Lebanese American University

Department of Computer Science & Mathematics

Computer Networks

الجامعة اللبنانية الأميركية

Lebanese American University

Lara Issa

Youmna Nasser

Lama El Kadi

Spongebob Chat

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Abstract

This report presents a detailed overview of developing a client-server based chat application using socket programming. The application is developed using Java programing. The primary objective of this report is to present the principles behind socket programming and the libraries available for socket programming applications in Java.

Introduction

Chatting is a method of using technology to bring people and ideas “together” despite of the geographical barriers. The technology has been available for years but the acceptance it was quite recent. Our project is an example of a client chat server. It is made up of 2 applications the client application, which runs on the user’s Pc and server application, which runs on any Pc on the network. To start chatting client should get connected to server. We will focus on TCP socket connections which are a fundamental part of socket programming.

System Objectives

Communication over a network is one field where this tool finds wide ranging application. Chat application establishes a connection between 2 or more systems connected over an intra-net or ad-hoc. This tool can be used for large scale communication and conferencing in an organization or campus of vast size, thus increasing the standard of co-operation. In addition, it converts the complex concept of sockets to a user friendly environment.

System Considerations:

Approach:

The application has been designed using Java programing language in WindowBuilder (Windows Application environment).

Methodology:

The user interacts with the tool using a GUI.

- The GUI operates in two forms, the List form & the chat form.
- The List form contains the names of all the systems connected to a network.
- The chat form makes the actual communication possible in the form of text.

Operational Concepts and Scenarios

Operation of the application based on the inputs given by the user:

- When the run button is clicked then the chat form is initialized with a connection between the host and the client machine.

• Note: server must be started at first before a client start.
• Contains a rich textbox which send messages from one user to another
• Contains a textbox for messages to be written that is sent across the network.
• Contains a Send button.
• When the sent button is clicked, in the background, the text in the textbox is encoded and sent as a packet over the network to the client machine. Here this message is decoded and is shown in the rich textbox.
•The server takes part in receiving the messages from different clients, where each client is a thread. The incoming message from each client is taken by the server and broadcasted to other clients in the chat. Also, the server manages private messages between 2 clients. When a client closes the connection he is deleted from the list of clients. The client can logout by disconnecting to the server.

Socket Overview

A socket is an object that represents a low level access point to the IP stack. This socket can be opened or closed or one of a set number of intermediate states. A socket can send and receive data down disconnection. Data is generally sent in blocks of few kilobytes at a time for efficiency; each of these block are called a packet.

All packets that travel on the internet must use the Internet Protocol. This means that the source IP address, destination address must be included in the packet. Most packets also contain a port number. A port is simply a number between 1 and 65,535 that is used to differentiate higher protocols. Ports are important when it comes to programming your own network applications because no two applications can use the same port.

Packets that contain port numbers come in two flavors: UDP and TCP/IP. UDP has lower latency than TCP/IP, especially on startup. Where data integrity is not of the utmost concerned, UDP can prove easier to use than TCP, but it should never be used where data integrity is more important than performance; however, data sent by UDP can sometimes arrive in the wrong order and be effectively useless to the receiver. TCP/IP is more complex than UDP and has generally longer latencies, but it does guarantee that data does not become corrupted when travelling over the internet. TCP is ideal for file transfer, where a corrupt file is more unacceptable than a slow download; however, it is unsuited to internet radio, where the odd sound out of place is more acceptable than long gaps of silence.

A socket is simply an endpoint for communications between the machines. The Socket class can be used to create a socket. Socket Programming is used for communication between machines using a Transfer Control Protocol (TCP). It can be connectionless or connection-oriented. Server Socket 6 and Socket classes are used for connection-oriented socket programming. After creating a connection, the server develops a socket object on its end of the connection. The server and client now start communicating by writing to and reading from the socket. The client needs to know two basic information, which are: Port number& IP address of server.

If everything goes well, the server accepts the connection. Upon acceptance, the server gets a new socket bound to the same local port and also has its remote endpoint set to the address and port of the client. It needs a new socket so that it can continue to listen to the original socket for connection requests while tending to the needs of the connected client. On the client side, if the connection is accepted, a socket is successfully created and the client can use the socket to communicate with the server. The client and server can now communicate by writing to or reading from their sockets.

TCP connection uses Sockets to communicate between client and server and between clients, however IDP uses DatagramSocket which provides connection-less point for sending and receiving packets. Every packet sent from a datagram socket is individually routed and delivered. In our program we used TCP connection.

Project Scope

This project can be mainly divided into two modules:

1. Server
2. Client

This project is mainly depended on client/server model. The client requests the server and server responses by granting the clients request. The proposed system should provide both of the above features along with the followed ones:

Server

A server is a computer program that provides services to other computer programs (and their users) in the same or other computers. The computer that a server program runs in is also frequently referred to as a server. That machine may be a dedicated server or used for other purposes as well. Example Server, Database, Dedicated, Fileserver, Proxy Server, Web Server. The server is always waiting for client's requests. The clients come and go down but the server remains the same.

A server application normally listens to a specific port waiting for connection requests from a client. When a connection request arrives, the client and the server establish a dedicated connection over which they can communicate. During the connection process, the client is assigned a local port number, and binds a socket to it. The client talks to the server by writing to the socket and gets information from the server by reading from it. Similarly, the server gets a new local port number (it needs a new port number so that it can continue to listen for connection requests on the original port). The server also binds a socket to its local port and communicates with the client by reading from and writing to it. The client and the server must agree on a protocol that is, they must agree on the language of the information transferred back and forth through the socket. Normally, a server runs on a specific computer and has a socket that is bound to a specific port number. The server just waits, listening to the socket for a client to make a connection request.

Development of Server

The steps involved in establishing a socket on the server side are as follows:

- Create a ServerSocket with the socket() system call and set port number the same between clients and server.
- Accepts connection with clients who have the same port number and add it to the client list
- For each client, a thread is created
- The messages sent by the clients are received by the server through getoutputstream(), and these messages are then broadcasted to all the other clients.
- The server also sends private messages between just 2 clients.

Client

On the client site the client knows the hostname of the machine on which the server is running and the port number on which the server is listening. To make a connection request, the client tries to rendezvous with the server on the server's machine and port. The client also needs to identify itself to the server so it binds to a local port number that it will use during this connection. This is usually assigned by the system.

The model used for this project is the single server – multiple client models. The following specifications must be implemented:

1. The server and client are two separate programs.
2. Multiple clients must be able to connect to a single server.
3. All input and output is via I/O Interface (GUI is Required).

Development of Client

The system calls for establishing a connection are somewhat different for the client and the server, but both involve the basic construct of a socket. Both the processes establish their own sockets. The steps involved in establishing a socket on the client side are as follows:

• Create a socket with the **socket()** system call.

• Connect the socket to the address of the server using the **connect()** system call.

• Send and receive data though outputstream and inputstream.

• Simple Client Program in Java

• The steps for creating a simple client program are:

1. Create a Socket Object:

Socket client = new Socket**(server, port_id);**

2. Create I/O streams for communicating with the server.

input = new DataInputStream(client.getInputStream());

output = new DataOutputStream(client.getOutputStream());

3. Perform I/O or communication with the server:

Receive data from the server: String line = input.readLine();

Send data to the server: output.writeBytes(”Hello Dr. Morkarian.\n”);

4. The client can log out from the chat through closing the socket when done:

• client.close();

GUI Module Name and Description

This module deals with the application interface with the end user.

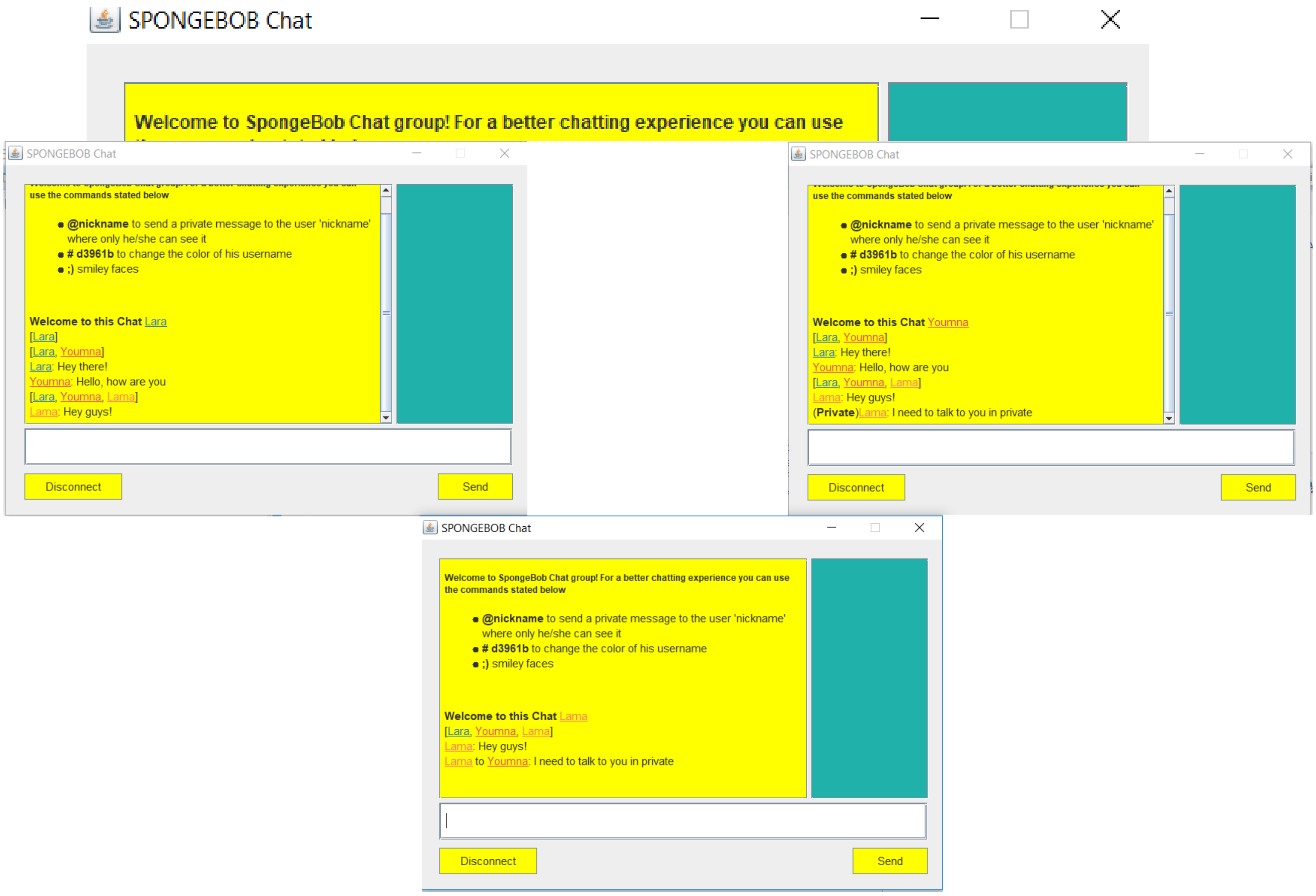
Design Alternatives

- Java programming approach is used as the tool has been developed in window Builder environment.

