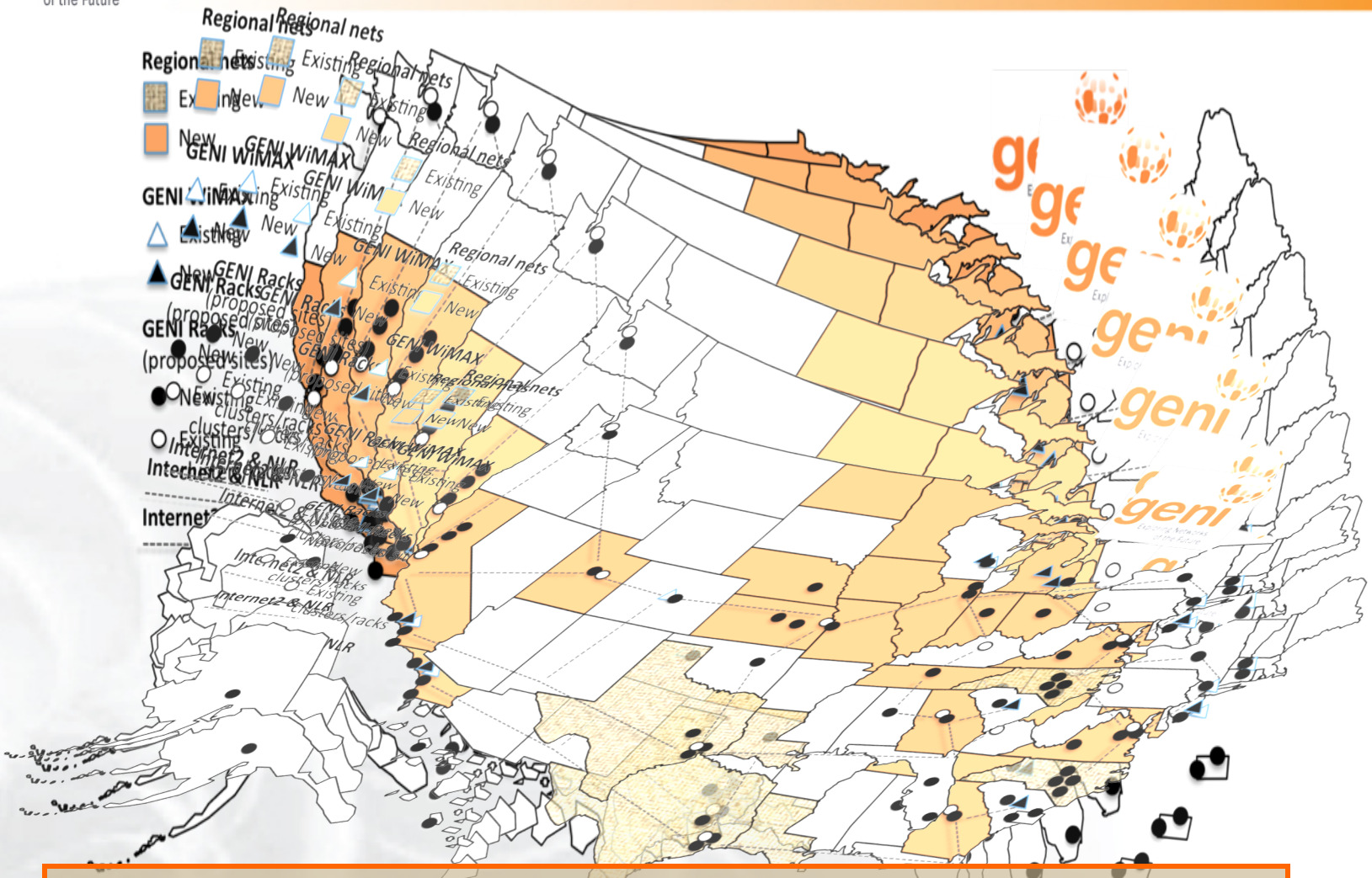
Are you ready?

Go to the GENI Portal at:

