1.Programming description

This assignment realizes the basic functions of the forum based on Python3 through the principles and methods of socket programming and multithreading programming, including user registration and login, thread and message publishing, consulting, modifying and deleting, and uploading and downloading files in the forum.

This assignment completes the second configuration required, adding the timeout retransmission mechanism to increase the reliability of UDP transmission, and allocating threads to each concurrent client through the address of the client to realize the function of the server to process concurrent clients.

The program uses UDP to communicate except TCP in the transmission process of uploading and downloading binary files, which meets the relevant requirements of the assignment.

2.Aplication layer message format

2.1 User login （Display on client side）

Enter username: Prompts the user for a user name

Enter password: Prompts the user for password

New user, enter password: Prompts the new user for password

Welcome to the forum Inform the user of successful login

Invalid password Inform the user of password error

{username} has already logged in Inform the user that he has logged in to another client

Enter one of the following commands: CRT, MSG, DLT, EDT, LST, RDT, UPD, DWN, RMV, XIT: Prompts the user for command

Goodbye Inform the user that the exit is successful

2.2 Command （Display on client side）

Thread {threadtitle} created Inform the user that the thread is created successfully

Thread {threadtitle} exists Inform the user that the thread exists

Thread {threadtitle} removed Inform the user that the thread is removed successfully

Thread {threadtitle} does not exist Inform the user that the thread does not exist

Thread {threadtitle} cannot be edited Inform the user have no power to edit the thread

The list of active threads:…… Shows existing thread in the forum

No threads to list Inform the user that no thread in the forum

Message posted to {threadtitle} thread Inform the user that the message posted successfully

Thread {threadtitle} is empty Inform the user that the thread has no message

The message has been deleted Inform the user that the message is deleted successfully

The message belongs to another user and cannot be edited Inform the user have no power to edit the message

The message does not exist Inform the user that the message does not exist

The message has been edited Inform the user that the message edited successfully

File {filename} exists Inform the user that the filename exists

{filename} uploaded to {threadtitle} thread Inform the user that the file uploaded successfully

File {filename} does not exist Inform the user that the file does not exist

{filename} successfully downloaded Inform the user that the file downloaded successfully

Incorrect syntax for {command} Prompted the user that the command format is incorrect

2.3 Display on server side

Client authenticating Indicating that a client wants to log in

{username} has already logged in Prompted that a duplicate user name wants to log in

{username} successful login Indicating that a user log in successfully

Incorrect password Indicating that a user input incorrect password

new user Indicating that a user wants to log in

{username} issued {command name} command Indicating that a user issued a command

Thread {threadtitle} created Indicating that a thread created successfully

Thread {threadtitle} exists Indicating that the thread exists

Thread {threadtitle} removed Indicating that a thread removed successfully

Thread {threadtitle} cannot be removed Indicating the user have no power to edit the thread

Message posted to {threadtitle} thread Indicating that a message posted successfully

Message cannot be deleted Indicating the user have no power to delete the message

Message has been deleted Indicating that a message deleted successfully

Message has been edited Indicating that a message edited successfully

Message cannot be edited Indicating the user have no power to edit the message

Incorrect thread specified Indicating that the thread cannot read

Thread {title} read Indicating that a thread read

{filename} exists Indicating that the file exists

{username} uploaded file {filename} to {threadtitle} Indicating that file uploaded successfully

{filename} does not exist in thread {threadtitle} Indicating that the file does not exist

{filename} downloaded from Thread {threadtitle} Indicating that file downloaded successfully

Waiting for clients Indicating that no client is online

2.4 Server-to-client message format

SUCCESS Correct username

OCCUPY Username is in use

NEW New username

CORRCET Correct password

INCORRCET Incorrect password

REGISTER_SUCCESS New user is successfully registered

LST_SUCCESS Read threadtitle list successfully

LST_EMPTY No thread in the forum

CRT_SUCCESS Create thread successfully

CRT_OCCUPY Thread you want to create exists

RMV_SUCCESS Remove thread successfully

RMV_NONE_POWER No power to remove thread

RMV_NONE_EXIST Thread you want to remove does not exist

MSG_SUCCESS Message post successfully

MSG_THREAD_NONE_EXIST Thread you want to post message in does not exist

DLT_NONE_POWER No power to delete message

DLT_SUCCESS Message delete successfully

DLT_THREAD_NONE_EXIST Thread you want to delete message in does not exist

EDT _NONE_POWER No power to edit message

EDT_SUCCESS Message edit successfully

EDT_THREAD_NONE_EXIST Thread you want to edit message in does not exist

RDT_THREAD_NONE_EXIST Thread you want to read does not exist

RDT_BEGIN Thread read begin

RDT_SUCCESS Thread read successfully

UPD_THREAD_NONE_EXIST The thread you want to upload to not exist

UPD_OCCUPY The file you want to upload exists in the thread

UPD_PERMIT Allowed to upload file

CONNECT_OK TCP connect successfully

UPD_OK File uploaded successfully

DNW_THREAD_NONE_EXIST The file you want to download does not exist in the thread

DNW_FILENAME_NONE_EXIST The file you want to download does not exist

DNW_OK File downloaded successfully

GOODBYE The user logs out successfully

3. circumstances that program does not work

3.1 When running RMV, an error will be reported if a folder in the server side working directory has the same name as the thread title

3.2 If the client exits unexpectedly without running the XIT command, the server still saves the client's login record