Universal Stablecoin and LST Infrastructure: Leveraging the Future of Digital Finance

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Abstract

Pecker is establishing the foundational infrastructure for the next era of digital money, addressing systemic inefficiencies in the rapidly expanding $500B+ stablecoin and liquid staking asset market. As stablecoins increasingly underpin global digital payments and decentralized finance, the proliferation of new issuances has led to fragmented liquidity, capital inefficiencies, and disjointed user experiences. Pecker introduces a unified framework to resolve these structural challenges.

Our flagship infrastructure, Pecker's Root, is a next-generation automated market maker (AMM) designed for generating universal USD and universal liquid staking assets for the Monad ecosystem. By concentrating liquidity across a single, composable pool, Pecker's Root enhances capital efficiency, improves trade execution, and unlocks superior yields for liquidity providers. For issuers, it offers immediate access to deep, aggregated liquidity across all supported stablecoins with a single integration.

1 Understanding USD% and LST%: A Novel Approach to Stablecoin and LST Liquidity

A Comprehensive Analysis of Pecker's Capital-Efficient Stablecoin Representation Mechanism

1.1 Conceptual Framework of USD%

USD% constitutes a sophisticated liquidity provider (LP) token that represents a proportional claim on Pecker's Root Pool—an advanced, auto-compounding reserve comprised of established stablecoins: **USDC, USDT**. Upon contribution of these underlying assets (either individually or in calibrated proportion) to the Root Pool, participants are allocated USD% tokens commensurate with their contribution.

Beyond its primary function as an LP token, USD% and LST% serves as a **unified stablecoin and LST representation mechanism**. This innovative construct abstracts the inherent complexities of stablecoin and LST diversification while simultaneously concentrating liquidity and yield generation within a singular, interoperable asset structure.

USD% and LST% facilitates unprecedented access to enhanced liquidity depth, sophisticated yield optimization strategies, and comprehensive cross-stablecoin interoperability—all while maintaining native composability within the Monad ecosystem.

1.2 USD% and LST% Issuance Methodology

The issuance of USD% and LST% occurs through contribution to the **Root Pool** via two principal methodologies:

- **Unilateral Asset Contribution:** A singular deposit of USDC, USDT yields USD% according to the prevailing conversion parameters and aprMON, sMON, WMON yields LST%
- **Multi-Asset Contribution:** Proportionally calibrated contributions of USDC/USDT result in optimized USD% and aprMON, sMON, WMON result in optimized LST% issuance with minimal slippage

This sophisticated mechanism enables developers and participants to establish a consistent stablecoin and LST interaction framework without necessitating the direct management of constituent tokens.

1.3 Operational Utility of USD%

Post-issuance, USD% exhibits multifaceted utility:

- **Exchange Functionality:** Facilitation of asset transformation via Pecker's Swap interface for compatible stablecoins and LSTs.
- **Yield Optimization:** Allocation to **Pecker Pools** generates supplementary returns derived from partner stablecoin and LST interactions
- **Ecosystem Integration:** Incorporation into decentralized applications, protocols, or financial products requiring a composable, yield-generating stablecoin representation

1.4 Why USD%

- **Unified Liquidity Layer:** No more fragmented stablecoin and LST pairs
- **Yield-Bearing:** Root Pool fees are auto-compounded into USD%
- **Risk-Isolated:** Exposure limited to trusted base assets in the Seed Pool

2 Pecker's AMM

2.1 Overview

Pecker's stableswap and LST AMM facilitates the launch, trading and liquidity provisioning of stablecoins by implementing composable, extensible pools and reducing idle-liquidity that exists in traditional AMM designs.

We have a flexible architecture to anticipate and adapt to emerging stablecoin and LST standards. Pecker AMM is the first stableswap to natively integrate Monad Interest Bearing Tokens (MIBT), empowering innovation and growth for the Monad stablecoin and LST ecosystem.

2.2 Structural Framework

Centralized Distribution Model

This modular architecture effectively compartmentalizes systemic risks while optimizing exchange efficiency through the strategic interconnection of established stablecoins with emerging assets. The framework consists of a central **Root Pool** that distributes liquidity systematically to multiple peripheral **Pecker Pools**.

Primary Liquidity Reservoir

The Root Pools functions as the fundamental liquidity nucleus, comprising widely-adopted and extensively integrated stablecoins including USDC, USDT, WMON, aprMON, sMON. USD% and LST% represents the liquidity provision token signifying proportional ownership of the Seed Pool, exhibiting continuous value appreciation as the reservoir accumulates transaction fees and implements automated yield compounding mechanisms.

