Homework 3 assignment for ECE374

Posted: 03/13/15

Due: 03/27/15

Note: *In all written assignments, please show as much of your work as you can. Even if you get a wrong answer, you can get partial credit if you show your work.* If you make a mistake, it will also help the grader show you where you made a mistake.

Problem 1 (10 Points):

Assume a datagram of size 5000 bytes crosses 5 different networks segments on its way from sender to receiver. The smallest MTU of all network segments is 820 bytes.

a. In how many datagrams does the original datagram have to be fragmented in?
b. At which point in the network does the fragmentation occur?
c. Show the length, ID, fragflag, and offset fields of the IP header of each fragment.
d. At which location are the IP fragments reassembled? Explain your answer.

Problem 2 IP (20 Points):

In the figure below, assign an IP address to each of the hosts and routers interfaces and specify the number of subnets.

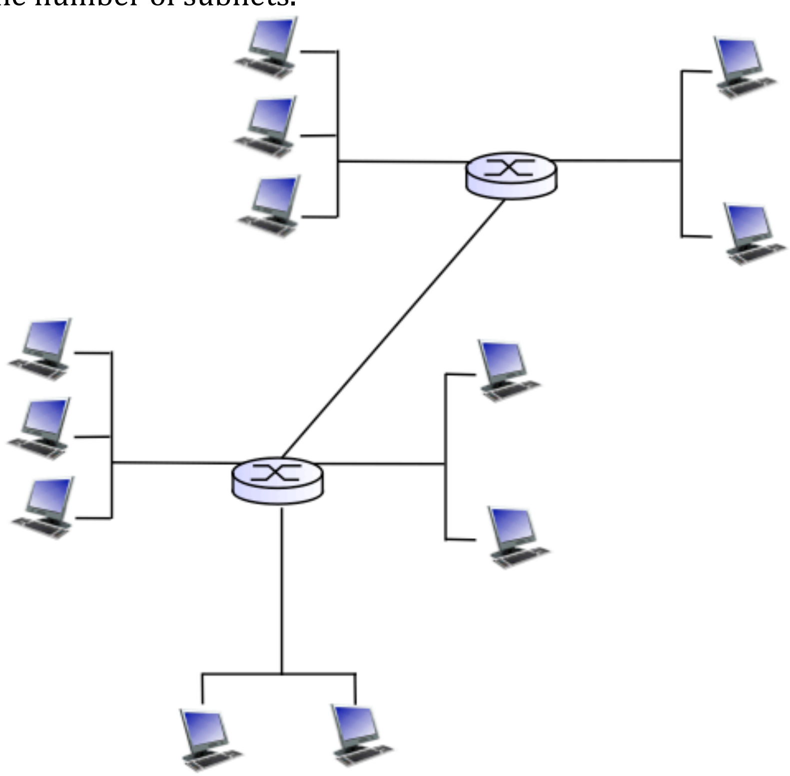

Figure 1

Problem 3 (16 Points):
Consider the network setup shown in Figure 2. Suppose that the ISP instead assigns the router the address 24.34.112.235 and that the network address of the home network is 192.168.1/24.

a. Assign addresses to all interfaces in the home network.
b. Suppose each host has two ongoing TCP connections, all to port 80 at host 128.119.40.186. Provide the six corresponding entries in the NAT translation table.

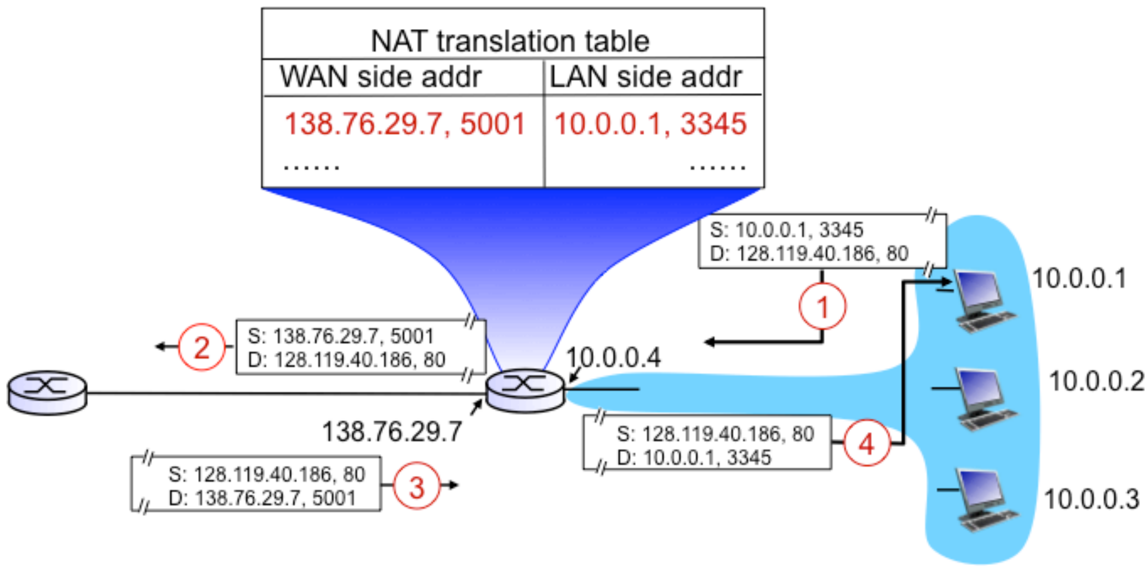

Figure 2

Problem 4 (20 Points):
To calculate the timeout value the TCP sender uses to trigger a retransmission (if an acknowledgement is not received) an exponential weighted moving average is uses. For this problem you should familiarize yourself with how TCP calculates Estimated RTT.

a. Capture 20 individual RTTs from your host to www.umass.edu and store them in an Excel table. SUBMIT the resulting Excel file as additional material with your homework!
b. For each of these RTTs calculate EstimatedRTT ($\alpha = 0.125$) and enter these values also in the table.
c. Plot the values for RTT and EstimatedRTT.
d. Repeat steps b. and c. for $\alpha = 0.25$ and $\alpha = 0.5$.

