

CS4320 (Principles of Operating Systems): Homework 2

Assigned: October 24, 2000.

Due: October 31, 2000, by 5pm.

Credit: 30 points.

Reading

Be sure you have read chapters 8 and 9. (You can skim sections 8.7, 9.5, 9.6, 9.7, and 9.9.)

Problems

Turn in hardcopy answers (either handwritten or generated by your favorite word-processing or text-formatting program) to the following problems.

1. (3 points) Consider a simple contiguous-allocation scheme for assigning memory to processes, as described in class and in section 8.4.2 of Silberschatz and Galvin. Suppose that as a result of previous activity memory contains the following. (To keep the notation simple, memory amounts will be in bytes and ridiculously small.)

Locations	Contents
0 – 1999	Operating system
2000 – 2999	Free
3000 – 4999	Process A
5000 – 5499	Free
5500 – 6499	Process B
6500 – 9499	Free
9500 – 9999	Process C

Now suppose we want to start a process requiring 400 bytes of memory. At what location will main memory be allocated for this process if we use

- a first-fit strategy for allocating memory?
 - a best-fit strategy?
 - a worst-fit strategy?
2. (4 points) Exercise 8.8 from Silberschatz and Galvin. (Interpret “word” to mean the smallest addressable unit of memory.)
 3. (4 points) Exercise 8.9 from Silberschatz and Galvin.
 4. (4 points) Exercise 8.11 from Silberschatz and Galvin.
 5. (3 points) Suppose you have a system in which pages are of size 64K (65536) bytes and addresses (both logical and physical) are 18 bits, and suppose you have the following page table for a particular process.

Page number	Page frame number
0_{16}	2_{16}
1_{16}	3_{16}
2_{16}	1_{16}
3_{16}	invalid

What are the physical addresses (in base 16) for each of the following logical (“program”) addresses?

- 00000_{16}
- $2A000_{16}$
- 30200_{16}

6. (4 points) Suppose you are designing a multiuser system that is to provide each process with a virtual address space of 2^{31} bytes, and you would like to make it possible to have at least 16 users at a time. How much main memory do you need? (Or is this not a fixed number, and if not, why not?) How much secondary memory do you need? (Or is this not a fixed number, and if not, why not?)
7. (4 points) For each of the following programming techniques and data structures, explain whether you think its use would or would not contribute to good program performance in a demand-paged environment and why.
- Array.
 - Hash table.
 - Sequential search.
 - Binary search.
 - Self-modifying code.
 - Linked list.
8. (4 points) Exercise 9.9 from Silberschatz and Galvin.