Network Architecture I

Project Report

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Introduction:

In this project, we have developed a simple TCP client and server programs using GENI for simple message exchanges and simple file transfers.

Initial setup:

- Geni account creation
- Slice creation
- Resource allocation.

Part I: GENI/Socket programming Warm-up

- Client and server java code
- Initial lookup for part 2.

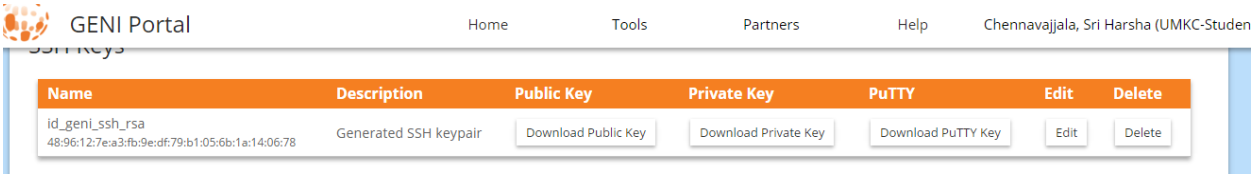
Requirements:

- Geni account and a slice to add resources where we can work on.
- SSH Keypairs for logging in to nodes and running scripts.
- Java scripts for communication between client and server.

Steps involved:

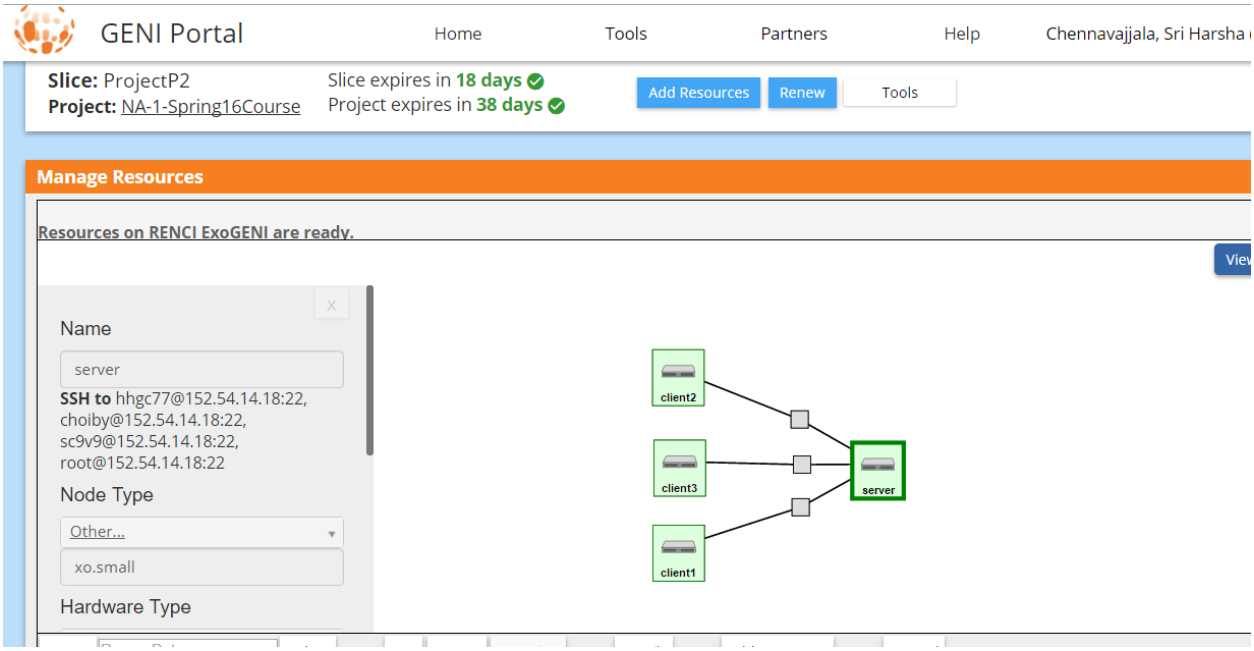
Step 1:

After logging in to GENI Portal, we have downloaded the SSH keypairs for authentication purposes.