Design Details

At a minimum, the following should be described –

a) Processing within module


SPONGEBOB Chat

Welcome to SpongeBob Chat group! For a better chatting experience you can use

SPONGEBOB Chat

use the commands stated below

- **@nickname** to send a private message to the user 'nickname' where only he/she can see it
- **# d3961b** to change the color of his username
- **;)** smiley faces

Welcome to this Chat Lara
[Lara]
[Lara, Youmna]
Lara: Hey there!
Youmna: Hello, how are you
[Lara, Youmna, Lama]
Lama: Hey guys!

SPONGEBOB Chat

use the commands stated below

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- **;)** smiley faces

Welcome to this Chat Youmna
[Lara, Youmna]
Lara: Hey there!
Youmna: Hello, how are you
[Lara, Youmna, Lama]
Lama: Hey guys!
(Private) Lama: I need to talk to you in private

SPONGEBOB Chat

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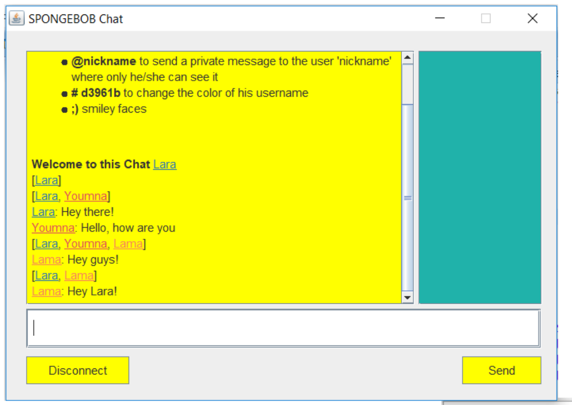
- **;)** smiley faces

Welcome to this Chat Lama
[Lara, Youmna, Lama]
Lama: Hey guys!
Lama to Youmna: I need to talk to you in private

We developed the user interface for the application through which the user interacts with the tool. It consists of a main window and boxes which are displayed as per the menu selections made by the user. Once the username, the host and the port number are set, the users press on “Connect” for them to enter the group chat.

As shown in the picture above, the users were able to access the chat and talk to each other either in private or all of them together. The “Send” button is used to transmit the message to the other clients, and the “Disconnect” button is used to let the client leave the chat and goes back to the main page.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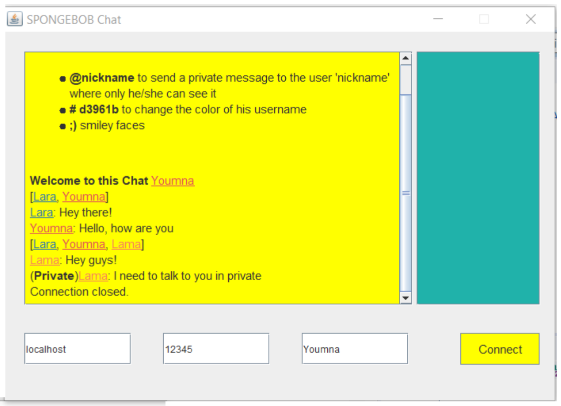
Welcome to this Chat Lara
[Lara]
[Lara, Youmna]
Lara: Hey there!
Youmna: Hello, how are you
[Lara, Youmna, Lama]
Lama: Hey guys!
[Lara, Lama]
Lama: Hey Lara!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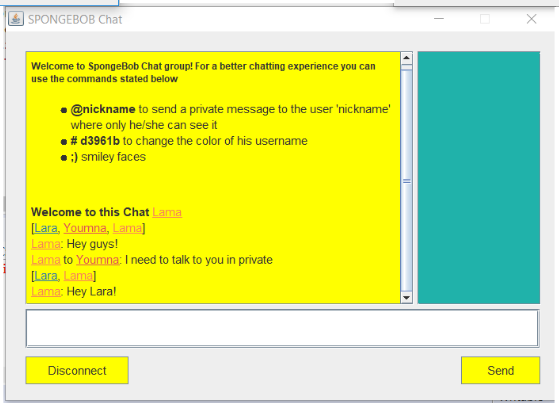
- ;) smiley faces

Welcome to this Chat Youmna
[Lara, Youmna]
Lara: Hey there!
Youmna: Hello, how are you
[Lara, Youmna, Lama]
Lama: Hey guys!
(**Private**)Lama: I need to talk to you in private
Connection closed.

localhost 12345 Youmna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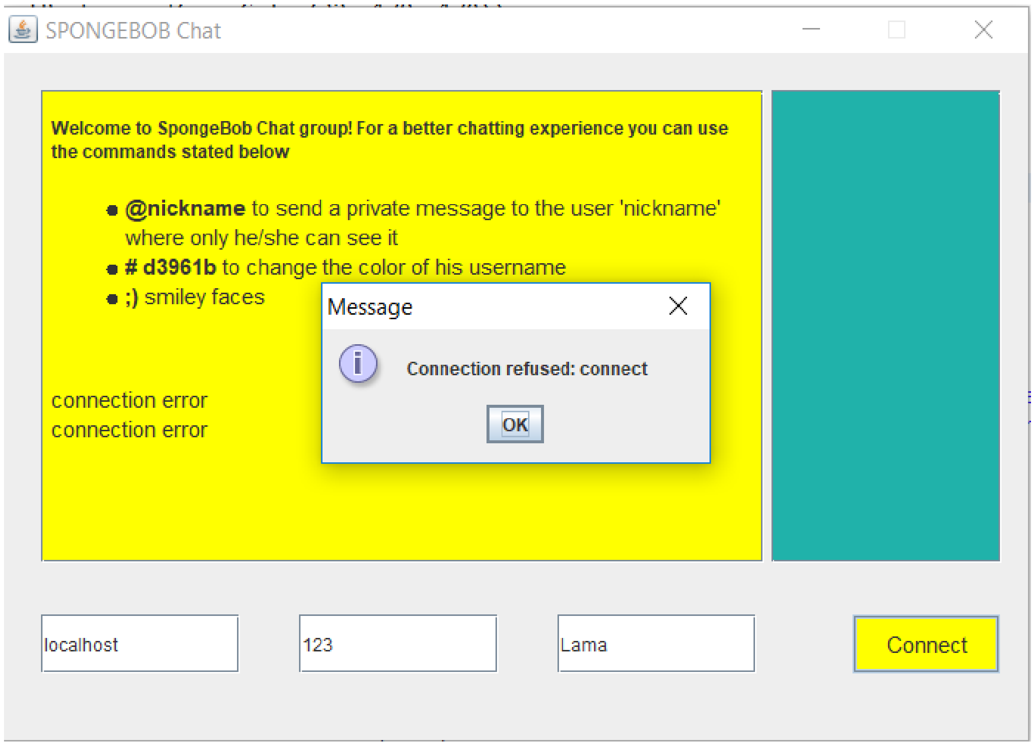
- ;) smiley faces

Welcome to this Chat Lama
[Lara, Youmna, Lama]
Lama: Hey guys!
Lama to Youmna: I need to talk to you in private
[Lara, Lama]
Lama: Hey Lara!

b) Error checking

➔ When there is a connection problem, an error will occur.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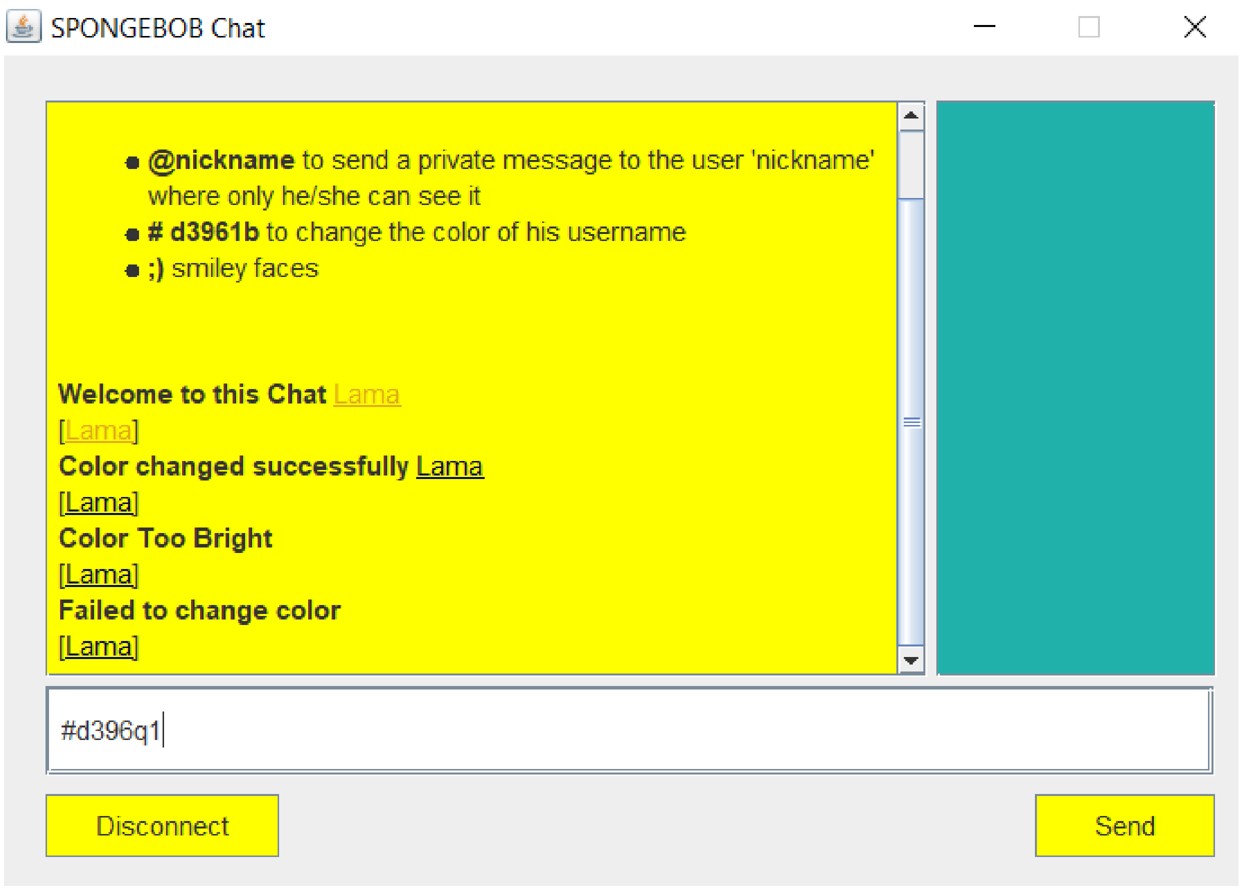
connection error
connection error

Message

Connection refused: connect

localhost 123 Lama

➔ Errors occurring due to incorrect input by user.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Welcome to this Chat Lama
[Lama]
Color changed successfully Lama
[Lama]
Color Too Bright
[Lama]
Failed to change color
[Lama]

#d396q1

Resolving Names Module Name and Description

In this module the application resolves the names of the systems connected to a network. These names are displayed in the form of a list. In this module the user communicates with the desired user in the form of text. A connection is formed between the server and client with the help of sockets which itself uses ports for packet data transfer. We show a windows form application that makes communication graphic oriented and user friendly. Three GUI interfaces are captured under this:

- Send Button When this button is pressed, the message in the textbox is displayed in the TextArea.
- Instant Buttons: Normally we need to type text to send to the end user, but this features could help to send text immediately without typing.

