

Operating Systems and Systems Programming (15B11CI412)

Tutorial - 7 Memory Management

1. Name two differences between logical and physical addresses.
2. Consider a system in which a program can be separated into two parts: code and data. The CPU knows whether it wants an instruction (instruction fetch) or data (data fetch or store). Therefore, two base-limit register pairs are provided: one for instructions and one for data. The instruction base-limit register pair is automatically read-only, so programs can be shared among different users. Discuss the advantages and disadvantages of this scheme.
3. Why are page sizes always powers of 2?
4. What is the effect of allowing two entries in a page table to point to the same page frame in memory? Explain how this effect could be used to decrease the amount of time needed to copy a large amount of memory from one place to another. What effect would updating some byte on the one page have on the other page?
5. Describe a mechanism by which one segment could belong to the address space of two different processes.
6. Sharing segments among processes without requiring that they have the same segment number is possible in a dynamically linked segmentation system.
 - (a) Define a system that allows static linking and sharing of segments without requiring that the segment numbers be the same.
 - (b) Describe a paging scheme that allows pages to be shared without requiring that the page numbers be the same.

7. Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. Perform the allocation of processes using-
- (a) First Fit Algorithm
 - (b) Best Fit Algorithm
 - (c) Worst Fit Algorithm
8. A certain computer system has the segmented paging architecture for virtual memory. The memory is byte-addressable. Both virtual and physical address spaces contain 2^{16} bytes each. The virtual address space is divided into 8 non-overlapping equal size segments. The memory management unit (MMU) has a hardware segment table, each entry of which contains the physical address of the page table for the segment. Page tables are stored in the main memory and consist of 2-byte page table entries. What is the minimum page size in bytes so that the page table for a segment requires at most one page to store it?
9. A certain computer system has the segmented paging architecture for virtual memory. The memory is byte addressable. Both virtual and physical address spaces contain 2^{16} bytes each. The virtual address space is divided into 8 non-overlapping equal size segments. The memory management unit (MMU) has a hardware segment table, each entry of which contains the physical address of the page table for the segment. Page tables are stored in the main memory and consist of 2-byte page table entries. Assume that each page table entry contains (besides other information) 1 valid bit, 3 bits for page protection and 1 dirty bit. How many bits are available in the page table entry for storing the aging information for the page? Assume that page size is 512 bytes.