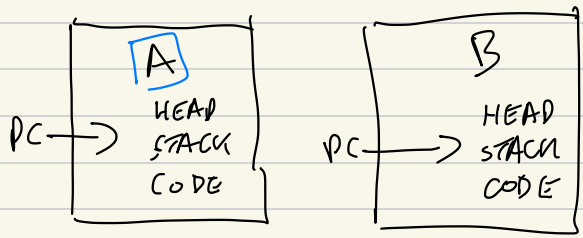
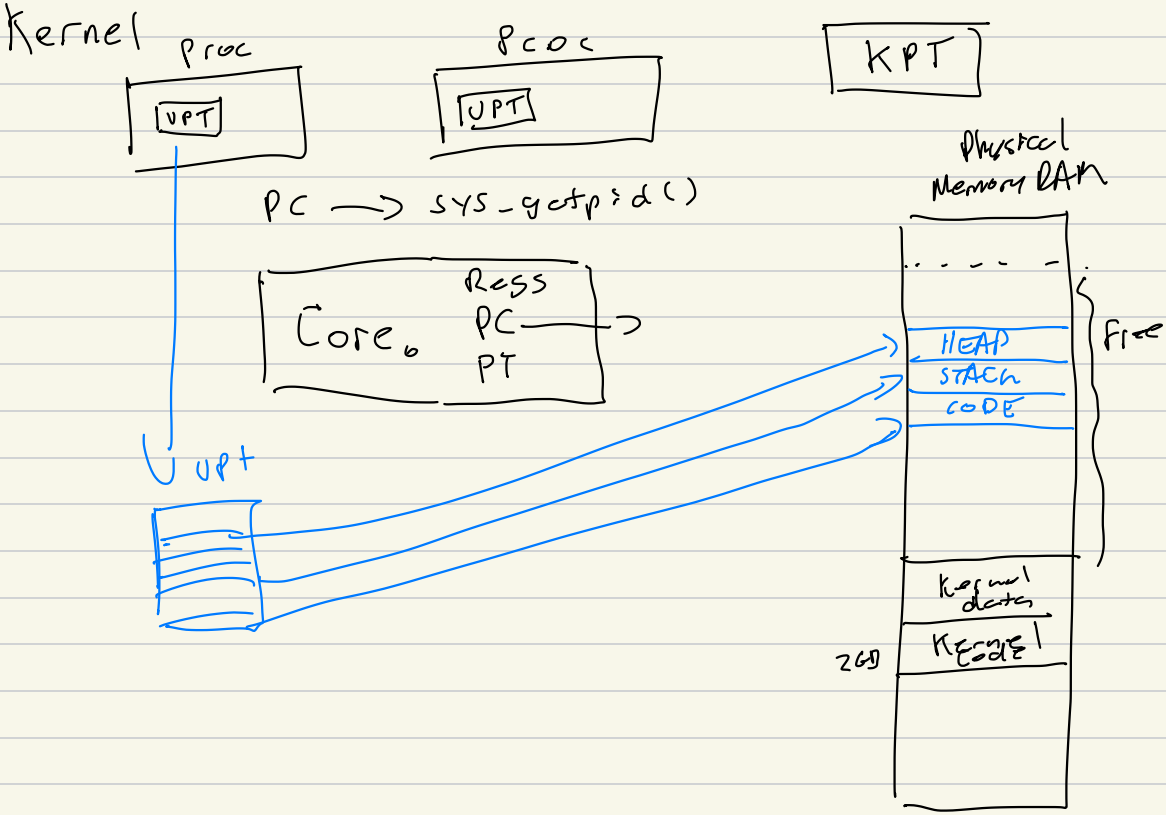
CS 631-01 OS Page Tables 2026-05-07

