# CHAT SERVER

## Abstract

A chat server is a simple communication system where multiple clients could send and receive messages in real time. Implemented in Java, a chat server fully utilizes multi-threading for supporting the concurrent handling of many clients. The architecture follows the client-server where, with the central server still having a control, the clients connect to the central server that forwards messages between clients.

This implementation uses a ServerSocket to listen for incoming client connections and keeps track of each client connection in its own thread, thus it can actively engage in conversations with multiple clients at once. The server keeps an active list of client connections and is able to send messages to all clients or users.

The Socket Connection with the server allows for an exchange of messages in real-time on the client side. Communication between client and server normally is controlled using InputStream to send messages and OutputStream to receive messages. Even these features like the following could be integrated into this server architecture:

User Authentication: Login and registration.

Private Messaging: Sending a message to a specific user.

Group Chat: Sending messages to multiple users who are in a group.

File Sharing: Send a file from one user to another.

Message Encryption: Ensuring secret communication between the clients and the server.

To eradicate thread-related problems and to have correct synchronization of messages, the chat server frequently uses synchronized blocks and message queues. Apart from these methods, integration of a database will enable logging of messages and handling of user management of a scalable system across multiple servers.

## Objectives

Implement a real-time chat server that supports multiple clients. Introduce the use of multithreading on concurrent connections, BlockingQueue for message management, and Semaphore for the connection limit. Add user authentication, message broadcasting, error robustness, and performance with proper documentation and testing.

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