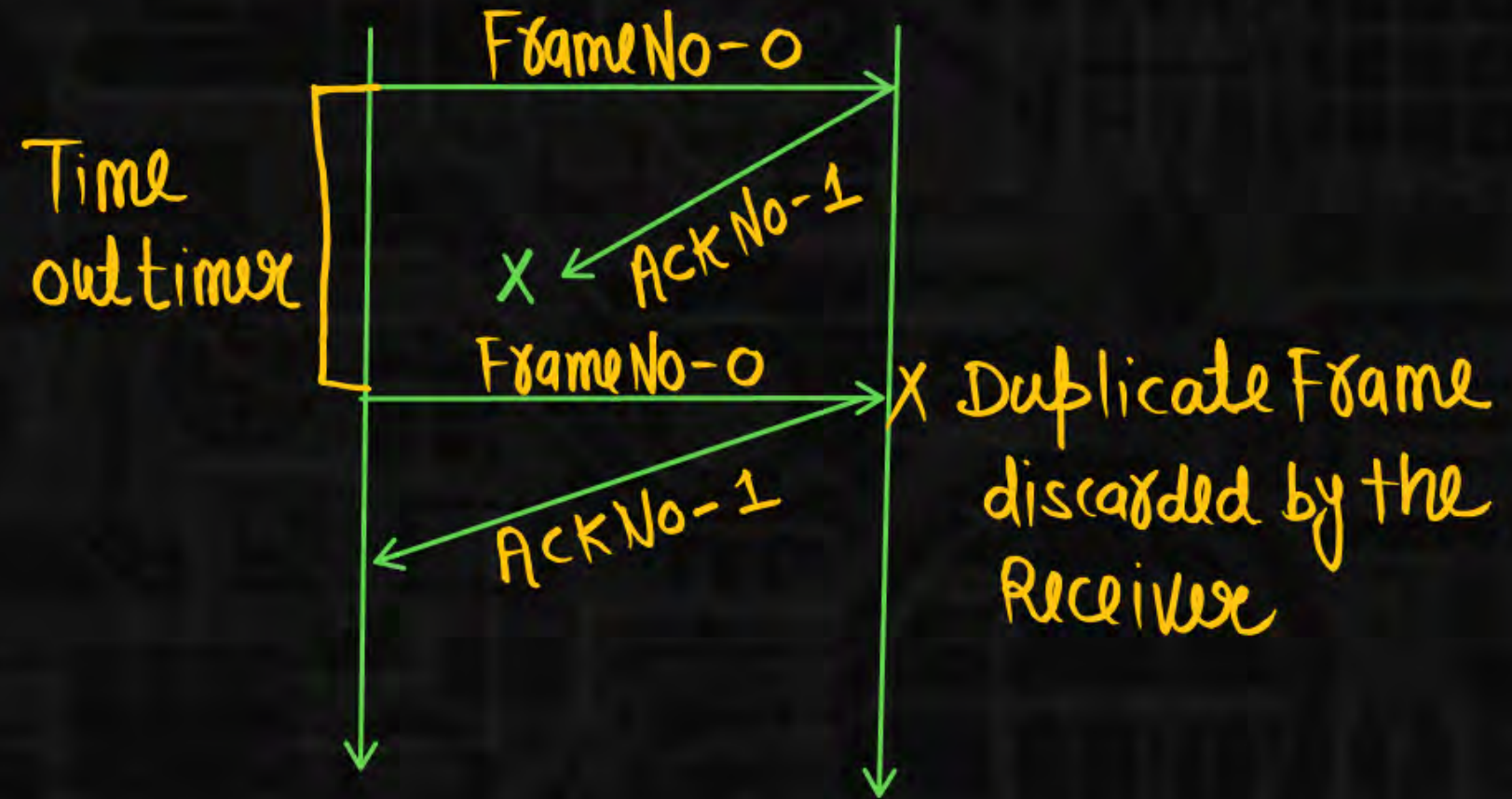


Frame #	SeqNo = 10 bit
F ₀	0000000000
F ₁	0000000001
F ₂	0000000010
F ₃	0000000011
F ₄	0000000100
⋮	
⋮	
⋮	
⋮	
⋮	
⋮	
F ₉₉₉	

