Assignment 4 – Part 1: Reliable Data Transfer over UDP

Name: _____
Roll No: _____
Course: Computer Networks

1. Introduction

This report presents the design and analysis of a reliable file transfer protocol implemented over UDP. Since UDP is unreliable, reliability mechanisms were implemented at the application layer using a sliding window approach.

2. Design Overview

2.1 Header Structure

Each packet has a maximum payload size of 1200 bytes with a 20-byte custom header:

| Seq Num (4 B) | Reserved/Optional (16 B) | Data (($\leq$ 1180 B) |

2.2 Reliability Mechanisms

- **Sliding Window:** Ensures in-order delivery and controlled transmission.
- **Acknowledgments:** Cumulative ACKs; optional SACK support.
- **Timeouts and Retransmissions:** RTO is estimated adaptively.
- **Fast Retransmit:** Triggered after three duplicate ACKs.

3. Experimental Setup

Experiments were run in Mininet using a two-host topology (h1{s1{h2) with variable delay, jitter, and loss.

4. Results and Analysis

4.1 Download Time vs Loss Rate

4.2 Download Time vs Delay Jitter

5. Observations

- Download time increases with packet loss due to retransmissions.
- Jitter affects timing but less severely than loss.
- Fast retransmit reduces latency compared to timeout-based recovery.

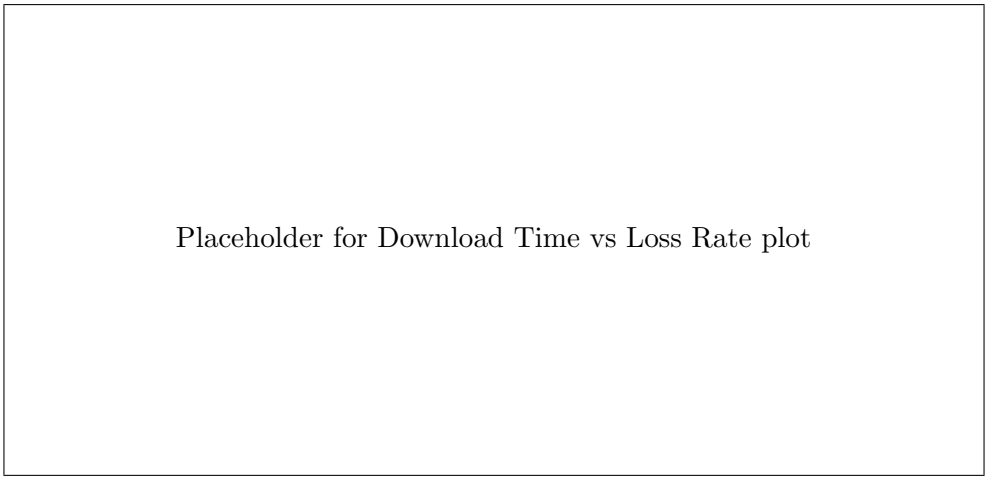

Figure 1: Download time vs packet loss rate (placeholder).

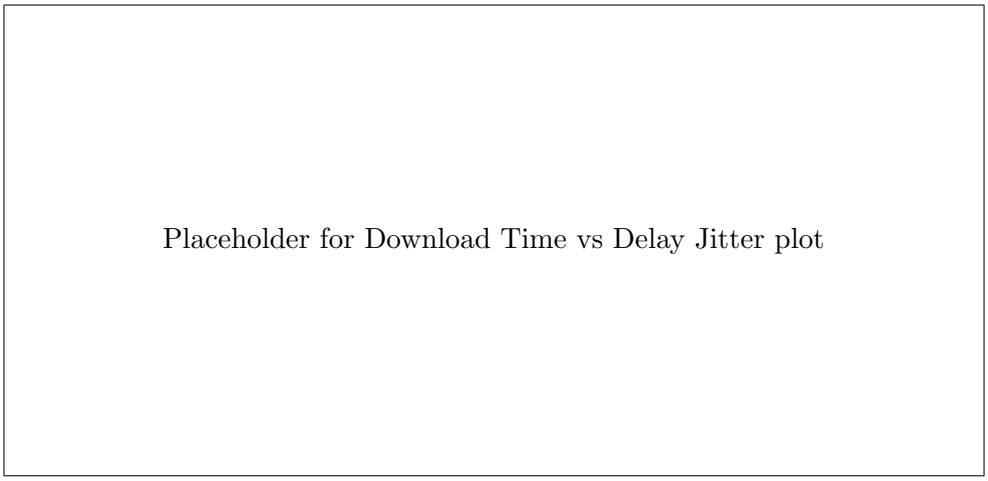

Figure 2: Download time vs delay jitter (placeholder).

6. Conclusion

The protocol ensures in-order and complete file delivery under adverse conditions, achieving reliability similar to TCP at the application layer.