CS & IT ENGINEERING

COMPUTER NETWORKS

Flow Control

Lecture No-11

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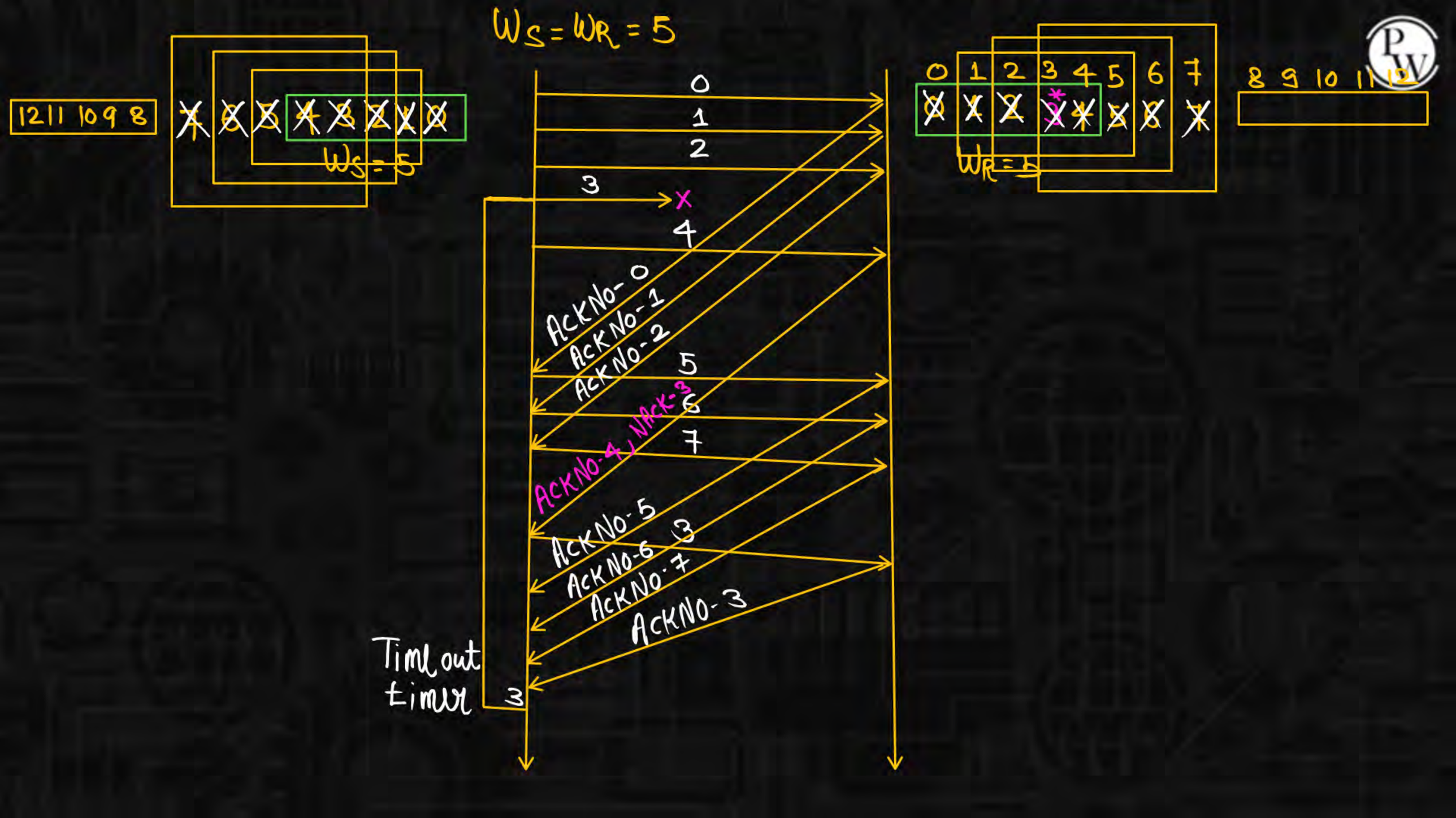
Selective Repeat ARQ

