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On-Chain Structuring: From Asset Mapping to Yield Stratification

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Abstract

As the real-world asset (RWA) market expands rapidly, the conventional 1:1 single-mapping model has begun to reveal its structural limitations. By compressing principal repayment, coupon income, and credit risk into a single token, this approach prevents investors from flexibly allocating risk exposures, suppresses secondary market activity, and substantially constrains the capital efficiency of RWA instruments.

To address this bottleneck, this paper examines the inevitable trajectory of RWA from simple asset mapping toward risk stratification and puts forward a practical framework for on-chain RWA structuring. The research demonstrates that the cash-flow waterfall mechanism enables the precise decomposition of underlying assets, allowing capital with varying risk appetites to find the most suitable instruments. Benchmarked against Centrifuge's conventional dual-tranche model, the paper focuses on AquaFlux—a three-tier yield-rights architecture built on Pharos Network. Through more thorough rights separation and an independent loss-absorption mechanism, AquaFlux achieves superior risk isolation and substantially broadens the design space for on-chain stratified investment strategies.

The paper concludes by emphasizing that complex structured assets fundamentally depend on robust underlying infrastructure. Only a public blockchain that combines high concurrency, low latency, and native compliance capabilities—together with purpose-built liquidity components—can support high-frequency asset decomposition and automated settlement, ultimately propelling RWA from Tokenization 1.0 toward Structuring 2.0.

Keywords: RWA; Single Mapping; Cash-Flow Waterfall; Three-Tier Yield-Rights Stratification Model

01 / Introduction: Structural Mismatch Between the Asset Side and the Capital Side

The migration of real-world assets (RWA) onto the blockchain is driving a deep convergence between traditional finance and DeFi at the level of issuance, trading, and settlement infrastructure. According to RWA.xyz data, the global tokenized RWA market reached approximately USD 45 billion by end-February 2026, representing year-on-year growth of more than 140% versus the same period in 2025.[1] On the institutional side, on February 11, 2026, BlackRock announced that its tokenized U.S. Treasury fund BUIDL would offer on-chain liquidity via UniswapX alongside a strategic investment in UNI tokens. Apollo Global Management, for its part, reached an agreement with Morpho to purchase up to 90 million $MORPHO tokens through secondary-market and over-the-counter transactions over a 48-month period. These developments underscore a critical backdrop: Wall Street's traditional financial giants have entered the strategic phase of competing for RWA liquidity.

Figure 1: Global tokenized RWA asset size and structure (as of the end of February 2026)

Classification	Amount (in billions of US dollars)
U.S. Treasury securities	one hundred and nine
Non US treasury bond bonds	ten
corporate bond	nineteen
Private Credit	two hundred and three
commodities	seventy-six
Institutional alternative funds	twenty-three
stock	ten
total	four hundred and fifty

Source: Pharos Research

Beneath this growth, however, a fundamental structural contradiction is becoming increasingly apparent: **a significant mismatch exists between the multi-dimensional complexity of the asset side and the homogeneity of the capital side.**

- On one hand, off-chain physical and financial assets inherently possess multi-dimensional risk-return profiles. A corporate bond, for instance, contains at least three independent value dimensions: the security of principal recovery, the stability of coupon income, and the distribution of credit risk. In traditional capital markets, investors can

isolate and recombine these dimensions through structured notes, credit derivatives, and asset securitization to build portfolios aligned with their individual risk tolerance.

- On the other hand, the dominant RWA tokenization paradigm largely remains at the stage of simple 1:1 mapping. Whether tokenized Treasuries, tokenized private credit, or tokenized real estate, investors hold a bundled, undifferentiated claim on the underlying asset pool and cannot selectively allocate across the asset's distinct attributes.

These structural limitations also represent a key factor constraining RWA token liquidity. The complexity inherent in underlying assets—priority of repayment, cash-flow timing, default exposure—is uniformly compressed into a single token. As a result, investors are forced to accept an unstructured, bundled risk-return package tied to the underlying asset, with no means of granular customization. This gives rise to a seemingly paradoxical phenomenon in the RWA market: TVL continues to grow, yet secondary market liquidity remains shallow and capital efficiency low.

The resolution lies in advancing RWA from Tokenization 1.0 toward **Structuring 2.0**. **Structuring is not simply the act of putting assets on-chain; it is the process of deconstructing and reassembling the cash flows of underlying assets through financial engineering, creating on-chain financial instruments with clearer risk-return profiles that are more amenable to pricing and compatible with existing DeFi modules.** This process involves not only technical implementation but also a comprehensive upgrade of the legal framework, risk pricing, and underlying settlement infrastructure—as analyzed in detail below.

02 / Market Status and Bottlenecks: The Single-Mapping Model

2.1 Current Market Landscape: The Dominance of Single Mapping

The first-phase paradigm of the current RWA market can be characterized as the 'single-mapping model.' Issuers typically establish a Special Purpose Vehicle (SPV) or fund entity as the legal vehicle to bundle the economic interests of a portfolio of underlying assets, then issue a single class of fungible tokens on-chain representing pro-rata claims against that pool. Whether it is Ondo Finance packaging the yields of short-duration assets such as U.S. Treasuries into USDY, or BlackRock's BUIDL—issued via Securitize—representing shares of a USD liquidity fund as on-chain tokens, the underlying logic is the same: a single token carries the cash flows and risks of an entire basket of assets.

This model was well-suited to the early stage of asset tokenization and drove the scale growth of a series of landmark RWA tokenization products.[2]

- BlackRock's BUIDL fund surpassed USD 2.8 billion in AUM in 2025, making it the largest tokenized Treasury product on-chain.
- Ondo Finance's USDY reached approximately USD 1.4 billion in AUM by end-2025, attracting more than 15,000 holders.

