ROM: read-only memory

ACL: Access control list: 檔案可被誰使用

FAT: file-allocation table 檔案配置表格

Operating Systems, Final Term Exam, January 9, 2006/1/9, Chapter 8,9,10,11,12

CLOSE BOOK ONLY. A total of 110 points.

1. (10%)Write the full name of the following abbreviations. Note that no explanation is needed.
(1) MMU, (2)LRU, (3) NFS (in file system), (4) FAT (in file system),
(5) ACL (in file protection), (6)RAID (in storage systems),
(7) NAS (in storage systems), (8) SAN (in storage systems),
(9) WORM (in storage systems), (10) SCSI (bus)

2. (30%)Explain the following terminology.
(1) Translation look aside buffer, (2) modify/dirty bit (in a paging system),
(3) a juke box (in storage systems),(4) dynamic linking,
(5) hierarchical page table, (6) working set,
(7) thrashing, (8) inode (in Unix),
(9) I/O interlock, (10) mirror disk

3. Assume that the full memory on the main PC board is 512Mbytes. Assume that a free-memory list and an allocated-memory link list are used by the operating system for memory management. Assume that the operating system is loaded in main memory after booting up, and it is resident in memory. No part of the operating system is to be moved out to secondary storage during its normal execution. Assume the operating system takes 64Mbytes. And it is allocated starting from 0 to 1Mbytes and 400Mbytes to 512Mbytes.

   (1) (20%)Suppose that the operating system that uses contiguous allocation and the process sequence is as follows: P1 (100M bytes), P2 (200Mbytes), P3 (50Mbytes). Suppose that P1 ends first and P3 ends. Then P4 (40Mbytes) comes. Draw the memory configuration after using: (a) First-fit, (b) Best-fit. Note that you must draw the contents of the free-memory list and the allocated-memory list.
   After (1) using first-fit, suppose that P4 ends and there comes P5 (120Mbytes). (c) What is the amount of fragmentation? (d)What will the memory management do? Draw the final memory configuration and the two link lists too.

   (2) (5%)Suppose the operating system use demand paging. Assume only paging is enabled. Suppose that each page occupies 2Mbytes (though may not be reasonable). Assume that process P1 (100Mbytes) is allocated 8 page frames. A simplified P1's execution address traces, using page numbers only, is recorded as follows:
   1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 11, 11, 13, 13, 14, 15,16,17,17,18,19,19
   How many page faults are there using LRU?

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(3) (15%)Suppose that a file, named StudentRecord is to be created to the record of students. Each record includes the student's name, ID, birthday, telephone number and email address, and others. Suppose there are five students' records: John, Mary, George, Janet, and Tom. And each record is saved in exactly one (disk) block. Given that the simplified disk space, which has only twenty free disk blocks now. The status are as follows: 1 (in-use), 2(free), 3(in-use),4~7(free), 8~18(in-use), 19~20(free).

(a) Draw a diagram and show how to open the StudentRecord file.

(b) Draw a diagram and show how to use contiguous (sequential) allocation for the five records.

(c) As (b), but use indexed file allocation.

(Hint: Do not forget to draw the directory structure.)

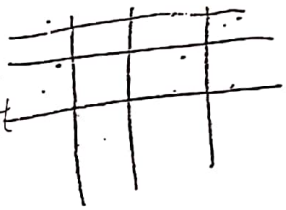
(4) (10%)Draw a diagram and explain the procedure that an operating system handles page fault.

4. (10%)Suppose that Int[128,128] data, and the compiler allocated memory using row-majored alignment. Given a virtual memory system, and each row is stored in exactly a page. Give two sample program segments:

better

(a) for (i = 0; i < 128; i++)
for (j = 0; j < 128; j++)
data[i,j] = 0;

128 x 128 個 page fault



(b) for (j = 0; j <128; j++)
for (i = 0; i < 128; i++)
data[i,j] = 0;

128 個

Which has better performance? Why? (b) ∵ 會一個 page

5. (10%)Consider disk scheduling algorithm SSTF, and C-LOOK. Take the following requests with a input queue(0-199): 98, 183, 37, 122, 14, 124, 65, 67. Assume that disk head pointer 40. Illustrate total head movements of cylinders for each. (Hint: C-LOOK: The disk Arm only goes as far as the last request in each direction, then reverses direction immediately, without first going all the way to the end of the disk.)