MASDA User manual

This document serves as a user manual for the **M**irae **A**sset **S**ecurities **D**emo **A**pplication (MASDA), namely its Server and Client components.

Tech stack

The front-end Client application is built with WinForms using .NET 8. The back-end Server application is built with ASP.NET Core, with SignalR providing real-time communication functionality. Programming language is C# for both applications.

MASDA Backend

MASDA Backend application can be run as a standalone application. Meaning, its functionality does not depend on the Client application. As per the scope of this assignment, MASDA Server adheres to the following functionality:

1. As soon as the server starts, it generates 12 random 3-character tickers and orderbooks with random entries for all tickers. Mid-price range for the orderbook layers is 90 to 110, while quantity range is from 1 to 50. As the server listens for incoming connections on localhost:5000, starting multiple servers is not allowed.
2. Every 5 seconds, a random trade is executed by the server. The server picks a random ticker and applies the trade order to that ticker, modifying its orderbook.
   Server-generated random trades always occur at the lowest ask price for “Buy” orders and highest bid price for “Sell” orders. The quantity of the trade order is a random number between 1 and 5. Every randomly generated trade is broadcasted to all clients at the same time as soon as it is made.
3. Trades and orderbooks are stored in the server for as long as it is running. Meaning, if the server starts and is not restarted manually, MASDA Client applications will receive and interact with the same data, regardless of the number of clients and whether they reconnect to the server or not. Restarting the server itself will result in the generation of a completely new set of tickers and orderbooks.
4. Client applications can submit a trade order as well, meaning that the trade history can consist of both server-generated and client-generated trades.
5. Trade orders made by client applications go through a pre-trade order check.
    a. Trades with a quantity of 0 are not allowed (discarded by server)
    b. Trades within the orderbook’s price range affect the position at the trade order’s specific price. Meaning, if a buy order at 110 for the quantity of 10 is made, and if one of orderbook’s ask layers, e.g. Ask 3, is shown with the price of 110, Ask 3 layer of the orderbook will be modified, either partially or fully.
    c. If the trade order’s quantity is higher than the one shown on the orderbook’s layer, the trade will be partially fulfilled with the quantity shown on the orderbook.

d. As soon as the quantity on any layer drops to 0, the layer is removed from the orderbook.
e. If a “Buy” order is made with the price higher than the highest ask, the trade is executed at the ticker’s highest ask price.
f. If a “Sell” order is made with the price lower than the lowest bid, the trade is executed at the ticker’s lowest bid price.
g. Client-made trades are broadcasted immediately to all other clients.

MASDA Client

MASDA Client, unlike MASDA Server, cannot be run just by itself. You can still run the client application without running the server, but the client simply will not be able to connect and provide its functionality. Therefore, the client application should be run after the server is started. As per the scope of this assignment, MASDA Client adheres to the following functionality:

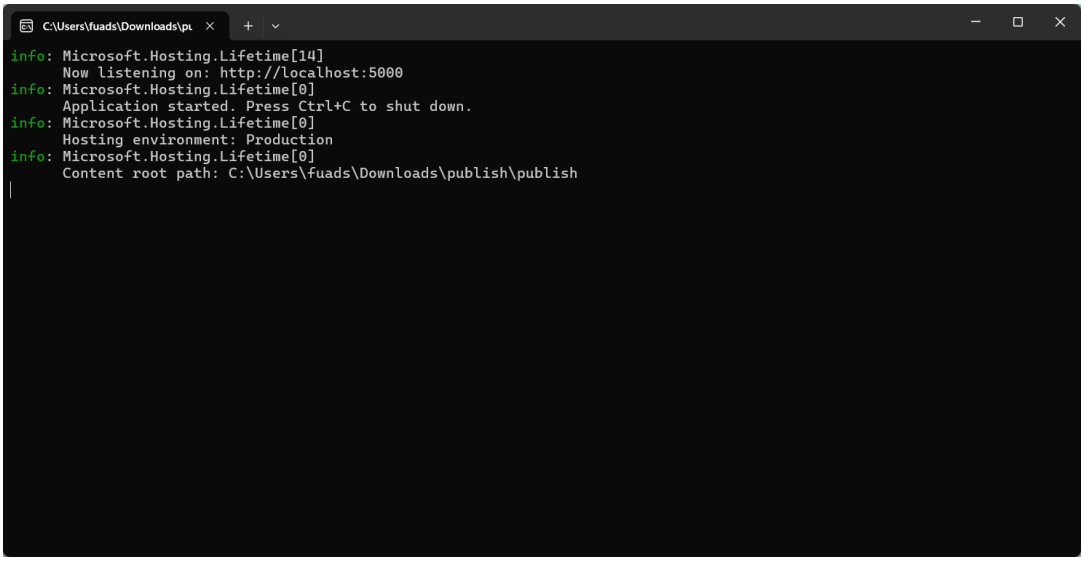
1. As soon as the client application starts, a user can connect to the server with the “Connect” button. Client connection status is alway shown below the “Connect” and “Disconnect” buttons.
2. After successful connection, “Trade History” and “Orderbooks” buttons appear. Clicking on any of them will toggle respective windows.
3. As soon as the client connects to the server, it “subscribes” to the trade history, meaning that it will immediately start receiving the server-generated and client-generated trades.
4. Orderbooks window allows the user to add as many orderbooks as they wish, each shown in a separate tab independently of other tabs. After adding a tab, a user can either remove the tab by clicking “Remove Orderbook”, or select one of the 12 server-generated tickers from the dropdown menu.
5. After a ticker is selected and the “Retrieve” button is clicked, the ticker’s orderbook appears.
6. To the right of the ticker’s orderbook is the menu that allows the user to place a trade order. User can choose an order side (buy/sell), and the desired price and quantity of the trade order (both limited to 1000 by the UI)
7. If either a server-generated random trade or client trade modified an orderbook, the update in the orderbook will be broadcasted immediately to all clients.
8. Changes in the orderbooks and trade history are sent to all connected clients simultaneously. Every client will see the exact same information if the same ticker is selected in the orderbooks window.
9. Closing and restarting the client will not affect the data - as the data is stored purely on the backend server, clients will see the same information as long as the server keeps running.
10. When a connection is established by the client and the server is manually stopped, an error window is shown to the user alerting them that the connection is lost. Afterwards, the client application waits for 5-10 seconds to attempt to reconnect to the server again. If within that waiting time the server is back online, the client will connect to the server

automatically. If the client disconnects from the server manually, meaning that the “Disconnect” button is clicked, the client will not attempt to reconnect automatically.

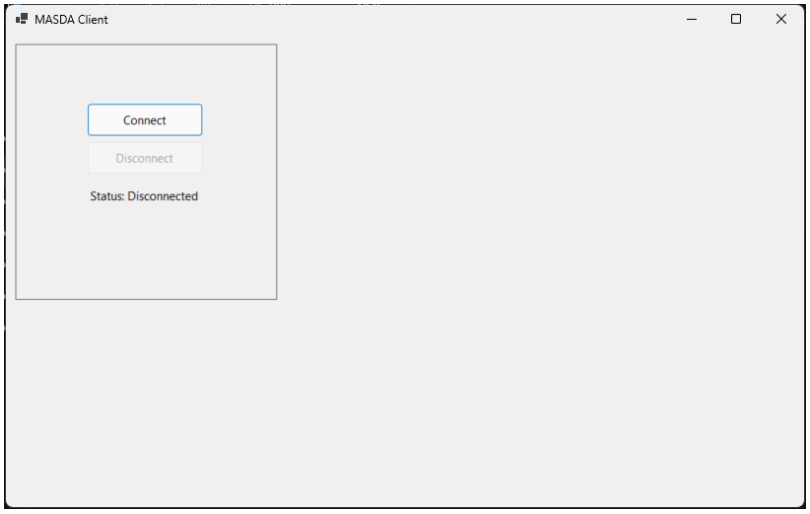
Limitations

When a layer is removed from an orderbook (when its quantity goes to 0), the orderbook is not populated by an additional layer. That means that if enough trades are made, the orderbook can become empty.

