CLIENT SERVER SOCKET PROGRAMMING

GitHub

INTRODUCTION :

This documentation provides an overview of the client and server programs implemented for the CN CSL317 Lab Assignment - Client-Server Socket Programming. There is one client program and four server programs, each handling a different number of clients concurrently.

INSTRUCTIONS FOR RUNNING THE CODE :

Server (server#.py)

- Open a terminal and run the server# program:
  `$ python server#.py <server-ip-addr> <server-port>`

- The server will start listening for connections on the specified IP address and port.

- To terminate the server, press **Ctrl + C**.

Client (client.py)

- Open a terminal and run the client program:
  `$ python client.py <server-ip-addr> <server-port>`

- The client will connect to the specified server using the provided IP address and port.

- To terminate the client, press **Ctrl + C**.

AGGRESSIVE TESTING :

Server1 :

Test 1 : We will start a single client, connect to server, and test all 4 arithmatic operations (+,-,,/) with two operands each.We will check that the results returned by the server to the client are correct.*

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 server1.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client socket number 4
Client sent message: 1+2
Sending reply: 3
Client sent message: 23-15
Sending reply: 8
Client sent message: 41*3
Sending reply: 123
Client sent message: 71/9
Sending reply: 7.888888888888889
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 1+2
Server replied: 3
Please enter the message to the server: 23-15
Server replied: 8
Please enter the message to the server: 41*3
Server replied: 123
Please enter the message to the server: 71/9
Server replied: 7.888888888888889
Please enter the message to the server:
```

Client Terminal

Test 2 : We will start a client, do some math operations (like TEST1), then terminate the client, start a second client, and check that the second client can chat with the server as well.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 server1.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client socket number 4
Client sent message: 34*5
Sending reply: 170
Client 4 disconnected.
Connected with client socket number 4
Client sent message: 5/4
Sending reply: 1.25
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 34*5
Server replied: 170
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 5/4
Server replied: 1.25
Please enter the message to the server:
```

Client 2 Terminal

Note : Here I have used file no. for referring to client, so these file no. can be same for different client.

Test 3 : We will try to connect a second client when the first one is still connected, and check that its socket operations fail.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 server1.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client socket number 4
Client sent message: 9*6
Sending reply: 54
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 9*6
Server replied: 54
Please enter the message to the server:
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 5/4
Server Busy. Please Wait...
```

Client 2 Terminal

Test 4 : Continuing with test 3 we will check if the request of client 2 gets fullfilled when the first client disconnects.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
server1.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client socket number 4
Client sent message: 9*6
Sending reply: 54
Client 4 disconnected.
Connected with client socket number 4
Client sent message: 5/4
Sending reply: 1.25
Client sent message: 9*5
Sending reply: 45
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 9*6
Server replied: 54
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 5/4
Server Busy. Please Wait...
Holaa..!! Server now serves You!!
Server replied: 1.25
Please enter the message to the server: 9*5
Server replied: 45
Please enter the message to the server:
```

Client 2 Terminal

Server2 :

Test 1 : We will check the correctness of arithmatic operations for a single client, as in Server1-Test1.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
server2.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client ('127.0.0.1', 65123)
Client Thread-1 (handle_client) sent message: 4+6
Sending reply to Thread-1 (handle_client): 10
Client Thread-1 (handle_client) sent message: 9/3
Sending reply to Thread-1 (handle_client): 3.0
Client Thread-1 (handle_client) sent message: 44-78
Sending reply to Thread-1 (handle_client): -34
Client Thread-1 (handle_client) sent message: 7*0
Sending reply to Thread-1 (handle_client): 0
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 4+6
Server replied: 10
Please enter the message to the server: 9/3
Server replied: 3.0
Please enter the message to the server: 44-78
Server replied: -34
Please enter the message to the server: 7*0
Server replied: 0
Please enter the message to the server:
```

Client Terminal

Test 2 : We will test that multiple clients can simultaneoulsy connect and chat with the server correctly. In addition we will connect a client, then connect and disconnect a second client. The first client should continue to function correctly.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 4*67
Server replied: 268
Please enter the message to the server: 7/3
Server replied: 2.3333333333333335
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 78/5
Server replied: 15.6
Please enter the message to the server: 75-23
Server replied: 52
Please enter the message to the server: 5+23
Server replied: 28
Please enter the message to the server:
```

Client 2 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 56-23
Server replied: 33
Please enter the message to the server: 4*5
Server replied: 20
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 3