Step 2:

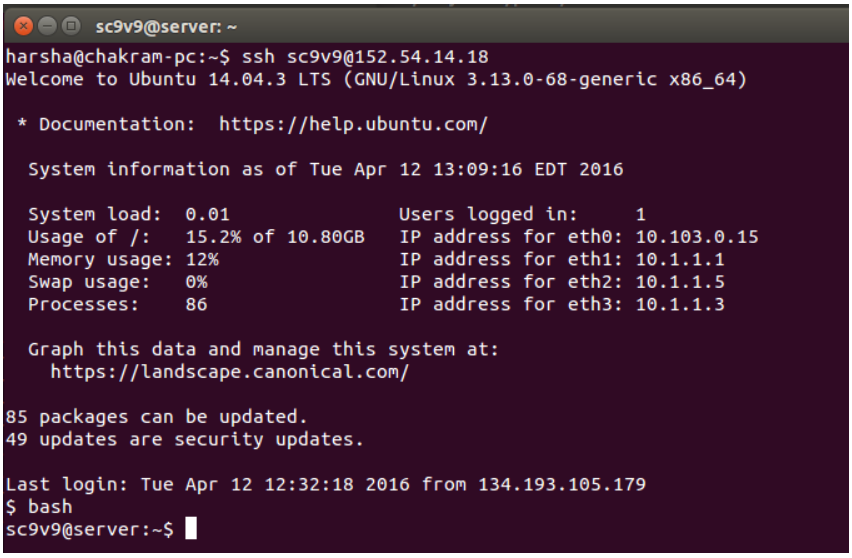
Created a slice “ProjectP2” and added four resources i,'e four VM’s. One of the VMs acts as server and the remaining three will act as clients. In the next step, I’ve established connection between these four resources.



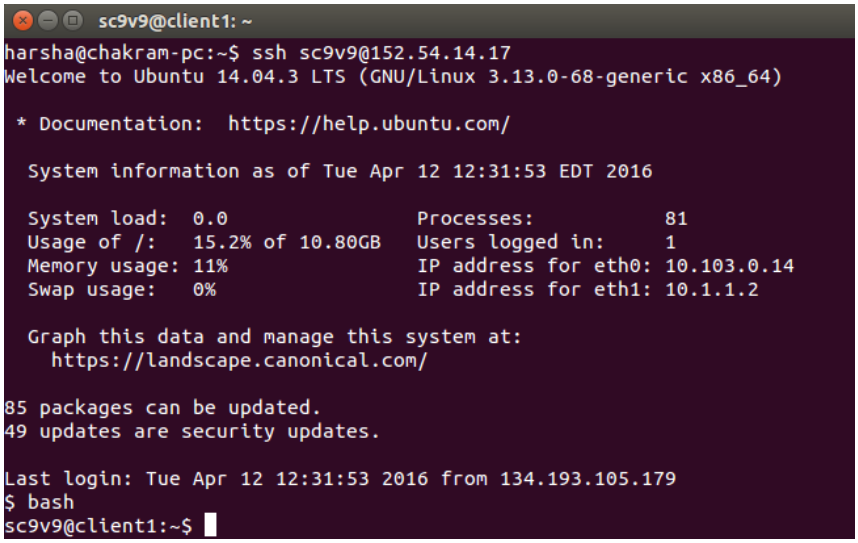
Step 3:

Logged in to our client and server nodes using SSH command to the client IP address and server IP address.

Screenshots showing client and server login:



Server Login Screenshot



Client1 login screenshot

Step 4:

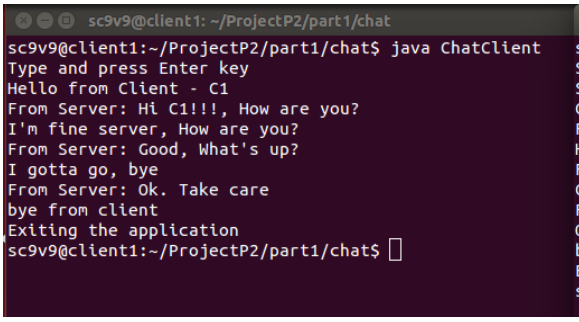
Part 1 contains two tasks, communication through simple messages and file exchanges.

