Introduction To OS

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50.005 CSE

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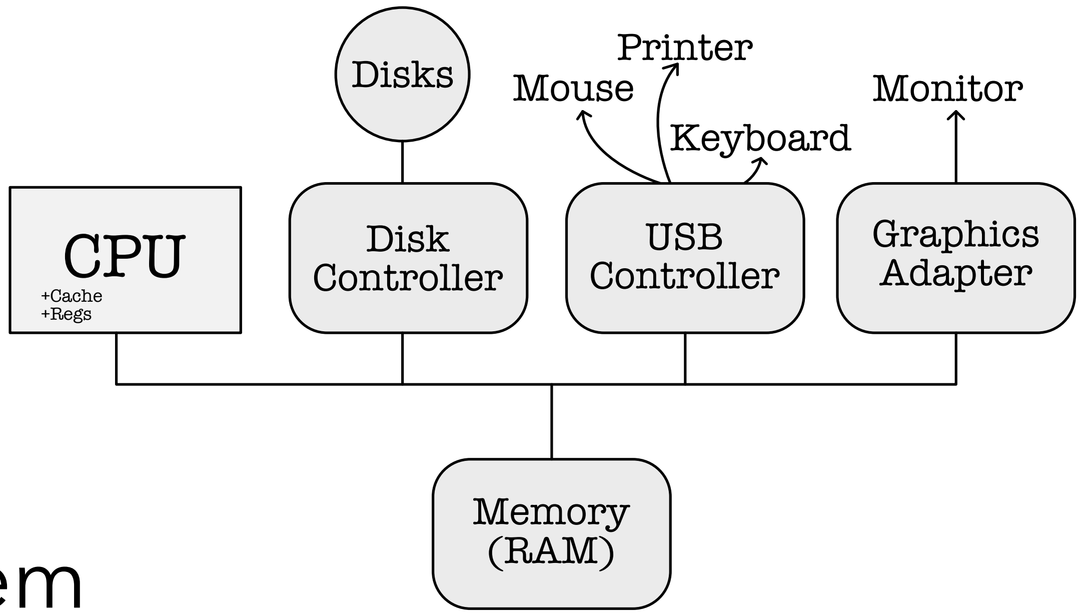
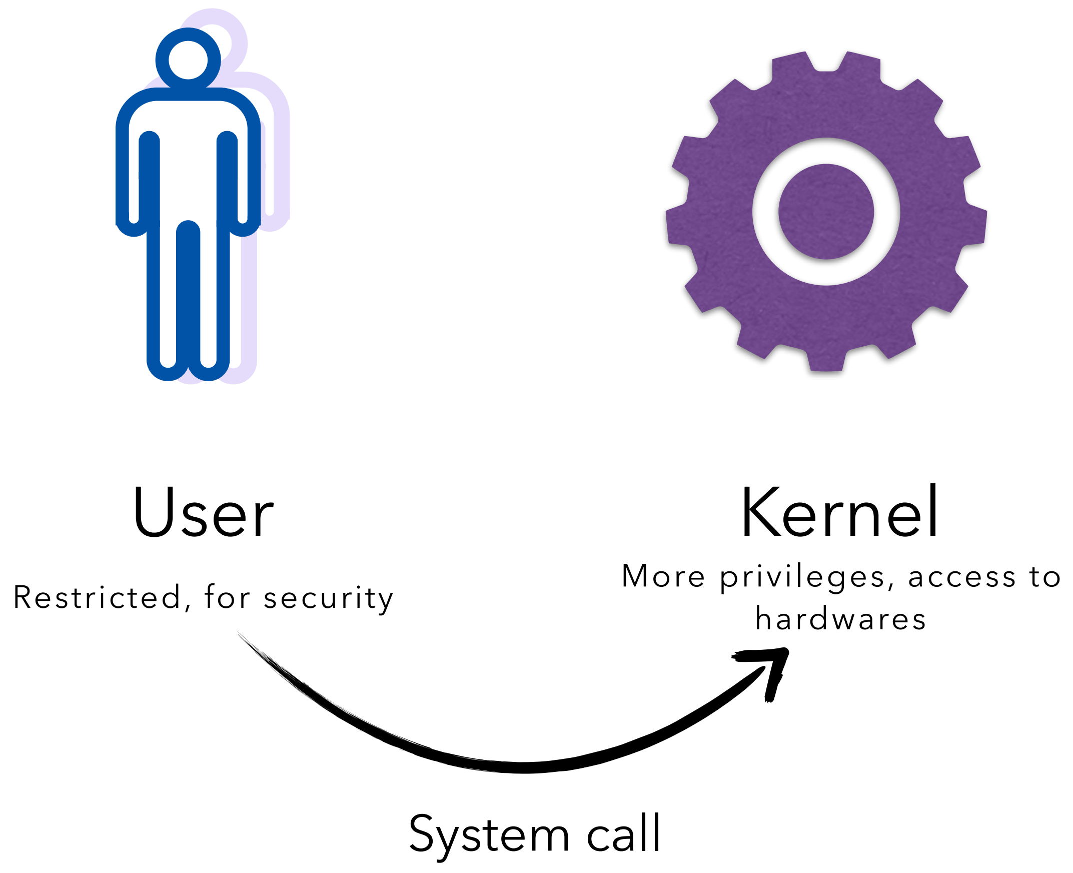
WHAT IS AN OS?

