Report Projectwork:
Chat TCP in C

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Task

Implementation of a simple chat in C.
The architecture must be client server and the communication must be implemented with sockets.
Client must connect to the Server to communicate with other Clients.
Each Client is identified by username.
The Server must manage connections and allows the exchange of messages between Clients.
A Client can also broadcast a message to all active Clients connected to the Server.

Software Environment

Distributor ID: Ubuntu

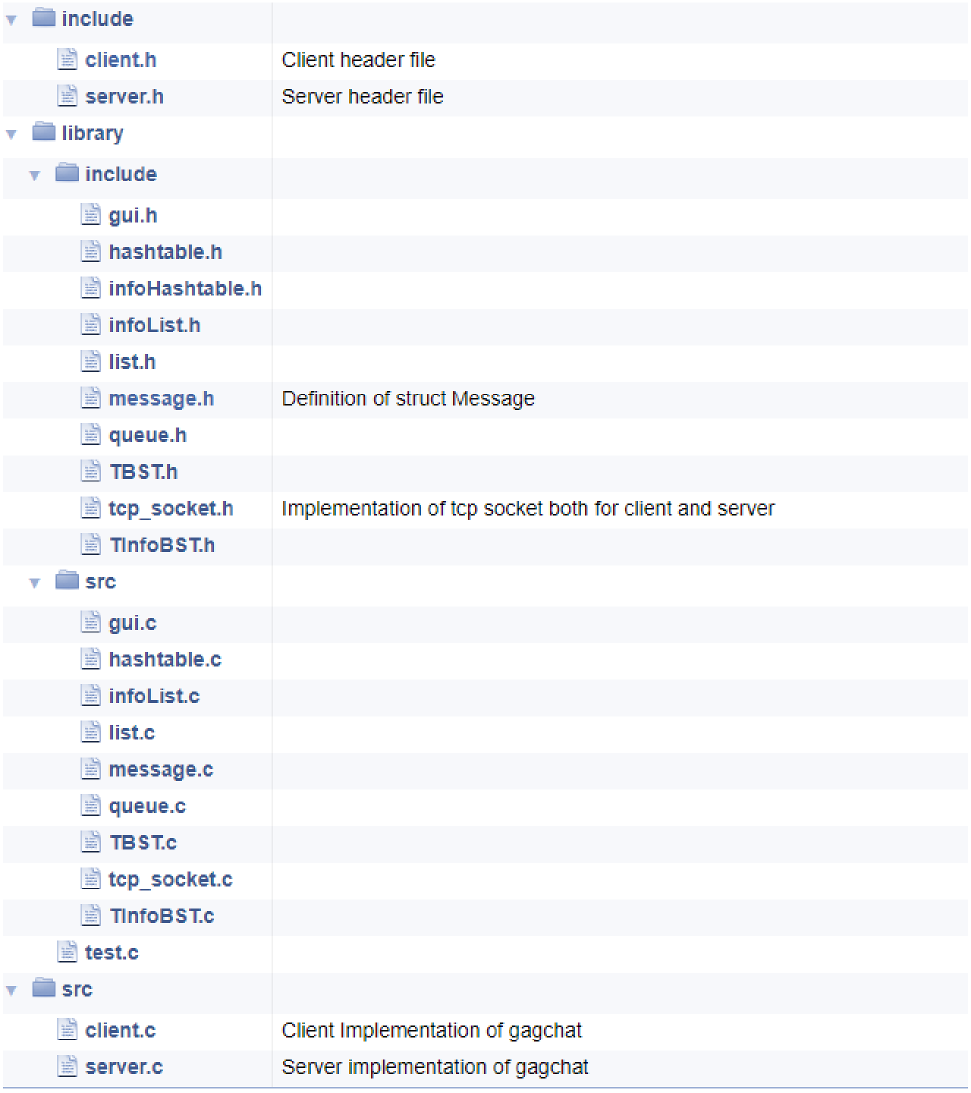
Description: Ubuntu 20.04.3 LTS

Release: 20.04

Codename: focal

File List

Here is a list of all documented files with brief descriptions:



▼ include	
client.h	Client header file
server.h	Server header file
▼ library	
▼ include	
gui.h	
hashtable.h	
infoHashtable.h	
infoList.h	
list.h	
message.h	Definition of struct Message
queue.h	
TBST.h	
tcp_socket.h	Implementation of tcp socket both for client and server
TInfoBST.h	
▼ src	
gui.c	
hashtable.c	
infoList.c	
list.c	
message.c	
queue.c	
TBST.c	
tcp_socket.c	
TInfoBST.c	
test.c	
▼ src	
client.c	Client Implementation of gagchat
server.c	Server implementation of gagchat

Communication Protocol

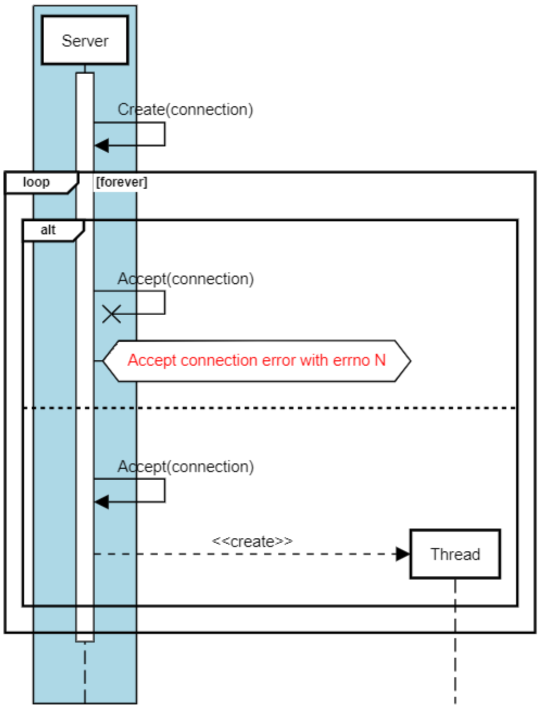
The communication protocol is characterized by the exchange of Messages between Client and Server. The basic message sent by parties is characterized by three params:

- user (string): the username string.
- text (string): the text string.
- code (int): a control code exchanged by parties, to simplify communication between client and server. There are many different codes:
    - **MESSAGE**: Normal Message directed to specified user.
    - **MSG_CLI_CREATE**: Request for creating a new user (specified by user).
    - **MSG_SRV_USRACK**: User is accepted by the server.
    - **MSG_SRV_USRNCK**: User is NOT accepted by the server.
    - **MSG_SRV_USRNRC**: User is NOT reachable from the server.
    - **MSG_CLI_LSTUSR**: Client request for the available list of users.
    - **MSG_SRV_AVLUSR**: Available user for client (specified by text).
    - **MSG_CLI_USR**: Client request user is available.
    - **MSG_SRV_USR_IS_AVL**: Server response "user is available".
    - **MSG_SRV_USR_IS_NAVL**: Server response "user is not available".
    - **MSG_SRV_NEW_USR**: New user logged.
    - **MSG_SRV_ALL**: Server "all" message.

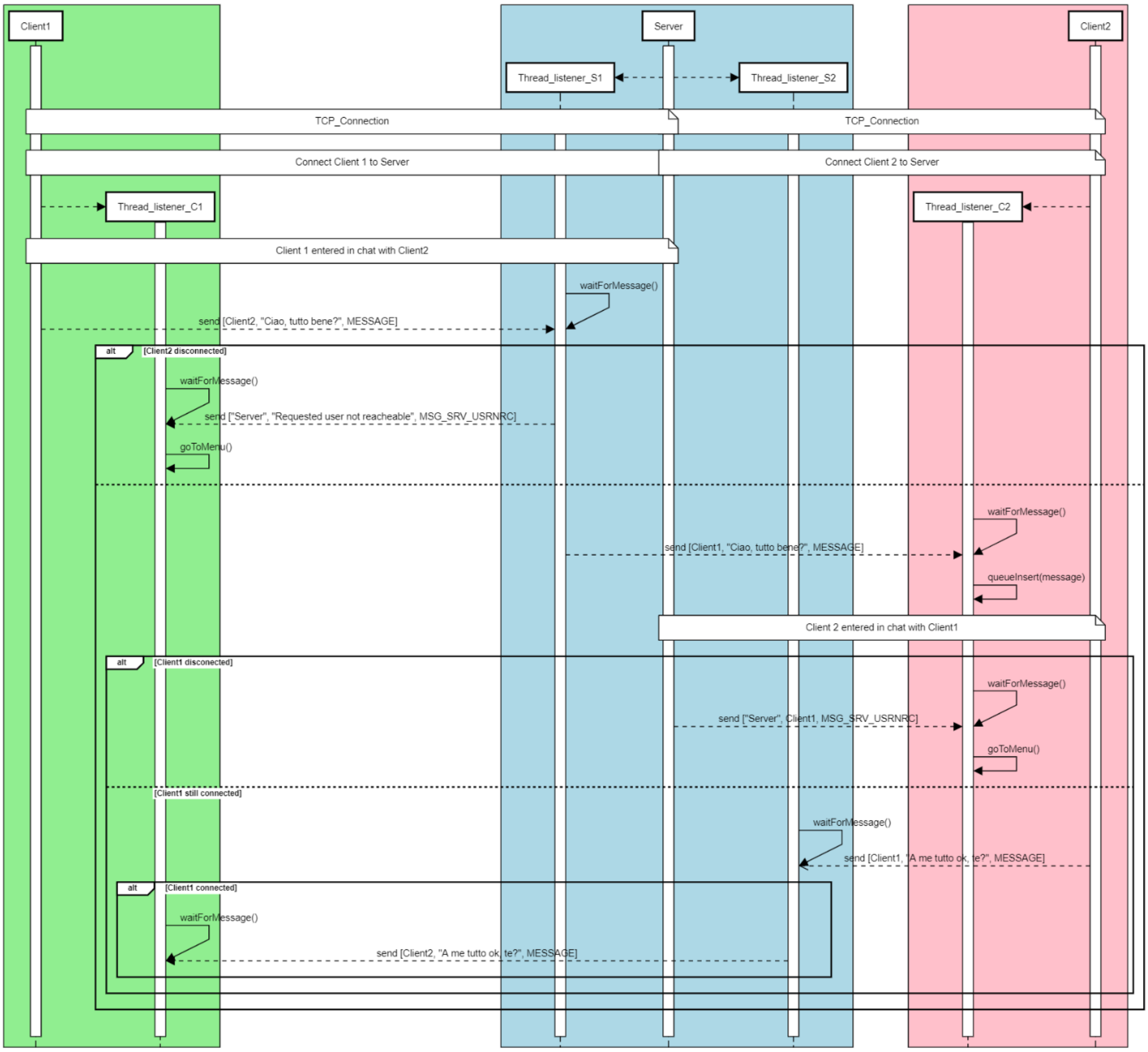
The protocol is simple. Clients connects to the server and needs to specify first his desired Username. If the server notice that the username is already present, it sends a message **MSG_SRV_USRNCK**, otherwise it sends **MSG_SRV_USRACK** message. When Client receives the USRACK message, he can perform three types of queries to server:

- **MSG_CLI_LSTUSR** message: client ask to server to show its list of users. Server answers with n **SG_SRV_AVLUSR** messages (with n number of users)
- **MESSAGE**: Normal Message directed to specified user.
    - If the specified user is represented by keyword **all**, server sends the message to all connected Users.

