Министерство образования Республики Беларусь

Учреждение образования

«Брестский государственный технический университет»

Кафедра ИИТ

**Лабораторная работа №12**

По дисциплине «СПП»

за 6-й семестр

Выполнил:

студент 3 курса

группы ПО-3 (1)

Афанасьев В.В.

Проверил:

Крощенко А.А.

Брест, 2021

**Цель работы:** освоить приемы разработки оконных клиент-серверных приложений на Java с использованием сокетов.

**Вариант:** 2

**Задание:**

Разработать клиент-серверное оконное приложение на Java с использованием сокетов и JavaFX.  
Можно сделать одну программу с сочетанием функций клиента и сервера либо две отдельных (клиентская часть и серверная часть). Продемонстрировать работу разработанной программы в сети  
либо локально (127.0.0.1). Лабораторную работу разрешается выполнять в команде из 2-х  
человек.

2) Простейший многопользовательский чат. Простой чат с возможностью подключения до 5 пользователей. Все пользователи подключаются к серверу, задача сервера – отображение сообщений  
конкретного пользователя (приват) или общего чата.

**Код программы:**

**Message**

package NordChat;  
  
import java.io.\*;  
  
public class Message implements Serializable {  
 protected static final long serialVersionUID = 1112122200L;  
  
 static final  
 int WHOISIN = 0,  
 MESSAGE = 1,  
 LOGOUT = 2;  
  
 private int type;  
 private String message;  
  
 Message(int type, String message) {  
 this.type = type;  
 this.message = message;  
 }  
  
 int getType() {  
 return type;  
 }  
  
 String getMessage() {  
 return message;  
 }  
}

**Server**

package NordChat;  
  
import java.io.\*;  
import java.net.\*;  
import java.text.SimpleDateFormat;  
import java.util.\*;  
  
/\*  
 \* This server can be run as a console application or as a GUI  
 \* To run as a console application just:  
 \* > java Server  
 \* > java Server portNumber  
 \* If the port number is not specified 1200-port is used  
 \*/  
  
public class Server {  
 private static int uniqueId; // An unique ID-code for each connection  
  
 private ArrayList<ClientThread> clients; // The list of the Clients  
  
 private ServerGUI serverAsGUI; // An object of ServerGUI (for gui running)  
  
 private SimpleDateFormat simpleDateFormat;  
 private int port;  
  
 private boolean isRunning; // The state of the server (running/is stop)  
  
 public Server(int port) { // For a console running  
 this(port, null);  
 }  
  
 public Server(int port, ServerGUI serverAsGUI) {  
 this.serverAsGUI = serverAsGUI;  
 this.port = port;  
 simpleDateFormat = new SimpleDateFormat("HH:mm:ss");  
 clients = new ArrayList<ClientThread>();  
 }  
  
 public void start() {  
 isRunning = true;  
 try {  
 ServerSocket serverSocket = new ServerSocket(port);  
 while (isRunning) {  
 display("Server is waiting for Guests on the " + port + " port.");  
 Socket socket = serverSocket.accept(); // Accept the connection  
  
 if (!isRunning)  
 break;  
  
 ClientThread thread = new ClientThread(socket); // Make a thread for it  
 clients.add(thread); // Saving in the Clients list  
 thread.start();  
 }  
  
 try {  
 serverSocket.close();  
  
 for (int i = 0; i < clients.size(); ++i) {  
 ClientThread clientThread = clients.get(i);  
 try {  
 clientThread.sInput.close();  
 clientThread.sOutput.close();  
 clientThread.socket.close();  
 }  
 catch (IOException ioException) {}  
 }  
 }  
 catch (Exception exception) {  
 display("Exception closing the server and guests: " + exception);  
 }  
 }  
  
 catch (IOException ioException) {  
 String message = simpleDateFormat.format(new Date())  
 + " IOException on the new ServerSocket: " + ioException + "\n";  
 display(message);  
 }  
 }  
  
 protected void stop() {  
 isRunning = false;  
  
 try {  
 new Socket("localhost", port);  
 }  
 catch (Exception exception) {}  
 }  
  
 private void display(String message) { // Displaying the event  
 String time = simpleDateFormat.format(new Date()) + " " + message;  
 if (serverAsGUI == null)  
 System.out.println(time);  
 else  
 serverAsGUI.appendEvent(time + "\n");  
 }  
  
 private synchronized void broadcast(String message) {  
 String time = simpleDateFormat.format(new Date());  
 String messageLf = time + " " + message + "\n";  
  
