

Lab4: Preemptive Multitasking

Mansour Alharthi

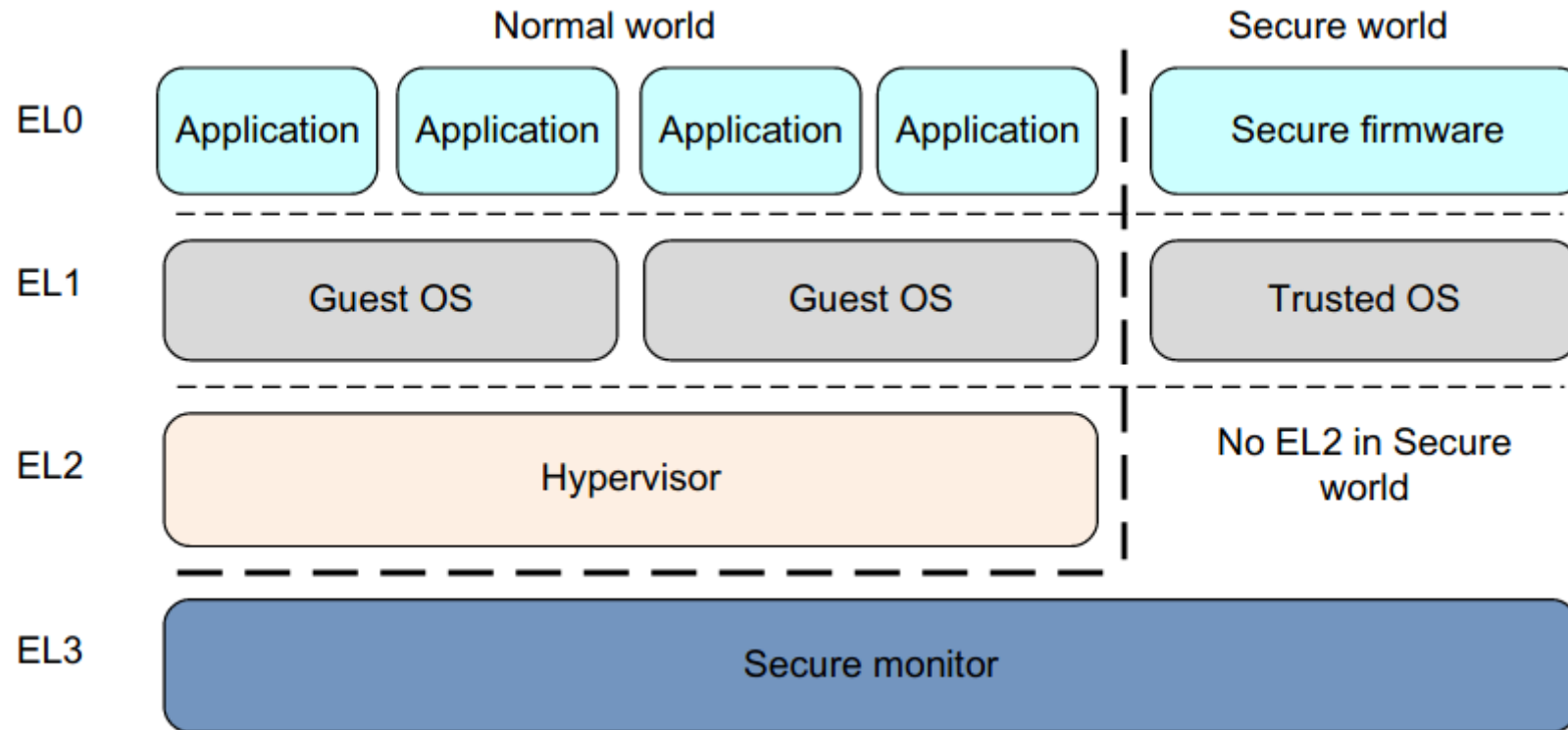
Overview

- Lab 4 is LONG.

Overview

- Lab 4 is ~~LONG~~. 3325 lines, 19756 words, and 134,143 chars!
- Due: < 5 weeks from now (Apr 13)

Our OS (Up to Lab3)



Our OS (Up to Lab3)

EL0

User

EL1

Kernel

EL2

Almost everything is here 😞

Hypervisor

EL3

Monitor

Our OS (Up to Lab3)



Wait, when did we move to EL2 from EL3?

