Are you ready for the tutorial?

1. Grab a worksheet and instructions

2. Did you do the pre-work?
   A. Do you have an account?
   B. Have you installed the tools?
      * ssh
      * omni

3. Connect to the network
   Connect to *BU Guest*

GENI Portal is at:

http://portal.geni.net

Lab Zero:
A First Experiment using GENI

Violet R. Syrotiuk

Arizona State University

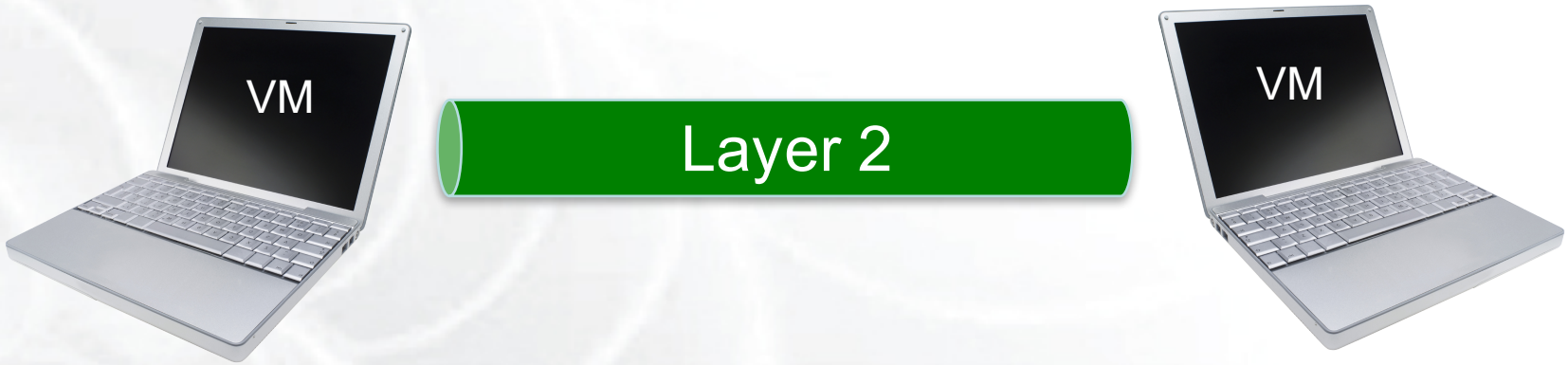
Presentation by Sarah Edwards, GENI Project Office

Sponsored by the National Science Foundation

Hands On Exercise

Do a Simple Experiment in GENI

Reserve two VMs connected at Layer 2



Use the GENI Portal and Jacks

geni
Exploring Networks of the Future

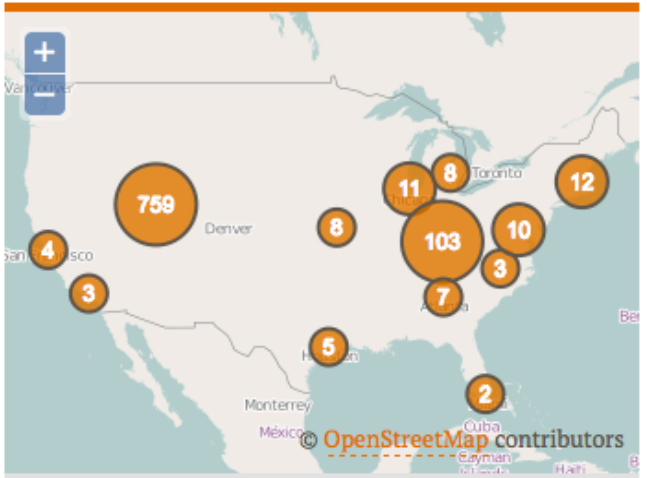
WELCOME TO GENI

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.

Experiment Workflow

- Part I: Design/Setup
- Part II: Execute
- Part III: Finish

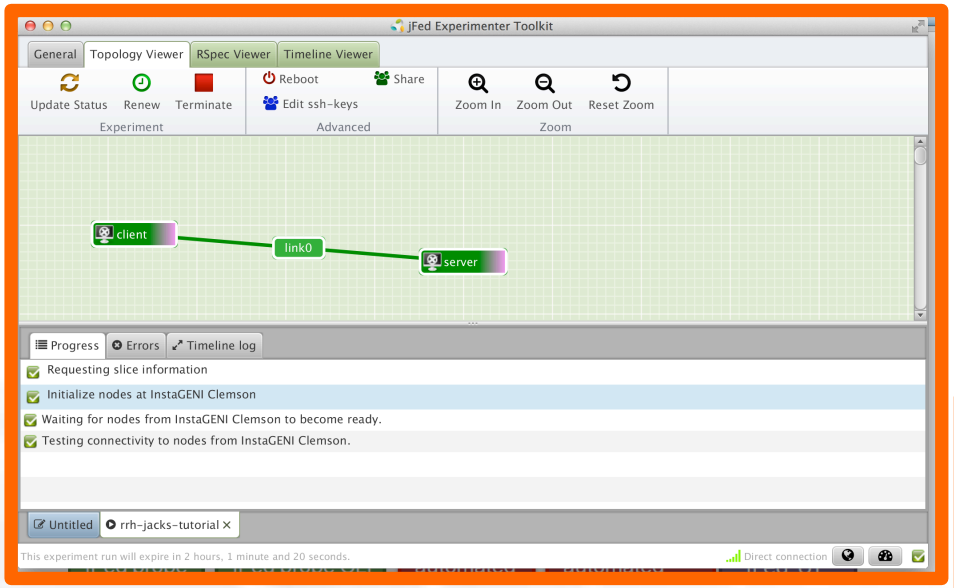
The GENI Portal is…

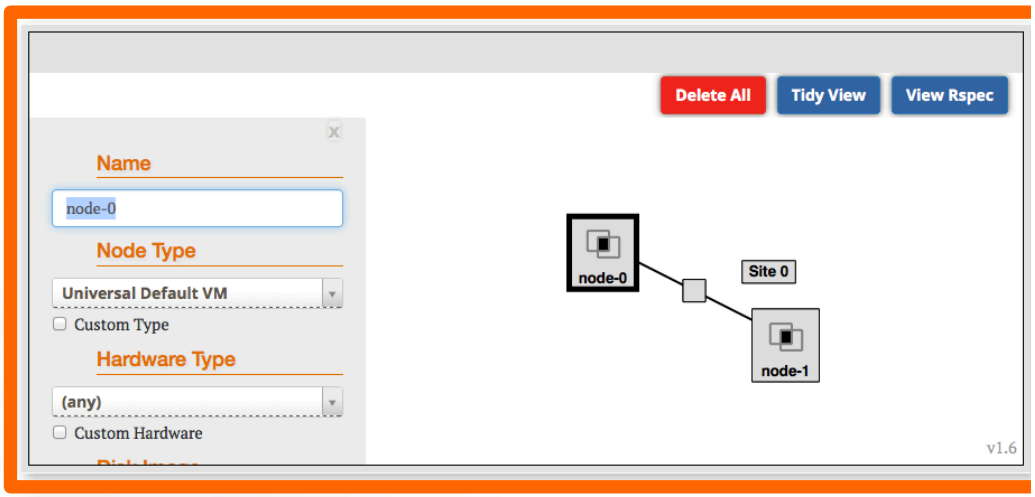
A web-based tool for experimenters to manage **experimenters**, **projects**, and **slices**.

Includes simple tools to reserve **resources**.

More to come in the future.

Jacks and jFed are …





Graphical user interfaces (GUIs) for:

– **designing topologies** in GENI

– **reserving resources** in GENI

Experiment Workflow

- **Part I: Design/Setup**
- Part II: Execute
- Part III: Finish

Part I: Establish Management Environment

1 Pre-work: Design your experiment

2.1 Pre-work: Create a GENI account

2.2 Pre-work: Project lead (e.g., tutorial leader) adds you to project

Project Name: GRWBU2016

2.3 Generate and Download ssh keypair

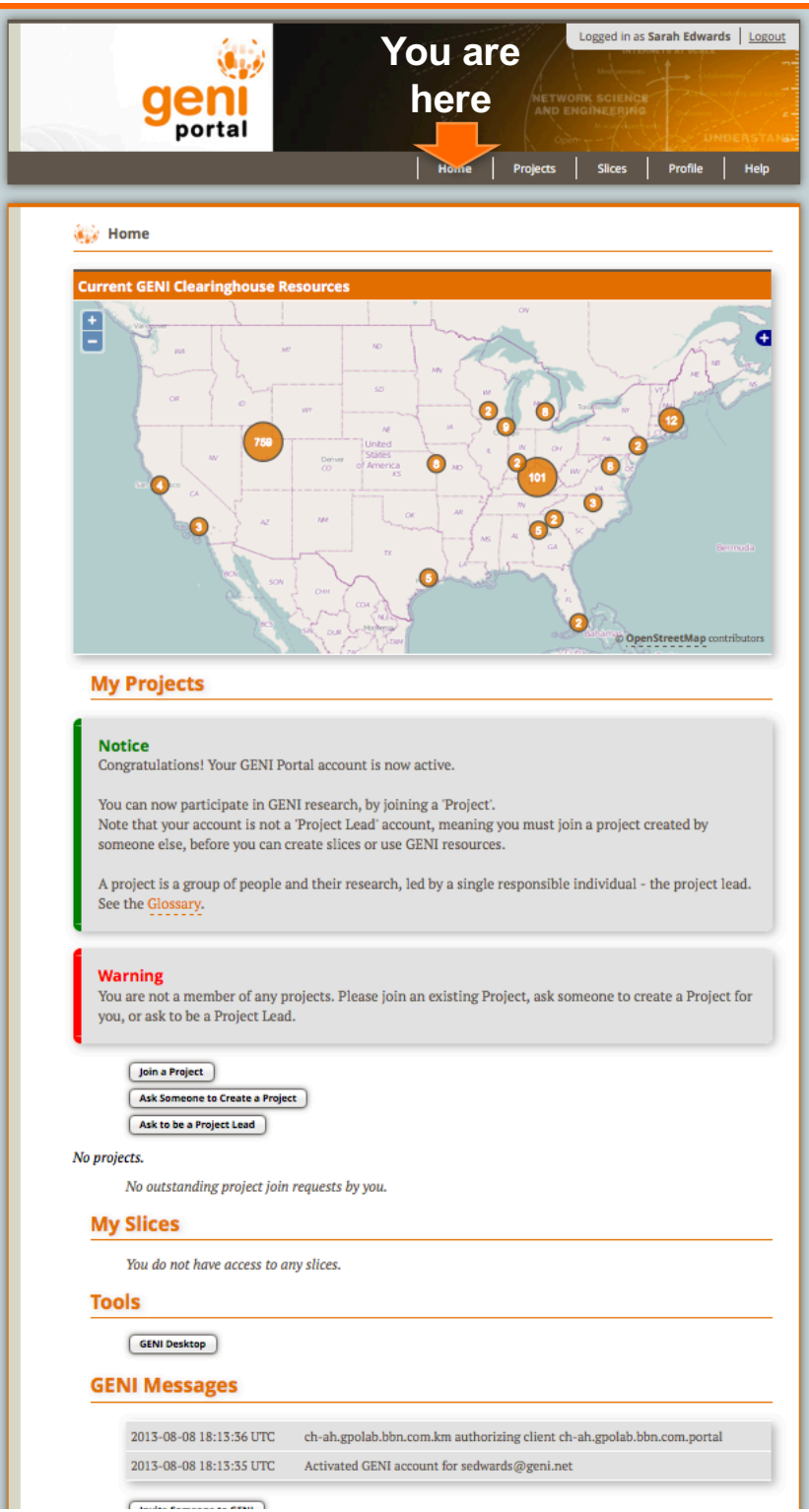
Map

Projects

Slices

Tools

Log Messages



Profile

Help

2

Login

Join Project

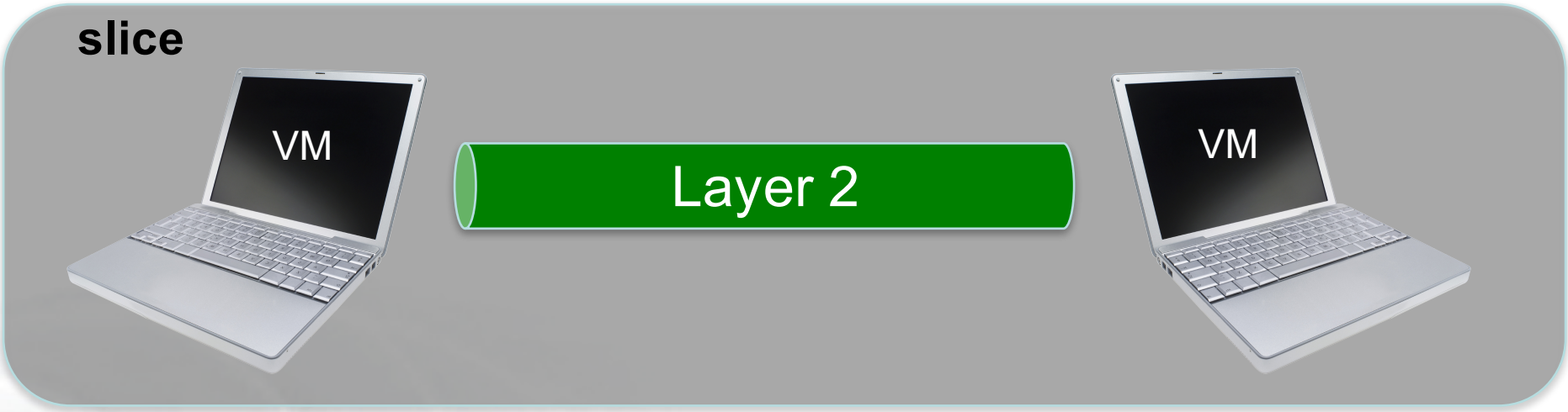
Generate SSH Keys & SSL Certs

2

On your local machine…

```
> mv ~/Downloads/id_geni_ssh_rsa ~/.ssh/.
> chmod 600 ~/.ssh/id_geni_ssh_rsa
> ssh-add ~/.ssh/id_geni_ssh_rsa
```