http://portal.geni.net

Your 1st GENI Experiment

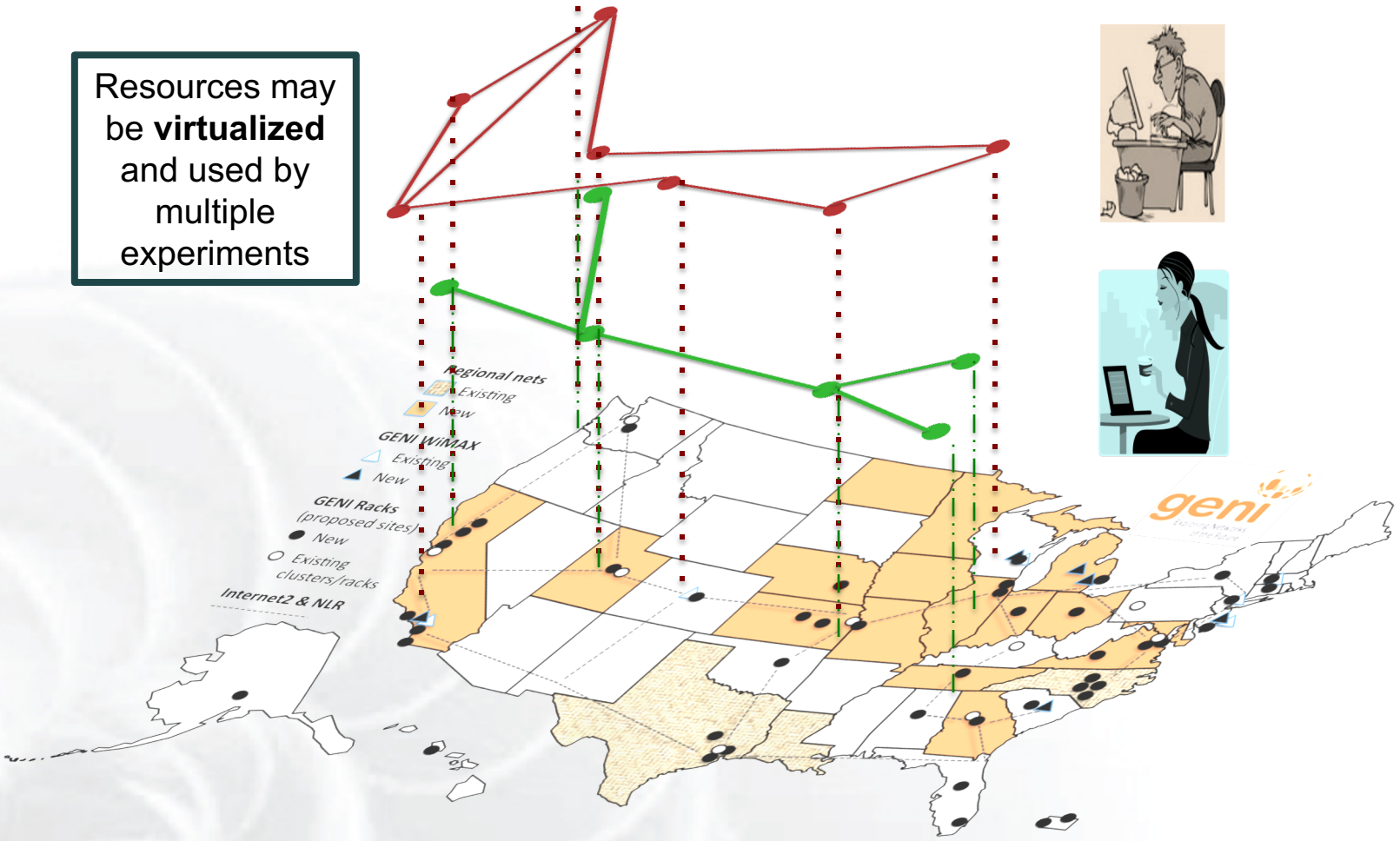
Infrastructure for Experimentation



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

Experiments run Concurrently

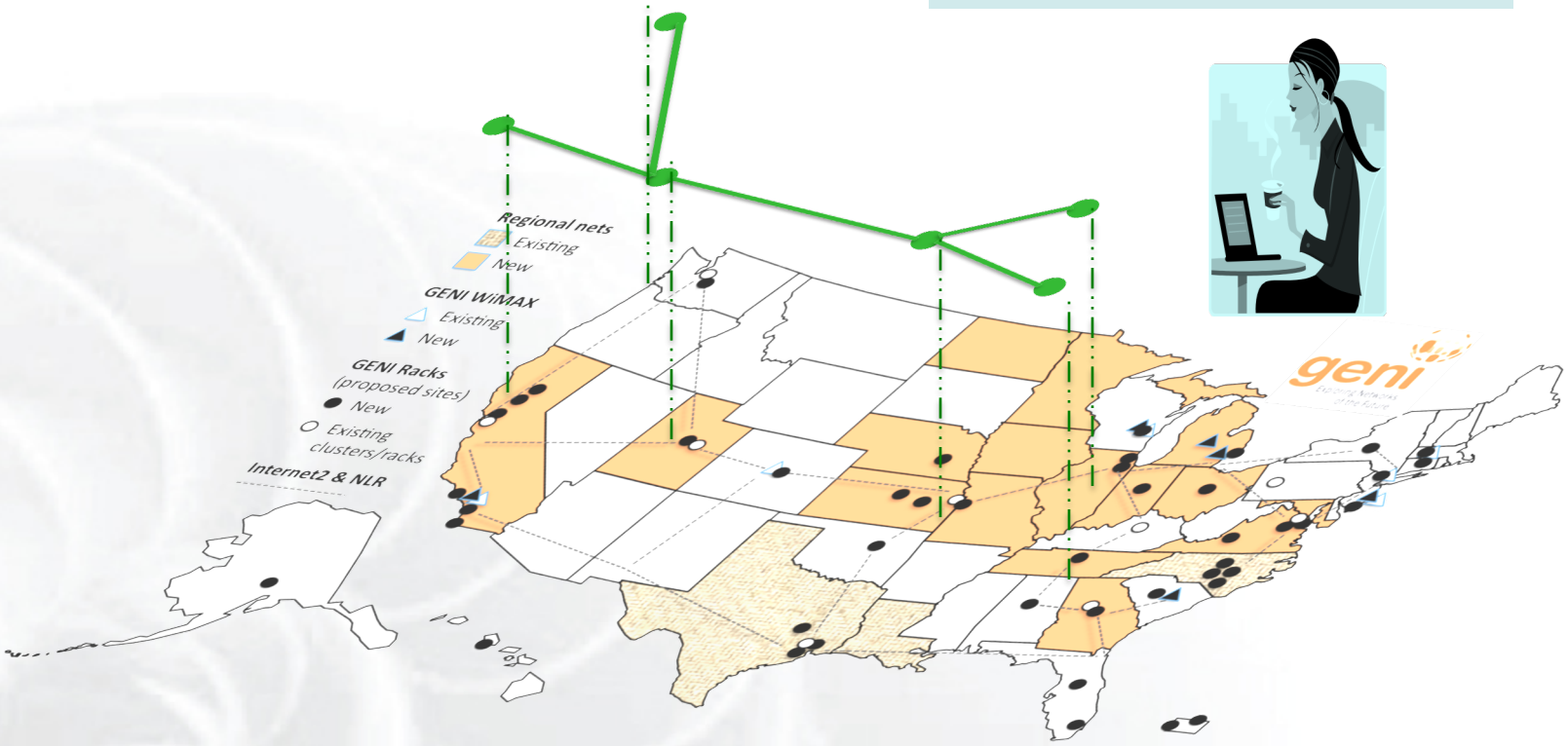
Resources may be **virtualized** and used by multiple experiments



