

Welcome to Operating Systems!

As a convention in this class, say your name before you speak to the group!

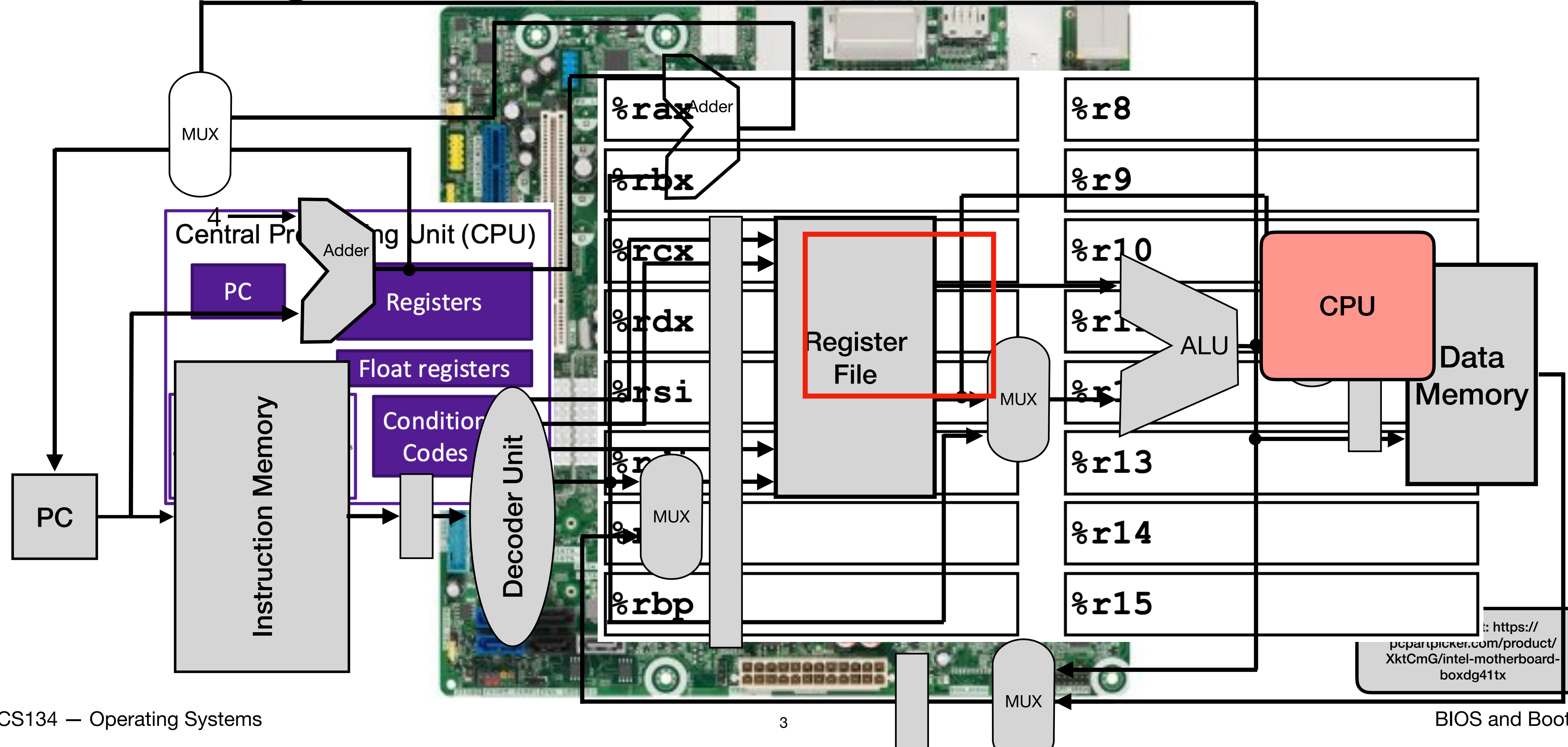
Introductions!

Name (pronouns),
Year, College

A recent class that
you loved (doesn't
have to be computer
science!)

Something fun from
summer!

Booting a Computer



Source: <https://pcpartpicker.com/product/XktCmG/intel-motherboard-boxdg41tx>

Chat with your neighbor(s)!

