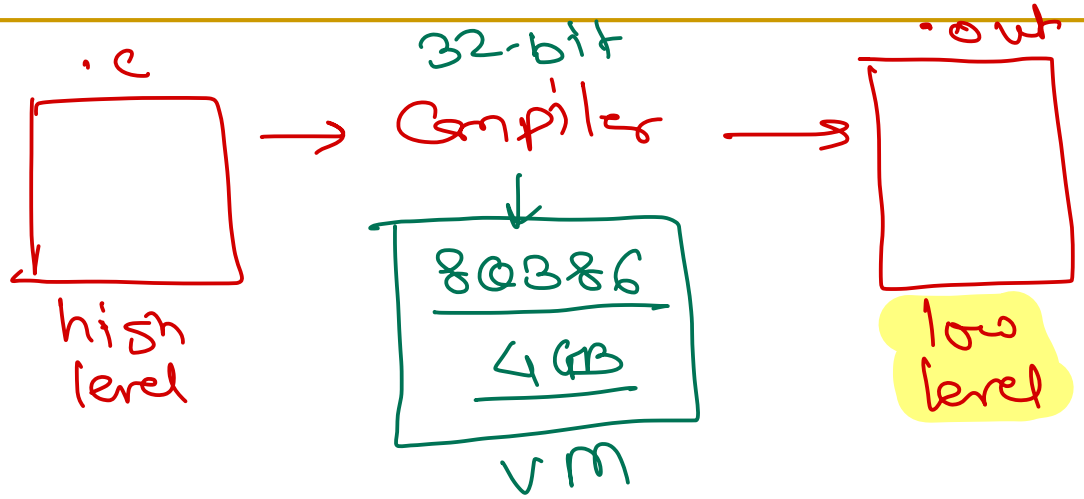
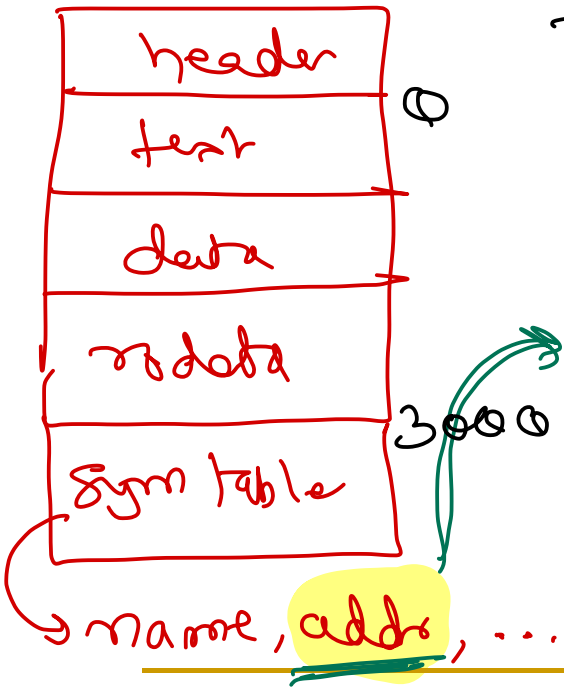
Computer System

Sunbeam Infotech



exe file (disk)

