geni
Exploring Networks of the Future

# GENI

## Exploring Networks of the Future

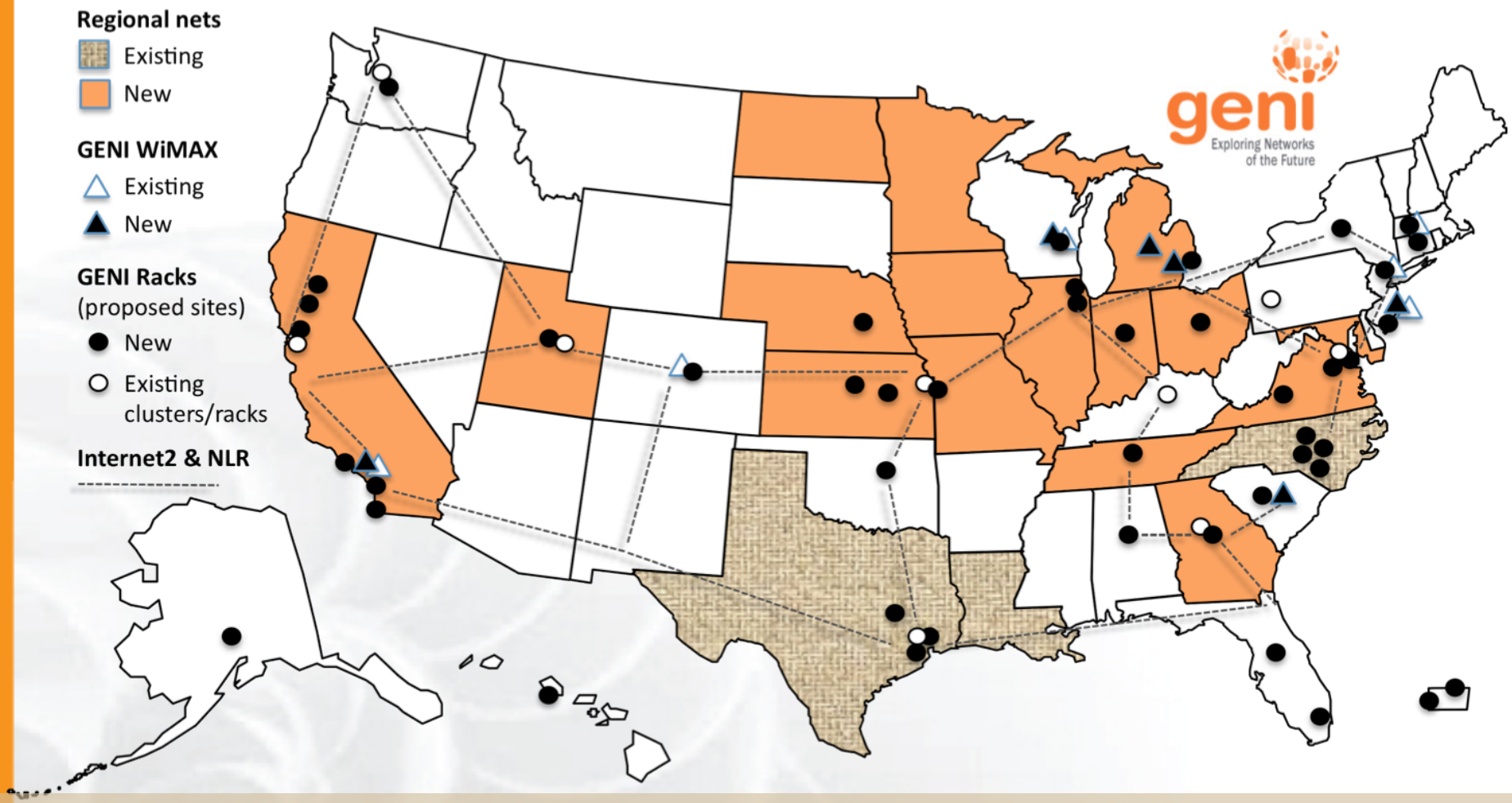
www.geni.net

Sponsored by the National Science Foundation

# Outline

- What is GENI?
- How is GENI being used?
- Key GENI Concepts

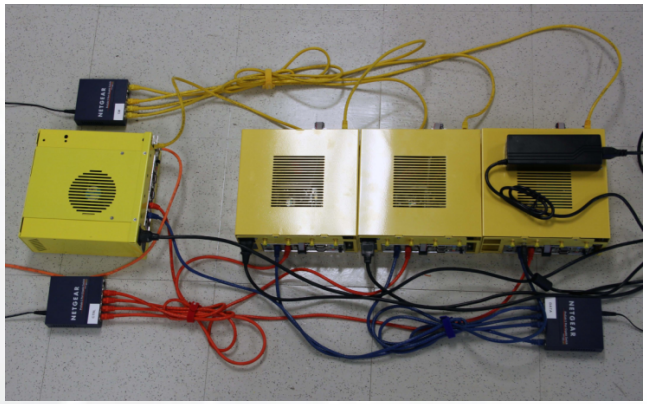
# GENI: Infrastructure for Experimentation




GENI provides compute resources that can be connected in experimenter specified Layer 2 topologies.

