



# Omnichain RWA portfolio management protocol with built-in lending market

Optimal Diversification of RWA holdings via on-chain tokenized baskets

---

White paper v.1.2

Powered by  **ASTERIZM**

*Konstantin Gamalev, Denis Polulyakhov, Artem Avdeev –  
Created 29/07/ 2024 • Updated 13/09/2024*

# Contents

---

1. RWA market overview.....	3
2. What problem do we address?.....	6
3. Solution Design.....	8
3.1 Baskets of RWA Tokens.....	8
3.2 Asterizm's Cross-Chain Stack as a Crucial Solution to Fix Market Fragmentation.....	9
4. Lending solution.....	11
4.1 Core Functionality .....	11
4.2 User Interface.....	13
5. Integration of non-EVM chains.....	14
6. Scope / Out of Scope.....	16
7. References.....	17

# 1. RWA market overview

This document outlines a blockchain solution for structured baskets, portfolio management and on-chain secured borrowing mechanisms that use tokens backed by the real-world assets (RWAs), to facilitate diversified baskets with customized underlying constituents and on-chain secured financing. The process of off-chain of assets registration, tokenization and on-chain issuance are not within the scope of this solution.

## Business case:

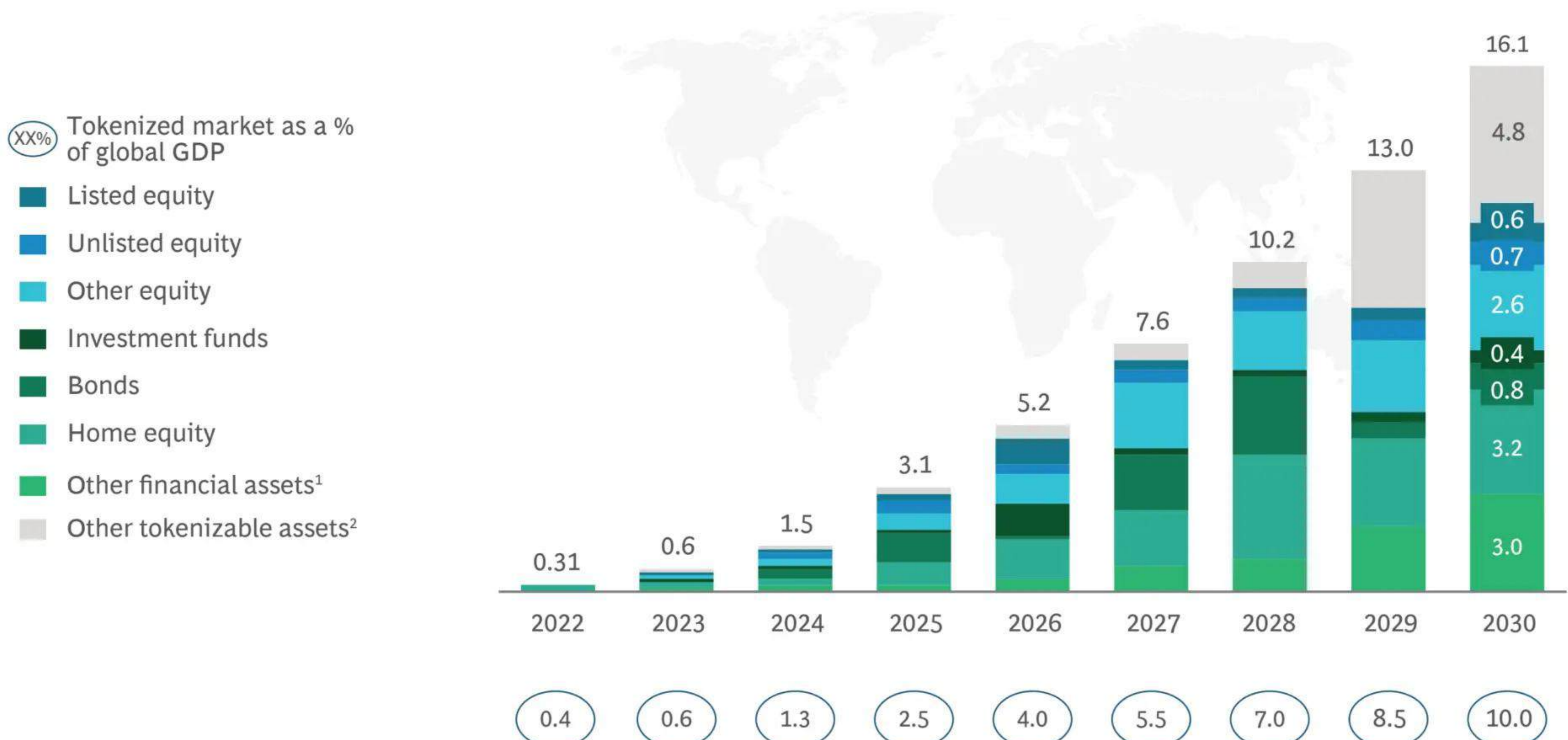
The RWA tokenization market is expanding rapidly, with major applications including government treasury bonds (mainly US, currently \$2 billion with an average yield to maturity of 4.95%), private asset-backed credit (standing at \$8.5 billion with an average APR of 9.45%), and tokenized commodities (current market cap at \$873 million).

**Figure 1: Examples of RWAs**

<b>Tangible Assets</b>	Real Estate	Commodities	Collectibles
<b>Intangible Assets</b>	Bonds	Equities	Carbon Credits

According to a report by the Boston Consulting Group, the market for tokenized assets is projected to reach US\$16 trillion by 2030, which would constitute 10% of the global GDP. This marks a substantial rise from US\$310 billion in 2022. The projection encompasses both on-chain asset tokenization, which is particularly pertinent to the blockchain sector, and traditional asset fractionalization, such as exchange-traded funds (ETFs) and real estate investment trusts (REITs). Given this anticipated market size, securing even a modest share could significantly benefit the blockchain industry.

