

# Running a class in GENI

GENI Project Office



# GENI Accounts and Projects

Exercises on GENI

Tips

Wrap Up

# Access to GENI

Leverage InCommon for  
single sign-on authentication

InCommon®

Experimenters from 304  
educational and research  
institutions have  
InCommon accounts

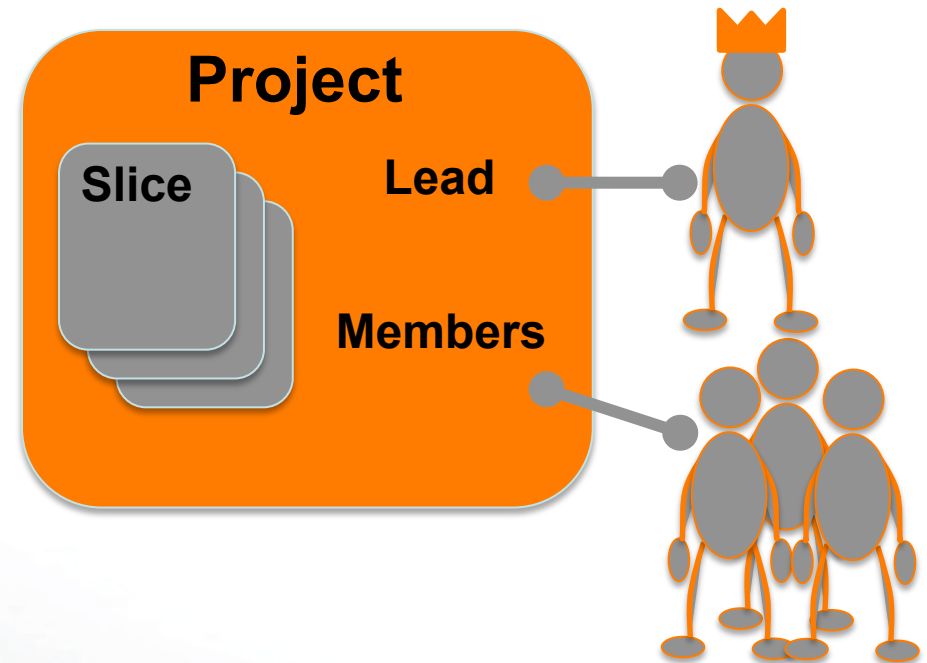
For many experimenters:

- no new passwords
- familiar login screens



**GENI Project Office** runs a federated IdP to  
provide accounts for non-federated organizations.

## Projects organize research in GENI

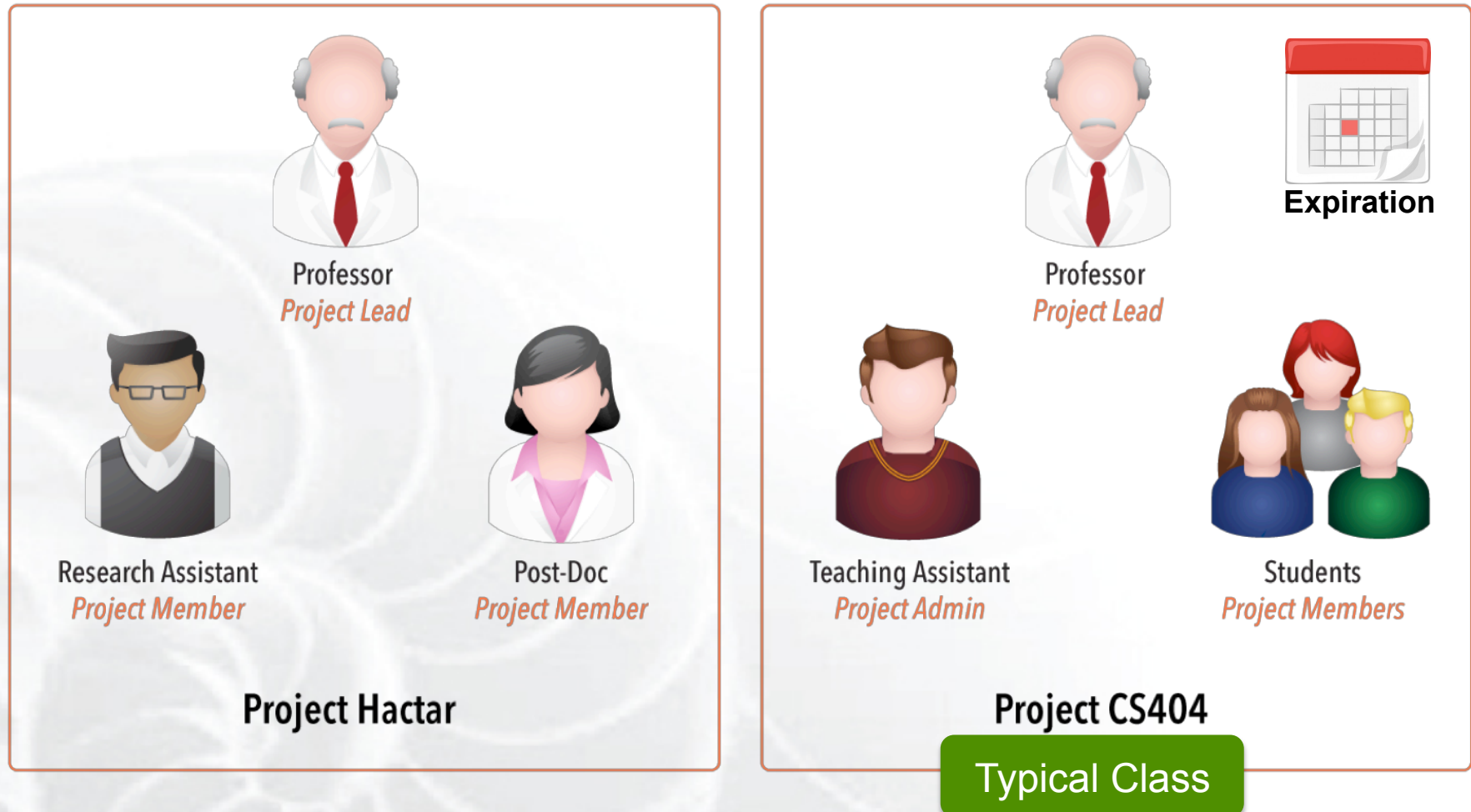


Projects contain both **people** and their **experiments**

A project is led by a single responsible individual:  
the **project lead**

# Project Membership example

Projects have 1 **Lead** and any number of **Admins**, **Members**, and **Auditors**



<http://groups.geni.net/geni/wiki/GENIConcepts#Project>

## 1. Member-initiated

Each experimenter asks to join a project, approval needed

- Typical for Research projects

Project	Purpose	Project Lead	Join
ADAMANT	Use GENI to demonstrate use in data-driven computational workflows	Ilya Baldin	<input type="button" value="Join"/>
ASU-GREE-Summer-Camp-2013		Violet Syrotiuk	<input type="button" value="Join"/>