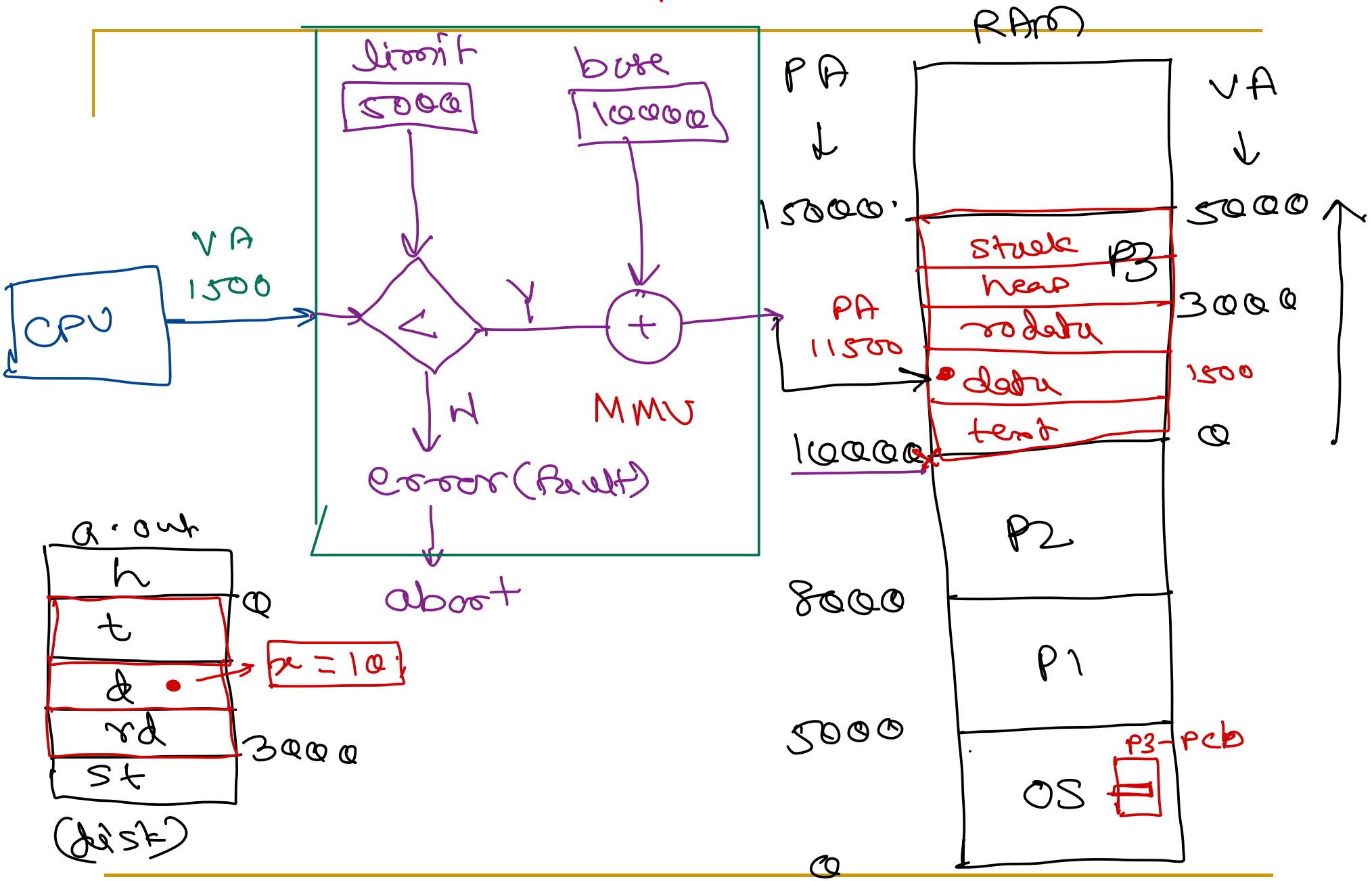


terminal> file exepath → ELF 80386

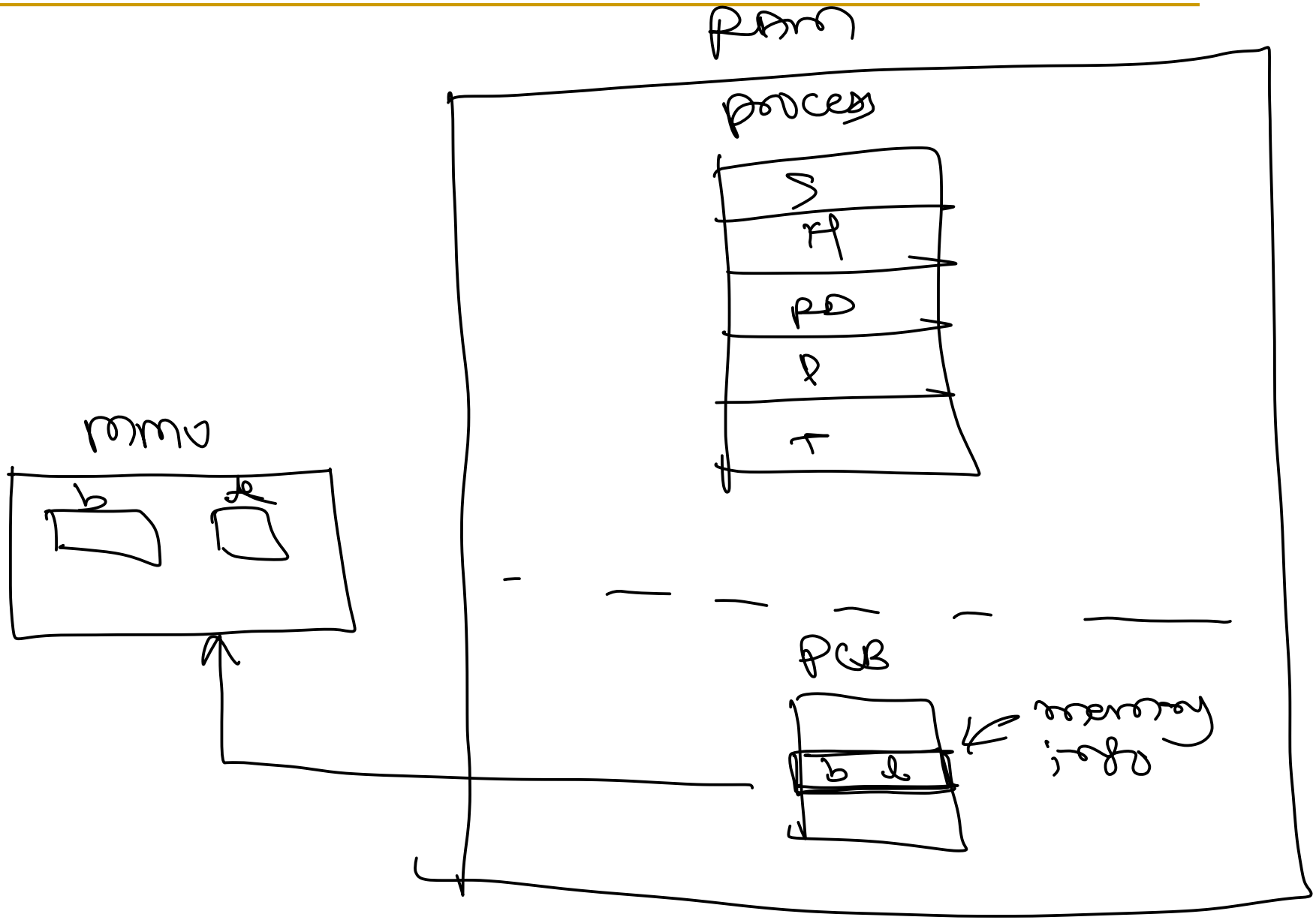
terminal> readelf -a exepath

logical addr / virtual addresses

CPU always execute a process in its virtual address space.



virtual addr space = set of virtual addresses.
physical addr space = set of physical addresses.