 if (serverAsGUI == null)  
 System.out.print(messageLf);  
 else  
 serverAsGUI.appendRoom(messageLf); // Append in the room window  
  
 for (int i = clients.size(); --i >= 0; ) { // The loop in the reverse order because of the opportunity  
 // to deleting disconected guest  
 ClientThread clientThread = clients.get(i);  
  
 if (!clientThread.writeMessage(messageLf)) {  
 clients.remove(i);  
 display("Disconnected Guest " + clientThread.username);  
 }  
 }  
 }  
  
 synchronized void remove(int id) {  
 for (int i = 0; i < clients.size(); ++i) {  
 ClientThread clientThread = clients.get(i);  
  
 if (clientThread.id == id) {  
 clients.remove(i);  
 return;  
 }  
 }  
 }  
  
 // ----  
  
 public static void main(String[] args) {  
 int portNumber = 1200;  
 switch (args.length) {  
 case 1:  
 try {  
 portNumber = Integer.parseInt(args[0]);  
 }  
 catch (Exception exception) {  
 System.out.println("Invalid port number.");  
 System.out.println("Usage is: > java Server [portNumber]");  
 return;  
 }  
 case 0:  
 break;  
 default:  
 System.out.println("Usage is: > java Server [portNumber]");  
 return;  
 }  
  
 Server server = new Server(portNumber);  
 server.start();  
 }  
  
 class ClientThread extends Thread {  
 Socket socket;  
  
 ObjectInputStream sInput;  
 ObjectOutputStream sOutput;  
  
 int id;  
 String username;  
 Message clientMessage;  
 String currentDate;  
  
 ClientThread(Socket socket) {  
 id = ++uniqueId;  
 this.socket = socket;  
  
 System.out.println("Thread trying to create Object Input/Output Streams");  
 try {  
 sOutput = new ObjectOutputStream(socket.getOutputStream());  
 sInput = new ObjectInputStream(socket.getInputStream());  
  
 username = (String) sInput.readObject();  
 display(username + " is connected.");  
 }  
 catch (IOException exception) {  
 display("Exception creating new Input/output Streams: " + exception);  
 return;  
 }  
 catch (ClassNotFoundException exception) {  
 }  
  
 currentDate = new Date().toString() + "\n";  
 }  
  
 public void run() {  
 boolean keepGoing = true;  
 while (keepGoing) {  
 try {  
 clientMessage = (Message) sInput.readObject();  
 }  
 catch (IOException exception) {  
 display(username + " Exception reading Streams: " + exception);  
 break;  
 }  
 catch (ClassNotFoundException exception) {  
 break;  
 }  
  
 String message = clientMessage.getMessage(); // The message part  
  
 switch (clientMessage.getType()) { // Switcher of the types  
 case Message.MESSAGE:  
 broadcast(username + ": " + message);  
 break;  
 case Message.LOGOUT:  
 display(username + " disconnected with a LOGOUT message.");  
 keepGoing = false;  
 break;  
 case Message.WHOISIN:  
 writeMessage("List of the guests connected at " + simpleDateFormat.format(new  
 Date()) + "\n");  
  
 for (int i = 0; i < clients.size(); ++i) {  
 ClientThread clientThread = clients.get(i);  
 writeMessage((i + 1) + ") " + clientThread.username + " since " +  
 clientThread.currentDate);  
 }  
 break;  
 }  
 }  
  
 remove(id); // Removing adm-id  
 close();  
 }  
  
 private void close() {  
 try {  
 if (sOutput != null)  
 sOutput.close();  
 }  
 catch (Exception exception) {}  
  
 try {  
 if (sInput != null)  
 sInput.close();  
 }  
 catch (Exception exception) {}  
  
 try {  
 if (socket != null)  
 socket.close();  
 }  
 catch (Exception exception) {}  
 }  
  
 private boolean writeMessage(String message) {  
 if (!socket.isConnected()) {  
 close();  
 return false;  
 }  
  
 try {  
 sOutput.writeObject(message);  
 }  
 catch (IOException exception) {  
 display("Error sending message to " + username);  
 display(exception.toString());  
 }  
  
 return true;  
 }  
 }  
}

**ServerGUI**

package NordChat;  
  
import javax.swing.\*;  
import java.awt.\*;  
import java.awt.event.\*;  
  
public class ServerGUI extends JFrame implements ActionListener, WindowListener {  
 private static final long serialVersionUID = 1L;  
  
 private JButton stopStart;  
 private JTextArea chat, event;  
 private JTextField tPortNumber;  
 private Server server;  
  
