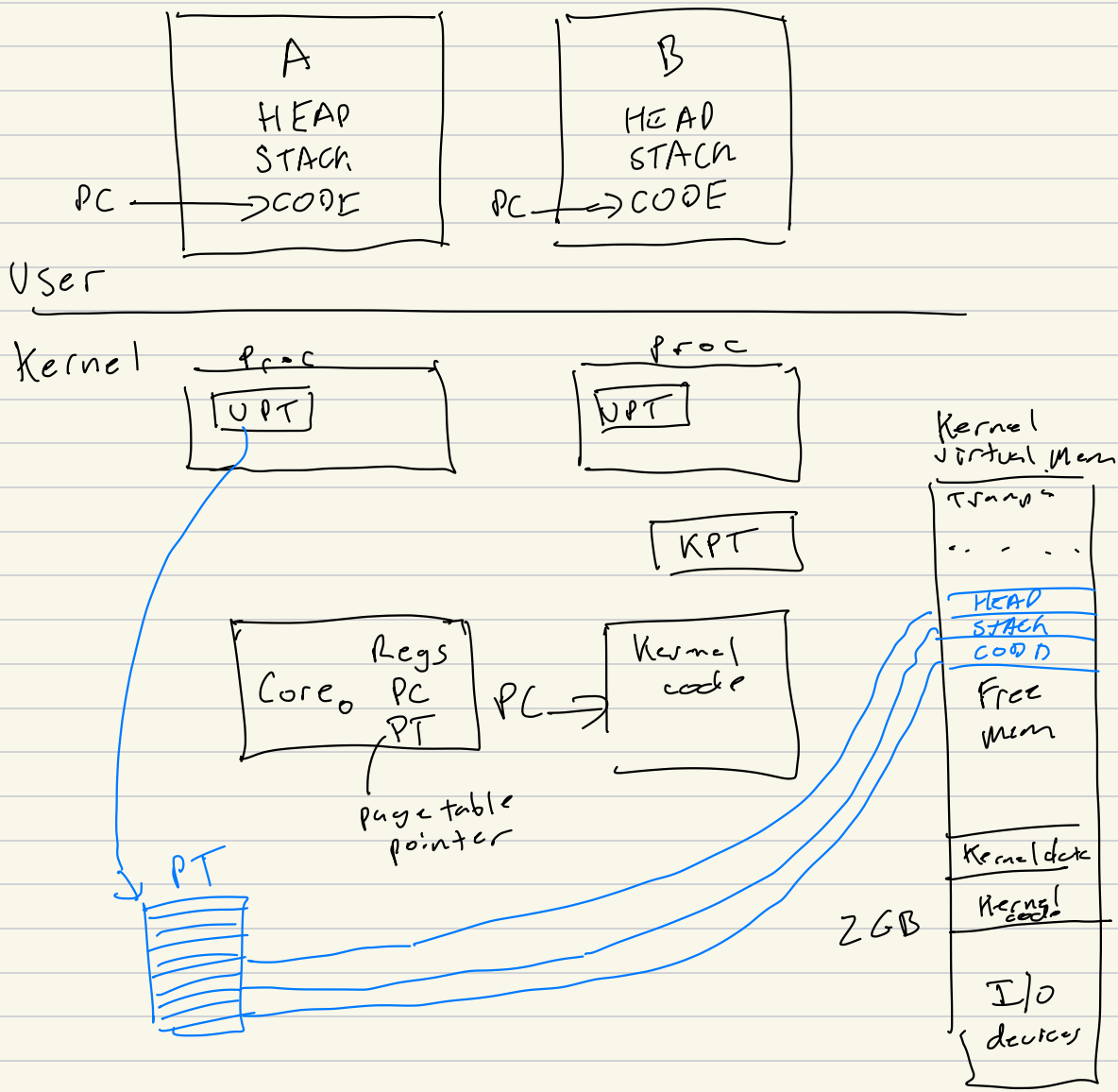
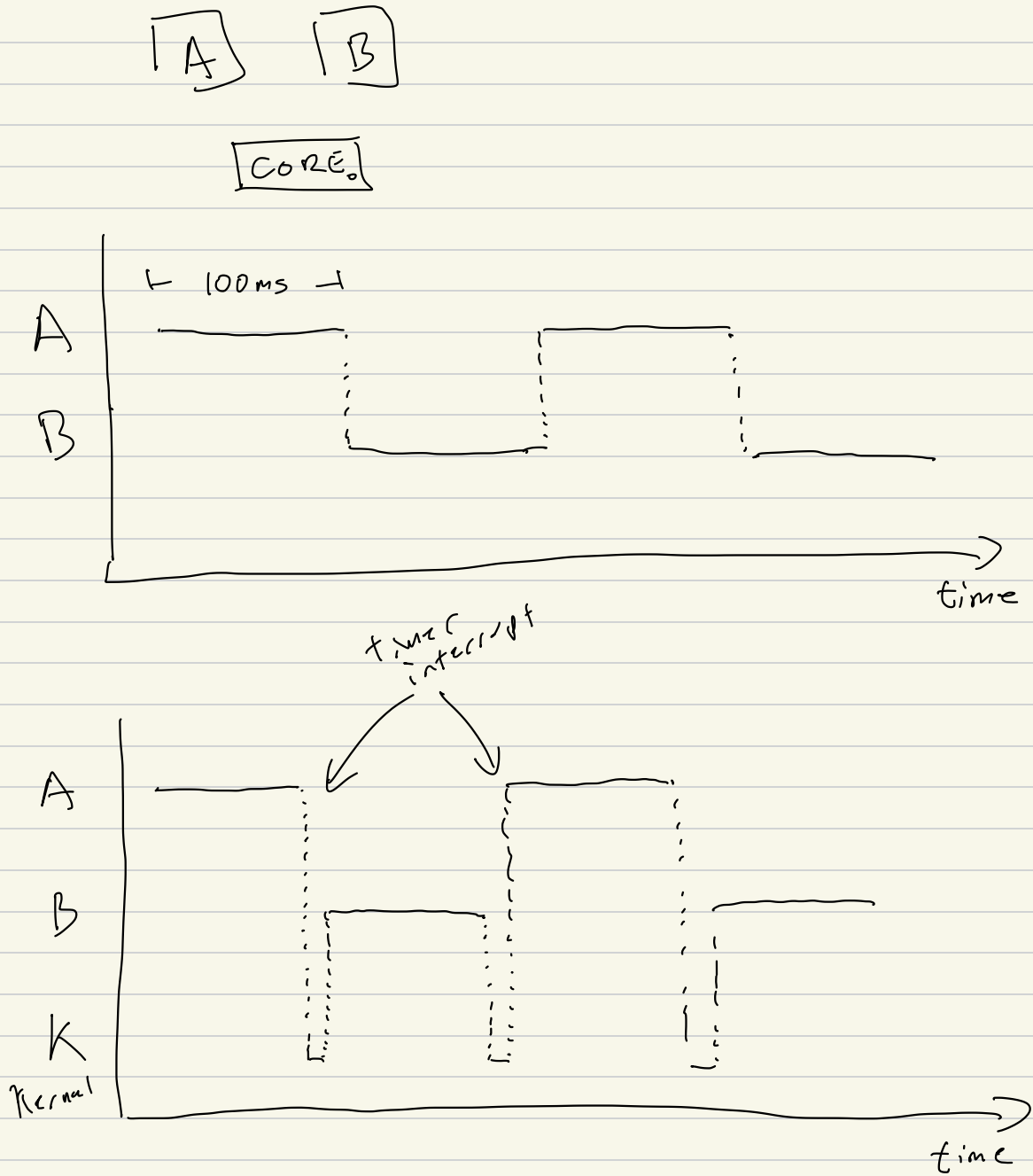
