



SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

CSE1004(NETWORK AND COMMUNICATION)LAB:L53-L54



**JANUARY 26, 2022
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20BCE2940**

QUESTION:

Write a TCP and UDP chat program for Client/Server Application with four clients to support multiple chats, develop a program using multithreading.

DESCRIPTION:

Socket programming:

Sockets can be thought of as endpoints in a communication channel that is bi-directional and establishes communication between a server and one or more clients. Here, we set up a socket on each end and allow a client to interact with other clients via the server. The socket on the server side associates itself with some hardware port on the server-side. Any client that has a socket associated with the same port can communicate with the server socket.

One socket(node) listens on a particular port at an IP, while the other socket reaches out to the other to form a connection. The server forms the listener socket while the client reaches out to the server.

Socket programming is started by importing the socket library and making a simple socket.

For TCP:

```
import socket
```

```
serverSocket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
```

Here we made a socket instance and passed it two parameters. The first parameter is **AF_INET** and the second one is **SOCK_STREAM**. **AF_INET** refers to the address-family ipv4. The **SOCK_STREAM** means connection-oriented TCP protocol. Now we can connect to a server using this socket.

For UDP:

```
import socket
```

```
serverSocket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
```

Here we made a socket instance and passed it two parameters. The first parameter is **AF_INET** and the second one is **SOCK_DGRAM**. **AF_INET** refers to the address-family ipv4. The **SOCK_DGRAM** means connection-oriented UDP protocol. Now we can connect to a server using this socket.

Multi-Threading:

A thread is a sub-process that runs a set of commands individually of any other thread. So, every time a user connects to the server, a separate thread is created for that user, and communication from the server to the client takes place along individual threads based on socket objects created for the sake of the identity of each client.

We will require two scripts to establish this chat room. One to keep the serving running, and another that every client should run in order to connect to the server.

Server Side Script:

TCP:

A server has a `bind()` method which binds it to a specific IP and port so that it can listen to incoming requests on that IP and port. A server has a `listen()` method which puts the server into listening mode. This allows the server to listen to incoming connections. And last a server has an `accept()` and `close()` method. The `accept` method initiates a connection with the client and the `close` method closes the connection with the client.

Every time a user connects, a separate thread will be created for that user. In each thread, the server awaits a message and sends that message to other users currently on the chat. If the server encounters an error while trying to receive a message from a particular thread, it will exit that thread.

UDP:

`bind()`: This method is used to bind your socket with a specific host and port which will be passed as an argument to this function and that means your socket will be sitting at a specific location where the client socket can send its data.

`recvfrom()`: This method can be used with a UDP server to receive data from a UDP client or it can be used with a UDP client to receive data from a UDP server. It accepts a positional parameter called *bufsize* which is the number of bytes to be read from the UDP socket. It returns a byte object read from a UDP socket and the address of the client socket as a tuple.

`sendto()`: It is a method of Python's socket class that is used to send datagrams to a UDP socket. The communication could be from either side. It could be from client to server or from the server to a client. The data to be sent must be in bytes format. If the data is in string format, the `str.encode()` method can be used to convert the strings to bytes. We must also pass a tuple consisting of IP address and port number.

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Every time a user connects, a separate thread will be created for that user. In each thread, the server awaits a message and sends that message to other users currently on the chat. If the server encounters an error while trying to receive a message from a particular thread, it will exit that thread.

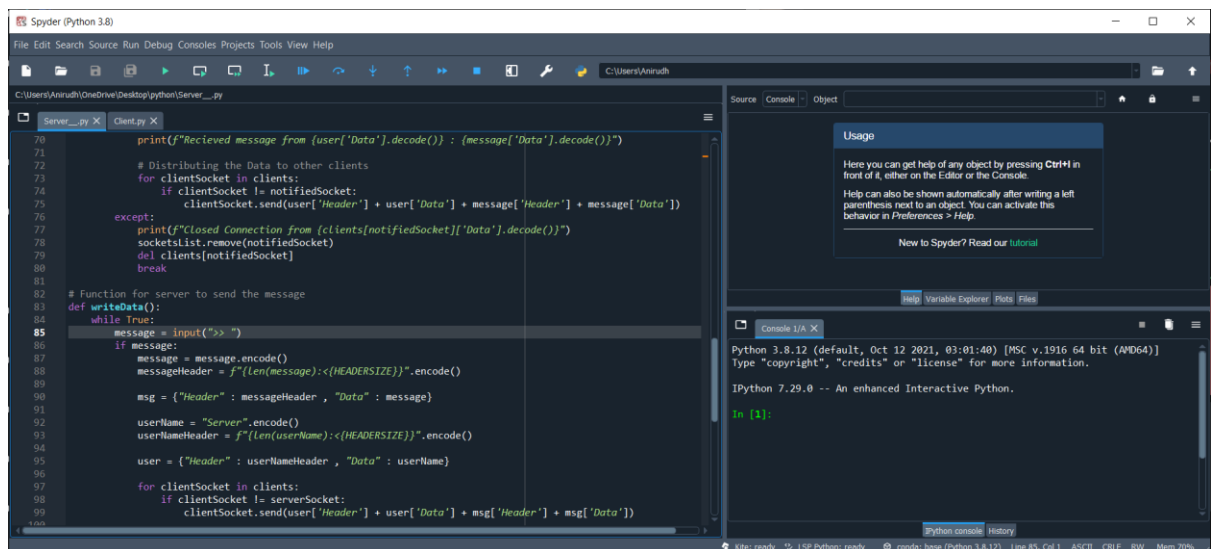
Client-Side Script:

The client-side script will simply attempt to access the server socket created at the specified IP address and port. Once it connects, it will continuously check as to whether the input comes from the server or from the client, and accordingly redirects output. If the input is from the server, it displays the message on the terminal. If the input is from the user, it sends the message that the user enters to the server for it to be broadcasted to other users.

This is the client-side script, that each user must use in order to connect to the server.

PROCEDURE:

- ➔ First Open your python ide
- ➔ I will be using anaconda distribution and a spyder IDE



