

# TESENGER: A Simple Chat Application

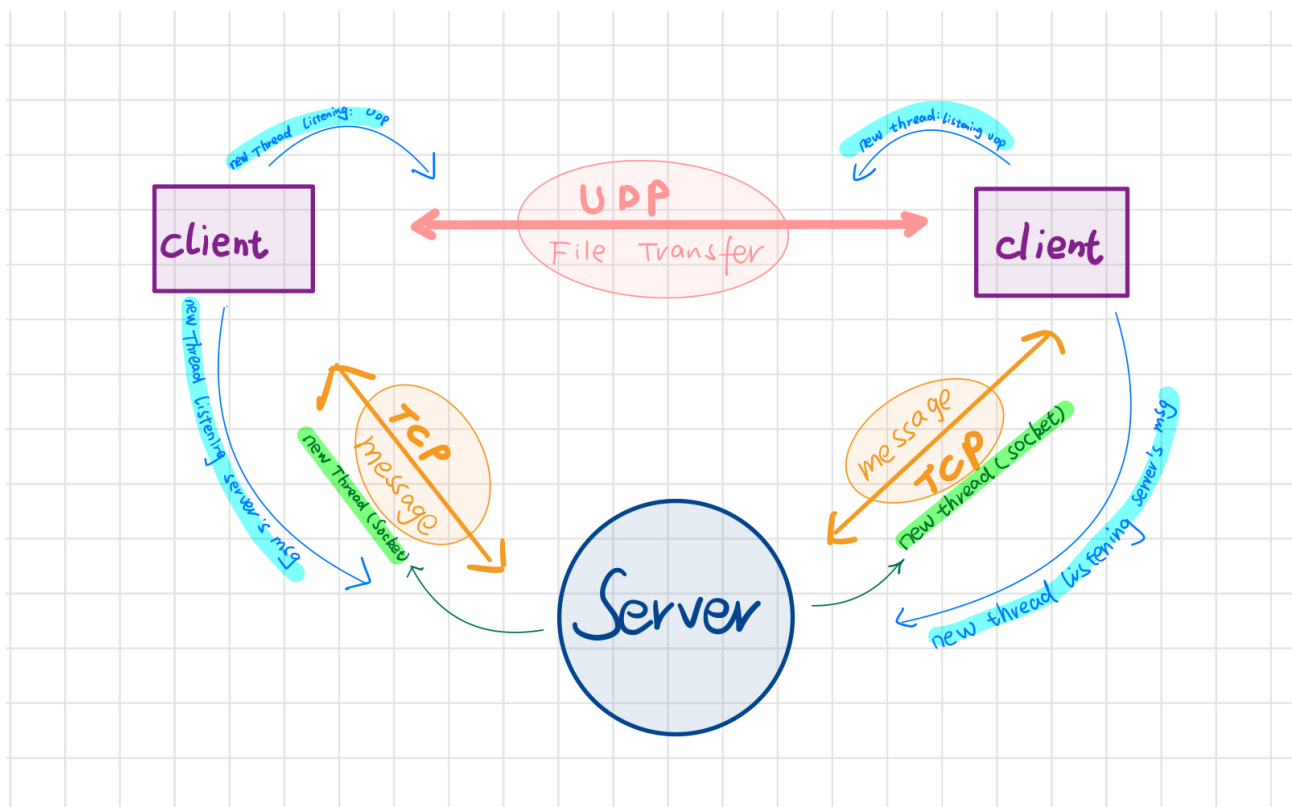
## Introduction

TESENGER is a simple chat application that allows users to communicate with each other using a client-server architecture. The application supports features such as user authentication, one-to-one messaging, group messaging, file sharing. The client-server communication is handled over TCP for command exchange and UDP for file and video transmission.

## Environment

- Python 3.11

## Components



### 1. Server

The server component of TEsenger is responsible for handling incoming client connections, authenticating users, and managing communication between clients. It listens for incoming connections on a specified TCP port and facilitates communication between clients.

Features:

- User Authentication: Users are required to provide a valid username and password for authentication.

- Blocklist: A blocklist is implemented to temporarily block users who exceed the maximum number of login attempts.
- Group Messaging: Users can create and join group chats to communicate with multiple users simultaneously.
- File Sharing: Clients can send files to each other using a combination of TCP and UDP protocols.
- Logging: Server logs user activity, messages, and group chat interactions.

## 2. Client

The client component of TESSENGER provides a command-line interface for users to interact with the server. Users can log in, send messages, create or join group chats, and share files. The client establishes a TCP connection with the server for command exchange and utilizes UDP for file and video transmission.

