

Computer Networks Lab: Tut-3

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OVERVIEW

Implemented 4 types of client server system, where the client chats with a 'calculator' server. and requests for an expression to be evaluated.

- `client.py`: A program for client through which the user requests for an expression to be evaluated. The client prompts the user after each expression whether they want to continue.
- `server1.py`: A program for first server, which can evaluate expressions and handles strictly one client at a time.
- `server2.py`: A program for second server, which can evaluate expressions and is a multi-threaded server, and can handle multiple clients concurrently.
- `server3.py`: A program for third server, which can evaluate expressions and is a single process server which can handle multiple clients concurrently using the `select.select()` method.
- `server4.py`: A program for fourth server, which echoes back the message as received by the client and is a single process server which can handle multiple clients concurrently using the `select.select()` method.

FUNCTIONALITIES IMPLEMENTED

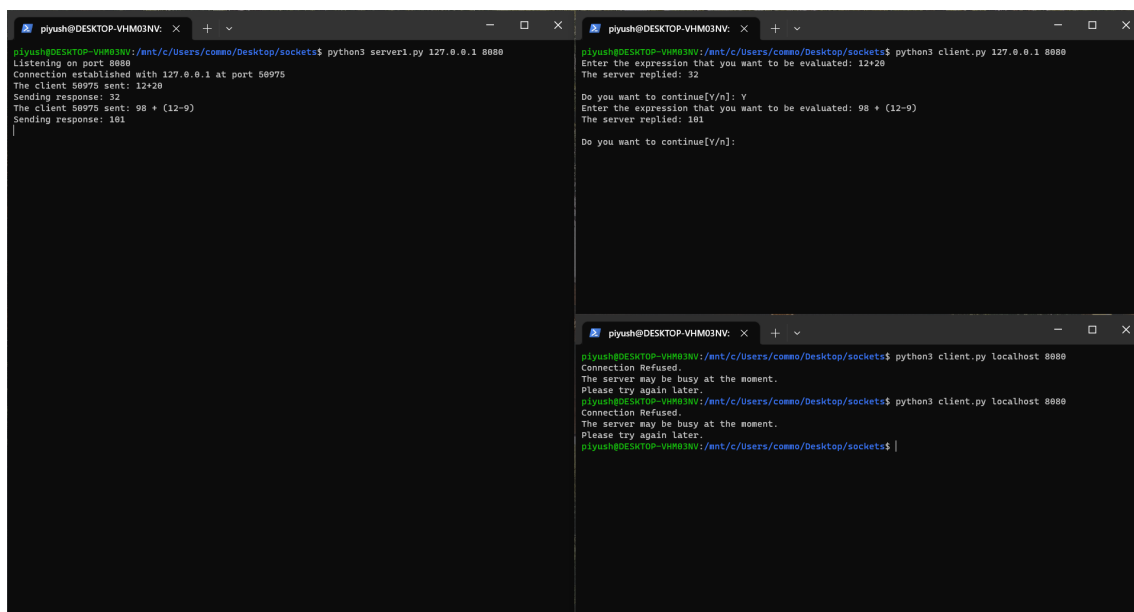
- All the servers except the echo server, can evaluate an expression having a valid syntax, including expression involving multiple operands, parenthesis etc. For instance, it can evaluate expressions like, " $5 + (21 - (-2 + 11))$ ", " $2/4 + (27 - 9)$ " etc.
- All 4 servers and the client have been implemented as specified.
- The code has several try-except blocks, for cases like, 'Invalid IP or Port Number', 'Permission Denied for the specified port number', 'invalid syntax for the expression to be evaluated'.

INSTRUCTIONS TO RUN

- The client should be run as
`python3 <File Name> <IP Address> <Port Number>`
- The server should be run as
`python3 <File Name> <IP Address> <Port Number>`

If hosted on localhost, 'localhost' can also be specified for IP instead of '127.0.0.1'.
For instance 'python3 client.py localhost 8080'

SERVER 1



```
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 server1.py 127.0.0.1 8080
Listening on port 8080
Connection established with 127.0.0.1 at port 58975
The client 58975 sent: 12+28
Sending response: 32
The client 58975 sent: 98 + (12-9)
Sending response: 181

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py 127.0.0.1 8080
Enter the expression that you want to be evaluated: 12+28
The server replied: 32
Do you want to continue[Y/n]: Y
Enter the expression that you want to be evaluated: 98 + (12-9)
The server replied: 181
Do you want to continue[Y/n]:

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Connection Refused.
The server may be busy at the moment.
Please try again later.
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Connection Refused.
The server may be busy at the moment.
Please try again later.
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$
```

