Programmatically Deploying Code on End User Devices: Seattle and Sensibility Testbed

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Observations from AIMS

Crowdsourcing provides a useful platform

- Buying hardware does not scale!
- User safety is paramount
  - Security / Performance isolation
  - Privacy Policies
- Bundling with apps is important

Experimenters want rich interaction

- Flexible expt type / timing / frequency
- Computation with a (standardized?) API
  - What abstraction?
- Does generality cause problems?

Our Vision

Securely Compute on Edge Devices

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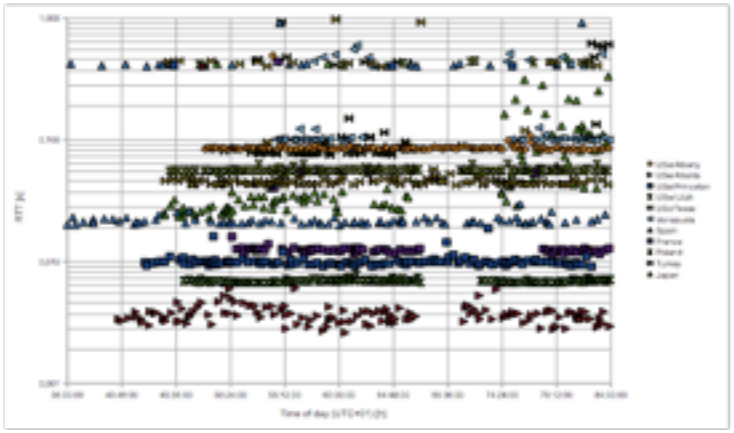
Seattle Testbed

Open peer-to-peer application hosting

- Unknown users donate resources (VMs)
  - Performance isolated to 10%
- Unknown developers push code
  - Security isolated so “do no harm”
- Tit-for-tat like model for resource sharing
- Commonly used like a P2P PlanetLab

https://seattle.poly.edu/

Practical use



- Deployed services
  - Intelligent distributed storage
  - Dynamic DNS remapping
  - Transparent network optimization
  - Censorship avoidance and measurement
  - YouTube CDN mapping
  - Etc.
- Community support
  - Android / OpenWRT / Raspberry PI port
  - Runs on PlanetLab, Emulab, GpENI, DOME, etc.
  - GENI workshops, PyCon, etc.
  - Port to Nokia N900 by Nokia
  - NaCl integration by U Victoria / HP Labs
  - iPad 2 port, tun / tap support, etc.

