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Internet Technology
3rd year 2st Sem BCSE UG
Assignment 1

Problem statement: Implement a key-value store using socket programming. The server implements the key-value store and clients make use of it. The server must accept clients' connections and serve their requests for 'get' and 'put' key value pairs. All key-value pairs should be stored by the server only in memory. Keys and values are strings.

Description: The client accepts a variable no of command line arguments where the first argument is the server hostname followed by port no. It should be followed by any sequence of "get <key>" and/or "put <key> <value>"

../client 192.168.124.5 5555 put city Kolkata put country India get country get city get Institute India

Kolkata

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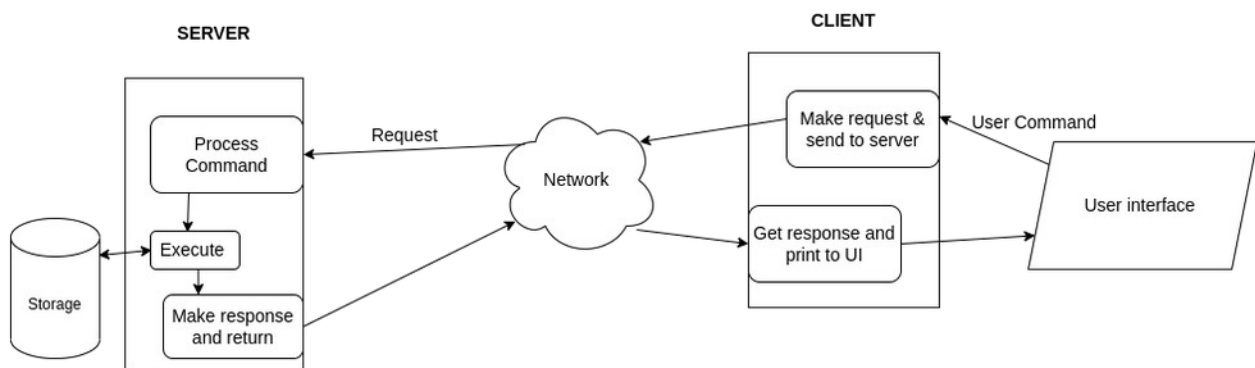
The server should be running on a designated port no. The server should support multiple clients and maintain their key-value stores separately. Comment on the port nos used by the server and the clients. Implement authorization so that only a few clients having the role "manager" can access other's key-value stores. A user is assigned the "guest" role by default. The server can upgrade a "guest" user to a "manager" user.

Design: A simple client and server model is implemented here. Server listens on port 8000 and clients connect to it. Client takes command from user and sends it to the server. Server processes the command and returns a response to the client. Client prints the response and waits for the next command. They are implemented using Java and server can handle multiple client at the same time.

Input/Output : Simple string is sent as data. The format at byte level is handled by JAVA APIs. Client always sends a single line of command but server response may contain multiple lines.

- Server allows following commands:
 - GET – takes a key string as argument
 - PUT – takes a key and a value as argument
 - MANAGER – takes a password string as argument
 - OTHERS – No argument required, but user must be authorised before using it through MANAGER command
 - VIEW – takes user-id as argument and returns all the key-value pair of that user's store. Again, user must be authorised to use this command.

Diagram:



Implementation:

Simple code snippet is provided below:

KeyStoreServer :

```
ServerSocket _server = new ServerSocket(8000);
System.out.println("started server at port: 8000");

while(true){
    Socket client = _server.accept();
    System.out.printf("Accepted connection from:%d\n",client.getPort());

    ServerHandler _handler = new ServerHandler(client,storage);
    Thread _t = new Thread(_handler);
    _t.start();
}
```

FTPClient :

```
System.out.print("remote> ");
String command = scanner.nextLine();
request.writeUTF(command);
// request.flush();

System.out.println(response.readUTF());

System.out.println();
```

