E 96
Introduction to Engineering Design

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Outline

- Purpose of the class
- Class plan and schedule
- Instructor and TA
- Required hardware
- Grading issues

Purpose of the Class

- To give students experience in engineering design
  - In this section, computer science design
- By hands-on work on a project
- In the realm of the Internet of Things
  - With some security focus

Why?

- To give you a taste of what a computer science career is really like
- Rather than just four years of classes
- Ideally, early in your career
- Both to get you excited
- And to help you understand why you're studying various things

Basic Concept For Class

- Students work in teams
- To put together hardware for a networked device
- And to build software to allow device to operate and talk to a server
- Study the implementations
- Design and build improved versions

Pre-Requisites

- Reasonable experience with computers
- CS 31 and CS 32, or equivalents
  - Need to be able to program a little
- No special hardware prerequisites
- No computer security prerequisites

Class Plan

- One lecture and one lab session per week
- Lecture will cover material relevant to what you'll be doing next
- Labs will help you build the hardware and software

Schedule

- Week 1 – Introduction
- Week 2 – Configuring and using Intel Edison kits
- Week 3 – Integrating sensors into Edison devices
- Week 4 – Introduction to networking on Edisons
- Week 5 – Simple socket programming

Schedule, Continued

- Week 6 – Security evaluation of prototypes
- Week 7-8 – Designing improved devices
- Week 9 – Implementation and testing of improved devices
- Week 10 – Presentation of your work

Instructor

- Peter Reiher
- Adjunct professor in UCLA CS department
- Done much research in computer systems, distributed systems, computer security, Internet of Things

My Office Hours

- TTh 1-2
- In 3532F Boelter Hall
- Other times possible by appointment

Teaching Assistant

- Our TA is Yi Zheng (zhengyipiz@gmail.com)
- He'll handle the labs
- Issues relating to the Edisons will be primarily his job
  - He's had strong Edison experience
- Office hours to be announced

Required Hardware

- An Intel Edison kit
- A Grove sensor kit
- Cables and other accessories
- A page on the web site shows exactly what you need and where to buy it

Class Readings

- No textbook required
- All readings made available on line
- Primarily tutorials describing how to do things with the Edison
- May be a few articles that you should read

Class Assignments

- Some are based on working hardware and software
- Some are based on testing
- Some are based on a written report

Grading

- No tests
- Grading will be based on project results
- Partially on working implementations
- Partially on reports

Grade Breakdown

- Initial implementation of device
  - 20%
- Report on testing brute force attacks
  - 10%
- Design document for improved device
  - 20%
- Implementation of improved device
  - 25%
- Final report
  - 25%

Implementation Grading Basis

- Demonstrations of your implementation to instructor and TA
- Initial implementation based on meeting specification
- Final implementation based on correctly implementing your design

Report Grading Basis

- Written reports
  - Specifics of length, content, due date will be given for each
- One report per group
  - Except final report, which will be individual

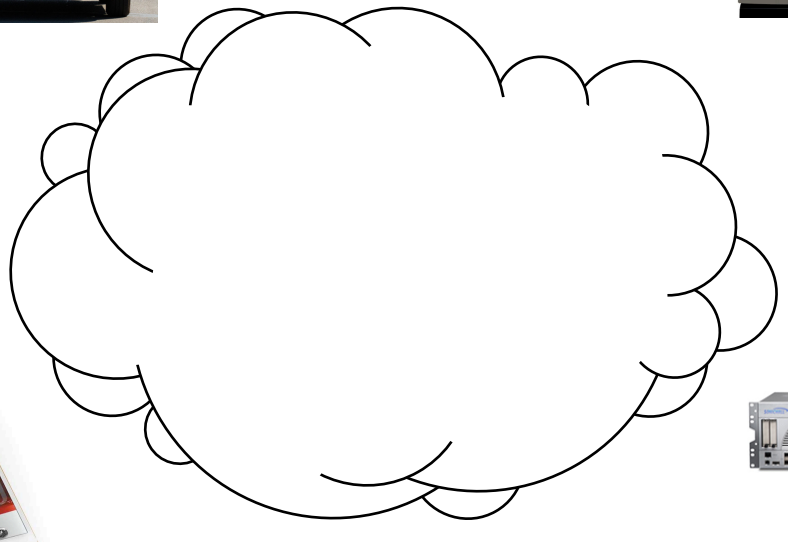
So, What Will You Be Building?

- You'll build a device for the Internet of Things
- A device that (in principle) could control a door lock
- Accepting a password input via a light sensor

Just What Is the Internet of Things?

- The "old fashioned" Internet connected people's devices
  - Desktops, laptops, tablets, smart phones, etc.
  - Also big server instillations (like Amazon and Google)
- The Internet of Things connects devices not oriented towards people

The Internet of Things



What Is It Really?

- Connecting various devices to the Internet
  - To control them remotely
  - To provide remote data
  - To enable cooperation among them
- Usually standalone devices
- Often wireless connected

What Are the Implications?

- Vast numbers of new devices connected to the Internet
- Performing wide range of functions
  - Sometimes critical or sensitive
- Not primarily computers
- Not human-tended
  - At least to extent a smart phone, tablet, laptop is

More Implications

- Intended to be of limited power and scope
  - But often with powerful HW/SW systems inside
- Don't always "look like" computers
  - Easy to overlook that
- Designed by non-computer experts

The Implications For Everyone

- Homes, offices, and the whole world will be studded with these devices
  - They'll be everywhere
  - Doing everything
- Immensely rich possibilities for improving life and work
- But also a new set of largely unexamined risks

The Implications For You

- As computer scientists
- Lots of jobs in this arena
- Lots of interesting new
  - Challenges
  - Opportunities
  - Unforeseen problems

Some Example Issues

- How do these set of devices share resources?
- How to we manage and configure them?
- How do we detect and handle bugs?
- How do we simply provide them with power?

Some Security Issues

- Many of these devices are designed with little thought to security
  - Or privacy
- But they're inside our homes and offices
- Will they offer footholds for attacks?
- How can we design them to be safer?

Conclusion

- E 96 will give you practical experience in computer science design
- It will give you a little familiarity with hardware, sensors, and networks
- It will start you thinking about securing your systems
- I hope it will be fun