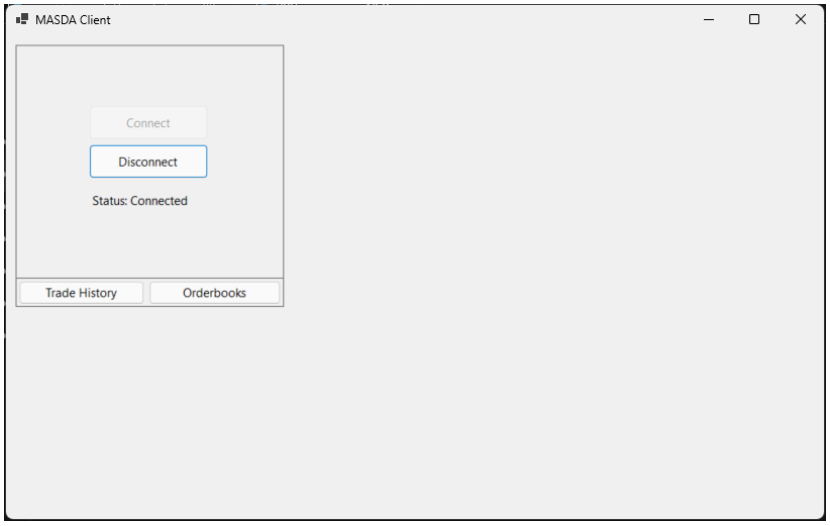
Screenshots



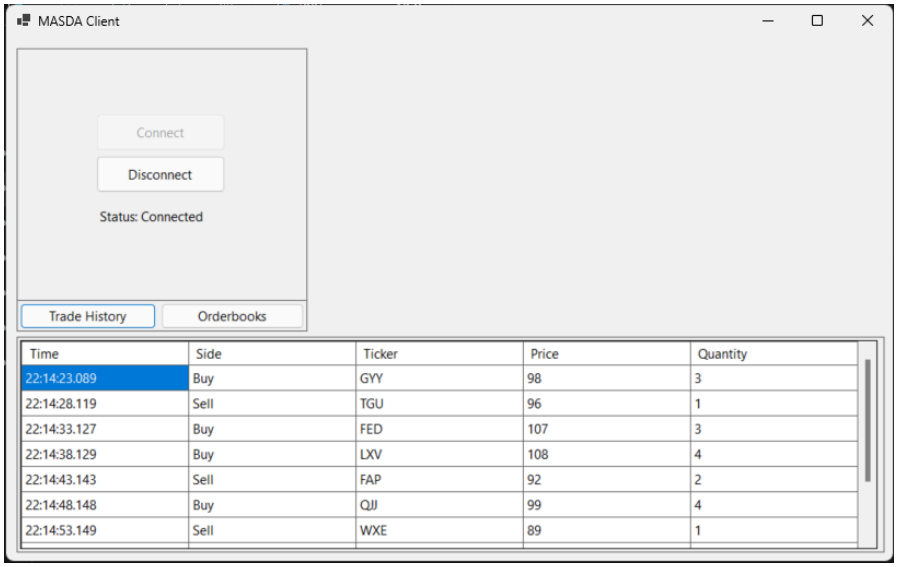
MASDA Server listening on localhost:5000