## 2. Admin-initiated

Project Lead/Admin bulk-adds experimenters

- Typical for Classrooms or Tutorials

### Upload Project Members

#### Action Legend

**Add as ...** Candidates who already use the portal will be added to your project with the specified role immediately.

**Invite as ...** Others will receive an invitation email with instructions on joining your project.

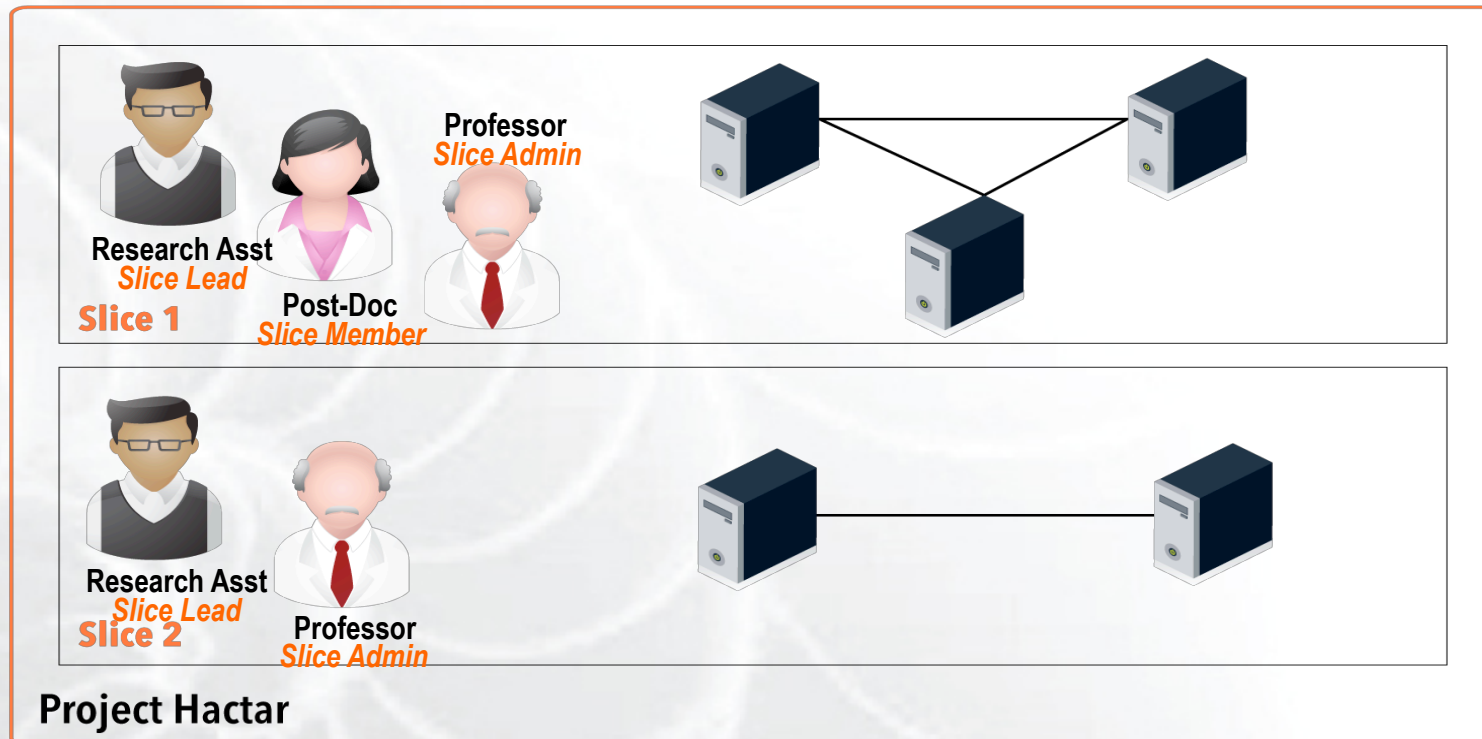
Candidate Name	Candidate Email	Action
Niky Riga	nriga@bbn.com	Already Member
Sarah Edwards	sedwards@bbn.com	<input type="button" value="Add as Member"/>
Vic Thomas	vthomas@geni.net	<input type="button" value="Invite as Member"/>



# Slice Membership example

Slices have:

- 1 **Lead** (person who **created** the slice)
- any number of **Admins**, **Members**, and **Auditors**
- **Project Lead/Admins** added as slice Admins



<http://groups.geni.net/geni/wiki/GENIConcepts#Slice>



# Project and Slice Roles

		Create project	Modify project & manage membership	Create slice	View project
Project	Lead	✓	✓	✓	✓
	Admin		✓	✓	✓
	Member			✓	✓
	Auditor				✓
		Manage slice membership	Act on slice	View slice	Account/ keys loaded on slice
Slice	Lead	✓	✓	✓	✓
	Admin	✓	✓	✓	✓
	Member		✓	✓	✓
	Auditor			✓	✓