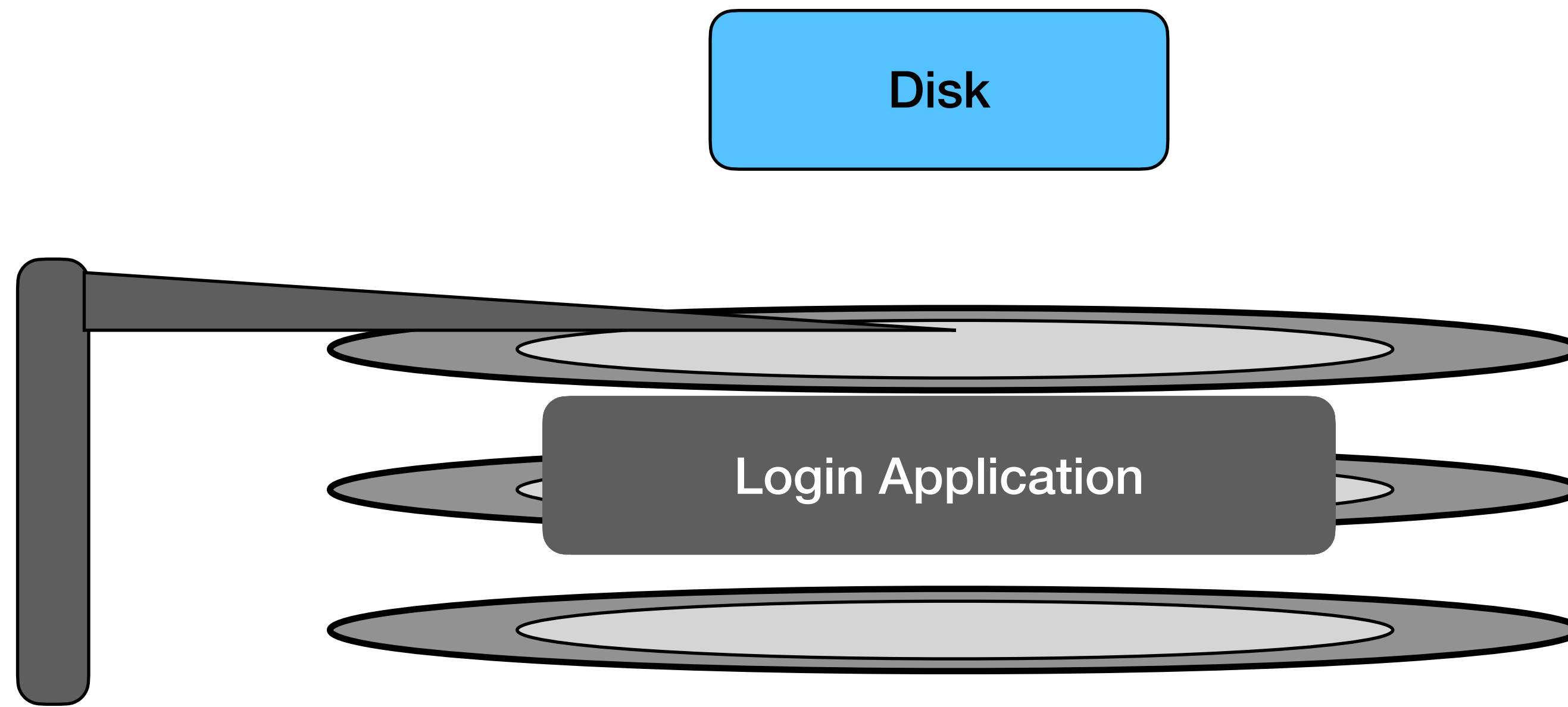
What is going on in the computer when we turn it on? Think about the various hardware components and what their state might be!

Much of the hardware requires power to maintain state (e.g., the devices are *volatile*)

To turn on a computer, we need non-volatile devices!

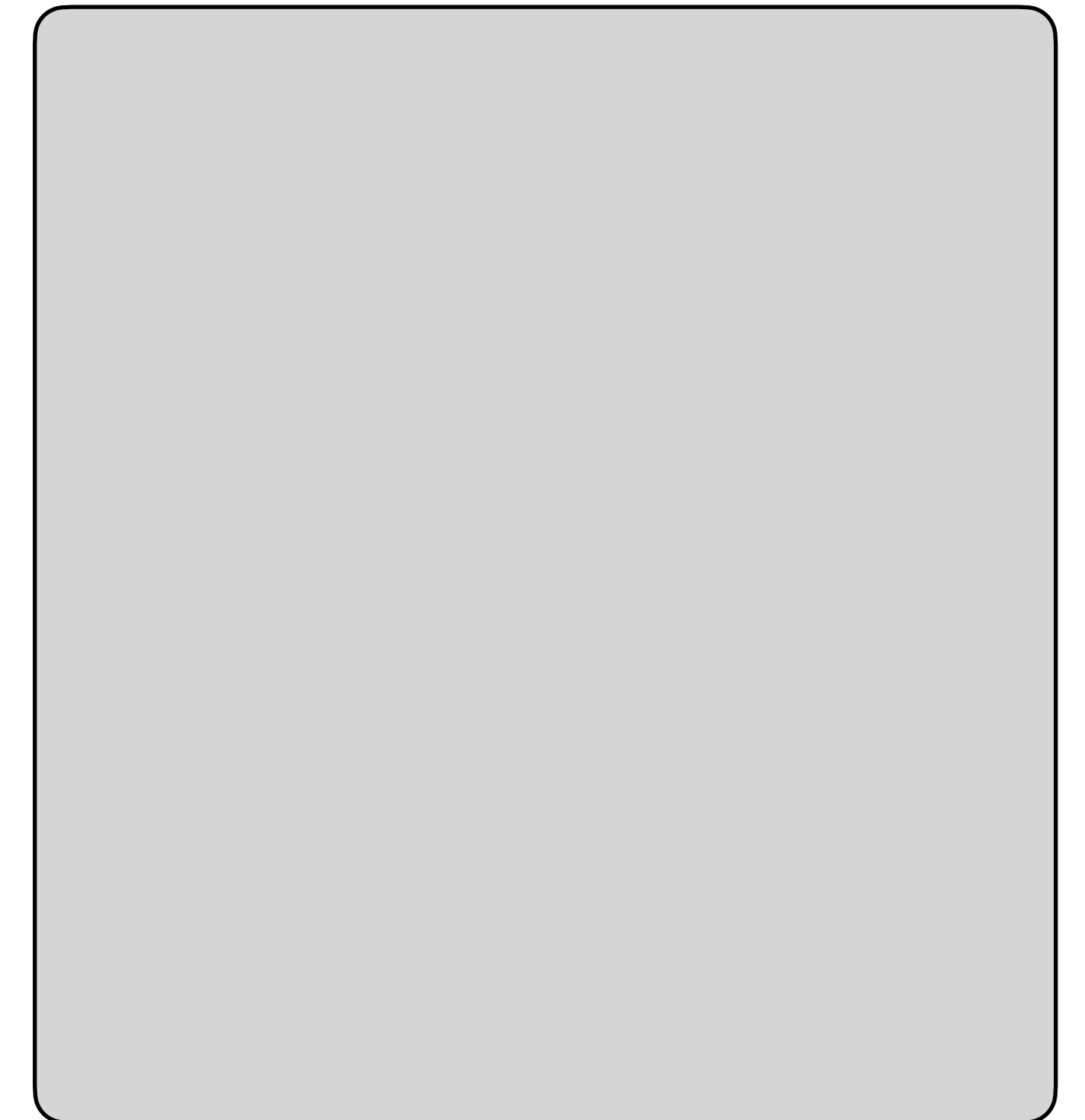
To start executing code, we need something in memory, but the operating system is not in memory...

