Solayer: Endogenous AVS on Solana Powered by Restaking

Solayer Team

v0, Part 1

Abstract

This paper introduces Solayer, a novel restaking platform facilitating endogenous Actively Validated Services (AVSs) on the Solana blockchain. Restaking, originally proposed by Eigenlayer, enables stakers to maximize the utility of their assets by opting in to validate external software modules built on top of the Ethereum blockchain. Solayer builds upon this concept, offering a restaking marketplace tailored specifically for Solana and focusing on endogenous AVSs, which directly support on-chain decentralized applications (dApps). Leveraging Solana's stake-weighted quality of service (QoS) infrastructure, Solayer empowers dApps to secure block space and prioritize transactions based on the amount delegated to the dApp. Furthermore, Solayer introduces AVS Token, which not only offers users Solana POS yield but also provides super liquidity through a pooled liquidity design, addressing concerns related to conversion delay and slippage.

1 Introduction to Restaking

Restaking is a concept popularised by Eigenlayer [Tea24]. It enables stakers to contribute their crypto-economic security by reusing their staked assets on Ethereum [B+13] as collateral in other proof-of-stake systems, also known as Actively Validated Services (AVSs). This innovative technique not only optimizes the usage of staked assets but also boosts the overall security and efficiency of the ecosystem. Stakers can earn additional rewards through restaking. These additional rewards may come in the form of proof-of-stake yield of the secured AVSs, bridge fees, or a combination of both.

In Eigenlayer's model, AVSs maintain off-chain networks and use the base chain (in Eigenlayer's case, Ethereum) to establish consensus on security via quorum-based slashing or on-chain verifiable proof. Examples of AVSs include cross-chain bridges, shared sequencers, oracle networks, among others. We refer to such systems as exogenous AVSs.

Like Eigenlayer, Solayer is a restaking marketplace developed on Solana [Yak18]. Instead of focusing on exogenous AVSs, Solayer aims to support on-chain decentralized applications (dApps) initially. The goal is to provide dApps on Solana with a greater likelihood of securing block space and prioritizing transaction inclusion. These are referred to as endogenous AVSs.

2 Solana's Stake-weighted Quality of Service

Stake-weighted quality of service (QoS) [Blo24] refers to the allocation of network resources, such as block space and transaction processing capacity, based on the amount of stake committed by validators or stakers. Under this model, a validator with 1% stake would have the right to transmit up to 1% of the packets to the epoch leader and would be capable of resisting Sybil attacks from the rest of the network. As pointed out by the Solana blog [Blo24], commercial RPC infrastructure operators and entities hosting their own validator nodes and RPC nodes would benefit the most from this, as RPC nodes could include more transactions in blocks by agreeing to peer with validators, and validators may sell more capacity to RPC nodes.

3 Endogenous AVS: The Stake-weighted Quality of Service Infrastructure for dApps

We envision a future where decentralized applications (dApps) can reserve and manage capacity for processing transactions on the blockchain through application-level staking into validators. This means that dApps with a higher total stake will have greater influence on the network's operations, leading to improved overall network efficiency and reliability for user transactions. DApps with large user stakes would benefit, as more transaction processing units (TPUs) will be allocated without the need for paying extra premiums to RPC node operators.

Solayer is an end-to-end trustless restaking marketplace for dApps to collect and manage staked assets from users and obtain proportional resource provisioning directly from validators. DApps provides the demand of stake, whereas Solana stakers are the supply of stake. Unlike Eigenlayer, which initially focuses on exogenous AVSs (e.g., cross-chain bridges, oracles, shared sequencers, and other non-mainnet systems), Solayer aims to start with native Solana on-chain dApps (referred to as endogenous AVSs) and assist them in reserving block space and prioritizing transaction inclusion based on the amount of stake delegated to them. Stakes delegated to on-chain dApps can also be re-delegated to secure exogenous AVSs later.