RAM
process
S
PD
D
T
MMU
PCB
memory info

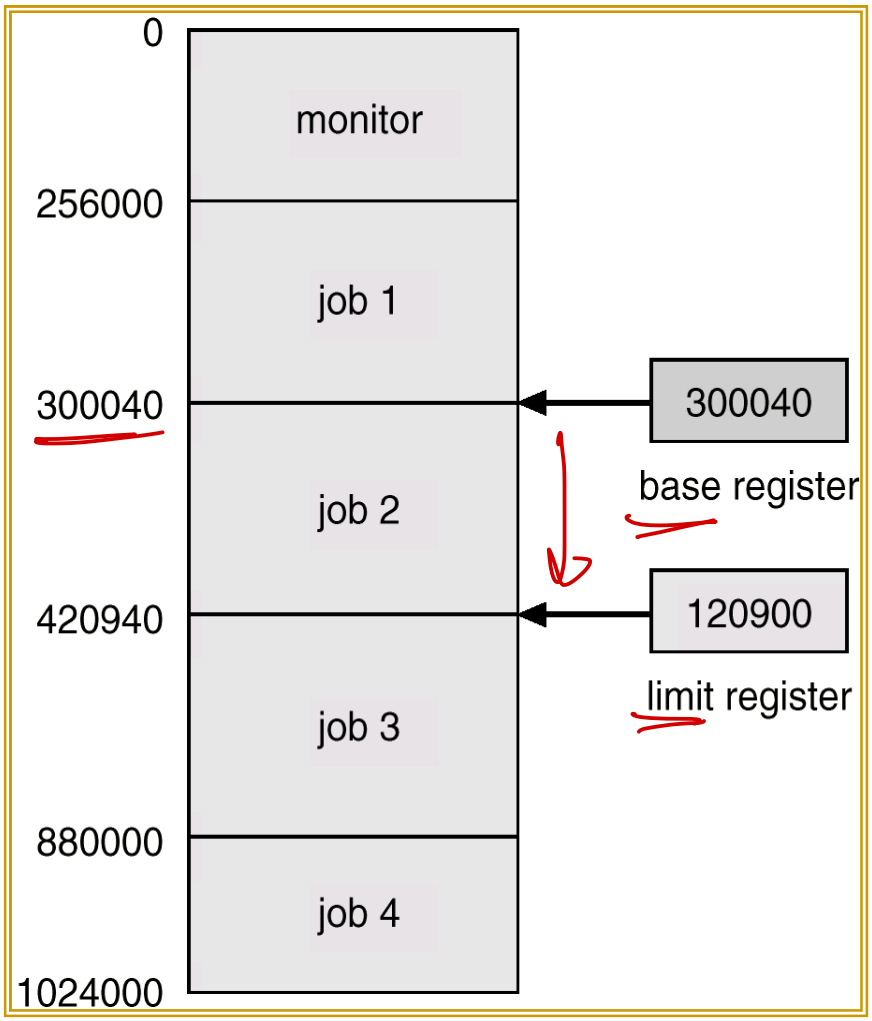
Memory Protection

- Must provide memory protection at least for the interrupt vector and the interrupt service routines.
- A user program must be protected from the other user program.
- In order to have memory protection, add two registers that determine the range of legal addresses a program may access:
  - Base register – holds the smallest legal physical memory address.
  - Limit register – contains the size of the range
- Memory outside the defined range is protected.