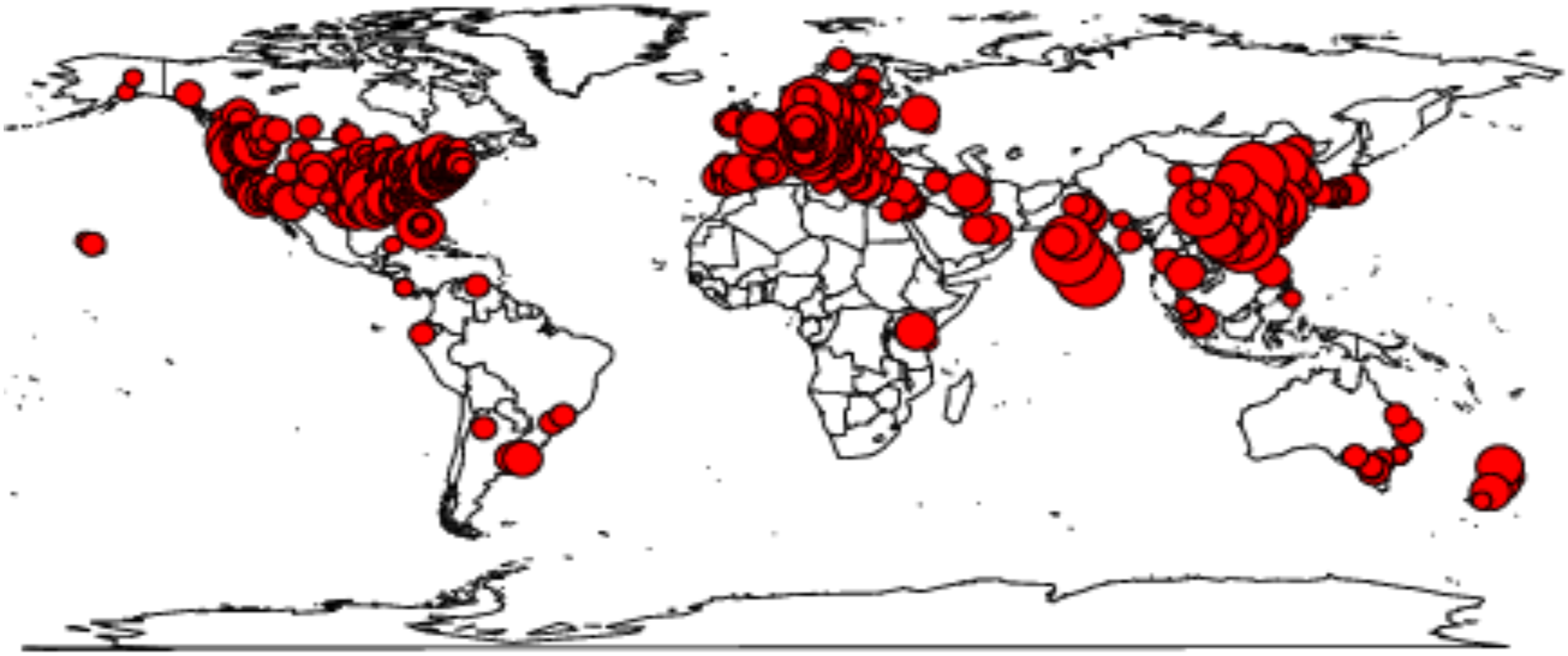
xvid solutions

Educational use

- Classroom experience
  - Released in Spring 2009
  - Used in >50 classes (so far)
  - 3 tutorials, 3 library references, etc.
  - 11 battle tested assignments (Networking and Security)
    - Overlay routing, flow control, NAT / Non-transitive connectivity, Chord (DHT), web / chat servers, reference monitors, NAT tunneling, etc.
    - OS classes are coming

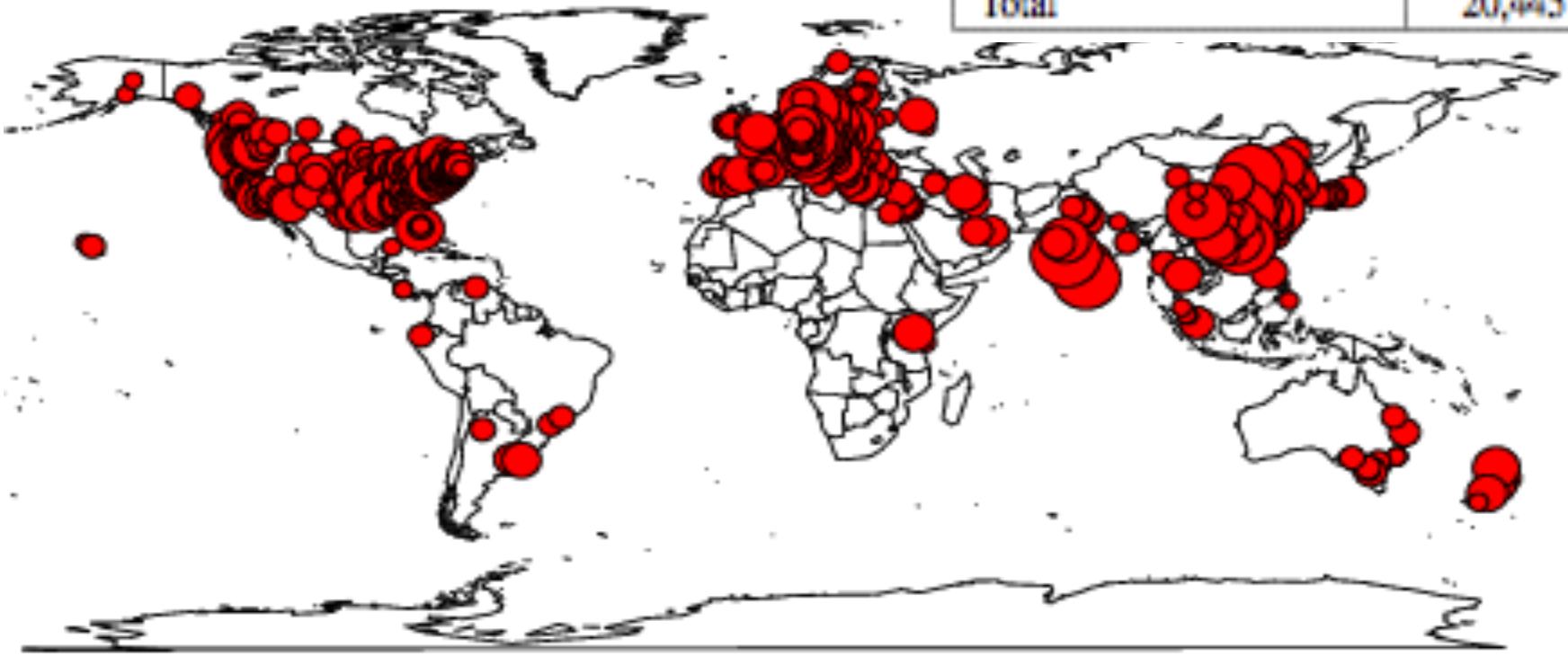
- Community support
  - Supported by educational groups
    - NWDCSD, HandsOnSecurity
  - 2 SIGCSE papers, 3 CCSC workshops, etc.
  - Top ranked SIGCOMM Educational Resource
  - Coming in Computer Networking by Kurose & Ross
    - Most popular networking book!