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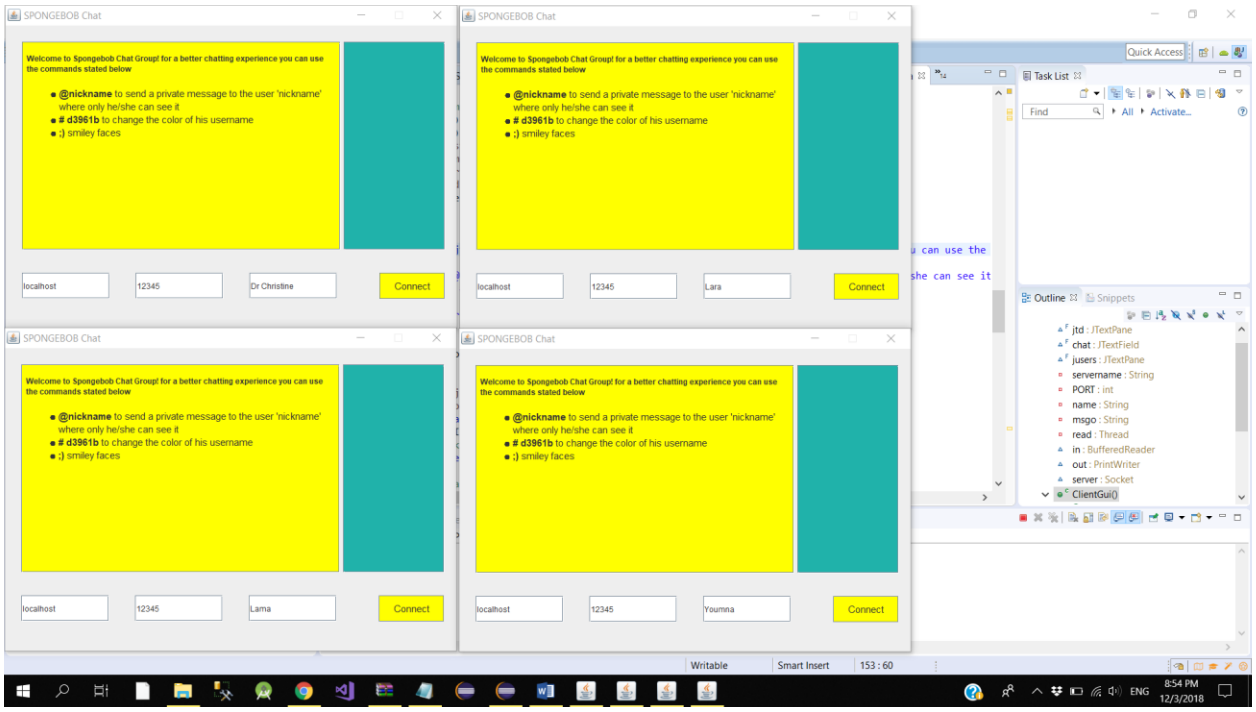
- Send Button When this button is pressed, the message in the textbox is displayed in the TextArea.
- Instant Buttons: Normally we need to type text to send to the end user, but this features could help to send text immediately without typing.

Testing

In this menu items were tested to ensure no functions has been missed out. This is done for the smooth working of the project. This is done after the completion of system; all the queries were carried out again to ensure that no errors have been introduced.

Test Cases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localhost | 12345 | Dr Christine | Connect

SPONGEBOB Chat

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localhost | 12345 | Lara | Connect

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- **;)** smiley faces

localhost | 12345 | Lama | Connect

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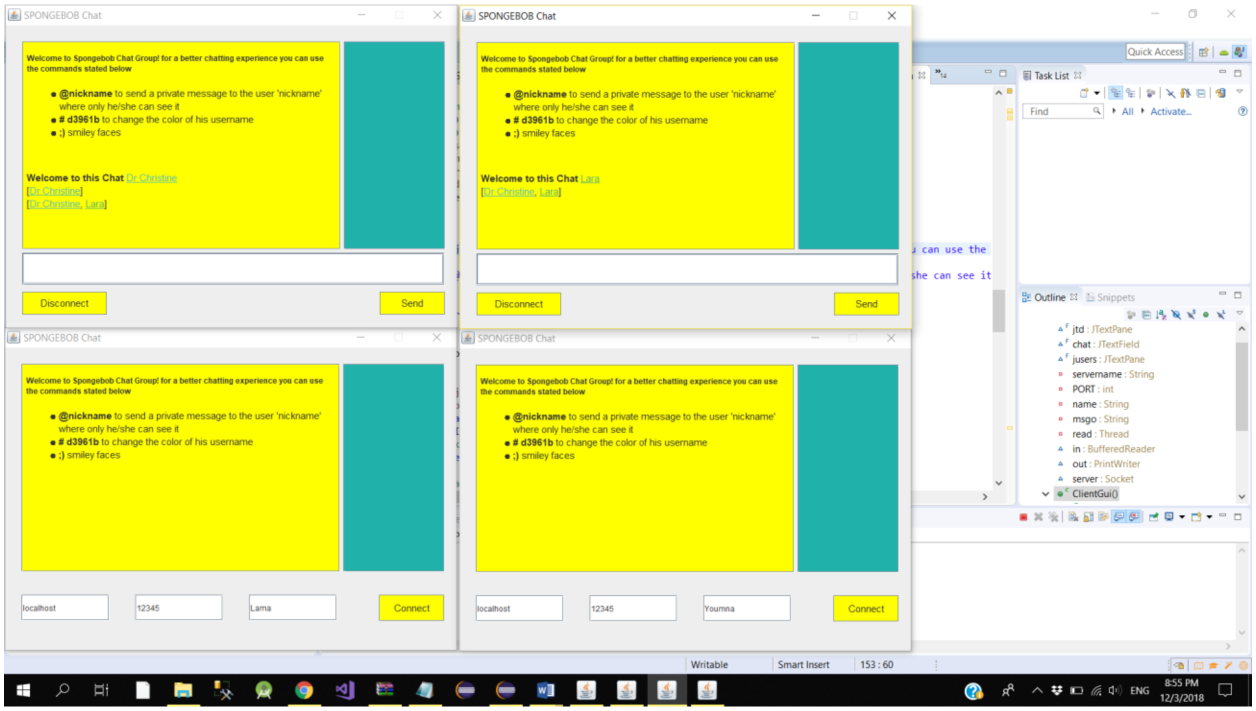
- **# d3961b** to change the color of his username
- **;)** smiley faces

localhost | 12345 | Youmna | Connect

```
u can use the
she can see it
```



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Welcome to this Chat Dr Christine
[Dr Christine]
[Dr Christine, Lara]

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Welcome to this Chat Lara
[Dr Christine, Lara]

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localhost | 12345 | Lama

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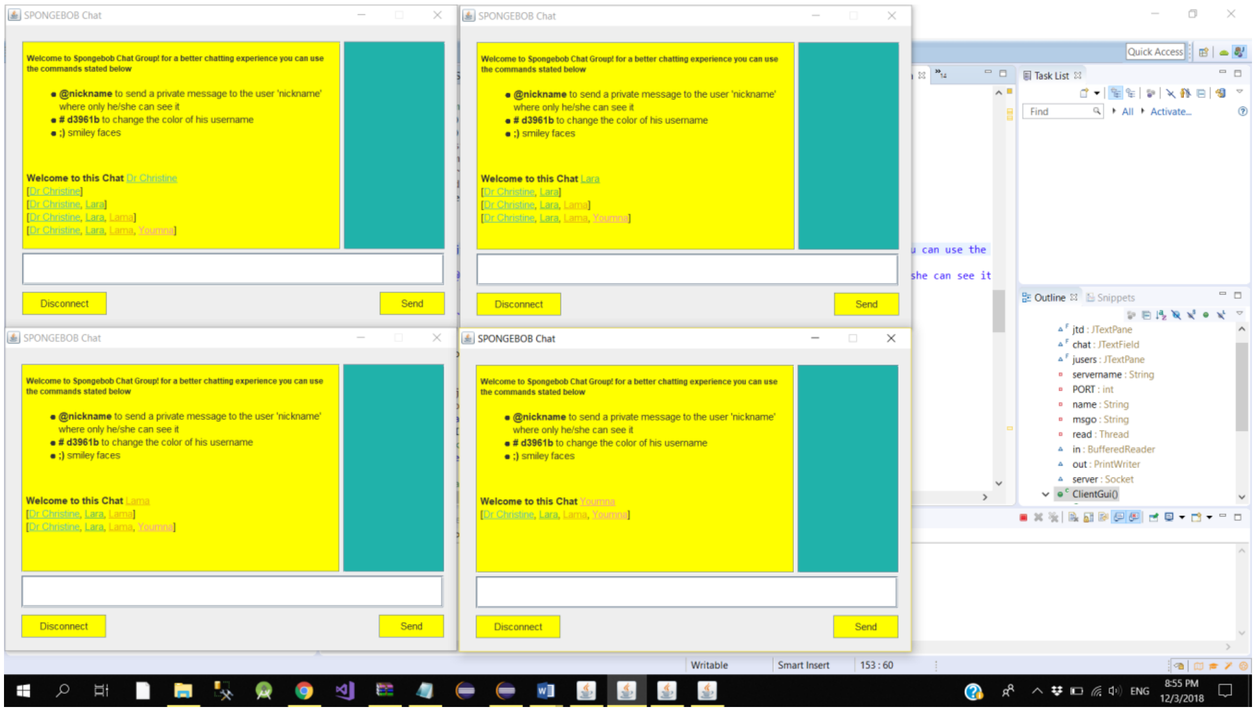
localhost | 12345 | Youmna



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Welcome to this Chat Dr Christine
[Dr Christine]
[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
[Dr Christine, Lara, Lama, Youmna]