Our OS (Up to Lab3)

```
switch_to_el2:
    // switch to EL2 if we're in EL3. otherwise switch to EL1
    cmp     x0, 0b11           // EL3
    bne     switch_to_el1

    // set-up SCR_EL3 (bits 0, 4, 5, 7, 8, 10) (A53: 4.3.42)
    mov     x2, #0x5b1
    msr     SCR_EL3, x2

    // set-up SPSR and PL switch! (bits 0, 3, 6, 7, 8, 9) (ref: C5.2.20)
    mov     x2, #0x3c9
    msr     SPSR_EL3, x2
    adr     x2, switch_to_el1
    msr     ELR_EL3, x2
    eret
```

kern/src/init/init.s

Our OS (Up to Lab3)

EL0

User

EL1

Kernel

EL2

FAT

Memory Allocator

Shell

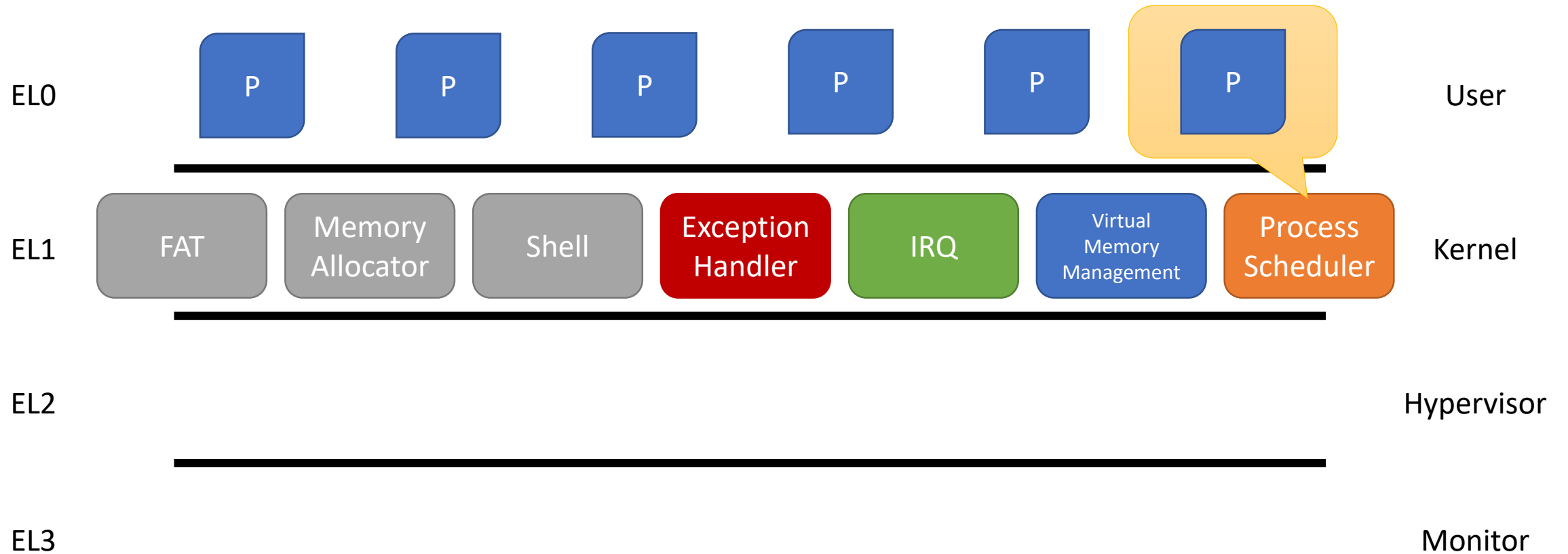
Hypervisor

EL3

Monitor



Our OS (after Lab4)



Overview

Phase 1: ARM Architecture (5 subphases).

Phase 2: It's a Process (5 subphases).

