

Functionality Implementation

Functionality 1: REGISTER

Client side: an infinity for loop until messages received using `recv()` function from sever side indicates registration success. First set buffer with "REGISTER", then get user input for name and password and append to buffer, then use `send()` function to send buffer to sever.

Server side: Extract name and password from buffer by delimiter ':'. Use `isNewUser(name)` function to check if it is new user.

For subcase that it is new user: allocate memory for the first free space in `listOfUsers[]` array and set corresponding attributes of `user_info_t` struct. Create .txt file with user's name as filename and broadcast welcome message as well as send registration success message to the new user.

For subcase that it is existing user: first check password, then change the user state and read the .txt file corresponding to the user and finally broadcast the welcome message.

Functionality 2: WHO

Server side: loop through the existing users in `listOfUsers[]` array and concatenate all the user names into the common-separated `ToClient[]` array as buffer and send it to the requesting client indicated by `pfds[i].fd` using `send()` function.

Client side: send input buffer with "WHO" in main loop that runs infinitely to get user input until interrupt. pthread created after the registration loop runs function infinitely until interrupt for receiving the data from server side using `recv()` function and then print it out.

Functionality 3: EXIT

Server side: Broadcast the leave message to the other users, then change the state of this user to offline, finally close the socket and remove the socket from `pfds[]`.

Client side: send input buffer with "EXIT" in main loop that runs infinitely to get user input until interrupt. Then use `pthread_join()` function to wait for the thread we create for receiving messages from server side to terminate. In the thread function we check return value of `recv()` function, if return value is 0, then we close the file descriptor FD and use `pthread_exit(NULL)` to terminate the thread. After that use `sigsuspend()` to pause the program and we can use Ctrl+C to terminate the client.

Functionality 4: Direct Message

Server side: we get the send user name using `get_username(pfds[i].fd)` function and extract the receive user name and message from buffer received from client side using delimiter ':'. Then we get the destination socket using `get_sockfd(destname)`. After that we check destination socket value to indicate whether destination user exist or not. In case the user exist, we send to the user's socket fd directly if the user is online. Otherwise, we open the

user's .txt file and write message to the .txt file.

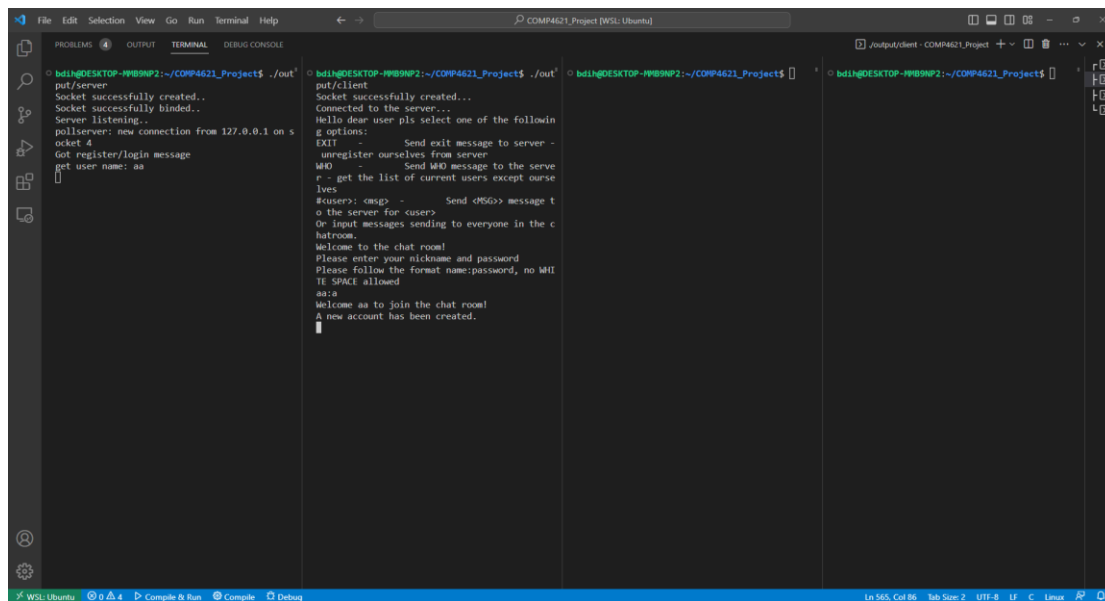
Client side: send input buffer with direct message in main loop that runs infinitely to get user input until interrupt. pthread created after the registration loop runs function infinitely until interrupt for receiving the data from server side using `recv()` function and then print it out.

