

QAO-RARECHAIN WHITE PAPER

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The RareChain Team

Abstract. RareChain is a stability-focused DeFi Ecosystem which includes its own governance token, (QAO) and its stablecoin (RARE) that can be used on Rarechain API. QAO will also be used for staking to earn fees from RareSwap. RareChain will originally launch on Ethereum and subsequently migrate to its own blockchain solution. The main focus of RareChain is its API which will act as an index strategy creator that is programmable independently for each user within our platform where they can manage their strategies and create their own algorithms. At a later stage user-based trading data will be analyzed and compared along with an infinitely optimizable Artificial Intelligence for the real-time adjustments in the API weighting method. This will eventually enable smart index creation and training & deployment of complex AI-based models.



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Overview

Rarechain is a stability-focused DeFi Ecosystem which includes its own governance token, Qao (QAO) and its stablecoin (RARE) that can be used on Rarechain API. QAO will also be used for staking to earn fees from RareSwap.

RARE is pegged to a iSmartAlpha (WI) built from over 1000 assets including stocks, bonds, ETFs, commodities, cryptocurrencies and other indices. RARE will serve as a proof of concept for RareChain's API on top of which the iSmartAlpha is built.

QAO is the governance token for RareChain with focus on voting and governance and the gradual complete decentralization of the RareChain ecosystem.

RareSwap is RareChain's own proprietary Swap solution optimised for the use of indexes created via the RareChain API.

RarePool is Rarechain's own staking pool solution optimized for automated staking.

Validator key owner: User & Service

Withdrawal key owner: User

Pool token: Yes

3rd Party Software: No

Min. Stake: 0.01ETH

Fee: 10% (50% of rewards fees goes to QAO stakers)

RareChain's API is a de-facto index strategy creator that is programmable independently for each user within our platform where they can manage their strategies and create their own algorithms. Our objective is to have a fully functional and optimizable algorithms-based dynamic financial model, which has its settings shareable with extensive analysis data sets. User-based trading data will be analyzed and compared along with an infinitely optimizable Artificial Intelligence for the real-time adjustments in the weighting method. With a decentralized approach to methodical diversification, we believe each can contribute regularly or not with various strategies with varied investment instruments. We also believe in the resource-based view of diversification and foremost in the power of the network to process asset analysis to minimize overall index risk and higher the potential of growth. Some of the use cases for RareChain's API include (but are not limited to):

- Markets AI analysis
- Custom Smart Indexes creation
- Train/deploy AI
- Data Verification
- Supply chain data optimization