Booting a Computer

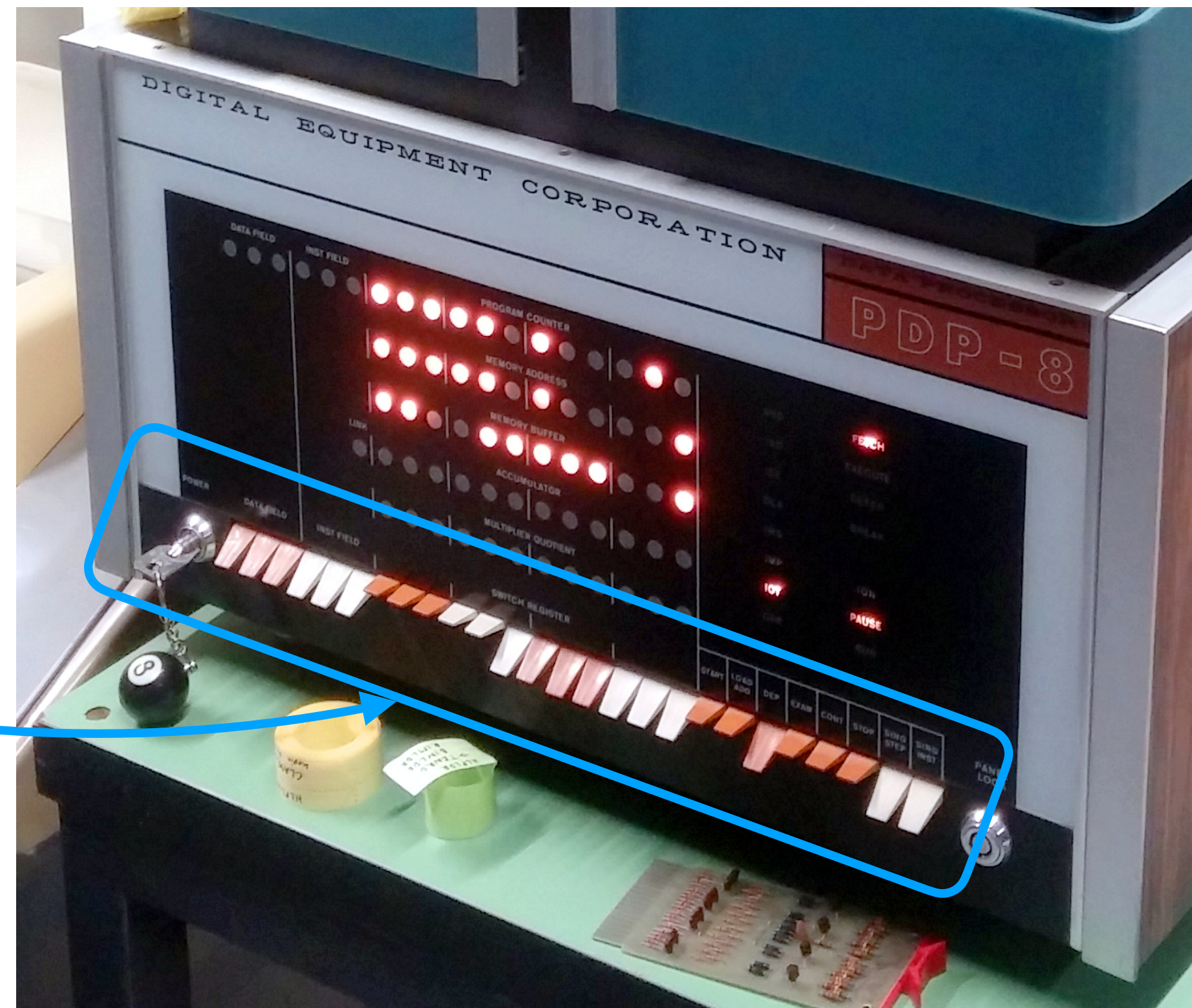


**Challenge: how do we know
where to get bootloader
instruction data from the disk?**

Physical Memory



Booting a Computer (Historically)

