

Network Architecture-1

Project Report

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Creation of slice:

GENI Portal

Home Tools Partners Help Beemidi, Praveen Reddy (UMKC-Student)

Create New Slice

A GENI slice is a container for reserving and managing a set of GENI resources.

| | |
|-------------------|----------------------|
| Project name | NA-1-Spring16Course |
| Slice name | Praveen3 -- Required |
| Slice description | NA-1-project |

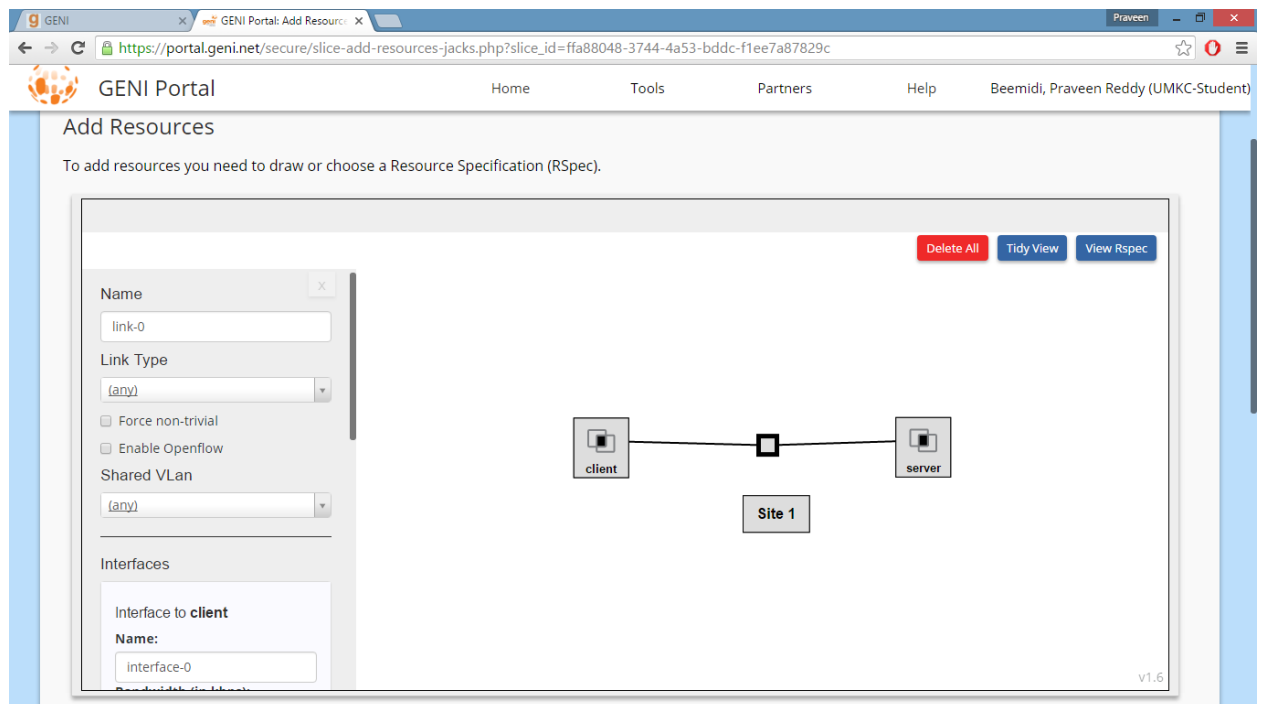
Note: Slice names must not contain whitespace. Use at most 19 alphanumeric characters or hyphen (no leading hyphen): "a-zA-Z0-9-".

Note: Slice names are public and must be unique across your project.

Create slice Cancel

GENI Portal Version 3.11
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GENI is sponsored by the National Science Foundation

Designing a topology (Adding Resources):



Configuration:

Choosing UMKC InstaGENI as Aggregate

The screenshot shows the GENI Portal interface. The top navigation bar includes 'Home', 'Tools', 'Partners', 'Help', and a user profile 'Beemidi, Praveen Reddy (UMKC-Student)'. The main heading is 'Add Resources'. Below it, a message states: 'To add resources you need to draw or choose a Resource Specification (RSpec).'

The central area contains a graphical editor. On the left, a sidebar has a 'Name' field with 'UMKC InstaGENI' and an 'Aggregate' dropdown menu also set to 'UMKC InstaGENI'. On the right, a diagram shows a 'client' node connected to a 'server' node via a line, with a box labeled 'UMKC InstaGENI' positioned below the connection. In the top right corner of the editor, there are three buttons: 'Delete All' (red), 'Tidy View' (blue), and 'View RSpec' (blue). The version 'v1.6' is noted in the bottom right corner of the editor area.

Reserve Resources:

The screenshot displays the 'Reserve Resources' section of the GENI Portal. The top navigation bar is identical to the previous screenshot. The main heading is 'Reserve Resources'. Below it, a message states: 'To reserve resources you need to draw or choose a Resource Specification (RSpec).'

The central area contains a form with several sections:

- Choose RSpec:** Includes a 'Select existing:' dropdown menu and a 'Select' button. Below this, it states 'This RSpec is valid and bound.'
- Save RSpec:** Includes a 'Download RSpec:' label and a 'Download' button.
- Editor Ops:** Includes buttons for 'Expand', 'Duplicate Nodes only', 'Auto IP', and 'Add Global Node'.

Below the form, there is a link: [View current aggregate status](#).

Three notes are provided:

- Note:** Use the 'Manage RSpecs' tab to add a permanent RSpec.
- Note:** You need to bind a request to a specific GENI site before reserving resources, you can do this in the graphical pane by clicking on the "Site X" icon.
- Note:** You can only add resources at aggregates where you do not yet have a reservation.

Another note follows:

Note: If you would like a Layer 2 link between sites, set the Link Type to "Stitched Ethernet". However, if you would like a Layer 2 link connecting only ExoGENI sites, instead set the Link Type to "(any)" and pick any two ExoGENI aggregates except "ExoGENI ExoSM".

At the bottom of the form, there are two buttons: 'Reserve Resources' (blue) and 'Cancel' (blue).

A final note is located below the form:

Note: To reserve FOAM or other non-compute resources, use the [Non Jacks Add Resources](#) page.

Manage Resources:

GENI Portal: Manage Resources

Slice: Praveen2
Project: NA-1-Spring16Course
Slice expires in 6 days
Project expires in 38 days

Resources on UMKC InstaGENI are ready.

server
client

Renew | Renew Date | Delete | SSH | Restart | Snapshot | Details | Add Resources | Expand

Resources Details:

GENI Portal: Aggregate UMKC InstaGENI's Resources:

Node #1:

| Status | Client ID | Component ID | Expiration | Type | Hostname |
|-------------|--|--------------|--------------------------|------------|--|
| READY | client | pc1 | 2016-04-18T23:59:58.000Z | default-vm | client.Praveen2.ch-geni-net.instageni.umkc.edu |
| Login | ssh hhgc77@pc1.instageni.umkc.edu -p 41274 ssh choib@pc1.instageni.umkc.edu -p 41274 ssh pbz89@pc1.instageni.umkc.edu -p 41274 | | | | |
| Interfaces | | MAC | Layer 3 | | |
| interface-0 | pc1:lo0 | 021fc81ee47f | ipv4: 10.10.1.1 | | |