What Our Current Status?



What Our Current Status?

Node Type	Quantity
University nodes	3,510
Home machines	7,594
Other Testbeds (PlanetLab, Emulab, etc.)	859
Phones	505
Unclassified	7,977
Total	20,445



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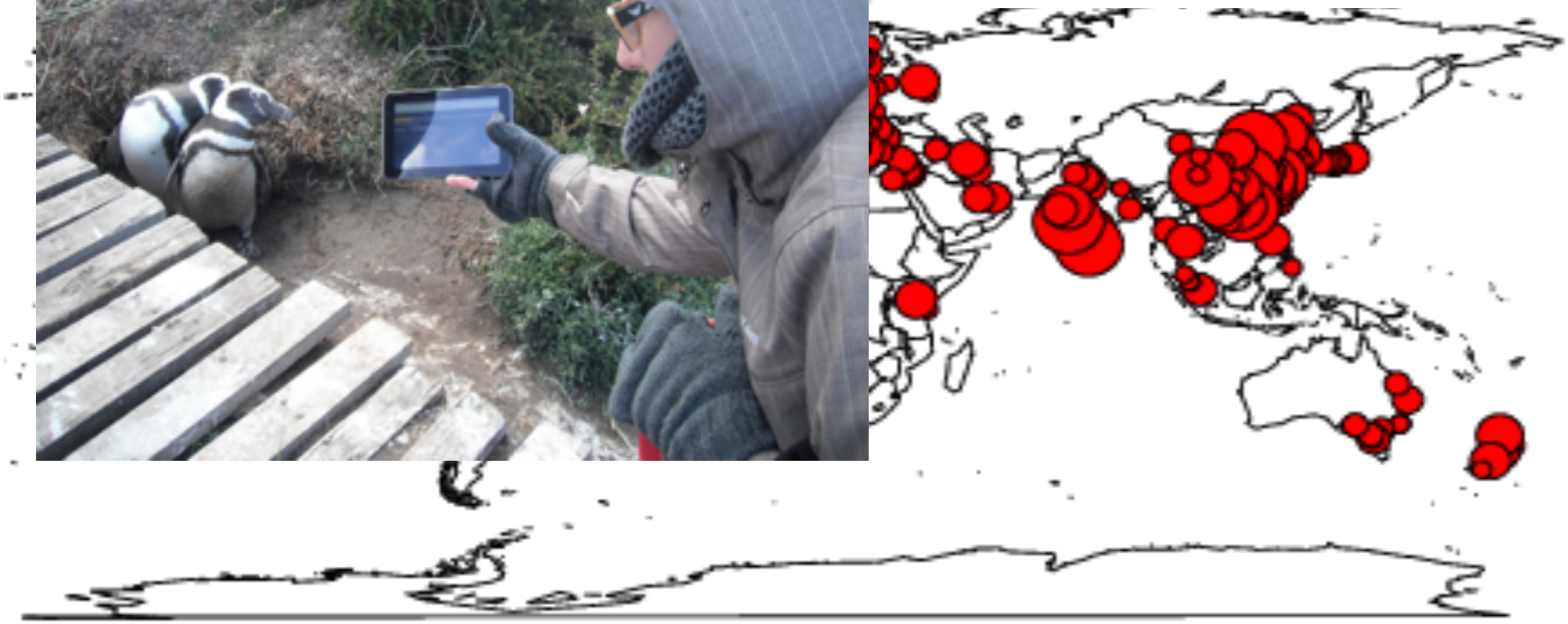

