NETWORKING ASSIGNMENT – 1,2,3

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Assignment- 1

Question: 1

Problem Statement:

Write a TCP Day-Time server program that returns the current time and date. Also write a TCP client program that sends requests to the server to get the current time and date. Choose your own formats for the request/reply messages.

Design for request and reply:

Here we have a single server and a single client who communicates among themselves. After the server is successfully created and has been bound it waits for the client to send requests.

The client after connecting with the server can send a message to the server. But if the client sends the message “GET_TIME” only then the server will reply with the current date and time.

The server formats the current date and time as Date: dd/mm/yy, Time: hh:mm:ss and sends this as reply to the client. The server keeps running and multiple clients can connect with the server at any given time.

Source Code:

The code for both the server and the client has been written using Python language and the socket library of python is used.

Code for Server:

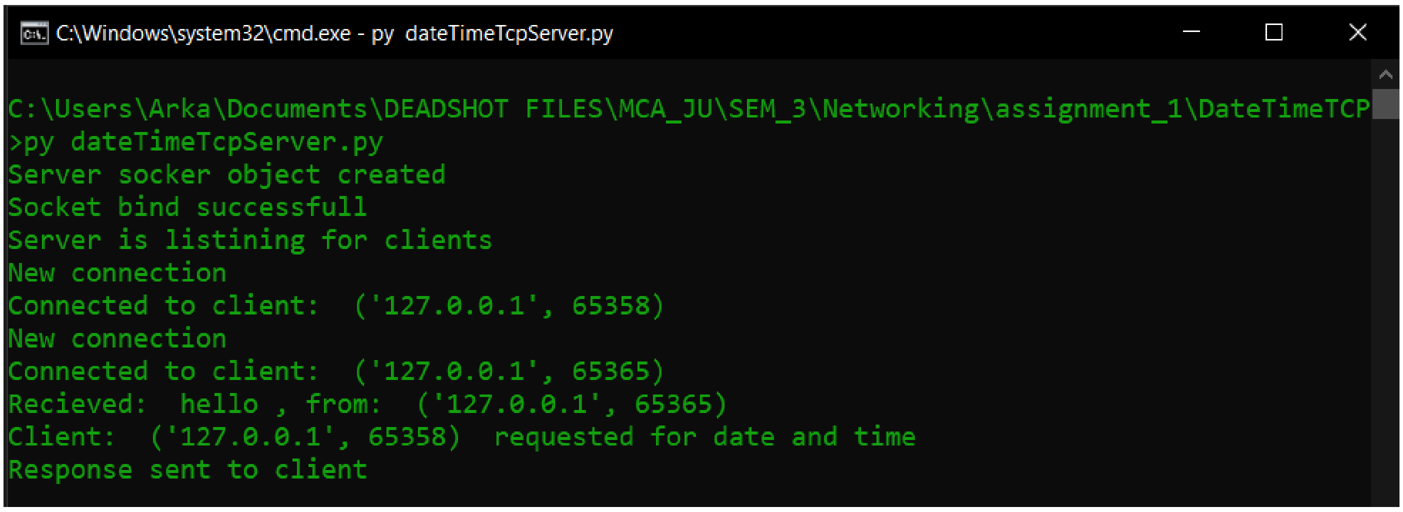
```
import socket
import threading
from datetime import datetime

ipAddr = "127.0.0.1"    #address for localhost
port = 5555

#thread for new client
def onNewClient(con, addr):
    data = con.recv(1024)
    if(data.decode() == "GET_TIME"):
        print("Client: ", addr , " requested for date and time")
        now = datetime.now()
        curr = now.strftime("Date: %d/%m/%Y, Time: %H:%M:%S")
        con.send(curr.encode()) #send this string to client
        print("Response sent to client")
    else:
        print("Recieved: ", data.decode(), ", from: ", addr)
        msg = "Different request given"
        con.send(msg.encode())
    con.close()

serverSocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
print("Server socker object created")
serverSocket.bind((ipAddr, port))
print("Socket bind successfull")
print("Server is listining for clients")

while True:
    serverSocket.listen(5)  #at most 5 client connection
    con, clientAddr = serverSocket.accept()
    print("New connection")
    print("Connected to client: ", clientAddr)
    t = threading.Thread(target = onNewClient, args = (con, clientAddr, ))
    t.start()

serverSocket.close()
```