2.2 Limitations of the Single-Mapping Model: Liquidity and Risk Management Bottlenecks

The single-mapping model reduces technical complexity, facilitates rapid market validation, and is more readily approved by regulators. However, as the market surpasses the hundred-billion-dollar threshold and the participant base expands from early adopters to institutional investors at scale, the shortcomings of this simplistic approach begin to manifest.

First, the forced bundling of risk and return suppresses capital allocation efficiency. Under the single-mapping model, purchasing a token simultaneously means acquiring the principal repayment risk, coupon rights, and potential default risk of an entire asset basket. This three-in-one structure cannot accommodate the heterogeneous risk preferences across investor types. Retirement funds seeking stable cash flows and hedge funds chasing high-risk, high-reward opportunities are compelled to invest in the same instrument, making effective risk-stratified pricing impossible. Ondo Finance's USDY, for example, bundles the returns of multiple underlying assets into a single pool and issues a single USDY token as a pro-rata claim. Holding USDY simultaneously exposes the investor to the principal recovery risk, interest cash flows, and potential default risk of every asset in the pool; it is

impossible to isolate the interest stream or specific default risk as independently tradable and hedgeable standardized claims.

Second, single mapping often fails to reduce information asymmetry—instead it further 'aggregates' critical risk information. While the blockchain provides transparency for token holdings and transaction history, single-mapping product pricing is typically anchored to the off-chain NAV of the SPV and redemption rules, meaning the true condition of underlying assets still depends on the off-chain judgment and disclosures of managers, servicers, and auditors. Since only a single token representing an undivided claim exists on-chain, disclosure is frequently compressed into pool-level 'summary metrics,' making it difficult for external investors to access continuously updated, verifiable asset-level event data—and often leaving them misled. The result is a market where risk perception is highly homogeneous and lagged: any negative event or inadequate disclosure strikes the entire token's valuation and liquidity directly, creating risk linkage and contagion that can infect genuinely sound assets.

Third, single-mapping products generally lack the intrinsic trading incentives required to sustain secondary market activity. Because the price anchor for RWA tokens is typically the off-chain NAV and the subscription/redemption channel—rather than a market price formed by continuous on-chain transactions—investors seeking to exit tend to redeem directly rather than transact on the secondary market, which mechanistically drains secondary liquidity supply. Simultaneously, market makers face cash flows that cannot be verified in real time and struggle to provide precise mark-to-market valuations for an entire asset basket, severely weakening their incentive to make markets. The consequence is a pattern common among many RWA tokens: active subscriptions and redemptions but minimal trading activity—failing to generate depth or effective price discovery in secondary markets.

Faced with these challenges, the RWA space has begun exploring new pathways. A clear trend is emerging: the market is moving from simple 'asset on-chain' toward 'asset structuring.'

03 / RWA Structuring: The Evolution from Asset Mapping to Asset Reconstruction

Relatively few projects have to date adopted structured token mapping for RWA; tokenized structured RWA products account for less than 10% of total RWA assets and are concentrated primarily in the private credit segment. Prominent examples include Centrifuge, Goldfinch, TrueFi, and the innovatively structured three-tier yield stratification platform AquaFlux.

Figure 2: Typical Structured RWA Asset List

Project Name	Layered form	Bottom level RWA type	Source of Income
Centrifuge	Priority and inferior double layer	Supply Chain Finance and Corporate Credit	Enterprise repayment interest
Goldfinch	Priority and Supporters Double Layer	Emerging market entity enterprise loans	Enterprise repayment interest
Figure Markets	Multi level rating structure	housing loan	The borrower repays the principal and interest of the mortgage
AquaFlux	Innovation Three Token Combination	Private equity credit and high net worth assets	Bottom level multi asset cash flow

Source: Pharos Research

3.1 The Essence of Structuring: Redistribution of Risk and Return

The core of RWA asset structuring is the on-chain prioritization and reordering of cash flows. Specifically, structuring refers to using smart contracts to slice and allocate the future cash flows (principal repayments and interest payments) generated by a single asset or group of underlying assets according to clearly defined rules, and to issue multiple types of on-chain tokens representing different repayment claims. Its essence is the redistribution of risk and return.

Structured finance is not a new concept. In traditional finance, mortgage-backed securities (MBS), collateralized debt obligations (CDOs), and similar instruments are all products of structuring. The core idea is to use legal and financial engineering techniques to distribute the future cash flows of a pool of assets to investors with different risk preferences according to a predetermined priority order (the 'payment waterfall'). The introduction of blockchain and smart contracts brings revolutionary potential for automation, transparency, and programmability to this process.

RWA structuring correspondingly encompasses three core elements: cash-flow decomposition, interest reconstruction, and risk stratification.

Figure 3: Analysis Table of the Core Three Elements of Structured RWA Assets

Core Elements	Positioning	Operating Mechanism	Specific Manifestations
Cash flow breakdown	Basic Operations	Identify future cash inflows of assets and break them down by time and nature	Split bonds into principal claim and interest claim
Equity restructuring	Core Innovation	Reorganize the dismantled rights into new tools according to specific rules	Divide security layer and risk layer based on cash flow sorting
risk stratification	main purpose	Accurately allocate composite risks to investors with different risk preferences	The priority layer gives up profits for safety, while the lower layer takes on risks for excess returns

Source: Pharos Research

Cash-flow decomposition is the foundational operation of structuring. Any cash-flow-generating asset—whether the coupon and principal of a bond, the repayments of a loan, or the rental income of real estate—can be decomposed into a series of cash inflows across a time dimension. The first step in structuring is to identify these cash flows and classify them as rights of different natures. A bond, for example, can be decomposed into a 'claim to principal at maturity' and a 'claim to periodic interest,' which differ substantially in their time distribution, risk characteristics, and pricing logic.

