Lecture 15 - ARQ and Flow Control

Exercise 1: Create a table summarizing the different types of ARQ. Include: throughput, transmitter memory, receiver memory and relative complexity.

throughput $\left\{\begin{array}{l}\text{low delay}\\\overline{\text{large delay}}\end{array}\right.$	stop and wait	go back N	selective repeat
	high / low	high if $\left(\begin{array}{l}N\approx\text{delay}\\\text{low error rate}\end{array}\right.$	high even if high error rate
tx memory	1	N	N
rx memory	1	1	N ?
complexity	simplest		most complex

Exercise 2: A data communication system operates at 1 Mb/s and uses 10000-bit data frames and 100-bit ACK frames. What are the frame durations? What is the throughput if there is no channel delay and no errors? If the round-trip channel delay is a 0.5s (typical for satellite links)? If go-back-N ARQ is used, assuming the transmitter can store all unacknowledged frames?

frame durations: 10000us = 10ms and 100us

no-delay throughput: 10000/10.1ms ~ 1 Mb/s

throughput with delay: 10000/0.5s ~ 20kb/s

using go-back-N (no waiting for ACK): ~ 1 Mb/s

Exercise 3: A communication system loses every 10th frame
(e.g. due to periodic noise bursts). Ignoring ACK overhead,
what is the throughput using go-back-N ARQ? Using Selective
ARQ?

throughput assuming N frames have to be
retransmitted every 10 frames: 10/(10+N)

using selective-repeat: 10/11

Exercise 4: Which of the above flow control methods can be
used with frame-oriented protocols? On unidirectional links?

ARQ-based flow control can only be used
with frame-oriented protocols.

software flow control requires a bidirectional
data link.