Operating Systems - II: CS3523

Homework on Memory Management, Virtual Memory and Flash Memory Architecture

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1.

$$\begin{aligned} Page\ Size = 2KB &= 2^{11}\ bytes \\ \implies Page\ Offset &= 2^{11} \\ &= 2048 \\ Address &= (4095)_{10} \\ &= (111111111111)_2 \\ &< 2 * 2^{11} \\ \implies Page\ Number &= 1 \end{aligned}$$

2.

$$\begin{aligned} Virtual\ Address &= 32\ bit \\ Physical\ Address &= 24\ bit \\ Page\ Size &= 2KB \end{aligned}$$

Number of pages in inverted page table is the same as number of physical pages.

$$\begin{aligned} \implies Number\ of\ Entries &= 2^{24}/2^{11} \\ &= 2^{13} \end{aligned}$$

3.

$$\begin{aligned} Available\ Chunk &= 512KB \\ Kernel\ Request &= 57KB \end{aligned}$$

We repeatedly break the Available chunk into two parts until we get to the point where the chunk size is less than the request size and then we fulfill the request with the just above chunk. On doing this we get 512 >> 256 >> 128 >> 64 >> 32(Not enough), so the request is fulfilled by the chunk of 64KB.

4. (a) 548
   (b) Not Valid $\because$ length of segment < 666.
   (c) 6326

5.

Segment	Base	Length
0	1100	700
1	9350	550
2	5600	600
3	2200	3400
4	6200	2500

6. The page length register can be used to store the value of the size of an individual page.

7. Total is 64 bits. First 6 bits (from right side)are used for fourth page table. The following 9 bits are used fot the 3rd page table. The next 13 bits are used for 2nd page table and the next 29 bits (maybe more) for the first page table.

8.

	Process Size	Order
Best FitAlgorithm	135	320, 580, 480, 220, 890, 600, 20
	650	320, 580, 480, 220, 240, 600, 20
	398	320, 580, 82, 220, 240, 600, 20
	220	320, 580, 82, 240, 600, 20
	520	320, 60, 82, 240, 600, 20
	440	320, 60, 82, 240, 160, 20

	Process Size	Order
Worst Fit Algorithm	135	320, 580, 480, 220, 755, 600, 155
	650	320, 580, 480, 220, 105, 600, 155
	398	320, 580, 480, 220, 105, 202, 155
	220	320, 360, 480, 220, 105, 202, 155
	520	No allocation
	440	320, 360, 40, 220, 105, 202, 155

9. There are four erase operations at the following one indexed write operation numbers 16,18,20,23.

0	5	1	4	8
6	7	2	1	6
	8	3	7	0

Green: Valid, Red: Invaild.

10.

$$\begin{aligned} Total\ Size &= 64GB \\ &= 2^{36} \\ Number\ of\ Pages\ per\ block &= 64 \\ &= 2^{6} \\ Size\ of\ Logical\ Page &= 4KB \\ &= 2^{12} \end{aligned}$$

$$(Number\ of\ Physical\ Pages)/(Number\ of\ Logical\ Pages) = 4$$

$$Size\ of\ table = Number\ of\ logical\ pages * (log(number\ of\ physical\ pages))$$

$$\begin{aligned} Number\ of\ logical\ pages &= 2^{36}/2^{12} \\ &= 2^{24} \\ Number\ of\ physical\ pages &= 4 * 2^{24} \\ &= 2^{26} \\ Size\ of\ table &= log(2^{26}) * 2^{24} \\ &= \ 16 * 26Mb \\ &= 416Mb \\ &= 52MB \end{aligned}$$