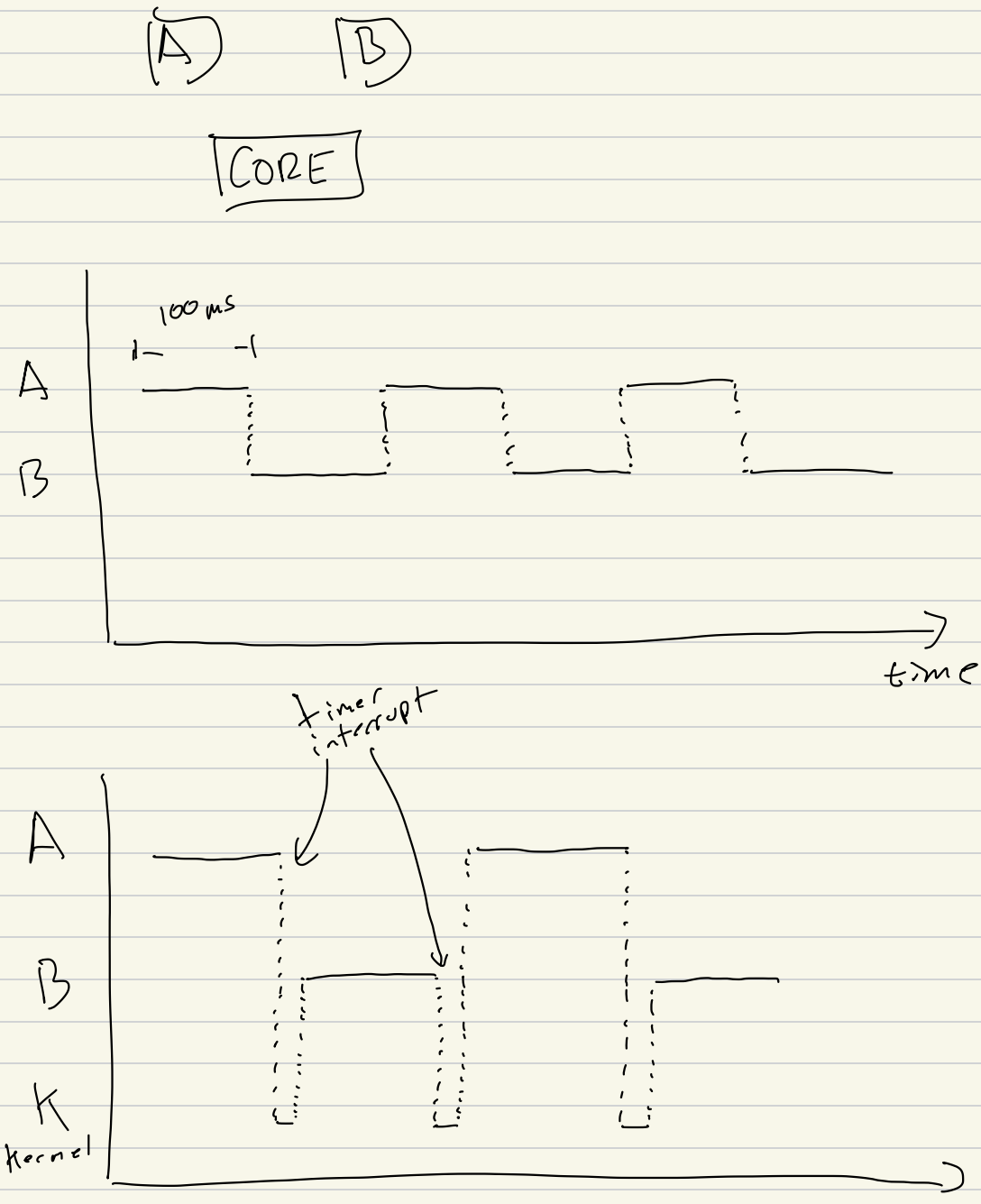
Process scheduling
Page Tables

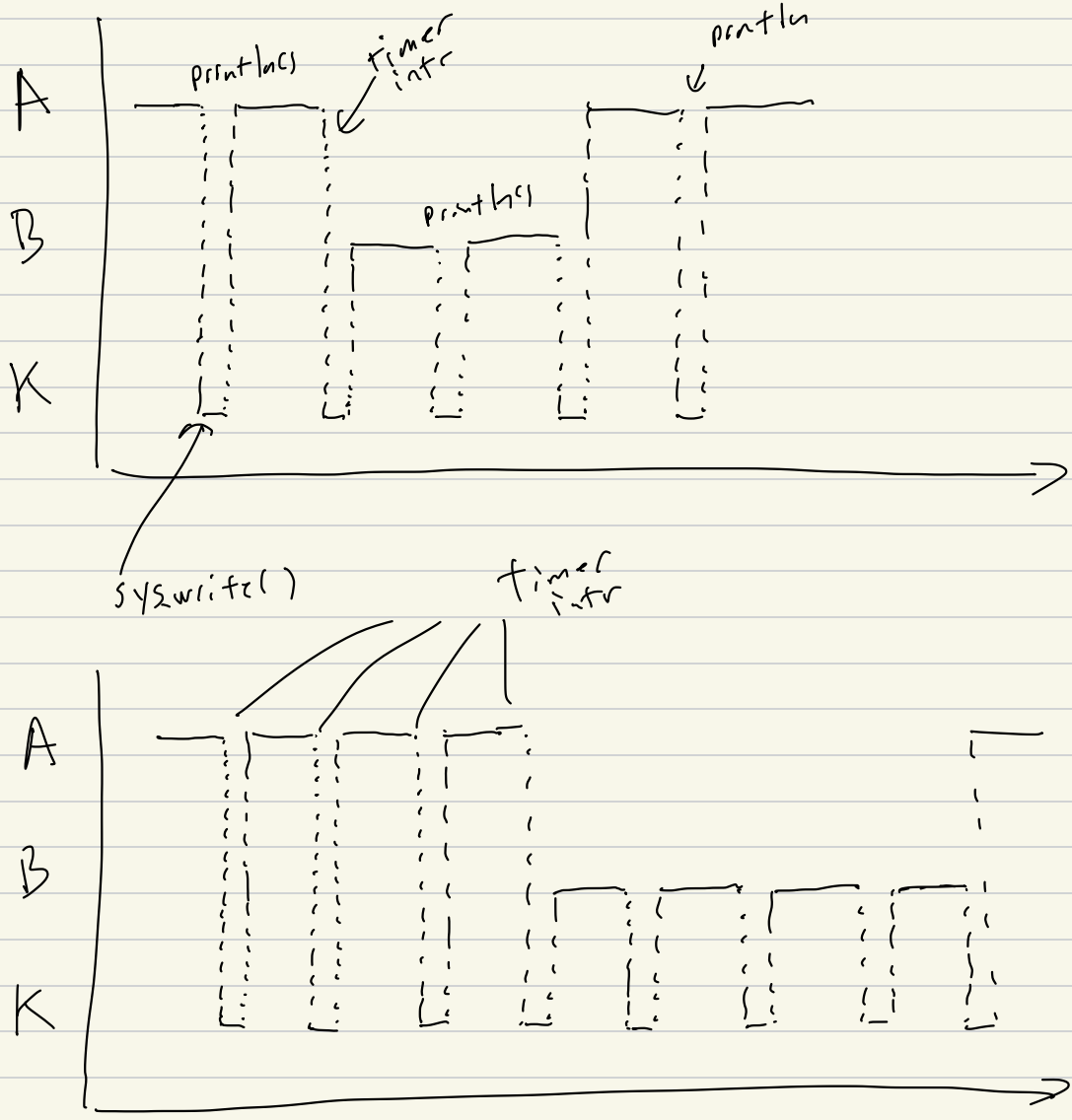


User

Kernel



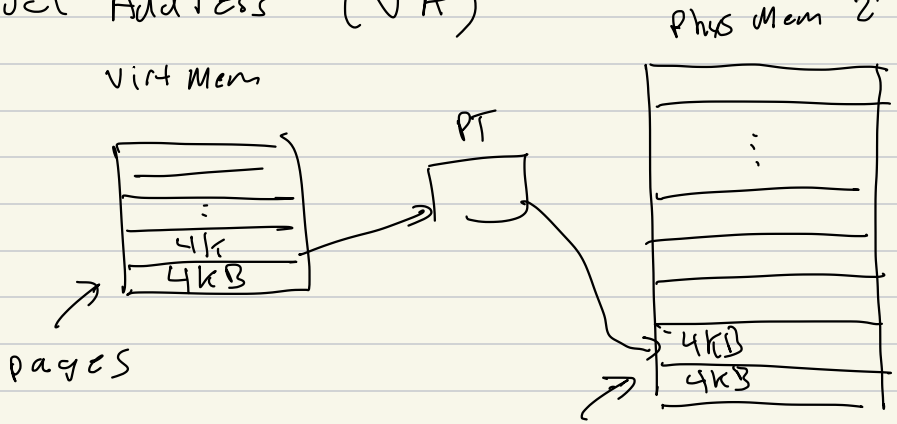

A
B
CORE
100 ms
A
B
time
timer interrupt
A
B
K
kernel


A
B
K
printlnC)
timer intr
println
println
sysWrite()
timer intr
A
B
K

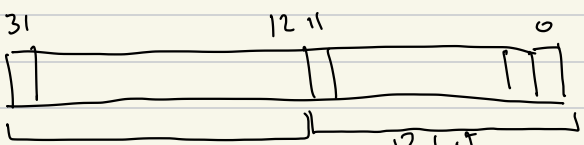
Page Tables (Virtual Memory)

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

Physical Address (PA) Page size (4KB)
Virtual Address (VA)



