

# Unlocking The Potential Of LSD: A Look At The Liquid Staking Revolution

HashKey Capital

JULY 2023

## HashKey Capital Research Team

### Author:

#### Henrique Centieiro

##### Senior Research Manager, HashKey Capital

Henri's mission is to leverage blockchain technology to educate, connect and build projects that can change the world for the better. Prior to HashKey, he worked as a Blockchain Project Manager at HSBC, supporting the implementation of different blockchain projects, including trade finance applications. With 5 years of experience educating students about blockchain and crypto at various universities and on online platforms, he also enjoys writing, having published several books.



#### Henrique Centieiro

Senior Research Manager

henri.centieiro@hashkey.com

### HashKey Capital

HashKey Capital is an institutional asset manager that invests exclusively in blockchain technology and digital assets. As one of the most experienced blockchain investors based in Asia, the HashKey Capital team has deep knowledge of the blockchain ecosystem in the region and has built a network connecting entrepreneurs, investors, developers, community participants, and regulators. HashKey Capital is affiliated with HashKey Group, a digital asset management and financial services institution in Asia.

### HashKey Capital Research

HashKey Capital Research is a multidisciplinary team that focuses on blockchain research. Led by Research Director Jupiter Zheng, the team's mission is to research and build reports that will help HashKey Group, investors and the public make sense of this new asset class and help drive informed investment decisions.



#### Jupiter Zheng

Research Director

jupiter.zheng@hashkey.com



#### Scarlett Xiao

Senior Research Analyst

scarlett.xiao@hashkey.com

# Foreword

The LSD sector has emerged as one of the largest DeFi ecosystems, attracting numerous participants and creating multiple investment opportunities. In this report, Henri delves into the principles of LSD, the participants involved, and the mechanisms of participation. He conducts an in-depth analysis of the immense potential of the LSD sector for future growth. Additionally, Henri shares the latest advancements in DVT technology, which have significant implications for the future development of the LSD sector. This comprehensive review aims to provide the industry with a thorough understanding of LSD and serve as a useful reference for its future development.

Jupiter Zheng, Research Director

<b>LSD Adoption</b>	<b>4</b>	<b>LSD Token, Commissions and Impacts</b>	<b>21</b>
<b>Ethereum PoS – LSD Market Shares</b>	<b>8</b>	<b>LSD Contenders for DeFi Next Big Thing</b>	<b>23</b>
<b>Ethereum Staking Distribution</b>	<b>10</b>	<b>LSD Wars and the Emergence of LSDfi</b>	<b>54</b>
<b>LSD Market Overview 2023</b>	<b>16</b>	<b>Conclusion</b>	<b>60</b>
<b>Decentralization in the LSD Space</b>	<b>18</b>	<b>Appendix</b>	<b>61</b>



# LSD Adoption

**The LSD market is revolutionizing Proof of Stake, the way we secure networks like Ethereum and on-chain yield generation. There are some upsides and also many downsides that we will cover in this report. Let's start with some key takeaways:**

The Shanghai (or Shapella) upgrade in April 2023 kickstarted the next big narrative: **the staking wars**. New innovative LSD protocols have been popping up in the market and promise to bring innovation, liquidity, and attractive yields to stakers and validators.

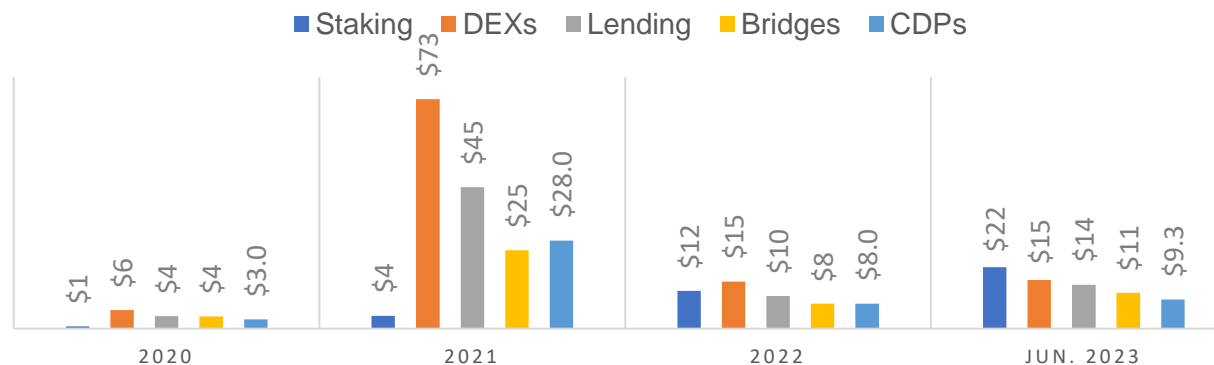
- Around \$140 million dollars are staked every day on the Ethereum chain.
- ETH staking increased over 15% after the Shanghai upgrade.
- Since the Merge (Sept. 2022) the annual inflation rate is -0.31%. Had Ethereum continued to have the same issuance, its inflation would be 3.5%.
- Ether average monthly staking inflow more than quadrupled.
- These metrics show us that organic demand is increasing while organic supply is decreasing. However, the Ethereum price might not have responded accordingly yet.