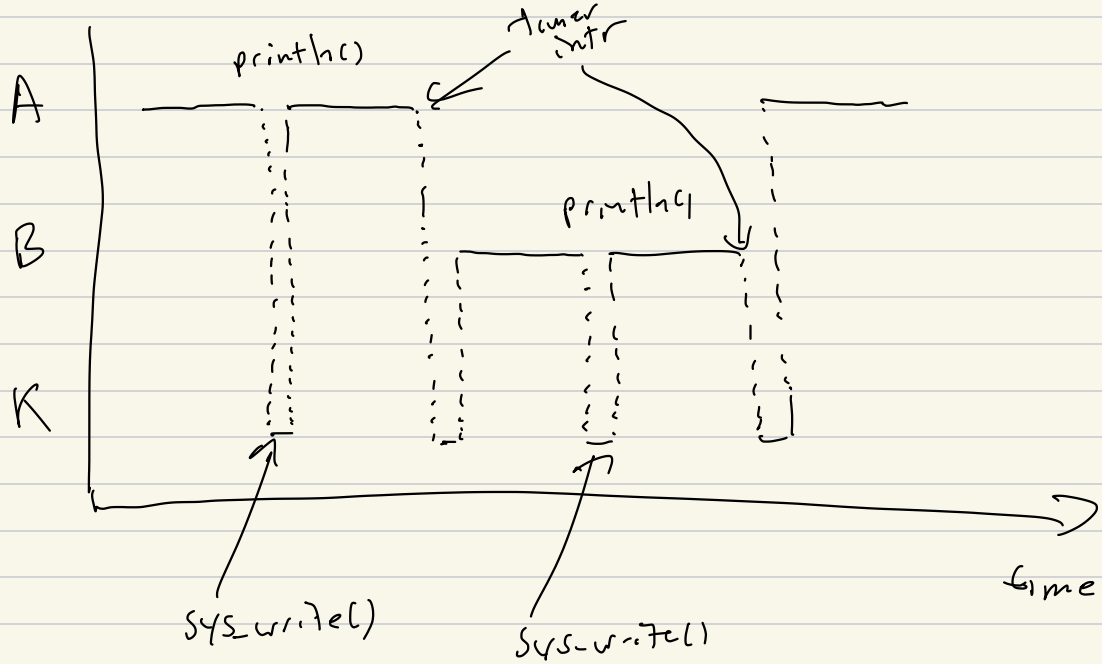
