Assignment 2

Student’s name:
1 Implementation

Implement an application-level over-UDP forwarder program that emulates a network link. The forwarder stores received messages in the First-In First-Out (FIFO) order. After sending any message \( m \), the forwarder waits for time \( t \) before sending the next pending message where \( t \) refers to the transmission delay of message \( m \) on the emulated link. The forwarder records changes of the message queue length in a file.

2 Experimental Setup

Utilize the implemented forwarder, as well as the client and server from Assignment 1, to recreate the logical experimental topology of Assignment 1. The client program at host A transmits the 500 messages to the forwarder program at host F. The forwarder program sends the received messages to the server program at host D. The server transmits the ACKs to the client directly through the ONL core, i.e., the ACKs do not traverse forwarder F. As in Assignment 1, this reverse path from server D to client A contains the delay plugin with the delay value set to 400 ms during the experiments. Configure the emulated link capacity in the forwarder to the same value as in your experiments in Assignment 1. Also, configure an ONL monitoring display to track the bitrate of traffic coming to host D. Hence, Assignment 2 uses ONL only to provide the desired network paths, delay the ACKs on the path from server D to client A, and monitor the incoming traffic bitrate for host D.

3 Experiments

Repeat the experiment from Assignment 1. If the results are significantly different from those in Assignment 1, change your implementation of the forwarder until the results are sufficiently close.

Increase the emulated link capacity until the results with the forwarder at host F become significantly different from those obtainable in the Assignment 1 settings where the ONL bottleneck link capacity is increased to the same value.

4 Report Preparation

Prepare a report that includes the following items:

1. Source code for the client, forwarder, and server programs as well as instructions how to install and run the programs;
2. ONL screenshot of the incoming traffic bitrate for host D;
3. Automatically plotted graph of the message queue length as a function of time in accordance with the measurements recorded by the forwarder;
4. Single graph plotting the analytical and experimental values of \( T \) as functions of the corresponding message/ACK sequence number where \( T \) is the difference between the ACK reception time and time when the client started to transmit message 1;
5. Link capacity that makes the results with the forwarder at host F significantly different from the results in the equivalent Assignment 1 settings; include both sets of the results and explain why the differences arise.

The report must be submitted by email to gorinsky@arl.wustl.edu in PDF format, except for Item 1 which should be submitted as separate text attachments to the email message. The report is due on Monday, March 2, by 2:00 pm, i.e., a half an hour before the class. A hard copy of the report must be submitted to the instructor before the class starts.