Interest reconstruction is the core innovation of structuring. The decomposed cash-flow rights can be recombined according to specific rules to form new financial instruments. The critical innovation lies in the design of recombination rules—how to make different combinations suitable for different investors' needs. Prioritizing the cash flows of multiple loans, for instance, creates a senior (safe) tranche and a junior (risk-taking) tranche; slicing the cash flows of long-dated assets by time period creates short-term and long-term instruments.

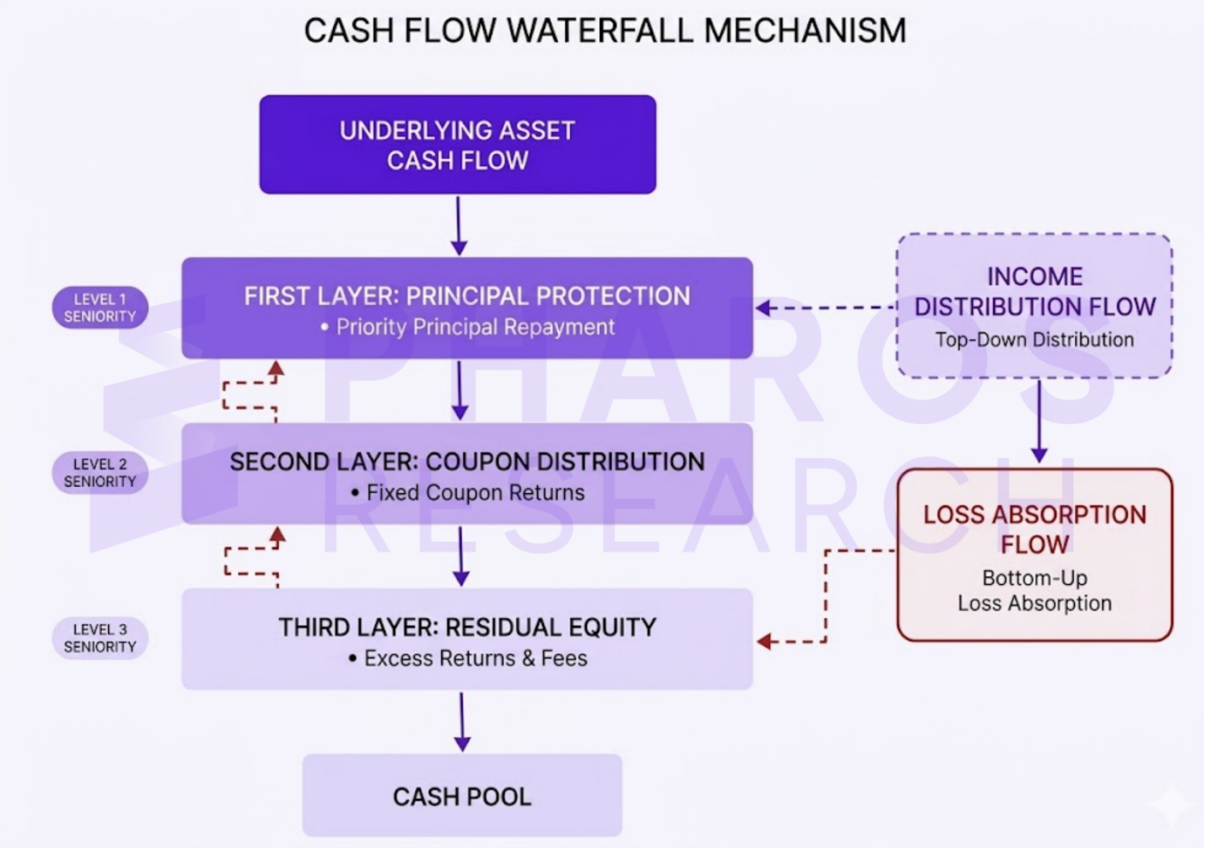
Risk stratification is the primary objective of structuring. Through the decomposition and reconstruction described above, the compound risks previously borne by a single investor are distributed across investors at different tiers. Risk-averse investors can purchase the senior tranche, sacrificing some yield in exchange for enhanced safety; risk-tolerant investors can purchase the junior tranche, absorbing higher risk in exchange for excess returns. This risk redistribution raises the market's overall risk-bearing capacity and improves capital allocation efficiency.

3.2 The Core Mechanism: The Cash-Flow Waterfall

In RWA asset securitization and on-chain financial product design, structured finance employs financial engineering techniques to reconstruct the risk and cash flows of underlying assets, creating investment products with differentiated risk-return profiles to meet the needs of different investor types. Common structuring approaches include tranching, over-collateralization, equity subordination, and yield stripping.

Among these, the cash-flow waterfall based on tranching has been widely adopted in traditional financial instruments such as ABS, MBS, and CDOs, and represents the core mechanism of current RWA asset structuring. It determines the order in which cash flows generated by underlying assets are distributed among investors at different tiers.

Figure 4: Cash-Flow Waterfall Diagram



Source: Pharos Research

In a typical waterfall structure, cash flow distribution follows a strict priority sequence. A canonical three-tier waterfall operates as follows:

- **Senior Tranche:** receives cash flows first. Investors in this tier are primarily exposed to systemic or extreme tail risks of the underlying assets, with very low credit risk, and accordingly require the lowest yield.
- **Mezzanine Tranche:** receives cash flows after the senior tranche has been fully paid. Its risk and return profile lies between those of the senior and junior tranches.

- **Junior / Equity Tranche:** receives payment last and serves as the 'first-loss layer' for the entire asset pool. It absorbs the primary credit risk in exchange for higher potential returns (excess spread, incentive payments, etc.).

Taking a bond asset as an example to elaborate on this mechanism:

During normal repayment, the first priority is to fulfill the principal protection commitment of the senior tranche, ensuring full-face-value redemption at maturity; the second priority is to pay the coupon income of the mezzanine tranche (C-Token), ensuring stable cash flows; any remaining income then flows to the junior tranche as compensation for bearing the highest risk.

