

Midterm – October 24

Open book section (50 points)

The exam is to be turned in at 2:50 pm. The closed book section should be turned in before you open your books and notes to work the open book section. For the open book section, write your answers on separate pieces of paper.

Problem 1. (12 points)

Consider the following modification to the Ethernet RARP protocol: A machine trying to obtain its IP address uses as the Ethernet destination address of its RARP request the multicast address `0x777777777777` rather than the broadcast address `0xffffffffffff`.

What changes would have to be made to RARP servers and clients to use this new destination address for RARP requests? (The ARP and RARP protocol packet formats are shown on page 55 of Comer. The Ethernet frame is shown on page 19.)

How would this change effect the efficiency of a network of machines?

Problem 2. (6 points)

What is the spanning tree embedded in the mesh of bridged Ethernets shown on the next page by the IEEE 802.1 algorithm? (You may just draw the tree in heavy lines on the figure and turn that in as your answer.)

Problem 3. (13 points)

ICMP, UDP, and TCP each contain their own form of an “echo” protocol.

Can a user process (under BSD) access all three different echoes? If so, how? Compare the difficulties of using each to discover if a remote machine is reachable?

Problem 4. (19 points)

Presently, if an IP gateway receives an IP packet that is too large for the next hop, the packet is fragmented. Let’s consider the following alternative to fragmentation when the IP packet is a TCP segment.

If a gateway receives an IP packet too large for the next hop *and* that IP packet contains a TCP segment, the gateway splits the segment at the TCP level instead of the IP level; that is, the gateway generates several small TCP segments (each encapsulated in its own IP packet) rather than fragmenting the IP datagram.

Describe how the fields of the headers of the new, smaller TCP segments could be derived from those of the original longer segment. Ignore the problems of dealing with URGENT data. (The TCP header is shown on page 140 of Comer.)

Compare the efficiency and robustness of TCP segment splitting (as proposed by you) versus old-fashion IP packet fragmentation.