simple mmu

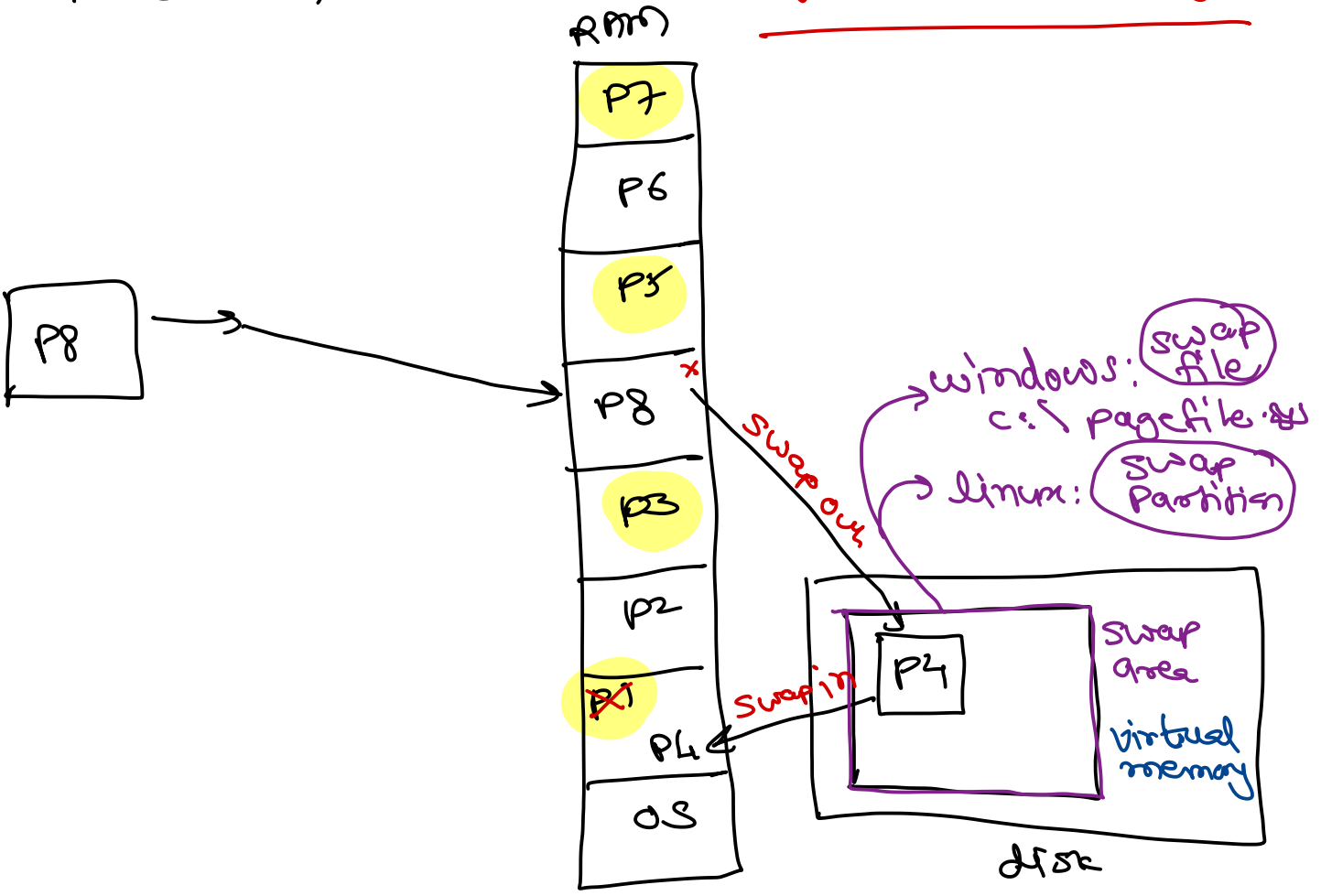
Use of Base and Limit Register

- When executing in monitor mode, the operating system has unrestricted access to both monitor and user's memory.
- The load instructions for the base and limit registers are privileged instructions.