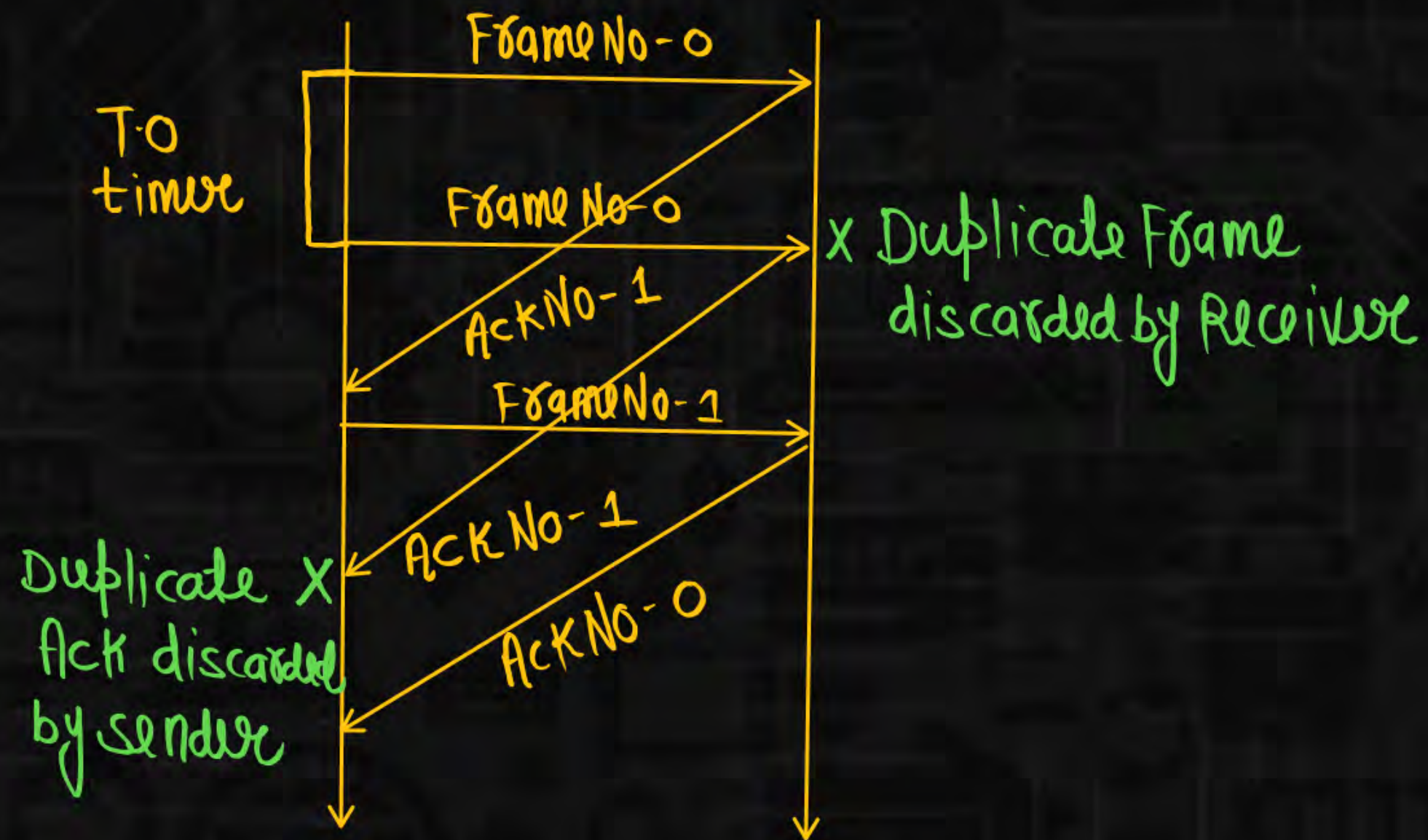
① Lost data PKT(Frame)