Part I continued: Obtain Resources



3.1 Create a slice

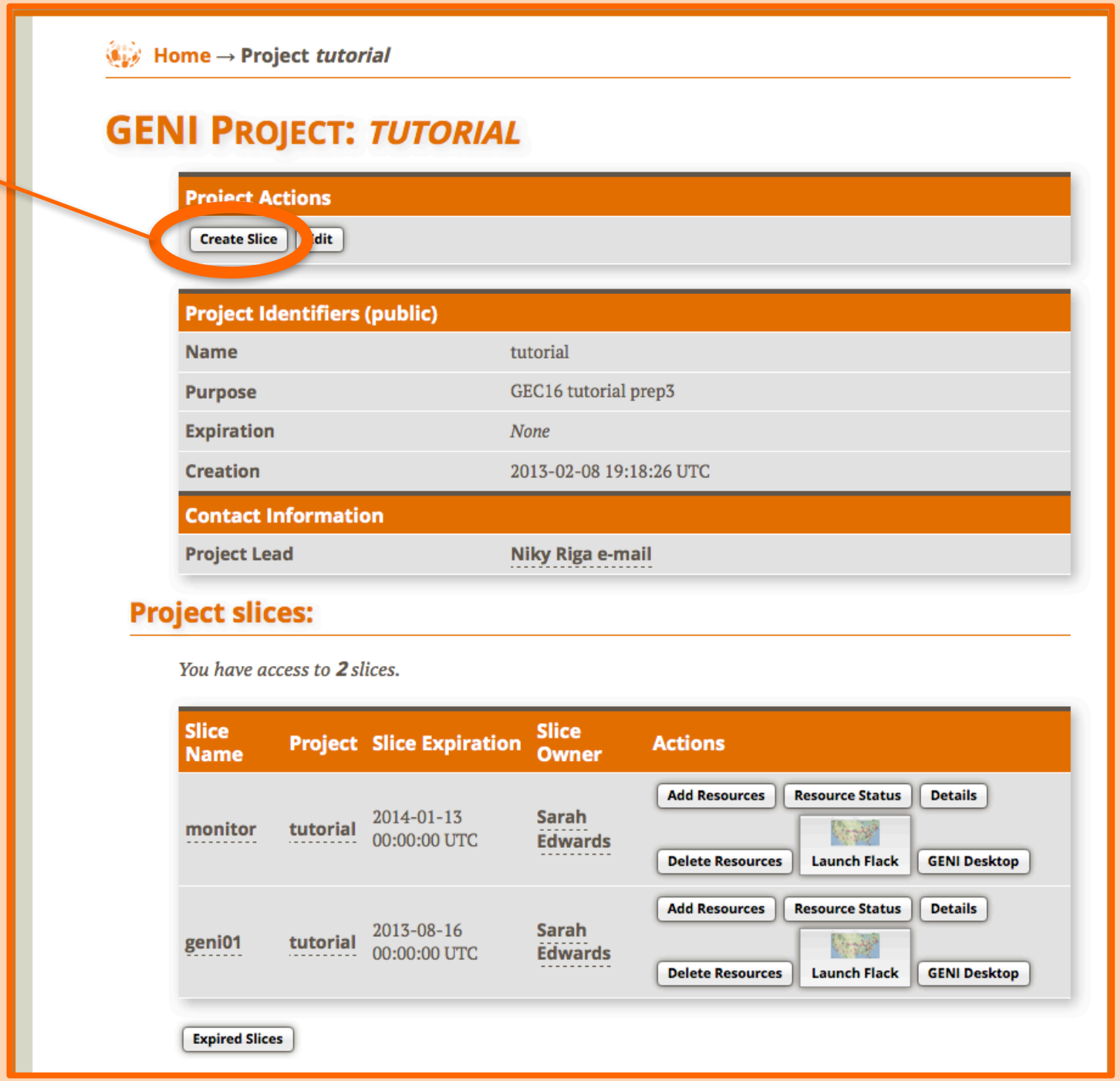
3.2 (Optional) Renew your slice

3.3 Reserve two VMs at one aggregate

3.4 Check whether VMs are ready to be used

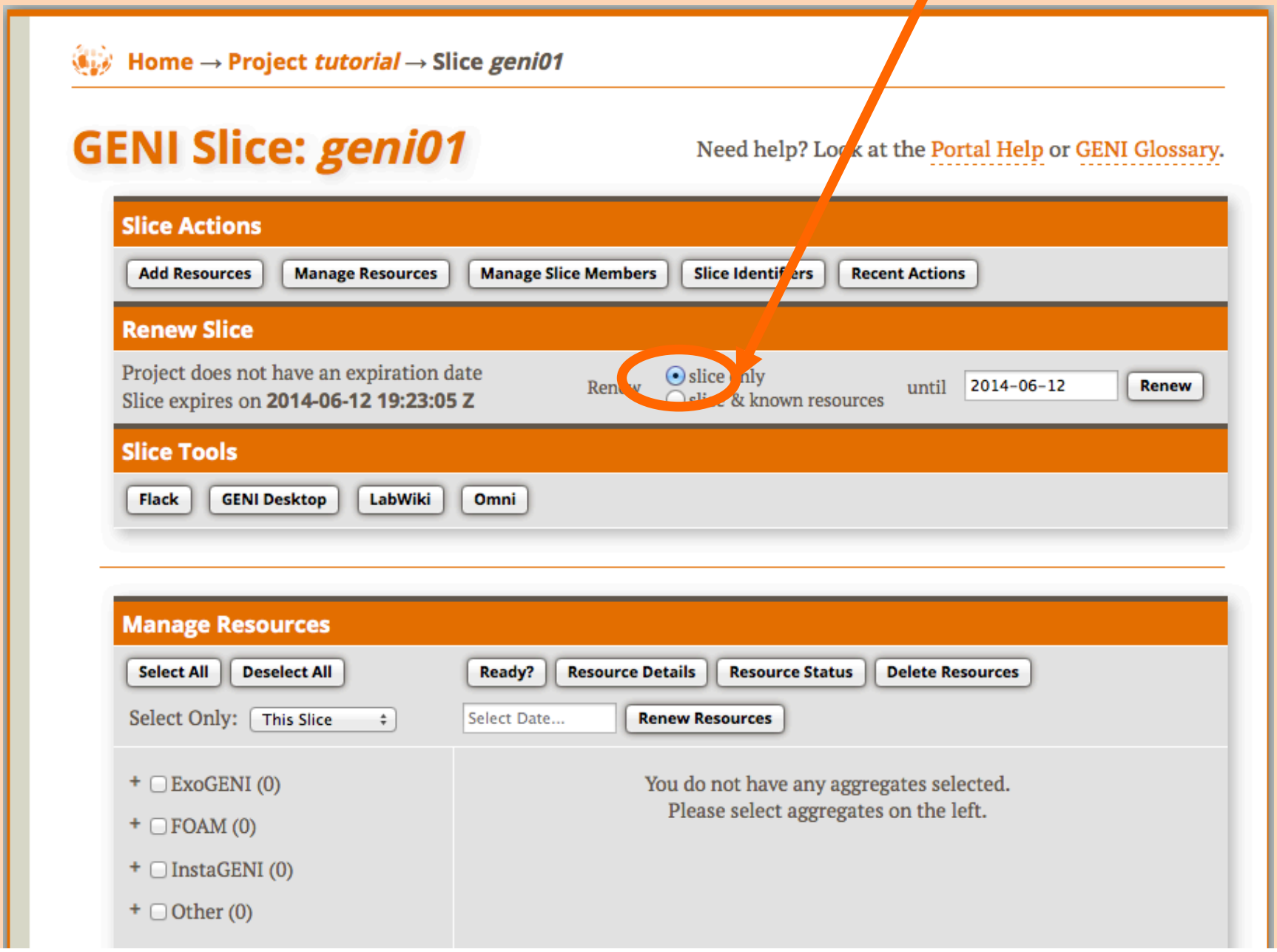
3.1

Create Slice



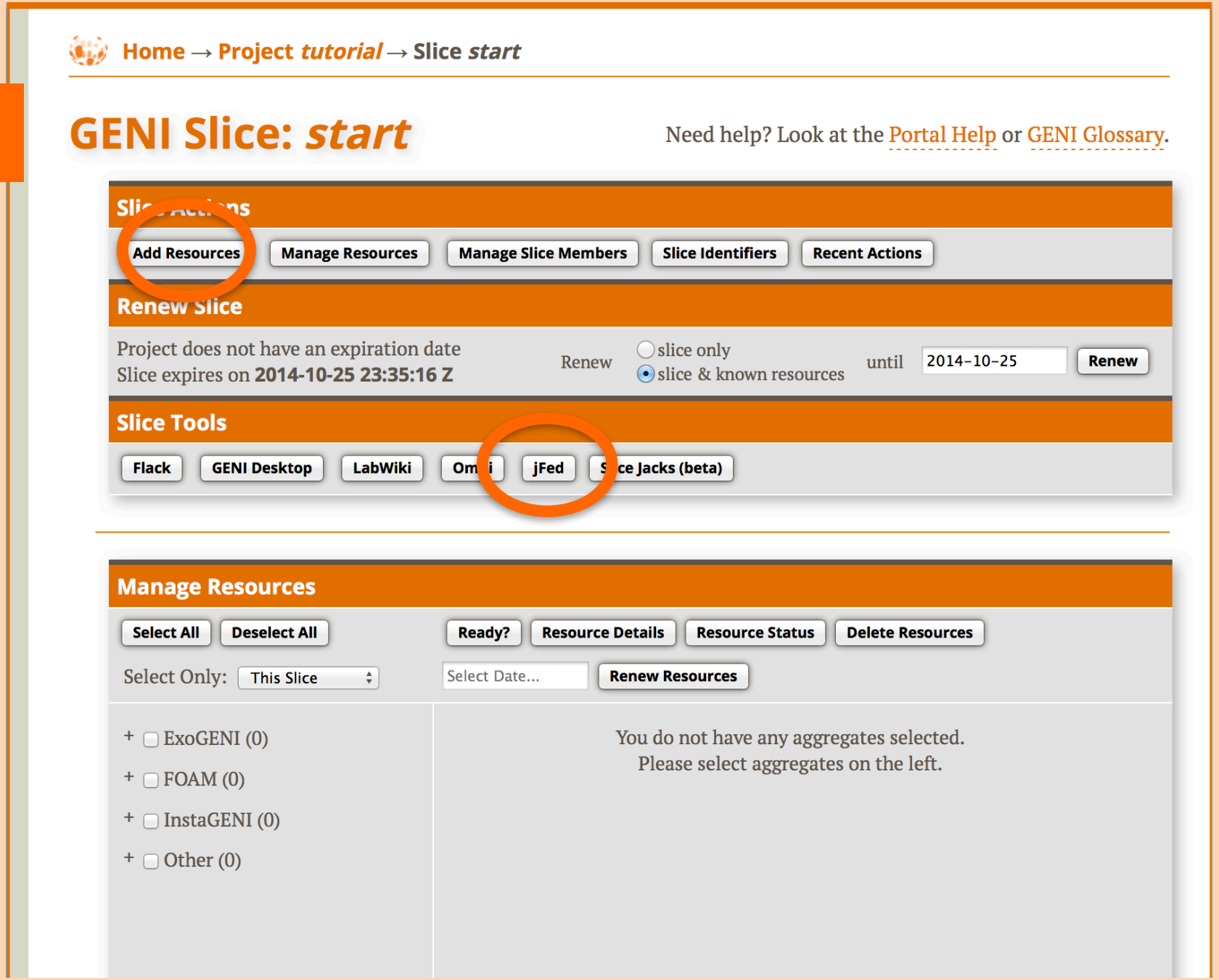
3.2

Extend slice expiration

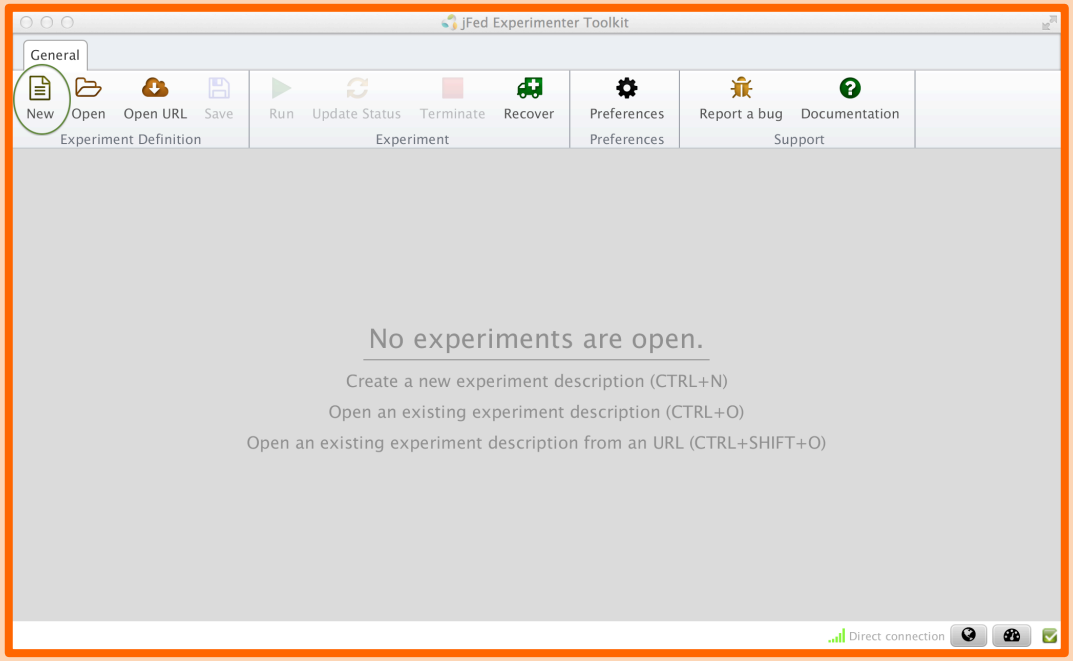


3.3