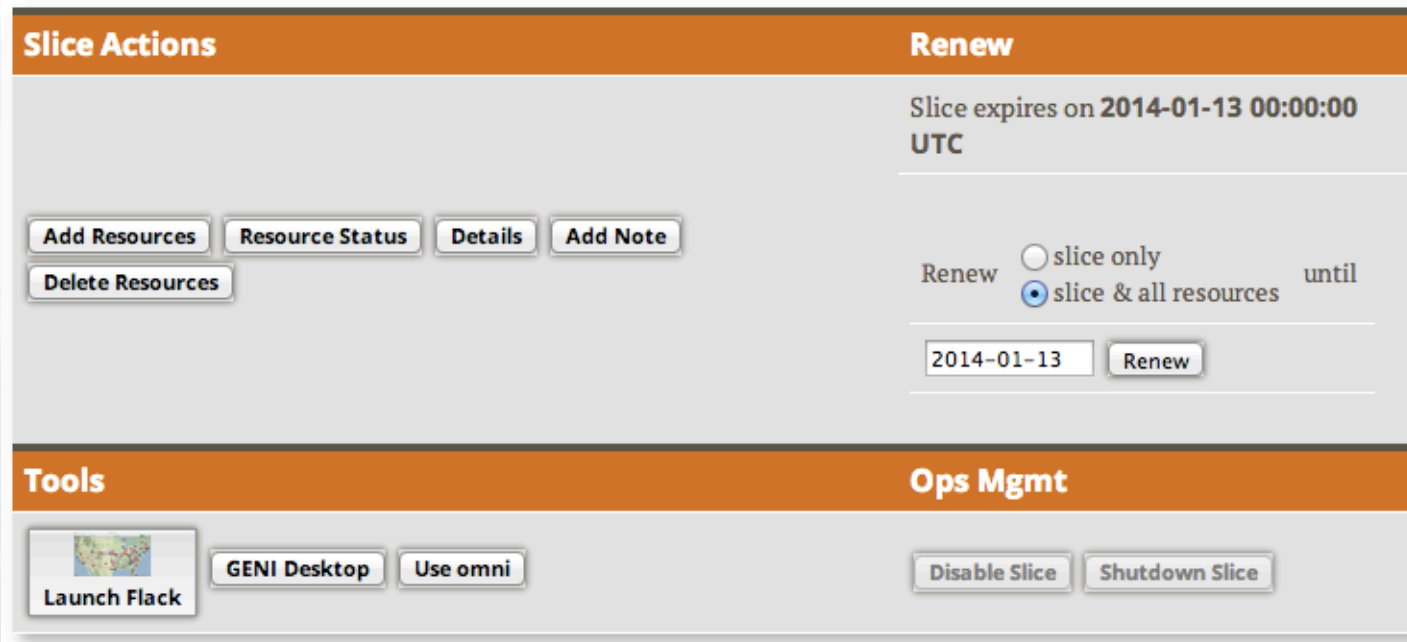
<http://groups.geni.net/geni/wiki/ProjectSlicesRoles>



Being a member of a slice means you can act on a slice:

- Add resources
- Check status
- Delete resources
- Renew resources

**With any tool!**



The screenshot displays a web interface for managing network slices. It is divided into four main sections:

- Slice Actions:** Contains buttons for "Add Resources", "Resource Status", "Details", "Add Note", and "Delete Resources".
- Renew:** Shows the expiration date "2014-01-13 00:00:00 UTC". It includes radio buttons for "slice only" and "slice & all resources" (which is selected), followed by a date input field showing "2014-01-13" and a "Renew" button.
- Tools:** Features a "Launch Flack" button with a map icon, and buttons for "GENI Desktop" and "Use omni".
- Ops Mgmt:** Contains buttons for "Disable Slice" and "Shutdown Slice".

# Slice Access: Logging in to resources



**Slice membership does not guarantee ability to login to resources!**

To ensure access in student's resources:

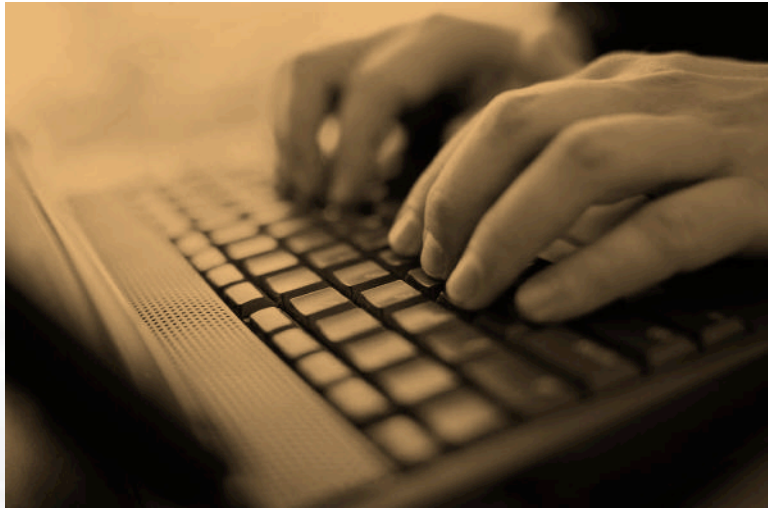
**Option 1: Make resource reservation from Portal**

- fix the membership of the slice
- Use the add resource button in the portal

**Option 2: Ensure common public key is loaded**

- distribute common public key to students
- ask students to upload it in their profile
- use corresponding private key to login

**Ability to login can help in debugging!**



- Test Slice access
- Test access to compute resources using both methods

# GENI Accounts and Projects

## Exercises on GENI

**Tips**

**Wrap Up**

## Available Exercises

- **List of sample assignments and tutorials:**

- Use as they are
- Modify to meet your needs



- **Annotated:**

- Type
- Purpose
- Resources needed
- Difficulty/Duration

# Available Exercises



- **Each sample exercise has:**
  - Handouts / Instructions for students
  - Further information about the instructors
  - For solutions email [help@geni.net](mailto:help@geni.net)
- **Instruction format:**
  - 3 Steps based on standard experiment lifecycle

## Tutorials:



- **Lab Zero**

Basic GENI understanding, ensures students setup their environment

- **Intro To OpenFlow**

Basic OpenFlow introductory tutorial, students learn how to setup OVS and write simple controllers

## Assignments:

- **IPv4 Routing**

Students understand IPv4 forwarding and how to configure static routes

- **TCP Network Awareness**

Students explore different TCP flavors and TCP parameters





# Migrate an Assignment to GENI



## 1. Figure out GENI Resources/Tools

- Wireless/Wired
- Flack, Omni, Portal, I&M?

## 2. Test your exercise

## 3. Adjust writeup for GENI

- Remember to include Clean Up!

# Test the Assignment in GENI

- **Run through the exercise**
- **Automate:**
  - Install scripts (HowTo/WriteInstallScripts)
  - Custom Image



**Create RSpec that instantiate the topology**  
– install scripts, images are included

## 1. Students make the reservation:

- RSpec (URL, File, Upload it in Portal)
  - Or the topology if they are just drawing it in Flack (e.g. Lab 0)
- AMs, Tool

## 2. \*Admin (Prof., TA) makes all the reservations:

- Create a Slice per student/group
- Make the student(s) member of the slice
- Ensure they have keys (email us if needed)
- Reserve resources **from the Portal**

\* **Lab Exercises:** Resource reservation might take time

**Assignments:** Resource reservation is complicated/unique or out of scope

# GENI Accounts and Projects

## Exercises on GENI

### Tips

## Wrap Up

# Tip #1: Start Early

**2 weeks  
before  
(or sooner)**

## **Class Prep:**

- ☐ GENI Access
- ☐ Project for the Class
- ☐ Test Exercises
- ☐ Notify GMOC
- ☐ Figure Student setup
- ☐ Email [help@geni.net](mailto:help@geni.net)

**1 week  
before**

## **Email Prework:**

- ☐ GENI account
- ☐ Computer setup\*
- ☐ Other?