Experiments live in **isolated** "slices"

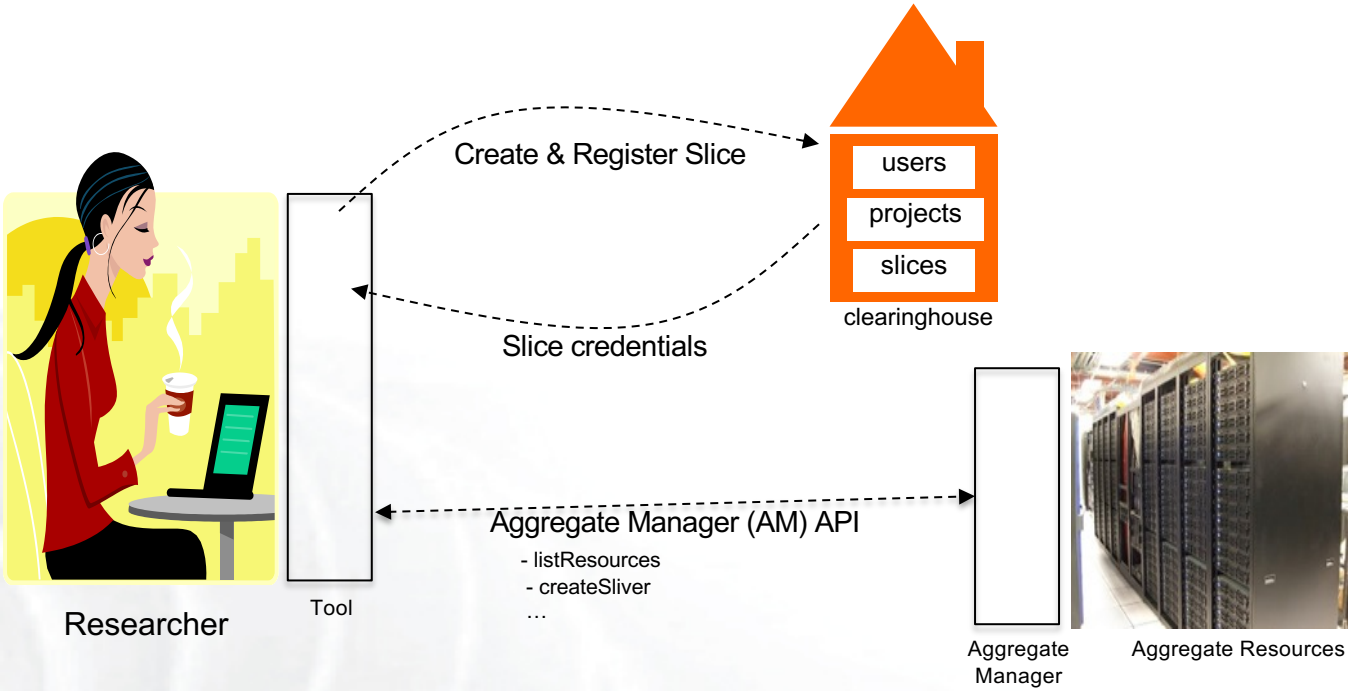
GENI is “Deeply Programmable”

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



Everything is programmable: Experimenters create and program custom topologies, protocols and flows

Clearinghouse and Aggregates



- Clearinghouse: Manages users, projects and slices
  - Standard credentials shared via custom API or new Common CH API
  - GENI supported accounts: GENI Portal/CH, PlanetLab CH, ProtoGENI CH
- Aggregate: Provides resources to GENI experimenters
  - Typically owned and managed by an organization
  - Speaks the GENI AM API
  - Examples: PlanetLab, Emulab, GENI Racks on various campuses

Resource Specifications (Rspecs)

- **RSpecs:** Lingua franca for describing and requesting resources
  - **"Machine language"** for negotiating resources between experiment and aggregate
  - Experimenter tools eliminate the need for most experimenters to write or read RSpec