# GENI Compute Resources

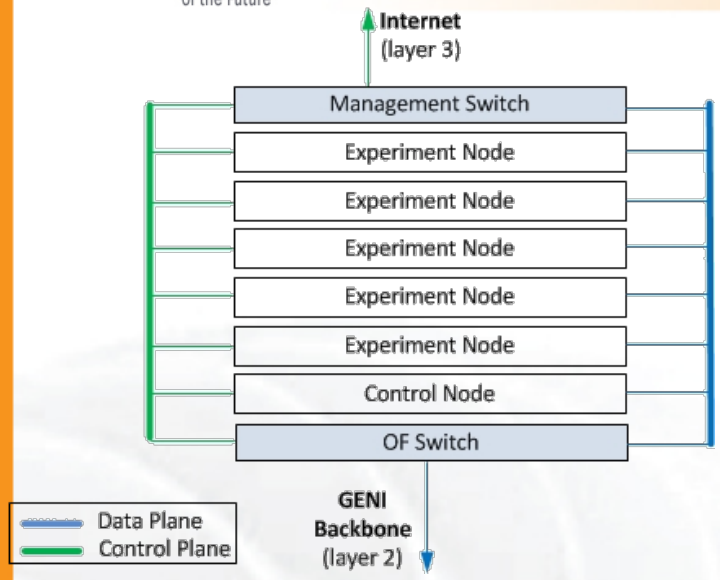
GENI Racks



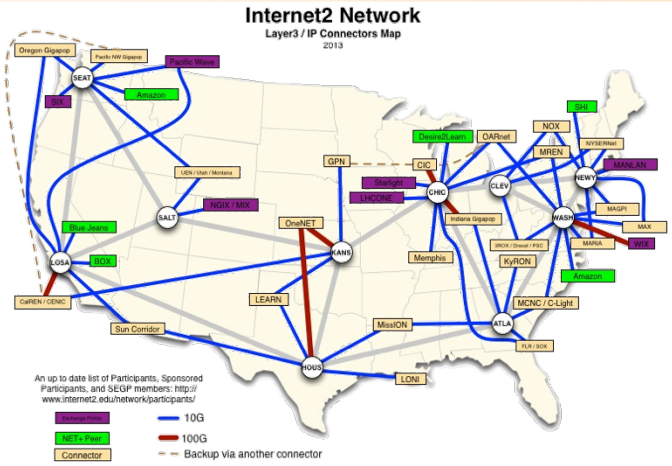
GENI Wireless compute nodes

Existing Testbeds (e.g. Emulab)

# Examples of GENI Networking Resources




Networking within a Rack




National Research Backbones
(e.g. Internet2)

WiMAX Base Stations


Regional Networks
(e.g. CENIC)

