Chapter 11

11.6 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 inmemory. For each of the three allocation strategies (contiguous, linked, and indexed), answer these questions:
a. How is the logical-to-physical address mapping accomplished in this system? (For the indexed allocation, assume that a file is always less than 512 blocks long.)
b. If we are currently at logical block 10 (the last block accessedwas block 10) and want to access logical block 4, how many physical blocks must be read from the disk?
Answer:
Let *Z* be the starting file address (block number).
1). Contiguous. Divide the logical address by 512 with *X* and *Y* the resulting quotient and remainder respectively.

a. Add *X* to *Z* to obtain the physical block number. *Y* is the displacement into that block.

b. 1

2). Linked. Divide the logical physical address by 511 with *X* and *Y* the resulting quotient and remainder respectively.

a. Chase down the linked list (getting *X* + 1 blocks). *Y* + 1 is the displacement into the last physical block.

b. 4

3). Indexed. Divide the logical address by 512 with *X* and *Y* the resulting quotient and remainder respectively.

a. Get the index block into memory. Physical block address is contained in the index block at location *X*. *Y* is the displacement into the desired physical block.

c. 2

11.7 Fragmentation on a storage device could be eliminated by recompaction of the information. Typical disk devices do not have relocation or base registers (such as are used when memory is to be compacted), so how can we relocate files? Give three reasons why recompacting and relocation of files often are avoided.
Answer:

Relocation of files on secondary storage involves considerable overhead—data blocks would have to be read into main memory and written back out to their new locations. Furthermore, relocation registers apply only to *sequential* files, and many disk files are not sequential.

For this same reason, many new files will not require contiguous disk space; even sequential files can be allocated noncontiguous blocks if links between logically sequential blocks are maintained by the disk system.