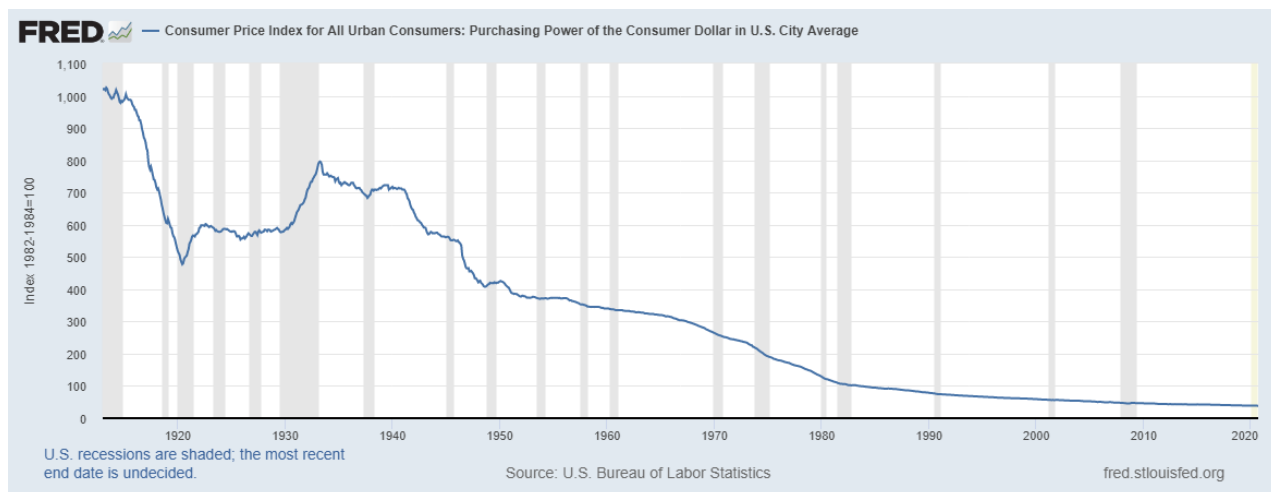
Economics

Stablecoin

The case for stablecoins

Stablecoins were a revolution in the crypto world. Without stablecoins there cannot be mass crypto adoption since merchants and non-crypto-natives will not accept the risk of huge price volatility. For the most part stablecoins are pegged to a FIAT currency (most commonly the US Dollar, but sometimes other currencies as well).

The USD, however, itself is not really stable (although it is the de-facto world reserve currency)! If we look at data provided by the Federal Reserve¹ we can see that the purchasing power of the USD has plummeted over 25 times (!!!) over the past 100 years.



This begs the question - how stable are stablecoins really if they are pegged to the USD. Wasn't the original goal of Bitcoin to preserve our purchasing power against the rapid devaluation of global currencies.

Rarechain aims to address the above issues by creating a fully decentralized stablecoin which is pegged to a complex iSmartAlpha comprising nearly 1000 asset classes. The pegging mechanism will be fully decentralized and will be a combinations of what has already been done by Maker² and Synthetix³.

¹ <https://fred.stlouisfed.org/series/CUUR0000SA0R>

² <https://makerdao.com/en/>

³ <https://www.synthetix.io/>

The iSmartAlpha Index is a market index that covers 100-300 indexes(covering over 10000 companies), 100-200 ETFs, 3 Diamond indexes, 10-20 commodities, 20-100 cryptocurrencies, 20-30 currencies, 6-10 metals products. It uses a dynamic weighting method which combines user-centric performance metrics and AI.

The RareChain stablecoin (RARE) will be the token pegged to the said index and it will serve as a proof of concept for the other major deliverable of the the RareChain project - a complex API enabling anyone to create intricate and complex indices on top of the Ethereum blockchain (and later on, on Rarechain's own blockchain).

The RARE token will be managed via a governance token named QAO (Qualified Autonomous Organisation).

The end result is RARE becoming a Stability-focused Ecosystem for DeFi and a revolution of community-driven asset management.

RARE creation (minting)

RARE is created in a similar fashion to other collateral backed crypto-assets:

1. A wants to lock some liquid cryptocurrency (full list of accepted tokens to be defined later) and open a RARE position.
2. The user deposits his/her collateral to the RARE smart contract.
3. The RareChain's API Oracle is queried to obtain the prices of (Collateral) /USD and (iSmartAlpha) /USD to determine the initial size of the RARE position.
4. The contract issues RARE tokens to the user based on the current collateralization ratio.

Value maintenance

RARE is expected to deviate slightly from the iSmartAlpha every now and then, however there are multiple stabilization mechanisms put into play to maintain this peg.

RARE is traded above its target value:

- Collateralization ratio decreases making it easier to create new RARE and enabling holders of existing RARE positions to mint RARE at no extra cost. Supply increases which should drive prices to decrease.
- This scenario creates arbitrage conditions, where RARE can be created, sold and later on re-purchased at a lower price in order to close the created RARE position.