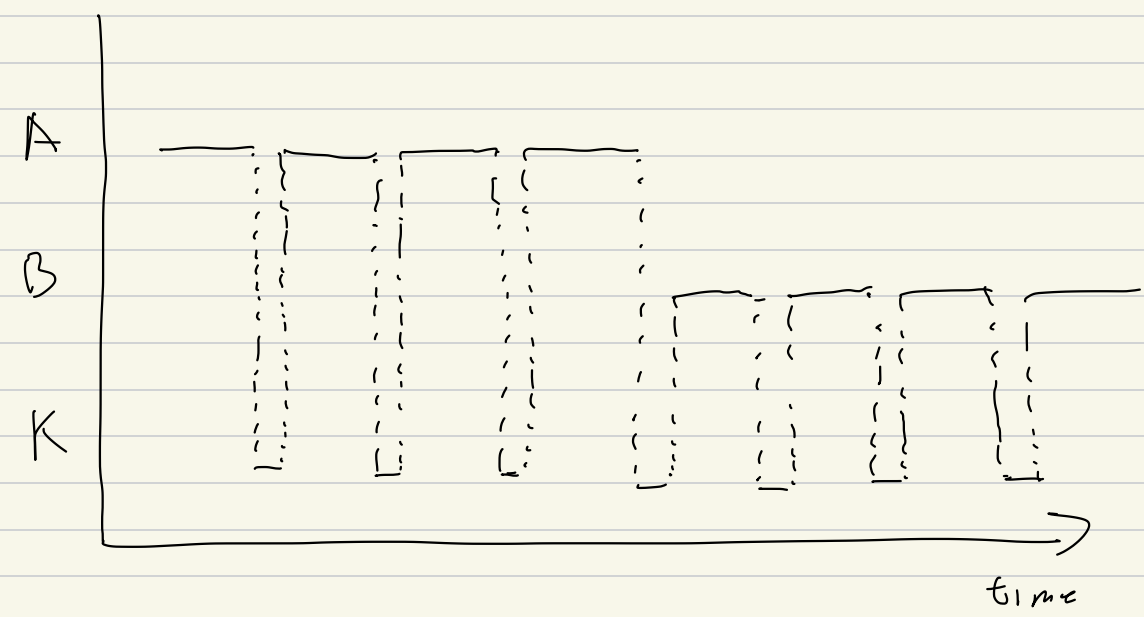
CS631-02 OS Page Tables 2026-05-07

