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RWA Tokens: Off-chain Law Beats On-chain Code



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01 / It starts with a story: Detroit's unfinished buildings and the disillusionment of ownership

Picture this: A tenant in Detroit's apartment building lived with mold-covered walls and eviction notices on the doors. He had been told the property was part of RealT, a revolutionary blockchain project aiming to democratize real estate. But when rent checks stopped coming and the project collapsed, he learned a hard truth: When physical assets are mismanaged and legal ownership gets tangled up in shell companies, the tokens in his digital wallet become worthless.

This story is not an isolated case—it epitomizes the early-stage challenges in the Real World Asset (RWA) industry. While we were promised authentic on-chain ownership, many RWA projects ultimately rest on shaky legal foundations ^[1]. The tokens you hold often serve merely as digital certificates with limited rights to their underlying assets ^[1].

The path to the trillion-dollar Reservoir of Wealth (RWA) market is not paved solely by clever smart contracts. Boston Consulting Group (BCG) predicts that the tokenized asset market could reach \$16 trillion by 2030, while other reports collaborating with Ripple forecast it will hit \$18.9 trillion by 2033 ^[2]. This journey requires a robust dual-layer architecture: a solid legal framework built off-chain and a sophisticated on-chain dual-chain system. Only such a model can withstand the test of reality.

Table 1: RWA tokenization market size forecast (through 2033)		
source	2024/2025	2030/2033 projections
Boston Consulting Group (BCG)	-	Approximately \$16 trillion (2030)
BCG & Ripple	\$600 billion (2025)	Approximately \$18.9 trillion (2033) ^[2]
Keyrock & Centrifuge	\$50 billion (2025)	-
Source: Boston Consulting Group, Ripple, Keyrock, Centrifuge (2025/08/04)		

02 / Core contradiction: the conflict between code ideal and legal reality

The failure of early RWA projects stems from a fundamental conflict: the automatic execution logic of smart contracts, and the complexity of the real-world legal framework.

2.1 Common problems with early RWA projects

From the RealT unfinished building in Detroit to the aborted student apartment deal for the Harbor project, these failed cases reveal a common pattern 5:

- Unverified ownership: The assets corresponding to the tokens sold by the project party are either not legally owned by them or have already been mortgaged. The Harbor project failed because its lenders prevented the tokenization of assets ^[3].
- Blurred accountability: RealT allegedly uses a network of shell companies that makes it impossible for tenants and token holders to determine who is responsible ^[3].
- Technology can't replace operations: While RealT uses blockchain to handle rent and token transfers, it fails at the most basic level: paying taxes and maintaining properties. Blockchain can't fix bad business practices ^[3].

2.2 Laws come first: code cannot override laws

We must confront a fundamental conflict: smart contracts execute automatically, while legal agreements require human judgment and court enforcement ^[1]. What happens when your token ownership of a building's partial ownership is recorded on-chain, yet the government's land registry off-chain refuses to recognize it? The answer is simple and harsh: the law remains the ultimate authority ^[4]. Your token ultimately becomes a claim legally unenforceable — — Theoretically intriguing, but practically worthless in real-world scenarios ^[1].

Unlike pure on-chain assets like Bitcoin, the core challenge of RWA lies not in technical aspects but in legal and operational dimensions. By definition, RWA inherently requires an off-chain physical component (such as a building, bond, or loan) ^[5]. This off-chain element necessitates a real person or legal entity to manage, custodiate, and legally hold it – the "counterparty". The failure of this counterparty would directly cause the on-chain token's value to vanish. Therefore, the most critical design consideration for any RWA system is not token standards or blockchain throughput (TPS), but rather the legal and operational robustness of the off-chain counterparty.

03 / Solution 1: Build a robust off-chain legal structure

The first and most critical step in the solution is to design legal engineering off-chain to provide an enforceable rights base for on-chain tokens.

3.1 Core mechanism: Special Purpose Entity (SPV) details

A Special Purpose Vehicle (SPV) is not a regular corporation. It is a legal entity established for a single, narrowly defined purpose: acquiring and holding specific assets. Without employees or physical offices, it operates under a set of predefined rules that strictly limit its activities. Its sole function is to serve as a secure, legally independent container for the tokenized assets. This structure forms the cornerstone of the trillion-dollar asset-backed securities (ABS) market in traditional finance.