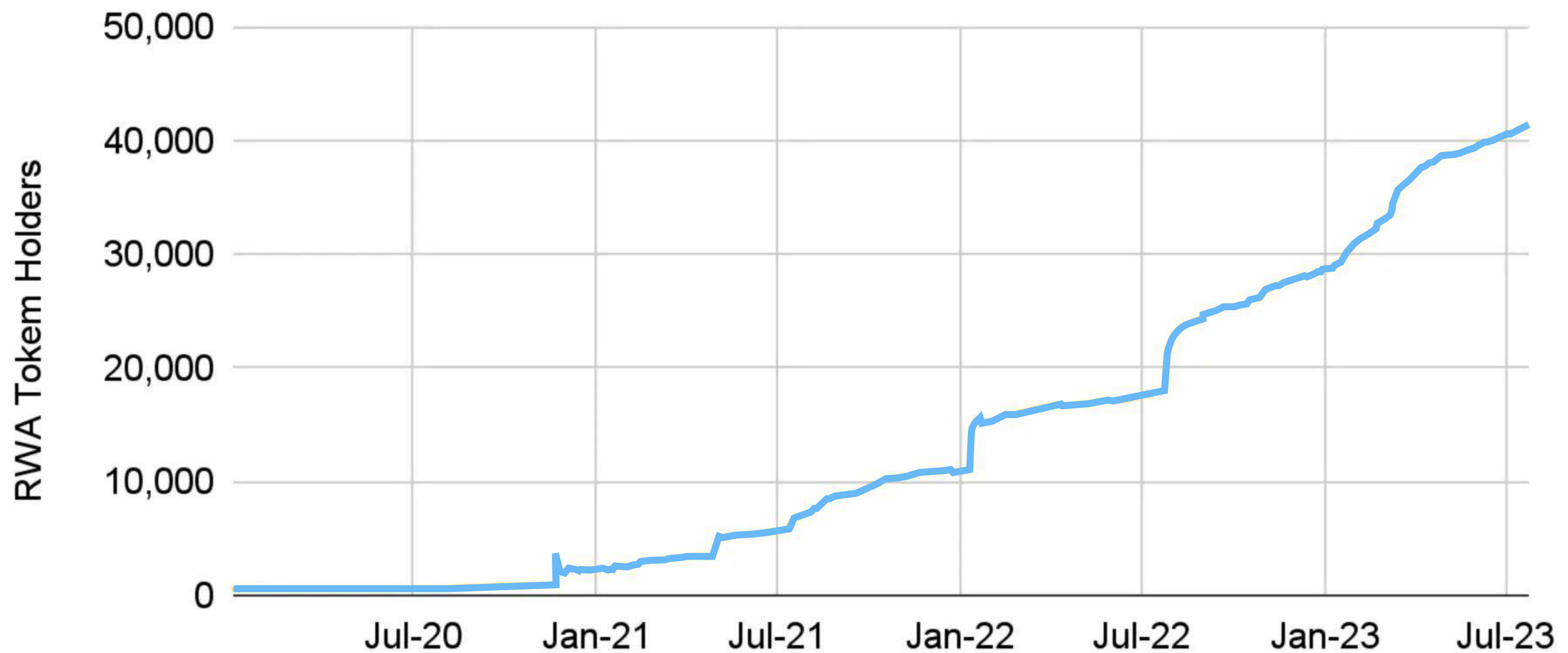
**Figure 2: The tokenization of illiquid assets is estimated to be a US\$16T business opportunity by 2030**



Source: Boston Consulting Group

Even at US\$16 trillion, tokenized assets will represent a relatively small portion of the current total global asset value, which is estimated at US\$900 trillion—amounting to less than 1.8%. This calculation does not account for future growth in global asset values. One could argue that the actual addressable market is the entire global asset market, as any asset that can be tokenized could potentially be represented as real-world assets (RWAs) on-chain.

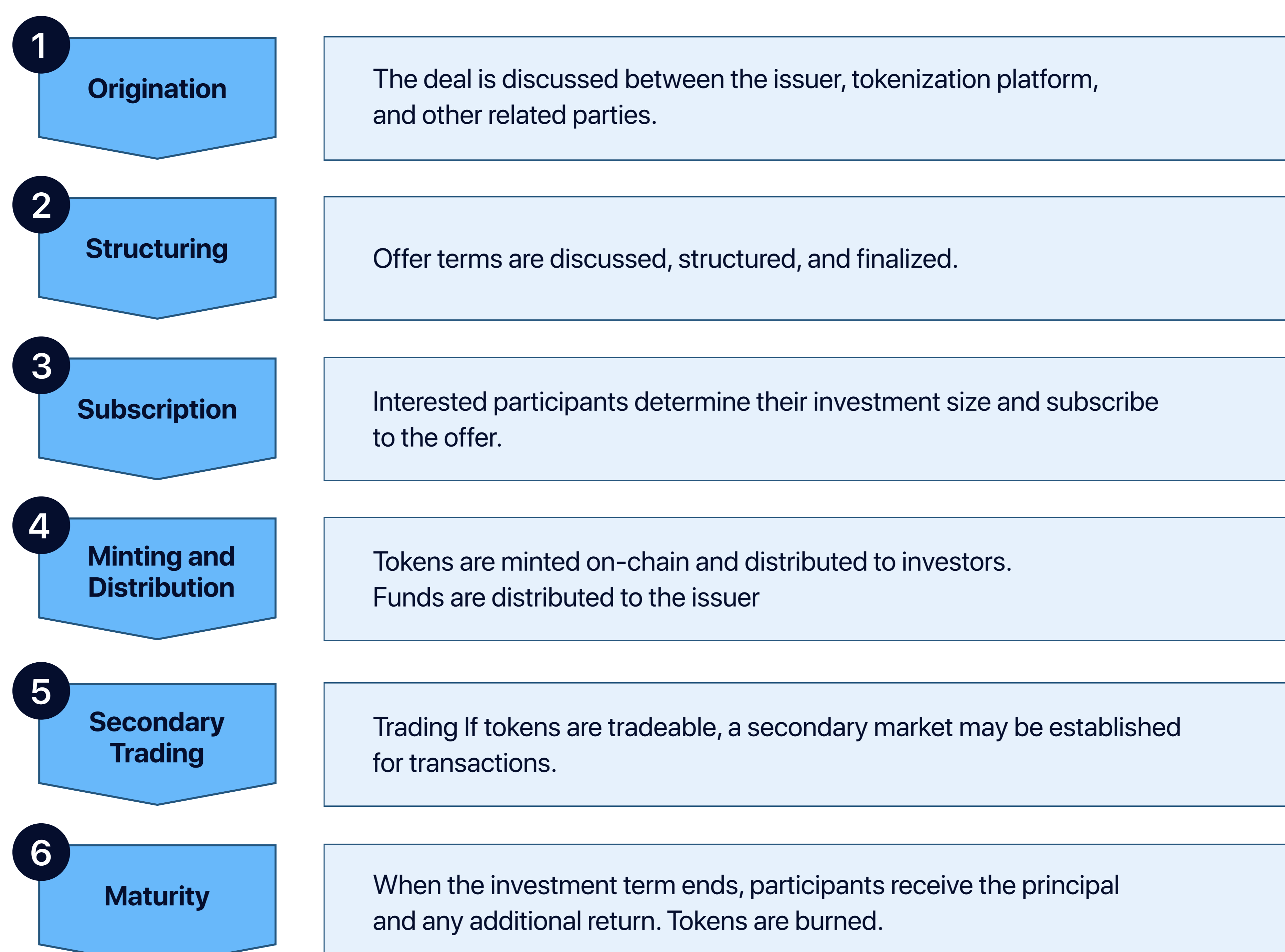
**Figure 3: The number of RWA token holders has increased steadily**



Source: Dune Analytics (@j1002), as of Jul 24, 2023. RWA Tokens Tracked: wCFG, MPL, GFI, FACTR, ONDO, RIO, TRADE, TRU, BST

For real-world assets (RWAs) to be represented on-chain, their ownership and representation need to be recorded on the blockchain. While the specific processes can differ, the general approach involves finalizing the deal terms before minting tokenized representations of the assets on-chain.

**Figure 4: Example of on-chain tokenization process**



Source: Boston Consulting Group, Binance Research

## The problem of illiquid assets

During the initial RWA tokenization phase, an agent facilitates initial sale of tokenized real world assets to investors via on-chain platforms/protocols such as, but not limited to: Backed Finance, Ondo, Goldfinch, Maple, Credix, Midas, and Arca Labs. After the initial token sale is completed and RWAs are minted on-chain, investors pay stablecoins to the agent platform and receive the tokens (primarily ERC20) in their respective wallets. Currently, there is no liquid secondary market available for RWA tokens, so these tokens become long-term investments in users' wallets and are redeemed at maturity or sold back to the issuer platform for a fee.

