McGill

"Inverse" Programming Assignment #4: File Systems

Due: April 13, 2005 @ 11:55pm

What is required as part of this assignment?

You are given the C source files for a very simple file system. Study these source files carefully and answer the following questions. Each question is worth 10 points unless specified otherwise.

1. Explain the operation of following file system commands. Your explanations should be clear and complete. Don't repeat the C code. Explain at a high level the significant operations that are performed by the commands. One appropriate/recommended way is to give the pseudo-code. Limit the length of the pseudo-code to 30 lines. **[20 pts]**
    a. read a block/variable from file system
    b. write a block/variable to file system
2. How does the file system allocate blocks? That is, what data structure is used and what is the allocation policy? How does this compare to the policies you studied for memory allocation?
3. How does the file system track the free blocks? Compare this with the approach you studied or implemented with the memory allocation assignment?
4. Can the above techniques for implementing the file allocation table and free list scale for very large file system sizes? What are the major limiting issues?
5. For a given memory size M (maximum memory you are willing to allocate for file system data structures excluding data), find the maximum file system size.
6. For the same value of M, can you improve the file system size? Sketch your approach in the form a pseudo-code. If you cannot find a solution explain the reasons.
7. File systems not only store the actual user data. They also store *meta* data. Meta data is defined as the information that describes how the user data is organized in the file system. For the given simple file system, identify the meta data.
8. Suppose you are implementing this file system on a flash memory card. You can assume constant latencies for reading data from the flash card that are independent of the locations. Derive an expression for turnaround time for the reading operation (hint: as the first step identify the key factors that impact the file system reading command). **[20 pts]**