Iowa State University
Department of Electrical and Computer Engineering
Cpr E 489: Computer Networking and Data Communications
Lab Experiment #5
Introduction to GENI
(Total Points: 100)

Objective

To get familiar with GENI portal and perform and set up your profile for running the experiment.

Pre-Lab

Before the lab starts you need to create an account and login to the portal as follows:

a. Go to https://portal.geni.net/ press the **Use GENI** button and select your institution from the Drop-Down menu. *(**Tip:** start typing the name of Iowa State University and then select from the list.)*
b. You will be transferred to the Login Page of iastate.edu. Fill in your iastate **username** and **password**.

Lab Expectations

Work through the lab and let the TA know if you have any questions. After the lab, write up a lab report with your partner. Be sure to:

- summarize what you learned in a few paragraphs. (**20 points**)
- include your answers for all questions, with screenshots. (**20 points each**)

Your lab report is due at the beginning of the next lab.

Problem Description

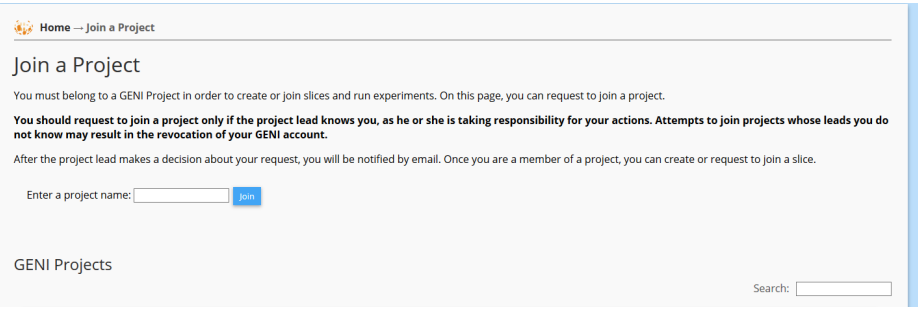
In this lab experiment, you are required to do the following:

1. Join a project through GENI portal and create a slice,
2. Generate and use a private SSH key.
3. Implement a simple experiment of one server and one client that are connected with a layer 2 link.

Procedure

1. Join a project and create a slice:

    a. After you log in through the GENI Portal website, click on **Projects**, then click on **Join Project**. On **Enter a project name** type: **CPRE_489_S20**. Then click **Join**
    ***Note**: Be sure that the Project lead is Daji Qiao*



b. After joining a project, you will be able to create a **Slice** (You can see the slice as your own experiment).

c. On the home page click on **slices** on top left corner for the website. Then click on **Create Slice**.

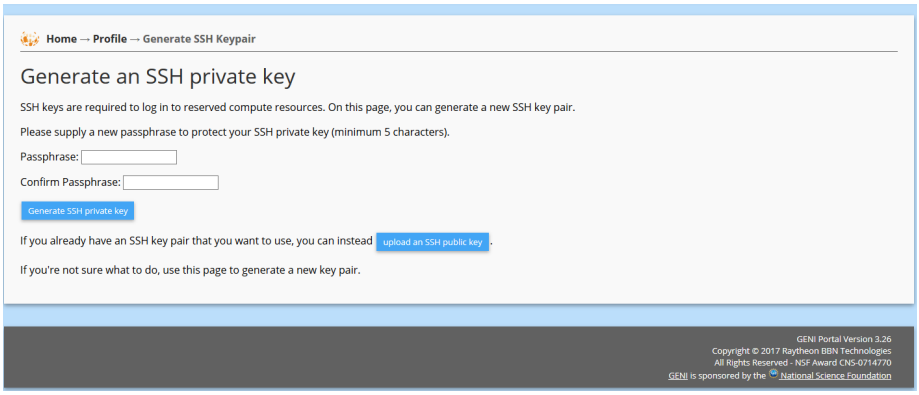
d. In the new window: name the slice **<YourLastName>-lab5**, then click on **Create Slice**

2. Generate and use a private SSH key.

a. On the top right corner click on your **profile** and choose **SSH Keys**.

b. On the new window click on **generate and download an SSH keypair**.

c. On the next window choose a passphrase for your SSH keypair (make sure that you remember the passphrase!), and click on **Generate SSH private key**



d. Download your Private SSH key onto your machine and store it under ~/.ssh/ as follows:

i. Open Terminal and if the directory does not exist, create it:
`mkdir ~/.ssh`

ii. Move the key to ~/.ssh/ :
`mv ~/Downloads/id_geni_ssh_rsa ~/.ssh/`

iii. Change the file permissions:
`chmod 700 ~/.ssh/id_geni_ssh_rsa`

3. Implement the Experiment:

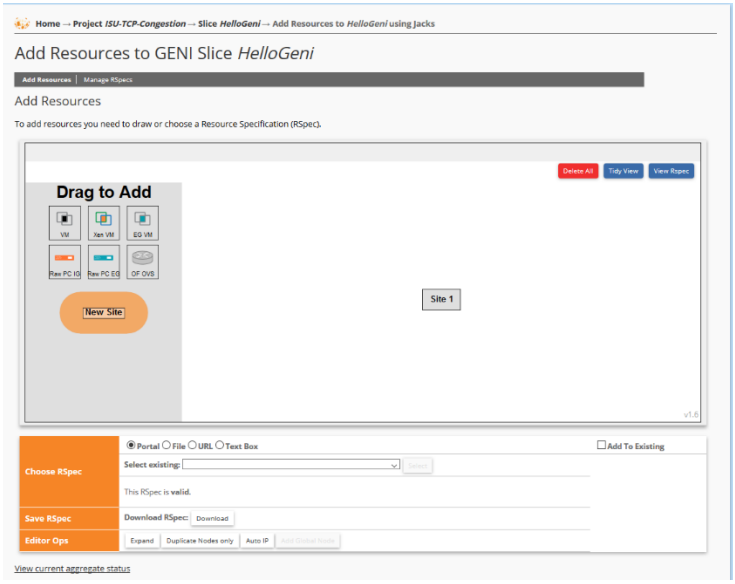
a. On the slice page, click on your **slice** and then click on the **Add Resources** button placed at the top part of the screen.

b. In the **Choose RSpec** section, choose the **Hello GENI** entry from **Select existing** entry. The selected RSpec file is stored in the Portal database.

c. You will need to choose an aggregate where you want this topology to be instantiated. Click on the **Site 28 box** and a panel on the left side of the canvas will appear. **Choose any aggregate with InstaGENI or ExoGENI in its name.**

d. Click on the **Reserve Resources button** on the bottom left part of the screen.

e. Wait while your resources are being reserved. **This will take several minutes so be patient.** The node statuses on the Home→Slice→Details screen will turn green (READY) to signify that your resources are ready.



4. Log in to your nodes (If you work from a Windows Machine, follow the steps in the Appendix A):

```
ssh -i <private key location> <username>@<hostname> -p <port>
```

For example:

```
ssh -i ~/.ssh/id_geni_ssh_rsa user@pcvm2-29.geni.it.cornell.edu -p 22
```

***Note**: If you are prompted for a password (instead of the passphrase you set for GENI) then something went wrong. Make sure that all the information is correct.*

   a. Open a terminal

   b. Run ssh (as above) and enter your passphrase when prompted

   c. To get the information you need, you can load your slice in the portal, and from the **Home tab** locate your slice and click on it to load it.

   d. Under the topology canvas, click the **Details button**. This page should have all the information you need.

5. Exercise: View Results:

For this experiment, GENI used the install script facility to automatically install the necessary software and kick-off the experiment. In this very simple setup, you have installed and launched a web server as well as an iperf server, on the server host. On the client, you have started some processes to test both of these services. To view the results of this experiment:

a. Log in to the server node following the steps in step 4. Get the control interface IP address by typing **ifconfig**. This IP address should be accessible from the internet. In a web browser, type the IP address found from ifconfig. (**20 points**)

b. Click the **Web Server Statistics** link to look at the statistics. Refresh the page a couple of times to see how the statistics change as the client requests documents. **Make sure you include a screenshot into your report.** (**20 points**)

c. Click the **Logs from the iperf Server** link to see the statistics from the iperf transfers. **Take a screen-shot of what you observe**. (**20 points**)

d. Then log in to the **client** node (note: it may use a port other than 22 – see GENI slice) and run this command:

```
iperf -c server -P 2
```

e. This task shouldn't take more than 30 seconds. Change the number after the "-P" argument and watch how the performance is affected while you change the number of parallel TCP connections. **Make sure you include a screenshot into your report.** (**20 points**)

6. Cleanup experiment:

After you are done with your experiment, you should always release your resources so that other experi-menters can use the resources. In order to cleanup your slice:

Press the **Delete** button in the bottom of the Manage Resources panel on the Slice page.

Wait a few moments for all the resources to be released and you will have an empty canvas again. Notice that your slice is still there. There is no way to delete a slice. It will be removed automatically after its expiration date, but remember that a slice is just an empty container, which doesn't take up any resources.

Appendix A: Logging in to your nodes from a Windows environment

1. Make sure that you have PuTTY installed on your machine and make sure you have a PuTTY version of the private key. You can download this from the Portal; look for SSH Keys under your name.
2. Run PuTTY.
3. On the Basic options screen, in the Host Name field enter: <username>@<hostname>
4. In the Port field enter the given port number
5. Make sure Connection type is: SSH
6. Under the settings categories on the left navigate to Connection-> SSH ->Auth.
    a) Next to the “Private key file for authentication” field at the bottom, click Browse… and select the private key file you saved to your computer, and click Open.
    b) Click Open to establish the SSH connection.
    c) If prompted about whether you trust the host (key not cached in registry), click Yes.
    d) When prompted for the Passphrase enter your passphrase.

If you see the shell command prompt, you have successfully logged-in to the node.