Midterm for CS 239, Lecture 3
Spring 1995

This is a take-home midterm. You may use any written materials or materials you retrieve via the net. You may not ask for help from anyone else, including posting requests on the net. You may ask me any questions you please, but I might not answer all of them.

Take 2 hours to complete this midterm. Time spent looking up materials and reading them counts against this limit. The test will be due at the start of class on Thursday, May 11.

There are three sections to the test. Choose one of the two questions from each section. All questions are in essay form, and your answers should be 1000 words or less for each. All questions are equally weighted in your grade.

Please submit your answers in printed text form. Formatting, spelling, and grammar will not count against you, unless they are so bad I cannot understand what you're trying to say. Include diagrams, if you wish, but making them counts against your time limit.

Good luck.

Section 1: File Systems (answer one of questions 1 and 2)

Question 1: Flash memory is a new form of solid state memory for long term storage. It is randomly accessible, like RAM, yet stores its values when power is off. Flash memory reads are fast (slightly longer than RAM reads), but writes take very much longer. A given piece of flash memory can only be written a certain number of times (perhaps several tens of thousands) before it begins to degrade. When sufficiently degraded, it can no longer be either written or read. Describe how these characteristics would affect the implementation of a file system built for flash memory, including commentary on achieving high performance, minimizing and handling failures due to degradation, and reliability in the face of crashes.

Question 2: Stackable layers file system technology has the possibility of poor performance for several reasons. Describe those reasons and measures that implementors of both the stackable layers infrastructure and the individual layers can take to counter possible performance problems.

Section 2: Interprocessor Communications (answer one of questions 3 and 4)

Question 3: Describe in detail how to implement Unix-style pipes using shared memory. Include descriptions of all important aspects of a pipe, including connecting to its ends, its fixed capacity, and pipe synchronization behavior.

Question 4: When performing interprocess communications in a distributed system, varying degrees of transparency in the IPC facility are possible. Discuss the extent to which RPC, shared memory, messages, and pipes should be transparent in a local area network environment, and in an Internet environment.

Section 3: Security (answer one of questions 5 and 6)

Question 5: Contrast the approaches Privacy Enhanced Mail and Kerberos have taken towards authentication. Describe the strengths and weaknesses of each approach, and what can be done to improve each of them using smartcards.

Question 6: You are designing a kernel service to protect a system against attacks by viruses. What are the advantages and disadvantages in this case for basing your access protection mechanisms on capabilities? On access control lists?