Node #2:

| Status | Client ID | Component ID | Expiration | Type | Hostname |
|-------------|--|--------------|--------------------------|------------|--|
| READY | server | pc1 | 2016-04-18T23:59:58.000Z | default-vm | server.Praveen2.ch-geni-net.instageni.umkc.edu |
| Login | ssh hhgc77@pc1.instageni.umkc.edu -p 41275 ssh choib@pc1.instageni.umkc.edu -p 41275 ssh pbz89@pc1.instageni.umkc.edu -p 41275 | | | | |
| Interfaces | | MAC | Layer 3 | | |
| interface-1 | pc1:lo0 | 02842e57954b | ipv4: 10.10.1.2 | | |

Link #1:

| Client ID | Endpoint #0 | Endpoint #1 |
|-----------|-------------|-------------|
| link-0 | interface-0 | interface-1 |

ssh://pbz89@pc1.instageni.umkc.edu:41275

Downloading Puttey key:

The screenshot shows the GENI Portal profile page for Beemidi, Praveen Reddy (UMKC-Student). The page has a navigation bar with links for Home, Tools, Partners, Help, and the user's name. Below the navigation bar is a table with columns: Name, Description, Public Key, Private Key, PuTTY, Edit, and Delete. The table contains one row for 'id_geni_ssh_rsa', which is a 'Generated SSH keypair'. Below the table, there is a section titled 'On Linux and Mac systems and for most Windows SSH clients (not PuTTY), do:' followed by a list of instructions and terminal commands. The instructions include downloading the private key, moving it to the ~/.ssh/ directory, and changing permissions. The terminal commands are: `mkdir ~/.ssh`, `mv ~/Downloads/id_geni_ssh_rsa ~/.ssh/`, and `chmod 0600 ~/.ssh/id_geni_ssh_rsa`. The final instruction is to use the SSH command: `ssh -i ~/.ssh/id_geni_ssh_rsa [username]@[hostname] -p [port]`. Below this, there is a section for 'For PuTTY users:' which includes instructions to download the PuTTY key and create a new session. At the bottom of the page, there is a download bar showing the file 'id_geni_ssh_rsa (1).ppk' and a link to 'Show all downloads...'.

| Name | Description | Public Key | Private Key | PuTTY | Edit | Delete |
|--|-----------------------|-------------------------------------|--------------------------------------|------------------------------------|----------------------|------------------------|
| id_geni_ssh_rsa cd:92:04:0d:3e:40:2a:66:11:29:53:05:e3:6e:8b:c3 | Generated SSH keypair | Download Public Key | Download Private Key | Download PuTTY Key | Edit | Delete |

On Linux and Mac systems and for most Windows SSH clients (not PuTTY), do:

- Download your private key.
- On Windows, just point your SSH client (not PuTTY) to the downloaded private key.
- On Linux and Mac, open a terminal.
 - Store your key under ~/.ssh/ :
 - If the directory does not exist, create it:

```
mkdir ~/.ssh
```
 - Move the key to ~/.ssh/ :

```
mv ~/Downloads/id_geni_ssh_rsa ~/.ssh/
```
 - Change the file permissions:

```
chmod 0600 ~/.ssh/id_geni_ssh_rsa
```
- Your SSH command will be something like:

```
ssh -i ~/.ssh/id_geni_ssh_rsa [username]@[hostname] -p [port]
```

For PuTTY users:

- Download PuTTY key.
- In PuTTY, create a new session that uses the 'username', 'hostname' and 'port' for the resources you have reserved.

id_geni_ssh_rsa (1).ppk [Show all downloads...](#)

Client Putty Configuration:

The screenshot shows the PuTTY Configuration dialog box. The 'Category' list on the left includes Session, Logging, Terminal, Keyboard, Bell, Features, Window, Appearance, Behaviour, Translation, Selection, Colours, Connection, Data, Proxy, Telnet, Rlogin, SSH, Kex, Cipher, Auth, and TTY. The 'Session' category is selected. The 'Basic options for your PuTTY session' section contains the following fields: 'Host Name (or IP address)' with the value 'pbz89@pc1.instageni.umkc.edu', 'Port' with the value '41274', and 'Connection type' with 'SSH' selected. Below these fields is a section for 'Load, save or delete a stored session' with a 'Saved Sessions' list containing 'Default Settings', 'geni client', and 'geni server'. To the right of this list are 'Load', 'Save', and 'Delete' buttons. At the bottom, there is a 'Close window on exit:' section with 'Only on clean exit' selected. The 'Open' button is highlighted.

PuTTY Configuration

Category:

- Session
- Logging
- Terminal
 - Keyboard
 - Bell
 - Features
- Window
 - Appearance
 - Behaviour
 - Translation
 - Selection
 - Colours
- Connection
 - Data
 - Proxy
 - Telnet
 - Rlogin
 - SSH
 - Kex
 - Cipher
 - Auth
 - TTY

Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address) Port

pbz89@pc1.instageni.umkc.edu 41274

Connection type:

☐ Raw ☐ Telnet ☐ Rlogin ☒ SSH ☐ Serial

Load, save or delete a stored session

Saved Sessions

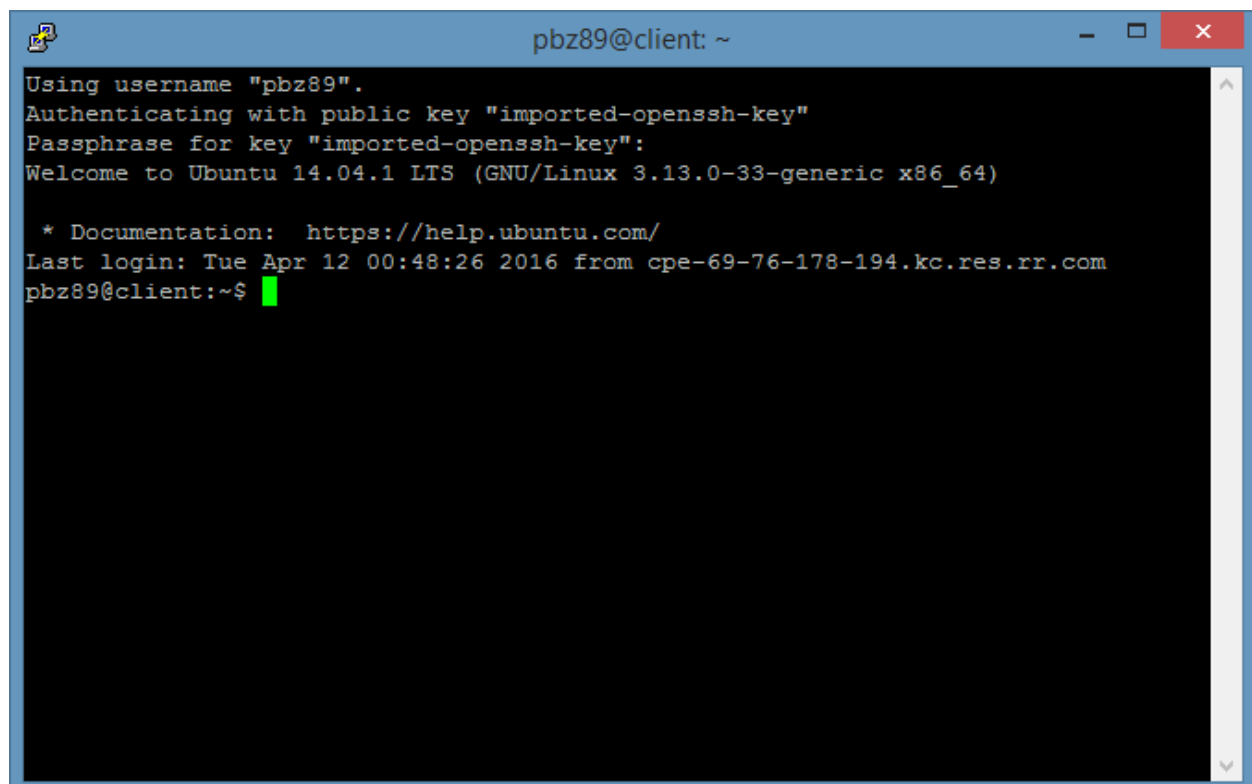
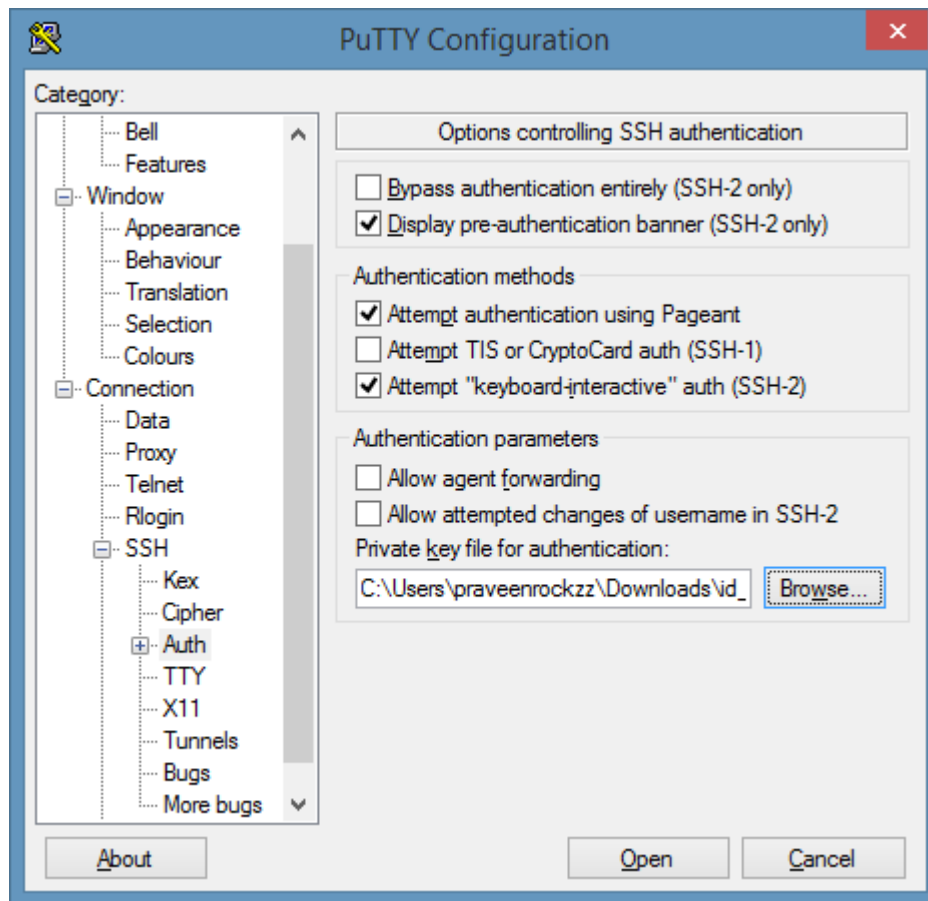
Default Settings
geni client
geni server

Load Save Delete

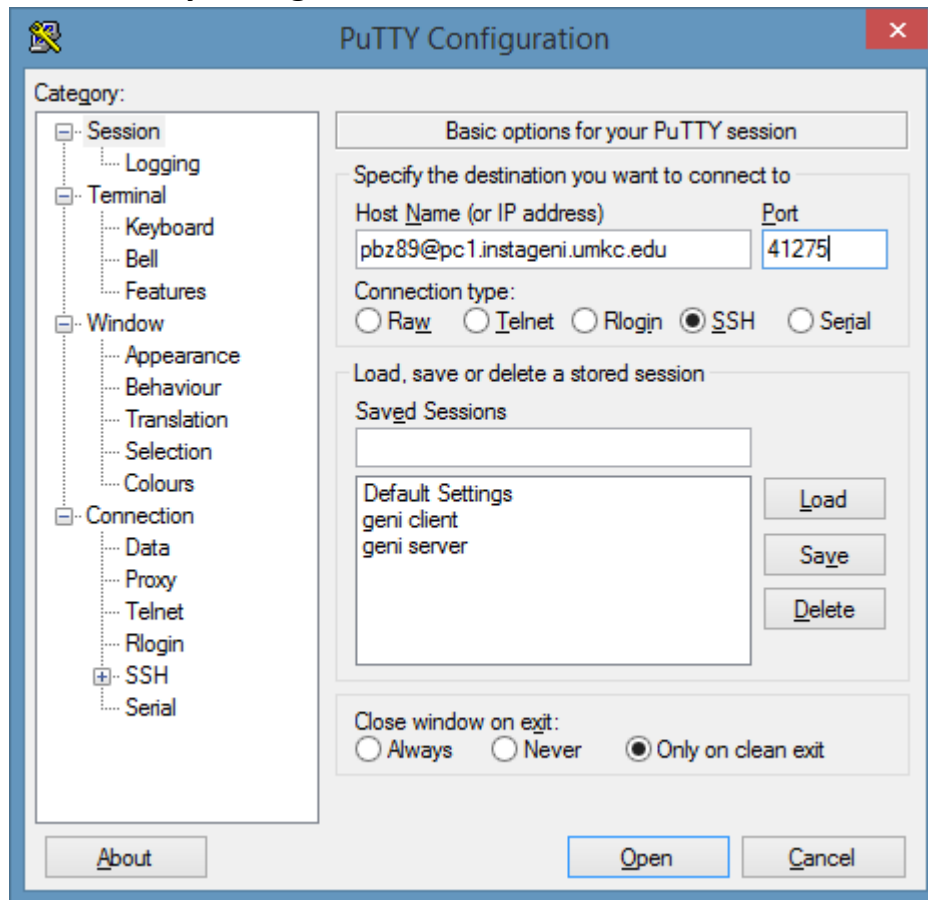
Close window on exit:

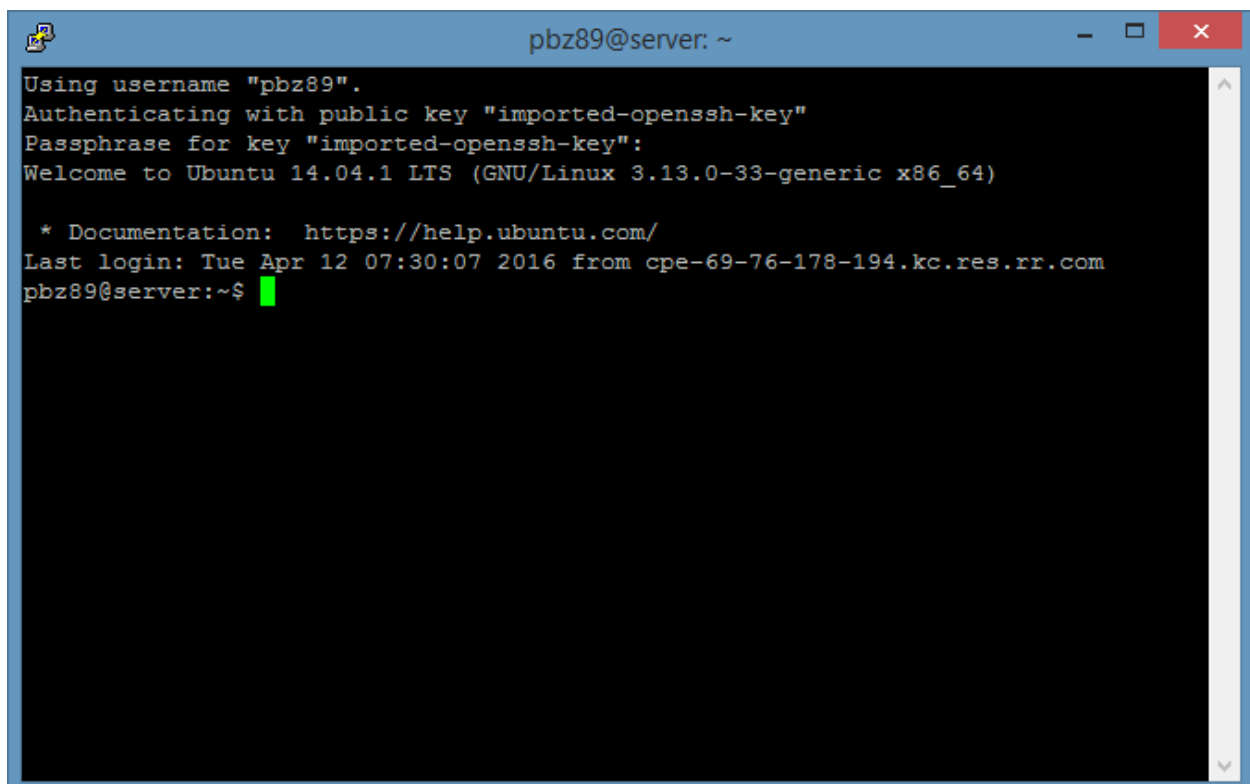
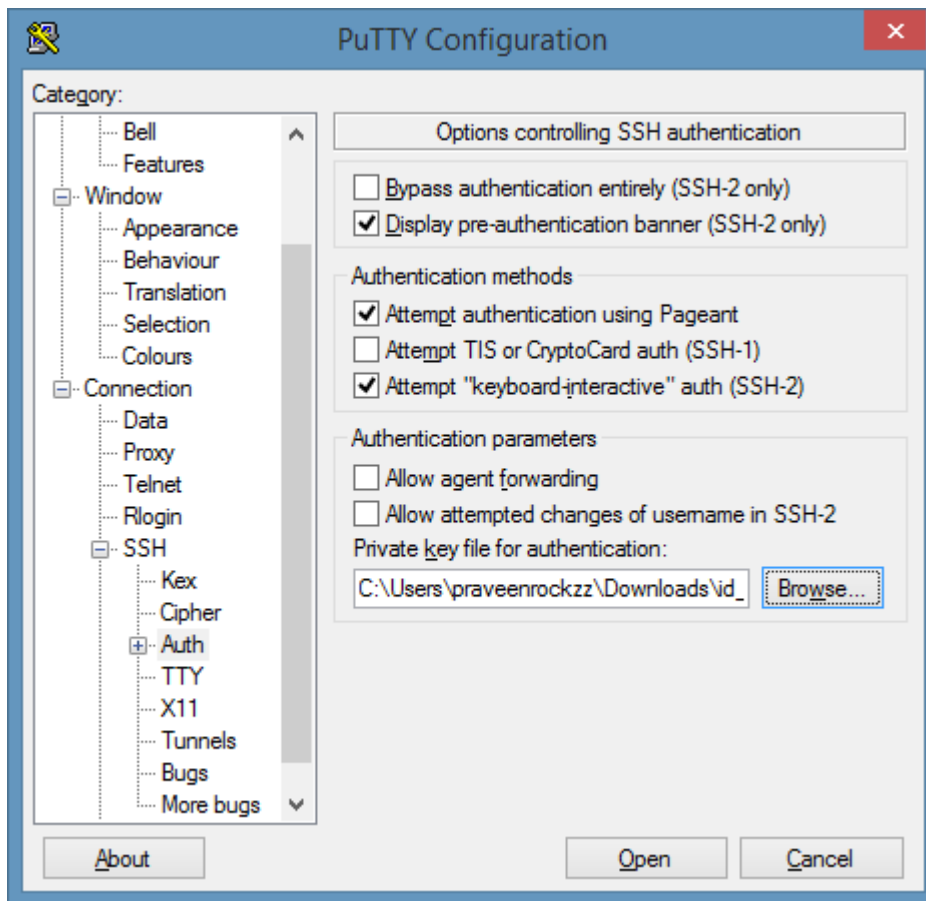
☐ Always ☐ Never ☒ Only on clean exit

About Open Cancel



Server Putty Configuration:





Part-1

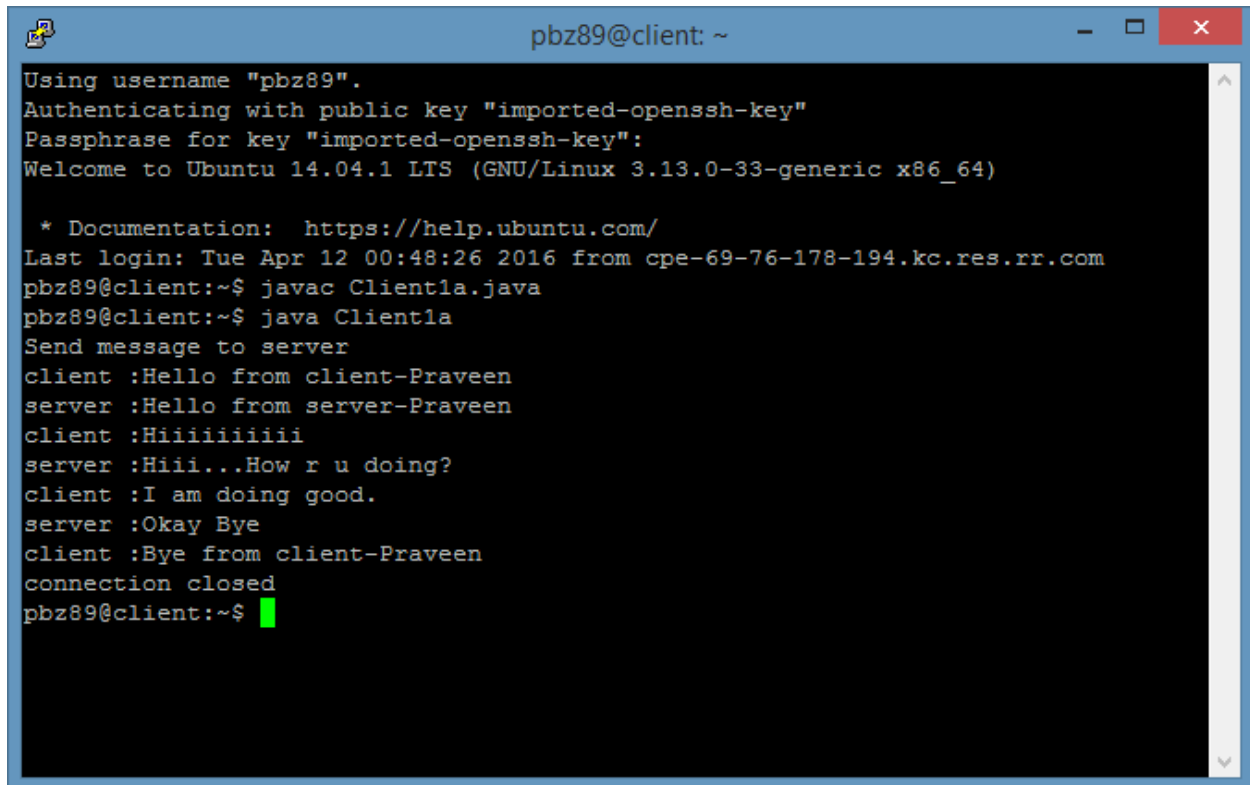
GENI/ Socket Programming

1. a. Start from client messages "hello from client-your name" and server responses with "Hello from server- your name". Then messages from each side are echoed to each other. Should quit the program by typing "Bye from client-your name" and "Bye from server- your name"