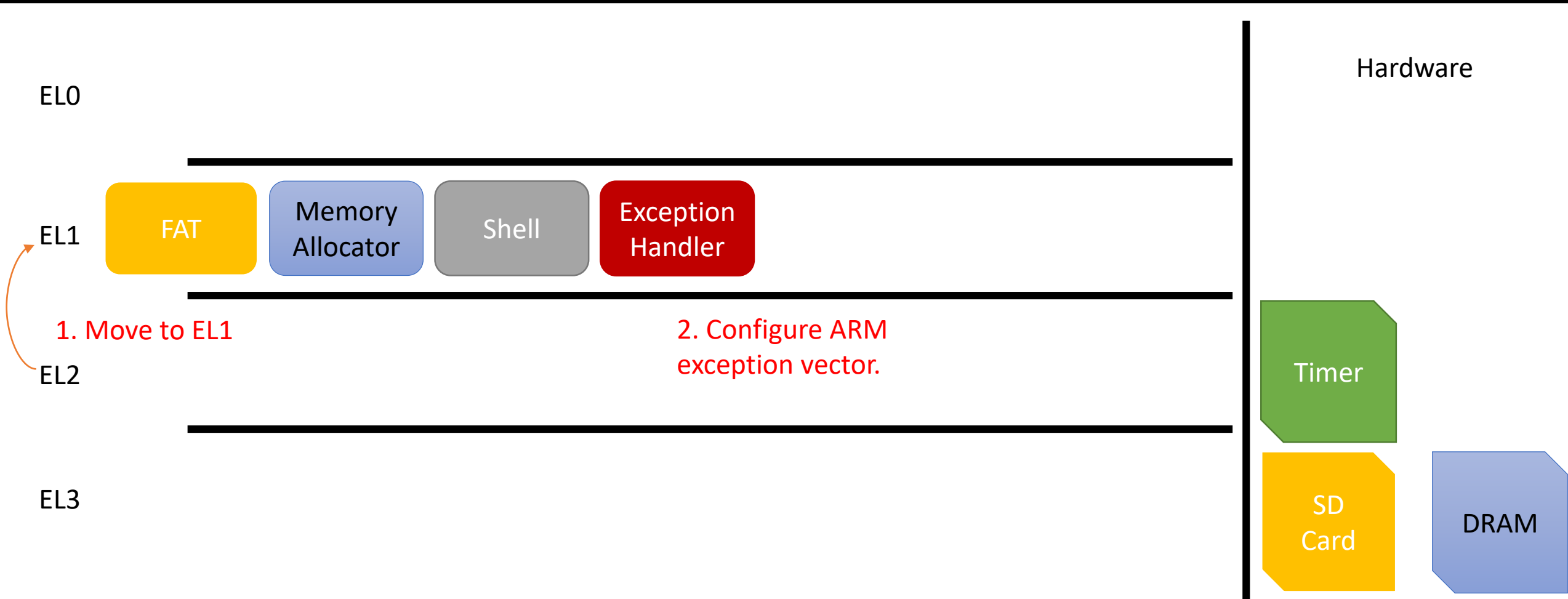
Phase 3: Memory Management Unit (2 subphases).

Phase 4: Programs In The Disk (2 subphases).