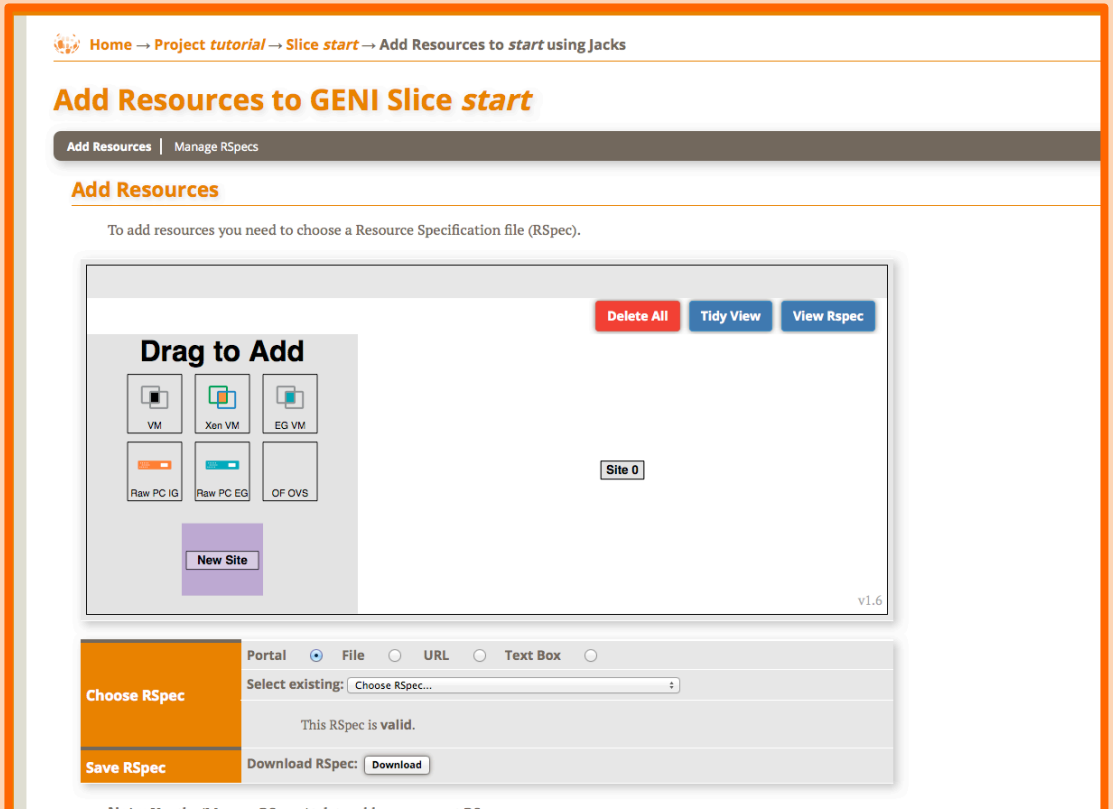
Launch tool



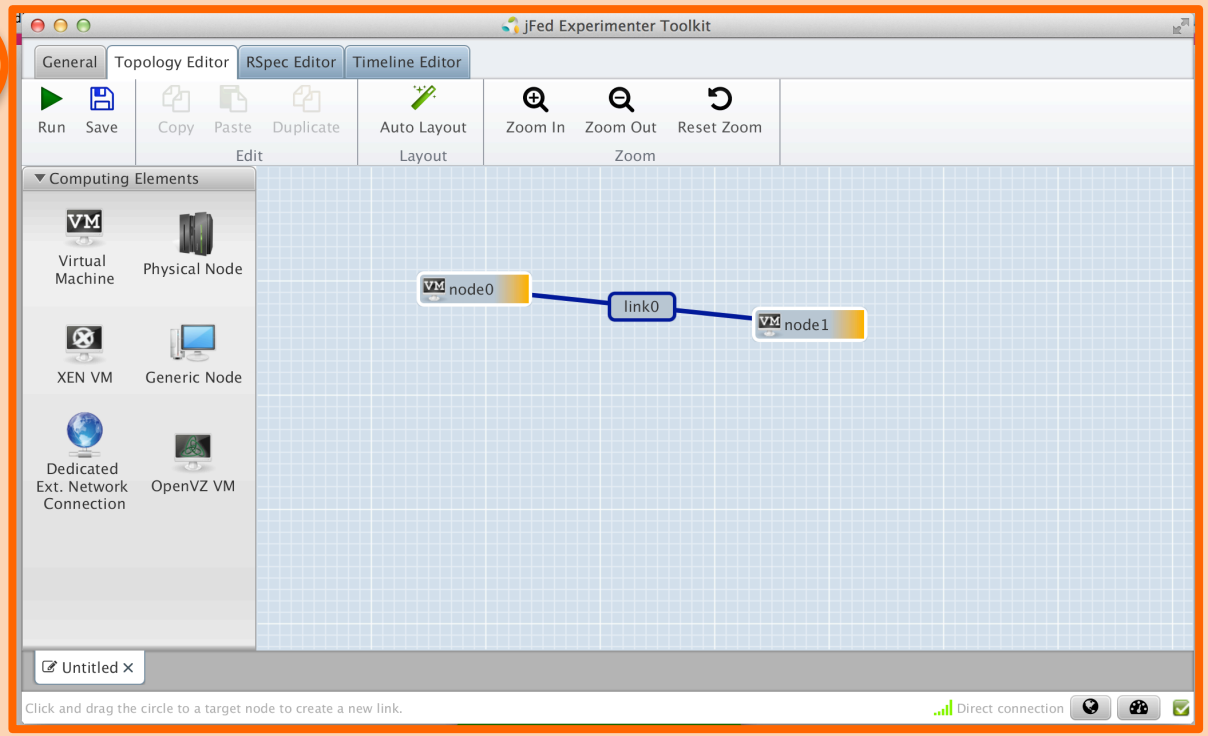
3.3



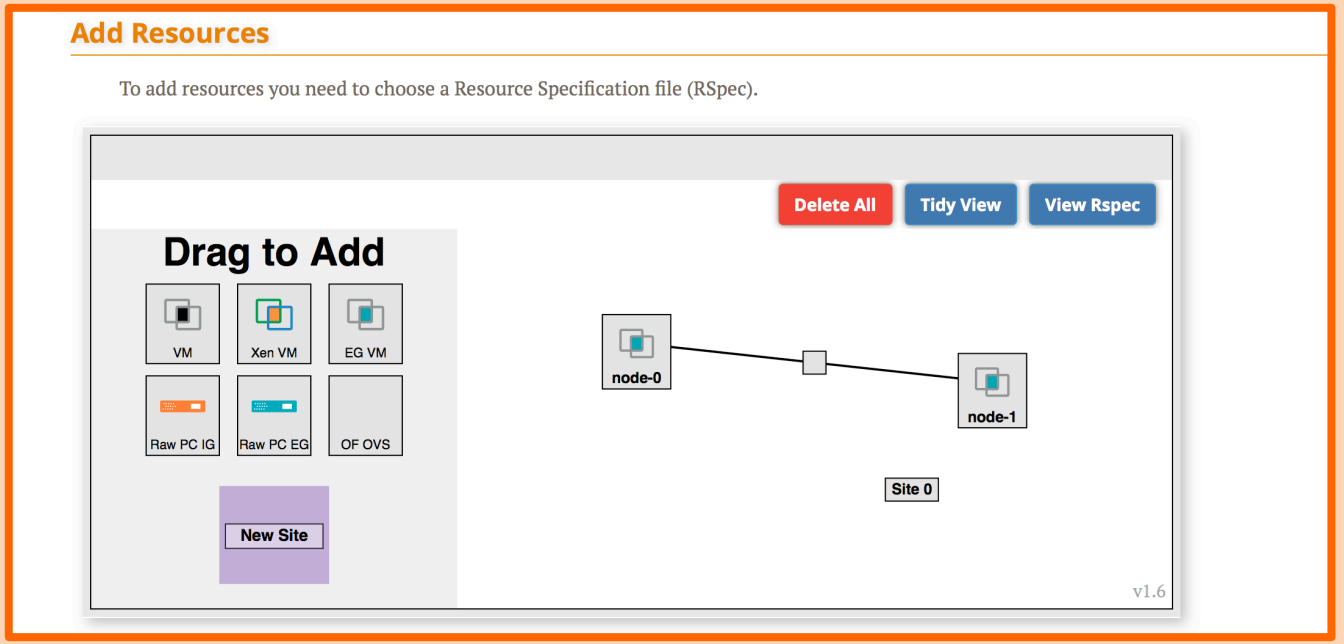
Launch Tool



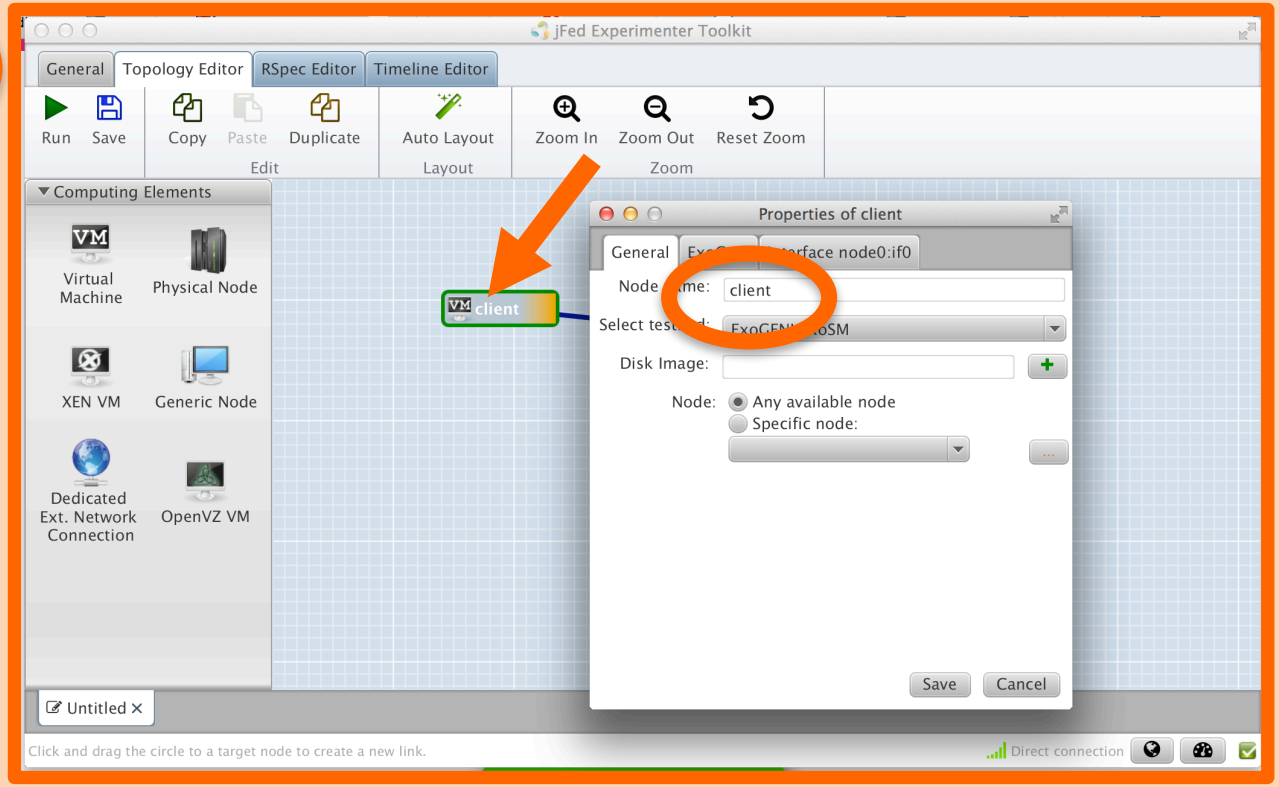
3.3



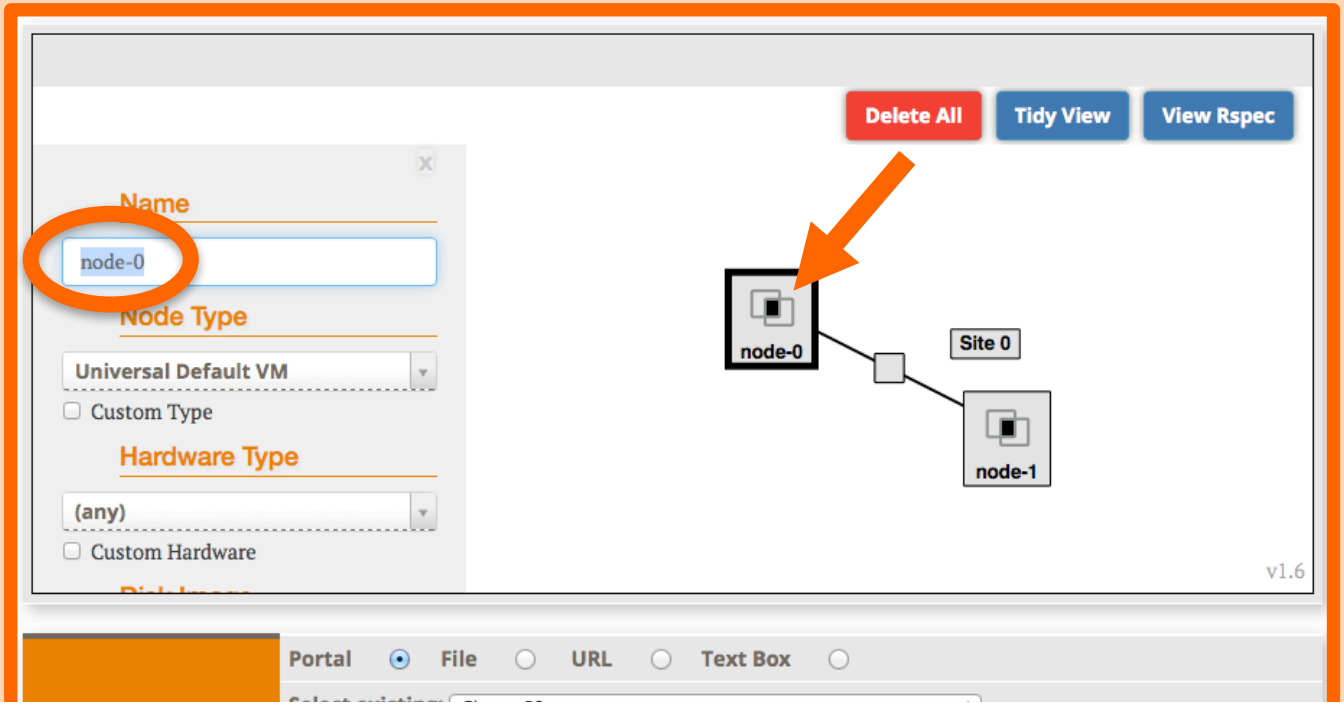
Draw two VMs connected by a link



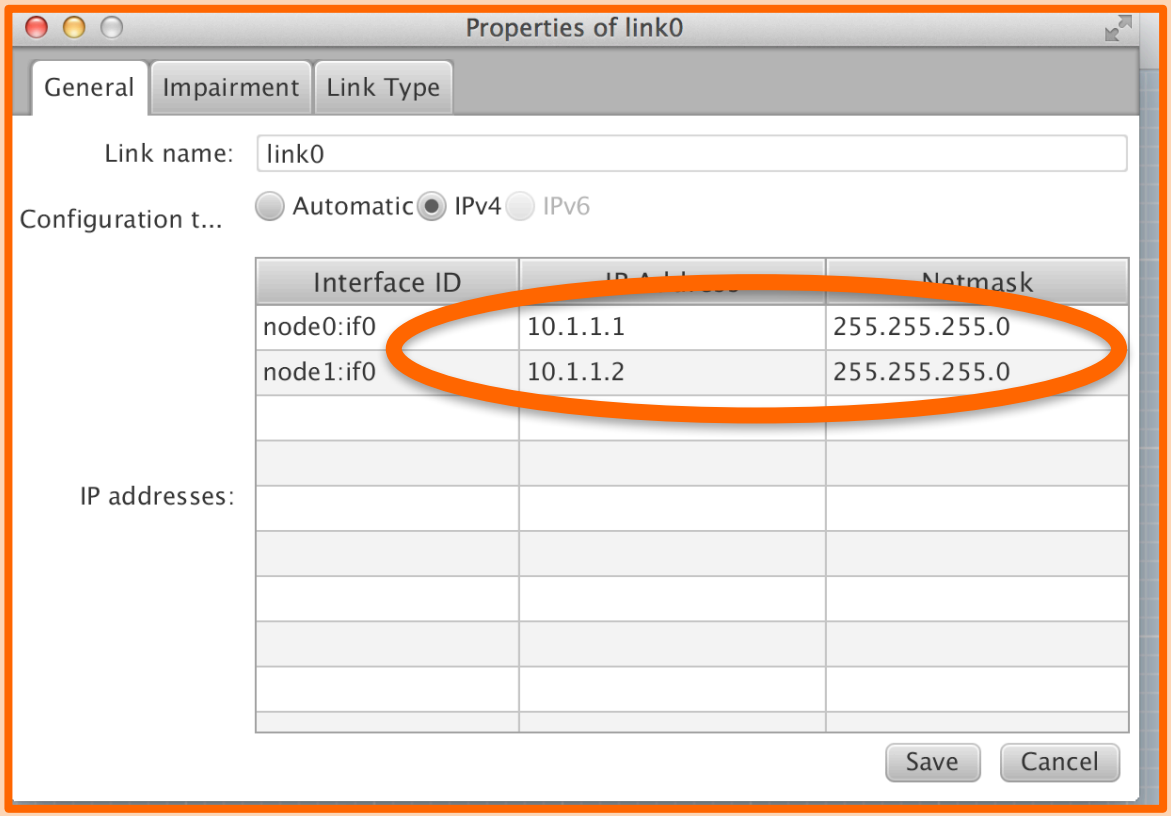
3.3



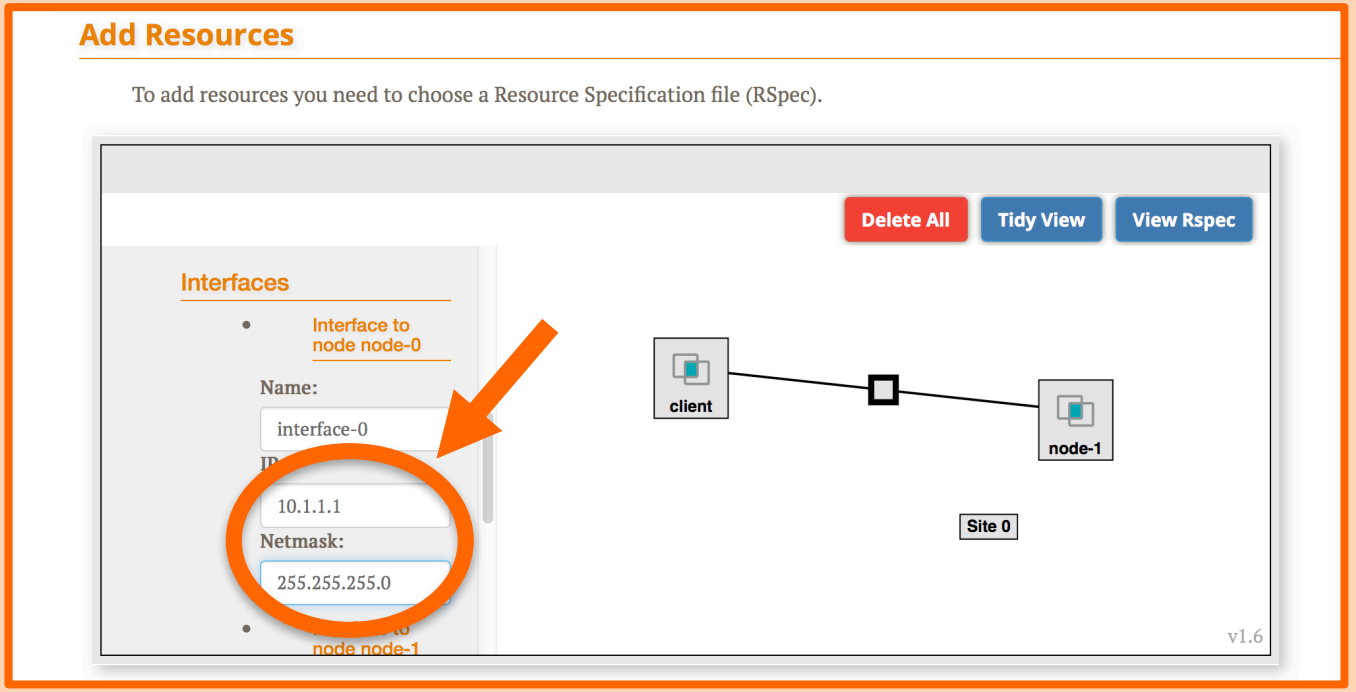
Change names of VMs



3.3

