Computer Networks
Practice Problem - 01: Reliable UDP

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Taken from `http://www.cse.iitd.ernet.in/~siy107537/csl374/a1/assignment1.pdf`

1. Write two socket programs in C, client.c and server.c, that together communicate using datagram sockets. Each datagram generated by client.c must contain

   (a) a sequence number which identifies the packet.

   (b) a timestamp with microsecond level precision which indicates the time at which the packet is first transmitted.

   (c) an even non-negative integer called the time-to-live TTL with initial value T. Let us assume that the packet is of size P bytes.

   When server.c receives a datagram from client.c, it immediately decrements (by one) the TTL value in the datagram and sends the same datagram (with the new TTL) back to client.c. The client.c program upon receiving a datagram from server.c, decrements (by one) the TTL value, and checks if this new value is zero. If the new TTL is greater than zero, then client.c sends the datagram (with the new TTL) back to server.c.

   However, if TTL is zero, then client.c prints to a file (on a new line) the difference between the current time and timestamp field in the datagram. Call this time the cumulative RTT. A new datagram is then generated by client.c with TTL set to T. The value of P and T, and the output file name for storing the cumulative RTT should be entered on the command line when executing client.c. P should be within the range 100 to 1300 bytes, and T between 2 and 20 (and must be even). The client.c program totally sends out 50 datagrams and then quits. Run client.c and server.c on two different machines.

   For $T = 2$ and different values of $P = 100, 200, \cdots, 1000$, run client.c. Plot a scatter-plot (using any suitable software, such as matlab) of cumulative RTT for all 50 datagrams vs. P for the different values of P when $T = 2$.