<u>Code for Client:</u>

```
import socket

ipAddr = "127.0.0.1"
port = 5555

clientSocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
print("Client socker object created")
clientSocket.connect((ipAddr, port))    #connect with server with particular port
print("Connected with server")

#ask for date-time to server
message = input("Enter message: ")  #GET_TIME for time
clientSocket.send(message.encode())

#recieve date time from server
if(message == "GET_TIME"):
    print("Request for current date and time sent to server")
    currTime = clientSocket.recv(1024)
    print("Current date and time recieved from server")
    print(currTime.decode())
else:
    msg = clientSocket.recv(1024)
    print(msg.decode())

clientSocket.close()    #close connections
```

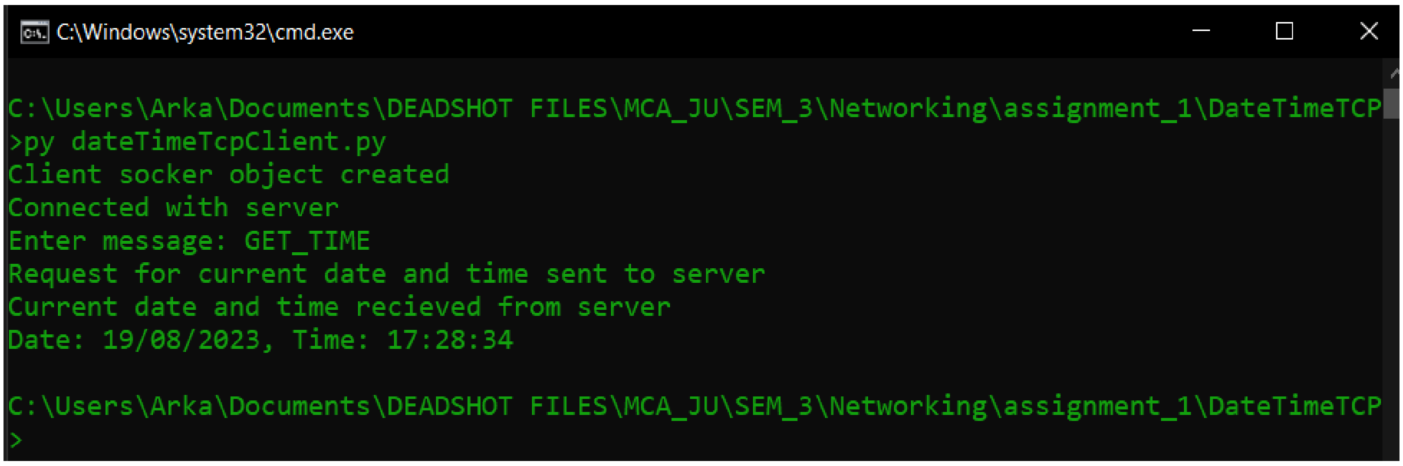
<u>Output:</u>

Server



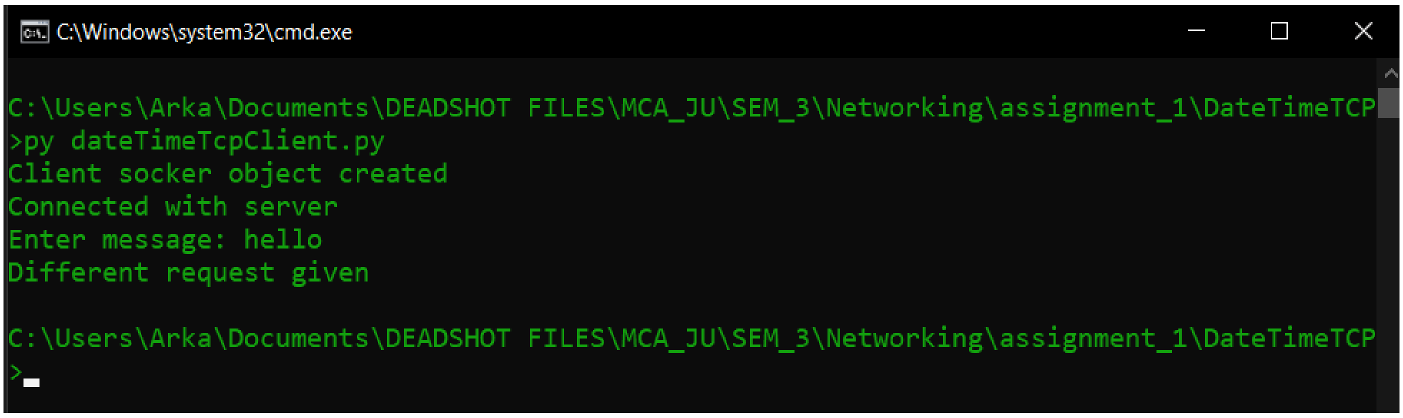
```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\DateTimeTCP
>py dateTimeTcpServer.py
Server socker object created
Socket bind successfull
Server is listining for clients
New connection
Connected to client:  ('127.0.0.1', 65358)
New connection
Connected to client:  ('127.0.0.1', 65365)
Recieved:  hello , from:  ('127.0.0.1', 65365)
Client:  ('127.0.0.1', 65358)  requested for date and time
Response sent to client
```

First client


C:\Windows\system32\cmd.exe

```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\DateTimeTCP
>py dateTimeTcpClient.py
Client socker object created
Connected with server
Enter message: GET_TIME
Request for current date and time sent to server
Current date and time recieved from server
Date: 19/08/2023, Time: 17:28:34

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\DateTimeTCP
>
```

Second client


C:\Windows\system32\cmd.exe

```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\DateTimeTCP
>py dateTimeTcpClient.py
Client socker object created
Connected with server
Enter message: hello
Different request given

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\DateTimeTCP
>
```

Question: 2

Problem Statement:

Write a TCP Math server program that accepts any valid integer arithmetic expression, evaluates it and returns the value of the expression. Also write a TCP client program that accepts an integer arithmetic expression from the user and sends it to the server to get the result of evaluation. Choose your own formats for the request/reply messages.

Design for request and reply:

Here we have a single server and a single client who communicates among themselves. After the server is successfully created and has been bound it waits for the client to send requests.

The client after connecting with the server can send a message to the server. Here the client can send any arithmetic expression either valid or invalid.

The server will receive the expression and will try to evaluate that expression. Now if the given expression is a valid one then the server will send the result back to the client.

If the expression is invalid then the server will catch any exception during evaluation and will send appropriate messages to the client.

The program is written in such way that server will keep running and multiple clients can connect with the server. Clients can connect and disconnect and all client operations are in isolation from other clients

Source Code:

The code for both the server and the client has been written using Python language and the socket library of python is used.

Code for Server:

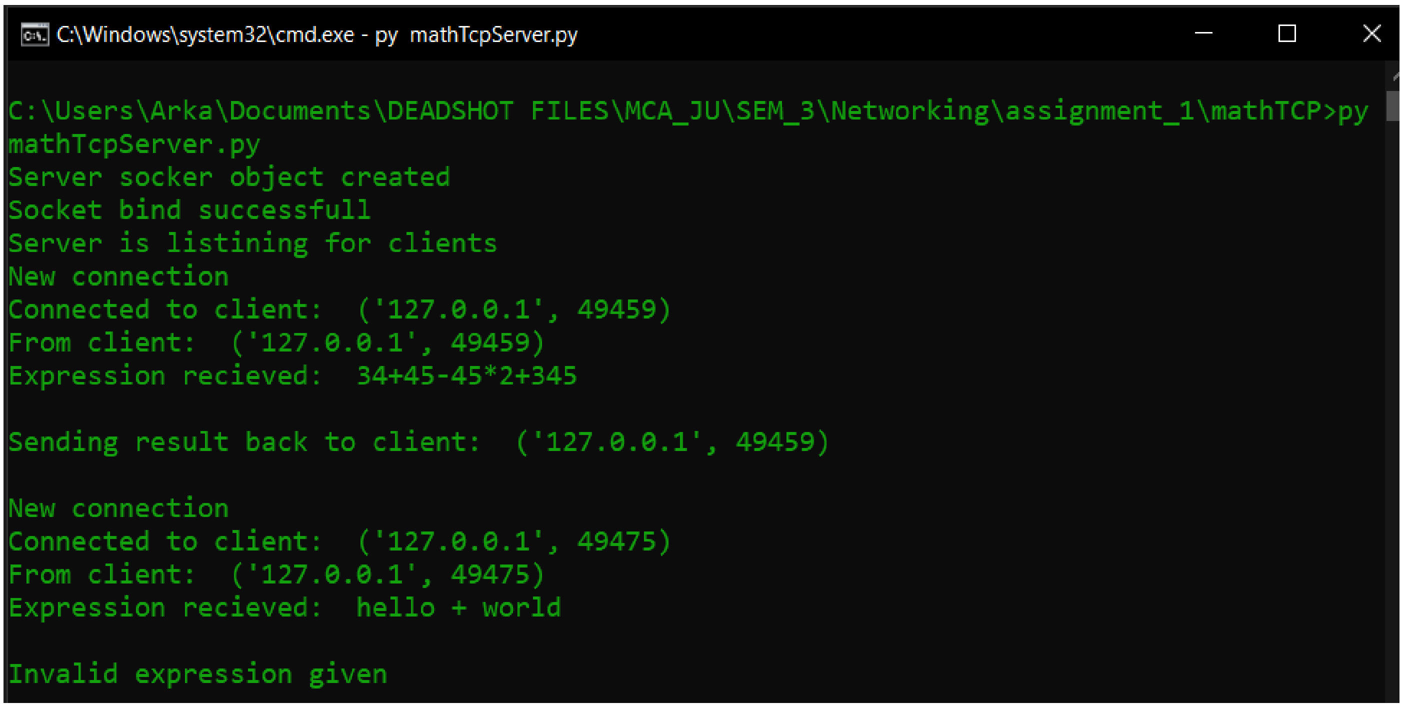
```
import socket
import threading

ipAddr = "127.0.0.1"    #address of localhost
port = 5555

def onNewThread(con, addr):
    expression = con.recv(1024).decode()    #recieve expression from client
    print("From client: ", addr)
    print("Expression recieved: ", expression, "\n")
    try:
        result = eval(expression)   #evaluate the expression
    except: #if any exception occurs
        msg = "Invalid expression given"
        print(msg, "\n")
        con.send(msg.encode())
    else:   #if no exception occurs
        print("Sending result back to client: ", addr, "\n")
        con.send(str(result).encode())
    con.close()

serverSocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
print("Server socker object created")
serverSocket.bind((ipAddr, port))   #bind socket with localhost and port
print("Socket bind successfull")
print("Server is listining for clients")

while True:
    serverSocket.listen(5)
    con, clientAddr = serverSocket.accept() #accept incoming connection
    print("New connection")
    print("Connected to client: ", clientAddr)
    t = threading.Thread(target=(onNewThread), args=(con, clientAddr, ))
    t.start()

serverSocket.close()
```

Code for Client:

```
import socket

ipAddr = "127.0.0.1"
port = 5555

clientSocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM);
print("Client socker object created")
clientSocket.connect((ipAddr, port))    #connect with server
print("Connected with server")

#ask for expression
print("Enter and integer expression to evaluate")
message = input()
clientSocket.send(message.encode()) #send the expression to server
print("Request for expression evaluation sent to server")

result = clientSocket.recv(1024)    #recieve result of expression
print("Result recieved from server")
print("Result of expression is: ", result.decode())

clientSocket.close()    #close all connection
```

Output:

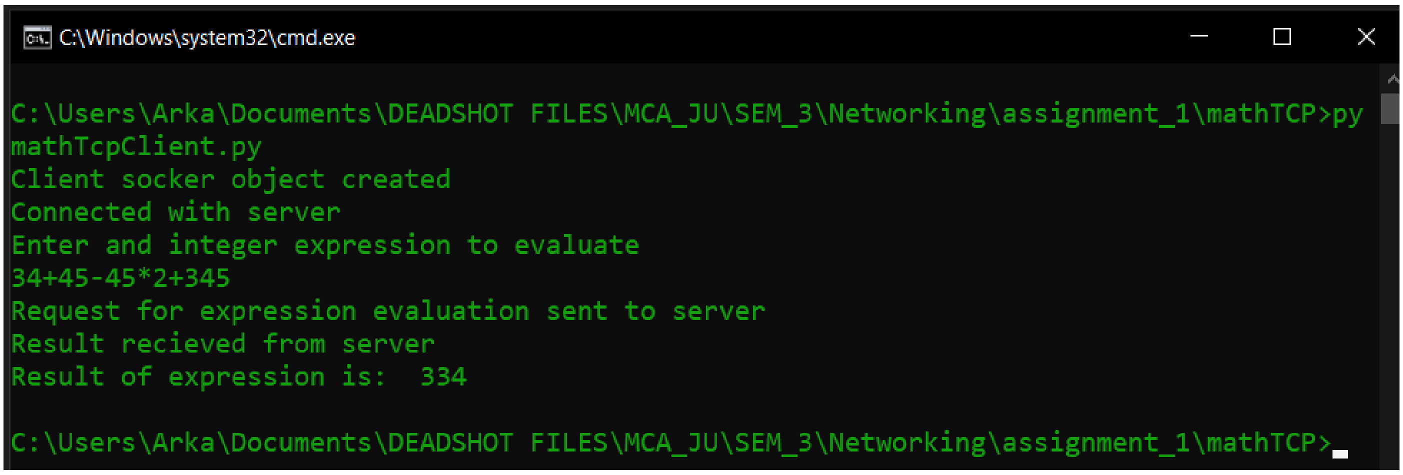
Server



C:\Windows\system32\cmd.exe - py mathTcpServer.py

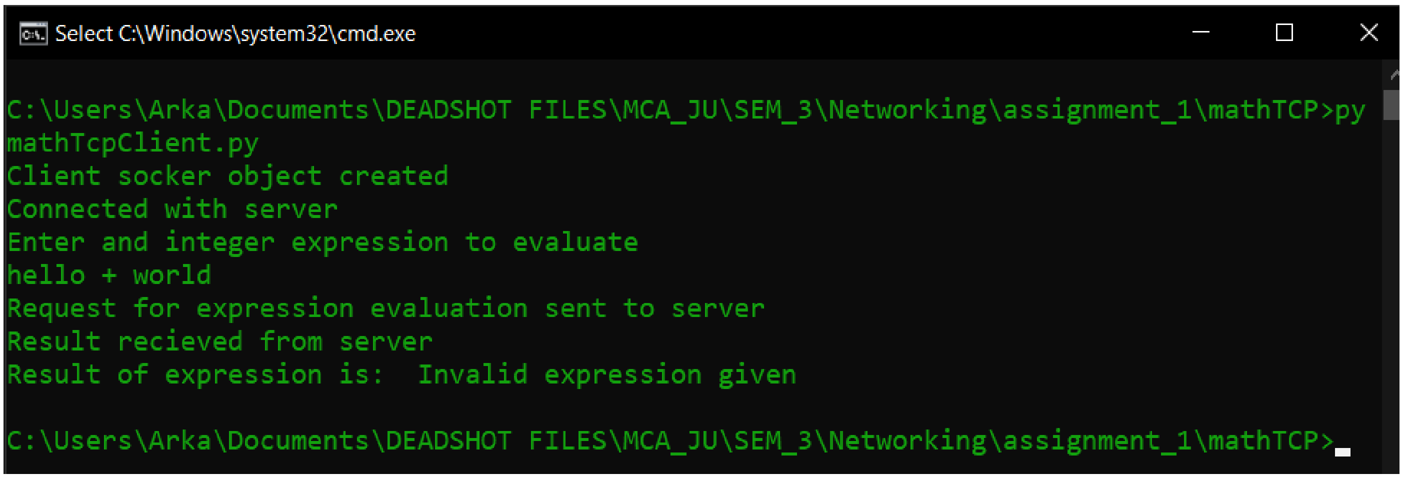
```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\mathTCP>py
mathTcpServer.py
Server socker object created
Socket bind successfull
Server is listining for clients
New connection
Connected to client:  ('127.0.0.1', 49459)
From client:  ('127.0.0.1', 49459)
Expression recieved:  34+45-45*2+345

Sending result back to client:  ('127.0.0.1', 49459)

New connection
Connected to client:  ('127.0.0.1', 49475)
From client:  ('127.0.0.1', 49475)
Expression recieved:  hello + world

Invalid expression given
```

