

Peer-to-peer Chat Project Report

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1. Project Summary

P2P Chat application is written with Java programming language and it aims to provide a peer-to-peer messaging solution.

2. Solution Approach

P2P Chat application consist of 2 parts. First is the peer program and the other one is the registrar program. Users are using the peer program to register their usernames, login to the system and search other users. After finding IP address and port number of any other user in the registration system, they can send request to them to start a chat.

Registrar program is responsible for keeping track of the registered users, their passwords, connection information (IP address and port) and online status. To make the testing easy with a single computer, it is assumed that both the registrar and the peer will be run on the “localhost” and it can be changed from the peer and registrar.

3. Usage Explanation

Usage of P2P Chat program is fairly simple. Firstly, we run the **Registrar** program to keep track of peers.

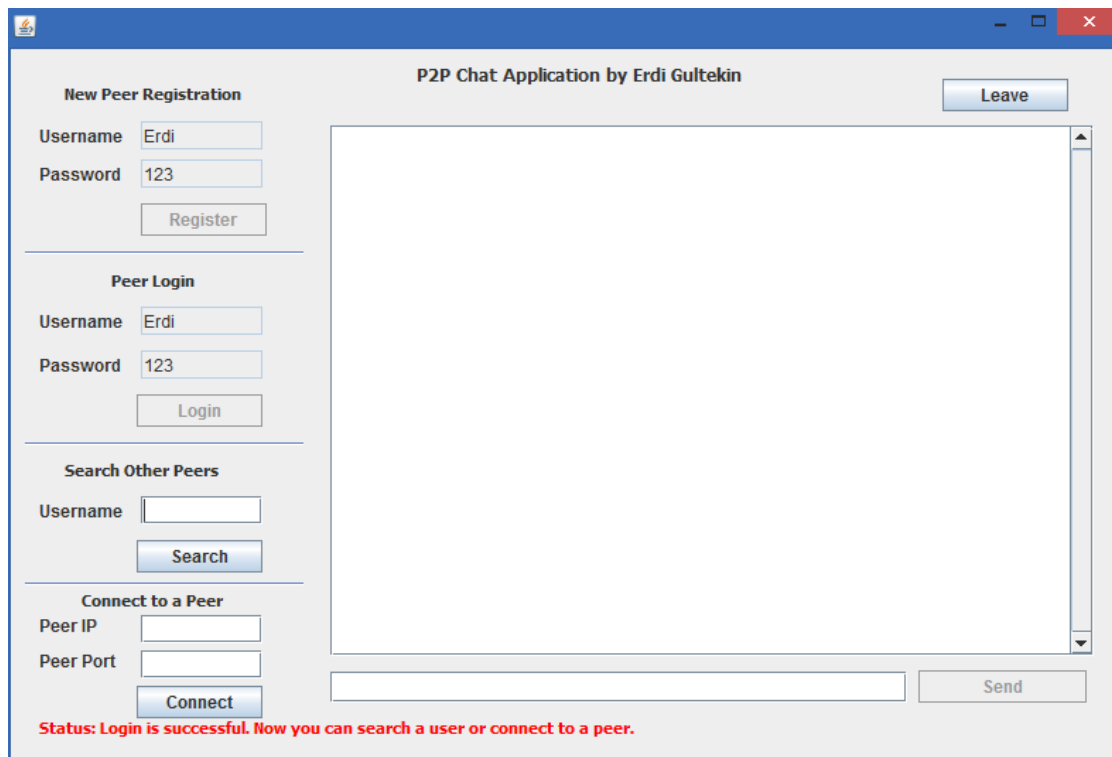
Then we can run the **Peer** program and the screen below will be opened:

The screenshot shows a window titled "P2P Chat Application by Erdi Gultekin". On the left, there are four sections: "New Peer Registration" with fields for Username and Password and a Register button; "Peer Login" with fields for Username and Password and a Login button; "Search Other Peers" with a Username field and a Search button; and "Connect to a Peer" with fields for Peer IP and Peer Port and a Connect button. On the right, there is a large empty chat area with a vertical scrollbar, a "Leave" button at the top right, and a "Send" button at the bottom right next to a text input field. At the bottom left, a red status message reads: "Status : Register or login to start a conversation".