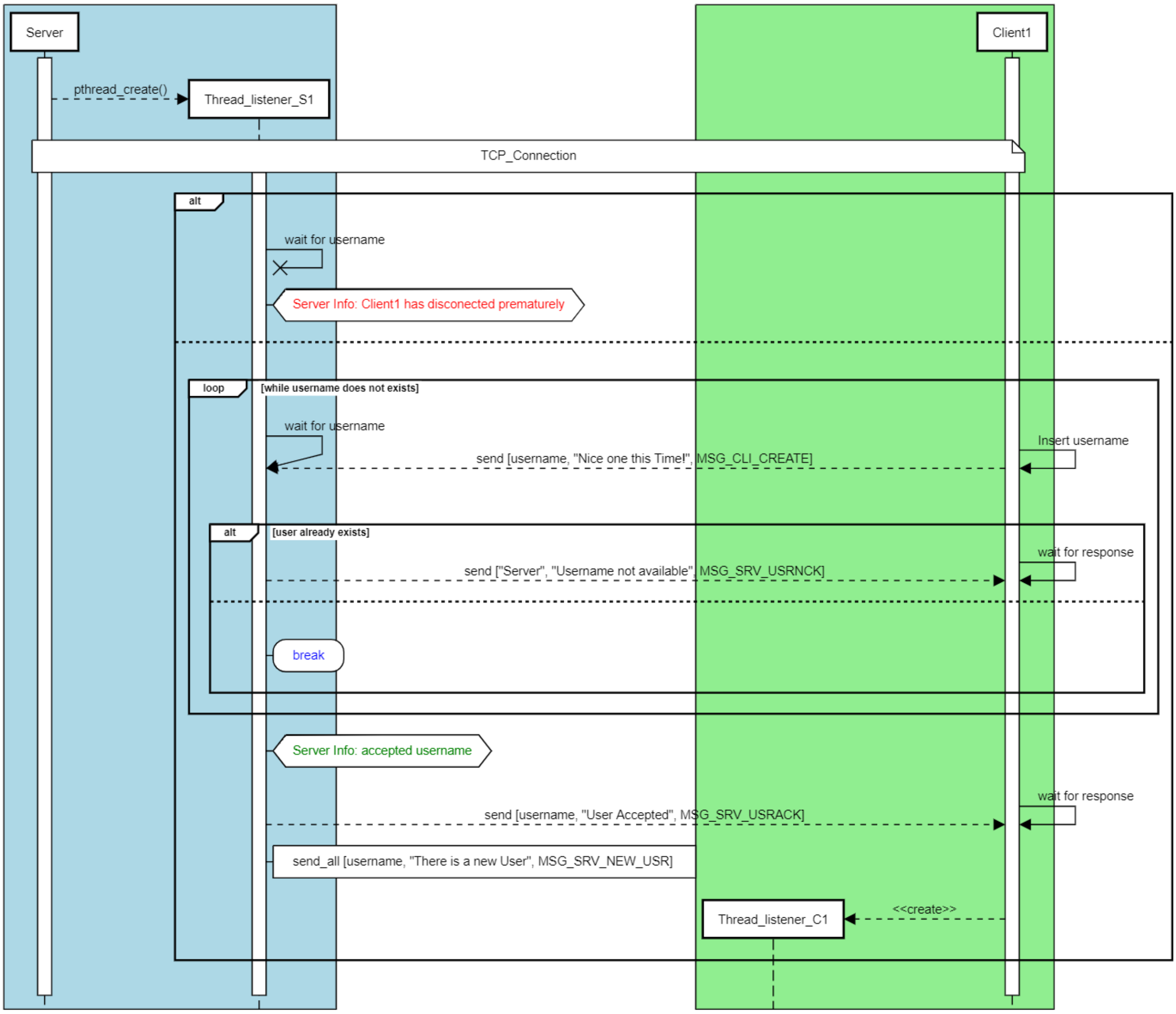
Server Configuration



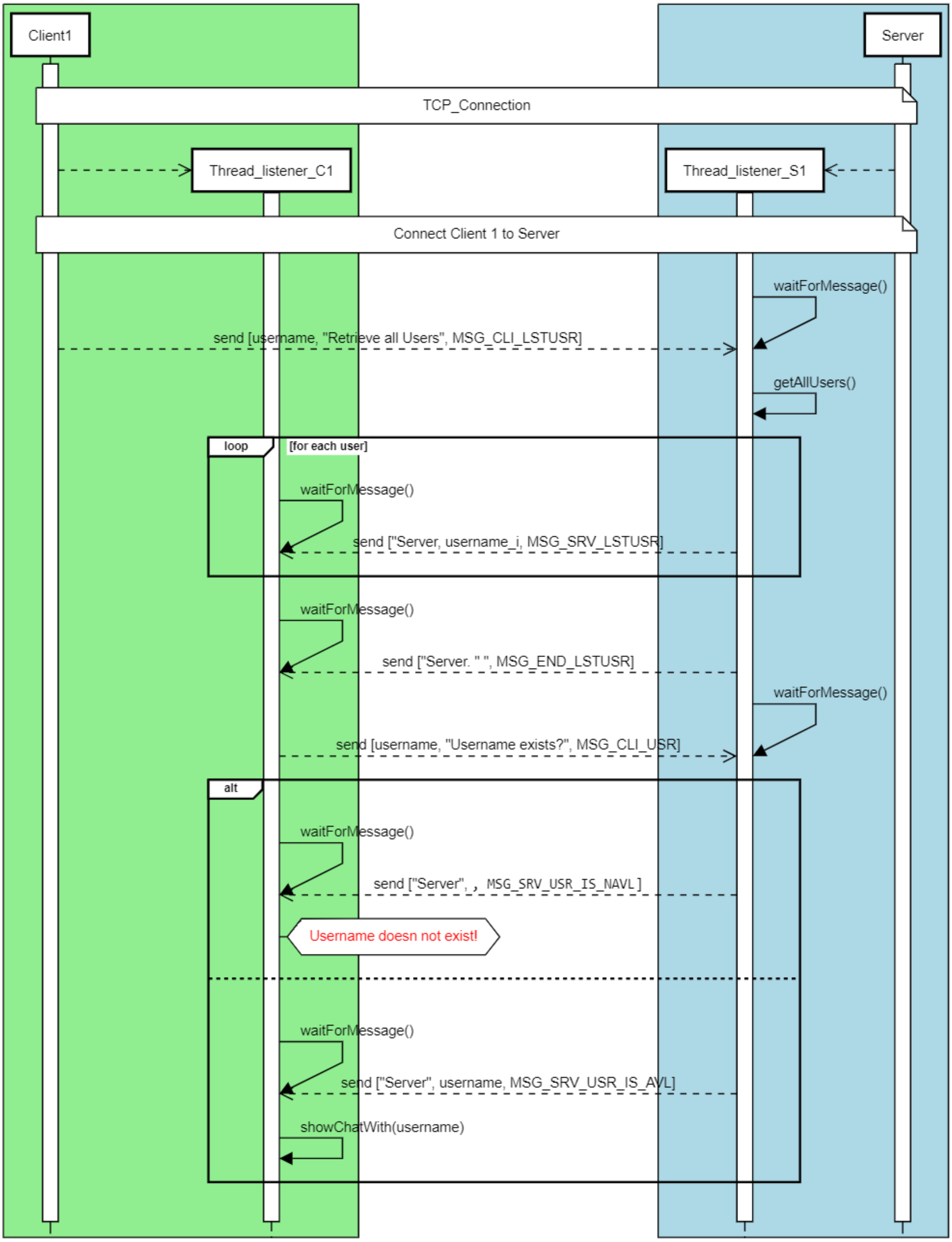
Client to Client comunication


Client1
Server
Client2
Thread_listener_S1
Thread_listener_S2
TCP_Connection
TCP_Connection
Connect Client 1 to Server
Connect Client 2 to Server
Thread_listener_C1
Thread_listener_C2
Client 1 entered in chat with Client2
waitForMessage()
send [Client2, "Ciao, tutto bene?", MESSAGE]
alt
[Client2 disconnected]
waitForMessage()
send ["Server", "Requested user not reacheable", MSG_SRV_USRNRC]
goToMenu()
waitForMessage()
send [Client1, "Ciao, tutto bene?", MESSAGE]
queueInsert(message)
Client 2 entered in chat with Client1
alt
[Client1 disconected]
waitForMessage()
send ["Server", Client1, MSG_SRV_USRNRC]
goToMenu()
[Client1 still connected]
waitForMessage()
send [Client1, "A me tutto ok, te?", MESSAGE]
alt
[Client1 connected]
waitForMessage()
send [Client2, "A me tutto ok, te?", MESSAGE]

Connect Client1 to Server


Server
Client1
pthread_create()
Thread_listener_S1
TCP_Connection
alt
wait for username
Server Info: Client1 has disconected prematurely
loop
[while username does not exists]
wait for username
Insert username
send [username, "Nice one this Time!", MSG_CLI_CREATE]
alt
[user already exists]
wait for response
send ["Server", "Username not available", MSG_SRV_USRNCK]
