CS 740, Fall 1995 Homework Assignment 4
Sample Answers

1. Time measurement

We can't do accurate transmission rate without digging into the OS, socket library, and network interface hardware, but we can roughly do the measurement by the following four methods based on the real time (the process actually used) or the elapsed time (the real word clock).

First, we can measure the elapsed time at the server. This means that we roughly measure the transmission time of the network. For example in TCP to transmit 1000 1000-byte message, at the server we can use the "select" function to check whether the first message is ready for read, then reset the timer, use while loop and "read" function to get these 1000 messages, and get the elapsed time divided by 1000. This will give you the elapsed time to get 1 1000-byte message at the server. If the network is slower than the machine (it is true in the real world) and the machine running the server is not running many processes, this elapsed time can roughly be the transmission time of the network. I would prefer to use this method.

Second, due to no synchronized clock among two machines, we can measure the elapsed time of the round trip transmissions at the client and divide it by 2 to get the elapsed time for one-way transmission. This elapsed time will include the process time at the client and the server, and the transmission time on the network. This method is useful for TCP, but can't be apply to UDP.

Third, we can measure the real (or elapsed) time at the sender. This means that we measure how fast the sender (client) can push the data streams (packets) into Ethernet. Fourth, we can measure the real-time (or elapsed) at the receiver (server). This means that we measure how fast the receiver can pick up the data stream from the network. If you use these methods, you probably can get the rate higher than 10Mbyte/sec which is impossible for Ethernet (10Mbits/sec).

2. UDP Accuracy measurement

In order to measure the UDP accuracy, the server have to know when it should stop. There are two methods to do that. Different methods will give different measurements.

First, after sending the messages, the client send a "terminated" message to the server using UDP. When the server receive this message, it terminated. But this "terminated" message may loss during the transmission. To overcome this problem, the client can resent this message each certain time (for example, 1msec) or sent this message serveral times.

Second, we can set up a TCP connection between the UDP client and UDP server. After sending the regular messages, the client send the "terminated" message to the server using TCP connection. This will guarantee the delivery of this message. In the server, we have to use the "select"

function in the while loop to check whether the messages are available at UDP or TCP. If there is a message available for UDP, the server reads it and increase the status. If there is no message for UDP and the terminated message is available for TCP, the server read this terminated message, print out the status and terminates itself.

3. Grade Distributions

100-90 : 13

89-80 : 3

79-70 : 3