**Operational Manual for WebSocket Server Application**

**Setup**

1. Software Requirements: Ensure you have .NET 8 installed on your machine. You can download it from the official Microsoft .NET download page.

2. Installation: Clone the repository or download the source code. Open the solution file in Visual Studio.

3. Build: Build the solution by clicking on Build > Build Solution in the menu or by pressing Ctrl+Shift+B.

4. Run: Run the application by clicking on Debug > Start Debugging in the menu or by pressing F5.

**Operation**

1. Login: When the application starts, a login form will appear. Enter the username and password. There are two types of users: admin and user. The credentials for the admin are “admin” and “adminpass” respectively. The credentials for the user are “user” and “userpass” respectively.

2. Admin Operations: As an admin, you can toggle the state of the LEDs by sending a message in the format username:password:toggle LED\_index. For example, admin:adminpass:toggle 0 will toggle the state of LED 1.

3. User Operations: As a user, you can check the status of the LEDs by sending a message in the format username:password:status. For example, user:userpass:status will return the current status of the LEDs.

**Usage**

1. WebSocket Server: The WebSocket server runs on ws://localhost:5000/ws. It accepts WebSocket connections and handles incoming messages.

2. Publisher: The Publisher connects to the WebSocket server and sends messages based on which LED the admin toggles.

3. Subscriber: The Subscriber connects to the WebSocket server and receives binary messages based on server broadcast and Publisher Input which in turn activates the LED panel. It also connects to a Modbus server and polls for the state of 5 coils.

**Troubleshooting**

1. Connection Issues: If you are unable to connect to the WebSocket server, ensure that the server is running, and that the URL is correct.

2. Login Issues: If you are unable to login, ensure that you are using the correct username and password.

3. Command Issues: If your commands are not working, ensure that they are in the correct format. For toggle commands, ensure that the LED index is valid.

4. Modbus Issues: If you are having issues with the Modbus client, ensure that the Modbus server is running and that the IP and port are correct. Refer the Modbus Server Setup documentation.

5. Error Logs: Check the logfile\_server.txt and logfile\_ui.txt files for any error messages. These files are located in the same directory as the executable.

6. Unit Tests: Run the unit tests to ensure that all components of the application are working correctly. You can run the tests by clicking on Test > Run All Tests in the menu or by pressing Ctrl+R, A.

Remember to always keep your software updated to the latest version for optimal performance and security.