In this screen, we have 2 options. We can register a new username with password or alternatively, we can login with an registered username and password.

This screenshot shows the same application window after a successful registration. The "New Peer Registration" section now has "Erdi" in the Username field and "123" in the Password field. The "Peer Login" section remains empty. The "Search Other Peers" and "Connect to a Peer" sections are also empty. The chat area on the right is still empty. The "Send" button is visible at the bottom right. The red status message at the bottom left now reads: "Status: Registration is successful. Now you can login.".

After the registration, we will be ready to login as in the screenshot above. We can now enter our username and password to login to the system.



The screenshot shows a window titled "P2P Chat Application by Erdi Gultekin". The interface is divided into several sections on the left and a large chat area on the right. The left section contains four sub-sections: "New Peer Registration" with fields for Username (Erdi) and Password (123) and a Register button; "Peer Login" with fields for Username (Erdi) and Password (123) and a Login button; "Search Other Peers" with a Username field and a Search button; and "Connect to a Peer" with fields for Peer IP and Peer Port, and a Connect button. The right section is a large chat area with a vertical scrollbar and a "Leave" button at the top right. At the bottom of the window, there is a status bar with a red text message: "Status: Login is successful. Now you can search a user or connect to a peer." Below the status bar, there is a text input field and a "Send" button.

After the login successful message, we can now search for other peers or fill the connection information of another peer if we already know them.

Let's start another instance of the Peer program and do the same steps above with a different username (e.g. register a new user with "Ahmet" name) to test the system:

The screenshot shows a window titled "P2P Chat Application by Erdi Gultekin". On the left, there are four sections: "New Peer Registration" with fields for Username (Ahmet) and Password (345), and a Register button; "Peer Login" with the same fields and a Login button; "Search Other Peers" with a Username field and a Search button; and "Connect to a Peer" with fields for Peer IP, Peer Port, and a Connect button. The right side of the window features a large chat area with a vertical scrollbar and a "Leave" button at the top right. Below the chat area is a text input field and a "Send" button. At the bottom, a red status message reads: "Status: Login is successful. Now you can search a user or connect to a peer."

In order to connect to another user (e.g. Ahmet) for chatting, we need to get its connection details. To get this information, type the username of the peer (e.g. Ahmet's name) into the search box and click on the Search button.

This screenshot shows the same application window after the search button has been clicked. The "Search Other Peers" section now displays "Ahmet" in the Username field. The red status message at the bottom has updated to: "Status: Ahmet is a registered peer and online. IP: 192.168.0.11 Port: 4497". All other UI elements, including the registration, login, and connect sections, remain the same as in the previous screenshot.

The registrar will return us the connection details of other peers and their online/offline status (e.g. whether Ahmet is a registered peer and online and his IP address and port number if he is online). If the user was offline, we would get the following message:

P2P Chat Application by Erdi Gultekin

New Peer Registration

Username:

Password:

Peer Login

Username:

Password:

Search Other Peers

Username:

Connect to a Peer

Peer IP:

Peer Port:

Status: Ahmet is a registered peer and offline.

Fill the connection details and click to Connect button:

P2P Chat Application by Erdi Gultekin

New Peer Registration

Username:

Password:

Peer Login

Username:

Password:

Search Other Peers

Username:

Connect to a Peer

Peer IP:

Peer Port:

Status: Ahmet is a registered peer and online. IP: 192.168.0.11 Port: 4497

The other peer will get a notification about your chat request. He can accept or reject your chat request:

P2P Chat Application by Erdi Gultekin

New Peer Registration

Username:

Password:

Peer Login

Username:

Password:

Search Other Peers

Username:

Connect to a Peer

Peer IP:

Peer Port:

Status: Login is successful. Now you can search a user or connect to a peer.

New Chat Request

Do you want to chat with Erdi?