Source Files:

Client1a.java

Server1a.java



```
pbz89@client: ~  
Using username "pbz89".  
Authenticating with public key "imported-openssh-key"  
Passphrase for key "imported-openssh-key":  
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-33-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com/  
Last login: Tue Apr 12 00:48:26 2016 from cpe-69-76-178-194.kc.res.rr.com  
pbz89@client:~$ javac Client1a.java  
pbz89@client:~$ java Client1a  
Send message to server  
client :Hello from client-Praveen  
server :Hello from server-Praveen  
client :Hiiiiiiiiiii  
server :Hiii...How r u doing?  
client :I am doing good.  
server :Okay Bye  
client :Bye from client-Praveen  
connection closed  
pbz89@client:~$
```

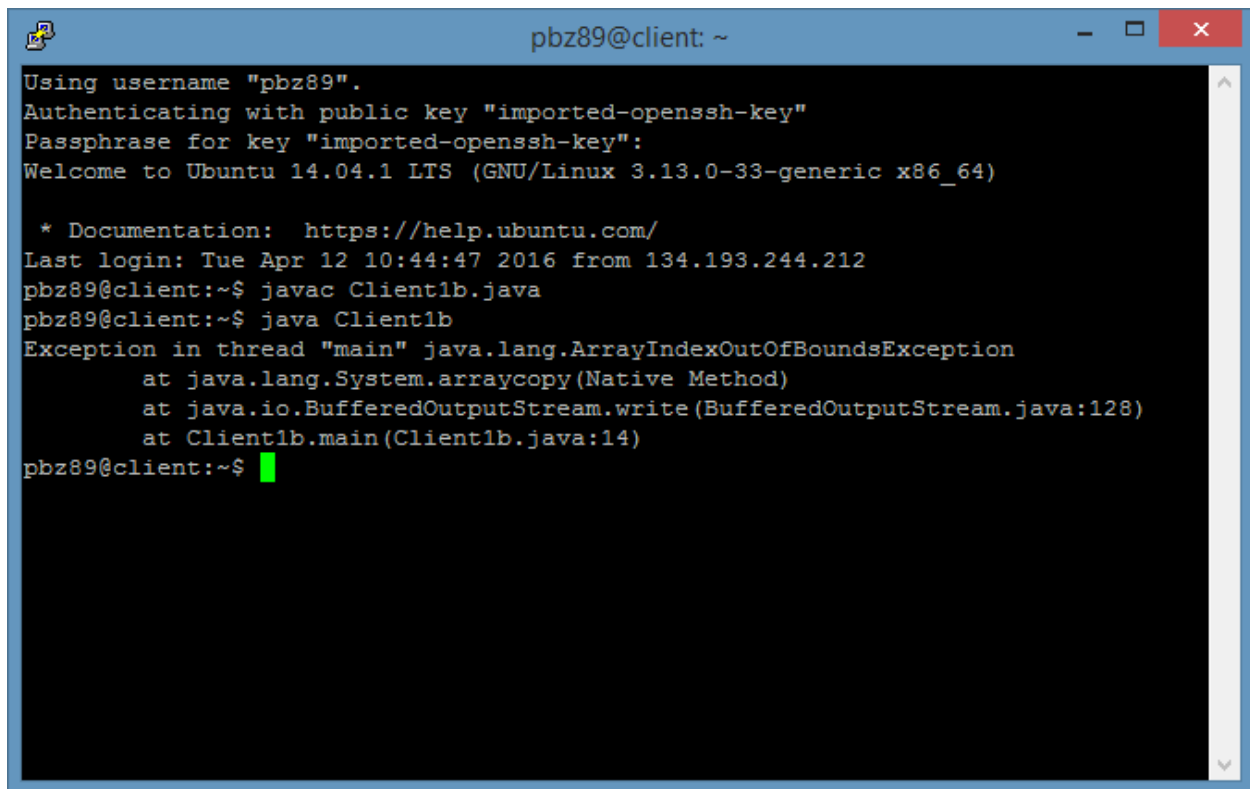
```
pbz89@server: ~  
Passphrase for key "imported-openssh-key":  
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-33-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com/  
Last login: Tue Apr 12 07:30:07 2016 from cpe-69-76-178-194.kc.res.rr.com  
pbz89@server:~$ javac Client1a.java  
pbz89@server:~$ java Server1b  
^Z  
[1]+  Stopped                  java Server1b  
pbz89@server:~$ javac Server1a.java  
  
pbz89@server:~$  
pbz89@server:~$ javac Server1a.java  
pbz89@server:~$ java Server1a  
waiting for message from client  
client :Hello from client-Praveen  
Server :Hello from server-Praveen  
client :Hiiiiiiiiiii  
Server :Hiii...How r u doing?  
client :I am doing good.  
Server :Okay Bye  
client :Bye from client-Praveen  
server :Okay bye  
pbz89@server:~$
```

1.b. Send a text file (>10kb) to a server

Source Files:

Client1b.java Server1b.java

```
pbz89@server: ~  
-Gangetic Plain from 606 to 647 CE, attempted to expand southwards, he was defeated by the Chalukya ruler of the Deccan.[67] When his successor attempted to expand eastwards, he was defeated by the Pala king of Bengal.[67] When the Chalukyas attempted to expand southwards, they were defeated by the Pallavas from farther south, who in turn were opposed by the Pandyas and the Cholas from still farther south.[67] No ruler of this period was able to create an empire and consistently control lands much beyond his core region.[66] During this time, pastoral peoples whose land had been cleared to make way for the growing agricultural economy were accommodated within caste society, as were new non-traditional ruling classes.[68] The caste system consequently began to show regional differences.[68]  
  
In the 6th and 7th centuries, the first devotional hymns were created in the Tamil language.[69] They were imitated all over India and led to both the resurgence of Hinduism and the development of all modern languages of the subcontinent.[69] Indian royalty, big and small, and the temples they patronised, drew citizens in great numbers to the capital cities, which became economic hubs as well.[70] Temple towns of various sizes began to appear everywhere as India underwent another urbanisation.[70] By the 8th and 9th centuries, the effects were felt in South-East Asia, as South Indian culture and political systems were exported to lands that became part of modern-day Myanmar, Thailand, Laos, Cambodia, Vietnam, Philippines, Malaysia, and Java.[71] Indian merchants, scholars, and sometimes armies were involved in this transmission; South-East Asians took the initiative as well, with many sojourning in Indian seminaries and translating Buddhist and Hindu texts into their languages.[71]  
  
After the 10th century, Muslim Central Asian nomadic clans, using swift-horse cavalry and raising vast armies united by ethnicity and religion, repeatedly overran South Asia's north-western plains, leading eventually to the establishment of the Islamic Delhi Sultanate in 1206.[72] The sultanate was to control much of North India, and to make many forays into South India. Although at first disruptive for the Indian elites, the sultanate largely left its vast non-Muslim subject population to its own laws and customs.[73][74] By repeatedly repulsing Mongol raiders in the 13th century, the sultanate saved India from the devastation visited on West and Central Asia, setting the scene for centuries of migration of fleeing soldiers, learned men, mystics, traders, artists, and artisans from that region into the subcontinent, thereby creating a syncretic Indo-Islamic culture in the north.[75][76] The sultanate's raiding and weakening of the regional kingdoms of South India paved the way for the indigenous Vijayanagara Empire.[77] Embracing a strong Shaivite tradition and building upon the military technology of the sultanate, the empire came to control much of peninsular India,[78] and was to influence South Indian society for long afterwards.[77]  
  
Salt Lake Stadium (Kolkata), DY Patil Stadium (Navi Mumbai), Feroz Shah Zafar Stadium (Lahore), Jawaharlal Nehru Stadium (Delhi), Indira Gandhi Athletic Stadium (Guwahati).[1]
```