Features:

- User Authentication: Users must log in with a valid username and password.

```
(base) macbookpro@LilyMacBook test % python3 server.py 127.0.0.1 12000 3
has reached maximum failed attempts aaa
has been blocked for 10 seconds aaa
has been unblocked aaa
>> aaa is online

(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000
Please login
Username: aaa
Password: 111
Invalid password. Please try again.
Username: aaa
Password: 111
Invalid password. Please try again.
Username: aaa
Password: 111
Invalid details. Your account has been blocked. Please try again later.
(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000
Please login
Username: aaa
Password: 111
Your account is blocked due to multiple login failures. Please try again later.

(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000
Please login
Username: aaa
Password: 123
Your account is blocked due to multiple login failures. Please try again later.

(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000
Please login
Username: aaa
Password: 123
Welcome to TESSENGER!

Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):
```

- Command Line Interface: Users interact with the application using command-line commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo).
  - activeuser

```
(base) macbookpro@LilyMacBook test % python3 server.py 127.0.0.1 12000 3
>> aaa is online
>> aaa issued activeuser command
>> Return active user list:
aaa, 127.0.0.1, 13000, 10 November 2023 21:07:07
>> bbb is online
>> aaa issued activeuser command
>> Return active user list:
aaa, 127.0.0.1, 13000, 10 November 2023 21:07:07.
bbb, 127.0.0.1, 13001, 10 November 2023 21:07:27
[]

(base) macbookpro@LilyMacBook test % clear
(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000
Please login
Username: aaa
Password: 123
Welcome to TESSENGER!

Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):

activeuser
aaa, 127.0.0.1, 13000, 10 November 2023 21:07:07

Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):

activeuser
aaa, 127.0.0.1, 13000, 10 November 2023 21:07:07.
bbb, 127.0.0.1, 13001, 10 November 2023 21:07:27

Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):
```

## - msgto/logout

|  |  |  |
|--|--|--|
| <pre>(base) macbookpro@LilyMacBook test % clear (base) macbookpro@LilyMacBook test % python3 server.py 127.0.0.1 12000 3 &gt;&gt; bbb is online &gt;&gt; aaa is online &gt;&gt; aaa issued msgto command &gt;&gt; aaa message to bbb "how are u ?" at 10 November 2023 20:57:10 &gt;&gt; bbb issued msgto command &gt;&gt; bbb message to aaa "good, how about you?" at 10 November 2023 20:57:16 &gt;&gt; aaa issued msgto command &gt;&gt; aaa message to bbb "so busy these days working on my assignment and I learnt a lot!" at 10 November 2023 20:57:10 &gt;&gt; aaa issued logout command &gt;&gt; aaa logout &gt;&gt; bbb issued msgto command &gt;&gt; bbb issued logout command &gt;&gt; bbb logout</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000 Please login Username: aaa Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  msgto bbb how are u ? message sent at 10 November 2023 20:57:10  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 20:57:16, bbb: good, how about you?  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  msgto bbb so busy these days working on my assignment and I learnt a lot! message sent at 10 November 2023 20:57:10  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  logout Bye, aaa!</pre> | <pre>Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 20:57:10, aaa: how are u ?  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  msgto aaa good, how about you? message sent at 10 November 2023 20:57:16  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 20:57:10, aaa: so busy these days working on my assignment and I learnt a lot!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  msgto aaa fair enough! user aaa not online  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  logout Bye, bbb!</pre> |
|--|--|--|

- Group Messaging: Users can create and join group chats to communicate with multiple users simultaneously.

## - creategroup/joingroup/groupmsg

|   |   |  |  |
|---|---|--|--|
| <pre>(base) macbookpro@LilyMacBook test % python3 server.py 127.0.0.1 12000 3 &gt;&gt; ccc is online &gt;&gt; bbb is online &gt;&gt; aaa is online &gt;&gt; aaa issued creategroup command &gt;&gt; Group chat room has been created, room name: g, user in this room are: aaa,bbb,ccc &gt;&gt; bbb issued joingroup command &gt;&gt; ccc issued creategroup command &gt;&gt; Return message Groupname g already exists. &gt;&gt; ccc issued groupmsg command &gt;&gt; ccc sent a message in group chat g:10 November 2023 21:20:10: "I wanna create a group for us, and found it exists already" &gt;&gt; bbb issued groupmsg command &gt;&gt; bbb sent a message in group chat g:10 November 2023 21:20:07: "haha!" &gt;&gt; aaa issued logout command &gt;&gt; aaa logout &gt;&gt; bbb issued groupmsg command &gt;&gt; bbb sent a message in group chat g:10 November 2023 21:20:07: "maybe next time!"</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000 Please login Username: aaa Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  creategroup g aaa bbb ccc Group chat created g  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 21:20:10, g, ccc: I wanna create a group for us, and found it exists already  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 21:20:07, g, bbb: haha!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  logout Bye, aaa! Error reading from server: [Errno 57] Socket is not connected</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13001 Please login Username: bbb Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  joingroup g You have already joined Groupchat g  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 21:20:10, g, ccc: I wanna create a group for us, and found it exists already  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  groupmsg g haha! Group chat message sent at:10 November 2023 21:20:07  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  groupmsg g maybe next time! Group chat message sent at:10 November 2023 21:20:07  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13002 Please login Username: ccc Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  creategroup g aaa bbb ccc Failed to create the group chat g: g exists!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  groupmsg g I wanna create a group for us, and found it exists already Group chat message sent at:10 November 2023 21:20:10  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 21:20:07, g, bbb: haha!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  10 November 2023 21:20:07, g, bbb: maybe next time!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):</pre> |
|---|---|--|--|

