

CSCU9V4 Systems: Tutorial 5

1. CDs and DVDs can hold quite a large amount of data. However, data is stored on a continuous spiral, unlike the way data is stored on a magnetic disk.
 - Why do you think that the data storage was designed in this way?
 - What difference does this make? (Consider: adding new files, and altering an existing file.)
2. A hard disk drive has 12 platters. The top and bottom surfaces are not used for recording. Each surface has 2500 tracks, 110 sectors/track, and 1024 bytes/sector.
 - Calculate the disk unit's total capacity.
 - If the disk rotates at 9000 rpm, how long is a single sector under the reading head?
 - What is the data rate for the transfer of a single sector?
 - If it takes 1ms to seek from one track to the next, how long would it take to go from the innermost cylinder to the outermost cylinder, assuming constant head velocity? Is this likely to be correct in practice?
3. A computer has 16 pages of virtual address space but only 4 physical page frames. Assume that the main memory is initially empty. A program references the virtual pages in the order:

0, 7, 2, 7, 5, 8, 9, 2, 4

 - a) Work out which pages will be in the physical memory, and which references cause a page fault if a least recently used (LRU) replacement technique is used?
 - b) Do the same for first in first out (FIFO) scheduling (in which the physical page loaded first is replaced first, whether it has been used recently or not)?
4. A (more realistic) computer has 512 Mbytes of main memory, and uses 4Kbyte pages.
 - How many pages can fit in the main memory?
 - It uses 32 bit addressing. How large is the virtual memory?
 - How big would the page table be?
 - If the architecture had a 64 bit address, how big would the page table be? Is this realistic?
5. A virtual memory has a page size of 1024 bytes, eight virtual pages, and four physical pages. The page table of the MMU is as follows:

Virtual Page	Physical Page number
0	3
1	1
2	not in main memory
3	not in main memory
4	2
5	not in main memory
6	0
7	not in main memory

- a) Make a list of all virtual addresses that will cause page faults.
- b) What are the physical addresses for the virtual addresses 0, 3278, 1023, 1024, 1025, 7800, and 4096?