

CS314 Operating System

Spring 2024

Exercise Questions on March 21st, 2024

EXERCISE #1:

Assume that the directory of your target file (the one you are about to access) has been loaded to the memory (from the hard disk), but none of the file's i-nodes. How many disk accesses are needed in the worst case when you try to read one byte in the file using the following assumptions?

- (a) The location of the one byte you try to read is 1,049,188 bytes from the beginning of the file.
- (b) The disk block size in the i-node file system is 256 bytes.
- (c) Each "pointer (to a disk block)" in the i-node file system is 4 bytes.
- (d) Your hard drive can access a disk block (i.e., one disk block is one disk sector).

Show your work.

EXERCISE #2:

For the same situation as above (EXERCISE #1), which of MAS FAT-16 or UNIX i-node files system will be faster in reading the one byte in your file?

For FAT-16, assume the followings:

- (e) The entire FAT has been loaded.
- (f) Multiple sectors in a cluster can be accessed (read) as one disk access.

EXERCISE #3:

Compare FAT-16 and UNIX i-node file system (assume that the sector (disk block) size is 256 bytes), for "storage capacity utilization".

Which one will be better than the other? Why?

EXERCISE #4:

Compare FAT-16 and UNIX i-node file system for “reliability”. The term “reliability” is defined as the amount of information we expect to retrieve from a target file when a disk sector that involves in accessing to a file is damaged (i.e., “bad sector” – no longer can be accessed).

Which one will be better than the other? Why?

EXERCISE #5:

Suppose that you have a hard disk that has a physical capacity of 4 GB (2^{32} bytes). If you format the hard drive using FAT-16, find the expected disk space utilization (in %) for the following assumptions:

- The disk sector size is 256 bytes
- The average file size is 21 KB ($= 21 \times 2^{10}$ bytes)