- ➔ We will be using 2 files for our purpose
- ➔ A server file
- ➔ A client file

There are some common steps to be followed explained below

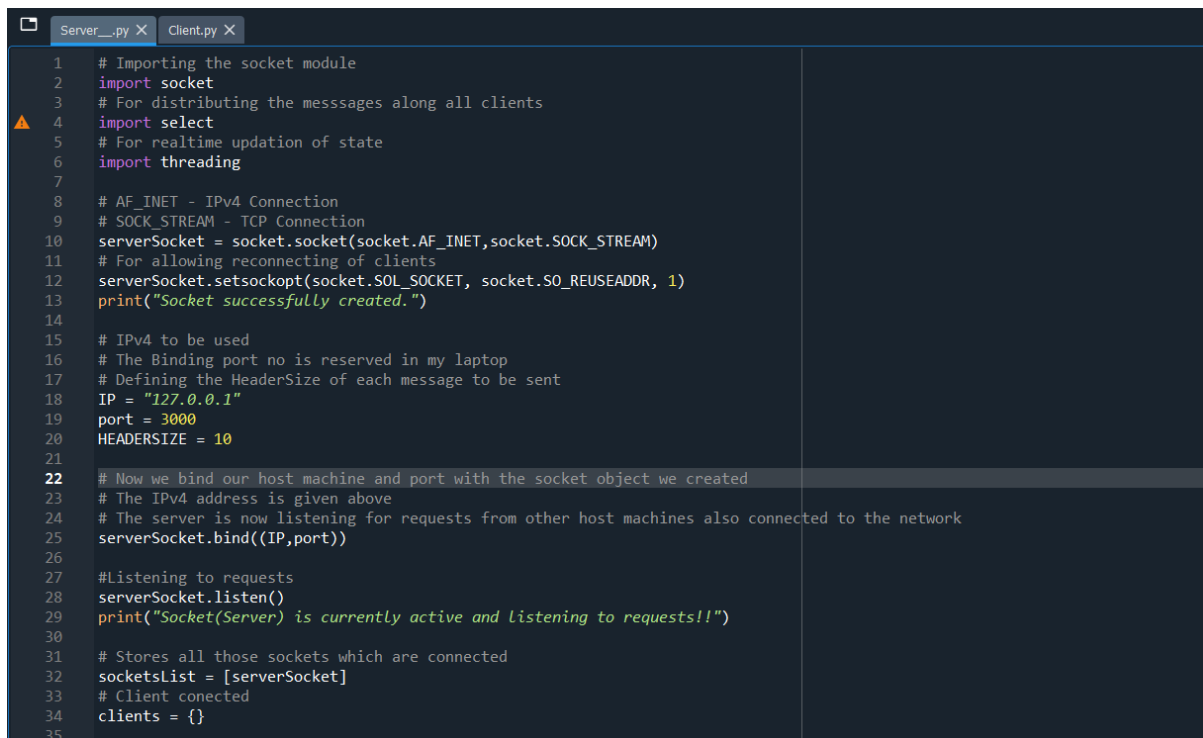
- ➔ A detailed explanation along with the code is given further below

Server.py:

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1. Import the necessary files.
2. Using a IPv4 connection and a TCP connection initiate the server side socket using `socket.socket(socket.AF_INET,socket.SOCK_STREAM)` or `socket.socket(socket.AF_INET,socket.SOCK_DGRAM)` method for a UDP connection.
3. Bind the server using `socket.bind(IP,port)` method providing the IP and the port.
4. We now define the `socketsList` which stores all the sockets currently in action and make a client Dictionary which stores information about the clients.
5. We then define a function for reading messages using `socket.recv()` method or `socket.recvfrom()`(for UDP).
6. We then make a function for writing the messages to the client using the `socket.send()` method or `socket.sendto()`(for UDP).
7. We then initiate 2 threads one for read and one for write and initiate them for runtime updation.

A code snippet for server.py:



```

1  # Importing the socket module
2  import socket
3  # For distributing the messages along all clients
4  import select
5  # For realtime updation of state
6  import threading
7
8  # AF_INET - IPv4 Connection
9  # SOCK_STREAM - TCP Connection
10 serverSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
11 # For allowing reconnecting of clients
12 serverSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
13 print("Socket successfully created.")
14
15 # IPv4 to be used
16 # The Binding port no is reserved in my laptop
17 # Defining the HeaderSize of each message to be sent
18 IP = "127.0.0.1"
19 port = 3000
20 HEADERSIZE = 10
21
22 # Now we bind our host machine and port with the socket object we created
23 # The IPv4 address is given above
24 # The server is now listening for requests from other host machines also connected to the network
25 serverSocket.bind((IP,port))
26
27 #Listening to requests
28 serverSocket.listen()
29 print("Socket(Server) is currently active and listening to requests!!")
30
31 # Stores all those sockets which are connected
32 socketsList = [serverSocket]
33 # Client connected
34 clients = {}
35

```

Client.py:

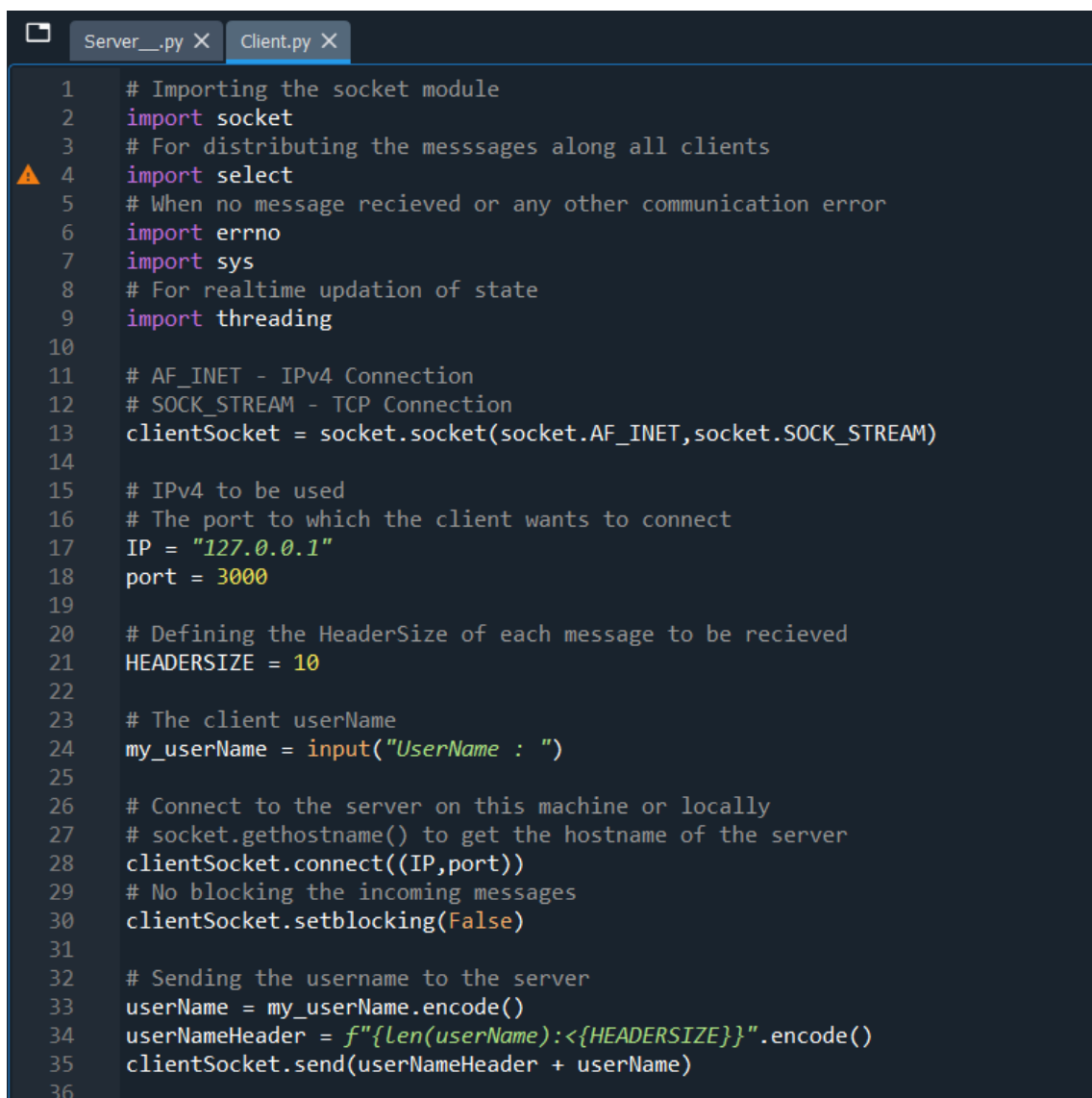
1. Import the necessary files.
2. Using a IPv4 connection and a TCP connection initiate the server side socket using `socket.socket(socket.AF_INET,socket.SOCK_STREAM)` or

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`socket.socket(socket.AF_INET,socket.SOCK_DGRAM)` method for a UDP connection.