# Multiple GENI Experiments run Concurrently

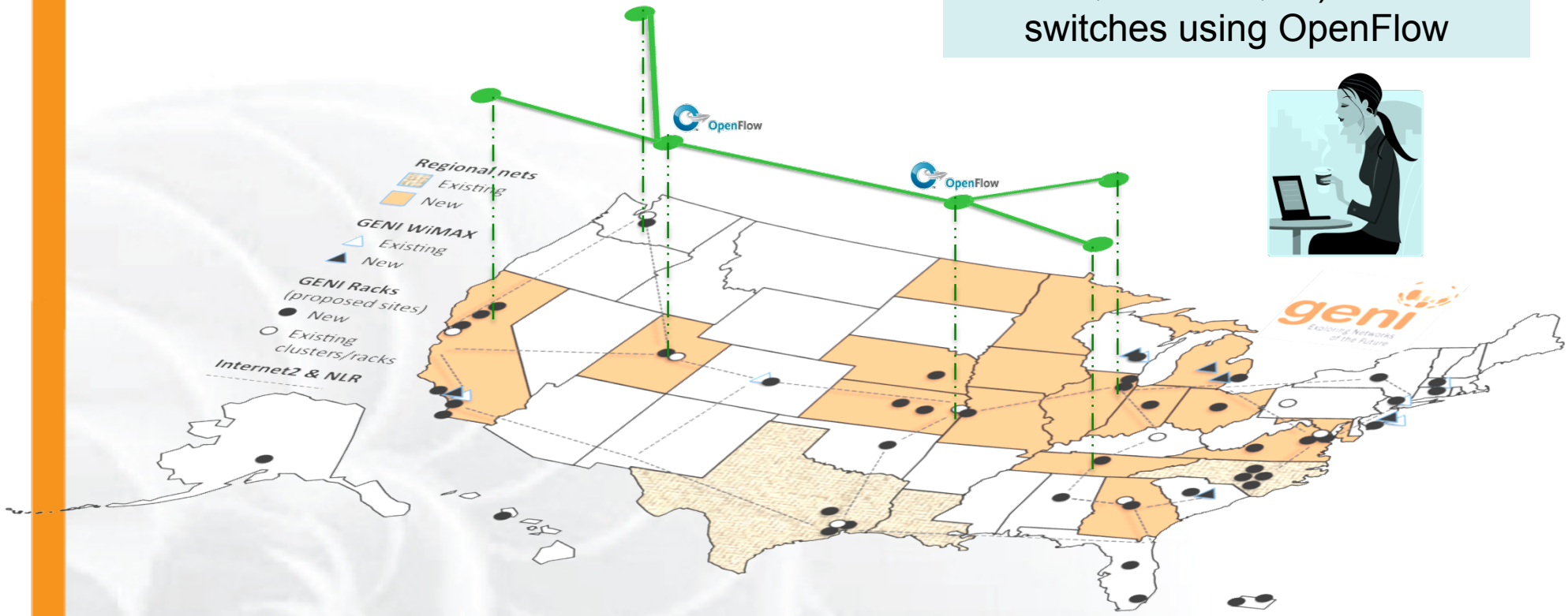
Experiments live in **isolated** "slices"




Resources can be **shared** between slices

# GENI is “Deeply Programmable”

I install software I want throughout my network slice (into routers, switches, …) or control switches using OpenFlow




OpenFlow part of the experiment not only the infrastructure

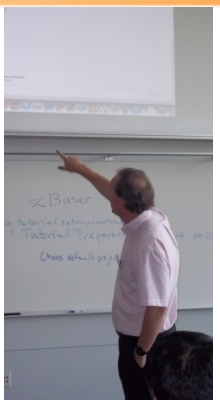
# Outline

- What is GENI?
- How is GENI being used?
- Key GENI Concepts

# How is GENI being Used?

## Research

- Future Internet architectures
- Software defined networking
- Large scale evaluation of smart grid protocols