Functionality 5: Broadcast Message

Server side: loop through the existing users in `listOfUsers[]` array and send buffer received from client side to user that is online (by checking 'state' field value) and not the sender (by compare 'sockfd' field value to `pfds[i].fd`).

Client side: send input buffer with broadcast message in main loop that runs infinitely to get user input until interrupt. pthread created after the registration loop runs function infinitely until interrupt for receiving the data from server side using `recv()` function and then print it out.

Test Case Screenshots



```
File Edit Selection View Go Run Terminal Help
COMP4621_Project (WSL: Ubuntu)
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
bdll@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out
put/server
Socket successfully created..
Socket successfully binded..
Server listening..
pollserver: new connection from 127.0.0.1 on socket 4
Got register/login message
get user name: aa

bdll@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the following options:
EXIT - Send exit message to server - unregister ourselves from server
WHO - Send WHO message to the server
r - get the list of current users except ourselves
#<user>: <msg> - Send <MSG> message to the server for <user>
Or input messages sending to everyone in the chatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHITE SPACE allowed
aa:
Welcome aa to join the chat room!
A new account has been created.
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
Server listening...
pollserver: new connection from 127.0.0.1 on s
ocket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
WHO - Send WHO message to the serve
r - get the list of current users except ourse
lves
#user>: msg> - Send <MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
WHO - Send WHO message to the serve
r - get the list of current users except ourse
lves
#user>: msg> - Send <MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:b
Welcome bb to join the chat room!
A new account has been created.
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
Server listening...
pollserver: new connection from 127.0.0.1 on s
ocket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb
Got direct message.
get user name: bb
sender:bb
receiver:aa
des_sock4
msg:Nice to meet you!
get user name: aa

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
WHO - Send WHO message to the serve
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lves
#user>: msg> - Send <MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you!

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
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o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:b
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you!
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
Server listening...
pollserver: new connection from 127.0.0.1 on s
ocket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb
Got direct message.
get user name: aa
sender:aa
receiver:BB
des_sock4-1
msg:Nice to meet you, too!

bdln@DESKTOP-HPB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
WHO - Send WHO message to the serve
r - get the list of current users except ourse
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o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you!
#BB:Nice to meet you, too!
There is no such user. Please check your input
format.
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
Server listening...
pollserver: new connection from 127.0.0.1 on s
ocket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb
Got direct message.
get user name: bb
sender:bb
receiver:aa
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:5
msg:Nice to meet you, tool
get user name: bb

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
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o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you!
#bb:Nice to meet you, tool
There is no such user. Please check your input
format.
#bb:Nice to meet you, tool

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
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#user>: msg> - Send #MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:b
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you!
aa to you: Nice to meet you, tool
[]

WSL: Ubuntu 4 4 Compile & Run Compile Debug Ln 565, Col 86 Tab Size 2 UTF-8 LF C Linux
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
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pollserver: new connection from 127.0.0.1 on s
ocket 4
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pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb
Got direct message.
get user name: bb
sender:bb
receiver:aa
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:5
msg:Nice to meet you, tool
get user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: aa

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
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Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you!
#bb:Nice to meet you, tool
There is no such user. Please check your input
format.
#bb:Nice to meet you, tool
EXIT
Client Exit...
^C

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
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unregister ourselves from server
WHO - Send WHO message to the serve
r - get the list of current users except ourse
lves
#user>: msg> - Send #MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:b
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you!
aa to you: Nice to meet you, tool
aa has left the chatroom
[]

WSL: Ubuntu 4 4 Compile & Run Compile Debug Ln 565, Col 86 Tab Size 2 UTF-8 LF C Linux
```