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Welcome to this Chat Lara
[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
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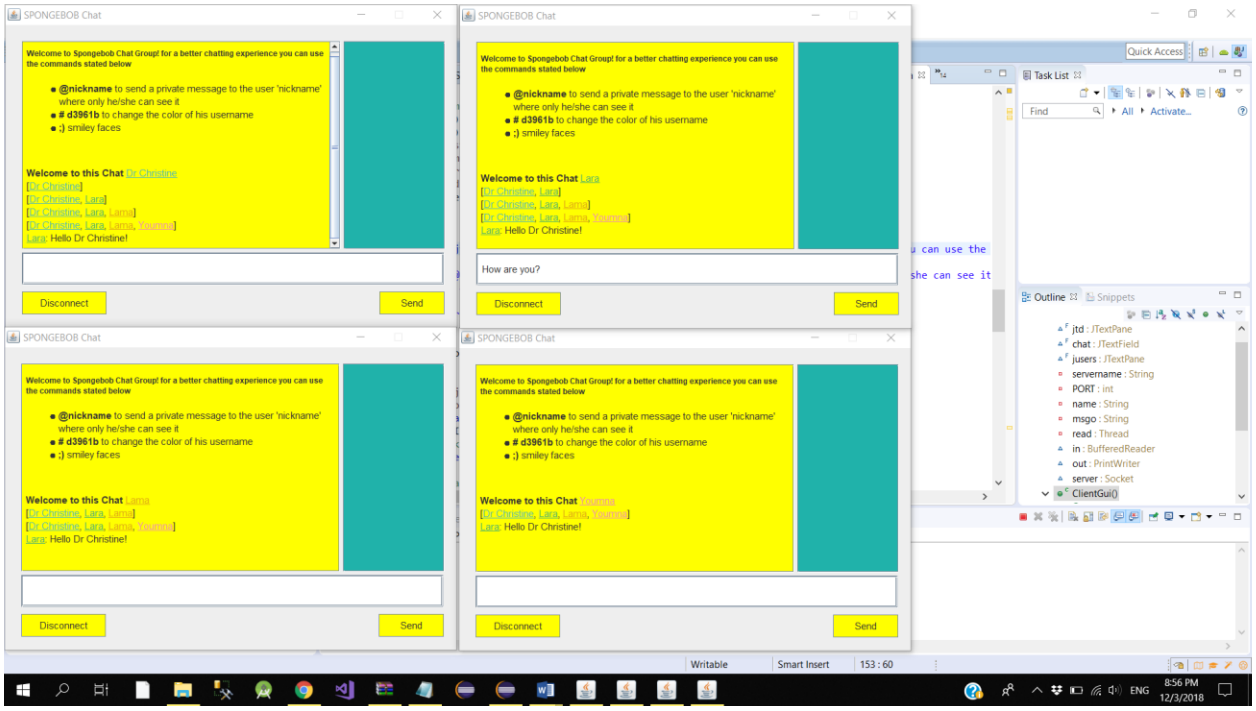
Welcome to this Chat Youmna
[Dr Christine, Lara, Lama, Youmna]



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Welcome to this Chat Dr Christine
[Dr Christine]
[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!

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Welcome to this Chat Lara
[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!

How are you?

SPONGEBOB Chat

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Lara: Hello Dr Christine!

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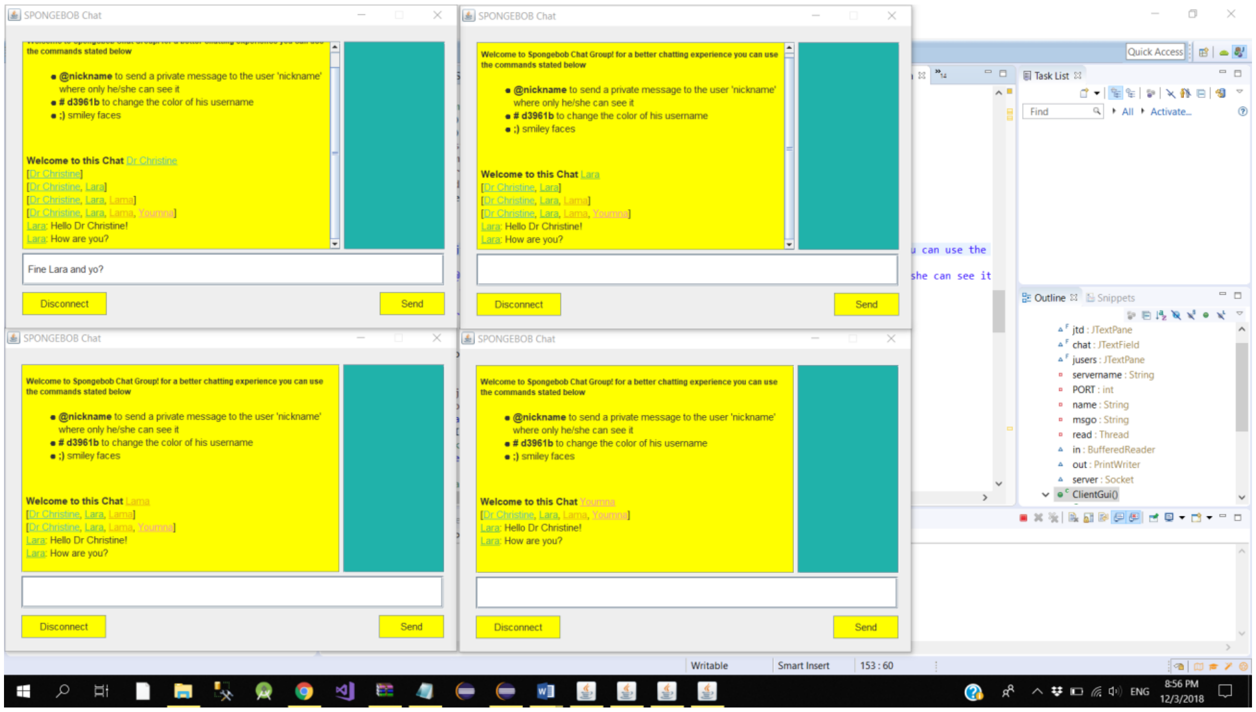
Welcome to this Chat Youmna
[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!

```
u can use the
she can see it
```

```
jtd : JTextPane
chat : JTextField
jusers : JTextPane
servername : String
PORT : int
name : String
msgo : String
read : Thread
in : BufferedReader
out : PrintWriter
server : Socket
ClientGui()
```



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Welcome to this Chat Dr Christine
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[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!
Lara: How are you?

Fine Lara and yo?

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Lara: How are you?

