**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

**10.1** Under what circumstances do page faults occur? Describe the actions

taken by the operating system when a page fault occurs.

A page fault occurs when an access to a page that has not been brought into main memory takes place. The operating system verifies the memory access, aborting the program if it is invalid. If it is valid a free frame is located and I/O requested to read the needed page into the free frame

Apage fault may occur at any memory

reference.

Apage fault may occur at any memory

reference. If the page fault occurs on the instruction fetch, we can restart by

fetching the instruction again. If a page fault occurs while we are fetching an

operand, we must fetch and decode the instruction again and then fetch the

operand.

When a page fault occurs, the operating system must bring the desired page

from secondary storage into main memory. To resolve page faults, most operating

systems maintain a **free-frame list**, a pool of free frames for satisfying

such requests (Figure 10.6). (Free frames must also be allocated when the stack

or heap segments from a process expand.) Operating systems typically allo

cate free frames using a technique known as **zero-fill-on-deman** . Zero-fillon-

demand frames are “zeroed-out” before being allocated, thus erasing their

previous contents. (Consider the potential security implications of ***not*** clearing

out the contents of a frame before reassigning it.)

When a system starts up, all available memory is placed on the free-frame

list. As free frames are requested (for example, through demand paging), the

size of the free-frame list shrinks. At some point, the list either falls to zero or

falls below a certain threshold, atwhich point it must be repopulated

**10.2** Assume that you have a page-reference string for a process with *m*

frames (initially all empty). The page-reference string has length *p*, and

*n* distinct page numbers occur in it. Answer these questions for any

page-replacement algorithms:

a. What is a lower bound on the number of page faults?

b. What is an upper bound on the number of page faults?

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