Lecture 1:
Course Introduction

CSE 123: Computer Networks
Stefan Savage
Personnel

- Instructor: Stefan Savage
  - Office hours: Thursday 4pm-5pm
  - EBU3B 3106

- TAs:
  - Shreeja Kumar
  - Vikas Lokesh
  - Office hours: TBA
About me...

- I work at the intersection of computer security, networking and operating systems.

- Research
  - I’m director of the Center for Networked Systems (CNS) on campus and the Center for Evidence Based Security Research (evidencebasedsecurity.org) with UCSD and UCB.
  - Lots of work on network measurement, network management, wireless networking, and routing.

- Policy
  - National Research Council’s Cybersecurity Research group
  - Institute for Defense Analysis ISAT advisory group
  - National Science Foundation CISE Advisory Committee

- Industry
  - Asta Networks (defunct anti-DDoS company)
  - Netsift (UCSD-originated worm/virus defense company) -> Cisco
Lecture 1 Overview

- Class overview
  - Expected outcomes
  - Structure of the course
  - Policies and procedures

- A brief overview of Computer Networking
  - High-level concepts
  - An end-to-end example
Prereqs

- CSE120
  - I’ve been instructed to enforce prerequisites
  - If there is room after the add deadline (i.e., no one is on the waitlist with prerequisites filled) then I will consider exceptions
    » Sorry, but I can’t predict what enrollment is going to look like (we are currently overfull and have a waitlist of 34)

- Programming experience
  - We will be assigning programming projects in C/C++
  - This course will not teach you C. The TAs will help, but you need to learn it on your own if you don’t already know it.
Expected Outcomes

- This course **will** teach you the *fundamentals* of computer networks:
  - Layering, signaling, framing, MAC, switching, routing, naming, Internetworking, congestion control, router design, etc.
  - At the end of this course you should completely understand what’s actually happening when you view a Web page

- This course **will not** teach you signals and coding
  - Take an EE course to learn about modulation, encoding, etc. on different hardware technologies

- Similarly, we **will not** cover Internet apps/services
  - CSE124 covers application layer protocols, Web, etc. (great class!)
  - You **will be able to** pick this up on your own with Google
CSE 123 Class Overview

- Course material taught through class lectures, textbook readings, and discussion sections
- Course assignments are
  - Homework questions (based on lecture)
  - Two substantial programming projects
- Discussion sections are a forum for asking questions
  - Help you get started on the projects
  - Lecture material and homework
  - **Additional networking topics**
  - No discussion section this Monday
- Discussion board (**Piazza.com**)  
  - The place to ask questions about lecture, hw, projects, etc.
Textbook


- Available online for free from UCSD networks:
  
  https://roger.ucsd.edu/record=b8932307~S9
Homeworks

- There will be 3-4 homeworks throughout the quarter
  - Reinforce lecture material…no better practice

- Cheating
  - You should discuss homework problems with others
    - You can learn a lot from each other
    - But there is a distinction between collaboration and cheating
  - Cheating is copying from other student’s homeworks or solution sets, searching for answers on the Web, anything which misrepresents your knowledge of the material or undermines my ability to fairly assess your abilities
  - If you’re not sure if something is allowed, then ask
  - All suspected violations will be reported to the Academic Integrity Office
Projects

● There will be two programming projects

● The projects must be completed in C/C++
  - We will prove skeleton code for you to use
  - Your job is to fill in the interesting/hard parts
  - The TAs will be available to help with coding

● The projects are INDIVIDUAL assignments
  - All code must be your own
  - OK to discuss design ideas, NOT OK to share/look at code
Espresso Prize
Computer Labs

- You are welcome to use any Linux machine in the labs in the basement of the CSE/EBU3B building
  - Linux running on Intel machines

- You can also use your home machine
  - The project source will work on Windows/OS X (with caveats)
  - Graders will test on ieng6 machines
  - Be sure to test your projects there as well
Exams

- Midterm
  - 10/28
  - Covers first half of class

- Final
  - Dec 9th (8am-11am I think)
  - Covers second half of class + selected material from first part
    » I will be explicit about the material covered

- No makeup exams
  - Unless dire circumstances

- Closed book with crib sheet
  - You can bring one double-sided 8.5x11” page of notes to each exam to assist you in answering the questions
  - Not a substitute for thinking
Grading

- **Homeworks**: 20%
  - Think of these collectively as a take-home midterm

- **Midterm**: 15%

- **Final**: 25%

- **Projects**: 40%
  - Divided evenly among the projects
How *Not* To Pass CSE 123

- **Do not come to lecture / discussion**
  - It’s nice out, class is early, the slides are online, and the material is in the book anyway
  - Lecture material is the basis for exams and directly relates to the projects
  - Besides, the professor thinks he’s funny and needs his ego stroked

- **Do not do the homework**
  - It’s only 20% of the grade
  - Excellent practice for the exams, and some homework problems are exercises for helping with the project
  - 20% is actually a significant fraction of your grade (easily the difference between an A and a C)
How *Not To Pass* (2)

- Do not ask questions in lecture, office hours, or email
  - Professor is scary, I don’t want to embarrass myself
  - Asking questions is the best way to clarify lecture material at the time it is being presented
  - Office hours and email will help with homeworks, projects

- Wait until the last couple of days to start a project
  - We’ll have to do the crunch anyways, why do it early?
  - The projects cannot be done in the last couple of days
  - Repeat: The projects cannot be done in the last couple of days
Class Web Page

http://www.cs.ucsd.edu/classes/fa16/cse123-a/

- Serves many roles…
  - Course syllabus and schedule (updated as quarter progresses)
    » Lecture slides
  - Announcements
  - Homework handouts
  - Project information

Not up currently online due to IT problem, but will be up shortly
Questions

Before we start the material, any questions about the class structure, contents, etc.?
This Class in One Slide

- **Protocols & Layering**
  - Manage complexity by decomposing the tasks
  - Standardizing syntax and semantics to support interoperability

- **Naming**
  - Agreeing on how to describe a host, application, network, etc.

- **Switching & Routing**
  - Deciding how to get from here to there
  - Forwarding messages across multiple physical components

- **Resource Allocation**
  - Figuring out how to share finite bandwidth, memory, etc.
A “Simple” Task

- Send information from one computer to another

- Endpoints are called **hosts**
  - Could be computer, iPod, iPhone, etc.

- The plumbing is called a **link**
  - We don’t care what the physical technology is: Ethernet, wireless, cellular, etc.
Actually Quite Complicated

- **ROUGHLY**, what happens when I click on a Web page from UCSD?

My computer  www.google.com

CSE 123 – Lecture 1: Course Introduction
Web request (HTTP)

- Turn click into HTTP request

GET http://www.google.com/ HTTP/1.1
Host: www.google.com
Connection: keep-alive

...
Name resolution (DNS)

- Where is www.google.com?

My computer (132.239.9.64)

What’s the address for www.google.com

Local DNS server (132.239.51.18)

Oh, you can find it at 66.102.7.104
Data transport (TCP)

- Break message into packets (TCP segments)
- Should be delivered reliably & in-order

```
GET http://www.google.com HTTP/1.1
Host: www.google.com
Connection: keep-alive
...
```

“and let me know when they got there”
Global Network Addressing

- Address each packet so it can traverse network and arrive at host

My computer (132.239.9.64)

www.google.com (66.102.7.104)
Network Routing

- Each router forwards packet towards destination
Link management (Ethernet)

- Break message into frames
- Media Access Control (MAC)
  - Can I send now? Can I send now?
- Send frame
Physical layer

2.4Ghz Radio
DS/FH Radio
(1-11Mbps)

802.11b Wireless Access Point

Cat5 Cable (4 wires)
100Base TX Ethernet
100Mbps

Ethernet switch/router

To campus backbone

62.5/125um 850nm MMF
1000BaseSX Ethernet
1000Mbps
For Next Class…

- Browse the course web
  - http://www.cs.ucsd.edu/classes/fa16/cse123-a/

- Read Chapter 1 and start Chapter 2 (up to 2.2)

- Next class: links and signaling

- Drop now or plan to stick it out!