

EE4204/TEE4204 Computer Networks (Part 1)
Socket Programming Assignment (Sem1, 2022-23)
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Instructions:

This lab assignment focuses on implementing a client server socket program with TCP transport protocol for transferring messages using a flow control protocol. Problems 1-3 are for your practice. Problem 4 is the assignment problem. Choose appropriate values for parameters such as data unit size. Repeat the experiment several times and plot the average values in a report with a brief description of results. The details of lab schedule, demo, and rubrics to be used for assessment will be announced separately.

The solution and program must be yours based on your own effort. Our university views any form of cheating and plagiarism (like copying from other students or reports or web sources) very seriously. The penalty for indulging such an act could be as severe as termination of your candidature or award of F grade in the module.

Practice Problems:

1. Develop a socket program in UNIX/Linux that uses (i) TCP as the transport protocol and (ii) UDP as the transport protocol for transferring a short message between a client and server. The client sends a string (input by the user) to the server and the server prints the string on the screen after receiving it.
2. Develop a TCP-based client-server socket program for transferring a large message. Here, the message transmitted from the client to server is read from a large file. The entire message is sent by the client as a single data-unit. After receiving the file, the server sends an ACK message to the receiver. Verify if the file has been sent completely and correctly by comparing the received file with the original file (“diff” command could be used). Measure the message transfer time and throughput.
3. Develop a TCP-based client-server socket program for transferring a large message. Here, the message transmitted from the client to server is read from a large file. The message is split into short data-units which are sent one by one without waiting for any acknowledgement between transmissions of two successive data-units. Verify if the file has been sent completely and correctly by comparing the received file with the original file. Measure the message transfer time and throughput for various sizes of data-units.

Assignment Problem

4. **[Jumping Window Protocol]:** Develop a TCP-based client-server socket program for transferring a large message using a hypothetical jumping window protocol. Here, the message transmitted from the client to server is read from a large file. The message is split into short data-units (DUs) which are sent and acknowledged in batches of size n . The sender sends n DUs and then waits for an ACK before sending the next batch of n DUs. It repeats the above procedure until the entire file is sent and the acknowledgement for the last batch is received. The receiver sends an ACK after receiving n DUs. It repeats the above procedure, until the acknowledgement for the last batch is sent. Note that the last batch may have less than n DUs.

Verify if the file has been sent completely and correctly by comparing the received file with the original file. Measure the message transfer time and throughput for various sizes of data-units. Choose appropriate values for “data unit size” and measure the performance. Repeat the experiment several times and plot the average values in a report with a brief description of results, assumptions made, etc.

Carry out the above experiments for three different batch size values: $n=1$, $n=2$, and $n=4$. Note that when $n=1$, this jumping window protocol becomes similar to the stop-and-wait protocol. Include the following two performance figures in your report:

- a. Transfer time vs data unit size (with three curves one each for $n=1$, $n=2$, and $n=4$)
- b. Throughput vs data unit size (with three curves one each for $n=1$, $n=2$, and $n=4$)

[ALL THE BEST]