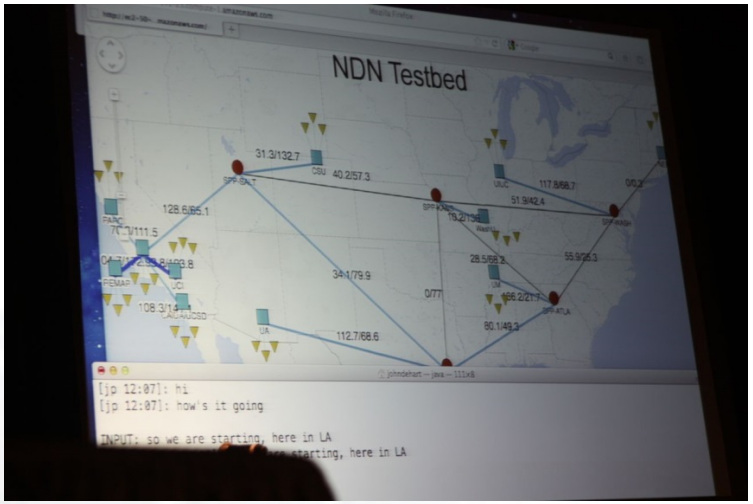


## Education

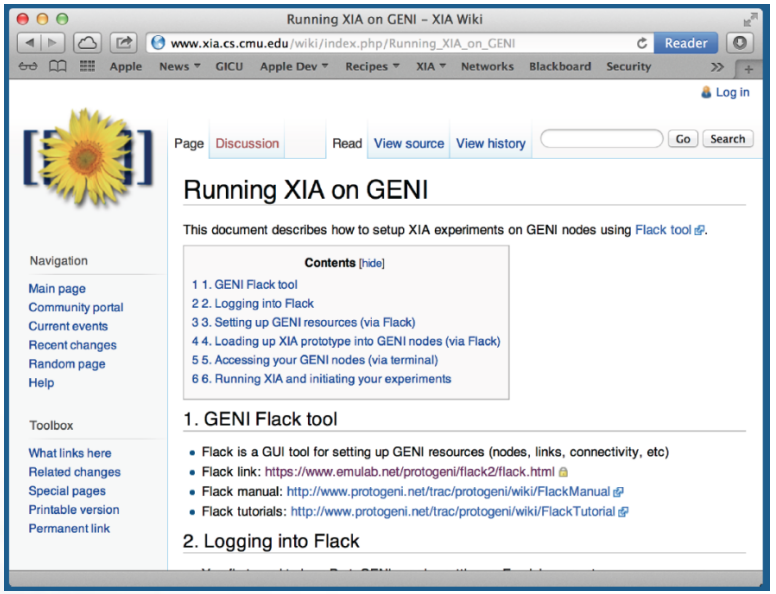
- Networking and Distributed systems classes
- Cloud computing classes
- WiMAX classes