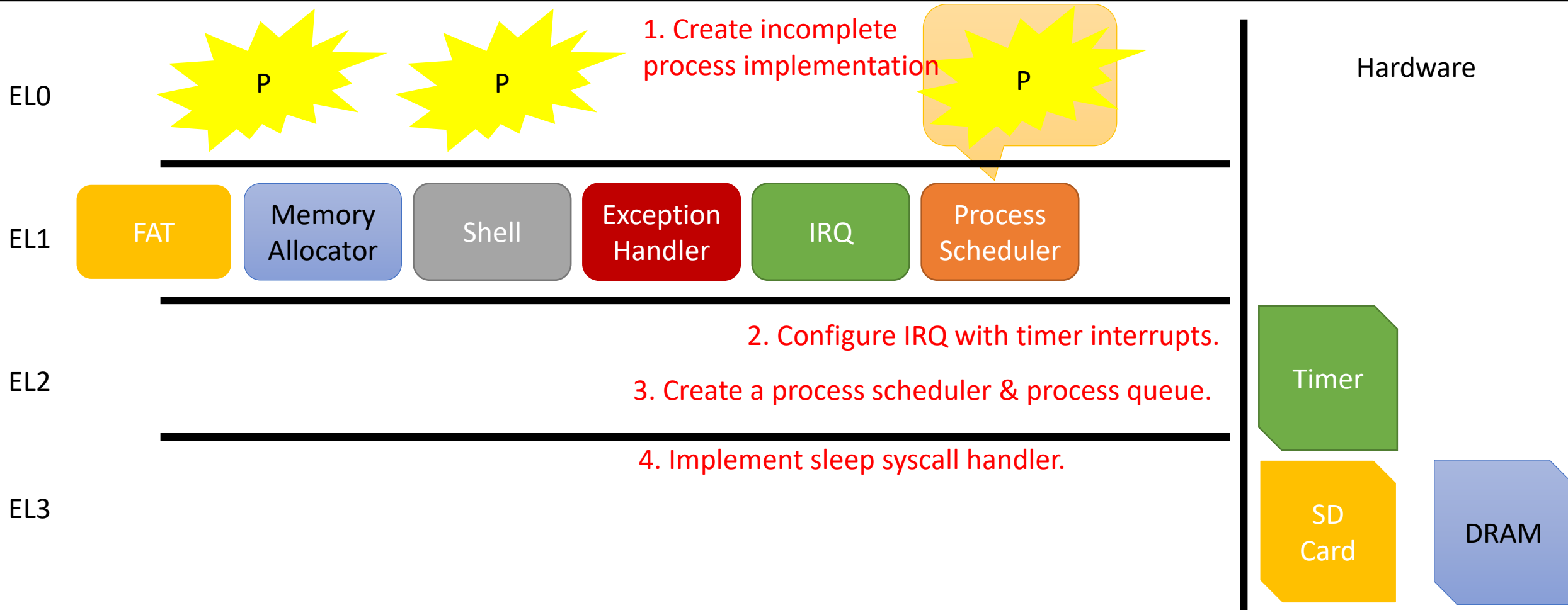
Our OS – Before Lab 4



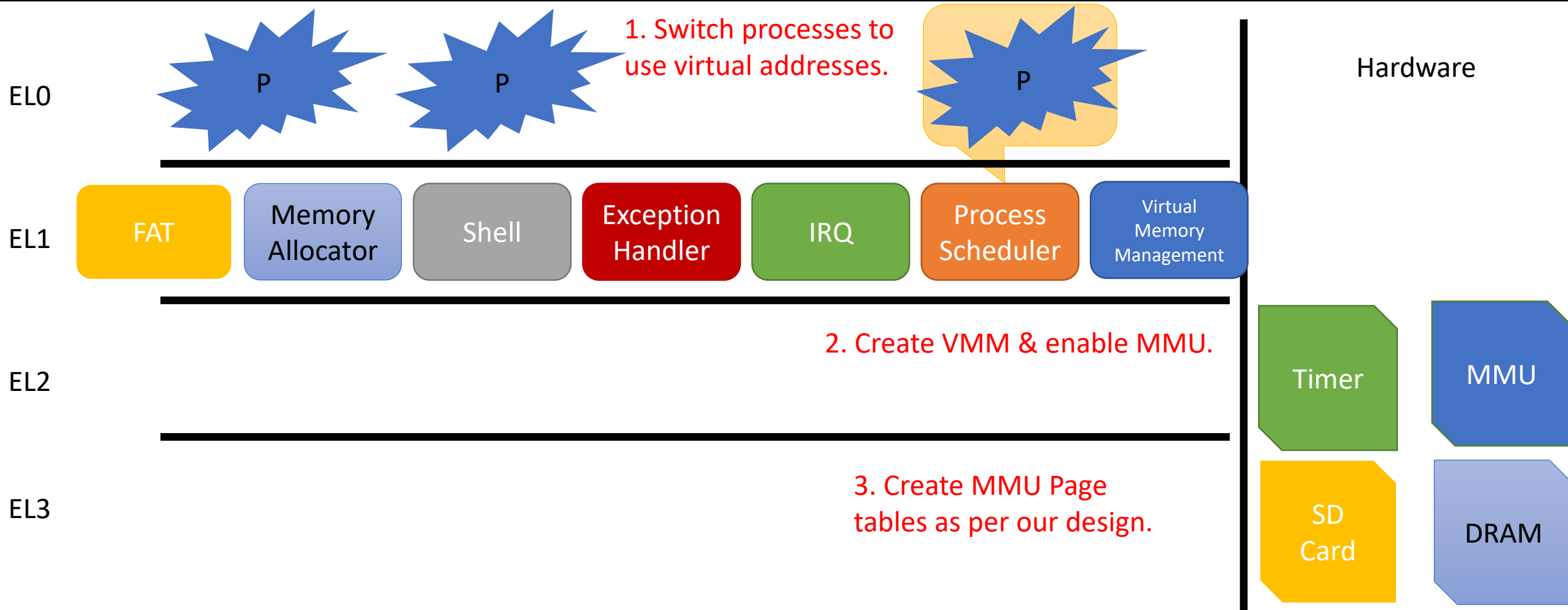
Our OS – Lab4 Phase 1