**In this report, we will cover the current landscape of the LSD market and where we are heading. We will compare different LSD protocols and provide important insights into why we think this market has a big potential to grow.**

### Key Insights:

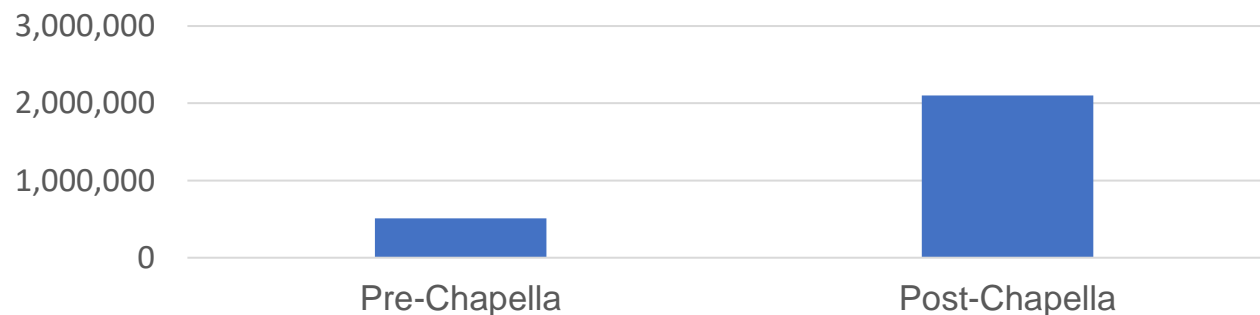
1. The percentage of ETH staked will double in the coming years.
2. The liquid staking LSD market share will take a big share from solo and CEX staking.
3. Emerging LSD protocols will take a large share of the currently dominating LSD protocols.
4. Staking yields will be lower but LSD composability with DeFi will boost the end-user yields.
5. New technologies such as DVT – Distributed Validator Technology – will further democratize and decentralize validator networks.
6. In the future, any rational actor would have 100% of its ETH staked in LSDs. Further implementation of EIP-4337 allow fees to with ERC-20 tokens (all LSD/LST tokens are ERC-20), meaning that holding simple ETH can become redundant.
7. Ethereum staking growth is accelerating fast and in 2 years, the percentage of staked ETH can reach 45% of the circulating ETH, which will represent hundreds of billions of dollars. This will foster the LSD growth.
8. Among all LSD protocols, Rocket Pool has been growing the fastest in the last few months. On the other hand, Coinbase's cbETH has been losing market share. This shows that the decentralization ethos matters for the community.
9. In the medium term, Ethereum staking is a 100's of billion dollars opportunity. In the long term, it has potential to represent a one trillion-dollar opportunity.

**TOP 5 DEFI SECTORS PER TVL (BILLION \$)**



The turn has started: while just a couple of years ago, the LSD market was minuscule, LSD protocols are now the top DeFi sector in terms of TVL – Total Value Locked – with \$22 billion at the time of the writing. Decentralized Exchanges follow with (only) \$15 billion in TVL.

**Average Monthly ETH Staking Netflow**



*The average monthly volume of ETH staked more than quadrupled since the Chapella upgrade.*

## Why LSDs?

ETH staking saw a sharp acceleration post Chapella upgrade in April 2023. Saying this, the total percentage of ETH staked is to double in the coming years and the market has much room to grow. To be more precise we have created a statistical model that shows us that within 2 years (i.e. end of Q2 2025) the total ETH staked should reach between 31% and 45% (it's 17% at the time of the writing). This growth can correspond to an additional \$18 billion to \$24 billion in TVL over the coming two years. In the long term, this growth will compound to hundreds of billions of dollars or even over one trillion dollars.

As protocol revenue for LSD protocols directly correlates with ETH prices, liquid staking protocols can be seen as a levered bet on ETH as they gain a stronger market share over staked ETH.

### **Why do we see such a big resurgence in LSD TVL, and why did LSD protocols flip DEX Total Value Locked in March 2023?**

Well, LSD protocols bring a strong use case to the market and significant benefits to Ethereum PoS stakers. For instance, in most PoS chains, the capital allocated to PoS validators is not liquid. It involves locking capital for a certain length of time and waiting in queues to stake and unstake. Additionally, when a user stakes their crypto in a PoS chain, the coins are locked for the staking period, making it capital inefficient, i.e. there's not much else the user can do with the staked asset.

On the other hand, LSD protocols issues a "derivative" token that represents that staked asset. This derivative token can be traded, and it is used for other purposes such as re-staking, getting a loan in DeFi, trade it or using these derivatives is a DeFi liquidity pool.

This opportunity led to the creation of multiple LSD protocols in multiple PoS chains such as Polkadot & Kusama, Cosmos, Polygon, Hedera, BNB, Fantom, Near, Avalanche, Solana, and, of course, Ethereum. Although many in the crypto industry started to hear about LSDs only very recently, they have existed for years.

In a nutshell, PoS chains need LSDs in order to attract liquidity that will increase the number of validators securing the network. For instance, Ethereum requires 32 ETH to run a "solo" validator (which is around \$64 000 at the time of writing); validators have to deal with technical specs, hardware requirements, they have slashing risks (i.e. can be punished for misbehaving or for being offline), and need to wait in a queue to stake and unstake. LSD protocols remove all these limitations.

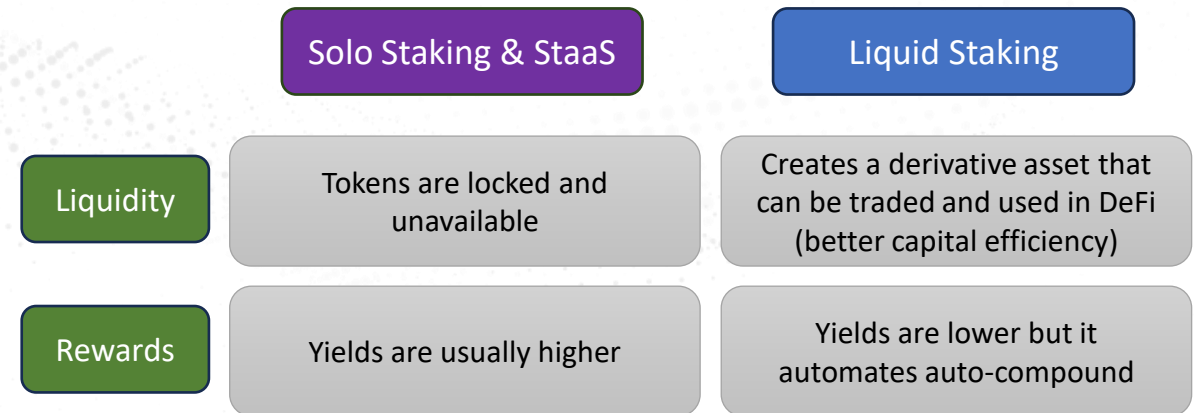
**In this report, we will focus on Ethereum LSD protocols which can potentially bring billions of dollars to this DeFi sector, being undoubtedly the biggest and fastest growing market in the DeFi space.**



