CS 428: Second Midterm (Spring ’04)

Answer all problems. You have 1.5 hours to complete this test. Your answers should be concise – short and to the point, but including the important technical issues. Be specific. Clearly state any assumptions. Good luck!

**Problem 1:** (12 points; 5 minutes)
Give very short answers to the following:

- True or False: Silly window syndrome occurs because of the flow control mechanism in TCP
- True or False: Multicast is anonymous (the sender doesn’t know who the receivers are)
- What problem is forcing people to think about a replacement for IP? (single sentence)
- What is a performance problem in Mobile IP? (single sentence)

**Problem 2:** (16 points; 10 minutes) Explain what the following are used for and mention one feature that improves their performance or functionality.

1. Internet Group Management Protocol (IGMP)
2. Border Gateway Protocol (BGP)
3. Link State Multicast
4. IPv6

**Problem 3:** (24 points; 20 minutes) Answer the following questions

1. What factors determine the route between two hosts on the Internet? Is the path generally symmetric (same path from A to B as from B to A)?
2. Compare any two of application level multicast, Mbone, and Core based trees. Be sure to identify the metrics you are using to compare them.
3. What property or properties of TCP make it suitable for use as an end-to-end protocol (that is, make it perform well on all types of connections)

**Problem 4:** (24 points; 20 minutes)
(a) What problems occur due to the limited size of the fields in TCP? Show the problems using an example.
(b) Suggest one solution for each of these problems. Explain how it solves the problem
(c) Would similar solutions be needed for UDP?

**Problem 5:** (24 points; 20 minutes)

(a) (12 points) Why is tunneling prevalent on the Internet – what are two of its major uses (new abilities that tunneling enables, not specific protocols that use it)
(b) (12 points) Alice and Bob are in love. Alice’s Mom is determined to prevent them from seeing each other and therefore grounds Alice indefinitely. But Alice and Bob start sending emails to each other. To prevent Mom from reading these emails, Alice encrypts them. However, Mom being network savvy, figures out that by looking at the IP header of the encrypted packet (which she can get by capturing packets on the cable coming out of Alice’s room), she can figure that the packet is going to Bob. This is enough to get Mom to ground Alice again or even to remove her network access.

One way to fool Mom is for Alice to send email to her friend Carol, who then forwards the email to Bob’s friend David (to fool Bob’s Mom as well). David then forwards the email to Bob.

Suggest a solution using tunneling to allow Alice and Bob to communicate. Does it matter if Carol and David’s Moms are friend of Alice and Bob’s Moms? Does it matter if only one is?

**Problem 6:** (10 points bonus; 10 minutes)
Show a multicast topology (indicating member nodes) where the shortest path tree is different from the minimum load tree. Compare stretch and stress for the two trees.