Selective Repeat ARQ

Selective Repeat/ Selective Reject ARQ

$W_S > 1$
$W_R > 1$

1. In SR Protocol window sender size is equal to window receiver size. ($W_S = W_R$)
2. SR Protocol uses independent acknowledgement, and acknowledgement number defines number of error free packet received
3. SR receiver can receive out of order packet but packets are delivered to upper layer in order.
4. In SR protocol searching and sorting logic is required. Searching is done by sender and sorting is done by receiver.
5. Timer is maintained for each and every frame in the window at sender side

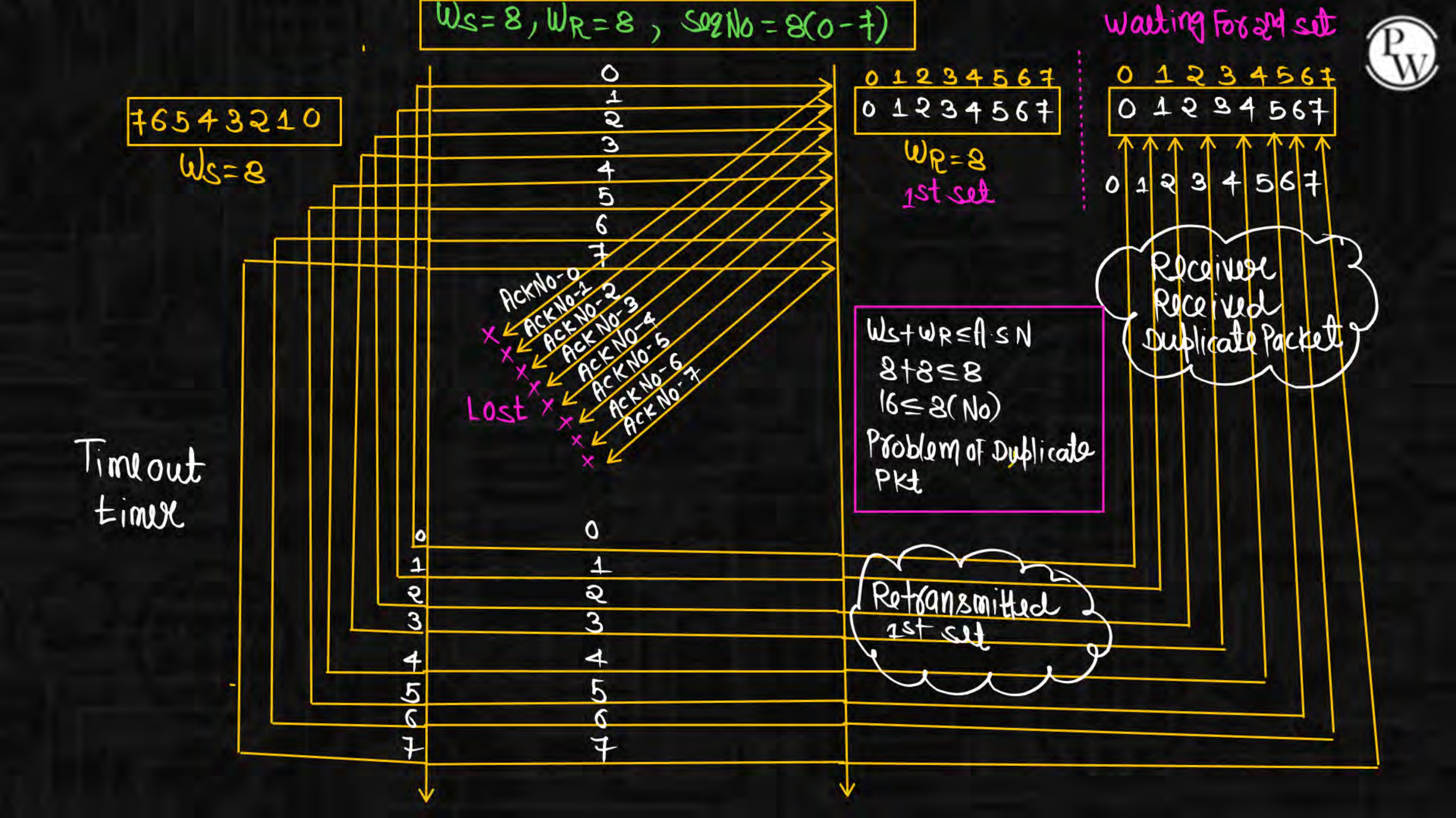

$W_S = W_R = 5$
12 11 10 9 8
$W_S = 5$
0 1 2 3 4 5 6 7
$W_R = 5$
8 9 10 11 12
0
1
2
3
X
4
AckNo-0
AckNo-1
AckNo-2
5
6
7
AckNo-4, NAck-3
AckNo-5
AckNo-6
AckNo-7
3
AckNo-3
Timeout timer
3

Important Point

1. For 1st out of order delivery or if packet received is corrupted then NAK for respective packet is sent by receiver to sender.

