CSE 123A
Computer Networks
Fall 2005

Lecture 1: Introduction and Overview

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Today

- Short class
- Who is your professor?
- Course overview, expectations, etc
- Simple network basics
About me

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

- Research
  - I’m director of the Collaborative Center for Internet Epidemiology and Defenses (CCIED)
    - Focused on large-scale network attacks
    - Worms, viruses, botnets, etc
  - I’ve also done a lot of network measurement/analysis work

- Government
  - National Research Council’s Cybersecurity Research group
  - Institute for Defense Analysis advisory group for DARPA

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

- Course Material
  - Class lectures, textbook readings, and handouts

- Course Assignments
  - Homework questions from book and handouts
    - Handed out on Tuesday, due the following Tuesday
  - A small number of programming projects

- Exams
  - Midterm (Oct 25th or 27th) and Final (Dec 6th)
  - I will be explicit about what is covered in each
Prerequisites

- Officially: CSE141
  - I will allow you to take the class without this
  - However, I will use concepts like pipelining and caches that you will be expected to know
- Unofficially: the class is easier if you’ve taken CSE120
- You’re going to need to be able to program in “C”
Rules

- Assignments are due at the *beginning* of class
- Regrades should be the *exception*
  - Addition errors (happy), significant errors in grading (fine), nit-picking/grade mongering (die)
  - We reserve the right to *completely* regrade your assignments
- Cheating means not doing the assignment yourself
  - No copying, no Google, etc. If you’re not sure, then ask
  - Ok to *talk* with other students about assignments
  - *Gilligan’s Island* rule: if you can remember it after watching a rerun of Gilligan’s Island (or equivalent) then its probably ok
- Don’t mess with the professor.
Grading

- Homework: 25%
- Projects: 25%
- Midterm: 20%
- Final: 30%
Some hints

- Come to lecture
  - Yes, I will distribute the lectures slides online, and yes some of the material is in the book
  - However, lecture materials are the basis for exams

- Do the homework
  - You will have a hard time with the exams without doing the homework
  - Its 25% of your grade (easily the difference between an A and C)
Some hints II

- **Ask questions**
  - In class, via e-mail and at office hours
  - Inevitably you won’t understand something… that’s my fault, but you need to help

- **Start assignments early**
  - There is a statistical relationship between when you start and what grade you get.

- **Sleep from time to time**
Administrativa

- Web page (up very shortly)
  
  http://www-cse.ucsd.edu/classes/fa05/cse123a/

- Textbook
  
  *Computer Networks: A Systems Approach* (3rd ed) by Peterson and Davie

- Office Hours:
  
  - Tu 11:00am-12:00pm, CSE 3106 or by appt

- Discussion section
  
  - F 2:00-2:50 HSS 1330 (but not this Friday)

- TA’s
  
  - Calvin Hubble abd Mikhail Afansyev (schedule TBA)
Overall goal

- Understand how network-based communication takes place
  - Fundamental problems
  - Established design principles
  - Standard protocols and implementations

- Understand most of what’s actually happening when you download a Web page
Course material

- The key aspects of modern computer networking
  - Layering
  - Signaling, coding, clock recovery
  - Framing/stuffing, error detection/error correction
  - Media access protocols
  - Bridging/switching
  - Queuing/QoS
  - Internetworking
  - Efficient reliable communication
  - Connection management
  - Flow Control
  - Congestion control
  - Routing (intradomain and interdomain, unicast/multicast)
  - Router Design
Simple Communication Model

- **Hosts**: endpoints that communicate
  - e.g. workstation, server, PDA, Cell phone
- **Links**: transmission medium (a bit pipe)
  - e.g. Ethernet, 802.11, DSL, Cable Modem

Basic Metrics

Bandwidth, delay, overhead, error rate and message size
Network metrics

- **Bandwidth**
  - Data transmitted at a rate of $R$ bits/sec

- **Delay or Latency**
  - Takes $D$ seconds for a bit of data to propagate down link
  - Sometimes used to mean “round-trip time” from one host to another and back again

- **Overhead**
  - Takes $O$ secs for CPU to put message on wire

- **Error rate**
  - Bit error: Probability that a bit will not arrive intact
  - Message error: Probability that a group of bits will be corrupted

- **Message size**
  - Size $M$ of data being transmitted
How long to send a message?

- Transmit time \( T = \frac{M}{R} + D \)
  - 10Mbps Ethernet LAN (\( M=1\)KB)
    » \( \frac{M}{R}=1\)ms, \( D \approx=5\)us
  - 155Mbps cross country ATM link (\( M=1\)KB)
    » \( \frac{M}{R} = 50\)us, \( D \approx=40\text{-}100\)ms

- \( R \cdot D \) is called the bandwidth delay product
  - How many bits can be “stored” be stored in transit
Connecting links

- **Routers/Switches**: moves bits between links
  - *Circuit switching*: guaranteed channel for a session (Telephone system)
  - *Packet switching*: statistical multiplexing of independent pieces of data (Internet)
For Next Time...

- Decide if you’re dropping the class or not
- Read Peterson & Davie Chap1 (you can skip 1.4)
- We’re going to cover protocols and layering

- However, I won’t be in San Diego so Amin Vahdat will be covering
  - He’s really mean, don’t mess with him
Questions