NEIL KLINGENSMITH

CS 310 OPERATING SYSTEMS

https://neilklingensmith.com/teaching/loyola/cs310-s2020/
WHY DO YOU HAVE TO TAKE THIS STUPID CLASS

- People don’t just write programs in one language for one platform anymore. Real projects have lots of parts.
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- People don’t just write programs in one language for one platform anymore. Real projects have lots of parts.
- Computers are changing: parallelism is much more important today than it was in the 90s.
- Stuff you learn here will be used in security, OS, etc.
WHAT IS THIS GUY DOING?

UNIVAC, 1951
<table>
<thead>
<tr>
<th>Process Name</th>
<th>% CPU</th>
<th>CPU Time</th>
<th>Threads</th>
<th>Idle Wake Ups</th>
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<td>10</td>
<td>13</td>
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<td>3</td>
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<td>19:07.03</td>
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<tr>
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<td>9</td>
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</table>

System: 5.59%
User: 3.05%
Idle: 90.06%
CPU LOAD: 7.02%
Threads: 2,530
Processes: 590
What is an Operating System?

- **Referee**
  - Manage sharing of resources, Protection, Isolation
    - Resource allocation, isolation, communication

- **Illusionist**
  - Provide clean, easy to use abstractions of physical resources
    - Infinite memory, dedicated machine
    - Higher level objects: files, users, messages
    - Masking limitations, virtualization

- **Glue**
  - Common services
    - Storage, Window system, Networking
    - Sharing, Authorization
    - Look and feel
Across incredibly diversity

Bell's Law: new computer class per 10 years

- **Computers Per Person**
  - 1:10^6
  - 1:10^3
  - 1:1
  - 10^3:1

- **Years**

- **Number crunching, Data Storage, Massive Inet Services, ML, …**
- **Productivity, Interactive**
- **Streaming from/to the physical world**

- **The Internet of Things!**

- **Mote!**
Moore’s Law – The number of transistors on integrated circuit chips (1971-2018)

Moore’s law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are linked to Moore’s law.

Moore’s Law Officially Ended in 2016:
No longer doubling transistor density every 18-24 months
• In 2011, smartphone shipments exceeded PC shipments!

• 2011 shipments:
  – 487M smartphones
  – 414M PC clients
    » 210M notebooks
    » 112M desktops
    » 63M tablets
  – 25M smart TVs

• 4 billion phones in the world → smartphones over next few years

• Then…
The world is a large distributed system
- Microprocessors in everything
- Vast infrastructure behind them

• MEMS for Sensor Nets
• Internet Connectivity

Scalable, Reliable, Secure Services
- Databases
- Information Collection
- Remote Storage
- Online Games
- Commerce
...
TURNING IN ASSIGNMENTS:

- We will use GitHub Classroom. See course webpage for link.
CODING GUIDELINES:

- Make sure you test code a bit at a time—split into functions.
- Build pieces one at a time.
- Plan first.
LABS:

- 2 hour lab session in Doyle 314 from 4-6PM Thursdays.
- Get help with homework.
READING GROUP:

- Grad students have required weekly reading assignments posted on the course webpage.
- Reading and reviewing papers is extra credit for undergrads.
- Extra credit reading group discussion at 4PM Thursdays at the beginning of lab.
PAPER REVIEWS:

- Email to Neil the night before class.
- Format:
  1. 3-4 sentence summary of paper, including problem it’s trying to solve, objectives, assumptions.
  2. Feedback for authors: shortcomings, etc.
GRADING

- No quizzes or exams. Your whole grade is based on homework and final project.
- No partial credit for code that doesn’t compile.
- Start homework on Tuesday/Wednesday so you can get help on Thursday in lab if you get stuck.

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Progress</td>
<td>10%</td>
</tr>
<tr>
<td>Final Project</td>
<td>40%</td>
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</table>
PROJECT

• You will work in teams of 3-4 for your final project
• Everyone should do work and have clear responsibilities.
• You will evaluate your team mates at the end of the project.
• Communicate with TA/instructor:
  • What is the team’s plan?
  • What is each team member’s responsibility?
  • Short progress reports are required.