Distributed Systems in Challenging Environments

Today

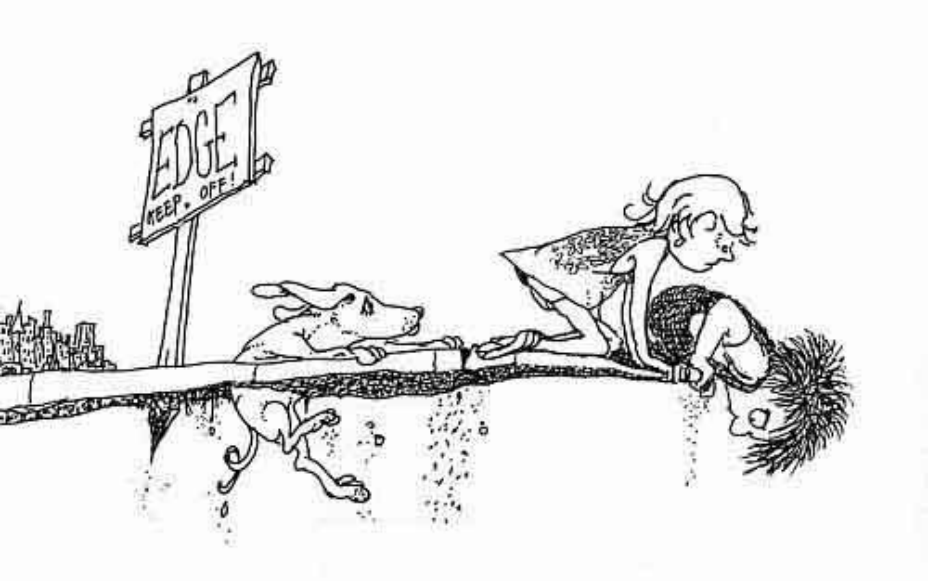
- Welcome
- Class organization and guidance

Next time

- Consensus routing – paper presentation and discussion

What is this about?

- Distributed systems
  - A collection of independent, interconnected processors that communicate and coordinate their action by exchanging messages
- Goal – to review cool ideas and projects that are pushing distributed systems to *uncomfortable* places
  - This year focus – running at the edge of the world



At home and on the road, from your desktop, laptop, pad, smart phone.

Not just in the US and Western Europe, but also in Africa, Latin America, …

What topics will we cover?

- How does the network look from the edge?
- How do new popular applications running at the edge impact the network?
- .. And how would you build the network to support them if you had a second chance?
- Running at the scale of Internet systems, how would you handle
- … debugging?
- … coordination?
- … energy usage?
- … privacy?
- … security?

A higher level goal

- Goal – to learn systems research by doing
  - Read research papers
  - Present research ideas (yours and others)
  - Pick a research project and execute it
  - Write a research paper

Class structure

- Classes
  - Read research papers
  - Present research ideas
  - Learn about ongoing work
- Project
  - Come up with a new idea, but I'll give you something to get started
  - Model, implement, evaluate, …
  - Write a report/paper on your project
  - Present

Grading

- No exams
- Class (50%)
  - Participation 15%
  - Summaries 15% (*90% required*)
  - Presentation and discussion leading 20%
- Project (50%)
  - Proposal 10%
  - Midterm report and presentation 15%
  - Final report and presentation 25%

Reading papers

- Why reading?
  - You need an overview, you are presenting the paper, …
- Deciding what to read
  - What did they do? Title & abstract should tell you that
- Reading for breadth
  - Develop a framework of the paper and asses authors' credibility by skimming; if you want to know how they did it …
- Reading in depth
  - Challenge their argument – examine their assumptions, methods, experimental framework, statistics, conclusions
  - Can you use apply their research to your work?
- Take notes
  - Highlight major points, note definitions, construct an example, …

Reviews

- After reading and writing down your notes
- What have you learned? What where the main points?
- To submit
  - Paper title and its authors
  - Brief one-line summary, in *your own words*
  - A paragraph of the most important ideas
  - A paragraph of the largest flaws
  - A last paragraph where you state the relevance of the ideas today, potential future research suggested by the article, etc.

  Useful: *Hanson, McNamee, "Efficient reading of papers in Science and Technology"*
- *Due – 10AM Mon/Wed*

Presentations

- Given a good research talk is not easy – some guidelines
- The talk is just a taster rather than an in-depth treatment of the work; determine …
  - Who is your primary audience?
  - If someone remembers one thing from your talk, what would you like it to be?
- Think of what motivated you (or the authors)
  - Use examples to motivate the work and approach
  - Use examples to illustrate your points
- Saying enough without saying too much
  - Enough depth to convey your ideas, but not to much to overwhelm your audience – follow a non-uniform approach

Presentations

- Don’t put too much on the slide
  - Prune and then prune again
  - People can take only very limited information per slide: 5+/-2 things
- Don’t repeat what you plan to say
- Seriously consider dropping the typical “overview/roadmap” slide
- Just one figure per slide!
- Use the slide header when possible
- Mind the time!
- Don’t start to work on the slides too early

Project

- One single project – this is a critical component of the course – 50%
- Your goal – to design, construct and evaluate an interesting distributed system
- Projects must be written up in a term paper and teams will present their results at the end of the course in a systems class mini-conference
- Teams of 2-3 people; based on topics you will be assigned a project leader (could be me or somebody from outside the class)

Schedule

- Form a group – Jan 3-7
- Project meeting with me – Jan 10-14
- Project initial presentation – Jan 17 & 19
- Midterm presentation and report – Feb 7 & 9
- Project meeting with me – Feb 21-25
- Final presentation – Finals week
- Final report due – Finals week
  - HotNets or HotOS format: *submissions should contain six or fewer two-column pages, including all figures and references, using 11-point fonts, standard spacing, and 1-inch margins.*

A common approach

- Pick a topic/area
- Learn about the area, typically by reading papers
- Come up with a new idea
  - A solution to a problem you notice
  - An open research question
- Execute your idea
  - Model, implement, evaluate, …
- Share what you have learned by writing a paper and presenting it somewhere

Project presentations

- Initial presentation – 4 slides
  - Project name and team members
  - What is the research contributions of the project? List of new/interesting concepts to be investigated
  - Why do we care if you are successful?
  - Project milestones and schedule for the rest of the quarter.
- Midterm presentation and report – 4 slides
  - Project name and team members
  - Revised statement of project goals and list of new/interesting concepts to be investigated
  - List of issues addressed and pending
  - Updated project milestones, highlighting accomplishments to date, and schedule for the rest of the quarter
- Final presentation – ~15’ based on final report

Final report

- Abstract
  - *What did you do, why is important & what are your high-level results?*
- Problem statement
  - *What is the problem you tried to solve?*
- Prior work
  - *How has the problem being dealt with before? Why was that not enough?*
- *…*

Final report

- …
- Research approach
  - *Approach to solving the problem? What did you design, built? What was your evaluation methodology?*
- Results
  - *How did you evaluate the work? What were your figures of merit?*
- Lessons learned and future work
  - *What would you have done differently? What's left for future work?*
- Summary and conclusions

Next time/TODO

- Form a group!
- Start thinking of project topics or talk to me
- Read Consensus routing – to be presented by Fabián
- Read background material – available in the website
  - I will also cover some of them as part of the presentation