A universal USD% is minted from a Monad-native USDT and USDC stableswap pool and paired with other ecosystem stablecoins.

Similarly, a universal LST% is minted from the WMON, aprMON, and sMON stableswap pool and paired with other ecosystem LSTs. Effectively solving fragmented liquidity.

Secondary Liquidity Extensions

Pecker Pools augment the protocol's operational capabilities, structured around USD% as the central asset, complemented by individual partner stablecoins functioning as peripheral assets. Exchange operations traverse USD% through dual-hop transactions: initial conversion into USD% followed by subsequent conversion into the target asset. This sophisticated routing methodology insulates the Root Pool from exogenous risks while maximizing the capital efficiency of Pecker's total value locked—enabling USD% issuers to capture both Root Pool yields and supplementary returns through Pecker Pool participation.

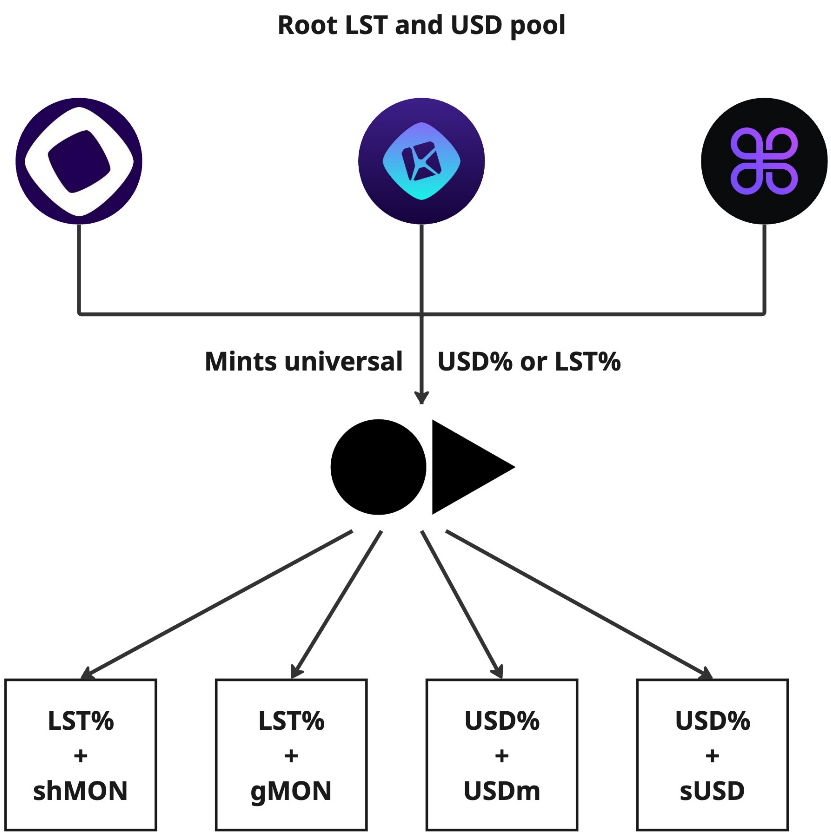

Figure 1: Universal mechanism for liquidity provision and asset exchange within the Pecker Protocol ecosystem.

2.3 Technical Characteristics

Constrained Liquidity Allocation

The constrained liquidity allocation methodology substantially reduces asset underutilization, resulting in enhanced exchange rate efficiency and amplified transaction revenue generation. This characteristic assumes particular significance within stablecoin and LST liquidity pools, as the predominance of trading activity occurs within minimal deviation from price parity.

This implementation strategically concentrates liquidity allocation within a precisely defined range—specifically at nominal parity pricing (0.99-1.01)—in contrast to conventional approaches that distribute liquidity across an expansive price spectrum. Upon reaching the defined liquidity allocation boundaries, the pool architecture restricts transaction directionality until pricing parameters return to the specified range.

Parametric Asset Distribution

Pecker's liquidity architecture implements configurable asset distribution parameters to maintain optimal system equilibrium and transaction efficiency throughout the protocol. This market-responsive methodology establishes a self-regulating mechanism that preserves stability without requiring external intervention by algorithmically adjusting exchange rates based on asset proportionality.

From a technical perspective, the invariant equation defines a mathematical reference point that allocates liquidity according to predetermined distribution parameters. When asset proportions deviate from these established parameters, the equation automatically generates arbitrage opportunities through preferential exchange rates that incentivize liquidity realignment toward equilibrium.