 ServerGUI(int port) {  
 super("NordChat (Server)");  
 server = null;  
  
 JPanel nord = new JPanel();  
  
 nord.add(new JLabel("Port: "));  
  
 tPortNumber = new JTextField(" " + port);  
 nord.add(tPortNumber);  
  
 stopStart = new JButton("Start");  
 stopStart.addActionListener(this);  
 nord.add(stopStart);  
  
 add(nord, BorderLayout.NORTH); // The event and chat room  
  
 JPanel center = new JPanel(new GridLayout(2, 1));  
  
 chat = new JTextArea(90, 90);  
 chat.setEditable(false);  
 appendRoom("Chating room\n");  
 center.add(new JScrollPane(chat));  
  
 event = new JTextArea(90, 90);  
 event.setEditable(false);  
 appendEvent("Events log.\n");  
  
 center.add(new JScrollPane(event));  
 add(center);  
  
 addWindowListener(this);  
 setSize(400, 500);  
 setVisible(true);  
 }  
  
 void appendRoom(String str) { // Append a message to the two JTextAreas  
 chat.append(str);  
 chat.setCaretPosition(chat.getText().length() - 1);  
 }  
  
 void appendEvent(String str) {  
 event.append(str);  
 event.setCaretPosition(chat.getText().length() - 1);  
 }  
  
 public void actionPerformed(ActionEvent event) {  
 if (server != null) {  
 server.stop();  
 server = null;  
 tPortNumber.setEditable(true);  
 stopStart.setText("Starting");  
  
 return;  
 }  
  
 int port = 0;  
 try {  
 port = Integer.parseInt(tPortNumber.getText().trim());  
 }  
 catch (Exception exception) {  
 appendEvent("Invalid port number");  
  
 return;  
 }  
  
 server = new Server(port, this);  
  
 new ServerRunning().start();  
  
 stopStart.setText("Stop");  
 tPortNumber.setEditable(false);  
 }  
  
 public static void main(String[] arg) { // Starting the server  
 new ServerGUI(1200);  
 }  
  
 public void windowClosing(WindowEvent event) { // Closing by Windows event  
 if (server != null) {  
 try {  
 server.stop();  
 }  
 catch (Exception eClose) {}  
 server = null;  
 }  
  
 dispose();  
 System.exit(0);  
 }  
  
 public void windowClosed(WindowEvent event) {}  
 public void windowOpened(WindowEvent event) {}  
 public void windowIconified(WindowEvent event) {}  
 public void windowDeiconified(WindowEvent event) {}  
 public void windowActivated(WindowEvent event) {}  
 public void windowDeactivated(WindowEvent event) {}  
  
 class ServerRunning extends Thread {  
 public void run() {  
 server.start(); // Should executing until if fails  
  
 stopStart.setText("Start");  
 tPortNumber.setEditable(true);  
 appendEvent("Server is stopped\n");  
 server = null;  
 }  
 }  
}