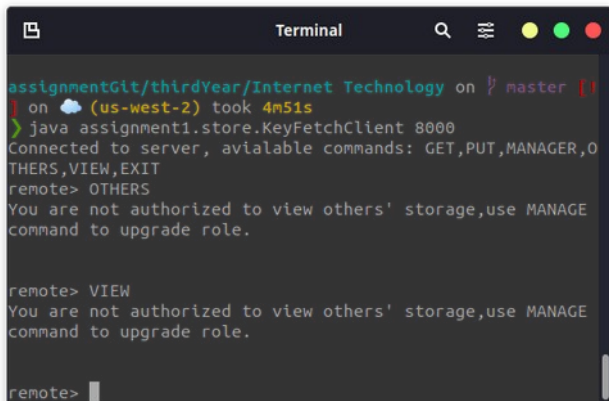
Test cases:

This program is tested through running the server and two different clients, one is in guest mode, another is in manager mode. Result is shown below.

Results and Analysis:

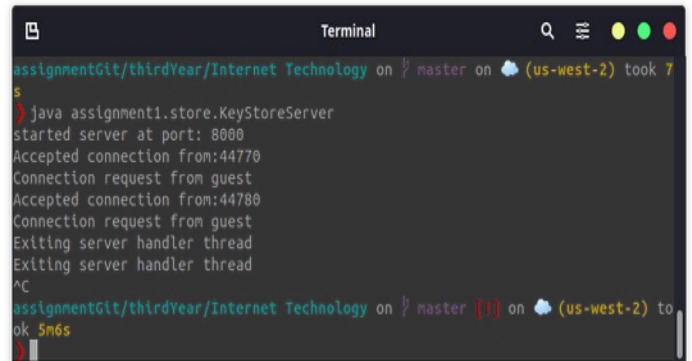
Results:

Following screenshot shows the interaction between client and server. Left terminal shows the client side:



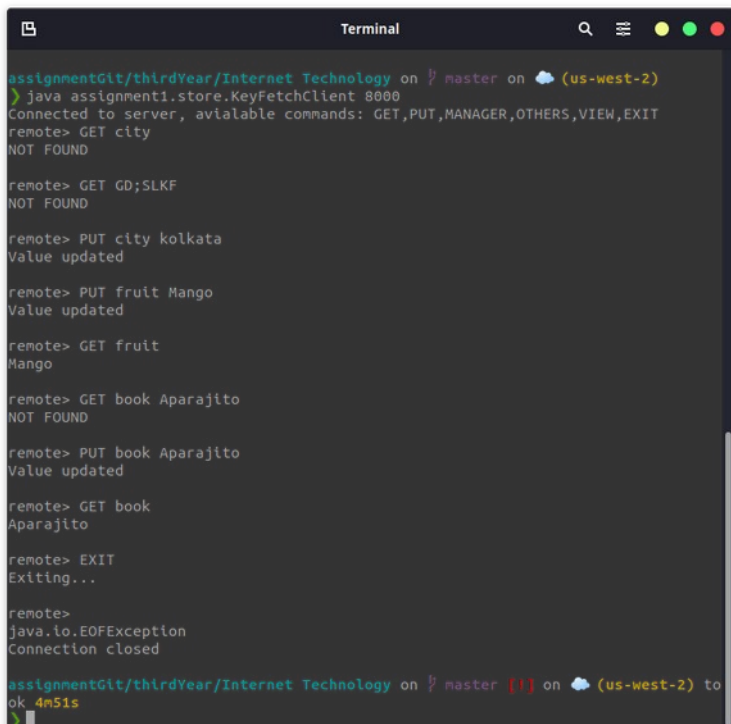
```
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2) took 4m51s  
> java assignment1.store.KeyFetchClient 8000  
Connected to server, available commands: GET,PUT,MANAGER,OTHERS,VIEW,EXIT  
remote> OTHERS  
You are not authorized to view others' storage,use MANAGE  
command to upgrade role.  
  
remote> VIEW  
You are not authorized to view others' storage,use MANAGE  
command to upgrade role.  
  
remote>
```

