

Report

This report is an analysis of a chat application and the protocol that supports the application. It encompasses features of the application, the protocol design and the individual client implementations of the application

1. Protocol Design and Functionality

The protocol's design was developed with the following rules in mind: these are rules that all client implementations and communications must follow.

Protocol Rules:

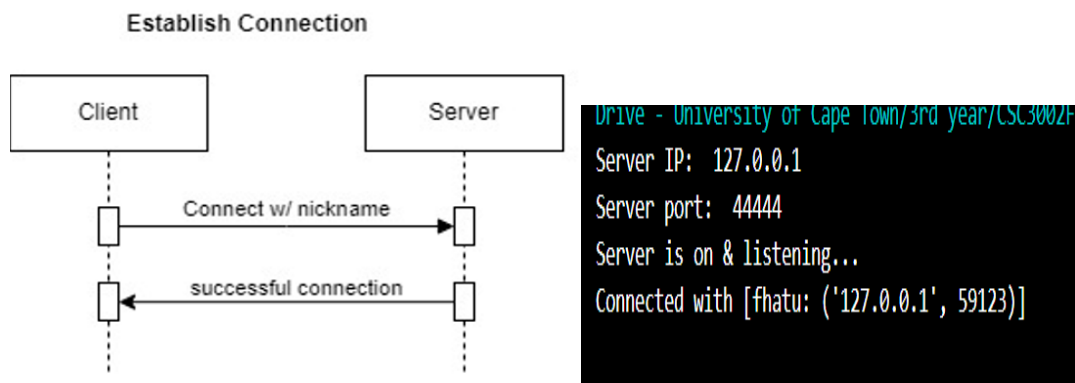
- **Message Encoding:** Exchanging of messages between clients and servers should be encoded in ASCII.
All queries to the server must start with “/”, else the message is processed as normal or not at all.
- **Message Length:** A maximum of 1024 bytes can be exchanged between clients and the server.
- **Connection Management:** All clients must be actively connected to the server while running.
To close the connection to the server – clients must terminate their programs.
ConnectionResetError is handled by removing the client from the list of active clients.

1.1 Client connection:

When a client connects to the server, the client sends their nickname to the server.

The server acknowledges this connection and adds the client to the list of active clients that are connected to the server

(see sequence diagram below + screenshot of server output)



1.2. Message Exchange:

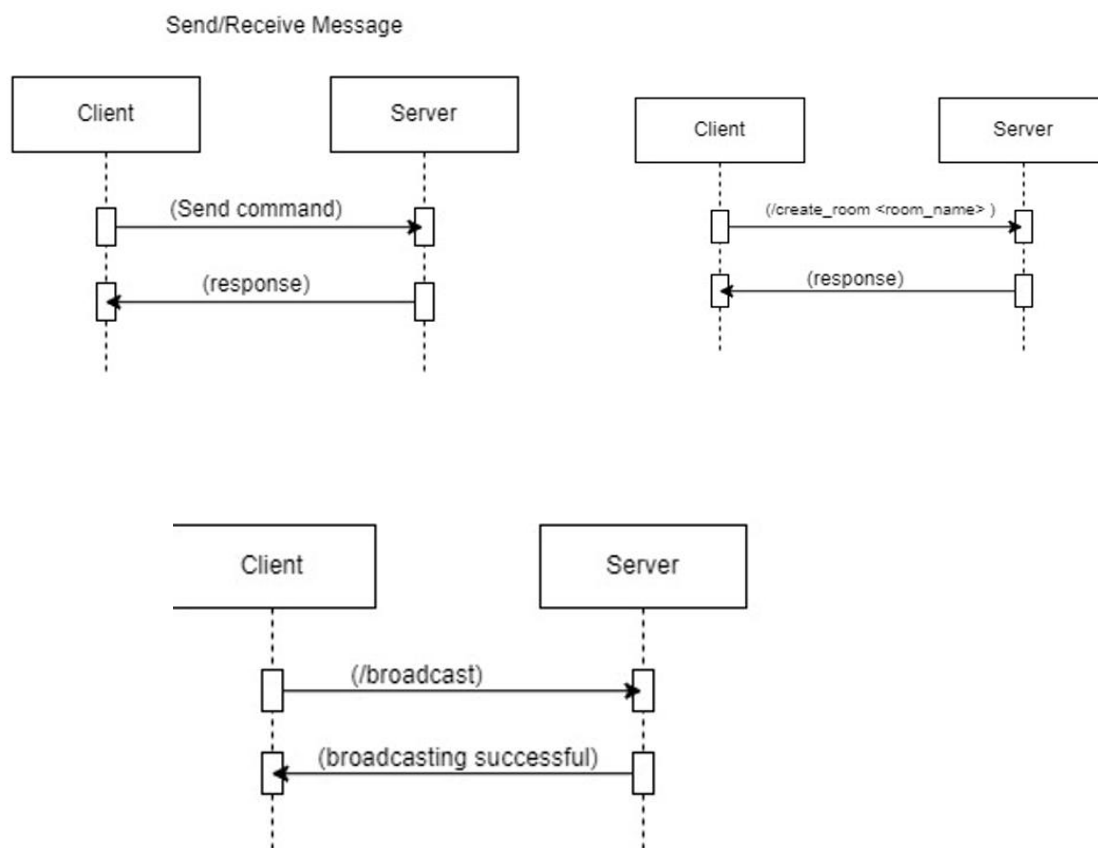
Clients can send numerous messages to the server.