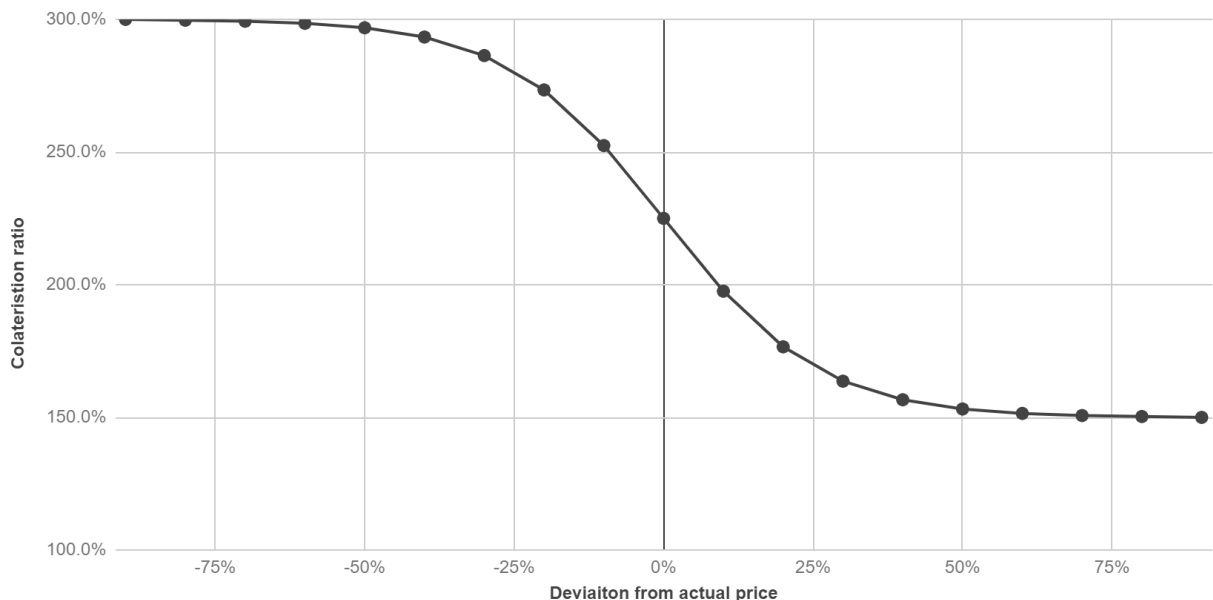
RARE its target value:

- Collateralization ratio increases making it harder for RARE to be created and requiring existing positions to increase their collateral.
- The liquidation ratio guarantees that eventually RARE will be restored to its peg (e.g. if in extreme conditions all RARE positions are liquidated, this will be done at a price near its peg point).
- This creates arbitrage conditions, where users can purchase RARE off exchanges and sell it for a profit once the price stabilizes.

On top of the above, governance token distribution to RARE position holders is maximised, when the RARE token's price is as close as possible to its peg (explained further in the Governance token section).

Collateralization ratios

When a RARE position is created, it is done so using a certain collateralization ratio. This ratio is determined by the current deviation of the asset (RARE) from its target (iSmartAlpha). The collateralization ratio falls on the range (150% : 300%).



If RARE is traded below its peg (iSmartAlpha) then the collateralization ratio increases, making it harder for new RARE to be created until the peg is restored. It also requires existing RARE positions to increase their collateral in order to maximize their QAO gain. This increases the scarcity of the asset, contracts its expansion and might even prompt certain users to close their RARE positions.

Inversely, if RARE is traded above its peg (iSmartAlpha) then the collateralization ratio decreases, making it easier to create RARE and enabling people who hold RARE positions to mint new RARE. Then they can opt to sell it on the open market, and once the price restores back to normal, buy it back in order to re-collateralize their position, making profit from the price difference in the meanwhile.

Lastly, the system also has a liquidation ratio which is fixed at 120%. If at any point in time, the value of the underlying collateral drops below 120%, the collateral will get liquidated.

Fees

One of the core features of RARE is the fire and forget approach to fees, where unlike similar projects a single fee is charged only at time of creation of RARE.

This fee is equivalent to 5% of the RARE position opened and is payable in QAO creating a self-enforcing loop between the stablecoin and the governance token. Eventually if the RARE position is open for long enough it will pay for itself by earning enough governance tokens to cover the initial cost.

Furthermore half of the fee collected is burned, creating a balancing mechanism for the supply of QAO.

Governance token

The qualified autonomous organisation (QAO)token is the governance token issued as a reward for participants in the ecosystem. QAO is a governance token with perpetual inflation and deflation, which will be rewarded to network participants who create RARE by providing collateral in other assets. The QAO main purpose is to be used for governance via voting on the system's parameters.

Issuance

The goal of Rarechain is to be fully decentralized. The path to decentralization will happen over time, since the project will need to be governed at least in the beginning.

