Java Final Project

Crypto Exchange System

Congratulations, You've just been hired as a key developer for an exciting and innovative project: a Crypto Exchange System that will revolutionize the way users trade cryptocurrencies.

The Crypto Exchange System will allow users to trade cryptocurrencies efficiently,users deposit money into their wallets and use these funds to buy cryptocurrencies from the exchange or other users.

As an exchange user you start by creating an account on the platform, providing your name, email and password. Once registered, you receive a unique ID that identifies you within the system. As a user, you have a digital wallet linked to your account where you can deposit real money**(USD)** and store your cryptocurrency holdings

Your wallet acts as a digital purse, securely tracking your funds. It has two main sections: one that shows your balance in fiat money (like USD) and another that lists the different cryptocurrencies you own, along with their respective amounts, such as **$500** in fiat money and **2.5 BTC**.

Cryptocurrencies are the digital assets available for trading on the exchange. Each cryptocurrency, like **Bitcoin** or **Ethereum**, has a unique identifier and a shorthand symbol (such as BTC for Bitcoin or ETH for Ethereum). The system keeps track of the current market price for each cryptocurrency, so you always know their value

Every time you buy or sell cryptocurrency, a transaction is recorded, which includes the type of cryptocurrency involved, the amount traded, the price at which it was traded, and whether it was a buy or sell action. These transactions are like digital receipts, keeping a record of all your trades.

When you want to sell cryptocurrency, you place a selling order. The system will prompt you to enter the type of cryptocurrency, the amount you want to sell, and the price you are willing to accept. For example, you might want to sell 1 Bitcoin at a price of $42,000. The system will place your sell order in the order book, and it will only be executed if the market price matches your specified price.

The selling order will only be executed if there is one buyer that wants to buy the exact amount of crypto at the selling price or at a greater one but the transaction will always be executed using the selling price.

This means that a transaction will only be composed by **1 Buye**r and **1 Seller**

If there are multiple sellers that match a buy order, the first seller that placed the sell order must be chosen

When we refer to **"the market"** in this context, we are indeed talking about buyers and sellers who interact within the exchange platform. The exchange itself acts as an intermediary, facilitating the matching of buy and sell orders from different users.

When you want to buy cryptocurrency, you place a buy order. The system will prompt you to enter the type of cryptocurrency, the amount you want to buy, and the maximum price you are willing to pay

Before trading, you need to deposit fiat money into your wallet, topping up your account balance to show how much money you have available for trading. With funds in your wallet, you can place buy orders for cryptocurrencies or buy cryptocurrencies directly from the exchange. **The system ensures you have enough funds to complete your buy orders** and matches a single buy and with a single sell order to execute trades, updating the wallets of both the buyer and the seller accordingly.

Each trade is recorded as a transaction, detailing the type of cryptocurrency, the amount traded, the price, and whether it was a buy or sell action, maintaining a digital ledger of all your trading activities

The system continuously monitors the order book for matching buying and selling orders

To exit the application, you can select the "Quit" option from the main menu. This option allows you to safely close the application

If the user enters an invalid option, an error message should appear.

<p align="center">**Use Cases**</p>

User Registration

When you first open the application, you'll see a menu with options. By selecting **"Register"** the app will prompt you to enter your name, email, and create a secure password. After submitting these details, the system will generate a **unique user ID** for you. You'll receive a confirmation message indicating that your registration is successful, and you'll be ready to log in.

User Login

Upon selecting **"Login"** from the main menu, the app will ask for your email, and password. After entering these credentials, the system will verify them. If the credentials match, you will gain access to your account and see a menu of options for managing your trading activities. If the credentials are incorrect, you'll receive an error message prompting you to try again.

User Logout

There must be an option that lets the user logout from the application.

Initialize Cryptocurrency Prices

When the system starts for the first time or upon resetting, it will initialize

- The current market prices for major cryptocurrencies such as Bitcoin (BTC) and Ethereum (ETH). For example, the initial prices might be set to $50,000 for BTC and $3,000 for ETH. These initial values can be predefined or fetched from a reliable source. This ensures that you always have a current reference for the value of each cryptocurrency.

- A certain amount of cryptocurrency available for selling. This initial supply ensures that users can immediately buy cryptocurrencies directly from the exchange. For example, the exchange might start with 100 BTC and 500 ETH available for trading.