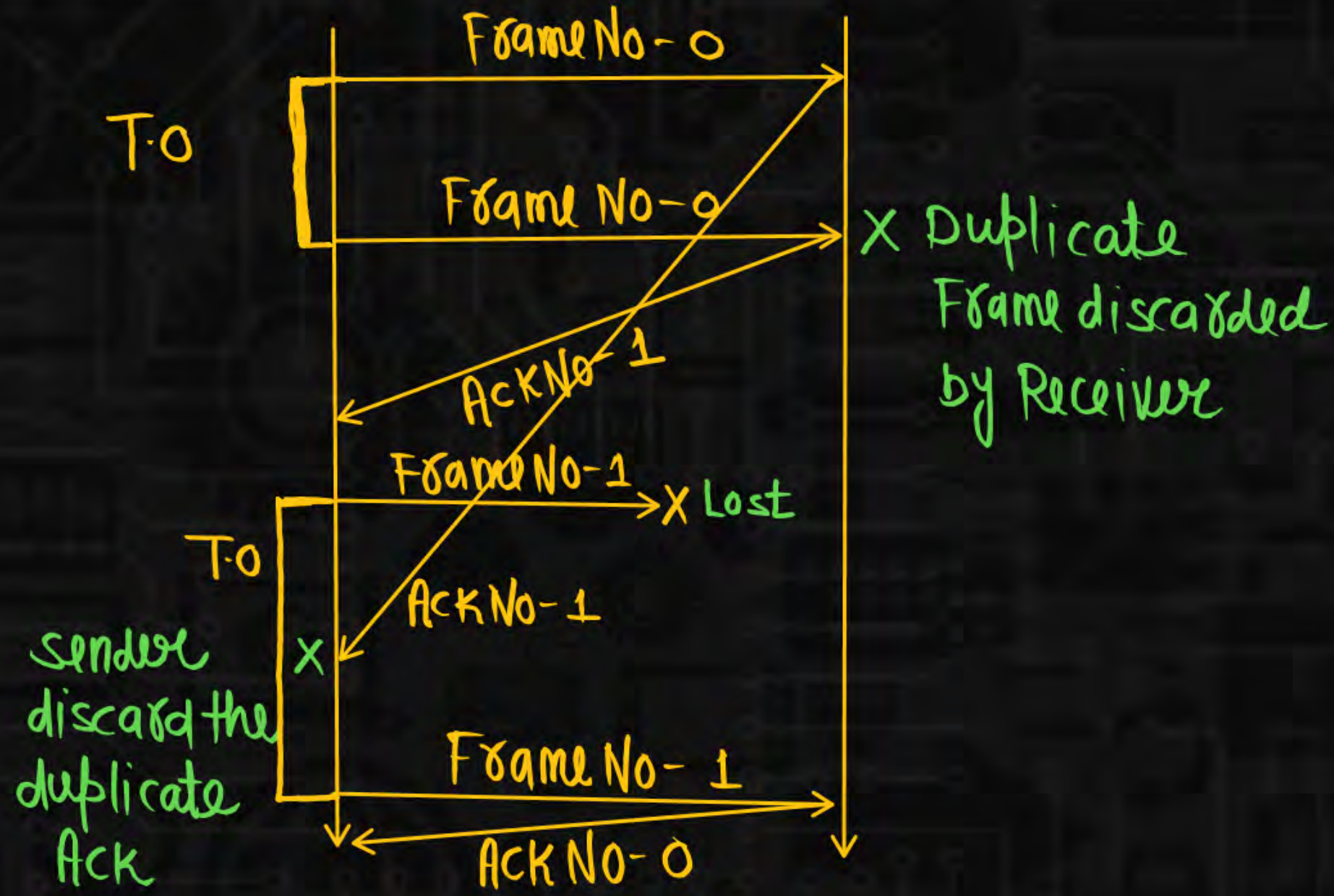
② Lost ACK



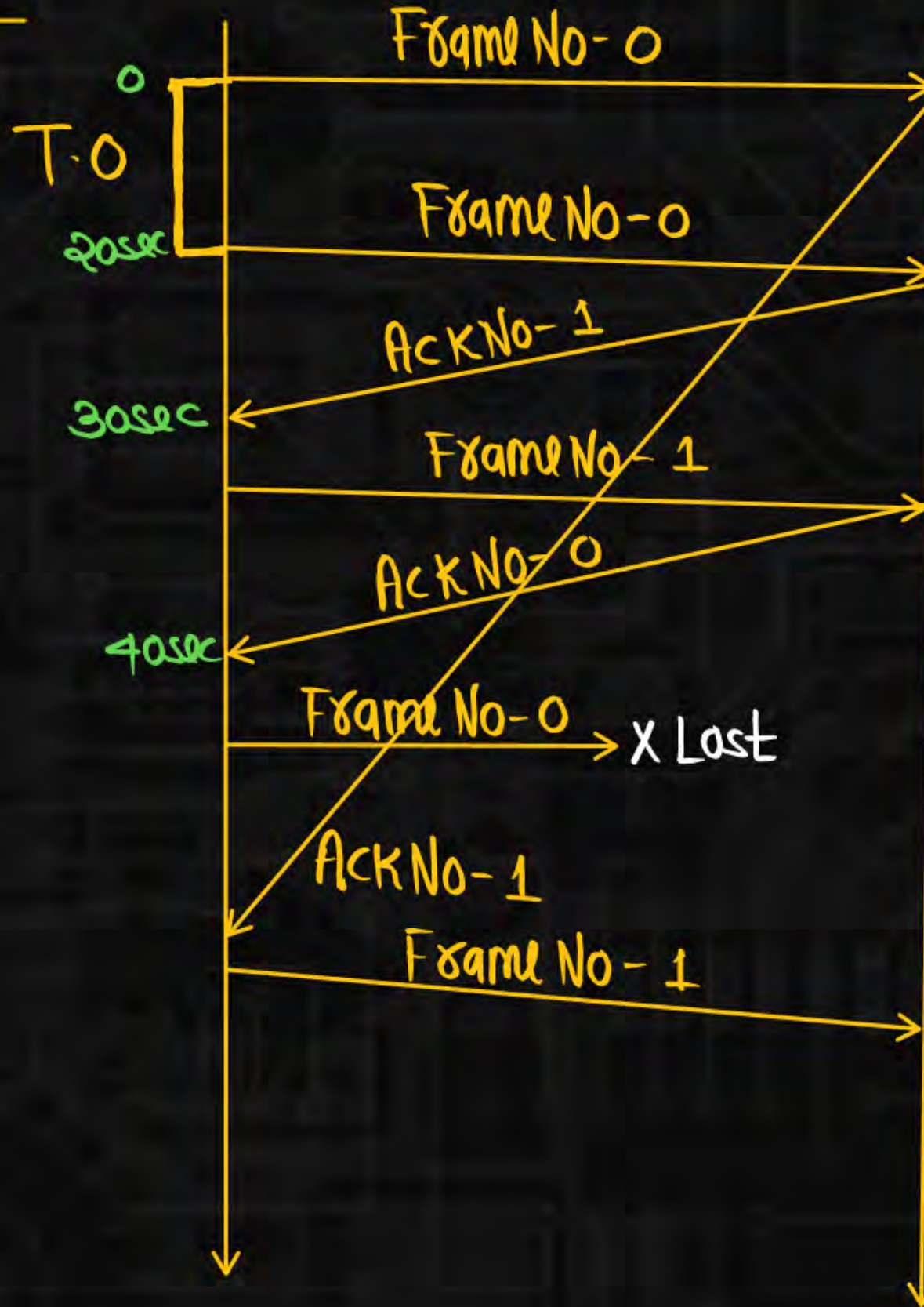
(3) delay ACK (case I)



delay ACK (Case II)



delay Ack (case III)



$$T.O = 2 \times RTT$$

$$TTL = 2 \times T.O$$

Duplicate Frame
discarded by Receiver

$$RTT = 10\text{sec}$$

$$T.O = 2 \times RTT$$

$$T.O = 2 \times 10\text{sec} = 20\text{sec}$$

$$TTL = 2 \times T.O$$

$$TTL = 2 \times 20 = 40\text{sec}$$

(4) Corrupted Packet (Frame)

