CS 43: Computer Networks

01: Course Administration & Introduction

September 3, 2018
Today

• Course Administration
  – Structure & Grading
  – Academic Honesty
  – About this class

• Introduction
  – What is this course about?
  – Topics we will cover
Course Goals

• What is a computer network? core design principles of the Internet.

• How applications that use networks work: HTTP, DNS, Email, etc.

• Write programs that communicate over networks.

• How different protocols, policies, and mechanisms interact to provide an effective communication medium.
Research:

• Performance Modeling
• Future Internet Architectures
• Differential privacy for network data
Office Hours

• 255-D Science Center
• Monday: 12:30 PM - 2:00 PM
• Wednesday: 2:45 PM - 4:00 PM
  – NOTE: See availability on sheet outside my office door
• By appointment
Resources

- Piazza Q&A Forum, Github Enterprise
  - https://piazza.com/swarthmore/fall2018/cs43/home
  - https://github.swarthmore.edu

- Slides on course website

- Lab sections:
  - Science Center 240
  - Friday 2:15-3:45, Friday 4:00-5:30
Email Policy

• For public questions: use Piazza!
  – Your classmates benefit from your questions
  – Your classmates can answer your questions
  – I will check the forum frequently

• For private questions: use email (chaganti@cs).
  – I will attempt to respond to within 24 hours
How does this class work?

This class is designed a bit differently:

- Class will be centered around you
- Requires your participation

• Ever considered why we have lectures?
Traditional Lectures:
Traditional Lectures:

• Little opportunity for expert feedback
Interactive Classes with Peer Instruction

- You do the “easy” part before class.

Class is reserved for interactive, customized experiences

Research on how people learn:
- Everyone constructs their own understanding
- To learn, YOU must actively work with a problem and construct your own understanding of it
Clickers!

- Lets you vote on questions in real time.

- Like pub trivia, but the subject is always networks.

- You NEED one of these for the course!

- Registration: [https://goo.gl/forms/7h7M1xAMqTWNaN343](https://goo.gl/forms/7h7M1xAMqTWNaN343)
Clicker Registration

Please register ASAP

https://goo.gl/forms/7h7M1xAMqTWNaN343
Peer Instruction

• Short quiz at the beginning of class
• During class: pose carefully designed questions
  – Solo vote: Think for yourself and select answer
  – Discuss: Analyze problem in teams of 3
    • Practice analyzing, talking about challenging concepts
    • Reach consensus
    • If you have questions, raise your hand and I’ll come over
  – Group vote: Everyone in group votes
    • You must all vote the same to get your point
  – Class wide discussion:
    • Led by YOU (students) – tell us what you talked about in discussion that everyone should know!
Why Peer Instruction?

• You get a chance to think.
• I get feedback as to what you understand.
• It’s less boring!
• Research shows it promotes more learning than traditional lecture.
Group Discussion

– Ask a question
– Share an explanation
– Summarize what their group talked about

• Your explanations are CRITICAL for fellow students’ learning
Example Question

• Individual vote

• Group discussion / group vote
  – Room should be LOUD

• Class discussion
The most useful super power for a college student would be:

- A: Invisibility
- B: Lots of $$$
- C: Telepathy
- D: Weather
- E: Some other power (be prepared to discuss)
Grading

- 5% Reading Quizzes
- 5% Class participation
- 25% Midterm Exam
- 30% Final Exam
- 35% Programming Assignments
Grading

- 5% Reading Quizzes
- 5% Class participation
- 25% Midterm Exam
- 30% Final Exam
- 35% Programming Assignments

- I will drop your three lowest quizzes/no-shows.
• *Computer Networking: A Top-Down Approach (7th Edition)*

• You need this book!
Policies

• Collaboration
  – You may discuss approaches, not solutions
  – You must submit your own work
  – Exams will include questions on programming

• Cheating
  – Zero tolerance for cheating, don’t do it!

• Lab Lateness
  – 2 days of extra (at the granularity of days)
  – Let me know when you’ve submitted
Tentative Schedule

• Midterm – October 24th, in class

• Final - TBD

• Labs
  – Out on Fridays (lab section)
  – Due on Thursdays
  – First lab: solo, others in pairs
Administrative Questions?

• All of this info (should be) on class website

• Feel free to ask on Piazza discussion board
What is the goal of a network?

• Allow devices communicate with one another and coordinate their actions to work together.

• Piece of cake, right?
A “Simple” Task

- Send information from one computer to another
- Endpoints are called hosts
  - Could be computer, iPod, cell phone, etc.
- The plumbing is called a link
  - Ethernet, wireless, cellular, etc.
Not Really So Simple…

Host (PC)  

Link  

Host (Server)
Not Really So Simple…
Not Really So Simple…
Not Really So Simple…
Not Really So Simple…

Google

Swat

AT&T

Cogent

Quest

Google

not really so simple
We only need...

- Manage complexity and scale up
  - Layering abstraction: divide responsibility
  - Protocols: standardize behavior for interoperability
We only need...

• Manage complexity and scale up
• Naming and addressing
  – Agreeing on how to describe/express a host, application, network, etc.
We only need...

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
  - Routing: deciding how to get it there
  - Forwarding: copying data across devices/links
We only need...

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
  - (How) can we guarantee that the data arrives?
  - How do we handle link or device failures?
We only need...

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
- Resource allocation
  - How do we share the network’s capacity?
We only need...

- Manage complexity and scale up
- Naming and addressing
- Moving data to the destination
- Reliability and fault tolerance
- Resource allocation

(Lots of others too.)
Pull back the curtain on the Internet
Why should you care?

• To know how the Internet works
  – What may be wrong with your networks
  – When was the last time you went 24 hours without going online?

• Network programmers get respect
  – In high demand, get paid well
The Internet is Exciting!

- Rapid growth and success.
  - 1977: 111 machines on Internet
  - 1981: 213
  - 1983: 562
  - 1986: 5000
  - 1989: 10,000
  - 1992: 1,000,000
  - 2001: 150 – 175 million
  - 2002: > 200 million
  - 2011: > 2 billion (~1B are phones/tablets)
Global Internet Device Sales

Source: Gartner, IDC, Strategy Analytics, Company Filings, BI Intelligence Estimates
The Internet is Exciting!

- Rapid growth and success.
The Internet is Exciting!

• Rapid growth and success.

• We’re here at the beginning.
  – Most of the growth happened in our lifetime.
  – Still TONS of untapped potential.

Google

Founded 1998

Facebook

Founded 2004
The Internet is Exciting!

- Rapid growth and success.
- We’re here at the beginning.
- Communication is empowering.
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- We’re here at the beginning.
- Communication is empowering.

(Late 60s)
Next Class

- What is a Protocol?
- End-to-end argument
- OSI Model and layering
TODO List

• Reading: Protocols
  – Sections 1.1, 1.5

• Sign up on Piazza!

• Register your clicker!

• Please let me know:
  – Your preferred name/pronouns, if different than roster information
  – Academic accommodations