Exercise session
(File Systems / I/O Systems)

Operating Systems – EDA092/DIT400

UNIVERSITY OF
GOTHENBURG

Question 1

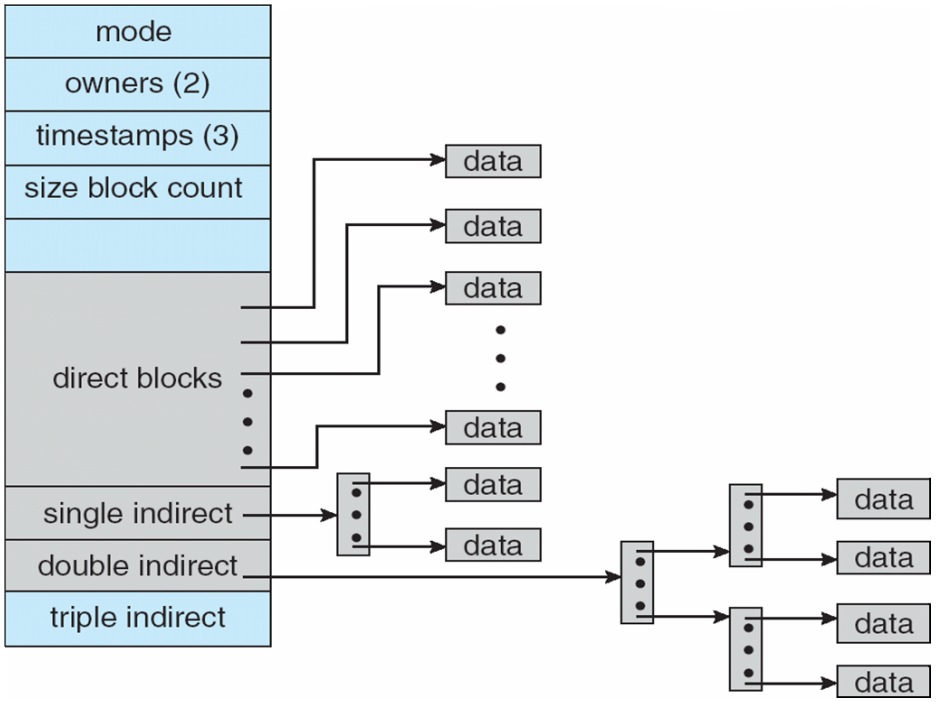
What are the advantages of the variation of linked allocation that uses a FAT to chain together the blocks of a file?

Question 2

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

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 4

Consider a file system similar to the one used by UNIX with indexed allocation. How many disk I/O operations might be required to read the contents of a small local file at /a/b/c? Assume that none of the disk blocks is currently being cached.

Question 5

Some file systems allow disk storage to be allocated at different levels of granularity. For instance, a file system could allocate 4 KB of disk space as a single 4-KB block or as eight 512-byte blocks. How could we take advantage of this flexibility to improve performance? What modifications would have to be made to the free- space management scheme in order to support this feature?

Question 6

When multiple interrupts from different devices appear at about the same time, a priority scheme could be used to determine the order in which the interrupts would be serviced. Discuss what issues need to be considered in assigning priorities to different interrupts.

Question 7

What are the various kinds of performance overheads associated with servicing an interrupt?

Question 8

Some systems provide file sharing by maintaining a single copy of a file; other systems maintain several copies, one for each of the users sharing the file. Discuss the relative merits of each approach.

Question 9

Typically, at the completion of a device I/O, a single interrupt is raised and appropriately handled by the host processor. In certain settings, however, the code that is to be executed at the completion of the I/O can be broken into two separate pieces. The first piece executes immediately after the I/O completes and schedules a second interrupt for the remaining piece of code to be executed at a later time. What could be the purpose of using this strategy in the design of interrupt handlers? In case of disk I/O, what could be done when handling the first interrupt and the second interrupt?

Question 10

Consider a file system on a disk that has both logical and physical block sizes of 512 bytes. Assume that the information about each file is already in memory. For the linked-list allocation strategy, answer these questions:

1. How is the logical-to-physical address mapping accomplished in this system?
2. If we are currently at logical block 10 (the last block accessed was block 10) and want to access logical block 4, how many physical blocks must be read from the disk?