PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
FACULTAD DE CIENCIAS E INGENIERÍA

SISTEMAS OPERATIVOS

3ra práctica (tipo a)
(Primer semestre de 2013)

Horario 0781: prof. V.Khlebnikov
Horario 0782: prof. A.Bello R.

Duración: 1 h. 50 min.
Nota: No se puede usar ningún material de consulta.
La presentación, la ortografía y la gramática influirán en la calificación.
Puntaje total: 20 puntos

Pregunta 1 (8 puntos) (*W. Stallings, Operating Systems: Internals and Design Principles, 7th Ed.*) Problems 7.2 and 7.6 (modified):

a) (1 punto) Consider a fixed partitioning scheme with equal-size partitions of 2^{16} bytes and total main memory size of 2^{30} bytes. A process table is maintained that includes a pointer to a partition for each resident process. How many bits are required for the pointer?

b) (7 puntos) This diagram shows an example of memory configuration (M=2^{20}, K=2^{10}) under dynamic partitioning, after a number of placement and swapping-out operations have been carried out. Addresses go from left to right; gray areas indicate blocks occupied by process; white areas indicate free memory blocks. The last process placed is 2560-Kbyte and is marked with an X. Only one process was swapped out after that.

- **(1 punto)** What was the maximum size of the swapped out process?
- **(2 puntos)** What was the size of the free block just before it was partitioned by X? What can you say about the placement algorithm used for this allocation?
- **(4 puntos)** A new 3-Mbyte allocate request must be satisfied next. Indicate the intervals of memory where a partition will be created for the new process under the following four placement algorithms: best-fit, first-fit, next-fit, worst-fit. For each algorithms, draw a horizontal segment under the memory strip and label it clearly.

Pregunta 2 (2 puntos) (*W. Stallings, Operating Systems: Internals and Design Principles, 7th Ed.*) Problem 7.8: Consider a buddy system in which a particular block under the current allocation has an address of 011011110000 (0x6f0).

a) (1 punto) If the block is of size 4, what is the binary address of its buddy?

b) (1 punto) If the block is of size 16, what is the binary address of its buddy?

Pregunta 3 (5 puntos) Virtual Memory

a) (2 puntos) (*W. Stallings, Operating Systems: Internals and Design Principles, 4th Ed.*) Problem 7.10. A virtual address a in a paging system is equivalent to a pair (p, w), in which p is a page number and w is a byte number within the page. Let z be the number of bytes in a page. Find algebraic equations that show p and w as functions of z and a.

b) (3 puntos) (*Andrew S. Tanenbaum, Operating Systems Design and Implementation. 3rd Ed.*) Problem 27. Chapter 4. An embedded computer provides each process with 65,536 bytes of address space divided into pages of 4096 bytes. A particular program has a text size of 32,768 bytes, a data size of 16,386 bytes, and a stack size of 15,870 bytes. Will this program fit in the address space? If the page size were 512 bytes, would it fit? Remember that a page may not contain parts of two different segments. Explain your answer.

Pregunta 4 (5 puntos) Paging (*W. Stallings, Operating Systems: internals and design principles, 4th ed.*) Problems 8.8 and 8.15):

a) (2 puntos) Suppose the page table for the process currently executing on the processor looks like the following. All numbers are decimal, everything is numbered starting from zero, and all addresses are memory byte addresses. The page size is 1,024 bytes.

Virtual page number	Valid bit	Reference bit	Modify bit	Page frame number
0	1	1	0	4
1	1	1	1	7
2	0	0	0	—
3	1	0	0	2
4	0	0	0	—
5	1	0	1	0

What physical address, if any, would each of the following virtual addresses correspond to? (Do not try to handle any page faults, if any.) 15, 1052, 2221, 5499

b) (3 puntos) Consider a paged logical address space (composed of 32 pages of 2 Kbytes each) mapped into a 1-Mbyte physical memory space.

- **(0,5 puntos)** What is the format of the processor's logical address?
- **(0,5 puntos)** What is the length and width of the page table (disregarding the "access rights"bits)?
- **(2 punto)**Assume that an element in physical location 00021ABC is accessed by this task. What is the format of the logical address that the task generates for it? What is the maximum physical address space for the system?

La práctica fue preparada por AB(3,4) y VK(1,2)

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Pando, 28 de mayo de 2012