

CSE 121 Winter 2005

Homework 1

Due: Thursday, January 20 2005

Operating System Review

1. Briefly explain the difference between a thread and a process
2. One of the main goals of operating systems is the distribution of resources. Give a general explanation of how modern OS's multiplex the following resources (i.e. name the mechanism and give a two sentence description of what the mechanism does):
 - (a) CPU
 - (b) Physical Memory
 - (c) Disk

Fast File System

3. Assume a block size of 4k and that an inode has 12 direct pointers, 3 indirect pointers, 1 double indirect pointer and 1 triple indirect pointer (while all other indirect blocks have 16 pointers). How many block reads are required to read a file of size 1,378,000 bytes. Assume no cache and that all data must be fetched from disk.
4. The FFS paper mentions that doubling block size roughly doubles bandwidth. Explain why this is true. Why do the OS designers not simply continue doubling block size to achieve very high bandwidth performance?
5. Define the freespace reserve and briefly describe why it is necessary.
6. This question is about the relative performance of reads and writes in the old unix file system and in FFS. For each of the two questions, circle one of the given options that makes the sentence true. For example, in question (a) if you believe reads were faster than writes in the old unix file system, circle "reads" in the first selection, "fasterthan" in the second selection, and "writes" in the third selection.
 - (a) In the old unix file system, (reads |writes) were (fasterthan |sameas) (reads |writes). Explain why.
 - (b) In FFS, (reads |writes) are (fasterthan |sameas) (reads |writes). Explain why.

Log Structured File System

7. Changing trends in technology often shape the direction of research. What was the primary assumption regarding file systems that motivated LFS? How does this contradict with the assumptions made by FFS?
8. Define metadata. Why are metadata writes traditionally synchronous? Assume that FFS had asynchronous metadata writes and describe a situation where a system crash would be very bad.
9. Given a file name, describe the steps needed to read the first data block of that file in terms of accesses to LFS data structures.