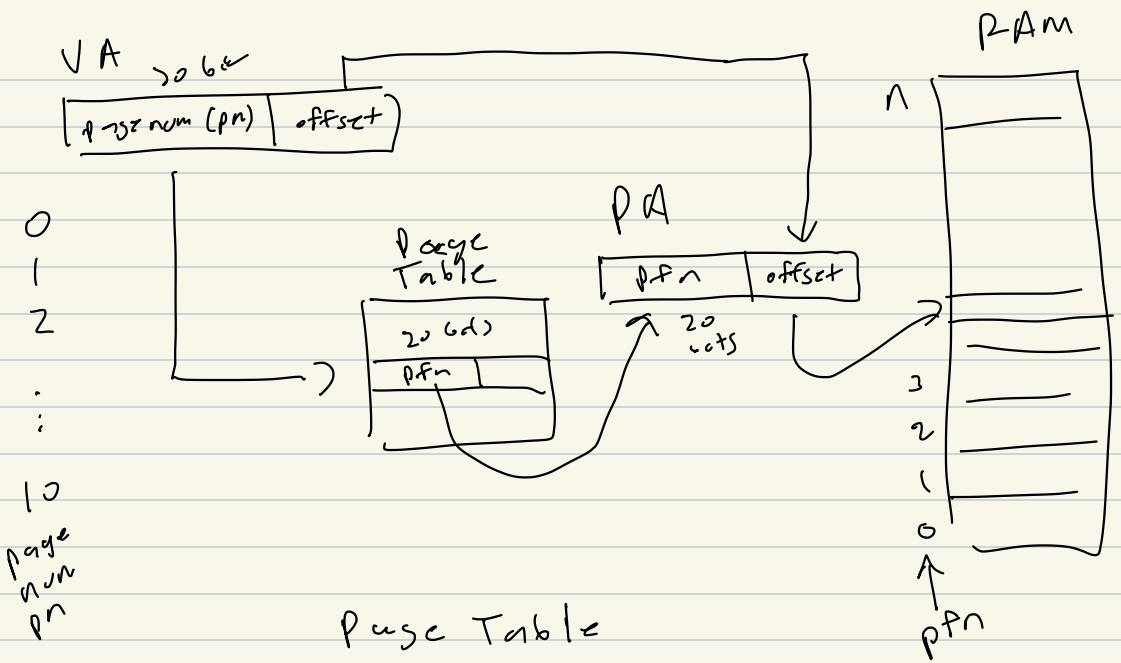
VA



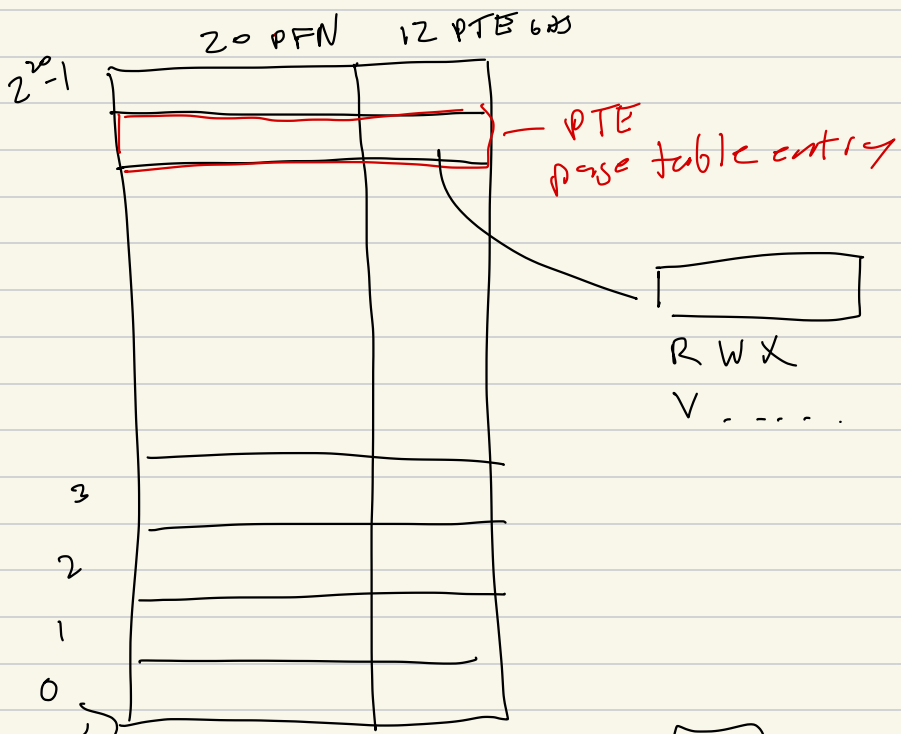
$\frac{2^{32}}{2^{12}} = \frac{4GB}{4KB}$

$= 2^{20}$ ≈ 1 million

VA → PA


VA
>> 64
page num (pn)
offset
0
1
2
10
page num pn
Page Table
20 bits
pfn
PA
pfn
offset
20 bits
RAM
n
3
2
1
0
pfn