break
Server Info: accepted username
wait for response
send [username, "User Accepted", MSG_SRV_USRACK]
send_all [username, "There is a new User", MSG_SRV_NEW_USR]
<<create>>
Thread_listener_C1

Client enter in a chat with another Client


Client1
Server
TCP_Connection
Thread_listener_C1
Thread_listener_S1
Connect Client 1 to Server
waitForMessage()
send [username, "Retrieve all Users", MSG_CLI_LSTUSR]
getAllUsers()
loop
[for each user]
waitForMessage()
send ["Server, username_i, MSG_SRV_LSTUSR]
waitForMessage()
send ["Server. " ", MSG_END_LSTUSR]
waitForMessage()
send [username, "Username exists?", MSG_CLI_USR]
alt
waitForMessage()
send ["Server", , MSG_SRV_USR_IS_NAVL]
Username doesn not exist!
waitForMessage()
send ["Server", username, MSG_SRV_USR_IS_AVL]
showChatWith(username)

Documentation

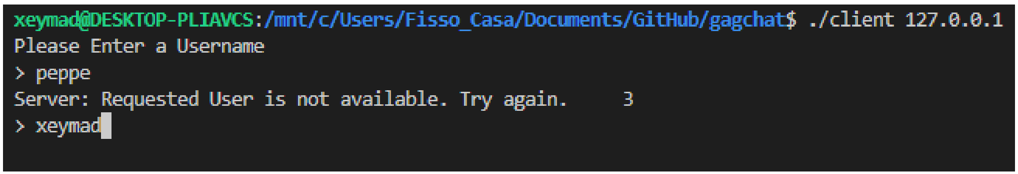
For the code documentation, see the attached file refman.pdf.

How To Run

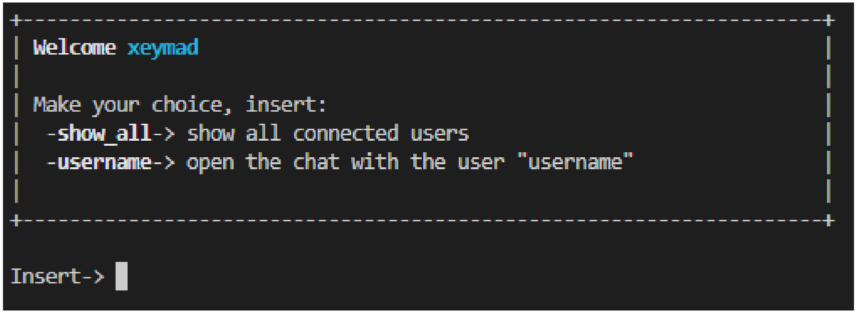
1. Extract the project on a generic dir.
2. Launch the command `make`.
3. `./server` command to execute Server
4. `./client ip` command to execute Client.
    a. Ip must be a valid ip address. If you are running client on the same machine as server, run `./client 127.0.0.1`

Demo Interfaces

Client username insertion.

