CS 4513 Distributed Computing Systems WPI, B Term 2001
Craig E. Wills Midterm Exam (100 pts)
Given: Tuesday, November 20, 2001

NAME:____________________________________

This is a closed book (and notes) examination. Answer all questions on the exam itself. Take the number of points assigned to each problem and the amount of space provided for your answer as a measure of the length and difficulty of the expected solution. The exam totals 100 points.

SCORE:____________________________________

1. (7 points) What is a file?

2. (12 points) What is the distinguished feature of a journal-based (or log-based) file system? What are its advantages and disadvantages? Give an example of a file system that supports journaling.

3. (12 points) You are building an RPC mechanism. The RPC client sends a request to an RPC server. How can an RPC request fail and how does the client determine that a failure has occurred?

   In the case of failure, how can your RPC mechanism provide each of the following semantics:

   (a) at least once

   (b) at most once

   (c) exactly once

4. (7 points) An issue in distributed systems is scalability. Give an example in distributed systems where this issue matters.

5. (9 points) Where is the size for each file stored in each of the following file systems?

   (a) FAT

   (b) NTFS

   (c) Unix

6. (9 points) Where is the name for a file stored in each of the following file systems?

   (a) FAT

   (b) NTFS

   (c) Unix

7. (9 points) What must the file system software do to access the *nth* byte of a file in each of the following file systems where *n* is an integer smaller than the size of the file?

   (a) FAT

   (b) NTFS

   (c) Unix

8. (7 points) What is the difference between a distributed operating system and a network operating system?

9. (12 points) In project 1, you added user-defined attributes to an existing file system.

   (a) Assume a user added the attribute `App` with value of `emacs` to the file `foo.c`. What routine would be invoked and how would it store this attribute in your file system?

   (b) Assume a user wanted to determine the *names* of the user-defined attributes available for a file `bar.h`. What routine would be invoked and how would this routine determine the set of attributes? How could the *values* of these attributes be obtained?

10. (8 points) A simple operating system only supports a single directory, but allows the directory to have arbitrarily many files with arbitrarily long file names. Can the file system be made to look like a hierarchical file system for its users? If so, indicate how. If not, indicate why.

11. (8 points) In Unix, space for file inodes is allocated at the beginning of a partition with directory entries containing the index of an inode for each file. Consider an alternate design where a separate inode space is not used, but rather the inode information for each file is stored in the first data block for the file. In this design, directory entries contain the first data block number for each file. Discuss the pros and cons of this design alternative.