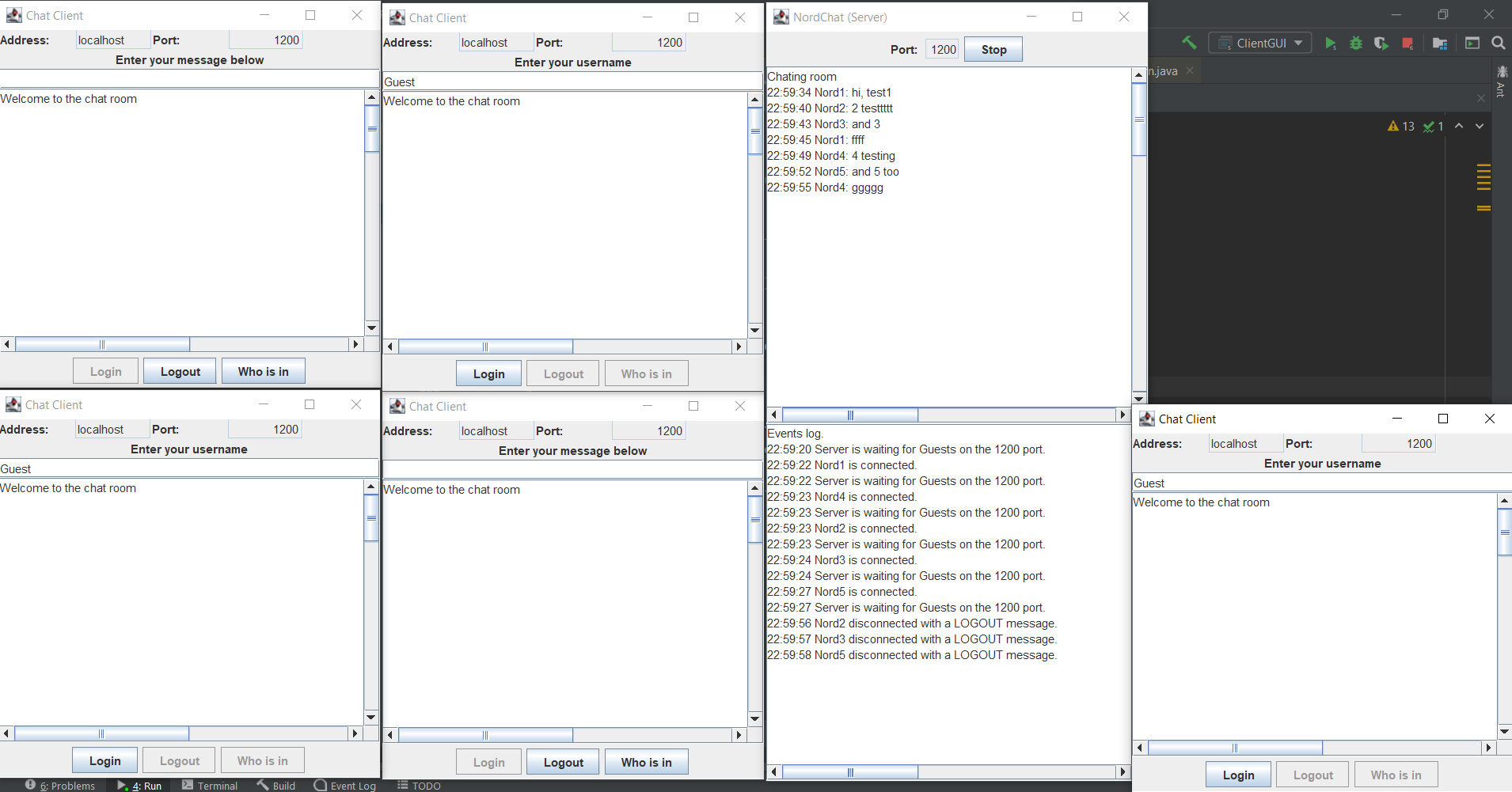
**Client**

package NordChat;  
  
import java.net.\*;  
import java.io.\*;  
import java.util.\*;  
  
/\*  
 \* To start the Client-part in console mode use one of the following command  
 \* > java Client  
 \* > java Client username  
 \* > java Client username portNumber  
 \* > java Client username portNumber serverAddress  
 \* at the console prompt  
 \* If the portNumber is not specified 1200 is used  
 \* If the serverAddress is not specified "localHost" is used  
 \* If the username is not specified "Guest" is used  
 \* > java Client  
 \* > java Client Anonymous 1200 localhost  
 \*/  
  
public class Client {  
 private ObjectInputStream sInput; // To read from the socket  
 private ObjectOutputStream sOutput; // To write to the socket  
  
 private Socket socket;  
  
 private ClientGUI clientGUI;  
  
 private String server, username;  
 private int port;  
  
 Client(String server, int port, String username) {  
 this(server, port, username, null);  
 }  
  
 Client(String server, int port, String username, ClientGUI clientGUI) {  
 this.server = server;  
 this.port = port;  
 this.username = username;  
 }  
  
 public boolean start() {  
 try {  
 socket = new Socket(server, port);  
 }  
  
 catch (Exception exception) {  
 display("Error connectiong to server:" + exception);  
 return false;  
 }  
  