## Lack of interoperability

While tokenized RWA is an asset, secondary market solutions for these assets are not well developed at the moment, leading to a significant amount of value being locked on-chain. The primary reason is that RWA-backed tokens are issued by competing protocols operating in different blockchains that are not interconnected and do not have common interface to standardize and group these RWAs into usable automated liquidity pools based on underlying asset characteristics such as: asset class, issuer where applicable, credit rating, maturity date, geography and so on.

## Lack of lending markets for tokenized RWAs

In traditional capital markets, investors can pledge various types of securities for margin financing. Similarly, holders of RWA tokens may use them to borrow funds for additional leverage, increase existing RWA positions, or gain exposure to other investment opportunities. In a favorable interest rate environment, where the cost of short-term financing is lower than long-term rates, a classical REPO trade can be executed on the platform. This allows an investor to gain a positive interest rate spread by holding a long position in higher maturity bonds while financing with short-term borrowings. Another scenario is when an investor anticipates a bullish trend in some asset classes; they can pledge protocol native tokens as collateral, borrow stable coins and use them to buy trending baskets, or even off-ramp stable coins out of the crypto space if needed.

## 2. What problem do we address?

The practice of Real World Asset (RWA) tokenization is currently growing at a rapid pace, with many platforms tokenizing various asset classes such as real estate, government and corporate bonds, stocks, commodities, precious metals, and other exotic assets. These tokens are issued on multiple blockchains, but there is currently no single protocol that enables seamless cross-chain integration, allowing investors to combine different RWA tokens and NFTs into a unified portfolio, track, and maintain it on one platform. Information regarding newly issued RWAs is often fragmented and difficult to find, requiring retail investors to spend countless hours browsing the web to research and assess the risks associated with custody and new issuances.

In traditional finance, private investors typically allocate funds into various types of managed funds (mutual funds, hedge funds, closed-end, open-end, ETFs) to diversify risk, reduce transaction fees, and save time by relying on professional fund management. According to Markowitz's Efficient Frontier [academic research](#), a well-diversified portfolio has historically outperformed individual assets on a risk-adjusted basis. Rational investors, therefore, tend to invest in diversified portfolios or index funds. Similarly, rational on-chain high-net-worth crypto investors have a need for well-diversified portfolios. While the crypto space offers diversification within the realm of altcoins, memes, and NFTs, it does not provide diversification outside of crypto, leaving on-chain investors with concentrated risk in the crypto market.

RWA tokenization offers a promising opportunity for better diversification by bringing traditional financial instruments, as well as exotic or innovative asset classes such as carbon credits, racehorses, and diamonds, onto the blockchain. However, friction still exists in transactions because these assets are tokenized by different issuers across multiple blockchains.

The Liquid protocol provides an innovative, secure, and convenient way to invest in a well-balanced and diversified on-chain portfolio of tokenized RWAs. Liquid platform integrates leading RWA issuer platforms and conducts thorough due diligence covering asset quality, tokenization processes, custodian risk ratings, and legal compliance reviews. On-chain investors will benefit from the convenience and peace of mind of investing in diversified on-chain funds or portfolios composed of RWAs issued across various platforms and blockchains. The solution will facilitate innovative on-chain structured products that cannot be created in traditional Web2 finance.

Additionally, some RWA issuers impose high minimum investment amounts, typically ranging from \$5,000 to \$100,000, which makes it difficult for the average retail investor to build a diversified portfolio. Liquid protocol eliminates this barrier by allowing investors to purchase fractional shares of tokenized RWA portfolios. All incoming repayments and dividends from RWAs will be distributed to the portfolio and its token holders according to their percentage of ownership, ensuring that even smaller investors can participate in and benefit from a diversified on-chain portfolio.

### **To summarize the problem (potential clients/users):**

- There is a growing demand among rational, high-net-worth crypto individuals for exposure to real-world assets (RWAs) through well-diversified portfolios.

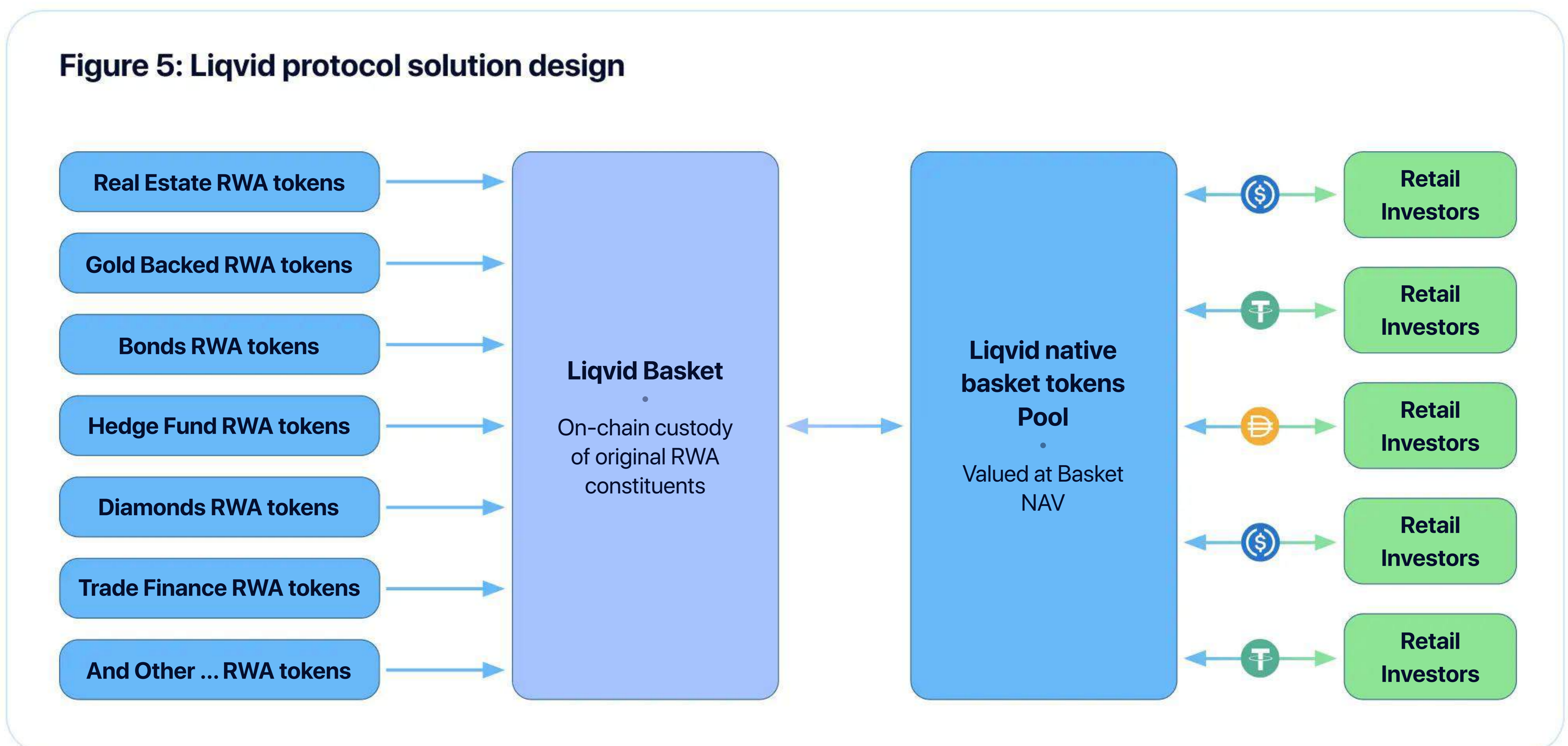
### **Challenges:**

- RWA tokens are issued across various blockchains, with no common interoperability protocol for constructing portfolios from tokens issued on different platforms.
- High minimum investment amounts make it difficult for smaller investors to access RWAs.
- Information on tokenized RWAs is fragmented, including details about platforms, the tokenization process, jurisdictions, and legal recourse.