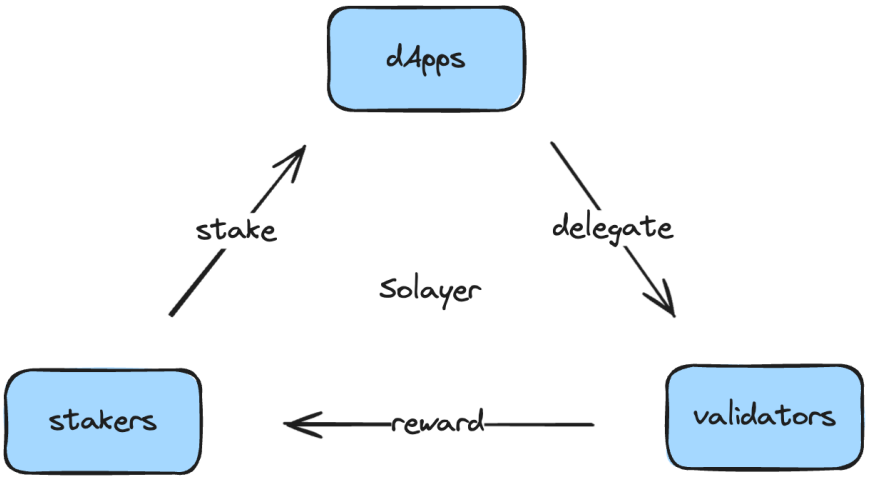

Figure 1: Solayer is the restaking marketplace for endogenous AVS

3.1 Solayer Endogenous AVS Token

Solayer provides decentralized applications (dApps) with a simple method to create their own AVS LST. These tokens come with Solana's native staking yield as their base rewards, along with additional MEV yields. Solayer optimizes the staking yield by delegating it to the highest yield-bearing validators. Additionally, Solayer runs its own validator implementation that supports app-level stake-weighted quality of service provisioning. Moreover, dApps can receive a portion of the staking commission and will be able to configure the underlying operators for stake delegation in the future. The Solayer AVS Token is a delegated representation of sSOL, which is the Solayer-managed LST token on Solana.

In the future, we envision dApps having direct control over the validators to which the underlying SOL is delegated. They should also be able to configure the required stake-weighted quality of service with a dynamic pricing mechanism depending on the current network workload.

3.2 Solayer Stake Delegation Flow

First, users convert SOL into its natively staked form, sSOL. Staked SOL will be delegated to Solayer-recommended validators. They then delegate it to an endogenous dApp AVS on Solayer, which converts

sSOL to a delegated form. Finally, Solayer AVS mints AVS tokens which can later be used as a stake proof to retrieve staked SOL back and claim rewards.

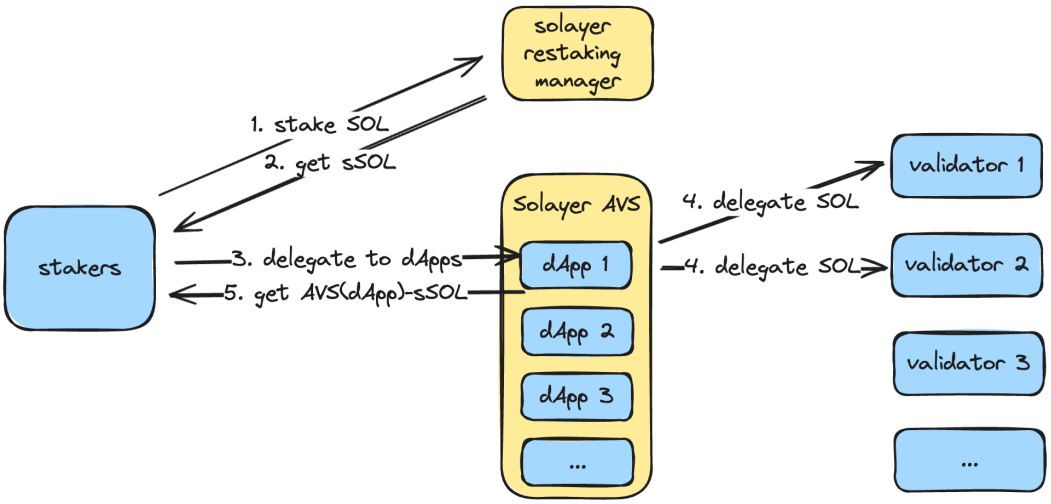

Figure 2: Solayer stake delegation flow

3.3 Solayer AVS Transaction Prioritization Flow

When executing transactions, dApps send transactions to Solayer-specified RPC nodes with additional server-side signatures. RPC nodes forward the transactions to delegated validators. After validating the identity of the sender, validators prioritize such transactions based on the stake weight delegated when creating blocks or forwarding transactions to the leader of the epoch.[Blo24].