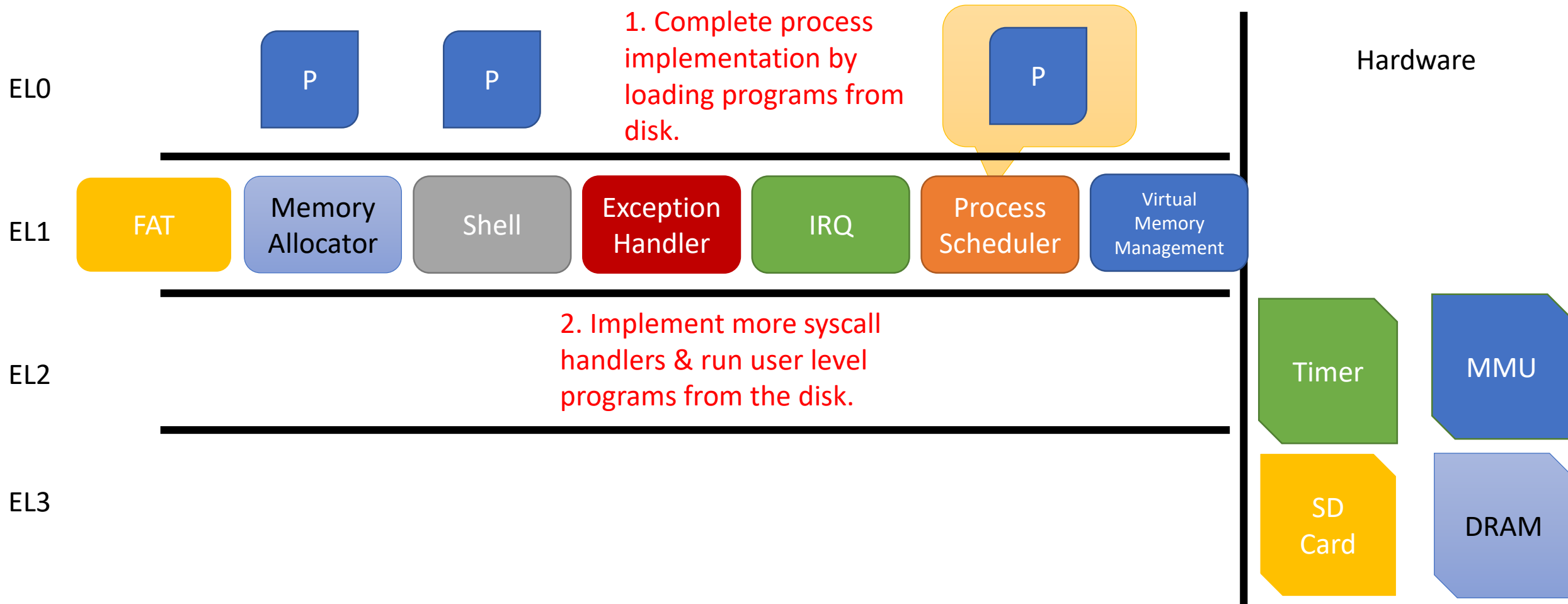
Our OS – Lab4 Phase 2



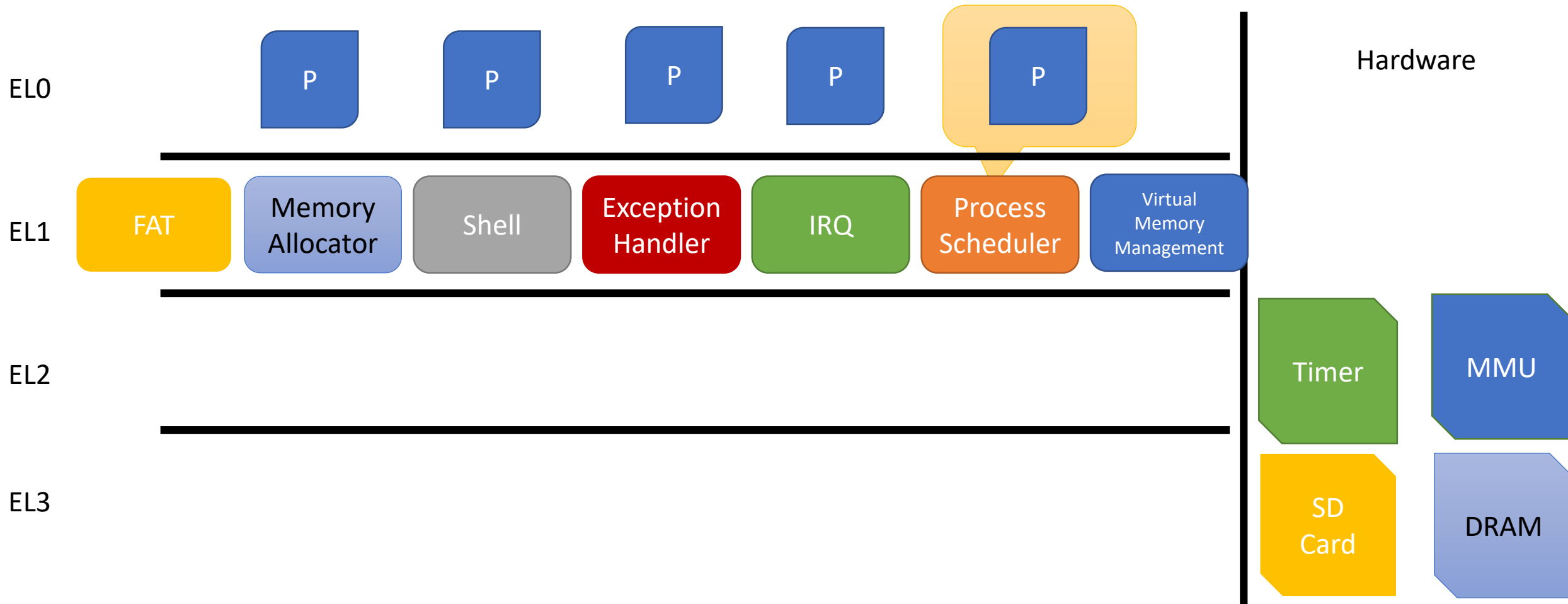