**As of October 2013, GENI had over a 1200 users!**

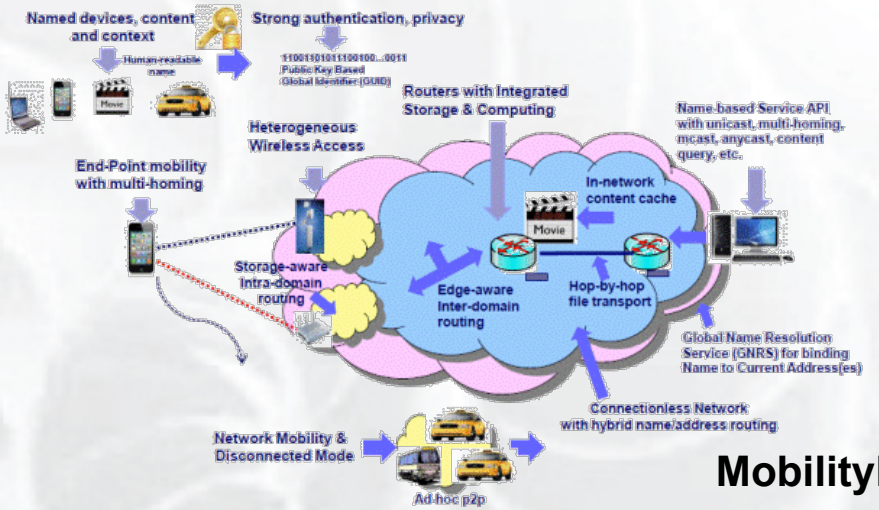
# Three FIA Teams have Slices on GENI




**NDN (demo at GEC 13)**



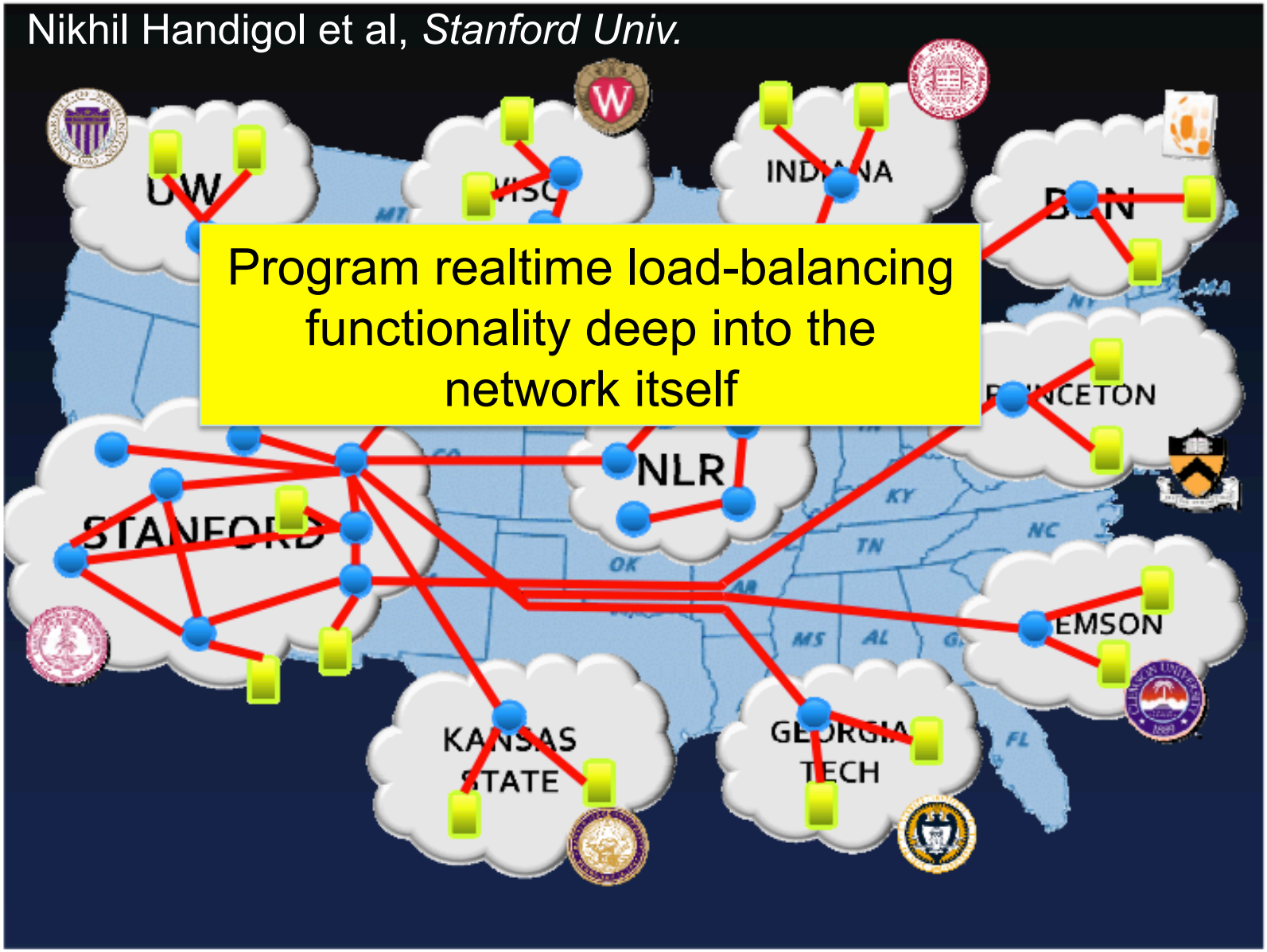

**XIA (demo at GEC15)**




**MobilityFirst (demo