

CSC2209
Computer Networks

Changing the Internet

Stefan Saroiu
Computer Science
University of Toronto

Administrivia

- Proposal
 - No papers to review on December 7th (last lecture)
 - Have project presentations on December 8th
 - 15 minute presentation followed by 5 Q&A
 - 3 hour slot
 - Take-home final: Saturday December 9th, 9am
 - Due Tuesday December 12th, 9am
 - Project writeup due **December 15th at 11:59pm**

Idea behind Active Networks

- Code running in the middle of the network
- Motivation:
 - Easy to deploy and test new protocols
 - Could better handle network heterogeneity
 - Discontinuities is where action in the networks occurs
 - Today's ability to manage heterogeneity limited by end-to-end
- Is this a good idea?

Mechanism for Active Networks

- Restricted by the API
- Trade-off between “too restricted” and performance
- Problems:
 - Unclear how to do network measurements
 - Measure the network or measure code performance?
 - Computation on payload
 - Code must be very well hardened
 - Reliable communication is still unavailable
 - Code must handle it

ANTS

- Code handles each packet individually
- Alternative: code can handle streams of data
- Capsule has a type registered when first entering the network
 - Type determines how to handle the capsule and what packets the capsule can access
 - Type restricts capsules from unlimited access
 - How are firewalls done then?

Pros and Cons of Active Nets?

- Pros:
- Cons:

Pros and Cons of Active Nets?

- Pros:
 - ISPs can prototype / deploy new apps very quickly
- Cons:
 - Security
 - Performance
 - No service guarantees
 - No killer app.

What Other Options Instead of Active Nets?

What Other Options Instead of Active Nets?

- Overlays
 - I3 can be thought of a “simple overlay”

GENI

- New NSF planned large-scale networking project
 - Many ideas inspired from Active Networks (+ PlanetLab?)
- Programmable nodes deployed on top of network
- Horizontal virtualization
- Users can opt-in into each horizontal slice

- Huge effort by the research community

Overlays

- No need to change Internet infrastructure
 - Ease of deployment
- Build virtual links from Internet paths
- Route packets through virtual links
- Sometimes could find better path than what the Internet would offer

I3

- An overlay providing a level of indirection only is sufficient to build many services
- You can provide level of indirection through proxy only
 - V. simple version of an overlay
- Abstraction supported by I3
 - A sends packets to B's mailbox in the proxy
 - B requests the packets when it wants them

Mobility

- How can I3 support mobility?

Multicast

- How can I3 support multicast?