**First Exercise  
in GENI**

- ☐ Bulk-add students to project

\* Include steps for testing the setup

## Tip #2: Load Balance the students

- Split students/groups between equivalent resources (e.g. racks) to avoid resource contention
- If using scarce resources consider a rolling deadline



### **GMOC: GENI Meta-operation Center**

- Keeps track of outages
- Notification system for resource reservation



### **GMOC Google Calendar keeps track of reservations/outages**

<http://groups.geni.net/geni/wiki/HowTo/PreReserveGENIResources>



## Tip #4: Setup for the Students

- **Use their personal laptop**
  - **LabZero** is a good way to get setup
  - There are Mac/Windows Binaries for Omni
- **Use Lab computers**
  - Go through the exercises in lab computers
  - stress-test the resources or split students
- **Use a VM with all the software loaded**
  - <http://groups.geni.net/geni/wiki/HowTo/CreateTutorialVM>

**Make sure they test it early in the class!**

## Tip #5: Accessing GENI Resources: SSH

Login to all GENI compute resources using  
*ssh keys – no password*



If you are ever **prompted** for a **password** during login to **GENI nodes** something is **wrong**

Using key-pair to SSH:



**Public key:** is public to everyone, loaded to nodes

**Private key:** kept private in your computer, provided to SSH to verify it matches the loaded public key



## Tip #5: SSH Challenges

- Students might not be familiar with CLI
- Students might not be familiar with public key cryptography
  - Hard to distinguish between private and public
  - Hard to distinguish between password and passphrase

**Consider a brief SSH tutorial/intro**

*<http://groups.geni.net/geni/wiki/HowTo/LoginToNodes>*

## Tip #5: SSH from Windows

### SSH with keys from **Windows** is **non-trivial**

- No built-in ssh client

### Possible Solutions



- BitVise
- FireSSH – javascript plugin for Firefox
- SecureCRT (not free)
- cygwin
- *Linux VM – make use of a slim OS*
- PuTTY (private key format different)

**Need to address this early!**

<http://groups.geni.net/geni/wiki/HowTo/LoginToNodes>

## Tip #6: Effective debugging

- Ask students to be specific about what is not working
  - Step-by-step run through usually helps
- Ask for what they see:
  - screenshots
  - omni output errors
- Gather as much information as you can
  - get slice name
  - tool they used
  - rspec
- Remember you have access to their slices, check for yourself!
- Register for resource mailing lists
  - Better that you contact resource owners and not the students

## Tip #6: Debugging Example

### Problem: Can't login to a node

#### Possible causes:

- **Slice/sliver expired**
- Wrong username
- Public key isn't loaded, Private key is wrong or non-existing
- Private key has wrong permissions (it should have 0600)
- Technical issue with node

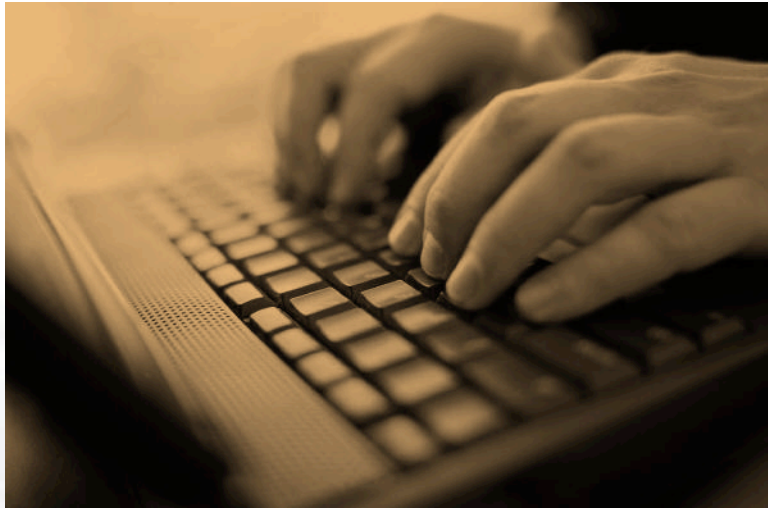
#### Debug strategy:

1. Check the status of the sliver
2. Try logging in to the node yourself
  - Look for loaded keys

```
sudo cat <student_user_path>/.ssh/authorized_keys
```

3. Ask them to use `'-v'` option

```
ssh -v foo@bar.example.net
```



- Renew slices/slivers
- Use of different tools
  - Flack, Portal, (Omni)



# GENI Accounts and Projects

## Exercises on GENI

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## Wrap up

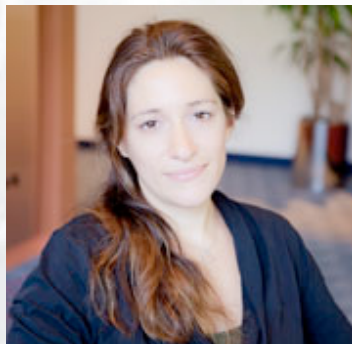
# Have a question? Answer is

**help@geni.net**

which is an email list which only goes to members of the GPO including...