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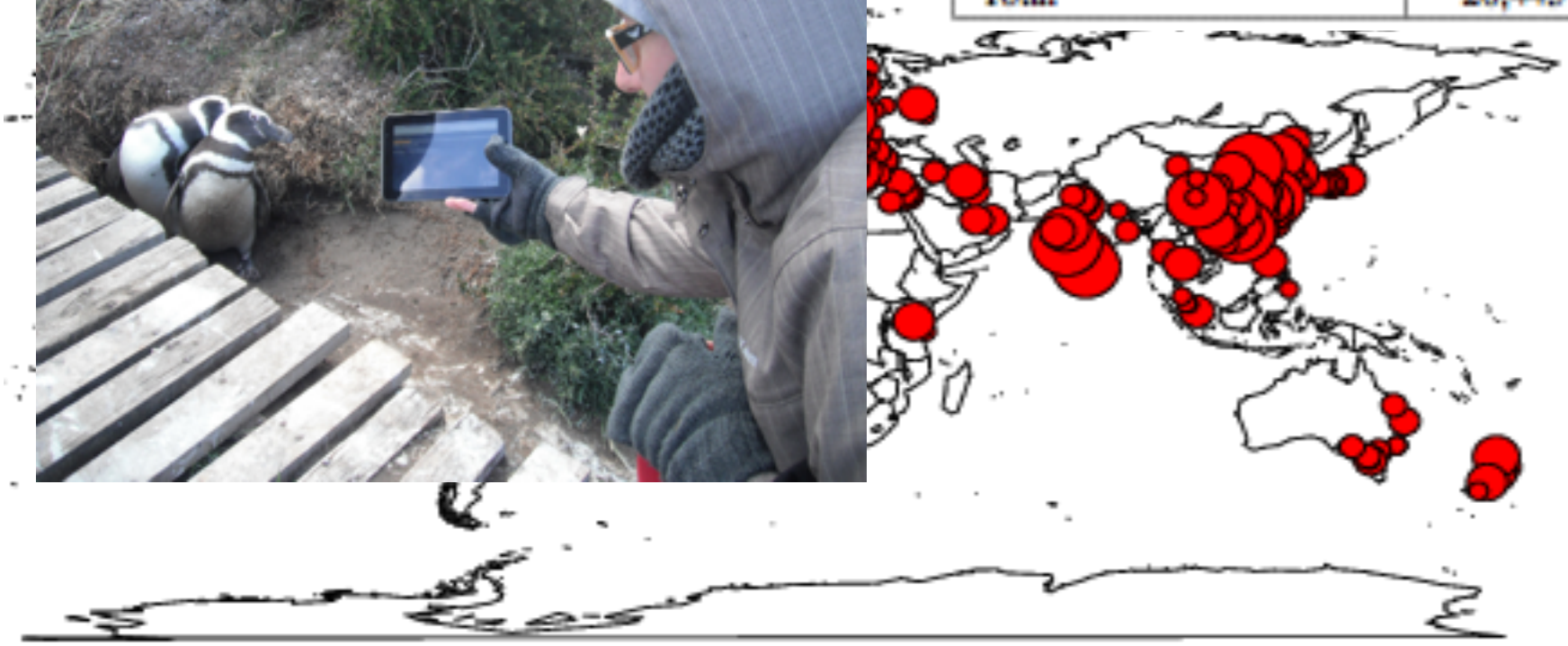

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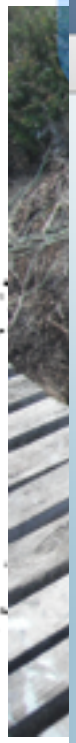