Process scheding
Page Tables




A
B
CORE 0
100ms
A
B
time
timer interrupt
A
B
K
Kernel
time


A
B
K
println()
timer intr
println()
sys_write()
sys_write()
time

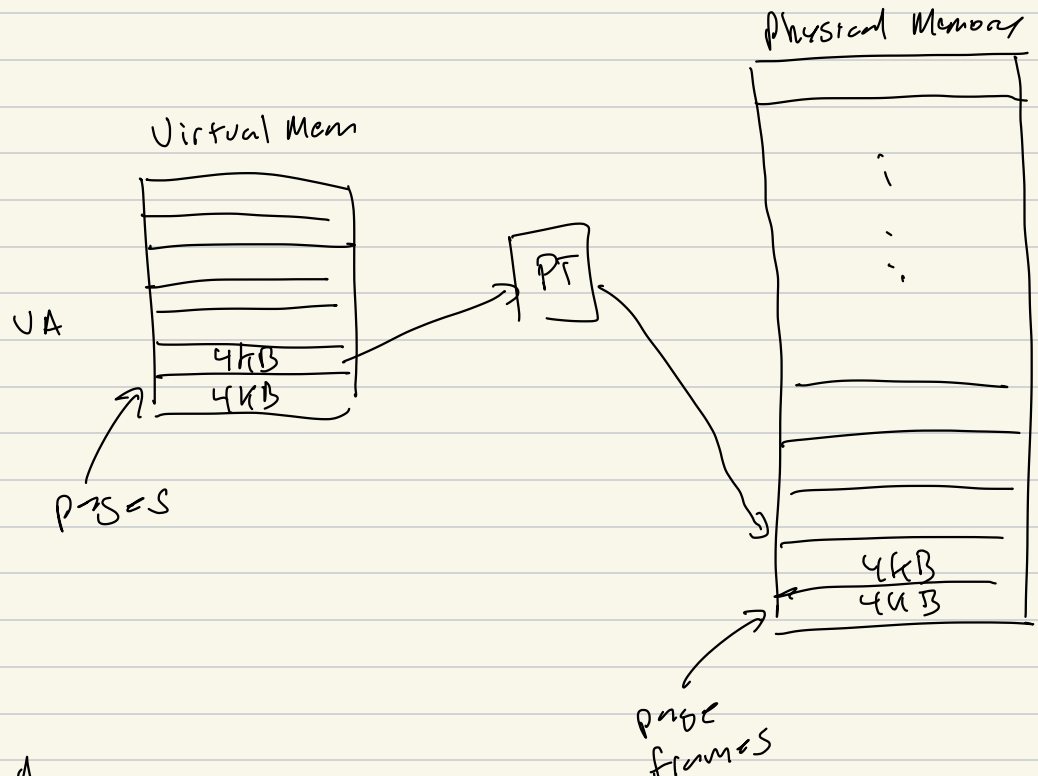

A
B
K
time

Page Tables (Virtual Memory)

Assume a 32 bit architecture $2^{32} = 4GB$

Physical Address (PA)
Virtual Address (VA)