Sarah Edwards



Niky Riga



Vic Thomas

(However, the archive of the list is public)

# Ways to Get Help

- Sign Up for :

[geni-users@googlegroups.com](mailto:geni-users@googlegroups.com)



- Use #geni IRC chatroom
- Go over HowTo pages

*<http://groups.geni.net/geni/wiki/GENIExperimenter/GetHelp>*

# Finding other resources

- GENI wiki
  - Pages for **Instructors** and **Experimenters**

*<http://groups.geni.net/geni/wiki>*



The screenshot shows the GENI Wiki homepage. At the top is the GENI logo and a navigation bar with links: Wiki, Newcomers, Experimenters, Instructors, Aggregate Providers, Operations, Developers, Spiral Four, and GPO Docs. Below the navigation bar is a 'Welcome to the GENI Wiki' section with a brief description and a link to the GENI Project Office (GPO). To the right is a 'Table of Contents' box with links to various wiki pages. At the bottom is a section titled 'Finding Information in the Wiki' with a row of icons and labels: Newcomers to GENI, Experimenters, Instructors, Opt-in Users, GENI Aggregate Providers including GENI Campus Operators, GENI Operations, GENI Developers, GENI Project Office (GPO), and Related Projects. Two large arrows, one grey and one orange, point to the 'Instructors' and 'Experimenters' links in the navigation bar and the corresponding icons in the bottom row.

# “How To” pages



- Listed under the “Experimenters” section
- Each “How To” is a short descriptions of how to do various tasks
- New entries being added all the time

## Using GENI

- [How to Pick a Slice Name](#)
- [How to Login to Nodes](#)
- [How to Write Install Scripts](#)
- [How to pre-reserve GENI resources \(aka How to Notify GMOC\)](#)

[Tutorials](#)  
[PlanetLab](#)  
[Index](#)



## Omni

- [How to Specify Aggregates In Omni](#)
- [How to Specify RSpecs In Omni](#)
- [How to Add Users to an `omni\\_config`](#)

## OpenFlow

- [How to Install OVS in ProtoGENI](#)
- [How to Run OpenFlow tutorial](#)
- [How to write OpenFlow v3 rspecs](#)
- [How to run the OpenFlow Nox controller in Fedora8 \(OS in many MyPlc hosts\)](#)

## RSpecs

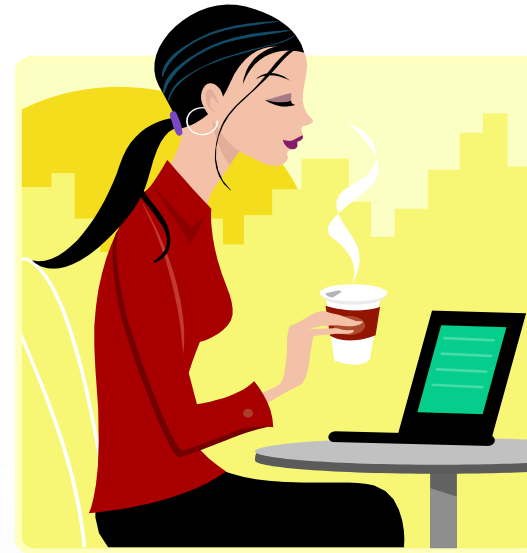
- [How to Convert ProtoGENI v2 to GENI v3 RSpecs](#)



- **GENI Tutorials at SIGSCE'14, IC2E'14**
- **19th meeting, open to all:**  
**March 17-19, 2014, Georgia Tech Atlanta**
  - Planning & discussion for experimenters, software, infrastructure
  - Tutorials and workshops (**GREE workshop**)
  - **Travel grants** to US academics for participant diversity
- **GENI Summer Camp**



Thank you  
for attending!



Please fill out the survey  
<http://tinyurl.com/TrainTASpring14>