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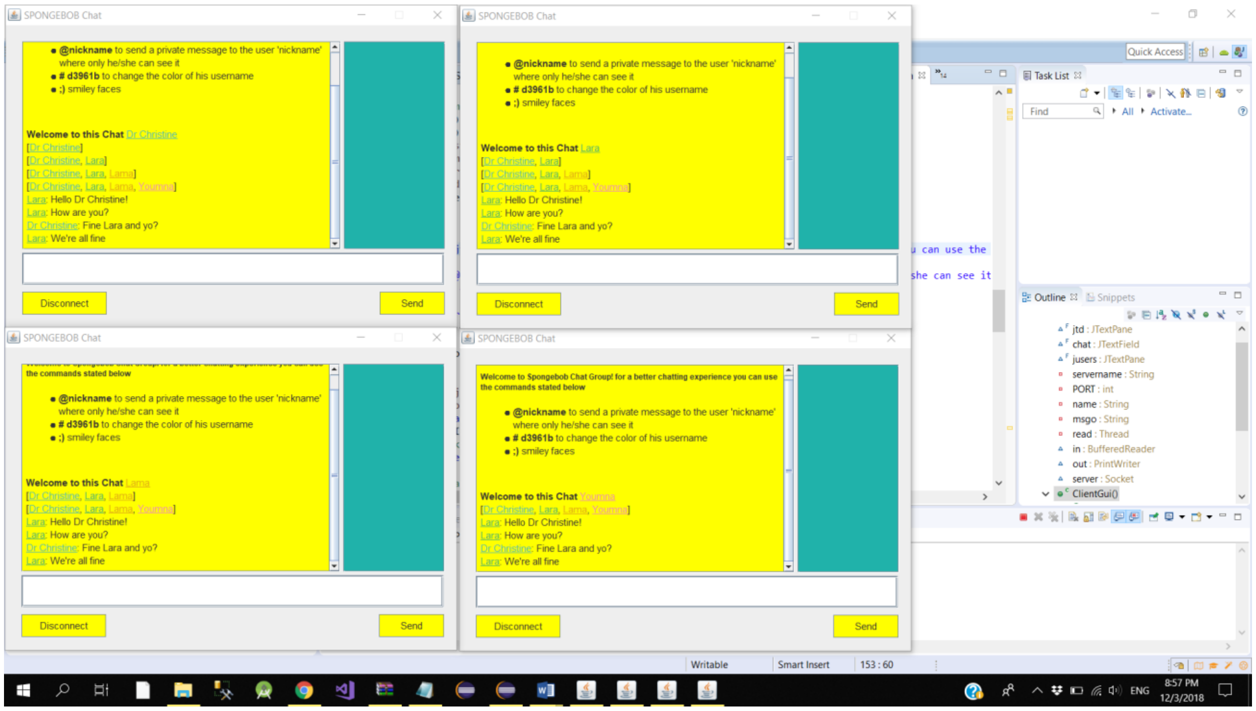
jtd : JTextPane
chat : JTextField
jusers : JTextPane
servername : String
PORT : int
name : String
msgo : String
read : Thread
in : BufferedReader
out : PrintWriter
server : Socket
ClientGui()
```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Welcome to this Chat Dr Christine
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[Dr Christine, Lara]
[Dr Christine, Lara, Lama]
[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!
Lara: How are you?
Dr Christine: Fine Lara and yo?
Lara: We're all fine

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[Dr Christine, Lara, Lama, Youmna]
Lara: Hello Dr Christine!
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SPONGEBOB Chat

Welcome to Spongebob Chat Group! for a better chatting experience you can use the commands stated below

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- **;)** smiley faces

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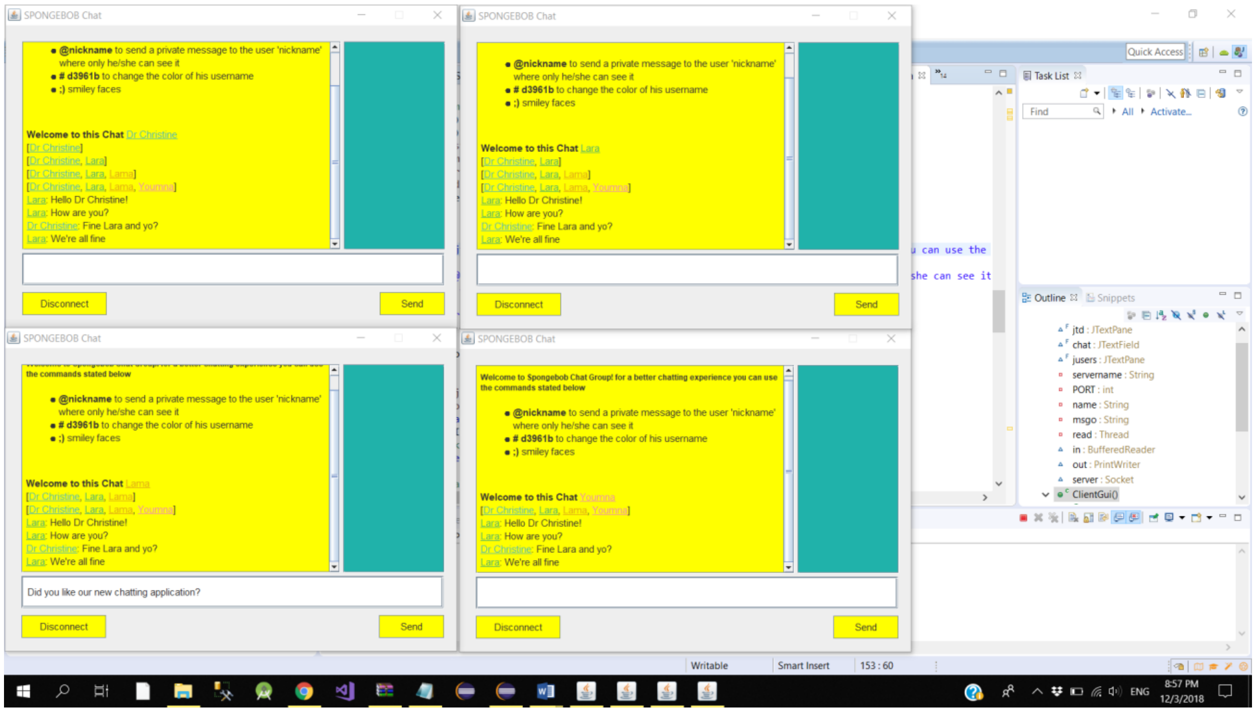
```
jtd : JTextPane
chat : JTextField
jusers : JTextPane
servername : String
PORT : int
name : String
msgo : String
read : Thread
in : BufferedReader
out : PrintWriter
server : Socket
ClientGui()
```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Did you like our new chatting application?

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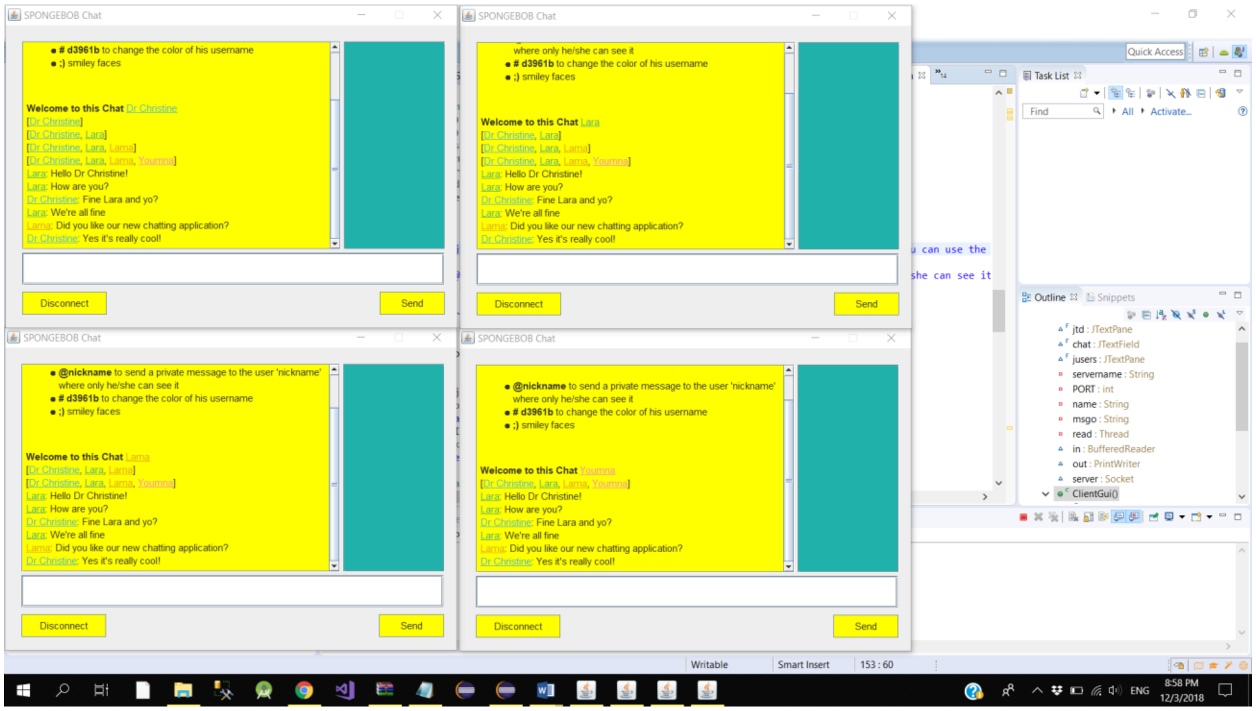