Page size = 4KB
2^{12} bytes



VA

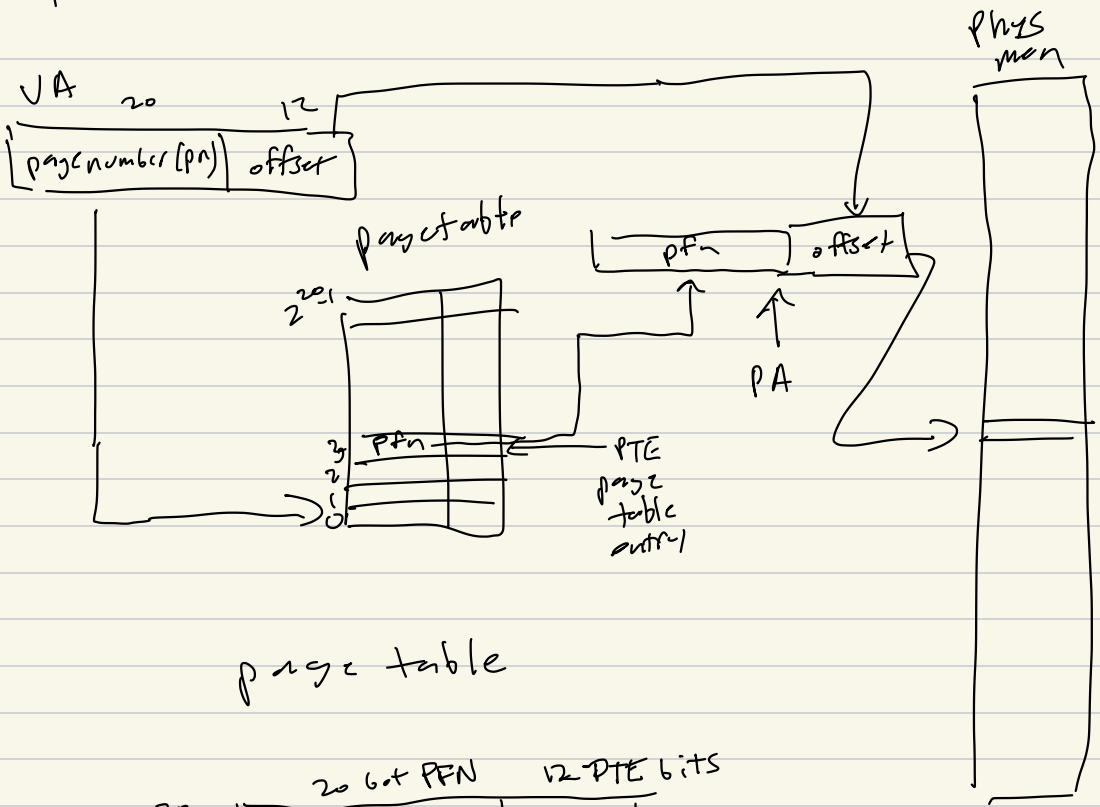
$\frac{2^{32} = 4GB}{2^{12} = 4KB}$

$= 2^{20} \approx 1$ million