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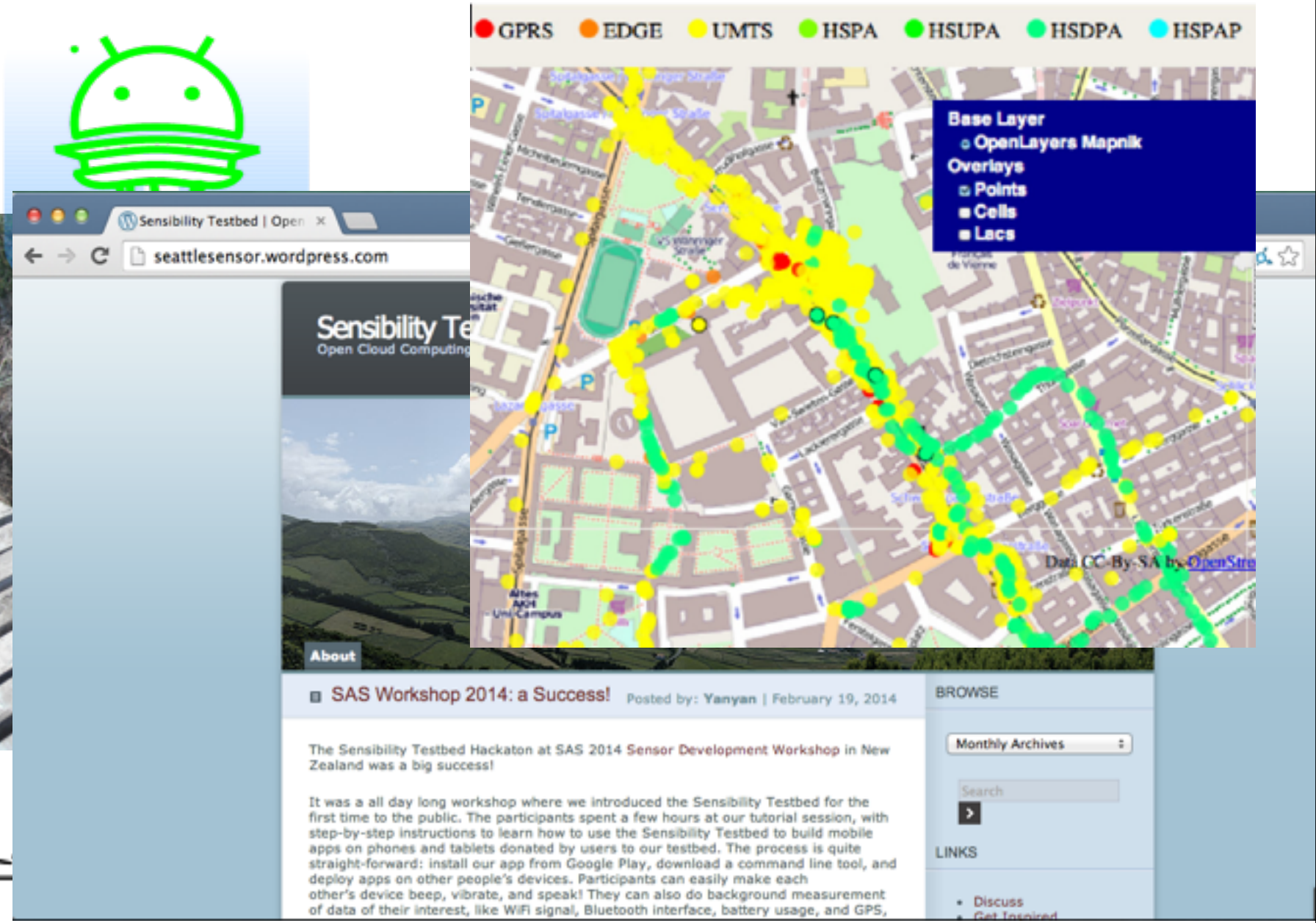

