CSC2209
Computer Networks

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Questions

- Why we build networks?
- Why do networking research?
- What are the “hard” problems?

Networking Research

- Is networking research…
  - theory?
  - science?
  - engineering?

Networking Research

- Is networking research…
  - theory?
  - science?
  - engineering?
- All of the above!

What this course is about

- What is a “core course”
  - Introductory graduate course in field targeting **ALL** students
  - Helps you become intimately familiar with field
  - Helps you read and review papers
  - Helps you understand how others evaluate work in a field
  - Helps you build lingo + background for research in a field
- CSC2209: Core Course in Networking
- By the end of this course, any student should be able to have a technical argument with a networking researcher and …. win it

What your role in course will be

- You have five jobs this term
  1. Read and synthesize 1 or 2 papers per class
     - Submit review two-hours before class
  2. Actively participate in class discussions
     - Come to class with questions and ideas
  3. Work on research project
     - In groups of two students; form groups asap
  4. Give two presentations summarizing relevant news
     - **You get credit for reading newspaper in class!**
  5. Write a take-home final

Paper Reviews

- Do not write long reviews
- Focus on what's important + high-level points
  - What did you learn from the paper?
- Reviews will be graded on a 3-point scale:
  - 0: no review submitted
  - 1: review demonstrated some understanding
  - 2: review demonstrated strong understanding and interesting critical evaluation of paper

How to submit reviews

- demo

Research Project

- Form groups (deadline is Sept. 28th)
- Choose a project topic (create your own one)
  - Deadline is October 3rd
- Create project Web page early next month (Oct 10th)
  - What is the problem you're solving?
  - Why is the problem interesting?
  - Why is the problem hard?
  - How are you planning to solve the problem?
  - What is the related work?
- Submit progress report November 10th
- 5 minute mid-term presentations November 14th
- Final presentation + report in December

Summarizing News

- See *Big Picture*: essential research skill
  - Make sure work on relevant problems (not in ivory tower)
  - Make sure you capture others' interest in your work
- This course will build you this "muscle"
- First 5 mins of each lecture, one student presents:
  - 1 slide, 3 bullets, each with one news relevant to networking
  - News must appear on that day's NYT or WSJ
  - Student should bring 1 physical copy of the article (or newspaper)
  - Student orally argues why news is relevant to nets researchers
  - Students submits a writeup with summary to me (e-mail)
- Why not /.?
  - If it's relevant to all, it will appear in NYT or WSJ

Take-Home Final

- Final will be posted online and due in K hours
  - For K = 24, 48, 72 or something like that
- Works on the honor system

What my role in course will be

- I also have a few jobs:
  - Present the papers focusing on the take-away points
    - What's important vs. what's not
  - Reading summaries and giving feedback occasionally
  - Summarizing the news for first few lectures
  - Help you with the project
    - Make sure you don't get stuck, keep making progress
    - Seek my help