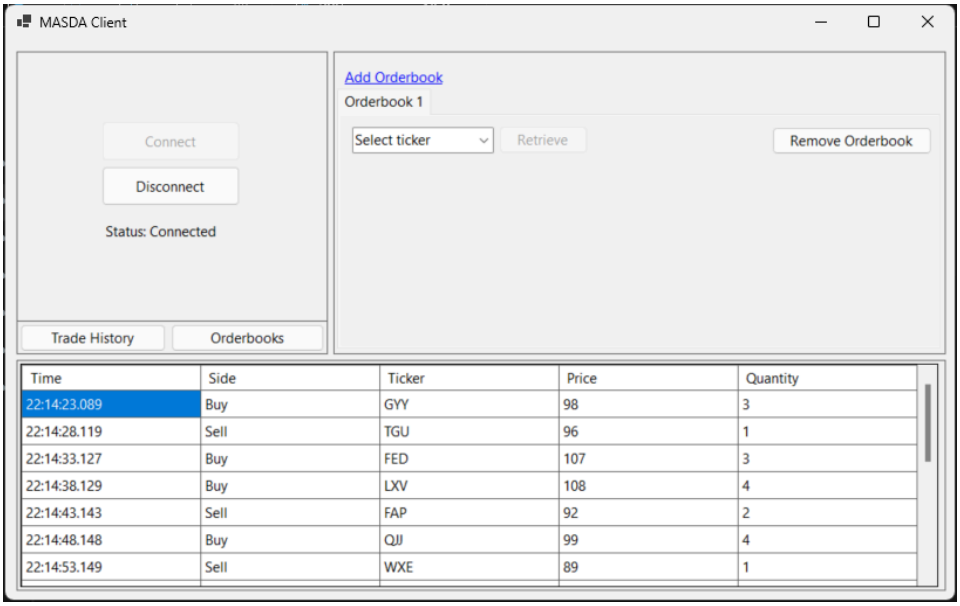
MASDA Client before connection is established



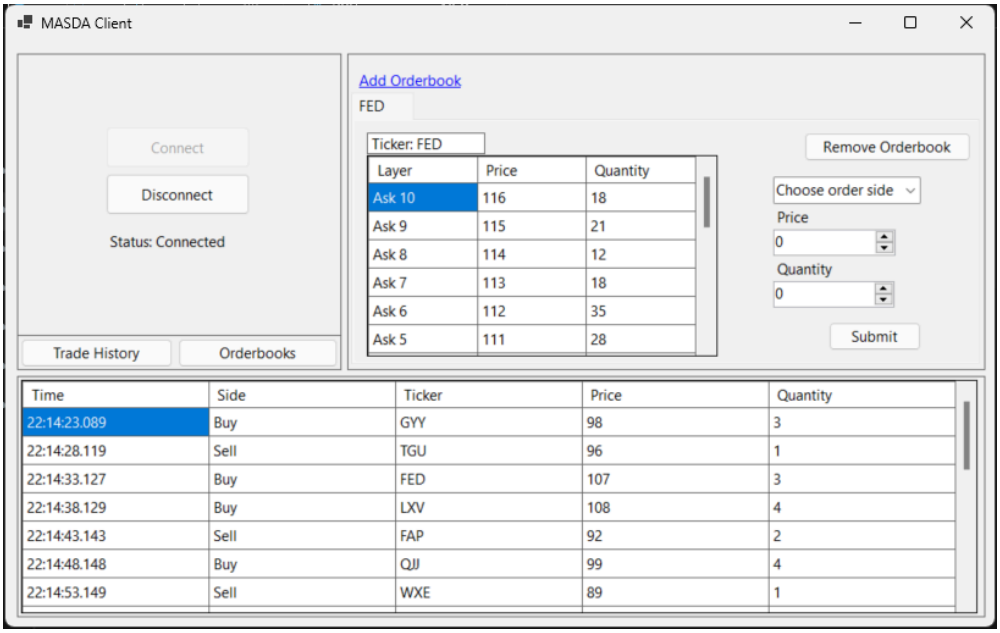
MASDA Client connected to MASDA Server



MASDA Client with Trade History window open



MASDA Client with Orderbooks window open



MASDA Client displaying an orderbook for the selected ticker