Initial allocations of the RareChain project will be as follow:

- Liquidity pool: 4 500 000 000 000 tokens
- Initial Burn: 4 500 000 000 000 tokens
- QAO Locked Treasury - 1 000 000 000 000 tokens per year, for the first 4 years

After this point when Rarechain API launches QAO will be minted at a base rate of 100 000 000 QAO daily. The mint will have an additional multiplier for the mint amount, which would ensure a gradual decrease in the minted tokens over time. The minted tokens would be allocated as follows:

- 45% distributed pro-rata between everyone who holds an open RARE position (pro-rata based on their position size).
- 45% MM distributed to liquidity providers on RareSwap (pro-rata based on their position size).
- 10% MM distributed to Rarechain's API users, awarded to the most used and successful API implementations (created new indices) at the time.

Since the multiplier will be variable, the token inflation will be created with a decreasing multiplier of 1. The inflation will become lower overtime.

QAO treasury will be locked for community management of all spheres; Long-term Holding, Grants, Partnerships, Contributors Fund, Maintenance, Marketing, Development, Research. Each decision will be made by a vote of the whole community.

No other funds will be issued for the treasury as 10% of the fees collected from Rareswap goes to the QAO treasury, this makes it sustainable and self-funded as a true QualiFied Autonomous Organization.

Deflation

The deflationary mechanics of the QAO tokens will be community driven as follows:

- Buyback and burn events voted on by the community
- Reward buffer pool - the treasury will have a limit on the fees directed to it. Excessive fees generated from the protocol are diverted to a reward buffer pool to be used as protocol rewards reducing inflation.

Voting

Voting is intended as the main governance mechanism of the system. Pretty much all system parameters and functionality can be put up for a vote (including the voting rules). The initial set of rules under which voting will be held are described below. In order to be eligible for Voting QAO should be staked in the voting contract.

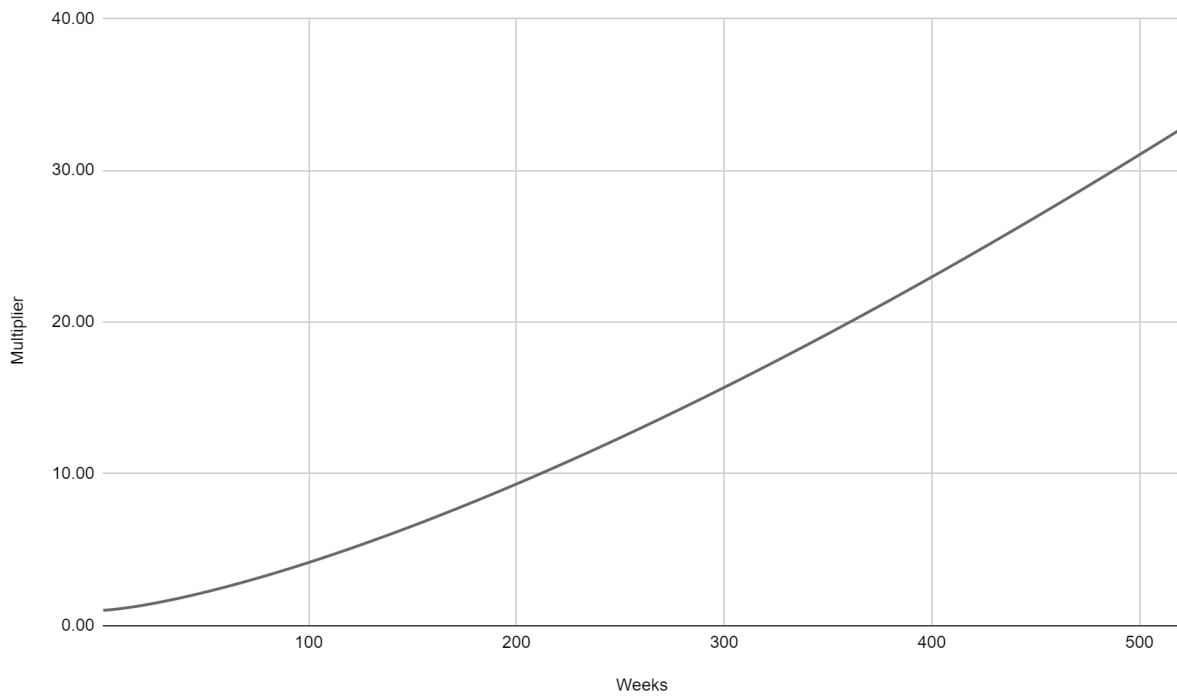
The goal for voting is to become easier over time and more distributed as the community grows. Due to this, even though QAO is perpetually inflationary, the amount of tokens needed to vote will be fixed to:

- 1 000 000 QAO needed to initiate a vote
- 10 000 000 QAO needed for a vote quorum - the minimum number of tokens that need to vote before the vote is considered valid.
- Proposal passes if 51% of the tokens which voted, voted for “Yes”

Only tokens which are staked in the voting module are eligible for voting and for receiving rewards. When the tokens are staked, it can be done so in two ways:

- Without duration - e.g. the tokens can be unstaked at any given point in time within 1 day minimum.
- With duration - a minimum of 1 week and a maximum of 10 years

Tokens staked with duration receive a duration multiplier which is used both for voting and for voting weight and for rewards. The multiplier (M) is determined by the following chart and formula, based on number of staked tokens (T) and staked duration in weeks (D):



$$M = 1 + 0.005 \times D^{1.4}$$

So for example, if a person stakes with no duration, he gets a multiplier of 1 - his voting power and rewards shares are equal to the staked tokens. If however he stakes for 104 weeks (2 years), he gets a reward multiplier of 4.33, so that for each token staked he gets 4.33 voting/reward shares.

The purpose of this is to incentivise people who are long-term committed to the protocol with better rewards and have them be the key decision takers.

Technical specification

Implementation

RareChain will be implemented in several stages. Initially the ecosystem will be deployed on Ethereum, at a later stage migrated to layer2 with zkSnarks and eventually transferred to its own blockchain solution. A more detailed roadmap of the expected implementation stages can be found below:

Project roadmap:

- **Stage 1:**
 - Deploy initial version of QAO on Ethereum
- **Stage 2:**
 - Deploy initial version of Rarechain's API
 - Deploy initial version of RARE on Ethereum
 - Integrate QAO with RARE
- **Stage 3:**
 - Deploy initial version of RareSwap on Ethereum
 - Integrate QAO with RareSwap
- **Stage 4:**
 - Migrate to layer 2 on zkSnarks
- **Stage 5:**
 - Deploy own blockchain solution (RareChain)
 - Enable migration of RARE form Ethereum to RareChain
- **Stage 6:**
 - Optimize RareChain TPS
 - Optimize RareChain rewards for miners
- **Stage 7:**
 - Finalize RARE migration to RareChain
 - Migrate QAO to RareChain
- **Stage 8:**
 - Migrate RareSwap to RareChain
 - Introduce Proof-of-loyalty to RareChain

RareSwap

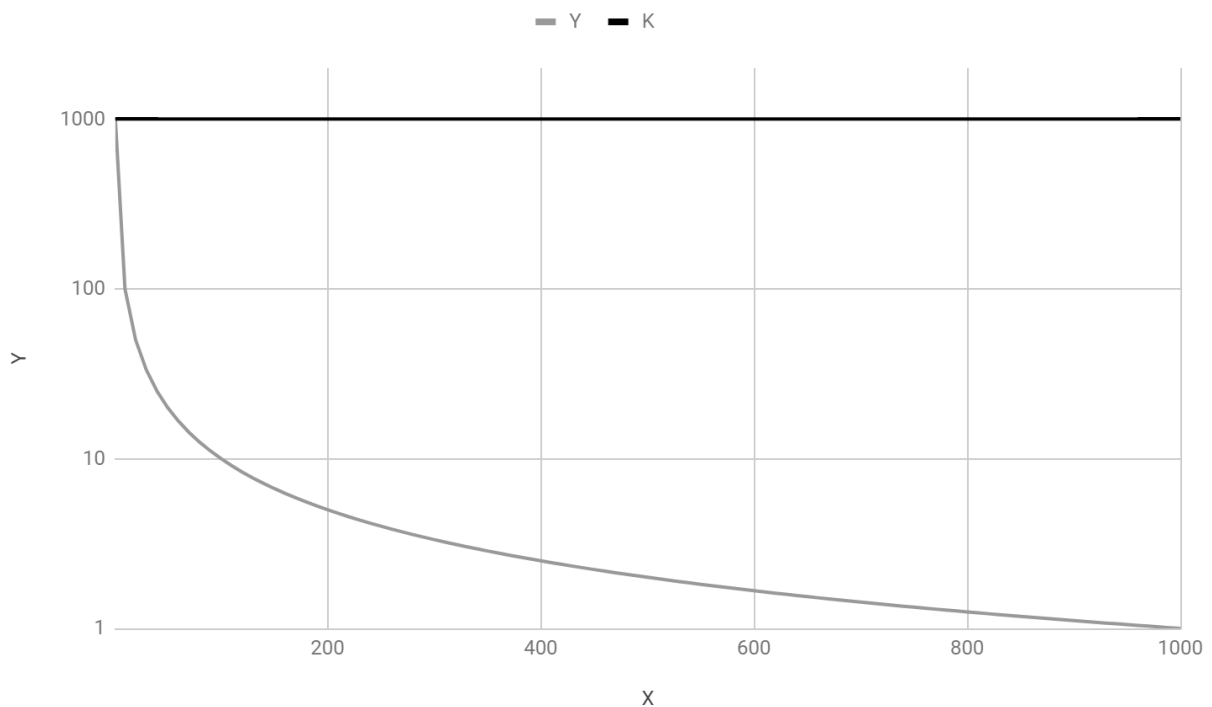
During the early stages of the project RARE and QAO will be integrated with existing market swap solutions like UniSwap. Incentives will be offered to liquidity providers on those platforms in the form of QAO allocations proportional to the liquidity provided.