# Ethereum PoS – LSD Market Shares

Since the Chapella upgrade on April 13th 2023, Ethereum is a complete system. Staking and the EVM general-purpose language come together, bringing to ETH fully aligned incentives that foster a new layer of DeFi applications that we call LSD. Since withdrawals were enabled for consensus layer, there's a renewed confidence for LSD users and new technologies such as DVT carry more decentralization, resilience, and scalability to LSD protocols.

We are also starting to see the emergence of DVT – Distributed Validator Technology – that allows many validators to come together and work as a single unit from the network perspective. This democratizes ETH staking. ETH staking requires 32 ETH, but DVT allows, for example, 16 people to stake 2 ETH and run a node, each providing a better-decentralized network, more resilient and better capital efficiency.

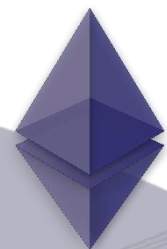


*LSDs in the spotlight: although the LSD market exists for years, the Shapella upgrade brought technical confidence in Ethereum PoS (e.g., reduced risks related to staking withdrawals timeline) and triggered a flood of new use cases and protocols developing LSDs.*



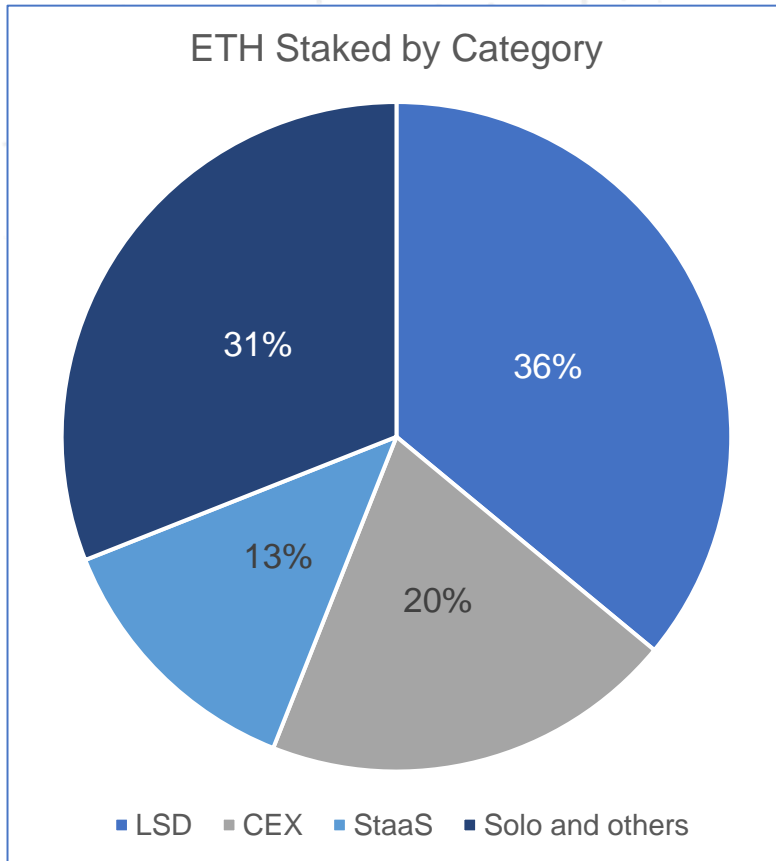
We will now categorize the different types of staking. Then, we will make a brief description of each one of these types of staking. This is important to understand better why LSD is important and what LSD characteristics are valued the most.

Solo Staking	Staking as a Service	Pooled Staking	Centralized Exchanges	DVT	LSDfi
DIY staking	BloxStaking	Rocket Pool	Coinbase	Obol	Ether.fi
	Abyss Finance	Stakewise	Binance	Puffer	unshETH
	Ethpool	Lido	Kraken		Agility
	Sensei node	Stakefish			Lybra
	Kiln	Ankr			Pendle
	Allnodes	Stafi			
		Stader			
		Frax			
		Stakehouse			
		Swell			
	NodeDAO				



- Ethereum Merge - PoW -> PoS Sept. 2022
- Chapella upgrade enabled withdrawals - April 2023
- 32 ETH required to start a validator node
- Pooled staking remove the capital and technical barriers
- LSD protocols are dominating the validator set
- The community has been criticizing LSD protocols over centralization

# How is Ethereum Staking Distributed across the network?



**The LSD market share is likely to grow over time as LSD protocols get more user friendly, secure and further integrated with DeFi. However, the future of this growth is in the hands of decentralization.**

The categories in the graph have varying degrees of decentralization, from Solo Staking as the most decentralized to CEX as the most centralized. LSDs have been in the middle but only the community and governance can pull LSDs to the right side of the decentralization spectrum.