at GEC 12 & GEC18)**

**GENI is the only testbed that can support these teams.**

# Aster*x Load Balancing (OpenFlow)
## Stanford University



# Outline

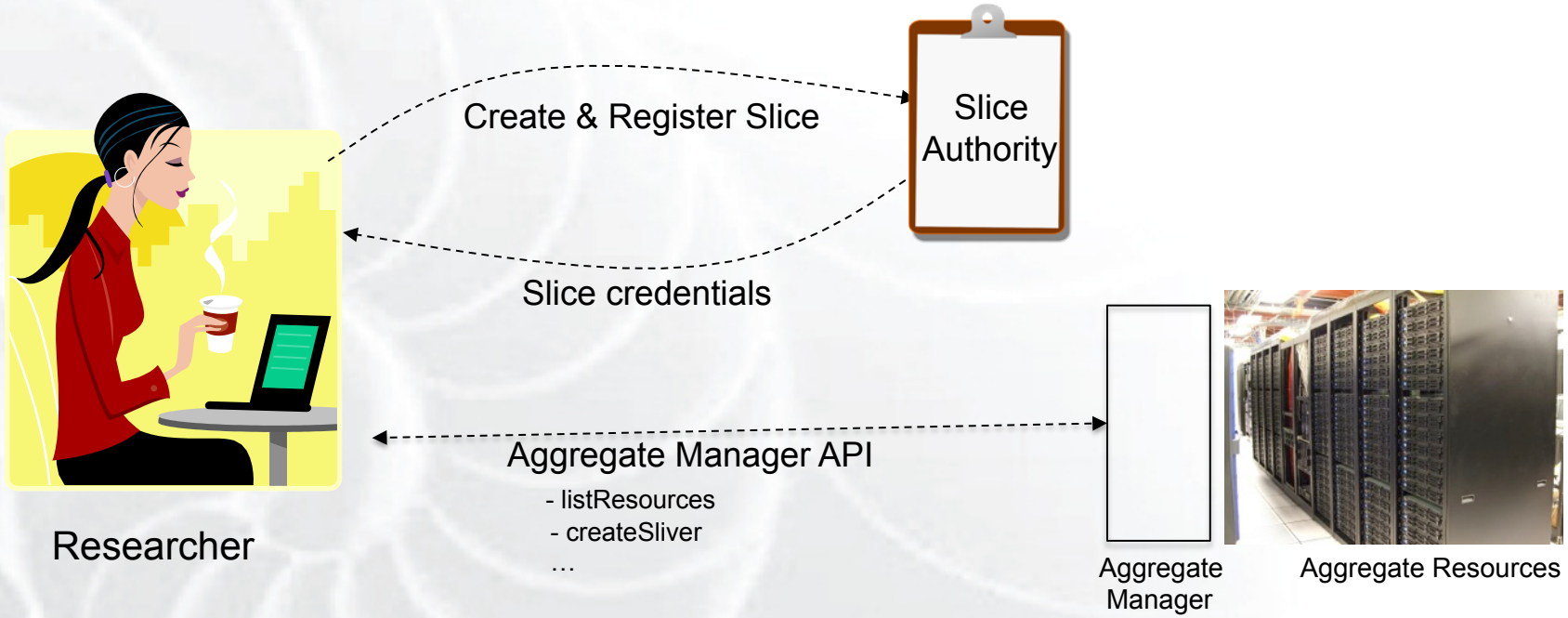
- What is GENI?
- How is GENI being used?
- Key GENI Concepts

