Instructor: Dr. Clark   October 19, 2005

CS 6250
Fall 2005 - Midterm Exam

Problem	Possible	Score
1	20	
2	10	
3	16	
4	18	
5	16	
6	20	
Total	100	

This test is closed book and closed notes. Answer the questions in the space provided. When answering questions, please state any and all assumptions you are making.

Part 1: Protocol Layering (20 points)

List, in order, the five protocol layers we discussed. For each layer, provide the following 4 things: 1) Name of the layer, 2) Service(s) provided by this layer to the upper layer, 3) A specific *standard* protocol that fits in this layer. 4) Where (on which devices) this layer is implemented.

Part 2: IPv6 (10 points)

What steps did the designers of IPv6 take to make packet header processing more efficient? There are several things that were done. List them all for full credit.

Part 3: Network Programming (16 points)

1. **(8 pts)** I've said that our TCP programs must "perform all I/O operations in a loop". What is meant by this? Explain why it is important.

2. **(8 pts)** What is meant by the term "byte ordering"? Explain why it is important in the context of network programming.

Part 4: Routing (18 points)

1. **(6 pts)** What is meant by the term *domain based routing*?

2. **(6 pts)** What mechanisms does BGP use to prevent routing loops?

3. **(6 pts)** Why do the administrators of the Tier 1 networks restrict route advertisements to netmasks of no more than 22 bits?

Part 5: Network Address Translation (16 points)

1. **(8 pts)** What specific problems does NAT solve? What benefits does a NAT device provide? As part of your answer, give a specific example of a case where NAT is deployed.

2. **(8 pts)** What problems are created by the use of NAT? As part of your answer, give a specific example of a case where a NAT devices creates such a problem.

Part 6: Mobile IP (20 points)

Consider a mobile node *MN* from network *X*. The user of *MN* wishes to communicate with a corresponding node *CN* in network *Y*. The node *MN* moves from *X* to a foreign network *A*.

1. **(10 pts)** Describe the sequence of messages that are required in Mobile IPv4 so that *MN* and *CN* can continue to communicate. Give the purpose of each message, where it is from, where it is to, and the path that it takes. Include both the user data messages and the Mobile IP control messages.

2. **(10 pts)** Now, consider the case where *CN* moves to foreign network *B* while *MN* is still in the foreign network *A*. Can *CN* and *MN* still communicate? (Does Mobile IP support both endpoints moving?) Show the message flow to indicate how it will succeed or fail in this case.