Homework 9

1. Exercise 13.9 (10 points) Consider a file system in which a file can be deleted and its disk space reclaimed while links to that file still exist. What problems may occur if a new file is created in the same storage area or with the same absolute path name? How can these problems be avoided?

2. Exercise 13.10 (10 points) The open-file table is used to maintain information about files that are currently open. Should the operating system maintain a separate table for each user or maintain just one table that contains references to files that are currently being accessed by all users? If the same file is being accessed by two different programs or users, should there be separate entries in the open-file table? Explain.

3. Exercise 14.8 (10 points) Contrast the performance of the three techniques for allocating disk blocks (contiguous, linked, and indexed) for both sequential and random file access.

4. (10 points) Suppose an application opens a file, sets the read pointer to address 2,112 (0x840) and calls the read( ) system call to read one byte from the file. How many different blocks or contiguous regions on the disk are accessed to service the read( ) system call? Describe each access and explain your answer. For file systems that use blocks, assume a block size of 512 (0x200) bytes.

a. Contiguous
b. Linked without a FAT (File Allocation Table)
c. Linked with a FAT (File Allocation Table)
d. Indexed

5. (10 points) Some file systems allow disk storage to be allocated at different levels of granularity. For instance, a file system could allocate 4 KB of disk space as a single 4-KB block or as eight 512-byte blocks.

a. How could we take advantage of this flexibility to improve performance?
b. What modifications could be made to the bitmap free-space management scheme in order to support this feature?

6. (10 points) Consider a file system that uses Unix-style inodes (index nodes) to represent files. Blocks are 16 KB in size, and a pointer to a disk block requires 8 bytes. The file system has 16 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?