Cryptocurrency Exchange Engine

Platform details • Pricing • Support and Customization

Table of Contents

What we offer

Exchange Platform

QODEX (Qoden Exchange) is our flagship cryptocurrency trading platform. Capable of integrating with the industry's leading blockchains, QODEX is lightning-fast, highly secure, and has been rigorously tested on cloud and on-premises deployments worldwide.

Following modules included with the platform:

Module	Functions
Trading UI	1. Interactive mini ticker widget displaying shot statistics for all instruments. 2. Place order widget to place limit and market orders. 3. Open orders widgets. 4. Order history widget. 5. Order book widget. 6. Order book overview chart. 7. TradingView price chart. 8. Account and balance overview. 9. Withdraw and deposit for supported coins (see below). 10. Sign up and login with Google two-factor authentication (2FA).
Admin panel	1. Manage users (look up, monitor, block, and approve). 2. Manage assets and instruments.

Module	Functions
Exchange services	1. Order matcher. 2. Back office API. 3. Front office API. 4. Market data service. 5. Blockchain integrations (ETH, BTC, BCH, ERC20, and LTC).
Trading bots	1. Market maker bot, designed to replicate orders from Binance. 2. Volume generator bot, designed to generate trades with defined parameters. 3. Bot SDK.
AWS Deployment	1. EC2 servers to run exchange code. 2. Load balancer. 3. EBS volumes to store exchange data. 4. Databases for back office and market data. 5. NATS messaging solution. 6. Docker repository to host pre-built exchange service docker images. 7. Secure storage for critical and confidential information.
Continuous integration environment	1. Gitlab instance with exchange source code. 2. CI pipelines to test and deploy code. 3. Deployment scripts to seamlessly roll out new deployments.
Tests suite	1. Development testing suite to be run on developer's computer to automatically detect regressions. 2. Sophisticated end-to-end test suite to automatically pinpoint subtle integrational bugs. 3. Manual test cases to run manual checks.

By choosing QODEX Exchange Platform, you gain access to our full source code, technical documentation, practical samples, and tutorials. What's more, these intellectual rights are delivered to you without vendor lock-in. Your development team will thus immediately be equipped with the resources necessary to autonomously leverage our technology to its full potential—new functionalities can be added to the core platform without having to modify the entirety of the system's code.

For a competitive, one-time license fee you will receive a worldwide, perpetual, non-transferable, and non-exclusive license to use the QODEX platform for one exchange under a single domain name.

Updates and New Features

In addition to the exchange license, you will receive 5 months of complimentary technical maintenance. This will entitle you to receive ongoing updates and new features developed by our team during this time period. Our development team stays up-to-date with the most in-demand customer features, ensuring your system is constantly satisfying user expectations.

To respect your product development plans and avoid disruptions due to unexpected updates, our team reliably issues an update every two weeks. These updates will be delivered to you in the form of source code patches and can either be integrated immediately or postponed to a later date—granting you complete control over the maintenance of your product.

After the complimentary 5-month technical maintenance period concludes, you can continue your subscription for a monthly rate receiving ongoing updates as usual. If you opt to suspend your subscription, however, you can subsequently renew it at any time.

Development Support

Here at Qoden Technologies, we understand the difficulties of learning and implementing unfamiliar code. This is why we offer development-level support, comprising technical training and consulting services.

Customization Services

If you require a specific feature for your product which is unavailable in our standard offering, we are happy to provide a dedicated development team to help you create this custom functionality.

QODEX Platform Implementation Plan

Implementing QODEX into your product follows a well-defined, simple process outlined below.

Firstly, upon completing the purchase, you will be assigned a dedicated account manager who will guide you through the process and serve as your convenient point of contact. Once your development environment has been set up by our team, you will receive a functional exchange featuring our default UI and configurations. From there, your exchange can be deployed as is or customized by your team or ours if needed.