At a later stage the RareChain project will launch its own swap solution (RareSwap), optimised for the usage of indexes created by the RareChain API. At this stage QAO incentives will be offered exclusively on the project's swap solution.

RareSwap will act like an automated market maker (AMM) similar to other DeFi solutions in this regard. Automated market makers are smart contracts that hold liquidity reserves (or liquidity pools) that traders can trade against. These reserves are funded by liquidity providers. Anyone can be a liquidity provider who deposits an equivalent value of two tokens in the pool. In return, traders pay a fee to the pool that is then distributed to liquidity providers according to their share of the pool⁴.

RareSwap will follow the industry standard pricing model of:

$$x * y = k$$



*Constant product of $x * y = k$ note the logarithmic vertical axis*

Let's illustrate this with an example:

So, let's consider a theoretical RARE/USDT liquidity pool. Let x be the RARE portion of the pool x and y the USDT portion of it. The swap solution takes these two quantities and multiplies them to calculate k which is the total liquidity in the pool. The basic premise is that k remains constant.

⁴ <https://academy.binance.com/en/articles/what-is-uniswap-and-how-does-it-work>

Below is an explanation of the mechanic from Binance academy⁵:

Let's say Alice buys 1 ETH for 300 USDT using the ETH/USDT liquidity pool. By doing that, she increases the USDT portion of the pool and decreases the ETH portion of the pool. This effectively means that the price of ETH goes up. Why? There is less ETH in the pool after the transaction, and we know that the total liquidity (k) must remain constant. This mechanism is what determines the pricing. Ultimately, the price paid for this ETH is based on how much a given trade shifts the ratio between x and y .

It's worth noting that this model does not scale linearly. In effect, the larger the order is, the more it shifts the balance between x and y . This means that larger orders become exponentially more expensive compared to smaller orders, leading to larger and larger amounts of slippage. It also means that the larger a liquidity pool is, the easier it is to process large orders. Why? In that case, the shift between x and y is smaller.

RareSwap will incur a 0.3% fee on each trade, with the allocation of this fee distributed as follows:

- 10% to the QAO treasury for community management
- 90% to QAO token holders as incentives for voting and staking

RareSwap will also enable trading of derivatives and synthetic assets.