For task 1(a), communication through simple messages we developed two java files ChatClient.java and ChatServer.java.

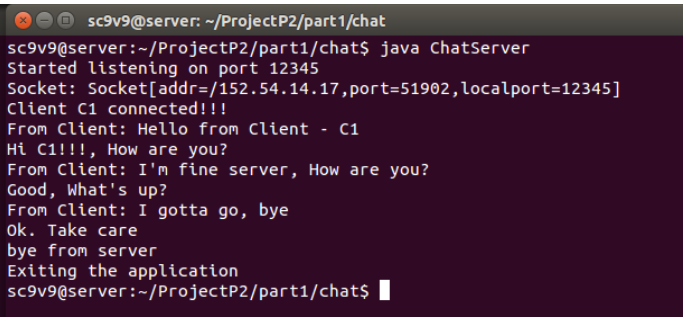
The mechanism in ChatClient.java and ChatServer.java is as follows:

- Running ChatServer.java starts server and waits for the client to connect to it.
- After connection establishment client can send message to server and server can send message to client.
- Server or client needs to send “bye from server” or “bye from client” message to terminate the connection.

Below is screenshots of simple chat between client and server:



Client chat window



Server chat window

For task 1(b) we have developed two applications FileClient and FileServer, running FileClient sends a text file to server and server first displays the contents of received file and saves the file in local system.

```
sc9v9@server: ~/ProjectP2/part1/server

sc9v9@server:~/ProjectP2/part1/server$ java FileServer
Printing the file contents to screen:

Lorem ipsum dolor sit amet, quis nostrud mel ei. Vide debet in has, diceret apei
rian his no, ei vidisse electram vim. Quo ex audire utroque placerat. Ne ius nib
h nulla percipitur. Singulis interesset vis in.

Homero legimus eleifend pri eu, quo vocibus accusata ad, et salutandi rationibus
 qui. Inani oporteat sed ne, ullum veniam everti sit et. Rebum accumsan eos in.
Latine saperet cu mel, discere corpora et nam, ea ius iusto pericula principes.
Duo at omnis legere omnium, in commodo molestiae nec. Dolore recteque salutandi
```

Server displaying the received file contents

```
sc9v9@client: ~/na1htr/source
sc9v9@client:~/na1htr/source$ java FileServer
Printing the file contents to screen:

Lorem ipsum dolor sit amet, quis nostrud mel ei. Vide debet in has, diceret apei
rian his no, ei vidisse electram vim. Quo ex audire utroque placerat. Ne ius nib
h nulla percipitur. Singulis interesset vis in.

Homero legimus eleifend pri eu, quo vocibus accusata ad, et salutandi rationibus
 qui. Inani oporteat sed ne, ullum veniam everti sit et. Rebum accumsan eos in.
Latine saperet cu mel, discere corpora et nam, ea ius iusto pericula principes.
Duo at omnis legere omnium, in commodo molestiae nec. Dolore recteque salutandi
nec in.

Ut eam dolorem propriae theophrastus. Eleifend iracundia ex pro, qui facer nulla
 similique at. Nam utroque appellantur in, in vivendo atomorum delicata vis. Mag
na mollis vocibus sed no. Purto rationibus at qui, ornatus meliore officiis id v
im, fabulas offendit rationibus has ad. Modo nullam consulatu his cu, accusata m
aluisset conceptam eam ne.
```

Server displaying the file contents after received from client

Server appends the one more line to received file and sends the updated file back to client. Client now displays the file on screen after receiving the full updated file.

```
sc9v9@server: ~/ProjectP2/part1/server
Ut eam dolorem propriae theophrastus. Eleifend iracundia ex pro, qui facer nulla
 similique at. Nam utroque appellantur in, in vivendo atomorum delicata vis. Mag
na mollis vocibus sed no. Purto rationibus at qui, ornatus meliore officiis id v
im, fabulas offendit rationibus has ad. Modo nullam consulatu his cu, accusata m
aluisset conceptam eam ne.

Eu his ipsum utinam ceteros, iusto nostro splendide cu mea. Omnis electram an qu
i, primis maiestatis mnesarchum mel no, nisl molesti
Appending the text to the file
Sending file back to client
sc9v9@server:~/ProjectP2/part1/server$
```

