

Rust Implementation Evidence

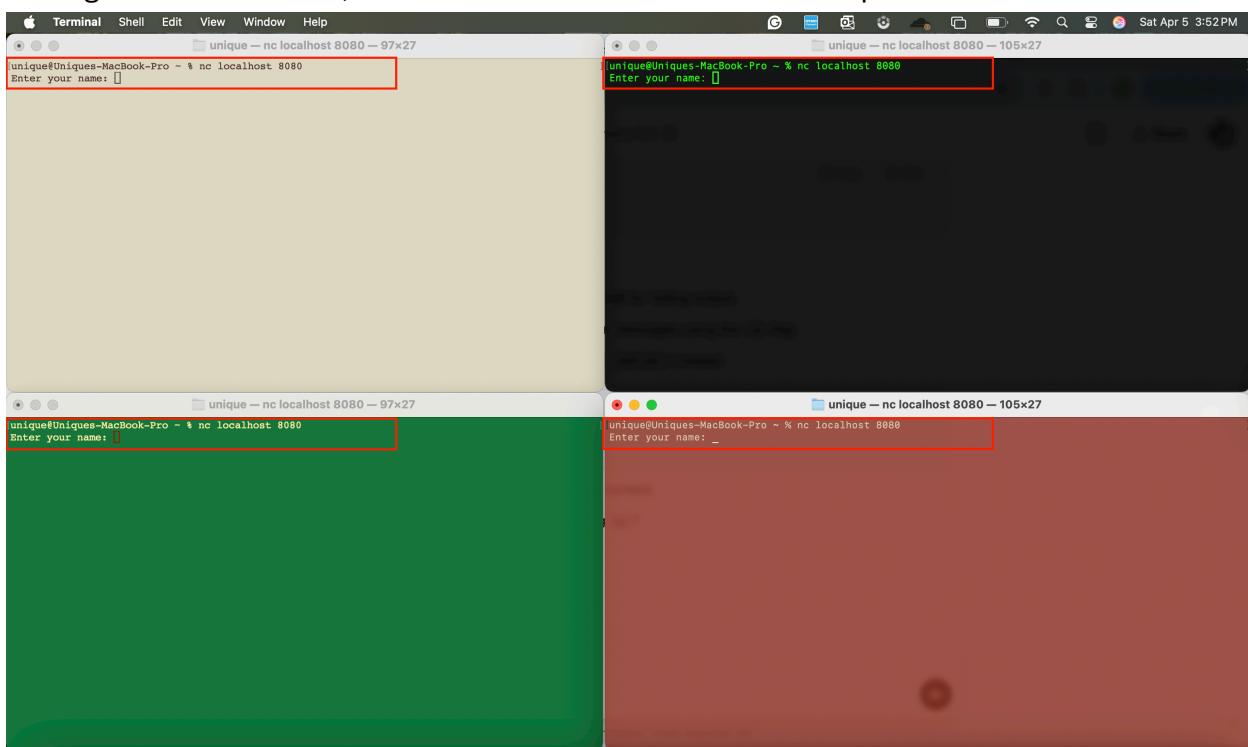
- 1) Below is the screenshot of running the rust application using cargo.

```
unique@Uniques-MacBook-Pro SimpleRustChatApp % pwd
/Users/unique/Documents/UConnBards/AdvancedProgrammingLanguages/GroupAssignment/MSCS632-Group4-SimpleChatApplication/SimpleRustChatApp
unique@Uniques-MacBook-Pro SimpleRustChatApp % RUSTFLAGS="-Awarnings" cargo run

Compiling libc v0.2.171
Compiling autocfg v1.4.0
Compiling proc-macro2 v1.0.94
Compiling unicode-ident v1.0.18
Compiling cfg-if v1.0.0
Compiling parking_lot_core v0.9.10
Compiling scopeguard v1.2.0
Compiling getrandom v0.3.2
Compiling smallvec v1.15.0
Compiling core-foundation-sys v0.8.7
Compiling bytes v1.10.1
Compiling pin-project-lite v0.2.16
Compiling iana-time-zone v0.1.63
Compiling lock_api v0.4.12
Compiling num-traits v0.2.19
Compiling quote v1.0.40
Compiling syn v2.0.100
Compiling signal-hook-registry v1.4.2
Compiling socket2 v0.5.9
Compiling mio v1.0.3
Compiling parking_lot v0.12.3
Compiling uuid v1.16.0
Compiling chrono v0.4.40
Compiling tokio-macros v2.5.0
Compiling tokio v1.44.2
Compiling SimpleRustChatApp v0.1.0 (/Users/unique/Documents/UConnBards/AdvancedProgrammingLanguages/GroupAssignment/MSCS632-Group4-SimpleChatApplication/SimpleRustChatApp)
Finished `dev` profile [unoptimized + debuginfo] target(s) in 5.16s
Running `target/debug/SimpleRustChatApp`
```