Page Table

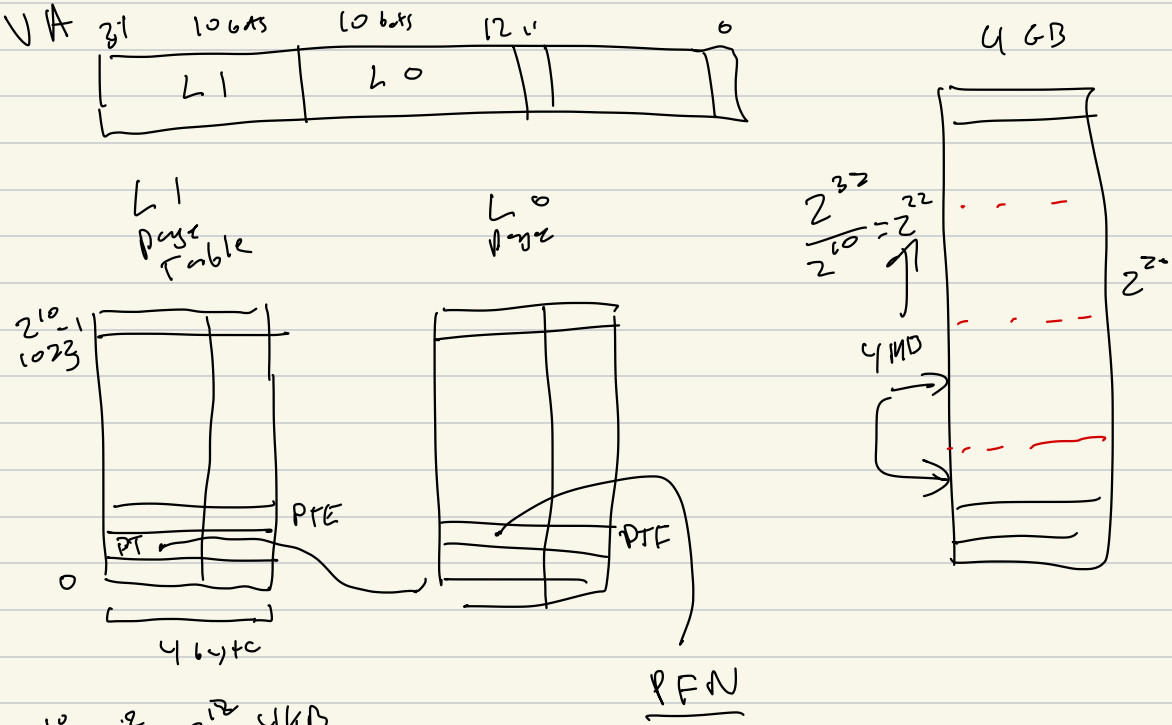

20 PFN
12 PTE bits
$2^{20}-1$
PTE
page table entry
R W X
V . . . . .
3
2
1
0
PT
Reg
32 bits = 4 bytes
2^2

Size of the page table

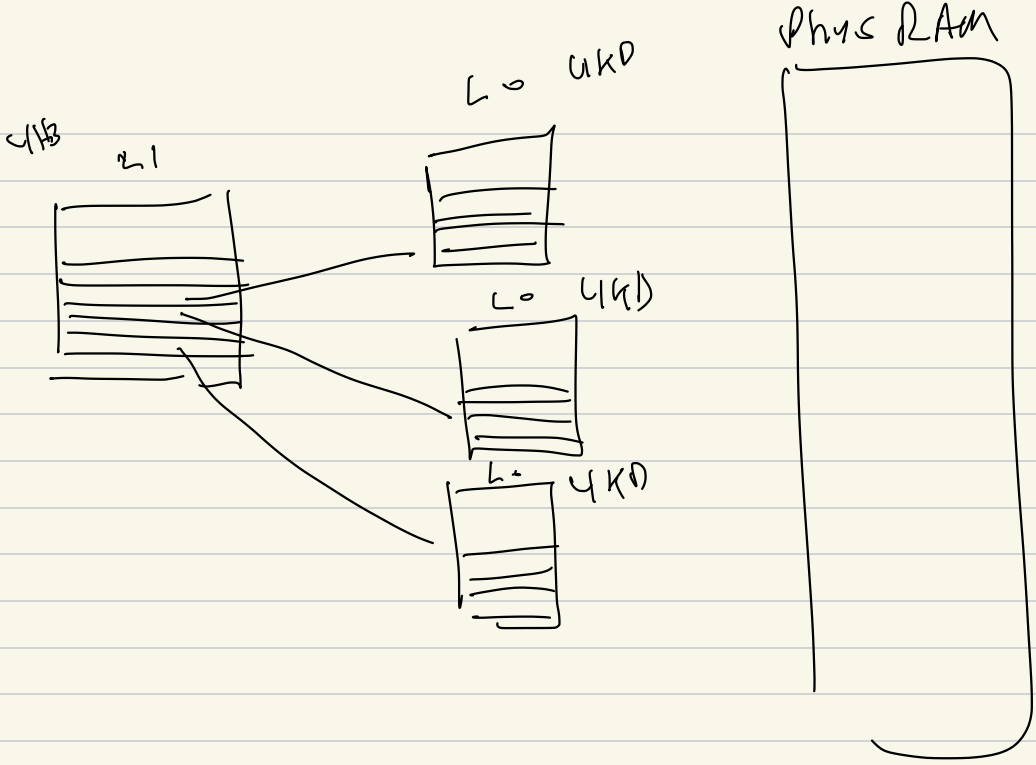
$$2^2 \times 2^{20} = 2^{22} = \boxed{4\ MB}$$

100 procs $\quad 100 \times 4 = \boxed{400\ MB}$

Multi-level Page Tables (Sparse)



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


Phys RAM
L0 4KB
L1
L0 4KB
L0 4KB
L0 4KB