The primary liquidity reservoir targets a precise distribution of 50% USDC, 50% USDT. And for LST Root Pool it will be 33% WMON, 33% aprMON, 33% sMON. Should asset representation decline below its designated weight threshold, the invariant equation generates favorable exchange rates for transactions contributing that asset, thereby incentivizing arbitrage participants to restore distribution equilibrium.

Secondary liquidity extensions implement this distribution methodology with a balanced 50/50 allocation between USD% and their respective partner stablecoins or LSTs. This calibrated distribution ensures efficient exchange facilitation between emerging stablecoins and LSTs and established assets within the primary liquidity reservoir, while the centralized distribution model effectively isolates associated risks.

Through this sophisticated, market-responsive approach, the protocol maintains exceptional capital efficiency and systemic stability across both liquidity structure types without necessitating active administrative intervention.

2.4 User Benefits

Capital efficiency usually comes with additional complexities and risks on traditional Monad AMMs, causing fragmented liquidity and increased conversion costs among a wider range of stablecoins. By unifying liquidity with superior capital efficiency, Pecker address these inefficiencies in DeFi providing unique advantages for all participants.

Liquidity Providers

Earn higher returns with passive liquidity provision

1. Pools have improved fee generation through more in-the-money liquidity (i.e, liquidity is concentrated around the peg within a narrow, 0.99-1.01, price range)

2. Yields from swap fees are auto-compounded without manual rebalancing of positions

3. Pecker Pools have 1.5x yield opportunity by combining native swap fees with USD% yield from the Root Pool

4. Liquidity Providers receive 100% of swap fees in all Pools, with a protocol fee planned for future implementation

Stablecoin Issuers

Pecker was designed with composability of issuers in mind, eliminating common bootstrapping challenges through a single, faster integration point.

1. Skip building liquidity independently, no more two-sided liquidity with USDC
2. Integrate with PeckerUSD or PeckerLST and access tightly, concentrated liquidity across its underlyings (USDC/USDT) or (aprMON, sMON)
3. Reduce upfront capital and complexity with single-sided liquidity provision and minimal overhead

Traders

Better Rates, Simpler Trading

1. Pay less when swapping your favorite stablecoins
2. Trade emerging stablecoins through a single unified interface

3 Technical Design

Capital efficient multi-asset stableswap

3.1 Macroscopic System Architecture

Pecker represents an advanced stableswap automated market making system that aggregates multiple stablecoin assets into a unified multi-asset liquidity reservoir. This reservoir exhibits hybrid characteristics of both parametrically weighted pools and conventional StableSwap implementations.

The multi-asset reservoir constitutes a composite structure of multiple binary asset pools—one dedicated to each stablecoin—where each binary pool maintains liquidity in its respective stablecoin alongside liquidity in a reference asset denoted as $*$. This reference asset $*$ can be conceptualized as an abstract value representation, functioning as a *PECKER*, and embodies the fundamental concept of a standardized unit of value equivalent to one US dollar.

During initialization, each binary asset pool receives equivalent proportions of its designated stablecoin and the reference asset $*$, reflecting the foundational assumption that all stablecoins maintain 1:1 parity with $*$. Consequently, all stablecoins initially maintain 1:1 exchange parity with each other, facilitated through $*$. The system requires only that each pool maintains internal parity between its stablecoin and $*$, while allowing variability in absolute quantities across different pools. Thus, the proportional composition of the multi-asset reservoir constitutes an equilibrium weight distribution w_i for each stablecoin, where $\sum_i w_i = 1$.

Examining our primary liquidity reservoir, comprising 50% USDC, 50% USDT, exchange operations between any stablecoin pair interfacing with $*$ can be executed through dual-traversal transactions—initial conversion into $*$ followed by subsequent conversion to the target asset. The resulting star-topology of liquidity providers effectively functions as a unified multi-asset reservoir. By restricting exchange operations exclusively to dual-traversal paths (never terminating at $*$), the exchange rate between $*$ and each constituent token effectively serves as a price oracle reflecting the market valuation of these stablecoins, without $*$ itself existing as a directly holdable asset.

3.2 Properties of The AMM

1. **Open market arbitrage**

   - The exchange rate offered by our multi-asset pool (amount of token y out over amount of token x in) is $\frac{a_x}{a_y} = \frac{a_x^*}{a_y^*}$, equaling the open market exchange rate, assuming rational arbitragers.