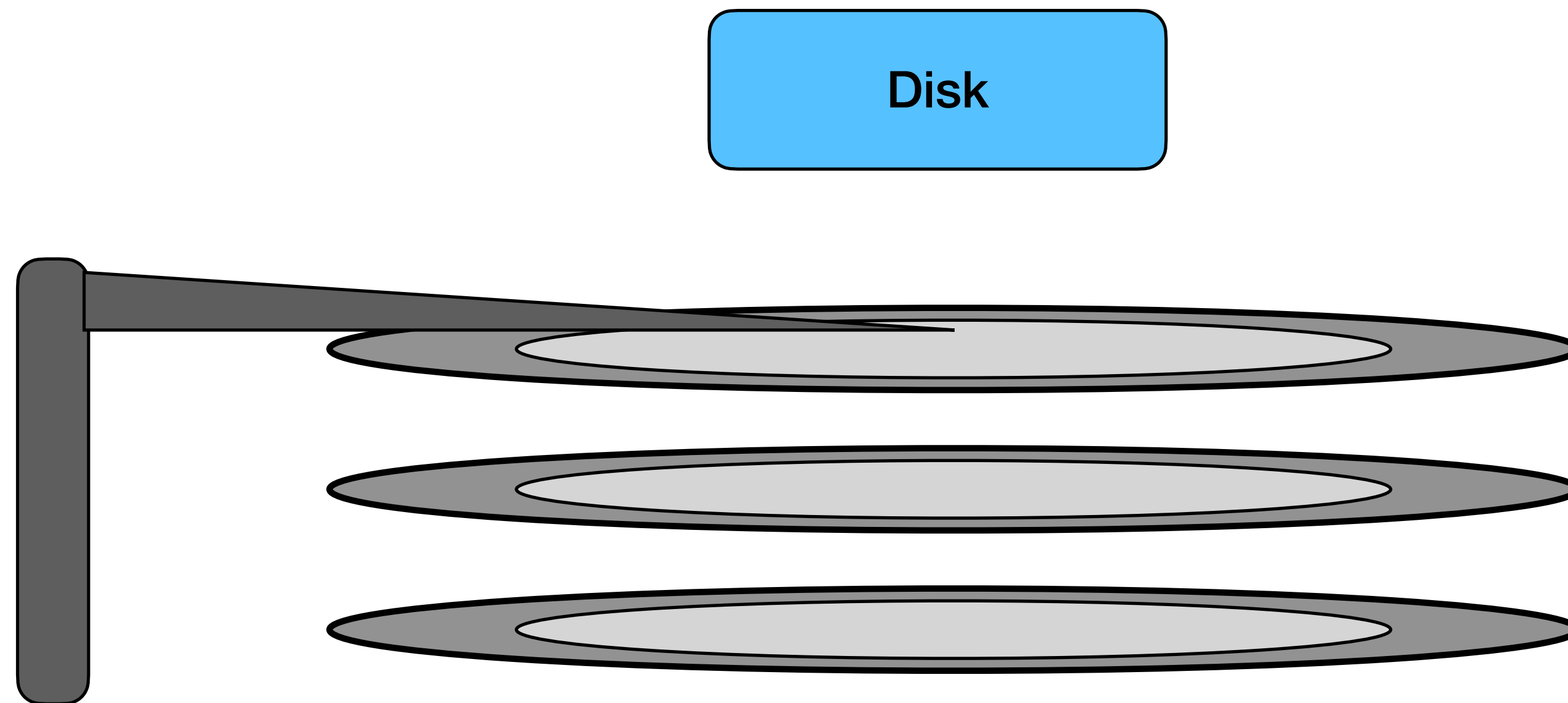


Input switches to
“toggle in” the
bootloader into
memory!

What are some problems with
this approach?

Image credit: [https://
en.wikipedia.org/wiki/PDP-8](https://en.wikipedia.org/wiki/PDP-8)

Booting a Computer



Disk

Challenge: how do we know
where to get bootloader
instruction data from the disk?

The CPU has a small read-only
memory (ROM) for boot
instruction sequence called
BIOS!

Physical Memory

BIOS

Bootloader

OS Kernel

Login Application

Booting a Computer

- When a computer boots, it sets the processor's program counter (%rip in x86) to a pre-determined position in physical memory at the beginning of the BIOS instructions
 - BIOS: Basic Input/Output System for reading boot binaries from disk
- BIOS copies the bootloader from disk to physical memory and moves the program counter to the beginning of the bootloader
- The bootloader copies to OS kernel (instructions and data) from disk into physical memory to start executing
- The OS kernel sets up its subsystems and copies the login application (instructions and data) into physical memory to start executing

Chat with your neighbor(s)!

What is the “operating system kernel” that the bootloader fetches from disk and tells the processor to start executing?