One of the four parts of computer system:

- Hardware
- Operating System
- Programs
- User



DUAL MODE


User
Restricted, for security
Kernel
More privileges, access to hardwares
System call

WHAT IS AN OS **FOR**?

Functions of the OS:

- Resource allocator
- Control program executions

The heart of the OS is the **Kernel**

HOW DOES OS RUN?

1. Computer ON

Loads BIOS

2.BIOS Scans

Prep all attached devices to CPU in a state for OS

3. BIOS Loads Bootloader

Bootloader: points to the entry code of the OS

4. OS starts

OS bootstraps and starts

PURPOSES OF AN OS

Controls and coordinate use of hardware among various applications (programs) and users

1. Hardware & I/O control

WHAT ARE I/O DEVICES?

Input:

- Graphic tables
- Cameras
- Barcode reader
- Gamepad
- Joystick
- Mouse
- Keyboard
- Microphone
- Scanner
- Touchpads
- Pen input

Output:

- Monitor
- Printer
- Projector
- Speaker
- Headphones
- Monitors

Both:

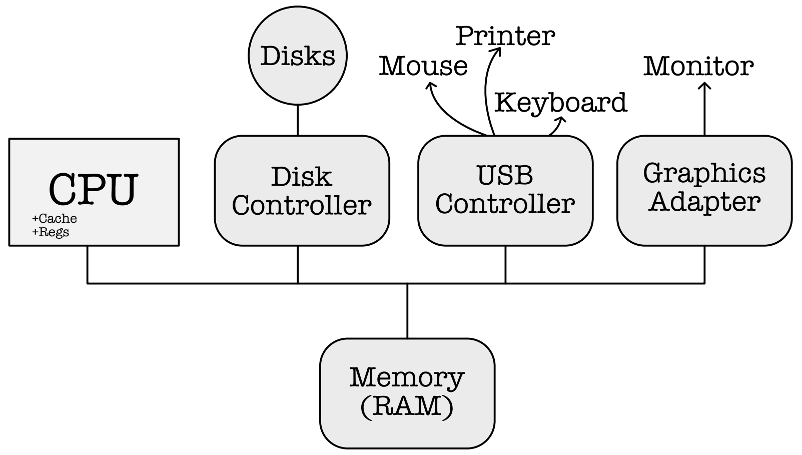
- Modems
- Network cards
- Touch screen
- FAX
- Sound card