# GENI: Terms and Definitions

- Slice: Abstraction for a collection of resources capable of running experiments
  - An experiment uses resources in a slice
  - Slices isolate experiments
  - Experimenters are responsible for their slices

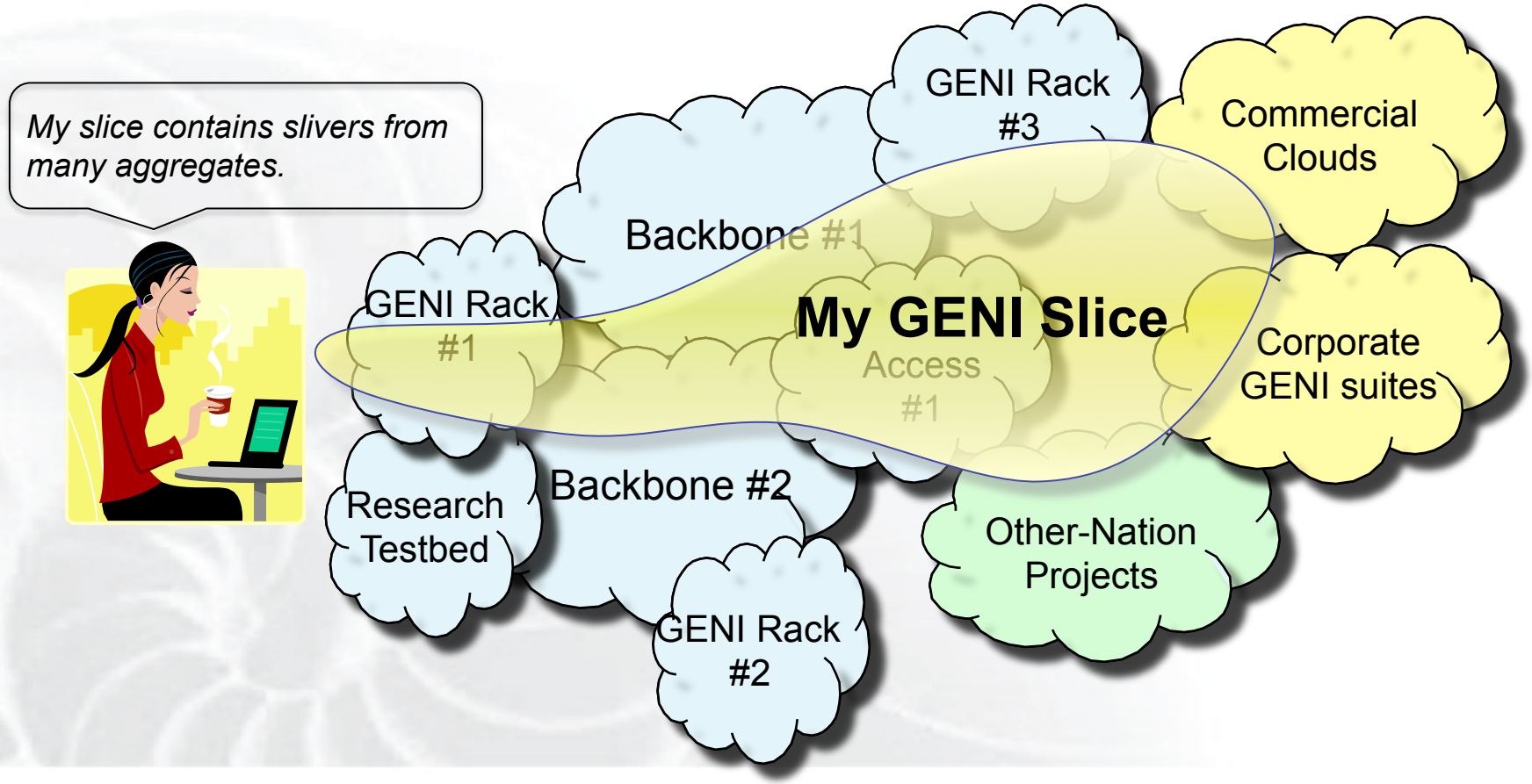
# GENI: Terms and Definitions

- Slice authority: Creates and registers slices
  - GENI slice authorities: GENI Portal, PlanetLab, ProtoGENI
- Aggregate: Provides resources to GENI experimenters
  - Typically owned and managed by an organization
  - Examples: GENI Racks, Internet2, Emulab, PlanetLab
  - Aggregates implement the GENI AM API



