Lecture 1:
Course Introduction

CSE 123: Computer Networks
Alex C. Snoeren
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 Mondays 3:30-4:30pm (CSE3114/Zoom) or by appointment
- Project 1 TA: Jamshed Ashurov
  - Office hours Mondays 11:00am-1:00pm; Thursdays 5-7pm (CSE270A)
- Project 2 TA Adyanth Hosavalike
  - Office hours Tuesdays 3:00-5:00pm (Zoom)
- Tutor: Fucheng Shang
  - Standing office hours Mon 1-3pm, Tue/Thu 2-4pm, Fri 11-1pm
  - In person in the basement
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 TA/Tutors 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 or fire up Zoom

- 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.
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 (in four parts)
- Discussion section (Wed 5-5:50pm CSB002)
  - Help you get started on the projects
  - Lecture material and homework
  - Additional networking topics
- Discussion board (Piazza)
  - The place to ask questions about lecture, HW, projects, etc.
Textbook


Homeworks

- There will be 4 homeworks throughout the quarter
  - Reinforce lecture material…no better practice
  - Assigned and collected on GradeScope
  - Grading is completion only; solutions available after deadline

- 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, over Zoom, walk home, hang up, and only afterwards write up answers independently
  - They’re not graded for correctness, so you’re only cheating yourself by not trying to solve independently!
Projects

- There will be four programming projects (really two, each split in half)
  - You will have approximately two weeks to complete each
  - The first is assigned MONDAY, discussed WEDNESDAY

- 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 TA and tutors will be available to help with coding

- The projects are INDIVIDUAL assignments
  - All code must be your own (not copied from GitHub or generated by CoPilot/LLMs!)
  - OK to discuss design ideas, NOT OK to share/look at code
  - Projects assigned AND SUBMITTED via private GitHub repo
Development environment

- We expect you to use your own machine
  - The project source will work on Linux/Windows/OS X
    - Windows users need Windows Subsystem for Linux (WSL)
  - Code executes in Containers/VMs, just like on GradeScope
  - TAs will address discrepancies between GradeScope and provided execution environments

- You can also use lab machines/Cloud VM
  - There may be some differences in getting Containers/VMs setup
  - Start early and ask for help immediately if you go this route
Assessments

- Quiz 1
  - Friday, October 27th
  - Covers first third of class

- Quiz 2
  - Friday, November 17th
  - Covers second third of class

- Quiz 3 (aka Final)
  - Friday, December 15th (8:00-11:00am)
  - Covers last third of class + selected material from earlier parts
    » I will be explicit about the material covered

- All exams are in person; No makeup exams
  - Unless dire circumstances; contact me NOW if you have a conflict or OSD
Grading

- Homeworks: 5% *completion only*
- Quizzes: 20% each
- Final: 25%
- Projects: 30%
  - Divided evenly among the four projects
A Few Class Policies

- Regardless of modality, this class is “live”
  - In-person lectures podcast, but intended for review
  - May be one or two Zoom lectures due to instructor travel; details later

- Discussion attendance is strongly encouraged
  - The projects are involved; the TAs will use the time to get you going

- Zoom Office hours are NOT RECORDED
  - Please turn your camera on when interacting with TAs/Tutors

- No late assignments
  - HWs submitted via GradeScope, Projects via GitHub
How *Not* To Pass CSE 123

- Do not attend lecture / discussion
  - Podcast is available, 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 5% of the grade, and you can just submit random answers
  - Excellent practice for the exams, and some homework problems are exercises for helping with the project
How Not To Pass (2)

- Do not ask questions in lecture, office hours, or Piazza
  - 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 Piazza will be invaluable for 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

- Everything on the Web (wrapped in Canvas)

  
  - 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 \[\text{www.google.com}\]

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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)

Local DNS server (132.239.51.18)

What’s the address for www.google.com

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

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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

802.11ac Wireless Access Point

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

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 website (also on Canvas)
  - http://www.cs.ucsd.edu/classes/fa23/cse123-a/

- Read Chapter 1.3 and 2.3

- Monday: Layers and Framing

- Drop now or plan to stick it out!