HOW I/O DEVICES WORK

CPU and I/O devices act **independently** of one another

I/O devices can run code an starts activity on its own too

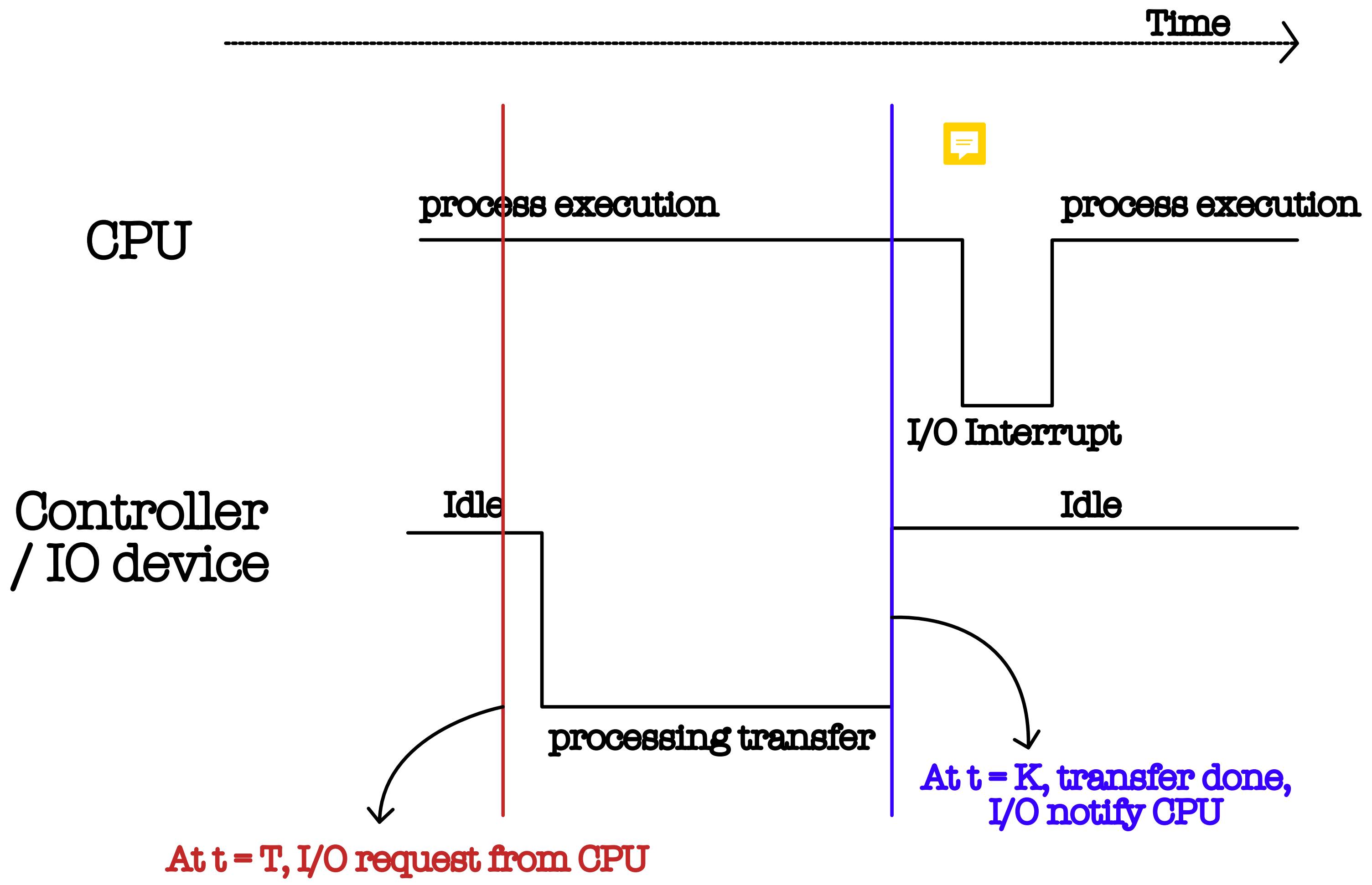
Each I/O device has a **controller** (whats why you install *drivers*) that comes with a ***local buffer***



(A) CPU wants to move data to/from local buffer from/to memory (RAM)
(B) I/O happens when data is moved from/to local buffer to/from device