- 2) After the application runs, it can be accessed through different terminals, each acting as a separate user.

Following is the screenshot, where we started four terminals to replicate four users.



- 3) Instantiated two users initially.

The image shows four terminal windows side-by-side. The top-left window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 97x27) displays a help message and a join message for 'Unique' at 2025-04-05 15:53:37. The top-right window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 105x27) shows a join message for 'Chetan' at the same time. The bottom-left window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 97x27) shows a join message for 'Chetan' at 2025-04-05 15:53:55. The bottom-right window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 105x27) shows a join message for 'Unique' at 2025-04-05 15:53:55.

```

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Unique

*****
- Type 'exit' to leave
- Type '/search <query>' to search by keyword
- Type '/user <username>' to search by user
- Type any other message to chat
*****


>

*** Unique has joined at 2025-04-05 15:53:37 ***

>

*** Chetan has joined at 2025-04-05 15:53:55 ***

> □

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Chetan

*****
- Type 'exit' to leave
- Type '/search <query>' to search by keyword
- Type '/user <username>' to search by user
- Type any other message to chat
*****


>

*** Unique has joined at 2025-04-05 15:53:37 ***

>

*** Chetan has joined at 2025-04-05 15:53:55 ***

> □

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Chetan

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Unique

```

4) Instantiate two more users. Here, we can see what time the users joined the conversation.

The image shows four terminal windows side-by-side. The top-left window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 97x27) shows joins for 'Unique' (2025-04-05 15:53:37), 'Chetan' (2025-04-05 15:53:55), 'Tejeswar' (2025-04-05 15:56:40), and 'Sana' (2025-04-05 15:56:44). The top-right window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 105x27) shows joins for 'Unique' (2025-04-05 15:53:37), 'Chetan' (2025-04-05 15:53:55), 'Tejeswar' (2025-04-05 15:56:40), and 'Sana' (2025-04-05 15:56:44). The bottom-left window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 97x27) shows joins for 'Unique' (2025-04-05 15:53:37), 'Chetan' (2025-04-05 15:53:55), 'Tejeswar' (2025-04-05 15:56:40), and 'Sana' (2025-04-05 15:56:44). The bottom-right window (unique@Uniques-MacBook-Pro ~ % nc localhost 8080 — 105x27) shows joins for 'Unique' (2025-04-05 15:53:37), 'Chetan' (2025-04-05 15:53:55), 'Tejeswar' (2025-04-05 15:56:40), and 'Sana' (2025-04-05 15:56:44).

```

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Unique

*****
- Type '/search <query>' to search by keyword
- Type '/user <username>' to search by user
- Type any other message to chat
*****


>

*** Unique has joined at 2025-04-05 15:53:37 ***

>

*** Chetan has joined at 2025-04-05 15:53:55 ***

>

*** Tejeswar has joined at 2025-04-05 15:56:40 ***

>

*** Sana has joined at 2025-04-05 15:56:44 ***

> □

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Chetan

*****
- Type '/search <query>' to search by keyword
- Type '/user <username>' to search by user
- Type any other message to chat
*****


>

*** Unique has joined at 2025-04-05 15:53:37 ***

>

*** Chetan has joined at 2025-04-05 15:53:55 ***

>

*** Tejeswar has joined at 2025-04-05 15:56:40 ***

>

*** Sana has joined at 2025-04-05 15:56:44 ***

> □

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Tejeswar

unique@Uniques-MacBook-Pro ~ % nc localhost 8080
Enter your name: Sana

```

5) Start a conversation.