## Solo Staking

### TL:DR

- **Contributes to the network decentralization;**
- **Users receive 100% of the rewards;**
- **Requires a dedicated computer running 24/7;**
- **Requires 32 ETH;**
- **Although not complex, it requires some technical know-how and dedicated hardware.**

Being a permissioned chain, Ethereum allows anyone to participate directly as a PoS validator. While the Ethereum “endgame” is to allow a validator node to run a light client on equipment with small capacity (such as mobile phones), we will still need to wait for “The Purge” upgrade to allow nodes to run without historical data. This might take years.

For now, considering the size of the blockchain and network requirements, validating nodes need to run equipment with minimum specs – a decent CPU, 16 GH RAM, and 1 Terabyte of disk space. This means that there’s an entry barrier as users need to have a device with these specs.

There are some advantages for running a validating node: full control over the node and private keys, receiving 100% of the rewards, and contributing to the network decentralization.

On the other hand, validators are required to have some technical knowledge, keep the node running 24/7 or risk losing part of their rewards (inactivity leak). The biggest barrier is probably the fact that most people don’t have 32 ETH to start a validator.

## Staking as a service (StaaS)

### TL:DR

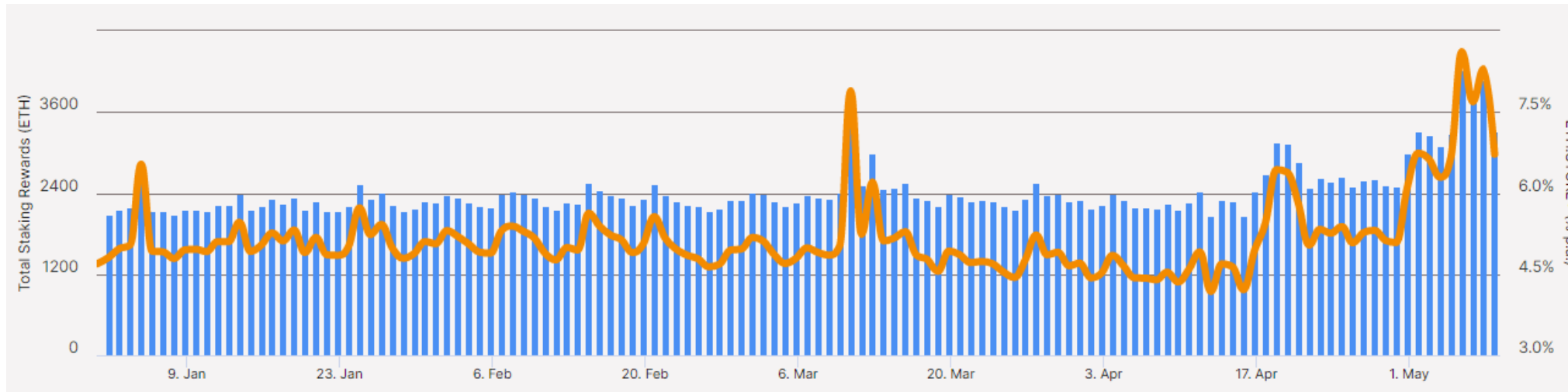
- **It delegates the infrastructure to a 3rd party;**
- **User receives 100% of the rewards but needs to pay a management fee;**
- **User keeps control of the keys;**
- **It still requires the 32 ETH.**

Staking as a service is run by infrastructure providers. These infrastructure providers operate the validator node hardware while, in most cases, the users continue to control the private keys of the validator in a no-ops manner.

Staking as a service removes the technical requirements, but it requires the user to trust that the “staking as a service” provider will do a good job (i.e. run the node 24/7 and not commit slashable offenses). Some of the operators have their own datacenters, others use popular cloud providers to spin up the nodes. Stakers still need to deposit the full 32 ETH.

Ethpool, Abyss, BloxStaking, Allnodes, Kiln and Sensei Node are some of the staking as a service providers in the market. These providers can be custodial or non-custodial.

Some of these StaaS providers/node operators are also implementing DVT – Distributed Validator Technology – which is the case of Sensei Node. This allows operators to run clusters of nodes instead of a single node for increased resilience. Later in the report we will come back to DVT.



Staking rewards on Ethpool. This is a great illustration showing that the yields can vary from 4.2% up to 8.6%. The validator rewards come from 2 sources:

- a) **consensus reward**, and
- b) **execution rewards**.

The second is depend on the gas fees and priority fees paid by the users minus burnt fees (EIP1559 for more).

It's not possible to gather accurate on-chain data in regards to the total being staked through StaaS because, from the network perspective, these validator nodes can't be differentiated from any other nodes on the network.



## Pooled Staking (aka LSD)

### TL:DR

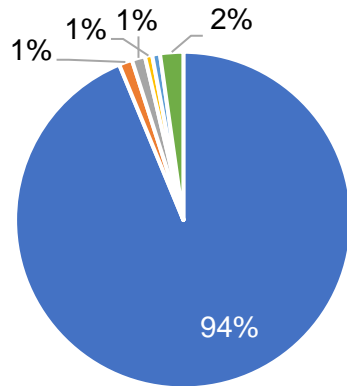
- **No minimum staking required;**
- **No technical knowledge required;**
- **Users receive a derivative token representing their staked ETH;**
- **Easy custody.**

Supported assets across the top 16 LSD protocols:

LSD prov.	ETH	SOL	DOT	Gnosis	BSC	Fantom	Avalanche	Polygon	Kusama	Acala	Near	Hedera
Lido	x	x	x					x	x			
Coinbase	x											
Rocket Pool	x											
Frax	x											
StakeWise	x			x								
Parallel			x									
Ankr	x		x	x	x	x	x		x			
Acala										x		
Stader	x				x	x					x	x
Marinade		x										
Benqi							x					
Ether.fi	x											
Stafi	x	x	x		x			x	x			
NodeDAO	x											
Swell	x											
Stakehouse	x											

As previously mentioned, there are LSD protocols available for many major PoS chains. However, we will concentrate on Ethereum because it is the ecosystem from which most innovations and excitement arise.