 String message = "Connection accepted " + socket.getInetAddress() + ":" + socket.getPort();  
 display(message);  
  
 try {  
 sInput = new ObjectInputStream(socket.getInputStream()); // Creating data streams  
 sOutput = new ObjectOutputStream(socket.getOutputStream());  
 }  
 catch (IOException IOException) {  
 display("Exception creating new Input/output Streams: " + IOException);  
 return false;  
 }  
  
 new ListenFromServer().start(); // Create the thread to listen from the server  
  
 try {  
 sOutput.writeObject(username);  
 }  
 catch (IOException IOException) {  
 display("Exception doing login : " + IOException);  
 disconnect();  
 return false;  
 }  
  
 return true;  
 }  
  
 private void display(String message) { // To send a message to the console or to the GUI  
 if (clientGUI == null)  
 System.out.println(message); // Console mode  
 else  
 clientGUI.append(message + "\n"); // ClientGUI JTextArea  
 }  
  
 void sendMessage(Message message) { // Send to the server  
 try {  
 sOutput.writeObject(message);  
 }  
 catch (IOException exception) {  
 display("Exception writing to server: " + exception);  
 }  
 }  
  
 private void disconnect() {  
 try {  
 if (sInput != null) sInput.close();  
 }  
 catch (Exception exception) {}  
 try {  
 if (sOutput != null) sOutput.close();  
 } catch (Exception exception) {  
 }  
 try {  
 if (socket != null) socket.close();  
 }  
 catch (Exception exception) {}  
  
 if (clientGUI != null) // Inform the GUI-part  
 clientGUI.connectionFailed();  
 }  
  
 public static void main(String[] args) {  
 int portNumber = 1200;  
 String serverAddress = "localhost";  
 String userName = "Guest";  
  
 switch (args.length) {  
 case 3:  
 serverAddress = args[2];  
 case 2:  
 try {  
 portNumber = Integer.parseInt(args[1]);  
 }  
 catch (Exception exception) {  
 System.out.println("Invalid port number.");  
 System.out.println("Usage is: > java Client [username] [portNumber] [serverAddress]");  
 return;  
 }  
 case 1:  
 userName = args[0];  
 case 0:  
 break;  
 default:  
 System.out.println("Usage is: > java Client [username] [portNumber] {serverAddress]");  
 return;  
 }  
  
 Client client = new Client(serverAddress, portNumber, userName);  
  
 if (!client.start())  
 return;  
  
 Scanner scan = new Scanner(System.in); // Waiting for messages from the user  
  
 while (true) {  
 System.out.print("> ");  
  
 String message = scan.nextLine(); // Reading the message  
  
 if (message.equalsIgnoreCase("LOGOUT")) {  
 client.sendMessage(new Message(Message.LOGOUT, ""));  
 break;  
 }  
 else if (message.equalsIgnoreCase("WHOISIN")) {  
 client.sendMessage(new Message(Message.WHOISIN, ""));  
 }  
 else {  
 client.sendMessage(new Message(Message.MESSAGE, message));  
 }  
 }  
  
 client.disconnect();  
 }  
  
 class ListenFromServer extends Thread { // Waits for the message from the server and append them to the  
 // JTextArea or to the console mode  
 public void run() {  
 while (true) {  
 try {  
 String message = (String) sInput.readObject();  
 if (clientGUI == null) {  
 System.out.println(message);  
 System.out.print("> ");  
 }  
 else {  
 clientGUI.append(message);  
 }  
 }  
 catch (IOException exception) {  
 display("Server has close the connection: " + exception);  
 if (clientGUI != null)  
 clientGUI.connectionFailed();  
 break;  
 }  
 catch (ClassNotFoundException exception) {}  
 }  
 }  
 }  
}

**ClientGUI**

package NordChat;  
  
import javax.swing.\*;  
import java.awt.\*;  
import java.awt.event.\*;  
  
public class ClientGUI extends JFrame implements ActionListener {  
 private static final long serialVersionUID = 1L;  
  
 private JLabel label; // For username/enter message  
  
 private JTextField textField;  
  
 private JTextField tfServer, tfPort;  
  
 private JButton login, logout, whoIsIn;  
  
 private JTextArea textArea;  
  
 private boolean connected;  
  
 private Client client;  
  
 private int defaultPort;  
 private String defaultHost;  
  
 ClientGUI(String host, int port) { // Receive a socket number  
 super("Chat Client");  
 defaultPort = port;  
 defaultHost = host;  
  
 JPanel nordPanel = new JPanel(new GridLayout(3,1));  
  