```
File Edit Selection View Go Run Terminal Help
COMP4621_Project [WSL: Ubuntu]

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/server
Socket successfully created...
Server listening...
pollserver: new connection from 127.0.0.1 on s
ocket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on s
ocket 5
Got register/login message
get user name: bb
Got direct message.
get user name: bb
sender:bb
receiver:aa
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:5
msg:Nice to meet you, tool
get user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: aa
get user name: aa
get user name: bb
sender:bb
receiver:aa
des_sock:2
msg:See you next time.
get user name: aa

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
WHO - Send WHO message to the serve
r - get the list of current users except ourse
lves
#user>: msg> - Send #MSG> message t
o the server for <user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:b
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you!
aa to you: Nice to meet you, tool
aa has left the chatroom
#aa:See you next time.
aa is offline. Leaving message successfully
[]

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$

WSL: Ubuntu 4 4 Compile & Run Compile Debug Ln 565, Col 86 Tab Size 2 UTF-8 LF C Linux
```

```
pollserver: new connection from 127.0.0.1 on socket 4
Got register/login message
get user name: aa
pollserver: new connection from 127.0.0.1 on socket 5
Got register/login message
get user name: bb
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:1
msg:Nice to meet you, tool
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:5
msg:Nice to meet you, tool
get user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: bb
sender:bb
receiver:aa
des_sock:2
msg:See you next time.
get user name: aa
pollserver: new connection from 127.0.0.1 on socket 4
Got register/login message
get user name: cc
send: Bad file descriptor

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the following options:
EXIT      - Send exit message to server - unregister ourselves from server
WHO       - Send WHO message to the server - get the list of current users except ourselves
#users> cmsg - Send <MSG> message to the server for <user>
Or input messages sending to everyone in the chatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHITE SPACE allowed
aa:aa
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you, tool
#bb:Nice to meet you, tool
There is no such user. Please check your input format.
#bb:Nice to meet you, tool
EXIT
Client Exit...
^C

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$
```

```
pollserver: new connection from 127.0.0.1 on socket 5
Got register/login message
get user name: aa
Got direct message.
get user name: bb
sender:bb
receiver:aa
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:1
msg:Nice to meet you, tool
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:5
msg:Nice to meet you, tool
get user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: bb
sender:bb
receiver:aa
des_sock:2
msg:See you next time.
get user name: aa
pollserver: new connection from 127.0.0.1 on socket 4
Got register/login message
get user name: cc
send: Bad file descriptor
Got WHO message from client.
get user name: cc
get user name: cc
get user name: cc

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the following options:
EXIT      - Send exit message to server - unregister ourselves from server
WHO       - Send WHO message to the server - get the list of current users except ourselves
#users> cmsg - Send <MSG> message to the server for <user>
Or input messages sending to everyone in the chatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHITE SPACE allowed
aa:aa
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you, tool
#bb:Nice to meet you, tool
There is no such user. Please check your input format.
#bb:Nice to meet you, tool
EXIT
Client Exit...
^C

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$
```

```
receiver:aa
des_sock:4
msg:Nice to meet you!
get user name: aa
Got direct message.
get user name: aa
sender:aa
receiver:bb
des_sock:1
msg:Nice to meet you, tool
get user name: aa
Got direct message. Removing user from system
get user name: aa
get user name: bb
sender:bb
receiver:aa
des_sock:5
msg:Nice to meet you, tool
get user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: bb
sender:bb
receiver:aa
des_sock:2
msg:See you next time.
get user name: aa
pollserver: new connection from 127.0.0.1 on socket 4
Got register/login message
get user name: cc
send: Bad file descriptor
Got WHO message from client.
get user name: cc
get user name: cc
get user name: cc
sender:cc
receiver:aa
des_sock:2
msg:Hello aa, i am cc
get user name: aa

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$ ./out/put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the following options:
EXIT      - Send exit message to server - unregister ourselves from server
WHO       - Send WHO message to the server - get the list of current users except ourselves
#users> cmsg - Send <MSG> message to the server for <user>
Or input messages sending to everyone in the chatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHITE SPACE allowed
bb:bb
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you!
aa to you: Nice to meet you, tool
aa has left the chatroom
#aa:See you next time.
aa is offline. Leaving message successfully
Welcome cc to join the chat room!

bdl@DESKTOP-WB9NP2:~/COMP4621_Project$
```


The screenshot displays a Kali Linux desktop environment with a terminal window open. The terminal shows three separate netcat listener sessions running on IP 10.10.10.10, port 4444. Each session has received a connection from a client at 172.0.0.1.

