BLG 433E

COMPUTER COMMUNICATIONS

PROJECT 1

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In this project we implemented an instant messaging application using python socket programming. Sockets are bi-directional communication channels that establishe communication between a server and one or more clients. For this application we had one server and multiple clients. The socket on the server side associates itself with a port number and clients can communicate with each other from that port number via server. Since there are multiple clients I used multi-threading for clients side. So, for each client connecting to the server, a seperate thread was created. For this application I created two scripts: *Server.py* and *Client.py.*

Server.py:

Server script firstly, establishes a socket and binds it to an ip address and port 12000. Then it starts to wait for clients and when it receives a connection, it keeps those connections in a list (*list_of_clients*). For each connection a threat is created and in each thread, server waits for a message from clients and after receiving the message it sends the message to other clients.

```
serverSocket = socket(AF_INET, SOCK_STREAM)  // AF_INET is the address domain of the
socket. This is used when we have an Internet Domain with any two hosts. The second
argument is the type of socket. SOCK_STREAM means that data or characters are read in
a continuous flow.

serverSocket.setsockopt(SOL_SOCKET, SO_REUSEADDR, 1)  //allow reuse of ip addresses

serverPort = 12000 //port number is 12000

serverSocket.bind(('', serverPort))  //bind the server to '0.0.0.0' and port: 12000

serverSocket.listen(50) //listen for 50 active connections

list_of_clients = []  //client list

def client_thread(connectionSocket, nameofClient): //thread for clients

   connectionSocket.send("You are connected to chatroom.".encode())

   while True:
         try:

             message = connectionSocket.recv(2048)  //receive a message from a client
```

```
            if message:
               message_to_send = "<" + nameofClient.decode("utf-8") + "> " +
message.decode("utf-8")  // if there is a message concatenate it with senders username
               broadcast(message_to_send, connectionSocket)  //call a function to broadcast
the message

            else:
               remove(connectionSocket)  //else remove connection



         except:
            continue

def broadcast(message, connection):  //this function sends message to whole clients
except the one who is sending the message
   for clients in list_of_clients:
      if clients!=connection:
         try:
            clients.send(message.encode())
         except:
            clients.close() //close and remove client
            remove(clients)

def remove(connection):  //this function removes the connection from the list of clients
   if connection in list_of_clients:
      list_of_clients.remove(connection)

while True:

   connectionSocket, addr = serverSocket.accept()
   list_of_clients.append(connectionSocket)

   message = ("Please enter your username: ") //ask for username
   connectionSocket.send(message.encode())
   nameofClient = connectionSocket.recv(2048) //receive username
   nameofClient = nameofClient.rstrip() //remove newline character from username
   if nameofClient:
      print(nameofClient.decode("utf-8") + " connected")  //print username
   else:
      print("Could not receive")

   start_new_thread(client_thread,(connectionSocket,nameofClient)) //create new thread

connectionSocket.close()
serverSocket.close()
```

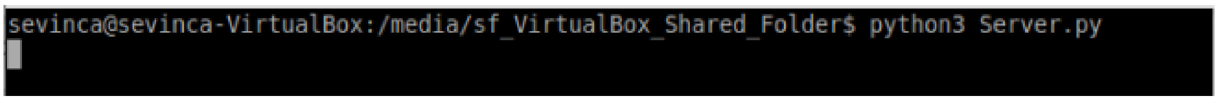
Client.py:

Client-side script firstly tries to access the server socket created at the specified IP Address and port number. After connecting to the server, it continuosly checks for input. There are two possible inputs: input from user and input from server. If user types a message client sends this message to the server. If message comes from server, it prints the message.

```
clientSocket = socket(AF_INET, SOCK_STREAM)

if len(sys.argv) != 3:    // receive ip address and port number from the command line
   print ("Please enter IP address and port number")
   exit()
serverName = str(sys.argv[1])
serverPort = int(sys.argv[2])

clientSocket.connect((serverName, serverPort))  //connect to the server

while True:

   sockets_list = [sys.stdin, clientSocket]  //list of inputs
   readSockets, writeSocket, errorSocket = select.select(sockets_list,[],[])

   for socks in readSockets:
      if socks == clientSocket:   //input from the server
         message = socks.recv(2048)  //receive message
         print(message.decode("utf-8"))  //print message
      else:   //input from the user
         message = sys.stdin.readline() //read user input
         clientSocket.send(message.encode())    //send it to the server to broadcast
         sys.stdout.flush()
clientSocket.close()
```

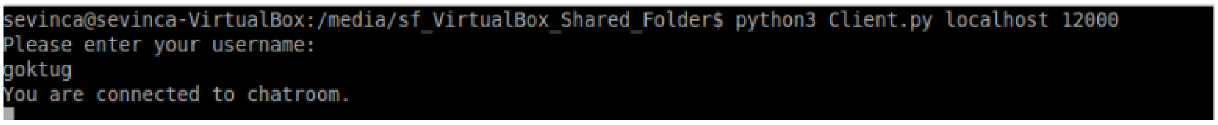
COMPILATION PROCEDURE

Firstly we run Server.py:



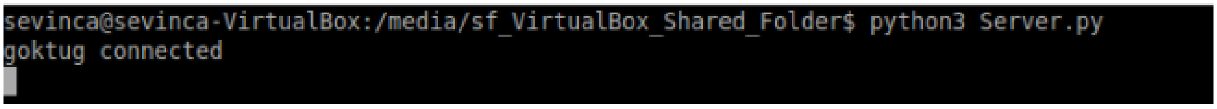
```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Server.py
```

Then we run Client.py script with IP and Port number arguments:



```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py localhost 12000
Please enter your username:
goktug
You are connected to chatroom.
```

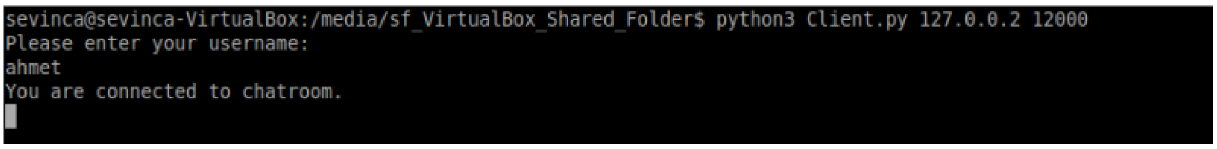
It asks for username and after entering username it gives a message saying connection is successful.



