

CSSE 332 – Operating Systems  
Rose-Hulman Institute of Technology  
Computer Science and Software Engineering Department

Page Table Structure B

Name:\_\_\_\_\_ Box:\_\_\_\_\_

See next page

(3 points) Consider a two level paging system. Assume that frames are 256 bytes.

Root Page Table Ptr
0

Addressss	Main Memory	
	Valid bit	Frame Number
0	1	104
4	1	334
8	0	45
12	1	1
16	1	115
20	1	713
24	1	2
28	0	228
...		
256	1	900
260	1	1005
264	0	820
268	1	20
272	0	5
276	0	1005
280	0	220
...		
512	1	303
516	1	689
520	0	446
524	1	848
528	0	666
532	1	111
536	1	229

Physical Address	
Frame #	Offset

For each of the following virtual addresses, determine whether or not a page fault occurs, if one occurs specify the level at which it occurs, and if a page fault does not occur, translate the virtual address to a physical address.

1.  $2|2|105$
2.  $6|2|240$
3.  $3|3|120$

(7 points) Consider a 32-bit addressing scheme with 6 bits for Index<sub>1</sub>, 12 for Index<sub>2</sub>, 14 for the offset and 4 GB of physical memory.

4. How many entries are there in the root page table?
5. How many entries are there in the second level page table?
6. How many total entries are there in the page table structure?
7. What is the minimum size of each page table entry?
8. What is the size of each page?
9. What are the advantages of using a two level page table?
10. What are the disadvantages of using a two level page table?

(5 points) Consider an inverted page table system with hashing. Assume that frames are 1024 Bytes.

Virtual Address		Main Memory				Physical Address		
Page #	Offset	Address	Page #	Frame #	Valid bit	Rel. Ptr	Frame #	Offset
		0	104	8	1	0		
			...					
Hash Function		256	33	0	0	0		
		260	81	1	1	0		
		264	807	2	1	0		
		268	19	3	1	0		
		272	41	4	1	-3		
		276	26	5	0	0		
		280	803	6	1	-3		
	284	404	7	0	0			
Page Table Ptr		Register						
256		Interrupt Indicator						

For each of the following virtual addresses, determine whether or not a page fault occurs, and if a page fault does not occur, translate the virtual address to a physical address.

Assume the hash function is  $h(x) = 3 + (x \% 8)$

Note that this system uses chained hashing, with the Rel Ptr indicating the page table elements to the next entry in the chain.

11. 81|105
12. 41|640
13. 25|320
14. 28|204
15. 19|880