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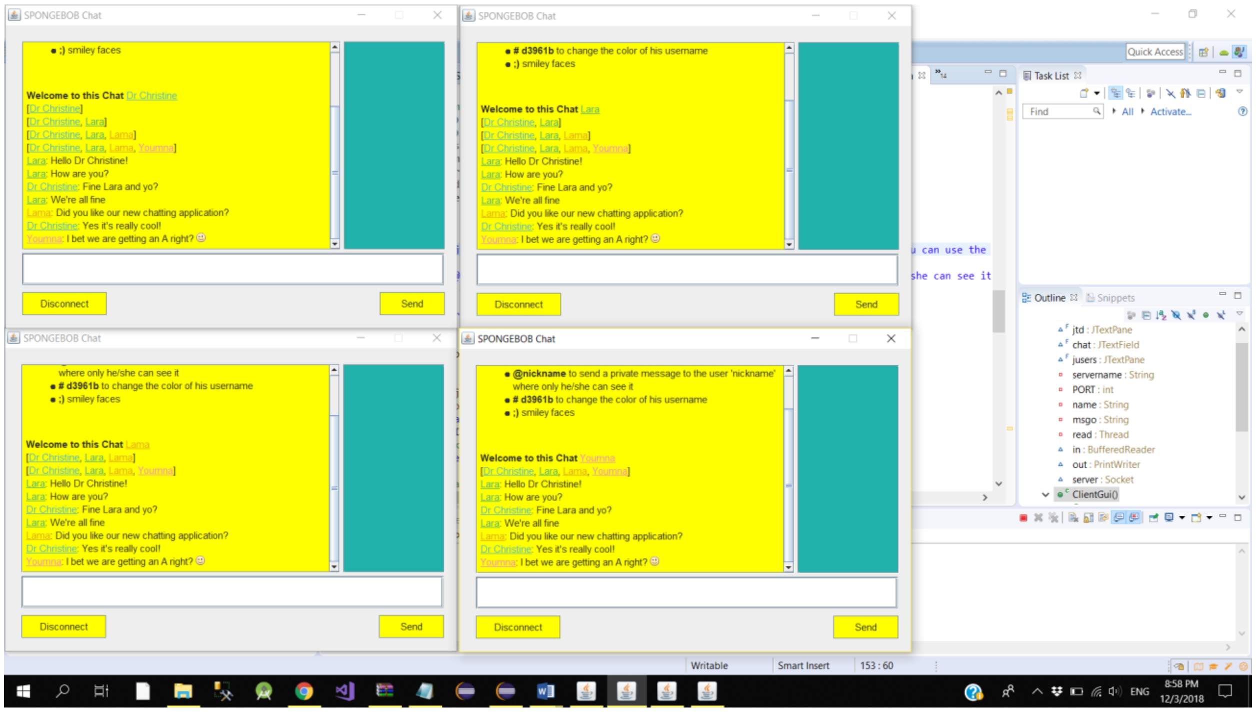

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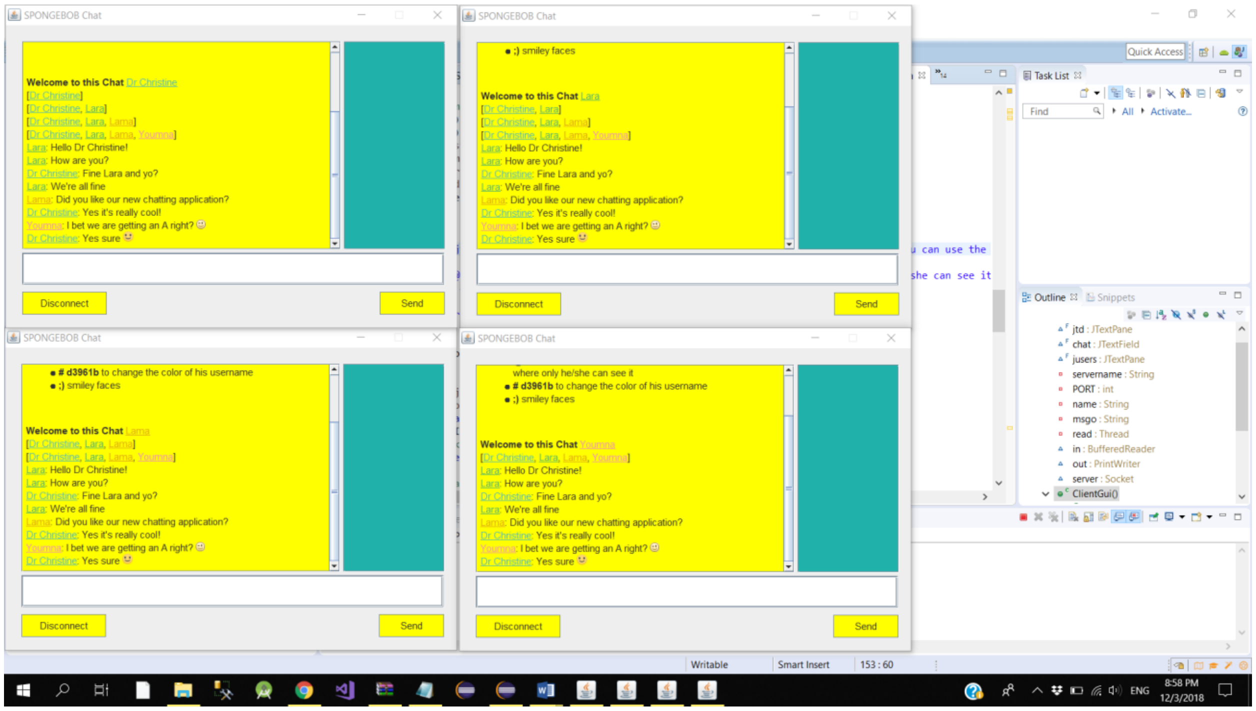

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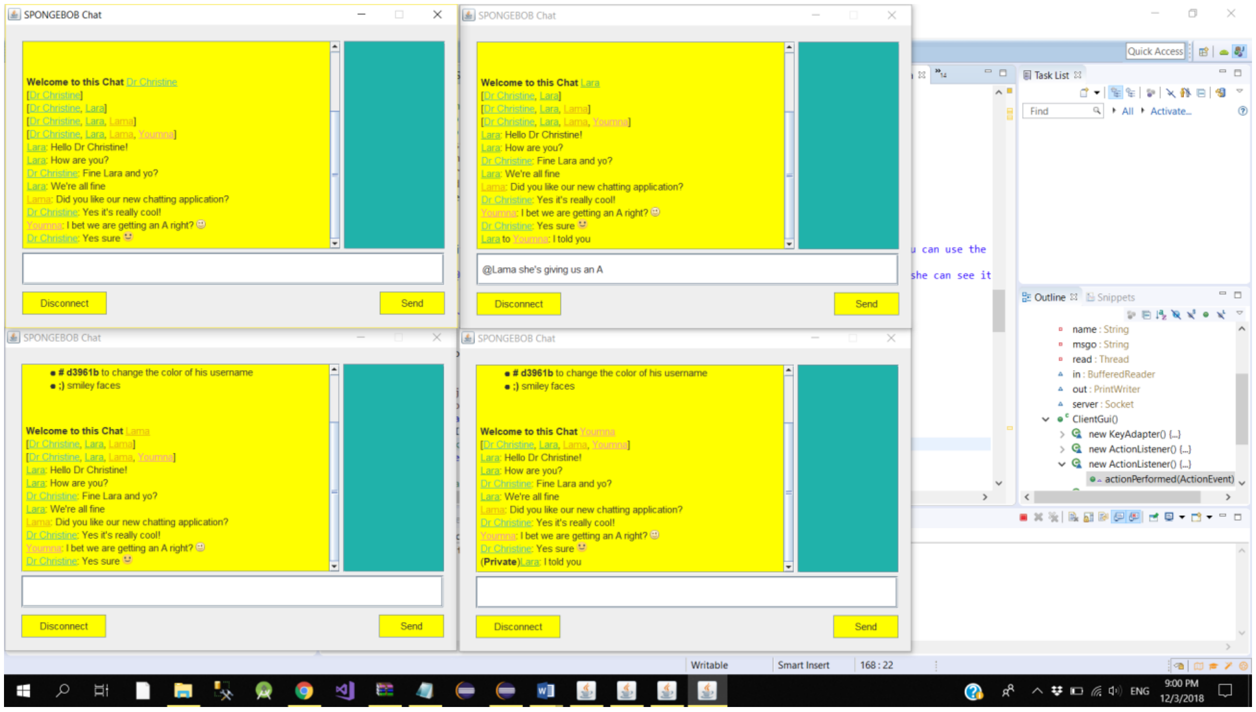

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```
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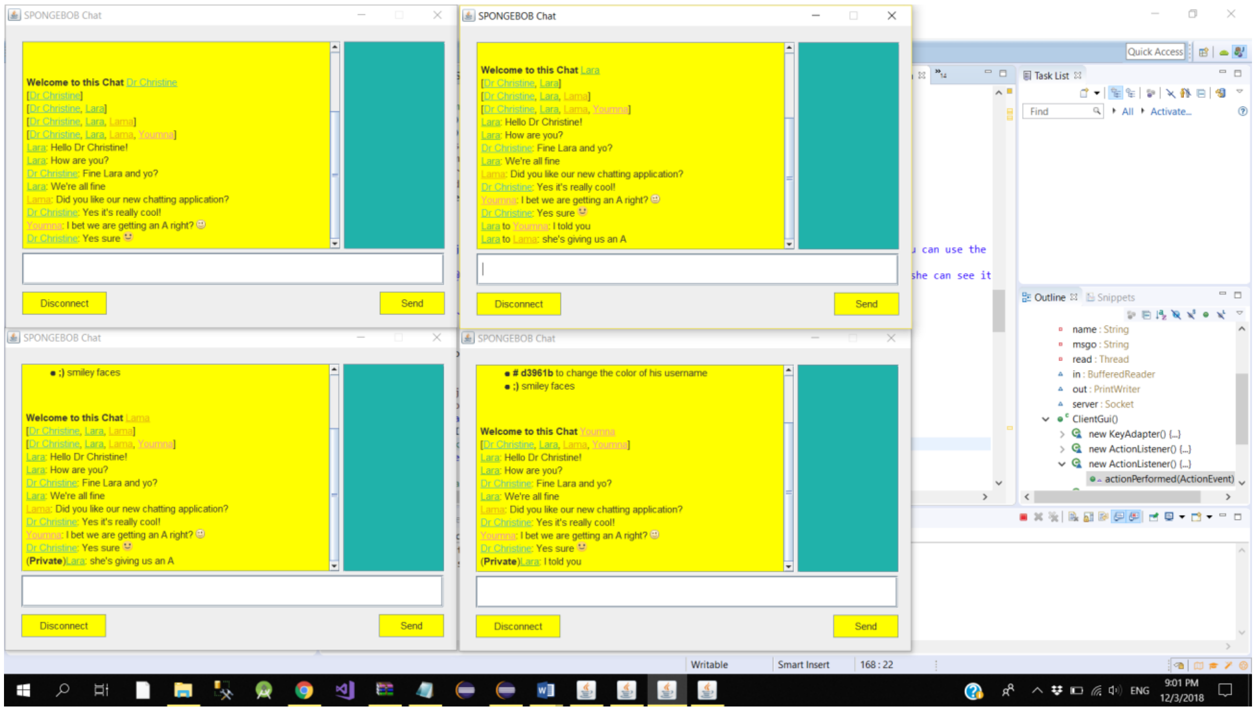

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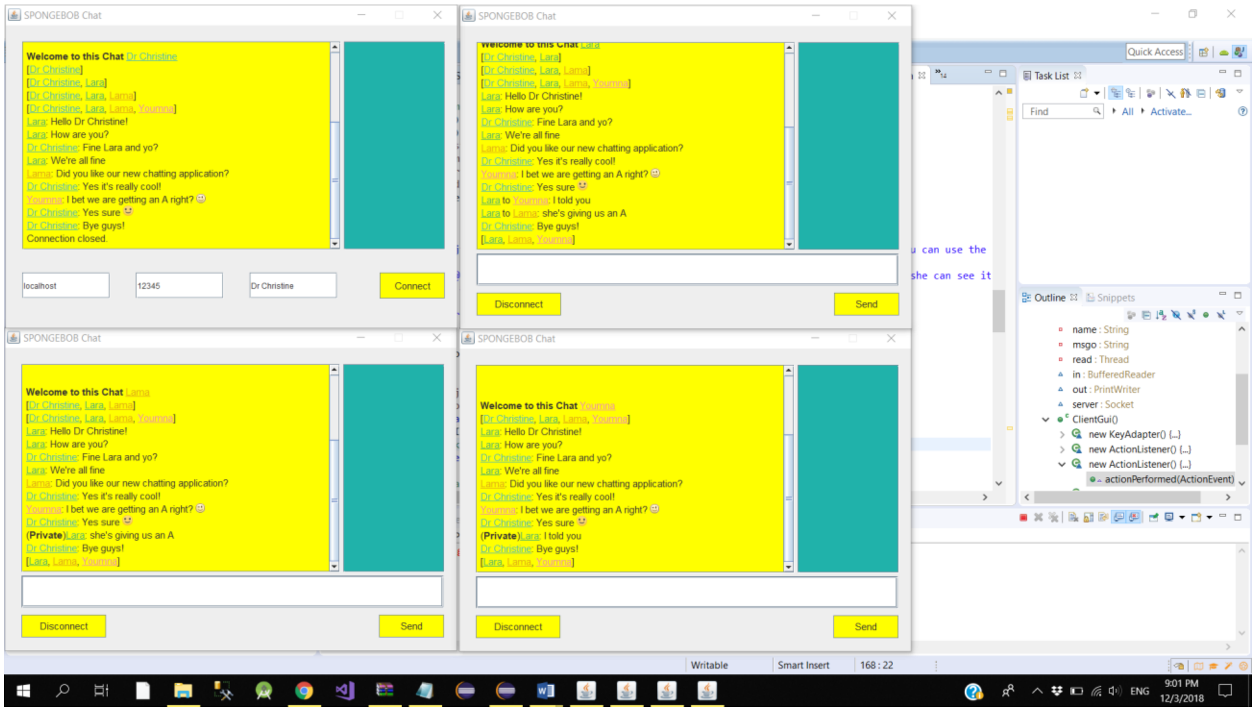

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Dr Christine: Bye guys!
Connection closed.

localhost    12345    Dr Christine    Connect
```

```
SPONGEBOB Chat

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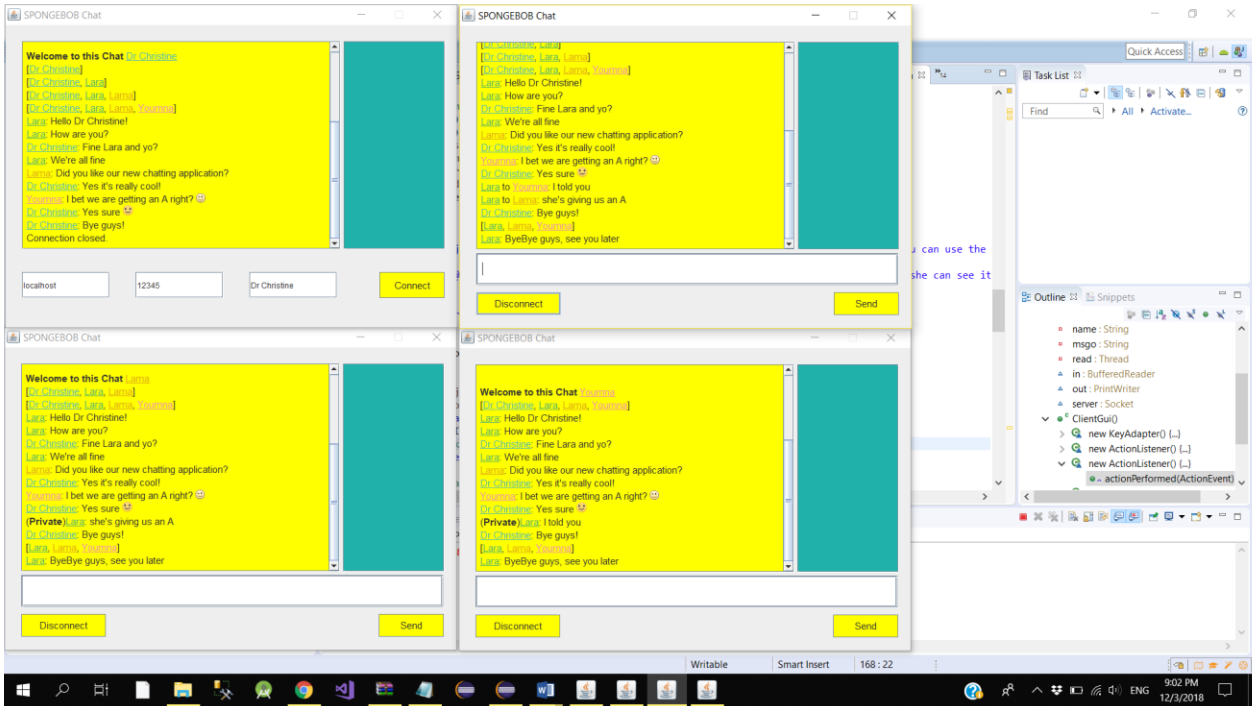

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```

localhost | 12345 | Dr Christine

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[Lara, Lama, Youmna]
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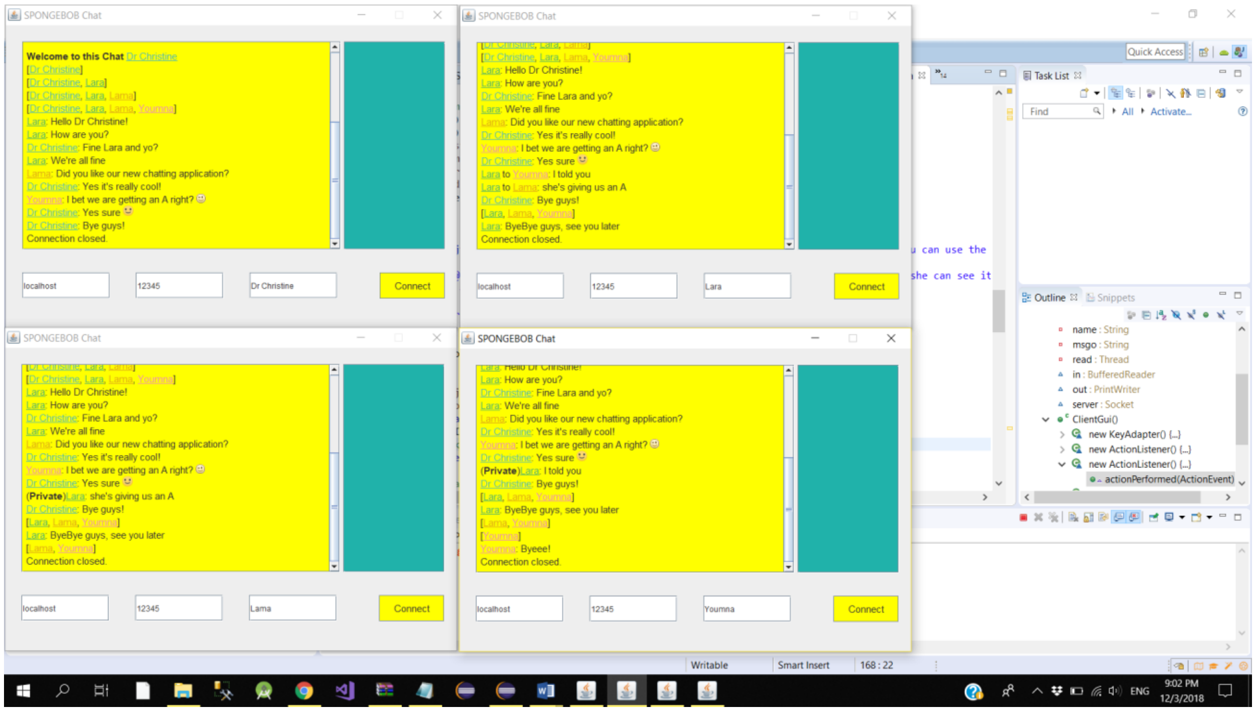

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Lara: ByeBye guys, see you later
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```

localhost | 12345 | Lara

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Lara: ByeBye guys, see you later
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```

localhost | 12345 | Lama