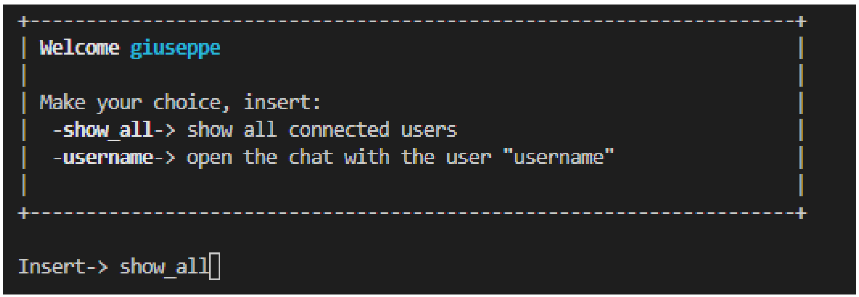


```
xeymad@DESKTOP-PLIAVCS:/mnt/c/Users/Fisso_Casa/Documents/GitHub/gagchat$ ./client 127.0.0.1
Please Enter a Username
> peppe
Server: Requested User is not available. Try again.     3
> xeymad
```

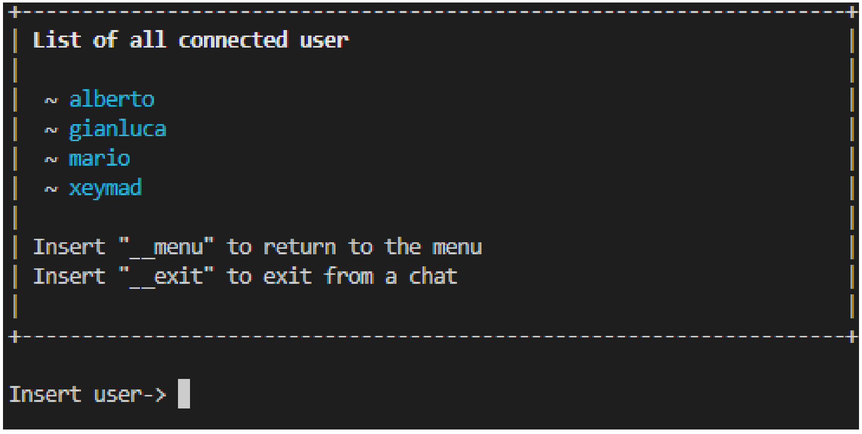


```
+-------------------------------------------------------------------+
| Welcome xeymad                                                    |
|                                                                   |
| Make your choice, insert:                                         |
|  -show_all-> show all connected users                             |
|  -username-> open the chat with the user "username"               |
|                                                                   |
+-------------------------------------------------------------------+

Insert->
```

Client interface for commands.

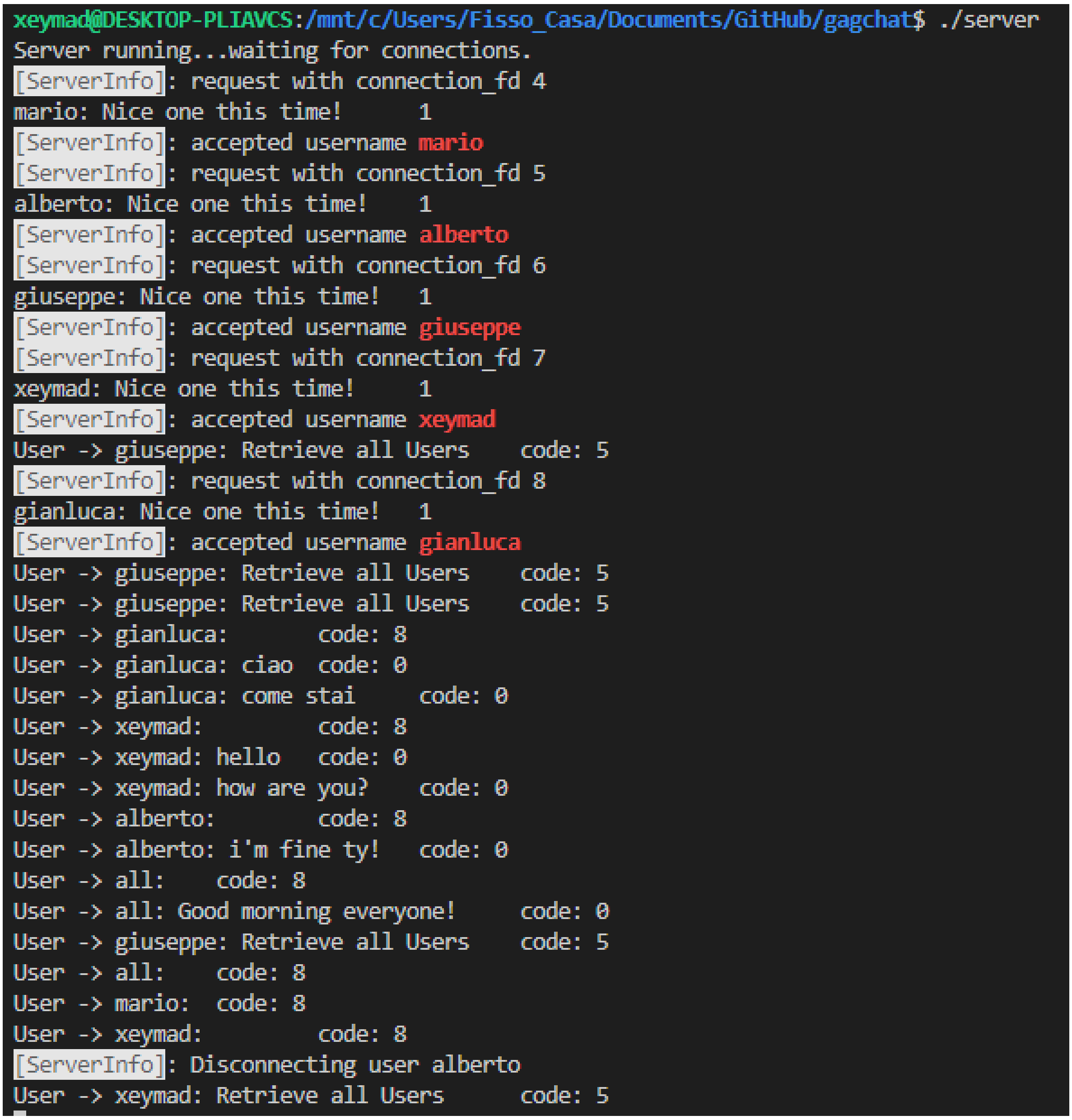


```
+-------------------------------------------------------------------+
| Welcome giuseppe                                                  |
|                                                                   |
| Make your choice, insert:                                         |
|  -show_all-> show all connected users                             |
|  -username-> open the chat with the user "username"               |
|                                                                   |
+-------------------------------------------------------------------+

Insert-> show_all
```