## Our Solution:

Liquidity protocol will provide an innovative, secure, and convenient way to build diversified portfolios of tokenized RWAs, including professionally managed RWA index funds. These portfolios are composed of RWA tokens or basket tokens issued on multiple blockchains by various platforms. The platform will also support the creation of tokenized fund-of-funds structures once individual investment funds are deployed on-chain as part of the tokenization process.

Anyone with a crypto wallet will be able to purchase basket shares using stablecoins, following a successful KYC process. The diagram below illustrates a general overview of the basket composition.



## 3. Solution Design

### 3.1 Baskets of RWA Tokens

The basket will consist of RWA tokens issued by various issuers on multiple blockchain platforms. These tokens will initially be purchased and placed into Liquidity smart contracts on their respective chains, as part of an on-chain custody system. Cross-chain communication will enable integration with a master basket smart contract located on the home chain. This master contract will issue Liquidity Basket native tokens, which represent proportional ownership claims on the basket's Net Asset Value (NAV) and quoted at the corresponding NAV price per token.

Retail investors will be able to buy Liquidity Basket native tokens at the protocol's portal and receive them in their corresponding on-chain wallet controlled by the user.

**[Redemption]** In case of an exit basket token holders will have an option to redeem RWA tokens from the basket contract according to the prevailing basket asset allocation ratios by burning their Liquidity Basket native tokens.

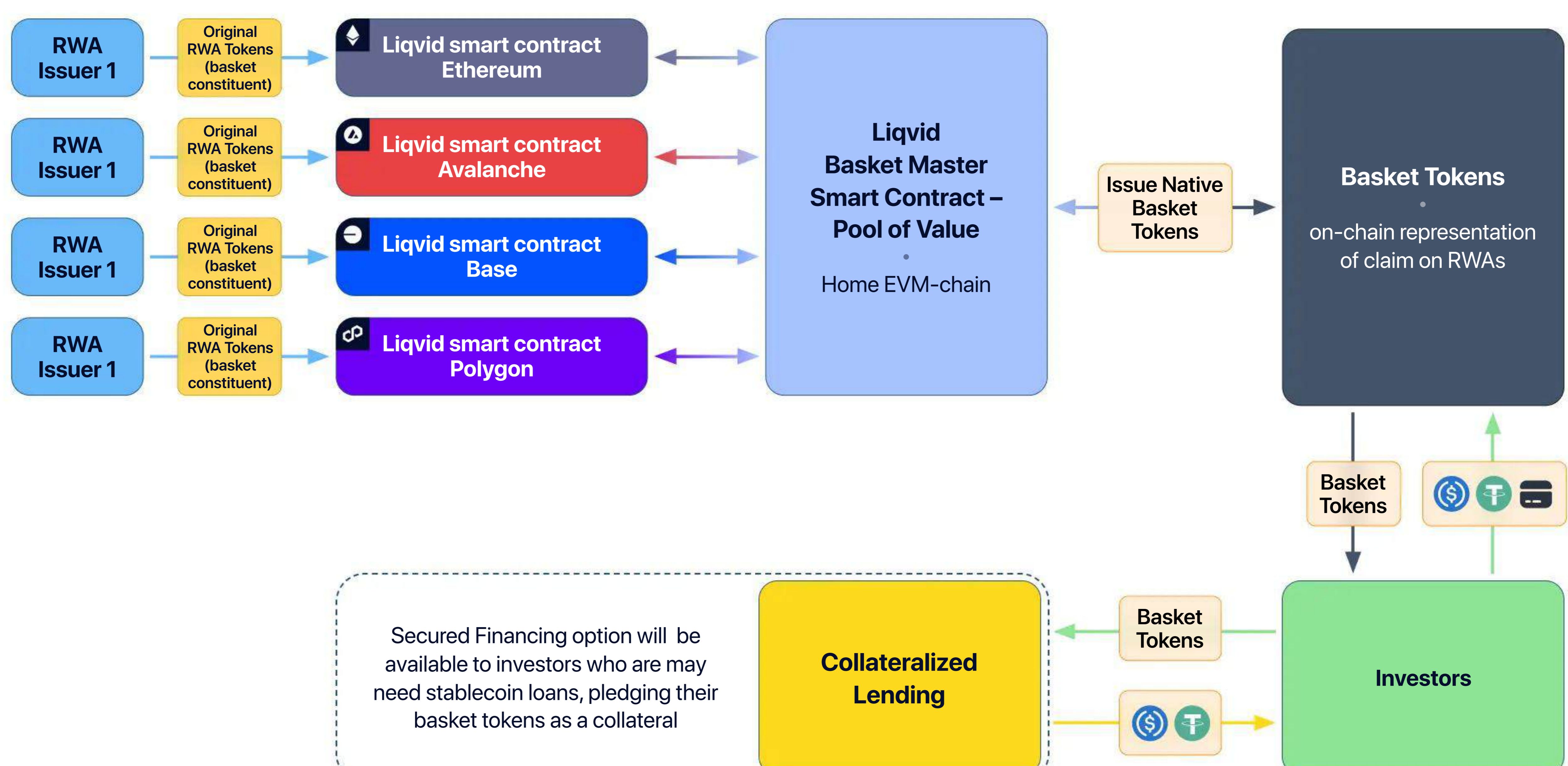
Additionally, basket token holders will be able to sell their basket tokens to the Liquidity protocol for cash, at prevailing basket NAV price.

**[Price oracles]** The basket's NAV and the token price will be derived from market value of the individual RWA tokens within each basket. An oracle will be established for each RWA position: for RWAs with active markets, prices will be sourced from the relevant markets; for RWAs without active markets, prices will be obtained from specialized appraising service companies.

The on-chain structure of baskets will be supported by the off-chain fund management.

**[Value flow]** Onchain flow of value is illustrated by the diagram below, starting from left to right with initial purchasing of RWA tokens of interest from approved issuers and placing them in corresponding Liquidity controlled on-chain custody smart contracts in various blockchains where RWA tokens are originally purchased. Then after all basket RWA constituents are purchased in, the basket is considered finalized and Liquidity native basket tokens are minted for each basket and set available for sale to the on-chain investors.

**Figure 6: RWA value flow**





**[Customizable baskets]** There will also be functionality for advanced users and professional portfolio managers to create their own tokenized baskets of whitelisted RWA tokens within the Liquidity protocol, allowing them to offer these baskets to other investors. These transactions will take place within Liquidity's network of cross-chain smart contracts, optimized for efficient transaction costs.

**[Basics and principles]** High data quality, UI convenience, asset security, and transparency of holdings will be core principles of the protocol. Users will have easy access to key portfolio risk metrics, such as Sharpe ratio, correlation with major indices, and historical basket performance over a large time frame.