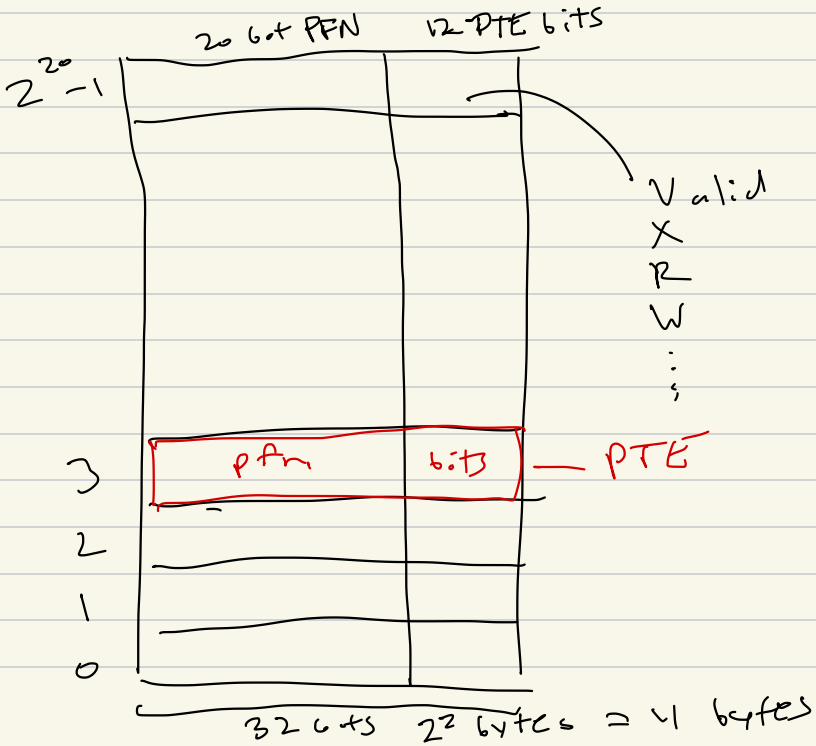
1 megabyte

VA → PA

Translation



page table

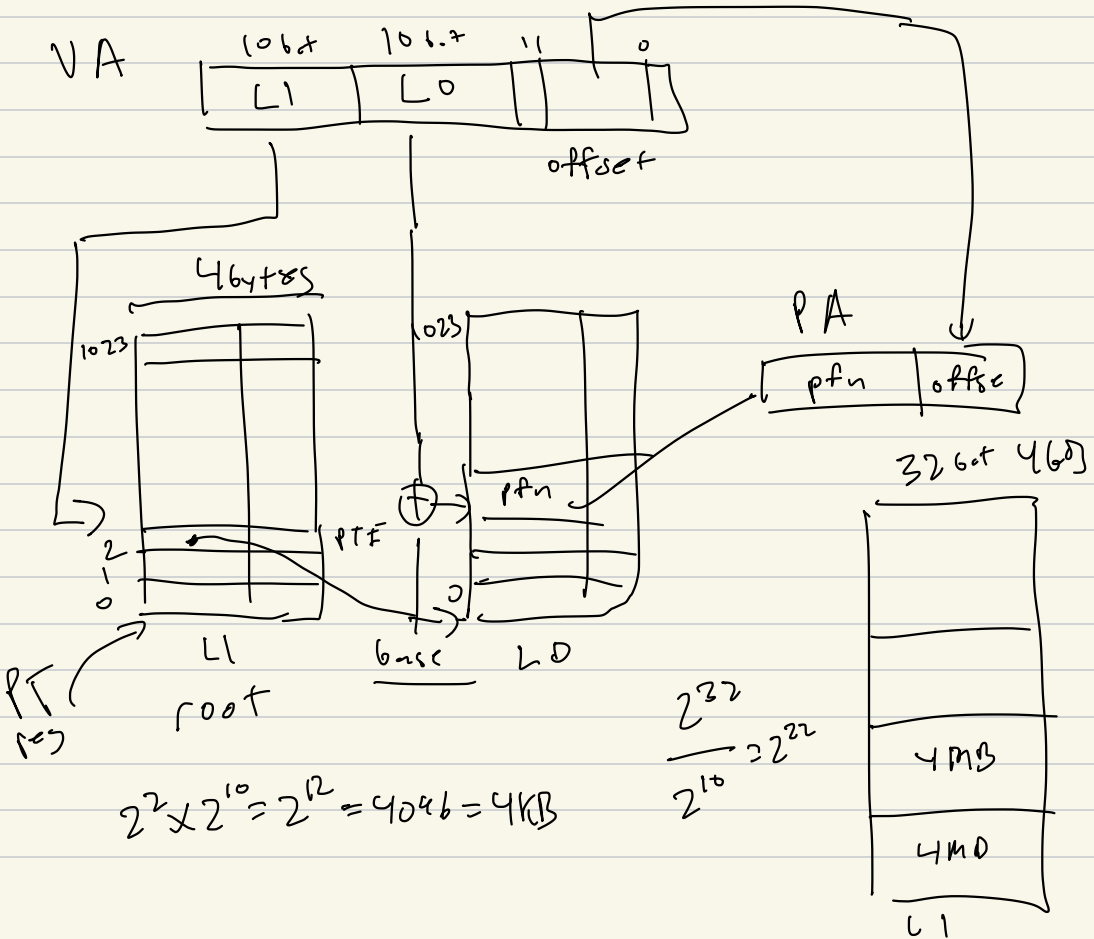


What is the size of the PageTable?