The image shows four terminal windows arranged in a 2x2 grid, each running a 'unique' command on localhost 8080. The terminals are color-coded: top-left is light blue, top-right is dark grey, bottom-left is green, and bottom-right is red. Each window displays a list of users who have joined the chat, starting with Unique at 15:53:37. A red box highlights the first message from Unique: "Hi Everyone!!!". Subsequent messages from Unique at 15:58:26 and Chetan at 16:00:03 are also highlighted with red boxes.

```
unique -- nc localhost 8080 - 97x27
unique -- nc localhost 8080 - 105x27
unique -- nc localhost 8080 - 97x27
unique -- nc localhost 8080 - 105x27
```

- Type any other message to chat

>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> Hi Everyone!!!
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
>
- Type '/user <username>' to search by user
- Type any other message to chat

>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
>
- Type '/user <username>' to search by user
- Type any other message to chat

>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
>

The image shows four terminal windows arranged in a 2x2 grid, each running a 'unique' command on localhost 8080. The terminals are color-coded: top-left is light blue, top-right is dark grey, bottom-left is green, and bottom-right is red. Each window displays a list of users who have joined the chat, starting with Unique at 15:53:37. A red box highlights the first message from Unique: "Hi Everyone!!!". Subsequent messages from Unique at 15:58:26, Chetan at 16:00:03, and Chetan at 16:00:03 are also highlighted with red boxes.

```
unique -- nc localhost 8080 - 97x27
unique -- nc localhost 8080 - 105x27
unique -- nc localhost 8080 - 97x27
unique -- nc localhost 8080 - 105x27
```

- Type any other message to chat

>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> Hi Everyone!!!
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!
>
- Type any other message to chat

>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!
>

Terminal Shell Edit View Window Help

unique — nc localhost 8080 — 97x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> Hi Everyone!!!
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
```

unique — nc localhost 8080 — 105x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> Hi ALL!!!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
```

unique — nc localhost 8080 — 97x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> (2025-04-05 15:58:26) Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> Hi Team :)
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
```

unique — nc localhost 8080 — 105x27

```
*****
```

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
```

Terminal Shell Edit View Window Help

unique — nc localhost 8080 — 97x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> Hi Everyone!!!
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
> [2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
```

unique — nc localhost 8080 — 105x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> Hi ALL!!!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
> [2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
```

unique — nc localhost 8080 — 97x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> (2025-04-05 15:58:26) Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> Hi Team :)
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
> [2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
```

unique — nc localhost 8080 — 105x27

```
>
*** Unique has joined at 2025-04-05 15:53:37 ***
>
*** Chetan has joined at 2025-04-05 15:53:55 ***
>
*** Tejeswar has joined at 2025-04-05 15:56:40 ***
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> [2025-04-05 15:58:26] Unique: Hi Everyone!!!
> [2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> [2025-04-05 16:05:01] Tejeswar: Hi Team :)
> Hi all, hope everyone is doing okay..
> [2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
```


7) Search messages by keyword.

Search by keyword can be done by running the command: `/search <keyword>`

Note here that the user who searches for the keyword, only that user gets the response.

8) Search user and display the messages.

