Introduction

This documentation is intended to introduce the general user to the project, as well as to serve as a guide for anyone who may be developing software using Lido.

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What is Lido

Lido is the leading liquid staking solution - providing a simple way to get rewards on your digital tokens. By staking with Lido your tokens remain liquid and can be used across a range of DeFi applications, getting extra rewards.

1. Staking pool
2. . Protocol to manage deposits, staking rewards, and withdrawals. A separate one for every supported network.
3. st[token]
4. . Unlike staked tokens, the Lidost[token]
5. are freely transferable instead of locked as in the case of native staking. Lido lets users operate with staked tokens by leveraging collateral, lending, farming, and other kinds of DeFi protocols.
6. DAO
7. . Lido liquid protocols management entity, responsible for picking node operators, configuring the protocol parameters and much more.

To dive into the details of governance design and implementation, proceed to[DAO](#) 1. Node Operators 2. . entities that manage a secure and stable infrastructure for running validator clients for the benefit of the protocols. They're dedicated staking providers who can ensure the safety of funds belonging to the protocol users and correctness of validator operations.

Ethereum is and remains a primary focus of Lido. That's affected the organisational structure - the governance is implemented through ERC20LDO token. Currently Lido supports also the Polygon PoS network - when staking native tokens with Lido, users will receive ast[token] , which represents their[token] which represents their deposit and the rewards aggregated over time (penalties too).

[Lido on Polygon (stMATIC) For the Lido on Polygon protocol documentation please proceed to a separate portal.](#)

Liquid staking

Problem statement

Traditionally, staking in Proof-of-Stake (PoS) protocol based projects has been about locking one's tokens in one project for a long time and expecting a fixed, predetermined staking reward in return. While it guarantees the return on staked tokens much like a bond, it also limits the opportunities of generating higher returns on those tokens from the DeFi ecosystem. If you've staked all of your crypto holdings, you can't invest or trade in more profitable crypto pairs on exchanges.

Solution

Liquid staking allows using thest[token] in other trading opportunities to let the user get the best of both worlds - a reward on your staked tokens, as well as the returns from new trading opportunities. Liquid staking introduces various fundamental benefits by:

- Making staking process simple - no need to worry about hardware setup and maintenance;

- Making it possible to get rewards on as small a deposit as users want (i.e, Ethereum requires minimum 32ETH
- staked);
- Providing thest[token]
- a building block for other applications and protocols (e.g., as collateral in lending or other trading DeFi solutions). Liquid staking gives an opportunity to maximize the potential while having the best of both worlds;
- Providing an alternative to or even encompassing exchange staking, solo staking, and other semi-custodial and decentralised protocols.

Comparison with other staking options

Solo staking is great, but it comes with some disadvantages. Setting up a validator node requires a pristine technical understanding, brings with it a minimum deposit of 32 ETH in Ethereum case, slashing and offline penalties can get very severe if the staking is managed improperly and finally the staked amount is locked up for a significant period.

Solo staking is similar to other optionSaaS staking in that you are having your own validator keys. Nevertheless, with SaaS you must trust a third-party (usually centralised), which may act maliciously, attacked or simply regulated. Going back to the Ethereum example, there remains a requirement for a minimum amount of 32ETH staked.

Alternatively, it may be possible to produce staking throughcentralised exchanges . Needless to say, crypto tokens and CeFi are not suited well together from the fundamental standpoint. It is also worth mentioning the economic aspect - by staking within some centralised entities, the user does not receive a corresponding token in return and, thus, loses the opportunity to perform any subsequent activity within DeFi or the same centralised entity, where tokens were staked. Yes, APR, when staking on centralised exchanges might be higher, but with a significant amount aggregated within the centralised entity comes a huge potential influence to the ecosystem that was fundamentally designed decentralised.

Through the use of aliquid staking solution such as Lido, users can eliminate these inconveniences and benefit from non-custodial staking backed by the actively maintained validators set. Liquid staking is unlocking the potential of PoS by giving users the ability to not only stake their tokens, but have the liquidity to use those tokens in DeFi projects that way not only increasing rewards for the individual, but growing the staking participation in general.

Lido on Ethereum APR

note APR provides only the current estimation of the rewards without any upfront forecasts. User's APR (Lido staking APR) = Protocol APR * (1 - Protocol fee)

Protocol APR

By Protocol APR we mean gross annual percentage rate — the overall Consensus Layer (CL) and Execution Layer (EL) rewards received by Lido validators to total pooled ETH estimated as moving average of the last 7 days.

Consensus Layer

Validators receive rewards when they perform consensus layer validators' duties:

- attest blocks
- propose blocks
- participate in sync committees.

The value of the rewards in each epoch is calculated from a base reward. This is the base unit representing the average reward received by a validator under optimal conditions per epoch. Base rewards are inversely proportional to the square root of the total staked ether in Ethereum, that's why the amount of reward per validator decreases as the overall number of validators on Ethereum grows.

In addition to rewards, penalties and slashing can be applied to validators on the CL.

A penalty is a form of reducing the validator's stake, which is not online or doesn't meet certain specifications criteria when attesting the blocks.

Being slashed means that the misbehaving validator is forced to exit the beacon chain at a point in the future, receiving anumber of penalties until it leaves. As a result of it, APR can also reduce.

Performance of Lido validators The better the underlying operator sets are, the more robust, resilient, and performant the underlying protocol. CheckOperator Statistics and Metrics . Learn more about rewards and penalties ethereum.org

Execution Layer

Validators began to receive EL rewards afterthe Merge . EL rewards consist of four parts:

- Priority fee

- Priority fee refers to optional additional fees (for example it may refer to EIP-1559) paid directly to validators in order to incentivize them to include the given transaction in a block. Also it depends on network demand: as higher network demand, as higher could be priority fee.
- Maximal Extractable Value (MEV) rewards
- MEV refers to the maximum value that can be extracted by the validator from block production in excess of the standard block reward and gas fees by including, excluding, and changing the order of transactions in a block.

Rewards socialization model

With Lido, you receive staking rewards within 24 hours of your deposit being made, without waiting for validator activation.

Protocol fee

Lido applies a 10% fee on staking rewards that are split between node operators and the DAO Treasury. The fee can be changed by the DAO pending a successful vote.

More about APR calculation

Please refer to the API doc page for further details.

Security

The security of Lido is highest priority beginning at the time of its initial deployment, but still users should investigate risks involved with Lido before engaging with it. We are constantly working on security improvements:

- Using of DAO for governance decisions & to manage risk factors.
- Having multiple audits finished (see more
-).
- Having a committee of elected, best-in-class validators to minimise staking risk.
- Allowing staking across multiple validators (i.e. current Ethereum staking mechanism only allows to choose only a single validator)
- Using of non-custodial staking service to eliminate counterparty risk.

In the scorecard you may find an outlined set of attributes that we think are important for the decentralisation of the protocol, and how Lido is faring against these targets.

As for now, scorecard has only Ethereum related content. Edit this page Next Lido DAO