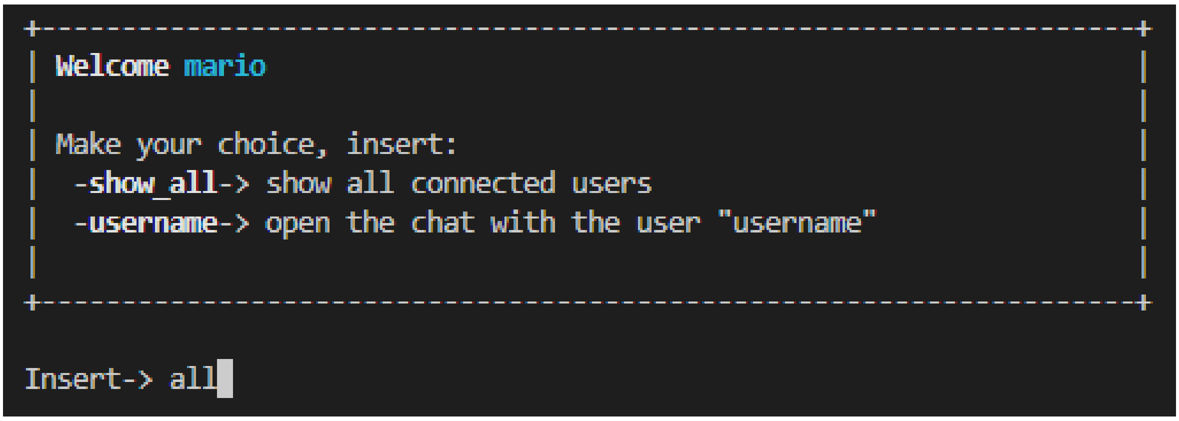
```
+-------------------------------------------------------------------+
| List of all connected user                                        |
|                                                                   |
|  ~ alberto                                                        |
|  ~ gianluca                                                       |
|  ~ mario                                                          |
|  ~ xeymad                                                         |
|                                                                   |
| Insert "__menu" to return to the menu                             |
| Insert "__exit" to exit from a chat                               |
|                                                                   |
+-------------------------------------------------------------------+

Insert user->
```

Server visualization.

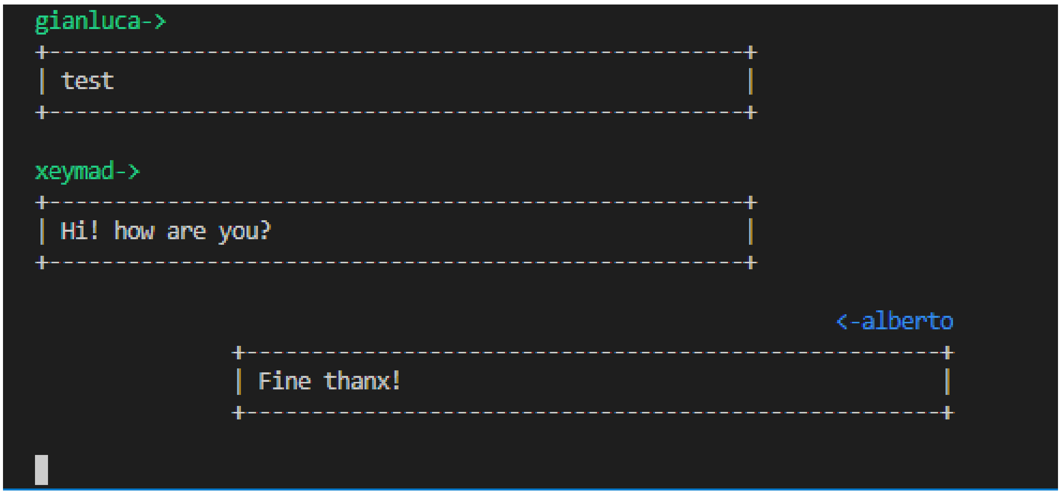


```
xeymad@DESKTOP-PLIAVCS:/mnt/c/Users/Fisso_Casa/Documents/GitHub/gagchat$ ./server
Server running...waiting for connections.
[ServerInfo]: request with connection_fd 4
mario: Nice one this time!      1
[ServerInfo]: accepted username mario
[ServerInfo]: request with connection_fd 5
alberto: Nice one this time!    1
[ServerInfo]: accepted username alberto
[ServerInfo]: request with connection_fd 6
giuseppe: Nice one this time!   1
[ServerInfo]: accepted username giuseppe
[ServerInfo]: request with connection_fd 7
xeymad: Nice one this time!     1
[ServerInfo]: accepted username xeymad
User -> giuseppe: Retrieve all Users    code: 5
[ServerInfo]: request with connection_fd 8
gianluca: Nice one this time!   1
[ServerInfo]: accepted username gianluca
User -> giuseppe: Retrieve all Users    code: 5
User -> giuseppe: Retrieve all Users    code: 5
User -> gianluca:       code: 8
User -> gianluca: ciao  code: 0
User -> gianluca: come stai     code: 0
User -> xeymad:         code: 8
User -> xeymad: hello   code: 0
User -> xeymad: how are you?    code: 0
User -> alberto:        code: 8
User -> alberto: i'm fine ty!   code: 0
User -> all:    code: 8
User -> all: Good morning everyone!     code: 0
User -> giuseppe: Retrieve all Users    code: 5
User -> all:    code: 8
User -> mario:  code: 8
User -> xeymad:         code: 8
[ServerInfo]: Disconnecting user alberto
User -> xeymad: Retrieve all Users      code: 5
```

