Introduction to Operating Systems

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"Modern operating systems do a million things, but their fundamental job is to lie to programs."
– Tim Herd, "Lies, Caffeinated Lies, and Operating Systems"

Key Questions

- Why do operating systems (OSes) exist?
- What do OSes do for users?
- What are the major components of OSes?
- How do computer scientists design and build layers of abstractions?

Basic Concepts

- Hardware: The physical devices that, together, make up a computer
- Program: Instructions and data stored somewhere in a computer
- Computer: The magical interactive device that runs programs!
- Abstraction (or virtualization): Removing certain details from a model of something in order to focus on other things
    - When you buy something on Amazon, you don't need to worry about the warehouse it's stored in, or the shipping networks that bring it to you. Amazon *abstracts* logistics from its buyers.
- Operating system: The program on a computer that allows other programs to run safely and reliably through cooperation with computer hardware

Some Answers

- The OS lies: programs believe they're the only things running on a computer.
- OSes provide *security* to running programs, *reliability* to computer users, and *better abstractions* to computer programmers.
- OSes make windowing systems and graphical user interfaces possible!
- Major abstractions that operating systems provide are:
    - File systems, to store all your data *persistently*.
    - Processes and threads, so that multiple programs can share computer time.
    - Virtual memory, so that each process can pretend to use more memory than the computer has installed.
- *Abstractions* are used to hide *complexity*.
- *Modularity* is a key technique in building (and debugging) any computer system.

I Want To Learn More!

- Operating Systems: Three Easy Pieces, by Remzi and Andrea Arpaci-Dusseau. 100% free textbook with supplemental projects on GitHub. Very well-written!
- Princeton COS 318. The operating systems course I took in fall 2018.
- Stanford CS140. Good slides, but I think my class was more difficult ;)