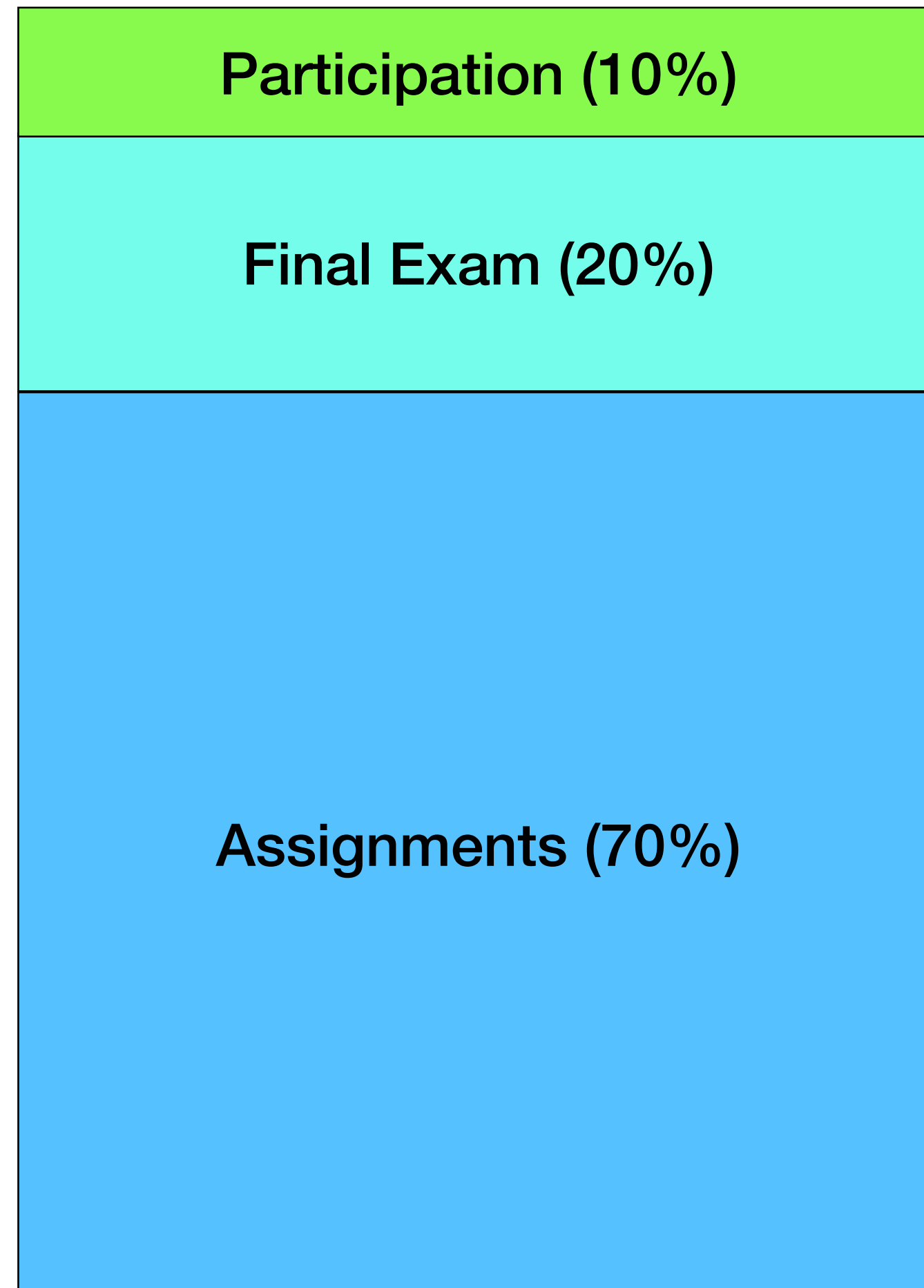
Examples of Operating Systems

Role of an Operating System

Subsystems of an Operating System

Interfaces to Use an Operating System

Course Structure



- 6* pair programming assignments that build into functional operating system!
- 50% of grade from programming component
- 50% of grade from code review component
- Assignments 2-6 to be done on course VM (same as CS105/181CA)!

Free response questions about topics from class

AI Didn't Make Programming Easier. It Just Made It Differently Difficult

The future of software development will belong to those who can think clearly at scale, maintain durable mental models amid rapid change, and integrate machine-generated output into human-directed intent.