Connection Request refused for the second client (bottom right) while the first client is running(top right)

```
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 server1.py 127.0.0.1 8080
Listening on port 8080
Connection established with 127.0.0.1 at port 50975
The client 50975 sent: 12+20
Sending response: 32
The client 50975 sent: 98 + (12-9)
Sending response: 98 + (12-9)
Connection closed with 127.0.0.1 at port 50975
Connection established with 127.0.0.1 at port 51802
The client 51802 sent: 12+91
Sending response: 103

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py 127.0.0.1 8080
Enter the expression that you want to be evaluated: 12+20
The server replied: 32
Do you want to continue[Y/n]: Y
Enter the expression that you want to be evaluated: 98 + (12-9)
The server replied: 98 + (12-9)
Do you want to continue[Y/n]: n
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Connection Refused.
The server may be busy at the moment.
Please try again later.
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Connection Refused.
The server may be busy at the moment.
Please try again later.
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Enter the expression that you want to be evaluated: 12+91
The server replied: 103
Do you want to continue[Y/n]: |
```

Second client is able to connect after the first client has terminated.

SERVER 2

```
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 server2.py 127.0.0.1 8080
Listening on port 8080
Connection established with 127.0.0.1 at 51103
The client 51103 sent: 125+151+898
Sending response 1174
Connection established with 127.0.0.1 at 51104
The client 51104 sent: 189+787+78+8
Sending response 1600
Connection established with 127.0.0.1 at 51105
The client 51105 sent: 414+987
Sending response 1401
Connection closed with client 51105

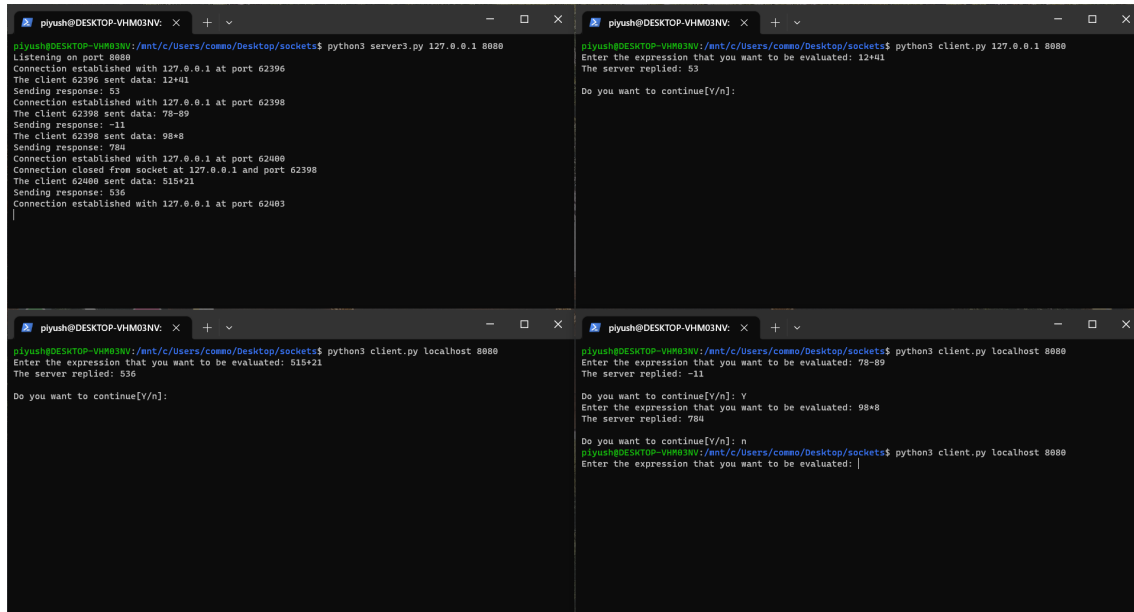
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py 127.0.0.1 8080
Enter the expression that you want to be evaluated: 125+151+898
The server replied: 1174
Do you want to continue[Y/n]:

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Enter the expression that you want to be evaluated: 414+987
The server replied: 1401
Do you want to continue[Y/n]: n
piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$

piyush@DESKTOP-VHM03NV: /mnt/c/Users/commo/Desktop/sockets$ python3 client.py localhost 8080
Enter the expression that you want to be evaluated: 189+787+78+8
The server replied: 1600
Do you want to continue[Y/n]:
```

All three clients are able to connect simultaneously and the server handles all of them concurrently. The server uses multi-threading