3.2 How does SPV achieve bankruptcy isolation

This is the key advantage of SPV, which protects investors by isolating assets from the financial risk of the sponsor. This mechanism is achieved through three key steps:

1. Ownership Segregation ("Orphan" SPV): To achieve true asset isolation, the ownership of an SPV is typically placed in a trust structure managed by professional trustees, making it an "orphan" ^[6]. This arrangement prevents both the asset sponsor and investors from directly owning or controlling the SPV itself, thereby avoiding creditors' claims on its assets in the event of the sponsor's bankruptcy.
2. Real Sale (Irrevocable Assignment): The asset originator must "really sell" the asset to the SPV ^[7]. This constitutes a legally binding, non-recourse transfer of title, meaning the originator relinquishes all rights to the asset.
3. Contractual restrictions (limited recourse and prohibition of bankruptcy filing): The legal documents of an SPV contain specific clauses. "Limited recourse" means that the creditors of the SPV can only claim against a specific asset within the SPV. The "prohibition of bankruptcy filing" clause prevents the counterparty from forcing the SPV into bankruptcy proceedings ^[6].

3.3 Case study: The "hybrid model" controversy and legal reality of Figure

Figure As a leader in the field of tokenized private credit, its recent public dispute with data platform DefiLlama perfectly reveals the true operation mode of current RWA business under the lagging regulation.

The dispute arose when DefiLlama refused to fully include the over \$10 billion TVL (total locked value) claimed by Figure on the Provenance chain in its statistics, citing that the on-chain data could not sufficiently verify this scale and that its activity pattern was more like mirroring an internal database onto the chain, lacking real on-chain asset transfers and transactions ^[8].

The crux of this controversy lies not in Figure's business fraud — As an American company that has filed for IPO, its financial data undergoes rigorous auditing, making such fraud prohibitively

costly. The real conflict stems from RWA's current operational model—a hybrid system combining "on-chain visibility with off-chain rights confirmation."

As disclosed in the S-1 filing with the U.S. Securities and Exchange Commission (SEC) in Figure, its Provenance Blockchain operates as a permissioned consortium blockchain rather than a public chain requiring no authorization. This mechanism restricts participation to certified entities like financial institutions that can validate transactions, making it challenging for third parties such as DefiLlama to conduct comprehensive on-chain due diligence.

More crucially, under the current U.S. securities law framework (such as the Securities Exchange Act of 1934), the ultimate ownership of securities must be based on the official records of the transfer agent ^[9]. On-chain records currently serve only as "auxiliary documentation" and do not constitute legally binding ownership certificates. Figure explicitly states in its legal documents: "Peer-to-peer transactions are not final... until the transfer agent records them in official documentation."

This hybrid model is an inevitable choice under the current regulatory environment for the following reasons:

- Identity compliance: The law requires securities holders to pass AML/KYC (anti-money laundering/know your customer) clearance. Wallet addresses alone do not meet this requirement.
- Investor protection: If a private key is lost or a fraudulent transfer occurs, there must be an authoritative legal entity (i.e. Transfer Agent) to handle disputes and restore ownership.
- Regulatory framework not updated: Regulators such as the SEC have yet to amend rules to recognize that "on-chain registration is legal ownership".

Therefore, Figure's model represents a crucial phase in the evolution of RWA: leveraging blockchain to achieve transaction transparency and partial process automation, while anchoring final legal rights confirmation within traditional financial infrastructure off-chain. This controversy clearly demonstrates that evaluating RWA projects should not focus solely on on-chain data, but must also understand the underlying legal frameworks and regulatory constraints.

04 / Solution 2: Design a two-tier chain architecture

On top of a solid legal foundation, an efficient and secure on-chain technology architecture is needed to support the liquidity of assets.