 JPanel serverAndPort = new JPanel(new GridLayout(1,5, 1, 3));  
  
 tfServer = new JTextField(host);  
 tfPort = new JTextField("" + port);  
 tfPort.setHorizontalAlignment(SwingConstants.RIGHT);  
  
 serverAndPort.add(new JLabel("Address: "));  
 serverAndPort.add(tfServer);  
  
 serverAndPort.add(new JLabel("Port: "));  
 serverAndPort.add(tfPort);  
  
 serverAndPort.add(new JLabel(""));  
  
 nordPanel.add(serverAndPort);  
  
 label = new JLabel("Enter your username ", SwingConstants.CENTER);  
 nordPanel.add(label);  
  
 textField = new JTextField("Guest");  
 textField.setBackground(Color.WHITE);  
 nordPanel.add(textField);  
  
 add(nordPanel, BorderLayout.NORTH);  
  
 textArea = new JTextArea("Welcome to the chat room\n", 70, 70);  
 JPanel centralPanel = new JPanel(new GridLayout(1,1));  
 centralPanel.add(new JScrollPane(textArea));  
  
 textArea.setEditable(false);  
 add(centralPanel, BorderLayout.CENTER);  
  
 login = new JButton("Login");  
 login.addActionListener(this);  
  
 logout = new JButton("Logout");  
 logout.addActionListener(this);  
 logout.setEnabled(false);  
  
 whoIsIn = new JButton("Who is in");  
 whoIsIn.addActionListener(this);  
 whoIsIn.setEnabled(false);  
  
 JPanel downPanel = new JPanel();  
 downPanel.add(login);  
 downPanel.add(logout);  
 downPanel.add(whoIsIn);  
  
 add(downPanel, BorderLayout.SOUTH);  
 setDefaultCloseOperation(EXIT\_ON\_CLOSE);  
  
 setSize(400, 400);  
 setVisible(true);  
  
 textField.requestFocus();  
 }  
  
 void append(String str) { // Appending the text in the TextArea  
 textArea.append(str);  
 textArea.setCaretPosition(textArea.getText().length() - 1);  
 }  
  
 void connectionFailed() {  
 login.setEnabled(true);  
 logout.setEnabled(false);  
 whoIsIn.setEnabled(false);  
  
 label.setText("Enter your username");  
 textField.setText("Guest");  
  
 tfPort.setText("" + defaultPort);tfServer.setText(defaultHost);  
  
 tfServer.setEditable(false);  
 tfPort.setEditable(false);  
  
 textField.removeActionListener(this);  
 connected = false;  
 }  
  
 public void actionPerformed(ActionEvent event) {  
 Object tempObject = event.getSource();  
  
 if (tempObject == logout) {  
 connectionFailed();  
 client.sendMessage(new Message(Message.LOGOUT, ""));  
 return;  
 }  
  
 if (tempObject == whoIsIn) {  
 client.sendMessage(new Message(Message.WHOISIN, ""));  
 return;  
 }  
  
 if (connected) { // Come from the JTextField  
 client.sendMessage(new Message(Message.MESSAGE, textField.getText()));  
 textField.setText("");  
 return;  
 }  
  
 if (tempObject == login) {  
 String username = textField.getText().trim(); // A connection request  
  
 if (username.length() == 0)  
 return;  
  
 String server = tfServer.getText().trim();  
 if (server.length() == 0)  
 return;  
  
 String portNumber = tfPort.getText().trim();  
 if (portNumber.length() == 0)  
 return;  
  
 int port = 0;  
 try {  
 port = Integer.parseInt(portNumber);  
 }  
 catch(Exception exception) {  
 return;  
 }  
  
 client = new Client(server, port, username, this);  
  
 if (!client.start())  
 return;  
  
 textField.setText("");label.setText("Enter your message below");  
 connected = true;  
  
 login.setEnabled(false);  
  
 logout.setEnabled(true);  
 whoIsIn.setEnabled(true);  
  
 tfServer.setEditable(false);  
 tfPort.setEditable(false);  
  
 textField.addActionListener(this); // Action listener for when the user enter a message  
 }  
 }  
  
 public static void main(String[] args) {  
 new ClientGUI("localhost", 1200);  
 } // Start the whole server  
 @SuppressWarnings("unchecked")  
 private void initComponents() {  
 setDefaultCloseOperation(javax.swing.WindowConstants.EXIT\_ON\_CLOSE);  
 javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());  
 getContentPane().setLayout(layout);  
 layout.setHorizontalGroup(  
 layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)  
 .addGap(0, 400, Short.MAX\_VALUE)  
 );  
 layout.setVerticalGroup(  
 layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)  
 .addGap(0, 300, Short.MAX\_VALUE)  
 );  
 pack();  
 }  
}

**Результаты работы:**

****

**Выводы:** в ходе выполнения лабораторной работы были освоены приемы разработки оконных клиент-серверных приложений на Java с использованием сокетов.