LSD total TVL distribution per chain



- Ethereum
- Solana
- BSC
- Avalanche
- OKX
- Others

Pooled staking includes the protocols known as LSDs that aim to remove some of the entry barriers that we saw before, including the 32 ETH minimum, technical barriers, node operations, and asset lock-up. Stakers pool their resources into a smart contract that distributes the stakes to validator sets.

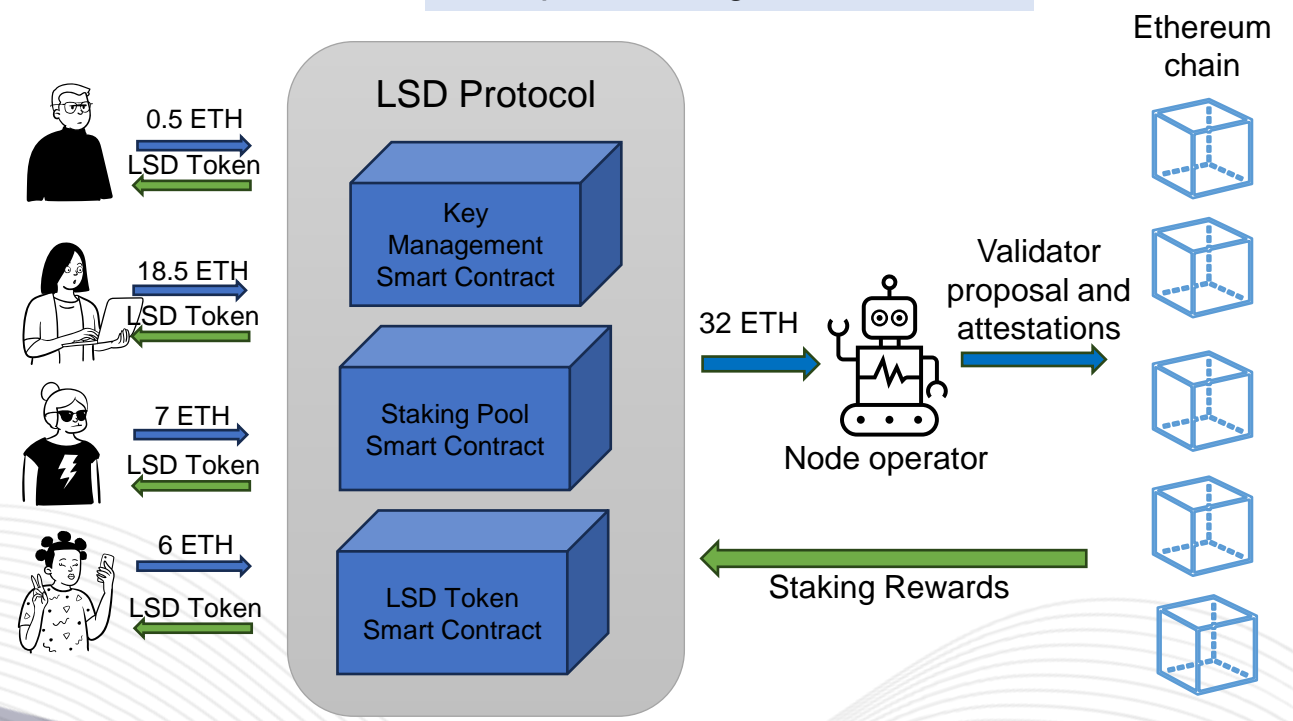
Pooled staking allows stakers to have instant access to liquidity and redeem their stake anytime, it requires no technical expertise, no minimum amount and, the cherry on the top of the cake, users can use the LSD tokens in DeFi - either as collateral, LP or yield farming.

The underlying ETH gets organized into smart contract-managed staking pools that allocate the ETH to node operators.

We can see that Ethereum has the highest number of LSD protocols and has the highest representation in terms of TVL. Considering all LSDs across all PoS chains, Ethereum's LSDs are responsible for 94% of the entire LSD market TVL across all chains.

There are 13 different Ethereum LSD protocols with a TVL higher than \$10 million.

### Liquid Staking Mechanism



# Complete Overview of the LSD Market in 2023

	Lido	Coinbase	Rocket Pool	Frax	StakeWise	Ankr	Stader	Ether.fi	Stafi	Swell	NodeDAO	Stakehouse
<b>LSD token</b>	stETH	cbETH	rETH	frxETH + sfrxETH	sETH2 + rETH2	ankrETH	ETHx	eETH	rETH	swETH	nETH	dETH
<b>Token Mechanism</b>	Rebasing token	Reward bearing token	Reward bearing token	Base token + reward bearing token	Base token + reward bearing token	Reward bearing token	Reward bearing token	Reward bearing token	Reward bearing token	Reward bearing token	Reward bearing token	Reward bearing token
<b>Commission</b>	10%	25%	15%	10%	10%	10%	10%	0% (for now)	5%	0% - 5%	10%	Depends
<b>Commission Distribution</b>	Validators: 5% Lido DAO: 5%	Coinbase: 25%	Pool validators: 15%	Frax treasury: 8% Fund: 2%	Stakewise DAO and node vaults	Nodes and project treasury	5% to the DAO, 5% to nodes	N/A	3.5% to FIS token holders, 1% to treasury, 0.5% stafi team	N/A	7% distributed to node operators and 3% to NodeDAO	Depends on governance
<b># node operators</b>	29	1	2 800	1	3	3	N/A	Multiple	1	N/A	N/A	N/A
<b>Min. staking for validators</b>	N/A (permissioned)	N/A (permissioned)	8	N/A	N/A	N/A	4	Permissioned ATM	12 ETH	N/A	1.1 ETH	Depending on governance
<b>Governance token</b>	LDO	N/A	RPL	FXS	SWISE	ANKR	SD	N/A	FIS	N/A	N/A	N/A
<b>Token mcap</b>	\$1 556 mil	N/A	\$783 mil	\$405 mil	\$18 mil	\$165 mil	\$20 mil	N/A	\$16 mil	N/A	N/A	N/A
<b>TVL/mcap</b>	0.12	N/A	0.46	0.53	0.11	1.23	0.25	N/A	0.64	N/A	N/A	N/A
<b>FDV</b>	\$1 769 mil	N/A	\$783 mil	\$558 mil	\$66 mil	\$165 mil	\$118 mil	N/A	\$31 mil	N/A	N/A	N/A
<b>% circ. supply</b>	88%	N/A	100%	72%	27%	100%	17%	N/A	53%	N/A	N/A	N/A