The server processes these messages and responds accordingly.

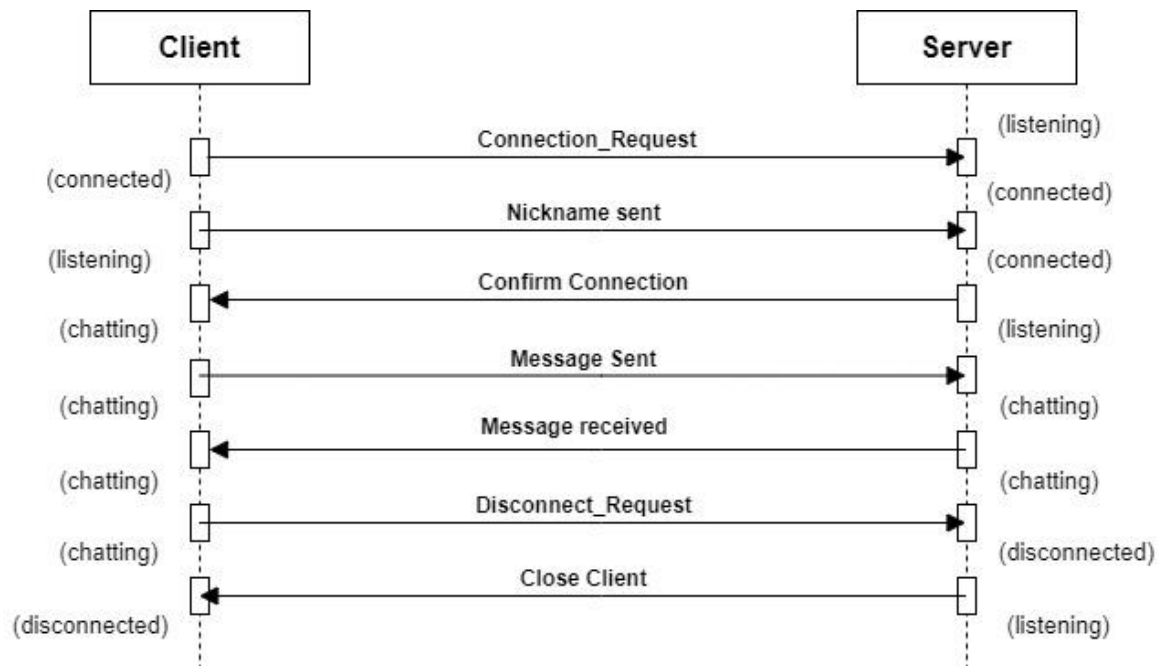
Valid commands are:

- /members : to obtain a list of active members
- /hide : to hide the client's nickname from list of active members
- /reveal : to show the client's from list of active members
- /broadcast : to broadcast a message to all active members
- /create_room : to create a new chatroom
- /join : to join a chatroom
- /room : to send a message to a chatroom
- /get_rooms : to obtain a list of chatrooms
- /leave : to exit a chatroom

(see sequence diagrams)



Below is a sequence diagram indicating the different states in which the server and client are in and the events that prompt these events:



APPLICATION FEATURES

Available users: list of available users, with their ip address and port at which they're listening at.

Reasoning: a user might need to know who is available for communication if they want to broadcast a message or know who they can communicate with privately. This way, if the user they want to communicate with is not available, clients will not waste time trying to connect to an unavailable user. Including ip address and port number means any client who wants to connect to another active may get their details to request connection.

How it works: If the message the server receives is `/members`, the server will return a list of the currently connected and visible users with their IP address and their port number.

```

Enter server IP address: 127.0.0.1
Enter server port number: 44444
Enter your nickname: lu
Connected to the server
/members
Active chat members are:
1.fhatu: ('127.0.0.1', 23486)2.lu: ('127.0.0.1', 23760)
  
```

Visibility: connected users can choose to be visible to/hidden from other users

Reasoning: Sometimes a person might be connected but busy or not wanting any connections, or to receive broadcast messages. This feature gives the users the option to not appear as online, while staying connected. They can then choose to appear to other users when they please. This ensures have some level of control of when other users can communicate with them, and their privacy.