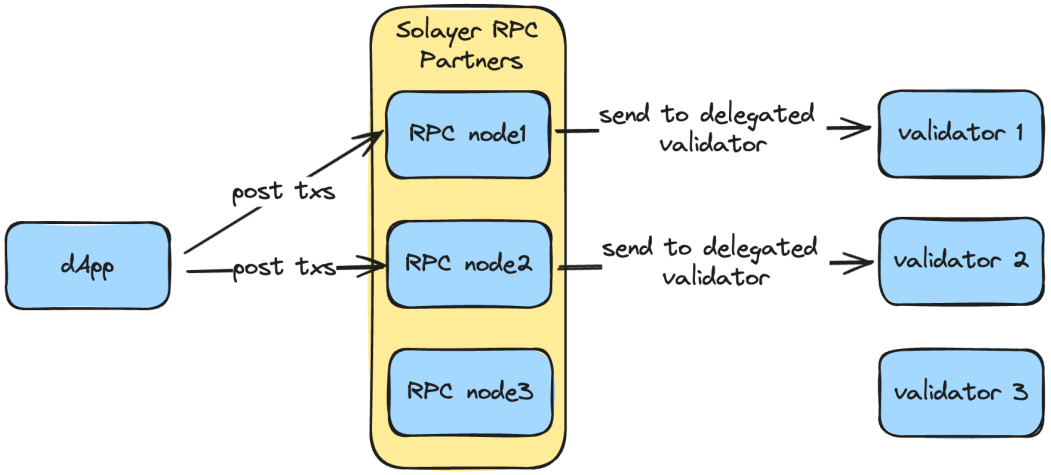

Figure 3: Solayer AVS transaction prioritization flow

3.4 Solayer Unstake and Rewards Collection

Upon withdrawal requests, Solayer AVS would unstake AVS tokens back to sSOL. Users can then claim the SOL from Solayer as well as the staking rewards, including Solana staking rewards and AVS rewards. Note that Solayer will share a portion of the Solana staking commission back to the dApps. Users retain the majority of the staking rewards.

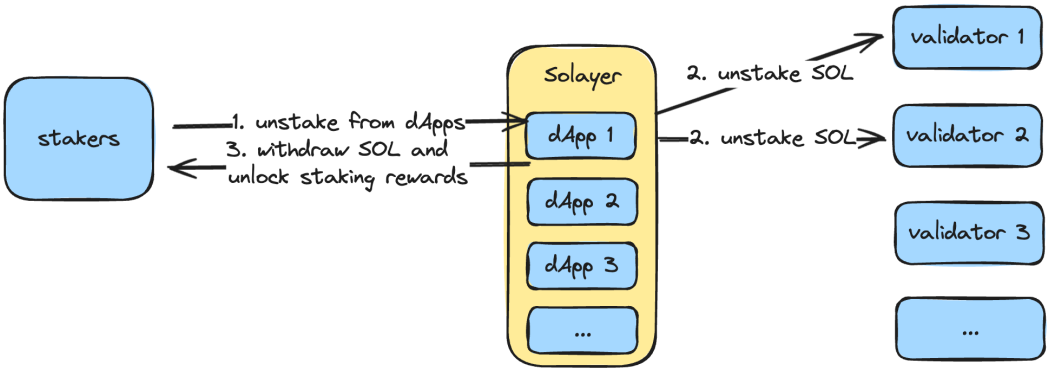

Figure 4: Solayer unstake and rewards collection flow

3.5 Super Liquidity

Liquidity is the most important factor for the adoption of any asset. Conversion delay and slippage are two key considerations. In an ideal world, there would be no slippage and instant conversion, so all Solana users should hold yield-bearing LSTs instead of SOL. What prevents this from happening is the liquidity of such LSTs. Each LST needs to have a deep pool with low swap fees and a significant amount of trading volume to offset LP's capital costs. To address this problem, Solayer introduces Superior Liquidity for AVS Tokens using a pooled liquidity design.