Problem 5 (20 Points):
Consider the following network. With the indicated link costs, use Djikstra's shortest-path algorithm to compute the shortest path from *A* to all network nodes. Show how the algorithm works by computing a table below.

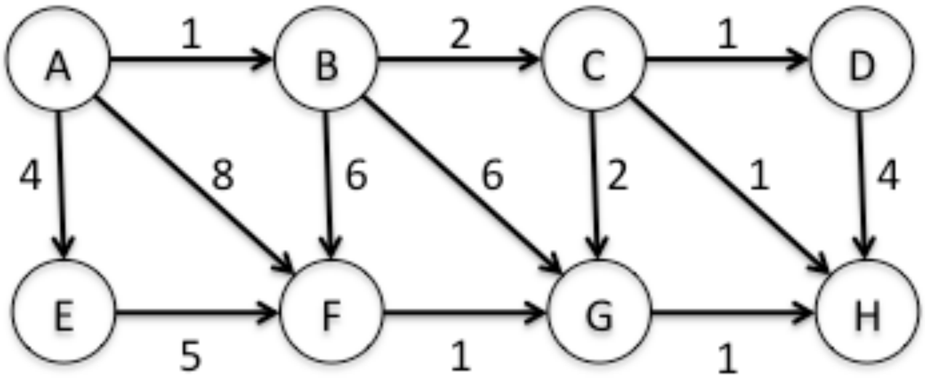

Figure 3

St ep	N'	D(A),p(A)	D(B),p(B)	D(C),p(C)	D(D),p(D)	D(E),p(E)	D(F),p(F)	D(G),p(G)	D(H),p(H)
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									

Problem 6: (14 Points)
For this problem consider Figure 4 and answer the following questions. In all cases provide a short discussion justifying your answer.

a. For the *TCP 1* transmission, identify the time intervals when TCP slow start is operating.
b. For the *TCP 2* transmission, identify the time intervals when TCP slow start is operating.
c. For *TCP 1* transmission, identify the time intervals when congestion avoidance is operating.
d. For *TCP 2* transmission, is the segment loss detected by triple duplicate ACK or by timeout?
e. What is the initial value of ssthresh?
f. What TCP flavor is shown by the *TCP 1* transmission?
g. What TCP flavor is shown by the *TCP 2* transmission?

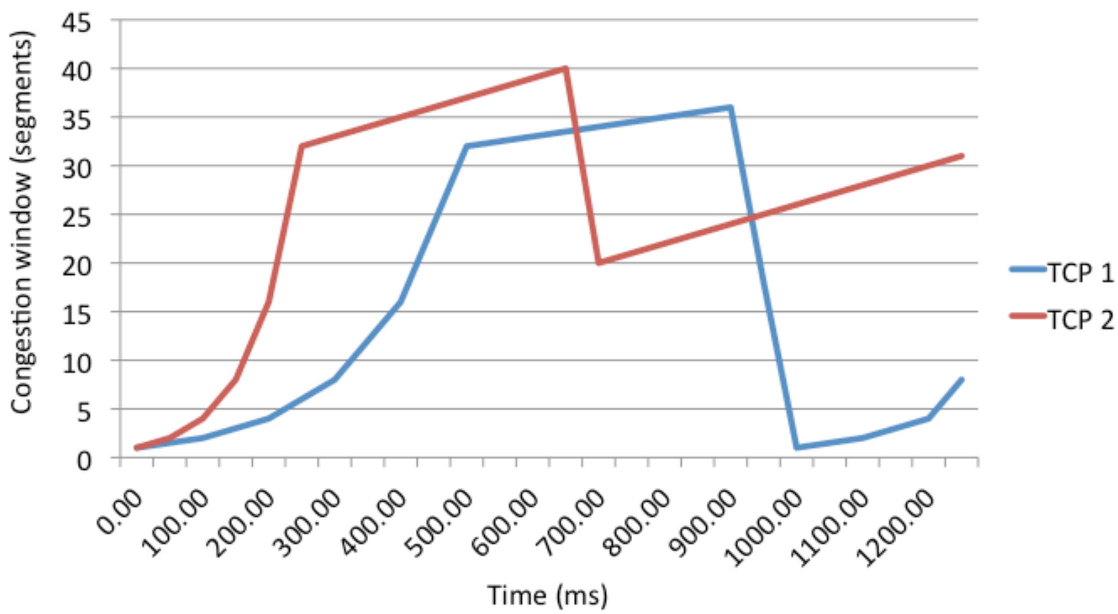
45
40
35
30
25
20
15
10
5
0
Congestion window (segments)
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
1100.00
1200.00
Time (ms)
TCP 1
TCP 2

Figure 4