CSCC69 Operating Systems

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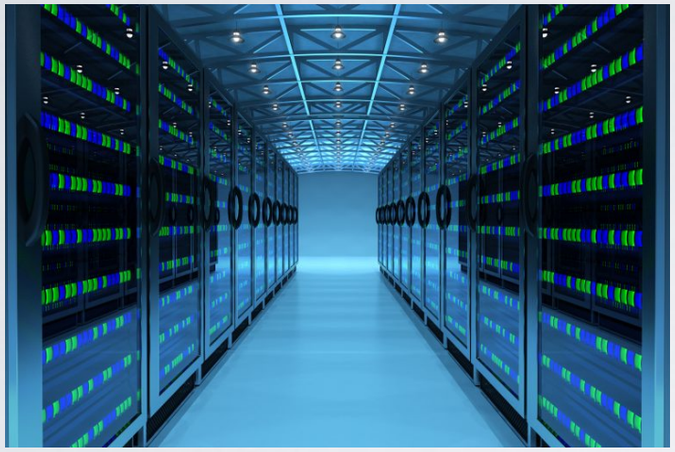
Why do we need operating systems?



Why learning about operating systems

- **An exciting time for building operating systems**
  New hardware, smart devices, self-driving cars, data centers, etc.
  Facing OS issues in performance, battery life, security, isolation

- **Pervasive principles for systems in general**
  Caching, concurrency, memory management, I/O, protection

- **Understand what you use**
  System software tends to be mysterious
  Understanding OS makes you a more effective programmer

- **Complex software systems**
  Many of you will go on to work on large software projects
  OSes serve as examples of an evolution of complex systems

CSCC69

- An introductory course on Operating Systems' design principles
- A hands-on experience building an OS

➡ Theory and practice goes hand-in-hand

New trends in OS
same same but different

Different architectures but, in the end, the same concepts defined in the 70s

But there are some new trends

- Multicore
- Energy efficiency (mobile and IoT devices)
- Virtualization (cloud computing)

New version of the course

- Better reflect on industry current standards and the newest trends

- A very hands-on approach to better understand x86 Operating Systems

This is a tough course ...

- Lots of things to read, materials to digest before being able to produce something that looks like the solution
- Half-way through implementing your solution, you will need to refactor it
- In the end, it will likely be one of the most challenging and significant piece of code that you have ever written

... but you will gain valuable learning and experience

Course Work

Pintos

- Developed in 2005 for Stanford's CS 140 OS class and used by many universities since then
- Written in C, built for x86 hardware

✓ Can run on a real machine!

Project Setup

Execute concurrent programs

- that run on Pintos
- that runs on Bochs/Qemu emulators
- that run on Linux
- that runs inside a Docker container
- that runs on your OS
- that runs on your personal computer

"Turtle all the way down" - Wikipedia

4 Projects

Project 1	**Threads**	Individual/Group	challenging
Project 2	**User Programs**	Individual/Group	challenging
Project 3	**Virtual Memory**	Individual/Group	very challenging
Project 4	**File System**	Individual/Group	very challenging

Team spirit ... or not

"*Alone we can do so little; together we can do so much.*"
– Helen Keller

"*Coming together is a beginning; keeping together is progress; working together is success.*"
– Henry Ford

"*You rise as a team, you die as a team*"
– Me

Projects deliverables and grading

1. Automated tests
   - All tests are given so you immediately know how well your solution performs
   - You either pass a test case or fail, there is no partial credit
2. Design document
   - Answer important questions related to your design for a lab
3. Coding style
   - Code must be easy to read and follow coding style guidelines
   - The TA will conduct a code review

The red line between collaboration and plagiarism

✓ Collaboration is allowed

- you can explain a concept to someone in another group
- you can discuss algorithms/testing strategies with other groups

◉ Plagiarism is not allowed

- you cannot discuss specific implementation details
- you cannot look at other people's solutions, including solutions online (e.g., GitHub)
- you cannot publish your own solution online (even after the course term)

✦ Looking for materials is tolerated

- you can look for snippets of code online as long as this piece of code does not directly answer your a specific problem of the assignment
- if you copy more than 5 lines of code, put the source url as a comment in your code
- if you use more than 25 lines, do not copy it

Late policies

Each team will have **4 days grace period** that can spread into 4 projects for interview, attending conference, errands, and so on, no questions asked

➡ **use it wisely**

Let's look at the syllabus

- https://thierrysans.me/CSCC69/

How to succeed in the course

- Stay on top of lecture materials and readings
- Start working on projects from day 1

Acknowledgments

Some of the course materials and projects are from

- Ryan Huang - teaching CS 318 at *John Hopkins University*
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- David Mazière - teaching CS 140 at *Stanford*