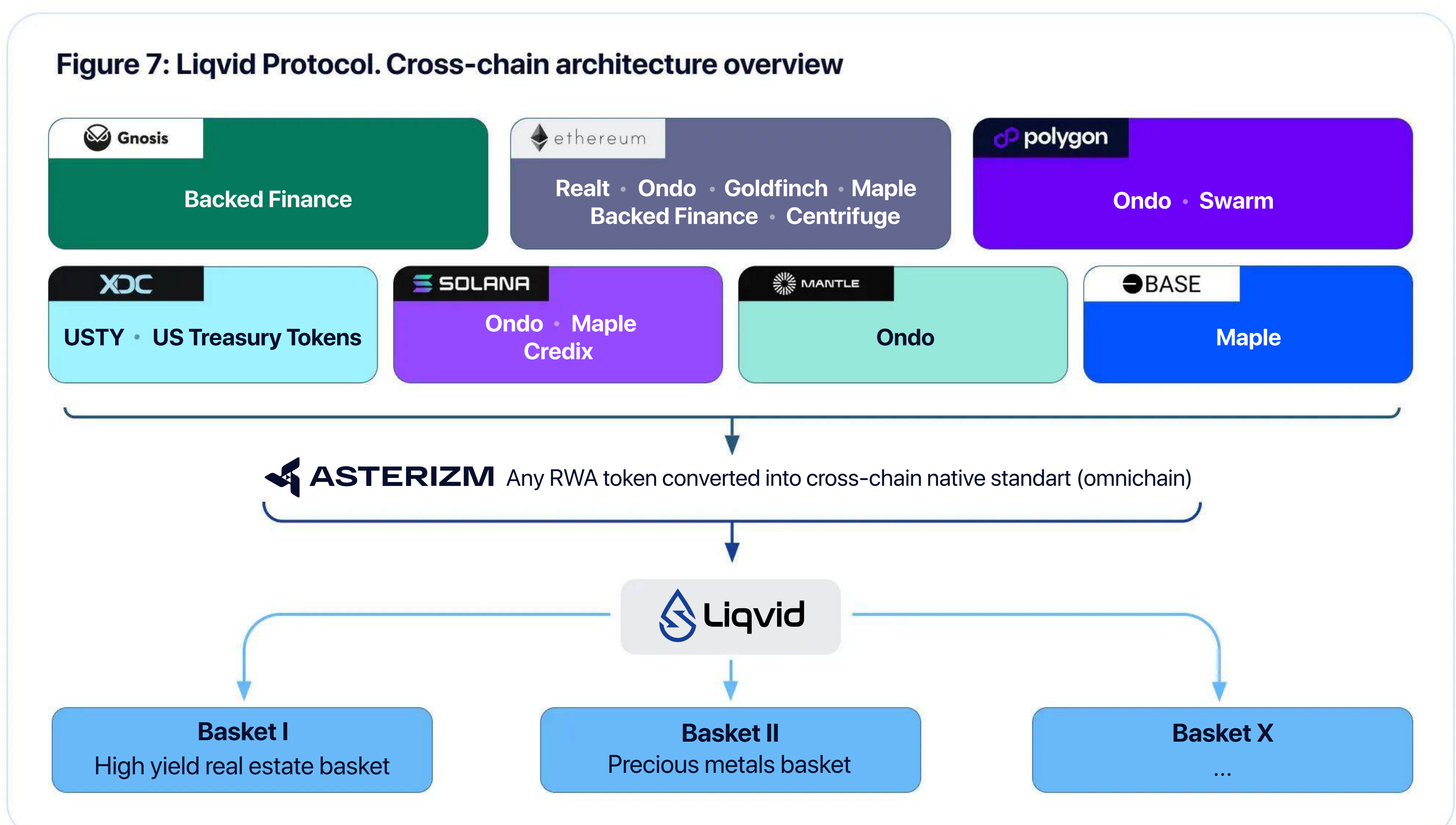
#### Key Value Proposition Points:

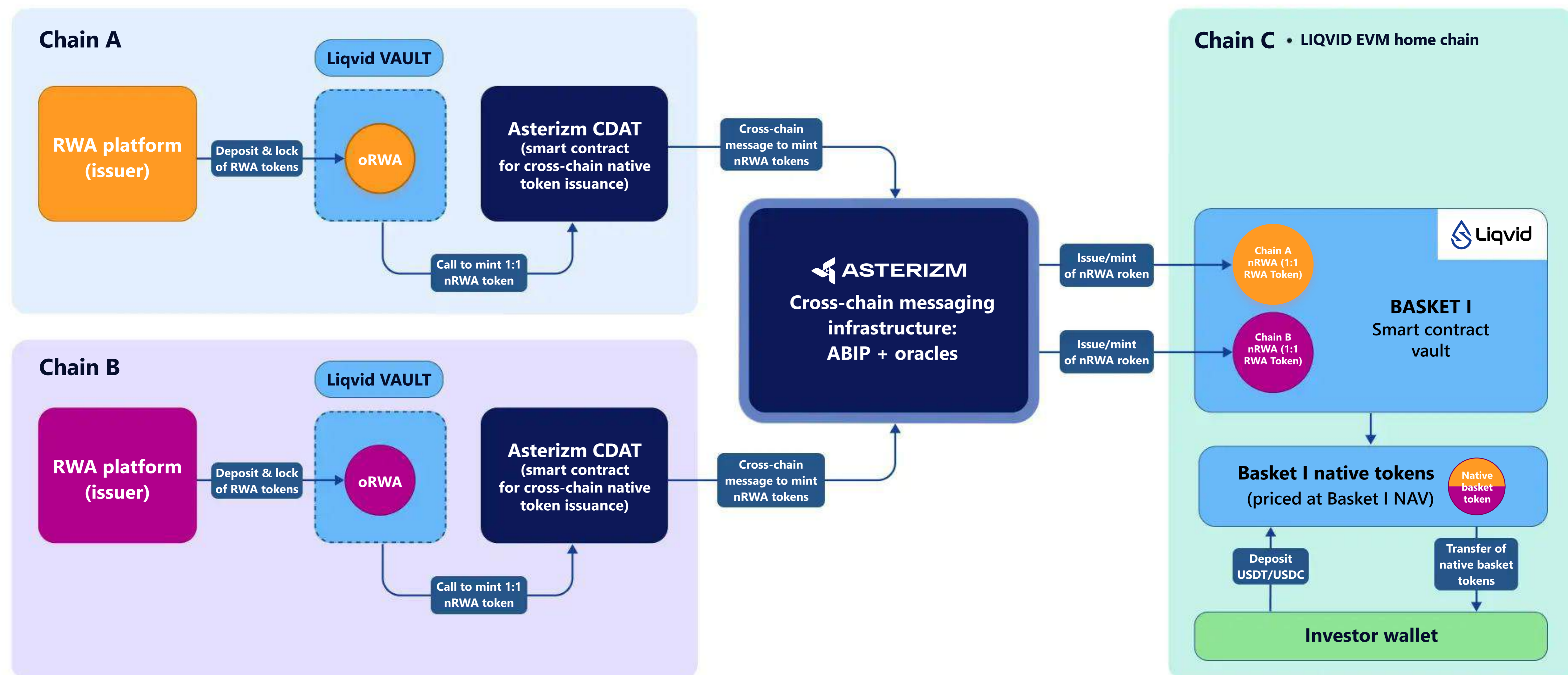
- Investors undergo a single KYC check (at Liquidity) and gain seamless, cost-efficient access to all RWA issuers integrated with the Liquidity protocol.
- Investors can gain exposure to a large number of RWAs with just one transaction.
- The low minimum purchase at the basket level makes RWAs accessible to more retail investors.
- A secured financing option allows investors to pledge protocol native basket tokens as collateral for stablecoin loans, enabling access to liquidity while remaining invested in the basket.

