Performance Report: Lab 7 – Reliable Data Transfer over UDP

Instructor: Shashi Prabh
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Name and Enrollment Number: Aom Kapadia(AU2240200), Kevin Mehta(AU2240116)
Course: Computer Networks

The implementation of a UDP-based file transfer system provides essential training for fundamental computer networking principles specifically sockets and data packets and error handling as well as acknowledgments. The file transfer system includes two main parts consisting of the server alongside the client which execute specific duties during file transmission.

The server application executes a UDP socket that operates on port 8080 until it receives file requests from clients. The server examines the received request package to retrieve the necessary filename information after receiving the request. The server handles two actions upon finding the requested file: it obtains file metadata before determining chunk sizes through established buffer and structure limitations and distributes initial metadata and first file chunk data to the client. The program enters into a repeated cycle to transmit sequential file chunks which are packaged into data packets together with sequence numbers. The server maintains a waiting period for a client acknowledgment after sending each packet. Sequence numbers together with acknowledgment messages enable correct and ordered packet reception even though UDP operates as a connectionless and unreliable protocol. The server returns a distinctive error packet to the client whenever it cannot find the requested file.

The client code implements a UDP socket function to transmit file requests toward the server endpoint. After the server returns a response the client verifies if the response contains a valid file or error information. A valid response allows the client to create and open a new file locally for writing out a requested file and extract metadata before starting to write received data. The client responds with an acknowledgment to the server regarding the first received packet before continuing the reception of additional data pieces. The client writes file data to the output after getting an expected packet with correct sequence numbers before sending a cumulative acknowledgment. The system operates until it finishes writing the complete received file data.

This system presents reliable file transmission that works through UDP with features that emulate TCP sequence control and acknowledgment functions. The system structure helps handle packet loss while assuring that the client obtains the whole file without any errors. The assignment develops student understanding of C network protocols through sockets while teaching essential reliability methods for unreliable protocols like UDP.