CS 268: Project Suggestions (cont'd)

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Outline

- Traditional networking
- Slightly nontraditional networking
- New Architectures and Paradigms
- Theory

Project 16: Quickstart+TCP vs XCP

- XCP (Katabi et al.) is a recent congestion control proposal (we'll cover it later) that requires dramatic changes in TCP and routers
- Quickstart is a quick-and-dirty hack:

  http://www.icir.org/floyd/quickstart.html
- Is XCP significantly better?

Project 17: Burst Switching

- Two main communication models
  - Datagrams: each packet is individually switched (routed)
  - Circuits: a circuit is set-up and all packets are forwarded
- Hybrid model: burst switching
  - First packet describes how many packets are in a burst
  - Router decides whether to forward all packets in the burst or none of them
- Research
  - Design a burst switching protocol and study its trade-offs

Project 18: Interdomain Traffic Engineering

- Interdomain traffic engineering is a mess:
  - Ambiguous goals
  - Ad hoc techniques
- The best known paper on this is "Guidelines or Interdomain Traffic Engineering" by Feamster et al.
- Can one come up with a specification language and a coherent set of mechanisms?

Slightly Nontraditional Networking

Project 19: Resiliency via Incast

- Send to set of waypoints (in mcast group):
- Each waypoint forwards data toward receiver
- Incast boxes (one or more along path) strip out extra redundancies (configurable parameter)
- How reliable does that make delivery?
- What is a coherent architecture for this?
  - i3, DOA, etc.?

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Project 20: Reconfigurable Directional Antennae

- Lots of interest in "mesh networking"
  - Many performance problems because of interference
- What if we had reconfigurable directional antennae instead of broadcast?
- Could quickly reconfigure "links" to produce good paths
- Design such a system and analyze it

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New Architectures and Paradigms

Project 21: DoS Prevention

- DoS Resilient Architecture
  [http://www.cs.ucl.ac.uk/staff/M.Handley/papers/dos-arch.pdf]
  - Separate clients from servers
  - Only servers can be directly contacted
  - Clients can be contacted only if it allows this explicitly
- Research:
  - Other alternatives to implement such architecture?
  - How well can you do in the context of the current Internet?
    - Note: can use DOA, i3 like architectures

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Project 22: Checkable Protocols

- Protocols that check correctness but do not guarantee it, e.g.,
  - ECN-nonce
    [http://www.cs.ucsd.edu/~savage/papers/ICNP01.pdf]
  - Listen and Whisper
    [http://www.cs.berkeley.edu/~lakme/listenwhisper.pdf]
  - SV-CSFQ
    [http://citeseer.ist.psu.edu/stoica02selfverifying.html]
- Develop other applications, e.g.,
  - Differentiated services: make differentiated service more robust to malicious/misconfigured ingress nodes

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Theory

Project 23: CAP vs CAS

- The famous CAP theorem (easy to read) states that one cannot achieve:
  - **C**onsistency
  - **A**vailability
  - Ability to function while **P**artitioned
- Partitioning is no longer necessary
- What we really care about is C, A, and **S**caling!
- Can we formulate and prove a CAS theorem?

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Project 24: Overlay Routing

- Assume
  - A network topology T
  - A routing algorithm running on top of T
  - You control a fraction *f* of nodes in T
- Question:
  - How well can you approximate an "arbitrary" routing metric as a function of *f* and topology T ?
- Example:
  - T uses # of hops to implement shortest path
  - You know delay distributions along links in T
  - How well can you approximate lowest latency routing metric assuming a power-law topology and *f* = 10%?

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Project 25: Geographic Routing

- Consider a stationary ad hoc network
- Design a compact routing scheme (small routing tables)
- Require that this scheme have low incremental costs when nodes and links come/go
- Is geographic routing the only such scheme?

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Next Step

- You can either choose one of the projects we discussed during this lecture, or come up with your own
- Pick your partner, and submit a one page proposal by February 6. The proposal needs to contain:
  - The problem you are solving
  - Your plan of attack with milestones and dates
  - Any special resources you may need

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