During a default event, the order is completely reversed. Losses are first absorbed by the junior tranche until its equity is exhausted; if losses continue to expand, the mezzanine tranche's income rights begin to be impaired; only in extreme circumstances would the principal of the senior tranche be threatened.

This 'forward distribution, reverse absorption' mechanism creates a distinctive risk-return structure. The senior tranche behaves like a zero-coupon bond—its price converges toward par as maturity approaches, with relatively contained volatility. The mezzanine tranche generates stable coupon income, resembling a fixed-rate bond, but does not incur losses until the junior tranche is exhausted. The junior tranche has option-like characteristics: it earns excess returns under normal conditions but may be entirely wiped out in a default scenario.

The value of the waterfall mechanism lies in creating a form of 'insurance market.' Junior tranche investors are, in effect, selling credit protection to senior and mezzanine tranche investors in exchange for premium-like excess returns. This arrangement allows risk-averse investors to obtain protection at lower cost, while risk-tolerant investors can earn returns by assuming risk. Without structuring, such transactions would be difficult to achieve, as direct trading of credit risk requires complex derivative contracts. The waterfall mechanism embeds this logic directly into the asset structure.

3.3 Implementation of Structuring: Dual Dimensions of Legal and Technical Architecture

On-chain asset structuring involves two indispensable dimensions: legal and technical.

Legal structuring centers on the establishment of an SPV (Special Purpose Vehicle). In a typical RWA structured transaction, the underlying asset (e.g., a loan) is legally transferred to an independently registered SPV whose sole purpose is to hold the asset and issue structured securities. This arrangement achieves 'bankruptcy remoteness'—even if the originator becomes insolvent, the assets held by the SPV are ring-fenced from the bankruptcy estate, protecting the rights of token holders.

The SPV structure must also address jurisdictional selection, investor suitability requirements, and tax treatment. Different jurisdictions classify tokenized assets differently—some may treat them as debt instruments, others as investment contracts—directly affecting disclosure obligations and transfer restrictions. Currently, the Cayman Islands, Jersey, Switzerland, and Singapore are popular incorporation jurisdictions for RWA SPVs due to their relatively accommodating regulatory environments and mature fund legal frameworks.

Technical structuring centers on smart contract execution of the distribution logic. The legal structure determines the ownership of rights, but their realization depends on the automatic execution of code. Smart contracts must precisely implement the waterfall mechanism's logic, including: when to trigger distributions (e.g., quarterly, upon each repayment receipt); how to calculate each tranche's entitlement; how to handle loss allocation in default scenarios; and how to support the independent transfer of each tranche's tokens.

Technical structuring also involves the selection of token standards. Although ERC-20 is the generic tokenization standard, it may be too simplistic for structured assets. Some projects are exploring extended standards such as ERC-1400 (Security Token Standard), which supports access controls and partition management, and ERC-4626 (Tokenized Vault Standard), which supports yield calculation and share management. In more complex scenarios, bespoke token contracts may be required to implement specific structuring logic.

The alignment between legal structure and technical structure is an easily overlooked but critically important issue. Legal documents must clarify the legal status of smart contracts—does the contract code constitute a binding commitment to holders? Who bears the losses resulting from code upgrades or exploits? Ideally, legal documents should 'reference' a specific version of the smart contract and stipulate procedures for code audits and upgrades, ensuring on-chain/off-chain consistency.

04 / Implementation Pathways and Case Studies of RWA Structuring

4.1 The Traditional Dual-Tranche Model: Applications by Centrifuge and Goldfinch

Current on-chain structured products primarily employ a binary tranche structure. Centrifuge's Tinlake protocol divides each asset pool into two token types: DROP and TIN. DROP, as the senior tranche, enjoys fixed interest and priority claims; TIN, as the subordinated tranche, absorbs first losses and captures residual returns. Goldfinch adopts a dual-layer structure comprising a reserve pool plus individual borrower pools, with community Backers providing first-loss capital to protect the Senior Pool.

These binary structures achieve basic risk stratification but exhibit notable limitations. First, they do not sufficiently separate the three distinct value dimensions of principal, income, and risk—the DROP/TIN structure primarily distinguishes risk tiers, but treatment of principal and income remains bundled. Second, binary structures offer limited flexibility for portfolio construction: investors can only choose between 'senior' and 'junior,' precluding more complex strategy combinations. More critically, most dual-tranche structures remain anchored to the 'priority' dimension alone and lack consideration of the 'liquidity' dimension. DROP and TIN in Centrifuge, for example, both represent claims on the same underlying asset, making their liquidity conditions highly correlated and preventing effective risk hedging; when underlying assets encounter difficulties, both tranche tokens may simultaneously suffer liquidity exhaustion.

