Examen 02: Memory Management

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1. Describe in your own words, what is the purpose of the virtual memory? Name two differences between logical and physical address? (15 pts)

2. Given a memory partition of free spaces of 100K, 500K, 200K, 300K, and 600K (in that order), how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212K, 417K, 112K, and 426K in order. Which algorithm makes the most efficient use of memory? (20 pts)

600K
300K
200K
500K
100K

3. Consider a virtual memory with 32 pages of 8K words, and a physical memory with 16 page frames.

a) How many bits are need to address the virtual memory? (5 pts)
b) How many bits are need to address the physical memory? (5 pts)

4. Following Figure 1. How would translate the following virtual addresses into physical addresses? (10 pts, 2 each)

a) 0010001000000101
b) 0101000100100111
c) 1011000010000001
d) 0000000000000000
e) 1111111111111111

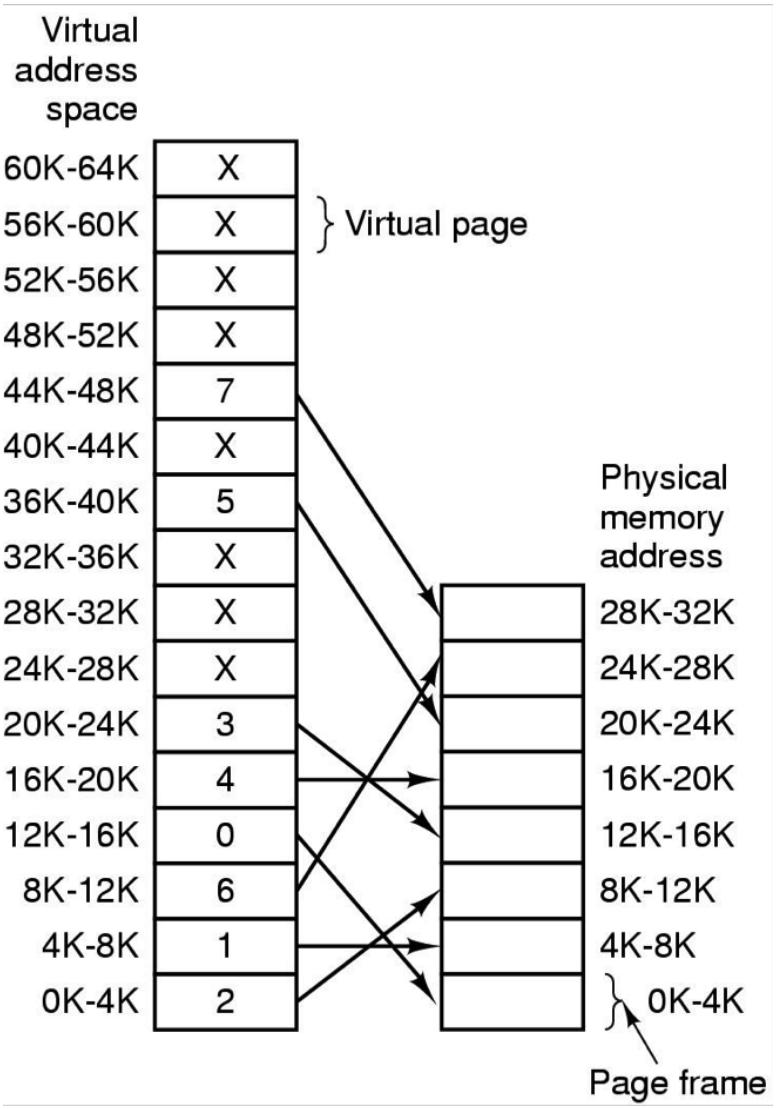
5. Describe a good reason in which one segment could belong to the address space of two different processes? (10 pts)

6. Describe the process that generates a page fault, and how it is handled. (10 pts)

7. Assume you have a physical memory with room for 5 pages. Use the following simplified page memory access sequence (7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1) and count the number of faults that occur using the following page replacement algorithms: (30 pts)

a) Optimal page replacement algorithm
b) Clock page replacement algorithm (FIFO Clock)
c) Working set page replacement algorithm with tau=5 (LRU Clock)

Figure 1.


Virtual address space
60K-64K
56K-60K
52K-56K
48K-52K
44K-48K
40K-44K
36K-40K
32K-36K
28K-32K
24K-28K
20K-24K
16K-20K
12K-16K
8K-12K
4K-8K
0K-4K
X
X
X
X
7
X
5
X
X
X
3
4
0
6
1
2
Virtual page
Physical memory address
28K-32K
24K-28K
20K-24K
16K-20K
12K-16K
8K-12K
4K-8K
0K-4K
Page frame