CSE 291: INTERNET INFRASTRUCTURE

Infrastructure History

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Entire Internet (ARPANET) in 1973

UC San Diego
LOGISTICS

• Canvas
  • https://canvas.ucsd.edu
  • Course homepage has schedule
  • Online Q&A
  • Quizes, gradebook, some materials
• Each other!
GRADING

• Class project: 50%
• In-class participation: 25%
• After-class Quizzes (once a week on Fri): 25%
• Total: 100%
GOAL OF CSE 291

• Bring you up to the state of the art in Internet Infrastructure design and operation

  • [Mon] review of concept then [Wed]/[Fri] Papers

• Give you the skills needed to stay at the state of the art for your entire career

• Project: Work on a (small) research project of your own to study your own Internet infrastructure, culminating in a ~6 page research paper.

• Deadlines on schedule, seed ideas posted soon
CLASS PROJECT (DETAILS COMING NEXT WEEK)

• Study Internet Infrastructure in San Diego
  • Deploy your own Internet measurement system
    • Quite a bit of Internet infrastructure in San Diego:
      • Cox, Spectrum, AT&T (fiber), Verizon, AT&T (mobile), T-Mobile Campus (CENIC)
  • Observe the topology, performance, and reliability
  • Write a 6-page report
• Or reproduce research we discuss in this class...
Why? Primary source information about infrastructure is buried in jargon-filled technical documents (specs, internal docs).

Researchers do a good job of telling you what you need to know:

*We will spend lots of time talking about the background sections of research papers*

Researchers dig into why infrastructure works or does not work as expected.
WAYS OF READING

• There are many ways to read something
  • To get a broad overview of the main idea
  • To determine the main “takeaway points”
  • To find something specific (e.g. what is the repair protocol for the Pastry protocol again?)
  • “Close” readings
• We’re going to be doing close readings of 1 paper per class discussion
WHAT IS “CLOSE READING”?  

• Not just “what”, but *WHY*
  • Why did they design the infrastructure in this way?
  • Why were alternatives ruled out?
  • Why does the system behave the way it does?
  • Could we make it better?

• What can you learn from their experiments? From the workloads used in the evaluation?
INTERNET INFRASTRUCTURE VS. TELECOM & TELEGRAPH (BARAN)

- "All-Digital" Communication Links
  - Receive, check if its correct (same bits as intended)
  - Store and Forward "relay" (can repeat msgs. over many hops)

- Packet Switching
  - Messages separated into "blocks" (packets) that contain their own addressing information
FIG. 9 - All Digital Network Composed of Mixture of Links
Circuit switching (not packet), but a perfect starter infrastructure for the Internet
LONG LINES IS STILL HERE...

Directional microwave antennas pointing northeast
• The Internet architects couldn’t convince AT&T to make their infra packet switched.
• Possibly delayed the adoption of the Internet!

Why?
UNDERSEA CABLES WERE ALSO ALREADY POPULAR

Became standard for overseas telephone and telegraph
FIRST COMMUNICATION SATELLITE (TELSTAR 1) 1962
GAME CHANGER: FIBER ALONGSIDE RAILROADS

Railroads had right-of-way permits across continents in 80s (and needed comms)

Fiber brought a massive growth in capacity and performance (way more than needed)
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<td>Long-Haul Terrestrial Internet Links</td>
<td>InterTubes: A Study of the US Long-haul Fiber-optic Infrastructure</td>
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