Administrivia

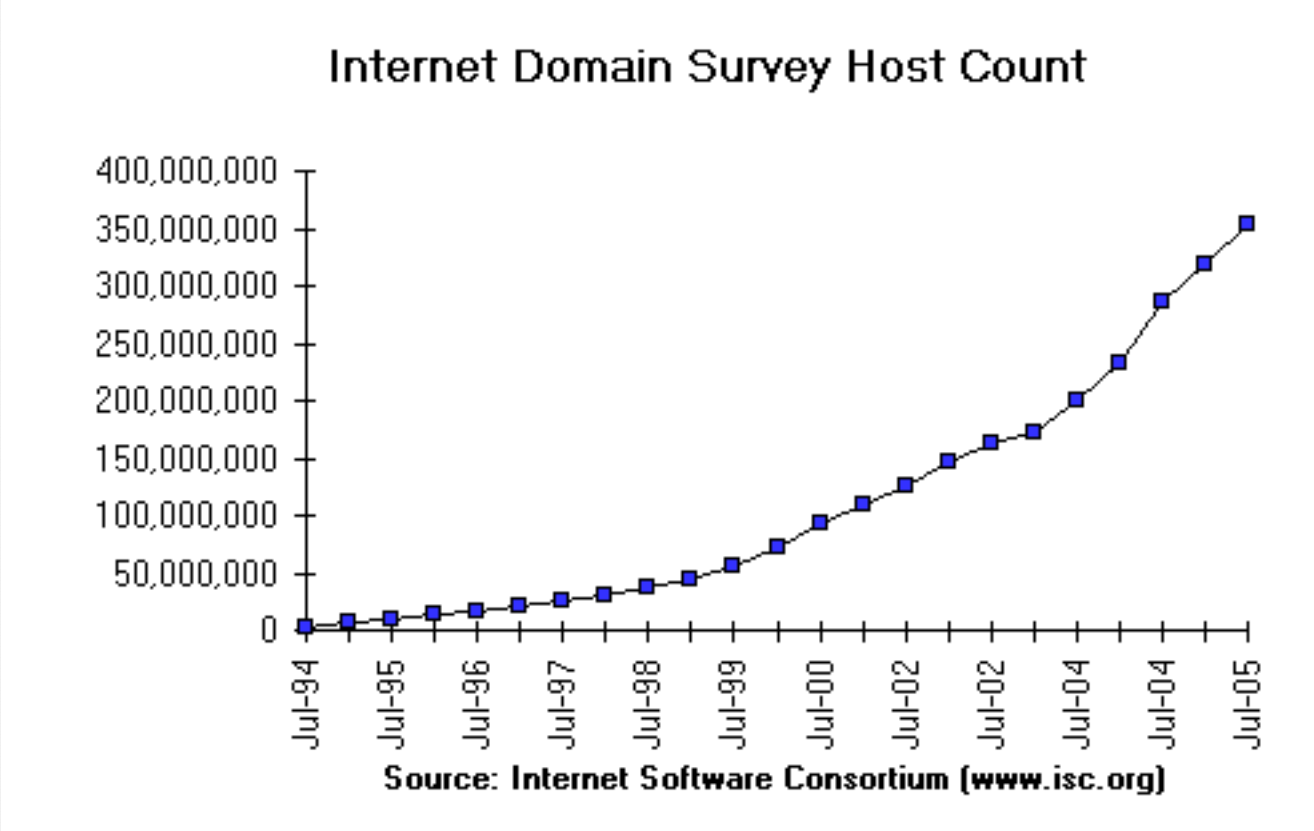
- Class times and location
  - Tue + Thur 1pm -- 2pm in BA7231
- Office hours: ???
- Pre-requisites: CSC458
- Grades
  - Paper summaries 10%
  - Participation 10%
  - News summary 10%
  - Project 40%
  - Final 30%

The topics…

The networks we study

- We are interested in networks that are:
  - Large scale
  - Intrinsically unreliable
  - Distributed
  - Heterogeneous

The meaning of “Large-scale”



Intrinsic Unreliability

- Information sent from a first place to a second
  - May not arrive
  - May arrive more than once
  - May arrive in garbled fashion
  - May arrive out of order
  - May be read by others
  - May be modified by others
- Why build intrinsically unreliable networks?

Distributed

"A distributed system is a system in which I can't do my work because some computer has failed that I've never even heard of." – Lamport

- (Hopefully) independent failure modes
- Exposed and hidden dependencies
- Independent administrative controls
- Leads to…

