

Bài Tập Hệ Thống Tập Tin Và Quản Lý Đĩa

1. Xét 1 hệ thống tập tin với các khối 4096Bytes và các con trỏ khối đĩa và tập tin 32 bit, mỗi tập tin có 13 con trỏ trực tiếp, 4 con trỏ gián tiếp cấp 1, 1 con trỏ gián tiếp cấp 2, 1 con trỏ gián tiếp cấp 3. Tính :
 - a. Kích thước đĩa tối đa có thể được hỗ trợ
 - b. Kích thước tập tin tối đa
2. Giả sử ổ đĩa có 5000 cylinder, được đánh số từ 0 tới 4999. Hiện tại ổ đĩa đang phục vụ yêu cầu tại cylinder 143 và trước đó ở cylinder 125, hàng đợi các yêu cầu sắp xảy ra theo thứ tự FIFO là : 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130
Bắt đầu từ vị trí hiện tại, tính tổng khoảng cách (theo số cylinder) mà đầu từ phải di chuyển để thỏa mãn các yêu cầu sắp xảy ra theo các thuật toán : FCFS, SSTF, SCAN, LOOK, C-SCAN và C-LOOK
3. Xét hệ thống tập tin với các khối 2048 bytes và các con trỏ khối file và đĩa 32 bit. Mỗi file có 12 con trỏ trực tiếp, 1 con trỏ gián tiếp cấp 1, 1 con trỏ gián tiếp cấp 2, 1 con trỏ gián tiếp cấp 3.
 - a. Hệ thống tập tin này có thể hỗ trợ đĩa lớn bao nhiêu
 - b. Kích thước tối đa của tập tin là bao nhiêu
4. A floppy disk has 40 cylinders. A seek takes 6 msec per cylinder moved. If no attempt is made to put the blocks of a file close to each other, two blocks that are logically consecutive (i.e., follow one another in the file) will be about 13 cylinders apart, on the average. If, however, the operating system makes an attempt to cluster related blocks, the mean interblock distance can be reduced to 2 cylinders (for example). How long does it take to read a 100-block file in both cases, if the rotational latency is 100 msec and the transfer time is 25 msec per block?
5. A certain file system uses 2-KB disk blocks. The median file size is 1 KB. If all files were exactly 1 KB, what fraction of the disk space would be wasted? Do you think the wastage for a real file system will be higher than this number or lower than it? Explain your answer.
6. The MS-DOS FAT-16 table contains 64K entries. Suppose that one of the bits had been needed for some other purpose and that the table contained exactly 32,768 entries instead. With no other changes, what would the largest MS-DOS file have been under this conditions?
7. A UNIX file system has 1-KB blocks and 4-byte disk addresses. What is the maximum file size if i-nodes contain 10 direct entries, and one single, double, and triple indirect entry each?
8. A Compact Disc holds 74 min of music or 650 MB of data. Make an estimate of the compression factor used for music.
9. Suppose that we have a disk with the following parameters:
 - 750GB in size
 - 12000 RPM, Data transfer rate of 40 Mbytes/s (40×10^6 bytes/sec)
 - Average seek time of 8ms

- ATA Controller with 2ms controller initiation time
 - A block size of 4Kbytes (4096 bytes)
- a. What is the average time to read a random block from the disk (assuming no queueing at the controller). Show your work. *Hint: there are 4 terms here.*
 - b. Given the same parameters from above, assume that the operating system has exploited locality by grouping related blocks together in the filesystem. As a result, the typical access pattern is not as random as in (a). It typically retrieves 10 blocks sequentially at a time and spends only 1 ms for each seek. What is the average time to read a single block now? Show your work.
10. Rather than writing updated files to disk immediately when they are closed, many UNIX systems use a delayed write-behind policy in which dirty disk blocks are flushed to disk once every 30 seconds.
- a. List two advantages and one disadvantage of such a scheme:
 - b. Describe a technique that can be used to mitigate the disadvantage of (a) without losing the advantages of (a). Be explicit here
11. Consider a file system with 4096 byte blocks and 32-bit disk and file block pointers. Each file has 13 direct pointers, 4 singly-indirect pointers, a doubly-indirect pointer, and a triply-indirect pointer. In the following be explicit about your work:
- a. What is the maximum disk size that can be supported? Explain.
 - b. What is the maximum file size? Explain.
 - c. Give some reasonable assumptions and compute the number of inodes that can fit into a disk block
12. Suppose that video files are laid out in 64K (65536 bytes) chunks on the disk (i.e. 64K in successive sectors on a track). Compute the overhead for reading such a 64K chunk from a random place on the disk. Assume that the disk controller automatically DMA's the data to kernel memory in a fashion that is overlapped with reading it from the disk (so that you do not have to worry about DMA for this operation). After finishing, the controller generates an interrupt; the interrupt routine may submit another request to the controller (if one is queued on the DDRQ). Assume the disk parameters given above (repeated here):
- 750GB in size
 - 10000 RPM, Data transfer rate of 50 Mbytes/s (50×10^6 bytes/sec)
 - Average seek time of 4ms
 - ATA Controller with 1ms controller initiation time
 - A block size of 4Kbytes (4096 bytes)
- a. What is the total time to read 64K chunk from a random place on the disk into memory including the interrupt? *Hint: there are 5 terms here including the interrupt!*
 - b. Now, assume that the video player works by sending requests for 64KB (=65536 bytes) at a time to the video server. Assuming that these requests are pipelined for maximum bandwidth, at what rate must it send these requests to achieve the bandwidth of a?

- c. Compute the total processor overhead for satisfying a 64K request at the server. Processor overhead includes (1) interrupts, (2) header generation overhead and (3) copying overhead. Note that generating a byte of header is as expensive as copying. Processor overhead does not include DMA or disk controller actions since these are overlapped with the CPU. The data portion of a request message is 16 bytes.