Frist client


C:\Windows\system32\cmd.exe

```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\mathTCP>py
mathTcpClient.py
Client socker object created
Connected with server
Enter and integer expression to evaluate
34+45-45*2+345
Request for expression evaluation sent to server
Result recieved from server
Result of expression is:  334

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\mathTCP>
```

Second client


Select C:\Windows\system32\cmd.exe

```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\mathTCP>py
mathTcpClient.py
Client socker object created
Connected with server
Enter and integer expression to evaluate
hello + world
Request for expression evaluation sent to server
Result recieved from server
Result of expression is:  Invalid expression given

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\mathTCP>
```

Question: 3

Problem Statement:

Implement a UDP server program that returns the permanent address of a student upon receiving a request from a client. Assume that a text file that stores the names of students and their permanent addresses is available locally to the server. Choose your own formats for the request/reply messages.

Design for request and reply:

Here we have a single server and a single client who communicates among themselves. After the server is successfully created and has been bound it waits for the client to send requests. Here the protocol will be used is UDP.

The client will now send a message using the server's address and port number. There is no connection object here like TCP. Both server and client will communicate using each other's address and port.

Server will have a CSV file containing the data about students and their addresses. Before creating the socket, it will load the data of the CSV file and will create a dictionary with the student name being the key and corresponding addresses being the value.

If a student name (key) doesn't exist in the dictionary then it will send an appropriate message to the client.

Source Code:

The code for both the server and the client has been written using Python language and the socket library of python is used.

Code for Server:

```
import socketimport csv

ipAddr = "127.0.0.1"
port = 5555

#creating map of addresses
data = {}
with open('data.csv', mode = 'r') as file:
      csvFile = csv.reader(file)   #load data from a CSV file
      for lines in csvFile:
            data[lines[0]] = lines[1]    #populate the dictonary


udpServerSocket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM) #udp socket
object
#if connection in port already exists then reuse that connection
udpServerSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
print("Socket object created")
udpServerSocket.bind((ipAddr, port))
print("Socket bind done")

#recieve student name from client
while True:
      conn = udpServerSocket.recvfrom(1024)    #recieve data from client
      #conn[0] contains the message send by client
      #conn[1] contains the address of client who has sent the data
      studentName = conn[0].decode()
      print("Name = \"", studentName, "\" revieved from: ", conn[1])
      add = data.get(studentName)  #get data from dictionary
```