## 3.2 Asterizm's Cross-Chain Stack as a Crucial Solution to Fix Market Fragmentation

As highlighted above, one of the primary challenges in the current landscape is market fragmentation. The diverse array of tokenization protocols lacks interconnectivity, as they are deployed on disparate blockchains without effective communication and liquidity exchange mechanisms. Numerous platforms and protocols facilitate the initial sale of tokenized assets to investors, such as Realt, Backed Finance, Ondo, Wisdomtree Prime, Goldfinch, Maple, Credix, Midas, Swarm, Arca Labs, and others. However, these platforms are deployed across various blockchains, including Ethereum, Stellar, Solana, Polygon, Mantle, Base, and XDC. Consequently, a significant amount of value remains "stuck" on-chain, restricted to investors operating within the specific blockchain.

To address this issue, Asterizm's cross-chain native token standard and interoperability infrastructure will be utilized.



**Figure 8: RWA cross-chain aggregation logic with Asterizm ABIP & CDAT**


### Detailed Description of Cross-Chain Transfer:

- The receiving Liquidity smart contract accepts the RWA token in the originating network (designated as oRWA).
- The receiving Liquidity smart contract locks the oRWA tokens.
- The Liquidity issuing contract (derived from Asterizm’s asset tokenizer) issues new tokens in the cross-chain native (omnichain) standard, on a one-to-one basis with the locked tokens in the receiving contract (designated as nRWA). These tokens are issued in the network where the smart contract of the corresponding Liquidity basket resides.
- The Liquidity issuing contract transfers nRWA tokens to the smart contract of the corresponding basket.

Thus, the original oRWA tokens do not leave the originating network. However, with Asterizm’s cross-chain native token technology, users are relieved from the necessity of searching for and using bridges to interact with the protocol and receive liquidity in stablecoins against their RWA token collateral.

A comprehensive cross-chain transaction flow is detailed on the website, in the [white paper](#), and in the technical documentation available on the [Asterizm website](#)

## 4. Lending solution

### 4.1 Core Functionality

Liquid protocol will be composed of EVM compatible smart contracts, acting as liquidity pools that accept RWA basket tokens as collateral and release base asset (stable coin) to the borrower.

At its core - the solution will fork Compound III protocol, inheriting key functionality such as:

**4.1.1 Pool Interest Rates Model:** The interest rate in the pool will be determined by market supply and demand for borrowed liquidity, also known as the pool utilization rate. When the utilization rate is high, indicating high demand for base assets (borrowing stablecoins), the interest rate in the pool increases automatically, as calculated by a formula in the smart contract. Consequently, borrowers pay a higher rate. The increased rate attracts fresh capital from liquidity providers, which lowers the pool utilization rate, eventually allowing market forces to reach an equilibrium. Conversely, when demand for liquidity is low, the pool utilization rate drops, leading to a decrease in the cost of borrowing, which attracts new borrowers.

Below is an example of the **Interest Rate Model curve**, which shows that the relationship between utilization and interest rate is nearly linear until **utilization exceeds 90%**, at which point the interest rate increases exponentially.