It shows authorisation error in client



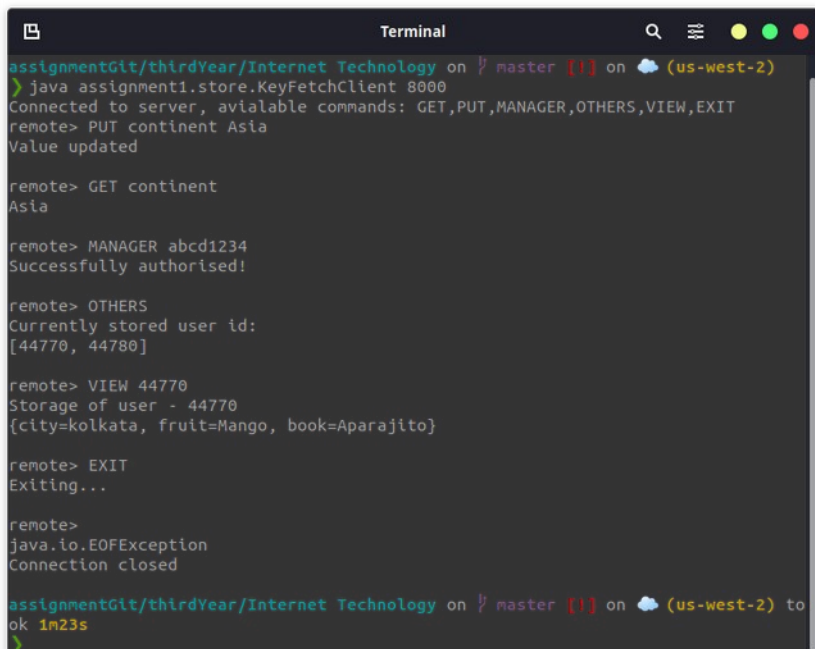
```
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2) took 7  
s  
> java assignment1.store.KeyStoreServer  
started server at port: 8000  
Accepted connection from:44770  
Connection request from guest  
Accepted connection from:44780  
Connection request from guest  
Exiting server handler thread  
Exiting server handler thread  
^C  
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2) to  
ok 5m6s
```

Server side logs (handling two client simultaneously)



```
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2)  
> java assignment1.store.KeyFetchClient 8000  
Connected to server, available commands: GET,PUT,MANAGER,OTHERS,VIEW,EXIT  
remote> GET city  
NOT FOUND  
  
remote> GET GD;SLKF  
NOT FOUND  
  
remote> PUT city kolkata  
Value updated  
  
remote> PUT fruit Mango  
Value updated  
  
remote> GET fruit  
Mango  
  
remote> GET book Aparajito  
NOT FOUND  
  
remote> PUT book Aparajito  
Value updated  
  
remote> GET book  
Aparajito  
  
remote> EXIT  
Exiting...  
  
remote>  
java.io.EOFException  
Connection closed  
  
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2) to  
ok 4m51s
```

An user in guest mode.



```
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2)  
> java assignment1.store.KeyFetchClient 8000  
Connected to server, available commands: GET,PUT,MANAGER,OTHERS,VIEW,EXIT  
remote> PUT continent Asia  
Value updated  
  
remote> GET continent  
Asia  
  
remote> MANAGER abcd1234  
Successfully authorised!  
  
remote> OTHERS  
Currently stored user id:  
[44770, 44780]  
  
remote> VIEW 44770  
Storage of user - 44770  
{city=kolkata, fruit=Mango, book=Aparajito}  
  
remote> EXIT  
Exiting...  
  
remote>  
java.io.EOFException  
Connection closed  
  
assignmentGit/thirdYear/Internet Technology on master [!]  
on (us-west-2) to  
ok 1m23s
```

An user in manager mode