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3 server2.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client ('127.0.0.1', 49228)
Connected with client ('127.0.0.1', 49239)
Client Thread-1 (handle_client) sent message: 4*67
Sending reply to Thread-1 (handle_client): 268
Client Thread-2 (handle_client) sent message: 78/5
Sending reply to Thread-2 (handle_client): 15.6
Client Thread-1 (handle_client) sent message: 7/3
Sending reply to Thread-1 (handle_client): 2.3333333333333335
Connected with client ('127.0.0.1', 49252)
Client Thread-3 (handle_client) sent message: 56-23
Sending reply to Thread-3 (handle_client): 33
Client Thread-2 (handle_client) sent message: 75-23
Sending reply to Thread-2 (handle_client): 52
Client 4 disconnected.
Client Thread-3 (handle_client) sent message: 4*5
Sending reply to Thread-3 (handle_client): 20
Client 6 disconnected.
Client Thread-2 (handle_client) sent message: 5+23
Sending reply to Thread-2 (handle_client): 28
```

Server Terminal

Server3 :

Test : Repeating tests for server2

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
server3.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client 4
Client 4 sent message: 34-5
Sending reply to 4: 29
Connected with client 5
Client 5 sent message: 56/7
Sending reply to 5: 8.0
Client 5 disconnected.
Client 4 sent message: 90+3
Sending reply to 4: 93
Connected with client 5
Client 5 sent message: 234/5
Sending reply to 5: 46.8
Client 4 sent message: 78*2
Sending reply to 4: 156
Client 4 disconnected.
Client 5 sent message: 8+0
Sending reply to 5: 8
Client 5 disconnected.
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 34-5
Server replied: 29
Please enter the message to the server: 90+3
Server replied: 93
Please enter the message to the server: 78*2
Server replied: 156
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 56/7
Server replied: 8.0
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 2 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 234/5
Server replied: 46.8
Please enter the message to the server: 8+0
Server replied: 8
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 3 Terminal

Server4 :

Test : We will test echo server with one and more clients and check whether it is working correctly.

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
server4.py 127.0.0.1 5001
Echo Server listening on 127.0.0.1:5001
Connected with client 4
Received from client 4: Shubham
Connected with client 5
Received from client 5: Computer Netwoking is my favourite course in Computer Sc
ience
Connected with client 6
Received from client 6: I loved doing this Socket Programming Assignment!!
Client 5 disconnected.
Received from client 4: 123 > 89
Received from client 6: It was a great experience doing this assignment!!
Client 6 disconnected.
Received from client 4: All is Well...
Client 4 disconnected.
^CServer terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: Shubham
Server replied: Shubham
Please enter the message to the server: 123 > 89
Server replied: 123 > 89
Please enter the message to the server: All is Well...
Server replied: All is Well...
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 1 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: Computer Netwoking is my favourite cours
e in Computer Science
Server replied: Computer Netwoking is my favourite course in Computer Science
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 2 Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: I loved doing this Socket Programming As
signment!!
Server replied: I loved doing this Socket Programming Assignment!!
Please enter the message to the server: It was a great experience doing this ass
ignment!!
Server replied: It was a great experience doing this assignment!!
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client 3 Terminal

SPECIAL FEATURES TEST CASES :

Test : Any arithmetic combination with (+,-,/,*) with multiple operands works for any server!! Any type of spacing between operands and operator works!! Also error handling if client enters wrong operations!!

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
server1.py 127.0.0.1 5001
Server listening on 127.0.0.1:5001
Connected with client socket number 4
Client sent message: 1+2*5
Sending reply: 11
Client sent message: 67/4*7+6-9
Sending reply: 114.25
Client sent message: 23    + 9
Sending reply: 32
Client sent message: 644+89/78-2+99/656  +78
Sending reply: 721.291940275172
Client sent message: 644+89/78-2+99/656  09 +78
Sending reply: Error: Invalid input. Please enter a valid arithmetic expression.
Client 4 disconnected.
^CServer terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Server Terminal

```
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming % python3
client.py 127.0.0.1 5001
Connected to server
Please enter the message to the server: 1+2*5
Server replied: 11
Please enter the message to the server: 67/4*7+6-9
Server replied: 114.25
Please enter the message to the server: 23    + 9
Server replied: 32
Please enter the message to the server: 644+89/78-2+99/656  +78
Server replied: 721.291940275172
Please enter the message to the server: 644+89/78-2+99/656  09 +78
Server replied: Error: Invalid input. Please enter a valid arithmetic expression
.
Please enter the message to the server: ^CClient terminated by user.
(base) shubhamsarjeraophapale@Shubhams-MacBook-Air Socket Programming %
```

Client Terminal

STUDENT RESPONSE :

Exclusively I gave most of the time building the single process single client server. I have used socket timeout feature for the client so that when second client makes request for chat the client comes to know after the timeout that server is busy (Conveyed through spacial message) and when the first client disconnects the second client gets opportunity to connect and chat(Again conveyed through special message).

Really Enjoyed doing this assignment and got exhausted too while thinking and debugging about how the client will know that server is busy for server1.py !! Also encorporated excessive error handling trapping os error and giving user friendly error messages.

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