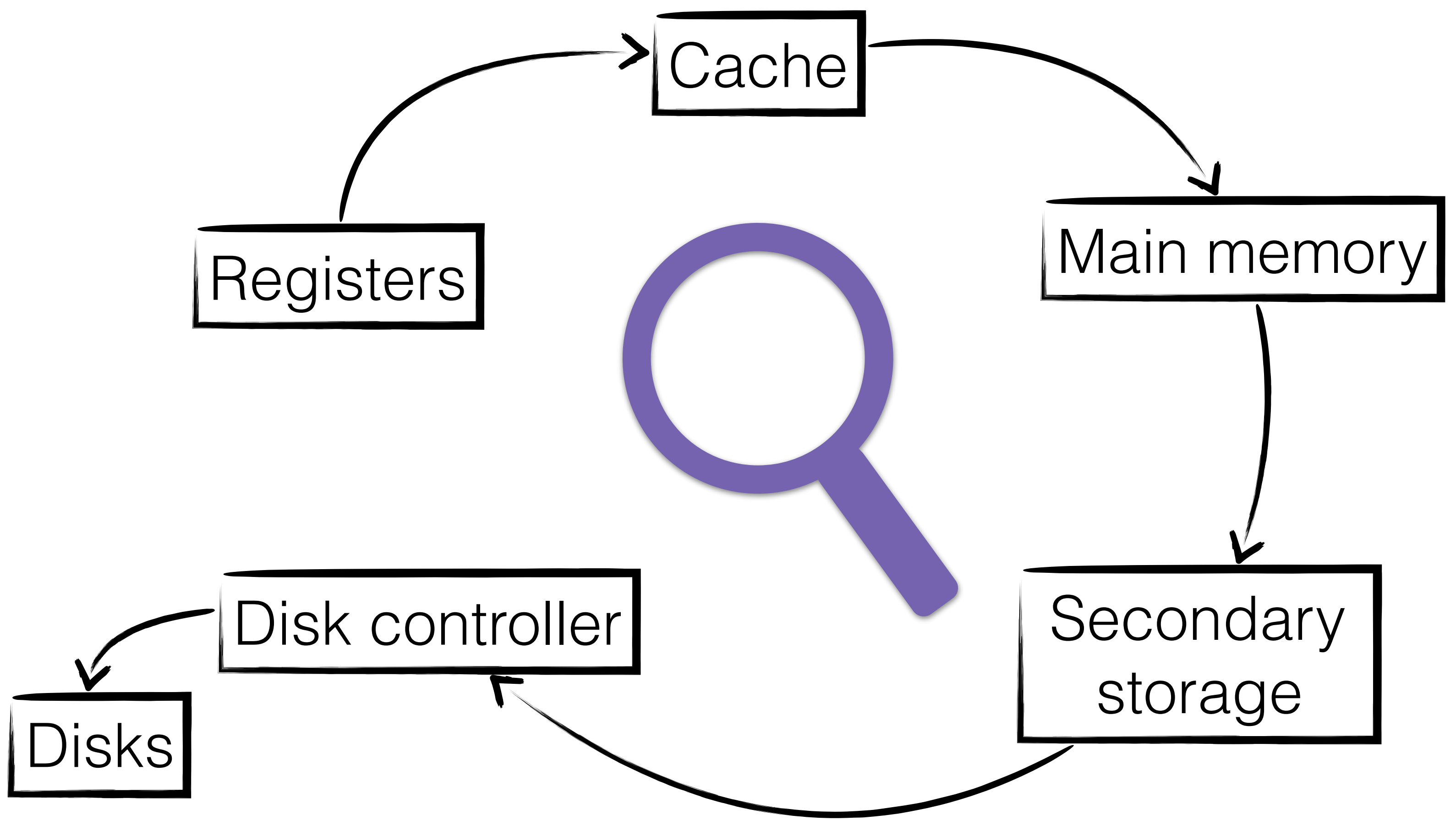
We need **coordination** to do step (A) and (B) above: with *interrupts*

