CSCI 6760 Home work assignment 1

Assigned: Tuesday, Feb 5
Due: Thursday, Feb 14, 2:00 PM
(LATE SUBMISSIONS WILL NOT BE ACCEPTED)
(INDIVIDUAL EFFORT ONLY. ABSOLUTELY NO COLLOBORATION)

1. Peterson and Davie: Exercises: Chapter 2, Question 18.
2. Peterson and Davie: Exercises: Chapter 2, Question 19.
3. Peterson and Davie: Exercises: Chapter 2, Question 23.
4. Peterson and Davie: Exercises: Chapter 2, Question 33.
5. Peterson and Davie: Exercises: Chapter 2, Question 46.
6. Compare and contrast shared medium network and switched network. What are the advantages and disadvantages of each approach?

   The next three problems measures the throughput achieved by TCP and UDP streams. The tornado cluster in the lab utilizes 100 Mbps full duplex fast ethernet networks for interconnection.

7. **Throughput measurement: UDP**

   Write a UDP sender and receiver program to measure the effective throughputs. The sender will continously send UDP packets (of various sizes) with an application level sequence number. The receiver will measure the per second throughput (amount of packet data received in the past second) and the data loss rate (using the missing sequence numbers). Plot the throughput with time.

8. **Throughput measurement: TCP** Repeat the above experiment for TCP streams. Note that you should not notice any packet loss.
9. **TCP behavior in lossy networks** Repeat the above experiment for TCP streams under lossy network conditions. Since our lab LAN operates under fairly lossless conditions, we will use dummynet [1] to simulate lossy networks. Dummynet is a traffic shaper. You will use *ipfw* to control this traffic shaper. You have to login as *root* to access ipfw. You can use *sudo* to temporarily login as root. For example, the command `sudo ipfw show` will show the installed rules. Running `sudo ipfw add prob 0.05 deny ip from 192.168.1.100 to 192.168.1.103 in` in sleepy will drop 5% of the network packets that are sent from 192.168.1.100 (sleepy) to 192.168.1.103 (happy). Refer to the manual pages for ipfw for the full usage syntax.

   Before you use these commands between a pair of machines, please send email to the entire class and reserve a time slot so that you don't interfere with someone elses' setup.

10. **Routing anamolies:** Here is an actual traceroute from UGA to bhphotovideo.com. The first column shows the name of the router and the last three column prints the RTT. From the name of the routers, it appears that I go to SanFrancisco today before going to NYC. However, the same traceroute (at the same time) from my house (Bellsouth ADSL) goes directly to NYC from ATL. Provide an explanation of why this might happen? (HINT: Look at the name of the routers. The domain name of the routers gives hints on the networks that they service). By the way, both the packets go through the same number of routers

```
------Traceoute from UGA-------------
128.192.4.1 (128.192.4.1)  1.131 ms  0.460 ms  0.407 ms
 2  128.192.0.5 (128.192.0.5)  0.483 ms  0.467 ms  0.415 ms
 3  10.187.187.2 (10.187.187.2)  0.607 ms  1.189 ms  0.582 ms
 4  128.192.166.1 (128.192.166.1)  1.670 ms  1.580 ms  1.173 ms
 5  131.144.206.229 (131.144.206.229)  2.562 ms  2.295 ms  2.006 ms
 6  131.144.200.21 (131.144.200.21)  5.385 ms  5.258 ms  5.771 ms
 7  at-1-2-0--4.tr1.Atlanta1.GA.us.netrail.net (205.215.15.89)  5.854 ms  5.710 ms  5.5
 8  sfo.netrail.demarc.cogentco.com (66.28.28.58)  91.108 ms  91.206 ms  91.283 ms
 9  ge-2-2-0--0.pr1.SanFrancisco1.CA.us.netrail.net (205.215.12.2) 91.653 ms  90.023 m
10  205.215.1.170 (205.215.1.170)  92.191 ms  91.318 ms  90.525 ms
11  ggr1-p381.sffca.ip.att.net (12.123.221.1)  97.571 ms  97.854 ms 97.379 ms
12  tbr1-p013302.sffca.ip.att.net (12.122.11.217)  98.760 ms  104.109 ms  105.703 ms
13  tbr1-cl1.cgcil.ip.att.net (12.122.10.5)  140.379 ms  150.642 ms 141.237 ms
14  tbr1-p012301.n54ny.ip.att.net (12.122.10.1)  195.746 ms  213.728 ms  173.561 ms
15  gbr5-p30.n54ny.ip.att.net (12.122.11.10)  158.292 ms  157.366 ms 159.418 ms
16  ar17-p310.n54ny.ip.att.net (12.123.1.193)  158.447 ms  158.171 ms 158.894 ms
......
------------------Traceroute from Bellsouth------
dsl-63-221-1.asm.bellsouth.net (208.63.221.1)  42.702 ms  41.398 ms  41.257 ms
 3  209.149.96.1 (209.149.96.1)  43.564 ms  42.329 ms  42.950 ms
 4  209.149.96.238 (209.149.96.238)  43.080 ms  42.205 ms  42.410 ms
 5  500.POS1-2.GW10.ATL5.ALTER.NET (65.195.238.169)  44.224 ms  43.372 ms  43.157 ms
 6  so-1-1-0.XL2.ATL5.ALTER.NET (152.63.85.174)  43.474 ms  43.790 ms  42.973 ms
 7  192.ATM6-0.BR2.ATL5.ALTER.NET (152.63.82.193)  42.983 ms  43.156 ms  42.991 ms
 8  uu-gw.attga.ip.att.net (192.205.32.129)  44.172 ms  44.043 ms  44.455 ms
 9  gbr4-p50.attga.ip.att.net (12.123.20.254)  44.334 ms  44.928 ms  43.947 ms
10  gbr4-p10.wswdc.ip.att.net (12.122.2.162)  58.613 ms  58.558 ms  57.896 ms
11  gbr3-p60.wswdc.ip.att.net (12.122.1.129)  58.598 ms  57.355 ms  57.687 ms
12  gbr3-p20.n54ny.ip.att.net (12.122.3.53)  64.440 ms  63.176 ms  64.198 ms
13  gbr6-p60.n54ny.ip.att.net (12.122.5.113)  64.414 ms  64.893 ms  63.999 ms
14  ar17-p3110.n54ny.ip.att.net (12.123.1.197)  64.633 ms  63.977 ms  64.271 ms
```

References

[1] Luigi Rizzo. Dummynet: a simple approach to the evaluation of network protocols. *ACM Computer Communication Review*, 27(1):31–41, January 1997.