Session 1 (Left):

```
receiver:bb  
des_socks:1  
msg:Nice to meet you, too!  
Got direct message.  
get user name: aa  
sender:aa  
receiver:bb  
des_socks:3  
msg:Nice to meet you, too!  
get user name: bb  
Got exit message. Removing user from system  
get user name: aa  
get user name: aa  
get user name: aa  
get user name: aa  
get user name: bb  
sender:bb  
receiver:aa  
des_socks:2  
msg:See you next time.  
get user name: aa  
poll:ever new connection from 172.0.0.1 on socket 4  
Got register/login message  
get user name: cc  
send: Had file descriptor  
Got MIO message from client.  
get user name: cc  
get user name: cc  
get user name: cc  
Got direct message.  
get user name: cc  
sender:cc  
receiver:aa  
des_socks:2  
msg:Hello aa, i am cc  
get user name: aa  
Got direct message.  
get user name: cc  
sender:cc  
receiver:bb  
des_socks:3  
msg:Hello bb, i am cc  
get user name: bb
```

Session 2 (Middle):

```
bdn@DESKTOP-7P8BNP2:~/COMP4621_Project$ ./out  
putClient  
Socket successfully created...  
Connected to the server...  
Hello dear user pls select one of the followin  
g options:  
EXIT - Send exit message to server -  
unregister ourselves from server  
MIO - Send MIO message to the serve  
r - get the list of current users except ourse  
lves  
Kusero: cmsg - Send cMSG() message t  
o the server for <user>  
On input messages sending to everyone in the c  
hatroom.  
Welcome to the chat room!  
Please enter your nickname and password  
Follow the format name:password, no WHI  
TE SPACE allowed  
aaa  
Welcome aa to join the chat room!  
A new account has been created.  
Welcome bb to join the chat room!
```

