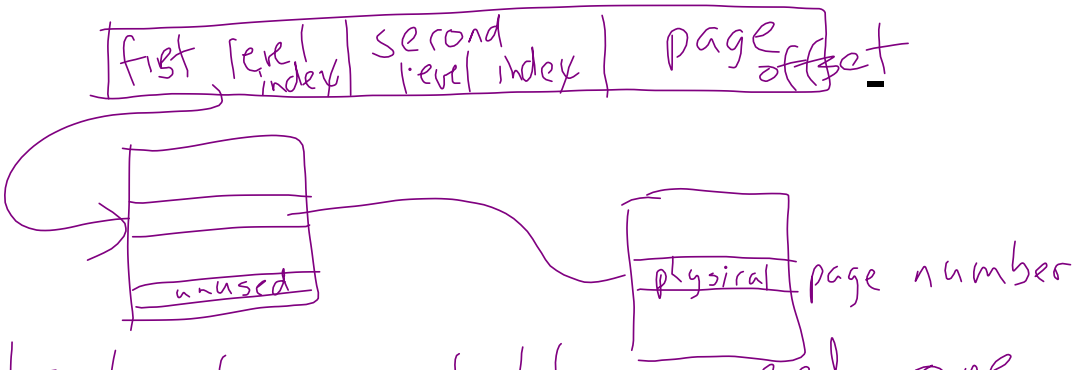
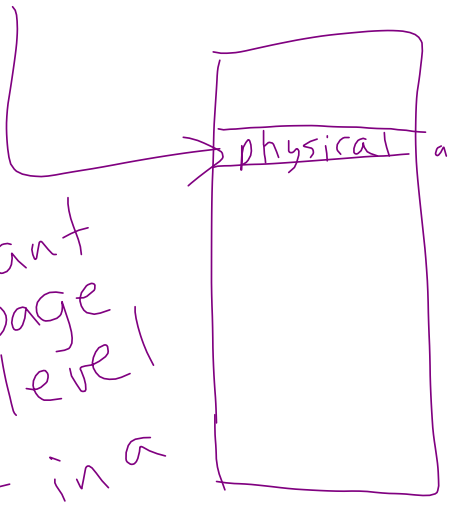
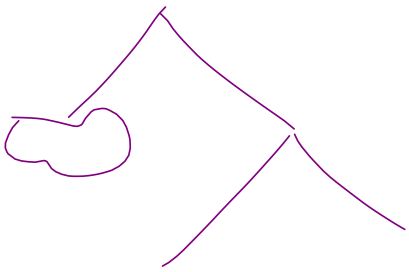
Multiple Level Page Tables



Single level page table - need one entry for every virtual page number



You want each page table level to fit in a page



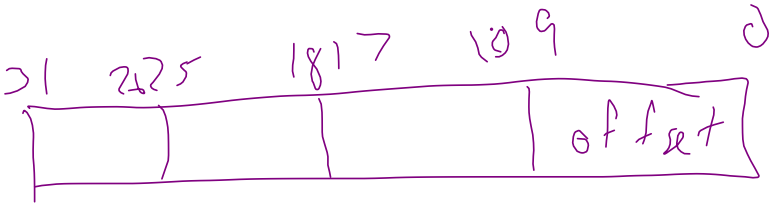
Page size 1KB
PTE 4B
Physical address 32 bits
Virtual address 32 bits

How many level page table is required?

$$\frac{1\,KiB}{page} \times \frac{PTE}{4B} = \frac{256}{2^8}\,\frac{PTE}{page}$$

1KiB page => 10 bits offset

$2^{10} = 1K$



First Level
64 entries
next level
third level

1234	5678	9 10 11 12
0011	0111	0101

$C_1 = XOR(1,3,5,7,9,11) = 0$

$C_2 = XOR(2,3,6,7,10,11) = 0$

$C_4 = XOR(4,5,6,7,12) = 0$

$C_8 = XOR(8,9,10,11,12) = 1$ ← MSB

error in bit 8

$C_1 = 1$

$C_2 = 0$

$C_4 = 1$

$C_8 = 0$

Bit 5 is wrong

$C_1 = 0$

$C_2 = 0$

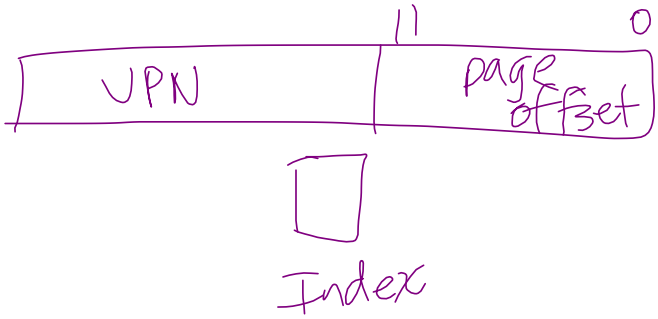
$C_4 = 0$

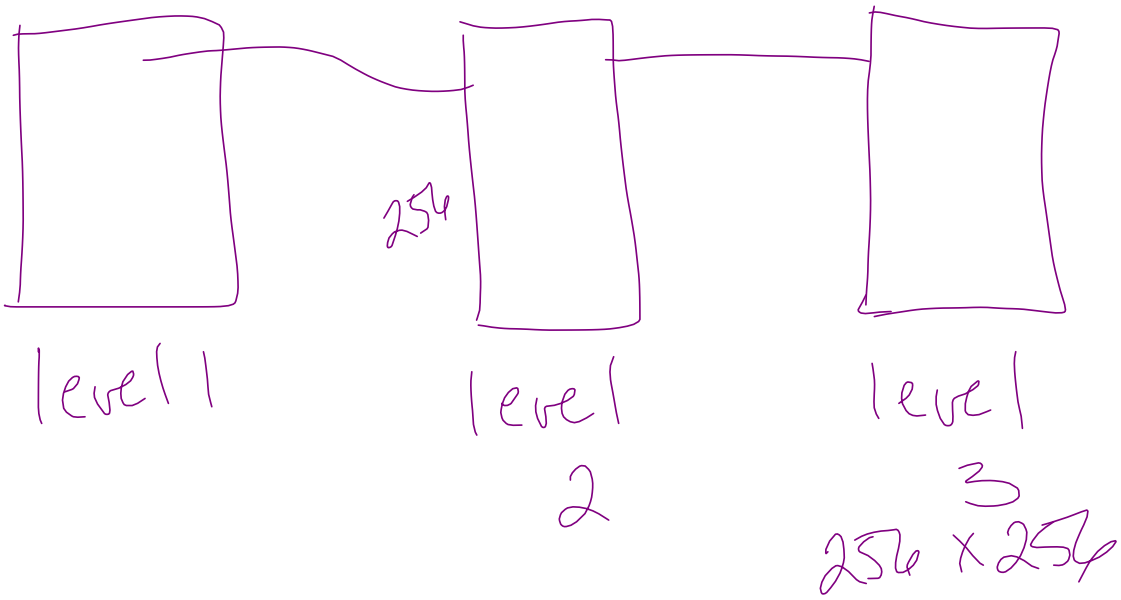
$C_8 = 0$

all correct

	V	Tag	PPN
0	1	11	12
1	1	7	4
2	1	3	6
3	0	4	9

4096 Page #




256
level 1
level 2
level 3
256 x 256