terminal> free -m

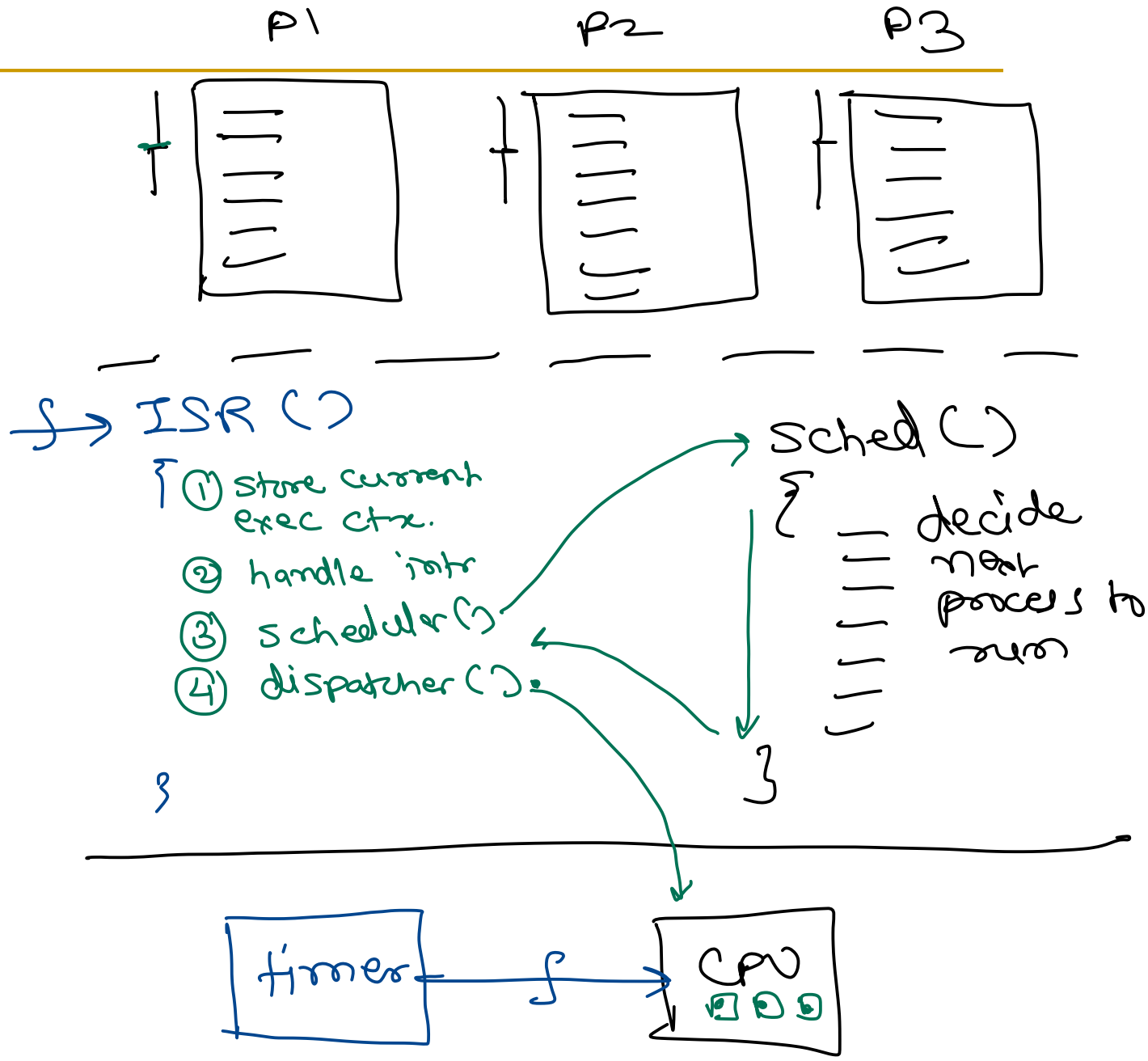
Virtual memory



CPU Protection

- User program may stuck up in infinite loop and may not return control to the operating system.
- Timer interrupts computer after specified period to ensure operating system maintains control.
  - Timer is decremented every clock tick.
  - When timer reaches the value 0, an interrupt occurs.
  - Set up before scheduling process to regain control or terminate program that exceeds allotted time
- Timer is commonly used to implement time sharing.
- Changing timer values is a privileged instruction.
- Computers may have time-of-day clock that is independent of operating system.

win 2.x


P1
P2
P3
ISR()
{
① store current exec ctx.
② handle intr
③ scheduler()
④ dispatcher();
}
sched()
{
decide next process to run
}
timer
CPU

Thank you!

Source: Galvin OS books/slides

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