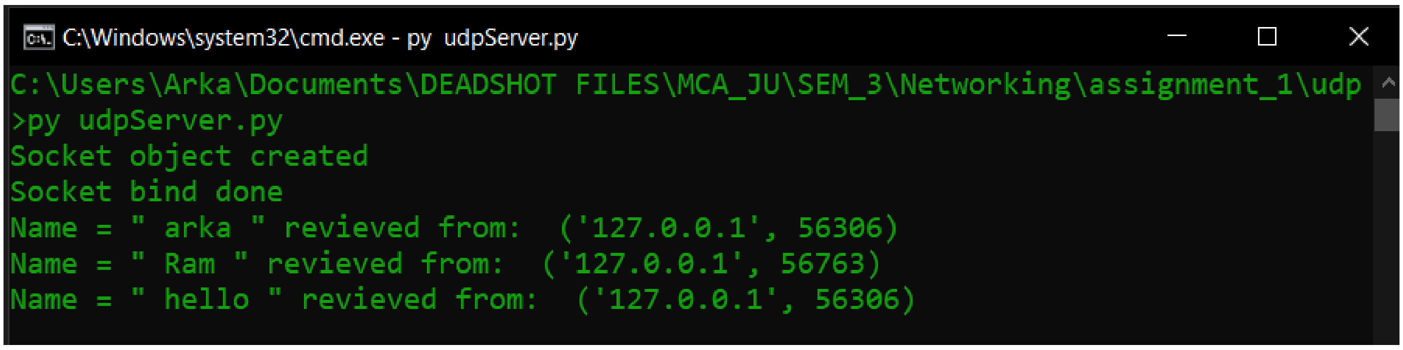
```
        if add == None:   #if address not found
                msg = "Student record not found"
                udpServerSocket.sendto(msg.encode(), conn[1])
        else:
                udpServerSocket.sendto(add.encode(), conn[1])

udpServerSocket.close()      #close connection
```

Code for Client:

```
import socket
ipAddr = "127.0.0.1"
port = 5555

udpClientSocket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
print("Socket object created")

while True:
        print("Enter a student name: ")
        msg = input()
        if(msg == "exit"):
                break
        udpClientSocket.sendto(msg.encode(), (ipAddr, port)) #send message to server
        data = udpClientSocket.recvfrom(1024)    #recieve response
        #data[0] contains the message from server
        #data[1] contains the address of server
        add = data[0].decode()
        print("Address for student: ", end="")
        print(add, "\n")

udpClientSocket.close()
```

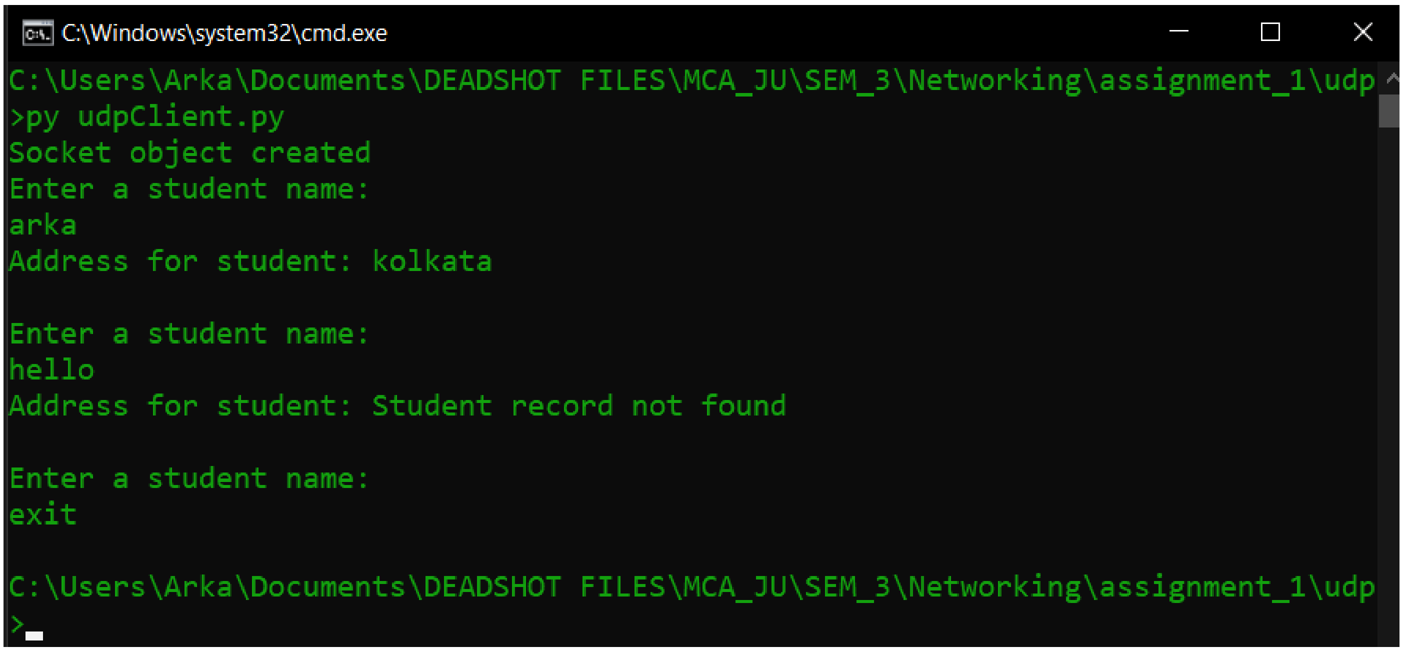
Output:

Server



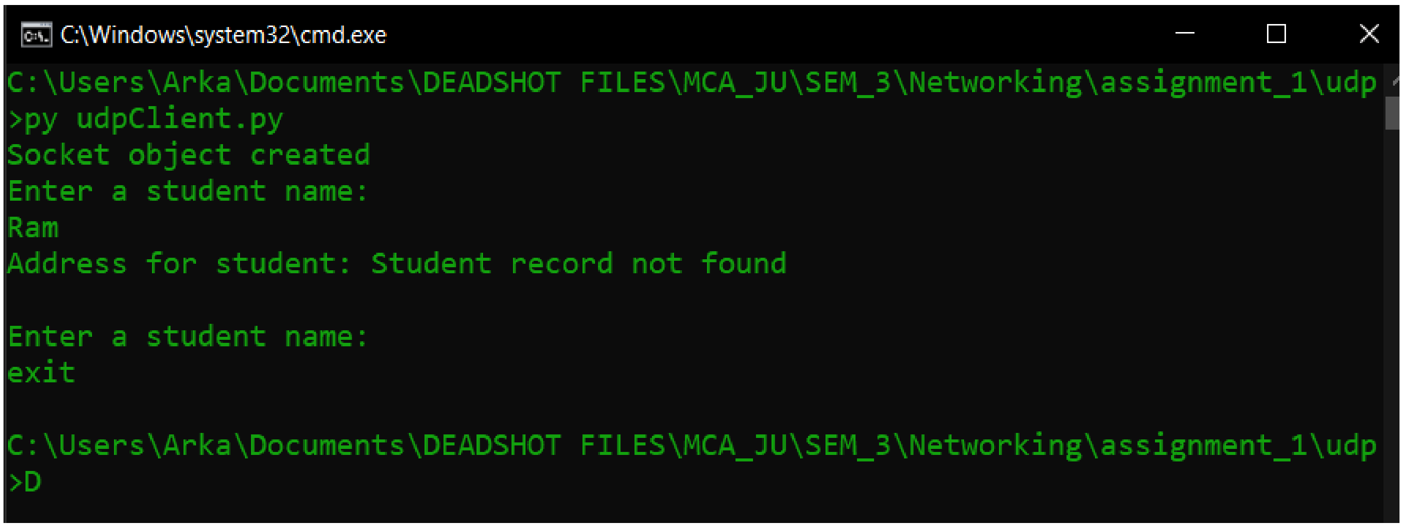
```
C:\Windows\system32\cmd.exe - py  udpServer.py
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\udp
>py udpServer.py
Socket object created
Socket bind done
Name = " arka " revieved from:  ('127.0.0.1', 56306)
Name = " Ram " revieved from:  ('127.0.0.1', 56763)
Name = " hello " revieved from:  ('127.0.0.1', 56306)
```

First client



```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\udp
>py udpClient.py
Socket object created
Enter a student name:
arka
Address for student: kolkata

Enter a student name:
hello
Address for student: Student record not found

Enter a student name:
exit

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\udp
>
```

Second Client



```
C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\udp
>py udpClient.py
Socket object created
Enter a student name:
Ram
Address for student: Student record not found

Enter a student name:
exit

C:\Users\Arka\Documents\DEADSHOT FILES\MCA_JU\SEM_3\Networking\assignment_1\udp
>D
```