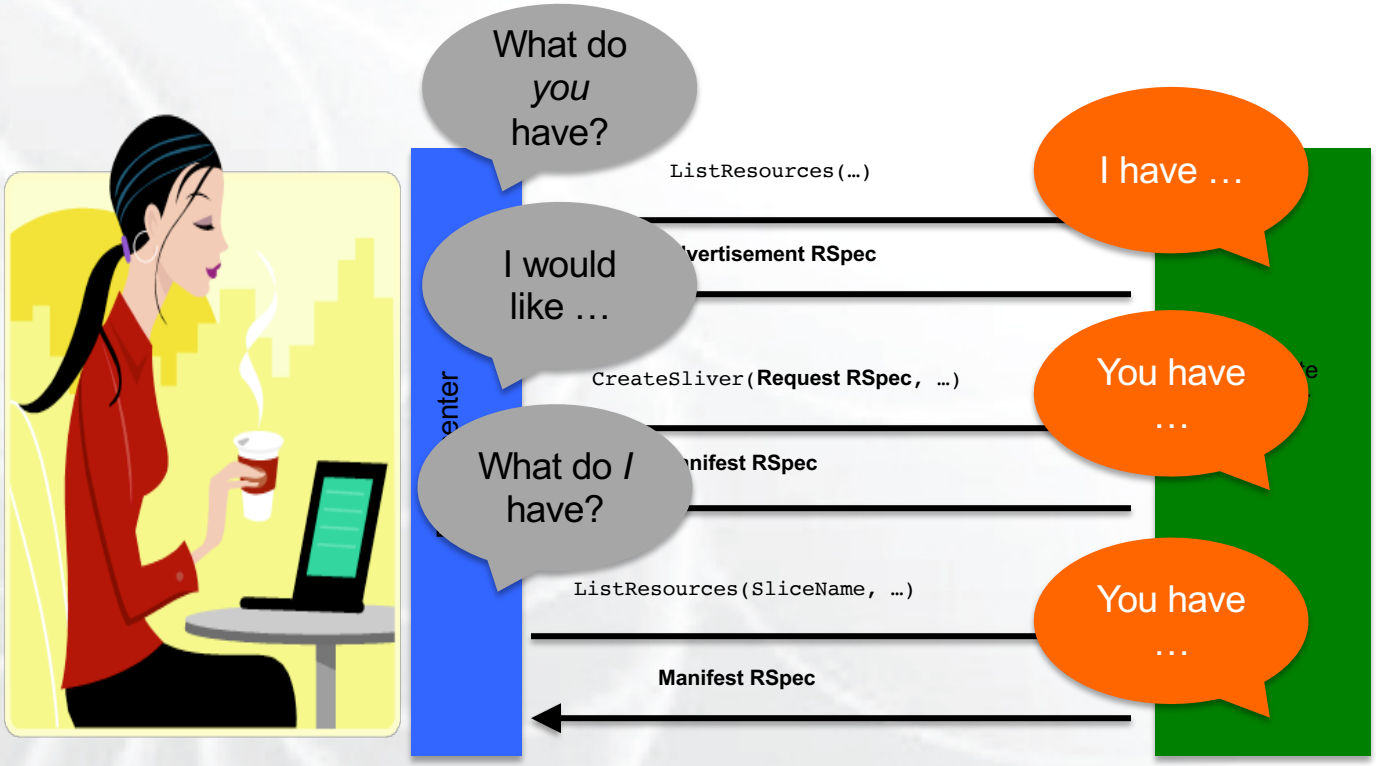
```
<?xml version="1.0" encoding="UTF-8"?>
<rspec xmlns="http://www.protogeni.net/resources/rspec/2"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="http://www.protogeni.net/resources/rspec/2
                           http://www.protogeni.net/resources/rspec/2/request.xsd"
       type="request" >
  <node client_id="my-node"
        exclusive="true">
    <sliver_type name="raw-pc" />
  </node>
</rspec>
```

RSpec for requesting a single node

Reserving Resources using RSpecs and the AM API

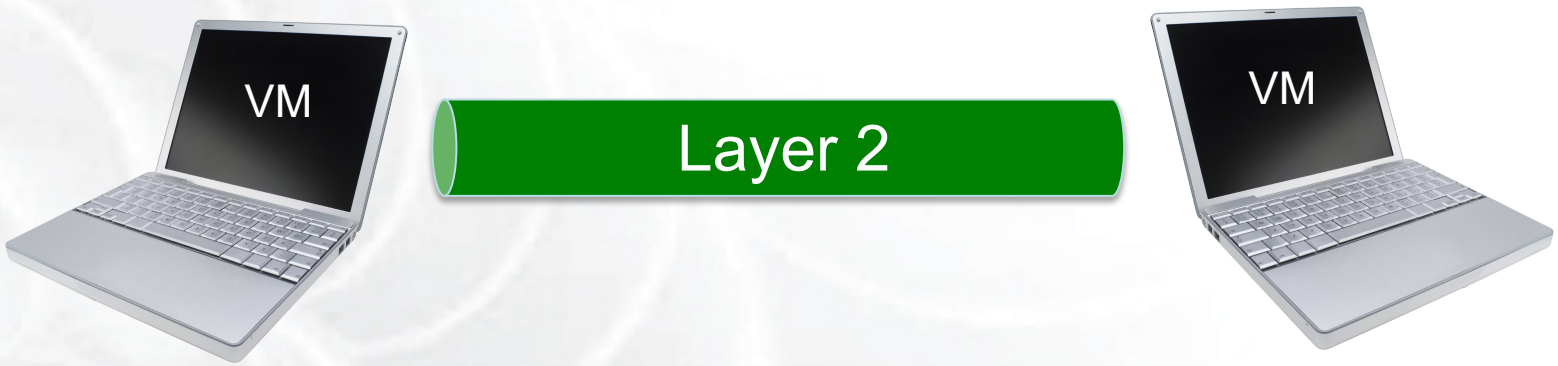
Experimenter **tools** and **aggregates talk** to each other **using** resource specifications (**RSpecs**) and the GENI Aggregate Manager API (**GENI AM API**)

- **Advertisement RSpec:** What does an aggregate have?
- **Request RSpec:** What does the experimenter want?
- **Manifest RSpec:** What does the experimenter have?