3. Connect to the server using `socket.connect(IP)` function by providing the appropriate IP address (For UDP) No need to use connect function.
4. Select a username and send it to the server.
5. We then define a function for reading messages using `socket.recv()` method or `socket.recvfrom()`(for UDP).
6. We try to catch as many errors as possible in it.
7. We then make a function for writing the messages to the client using the `socket.send()` method or `socket.sendto()`(for UDP).
8. We then initiate 2 threads one for read and one for write and initiate them for runtime updation.

A code snippet for `client.py`:



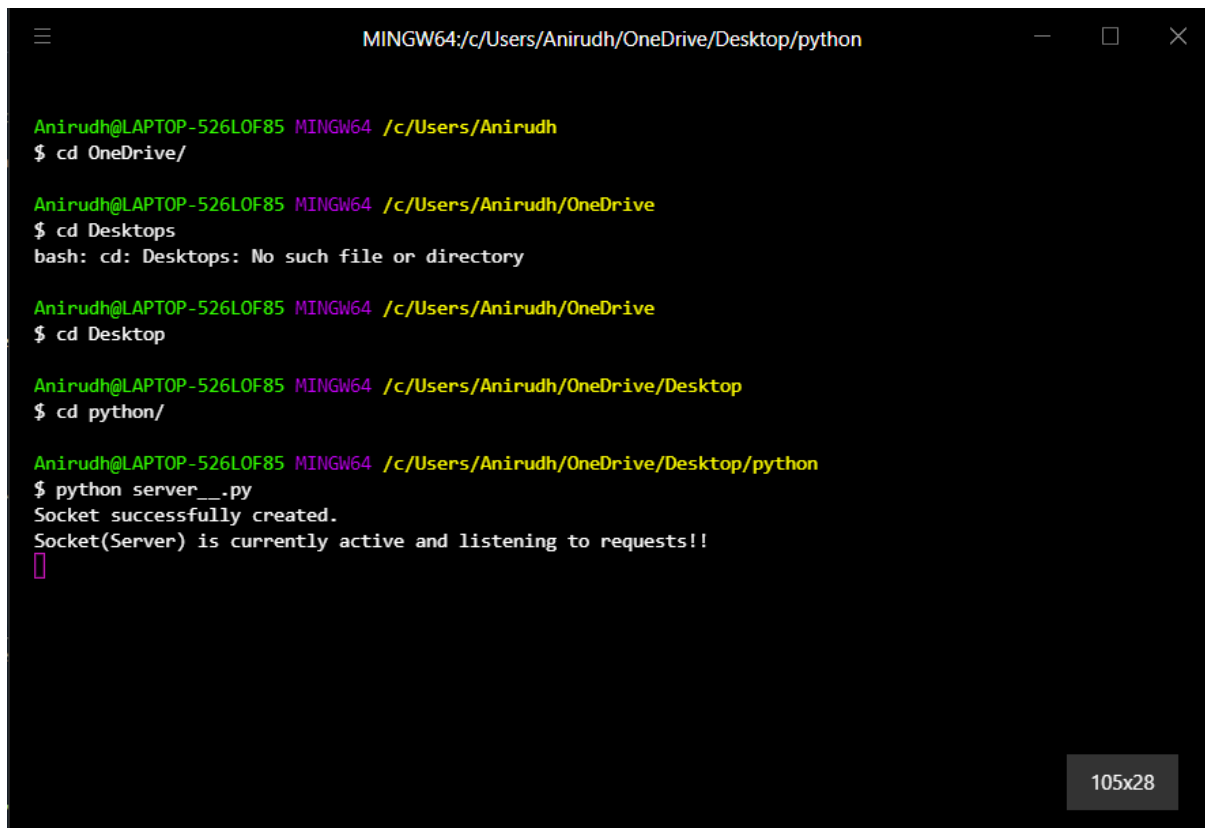
```

1  # Importing the socket module
2  import socket
3  # For distributing the messsages along all clients
4  import select
5  # When no message recieved or any other communication error
6  import errno
7  import sys
8  # For realtime updation of state
9  import threading
10
11 # AF_INET - IPv4 Connection
12 # SOCK_STREAM - TCP Connection
13 clientSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
14
15 # IPv4 to be used
16 # The port to which the client wants to connect
17 IP = "127.0.0.1"
18 port = 3000
19
20 # Defining the HeaderSize of each message to be recieved
21 HEADERSIZE = 10
22
23 # The client userName
24 my_userName = input("UserName : ")
25
26 # Connect to the server on this machine or locally
27 # socket.gethostname() to get the hostname of the server
28 clientSocket.connect((IP,port))
29 # No blocking the incoming messages
30 clientSocket.setblocking(False)
31
32 # Sending the username to the server
33 userName = my_userName.encode()
34 userNameHeader = f"{len(userName):<{HEADERSIZE}}".encode()
35 clientSocket.send(userNameHeader + userName)
36
  
```

In order to run our Application, we follow the following steps:

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- ➔ Open the Hyper terminal or Command Prompt
- ➔ Navigate onto your working file in our case server.py and client.py
- ➔ Write python filename to run a particular file make sure python is installed beforehand.
- ➔ Now you can freely use the Chat Application



```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive
$ cd Desktops
bash: cd: Desktops: No such file or directory

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive
$ cd Desktop

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop
$ cd python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
█
```

105x28

Output for TCP Chat Application:

CODE:

Server.py:

Importing the socket module

```
import socket
```

For distributing the messages along all clients

```
import select
```

For realtime updation of state

```
import threading
```

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

AF_INET - IPv4 Connection

SOCK_STREAM - TCP Connection

```
serverSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
```

For allowing reconnecting of clients

```
serverSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
```

```
print("Socket successfully created.")
```

IPv4 to be used

The Binding port no is reserved in my laptop

Defining the HeaderSize of each message to be sent

```
IP = "127.0.0.1"
```

```
port = 3000
```

```
HEADERSIZE = 10
```

Now we bind our host machine and port with the socket object we created

The IPv4 address is given above

The server is now listening for requests from other host machines also connected to the network

```
serverSocket.bind((IP,port))
```

#Listening to requests

```
serverSocket.listen()
```

```
print("Socket(Server) is currently active and listening to requests!!")
```

Stores all those sockets which are connected

```
socketsList = [serverSocket]
```

Client conected

```
clients = {}
```

A function to recieve messages from the clients connected over the network

```
def recieveMessage(clientSocket):
```

```
    try:
```


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We add some extra header information to our msg in order to know the size of the message we are sending

Getting the message header

```
messageHeader = clientSocket.recv(HEADERSIZE)
```

```
if not len(messageHeader):
```

```
    return False
```

Decoding the message length

```
messageLength = int(messageHeader.decode().strip())
```

Returning the message and its header

```
return {"Header" : messageHeader , "Data" : clientSocket.recv(messageLength)}
```

```
except:
```

```
    return False
```

Making a thread for every user connected to the server

```
def clientThread(notifiedSocket):
```

```
    while True:
```

```
        try:
```

```
            message = recieveMessage(notifiedSocket)
```

The part to do if a client leaves the connection

```
    if message is False:
```

```
        print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
```

```
        socketsList.remove(notifiedSocket)
```

```
        del clients[notifiedSocket]
```

```
        break
```