```
Terminal Shell Edit View Window Help unique — nc localhost 8080 — 97x27
> Sana has left.
> /search leaving
Search results by keyword:
[2025-04-05 16:13:29] Sana: I need to drop off.. so leaving the chat..
> /user Sana
Search results by user:
[2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
[2025-04-05 16:11:17] Sana: same here
[2025-04-05 16:11:44] Sana: What's your weekend plan?
[2025-04-05 16:12:09] Sana: OK.
[2025-04-05 16:13:29] Sana: I need to drop off.. so leaving the chat..
> /user Chetan
Search results by user:
[2025-04-05 16:00:03] Chetan: Hi ALL!!!!
[2025-04-05 16:11:06] Chetan: I am done
[2025-04-05 16:12:02] Chetan: Nothing much..
>/user Unique
Search results by user:
[2025-04-05 15:58:26] Unique: Hi Everyone!!!
[2025-04-05 16:10:58] Unique: how are your assignments going on?
[2025-04-05 16:11:54] Unique: Nothing for me.. what about you guys??
>/user Tejewar
Search results by user:
[2025-04-05 16:05:01] Tejewar: Hi Team :)
[2025-04-05 16:11:15] Tejewar: I am also done with the assignments.
[2025-04-05 16:12:06] Tejewar: Same here.

*** Sana has joined at 2025-04-05 15:56:44 ***
> (2025-04-05 15:58:26) Unique: Hi Everyone!!!
> (2025-04-05 16:00:03) Chetan: Hi ALL!!!!
> Hi Team :)
> (2025-04-05 16:05:01) Tejewar: Hi Team :)
> (2025-04-05 16:08:24) Sana: Hi all, hope everyone is doing okay..
> (2025-04-05 16:10:58) Unique: how are your assignments going on?
> (2025-04-05 16:11:06) Chetan: I am done
> I am also done with the assignments.
> (2025-04-05 16:11:15) Tejewar: I am also done with the assignments.
> (2025-04-05 16:11:17) Sana: same here
> (2025-04-05 16:11:44) Sana: What's your weekend plan?
> (2025-04-05 16:11:54) Unique: Nothing for me.. what about you guys??
> (2025-04-05 16:12:02) Chetan: Nothing much..
> Same here.
> (2025-04-05 16:12:06) Tejewar: Same here.
> (2025-04-05 16:12:09) Sana: OK.
> (2025-04-05 16:13:29) Sana: I need to drop off.. so leaving the chat..
>
*** Sana has left at 2025-04-05 16:13:35 ***
> Sana has left.

unique — nc localhost 8080 — 105x27
*** Sana has joined at 2025-04-05 15:56:44 ***
> (2025-04-05 15:58:26) Unique: Hi Everyone!!!
> Hi ALL!!!!
> (2025-04-05 16:00:03) Chetan: Hi ALL!!!!
> (2025-04-05 16:05:01) Tejewar: Hi Team :)
> (2025-04-05 16:08:24) Sana: Hi all, hope everyone is doing okay..
> (2025-04-05 16:10:58) Unique: how are your assignments going on?
> I am done
> (2025-04-05 16:11:06) Chetan: I am done
> I am also done with the assignments.
> (2025-04-05 16:11:15) Tejewar: I am also done with the assignments.
> (2025-04-05 16:11:17) Sana: same here
> (2025-04-05 16:11:44) Sana: What's your weekend plan?
> (2025-04-05 16:11:54) Unique: Nothing for me.. what about you guys??
> (2025-04-05 16:12:02) Chetan: Nothing much..
> Same here.
> (2025-04-05 16:12:06) Tejewar: Same here.
> (2025-04-05 16:12:09) Sana: OK.
> (2025-04-05 16:13:29) Sana: I need to drop off.. so leaving the chat..
>
*** Sana has left at 2025-04-05 16:13:35 ***
> Sana has left.

unique — zsh — 105x27
>
*** Sana has joined at 2025-04-05 15:56:44 ***
> (2025-04-05 15:58:26) Unique: Hi Everyone!!!
> (2025-04-05 16:00:03) Chetan: Hi ALL!!!!
> (2025-04-05 16:05:01) Tejewar: Hi Team :)
> Hi all, hope everyone is doing okay..
> (2025-04-05 16:08:24) Sana: Hi all, hope everyone is doing okay..
> (2025-04-05 16:10:58) Unique: how are your assignments going on?
> (2025-04-05 16:11:06) Chetan: I am done
> I am also done with the assignments.
> (2025-04-05 16:11:15) Tejewar: I am also done with the assignments.
> (2025-04-05 16:11:17) Sana: same here
> What's your weekend plan?
> (2025-04-05 16:11:44) Sana: What's your weekend plan?
> (2025-04-05 16:11:54) Unique: Nothing for me.. what about you guys??
> (2025-04-05 16:12:02) Chetan: Nothing much..
> Same here.
> (2025-04-05 16:12:06) Tejewar: Same here.
> (2025-04-05 16:12:09) Sana: OK.
> (2025-04-05 16:13:29) Sana: I need to drop off.. so leaving the chat..
>
*** Sana has left at 2025-04-05 16:13:35 ***
> Sana has left.
```

Search by user can be done by running the command: `/user <username>`

Note here that the user who searches for the user, only that user gets the response.

Search results by user:

```
[2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
[2025-04-05 16:11:06] Chetan: I am done
[2025-04-05 16:12:02] Chetan: Nothing much..
> /user Unique
Search results by user:
[2025-04-05 15:58:26] Unique: Hi Everyone!!!
[2025-04-05 16:05:01] Unique: how are your assignments going on?
[2025-04-05 16:11:54] Unique: Nothing for me.. what about you guys??
> /user Tejeswar
Search results by user:
[2025-04-05 16:05:01] Tejeswar: Hi Team :)
[2025-04-05 16:11:15] Tejeswar: I am also done with the assignments.
[2025-04-05 16:12:06] Tejeswar: Same here.
>
```

*** Chetan has left at 2025-04-05 16:21:43 ***

> Chetan has left.

>

*** Tejeswar has left at 2025-04-05 16:21:46 ***

> Tejeswar has left.

*** Sana has left at 2025-04-05 16:13:35 ***

> Sana has left.

> exit

unique@Uniques-MacBook-Pro ~ %

Search results by user:

```
[2025-04-05 16:00:03] Sana: Hi all, hope everyone is doing okay..
[2025-04-05 16:10:58] Unique: how are your assignments going on?
[2025-04-05 16:11:06] Chetan: I am done
> I am also done with the assignments.
> [2025-04-05 16:11:15] Tejeswar: I am also done with the assignments.
> [2025-04-05 16:11:17] Sana: same here
> [2025-04-05 16:11:44] Sana: What's your weekend plan?
> [2025-04-05 16:11:54] Unique: Nothing for me.. what about you guys??
[2025-04-05 16:12:02] Chetan: Nothing much..
> Same here.
> [2025-04-05 16:12:06] Tejeswar: Same here.
> [2025-04-05 16:12:09] Sana: OK.
> [2025-04-05 16:13:29] Sana: I need to drop off.. so leaving the chat..
>
```

*** Sana has left at 2025-04-05 16:13:35 ***

> Sana has left.

>

*** Chetan has left at 2025-04-05 16:21:43 ***

> Chetan has left.

> exit

unique@Uniques-MacBook-Pro ~ %

9) More testing on search keywords and search users.

> /search Computer

No results found.

> /user Newuser

No results found.

> /search Hi

Search results by keyword:

```
[2025-04-05 15:58:26] Unique: Hi Everyone!!!
[2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
[2025-04-05 16:05:01] Tejeswar: Hi Team :)
[2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
> /search Unique
```

No results found.

> /search Team

Search results by keyword:

```
[2025-04-05 16:05:01] Tejeswar: Hi Team :)
> /search .
```

Search results by keyword:

```
[2025-04-05 16:08:24] Sana: Hi all, hope everyone is doing okay..
[2025-04-05 16:11:15] Tejeswar: I am also done with the assignments.
[2025-04-05 16:11:54] Unique: Nothing for me.. what about you guys??
[2025-04-05 16:12:02] Chetan: Nothing much..
[2025-04-05 16:12:06] Tejeswar: Same here.
[2025-04-05 16:12:09] Sana: OK.
[2025-04-05 16:13:29] Sana: I need to drop off.. so leaving the chat..
> /search !!!
```

Search results by keyword:

```
[2025-04-05 15:58:26] Unique: Hi Everyone!!!
[2025-04-05 16:00:03] Chetan: Hi ALL!!!!!
> exit
```