Exercise session
(File Systems / I/O Systems)

Operating Systems – EDA092/DIT400

UNIVERSITY OF
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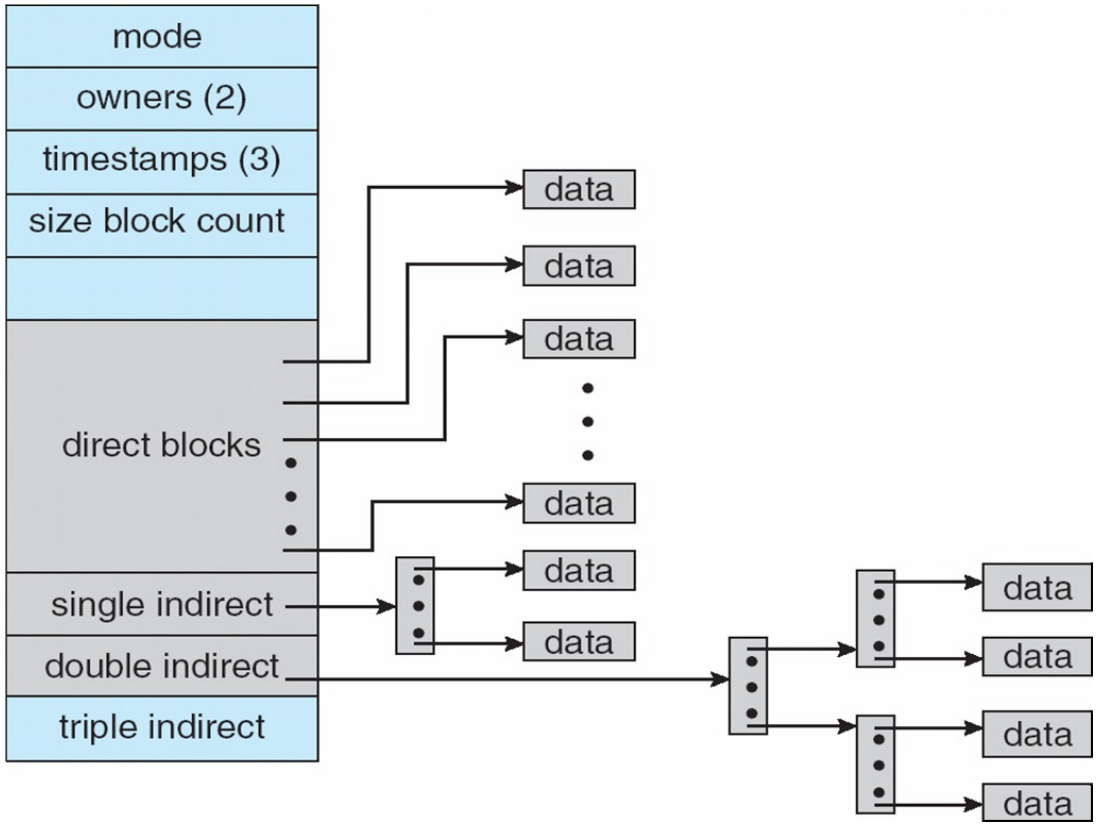
Question 1

Consider a file system that uses i-nodes to represent files. Disk blocks are 8-KB in size and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, plus single, double, and triple indirect disk blocks (as shown in the picture). What is the maximum size of a file that can be stored in this file system?



Question 1 - Answer

(12 * 8 /KB/) + (2048 * 8 /KB) + (2048 * 2048 * 8 /KB/)
+ (2048 * 2048 * 2048 * 8 /KB) = 64 terabytes

Question 2

What are the advantages of the variation of linked allocation that uses a FAT to chain together the blocks of a file?

Question 2 - Answer

The advantage is that while accessing a block that is stored at the middle of a file, its location can be determined by chasing the pointers stored in the FAT as opposed to accessing all of the individual blocks of the file in a sequential manner to find the pointer to the target block. Typically, most of the FAT can be cached in memory and therefore the pointers can be determined with just memory accesses instead of having to access the disk blocks.

Question 3

Consider a system where free space is kept in a free-space list. Suppose that the pointer to the free-space list is lost. Can the system reconstruct the free-space list? Explain your answer

Question 3 - Answer

In order to reconstruct the free list, it would be necessary to perform “garbage collection.” This would entail searching the entire directory structure to determine which pages are already allocated to jobs. Those remaining unallocated pages could be relinked as the free-space list.