Networks Lab

Assignment 2 (Getting started with NS-3)

Note:
1. You need to setup ns-3 (network simulator) for this assignment.
2. Refer to www.nsnam.org for all information about ns-3.
3. Also install tcpdump on your machines
4. Refer to www.tcpdump.org/ for tcpdump
5. Assuming your installation directory is ns-allinone-3* . We call it the home directory of ns-3.
6. Do not copy the solutions from others. Cases of plagiarism will be treated seriously.

The purpose of this assignment is to get acquainted with the working of ns-3 (a discrete-event network simulator for the Internet systems) and its various tweaks available. In this assignment, you will learn the basics of ns-3 silulators and a details hands-on experience on data/trace parsing and analysis. Please go through ns-3 tutorials (http://www.nsnam.org/docs/release/3.21/tutorial/html/tracing.html) on different tracing methods available. In this assignment, we shall use ASCII tracing and PCAP tracing methods.

For this assignment, you have to use the file ns-3.*/examples/udp/udp-echo.cc. This example file creates a simple network topology with a few nodes with udp client and server. The udp client sends a echo request which is forwarded back by the server. Study the source code of this example to find out different configuration parameters.

Now, copy this file to the *scratch* folder under your ns3 installation directory and execute it with the *waf* command. The script generates an ascii trace file and a set of pcap trace files that contains the packet tracing details for the execution script. The pcap files and the .tr trace files have a format of their own. Find out the tracing formats and the meaning of different fields in the trace. The user can extract all the network statistics from these files using flow monitors. However we would not use the flow monitor here as our prime purpose is to know what all information is there in these files and where.

Now figure out the format of the trace files and the information that they give you. Use tcpdump for analysing .pcap files.
Note: Do not use any flow monitor for extracting the statistics
The udp-echo.cc script needs to be changed in order for it to accept the parameters from command line arguments. Modify the script such that you are able to tweak the various attributes from command line arguments. We shall tweak and work with three parameters – MaxPackets (denotes maximum number of echo packets forwarded by the client), Interval (time interval between two consecutive echo packets), and PacketSize (payload size of the echo packets). Use following configurations of these parameters, and execute the script by supplying these parameters as a command line argument.

MaxPackets=1000,
Interval=0.01 sec
PacketSize = {64,128,256,512,1024} KB

For every individual packet size, find out the statistics parameters given below and tabulate the results.

1. timeFirstTPacket: when the first packet in the flow was transmitted;

2. timeLastTPacket: when the last packet in the flow was transmitted;
3. timeFirstRPacket: when the first packet in the flow was received by an end node;
4. timeLastRPacket: when the last packet in the flow was received;
5. delaySum: the sum of all end-to-end delays for all received packets of the flow;
6. tBytes, tPackets: total number of transmitted bytes / packets for the flow;
7. rBytes, rPackets: total number of received bytes / packets for the flow;
8. lostPackets: total number of packets that are assumed to be lost (not reported over 10 seconds);
9. timesForwarded: the number of times a packet has been reportedly forwarded;
10. packetsDropped, bytesDropped: the number of lost packets and bytes.
11. transmitterThroughput : the throughput of the transmitter, calculated as amount of bytes transmitted divided by total time
12. recieverThroughput : the throughput of the receiver, calculated as amount of bytes received divided by total time

Repeat the same experiment of following configuration parameters.

MaxPackets = 1000
PacketSize = 128KB
intervals = {0.02, 0.05, 0.1, 1} sec
Tabulate the results for different intervals.

State your observations on the impact of packet size and intervals over the different statistical performance parameters.

NOTE for Submission:

1. You need to do this experiment in a group of two (as decided in the first lab).

2. Write down a perl/python script (or any other scripting language of your choice) to extract different statistical parameters from the trace.

2. After the experiment, prepare a report with the results and analysis.

3. Create a gziped tarball file (tar.gz) containing the <u>data analysis script and the report</u>. The name of the compressed file shopuld be assign_2_<roll_number_member_1>_<roll_number_member_2>.tar.gz . For example, if the members of the group are 12CS10001 and 12CS10002, then the file name should be assign_2_12CS10001_12CS10002.tar.gz. <u>Do not include the simulation script (.cc) or the trace files in the archive folder.</u>

4. One of the member of the group should upload the assignment to the Moodle course web page by the submission deadline.

5. **<u>Submission deadline: 26 January, 2014, 11:59 pm.</u>**