A terminal window titled "pbz89@client: ~" with standard window controls. The terminal output shows an SSH login process for user "pbz89" on Ubuntu 14.04.1 LTS. After successful authentication, the user runs "javac Client1b.java" and "java Client1b". The second command results in a "java.lang.ArrayIndexOutOfBoundsException" with a stack trace pointing to "Client1b.java:14".

```
pbz89@client: ~  
Using username "pbz89".  
Authenticating with public key "imported-openssh-key"  
Passphrase for key "imported-openssh-key":  
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-33-generic x86_64)  
  
 * Documentation:  https://help.ubuntu.com/  
Last login: Tue Apr 12 10:44:47 2016 from 134.193.244.212  
pbz89@client:~$ javac Client1b.java  
pbz89@client:~$ java Client1b  
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException  
    at java.lang.System.arraycopy(Native Method)  
    at java.io.BufferedOutputStream.write(BufferedOutputStream.java:128)  
    at Client1b.main(Client1b.java:14)  
pbz89@client:~$
```

Part-2

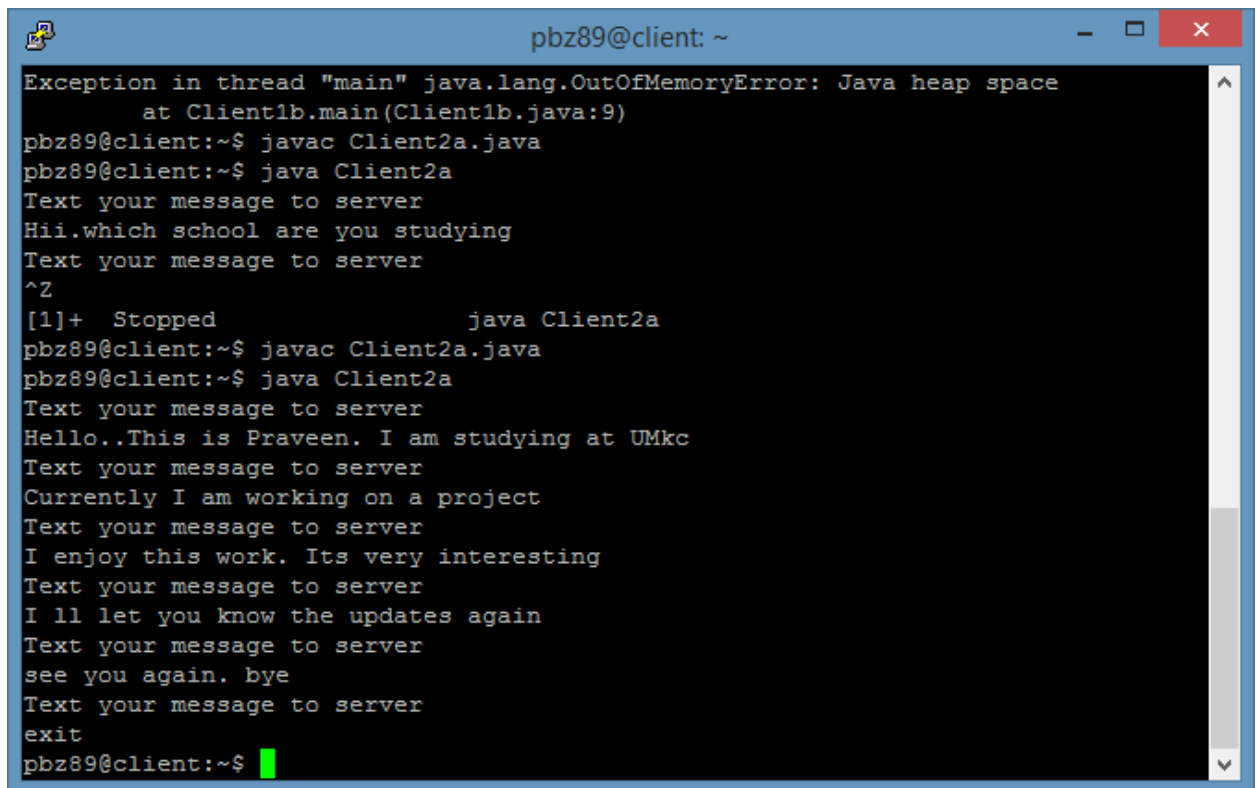
2. a. A chat server will accept a single client connection and display everything the client types. If the client user types exit both client and server will end the program.

Source Files:

Client2a.java

Server2a.java

Client:



```
pbz89@client: ~
Exception in thread "main" java.lang.OutOfMemoryError: Java heap space
    at Client1b.main(Client1b.java:9)
pbz89@client:~$ javac Client2a.java
pbz89@client:~$ java Client2a
Text your message to server
Hii.which school are you studying
Text your message to server
^Z
[1]+  Stopped                  java Client2a
pbz89@client:~$ javac Client2a.java
pbz89@client:~$ java Client2a
Text your message to server
Hello..This is Praveen. I am studying at UMkc
Text your message to server
Currently I am working on a project
Text your message to server
I enjoy this work. Its very interesting
Text your message to server
I ll let you know the updates again
Text your message to server
see you again. bye
Text your message to server
exit
pbz89@client:~$
```

Server:

```
pbz89@server: ~
the sultanate, the empire came to control much of peninsular India,[78] and was
to influence South Indian society for long afterwards.[77]

Salt Lake Stadium (Kolkata), DY Patil Stadium (Navi Mumbai), Fatorda Stadium (M
argao), Jawaharlal Nehru Stadium (Delhi), Indira Gandhi Athletic Stadium (Guwaha
ti).[1]
^Z
[3]+ Stopped          java Server1b
pbz89@server:~$ javac Server2a.java
pbz89@server:~$ java Server2a
Client typed Hii.which school are you studying
UMKC
^Z
[4]+ Stopped          java Server2a
pbz89@server:~$ javac Server2a.java
pbz89@server:~$ java Server2a
Client typed Hello..This is Praveen. I am studying at UMkc
Client typed Currently I am working on a project
Client typed I enjoy this work. Its very interesting
Client typed I ll let you know the updates again
Client typed see you again. bye
Client texted you
exit
pbz89@server:~$ █
```