Assuming the following two prerequisites are met, your platform can be set up in as little as 2 weeks:

1. Contract signed and invoice processed.
2. Access to Amazon AWS account provided.

Milestone	Timeline
Development environment setup	2 days
Provisioning of servers, databases, and other infrastructural components from AWS	1 day
Synchronization of blockchain nodes with main net	3-5 days
Domains, DNS, and SSL certificate setup	1 day
Deployment of web UI	1 day
Configuration of services; successful completion of internal tests	1 day

Within 12-14 days, you will be ready to invite your first users to trade on your exchange!

Platform Components

QODEX Exchange Platform contains many components, all of which delivered with source codes, allowing for customizations and extensions as needed. Components marked as add-ons are not included by default and can be custom-created based on client request.

Trading Engine

Overview of the trading engine architecture:
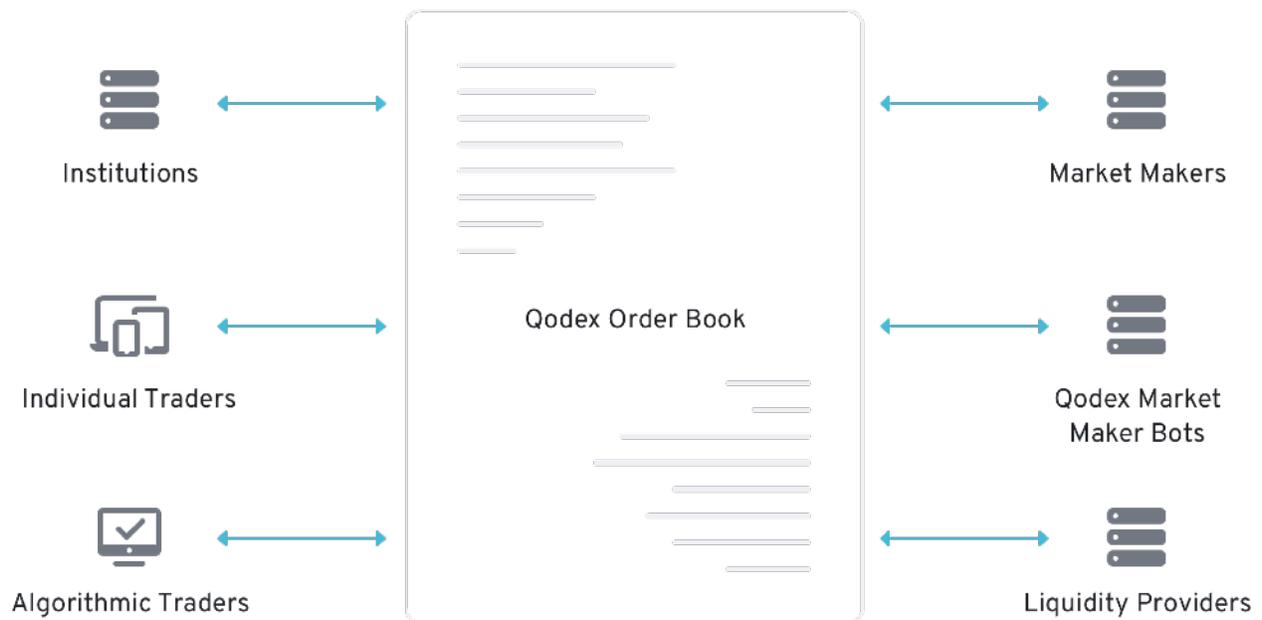
The trading engine matches incoming orders, maintains order books, and produces outgoing market data (Level 3 books, trades, summaries, etc).

The engine supports the following order types:

- Limit

- Market

- Stop

The engine supports the following time-in-force settings:

- Good-till-cancelled (GTC)

While short maintenance windows may arise, the exchange engine has been built to operate in 24/7 mode to meet current industry conditions. It boasts a matching latency of less than 50ms for 98% of incoming orders, measured request-to-response.