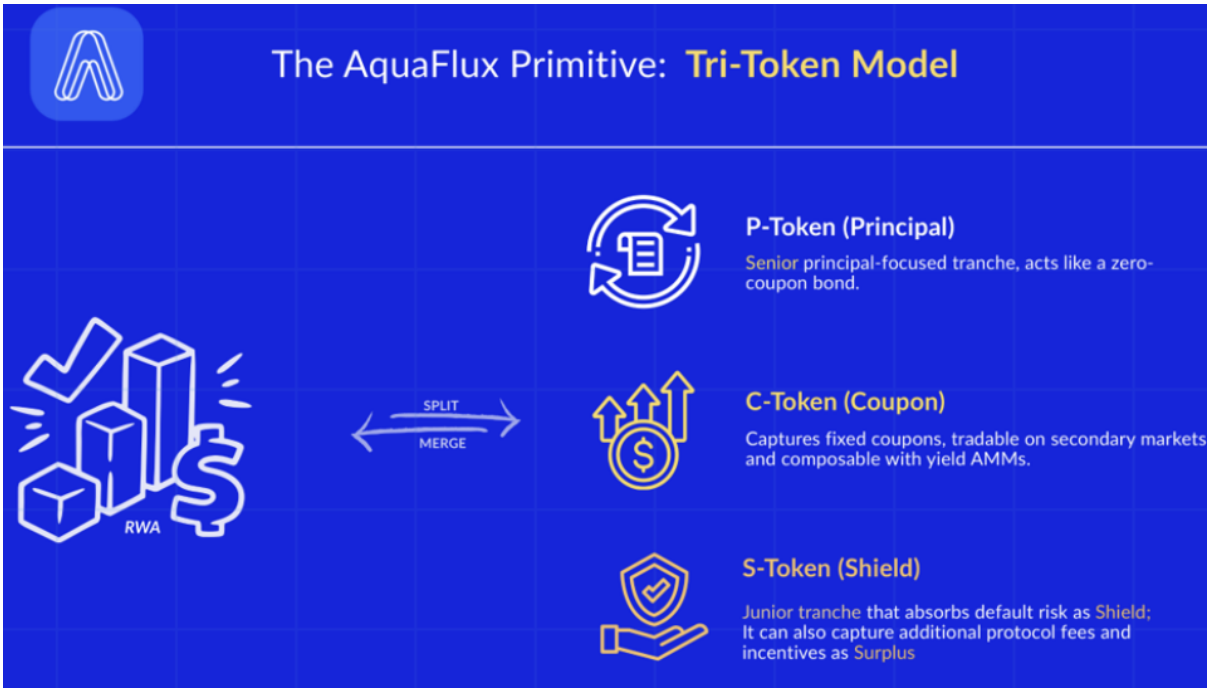
Accordingly, structural innovation in the RWA space must evolve to deeper levels—not merely more risk-cutting tiers, but comprehensive application of techniques such as principal-interest separation, maturity splitting, and risk reconstruction. It is precisely in this direction that AquaFlux, operating within the Pharos Network ecosystem, has introduced a three-tier yield-rights stratification model of considerable innovative significance.

4.2 The Three-Tier Yield-Rights Stratification Model: An Innovative Risk-Return Structure and Asset Liquidity Mechanism

Building on the traditional dual-tranche structure, AquaFlux applies the structural 'cash-flow waterfall mechanism' to introduce the Tri-Token Model. This model decomposes a single bond-type RWA token into three independent tokens—P-Token (Principal Token), C-Token (Coupon Token), and S-Token (Shield Token)—each corresponding to a distinct value proposition and risk-return profile.

- **P-Token corresponds to the principal repayment claim and is designed to maximize principal safety.** Under a normal repayment path, P-Token holders are entitled to redeem the token at face value on the maturity date, receiving funds equal to the face value of the original bond. Because S-Token provides first-loss protection, P-Token is only impaired in extreme default scenarios. This design makes it analogous to a zero-coupon bond, with its price converging toward par over time, making it suitable for risk-averse investors as a stable store of value.
- **C-Token corresponds to the coupon income rights and is designed to deliver stable cash-flow income.** C-Token holders enjoy the coupon distribution rights of the original bond without bearing principal risk (unless S-Token is exhausted). This design makes it similar to a fixed-rate bond or a perpetual note, suitable for investors requiring periodic income, such as DAO treasuries and income funds.
- **S-Token is the most innovative and most challenging component of the Tri-Token Model.** It simultaneously fulfills two functions: first, acting as a 'shield' that absorbs default losses from the underlying assets to protect P-Token and C-Token holders; second, serving as an 'equity carrier' that captures protocol-level value, including partial coupon allocation, protocol fees, and ecosystem incentives. This dual character means S-Token's value derives from both the intrinsic value tied to the underlying assets and the extrinsic value tied to protocol growth, forming a distinctive risk-return profile.

Figure 5: AquaFlux Tri-Token Model Diagram



Source: AquaFlux Official Website

The core advantage of the three-tier yield-rights stratification model is the creation of three mutually independent yet interconnected liquidity pools. P-Token, C-Token, and S-Token can each be traded on AMMs, with their own supply-demand curves and price discovery mechanisms. This stands in sharp contrast to the dual-tranche model, where senior and junior tranches—despite different risk-return profiles—are both closely tied to the same underlying asset and tend to move in the same price direction. In the three-tier model, the three tokens can exhibit divergent price dynamics: when market concerns about the credit risk of the underlying assets rise, S-Token's price may plummet, while P-Token, protected by S-Token, may remain relatively stable; when the market is bullish on the protocol's growth prospects, S-Token may appreciate on the back of higher expected protocol fees, without necessarily affecting the pricing of P-Token and C-Token.

This independence unlocks substantial trading and arbitrage opportunities. For instance, when the combined value of 1 P + 1 C + 1 S exceeds the price of the underlying RWA, arbitrageurs can buy the RWA, split it into three tokens, and sell each component for a profit; the reverse applies as well. This arbitrage mechanism helps maintain price consistency between the tri-token combination and the underlying asset while continuously providing market liquidity.

4.3 Strategy Combinations of the Three-Tier Model: The Potential for Customized Portfolios

The true significance of the three-tier yield-rights stratification model lies in the combinatorial strategy overlay. Because P, C, and S tokens can be held independently and recombined freely, investors can construct customized exposures according to their risk tolerance and market views.

