

Overview of Computer System and OS

Hui Chen ^a

^aCUNY Brooklyn College

September 2, 2026

Outline

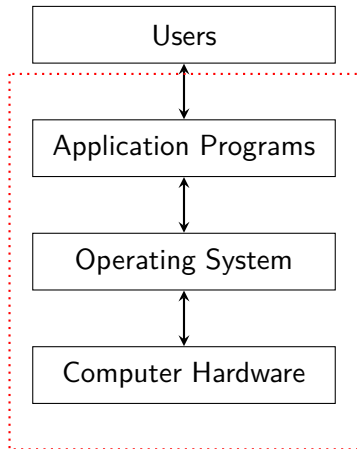
- 1 Opening Discussion
- 2 Overview of Operating Systems
- 3 Virtualization and Emulation
- 4 Ways to Run User Programs
- 5 Experiments

Let's discuss

You have been using computers and operating systems. Based your experience, let's discuss

1. What computers have you used before?
2. Where are these computers?
3. What do you use these computers for?
4. Do these computers have operating systems? What are these operating systems?
5. What do we need these operating systems for? In other words, what do these operating systems do?

A View of Computer Systems

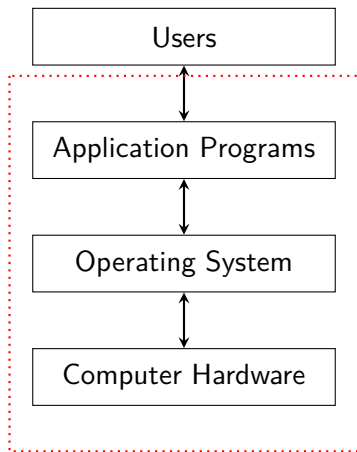


Operating Systems

- ▶ User view (ease of use)
- ▶ System view (efficient use of resources)

Running User Programs

Computers are for running useful programs. Is this the only way to run useful programs (i.e., as an application program in an operating system)?



Virtualization and Emulation

- ▶ Virtualization is a technology to abstract the hardware of a single computer to create the illusion of having multiple private computers on a single system.
 - ▶ Virtualization allows operating systems to run as applications within other operating systems.
 - ▶ Hypervisor vs. emulation
- ▶ Abstraction is a corner stone of computing and operating system, as a result, we have “virtual memory”.
 - ▶ Virtual memory is an abstraction of physical memory.
 - ▶ What other abstraction do we need to “virtualize” the single computer?

Ways to Run Programs?

- ▶ Exploring different ways we can run a program;
- ▶ Reviewing concepts of computer organization and architecture; and
- ▶ Thinking about what abstraction we need to *ease the use of the computer* and *manage the resources efficiently*.

Experiment with Computer Systems

To understand and help us review a few concepts of computer systems, let's review the concept of the Personal Computers, and do a few experiments.

1. Setting up Oracle VirtualBox (if not done before)
 - 1.1 If you have a Mac with Arm processor (like M1/M2), set up VMWare Fusion Player
2. Setting up a Linux operating system (Debian) on a VirtualBox Virtual Machine (Linux VM)
3. Setting up QEMU on the Linux VM
4. Running Boot sector example programs

Experiment with Computer Systems: Run Boot Sector Programs

- ▶ We discuss a few simple boot sector programs including a simple interrupt handler.
- ▶ To run conveniently the boot sector code, we use PC virtual machines and emulators.
 1. Set up a Debian Linux system on an Oracle VirtualBox virtual machine
 2. Install PC emulator and assembly language compiler on the Debian Linux system
 3. Enter a boot sector program, compile and run it using the PC emulator.
 4. See the tutorial for more details.

Ways to Run Application Programs

We have in fact demonstrated a few ways to run application programs. Consider:

- ▶ Explore the different ways to run application programs, and think about the pros and cons of each way.
- ▶ Think about what abstraction we need to ease the use of the computer and manage
- ▶ with the help of Web searches and generative AI.

Summary and Questions

- ▶ Provide a brief of operating system overview.
- ▶ Questions?