Liquidity Bot

The exchange engine features an API that allows users to programmatically trade on the exchange. Automated trading robots are used to provide liquidity to the markets, connecting to and monitoring other exchanges, relaying identical orders to your exchange.

This mirrors natural trading activity, attracting users to your exchange and allowing you to add small discrepancies to the spread, enabling incremental revenue generation.

Admin Panel

QODEX comes equipped with a back office admin panel that allows you to easily review user activity and tweak exchange parameters. This admin panel can be extended with dashboards highlighting key system statistics, deposit and withdrawal requests, logs and audits, and other valuable features.

Exchange Web UI and Building Blocks

Our platform includes a comprehensive exchange web UI that can be used as a template for your branded UI. The pre-built UI consists of reusable components and widgets.

Widget	Features
Mini ticker	Mini ticker is a primary widget used to navigate exchange instruments. With mini ticker, users can:
	Search for a financial instrument by typing its name.
	Create collections, such as "Favorites", for quick access to instruments of interest.
	View key instrument metrics, including 24hr volume, absolute and relative price changes.
TradingView price chart	TradingView's price chart is the industry standard charting solution. This chart features a variety of instruments, multiple timeframe analysis options, and many more technical charting tools.
Order book overview chart	Provides a graphical view of cumulative volumes within the order book. Using this chart, traders can quickly estimate order book pressure and predict most likely short term price directionality.
Order book widget	Provides Level 2 data (depth book) it displays the last trade price, most favorable bid/ask, and bid/ask volumes with configurable decimal place settings. The order book widget connects to WebSocket API and can withstand a high throughput of ever-updating data.
Trade history	This table displays the most recent trades, including volumes, time, and price. It informs traders about actual trades, not just price level movements due to opened and cancelled orders.
Place order widget	Supports limit, market, and stop orders. This widget automatically validates price and volume information and predicts the maximum available amount of an asset at the entered price. For faster order entry, order prices can be automatically set based on the order book or trading history.

Widget	Features
Open orders table	Lists open orders with critical information such as order volume, price, fee, order type, etc. Traders use this widget to review their positions and adjust or close them. Thanks to its high-speed WebSocket connection, order information is immediately updated.
Order history	Offers the same functionalities as the open orders table but for archived and inactive orders.
Balance widget	Displays user balances. This widget can display a pre-configured set of assets or auto-switch between assets based on selected instrument.
Withdraw/deposit operations list	Lists recent deposits and withdrawals together with vital information such as number of confirmations, links to blockchain explorers, and status information.
Assets list	Displays all available assets in a single list. This can be used to initiate withdrawal and deposit operations, and indicates if asset deposits or withdrawals are unavailable at a given moment (as set by the admin). This list also indicates the quantity of an asset that users have available, in total, and pending in orders.
Portfolio overview widget	Displays the distribution of a user's assets in a bar chart. All prices are calculated in a single currency (usually BTC or USDT) and displayed as a bar chart, providing visual representation of a user's portfolio.
Access management dialogs	Enables user access management via login, sign up, reset password, and 2FA dialogs.
Flexible tables and menus	Admin panel is built with flexible table and menu components. These components provide an easy way to display, navigate, sort, and search through tabular information.

Two-Factor Authentication (2FA)

Two-factor authentication consists of implementing additional security measures than mere username and password-based login credentials. We offer two options for 2FA security:

1. The issuance of email tokens, or;
2. The use of Google Authenticator.

Both of these options can be combined to ensure maximum security. Moreover, SMS-based authentication can be integrated as an add-on service.

Cryptocurrency Deposits and Withdrawals

Every new user will obtain a unique cryptocurrency wallet which can be used to deposit money into an exchange account. While large withdrawals are subject to manual review and confirmation, most withdrawals can be made to any crypto wallet at any time. Some withdrawals may require system admin intervention to move money from a cold to a hot wallet. This process can be designed in a way that requires multiple signatures to confirm large withdrawal transactions.