API

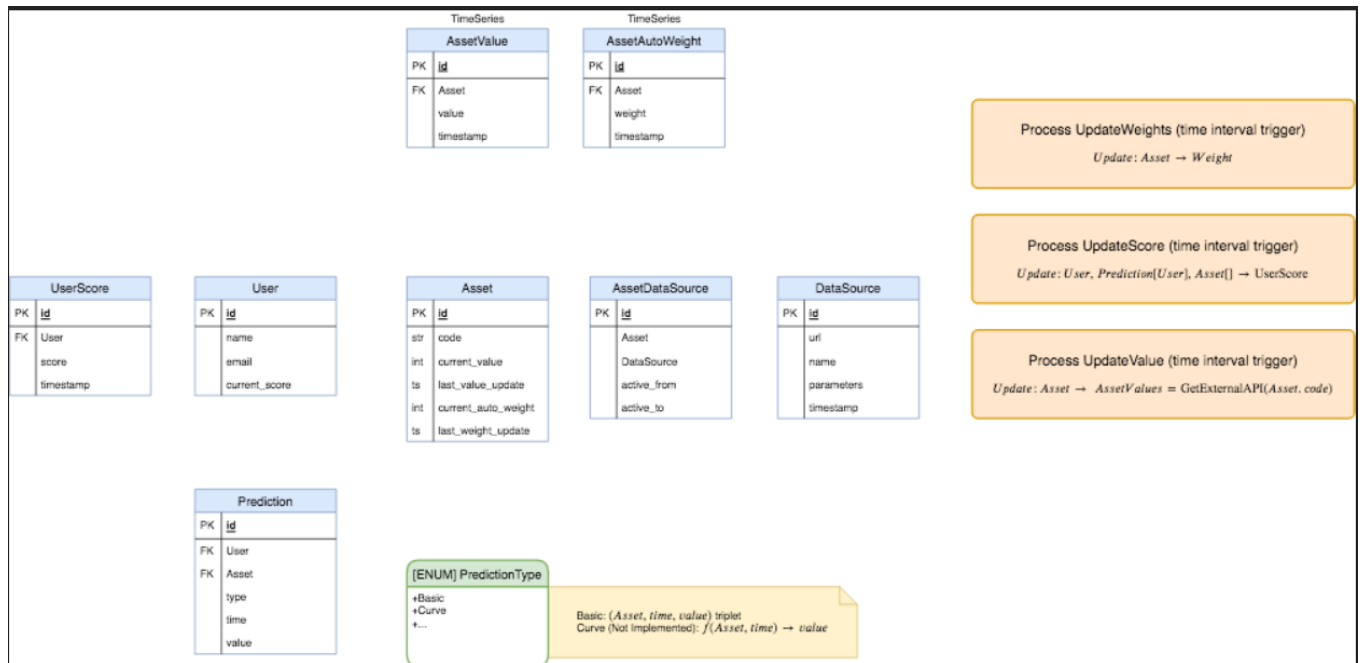
The goal of the RareChain API is to enable exclusive algorithm creation by and for the RareChain community. The endgame for the RareChain API is to become a human-understandable interface for connecting humans to AI with real-life applications. In the short (immediate) future it will enable users to create complex and transparent indices using various data sources.

Below is a shortlist of only part of the APIs which will be available through the rareChain API:

- Yahoo
- IEX Cloud
- Quandl
- Polygon
- Intrinio
- Alpaca Markets
- Aragon

⁵ <https://academy.binance.com/en/articles/what-is-uniswap-and-how-does-it-work>

- Algorand
- Perlin



Each index which will be created in this way is going to be fully transparent (available for review to the entire community). Once the index is deployed, the API will enable the index owners to:

- Backtest the index performance
- Tokenize the index using various approaches:
 - **Collateralized token creation** - where the owners will be able to automatically deploy a collateral backed token on the Ethereum network, via the RareChain API, after specifying liquidity and collateralization requirements.
 - **Non-collateralized token creation** - where the token will be deployed without a collateral, but with a smart contract fixing the exchange price at the tracked asset.

All operations performed via the RareChain API will incur fees, which will be re-distributed as follows:

- 10% to the QAO treasury for community management
- 90% to QAO token holders as incentives for voting and staking

In the pipeline

The above functionalities are only part of what RareChain has in store for its users.

At a later stage, using the AI capabilities of the platform, users of the API and index creators will be able to:

- Optimize indexes
- Analyze multiple markets simultaneously
- Explore index and market correlations
- Perform automated technical analysis
- Analyse index and market fundamentals

Indexes themselves will be segmented in various baskets, as per their compositions:

- Developed
- Advanced
- Emerging

Product wise, RareChain wants to expand its ecosystem, by either developing or integrating with the following solutions:

- Decentralized Encrypted Ledger
- Password-Protected Transactions
- OTR messaging
- Custom Confirmation Payment
- Key-Locked Vaults
- Automated Transactions
- Complex voting rules
- Data Analytics
- P2p escrow transaction protocol
- Rarity Meter

Where to find us

www.QAO.io