Electrical, Computer, and Systems Engineering
ECSE 4760: Computer Communication Networks

Homework set 4. Due Dates:
For On-Campus and Live Students Due Tuesday, October 30th
For Tape-delayed Students Due Friday, November 9th (after exam 2)

Notes:

1. Be brief.
2. **SUBMIT THIS HOMEWORK USING WEBCT DROP BOX.**
3. 4000 level students need to answer only Reading Assignment question 1 and Homework Problems 1, 2, 3 and 4.
4. 6000 level students need to answer all questions.
5. All papers for the reading assignment are available from the course web page and at the backup page: http://www.ecse.rpi.edu/Homepages/shivkuma/teaching/fall2001/index.html

Reading Assignment

1. Read and summarize Mogul et al's paper "Fragmentation considered harmful," which argues for trying to avoid fragmentation whenever possible. Your summary should not exceed one page. The paper is available at:
http://www.ecse.rpi.edu/Homepages/shivkuma/teaching/sp2001/readings/ccr-9501-mogulf1.pdf
(15 pts)

Homework Problems

1. Dijkstra's Algorithm: Do Problem 3 in Chapter 4, pg 370-371. You need to show the steps of Dijkstra's algorithm and create a table similar to that in page 284 (table 4.2). (30 points)

2. **Distance-Vector Algorithm:** Consider the 5-node network shown in page 371 (below problem 4) in the Kurose/Ross textbook. What is the *initial* distance table at node E and node C. After initialization, in the first iteration of the distance vector (DV) algorithm (page 288), what are the values which node C sends to node E ? What is the new distance table at node E after receiving and processing the information from node C ? (30 points)

3. **Concepts: Address Space Management:** Discuss the allocation inefficiencies brought about by the original addressing scheme of the Internet which had multiple classes. How does CIDR address this problem ? How does subnet masking address this problem? How does the use of DHCP lead to further efficiencies in address space management ? (20 pts)

4. **Concepts: IP Forwarding** Summarize how IP forwarding works when a) the source (S) and destination (D) are in the same subnet and b) when S and D are in different subnets separated by a sequence of routers R1, R2, R3. (20 pts)

Additional questions for 600 level students

1. Consider the 5-node network shown in page 371 (below problem 4) in the Kurose/Ross textbook. What are the *initial* distance tables at *all* nodes ? Assume every iteration happens synchronously, i.e., once the distance tables for an iteration are ready, the distance vectors are exchanged simultaneously and the distance tables are updated. Trace the iterations of the distance vector (DV) algorithm (pg 288) and in every iteration, show only the distance tables that have changed. After the algorithm terminates, show the final distance tables. How many iterations does the algorithm take to converge? How is the number of iterations related to the graph characteristics? (50 points)