

# Computer Networks, Spring 2026

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## Lab 9: Reliable Data Transfer over UDP (Capstone)

### 1 Objective

The goal of this capstone lab is to implement a reliable transport layer on top of the unreliable UDP protocol. You will implement a Sliding Window ARQ mechanism to ensure that data is delivered correctly and in order, even in the presence of packet loss. *This lab is to be done in pairs (preferable) or individually.*

### 2 Protocol Specification

You must implement a protocol that handles:

- **Acknowledgements (ACKs):** The receiver must notify the sender of successfully received packets.
- **Timeouts and Retransmissions:** The sender must retransmit packets if an ACK is not received within a specified window.
- **Sequence Numbers:** To ensure in-order delivery and detect duplicates.
- **Flow Control:** Using a sliding window mechanism (e.g., Go-Back-N or Selective Repeat).

### 3 Message Structure

Refer to the detailed message types (type 0 for request, type 1 for ACK, type 2/3 for data) specified in the course resources. Ensure proper use of `htons()` and `htonl()` for multi-byte fields.

### 4 Performance Analysis

1. Verify the integrity of a 10MB file transfer over a lossy link (you can simulate loss or use a wireless connection).
2. Measure the throughput as a function of the Sending Window Size (SWS).
3. **Extra Credit:** Implement Selective Repeat to improve efficiency over high-loss links.

### 5 Submission

A detailed report explaining your window management logic, timeout handling, and performance results is required along with your source code.