Experiment #1 in GENI

Reserve two VMs connected at Layer 2



Use the GENI Portal and Jacks

geni
Exploring Networks of the Future

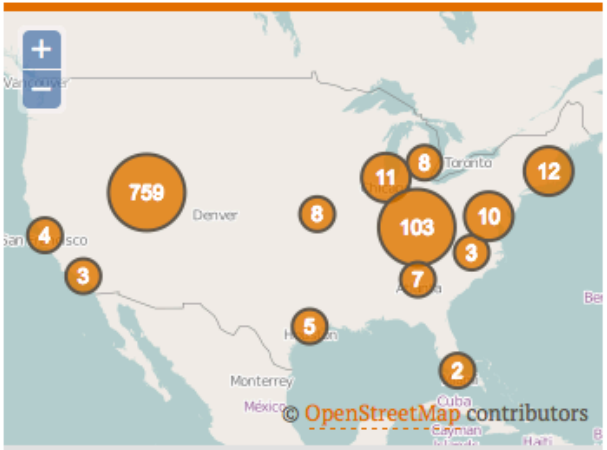
WELCOME TO GENI

GENI is a new, nationwide suite of infrastructure supporting "at scale" research in networking, distributed systems, security, and novel applications. It is supported by the National Science Foundation, and available without charge for research and classroom use.

Use GENI

Find out more about using GENI

- Information for GENI experimenters
- Published research that used GENI resources
- Get help using GENI



These are some of the many resources being used in GENI experiments across the country.

http://portal.geni.net

The GENI Portal is…

A web-based tool for experimenters to manage **experimenters**, **projects**, and **slices**.

Includes simple tools to reserve **resources**.

Among other things!

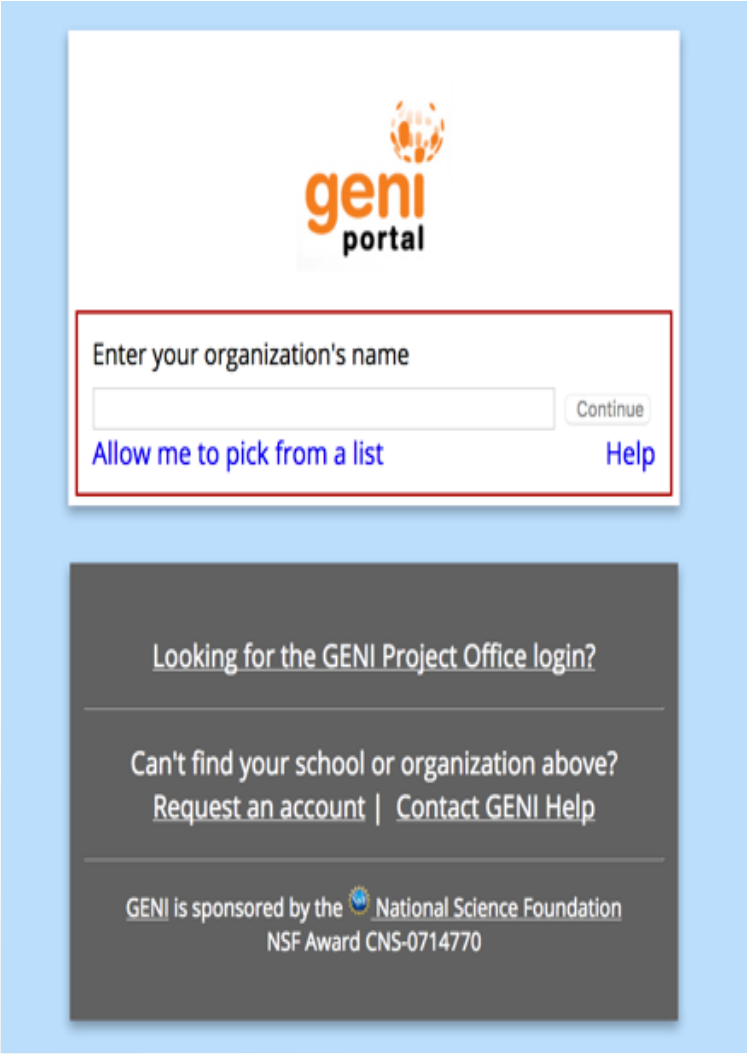
Establish Management Environment

- Establish the environment
  - Pre-work: Create a GENI account
  - Pre-work: Ask to join a project

    Project Name: CS-655-Fall2020
- Generate and download ssh keypair
  - **Click on SSH Keys drop-down menu under “Your Name”**

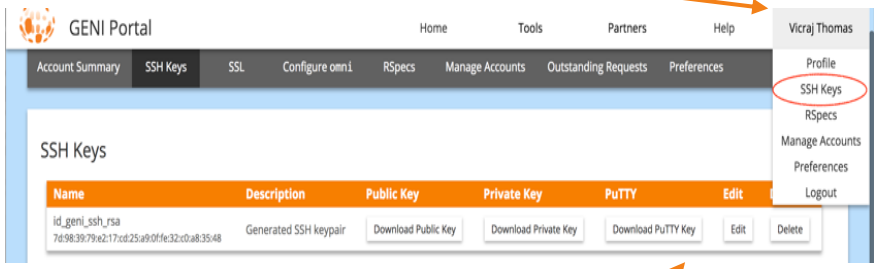
Ready?