Our OS – Lab4 Phase 3



Our OS – Lab4 Phase 4

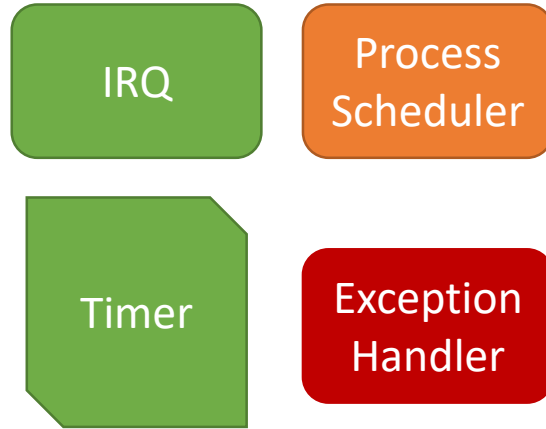


Our OS – After Lab4

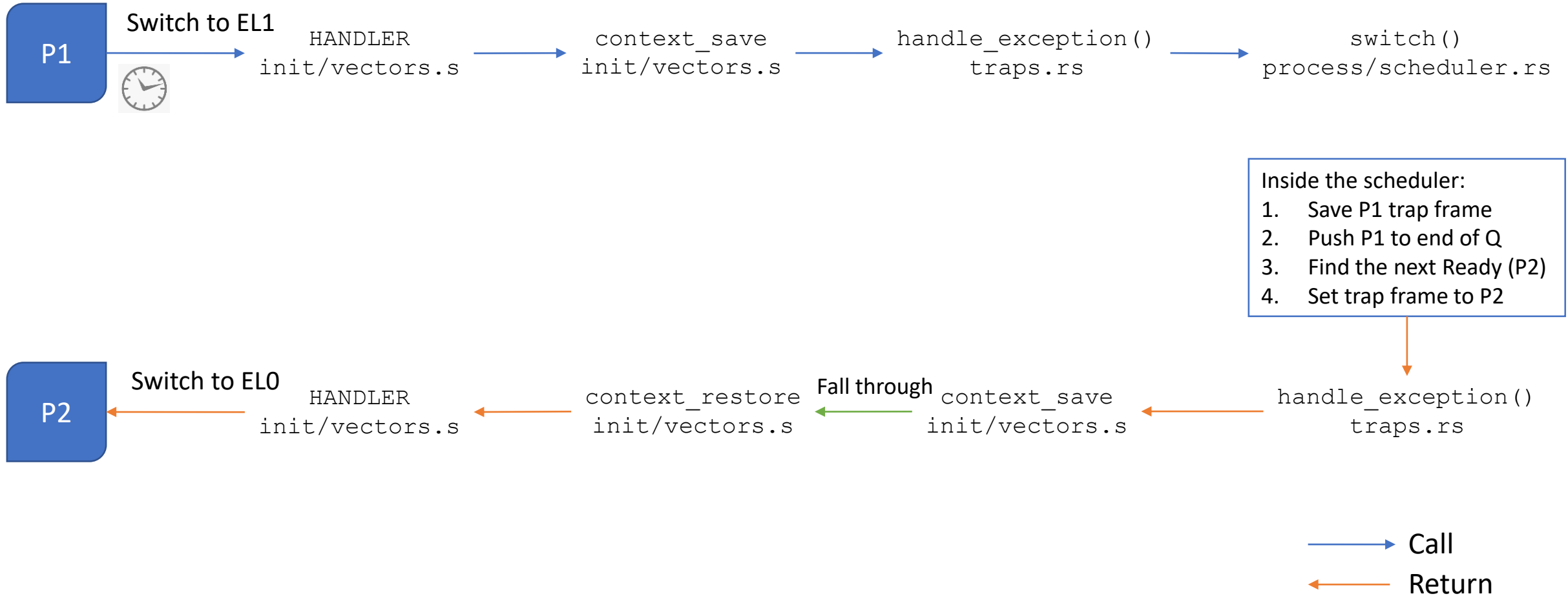