This is the exiting condition if the user types exit@me he exists the connection

```
    if ((message["Data"].decode()) == "exit@me"):
```

```
        print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
```

```
        socketsList.remove(notifiedSocket)
```

```
        del clients[notifiedSocket]
```

```
        break
```

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```

user = clients[notifiedSocket]

print(f"Recieved message from {user['Data'].decode()} : {message['Data'].decode()}")

# Distributing the Data to other clients

for clientSocket in clients:

    if clientSocket != notifiedSocket:

        clientSocket.send(user['Header'] + user['Data'] + message['Header'] + message['Data'])

except:

    print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")

    socketsList.remove(notifiedSocket)

    del clients[notifiedSocket]

    break

```

Function for server to send the message

```

def writeData():

    while True:

        message = input("")

        # To ban a member

        if message == "ban@":

            ban_member = input("Enter the name of the member to ban :")

            for x in clients:

                if clients[x]["Data"].decode() == ban_member:

                    print(f"Closed Connection from {clients[x]['Data'].decode()}")

                    socketsList.remove(x)

                    del clients[x]

                    break

            else:

                if message:

```

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```
message = message.encode()
```

```
messageHeader = f"{len(message):<{HEADERSIZE}}".encode()
```

```
msg = {"Header" : messageHeader , "Data" : message}
```

```
userName = "Server".encode()
```

```
userNameHeader = f"{len(userName):<{HEADERSIZE}}".encode()
```

```
user = {"Header" : userNameHeader , "Data" : userName}
```

```
for clientSocket in clients:
```

```
    if clientSocket != serverSocket:
```

```
        clientSocket.send(user['Header'] + user['Data'] + msg['Header'] + msg['Data'])
```

Listening to requests infinitely untill interrupted

```
while True:
```

```
    # Accepting the user and storing its address in the below defined variables
```

```
    clientSocket, clientAddress = serverSocket.accept()
```

```
    # Getting the information user wants to send
```

```
    user = recieveMessage(clientSocket)
```

```
    if user is False:
```

```
        continue
```

```
    socketsList.append(clientSocket)
```

```
    clients[clientSocket] = user
```

```
    print(f"Connection from {clientAddress} has been established!! : UserName :  
{user['Data'].decode()}")
```

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We add some extra header information to our msg in order to know the size of the message we are sending

The message to be sent

```
msg = "Welcome to the server,Thanks for connecting!!"
```

Adding the length of the message as the header information

```
msg = f'{len(msg):<{HEADERSIZE}}' + msg
```

Sending information to client socket

```
clientSocket.send(msg.encode())
```

```
thread = threading.Thread(target = clientThread, args = (clientSocket,))
```

```
thread.start()
```

```
writeThread = threading.Thread(target = writeData)
```

```
writeThread.start()
```

Client.py:

Importing the socket module

```
import socket
```

For distributing the messages along all clients

```
import select
```

When no message recieved or any other communication error

```
import errno
```

```
import sys
```

For realtime updation of state

```
import threading
```

AF_INET - IPv4 Connection

SOCK_STREAM - TCP Connection

```
clientSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
```

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IPv4 to be used

The port to which the client wants to connect

IP = "127.0.0.1"

port = 3000

Defining the HeaderSize of each message to be recieved

HEADERSIZE = 10

The client userName

my_username = input("UserName : ")

Connect to the server on this machine or locally

socket.gethostname() to get the hostname of the server

clientSocket.connect((IP,port))

No blocking the incoming messages

clientSocket.setblocking(False)

Sending the username to the server

userName = my_username.encode()

userNameHeader = f"{len(userName):<{HEADERSIZE}}".encode()

clientSocket.send(userNameHeader + userName)

recieving chunks of data from the server

def recieveData():

flag = 0

Recieving things infinitely

while True:

try:

if(flag == 0):# For the initial informative message

initHeader = clientSocket.recv(HEADERSIZE)

initLength = int(initHeader.decode().strip())

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```
msg = clientSocket.recv(initLength).decode()

print(f"Server > {msg}")

flag = 1

else:# For the subsequent messages

    userNameHeader = clientSocket.recv(HEADERSIZE)

    if not len(userNameHeader):

        print("Connection closed by the Server")

        sys.exit()

    userNameLength = int(userNameHeader.decode().strip())

    userName = clientSocket.recv(userNameLength).decode()


    messageHeader = clientSocket.recv(HEADERSIZE)

    messageLength = int(messageHeader.decode().strip())

    message = clientSocket.recv(messageLength).decode()


    print(f"{userName} > {message}")

except IOError as e:

    # This is normal on non blocking connections - when there are no incoming data, error is
    # going to be raised

    # Some operating systems will indicate that using AGAIN, and some using WOULDLOCK
    # error code

    # We are going to check for both - if one of them - that's expected, means no incoming data,
    # continue as normal

    # If we got different error code - something happened

    if(e.errno != errno.EAGAIN and e.errno != errno.EWOULDBLOCK):

        print("Reading Error",str(e))

        sys.exit()

    continue

except Exception as e:

    print("General error",str(e))

    sys.exit()
```

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Writing the data and sending it

```
def writeData():
```

```
    while True:
```

```
        message = input(">> ")
```

```
        if message:
```

```
            message = message.encode()
```

```
            messageHeader = f"{len(message):<{HEADERSIZE}}".encode()
```

```
            clientSocket.send(messageHeader + message)
```

```
recieveThread = threading.Thread(target = recieveData)
```

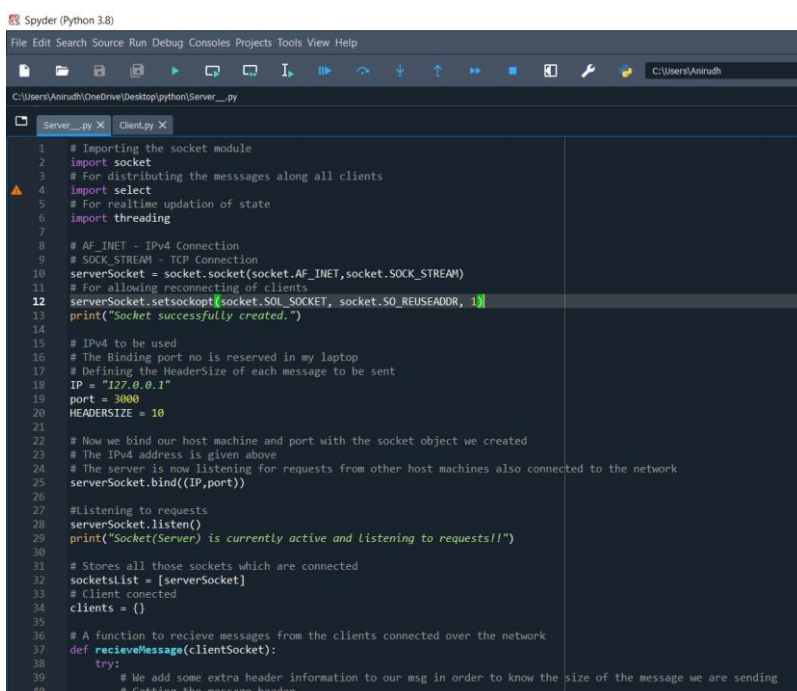
```
recieveThread.start()
```

```
writeThread = threading.Thread(target = writeData)
```

```
writeThread.start()
```

CODE SNAPSNOTS:

Server.py:



```
1 # Importing the socket module
2 import socket
3 # For distributing the messages along all clients
4 import select
5 # For realtime updation of state
6 import threading
7
8 # AF_INET - IPv4 Connection
9 # SOCK_STREAM - TCP Connection
10 serverSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
11 # For allowing reconnecting of clients
12 serverSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
13 print("Socket successfully created.")
14
15 # IPv4 to be used
16 # The Binding port no is reserved in my laptop
17 # Defining the HeaderSize of each message to be sent
18 IP = "127.0.0.1"
19 port = 3000
20 HEADERSIZE = 10
21
22 # Now we bind our host machine and port with the socket object we created
23 # The IPv4 address is given above
24 # The server is now listening for requests from other host machines also connected to the network
25 serverSocket.bind((IP,port))
26
27 #listening to requests
28 serverSocket.listen()
29 print("Socket(Server) is currently active and listening to requests!!")
30
31 # Stores all those sockets which are connected
32 socketsList = [serverSocket]
33 # Client connected
34 clients = {}
35
36 # A function to recieve messages from the clients connected over the network
37 def recieveMessage(clientSocket):
38     try:
39         # We add some extra header information to our msg in order to know the size of the message we are sending
40         # Getting the message header
```

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Spyder (Python 3.8)

```
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Anirudh\OneDrive\Desktop\python\Server_.py

Server_.py Client.py
39 # We add some extra header information to our msg in order to know the size of the message we are sendi
40 # Getting the message header
41 messageHeader = clientSocket.recv(HEADERSIZE)
42 if not len(messageHeader):
43     return False
44 # Decoding the message length
45 messageLength = int(messageHeader.decode().strip())
46 # Returning the message and its header
47 return {"Header" : messageHeader , "Data" : clientSocket.recv(messageLength)}
48 except:
49     return False
50
51 # Making a thread for every user connected to the server
52 def clientThread(notifiedSocket):
53     while True:
54         try:
55             message = recieveMessage(notifiedSocket)
56
57             # The part to do if a client leaves the connection
58             if message is False:
59                 print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
60                 socketsList.remove(notifiedSocket)
61                 del clients[notifiedSocket]
62                 break
63             # This is the exiting condition if the user types exit@me he exists the connection
64             if ((message["Data"].decode()) == "exit@me"):
65                 print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
66                 socketsList.remove(notifiedSocket)
67                 del clients[notifiedSocket]
68                 break
69             user = clients[notifiedSocket]
70             print(f"Recieved message from {user['Data'].decode()} : {message['Data'].decode()}")
71
72             # Distributing the Data to other clients
73             for clientSocket in clients:
74                 if clientSocket != notifiedSocket:
75                     clientSocket.send(user['Header'] + user['Data'] + message['Header'] + message['Data'])
76         except:
77             print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
78             socketsList.remove(notifiedSocket)
79             del clients[notifiedSocket]
```

Spyder (Python 3.8)

```
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Anirudh\OneDrive\Desktop\python\Server_.py


Server_.py Client.py
73 for clientSocket in clients:
74     if clientSocket != notifiedSocket:
75         clientSocket.send(user['Header'] + user['Data'] + message['Header'] + message['Data'])
76 except:
77     print(f"Closed Connection from {clients[notifiedSocket]['Data'].decode()}")
78     socketsList.remove(notifiedSocket)
79     del clients[notifiedSocket]
80     break
81
82 # Function for server to send the message
83 def writeData():
84     while True:
85         message = input("")
86         # To ban a member
87         if message == "ban@":
88             ban_member = input("Enter the name of the member to ban :")
89
90             for x in clients:
91                 if clients[x]['Data'].decode() == ban_member:
92                     print(f"Closed Connection from {clients[x]['Data'].decode()}")
93                     socketsList.remove(x)
94                     del clients[x]
95                     break
96
97         else:
98             if message:
99                 message = message.encode()
100                 messageHeader = f"{len(message):<{HEADERSIZE}}".encode()
101
102                 msg = {"Header" : messageHeader , "Data" : message}
103
104                 userName = "Server".encode()
105                 userNameHeader = f"{len(userName):<{HEADERSIZE}}".encode()
106
107                 user = {"Header" : userNameHeader , "Data" : userName}
108
109                 for clientSocket in clients:
110                     if clientSocket != serverSocket:
111                         clientSocket.send(user['Header'] + user['Data'] + msg['Header'] + msg['Data'])
112
113
```


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```
113
114
115 # Listening to requests infinitely untill interrupted
116 while True:
117     # Accepting the user and storing its address in the below defined variables
118     clientSocket, clientAddress = serverSocket.accept()
119
120     # Getting the information user wants to send
121     user = recieveMessage(clientSocket)
122     if user is False:
123         continue
124     socketsList.append(clientSocket)
125     clients[clientSocket] = user
126
127     print(f"Connection from {clientAddress} has been established!! : UserName : {user['Data'].decode()}")
128
129     # We add some extra header information to our msg in order to know the size of the message we are sending
130     # The message to be sent
131     msg = "Welcome to the server,Thanks for connecting!!"
132     # Adding the length of the message as the header information
133     msg = f'{len(msg):<{HEADERSIZE}}' + msg
134
135     # Sending information to client socket
136     clientSocket.send(msg.encode())
137
138     thread = threading.Thread(target = clientThread, args = (clientSocket,))
139     thread.start()
140
141     writeThread = threading.Thread(target = writeData)
142     writeThread.start()
143
```

Client.py:

 Spyder (Python 3.8)

```
File Edit Search Source Run Debug Consoles Projects Tools View Help
[Icons]
C:\Users\Anirudh\OneDrive\Desktop\python\Client.py
Server_.py X Client.py X
1 # Importing the socket module
2 import socket
3 # For distributing the messages along all clients
4 import select
5 # When no message recieved or any other communication error
6 import errno
7 import sys
8 # For realtime updation of state
9 import threading
10
11 # AF_INET - IPv4 Connection
12 # SOCK_STREAM - TCP Connection
13 clientSocket = socket.socket(socket.AF_INET,socket.SOCK_STREAM)
14
15 # IPv4 to be used
16 # The port to which the client wants to connect
17 IP = "127.0.0.1"
18 port = 3000
19
20 # Defining the HeaderSize of each message to be recieved
21 HEADERSIZE = 10
22
23 # The client userName
24 my_userName = input("UserName : ")
25
26 # Connect to the server on this machine or locally
27 # socket.gethostname() to get the hostname of the server
28 clientSocket.connect((IP,port))
29 # No blocking the incoming messages
30 clientSocket.setblocking(False)
31
32 # Sending the username to the server
33 userName = my_userName.encode()
34 userNameHeader = f'{len(userName):<{HEADERSIZE}}'.encode()
35 clientSocket.send(userNameHeader + userName)
36
37 # recieving chunks of data from the server
38 def recieveData():
39     flag = 0
40     # Recieving things infinitely
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```
Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Anirudh\OneDrive\Desktop\python\Client.py
Server_.py Client.py
37 # recieving chunks of data from the server
38 def recieveData():
39     flag = 0
40     # Recieving things infinitely
41     while True:
42         try:
43             if(flag == 0):# For the initial informative message
44                 initHeader = clientSocket.recv(HEADERSIZE)
45                 initLength = int(initHeader.decode().strip())
46                 msg = clientSocket.recv(initLength).decode()
47                 print(f"Server > {msg}")
48                 flag = 1
49             else:# For the subsequent messages
50                 userNameHeader = clientSocket.recv(HEADERSIZE)
51                 if not len(userNameHeader):
52                     print("Connection closed by the Server")
53                     sys.exit()
54                 userNameLength = int(userNameHeader.decode().strip())
55                 userName = clientSocket.recv(userNameLength).decode()
56
57                 messageHeader = clientSocket.recv(HEADERSIZE)
58                 messageLength = int(messageHeader.decode().strip())
59                 message = clientSocket.recv(messageLength).decode()
60
61                 print(f"{userName} > {message}")
62         except IOError as e:
63             # This is normal on non blocking connections - when there are no incoming data, error is going to be raised
64             # Some operating systems will indicate that using AGAIN, and some using WOULD_BLOCK error code
65             # We are going to check for both - if one of them - that's expected, means no incoming data, continue as normal
66             # If we got different error code - something happened
67             if(e.errno != errno.EAGAIN and e.errno != errno.EWOULDBLOCK):
68                 print("Reading Error",str(e))
69                 sys.exit()
70             continue
71         except Exception as e:
72             print("General error",str(e))
73             sys.exit()
74
75 # Writing the data and sending it
76 def writeData():
77     while True:
78         message = input("|")
79
80         if message:
81             message = message.encode()
82             messageHeader = f"{len(message):<{HEADERSIZE}}".encode()
83
84             clientSocket.send(messageHeader + message)
85
86         recieveThread = threading.Thread(target = recieveData)
87         recieveThread.start()
88
89         writeThread = threading.Thread(target = writeData)
90         writeThread.start()
```

