CSC 139 Operating System Principles
Homework 3

Spring 2020

Posted on May 6.

Exercise 1. (OSC 11.13) (18%) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2150, and the previous request was at cylinder 1805. The queue of pending requests, in FIFO order, is: 2069, 1212, 2296, 2800, 544, 1618, 356, 1523, 4965, 3681. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?

- FCFS

- SSTF

- SCAN

- LOOK

- C-SCAN

- C-LOOK

Exercise 2. (12%) One way to use contiguous allocation of the disk and not suffer from holes is to compact the disk every time a file is removed. Since all files are contiguous, copying a file requires a seek and rotational delay to read the file, followed by the transfer at full speed. Writing the file back requires the same work. Assuming a seek time of 5 msec, a rotational delay of 4 msec, a transfer rate of 80 MB/sec, and an average file size of 8 KB, how long does it take to read a file into main memory and then write it back to the disk at a new location? Using these numbers, how long would it take to compact half of a 16-GB disk?

Exercise 3. (8%) Given a disk-block size of 4 KB and block-pointer address value of 4 bytes, what is the largest file size (in bytes) that can be accessed using 10 direct addresses and one indirect block?

Exercise 4. (12%) The blocksize of a filesystem is 2048 bytes. Consider an inode with 8 pointers point to direct blocks, 3 pointers point to single indirect blocks, and 1 pointer points to a double indirect block. If block numbers (disk addresses) take 4 bytes, what is the maximum file size possible? Why? (Hints: Textbook Figure 14.8; Slides 4-3 p44 & p46)

Please complete the following survey questions:

1. How much time did you spend on this homework?

2. Rate the overall difficulty of this homework on a scale of 1 to 5 with 5 being the most difficult.

3. Provide your comments on this homework (e.g., amount of work, difficulty, relevance to the lectures, form of questions, etc.)