4.1 The separation of the asset chain (registration layer) and the transaction chain (speed layer)

A single blockchain cannot meet the conflicting needs of extreme security and finality required by asset ownership registration, and high speed and low cost required by financial exchanges at the same time^[10]. Therefore, a two-tier architecture has emerged.

feature	Asset chain (registration layer/L1)	Transaction chain (transaction layer / L2)
major function	Legal ownership registration (certification)	Financial transactions and liquidity
analogy	Government Land Registry	securities exchange
Core priorities	Safety and finality	Speed and throughput
transactions velocity	Slow (min/h)	Very fast (millisecond/second)
transaction cost	tall	low
Typical technologies	L1 blockchain (such as Ethereum, Polymesh) or consortium chain	L2 Rollup (e.g. Jovay, Arbitrum)
Asset types on the chain	An NFT representing the entire asset of SPV	Represent a homogeneous token that represents a fragmented share (e.g., ERC-20)
Core user operations	Forging, destruction, major legal updates	Deals, lending, mortgages
Source: Pharos Research		

The case of Figure happens to explain this problem. The Provenance Blockchain where its assets are located is a permissioned consortium blockchain (Permissioned Consortium Blockchain).

Unlike public chains (such as Ethereum) that can be used anonymously by anyone, nodes on a consortium chain are licensed and identifiable entities (such as banks, fund houses, auditors). This gives it several unmatched advantages as an "asset chain":

- Regulatory Compliance and KYC/AML: Real-world financial asset transactions must meet stringent "Know Your Customer" (KYC) and "Anti-Money Laundering" (AML) requirements. By implementing node access mechanisms, consortium chains ensure all participants are

compliant and authenticated financial institutions, effectively addressing compliance challenges stemming from anonymity at the source.

- Identity and recourse: In the event of extreme situations such as loss of private key or fraudulent transactions, since the identity of participants is known, recourse and arbitration can be carried out through off-chain legal channels. This is crucial for assets worth tens of millions or even billions, which is a security guarantee that public chains cannot provide.
- Performance and privacy control: The transaction throughput (TPS) of alliance chain is usually much higher than that of public chain, and the transaction data can be controlled more finely and only visible to relevant parties, which is more in line with the business needs of financial institutions.

Therefore, the core task of the asset chain is not to be decentralized, but to become a digital ownership registration system jointly maintained by multiple trusted institutions, which is immutable and legally recognized. Under the current legal framework, alliance chain is the best choice to carry this mission.

4.2 Case study: Practice of Jovay platform of Ant Group

Ant Group's "two chains and one bridge" architecture is a typical example of the two-layer model ^[11].

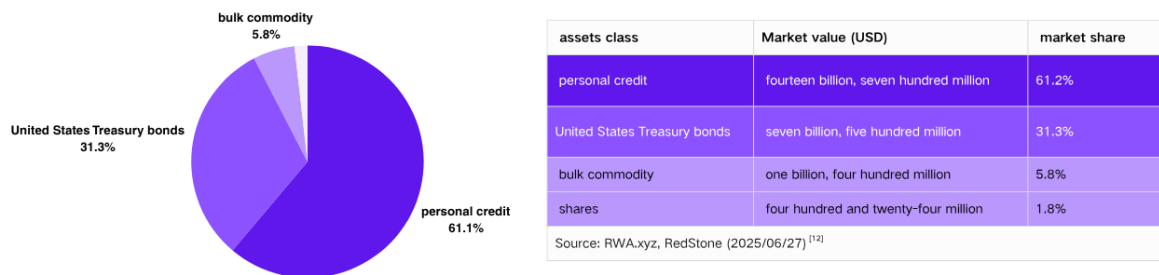
- Asset Chain: An alliance chain used to carry and verify data of real-world assets such as new energy equipment from the Chinese mainland, ensuring the authenticity and credibility of asset information.
- Transaction Chain (Jovay): A high-performance Layer 2 platform optimized for RWA transactions, supporting throughput of up to 100,000 TPS and a confirmation time of approximately 100 milliseconds, for processing capital tokenization and high-frequency trading.
- Trusted Cross-Chain Bridge: Connects the asset chain and transaction chain while ensuring data synchronization and secure transfer of assets between them. It employs security models such as "three-phase layered confirmation + TEE/ZKP" to guarantee the reliability of cross-chain operations.

In this architecture, assets are first confirmed and digitized on the asset chain, and then efficiently circulated and financial activities are carried out on the transaction chain Jovay, achieving a balance between security and efficiency.