Client send to all. Everyone will receive a message from Mario.

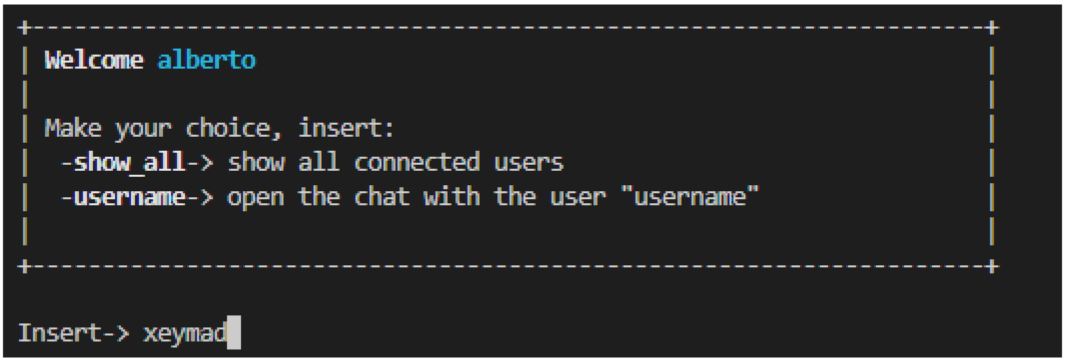


```
+--------------------------------------------------------------------+
| Welcome mario                                                      |
|                                                                    |
| Make your choice, insert:                                          |
|  -show_all-> show all connected users                              |
|  -username-> open the chat with the user "username"                |
|                                                                    |
+--------------------------------------------------------------------+


Insert-> all
```

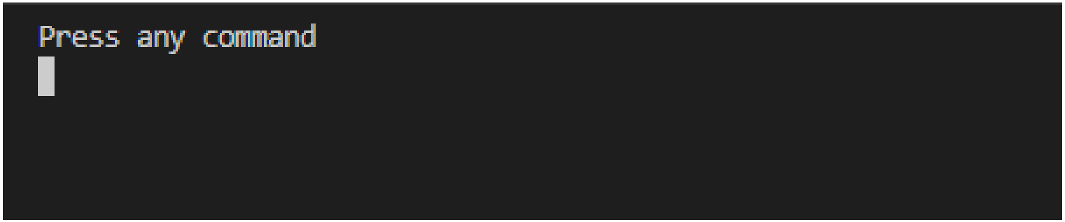


```
gianluca->
+--------------------------------------------------+
| test                                             |
+--------------------------------------------------+

xeymad->
+--------------------------------------------------+
| Hi! how are you?                                 |
+--------------------------------------------------+

                                                <-alberto
              +--------------------------------------------------+
              | Fine thanx!                                      |
              +--------------------------------------------------+

```

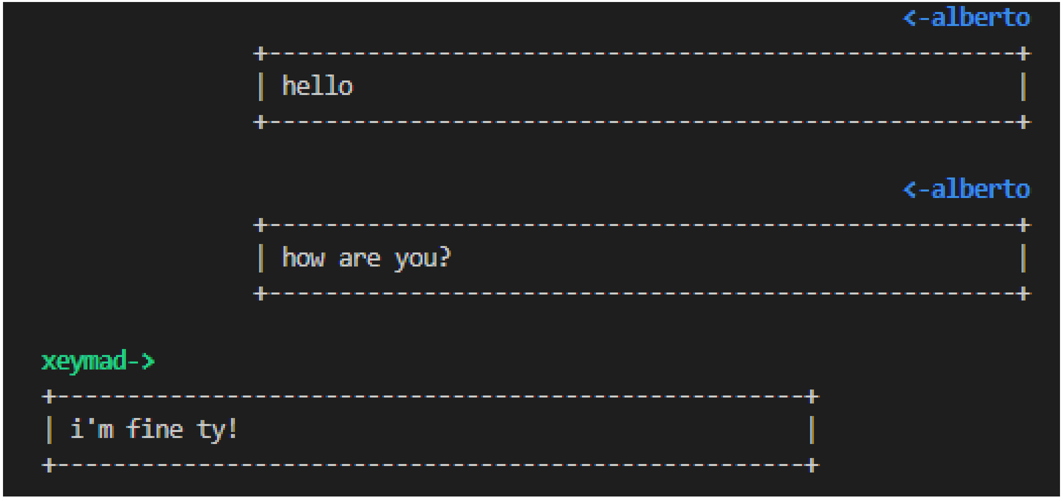
Client to Client communication.



```
+--------------------------------------------------------------------+
| Welcome alberto                                                    |
|                                                                    |
| Make your choice, insert:                                          |
|  -show_all-> show all connected users                              |
|  -username-> open the chat with the user "username"                |
|                                                                    |
+--------------------------------------------------------------------+

Insert-> xeymad
```