How it works:

If the message received by the server starts with “/hide”, the server prompts the client to send the nickname to be hidden, then removes that nickname from the list of available users. Updated list of members will not contain this client’s nickname.

```
/members
Active chat members are:
1.fhату: ('127.0.0.1', 23486)2.lu: ('127.0.0.1', 23760)

/hide
Enter nickname to hide
lu
You are now invisible!
/members
Active chat members are:
1.fhату: ('127.0.0.1', 23486)
```

If the message starts with “/reveal”, then the program will first check that user doesn’t appear on the current list of active clients, then add them to it if that’s the case. If the user is already visible, the server will do nothing.

```
lu
You are now invisible!
/members
Active chat members are:
1.fhату: ('127.0.0.1', 23486)

/reveal
Enter nickname to show
lu
You are now visible to other users!
/members
Active chat members are:
1.fhату: ('127.0.0.1', 23486)2.lu: ('127.0.0.1', 23760)
```

Creating new chatroom: this feature allows connected users to create a new chatroom where multiple clients can communicate with each other.

Reasoning: When users want to discuss something once off with people of like interests, they can just do so all at once. Instead of individual conversations where the same information would have to be shared repeatedly. Chatrooms also allow people to view announcements from others and others’ thoughts without having to be responsive. They are great avenues to sharing knowledge to people who care about it. This is better than broadcasting messages to all connected users because users would just get flooded with irrelevant messages that way.

How it works: the client must send the “/create_room” command accompanied by the name the user wants to give the chatroom. When the server receives “/create_room” command, it checks if the chat room name is unique, if the name already exists, the user will be notified then the user can choose to change the chat room name or join that existing chatroom. The server sends a message to notify the client of the created chatroom. The creator is automatically a part of the chatroom.

Server:

```
Server is on & listening...
Connected with [lu: ('127.0.0.1', 23431)]
Connected with [fhату: ('127.0.0.1', 23486)]
Client closed connection unexpectedly.
Connected with [lu: ('127.0.0.1', 23760)]
Created new chat room crew
```

Client creating chatroom:

```
/create room crew
Room crew created successfully!
```

If chatroom already exists:

```
/create room crew
Room crew already exists
```

Joining chatrooms:

Clients can join existing chatrooms.

Reasoning: if a client wants to join a chatroom that's based on a certain topic, they can join an existing one instead of having to create their own. This limits the number of chatrooms created, thus limiting the amount of computer resources required.

How it works: server receives “/join” message, if the client is not already in specified chatroom, client is added. The client is then notified of the chatroom they have joined. The Server also prints “{client} joined {room name} and notifies the other users. If the client is already a member of that chatroom, they are notified of this fact and not re-added. If the chatroom is not on the list of existing chatrooms, the client is told they are attempting to join a non-existent chatroom. **List of existing rooms** allows clients to get a list of chatrooms they can join using “/get_rooms”, so they don't have to create several chatrooms for similar discussions.

```
/create room crew
Room crew created successfully!
/create room group
Room group created successfully!
create room robotics
/create room robotics
Room robotics created successfully!
/get_rooms
Rooms:
crew group robotics
```

Users can also **send messages in the chatroom**, by sending a message that's starts with “/room”, followed by the chat room they want to broadcast to and then the message. If the room does not exist, the user is notified. Clients can **also leave chatrooms** by using the “/leave” command. The client is notified after they are removed from the chatroom. If a user tries to, leave a chatroom they are not a member of, they're notified.

More Chatroom commands in action:

```
/create room Twitter
Room Twitter created successfully!
/join Youtube
Room Youtube does not exist!
/join Facebook
Joined room Facebook successfully!
/room Facebook This room is boring, I am joining another room
This room is boring, I am joining another room
```

```
/leave
Foden: Hello everyone, let us create our rooms
/create room Facebook
Room Facebook created successfully!
```

Server:

```
<socket.socket fd=380, family=AddressFamily.AF_INET, type=SocketKind.SOCK_STREAM, proto=0, laddr=('192.168.252.130', 44444), raddr=('192.168.252.130', 50050)> joined room Facebook
Message broadcasted to members of Facebook
Send a list of rooms to <socket.socket fd=380, family=AddressFamily.AF_INET, type=SocketKind.SOCK_STREAM, proto=0, laddr=('192.168.252.130', 44444), raddr=('192.168.252.130', 50050)>
<socket.socket fd=380, family=AddressFamily.AF_INET, type=SocketKind.SOCK_STREAM, proto=0, laddr=('192.168.252.130', 44444), raddr=('192.168.252.130', 50050)> left room Facebook
Member left room Facebook
|
```

When client disconnects:

```
/quit
Goodbye!
```

Server:

```
Closed connection: Foden  
Closed connection: Lubasi  
Closed connection: Antoine  
|
```

Client Implementation

My client communicates with the server through a TCP port. The client continuously displays a menu for the user to pick options from. The program then converts the option chosen by the user into a format that can be understood and executed by the server, then sends that message to the server and shows the server responses to the user.