Figure 6: List of Combination Strategies for the Three Level Income Rights Grading Model

Strategy Name	Token combination	Core Logic (Financial Logic)	risk appetite	Typical Applicable Scenarios
Strategy 1: Original Bond Simulation	P + C	Complete replication of the underlying RWA's principal and interest, utilizing tokenization to enhance asset liquidity	robust	Investors seeking traditional bond yields but requiring flexible on chain trading
Strategy 2: Capital preservation enhanced type	P + S	Lock in principal security with P and obtain protocol premium/excess returns with S. Leverage can be increased through collateralized P loans	Risk averse type	Structured bill enthusiasts, investors pursuing a "base salary+bonus" model
Strategy Three: High Yield Type	C + S	Abandoning principal protection and purely pursuing the combination of interest (C) and agreement dividends (S)	Risk preference type	Radical investors, optimistic about long-term growth of the agreement and able to withstand fluctuations in principal
Strategy 4: Pure P leverage cycle	P+Loan	Using P as high LTV collateral, lending stablecoins and then buying P to achieve recursive amplification of returns	medium to high risk	Arbitrageurs who hope to amplify low-risk interest income through financial leverage during a stable market period
Strategy 5: Cross period arbitrage	C (different terms)	Using the implied yield difference of C-Tokens with different maturity dates for long and short operations	Professional transactional type	Traders with in-depth insights into macro interest rate trends or yield curve shapes

Source: Pharos Research

The diversity of these strategies illustrates the Tri-Token Model's potential contribution to the DeFi ecosystem. Most strategies in the current DeFi market are based on price volatility or farming incentives; the three-tier model introduces strategy dimensions grounded in time structure and credit structure, substantially enriching DeFi's strategic toolkit. The market has responded positively: according to Phemex News, AquaFlux's testnet recorded more than 95 million interactions and verified over 1.1 million unique addresses, further demonstrating the broad attention and active participation this innovative architecture has attracted.[3]

05 / Infrastructure Requirements for RWA Structuring

5.1 Asset Side: Cash-Flow Compatibility of Off-Chain Assets

The starting point for RWA structuring is an analysis of the characteristics of off-chain assets. Different asset types have different cash-flow structures and are suited to different structuring approaches. The table below summarizes the structuring compatibility of major RWA asset categories.

Figure 7: Structural Adaptation Analysis of Major RWA Assets

asset class	Cash flow characteristics	Structured focus	Typical structured products
U.S. Treasury securities	Regular coupon+principal at maturity	Separation of principal and interest, division of term	Zero coupon bond token, coupon token
Investment grade corporate bonds	Regular coupon rate+principal at maturity+credit risk	Risk stratification and separation of principal and interest	Priority layer token, inferior layer token, pure profit token
Private Credit	Irregular repayment+credit risk+early repayment risk	Priority layering, loss absorption layer	Priority layer token, inferior layer token
real estate	Rental income+asset appreciation	Separation of income rights and ownership	REITs tokens, rental income tokens
commodities	Storage costs+price fluctuations	Separation of physical support and financial derivatives	Gold token, crude oil token

Source: Pharos Research

As the matrix indicates, the asset categories most amenable to structuring are fixed-income instruments with credit risk, such as corporate bonds and private credit. The credit risk inherent in these assets is difficult to price directly; by using structuring to transfer risk to investors willing to bear it, the senior tranche becomes significantly more attractive to conservative investors.

Taking private credit as an example: the primary on-chain private credit issuers—Maple, Centrifuge, and Goldfinch—typically structure loans into two tiers, Senior and Junior. The senior tranche enjoys priority claim on principal and income, with a lower expected loss rate and yields generally in the 8%–12% range; the junior tranche absorbs first losses, with a higher expected loss rate but yields

potentially reaching 15%–25%. This structure partially satisfies the needs of investors with different risk appetites.

Yet the dual-tranche structure still has limitations. First, the senior/junior division is fixed and cannot be dynamically adjusted to market conditions. When underlying asset quality improves, senior investors are locked below a yield ceiling and cannot share in the upside; when quality deteriorates, junior investors face total wipeout with no buffer mechanism. Second, principal and income cannot be separated, preventing investors from expressing independent views on yield or principal.

The three-tier yield-rights stratification model offers substantially greater flexibility in these respects. Consider a corporate bond with face value USD 1,000, annual coupon 10%, and one-year maturity. Under this model, it can be decomposed as follows:

- **P-Token:** redeems at USD 1,000 at maturity; current trading price approximately USD 934.6 (implying a yield-to-maturity of around 7%).
- **C-Token:** represents the distribution rights to the one-year coupon cash flow (approximately USD 80 of the USD 100 coupon after the portion allocated to S-Token); current trading price may be approximately USD 70.
- **S-Token:** represents the first-loss absorption rights and protocol value capture (including coupon allocation, protocol fees, incentives, etc.); illustrative residual value approximately USD 20.

This decomposition allows investors to build different exposure combinations according to their views. An investor who is constructive on the bond's credit quality but wants to reduce principal risk can hold only P-Token; an investor who needs stable cash flows but does not want to lock up principal can hold only C-Token; an investor who believes the protocol will grow rapidly and is willing to bear credit risk can hold only S-Token.

Compared to the traditional dual-tranche structure, this three-tier yield-rights decomposition not only enhances pricing flexibility but also reduces the high co-movement of risks. P-Token, C-Token, and S-Token correspond respectively to principal value, interest cash flows, and residual risk equity, allowing different risk factors to be isolated and independently priced in the market. When underlying asset quality changes, the price adjustment trajectories of the three tranche tokens are not fully synchronized, providing investors with finer-grained risk management tools.