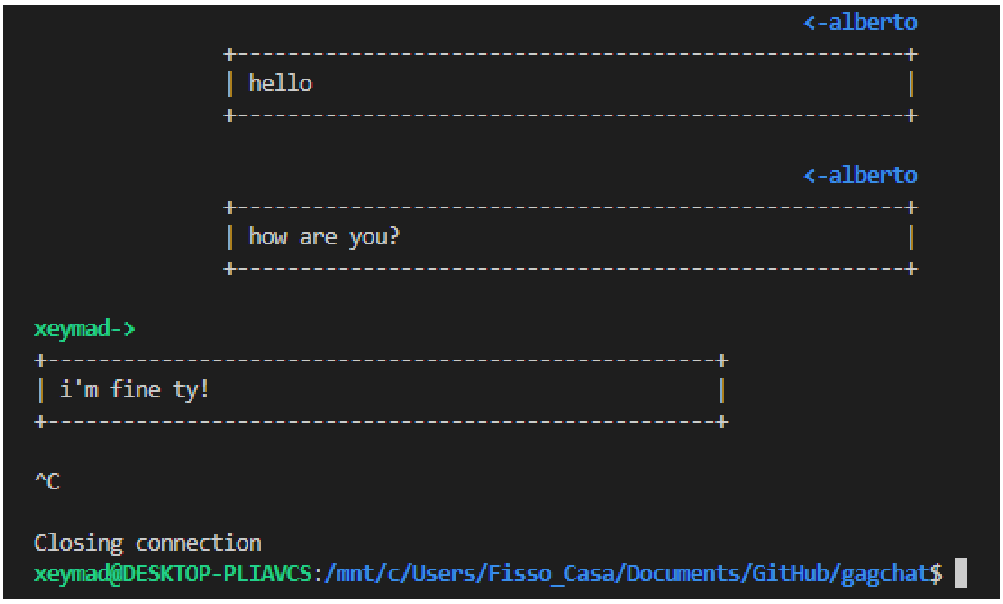


```
  Press any command
```

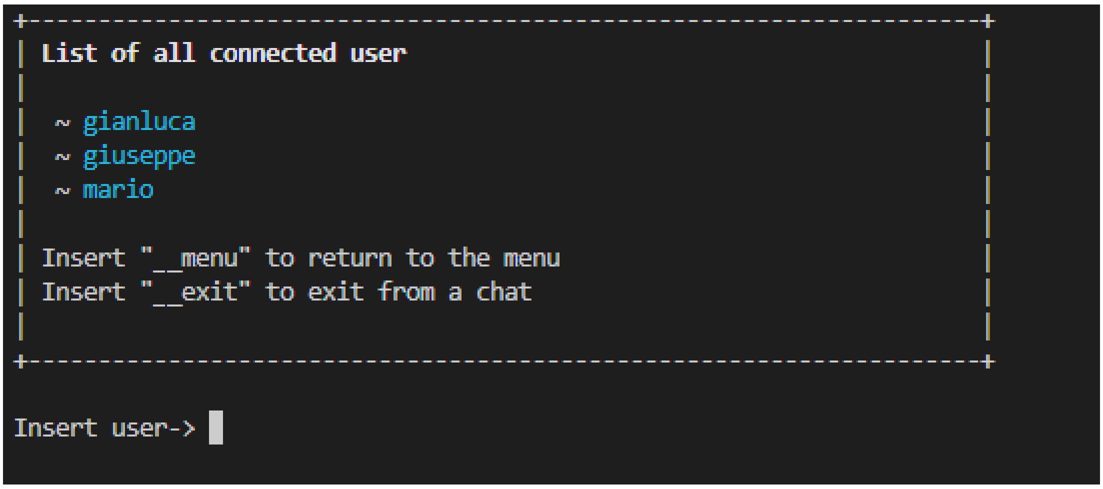


```
                                                          <-alberto
                 +--------------------------------------------------+
                 | hello                                            |
                 +--------------------------------------------------+

                                                          <-alberto
                 +--------------------------------------------------+
                 | how are you?                                     |
                 +--------------------------------------------------+

  xeymad->
  +--------------------------------------------------+
  | i'm fine ty!                                     |
  +--------------------------------------------------+
```

Client “alberto” disconnects while communicating with client “xeymad”. Client xeymad will automatically retrieve the full list of users



```
                                                               <-alberto
                 +---------------------------------------------------+
                 | hello                                             |
                 +---------------------------------------------------+

                                                               <-alberto
                 +---------------------------------------------------+
                 | how are you?                                      |
                 +---------------------------------------------------+

xeymad->
+---------------------------------------------------+
| i'm fine ty!                                      |
+---------------------------------------------------+

^C

Closing connection
xeymad@DESKTOP-PLIAVCS:/mnt/c/Users/Fisso_Casa/Documents/GitHub/gagchat$
```



```
+--------------------------------------------------------------+
| List of all connected user                                   |
|                                                              |
|  ~ gianluca                                                  |
|  ~ giuseppe                                                  |
|  ~ mario                                                     |
|                                                              |
| Insert "__menu" to return to the menu                        |
| Insert "__exit" to exit from a chat                          |
|                                                              |
+--------------------------------------------------------------+

Insert user->
```