Hot and Cold Wallets

Hot wallets are used to receive deposits and handle withdrawal requests. Only a small fraction of exchange funds will be held in hot wallets and available online. For enhanced security, the platform continuously monitors hot wallets and moves excess funds to cold wallets.

We recommend using hardware wallets to manage your exchange's cold wallets. These wallets should be stored in safe locations and protected with multiple signatures. QODEX never accesses your cold wallet(s) directly, it only sends excess funds to it. Exchange admins should monitor the status of hot wallets and manually move funds from cold to hot wallets as needed.

ERC20 Tokens (ICO/STO Support)

ERC20 token trading can be set up and launched with few configuration changes, enabling new ERC20 tokens to be added in just a matter of hours. By taking liquidity from other supported exchanges, market activity can quickly be generated by users. The Bot SDK can be used to program market making algorithms.

Deployment and DevOps Automation

- Automated scripts to deploy, update, and roll back exchange services.
- Separate environments for development, testing, and production.
- Centralized logging and auditing.
- Circuit breakers/alerting system designed to send email or SMS alerts to admin group upon reaching a certain threshold, such as low balance or high transactions.
- Auto-scaling and DDOS protection.

Security

Based on our industry knowledge and experience, we have designed a multilayer security architecture. We highlight all of the layers designed to secure exchange funds and render the system impenetrable below. Some of the security features are built into the system, whereas others are implemented during exchange setup or as administrative security policies. Collectively, these features make it impossible for the system to be attacked.

Web Application Firewall

Every packet that arrives at the exchange is thoroughly inspected based on a comprehensive set of criteria designed to detect any type of malicious activity. For example, this inspection can detect the utilization of Tor, a network often used by professional hackers to conceal their location. It can also detect typical attack vectors. For instance, it is capable of rejecting a packet with a potential SQL

injection or an XSS attack before the packet even reaches the exchange servers. We have successfully deployed Cloudflare, Azure Application Firewall, and Amazon Web Application Firewalls.

Virtual Private Network

All exchange personnel has to authenticate and connect to virtual private network in order to access exchange admin panel. This means that no strangers can even send a network packet to the exchange internal services. Within this network all traffic is secured with asymmetric encryption, potential attacker from the internet won't be able to hijack it even if she and exchange employee are sitting in the same restaurant and use same Wi-Fi network. This private network can be setup in a way to block any users trying to connect from unknown location. For example if employee lost password and hacker from Kamerun still won't be able to connect. A hacker has to somehow also control employee's physical network equipment to exploit lost password and connect to the private network.

Internal Firewalls

The platform designed in a way to hide most important services deep inside the cluster. Most sensitive service – wallet service, does not even have access to the outside world. It can only talk to blockchain nodes and other services inside the cluster. No external packets ever arrives at it, all data reaching wallet service is originated from inside the cluster. This means it is impossible to manipulate wallet service form the outside, attacker has to actually get inside it in order to access it.

Bu even if somehow attacker breaks into the system somehow she won't be able to do much because every service is isolated from the others. Our intelligent deployment script configures servers and networks in such a way that internal services can only talk to a minimum required subset of other services. All other communications are strictly prohibited. This means that an attacker won't be able to access exchange funds even if hacker bribes the system admin and get access to one of cluster servers.

Databases and tables inside them are protected in a similar way. The services can read only tables they supposed to read and can write to tables they supposed to write. All other activity is prohibited by security rules.

Key Vault for Private Keys and Passwords

No sensitive information is stored in plain text files on servers hard drives. Private keys, database access passwords, API keys – all such critical pieces of data are stored inside cloud provided key vault service. Inside that key vault data is encrypted and it is only available to designated services. For example only wallet service can read hot wallet private key.

