Comparison of ARQ Protocols

	S&W	GBN	SR
ACK	x	x	x
NAK			x
Timeout mechanism	x	x	x
Send window size	1	N	W_s
Receive window size	1	1	W_r
How many bits are needed for sequence numbering?	1	$\lceil \log_2(N + 1) \rceil$	$\lceil \log_2(W_s + W_r) \rceil$
Maximum # outstanding frames	1	N	W_s
Maximum # out-of-order frames buffered at receiver	0	0	$W_r - 1$
Transmitter: upon reception of an ACK/NAK frame with SN $\in [S_{last}, S_{recent} + 1]$	S_{last} = SN	S_{last} = SN	S_{last} = SN
	Send window may slide forward by 1	Send window may slide forward by more than 1	Send window may slide forward by more than 1
Transmitter: re-transmit _____ upon _____	S_{last}, timeout	from S_{last} to S_{recent}, timeout	S_{last}, timeout or NAK
Receiver: upon reception of an error-free in-order frame with SN = R_{next}	ACK	ACK	ACK
	Receive window slides forward by 1	Receive window slides forward by 1	Receive window may slide forward by more than 1
Receiver: upon reception of an error-free out-of-order frame with SN $\neq R_{next}$	ACK	ACK	NAK
	Receive window unchanged	Receive window unchanged	Receive window unchanged
	Discard the frame	Discard the frame	Buffer the frame if it is within the receive window: SN $\in [R_{next} + 1, R_{next} + W_r - 1]$