PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
FACULTAD DE CIENCIAS E INGENIERÍA

SISTEMAS OPERATIVOS

3ra práctica (tipo a)
(Primer semestre de 2012)

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 (7 puntos) (*W. Stallings, Operating Systems: internals and design principles, 7th ed.*) Problems 7.2 and 7.6:

a) (1 punto) Consider a fixed partitioning scheme with equal-size partitions of 2^{16} bytes and total main memory size of 2^{24} 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) (6 puntos) This diagram shows an example of memory configuration 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 2-Mbyte 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?
- **(1 punto)** What was the size of the free block just before it was partitioned by X?
- **(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 (5 puntos) (*W. Stallings, Operating Systems: internals and design principles, 7th ed.*) Problems 7.12 and 7.13:

a) (2 puntos) Consider a simple paging system with the following parameters: 2^{32} bytes of physical memory; page size of 2^{10} bytes; 2^{16} pages of logical address space. How many bits are in a logical address? How many bytes in a frame? How many bits in the physical address specify the frame? How many entries in the page table?

b) (3 puntos) Write the binary translation of the logical address `0001010010111010` under the following hypothetical memory management scheme, and explain your answer: a paging system with a 256-address page size, using a page table in which the frame number happens to be four times smaller than the page number. How many bits are in a physical address?

Pregunta 3 (5 puntos) (*A. S. Tanenbaum, Modern Operating Systems, 3rd ed.*) Problems 11, 12 and 13 for Chapter 3.

a) (2 puntos) Suppose that a machine has 38-bit virtual addresses and 32-bit physical addresses. With a two-level page table, 16-KB pages, and 4-byte entries, how many bits should be allocated for the top-level page table field and how many for the next-level page table field? Both level page tables fit into a single page. Explain your answer.

b) (2 puntos) A computer with a 32-bit address uses a two-level page table. Virtual addresses are split into a 9-bit top-level page table field, an 11-bit second-level page table field, and an offset. How large are the pages and how many are there in the address space?

c) (1 punto) Suppose that a 32-bit virtual address is broken up into four fields, a, b, c and d. The first three are used for a three-level page table system. The fourth field, d, is the offset. Does the number of pages depend on the sizes of all four fields? If not, which ones matter and which ones do not?

Pregunta 4 (3 puntos) (*W. Stallings, Operating Systems: internals and design principles, 7th ed.*) Problem 8.3 b):

Assume you want to implement a hashed inverted page table for the same addressing scheme as depicted in Fig 8.4, using a hash function that maps the 20-bit page number into a 6-bit hash value. the table entry contains the page number, the frame number, and a chain pointer. If the page table allocates space for up to 3 overflow entries per hashed entry, how much memory space does the hashed inverted page table take?

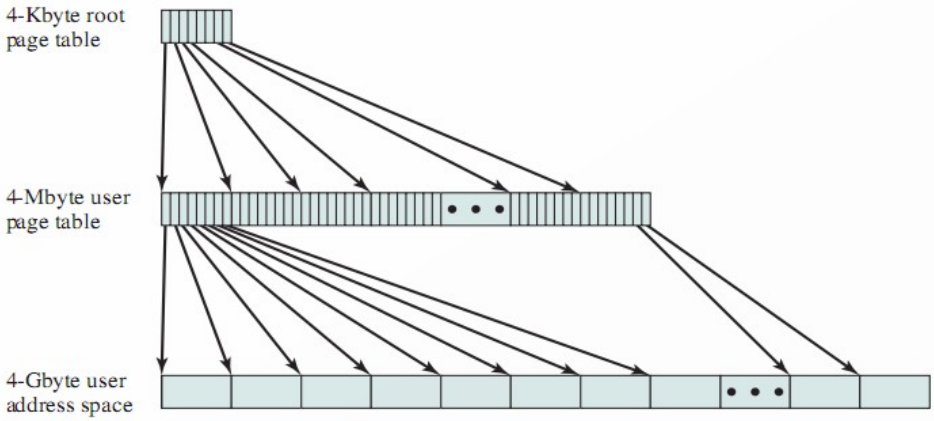

Figure 8.4 A Two-Level Hierarchical Page Table

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

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Pando, 23 de mayo de 2012