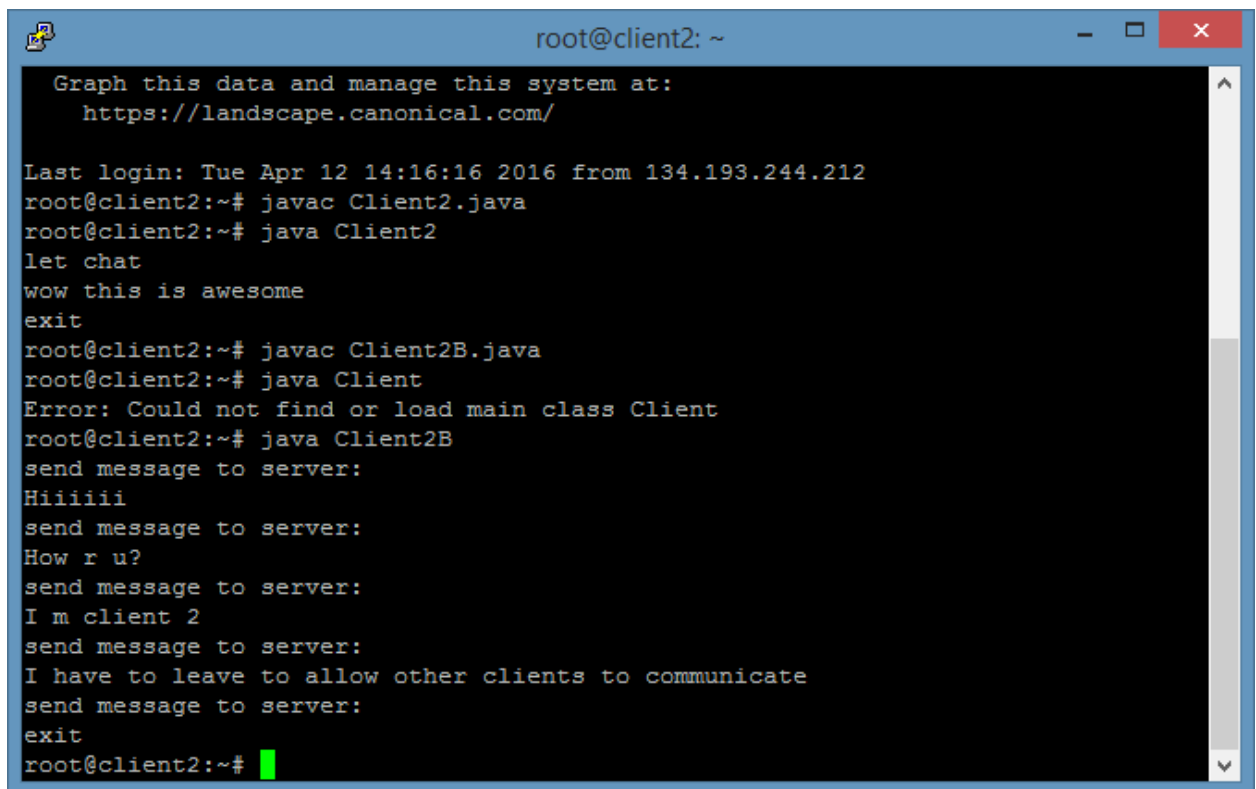
2.b. A server now remains open for additional connection once a client quits. The server can handle atmost one connection at a time.

Source Files:

Client2B.java

Server2B.java

Client 2:

A terminal window titled 'root@client2: ~' with standard window controls. The terminal output shows the execution of a Java program. It starts with a system message about Canonical Landscape, followed by the user logging in. The user runs 'javac Client2B.java' and 'java Client2B'. The program then enters a loop where it sends messages to a server. The messages are: 'let chat', 'wow this is awesome', 'exit', 'Hiiiiiii', 'How r u?', 'I m client 2', and 'I have to leave to allow other clients to communicate'. Each message is preceded by 'send message to server:'. The program ends with 'exit' and returns to the shell prompt 'root@client2:~#'.

```
root@client2: ~
Graph this data and manage this system at:
https://landscape.canonical.com/

Last login: Tue Apr 12 14:16:16 2016 from 134.193.244.212
root@client2:~# javac Client2B.java
root@client2:~# java Client2
let chat
wow this is awesome
exit
root@client2:~# javac Client2B.java
root@client2:~# java Client
Error: Could not find or load main class Client
root@client2:~# java Client2B
send message to server:
Hiiiiiii
send message to server:
How r u?
send message to server:
I m client 2
send message to server:
I have to leave to allow other clients to communicate
send message to server:
exit
root@client2:~#
```

Client 1:

```
root@client1: ~
root@client1:~# javac Client1
error: Class names, 'Client1', are only accepted if annotation processing is explicitly requested
1 error
root@client1:~# javac Client1.java
^[[Aroot@client1:~# java Client1
^Z
[1]+  Stopped                  java Client1
root@client1:~# javac Client1.java
root@client1:~# java Client1
hiiiiii
exit
root@client1:~# javac Client2B.java
root@client1:~# java Client2B
send message to server:
Hell0000000
send message to server:
this is client1
send message to server:
I have been waiting for a while
send message to server:
Now I got my chance after other client closed his communication
send message to server:
█
```

Server:

```
root@server: ~
lo          Link encap:Local Loopback
            inet addr:127.0.0.1  Mask:255.0.0.0
            inet6 addr: ::1/128 Scope:Host
            UP LOOPBACK RUNNING  MTU:65536  Metric:1
            RX packets:0 errors:0 dropped:0 overruns:0 frame:0
            TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
            collisions:0 txqueuelen:0
            RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@server:~# javac Server2B.java
root@server:~# java Server2B
Server started : ServerSocket[addr=0.0.0.0/0.0.0.0,localport=20000]
Client accepted:
Hiiiiiii
How r u?
I m client 2
I have to leave to allow other clients to communicate
exit
Client accepted:
Hell0000000
Tthis is client1
I have been waiting for a while
Now I got my chance after other client closed his communication
█
```

2.c. A server now can handle multiple clients at the same time. The output from all connected clients will appear on servers screen.

Source Files:

Client1.java

Client2.java

Server2.java

SThread.java

Topology:

The screenshot displays the GENI Portal web interface. At the top, there's a navigation bar with links for Home, Tools, Partners, Help, and a user profile for Beemidi, Praveen Reddy (UMKC-Student). Below this, a status bar indicates the current slice: 'Slice: Praveen5' and 'Project: NA-1-Spring16Course', with expiration dates of 6 days for the slice and 38 days for the project. A 'Manage Resources' section shows a network topology diagram. The diagram consists of three green boxes: 'client1', 'client2', and 'server'. 'client1' and 'client2' are connected to each other, and both are connected to the 'server'. Below the diagram is a control bar with buttons for 'Renew', 'Renew Date', 'Delete', 'SSH', 'Restart', 'Snapshot', 'Details', 'Add Resources', and 'Expand'. The footer of the page contains version information: 'GENI Portal Version 3.11', copyright notice for 2016 Raytheon BBN Technologies, and a reference to NSF Award CNS-0714770.

Resource Details:

GENI Portal

Home Tools Partners Help Beemidi, Praveen Reddy (UMKC-Student)

Results

Resources requested from RSpec:

Note that the results are current as of the finish time. Your resource allocation may have changed after this time if resources expired or were deleted. Check the [slice page](#) for the most up-to-date results about your slice's current allocated resources.