- The amount of cryptocurrency available should be updated when users buy directly from the exchange.

Deposit Money:

Once logged in, you can choose "Deposit Money" from the menu. The system will prompt you to enter the amount of fiat money you wish to deposit. After entering the amount, the system will update your wallet balance with the deposited funds and display a confirmation message showing your new balance. This ensures you know exactly how much money you have available for trading.

View Wallet Balance

To check your financial status, you can select "View Wallet Balance." The app will display your current fiat money balance and any cryptocurrencies you own. This information is presented clearly so you can see the exact amounts of each asset in your wallet.

Buy Cryptocurrencies from the Exchange

The user should be able to buy cryptocurrencies directly from the exchange
The app will prompt you to enter the type of cryptocurrency, the amount you want to buy and if you have enough funds, the transaction will be executed immediately.

Place Buy Order

The system will first show you the current market price of the cryptocurrency you wish to buy

To place a buy order, select **"Place Buy Order"** from the menu. The app will prompt you to enter the type of cryptocurrency, the amount you want to buy, and the maximum price you are willing to pay. For example, you might want to buy 1 Bitcoin at a maximum price of $49,000. The system will place your buy order in the order book, **and it will only be executed if there is one seller who is selling the exact amount the buyer wants and if the selling price is equal or lower to the maximum price that the buyer is willing to pay.**

If the selling price is lower than the maximum price the buyer established, **the selling price** will be the price at which the cryptocurrencies will be sold

If there are multiple sellers that match a buy order, **the first seller that placed the sell order must be chosen**

It is important to note that for any transaction **there is only going to be one buyer and one seller**, there's no way a single transaction could have multiple buyers or multiple sellers

Place Sell Order

The system will first show you the current market price of the cryptocurrency you wish to sell

To place a sell order, select **"Place Sell Order"** from the menu. The app will prompt you to enter the type of cryptocurrency, the amount you want to sell, and the price you are willing to accept . For example, you might want to sell 1 Bitcoin at a price of $51,000. The system will place your sell order in the order book, **and it will only be executed if a buy order exists with the exact amount of crypto that the seller wants and if the buying price is equal or greater.**

If the buying price is greater, the transaction will always be executed **with the selling price.**

If there are multiple buyers that match a selling order, the first buyer that placed the buy order must be chosen

Examples

Placing a Buy order for Buying 1 BTC

Let's suppose that you want to buy **1 BTC** at a price of **$49000**

Your buy order will be placed in the order book

If a seller is offering 1 Bitcoin at $49,000 or lower, the transaction will be executed

If the selling price is $48,000, **the transaction is executed at $48,000**

If multiple sellers are offering Bitcoin at $49,000 or lower, **the first seller to place their sell order will be chosen**

The system completes the transaction with only one buyer (you) and one seller.

You now own 1 Bitcoin purchased at the matched selling price

Placing a Sell order for Selling 1 BTC

Let's suppose that you want to sell **1 BTC** at a minimum price of **$51000**

The system searches for a matching buy order

If a buyer is looking to buy 1 Bitcoin at $51,000 or higher, the transaction will be executed.

If the buying price is $53,000, **the transaction is executed at your selling price of $51,000**

If multiple buyers match with the selling order, **the first buyer who place the sell order will be chosen**

The system completes the transaction with only one buyer and one seller.

You have successfully sold 1 Bitcoin at $51,000.

The system continuously monitors the order book for matching buy and sell orders. When a match is found, the app will automatically execute the trade. Your wallet will be updated to reflect the new cryptocurrency balance and the corresponding fiat money adjustment.

The order will only be executed if there are sufficient buyers to match **the entire amount** at your specified price or higher. This ensures that your order will only be fulfilled in its entirety.

View Transaction History

To review your past trades, select "View Transaction History" from the menu. The app will display a detailed list of all your transactions, including the type of cryptocurrency, amount traded, price, and whether it was a buy or sell action. This feature provides you with a transparent and organized record of all your trading activities.

Bonus(10 pts): Random Market Price Fluctuations

To simulate real market conditions, the system will randomly fluctuate the market prices of cryptocurrencies. At regular intervals, the prices for Bitcoin (BTC) and Ethereum (ETH) will randomly rise or fall by a small percentage.