Server appending new line to the received file

```
sc9v9@client1: ~/ProjectP2/part1/client
sc9v9@client1:~/ProjectP2/part1/client$ java FileClient
Getting updated file from the server....
Printing the file contents to screen:

Lorem ipsum dolor sit amet, quis nostrud mel ei. Vide debet in has, diceret apei
rian his no, ei vidisse electram vim. Quo ex audire utroque placerat. Ne ius nib
h nulla percipitur. Singulis interesset vis in.

Homero legimus eleifend pri eu, quo vocibus accusata ad, et salutandi rationibus
```

Client getting the updated file from server

```
sc9v9@client1: ~/ProjectP2/part1/client
aluisset conceptam eam ne.

Eu his ipsum utinam ceteros, iusto nostro splendide cu mea. Omnis electram an qu
i, primis maiestatis mnesarchum mel no, nisl molesti
This line is added by the Server
^Csc9v9@client1:~/ProjectP2/part1/client$ ls -ltr
```

Updated file at the client end

Step 5:

Part 2 contains four tasks - development of client-server chat application

Part 2(a): In this part, the chat server will start listening to the client. Once the client is connected, the server displays all the messages received from client. If the client types “exit”, both the client and server quits.

```
sc9v9@client1: ~/ProjectP2/part2/chat
sc9v9@client1:~/ProjectP2/part2/chat$ java ChatClient21
Type and press Enter key
Hello from Client - C1
How are you?
This is second message
I gotta go
exit
Exiting the application
sc9v9@client1:~/ProjectP2/part2/chat$
```

```
sc9v9@server: ~/ProjectP2/part2/chat2
sc9v9@server:~/ProjectP2/part2/chat2$ java ChatServer21
Started listening on port 12345
Client C1 connected!!!
From Client: Hello from Client - C1
From Client: How are you?
From Client: This is second message
From Client: I gotta go
Client asked to exit. Exiting...

sc9v9@server:~/ProjectP2/part2/chat2$
```

Client chat window

Server chat window

Part 2(b):

This part is similar to part 2(a) but the server remains active and waits to get new connection from client.

Here we test this scenario, with two clients C1, C2 and a Server. First client C1 connects to server sends some messages and exits the application. The server remains active. After sometime, client C2 connects to server and sends some messages. In the end, client C2 exits. Below screenshot shows the workflow.

```
sc9v9@server: ~/ProjectP2/part2/chat2
sc9v9@server:~/ProjectP2/part2/chat2$ java ChatServer22
Started listening on port 12345
```

Server started and waiting for the clients to connect

```
sc9v9@client1: ~/ProjectP2/part2/chat
sc9v9@client1:~/ProjectP2/part2/chat$ java ChatClient22
Type and press Enter key
Hello from Client - C1
Message 1 from C1
exit
Exiting the application
sc9v9@client1:~/ProjectP2/part2/chat$
```