Solayer AVS LST Tokens can be instantly unwrapped (or undelegated) back to the underlying representation, sSOL. Unlike others that use a multi-LST pool, where the liquidity for each LST depends on their LP pools (a less efficient design), Solayer consolidates all liquidity for Solayer AVS Tokens using the sSOL-SOL pair. This strategy results in significantly smaller price impact and significantly improved liquidity.

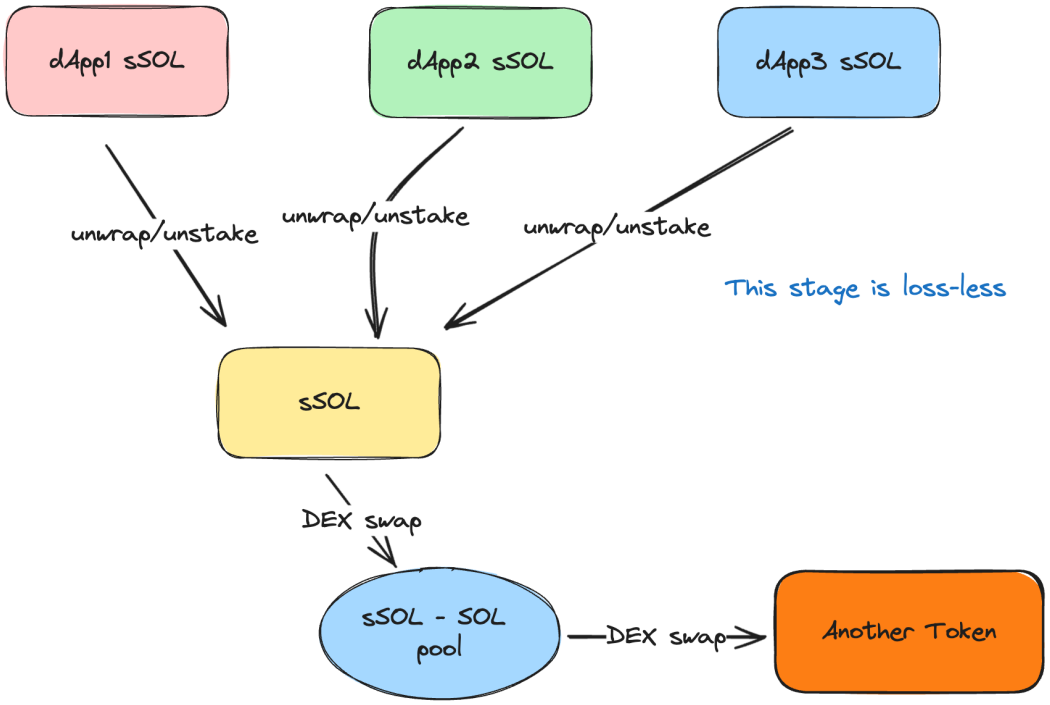

Figure 5: Solayer single LST pool

4 Conclusion

Solayer revolutionizes the restaking ecosystem by introducing endogenous AVS and enabling dApps to access stake-weighted quality of service, eliminating the need for an intermediary RPC node marketplace which can be centralized, and ensuring efficient allocation of transaction processing units. Additionally, Solayer's AVS Tokens provide a universal yield layer and improve liquidity by addressing conversion delay and slippage. Overall, Solayer's innovative restaking design significantly enhances operational efficiency and user experience on the Solana blockchain, paving the way for greater LST adoption and better quality of service guarantee and management.

References

[B+13] Vitalik Buterin et al. Ethereum white paper. *GitHub repository*, 1:22–23, 2013.

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