OUTPUT:

In the picture given below, a server has been initialized on the left side of the terminal and a client script on the right side of the terminal.

For initialization purposes, you can see that whenever a message is sent by a user, the message along with IP address is shown on the server-side.

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Initialization(Connecting 4 users):

server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 57033) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 57111) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 57113) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 57117) has been established!! : UserName : Rajarshi
```

client.py(All clients)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Sending messages from all the clients to server and to one another:

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server__.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 57033) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 57111) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 57113) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 57117) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Anirudh : Hey Vansh I am fine , What about you
Recieved message from Ayush : I am fine as well bro
Recieved message from Rajarshi : Same here
```

Client.py(All clients)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
I am fine as well bro
Rajarshi > Same here

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Same here
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Sending messages from Server to all the clients:

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 57033) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 57111) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 57113) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 57117) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Anirudh : Hey Vansh I am fine , What about you
Recieved message from Ayush : I am fine as well bro
Recieved message from Rajarshi : Same here
Hey everyone Server by the side , I hope everyone is happy to be here
```

Client.py(All clients)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

If the user wants to exit from Server: keyword – exit@me

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server__.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 57033) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 57111) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 57113) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 57117) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Anirudh : Hey Vansh I am fine , What about you
Recieved message from Ayush : I am fine as well bro
Recieved message from Rajarshi : Same here
Hey everyone Server by the side , I hope everyone is happy to be here
Recieved message from Anirudh : hey
Recieved message from Anirudh : guys
Recieved message from Anirudh : i hope
Recieved message from Anirudh : every one
Recieved message from Anirudh : is fine
Recieved message from Anirudh : and doing well
Closed Connection from Anirudh
```

Client.py(A Client left)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
hey
guys
i hope
every one
is fine
and doing well
exit@me
Connection closed by the Server
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Spamming can also be done:

Server.py

```
MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 57033) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 57111) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 57113) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 57117) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Anirudh : Hey Vansh I am fine , What about you
Recieved message from Ayush : I am fine as well bro
Recieved message from Rajarshi : Same here
Hey everyone Server by the side , I hope everyone is happy to be here
Recieved message from Anirudh : hey
Recieved message from Anirudh : guys
Recieved message from Anirudh : i hope
Recieved message from Anirudh : every one
Recieved message from Anirudh : is fine
Recieved message from Anirudh : and doing well
```

Client.py(All clients)

```
MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
Anirudh > hey
Anirudh > guys
Anirudh > i hope
Anirudh > every one
Anirudh > is fine
Anirudh > and doing well

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
Anirudh > hey
Anirudh > guys
Anirudh > i hope
Anirudh > every one
Anirudh > is fine
Anirudh > and doing well

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Anirudh > Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
Anirudh > hey
Anirudh > guys
Anirudh > i hope
Anirudh > every one
Anirudh > is fine
Anirudh > and doing well

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Hey Vansh I am fine , What about you
Ayush > I am fine as well bro
Rajarshi > Same here
Server > Hey everyone Server by the side , I hope everyone is happy to be here
hey
guys
i hope
every one
is fine
and doing well
```

ANIRUDH VADERA
SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Server can ban someone also: keyword – ban@

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive
$ cd Desktop

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop
$ cd python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 55460) has been established!! : UserName : Anirudh
hi anirudh
Recieved message from Anirudh : hi server
ban@
Enter the name of the member to ban :Anirudh
Closed Connection from Anirudh
```

Client.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/py

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive
$ cd Desktop

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop
$ cd python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Server > hi anirudh
hi server
Server > Connection from server has been closed
```


Output for UDP Chat Application:

CODE:

Server_UDP.py:

Importing the socket module

```
import socket
```

For realtime updation of state

```
import threading
```

AF_INET - IPv4 Connection

SOCK_DGRAM - UDP Connection

```
serverSocket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
```

For allowing reconnecting of clients

```
serverSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
```

```
print("Socket successfully created.")
```

IPv4 to be used

The Binding port no is reserved in my laptop

```
IP = "127.0.0.1"
```

```
port = 3000
```

Now we bind our host machine and port with the socket object we created

The IPv4 address is given above

The server is now listening for requests from other host machines also connected to the network

```
serverSocket.bind((IP,port))
```

```
print("Socket(Server) is currently active and listening to requests!!")
```

Stores all those sockets which are connected

```
socketsList = [port]
```

Client conected

```
clients = {}
```

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)**# Clients IP who are connected**

```
clients_ip = {}
```

A function to receive messages from the clients connected over the network

```
def receiveMessage():
```

```
    try:
```

Receiving the message from users

```
        sender = serverSocket.recvfrom(1024)
```

```
        sender_ip = sender[1][0]
```

```
        sender_port = sender[1][1]
```

```
        sender_message = sender[0].decode()
```

```
        if not len(sender):
```

```
            return False
```

Returning the message and its header

```
        return {"Sender_IP" : sender_ip , "Sender_Port" : sender_port , "Data" : sender_message}
```

```
    except:
```

```
        return False
```

Making a thread for every user connected to the server

```
def clientThread():
```

```
    while True:
```

```
        try:
```

```
            sender = receiveMessage()
```

```
            if(sender["Data"][0:8] == "USERNAME"):
```

```
                print(f"Connection from {(sender['Sender_IP'],sender['Sender_Port'])} has been  
established!! : UserName : {sender['Data'][8:]}")
```

The message to be sent

```
            msg = "Welcome to the server,Thanks for connecting!!"
```

Sending information to client socket

```
            serverSocket.sendto(msg.encode(),(sender['Sender_IP'],sender['Sender_Port']))
```

```
            socketsList.append(sender['Sender_Port'])
```

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```

clients[sender['Sender_Port']] = sender['Data'][8:]
clients_ip[sender['Sender_Port']] = sender['Sender_IP']
else:
    if sender["Sender_Port"] == "":
        print(f"Closed Connection from {clients[sender['Sender_Port']]}")
        socketsList.remove(sender["Sender_Port"])
        del clients[sender["Sender_Port"]]
        break