Figure 9: Interest rates model curve

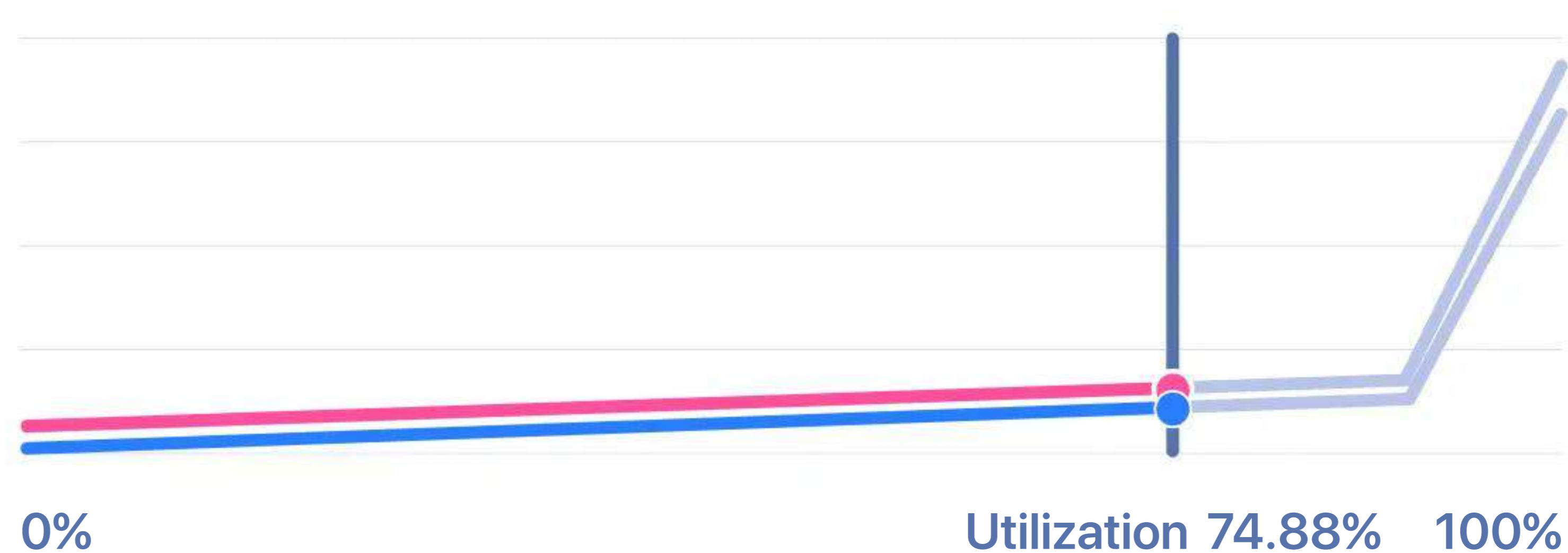
#### Interest Rate Model

Borrow APR

**6.06%**

Earn APR

**4.41%**



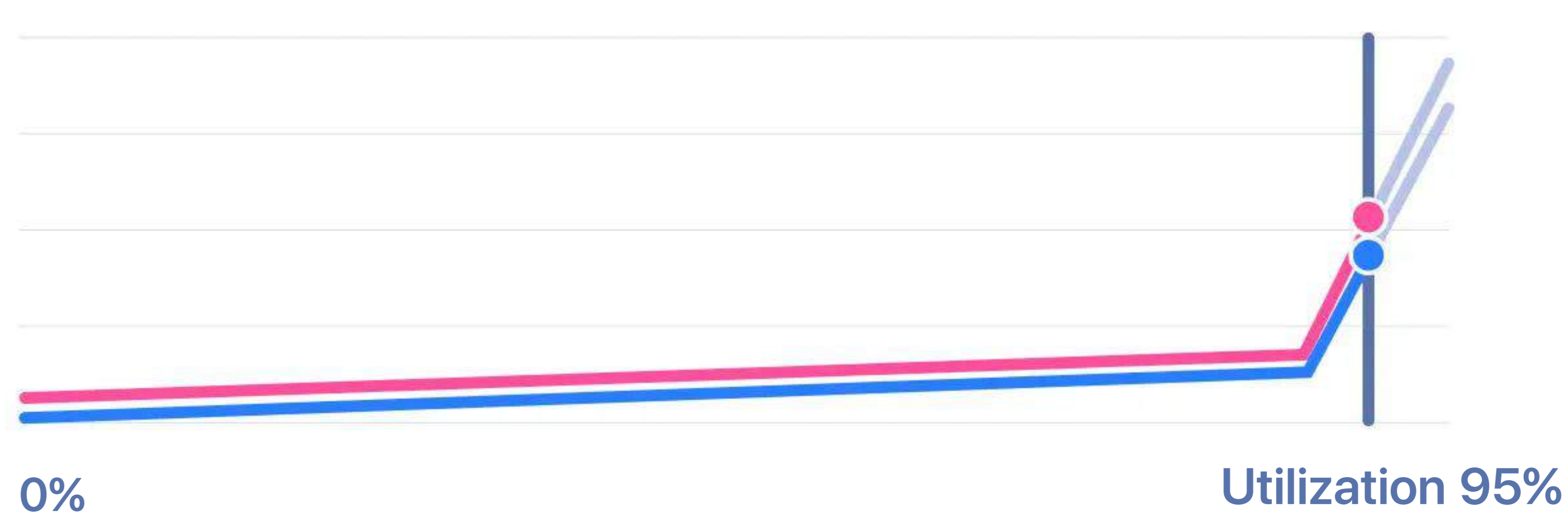
#### Interest Rate Model

Borrow APR

**26.19%**

Earn APR

**22.71%**



The relationship above is described by the following mathematical formula:

<b><math>L_t</math>, total liquidity</b>	Total amount of liquidity available in the reserve. The decimals of this value depend on the decimals of the currency.	
<b><math>B_s</math>, total stable borrows</b>	Total amount of liquidity available in the reserve. The decimals of this value depend on the decimals of the currency.	
<b><math>B_v</math>, total variable borrows</b>	Total amount of liquidity available in the reserve. The decimals of this value depend on the decimals of the currency.	
<b><math>B_t</math>, total borrows</b>	Total amount of liquidity available in the reserve. The decimals of this value depend on the decimals of the currency.	$B_t = B_s + B_v$
<b><math>U</math>, utilization rate</b>	Representing the utilization of the deposited funds.	$U = \begin{cases} 0, & \text{if } L_t = 0 \\ \frac{B_t}{L_t}, & \text{if } L_t > 0 \end{cases}$
<b><math>R_v</math>, variable borrow rate</b>	$R_v = \begin{cases} R_{v0} + \frac{U}{U_{optional}} R_{slope1}, & \text{if } U \leq U_{optional} \\ R_{v0} + R_{slope1} + \frac{U - U_{optional}}{1 - U_{optional}} R_{slope2}, & \text{if } U > U_{optional} \end{cases}$	

4.1.2 User with a positive balance of the base asset earn interest, denominated in the base asset, based on a supply rate model; users with a negative balance pay interest based on a borrow rate model. Collateral assets do not accrue interest rate.

4.1.3 There are borrow and lend rates, with the protocol earning spread profit on the difference between the two rates. The profit accrued is accumulated in the protocol and will be used as a base asset reserve to cover shortfall deficit in cases when collateral market value drops below the outstanding debt balance.

4.1.4 Users can only supply protocol native basket tokens collateral to the pool if the value of the total collateral pool is less than specified threshold, this is to limit risk exposure to an individual basket asset class / issuer.

4.1.5 Supplied collateral will increase users' borrowing capacity adjusted by borrow CollateralFactors (aka "haircut") set by the governance/risk management team. For example, if hair cut for commercial bonds basket is set at 15%, it means that users can borrow up-to \$0.85 for each \$1 collateral value supplied. The model allows multiple collateral assets within the pool, where baskets with common characteristics but different constituents can be blended together in the same pool. Final decision on this is TBD and will be based on market demand and other factors.

4.1.6 Market value of a collateral is calculated with the pricing feed connected to a smart contract; When market value of a collateral drops below liquidation collateral factors, (which are separate and higher than borrow collateral factors), the pool becomes eligible for liquidation.

4.1.7 When pool is eligible for liquidation, it will be handled by selling collateral automatically at prevailing NAV price to the Liquidity protocol, paying off the loan and transferring remaining liquidations proceeds (stable coins) to the user's wallet.

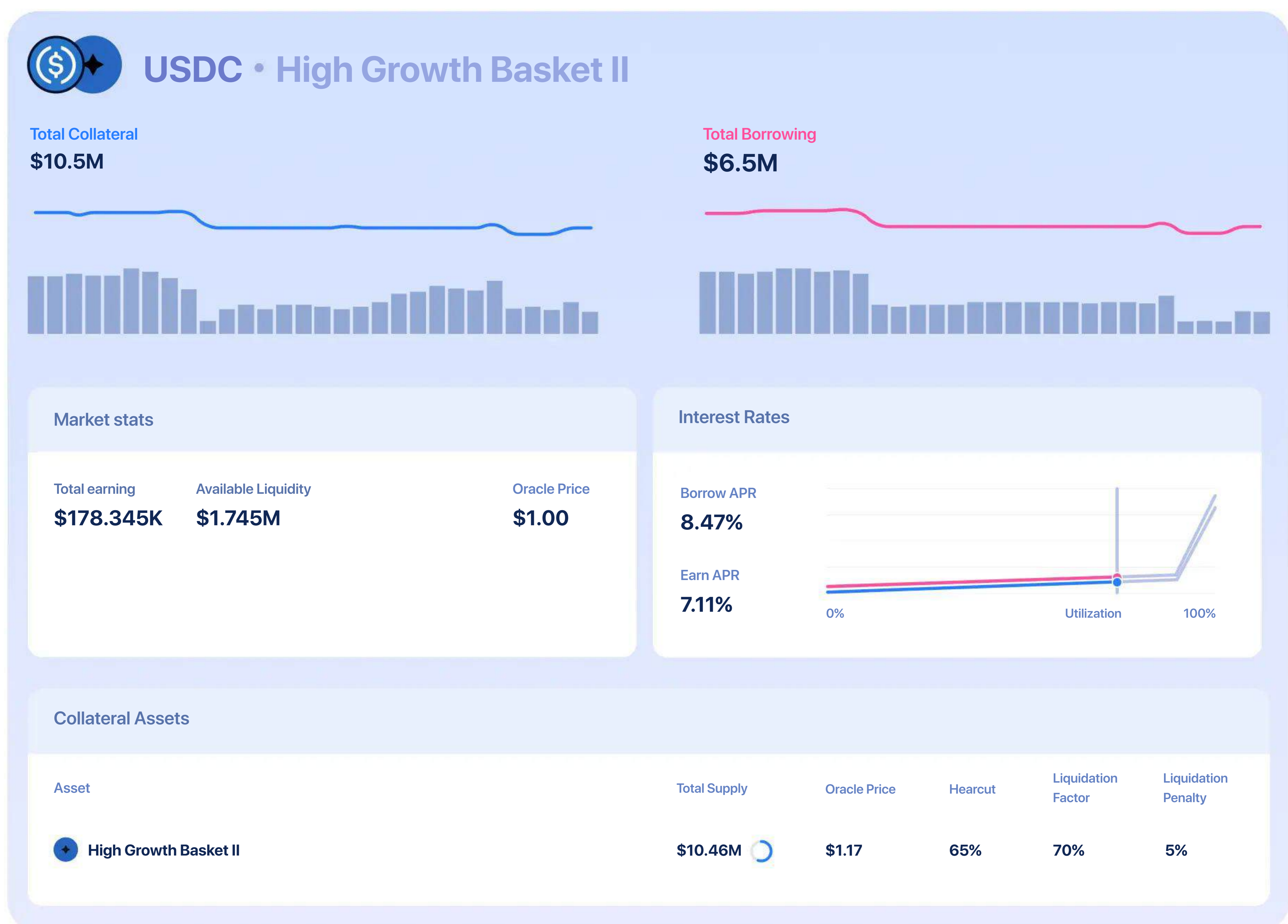
*Additional customization functionality may include the following:*