Hot and Cold Wallets

Imagine attacker breaks into the cloud data center and steals physical server with your data. Even in this case she won't get much. Exchange uses so-called hot wallets to receive deposits and handle withdrawal requests. Only small fraction of all exchange money are held in the hot wallet and available online. Platform continuously monitors hot wallets and move excess amount of funds to cold wallets. QODEX never access Cold wallet directly, it only sends excess amounts of funds to it.

We implement cold wallets as multi signature, hardware wallets that stored in a safe location. Multiple cold wallets may be used for additional protection.

Source Code Audits

To protect our customers from "trojan horses" that may be added by an attacker or malicious employee we implement strict security guidelines. Our development process at Qodex requires every line of code to be reviewed by peers before it gets into the system. Many our clients also hire security consultants to review our code. Recently our solution have passed security reviews by AVNET and Konfidas.

Add-On Services

In addition to the default features included in the QODEX platform, you may want to add extra functionalities to enhance your exchange. We would be happy to help you build additional features

by providing a dedicated professional team of senior developers, UI designers, project managers, and testers.

Integration with Top Coins

Most of the major coins like BTC, BCH, and LTC work with virtually identical APIs and internal protocols. Similarly, ERC20 tokens provide a standardized API which simplifies integration.

There are, however, tokens on the top coins list that have special characteristics, such as Monero (XMR) which is based on proof-of-stake (PoS) versus proof-of-work (PoW). As another example, Ripple (XRP) uses a Bitcoin-incompatible API and internal protocols. Therefore, these coins with special characteristics require manual integration efforts, which can take roughly one to four weeks, depending on available tools and API.

Mobile Applications and Mobile Web UI

The default QODEX UI can be customized to a highly mobile-responsive state. Widgets can be rearranged so as to optimize mobile screens' limited display areas. To further enhance mobile user experience, we can create native mobile apps.

Deposit with Bank Transfer (Manual)

The simplest way to accept bank wires is to manually process them. Users initiate the process by wiring an amount to the exchange bank account with all relevant details. A support agent at the exchange periodically monitors the bank account, debiting the user's account in the system once the incoming wire has been received.

Deposit with Credit Card

To accept deposits via credit card, your exchange requires an integrated payment processor. There are many companies which provide this service and QODEX can integrate with any of them. We have

integrated QODEX with Stripe, Plaid, OpenPay, PayPal, and more. Typical integration projects take about two to four weeks.

Withdrawal Fiat Amount (Manual)

Your exchange does not require any bank or payment gateway integration to enable users to withdraw fiat. When a user places a fiat withdrawal request, which is displayed in the admin panel, a support agent will review and verify pending withdrawals. After verification, the agent wires the money to the bank account specified by the user.

Deposits and Withdrawals with Bank Transfer (Automated)

Accepting bank transfers can be automated by integrating bank APIs. There are two ways to automatically connect to a bank:

1. Some banks provide API access to accounts—we can use such APIs, or;

2. We can reverse-engineer a bank's API from mobile apps or online banking software and use this API without having access to a formally documented bank API.

Integration is then implemented as an exchange service that continuously monitors the exchange's bank account for incoming wires. These wires are detected by certain text patterns in the special instructions or purpose of payment fields. Once detected, the wire amount gets debited to the user account within the exchange.

CRM/Helpdesk Integration

The exchange admin panel can be integrated with your CRM system of choice. Typical integration features include:

• Porting user spending and balance data from exchange to CRM;

• Shared login between helpdesk, CRM, and exchange;

• Enhancing support tickets with user balance and transaction information;

• Linking CRM accounts with backend accounts.