# This is the exiting condition if the user types exit@me he exists the connection
    if (sender["Data"] == "exit@me"):
        print(f"Closed Connection from {clients[sender['Sender_Port']]}")
        socketsList.remove(sender["Sender_Port"])
        del clients[sender["Sender_Port"]]
        break

    user = clients[sender["Sender_Port"]]
    print(f"Recieved message from {user} : {sender['Data'][(int(sender['Data'][0]) + 1) : ]}")

# Distributing the Data to other clients
    for client in clients_ip:
        if client != sender["Sender_Port"]:
            serverSocket.sendto(sender["Data"].encode(),(clients_ip[client],client))

except:
    print(f"Closed Connection from {clients[sender['Sender_Port']]}")
    socketsList.remove(sender["Sender_Port"])
    del clients[sender["Sender_Port"]]
    break

# Function for server to sendto the message
def writeData():
    while True:
        message = input("")
        if message:

```

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```

message = message.encode()
for client in clients_ip:
    if client != port:
        serverSocket.sendto("6Server".encode() + message,(clients_ip[client],client))

```

Listening to requests infinitely untill interrupted

```

while True:
    thread = threading.Thread(target = clientThread)
    thread.start()

    writeThread = threading.Thread(target = writeData)
    writeThread.start()

```

Client_UDP.py:**# Importing the socket module**

```
import socket
```

When no message recieved or any other communication error

```
import errno
```

```
import sys
```

For realtime updation of state

```
import threading
```

AF_INET - IPv4 Connection**# SOCK_DGRAM - UDP Connection**

```
clientSocket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
```

IPv4 to be used**# The port to which the client wants to connect and send data to**

```
IP = "127.0.0.1"
```

```
port = 3000
```

ANIRUDH VADERA
SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

The client userName

```
my_username = input("UserName : ")
```

Connect to the server on this machine or locally

No blocking the incoming messages

```
clientSocket.setblocking(False)
```

sendtoing the username to the server

```
my_username = "USERNAME" + my_username
```

```
userName = my_username.encode()
```

```
clientSocket.sendto(userName, (IP,port) )
```

```
my_username = my_username[8:]
```

recieving chunks of data from the server

```
def recieveData():
```

```
    flag = 0
```

Recieving things infinitely

```
while True:
```

```
    try:
```

```
        if(flag == 0):# For the initial informative message
```

```
            sender = clientSocket.recvfrom(1024)
```

```
            sender_message = sender[0].decode()
```

```
            print(f"Server > {sender_message}")
```

```
            flag = 1
```

```
        else:# For the subsequent messages
```

```
            sender = clientSocket.recvfrom(1024)
```

```
            if not (sender):
```

```
                print("Connection closed by the Server")
```

```
                sys.exit()
```

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```

sender_message = sender[0].decode()

sender_userName_length = int(sender[0].decode()[0])

sender_Name = sender[0].decode()[1:(sender_userName_length+1)]

sender_message = sender[0].decode()[(sender_userName_length+1) : ]

print(f"{sender_Name} > {sender_message}")

```

```
except IOError as e:
```

This is normal on non blocking connections - when there are no incoming data, error is going to be raised

Some operating systems will indicate that using AGAIN, and some using WOULD BLOCK error code

We are going to check for both - if one of them - that's expected, means no incoming data, continue as normal

If we got different error code - something happened

```
if(e.errno != errno.EAGAIN and e.errno != errno.EWOULDBLOCK):
```

```
    print("Reading Error",str(e))
```

```
    sys.exit()
```

```
continue
```

```
except Exception as e:
```

```
    print("General error",str(e))
```

```
    sys.exit()
```

Writing the data and sending it

```
def writeData():
```

```
    while True:
```

```
        message = input("")
```

```
        if message:
```

```
            message = message.encode()
```

```
            clientSocket.sendto((str(len(my_userName)) + my_userName).encode() + message, (IP,port) )
```

```
recieveThread = threading.Thread(target = recieveData)
```

```
recieveThread.start()
```

ANIRUDH VADERA


SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```
writeThread = threading.Thread(target = writeData)
```

```
writeThread.start()
```

CODE SNAPSHOTS:

Server_UDP.py:

 Spyder (Python 3.8)

```
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C:\Users\Anirudh\OneDrive\Desktop\python\Server_UDP.py

Server_UDP.py X Client_UDP.py X

1  # Importing the socket module
2  import socket
3  # For realtime updation of state
4  import threading
5
6  # AF_INET - IPv4 Connection
7  # SOCK_DGRAM - UDP Connection
8  serverSocket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
9  # For allowing reconnecting of clients
10 serverSocket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
11 print("Socket successfully created.")
12
13 # IPv4 to be used
14 # The Binding port no is reserved in my laptop
15 IP = "127.0.0.1"
16 port = 3000
17
18 # Now we bind our host machine and port with the socket object we created
19 # The IPv4 address is given above
20 # The server is now listening for requests from other host machines also connected to the network
21 serverSocket.bind((IP,port))
22 print("Socket(Server) is currently active and listening to requests!!")
23
24 # Stores all those sockets which are connected
25 socketsList = [port]
26 # Client conected
27 clients = {}
28 # Clients IP who are connected
29 clients_ip = {}
30
31 # A function to recieve messages from the clients connected over the network
32 def recieveMessage():
33     try:
34         # Recieving the message from users
35         sender = serverSocket.recvfrom(1024)
36         sender_ip = sender[1][0]
37         sender_port = sender[1][1]
38         sender_message = sender[0].decode()
39         if not len(sender):
40             return False
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

```

Spyder (Python 3.8)
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C:\Users\Anirudh\OneDrive\Desktop\python\Server_UDP.py

Server_UDP.py X Client_UDP.py X
41 # Returning the message and its header
42 return {"Sender_IP" : sender_ip , "Sender_Port" : sender_port , "Data" : sender_message}
43 except:
44     return False
45
46 # Making a thread for every user connected to the server
47 def clientThread():
48     while True:
49         try:
50             sender = recieveMessage()
51             if(sender["Data"][0:8] == "USERNAME"):
52                 print(f"Connection from {(sender['Sender_IP'],sender['Sender_Port'])} has been established!! : UserName : {sender['Data'][8:]})")
53                 # The message to be sent
54                 msg = "Welcome to the server,Thanks for connecting!!"
55                 # Sending information to client socket
56                 serverSocket.sendto(msg.encode(),(sender['Sender_IP'],sender['Sender_Port']))
57                 socketsList.append(sender['Sender_Port'])
58                 clients[sender['Sender_Port']] = sender['Data'][8:]
59                 clients_ip[sender['Sender_Port']] = sender['Sender_IP']
60             else:
61                 if sender["Sender_Port"] == "":
62                     print(f"Closed Connection from {clients[sender['Sender_Port']]})")
63                     socketsList.remove(sender["Sender_Port"])
64                     del clients[sender["Sender_Port"]]
65                     break
66                 # This is the exiting condition if the user types exit@me he exists the connection
67                 if (sender["Data"] == "exit@me"):
68                     print(f"Closed Connection from {clients[sender['Sender_Port']]})")
69                     socketsList.remove(sender["Sender_Port"])
70                     del clients[sender["Sender_Port"]]
71                     break
72                 user = clients[sender["Sender_Port"]]
73                 print(f"Recieved message from {user} : {sender['Data'][(int(sender['Data'][0]) + 1) : ]}")
74                 # Distributing the Data to other clients
75                 for client in clients_ip:
76                     if client != sender["Sender_Port"]:
77                         serverSocket.sendto(sender["Data"].encode(),(clients_ip[client],client))
78             except:
79                 print(f"Closed Connection from {clients[sender['Sender_Port']]})")
80                 socketsList.remove(sender["Sender_Port"])
81                 del clients[sender["Sender_Port"]]

```