SERVER 3



```
piyush@DESKTOP-VHM03NV: ~$ python3 server3.py 127.0.0.1 8888
Listening on port 8888
Connection established with 127.0.0.1 at port 62396
The client 62396 sent data: 12+41
Sending response: 53
Connection established with 127.0.0.1 at port 62398
The client 62398 sent data: 78-89
Sending response: -11
The client 62398 sent data: 98*8
Sending response: 784
Connection established with 127.0.0.1 at port 62400
Connection closed from socket at 127.0.0.1 and port 62398
The client 62400 sent data: 515+21
Sending response: 536
Connection established with 127.0.0.1 at port 62403

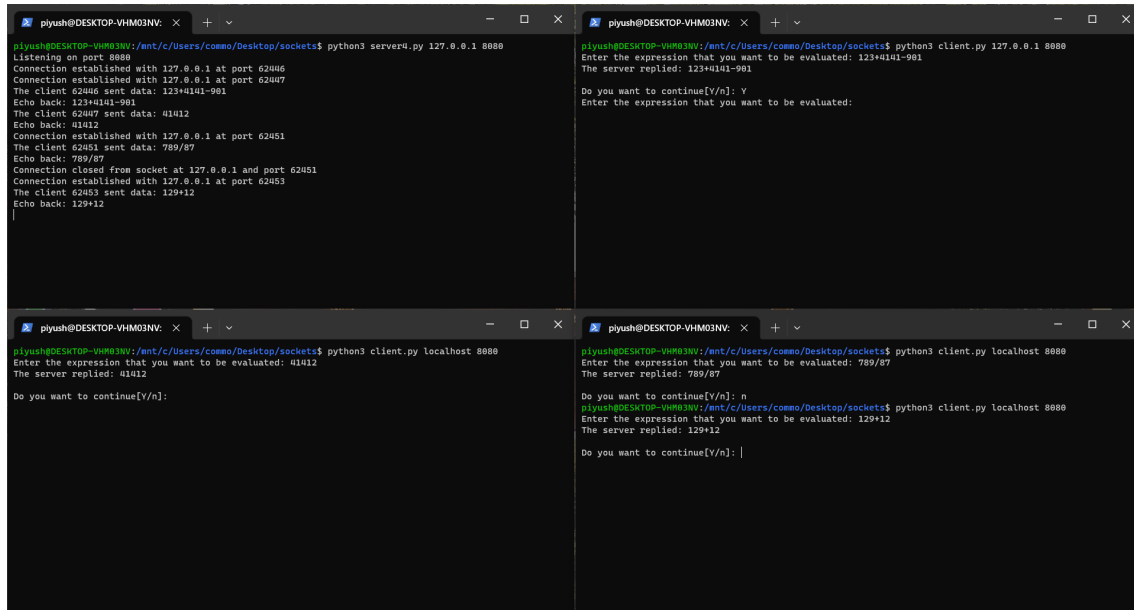
piyush@DESKTOP-VHM03NV: ~$ python3 client.py 127.0.0.1 8888
Enter the expression that you want to be evaluated: 12+41
The server replied: 53
Do you want to continue[Y/n]:

piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: 515+21
The server replied: 536
Do you want to continue[Y/n]:

piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: 78-89
The server replied: -11
Do you want to continue[Y/n]: Y
Enter the expression that you want to be evaluated: 98*8
The server replied: 784
Do you want to continue[Y/n]: n
piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: |
```

All three clients are able to connect simultaneously and the server handles all of them concurrently. The server uses the `select.select()` method to implement this.

SERVER 4



```
piyush@DESKTOP-VHM03NV: ~$ python3 server4.py 127.0.0.1 8888
Listening on port 8888
Connection established with 127.0.0.1 at port 62446
Connection established with 127.0.0.1 at port 62447
The client 62446 sent data: 123+4141-991
Echo back: 123+4141-991
The client 62447 sent data: 41412
Echo back: 41412
Connection established with 127.0.0.1 at port 62451
The client 62451 sent data: 789/87
Echo back: 789/87
Connection closed from socket at 127.0.0.1 and port 62451
Connection established with 127.0.0.1 at port 62453
The client 62453 sent data: 129+12
Echo back: 129+12

piyush@DESKTOP-VHM03NV: ~$ python3 client.py 127.0.0.1 8888
Enter the expression that you want to be evaluated: 123+4141-991
The server replied: 123+4141-991
Do you want to continue[Y/n]: Y
Enter the expression that you want to be evaluated:

piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: 41412
The server replied: 41412
Do you want to continue[Y/n]:

piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: 789/87
The server replied: 789/87
Do you want to continue[Y/n]: n
piyush@DESKTOP-VHM03NV: ~$ python3 client.py localhost 8888
Enter the expression that you want to be evaluated: 129+12
The server replied: 129+12
Do you want to continue[Y/n]:
```

This is an echo server. All three clients are able to connect simultaneously and the server handles all of them concurrently. The server uses the `select.select()` method to implement this.