```
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Lara: ByeBye guys, see you later
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localhost | 12345 | Youmna

Conclusion

We Developed network applications in Java by using sockets, threads, and Web services. These software is portable, efficient, and easily maintainable for large number of clients. Our developed web-based chatting software is unique in its features and more importantly easily customizable. The java.net package provides a powerful and flexible set of classes for implementing network applications. Typically, programs running on client machines make requests to programs on a server Machine. These involve -networking services provided by the transport layer. The most widely used transport protocols on the Internet are TCP (Transmission control Protocol) and UDP (User Datagram Protocol). TCP is a connection-oriented protocol providing a reliable flow of data between two computers. On the other hand, UDP is a simpler message-based connectionless protocol which sends packets of data known as datagrams from one computer to another with no guarantees of arrival.

Source Code

// Server.java: A server program.

```
import java.io.IOException;
import java.io.ObjectOutputStream;
import java.io.InputStream;
import java.io.PrintStream;
import java.net.ServerSocket;
import java.net.Socket;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
import java.util.regex.Pattern;
import java.util.regex.Matcher;
import java.awt.Color;

public class Server {


  private List<Users> cl1;
  private ServerSocket server;

  public static void main(String[] args) throws IOException {
    new Server().run();
  }

  public Server() {
  //creating an array of clients since the chat has multiusers
    this.cl1 = new ArrayList<Users>();
  }

  public void run() throws IOException {
         //open socket connection at the specified port
    server = new ServerSocket(12345) {
      protected void finalize() throws IOException {
        this.close();
      }
    };

    while (true) {
      // accepts a new client

      Socket client = server.accept();
       Scanner s = new Scanner ( client.getInputStream() );
      // get name of newUser
      String Name = s.nextLine();

      // create new User
      Users user = new Users(client, Name);

      // add newUser message to list
      this.cl1.add(user);
      // Welcome msg
      user.getOutStream().println("<b>Welcome to this Chat </b> " + user.toString()
);

      // create a new thread for newUser incoming messages handling
      new Thread(new UsersHandler(this, user)).start();
    }
  }

  // delete a user from the list
  public void CloseConnwithUser(Users user){
    this.cl1.remove(user);
  }
  // send list of clients to all Users
  public void SendUsers(){
          for (Users client : this.cl1) {
            client.getOutStream().println(this.cl1);
          }
        }

  // send incoming msg to all Users
  public void SendMessages(String msg, Users userSender) {

    for (Users client : this.cl1) {
      client.getOutStream().println(userSender.toString() + "<span>: " +
msg+"</span>");
    }
  }

  // send message to a User (String)
  public void sendmessages(String st1, Users userS, String user){
    boolean b1 = false;
    for (Users client : this.cl1) {

      if (client != userS/*not sending it to himself again*/ &&
client.getNickname().equals(user) ) {
        b1 = true;
        //print to whom this msg is
        userS.getOutStream().println(userS.toString() + " to " + client.toString()
+": " + st1);
        //print the message to this specific user
        client.getOutStream().println("(<b>Private</b>)" + userS.toString() +
"<span>: " + st1+"</span>");
      }
    }
    if (!b1) {
       //if the user isn't found
      userS.getOutStream().println(userS.toString() + " -> (<b>no one is found
here</b>): " + st1);
    }
  }
}


class ColorInt {
      //proposing different colors which the user can use to change his chat window
color
    public static String[] mColors = {
            "#3079ab", // dark blue
            "#e15258", // red
            "#f9845b", // orange
            "#7d669e", // purple
            "#53bbb4", // aqua
            "#51b46d", // green
            "#e0ab18", // mustard
            "#f092b0", // pink
            "#e8d174", // yellow
            "#e39e54", // orange
            "#d64d4d", // red
            "#4d7358", // green
    };

    public static String getColor(int i) {
        return mColors[i % mColors.length];
    }
}
```

// Users.java: A Users program.

```
import java.awt.Color;
import java.io.IOException;
import java.io.InputStream;
import java.io.PrintStream;
import java.net.Socket;
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class Users {
  private static int nbUser = 0;
  private int userId;
  private PrintStream streamOut;
  private InputStream streamIn;
  private String nickname;
  private Socket client;
  private String color;

  // constructor
  public Users(Socket client, String name) throws IOException {
    this.streamOut = new PrintStream(client.getOutputStream());
    this.streamIn = client.getInputStream();
    this.client = client;
    this.nickname = name;
    this.userId = nbUser;
    this.color = ColorInt.getColor(this.userId);
    nbUser += 1;
  }

  // change color user
  public void changecolor(String hexColor){
    // check if it's a valid hexColor
    Pattern colorPattern = Pattern.compile("#([0-9a-f]{3}|[0-9a-f]{6}|[0-9a-f]{8})");
    Matcher m = colorPattern.matcher(hexColor);
    if (m.matches()){
      Color c = Color.decode(hexColor);
      // if the Color is too Bright don't change
      double luma = 0.2126 * c.getRed() + 0.7152 * c.getGreen() + 0.0722 *
c.getBlue(); // per ITU-R BT.709
      if (luma > 160) {
        this.getOutStream().println("<b>Color Too Bright</b>");
        return;
      }
      this.color = hexColor;
      this.getOutStream().println("<b>Color changed successfully</b> " +
this.toString());
      return;
    }
    this.getOutStream().println("<b>Failed to change color</b>");
  }

  // tester
  public PrintStream getOutStream(){
    return this.streamOut;
  }
    public InputStream getInputStream(){
    return this.streamIn;
  }

  public String getNickname(){
    return this.nickname;
  }

  // print user with his color
  public String toString(){

    return "<u><span style='color:"+ this.color
      +"'>" + this.getNickname() + "</span></u>";

  }
}
```

// UsersHandler.java: A UsersHandler program.

```
import java.util.Scanner;

class UsersHandler implements Runnable {

  private Server server;
  private Users user;

  public UsersHandler(Server server2, Users user) {
    this.server = server2;
    this.user = user;
    this.server.SendUsers();
  }

  public void run() {
    String message;

    // when there is a new message, broadcast to all
    Scanner s = new Scanner(this.user.getInputStream());
    while (s.hasNextLine()) {
      message = s.nextLine();

      // showing smiley faces
      message = message.replace(":)", "<img
src='https://static.xx.fbcdn.net/images/emoji.php/v9/f4c/1/16/1f642.png'>");
      message = message.replace(":D", "<img
src='https://static.xx.fbcdn.net/images/emoji.php/v9/fce/1/16/1f600.png'>");
      message = message.replace(":d", "<img
src='https://static.xx.fbcdn.net/images/emoji.php/v9/fce/1/16/1f600.png'>");
      message = message.replace(":(", "<img src='http://2.bp.blogspot.com/-
rnfZUujszZI/UZEFYJ269-I/AAAAAAAADnw/BbB-v_QWo1w/s1600/facebook-frown-
emoticon.png'>");
      message = message.replace("-_-", "<img src='http://3.bp.blogspot.com/-
wn2wPLAukW8/U1vy7Ol5aEI/AAAAAAAAGq0/f7C6-otIDY0/s1600/squinting-emoticon.png'>");
      message = message.replace(";)", "<img src='http://1.bp.blogspot.com/-
lX5leyrnSb4/Tv5TjIVEKfI/AAAAAAAAAi0/GR6QxObL5kM/s400/wink%2Bemoticon.png'>");
      message = message.replace(":P", "<img
src='https://static.xx.fbcdn.net/images/emoji.php/v9/f9f/1/16/1f61b.png'>");
      message = message.replace(":p", "<img
src='https://static.xx.fbcdn.net/images/emoji.php/v9/f9f/1/16/1f61b.png'>");
      message = message.replace(":o", "<img src='http://1.bp.blogspot.com/-
MB8OSM9zcmM/TvitChHcRRI/AAAAAAAAAiE/kdA6RbnbzFU/s400/surprised%2Bemoticon.png'>");
      message = message.replace(":O", "<img src='http://1.bp.blogspot.com/-
MB8OSM9zcmM/TvitChHcRRI/AAAAAAAAAiE/kdA6RbnbzFU/s400/surprised%2Bemoticon.png'>");

      // Private message management
      //if we @ at the begining of the message so its for a specific user
      if (message.charAt(0) == '@'){
        if(message.contains(" ")){
          System.out.println("private msg: " + message);
          int firstSpace = message.indexOf(" ");
          String privatemg= message.substring(1, firstSpace);
          //send the msg

server.sendmessages(message.substring(firstSpace+1,message.length()),user,privatemg);
        }

      // Change management and change colors if the msg started with #

      }else if (message.charAt(0) == '#'){
        user.changecolor(message);
        // update color for all other users
        this.server.SendUsers();
      }else{
        // update user list
        server.SendMessages(message, user);
      }
    }
    // end of Thread
    server.CloseConnwithUser(user);
    this.server.SendUsers();
    s.close();
  }
}
```