- i. The Risk Management / Governance team may have authority to control and set price for illiquid collateral RWAs such as private asset backed credit, or commercial bonds that don't have an active market, reduce price or increase hair-cut in cases of credit rating downgrades or severe market volatility for additional protection of liquidity providers.
- ii. Price of stable coins in the protocol will be capped at \$1, to mitigate risk of pricing feed manipulation.

## 4.2 User Interface

Protocol's UI will facilitate user's control of a Borrow/Lend/Liquidate workflows, by calling underlying smart contract functions and displaying returned results. The actual UI components, web portal layout and detailed functionality is TBD. But the general idea is for the dashboard to display key information such as Collateral Assets, Supply and limit utilization, Oracle Prices, Collateral Factor, Liquidation Factor, Liquidation penalty.

**Figure 10: Illustration of User interface**



## 5. Integration of non-EVM chains

### Why Liquidity Should Integrate Stellar

#### Overview

Liquidity is at the forefront of tokenizing Real World Assets (RWAs) and facilitating cross-chain interoperability, empowering users to access baskets of tokenized RWAs on various blockchains and secure financing through lending mechanisms. Stellar, with its focus on simplifying cross-border asset transfers and its robust RWA ecosystem, offers a unique synergy that can drive Liquidity's growth and adoption, while simultaneously bringing TVL to Stellar ecosystem projects involved in the tokenized asset economy.

#### Stellar's RWA Ecosystem

According to the latest Stellar Quarterly report, the total supply of real-world assets now stands at \$598.6 million, while the total payment volume for these assets has reached \$1.8 billion.

Stellar has demonstrated a solid track record of integrating real-world assets (RWAs) through platforms like: Huma Finance, WisdomTree Prime, Smartlands, AirCarbon Exchange, and etc.

#### Why Stellar for Liquidity?

- 1. Cross-Border Efficiency:** Stellar is designed for fast, cost-effective cross-border transactions, which is a critical feature for Liquidity as it seeks to offer seamless cross-chain RWA tokens across global markets. Stellar's low fees and high scalability make it the optimal choice for Liquidity's international ambitions.
- 2. Strong RWA Focus:** Stellar's success with RWA tokenization through platforms like Huma Finance and HiYield shows a proven commitment to asset-backed tokens. Liquidity can leverage Stellar's established infrastructure to tokenize new asset classes such as real estate and trade finance.
- 3. Institutional Credibility and Compliance:** Stellar's integration with regulated exchanges like AirCarbon demonstrates its ability to manage compliance-heavy RWAs. This is crucial for Liquidity, especially as it seeks to expand into regulated markets and offer a more diverse range of asset-backed tokens, including sustainable finance projects.
- 4. Liquidity and Interoperability:** Stellar's built-in decentralized exchange (SDEX) offers immediate liquidity options for tokenized assets. Liquidity can benefit from Stellar's liquidity pools and facilitate instant swaps of its basket tokens, further enhancing cross-chain interoperability and user convenience.

#### Strategic Fit

- **Enhanced RWA Portfolios:** By integrating Stellar, Liquidity can broaden its portfolio of tokenized RWAs on Stellar Network, from real estate to sustainable finance, adding credibility and value to its asset baskets.
- **Boosted Market Reach:** Stellar's focus on connecting the unbanked and fostering financial inclusion aligns with Liquidity's mission to make asset-backed investments accessible to a broader global audience.
- **Regulatory Support:** Stellar's regulatory compliance framework allows Liquidity to seamlessly navigate international regulatory challenges as it expands its RWA offering.

## Conclusion

Integrating with Stellar would enable Liquidity to expand into new asset categories. Stellar's established RWA projects make it the ideal partner for Liquidity, facilitating the addition of tokenized RWAs issued on Stellar into baskets on the Liquidity platform for sale to investors, while also offering a cross-chain lending protocol that democratizes access to RWAs globally.

## 6. Scope / Out of Scope

Scope of the solution cover the following items.

The solution at the moment is chain agnostic and choice of block-chain is TBD.

In Scope Items	Description
<b>EVM compatible smart contracts handling protocol workflows(initial RWA acquisition, on-chain custody, basket composition, protocol native basket tokens issuance and redemption, on-chain financing backed by native basket tokens.</b>	This will be accommodated by building cross-chain network of smart contracts with in Asterizm as well as forking Compound version III protocol.
<b>Pricing feeds for RWA tokens with active markets.</b>	Pricing feeds will be established either from RWA issuer platforms where applicable or sourced from vendor systems such as Bloomberg/Reuters or open markets
<b>User Interface that will allow users to interact with the protocol.</b>	This will be a web-based portal where users connect wallet and can supply or withdraw assets to/from the protocol.
<b>KYC technical functionality and cross platform verification.</b>	This is a communication layer in cases where RWA Issuer platform may ask for automatic KYC/AML confirmation of basket investors and/or financing liquidity providers.

Out of Scope Items	Description
<b>Functionality to handle initial Real World Asset tokenization via SPV (Special Purpose Vehicle) and on-chain original RWA tokens deployment.</b>	This is traditional RWA tokenization process handled by an RWA Issuer.
<b>Protocol rewards tokens and points tracking.</b>	Generally there will be users reward tokens to incentivize protocol usage but currently details of the program are out out of scope of this document.



## 7. References

- [1] - Global market overview <https://app.rwa.xyz/treasuries>
- [2] - Asterizm Protocol. White paper v.1.3 by Artem Avdeev, Alex Gotovets, Denis Polulyakhov <https://asterizm.io/files/wp.pdf>
- [3] - Back to the Basics: Compound, Aave (Kirill Naumov) <https://medium.com/@kinaumov/back-to-the-basics-compound-aave-436a1887ad94>
- [4] - Binance. Real World Assets State of Market. <https://research.binance.com/static/pdf/real-world-assets-state-of-the-market.pdf>
- [5] - Outlier Ventures. Tokenization Of RWAs: Beyond The Hype <https://outlierventures.io/article/tokenization-of-rwas-beyond-the-hype/>
- [6] - Relevance of on-chain asset tokenization in 'crypto winter' By Sumit Kumar, Rajaram Suresh, Darius Liu, Bernhard Kronfellner and Aaditya Kaul <https://web-assets.bcg.com/1e/a2/5b5f2b7e42dfad2cb3113a291222/on-chain-asset-tokenization.pdf>