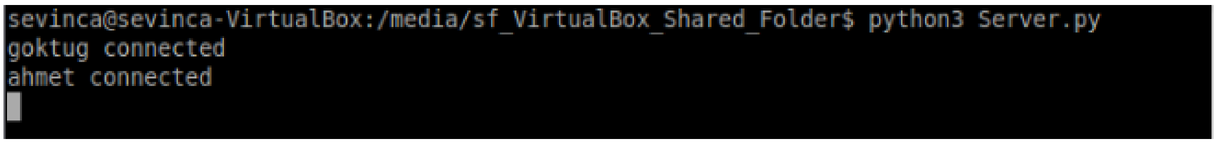
```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Server.py
goktug connected
```

Also after connection, server-side gives information about client.

Now we can connect another client:

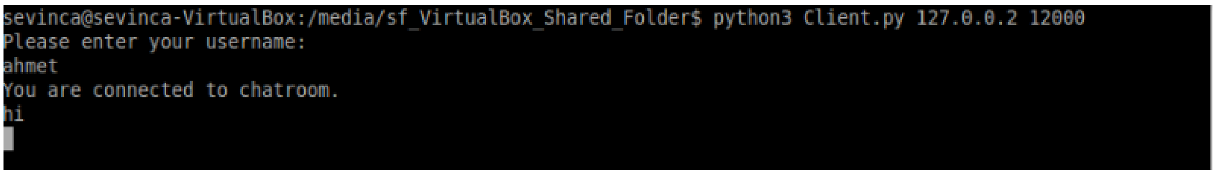


```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py 127.0.0.2 12000
Please enter your username:
ahmet
You are connected to chatroom.
```

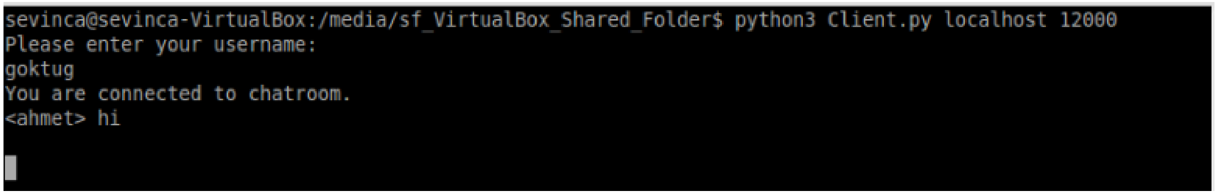


```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Server.py
goktug connected
ahmet connected
```

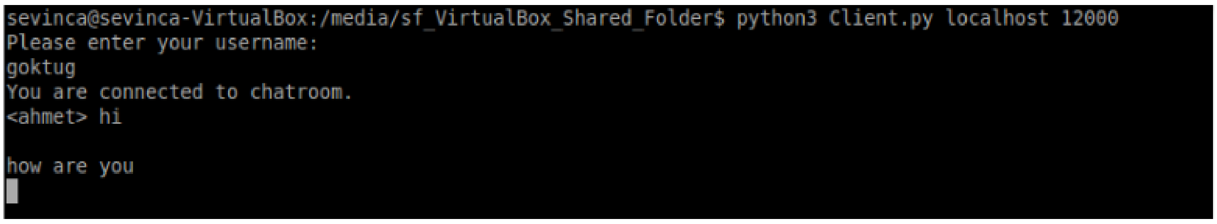
We can start messaging:



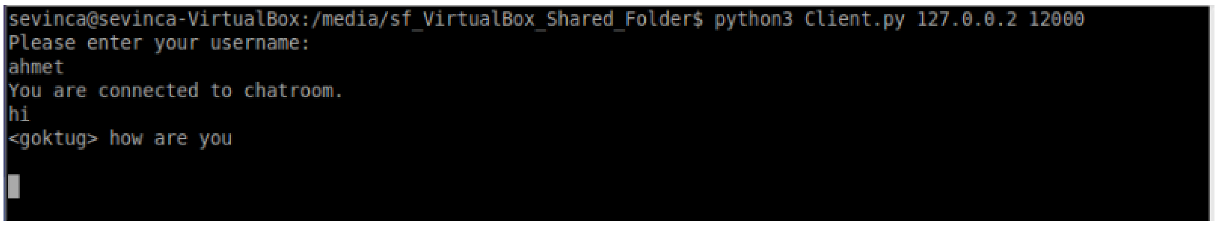
```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py 127.0.0.2 12000
Please enter your username:
ahmet
You are connected to chatroom.
hi
```



```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py localhost 12000
Please enter your username:
goktug
You are connected to chatroom.
<ahmet> hi
```



```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py localhost 12000
Please enter your username:
goktug
You are connected to chatroom.
<ahmet> hi

how are you
```



```
sevinca@sevinca-VirtualBox:/media/sf_VirtualBox_Shared_Folder$ python3 Client.py 127.0.0.2 12000
Please enter your username:
ahmet
You are connected to chatroom.
hi
<goktug> how are you
```