Main Memory

Practice Exercises

9.1 Name two differences between logical and physical addresses.

9.2 Why are page sizes always powers of 2?

9.3 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.

9.4 Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames.

    a. How many bits are there in the logical address?

    b. How many bits are there in the physical address?

9.5 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 one page have on the other page?

9.6 Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)?

9.7 Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers):

    a. 3085

    b. 42095

     c. 215201

     d. 650000

     e. 2000001

9.8 The BTV operating system has a 21-bit virtual address, yet on certain embedded devices, it has only a 16-bit physical address. It also has a 2-KB page size. How many entries are there in each of the following?

     a. A conventional, single-level page table

     b. An inverted page table

What is the maximum amount of physical memory in the BTV operating system?

9.9 Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames.

     a. How many bits are required in the logical address?

     b. How many bits are required in the physical address?

9.10 Consider a computer system with a 32-bit logical address and 4-KB page size. The system supports up to 512 MB 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