Seattle: Building a Million Node GENI by End User Opt-In

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What is Seattle?

- Incentivized Platform for Resource Donation
  - End User Opt-In
  - Programming Language VM
- Goals
  - Minimize Adoption Hurdles
  - Broad Set of Potential Adopters
  - Attractive to Multiple Communities
    - Currently focused on Education

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Donation

- Donation has worked well in other contexts

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are needed to see this picture.

  - SETI@Home, Protein Folding, Great Mersenne Prime Search, etc. (> 500K)

- Donation for Education
  - Incentives for donating (10 for 1)

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How Seattle Works

- An installer is downloaded
  - Requiring root / admin access would limit adoption
    - Can be installed in a restricted account
  - Multiple installs may happen on the same machine
    - Only one copy will run at a time
    - Credit for installation can be transferred
  - Restricting access to local users would complicate sharing
    - Node Manager allows remote users to execute programs
  - Limited platform support would prevent donation
    - Many platforms supported (Windows, Linux, Mac, BSD, mobile devices)

How Seattle Works (cont)

- Programs are run in a virtualized environment
  - Supporting diverse platforms raises portability concerns
    - VM ensures programs are portable
  - Students may have difficulty using the environment
    - Programming language VM based upon Python
  - Malicious programs could pose a security risk
    - Programs are checked for security
    - API calls are tightly controlled
  - Buggy programs could use too many resources
    - Resources are restricted by VM (similar to Xen, VMWare)

Common use

- Instructor sets up donations on computers
  - Credits can be shared with students
  - Students may also install
- Students
  - Request resources via website
  - Use shell to start / deploy program
  - View program output / tracebacks
- Students can also test on a local install

Demonstration

- Registration
- Download Installer
- Acquire resources
  - Use seattlegeni website
- Deploy all pairs ping
  - Use shell to locate and control resources