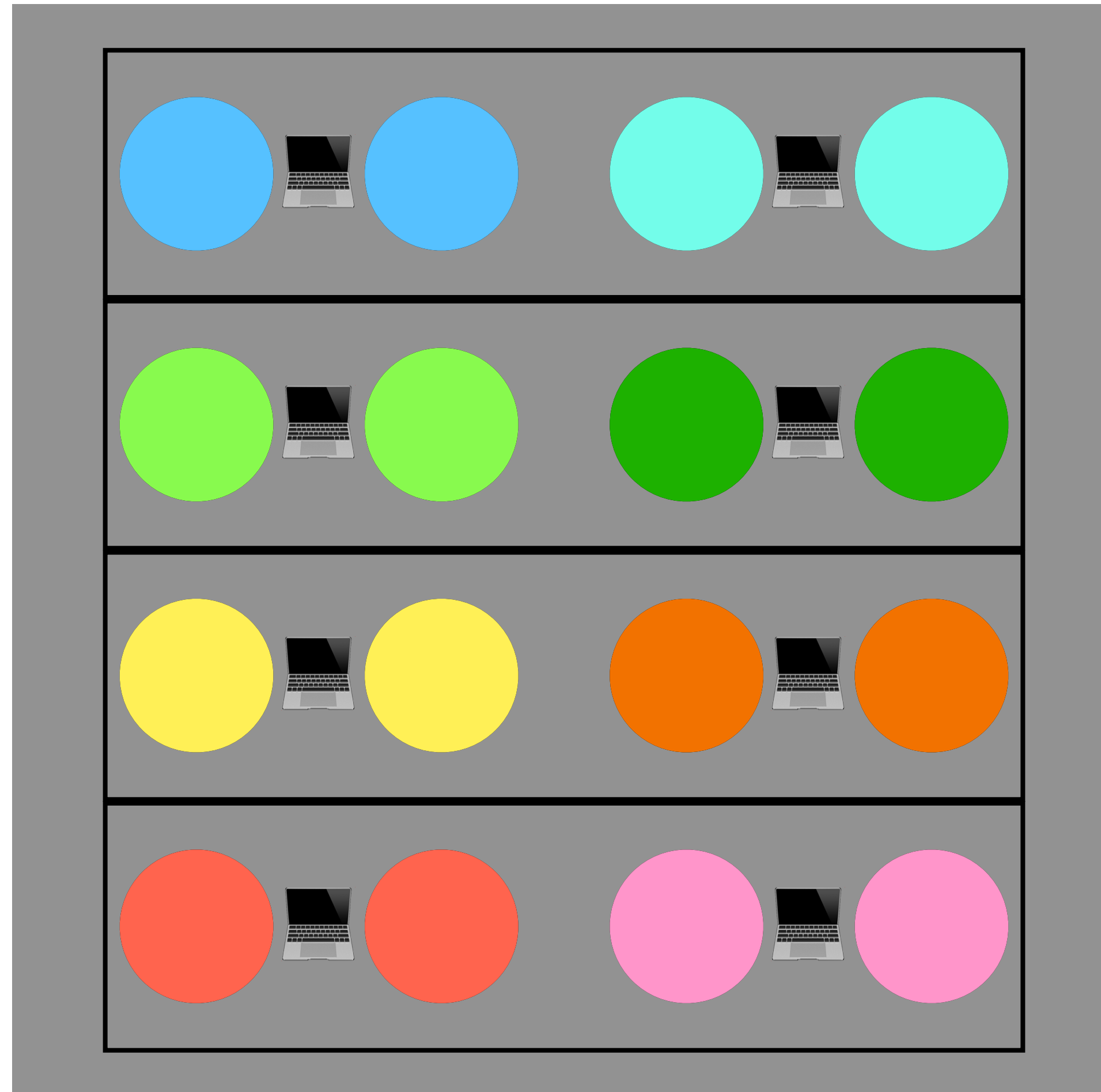
By [Jeremy Osborn](#)

Posted Jul 14 2026



Assignment Format

?? how does random pairing work ??