$$\underbrace{2^{2}}_{\text{PTE}} \times 2^{20} = 2^{22} = 4\,MB$$

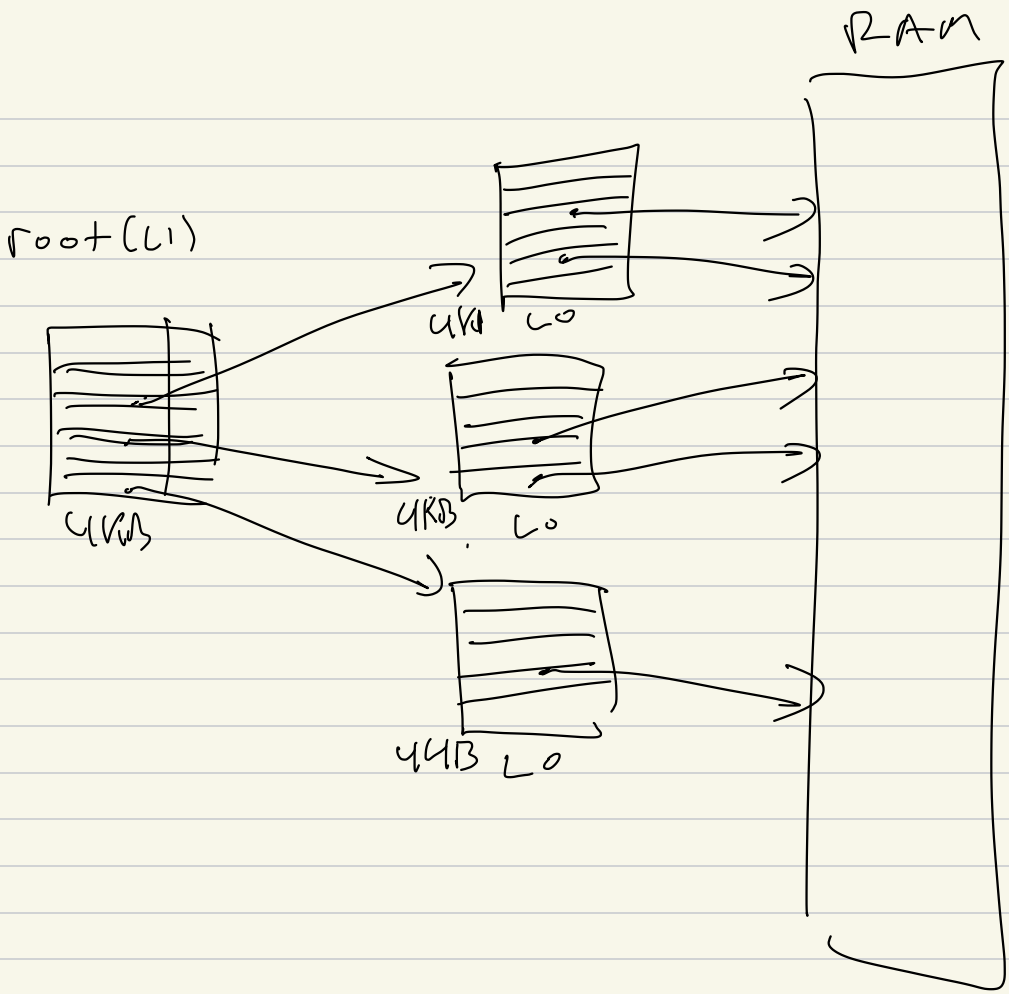
100 procs $\quad 100 \times 4\,MB = 400\,MB$

Multi-level PageTables (Sparse)



$2^2 \times 2^{10} = 2^{12} = 4096 = 4KB$

$\frac{2^{32}}{2^{10}} = 2^{22}$


RAM
root (L1)
L0
L0
L0