Session 3 (Right):

```
bdn@DESKTOP-7P8BNP2:~/COMP4621_Project$ ./ou  
tputClient  
Socket successfully created...  
Connected to the server...  
Hello dear user pls select one of the followin  
g options:  
EXIT - Send exit message to server -  
unregister ourselves from server  
MIO - Send MIO message to the serve  
r - get the list of current users except ourse  
lves  
Kusero: cmsg - Send cMSG() message t  
o the server for <user>  
On input messages sending to everyone in the c  
hatroom.  
Welcome to the chat room!  
Please enter your nickname and password  
Follow the format name:password, no WHI  
TE SPACE allowed  
ccc  
Welcome cc to join the chat room!  
A new account has been created.  
MIO  
Getting user list, pls hold on...  
If you want to send a message to one of the u  
sers, pls send with the format: "Username#me  
ssage"  
aaa:Hello aa, i am cc  
aa is offline. Leaving message successfully  
bbb:Hello bb, i am cc
```

```
# File Edit Selection View Go Run Terminal Help
# COMP4621 Project (WSL: Ubuntu)
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

Got direct message.
get user name: aa
sender: bb
receiver: bb
des_socks:5
msg:I want to meet you, tool
get user name: bb
cc:
Got exit message. Removing user from system
get user name: aa
get user name: aa
get user name: aa
Got direct message.
get user name: bb
sender: bb
receiver: aa
des_socks:2
msg:See you next time.
get user name: aa
poll:server: new connection from 127.0.0.1 on socket 4
cc:
Got register/login message
get user name: cc
send: add file descriptor
Got M4O message from client.
get user name: cc
get user name: cc
get user name: cc
Got direct message.
get user name: cc
sender: cc
receiver: aa
des_socks:2
msg:Hello aa, i am cc
get user name: aa
Got direct message.
get user name: cc
sender: cc
receiver: bb
des_socks:3
msg:Hello bb, i am cc
get user name: bb
poll:server: new connection from 127.0.0.1 on socket 6
cc:
Got register/login message

#users: cmisp - Send #MSG> message t
o the server for users)
or Input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa@a
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb to you: Nice to meet you!
#HB:Nice to meet you, tool
There is no such user. Please check your input
format.
#Bb:Nice to meet you, tool
EXIT
Client Exit...
^C
#bdin@DESKTOP-PWBNP2:~/COMP4621_Project$ ./out
put/client
Socket successfully connected...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
M4O - Send M4O message to the serv
er - get the list of current users except our
selves
#users: cmisp - Send #MSG> message t
o the server for users)
or Input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb@b
Welcome bb to join the chat room!
A new account has been created.
#aa:Nice to meet you,
aa to you: Nice to meet you, tool
aa has left the chatroom
Rassee you next time...
aa is offline. Leaving message successfully
Welcome cc to join the chat room!
cc to you: Hello bb, i am cc
aa is online!
[]

#bdin@DESKTOP-PWBNP2:~/COMP4621_Project$ ./ou
tput/client
Socket successfully connected...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT - Send exit message to server -
unregister ourselves from server
M4O - Send M4O message to the serve
r - get the list of current users except ours
elves
#users: cmisp - Send #MSG> message t
o the server for users)
or Input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa@a
Welcome back! The message box contains:
bb to you: See you next time.
cc to you: Hello aa, i am cc
```

```
File Edit Selection View Go Run Terminal Help
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

des_sock:5
mgi: Nice to meet you, too!
cc -> user name: bb
Got exit message. Removing user from system
get user name: aa
get user name: cc
get user name: aa
Got direct message.
sender: bb
receiver: aa
des_sock:7
mgi: See you next time.
cc -> user name: aa
poll: server: new connection from 127.0.0.1 on s
ocket: 4
Got register/login message
get user name: cc
send: bb file descriptor
Got WMO message from client.
get user name: cc
get user name: cc
Got direct message.
get user name: cc
sender: cc
receiver: aa
des_sock:7
mgi: Hello aa, i am cc
get user name: aa
Got direct message.
get user name: cc
sender: cc
receiver: bb
des_sock:5
mgi: Hello bb, i am cc
get user name: bb
poll: server: new connection from 127.0.0.1 on s
ocket: 4
Got register/login message
Got WMO message from client.
get user name: cc
get user name: cc
get user name: cc
cc -> you: Hello aa, i am cc
[]

#user: cc -> Send #MSG> message t
o the server for user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:aa
Welcome aa to join the chat room!
A new account has been created.
Welcome bb to join the chat room!
bb:bb
cc -> you: Nice to meet you!
bb: Nice to meet you, too!
There is no such user. Please check your input
format.
bb: Nice to meet you, too!
EXIT
Client Exit...
cc
#bb@DESKTOP-PW9BWP2:~/COMP4621_Project$ ./out
put/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT -> Send exit message to server -
unregister ourselves from server
WMO -> Send WMO message to the serv
er - get the list of current users except our s
elves
#user: cc -> Send #MSG> message t
o the server for user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
bb:bb
Welcome bb to join the chat room!
A new account has been created.
aa:aa
cc -> you: Nice to meet you, too!
aa has left the chatroom
Rassee you next time...
aa is offline. Leaving message successfully
Welcome cc to join the chat room!
cc -> you: Hello bb, i am cc
aa is online!
[]

#user: cc -> Send #MSG> message t
o the server for user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:aa
Welcome back! The message box contains:
cc -> you: See you next time.
cc -> you: Hello aa, i am cc
[]

#bb@DESKTOP-PW9BWP2:~/COMP4621_Project$ ./ou
tput/client
Socket successfully created...
Connected to the server...
Hello dear user pls select one of the followin
g options:
EXIT -> Send exit message to server -
unregister ourselves from server
WMO -> Send WMO message to the serv
er - get the list of current users except our s
elves
#user: cc -> Send #MSG> message t
o the server for user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
aa:aa
Welcome aa to join the chat room!
A new account has been created.
WMO
Getting user list, pls hold on...
If you want to send a message to one of the u
sers, pls send with the format: "Username:me
ssage"
aa", bb"
cc
#user: cc -> Send #MSG> message t
o the server for user>
Or input messages sending to everyone in the c
hatroom.
Welcome to the chat room!
Please enter your nickname and password
Please follow the format name:password, no WHI
TE SPACE allowed
cc:cc
Welcome cc to join the chat room!
A new account has been created.
WMO
Getting user list, pls hold on...
If you want to send a message to one of the u
sers, pls send with the format: "Username:me
ssage"
aa", bb"
cc
```

A screenshot of a Kali Linux terminal window. At the top, there's a menu bar with File, Edit, Selection, View, Go, Run, Terminal, Help. Below it, a toolbar shows icons for file operations and running commands. The main area displays a Netcat listener session. The user has executed 'nc -l -v'. Two incoming connections are shown. The first is from 10.10.10.10, where the user sends 'aa' and receives 'mughiello aa, i am cc'. The second is from 10.10.10.11, where the user sends 'bb' and receives 'mughiello bb, i am cc'. In both cases, the user responds with their own name ('aa' or 'bb') and asks for the next time. The session concludes with the user pressing Ctrl+C.