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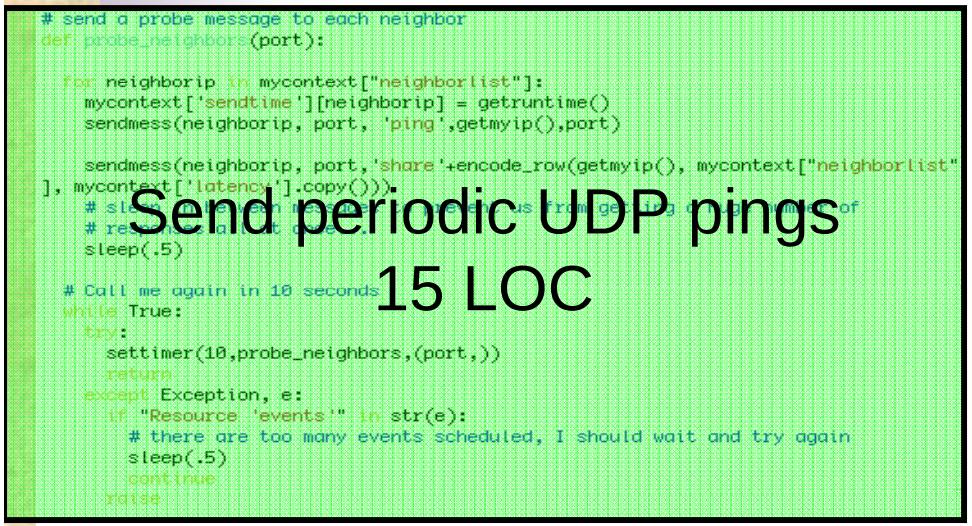
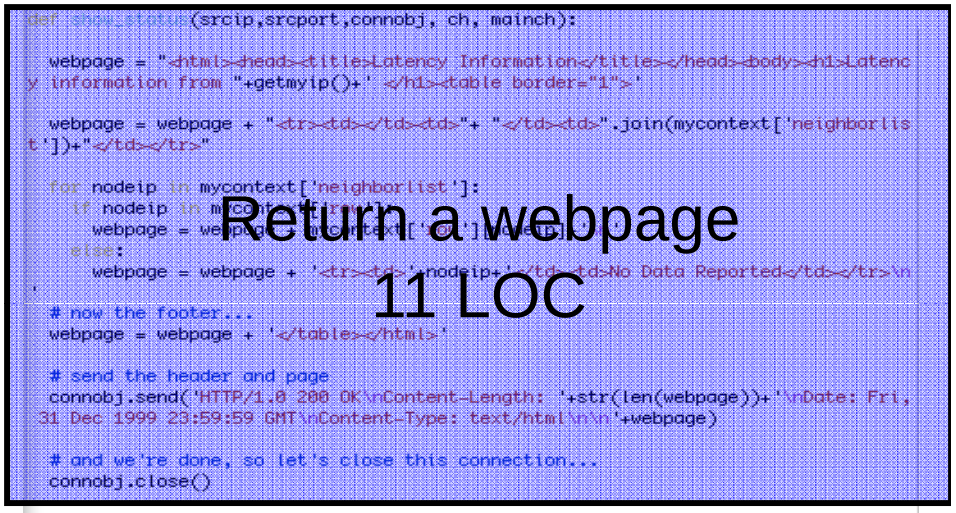
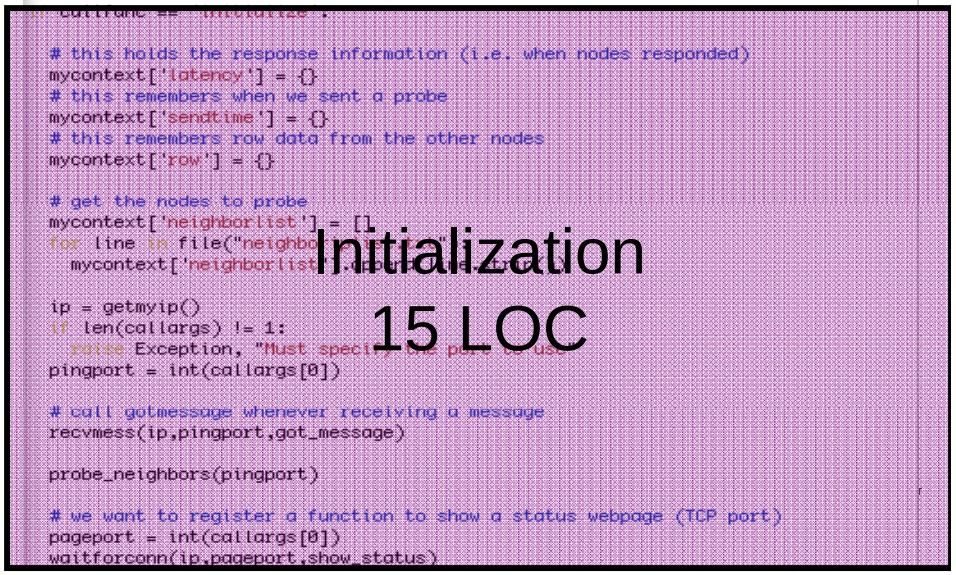
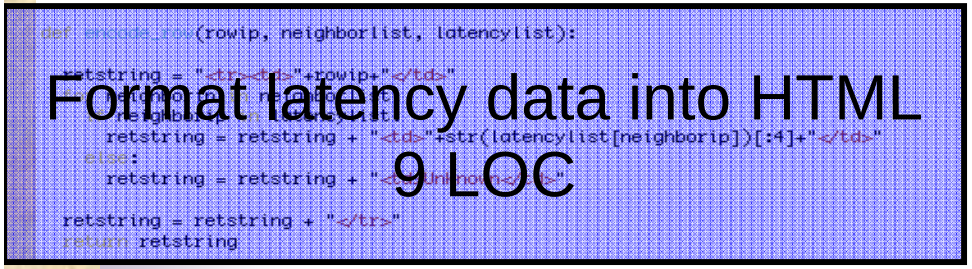
All Pairs Ping