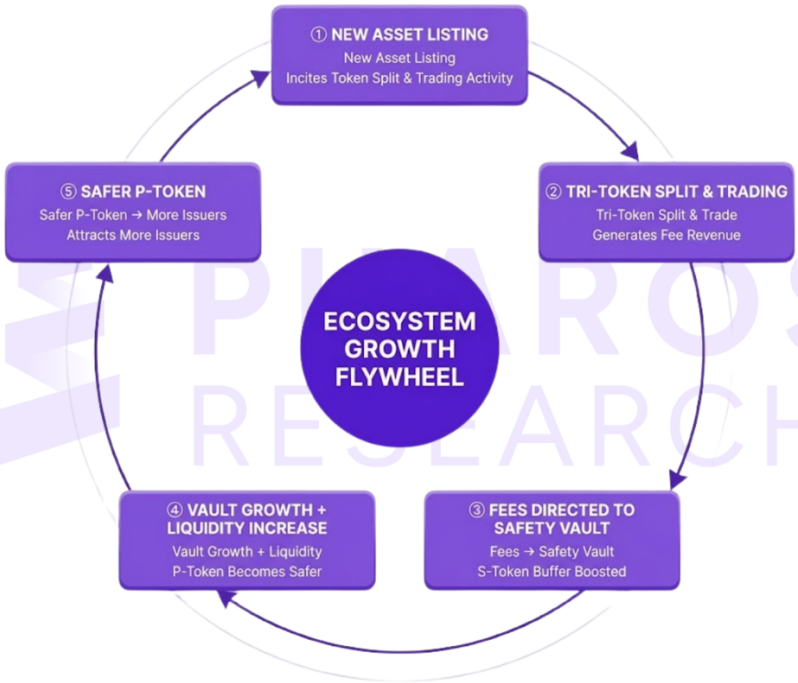
In AquaFlux's design, the underlying asset pool is typically composed of diversified credit instruments; the internal diversification of the pool helps reduce the impact of any single asset default on the overall structure and creates a degree of natural hedging across assets. Even if individual assets default, it will not immediately drain the liquidity of all tranche tokens simultaneously, thereby alleviating the 'highly correlated risk' problem inherent in traditional dual-tranche structures.

5.2 Infrastructure: Requirements for High-Performance Public Blockchains

The complexity of structured assets imposes performance requirements on the underlying blockchain far exceeding those of ordinary token transfers, particularly in terms of on-chain concurrent processing, real-time computation, and ultra-fast execution. When underlying assets generate repayments, smart contracts must complete the distribution of funds to P-Token, C-Token, and S-Token holders within an extremely short time window in accordance with the waterfall mechanism. This real-time cash-flow splitting and settlement involves high-concurrency multi-account balance updates and complex transfer logic. Furthermore, when structured assets are used as collateral in lending, the system must not only handle computationally intensive dynamic risk exposure assessments—tracking three-token prices in real time and calculating portfolio values—but must also, when extreme market conditions trigger rapid asset revaluation (e.g., a sharp S-Token price drop precipitating cascading rating adjustments), rely on the blockchain's high throughput and low latency to instantly execute complex automated liquidations, effectively preventing the accumulation of systemic bad debt.

This high-frequency, complex on-chain interaction manifests not only in individual settlement events but runs throughout the entire lifecycle of a structured asset, forming a positive feedback loop within the ecosystem. In the case of AquaFlux, the yield stratification mechanism in practice builds an 'ecosystem growth flywheel' dependent on continuous liquidity and real-time state updates.[4]

Figure 8: AquaFlux Ecosystem Flywheel Model



Source: Pharos Research

Pharos Network, as a high-performance public blockchain focused on RWA and DeFi infrastructure, holds significant advantages in these areas. According to its published materials, the Pharos testnet achieved a processing capacity of 30,000 transactions per second with a one-second finality time. Its GPU-accelerated architecture is designed to support billions of users while reducing storage consumption by 80%. This level of performance is critical for structured RWA applications requiring high-frequency interaction.[5]

More importantly, Pharos's architectural design reflects targeted optimization for financial application scenarios. Its modular design allows different types of transactions (e.g., simple transfers, complex contract calls, privacy computation) to be processed on dedicated sub-chains, eliminating resource contention found on general-purpose blockchains. Its native support for zk-based KYC/AML capabilities provides infrastructure-level support for RWA applications with stringent compliance requirements.

5.3 Market Ecosystem: The Foundation of Liquidity Infrastructure

The liquidity of structured assets depends not only on product design itself but also on the support of surrounding infrastructure.

On the AMM and PMM side: Automated Market Makers (AMMs) are a key source of DeFi liquidity, but the conventional constant-product market-making model (e.g., Uniswap's $x \cdot y = k$) is not fully suited to structured assets. Structured asset prices typically exhibit a convergence toward a target value—such as P-Token converging to par—rather than an entirely free random walk, necessitating more refined pricing and market-making mechanisms. In this context, some protocols adopt PMM (Proactive Market Maker) models or oracle-guided dynamic market-making strategies to better reflect an asset's theoretical price range. Native DEXs within the Pharos ecosystem adapted for RWA—such as Bitverse and FaroSwap—can support structured asset trading through more flexible market-making mechanisms. This intra-ecosystem infrastructure coordination can substantially enhance the liquidity of structured assets.

On the derivatives market side: A complete structured asset market requires not only spot trading but also derivative instruments for risk hedging. Investors holding large positions in C-Token, for example, may need interest rate swaps to lock in returns; investors holding S-Token may need credit default swaps (CDS) to hedge default risk. The development of these instruments requires reliable pricing data from oracles, performance assurance from clearinghouses, and risk buffers from insurance funds.

Through customized algorithms such as PMM adapted to the price-convergence profile of structured assets, and through derivative instruments serving risk-hedging demand, the market ecosystem for structured RWA can sustain fundamental liquidity provision. This coordination—from spot to derivatives, from algorithms to mechanisms—is a prerequisite for structured assets reaching market maturity.

06 / Conclusions and Outlook

6.1 Core Conclusions

The RWA market stands at a pivotal inflection point, transitioning from 'single asset mapping' toward 'deep structuring.' The analysis in this paper demonstrates that RWA asset structuring is not simply a technical upgrade; it is the necessary path for the RWA market to break through its liquidity bottleneck and achieve deep integration with the DeFi ecosystem.