2. **Achieves value weights only at equilibrium**

   - Let π_x be the proportion of the multi-asset pool (ignoring *) that is made up of stablecoin x. The multi-asset pool has token proportions equal to the initial seeding weights ($\pi_x = w_x, \forall\, x$), if and only if $\frac{a_x}{a_y} = 1, \forall\, x, y$. Otherwise there is an arbitrage incentive where some stablecoin can be traded to get more than 1 of some other stablecoin.

Note: The multi-asset pool is most capital efficient when the liquidity is distributed according to the initial weighting (the initial weighting is an anchor point for our CFMM). When this is not the case, the pool offers swaps towards equilibrium a premium.

3.3 Pecker's Bonding Curve

Bonding Curve Invariant

Recall that good stableswap invariants balance a tradeoff between constant product $xy = k$ and constant sum $x + y = k$, trying to behave like the latter as much as possible while still charging a price impact as reserves deplete.

Our two asset pool bonding curve is based on the Balancer stableswap invariant. Specifically given token amounts x and y, we start with the invariant

$$x + y - \frac{A}{x} - \frac{A}{y} = D \tag{1}$$

where A is an amplification parameter to control how much we behave like constant product vs. constant sum.

Stable Pool:

$$A \cdot n^n \cdot \sum_{i=1}^{n} x_i + D = A \cdot D \cdot \sum_{i=1}^{n} \frac{D}{n \cdot x_i}$$

where:

- A is the amplification coefficient,
- n is the number of stablecoins in the liquidity pool,
- x_i is the amount of each stablecoin in the pool,
- D is the total liquidity in the pool.

In the current intra-chain AMM market, applications are unable to unify their liquidity.

3.4 Adding and Removing Liquidity

Stable Pool:

Invariant Calculation:

$$D = \sum_i x_i$$

where x_i are the balances of the stablecoins in the pool after the addition.

LP Tokens Minted:

$$\Delta LP = \frac{\Delta D}{D_{\text{initial}}} \cdot LP_{\text{total}}$$

where ΔD is the change in the invariant, D_{initial} is the invariant before adding liquidity, and LP_{total} is the total supply of LP tokens before the addition.

Removing Liquidity

When removing liquidity, a user burns their LP tokens and receives stablecoins from the pool.

Stablecoins Received:

$$x_i = \frac{LP_{\text{burn}}}{LP_{\text{total}}} \cdot x_i^{\text{total}}$$

where LP_{burn} is the amount of LP tokens burned, LP_{total} is the total supply of LP tokens, and x_i^{total} are the total balances of the stablecoins in the pool.

4 Conclusion

Pecker Protocol represents a significant advancement in the stablecoin and liquid staking token (LST) infrastructure landscape, addressing critical inefficiencies that have emerged as the market has expanded beyond $500B. Through innovative architectural design and mathematical principles, Pecker establishes a unified framework that resolves the fundamental challenges of fragmented liquidity, capital inefficiency, and disjointed user experiences that have characterized the ecosystem to date.

The introduction of USD% and LST% as universal representation mechanisms marks a paradigm shift in how liquidity is managed across digital assets. By implementing a sophisticated Root Pool structure that leverages constrained liquidity allocation and parametric asset distribution methodologies, Pecker achieves superior capital efficiency while maintaining robust risk isolation. The protocol's star-topology architecture enables seamless interoperability between established stablecoins and emerging assets through a dual-traversal transaction pathway that preserves system stability.

From a technical perspective, Pecker's bonding curve implementation represents an elegant solution to the constant product versus constant sum tradeoff inherent in automated market makers. By employing a modified Balancer stableswap invariant, the protocol achieves optimal price discovery while minimizing slippage within a precisely defined range of nominal parity pricing (0.99-1.01). This sophisticated approach to liquidity management results in demonstrably enhanced fee generation and yield optimization opportunities for liquidity providers.

For issuers, Pecker eliminates traditional bootstrapping challenges through a single integration point, replacing the fragmented two-sided liquidity model with a unified access layer. This democratizes the stablecoin and LST ecosystem by lowering barriers to entry and accelerating innovation cycles. For traders, the improvement in execution efficiency and reduction in transaction costs represents a meaningful advancement in market microstructure.

As the digital asset ecosystem continues to evolve, Pecker's foundational infrastructure provides the composable building blocks necessary for the next generation of financial applications. By solving the liquidity fragmentation problem through elegant mathematical principles and thoughtful system design, Pecker Protocol stands poised to become the standard-bearing infrastructure for stablecoin and LST liquidity in the Monad ecosystem and beyond, driving adoption and establishing new paradigms for capital efficiency in decentralized finance.