Lab Report #4: Network Programming

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Project Overview

The students will be implementing a multi-user chat room using the socket library on Linux. Users will be able to send messages to each other using the command line. To run the program, one terminal must act as the server and other terminals need to connect to the server as a client.

To run the server, type the following command:

$ sudo ./main_server

To run the client, type the following command:

$ ./main_client 127.0.0.1

Or

$ ./main_client 127.0.0.1 new

Or

$ ./main_client 127.0.0.1 XXX

Display List of Clients

The main server is able to display an up to date list of clients that have joined (Figure 1) and which room they have joined (Figure 2). Once a client leaves the chatroom, the server prints that they have left (Figure 3).

```
Connected: 127.0.0.1
Current Client List:
        - Sockfd 4
        - Sockfd 5
```

Figure 1. Server Side - Client Connecting List Update

```
REQUEST: 5 is trying to join room 1
```

Figure 2. Server Side - Client Joining a Room

Figure 3. Server Side - Client Disconnecting List Update

Broadcasting Messages

The server will be able to accept and maintain multiple client connections. When a client types and sends a message to the chatroom, the server will broadcast the message to other clients in the chatroom (Figure 4 and 5).

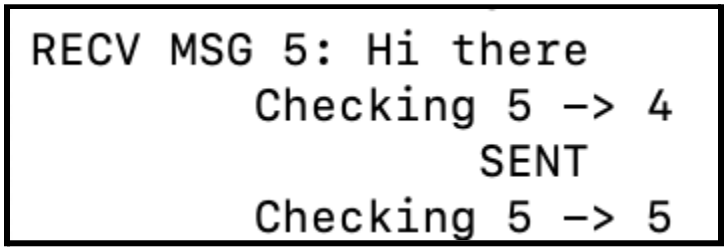

Figure 4. Server Side - Processing Client Broadcasting a Message

Figure 5. Client Side - Client Receiving Broadcasted Message

Client Usernames

When a client joins the server, the server will ask for the client to enter a username (Figure 6). Once entered, the username for the client is saved and will display whenever the client sends out messages (Figure 7).

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1 new
Try connecting to 127.0.0.1...
Please enter a username...
My_name
```

Figure 6. Client Side - Client Being Asked to Input a Username

```
[myname]:hello
```

Figure 7. Client Side - Username Showing Up on A Different Client

Multiple Chat Room Feature

The server has the ability to maintain multiple chat rooms. When the client joins they have two options: join a new room or an existing room.

To join a new chat room, the user should type the following:

$ ./main_client 127.0.0.1 new

The client will be assigned to a new chat room that does not have any existing users. The client will see a message indicating what chat room number they have joined (Figure 8).

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1 new
Try connecting to 127.0.0.1...
Please enter a username...
My_name
Joining Room 1
```

Figure 8. Client Side - Joining A New Room

To join an existing chat room, the user should type the following:

$ ./main_client 127.0.0.1 XXX

Where XXX is a pre-existing room number (Figure 9). If the client requests to join a room that does not exist, the request will be blocked (Figure 10).

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1 1
Try connecting to 127.0.0.1...
Please enter a username...
My_Other_Name
Joining Room 1
```

Figure 9. Client Side - Joining An Existing Room

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1 100
Try connecting to 127.0.0.1...
Please enter a username...
My_Other_Name
ERROR Invalid Input, Shutting Down Client
Disconnecting From Server
Sarems-MacBook-Pro:Project4 saremshalforoosh$
```

Figure 10. Client Side - Attempting to Join An Invalid Room

List of Chat Rooms

If the user runs the client script and does not specify the keyword new or specify the room they would like to join, the server will return a list of existing chat rooms that the user can join (Figure 11). However, if there are no existing rooms, the server will create a new room and the client will automatically join that room (Figure 12).

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1
Try connecting to 127.0.0.1...
Please enter a username...
My_Third_Name
Room 1: 1 people
Room 2: 1 people
Choose the room number or type [new] to create a new room:
```

Figure 11. Client Side - Listing All Available Rooms

```
Sarems-MacBook-Pro:Project4 saremshalforoosh$ ./main_client 127.0.0.1
Try connecting to 127.0.0.1...
Please enter a username...
My_Third_Name
Joining Room 1
```

Figure 12. Client Side - Running the Command While No Other Rooms Exist

Assigning Colors to Clients

When a client joins a chatroom, they will be automatically assigned a color and whenever they send messages. These messages will appear to other users in the color the sender was assigned upon receiving their message. However, the messages the client is sending will be in black (Figure 13 and 14).

```
Please enter a username...
My_Other_Name
Joining Room 1
Hello!
[My_name]:Hi!
```

Figure 13. Client Side - My_Name is Red on the My_Other_Name Client

```
Please enter a username...
My_name
Joining Room 1
[My_Other_Name]:[has joined the room]
[My_Other_Name]:Hello!
Hi!
```

Figure 14. Client Side - My_Other_Name is Green on the My_Name Client