Assignment 4

CSL 858

Due date: February 23, 2007 (Friday)

Topics: ns-2 simulator, ALOHA

The ns-2 simulator has become the de facto simulator for academic research. It has been installed on the CSE network (version 2.27): `/usr/local/ns-allinone-2.27/` . The latest ns-2 version (2.30) and user manual are available online at `www.cse.iitd.ac.in/~vinay/courses/CSL858/hw/ns/`. We will refer to the `*/ns-allinone-2.**/` directory as `NSALL` and the directory `*/ns-allinone-2.**/ns-2.**/` as `NS`. In order to run ns-2 successfully, you must put `NSALL/otcl-*` and `NSALL/lib` into your `LD_LIBRARY_PATH` environment variable as well as `NSALL/tcl-*` into your `TCL_LIBRARY` environmental variable. You can find an example of how to accomplish this at `www.cse.iitd.ac.in/~vinay/courses/CSL858/hw/ns/.bashrc`.

1. Consider the file `NS/tcl/ex/udpdata.tcl`. This is an example of an input file to the ns-2 simulator. It is written in "tcl" as opposed to the actual ns-2 code which is written in C++. Tcl is a *dynamic* programming language, along with other languages like Perl, Python, Ruby, etc. (these are also referred to using the slightly older term *scripting* languages). This is in contrast to system programming languages, of which C++ and Java are the most common examples.

   (a) Study `udpdata.tcl` carefully and if necessary look up the ns-2 user manual to understand the code. Explain what each of the following lines of code accomplishes.

      i. `set n2 [$ns node]`
      ii. `$ns duplex-link $n0 $n2 2Mb 5ms DropTail`
      iii. `$ns attach-agent $n0 $udp0`
      iv. `$ns at 0.4 "$udp1 send 828 ping (12345678)"`
      v. `exec nam out.nam &`

   (b) Run the ns-2 simulator with `udpdate.tcl` as input. You should see the `nam` visualization tool open two windows. Hit the play-forward button "▷" to visualize the simulation. Explain in brief what you observe.

   (c) Explain what each of the following lines from the output trace file mean.

      i. `+ 0.3 0 2 udp 500 ------- 0 0.0 1.0 4 8`
      ii. `- 0.3 0 2 udp 500 ------- 0 0.0 1.0 4 8`
      iii. `r 0.307 0 2 udp 500 ------- 0 0.0 1.0 4 8`

2. Consider the file `NS/tcl/ex/sat-aloha.tcl`.

   (a) Briefly describe the network this code sets up.

   (b) Run this code in the ns-2 simulator using the "poisson" command-line option. From the output file generated by ns-2, compute the offered load and throughput. Now change the offered load by modifying the appropriate parameters in the input tcl file and recompute the throughput. Do this several times for different offered loads and draw a plot of offered load vs. throughput.

   (c) Also plot in the same diagram the theoretical throughput which we derived in class. Are the two curves similar? Discuss.

3. In class we derived the throughput for ALOHA and Slotted-ALOHA. State as many short-comings of our analysis as you can. In particular, how realistic are the assumptions that we made?