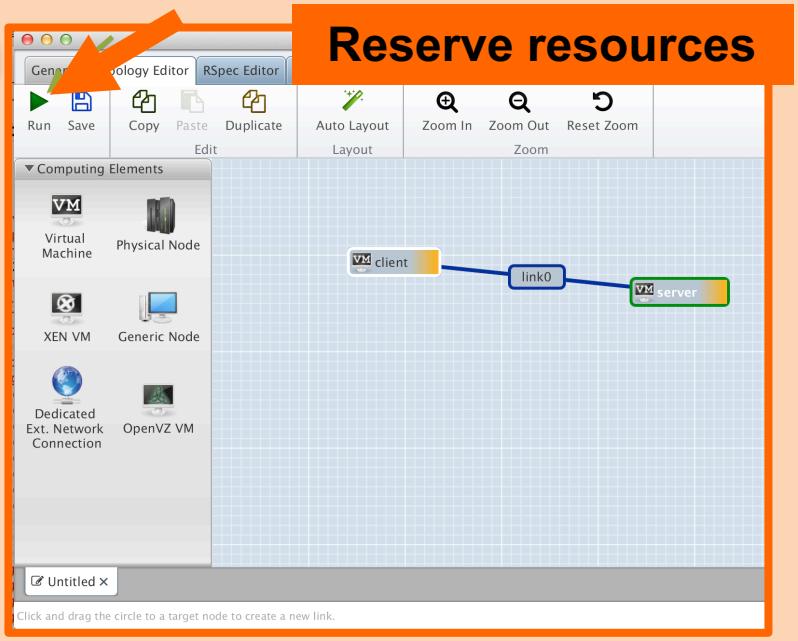


Set IP and mask of interfaces

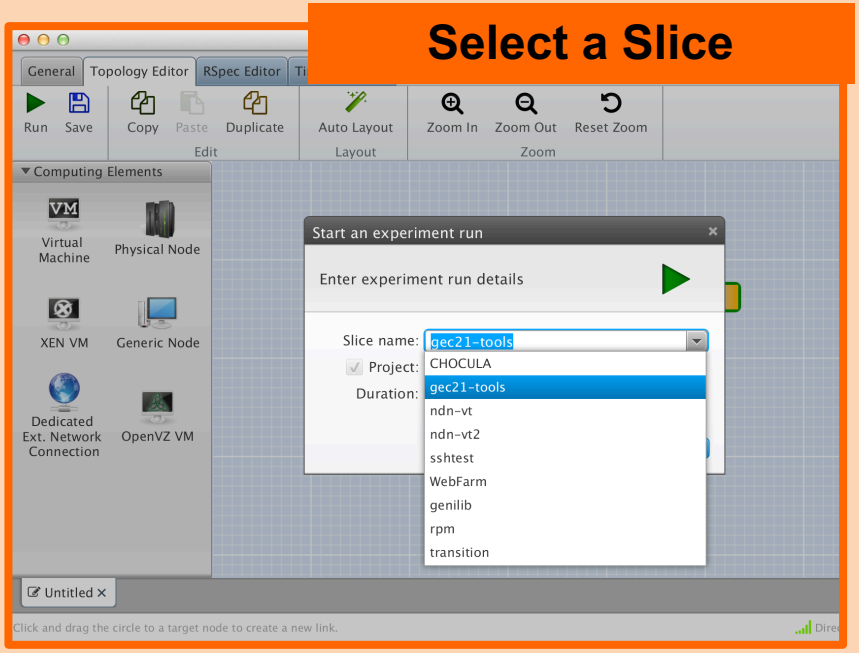


3.3

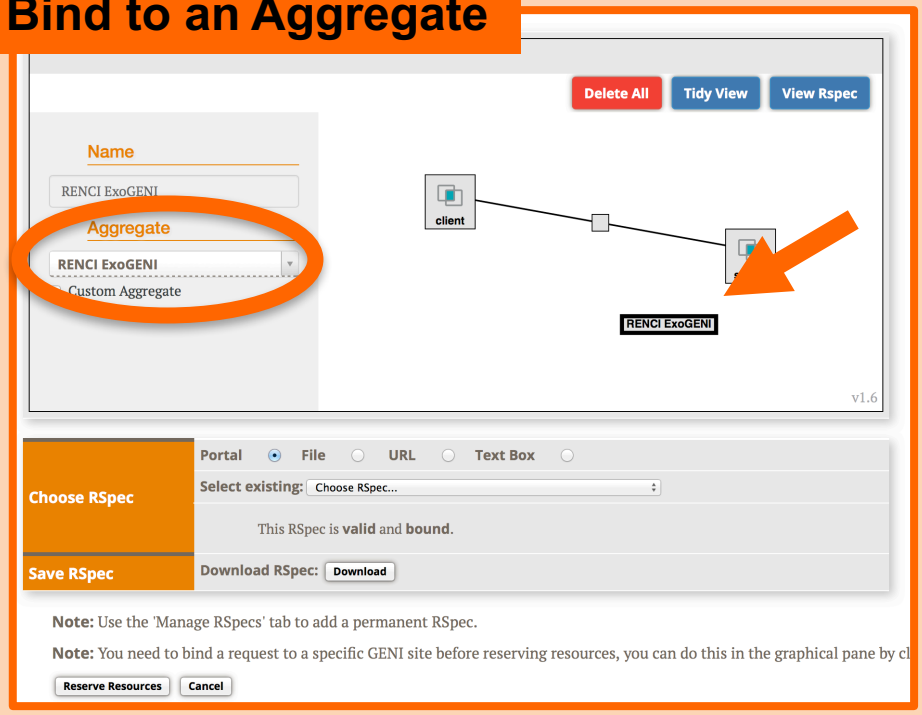
Reserve resources



Select a Slice

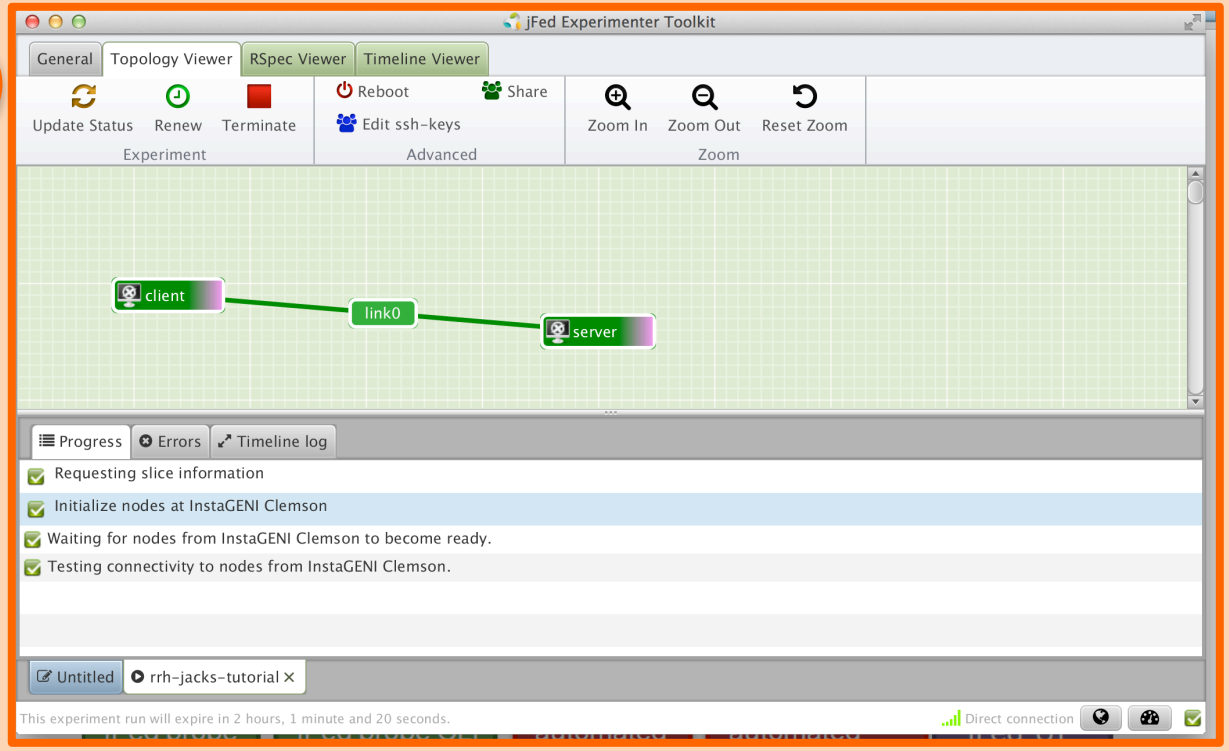


Bind to an Aggregate

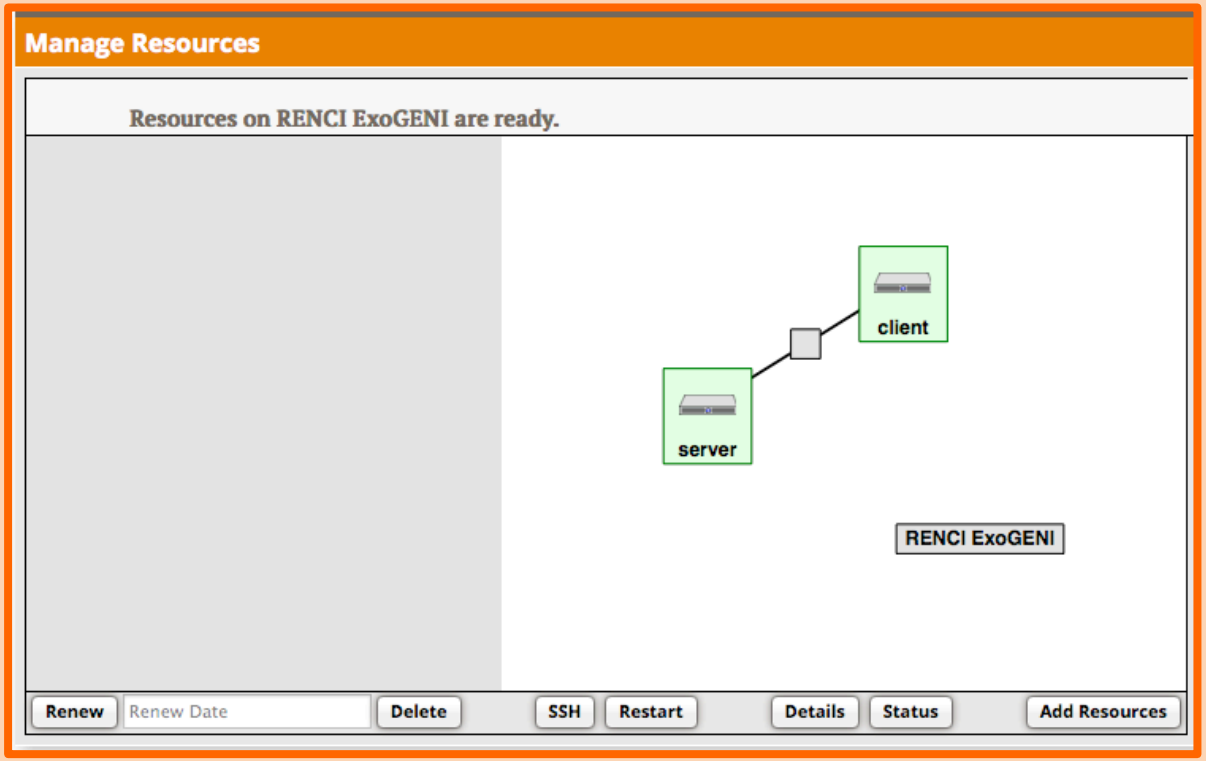


Reserve resources

3.4



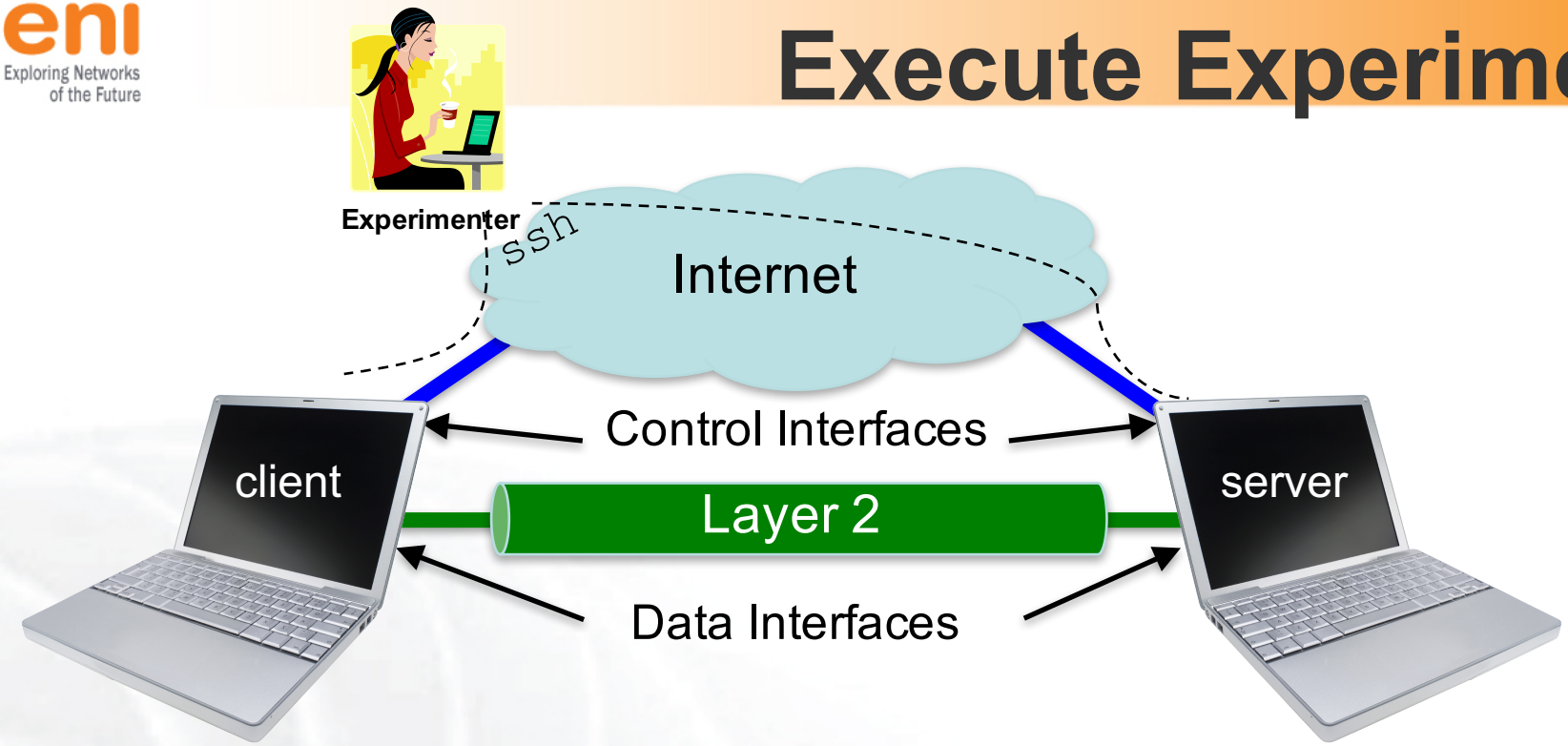
Resources are READY!!!