- Login to the GENI Portal
  - Log in using your BU's username/password
- Join the GENI project for the course
  - Click Home➔Projects➔Join a Project
  - The project is CS-655-Fall2020



Set?

- Create your ssh keys
  - Look for SSH Keys under your name



- Download your ssh private key
  - Mac/Linux:
    - Move key to .ssh folder

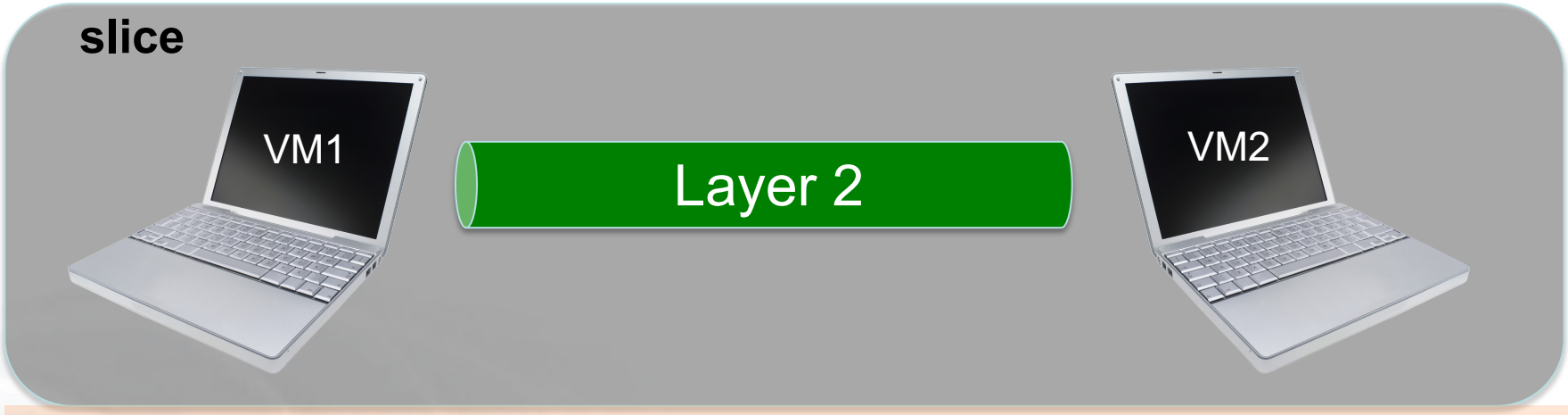
```
mv ~/Downloads/id_geni_ssh_rsa ~/.ssh/.
```

    - Change permission so only you can read it and add to keychain

```
chmod 600 ~/.ssh/id_geni_ssh_rsa
ssh-add ~/.ssh/id_geni_ssh_rsa
```

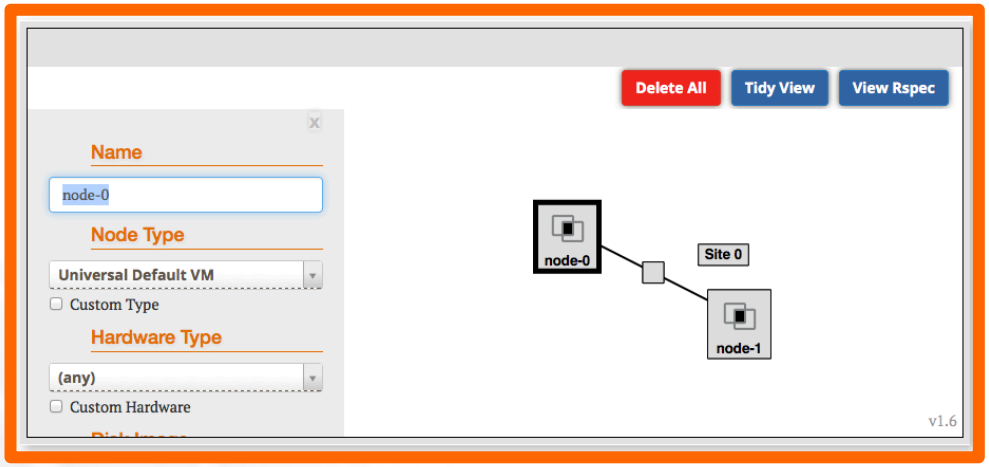
  - Windows:
    - PuTTY download: `http:www.putty.org`
    - Download your PuTTY key