PURPOSES OF AN OS



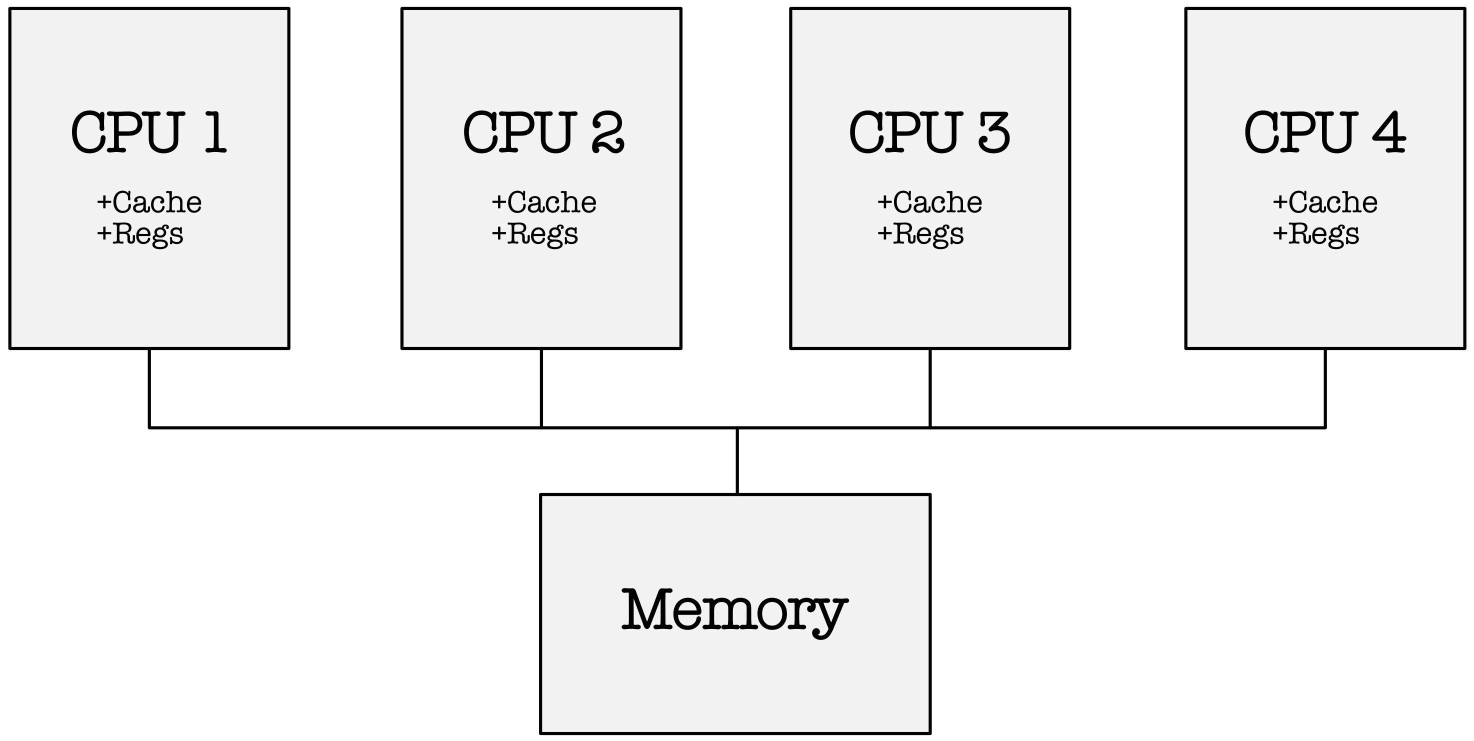
2. Handles interrupts

PURPOSES OF AN OS



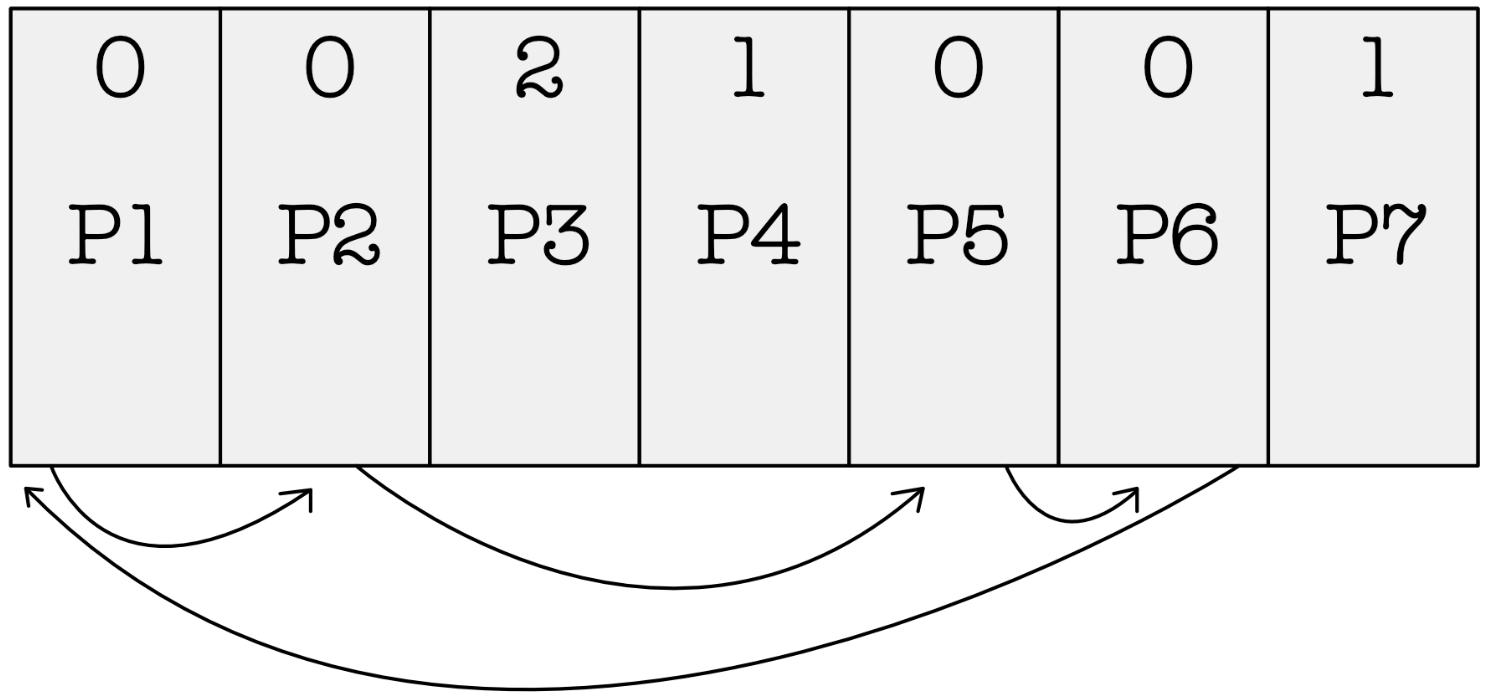
3. Managing the Storage Hierarchy

PURPOSES OF AN OS



4. Multiprogramming: process management (Scheduling & context switch)

WHY MULTIPROGRAMMING?



Context switch

MULTIPROGRAMMING

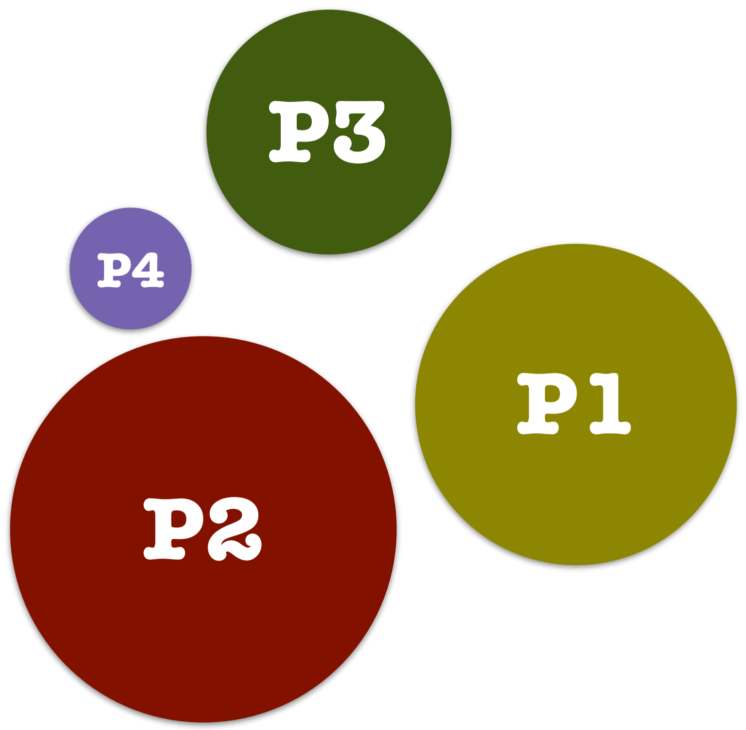
WHY

1. Be efficient in organizing / scheduling jobs or data, since CPU can only execute 1 instruction per clock cycle
2. Allows timesharing: context switch so rapidly that users still see it as interactive computing

HOW

1. Response time is fast enough
2. Always have at least 1 program active at any time
3. If RAM is full, swap with disk

PROCESS MANAGEMENT



System has many processes, **multiplexed**

1. Create/delete user & kernel processes
2. Schedule & sync process comms
3. Manage threads
4. Deadlock handling
5. Garbage collector (free resources)

Kernel's process manager