2. When sender receive NAK 3 then it will search in the window for packet 3 & immediately packet 3 is retransmitted even though its timer is not expired.

Relationship b/w window size & sequence No.


$W_S = 8, W_R = 8$, Seq No = 8 (0 - 7)
Waiting For 2nd set
7 6 5 4 3 2 1 0
$W_S = 8$
0 1 2 3 4 5 6 7
0 1 2 3 4 5 6 7
$W_R = 8$
1st set
0 1 2 3 4 5 6 7
0 1 2 3 4 5 6 7
Ack No-0
Ack No-1
Ack No-2
Ack No-3
Ack No-4
Ack No-5
Ack No-6
Ack No-7
Lost
Timeout timer
$W_S + W_R \leq 1 \cdot s N$
$8 + 8 \leq 8$
$16 \leq 8$ (No)
Problem of Duplicate PKt
Receiver Received Duplicate Packet
Retransmitted 1st set
0 1 2 3 4 5 6 7
0 1 2 3 4 5 6 7

Note

① Duplicate Packet Problem can be solved by Increasing the sequence Number OR Decreasing the sender window size

② Duplicate Packet Problem can be solved by using the Following Formula $W_S + W_R \leq A \cdot S \cdot N$

① $W_S + W_R \leq A \cdot S \cdot N$

Best $4 + 4 \leq 8$

② $W_S + W_R \leq A \cdot S \cdot N$

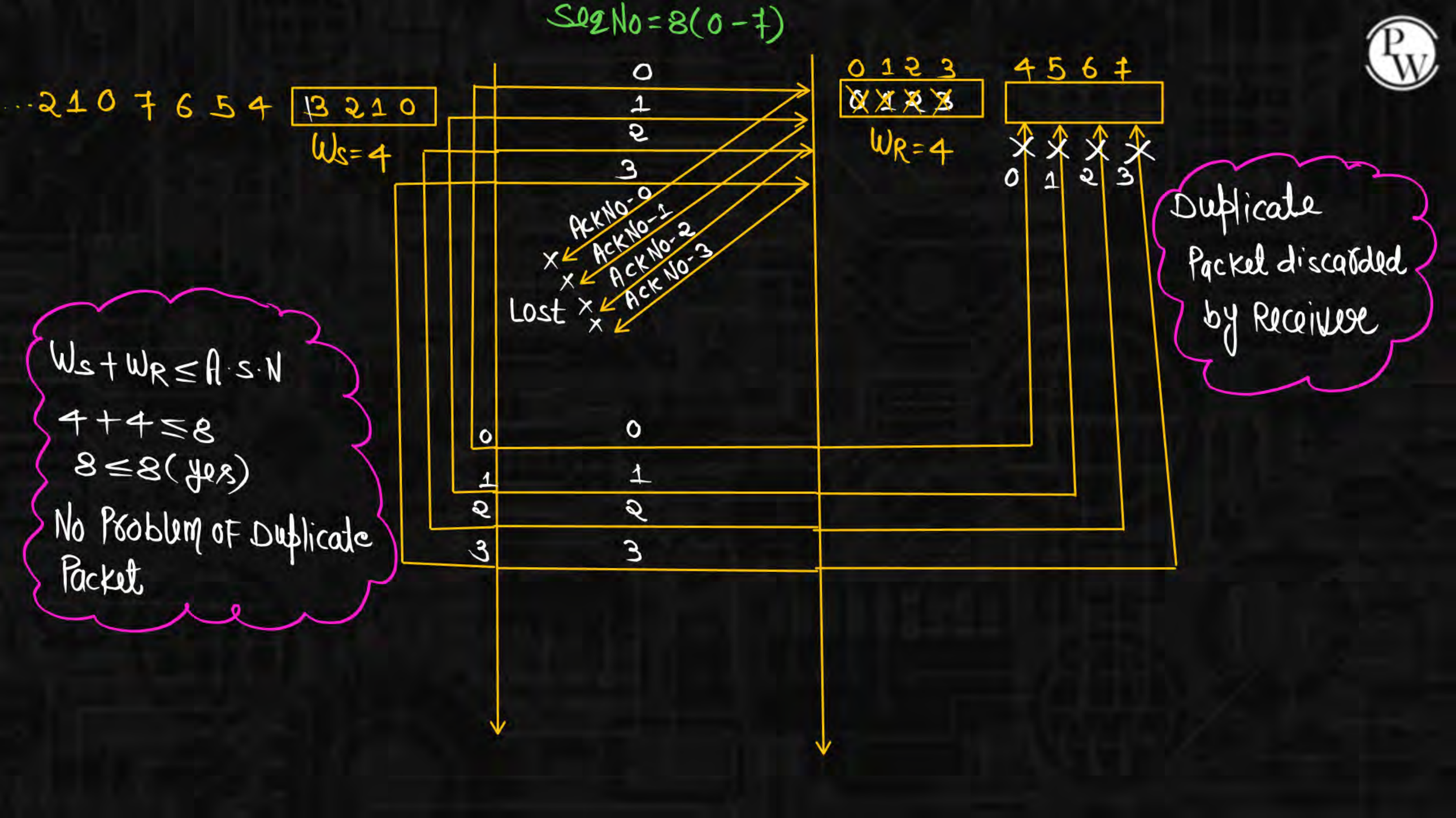
$5 + 3 \leq 8$

③ $W_S + W_R \leq A \cdot S \cdot N$

$3 + 5 \leq 8$

Note

According to Formula $W_S + W_R \leq A \cdot S \cdot N$, All the 3 conditions are correct but First one is Best and their is no meaning For Last one


Seq No = 8 (0 - 7)
...2 1 0 7 6 5 4
3 2 1 0
Ws = 4
0 1 2 3
WR = 4
4 5 6 7
0 1 2 3
Ack No-0
Ack No-1
Ack No-2
Ack No-3
Lost
0 1 2 3
0 1 2 3
Ws + WR ≤ A·S·N
4 + 4 ≤ 8
8 ≤ 8 (yes)
No Problem of Duplicate Packet
Duplicate Packet discarded by Receiver

1. Seq No = 8 (0 - 7)

W_S	W_R
4	4

2. Seq No = 16 (0 - 15)

W_S	W_R
8	8

3. Seq No = N [0 — N-1]

W_S	W_R
$\frac{N}{2}$	$\frac{N}{2}$

4. Seq No = 3 bit

Total Seq. No = $2^3 = 8$ (0 - 7)

W_S	W_R
$4\left[2^{3-1}\right]$	$4\left[2^{3-1}\right]$

5. Seq No = 4 bit

Total Seq. No = $2^4 = 16$ (0 - 15)

W_S	W_R
$8\left[2^{4-1}\right]$	$8\left[2^{4-1}\right]$

6. Seq No = K bit

W_S	W_R
2^{K-1}	2^{K-1}

7

	W_S	W_R	minimum Seq. No. required
(i)	4	4	8
(ii)	8	8	16
(iii)	N	N	2N

Minimum sequence No. required in SR Protocal = $W_S + W_R = N + N = 2N$ [0 - 2N-1]

Seq No = 3 bit, Total sequence No = $2^3 = 8$ (0-7)

W_S	W_R
4	4 Best
5	3 ✓
3	5 ✓
6	2 ✓
5	1 X ($W_R > 1$) in SR
1	1 X Stop & wait
1	2 X ($W_S > 1$) in SR

Q.6

Assume we need to design selective repeat protocol for a network in which bandwidth is 1 Mbps and average distance between sender and receiver is 5000 Km. Assume that average packet size is 5000 bits. Propagation speed in the media is 2 × 108 m/sec. If window sender size is 8 and process delay is 0.5 Msec and queuing delay is 2msec then what is the efficiency.

A 99%

B 57%

C 87%

D 70%


THANK YOU
GW
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