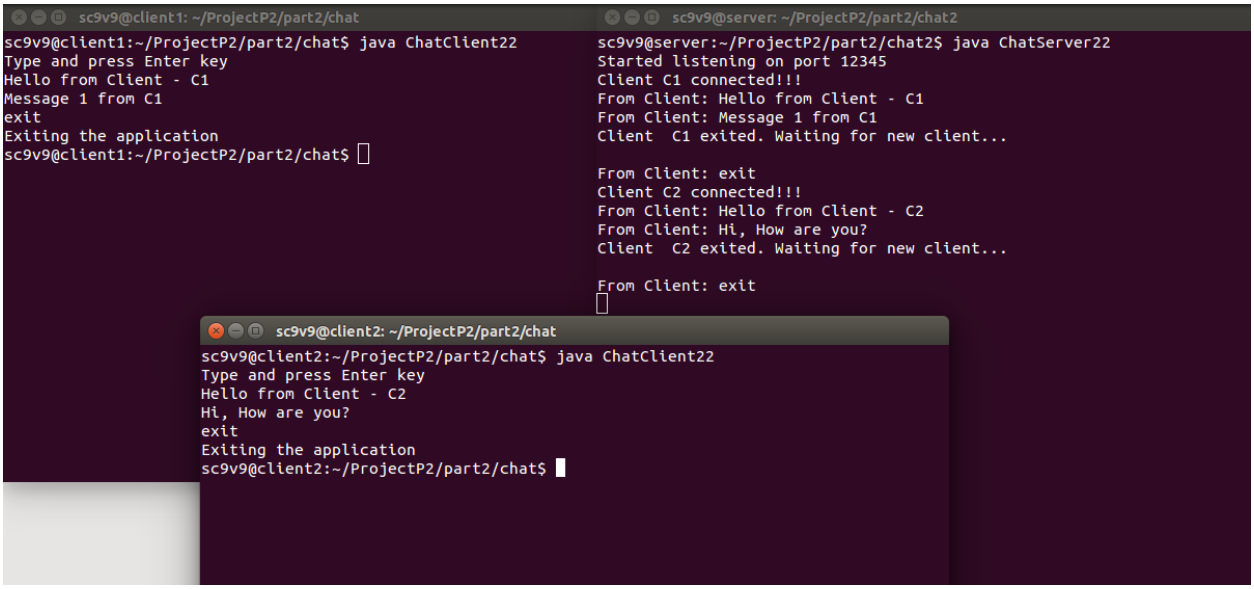
```
sc9v9@server: ~/ProjectP2/part2/chat2
sc9v9@server:~/ProjectP2/part2/chat2$ java ChatServer22
Started listening on port 12345
Client C1 connected!!!
From Client: Hello from Client - C1
From Client: Message 1 from C1
Client  C1 exited. Waiting for new client...

From Client: exit
```

Client C1 chat window

Server chat window

Client C1 connected and send messages and exited. Server waiting for new clients

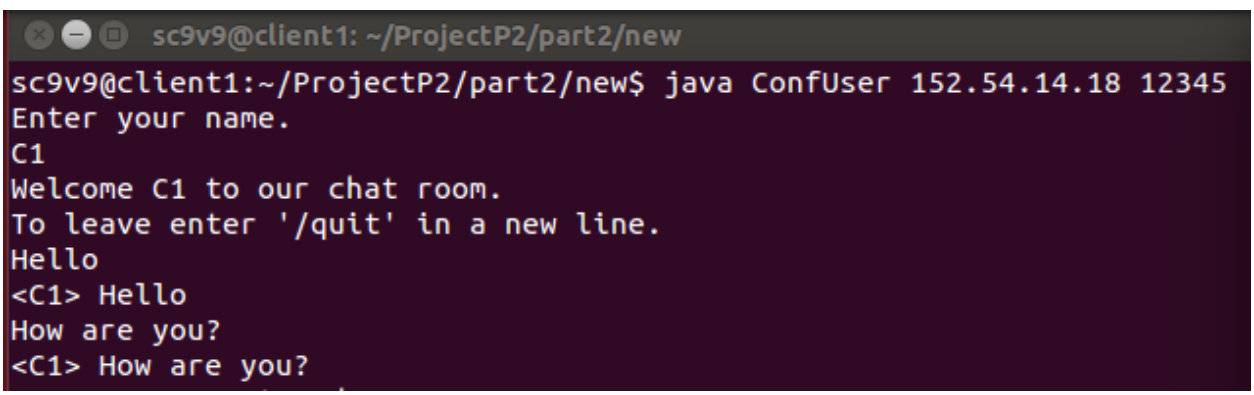


Once a new client C2 connected to the server, the server displays the message “Client C2 connected!!!”

