Socket Programming: Number Exchange

The protocol used in this socket programming project was TCP (Transmission Control Protocol).

The communication protocol can be outlined as:

- The client initiates communication with a "100 Hello" message to the server.
- Upon receiving the "Hello" message, the server response with "101 Hello Ack".
- The client sends "105 Primes a b" where 'a' and 'b' are two prime numbers.
- The server then calculates the LCM (Lowest Common Multiple) of 'a' and 'b' and responds with "107 LCM l", where 'l' is the calculated LCM.
- If the LCM calculated by the client matches the server's LCM, the client sends '200 OK'; otherwise, it sends "400 Error".

When the client starts, it prints "Client of [Name]" to identify the client user. The client prints a message when it establishes a connection with the server. Then, the server prints a message when it accepts a connection from a client. Now, both the client and server print informative statements for message sending and receiving. These informative messages are then displayed when processing messages, handling errors, and closing connections.

Testing

When testing, as you will see in the given screenshots below, I tested the server three times. Each with different inputs to see how it will react in hopes of error handling being able to hold:

1) Valid scenario:
    o The client sends two (2) valid prime numbers within the specified range.
    o The server calculates the correct LCM.
    o Client responds with "200 OK".

2) Invalid prime numbers:
    o The client sends non-prime numbers.

    o o The server responds with "400 Error".

3) Unexpected message:
   o The client sends an unexpected message. o Server
      responds with "500 Bad Request" **Screenshots:**

1) Valid Scenario

<u>**Server.py**</u>

```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\server.py 55555
Enter your name: Brandon Bradshaw
Server of Brandon Bradshaw
Connected from:  ('127.0.0.1', 51557)
Received:  100 Hello
Received:  105 Primes 1229 1231
Client's response: 200 OK (LCM: 1512899)
Connection closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 6:17:03 PM
```

<u>**Client.py**</u>

```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\client.py localhost 55555
Enter your name: Brandon Bradshaw
Client of Brandon Bradshaw

    The purpose of this program is to collect two prime numbers from the client, and then
    send them to the server. The server will compute their LCM and send it back to the
    client. If the server-computed LCM matches the locally computed LCM, the client sends
    the server a 200 OK status code. Otherwise, it sends a 400 Error status code, and
    then closes the socket to the server.

Connected to the server at 127.0.0.1:55555
Received: 101 Hello Ack
Enter a prime number between 1031 and 6397: 1229
Enter a prime number between 1031 and 6397: 1231
Server response: 200 OK
Connection to the server closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 6:17:01 PM
```

2) Invalid Prime numbers:

Server.py


```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\server.py 55555
Enter your name: Brandon Bradshaw
Server of Brandon Bradshaw
Connected from:  ('127.0.0.1', 52972)
Received:  100 Hello
Received:  400 Error
500 Bad Request
Connection closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 7:11:04 PM
```

Client.py


```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\client.py localhost 55555
Enter your name: Brandon Bradshaw
Client of Brandon Bradshaw

    The purpose of this program is to collect two prime numbers from the client, and then
    send them to the server. The server will compute their LCM and send it back to the
    client. If the server-computed LCM matches the locally computed LCM, the client sends
    the server a 200 OK status code. Otherwise, it sends a 400 Error status code, and
    then closes the socket to the server.

Connected to the server at 127.0.0.1:55555
Received: 101 Hello Ack
Enter a prime number between 1031 and 6397: 1032
Enter a prime number between 1031 and 6397: 6322
Server response: 400 Error
Connection to the server closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 7:11:02 PM
```

3) Unexpected Message

Client.py

```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\client.py localhost 55555
Enter your name: Brandon Bradshaw
Client of Brandon Bradshaw

    The purpose of this program is to collect two prime numbers from the client, and then
    send them to the server. The server will compute their LCM and send it back to the
    client. If the server-computed LCM matches the locally computed LCM, the client sends
    the server a 200 OK status code. Otherwise, it sends a 400 Error status code, and
    then closes the socket to the server.

Connected to the server at 127.0.0.1:55555
Received: 101 Hello Ack
Enter a prime number between 1031 and 6397: One Thousand Two Hundred Twenty-Nine
Unexpected bad response
Server response: 500 Bad Request
Connection to the server closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 7:27:01 PM
```

Server.py

```
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> python .\server.py 55555
Enter your name: Brandon Bradshaw
Server of Brandon Bradshaw
Connected from:  ('127.0.0.1', 53439)
Received:  100 Hello
Received:  Unexpected bad response
500 Bad Request
Connection closed
PS C:\Users\brand\OneDrive\Desktop\Project1_620155340> date

Monday, October 16, 2023 7:26:59 PM
```

Expected Outcomes

- All valid scenarios should result in "200 OK" and print the calculated LCM.
- Invalid prime numbers should lead to "400 Error".
- An unexpected message should result in "500 Bad Request".