



*School of Computer Science and Software Engineering*

## **CSE3020 Network Technology Semester 2, 2003**

### **Tutorial 6 - Week 7**

**Question T6.1** - What is the advantage of sliding-window flow control compared to stop-and-wait flow control?

- *The stop-and-wait approach requires acknowledgements after each frame.*
- *The sliding-window flow control technique can send multiple frames before waiting for an acknowledgement.*
- *Efficiency can be greatly improved by allowing multiple frames to be in transit at the same time.*

**Question T6.2** - Show the sender window operation for Figure 1. Assume a window size of 7.

**Question T6.3** - Describe automatic repeat request (ARQ). List and briefly define three versions of ARQ.

- *ARQ: A feature that automatically initiates a request for retransmission when an error in transmission is detected.*
- *Stop-and-wait ARQ: Based on stop-and-wait flow control. When an error is detected, the frame in question is retransmitted; or retransmission as a result of a timeout.*
- *Go-back-N ARQ: Based on sliding-window flow control. When an error is detected, the frame in question is retransmitted, as well as all subsequent frames that have been previously transmitted.*
- *Selective-reject ARQ: Based on sliding-window flow control. When an error is detected, only the frame in question is retransmitted.*

**Question T6.4** - A World Wide Web server is usually set up to receive relatively small messages from its clients but to transmit potentially very large messages to them. Explain, then, which type of ARQ protocol (selective-reject, go-back-N) would provide less of a burden to a particularly popular WWW server.

*The selective-reject approach would burden the server with the task of managing and maintaining large amounts of information about what has and has not been successfully transmitted to the clients; the go-back-N approach would be less of a burden on the server.*

**Question T6.5** - What are the three frame types supported by HDLC? Describe each.

- *Information frames (I-frames):* carry the data to be transmitted for the user (the logic above HDLC that is using HDLC). Additionally, flow and error control data, using the ARQ mechanism, are piggybacked on an information frame.
- *Supervisory frames (S-frames):* provide the ARQ mechanism when piggybacking is not used.
- *Unnumbered frames (U-frames):* provide supplemental link control functions.

**Question T6.6** - What is piggybacking?

*The inclusion of an acknowledgment to a previously received packet in an outgoing data packet.*

**Question T6.7** - Define data transparency. Bit stuff the following data:

*Data transparency: refers to the ability to include arbitrary bit patterns in the data field of a frame without any pattern being confused with part of the control information in the frame. This is achieved by bit stuffing.*

← 0 0 0 1 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1 0 1 0  
0 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1 1 0 1 1 1 1 1 0 1 0 1 0

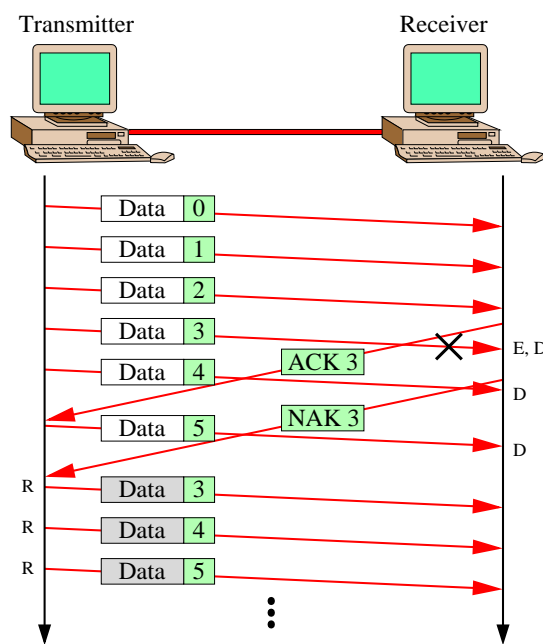


Figure 1: Transmit and Receive operations for **Question T6.2**.