After the confirmation of the other peer, now the users can send and receive messages from each other:

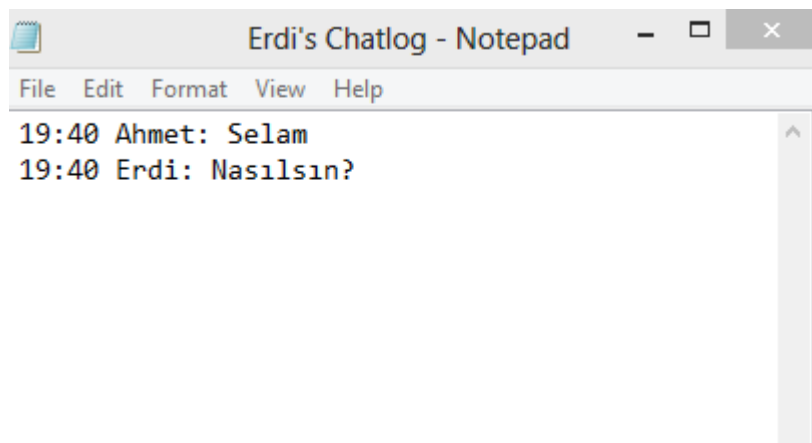
The screenshot shows a window titled "P2P Chat Application by Erdi Gultekin". On the left, there are four sections: "New Peer Registration" with fields for Username (Erdi) and Password (123) and a Register button; "Peer Login" with fields for Username (Erdi) and Password (123) and a Login button; "Search Other Peers" with a field for Username (Ahmet) and a Search button; and "Connect to a Peer" with fields for Peer IP (192.168.0.11) and Peer Port (4497) and a Connect button. On the right, there is a large chat area with a "Leave" button at the top right and a "Send" button at the bottom right. A status message at the bottom left reads "Status: Ahmet accepted your chat request".

The screenshot shows the same window as the previous one, but with updated content. The "New Peer Registration" section now has Username (Ahmet) and Password (345). The "Peer Login" section has Username (Ahmet) and Password (345). The "Search Other Peers" section has an empty Username field. The "Connect to a Peer" section has empty fields for Peer IP and Peer Port. The chat area now displays two messages: "19:40 Ahmet: Selam" and "19:40 Erdi: Nasılsın?". The status message at the bottom left now reads "Status: Peer Erdi is connected".

Users can leave the system by either clicking on the Leave button or the close button (X) at the top right corner of the screen.

After leaving the system, all chat message logs will be recorded to the same directory:

Name	Date modified	Type	Size
P2P Chat	20.8.2016 19:04	File folder	
Ahmet's Chatlog	20.8.2016 19:42	Text Document	1 KB
Erdi's Chatlog	20.8.2016 19:42	Text Document	1 KB
Peer	20.8.2016 19:03	Executable Jar File	34 KB



4. Protocols

The registrar is using the `java.net.ServerSocket` and `java.net.Socket` classes (like a server) to connect with the Peer program. The registrar handles each new peer connection by creating a new thread. Peer program is using only the `java.net.Socket` class (like a client) to connect with the registrar. These classes are using the TCP (Transmission Control Protocol) which is a reliable and stream oriented protocol. It is assumed that the registrar and peers will run on the localhost and use the predefined port 5555.

Messages sent between the registrar and peers with a `Packet` class instance. This class provides a basic communication structure and it allows to transfer peer registration, login and leave messages.

Peers have separate communication channels between themselves. They use `java.net.ServerSocket` and `java.net.Socket` classes to act like a server and a client at the same time to send and receive message. Their communication is again based on TCP. Their IP addresses can be different and their communication ports are assigned randomly by the registrar. This makes it easy to have separate channels of communication and run them on the same computer for testing purposes. Peers have a `Peer` class, a GUI (graphical user interface) class and a `PeerThread` class. `PeerThread` class is handling the server like processes in the peers and `Peer` class is handling the client like processes.

Messages between the peers are sent via different packet which is called ChatPacket class. This class provides communication with the message types like chat requests, chat messages, message delivery status, peer online/busy/offline status and other needed connection information.

The overall communication structure between the peers and registrar is depicted as below:

