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
Personnel

- Instructor: Alex C. Snoeren
  - Office hours Thursdays 10-11am or by appointment
  - EBU3B 3114

- Project TAs: Spoorti Joshi and Riley Hadden
  - P1 Office hours Tuesday 3-4pm
  - P2 Office hours Wednesday 12-1pm B215

- Homework TA: Lihao He
  - Office hours Tue/Thu 1-2pm
Prereqs

- **CSE30, CSE101, and CSE110**
  - Undergrads can’t enroll without them
  - We expect it (or equivalent) even for grad students

- **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.
  ◆ You will be able to pick this up on your own with Google
CSE 123 Class Overview

- Course material taught through *interactive* class lectures, textbook readings, and discussion sections
- Course assignments are
  - Homework questions (based on lecture)
  - Two substantial programming projects
- Discussion section *(Mon. 2pm Center 214)*
  - Help you get started on the projects
  - Lecture material and homework
  - Additional networking topics
- Discussion board *(Canvas)*
  - The place to ask questions about lecture, hw, projects, etc.
Peer Instruction

- Studies have shown it helps both with understanding and retention.

- Means you need to come to class prepared, have a clicker, and adhere to a slightly unusual class etiquette.

You must attend class
You must prepare for class
You must participate in class
iClickers: You must bring (only) yours

- Buy an iClicker at the Bookstore (or ebay)
- Register it following instructions in the Syllabus
- REGISTER ON CANVAS.
- Frequency AD
Textbook


Homeworks

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

- Collaboration vs. 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
  - Rule of thumb: Discuss together in library, walk home, and write up answers independently
  - Cheating is copying from other student’s homeworks or solution sets, searching for answers on the Web, etc.
  - Suspicious homeworks will be flagged for review
Projects

- There will be two programming projects
  - You will have four and a half weeks to complete each
  - The first will be assigned MONDAY

- The projects must be completed in C/C++
  - We will provide 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 (not copied from github!)
  - OK to discuss design ideas, NOT OK to share/look at code
  - Projects assigned AND SUBMITTED via private GitHub repo
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
  - Monday, October 28th
  - Covers first half of class

- Final
  - Monday, December 9th (8-11am)
  - 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

- Participation: 4%
  - Based on Clicker responses; you can miss up to three days w/o penalty
- Homeworks: 8%
- Midterm: 21%
- Final: 25%
- Projects: 42%
  - Divided evenly among the projects
A Few Class Policies

● NO Laptops, phones, or other electronic devices
  ◆ Unless you sit in the last four rows

● Class will start and end ON TIME
  ◆ Please do not leave until I end class
  ◆ If you know you need to leave early, please sit in the back

● No late assignments
How *Not* To Pass CSE 123

- Do not come to lecture / discussion
  - 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

- Do not do the homework
  - It’s only 8% of the grade
  - Excellent practice for the exams, and some homework problems are exercises for helping with the project
  - 8% is actually a significant fraction of your grade (easily the difference between an A and a B)
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
How *Not* To Pass (3)

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Class Web Page

http://www.cs.ucsd.edu/classes/fa19/cse123-a/

- Serves many roles...
  - Course syllabus and schedule (updated as quarter progresses)
  - Announcements
  - Homework handouts
  - Project information
- Class will be podcast
  - Lecture slides posted to website immediately after class
  - Podcast is for review, not intended as a substitute for lecture
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, iPhone, laptop, 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 device ➔ Internet ➔ 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 device (132.239.9.64)

What's the address for www.google.com

Oh, you can find it at 66.102.7.104

Local DNS server (132.239.51.18)
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 device
(132.239.9.64)

www.google.com
(66.102.7.104)

66.102.7.104 | 132.239.9.64 | GET http
Network Routing

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

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

5.8 Ghz Radio
OFDM/MIMO 4x4
1 - 1,300 Mbps

802.11ac Wireless Access Point

Cat 6 Cable (4 pairs)
NBase-T Ethernet
10 Gbps

Ethernet switch/router

To campus backbone

100 Gbps Ethernet

CSE 123 – Lecture 1: Course Introduction
For Next Class…

- Browse the course web
  - http://www.cs.ucsd.edu/classes/fa19/cse123-a/

- Read Chapter 1.3 and 2.3

- Monday: Layers and Framing

- Drop now or plan to stick it out!