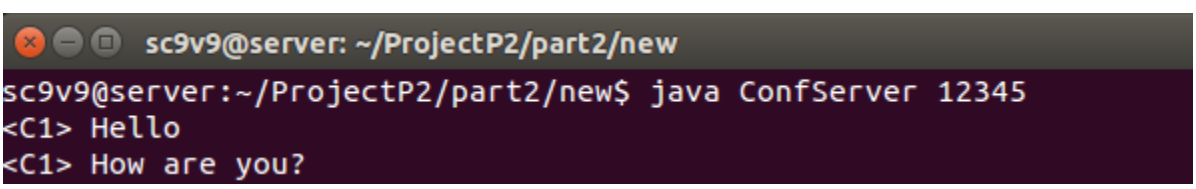
The client C2 sends messages and the messages will be displayed on server. Finally C2 disconnects from server by sending “exit” message.

Part 2(c):

In this case, the server should be capable of serving multiple clients simultaneously. All the messages from the clients will be displayed on server side.



Client C1 sending messages to Server



Server displays all the messages typed by client C1

Next C2 enters the chat, and sends messages to server. Once the clients are done with chat, they can exit the application by typing “/quit”.

```
sc9v9@client2: ~/ProjectP2/part2/new
sc9v9@client2:~/ProjectP2/part2/new$ java ConfUser 152.54.14.18 12345
Enter your name.
C2
Welcome C2 to our chat room.
To leave enter '/quit' in a new line.
Hello
<C2> Hello
This is from C2
<C2> This is from C2
/quit
C2Exited

sc9v9@client2:~/ProjectP2/part2/new$
```

```
sc9v9@server: ~/ProjectP2/part2/new
sc9v9@server:~/ProjectP2/part2/new$ java ConfServer 12345
<C1> Hello
<C1> How are you?
<C2> Hello
<C2> This is from C2
<C2> /quit
User C2 left
<C1> /quit
```

C2 chat window Server chat window

In the above screenshot, server is displaying the messages from both client C1 and client C2 simultaneously.

Part 2(d):

In this part, the messages sent by the clients will be passed through server and will be distributed to all the clients. So, if a client types a message, the message will be displayed on all the other clients.

Here I've used wo clients C2, C3 and a server. Below screenshots demonstrates the workflow.

C3 chat window **Server chat window**

```
sc9v9@client3: ~/ProjectP2/part2/new
sc9v9@client3:~/ProjectP2/part2/new$ java ConfUser 152.54.14.18 12345
Enter your name.
C3
Welcome C3 to our chat room.
To leave enter '/quit' in a new line.
Hello
<C3> Hello
New User C2 entered
<C2> Hi
<C2> C2 is great
no C3 is great
<C3> no C3 is great
<C2> noway
yes way
<C3> yes way
/quit
C3Exited

sc9v9@client3:~/ProjectP2/part2/new$
sc9v9@client3:~/ProjectP2/part2/new$
sc9v9@client3:~/ProjectP2/part2/new$
sc9v9@client3:~/ProjectP2/part2/new$
sc9v9@client3:~/ProjectP2/part2/new$
sc9v9@client3:~/ProjectP2/part2/new$
```

```
sc9v9@server: ~/ProjectP2/part2/new
sc9v9@server:~/ProjectP2/part2/new$ java ConfServer 12345
^Csc9v9@server:~/ProjectP2/part2/new$ java ConfServer 12345
<C3> Hello
<C2> Hi
<C2> C2 is great
<C3> no C3 is great
<C2> noway
<C3> yes way
<C3> /quit
User C3 left
<C2> /quit
```

```
sc9v9@client2: ~/ProjectP2/part2/new
sc9v9@client2:~/ProjectP2/part2/new$ java ConfUser 152.54.14.18 12345
Enter your name.
C2
Welcome C2 to our chat room.
To leave enter '/quit' in a new line.
Hi
<C2> Hi
C2 is great
<C2> C2 is great
<C3> no C3 is great
noway
<C2> noway
<C3> yes way
/quit
C2Exited

sc9v9@client2:~/ProjectP2/part2/new$
```

C2 chat window

In the above screenshot all the messages from C2 and C3 were displayed on server. Also all the messages of C2 were displayed on C3 and vice versa.

Source code Link:

https://drive.google.com/open?id=0B8RcAeWxxOPWNi1nSUwtblVMVzg