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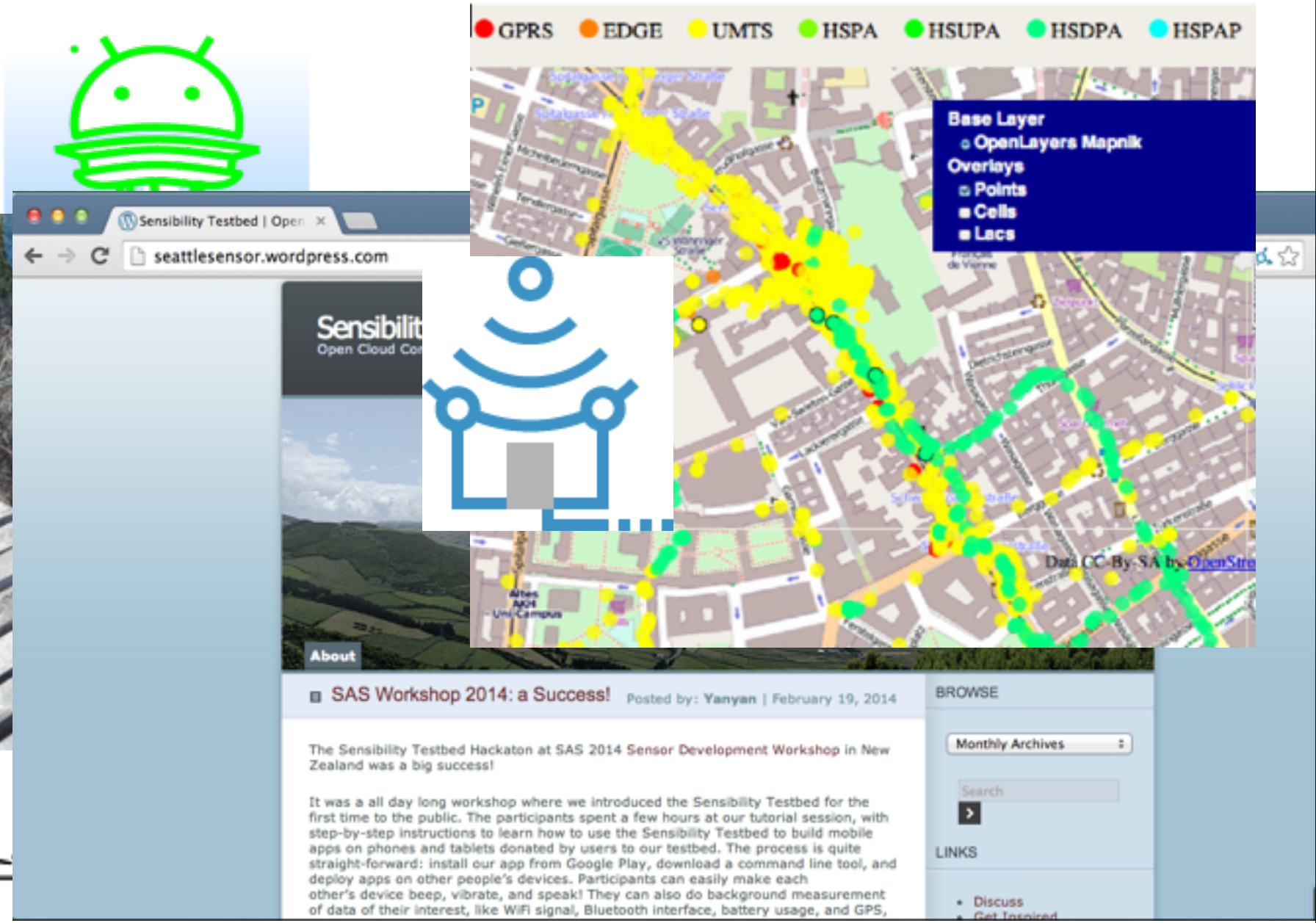


Demonstration

Typical Seattle Workflow

- Registration
- Download installer
- Acquire resources
  - Use Seattle public clearinghouse
- Deploy application

- Use shell to locate and control resources
- (All Pairs UDP Ping?)

Thanks to:

NSF

LABS hp

NYU·poly
POLYTECHNIC INSTITUTE OF NEW YORK UNIVERSITY

NWDCSD

geni

University of Victoria

WASHINGTON STATE UNIVERSITY
VANCOUVER

EVERGREEN
THE EVERGREEN STATE COLLEGE
OLYMPIA, WASHINGTON

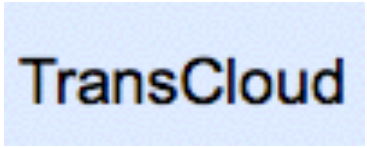
Lewis & Clark

universität
wien

NOKIA

Williams

TECHNISCHE UNIVERSITÄT
KAISERSLAUTERN


TransCloud

Seattle / Sensibility conclusion

- Seattle widely deployed around the world
  - Geographic diversity, network diversity, device diversity...
  - Tens of thousands of installs, thousands of VMs online at a time, thousands of developers
- Battle tested educational / research / app platform!
- Discussion: Where might we fit in?
  - Testbeds (Seattle / Sensibility) for experimentation
  - Common library for experiments
    - Collab(?) with mobiperf (expose their measurement libs)
  - Toolkit for easily building customized testbeds
    - Seattle, BISMark, ToMaTo, Sensibility Testbed, ICLab, SocialCloud, SciWiNet(?), PhantomNet(?), Mitate(?), etc.

https://seattle.poly.edu/ SeattleOnAndroid (Google Play)

Thanks!