Phase 0: Randomly Paired

Phase 1: Programming
Component

Phase 2: Code Review

Phase 3: Apply Changes

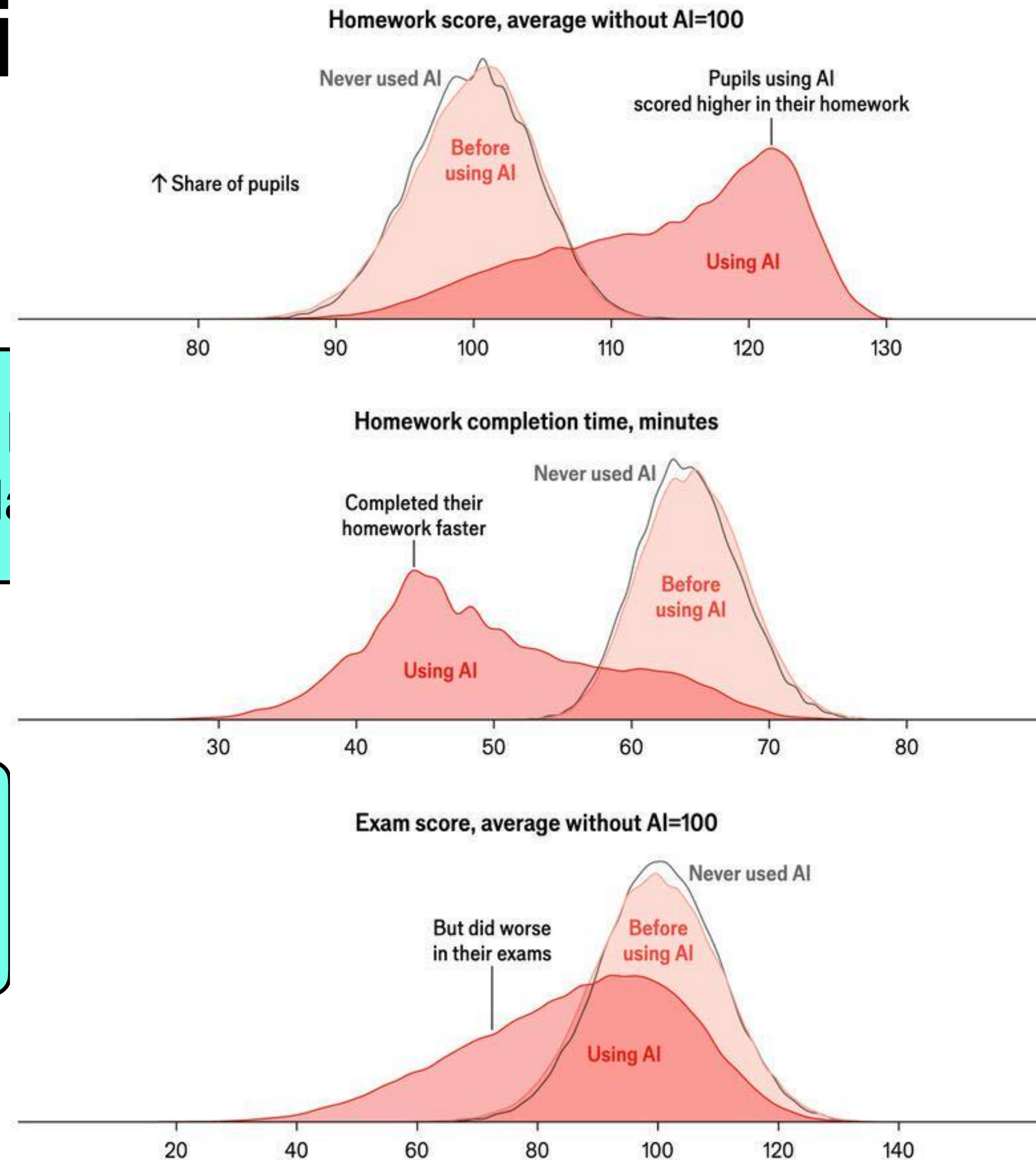
Metacogniti

Why am
cl

I just got back from an
internship and nobody codes
without AI tools any more...

ou mean
tograder?

What is a code review?
How am I supposed to
do that?



Source: "The generative AI learning penalty: evidence from Chinese secondary education", by D. Strömberg et al., preprint June 2026

*26,811 pupils aged 12-18

What Makes Good Code Review?

<https://google.github.io/eng-practices/>



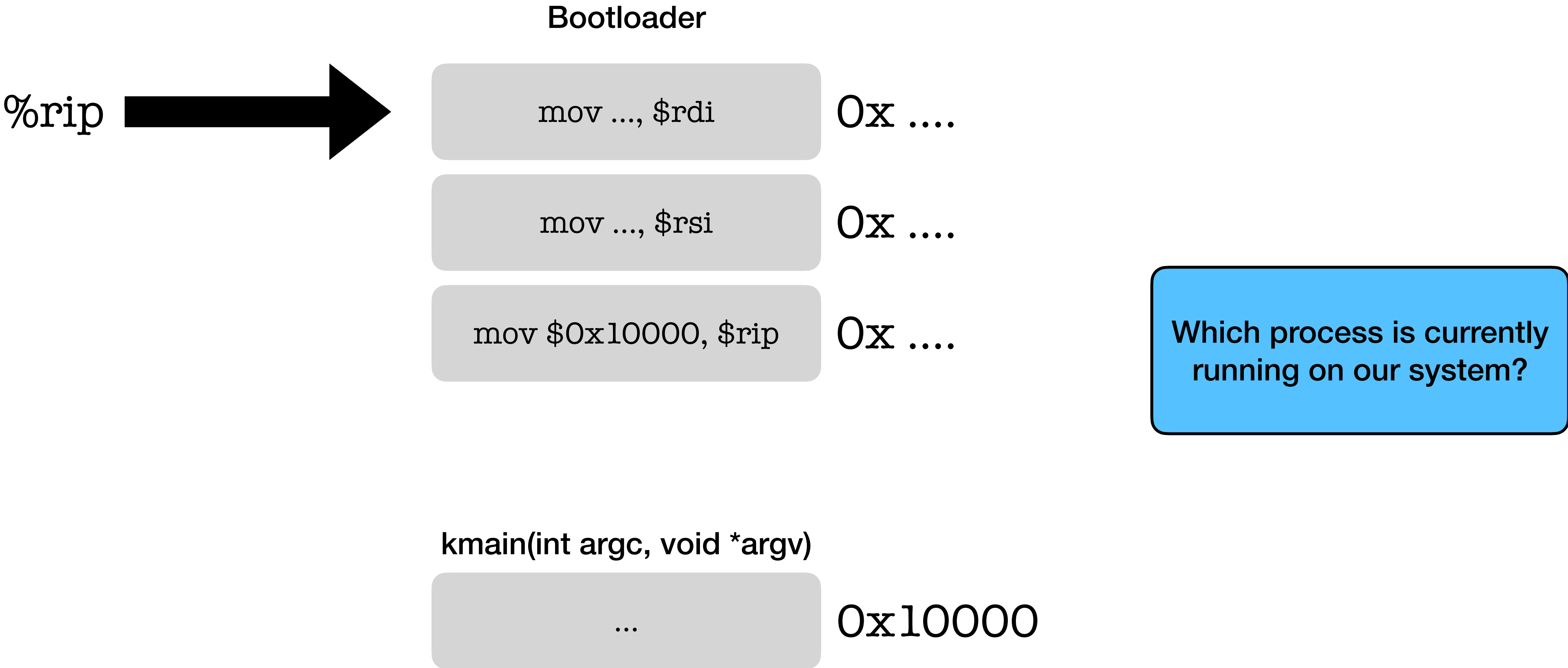
<https://www.gradescope.com/courses/1344491> (Entry Code: 2DZP46)