Obtain Resources



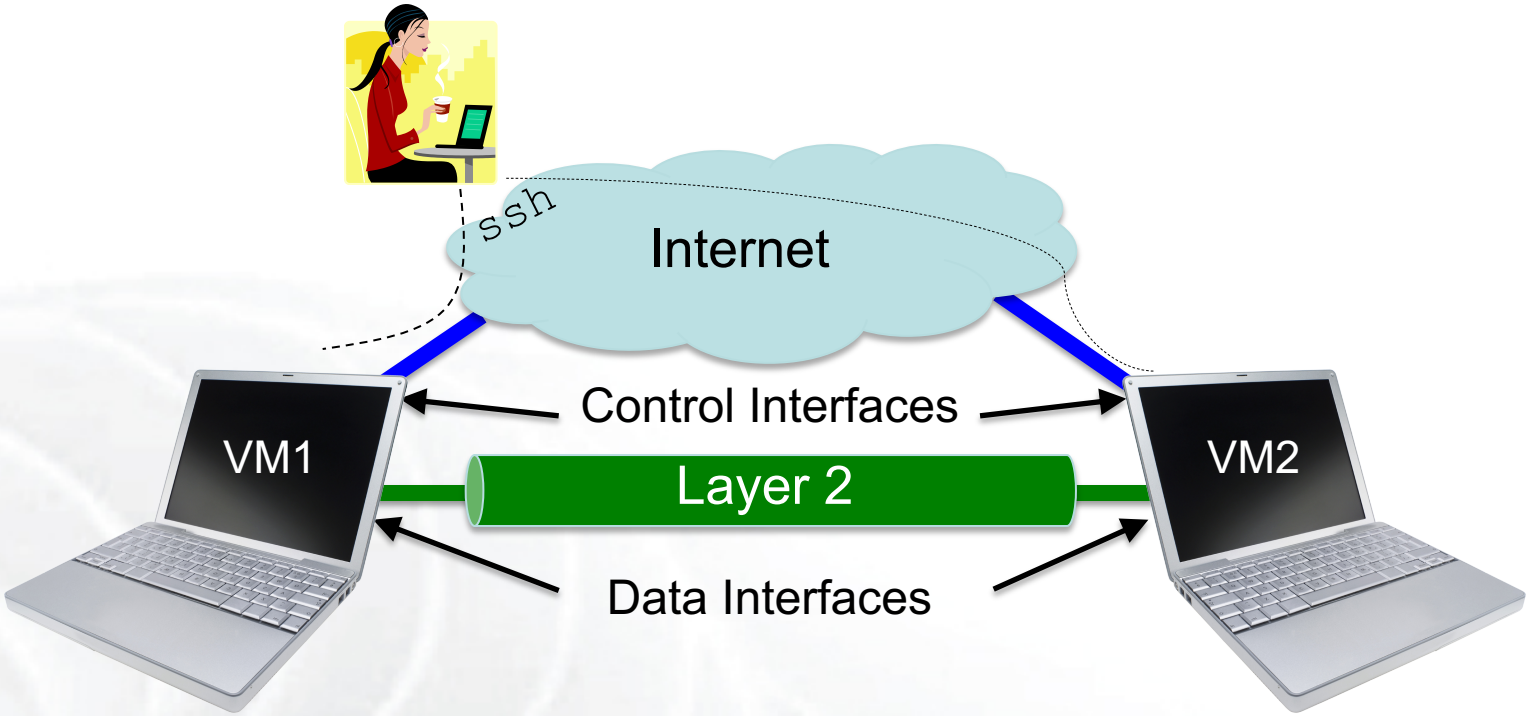
- Create a slice
  - call it “exp1-xy” where “xy” are your initials
- Reserve two VMs at one aggregate using Jacks
  - choose a lightly-loaded instaGENI rack: check status at https://genimon.uky.edu/status
- Check whether VMs are ready to be used