The table on the previous page shows a complete overview of the different LSD protocols available in the market. Note that some of these protocols are very recent, and they might look quite centralized in terms of the number of node operators, but most of them have plans to decentralize and add technologies such as DVT – Distributed Validator Technology for better resiliency and decentralization. Note that node operators and validator nodes are two different things: a node operator is an entity or individual that can run one or more validator nodes. Node operators can be a significant point of centralization for the network. The number of node operators should be the point of concern for centralization rather than the LSD protocol itself.

Some protocols don't have a token yet, but they might have it in the future (potential airdrop for early adopters?). This is the case for Ether.fi, Swell, NodeDAO, and Stakehouse.

We have also decided to include the ratio TVL/market cap, which gives us a better picture of the valuation of the project compared to the existing TVL.

# Why Decentralization in the LSD Space is Essential for Ethereum's Health

Ethereum LSD protocols are naturally fighting for their market share. A bigger market share brings more revenue to the protocol, which is good for its respective community and token holders. However, gaining too much market can be a double-edged sword, as it can harm the entire ecosystem in different ways:

- **Reduced competition:** centralization of staking can lead to less innovation, market manipulation and unfair practices.
- **Increased risk of censorship:** there is a heightened possibility of censorship with centralized staking players, as they may be subject to incentives or regulatory pressure to censor transactions. This can potentially result in a disruption of the trust within the network.
- **Decreased security:** big staking players make it easier for attackers to carry out malicious activities, such as 51% attacks.
- **Increased risk of collusion:** centralized stakers can collude to carry out actions that go against the decentralization ethos and against the users, such as malevolent MEV extraction and frontrunning.

These are the main reasons why the community has been pushing for better LSD decentralization. As seen in the previous table, many LSD protocols rely on a small number of node operators that centralize a large number of validator nodes.



The table below illustrates the current market share and delta since the Shapella upgrade:

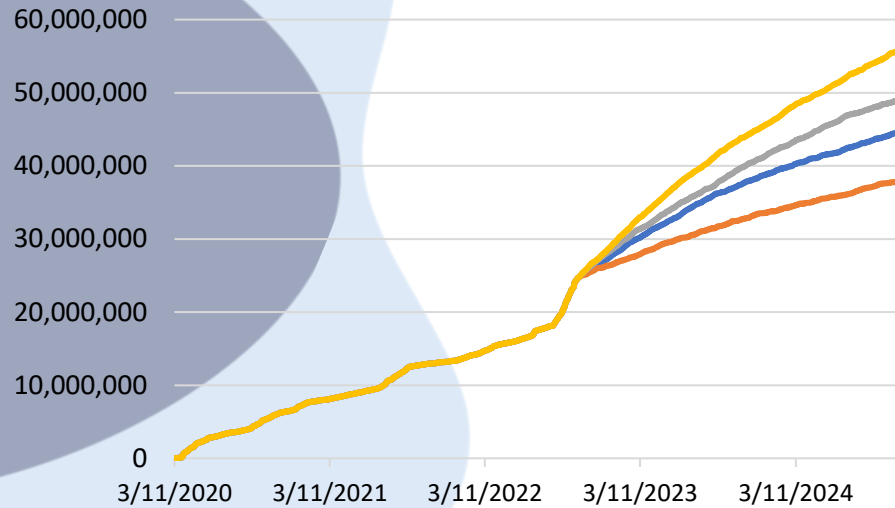
Protocol	Staked ETH	2 months after Shapella	Market share	LSD Market share 2-month $\delta$
Lido	7,410,310	+30%	79%	2.3%
Coinbase st ETH	1,085,972	-6%	11%	-4%
Rocket Pool	450,042	+94%	5%	2%
Frax	226,751	+72%	2.4%	0.6%
StakeWise	74,032	+1%	0.8%	-0.2%
Ankr	40,778	-19%	0.4%	-0.2%
Ether.fi	22,751	+69%	0.2%	0%
Stafi	12,032	+1%	0.1%	0%

Data as of June 16th, 2023

Since the Shapella upgrade, Lido has grown to a 79% market share, which is 2.3% more when compared to the pre-shapella market share. On the other hand, Coinbase's staked ETH "cbETH" saw the biggest decline in terms of market share, losing 4%. This can probably be explained by regulatory pressure, high fees (Coinbase reward commission is the highest at 25%), centralization, and the fact that other LSD protocols offer better composability and DeFi compatibility.

Rocket Pool, on the other hand, saw the biggest acceleration in terms of adoption, with a 2-month net growth of 94%, increasing the market share to 5%.