- File Sharing: Clients can send and receive files from other users.

|  |  |   |
|--|--|---|
| <pre>(base) macbookpro@LilyMacBook test % python3 server.py 127.0.0.1 12000 3 &gt;&gt; aaa is online &gt;&gt; bbb is online &gt;&gt; aaa issued activeuser command &gt;&gt; Return active user List: aaa, 127.0.0.1, 13000, 10 November 2023 21:35:49. bbb, 127.0.0.1, 13001, 10 November 2023 21:35:51 &gt;&gt; aaa issued p2pvideo command</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13000 Please login Username: aaa Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  activeuser aaa, 127.0.0.1, 13000, 10 November 2023 21:35:49. bbb, 127.0.0.1, 13001, 10 November 2023 21:35:51  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  p2pvideo bbb example1.mp4 p2pvideo 127.0.0.1 13001 example1.mp4 aaa  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  example1.mp4 has been uploaded.</pre> | <pre>(base) macbookpro@LilyMacBook test % python3 client.py 127.0.0.1 12000 13001 Please login Username: bbb Password: 123 Welcome to TESSENGER!  Enter one of the following commands (/msgto, /activeuser, /creategroup, /joingroup, /groupmsg, /logout, /p2pvideo):  Received example1.mp4 from aaa</pre> |
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## Design

- **Server Implementation:**

In the server script, threading is employed to handle multiple client connections concurrently. Each incoming client connection is processed in a separate thread using the `socket_target` function.

```
def main(server_ip, tcp_port, max_attempts):  
    socket_list = {}  
  
    s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)  
  
    s.setsockopt(  
        socket.SOL_SOCKET,  
        socket.SO_REUSEPORT,  
        1)  
  
    s.bind((server_ip, tcp_port))  
  
    s.listen()  
  
    setupLogs()  
  
    lock = threading.Lock()  
  
    while True:  
        conn, addr = s.accept()  
  
        threading.Thread(target=socket_target, args=(conn, socket_list,  
max_attempts, lock)).start()
```

The `socket_target` function is responsible for handling the communication with an individual client. This function is executed in a separate thread for each client connection.

- **Client Implementation:**

In the client script, threading is used to create two separate threads: one for receiving messages from the server (`read_server` function) and another for executing commands entered by the user (`execute_command` function).

```
def main(server_ip_, tcp_port_, udp_port_):  
    global udp_port, server_ip  
  
    s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)  
  
    udp_port = udp_port_  
  
    server_ip = server_ip_
```

```

try:
    s.connect((server_ip, tcp_port_))
    print('Please login')
    threading.Thread(target=UDP_recv, args=()).start()
    threading.Thread(target=read_server, args=(s,)).start()

    execute_command(s)
except:
    print('Connection refused!')

```

In the main function, two threads are started concurrently. One thread executes the UDP\_recv function, which handles UDP message reception, and the other thread executes the read\_server function, which reads messages from the server.

```

def read_server(s):
    global running, auth
    while running:
        try:
            content = s.recv(2048).decode('utf-8')
            print(content)

            if not content or 'Bye' in content or 'blocked' in content or
'error' in content:
                disconnect(s)
                running = False
                break

            if 'Invalid password' not in content:
                print(prompt)

            if 'Welcome' in content:
                auth = True

            elif 'p2pvideo' in content:
                _, addr, receive_port, file_name, sender =
re.split(r'\s', content)
                UDP_send((addr, int(receive_port)), file_name, sender)

```

```
except OSError as e:

    print(f"Error reading from server: {e}")

    running = False

    break
```

- **P2Pvideo Implementation:**

UDP is utilized for file transmission between clients. The UDP file transfer is implemented through two functions: UDP\_send in the client script and UDP\_recv in the server script. These functions work together to send and receive files over UDP.

## Usage

To run the TESSENGER application, execute the following commands:

### Server:

python server.py <server\_ip> <tcp\_port> <max\_attempts>

- <server\_ip>: IP address where the server is hosted.
- <tcp\_port>: Port for TCP communication.
- <max\_attempts>: Maximum login attempts allowed before temporary blocking.

### Client:

python client.py <server\_ip> <tcp\_port> <udp\_port>

- <server\_ip>: IP address where the server is hosted.
- <tcp\_port>: Port for TCP communication.
- <udp\_port>: Port for UDP communication.

## Conclusion

TESSENGER provides a simple and functional chat application that enables users to communicate securely and efficiently. The combination of TCP for command exchange and UDP for file and video transmission ensures a seamless user experience. The application's features, including user authentication, group messaging, file sharing make it a practical solution for online communication.