ECE/COMPSCI 356 Computer Network Architecture Lecture 1: Introduction

Neil Gong
neil.gong@duke.edu

Slides credit: Xiaowei Yang

Roadmap

- Course introduction
  - Audience
  - Course content
  - Staff
  - Assignments
  - Grading policy

Who should be taking this class?

- Curious about how things work
  - A lot of internals of networking
- Loves to build things
  - Programming labs
- Outcome
  - Build networks, analyze packet traces, write software that uses the network

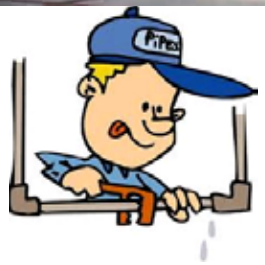
Why study networking?

Networking = "Plumbing"

Networking is the "plumbing" of computing

Almost all areas of computing are network-based.

- Distributed computing
- Big Data
- Cloud Computing
- Internet of Things
- Smart Cities



Networking is the backbone of computing.

Source: Raj Jain

Networking is Fueling All Sectors of Economy

Networking companies are among the most valued companies: Apple, AT&T, Samsung, Verizon, Microsoft, China Mobile, Alphabet, Comcast, NTT, IBM, Intel, Cisco, Amazon, Facebook, …

Note: Apple became highly valued only after it switched from computing to communications (iPhone)

Networking = Economic Indicator

Source: Raj Jain

Networks foster innovations

- Google, Facebook, Internet of Things, online games, e-commerce, cloud computing …

The big question we study:

How to design a computer network

What's a network?

- Wikipedia: A wide variety of systems of interconnected components are called **networks**.
- Examples of networks?
  - The Internet
  - Telephone networks
  - TV networks
  - Power networks
  - Sewage networks
  - Water networks
  - ….
- Why do we build networks?
  - To distribute/transfer something

What's a computer network

- End points are computers or devices that speak certain network protocols
- Edges are wired or wireless links
- Carry many different types of data
- Support an unlimited range of applications

What's the Internet?

- The **Internet** is a large-scale general-purpose computer network.
  - Run more than one application
- The Internet transfers information between computers.
- The Internet is a **network of networks**.

Course contents

- How to build a computer network, in particular the Internet
  - Design philosophy
  - Connecting computers
    - Encoding, error detection, reliable transmission
  - Internetworking
    - IP, TCP, Routing
  - Congestion control and resource allocation
  - Security

Prerequisites

- Know how to program in C/C++
- Labs are done in C/C++
  - pointers, struct
- Some knowledge of socket programming
  - Need to pick up the knowledge on your way

Course staff

- Instructor: Neil Gong
  - http://people.duke.edu/~zg70/
- UTAs/TAs
  - Jingzhi Zhao
  - James Guo
  - Shanghui Yin
  - Vivian Su
  - Stuart Tsao
  - Lena Wang
  - James Xu
  - Yuchen Jiang

Website: important

- http://people.duke.edu/~zg70/courses/ECE356/index.html

- Syllabus:
  - Book chapters related to lectures
  - Pointers to external papers for topics
  - Read before class for discussion
  - Assignments and due dates
  - Lectures

- All subject to change. Reload before checking

Recommended Textbook and resources

- Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, 5th Edition, Morgan Kaufmann
  - Available from bookstore, amazon
  - A view as a system builder, not a user
  - An online version is also available: https://github.com/SystemsApproach/book/releases
    - Match with 5th edition in most chapters.

Discussion forum

- Ed Discussion: link on Canvas
- Useful discussions

Contact Us: We are here to help you

- Office hours
  - Neil Gong
    - Mondays 1pm - 2pm @ Wilkinson 413
  - TAs' office hours TBD

- Email for meetings outside regular office hours

- No recitation section
  - Do come to office hours
  - Do communicate with us via email, Ed Discussion

Your work

- Assigned readings in the Syllabus
- Class participation
- Homework
  - Three
- Labs
  - Three

Labs

- Lab 1: An echo server. 10 pts (individual)
- Lab 2: Simple router. 15 pts (group 1 or 2 students)
- Lab 3: Dynamic routing protocols. 15 pts (group 1 or 2 students)

- Labs are distributed with skeleton code and most of them have reference implementations for testing
- Turn-ins include answers to pre-lab questions, source code, lab reports if we ask for them
- **Start to look for teammates**

Exams

- Closed-book midterm
  - 03/06, during lecture time
  - One us-letter-size, double-sided paper of notes is allowed
- Closed-book final
  - 04/29, 10:00 -- 11:30am
  - Two us-letter-size, double-sided papers of notes are allowed
    - E.g., the one for midterm exam + one more

Grading policy

- Homework: 25%
- Labs: 40%
  - In a group assignment, all students get the same grade for the assignment
- Midterm: 15%
- Final: 20%
- Class participation: 3% (Bonus)

Collaboration policy

- Discussion is encouraged
- Individual assignments must be completed independently
- Group assignments only need to turn in one copy of the files with group members noted in the submission

Academic honesty policy

- Don't know if you are cheating? Please check the course website

- If you are caught cheating, you will be reported to the Office of Student Conduct **and you will receive a failing grade in the class**

Late policy

- Due dates/times noted on the course website
- The deadline for any assignment can be extended with a 10% penalty per day
- No deadline can be extended by more than two days.
- Assignments will NOT be accepted 48 hours after the due date.
  - Tight schedule
  - Extension will delay next assignment
- If you are ill: contact the instructor and provide a medical note.

Questions?