Experiment Workflow

- Part I: Design/Setup
- **Part II: Execute**
- Part III: Finish

Part II: Execute Experiment



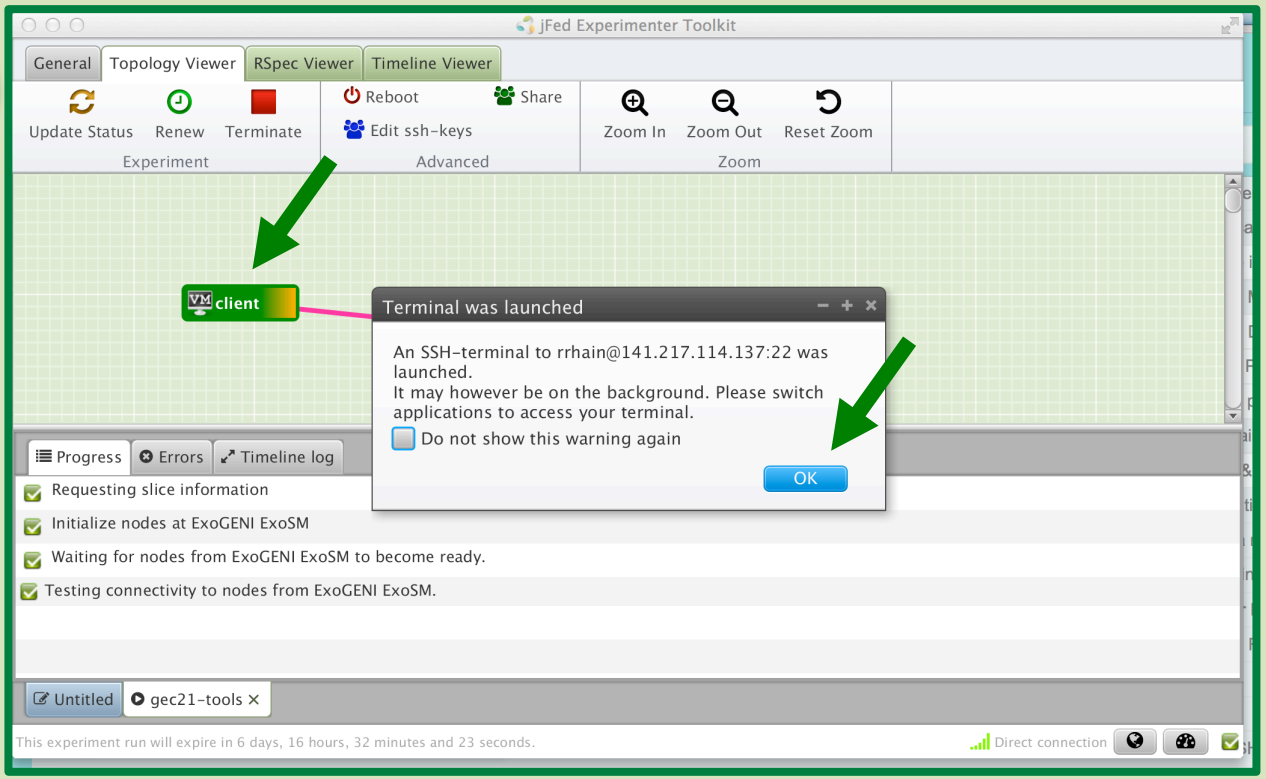
4.1 Login to the client and server nodes

5.1 Test connectivity

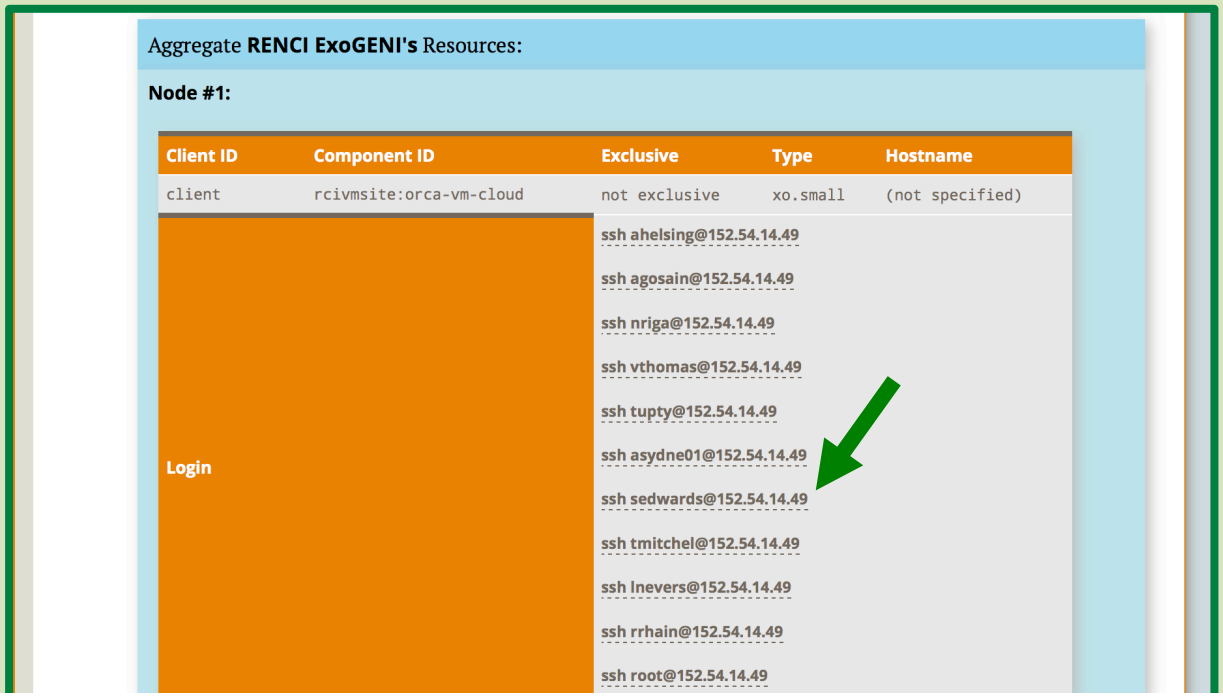
5.2 Explore the data and control planes

6.1 Logout of nodes

4.1


jFed Experimenter Toolkit
General
Topology Viewer
RSpec Viewer
Timeline Viewer
Update Status
Renew
Terminate
Experiment
Reboot
Share
Edit ssh-keys
Advanced
Zoom In
Zoom Out
Reset Zoom
Zoom
client
Terminal was launched
An SSH-terminal to rrhain@141.217.114.137:22 was launched.
It may however be on the background. Please switch applications to access your terminal.
Do not show this warning again
OK
Progress
Errors
Timeline log
Requesting slice information
Initialize nodes at ExoGENI ExoSM
Waiting for nodes from ExoGENI ExoSM to become ready.
Testing connectivity to nodes from ExoGENI ExoSM.
Untitled
gec21-tools
This experiment run will expire in 6 days, 16 hours, 32 minutes and 23 seconds.
Direct connection

Login


Aggregate RENCI ExoGENI's Resources:
Node #1:
Client ID
Component ID
Exclusive
Type
Hostname
client
rcivmsite:orca-vm-cloud
not exclusive
xo.small
(not specified)
Login
ssh ahelsing@152.54.14.49
ssh agosain@152.54.14.49
ssh nriga@152.54.14.49
ssh vthomas@152.54.14.49
ssh tupty@152.54.14.49
ssh asydne01@152.54.14.49
ssh sedwards@152.54.14.49
ssh tmitchel@152.54.14.49
ssh lnevers@152.54.14.49
ssh rrhain@152.54.14.49
ssh root@152.54.14.49

5.1

```
$ sudo ifconfig

$ ping 192.168.1.11 -c 5 # server data i/f
$ ping 172.17.1.9 -c 5 # server ctrl i/f
```

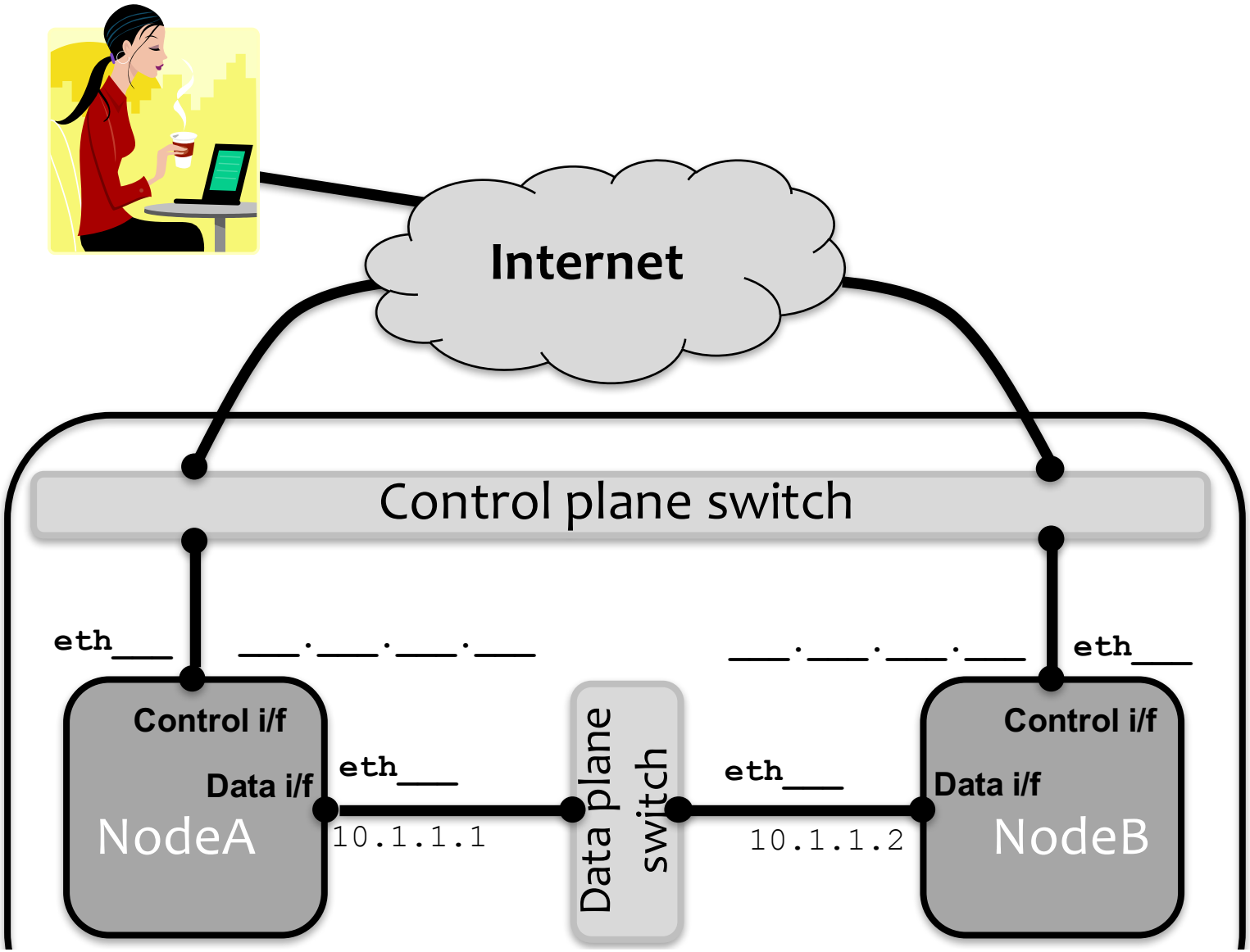
5.1

```
$ sudo ifconfig
```

5.1

Worksheet

Slice Name: lab0<your initials>



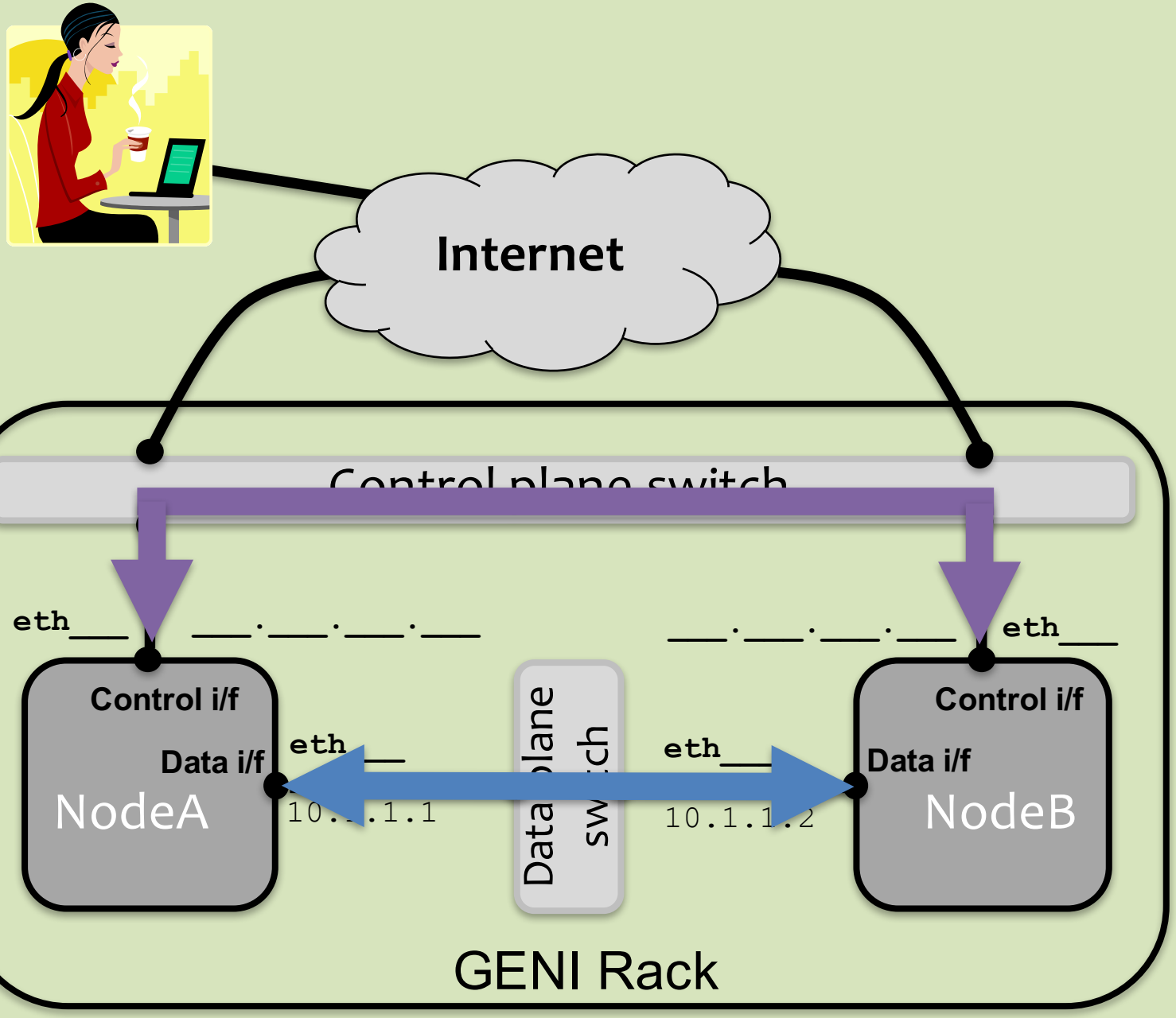
5.1

```
$ sudo apt-get install iperf
$ hash



# server data i/f
$ iperf -c 10.10.1.2
…



# server ctrl i/f
$ iperf -c 172.17.2.4
…
```


```
$ sudo apt-get install iperf
$ hash


# start an iperf server
$ iperf -s









# Stop the iperf server
<ctrl-c>
```

5.1 *What is the bandwidth of the **data** link? Why?*

*What is the bandwidth of the **control** link? Why?*



Demo here

5.2 Configure routing

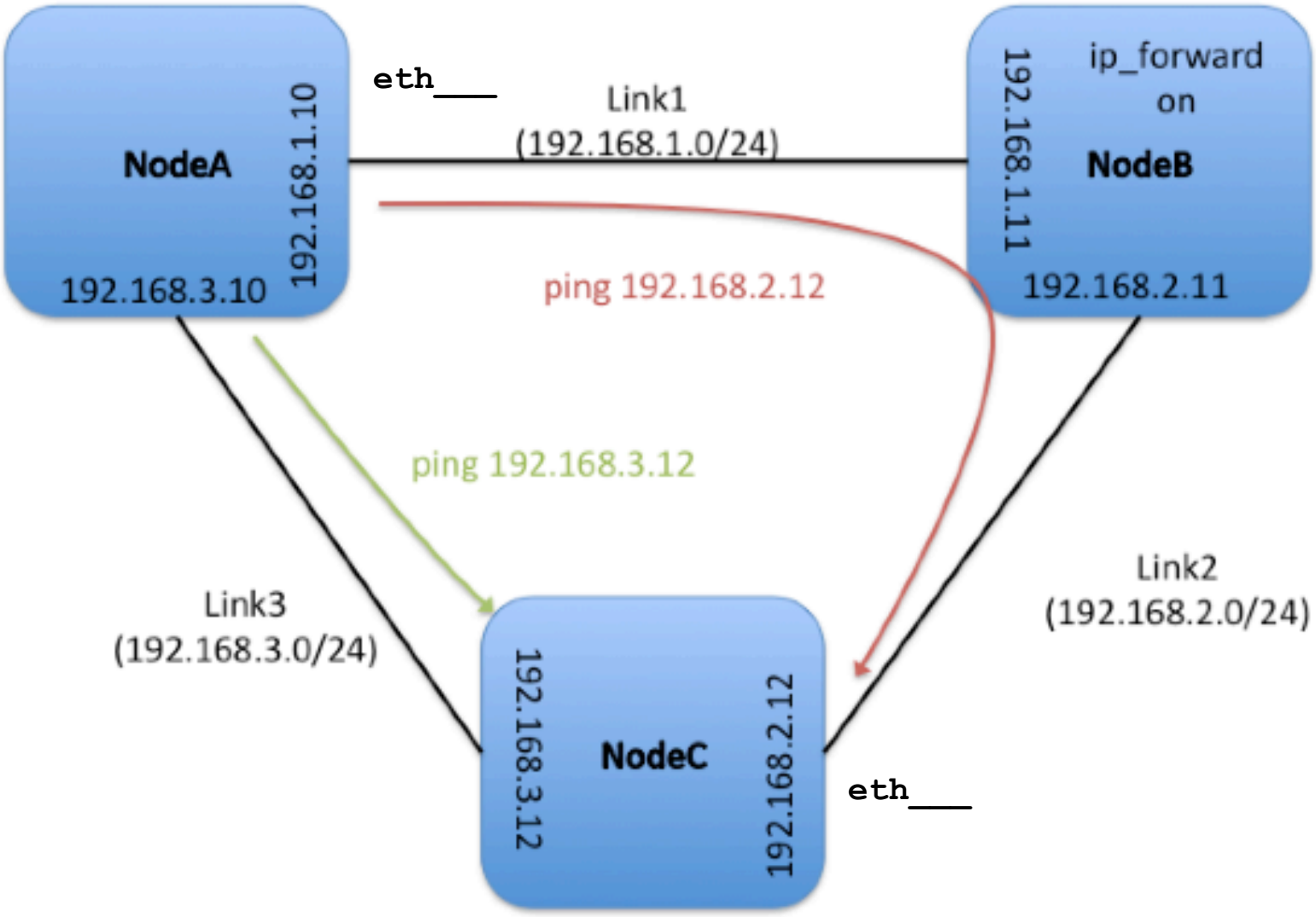


Figure 1 Topology and routing

5.2 Configure a static route

```
route add -net 192.168.1.0 netmask 255.255.255.0
                                gw 192.168.1.1 dev eth0
```

In above command:	
add	-Indicates that the route is added to routing table.
-net	-Indicates that desination is a network.
192.168.0.1	-Indicates IP address of destination network.
netmask	-Indicates the subnetmask of destination network.

Configure IP routing

```
sudo sh -c 'echo 1 > /proc/sys/net/ipv4/ip_forward'
```

From: *https://www.hscripts.com/tutorials/linux-commands/route.html*

```
# ping server data i/f
$ ping 192.168.1.11
…
```

5.3

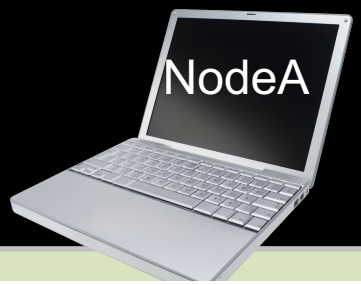
```
# For ExoGENI only do:
$ sudo service neuca stop
# bring down data i/f
$ sudo ifconfig eth12541 down
```

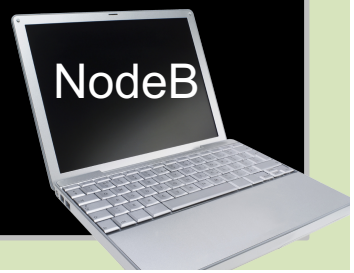
```
# ping server ctrl i/f
$ ping 172.17.2.4
…
```

5.3

```
# bring down ctrl i/f
$ sudo ifconfig eth999 down
```

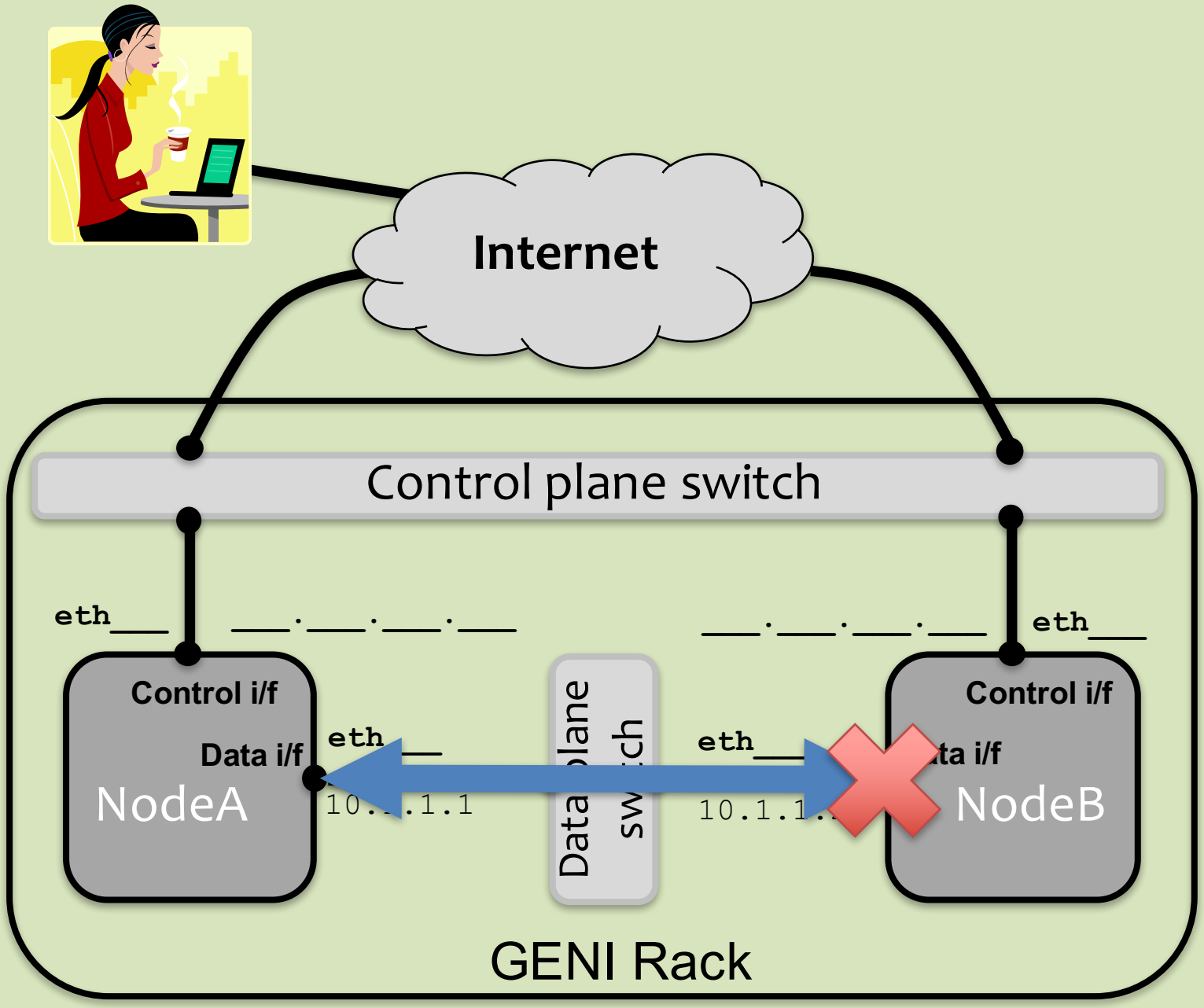
```
$ exit
```



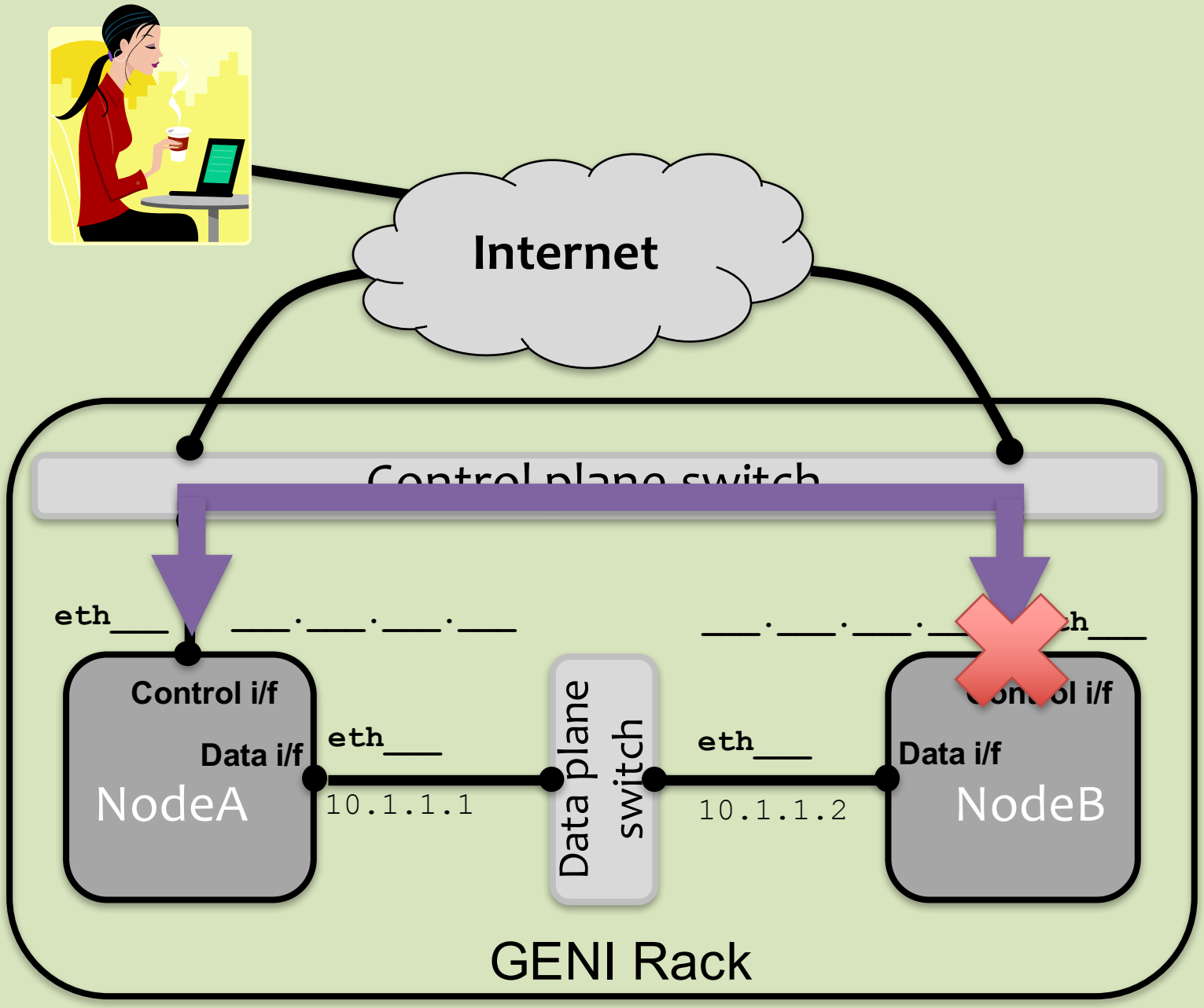


Demo here

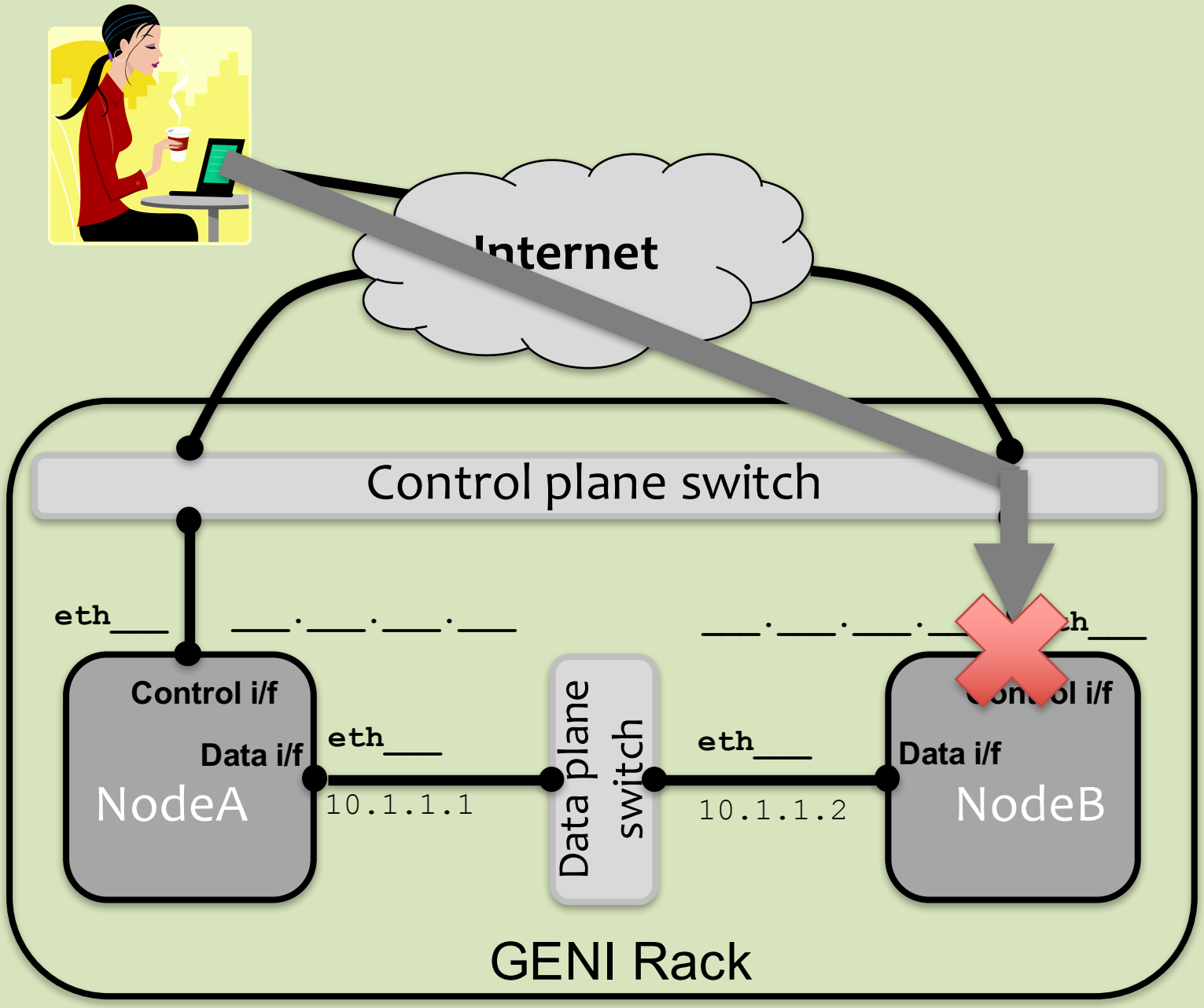
5.3 *When you bring down the **data** interface, the destination should become unreachable. Why?*



5.3 *After you bring down the **control** interface, the destination becomes unreachable. Why?*



5.3 *After you bring down the **control** interface, your ssh session should immediately hang. Why?*



You are trying to log in to a compute node on GENI using SSH and can't.

