Lista 3

Chapter 8

8.1 Explain the difference between internal and external fragmentation.

8.3 Why are segmentation and paging sometimes combined into one scheme?

8.4 Most systems allow a program to allocate more memory to its address space during execution. Allocation of data in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following schemes?
a. Contiguous memory allocation
b. Pure segmentation
c. Pure paging

8.5 Consider the Intel address-translation scheme shown in Figure 8.22.
a. Describe all the steps taken by the Intel Pentium in translating logical address into a physical address.
b. What are the advantages to the operating system of hardware that provides such complicated memory translation?
c. Are there any disadvantages to this address-translation system? If so, what are they? If not, why is this scheme not used by every manufacturer?

8.7 Explain why sharing a reentrant module is easier when segmentation is used than when pure paging is used.

8.9 Compare the segmented paging scheme with the hashed page table scheme for handling large address spaces. Under what circumstances is one scheme preferable to the other?

8.11 Compare paging with segmentation with respect to the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses.

8.13 Consider the following process for generating binaries. A compiler is used to generate the object code for individual modules, and a linkage editor is used to combine multiple object modules into a single program binary. How does the linkage editor change the biding of instructions and data to memory addresses? What information needs to be passed from the compiler to the linkage editor to facilitate the memory-binding tasks of the linkage editor?

8.15 Consider the hierarchical paging scheme used by the VAX architecture. How many memory operations are performed when a user program executes a memory-load operation?

8.18 Consider a computer system with a 32-bit logical address and 4-KB page size. The system supports up to 512MB of physical memory. How many entries are there in each of the following?
a. A conventional single-level page table
b. An inverted page table

Chapter 9

9.7 A simplified view of thread states is Ready, Running, and Blocked, where a thread is either ready and waiting to be scheduled, is running on the processor, or is blocked (i.e. is waiting for I/0.) This is illustrated in Figure 9.31. Assuming a thread is in the Running state, answer the following questions: (Be sure to explain your answer.)

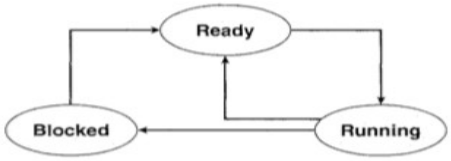

Figure 9.31 Thread state diagram for Exercise 9.7.

a. Will the thread change state if it incurs a page fault? If so, to what new state?
b. Will the thread change state if it generates a TLB miss that is resolved in the page table? If so, to what new state?
c. Will the thread change state if an address reference is resolved in the page table? If so, to what new state?

9.10 Consider a system that allocates pages of different sizes to its processes. What are the advantages of such a paging scheme? What modifications to the virtual memory system provide this functionality?

9.12 Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

9.14 Consider a system that provides support for user-level and kernel- level threads. The mapping in this system is one to one (there is a corresponding kernel thread for each user thread). Does a multithreaded process consist of (a) a working set for the entire process or (b) a working set for each thread? Explain.

9.28 A certain computer provides its users with a virtual memory space of 2^{32} bytes. The computer has 2^{18} bytes of physical memory. The virtual memory is implemented by paging, and the page size is 4,096 bytes. A user process generates the virtual address 11123456. Explain how the system establishes the corresponding physical location. Distinguish between software and hardware operations.

9.29 When virtual memory is implemented in a computing system, there are certain costs associated with the technique and certain benefits. List the costs and the benefits. Is it possible for the costs to exceed the benefits? If it is, what measures can be taken to ensure that this does not happen?

9.32 Is it possible for a process to have two working sets, one representing data and another representing code? Explain.