05 / Market snapshot: Data tells us what RWA looks like today

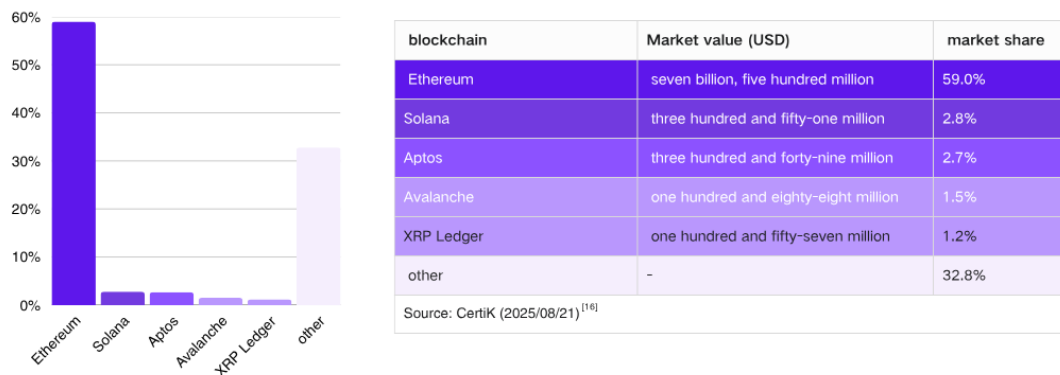
By mid-2025, the RWA market has grown into an ecosystem worth more than \$24 billion, dominated by specific asset classes and blockchain networks ^[12].

Figure 2: RWA market by asset class in 2025



As shown in Figure 2, private lending is the undisputed leader, accounting for over 60% of the market share. This is due to its ability to generate predictable returns, making it an ideal choice for DeFi investors seeking stable returns ^[13].

Figure 3: Market share of RWA by blockchain network in 2025



At the bottom of the technology, Ethereum and its Layer 2 solutions host about 59% of the tokenized value (excluding private credit), cementing its position as an "institutional standard" ^[12].

06 / The risk that cannot be ignored: The potential fault lines in the model

Although the double-layer architecture solves the core problem, risks remain.

6.1 The lingering risk of counterparties

While the SPV model has been mitigated, it hasn't eliminated counterparty risk. SPVs still require real-world service providers: trustees managing trust assets, custodians holding asset records, etc.^[14]. If these centralized entities are defrauded or go bankrupt, token holders' legal claims could become extremely complex and costly in court^[15]. The growing number of protocol vulnerabilities further exacerbates this risk. According to CertiK data, RWA protocols suffered \$14.6 million in losses due to security breaches during the first half of 2025 – surpassing the total for all of 2024 combined^[16]. The most significant incident occurred in March 2025 when Zoth's smart contract service wallet private key was stolen, resulting in \$8.5 million in losses.

Figure 4: Losses caused by vulnerabilities in the RWA protocol (annual)	
a particular year	Loss amount (in millions of United States dollars)
2023	17.9
2024	6.0
2025 (first half)	14.6
Source: CertiK (2025/08/21)	

6.2 Predictor data dependency problem

The entire blockchain ecosystem relies on oracle systems (such as Chainlink) to provide critical off-chain data — for asset valuation, rental income tracking, and default status monitoring [15]. If this data is manipulated, delayed, or incorrect, smart contracts will execute based on erroneous information. For example, a tokenized real estate protocol depends on an oracle to provide the latest property valuation. If the oracle is tampered with by malicious actors inputting false low valuations, users holding these property tokens as collateral could face unfair liquidation. Similarly, if a private lending protocol's oracle fails to update borrower defaults in a timely manner, on-chain investors might continue funding defaulted asset pools, potentially causing significant losses.

6.3 Anchor risk: USDC warning

The relationship between L2 transaction tokens and L1 asset representatives is a form of "anchoring". Similar to stablecoins, this anchoring can break under pressure. The March 2023

collapse of Silicon Valley Bank caused the USDC stablecoin, which was linked to these assets, to temporarily decouple to \$0.87 USD. This serves as a stark warning for RWA protocols that rely on traditional financial partners.

6.4 Complex global regulatory environment

The legal environment is a complex and ever-changing puzzle. A token might be classified as a security in the U.S. (subject to SEC regulations), function as a different instrument under the EU's MiCA framework, and present entirely distinct implications in Asia. This cross-border complexity creates substantial compliance costs and risks.