Which are possible explanations?

a) You entered the wrong password

b) You didn't offer the private key that matches the public key

c) The public key wasn't loaded onto the node

d) Permissions on the private key are too permissive

e) (b), (c), and (d)

Experiment Workflow

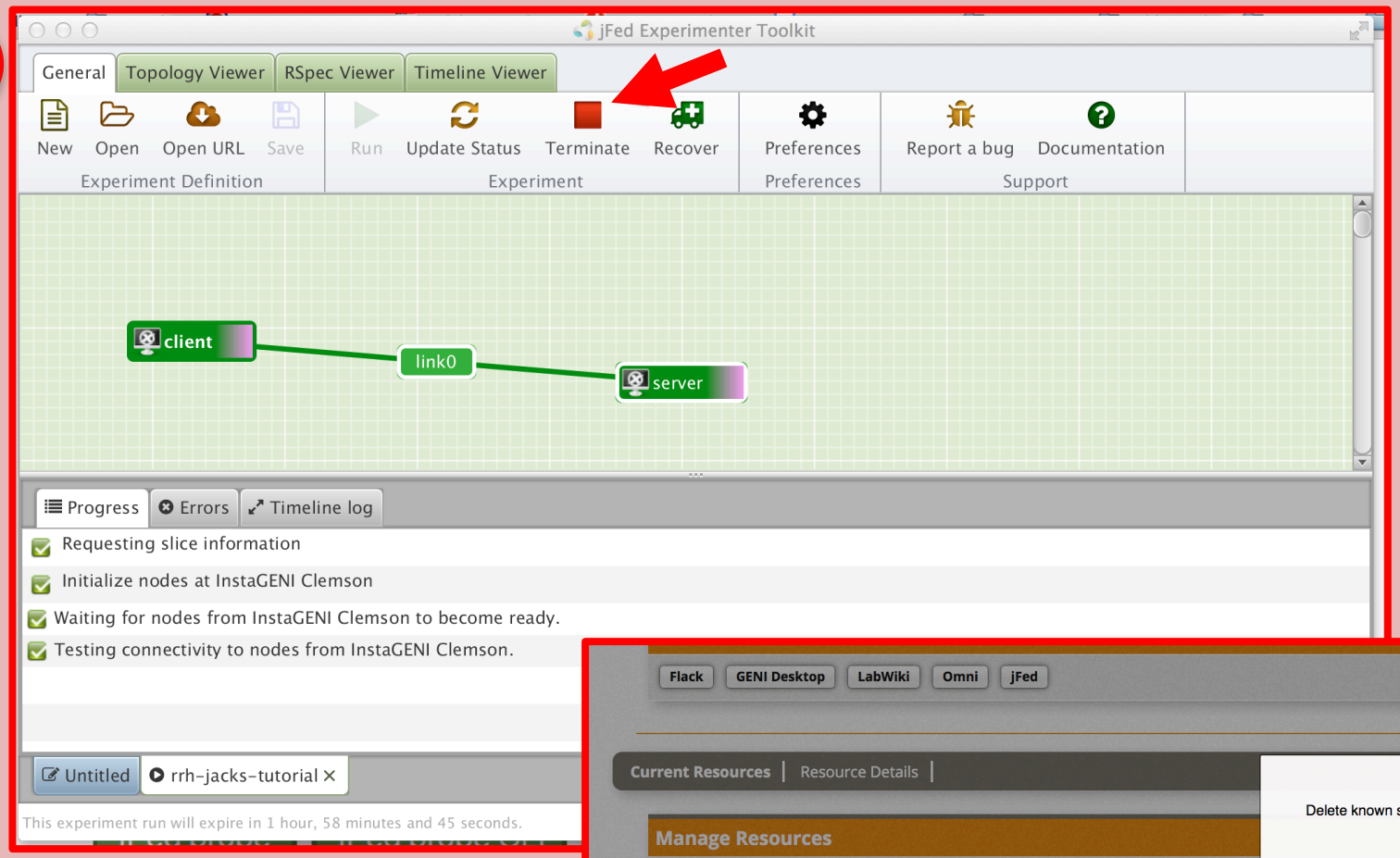
- Part I: Design/Setup
- Part II: Execute
- **Part III: Finish**

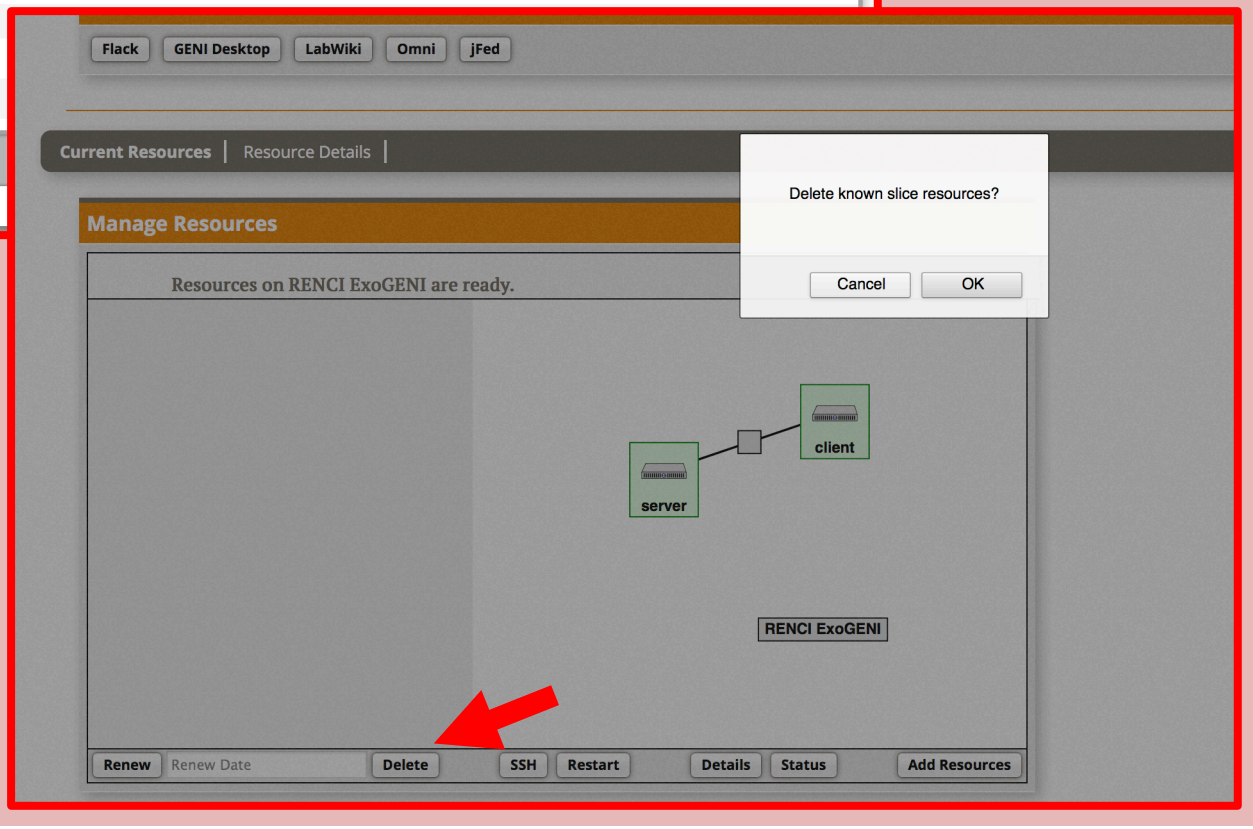
Finish

Don’t Delete YET!!!

We will clean up later

7





Delete Resources

Part III: Finish Experiment

project
resource
experimenter
aggregate
slice

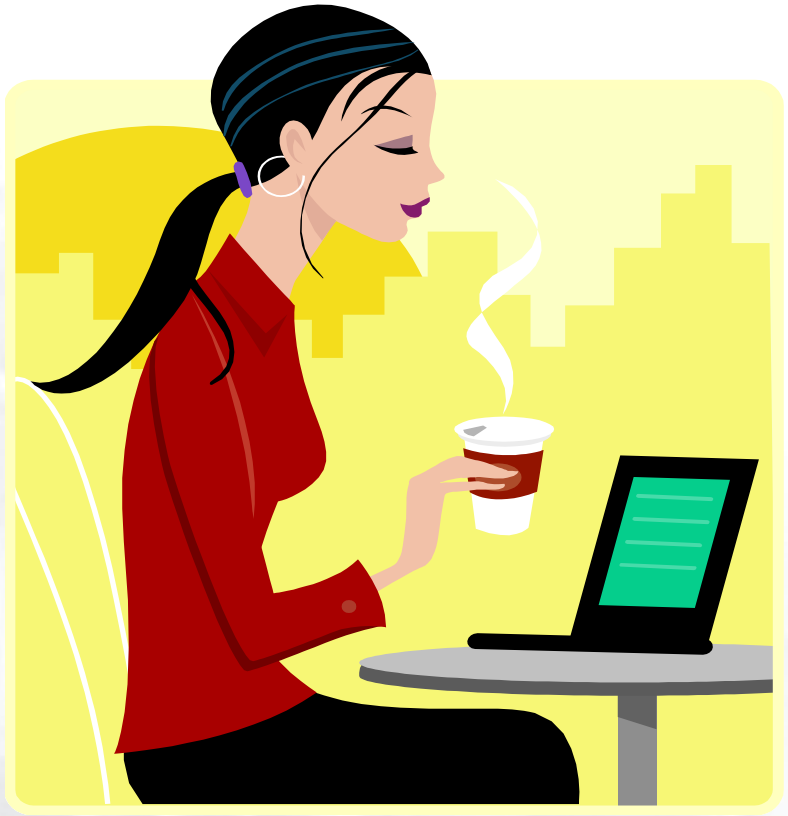
When your experiment is done, you should always release your resources.

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

Congratulations!

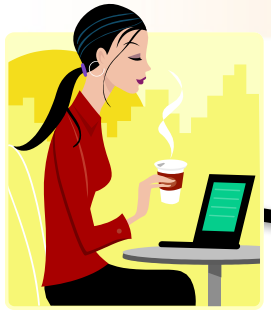
You have…

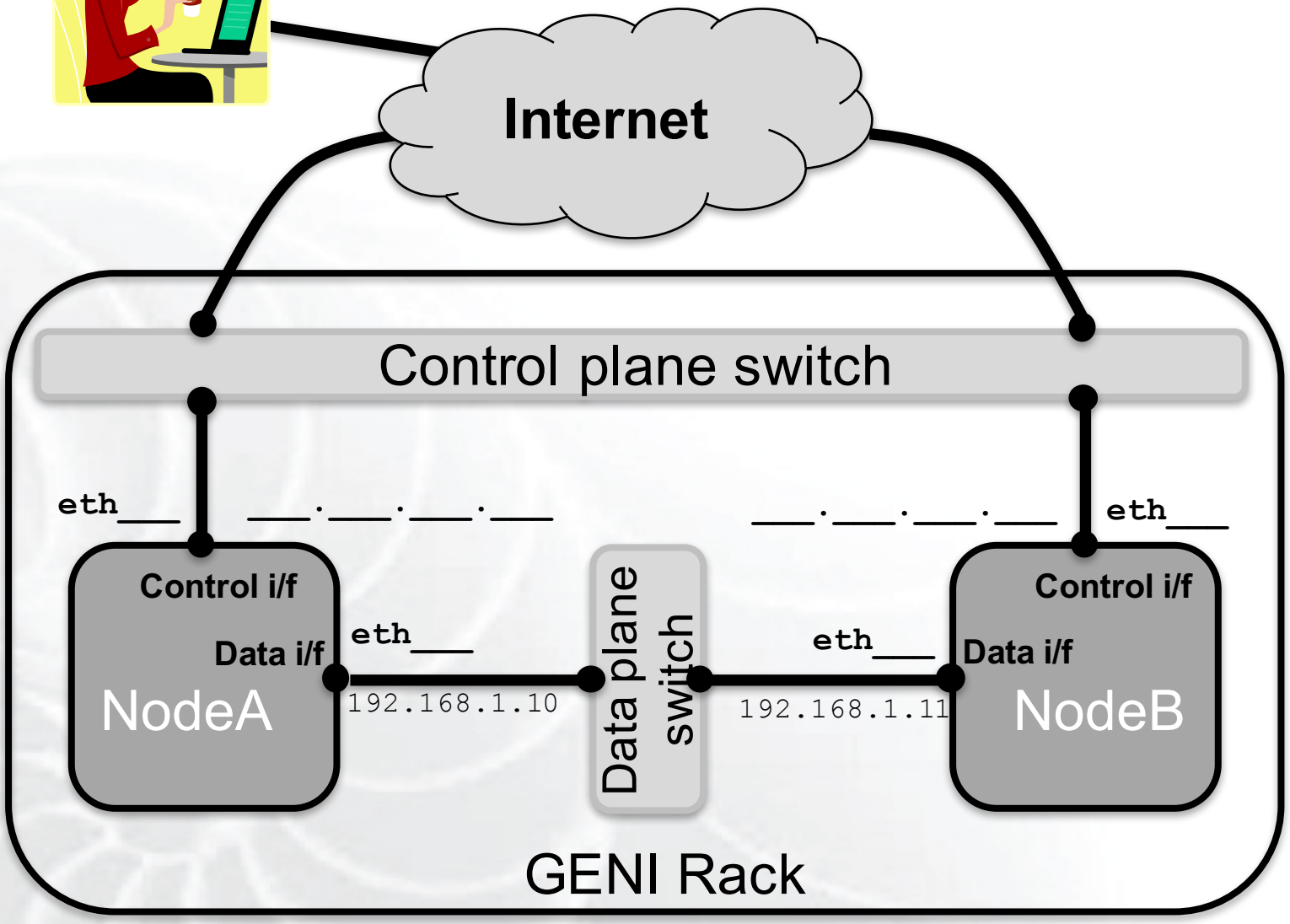
- Run your first GENI experiment!
- Exercised your knowledge of GENI terminology
- Used the GENI Portal and Jacks



Welcome to GENI!

Backups




Internet
Control plane switch
eth___
___.___.___.___
___.___.___.___
eth___
Control i/f
Data i/f
NodeA
eth___
192.168.1.10
Data plane switch
eth___
192.168.1.11
Control i/f
Data i/f
NodeB
GENI Rack