Total ETH Staked - Projection



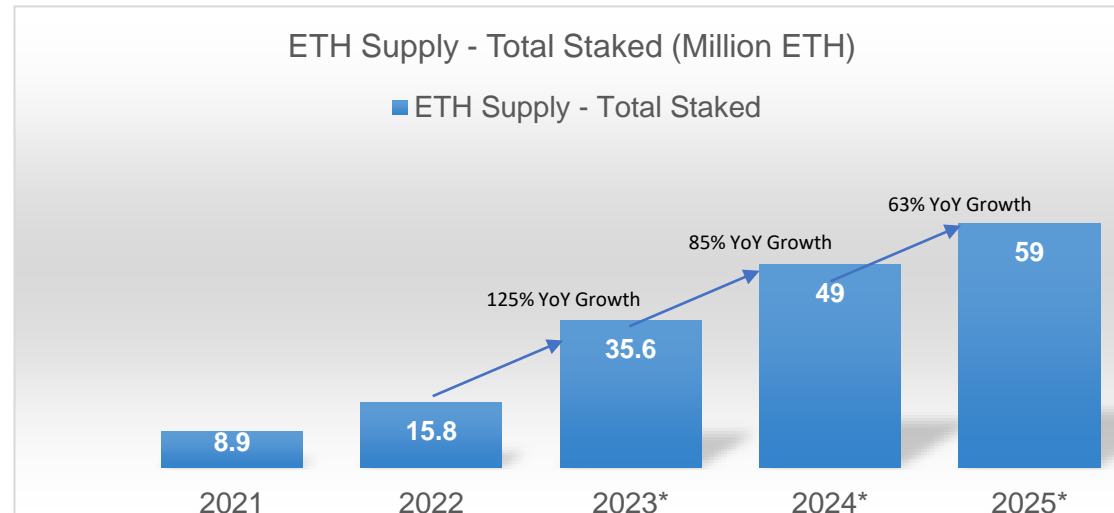
Not surprising that the LSD wars are starting.

According to the current progress of the ETH staking we have created a statistical model that shows us that within 2 years (i.e. end of Q2 2025), the total ETH staked should reach between 31% and 45% of the total supply. This means that the LSD market has the potential to more than double its size in only 2 years. This growth can correspond to an additional \$24 billion in TVL over the coming two years.

Reaching a total staked ETH between 31% and 45% in 2 years would represent an annual growth between 43% and 75% YoY.

In the medium term, Ethereum staking is a 100's of billion dollars opportunity. In the long term, it has potential to represent a one trillion-dollar opportunity.

Key Figures	
<b>Current staking</b>	<b>Q2 2025 projection</b>
16%	31% to 45%
Current ETH staked	Q2 2025 projection
19 million ETH	37 to 57 million ETH
Current mcap staked	Q2 2025 projection
\$36 billion	93% to 181% 2y growth



\*Projected

# LSD Token Types, Commissions, and its Impact on User Income

The type of token and protocol commission can play an important role when it comes to the income that stakers can generate.

**Rebasing tokens** will increase its underlying supply with yield accrual. On the other hand, **reward-bearing tokens** underlying supply remains constant, while the price of the token increases to reflect the staking rewards.

Staking protocols offering **reward-bearing tokens** seem to be more advantageous than rebase tokens (like Lido's stETH). There are two main reasons for this:

- **DeFi compatibility:** rebase tokens are harder to integrate with DeFi protocols as their supply keeps changing and most DeFi protocols smart contracts can't handle this. For this reason, in most cases users will have to wrap their stETH into wstETH adding additional transaction fees and complexity.
- **Tax efficiency:** depending on user's jurisdiction, staking might be a taxable event. In some cases, receiving tokens in a wallet is considered a taxable event (income tax), which is what happens with rebase tokens. On the top of that, when selling these tokens, the user might need to pay capital gains tax. Reward-bearing tokens increase in value rather than increasing in supply, which avoids the creation of potentially taxable events.

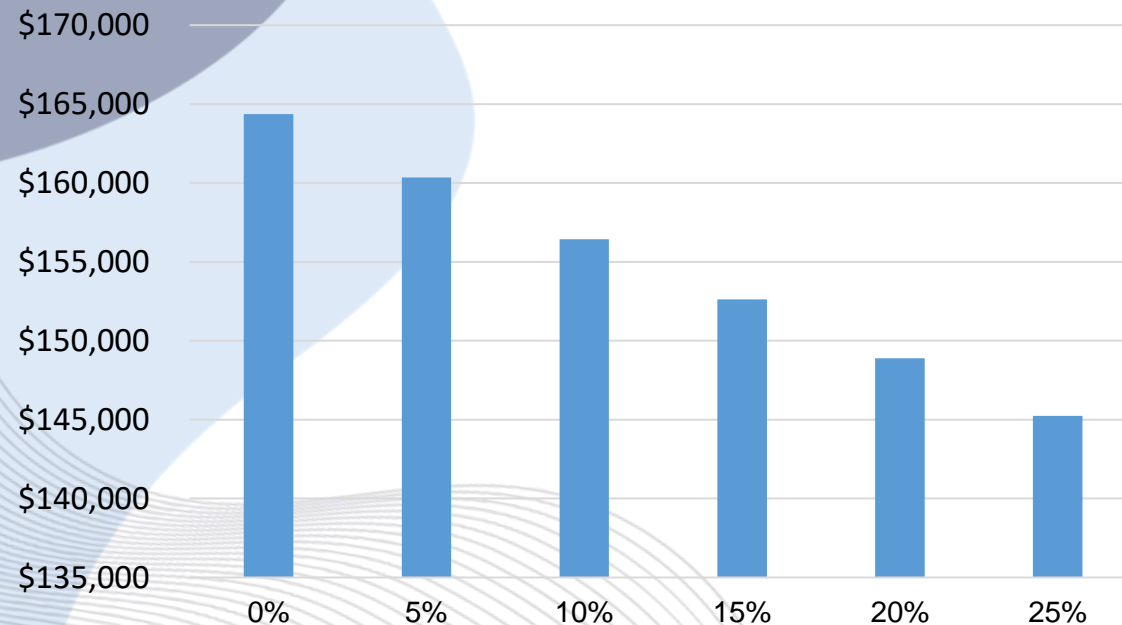
*NOTE: this will depend on user's jurisdiction. HashKey does not provide any tax, legal or accounting advice.*

Saying this, in the long term, the market might move towards reward-bearing tokens.