Flow of our process scheduler (context switching)

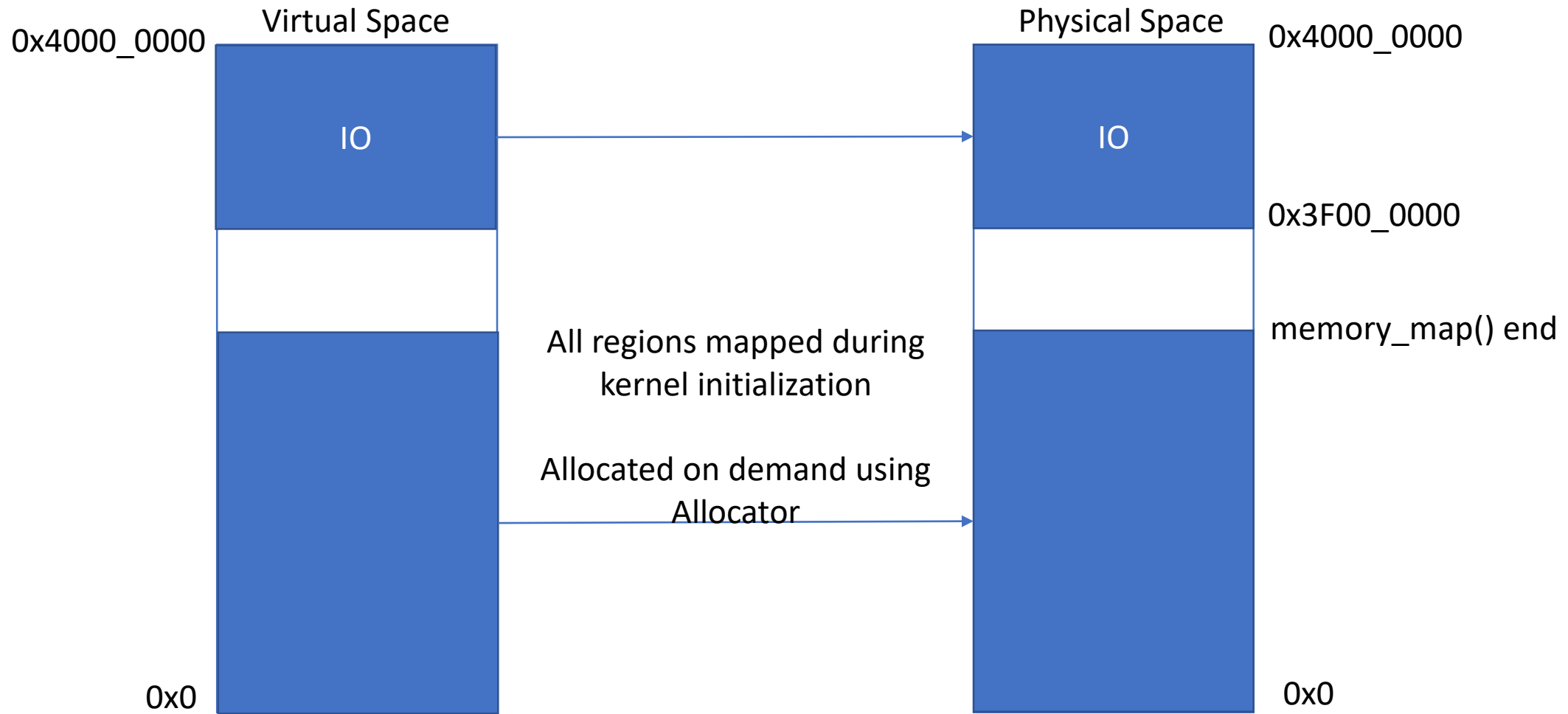
Initialize:



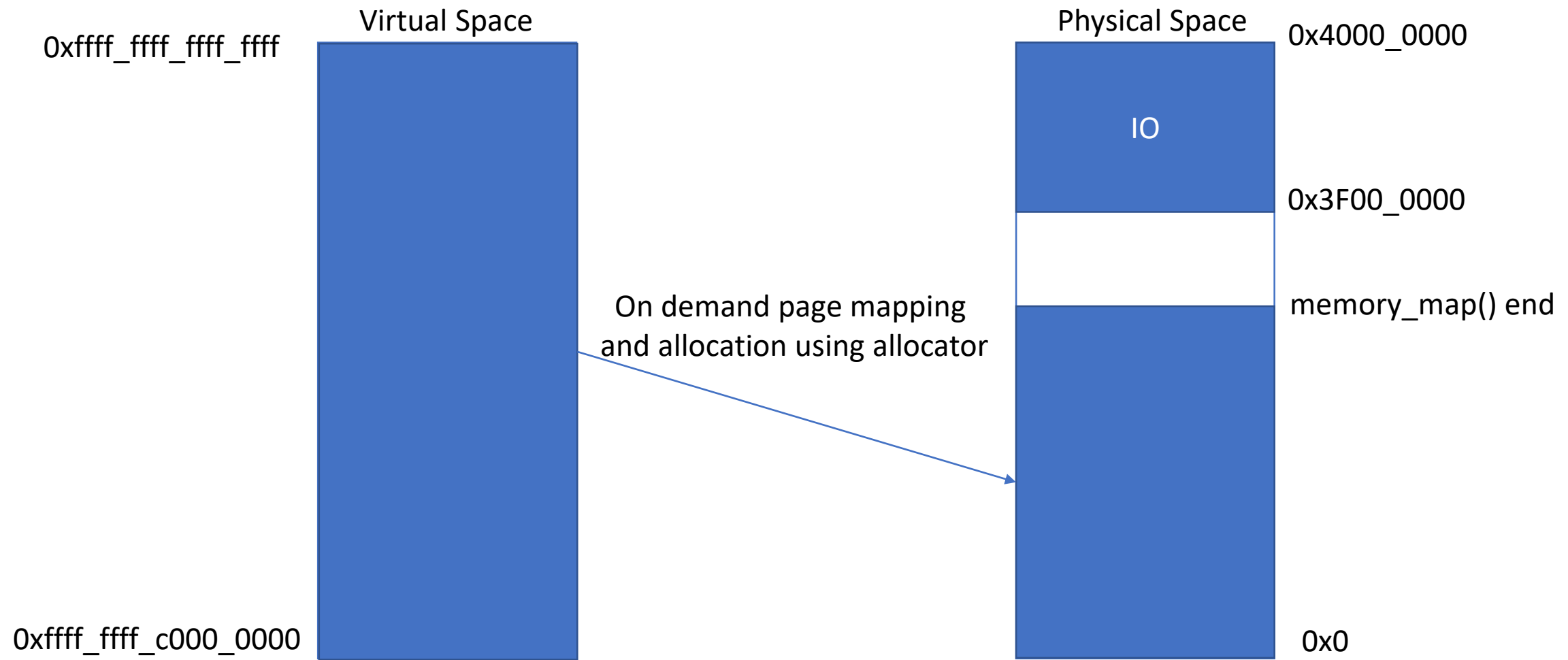
Flow of our process scheduler (context switching)



Virtual Vs Physical Layout (Kernel View)



Virtual Vs Physical Layout (User View)



Q&A