Final exam – December 14

Open book section (67 points)

The exam is to be turned in at 12:00 NOON. 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. (4 points)

How many possible Internet "class B" logical networks are there?

According to Internet addressing standards, what is the largest number of hosts a class B network can contain?

Problem 2. (4 points)

Name two different kinds of distance metrics used in routing algorithms. Give examples of routing protocols using these metrics.

Problem 3. (13 points)

Suppose you are given three (3) file servers, thirty-three (33) diskless clients, and a spool of Ethernet cable of infinite length. Further assume that each diskless client is equipped with one Ethernet interface card and transceiver while each file server is equipped with two Ethernet interface cards and two transceivers. Draw a *good* interconnection for these thirty-six machines assuming eleven diskless clients are assigned to each file server. [Note: You have *no* bridges.]

Further suppose you are assigned the IP Class C address 195.33.55.0 to use in your network. Describe how you would assign *subnets* within your network? Show the network number and subnet mask of each physical network.

Randomly choose a file server *and* a diskless client in your network. Show the routing tables in both of these machines.

Suppose `mercury.cs.unc.edu` and one of your file servers are interconnected into a two-machine physical network. How does that change your assignment of subnets? How does that change the routing tables in the diskless clients?

Problem 4. (4 points)

Typically, name server mappings of computer name to IP address timeout in about a week while ARP table mappings of IP address to hardware address timeout in about five minutes. Is the extreme difference between the length of the two timeout periods reasonable? Why?

Problem 5. (4 points)

Discuss the tradeoffs between having a caching name server on each workstation versus having one caching name server for an entire department of one hundred (100) workstations.

Problem 6. (10 points)

We looked at three different network file systems: Sun's NFS, RTI's FreedomNet, and ITC's Andrew File System. Describe how the differences among these file systems must influence the actions taken to implement the `close` system call.

Problem 7. (10 points)

Flooding algorithms are used both in the 802.1 standard for bridged LANs [Backes] and in the directory search function of SNA [Baratz *et al.*, pp. 421-422]. However, the flooding algorithm of LANs can only be applied to LANs in which a *spanning tree* has been embedded while the SNA algorithm can be applied to arbitrary topologies.

Explain why the SNA algorithm can be applied in these more general cases. Either outline an SNA-like algorithm to set up bridge forwarding tables in an arbitrary interconnection, via bridges, of Ethernets or explain why such an algorithm cannot be constructed.

Problem 8. (4 points)

In Gusella and Zatti's analysis of TEMPO, it is assumed that the interval between clock ticks is the same on all systems being synchronized. However, this is often not the case; for example, VAX ticks are 10 milliseconds apart while Sun ticks are 20 milliseconds apart.

Will the TEMPO algorithm work well when two systems have different clock tick intervals? If not, how should the algorithm be modified to work under these circumstances. Describe how Gusella and Zatti's analysis can be modified to justify your answer.

Problem 9. (4 points)

Briefly explain the tradeoff between increased concurrency and the increased chance of deadlock with which the ARGUS programmer must contend.

Problem 10. (10 points)

Suppose hosts X and Y want secure access to a few of each other's files using NFS based on the secure RPC authentication protocol described by Taylor. If a "spy" installs a machine S on the same LAN segment as X, what mischief can S perform without being detected? (Yes, S could "jam" the LAN, but not for long.) Can S impersonate X when talking to Y?

Now suppose that the spy has discovered that X and Y are not on the same LAN segment but are connected via a gateway G. If the spy replaces G with a spy gateway G_S, can G_S be used to impersonate X when talking to Y?