First, the cash-flow waterfall mechanism provides the financial engineering foundation for risk pricing in RWA structuring. By deconstructing and reassembling the principal, income, and risk exposure of underlying assets, structuring creates on-chain financial instruments with clearer risk-return profiles and greater ease of pricing, satisfying the needs of investors with diverse risk appetites.

Second, the three-tier yield-rights stratification model represents the current frontier of RWA structuring exploration. Compared to traditional dual-tranche structures, the P-Token/C-Token/S-Token tiered design proposed by AquaFlux demonstrates significant advantages in precision of risk isolation, flexibility of portfolio strategy construction, and potential for liquidity release.

Third, collaborative infrastructure is the critical enabler for scaled development of structured RWA. High-performance blockchains (such as Pharos Network) must meet the high-throughput and low-latency requirements for real-time cash-flow splitting, dynamic risk calculation, and automated liquidation; purpose-built liquidity infrastructure (such as PMM algorithms adapted to P-Token's convergence characteristics and derivative hedging tools) ensures price discovery and risk hedging for complex assets. Underlying networks combining high-performance computing and native compliance assurance, paired with customized liquidity layers, will become the core enablers of the RWA transformation.

6.2 Future Outlook

Looking ahead at the trajectory of RWA structuring, we anticipate the following trends:

First, structured products will expand from private credit toward a broader range of asset classes. Current structuring approaches are concentrated primarily in corporate credit and supply chain finance; future expansion is expected to encompass more complex RWA categories such as real estate, infrastructure, and carbon credit assets. The distinctive cash-flow characteristics of different asset types will give rise to more diverse structuring designs.

Second, the yield stratification model is expected to generate new DeFi primitive components. As liquidity pools for P-Token, C-Token, and S-Token are established, derivative markets built on these

foundational assets—including interest rate swaps, credit default swaps, and structured notes—will gradually develop, further enriching the on-chain financial system.

Third, institutional-grade compliance frameworks will become a key competitive differentiator. As traditional financial giants such as BlackRock and Apollo enter the space, the RWA market will enter a new phase dominated by structuring. Protocols and infrastructure with native KYC/AML capabilities, support for accredited investor access, and compliance with cross-jurisdictional regulatory requirements will enjoy substantial advantages.

Fourth, the importance of cross-chain interoperability will become increasingly prominent. Structured asset liquidity needs to flow across multiple chains; cross-chain bridges, unified liquidity layers, and standardized token protocols will become critical infrastructure. The coordination between RWA-focused base chains such as Pharos and mainstream chains such as Ethereum and Base will determine the market reach of structured assets.

6.3 Conclusion

The core competition in the RWA market has shifted substantively—from pure asset scale expansion toward the refined on-chain management of risk and return. Structuring is not merely a technical upgrade; it is the deep application of financial engineering logic within an on-chain environment. It requires, within the constraints of a compliance framework and network performance, the precise matching of underlying asset cash flows against the multi-dimensional risk preferences of diverse capital sources. The three-tier yield-rights stratification model pioneered by AquaFlux, together with Pharos Network's high-performance infrastructure, has already preliminarily validated the feasibility of this evolutionary pathway. As more complex assets come on-chain and supporting liquidity infrastructure matures, RWA has the potential to transcend its nascent stage of simple asset mapping and enter a new era of refined management and efficient risk pricing.

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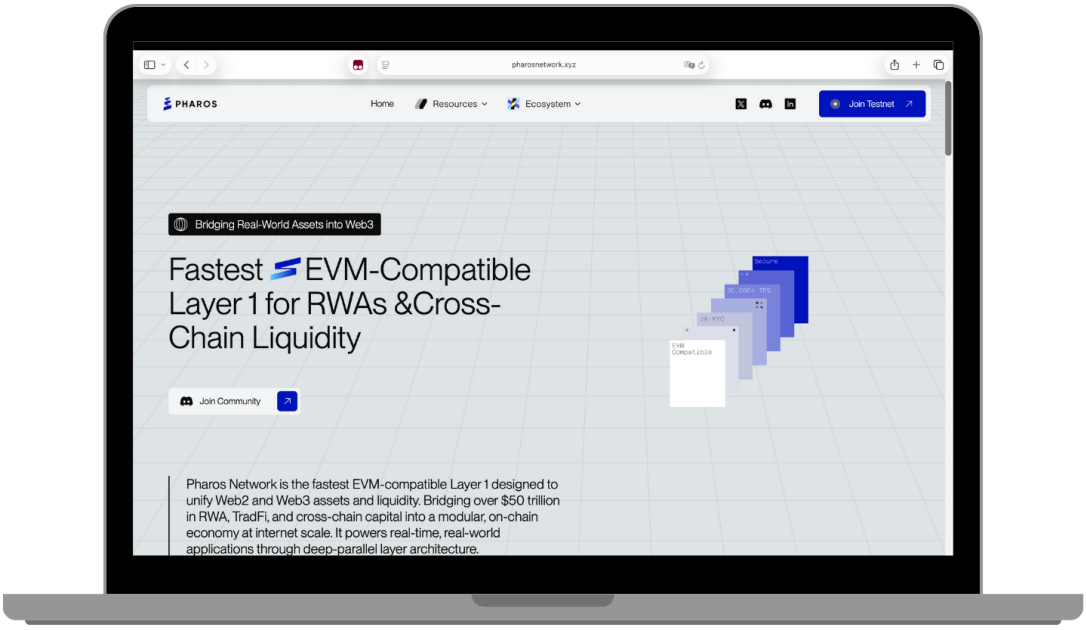
Pharos' Official Website: https://www.pharosnetwork.xyz/



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