Lab Assignment 7

(Due on 04/15/13)

**Objective.** This lab assignment is designed to have a better understanding on the network routing algorithm.

**Team.** You can work in a team of no more than three students. The IDs and names of all team members need to be provided in the submission.

**Submission.** Please email the solutions of this lab to our TA (zhijun.yin@vanderbilt.edu) and copy me (yuan.xue@vanderbilt.edu).

**Assignment.**

1. (6 pts) Find out the route from your computer (which is connected to the wireless network in FGH) to www.google.com using “tracert” on Windows machines, and record the output as the answer to this question. Now find out the route from your computer (which is connected to the wireless network in FGH) to www.vanderbilt.edu. Record the output. Based on the results, please provide the IP addresses of the Vanderbilt routers on these two routes. Can you estimate the IP address range (address block) of Vanderbilt? Now use “whois” command on a Linux/Unix system to find the registration information for IP address “129.59.90.20”. Copy the output as the answer. From the output, please provide the IP address range and CIDR of Vanderbilt.

2. (44 pts + bonus pts) In this experiment, we will setup network routing in DETERlab. Refer to the document at [https://trac.deterlab.net/wiki/Tutorial/CreatingExperiments](https://trac.deterlab.net/wiki/Tutorial/CreatingExperiments) (section “Setting up IP routing between nodes”) for the detailed information. Lab7.tcl file (available on the course website) provides an example TCL script for manual route setup. We will also use the network topology provided in this script in this experiment.

   a) (8 pt) Load the lab7.tcl file into DETERlab. What is the route used between z and u? what is the route used between w and t? Set up two TCP connections – one between z and u, the other between w and t. Measure the throughput of these two TCP connections. Record the value of the throughput. Now set up two UDP flows – one between z and u, the other between w and t. Measure the throughput of these two UDP flows. Record the value of the throughput.

   b) (12 pt) On the same network topology as in lab7.tcl, using delay as the cost metric, compute the minimum-cost routes – one between z and u, the other between w and t. Record these two routes. Configure your own TCL script to set up these two minimum cost paths as the routes. Similar to experiment a), please set up two TCP connections – one between z and u, the other between w and t. Measure the throughput of these two TCP connections. Record the value of the throughput. Set up two UDP flows (please choose appropriate sending rates) – one between z and u, the other between w and t. Measure the throughput of these two UDP flows. Record the value of the throughput.
c) (12 pt) On the same network topology as in lab7.tcl, using the multiplicative inverse of the link capacity as the cost metric, compute the minimum-cost routes – one between z and u, the other between w and t. Record these two routes. Configure your own TCL script to set up these two minimum cost paths as the routes. Similar to experiment a), please set up two TCP connections – one between z and u, the other between w and t. Measure the throughput of these two TCP connections. Record the value of the throughput. Set up two UDP flows – one between z and u, the other between w and t. Record the value of the throughput.

d) (6 +5 pt) Now, could you please design two routes – one between z and u, the other between w and t, on the same network topology to improve the throughput of UDP flows? Outline your idea of design and record the routes. Measure the UDP throughput and record the values. If your UDP throughput is better than the result from experiment a) (the lab7.tcl configuration), you will get 5 points extra credits. Then measure the TCP throughput and record the values.

e) (6 +5 pt) Now, could you please design two routes – one between z and u, the other between w and t, on the same network topology to improve the throughput of TCP flows? Outline your idea of design and record the routes. Measure the TCP throughput and record the values. If your TCP throughput is better than the result from experiment a) (the lab7.tcl configuration), you will get 5 points extra credits. Then measure the UDP throughput and record the values. If you are the administrator of the network, which routing scheme from the above configurations (experiment a, b, c, d, e) you will pick?