Jacks is…



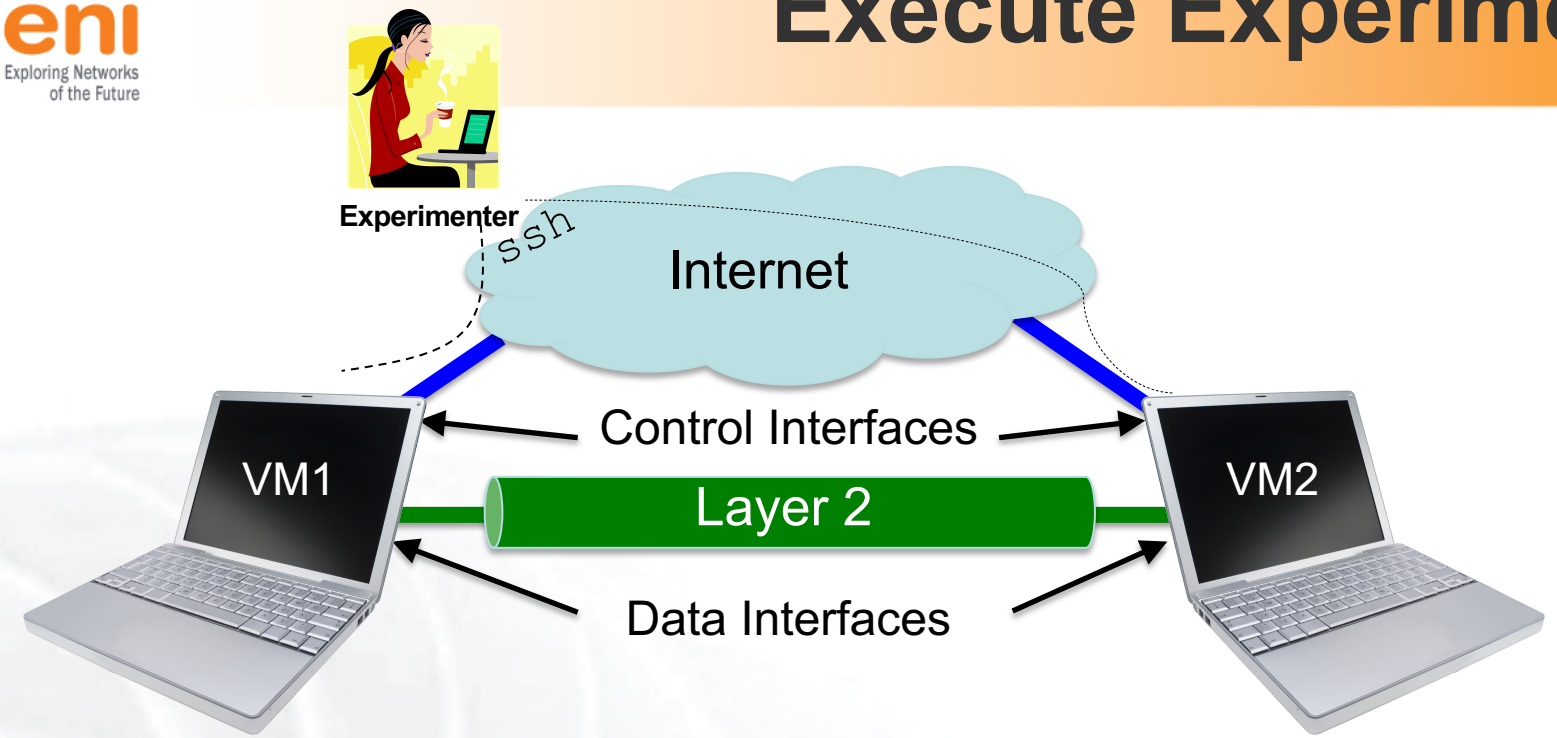
- A graphical user interface (GUI) for:
  - **Designing topologies** in GENI
  - **Reserving resources** in GENI
- In your slice, launch Jacks
  - Use drag and drop to create the two-node topology
  - Select an aggregate to instantiate the resources
  - Click on the blue reserve button

Execute Experiment



- Configure and initialize
  - Wait for the VMs to boot
  - `ssh` into the VM1 and VM2 nodes

Execute Experiment



- Execute experiment
  - Test connectivity: `ping` interfaces
  - Logout of your nodes
- Teardown experiment
  - Delete your resources

Teardown Experiment

project
resource
experimenter
aggregate
slice

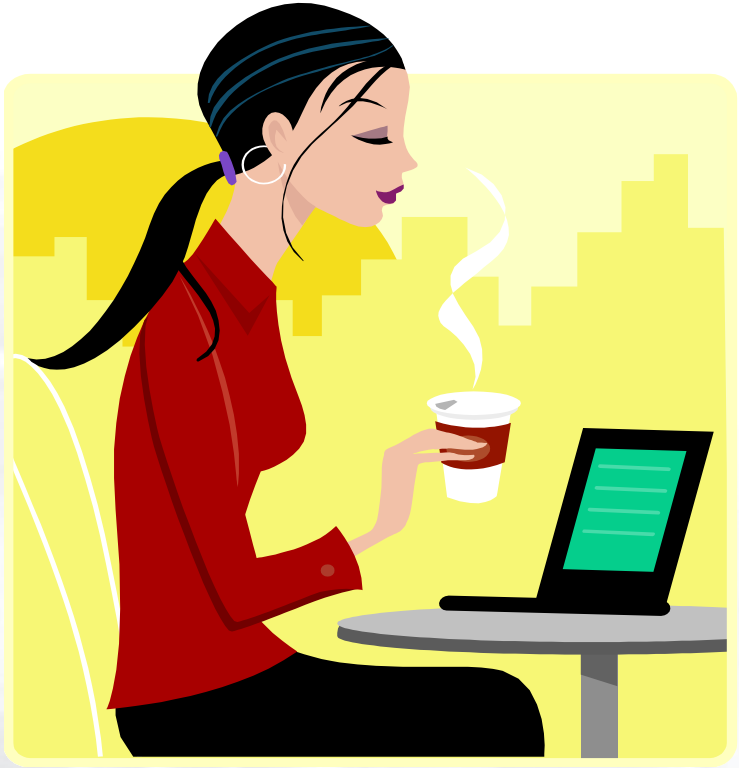
When your experiment is done, you should always release your resources

- Normally this is when you would archive your data and the experiment
- Delete your resources at **each** aggregate

Congratulations!

You have…

- Run your first GENI experiment!
- Exercised your knowledge of GENI terminology
- Used the GENI Portal and Jacks



Welcome to GENI!

What to submit?

- Instructions of this lab are at http://tinyurl.com/geni-labzero
- *Show your work by filling out the lab worksheet posted on Piazza*
- *In addition to the worksheet, also answer the lab questions under Part II (Execute):*
  - 5.2 d) What is the bandwidth (throughput) of this link? Why?
  - 5.2 e) What is the bandwidth (throughput) of this link? Why?
- Submit a PDF file on Gradescope