Heterogeneous Networks

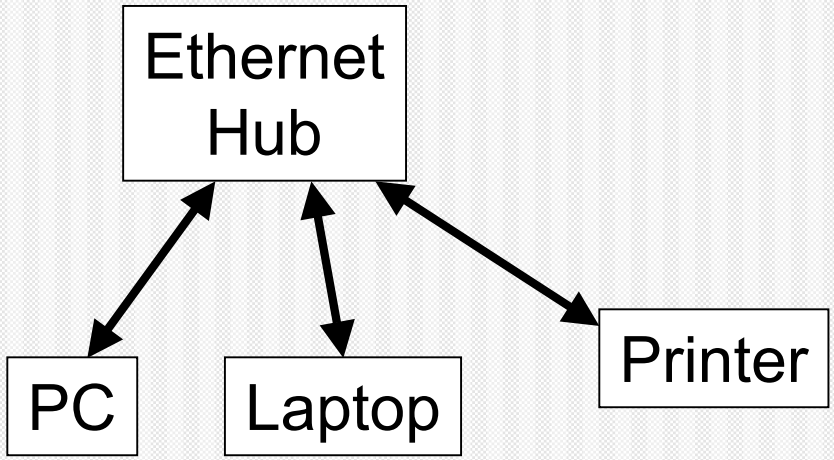
- Heterogeneous: Made up of different kinds of stuff
- Homogeneous: Made up of the same kind of stuff
- Principles
  - Homogeneous networks are easier to deal with
  - Heterogeneous networks lead to greater innovation and scale
  - Consider telephone network vs. Internet
  - Reasons?

Model of a Network

- Links carry information (bits)
  - Wire, wireless, fiber optic, smoke signals …
  - May be point-to-point or broadcast
- Paths formed of several links
  - Between two network endpoints
- Switches move bits between links
  - Routers, gateways,bridges, CATV headend, …
- Hosts are the communication endpoints
  - PC, PDA, cell phone, tank, toaster, …
  - Hosts have names

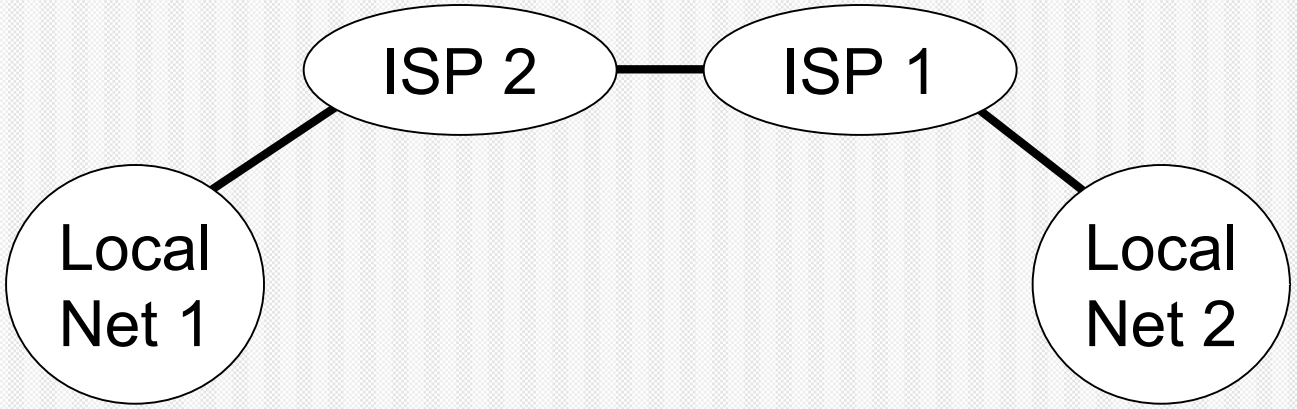
- Much other terminology: channels, nodes, intermediate systems, end systems, and much more.

Example – Local Area Network



- Your home network
  - Ethernet is a broadcast-capable multi-access LAN

Example – An Internetwork



- Internetwork is a network of networks
- The Internet is a global internetwork in which all participants speak a common language
  - IP, the Internet Protocol

Next class

- Papers review
  - *The E2E Argument*. Saltzer, Reed, and Clark. TOCS 84
  - *Design Philosophy of DARPA Internet Protocols.* Clark. Sigcomm '88.

- Reviews due at 11am