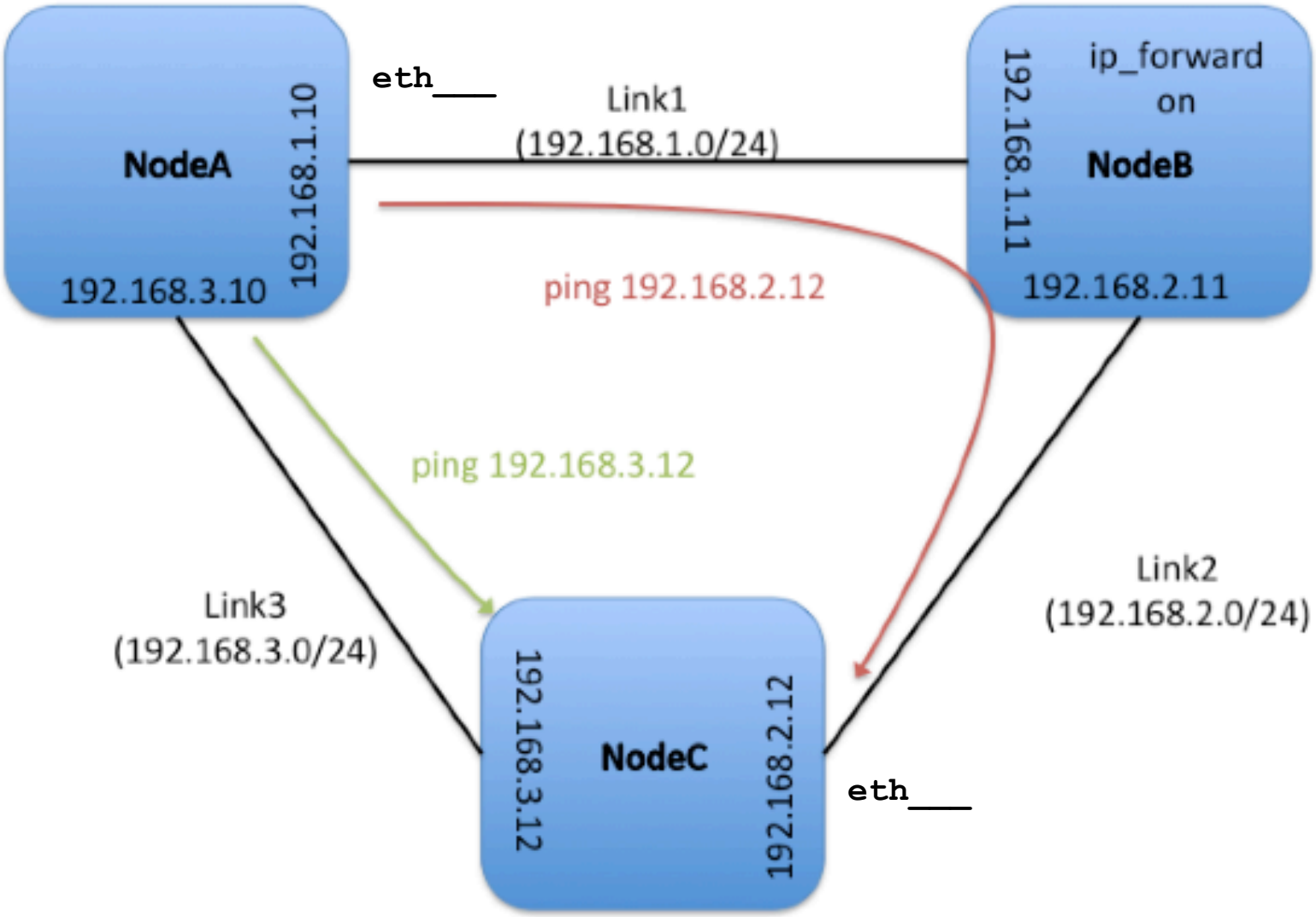
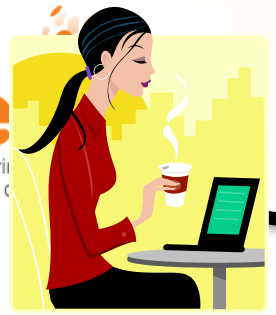
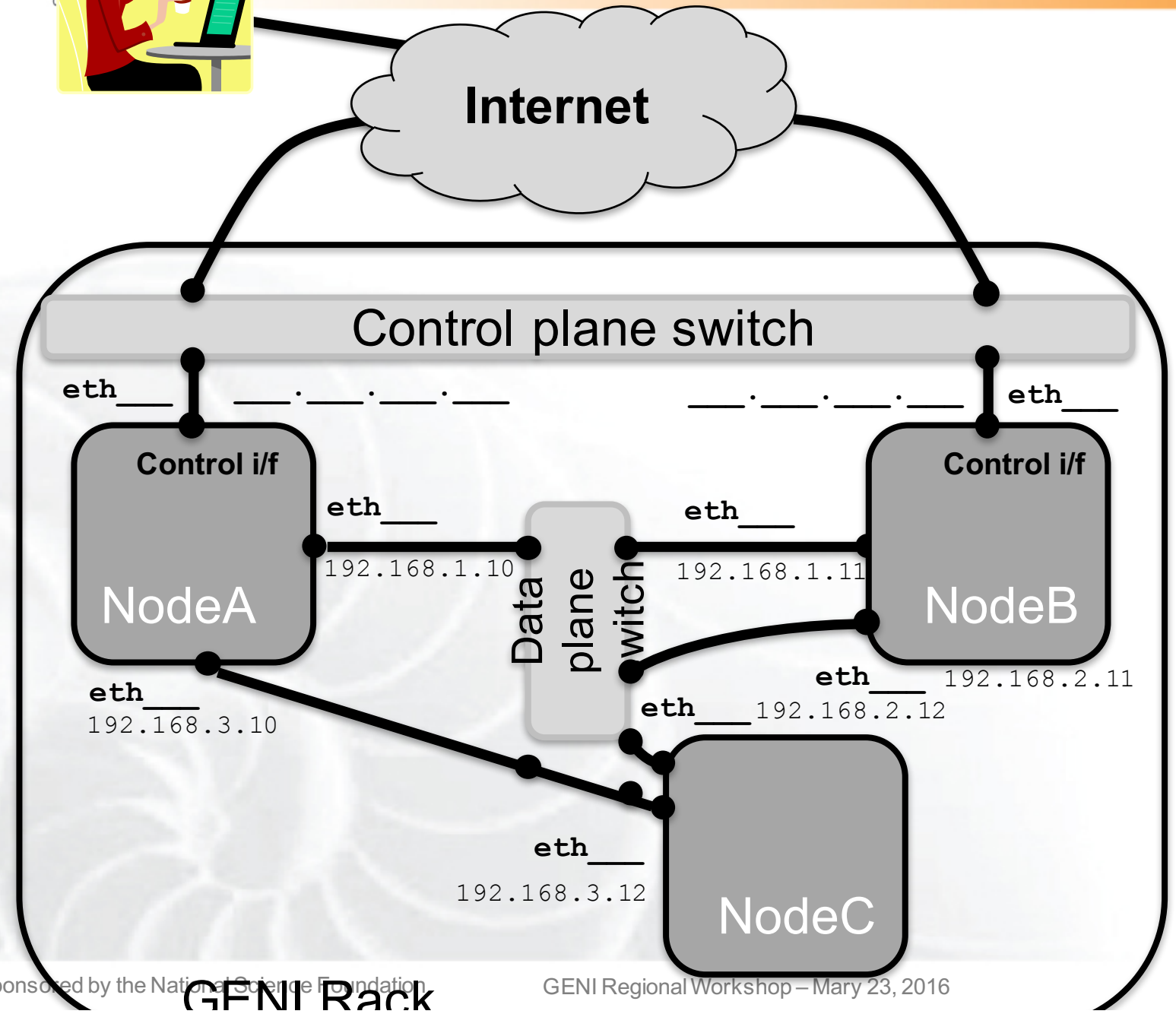
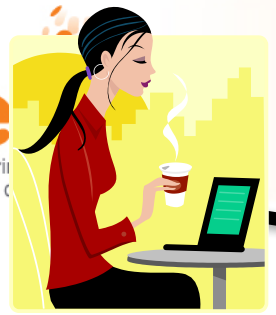
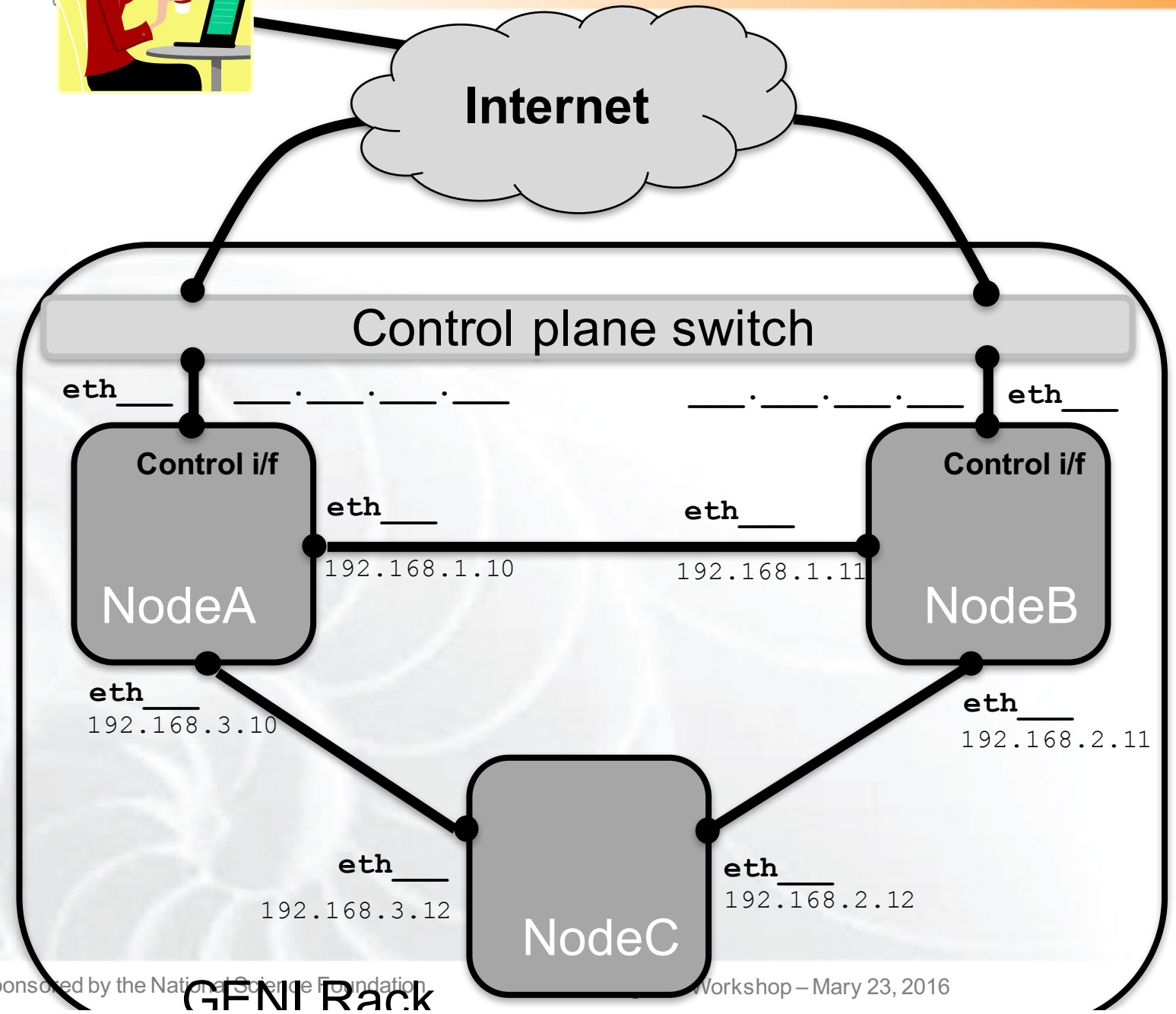


Figure 1 Topology and routing

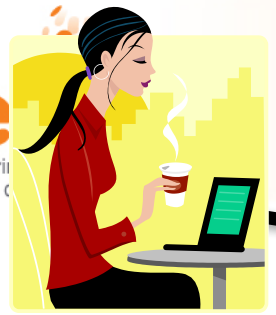


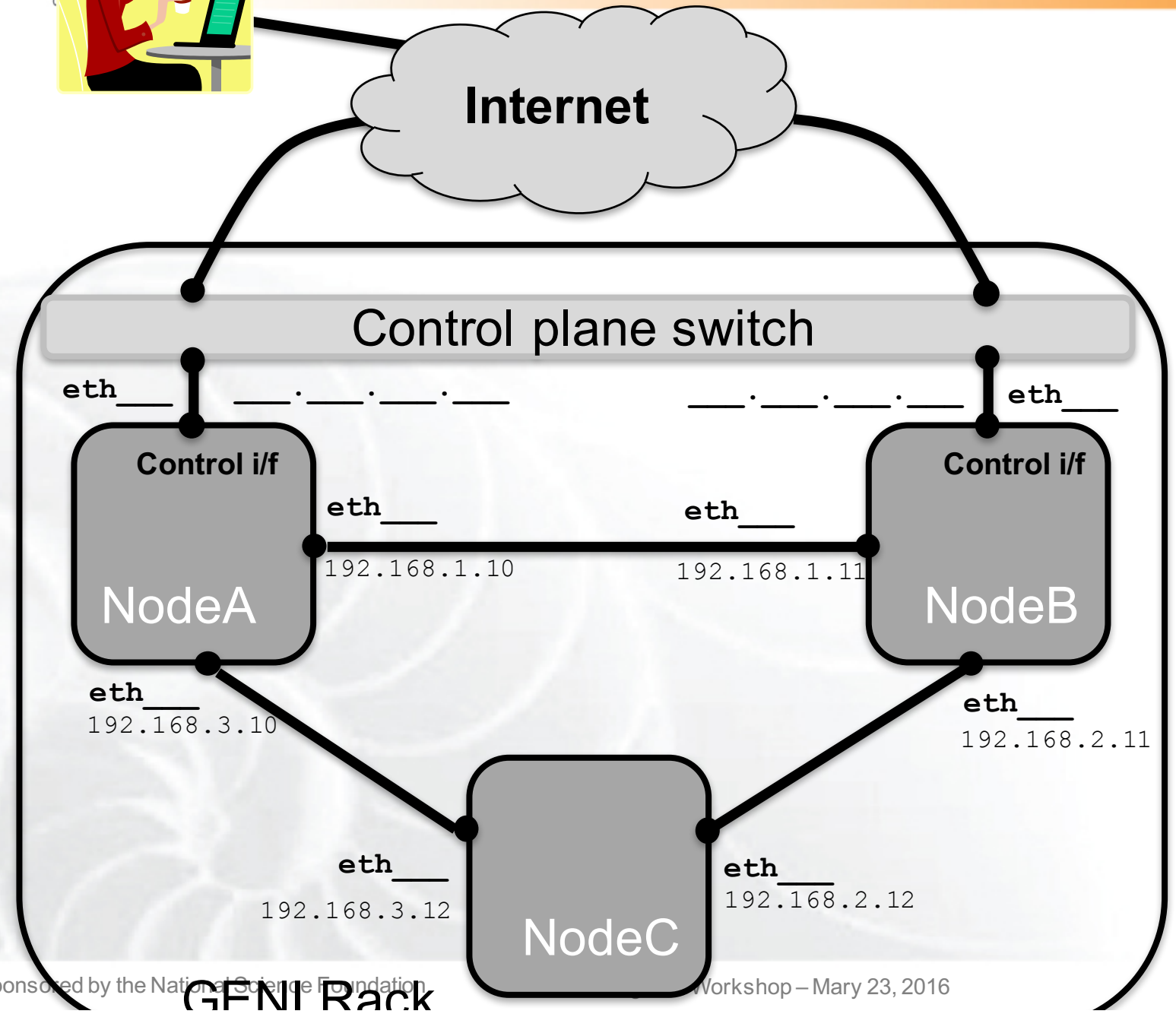

Internet
Control plane switch
eth___
___.___.___.___
___.___.___.___
eth___
Control i/f
Control i/f
eth___
192.168.1.10
eth___
192.168.1.11
NodeA
Data plane switch
NodeB
eth___
192.168.3.10
eth___
192.168.2.11
eth___
192.168.2.12
eth___
192.168.3.12
NodeC



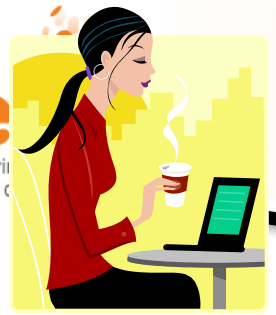


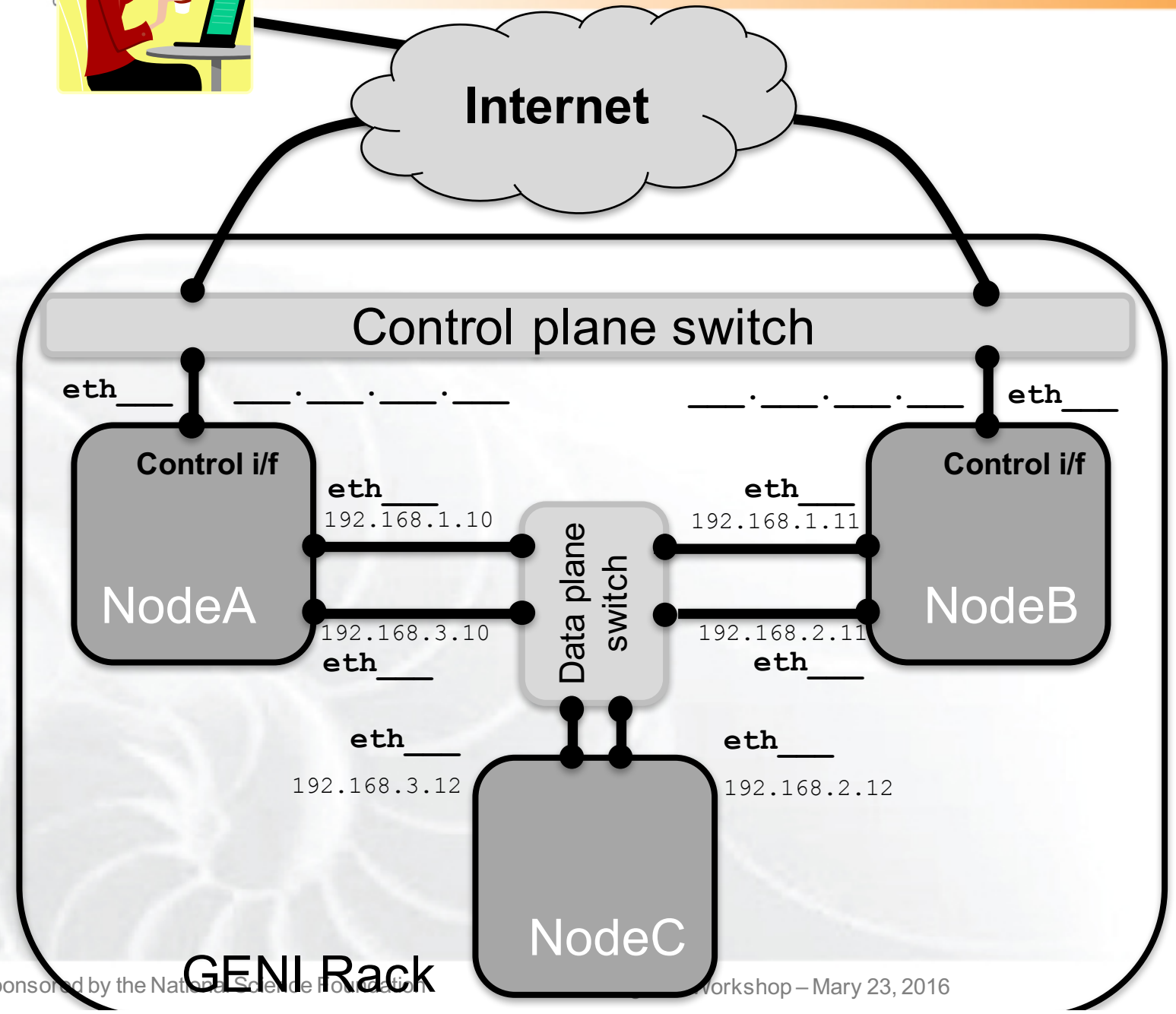
Data plan switc





Data plan switc




Internet
Control plane switch
eth___
___.___.___.___
___.___.___.___
eth___
Control i/f
NodeA
eth___
192.168.1.10
192.168.3.10
eth___
Data plane switch
eth___
192.168.1.11
192.168.2.11
eth___
Control i/f
NodeB
eth___
192.168.3.12
eth___
192.168.2.12
NodeC
GENI Rack