University of Dhaka

Department of Computer Science and Engineering

CSE 3111 – Computer Networking Laboratory Credits: 1.5 Batch: 27/3rd Year 1st Sem 2023

Instructors: Prof. Dr. Md. Abdur Razzaque (AR), Prof. Dr. Md. Mamun-Or-Rashid (MOR), Dr. Muhammad Ibrahim (MIb) and Mr. Md. Redwan Ahmed Rizvee (RAR)

Lab Assignment # 5

Name of the Experiment: Implementation of flow control and reliable data transfer through management of timeout, fast retransmit, cumulative acknowledgment, loss of data and acknowledgment packets.

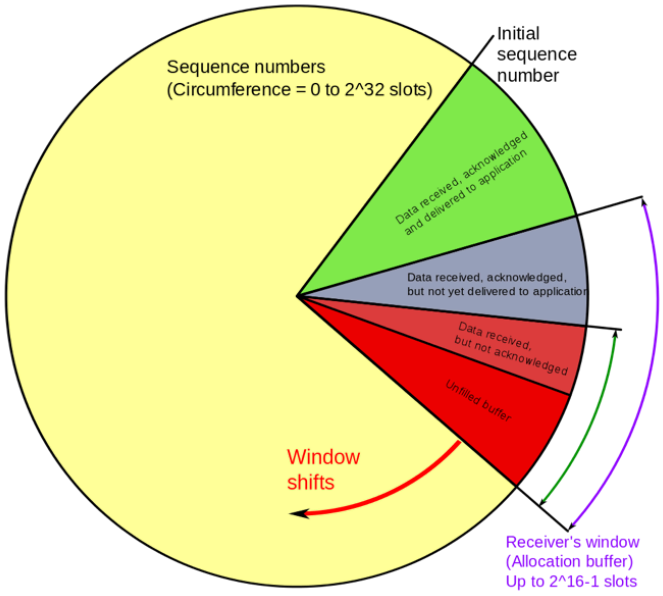
Objectives :

- To gather knowledge about how TCP controls the flow of data between a sender and a receiver
- To learn how TCP implements reliable data transfer and cumulative acknowledgment

Theory:

TCP is one of the protocols of the transport layer for network communication. TCP provides reliable, ordered, and error-checked delivery of a stream of bytes between applications running on hosts communicating via an IP network. TCP is connection-oriented, and a connection between client and server is established before data can be sent. The server must be listening (passive open) for connection requests from clients before a connection is established. Three-way handshake (active open), retransmission, and error-detection adds to reliability. Thus TCP can maintain various operations to establish perfect communications between a pair of hosts, e.g connection management, error detection, error recovery, congestion control, connection termination, flow control, etc. In this lab, we will have a look at the flow control mechanism and reliable data transfer mechanisms of the TCP protocol.

TCP uses a sliding window flow control protocol. In each TCP segment, the receiver specifies in the receive window field the amount of additionally received data (in bytes) that it is willing to buffer for the connection. The sending host can send only up to that amount of data before it must wait for an acknowledgement and window update from the receiving host.



Tasks :

Task 1: Implement TCP Flow Control

- Configure the server to use TCP flow control by setting the receive window size. The receive window size determines how much data the receiver is willing to accept before sending an acknowledgment.
- Configure the clients to use Cumulative Acknowledgment. Cumulative Acknowledgment means that the receiver sends an acknowledgment for the highest sequence number it has received in order, and it assumes that all packets up to that sequence number have been received.
- Test the TCP flow control by sending data from the clients to the server.

Task 2: Implement reliable data transfer

- Start a timer after sending data packets and calculate SampleRTT values for each of the packets.
- Configure the clients to use the EWMA equation to calculate the TimeOut value. The EWMA equation is used to estimate the round-trip time (RTT) and calculate the retransmission timeout (RTO) value.
- Implement the Cumulative ACK
- Implement the fast retransmit algorithm on receiving three duplicate acknowledgments for the same packet.
- Test the reliable data transfer control mechanisms by sending data from the clients to the server

Task 3: Analyze Results

- Analyze the captured network traffic to evaluate the performance of the TCP flow control and reliability control algorithms.
- Compare the results under different network conditions and analyze how the algorithms affect the network

Deliverables:

- Source code for the client-server application with flow control and reliable data transfer
- Run simulations and collect performance metrics such as throughput, packet loss rate, and round-trip time (RTT).
- A report that documents the design and implementation of the algorithms, as well as the performance comparison under different network conditions [Do not include code in the report]

References:

https://www.javatpoint.com/flow-control-vs-congestion-control
https://www.geeksforgeeks.org/difference-between-flow-control-and-congestion-control/