```

Spyder (Python 3.8)
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C:\Users\Anirudh\OneDrive\Desktop\python\Server_UDP.py

Server_UDP.py X Client_UDP.py X
72 user = clients[sender["Sender_Port"]]
73 print(f"Recieved message from {user} : {sender['Data'][(int(sender['Data'][0]) + 1) : ]}")
74 # Distributing the Data to other clients
75 for client in clients_ip:
76     if client != sender["Sender_Port"]:
77         serverSocket.sendto(sender["Data"].encode(),(clients_ip[client],client))
78 except:
79     print(f"Closed Connection from {clients[sender['Sender_Port']]})")
80     socketsList.remove(sender["Sender_Port"])
81     del clients[sender["Sender_Port"]]
82     break
83
84 # Function for server to sendto the message
85 def writeData():
86     while True:
87         message = input("")
88         # To ban a member
89         if message=="ban@":
90             ban_member = input("Enter the name of the member to ban :")
91
92             for x in clients:
93                 if clients[x] == ban_member:
94                     print(f"Closed Connection from {clients[x]})")
95                     socketsList.remove(x)
96                     del clients[x]
97                     break
98             else:
99                 if message:
100                     message = message.encode()
101                     for client in clients_ip:
102                         if client != port:
103                             serverSocket.sendto("6Server".encode() + message,(clients_ip[client],client))
104
105
106 # Listening to requests infinitely untill interrupted
107 while True:
108     thread = threading.Thread(target = clientThread)
109     thread.start()
110
111     writeThread = threading.Thread(target = writeData)
112     writeThread.start()

```


ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Client.py:

```
Spyder (Python 3.8)
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C:\Users\Anirudh\OneDrive\Desktop\python\Client_UDP.py

Server_UDP.py X Client_UDP.py X

1  # Importing the socket module
2  import socket
3  # When no message recieved or any other communication error
4  import errno
5  import sys
6  # For realtime updation of state
7  import threading
8
9  # AF_INET - IPv4 Connection
10 # SOCK_DGRAM - UDP Connection
11 clientSocket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
12
13 # IPv4 to be used
14 # The port to which the client wants to connect and send data to
15 IP = "127.0.0.1"
16 port = 3000
17
18 # The client userName
19 my_userName = input("UserName : ")
20
21 # Connect to the server on this machine or locally
22 # No blocking the incoming messages
23 clientSocket.setblocking(False)
24
25 # sendtoing the username to the server
26 my_userName = "USERNAME" + my_userName
27 userName = my_userName.encode()
28 clientSocket.sendto(userName, (IP,port) )
29
30 my_userName = my_userName[8:]
31
32 # recieving chunks of data from the server
33 def recieveData():
34     flag = 0
35     # Recieving things infinitely
36     while True:
37         try:
38             if(flag == 0):# For the initial informative message
39                 sender = clientSocket.recvfrom(1024)
40                 sender_message = sender[0].decode()
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OUTPUT:

In the picture given below, a server has been initialized on the left side of the terminal and a client script on the right side of the terminal.

For initialization purposes, you can see that whenever a message is sent by a user, the message along with IP address is shown on the server-side.

Initialization(Connecting 4 users):

server.py

```

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_UDP.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 55051) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 55052) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 56005) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 56007) has been established!! : UserName : Rajarshi

```

client.py(All clients)

```

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!

```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Sending messages from all the clients to server and to one another:

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_UDP.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 55051) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 55052) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 56005) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 56007) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Ayush : I am fine bro what about you
Recieved message from Anirudh : I am fine too waht about u
Recieved message from Rajarshi : yeah i am fine too
```

Client.py(All clients)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
I am fine too waht about u
Rajarshi > yeah i am fine too

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
yeah i am fine too
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Sending messages from Server to all the clients:

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_UDP.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 55051) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 55052) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 56005) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 56007) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Ayush : I am fine bro what about you
Recieved message from Anirudh : I am fine too waht about u
Recieved message from Rajarshi : yeah i am fine too
Hey everyone , Server by the side
```

Client.py(All clients)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side

MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
yeah i am fine too
Server > Hey everyone , Server by the side
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

If the user wants to exit from Server: keyword – exit@me

Server.py

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_UDP.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 56943) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 56945) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 56946) has been established!! : UserName : Rajarshi
Connection from ('127.0.0.1', 56948) has been established!! : UserName : Ayush
Recieved message from Vansh : Hey everyone how are you all
Recieved message from Rajarshi : I am fine bro what about you
Recieved message from Anirudh : Yeah i am fine
Recieved message from Ayush : Yeah me too
Closed Connection from Ayush
```

Client.py(A Client left)

```
MINGW64:/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python/

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey everyone how are you all
Rajarshi > I am fine bro what about you
Anirudh > Yeah i am fine
Yeah me too
exit@me
```

ANIRUDH VADERA

SINGLE SERVER – MULTI CLIENT CHAT APPLICATION USING SOCKETS(TCP AND UDP)

Spamming can also be done:

Server.py

```
MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python server_UDP.py
Socket successfully created.
Socket(Server) is currently active and listening to requests!!
Connection from ('127.0.0.1', 55051) has been established!! : UserName : Anirudh
Connection from ('127.0.0.1', 55052) has been established!! : UserName : Vansh
Connection from ('127.0.0.1', 56005) has been established!! : UserName : Ayush
Connection from ('127.0.0.1', 56007) has been established!! : UserName : Rajarshi
Recieved message from Vansh : Hey how are you all
Recieved message from Ayush : I am fine bro what about you
Recieved message from Anirudh : I am fine too waht about u
Recieved message from Rajarshi : yeah i am fine too
Hey everyone , Server by the side
Recieved message from Rajarshi : hey
Recieved message from Rajarshi : hi
Recieved message from Rajarshi : how
Recieved message from Rajarshi : is everyone
Recieved message from Rajarshi : my
Recieved message from Rajarshi : name
```

Client.py(All clients)

```
MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Anirudh
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side
Rajarshi > hey
Rajarshi > hi
Rajarshi > how
Rajarshi > is everyone
Rajarshi > my
Rajarshi > name

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Vansh
Server > Welcome to the server,Thanks for connecting!!
Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side
Rajarshi > hey
Rajarshi > hi
Rajarshi > how
Rajarshi > is everyone
Rajarshi > my
Rajarshi > name

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Ayush
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
I am fine bro what about you
Anirudh > I am fine too waht about u
Rajarshi > yeah i am fine too
Server > Hey everyone , Server by the side
Rajarshi > hey
Rajarshi > hi
Rajarshi > how
Rajarshi > is everyone
Rajarshi > my
Rajarshi > name

MINGW64/c/Users/Anirudh/OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh
$ cd OneDrive/Desktop/python

Anirudh@LAPTOP-526LOF85 MINGW64 /c/Users/Anirudh/OneDrive/Desktop/python
$ python client_UDP.py
UserName : Rajarshi
Server > Welcome to the server,Thanks for connecting!!
Vansh > Hey how are you all
Ayush > I am fine bro what about you
Anirudh > I am fine too waht about u
yeah i am fine too
Server > Hey everyone , Server by the side
hey
hi
hi
is everyone
my
name
```