Deployment

QODEX deployment summary diagram:
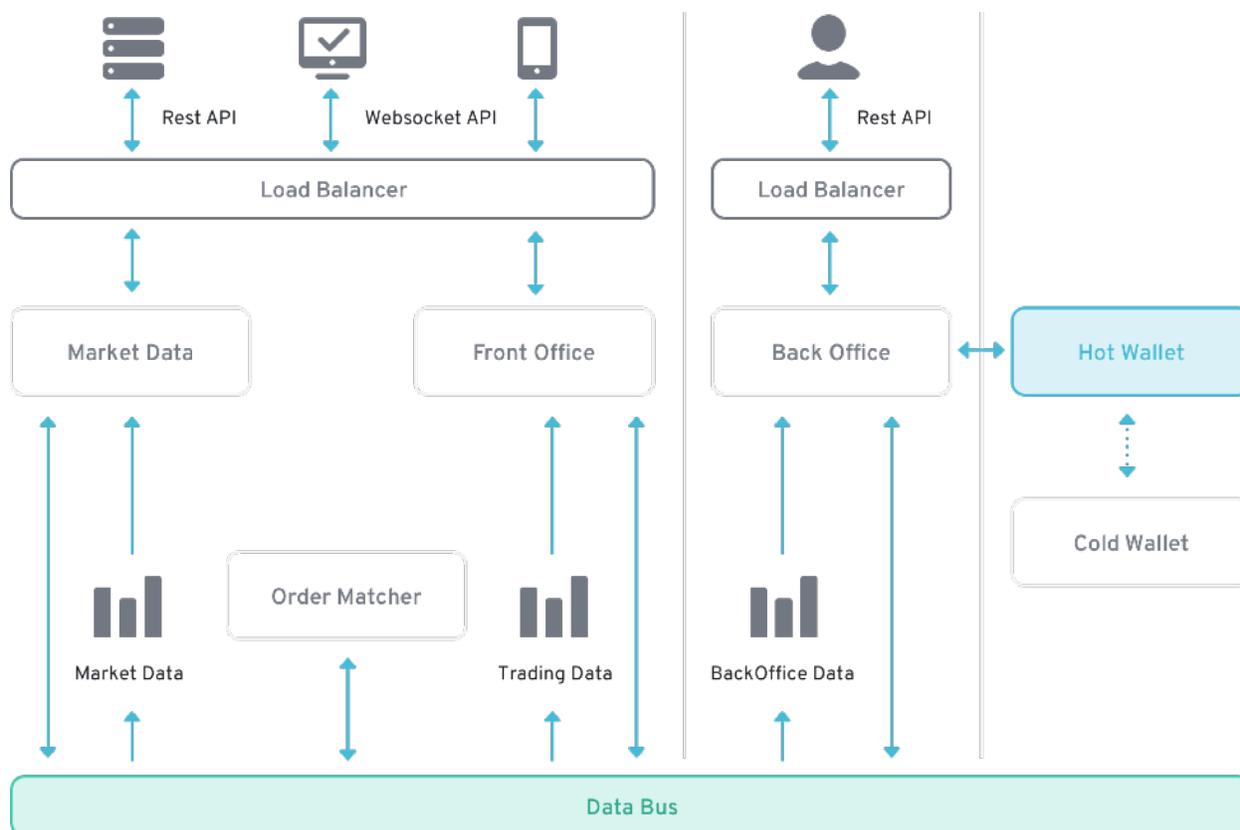
Our system is implemented as a basic three-tier architecture and deployed on Amazon's AWS cloud environment:

• Trade Engine, Exchange Web UI run as docker containers in EC2 instances.

• Database - Postgres and Timescale DB may run hosted or on-premises.

• Blockchain integration is done with most stable and secure blockchain servers available.

All deployment tasks from server provisioning to service configuration are automated with scripts. All configurations are described in configuration files, versioned and reviewed.

Example Hardware Cost with AWS

A typical deployment, capable of handling up to 20,000 requests per second, consists of the following components:

1. Two API servers

2. A backend server which handles: Order Matching and Messaging Bus

3. Database server

4. Marketdata server

On AWS, such a deployment would cost about $1,500 per month on hourly billing or $500 per month if reserved for 3 years.

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