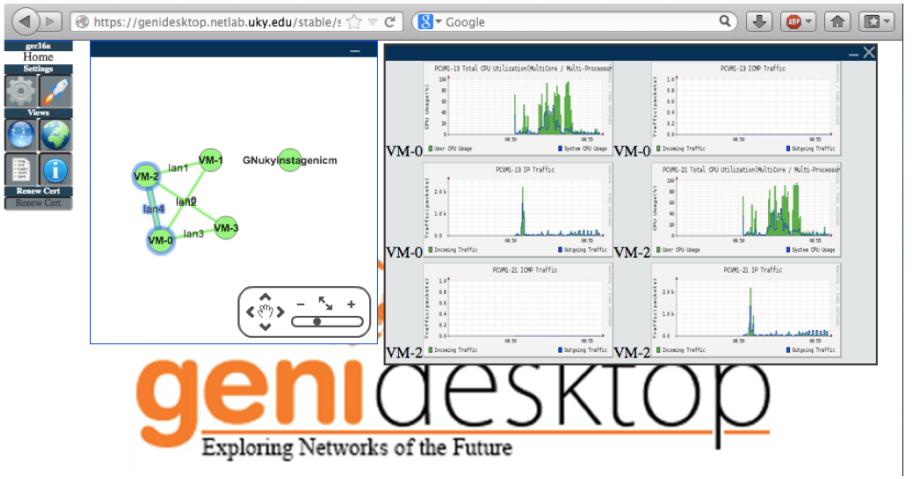
# GENI: Terms and Definitions

- A slice : One or more resources provided by an aggregate
  - E.g. Bare machines, virtual machines, VLANs

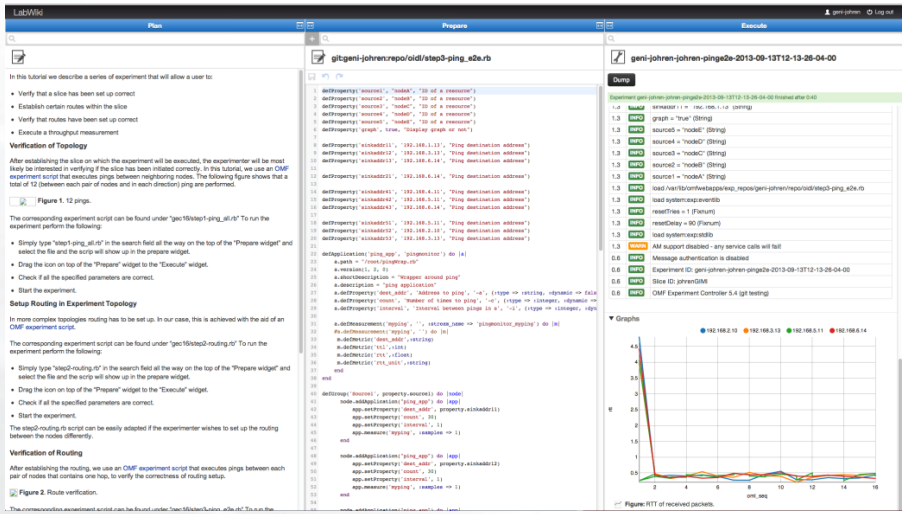


# GENI Tools: Instrumentation & Measurement

- Two major I&M systems being implemented
  - GEMINI (Indiana U. & U. of Kentucky)
  - GIMI (U. of Massachusetts, RENCI, NICTA)
- Support for active and passive measurements
- Repositories for archiving (and searching) for measurement data & meta-data




**The GENI Desktop and GEMINI**




**LabWiki and GIMI**

# QUESTIONS?