CS3041 - Assignment 1

Antony Franklin

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The goal of this assignment is to design and demonstrate an end-to-end application layer protocol. For this, you would develop an application protocol that is similar to the standard *"ping"* program available in modern operating systems, except that it is running at the application layer rather than in IP layer using Internet Control Message Protocol (ICMP) to communicate with each other.

1 PING PROTOCOL

"ping" is a utility for network performance measurement used to test the reachability of a host on an Internet Protocol (IP) network and to measure the round-trip time for messages sent from the originating host to a destination computer. The ping protocol allows a client machine to send a packet of data to a remote machine, and have the remote machine return the data back to the client unchanged (an action referred to as echoing). Among other uses, the ping protocol allows hosts to determine round-trip times to other machines.

2 THINGS TO DO

- **Protocol Design :** Design your application layer protocol by providing types of messages exchanged, message syntax, message semantics, and rules. You need to provide justification for your design decisions.
- **Ping Server:** The ping server program has to implement some additional functionalities to emulate the network parameters such as loss and delay. The server should have the tunable parameter $LOSS\_RATE$ and $AVERAGE\_DELAY$. When the $AVERAGE\_DELAY$ is 0 the ping program should be able to measure the actual delay.

- **Ping Client:** The ping client program should send 10 ping requests to the server, separated by exactly one second. After sending each packet, the client waits up to one second to receive a reply. If one seconds goes by without a reply from the server, then the client assumes that its packet or the server's reply packet has been lost in the network. At the end, the ping client should report the minimum RTT, maximum RTT, average RTT, Standard Deviation of RTT between the client and server. It should also report the loss rate. Look at the output of the *ping* command for more detail.

3 Deliverables

- Protocol design document with clear description of the design decision in a text file.
- The complete program code, both client and server, and additional programs as required.
- The code must be well documented.
- A README file containing the instructions on how to run the program.

All the deliverables must be uploaded as a single tar.gz file in the Course Web Page on Moodle. The deadline for submission of the project is Sunday, Aug 30, 2015, 11:55 PM. You should also get your program execution evaluated by the TAs before the deadline.

4 Evaluation Methodology

- Good Protocol Design with proper justification for the design decision (20 %)
- Basic client server communication protocol implementation (20 %)
- Correct emulation of ping command under loss and delay mechanism implemented in the server (30 %)
- Correct calculation of minimum RTT, maximum RTT, average RTT, Standard Deviation of RTT, and loss rate (10 %)
- Coding style and proper error handling in the program (10 %)
- Code Documentation/Comments/README file (10 %)