Incentives

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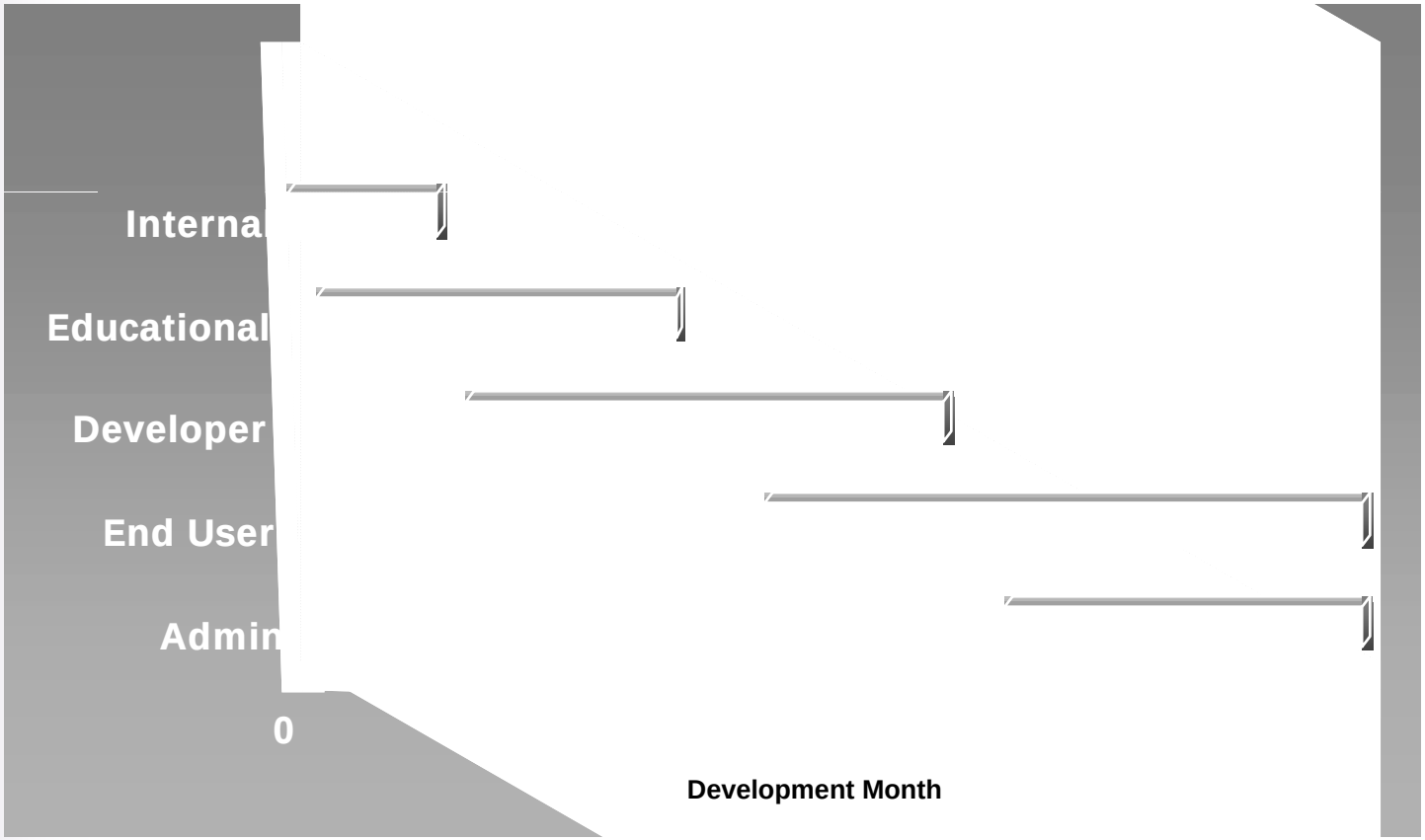
Development Focus



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Opt-In Types

- Wholesale
  - ISPs or universities
  - Network-based interposition
- End User
  - Individuals
    - Anyone who wants to join, can!!!
  - End host software-based interposition

End User Opt-In

- Opt-in mechanism may be specialized
  - Stake-holders must value the mechanism
  - GENI Public License allows forking!
- Stake-holders
  - User
  - Developer

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Users' Opt-In

- User
  - Control what types of experiments run
  - Control what developers run experiments
  - Control where traffic can be sent
  - Control which traffic can be sent
  - Dynamically add and remove services

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Developers' Opt-In

- Developer
  - Control their experiments
  - Control what their experiment interacts with
  - Control how their experiment is composed with services
  - Choose whether to utilize user resources

Summary

Seattle Testbed

- Safely uses donated resources
- Stays current with the latest technology
- As of Mar 2009, we have resources on over 1200 computers, 100s of universities, 6 continents

End-user opt-in

- Must appeal to developers and users
- Easy, safe, valuable
- Flexible controls with few restrictions

https://seattle.cs.washington.edu/