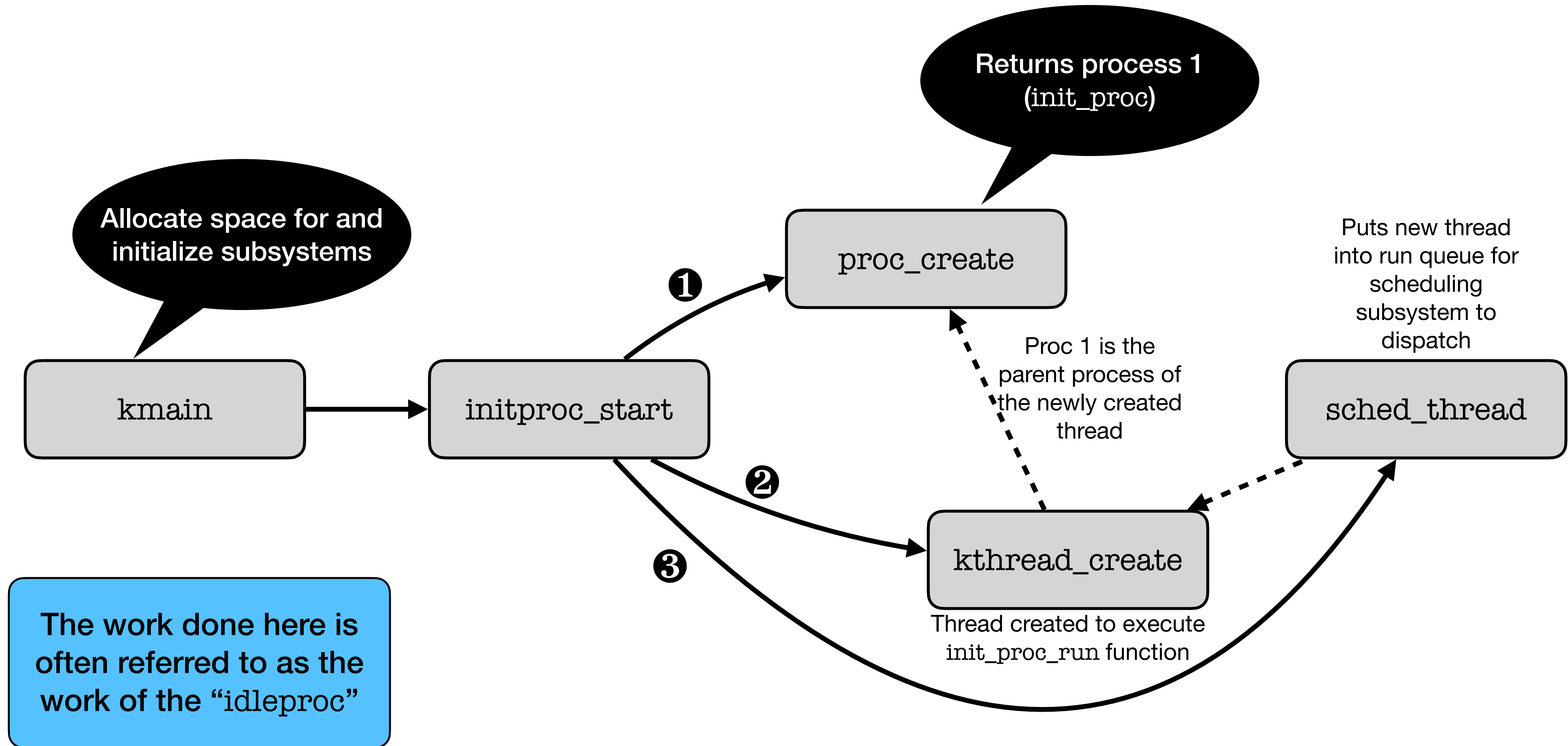
Chat with your neighbor(s)!

Compare and contrast booting a device with MacOS versus Windows or Ubuntu. What are some of the distinctions in the system setup that influences how the boot procedure may be implemented?

Case Study: Processes on Linux Start



Case Study: Processes on Linux Start



Chat with your neighbor(s)!

In the construction of the Linux `init_proc`,
how does the OS serve as a referee,
illusionist, and/or glue?

Takeaways

- Welcome to OS! This is a new course, and I look forward to hearing your feedback on what works well and doesn't work well throughout the semester
- When we boot an OS, we need to organize the components to be ready to execute instructions
- All OS subsystems (e.g., processes) are OS constructs! They don't exist outside the context of the OS, so it is our job in this class to think about how we will create them