6.5 The RWA Impossible Triangle: The Balancing Act Between Law, Efficiency and Decentralization

RWA systems face their own "trilemma" of legal enforceability, capital efficiency and decentralization. You can choose any two of them, but it is extremely difficult to achieve all three simultaneously.

- Legal enforceability + Capital efficiency: This is the SPV model we're discussing. It uses a centralized legal entity to provide strong legal claims and attract institutional capital, but sacrifices decentralization.
- Legal enforceability + Decentralization: While this framework enables asset control through DAOs, it faces implementation challenges. Courts and regulators prefer working with single-purpose legal entities (e.g., SPVs) for legal compliance. This combination severely undermines capital efficiency: DAO governance decisions are slow, each on-chain vote incurs high Gas fees, requires 150-200% over-mitigation rates (far exceeding SPV's 100-120%), institutional investors avoid DAO structures due to unclear accountability and compliance risks (limiting available funding scale as BCG predicts a \$16 trillion market primarily dependent on institutional participation), and emergency situations like RealT's tax default cannot be promptly resolved.
- Capital Efficiency + Decentralization: This was the early model of pure on-chain DeFi, using crypto assets as collateral. While efficient and decentralized, it lacked legal enforceability in the real world.

Therefore, the double chain/SPV architecture represents a pragmatic choice that prioritizes legal enforceability and capital efficiency at the expense of pure decentralization.

07 / From "Can it be tokenized?" to "Can it survive in court?"

The future of the RWA market will be dominated by teams that can both draft watertight legal provisions for SPVs and are skilled at writing secure smart contracts.

For years, the core question in our industry has been: "Can we tokenize it?" Technically speaking, we've proven that almost anything can be tokenized. But this is the wrong question. The crucial question now is: "Will the framework we've built survive its first confrontation with bankruptcy courts?" The answer to this will determine whether RWA tokenization becomes a \$16 trillion revolution or merely a billion-dollar footnote in financial engineering history.

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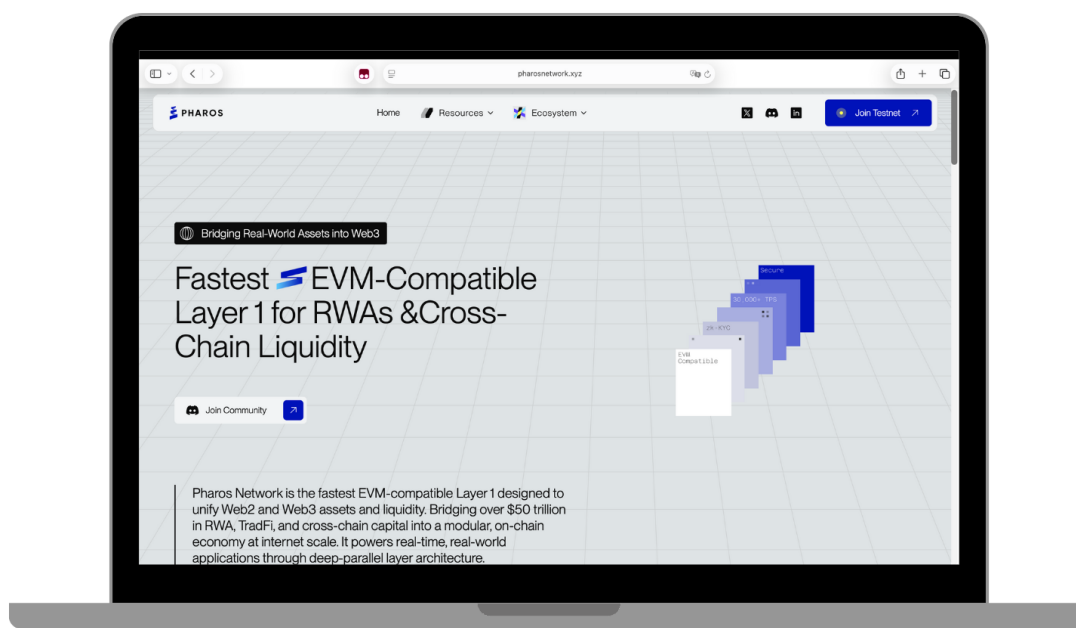
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