Node #1 (at Wayne State ExoGENI):

| Status | Client ID | Component ID | Expiration | Type | Hostname |
|-------------|-----------|------------------------|---------------------------|----------|-----------------|
| Unknown | server | wsuvmite:orca-vm-cloud | 2016-04-19T17:55:37+00:00 | xo.small | (not specified) |
| Interfaces | | MAC | | Layer 3 | |
| interface-3 | | | | | |
| interface-1 | | | | | |

Node #2 (at Wayne State ExoGENI):

| Status | Client ID | Component ID | Expiration | Type | Hostname |
|-------------|-----------|------------------------|---------------------------|----------|-----------------|
| Unknown | client2 | wsuvmite:orca-vm-cloud | 2016-04-19T17:55:37+00:00 | xo.small | (not specified) |
| Interfaces | | MAC | | Layer 3 | |
| interface-2 | | | | | |

Node #3 (at Wayne State ExoGENI):

| Status | Client ID | Component ID | Expiration | Type | Hostname |
|------------|-----------|------------------------|---------------------------|----------|-----------------|
| Unknown | client1 | wsuvmite:orca-vm-cloud | 2016-04-19T17:55:37+00:00 | xo.small | (not specified) |
| Interfaces | | MAC | | Layer 3 | |
| | | | | | |

Client1:

```
root@client1: ~  
  
System load: 0.0          Processes:           81  
Usage of /: 14.2% of 10.80GB Users logged in:    1  
Memory usage: 10%        IP address for eth0: 10.103.0.2  
Swap usage: 0%  
  
Graph this data and manage this system at:  
https://landscape.canonical.com/  
  
Last login: Tue Apr 12 14:15:24 2016 from 134.193.244.212  
root@client1:~# javac Client1.java  
root@client1:~# javac Client1  
error: Class names, 'Client1', are only accepted if annotation processing is explicitly requested  
1 error  
root@client1:~# javac Client1.java  
^[Aroot@client1:~# java Client1  
^Z  
[1]+  Stopped                  java Client1  
root@client1:~# javac Client1.java  
root@client1:~# java Client1  
hiiiiii  
exit  
root@client1:~#
```

Client2:

```
root@client2: ~
Using username "root".
Authenticating with public key "imported-openssh-key"
Passphrase for key "imported-openssh-key":
Welcome to Ubuntu 14.04.3 LTS (GNU/Linux 3.13.0-68-generic x86_64)

 * Documentation:  https://help.ubuntu.com/

System information as of Tue Apr 12 14:43:14 EDT 2016

System load:  0.0               Processes:            81
Usage of /:   14.2% of 10.80GB   Users logged in:     1
Memory usage: 10%              IP address for eth0: 10.103.0.3
Swap usage:   0%

Graph this data and manage this system at:
https://landscape.canonical.com/

Last login: Tue Apr 12 14:16:16 2016 from 134.193.244.212
root@client2:~# javac Client2.java
root@client2:~# java Client2
let chat
wow this is awesome
exit
root@client2:~#
```

Server:

```
root@server: ~
symbol:  class Server
location: class Server2
4 errors
root@server:~# javac Server2.java
Server2.java:51: error: cannot find symbol
    Server server =new Server();
                   ^
symbol:  class Server
location: class Server2
Server2.java:51: error: cannot find symbol
    Server server =new Server();
                   ^
symbol:  class Server
location: class Server2
2 errors
root@server:~# javac Server2.java
root@server:~# java Server2
hiiiiii
let chat
wow this is awesome
exit
exit
```

2.d.

Source Files:

Client2d.java

Client2dThread.java

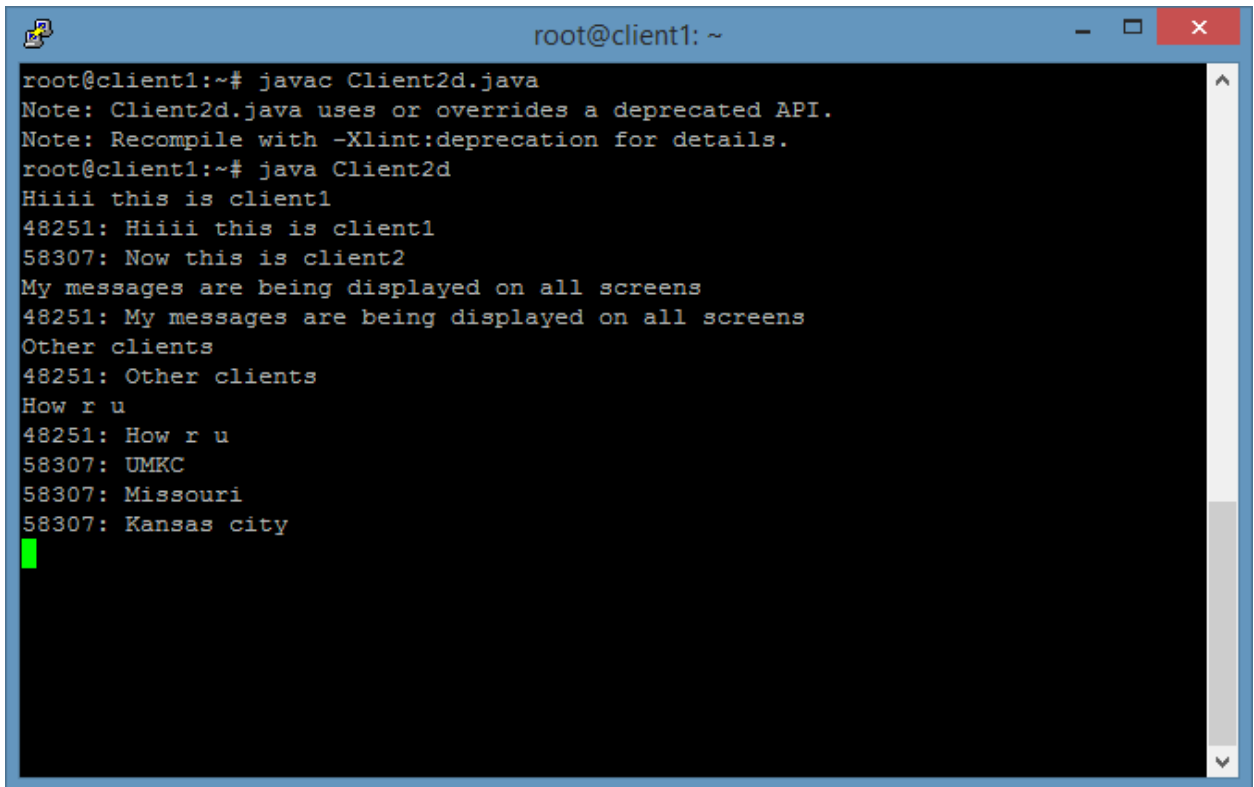
Client2d2.java

Client2dThread2.java

Server.java

ServerThread.java

Client1:



```
root@client1: ~
root@client1:~# javac Client2d.java
Note: Client2d.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
root@client1:~# java Client2d
Hiiii this is client1
48251: Hiiii this is client1
58307: Now this is client2
My messages are being displayed on all screens
48251: My messages are being displayed on all screens
Other clients
48251: Other clients
How r u
48251: How r u
58307: UMKC
58307: Missouri
58307: Kansas city
```

Client2:

```
root@client2: ~  
root@client2:~# javac Client2d2.java  
Note: Client2d2.java uses or overrides a deprecated API.  
Note: Recompile with -Xlint:deprecation for details.  
root@client2:~# java Client2d2  
48251: Hiiii this is client1  
Now this is client2  
58307: Now this is client2  
48251: My messages are being displayed on all screens  
48251: Other clients  
48251: How r u  
UMKC  
58307: UMKC  
Missouri  
58307: Missouri  
Kansas city  
58307: Kansas city  
█
```

Server:

```
root@server: ~  
root@server:~# javac Server.java  
Note: Server.java uses or overrides a deprecated API.  
Note: Recompile with -Xlint:deprecation for details.  
root@server:~# java Server  
Hiiii this is client1  
Now this is client2  
My messages are being displayed on all screens  
Other clients  
How r u  
UMKC  
Missouri  
Kansas city  
█
```