// ClientGui.java: A ClientGui program.

```
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.awt.event.KeyAdapter;
import java.awt.event.KeyEvent;
import java.net.*;
import java.io.*;
import javax.swing.*;
import javax.swing.text.*;
import javax.swing.event.DocumentEvent;
import javax.swing.event.DocumentListener;
import javax.swing.text.html.*;
import java.util.ArrayList;
import java.util.Arrays;


public class ClientGui extends Thread{

  final JTextPane jtd = new JTextPane();
  final JTextField chat = new JTextField();
  final JTextPane jusers = new JTextPane();
```

```
private String servername;
private int PORT;
private String name;
private String msgo = "";
private Thread read;

BufferedReader in;
PrintWriter out;
Socket server;

public ClientGui() {
      //intialize variables
  this.servername = "localhost";
  this.PORT = 12345;
  this.name = "name";

  String fontfamily = "Arial, sans-serif";
  Font font = new Font(fontfamily, Font.PLAIN, 15);

  final JFrame jfr = new JFrame("SPONGEBOB Chat");

  jfr.getContentPane().setLayout(null);
  jfr.setSize(700, 500);
  jfr.setResizable(false);
  jfr.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

  // Thread module
  jtd.setBounds(25, 25, 490, 320);
  jtd.setFont(font);

  jtd.setMargin(new Insets(6, 6, 6, 6));
  jtd.setEditable(false);
  JScrollPane jtdSP = new JScrollPane(jtd);
  jtdSP.setBounds(25, 25, 490, 320);

  jtd.setContentType("text/html");
  jtd.putClientProperty(JEditorPane.HONOR_DISPLAY_PROPERTIES, true);

  // Module of the list of users
  jusers.setBounds(520, 25, 156, 320);
  jusers.setEditable(true);
  jusers.setFont(font);
  jusers.setMargin(new Insets(6, 6, 6, 6));
  jusers.setEditable(false);
  JScrollPane jsplistuser = new JScrollPane(jusers);
  jsplistuser.setBounds(520, 25, 156, 320);
```

```java
jusers.setContentType("text/html");
jusers.putClientProperty(JEditorPane.HONOR_DISPLAY_PROPERTIES, true);

// Field message user input
chat.setBounds(0, 350, 400, 50);
chat.setFont(font);
chat.setMargin(new Insets(6, 6, 6, 6));
final JScrollPane chatSP = new JScrollPane(chat);

chatSP.setBounds(25, 350, 650, 50);

// button send
final JButton jsbtn = new JButton("Send");
jsbtn.setBackground(Color.YELLOW);
jsbtn.setFont(font);
jsbtn.setBounds(575, 410, 100, 35);

// button Disconnect
final JButton jsbtndeco = new JButton("Disconnect");
jsbtndeco.setBackground(Color.YELLOW);
jsbtndeco.setFont(font);
jsbtndeco.setBounds(25, 410, 130, 35);

chat.addKeyListener(new KeyAdapter() {
  // send message on Enter
  public void keyPressed(KeyEvent e) {
    if (e.getKeyCode() == KeyEvent.VK_ENTER) {
      sendMessage();
    }

    // Get last message typed
    if (e.getKeyCode() == KeyEvent.VK_UP) {
      String currentMessage = chat.getText().trim();
      chat.setText(msgo);
      msgo = currentMessage;
    }

  }
});

// Click on send button
jsbtn.addActionListener(new ActionListener() {
  public void actionPerformed(ActionEvent ae) {
    sendMessage();
  }
});
```

```
    // Connection view
    final JTextField jtfName = new JTextField(this.name);
    final JTextField jtfport = new JTextField(Integer.toString(this.PORT));
    final JTextField jtfAddr = new JTextField(this.servername);
    final JButton jcbtn = new JButton("Connect");
    jcbtn.setBackground(Color.YELLOW);


    // check if those field are not empty using textlistener
    jtfName.getDocument().addDocumentListener(new TextListener(jtfName, jtfport,
jtfAddr, jcbtn));
    jtfport.getDocument().addDocumentListener(new TextListener(jtfName, jtfport,
jtfAddr, jcbtn));
    jtfAddr.getDocument().addDocumentListener(new TextListener(jtfName, jtfport,
jtfAddr, jcbtn));

    // position of the Modules
    jcbtn.setFont(font);
    jtfAddr.setBounds(25, 380, 135, 40);
    jtfName.setBounds(375, 380, 135, 40);
    jtfport.setBounds(200, 380, 135, 40);
    jcbtn.setBounds(575, 380, 100, 40);

    // default color of Thread Modules and User List
    jtd.setBackground(Color.YELLOW);
    jusers.setBackground(new Color(32,178,170));

    // adding elements
    jfr.add(jcbtn);
    jfr.add(jtdSP);
    jfr.add(jsplistuser);
    jfr.add(jtfName);
    jfr.add(jtfport);
    jfr.add(jtfAddr);
    jfr.setVisible(true);


    //chat info
    appendToPane(jtd, "<h4>Hey there, for a better chatting experience you can use
the commands stated below </h4>"
        +"<ul>"
        +"<li><b>@nickname </b> to send a private message to the user 'nickname'
where only he/she can see it</li>"
        +"<li><b> # d3961b </b> to change the color of his username</li>"
        +"<li><b> ;) </b> smiley faces </li>"
        +"</ul><br/>");
    // On connect
    jcbtn.addActionListener(new ActionListener() {
      public void actionPerformed(ActionEvent ae) {
        try {
          name = jtfName.getText();
          String port = jtfport.getText();
          servername = jtfAddr.getText();
          PORT = Integer.parseInt(port);
//intializing sockets
             server = new Socket(servername, PORT);

//BufferedReader and PRintWriter are for reading and writing for other clients
          in = new BufferedReader(new InputStreamReader(server.getInputStream()));
          out = new PrintWriter(server.getOutputStream(), true);

          // send name to server
          out.println(name);

          // create new Read Thread
          read = new Read();
          read.start();
          jfr.remove(jtfName);
          jfr.remove(jtfport);
          jfr.remove(jtfAddr);
          jfr.remove(jcbtn);
          jfr.add(jsbtn);
          jfr.add(chatSP);
          jfr.add(jsbtndeco);
          jfr.revalidate();
          jfr.repaint();
          jtd.setBackground(Color.YELLOW);
          jusers.setBackground(new Color(32,178,170));
        } catch (Exception ex) {
          appendToPane(jtd, "<span>connection error</span>");
          JOptionPane.showMessageDialog(jfr, ex.getMessage());
        }
      }

    });

    // when disconnecting you interrupt the thread create to close the connection and
add again the info needed to reconnect like port number and name and ip address
    jsbtndeco.addActionListener(new ActionListener()  {
      public void actionPerformed(ActionEvent ae) {
        jfr.add(jtfName);
        jfr.add(jtfport);
        jfr.add(jtfAddr);
        jfr.add(jcbtn);
        jfr.remove(jsbtn);
        jfr.remove(chatSP);
        jfr.remove(jsbtndeco);
        jfr.revalidate();
        jfr.repaint();
        read.interrupt();
        jusers.setText(null);
        jtd.setBackground(Color.YELLOW);
        jusers.setBackground(new Color(32,178,170));
        appendToPane(jtd, "<span>Connection closed.</span>");
        out.close();
      }
    });

  }
      // sending messages
      public void sendMessage() {
            try {
                  String message = chat.getText().trim();
                  if (message.equals("")) {
                        return;
                  }
                  this.msgo = message;
                  out.println(message);
      //getting the input is heard by the respective Listener for that component
                  chat.requestFocus();
                  chat.setText(null);
            } catch (Exception ex) {

                  System.exit(0);
            }
      }

      public static void main(String[] args) throws Exception {
  ClientGui client = new ClientGui();
}

  // read new incoming messages
  class Read extends Thread {
    public void run() {
      String message;
      //at each thread read the message and preview it on the screen as long as the
thread is not being interrupted and the chat is still going on
      while(!Thread.currentThread().isInterrupted()){
        try {
          message = in.readLine();
          if(message != null){
```

```
         //sending the html to pane
              appendToPane(jtd, message);
            }
          }

        catch (IOException ex) {
          System.err.println("Failed to parse incoming message");
        }
      }
    }
  }

  // send html to pane
  private void appendToPane(JTextPane tp, String msg){
    HTMLDocument doc = (HTMLDocument)tp.getDocument();
    HTMLEditorKit editorKit = (HTMLEditorKit)tp.getEditorKit();
    try {
      editorKit.insertHTML(doc, doc.getLength(), msg, 0, 0, null);
      tp.setCaretPosition(doc.getLength());
    } catch(Exception e){
      e.printStackTrace();
    }
  }}
```

// TextListener.java: A TextListener program.

```
import javax.swing.JButton;
import javax.swing.JOptionPane;
import javax.swing.JTextField;
import javax.swing.event.DocumentEvent;
import javax.swing.event.DocumentListener;

public class TextListener implements DocumentListener {
       JTextField jtf1;
       JTextField jtf2;
       JTextField jtf3;
       JButton jcbtn;

       public TextListener(JTextField jtf1, JTextField jtf2, JTextField jtf3, JButton
jcbtn) {
              this.jtf1 = jtf1;
              this.jtf2 = jtf2;
              this.jtf3 = jtf3;
              this.jcbtn = jcbtn;
       }

       public void changedUpdate(DocumentEvent e) {
       }

       public void removeUpdate(DocumentEvent e) {
              if (jtf1.getText().trim().equals("") || jtf2.getText().trim().equals("")
|| jtf3.getText().trim().equals("")) {
                     //disable jcbtn
                     jcbtn.setEnabled(false);
              } else {
                     //enable jcbtn
                     jcbtn.setEnabled(true);
              }
       }

       public void insertUpdate(DocumentEvent e) {
              if (jtf1.getText().trim().equals("") || jtf2.getText().trim().equals("")
|| jtf3.getText().trim().equals("")) {
                     //disable jcbtn
                     jcbtn.setEnabled(false);
              } else {
                     //disable jcbtn
                     jcbtn.setEnabled(true);
              }
       }

       }
```