Intro to xv6

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What is xv6?

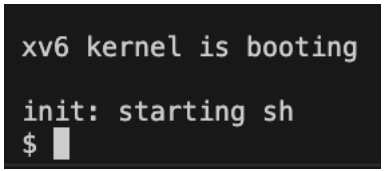
- Teaching-oriented operating system
- Developed and used by MIT for teaching Operating Systems
  - Only ~5,000 source lines of code
  - Used at many other universities
  - Based on 6th Edition of the real UNIX OS
  - Written primarily in C (with some assembly code)
- Intuitive and easy-to-understand structure

Xv6 Source Code Structure

- Kernel: **Located in the xv6 *`kernel`* directory**
  - Implements the “brains” of the Operating System
  - Exposes a small set of functionality available to user programs via “system calls”
- Userspace Library: **Generated automatically from *`user/usys.pl`***
  - Wraps kernel system calls to make them easily accessible from user programs
  - Similar to the C Standard Library
- Userspace Programs: **Located in the xv6 *`user`* directory**
  - User applications available for execution on the xv6 installation
  - Examples: ls, echo, cat, mkdir, etc.

Running xv6

- Requires a RISC-V CPU architecture (not ARM or Intel)
  - May be emulated using QEMU
  - QEMU installation instructions can be found at: https://pdos.csail.mit.edu/6.828/2023/tools.html
- Booting into xv6 is as simple as running **`make qemu`** in a terminal
  - Automatically compiles the entire OS and all user programs, generates a filesystem, then boots into the OS
  - To exit, press Control+A, then X
    - **Note:** *Release Control+A before pressing X*



Helpful Hints

- You will always obtain your xv6 source code from the GitHub repo corresponding to a programming assignment
  - Usually https://github.com/cs3281/assignment-[NUM]-[YOUR_ID]
  - To download or “clone” an assignment, use:
    `git clone https://github.com/cs3281/[ASSIGNMENT_URL]`
- Any user space programs you write should go in the “user” directory; any kernel alterations or updates should go in the “kernel” directory
  - Oftentimes, you will need to touch both directories

Helpful Hints

- You are not expected to understand the entire xv6 operating system on day 1; each programming assignment will introduce you to something new
  - Assignment #1 will familiarize you with how to implement system calls in xv6
- It may be helpful to scan through the first few chapters of the ”xv6 book” to get a general sense of how the OS functions:
  - https://pdos.csail.mit.edu/6.828/2023/xv6/book-riscv-rev3.pdf