Another factor that can have a strong impact on user staking income are the protocol commissions. Currently, protocol commissions widely vary from 0% to 25%. These commissions impact the compounding effect, thus having a strong impact in the long run.

In the chart below, we assume that the ETH staking yield rate will always be 5% over the next 10 years:

Impact of protocol commissions over a \$100 000 investment over 10 years

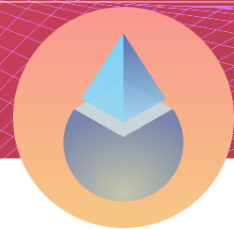


Fees can have a significant impact on the investment. This chart assumes that ETH staking will continue paying a 5% yield over the next 10 years and that everything else remains the same. In the long term, protocols with lower fees, such as Stafi, Ether.fi and Swell would bring stakers significantly better returns. On the other hand, Coinbase's cbETH would give the worse returns (\$19 116 less when compared to zero fees).

Solo stakers also enjoy the benefits of zero fees. However, it's also worth mentioning that solo stakers have more limitations to compounding their rewards. Solo stakers will have to wait until they accrue 32 ETH in rewards to spin up a new validator (i.e. reinvest their rewards). Saying this, only solo stakers with [4 or more validators](#) compounding yield will outpace the fees they would otherwise pay on LSD protocols.

Protocols will need to charge fees to reward node operators and fund their treasury, but we will probably find a sweet spot in terms of protocol commission in the near future. Perhaps LSD protocols will also find new revenue sources through technologies such as re-staking.





# Lido

**Category:** Pooled staking (LSD)

**Summary:** Lido is the leading LSD space in terms of TVL with over \$14 billion under management. It was launched in Dec. 2020, right after the Ethereum Beacon chain went live and saw a meteoric rise, becoming the most popular LSD protocol.

Although also providing staking LSDs on Solana, Moonbeam, Mooriver, Polkadot, Kusama and Polygon, Lido is most well known for having around 75% of the LSD market share on Ethereum. Lido has received some criticism for being a [centralization point](#) but, are those [concerns](#) legit? Although the community talks a lot about the risks of Lido's centralization, Lido's TVL grew 30% in 3 months, showing that general users are more concerned about convenience than decentralization. I will leave that answer for you, once you finish reading this report.

Users can stake any amount of ETH and receive 1:1 stETH token.

**Token use, type, and tokenomics:** Lido's stETH token is a rebase token, meaning that the user's balance of stETH will automatically update daily to reflect the rewards. Users that plan to do DeFi farming or liquidity providing in DeFi protocols, need to consider that most DeFi smart contracts will not compute token rebasing and the user might lose those rewards unknowingly. For this reason, it's worth exploring pools with wstETH token instead, as the wrapped version can always rebase. Users can [wrap stETH](#) from the Lido app.

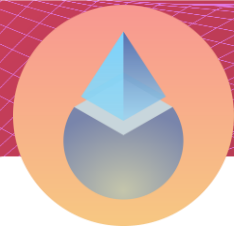
The LDO token is the governance token, meaning that it can be used by users voting in Lido's [governance process](#). The token was divided between investors, treasury, team and validators. At the time of the writing, 99% of the supply is unlocked and circulating.

**Commission/fee:** Lido charges a 10% fee on the staking rewards. The protocol revenue is divided between the Lido DAO treasury and the node operators. Over the last year, Lido accumulated \$735 million in fees, and the DAO treasury seats at \$318 million as of June 2023.

**Node operators:** Lido's node operators are onboarded in a permissioned/curated manner. A strict onboarding process has been needed as Lido needs to ensure the node operator infrastructure robustness/resilience, performance and [ethos alignment](#). As of June 2023, Lido has 29 node operators.

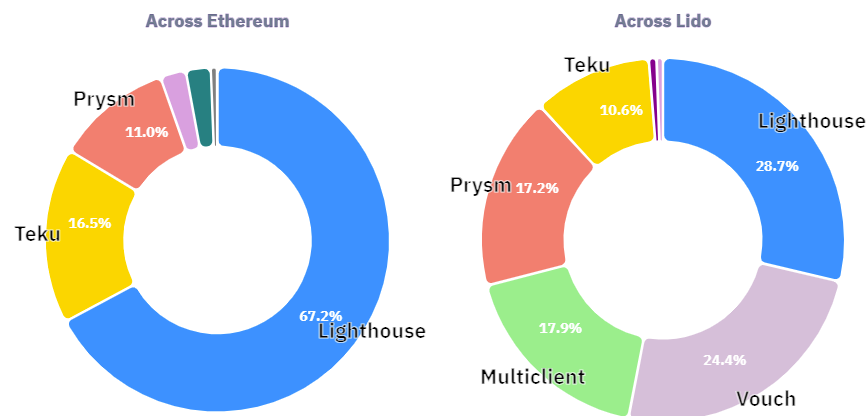
Although composed of only 29 operators, nodes are fairly well spread and distributed across different geographies, infrastructure type and different consensus clients.





# Lido

## Client Diversity (Consensus Layer)



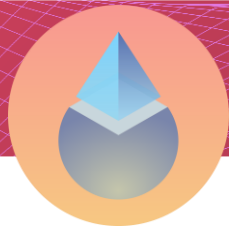
The client diversity for the execution layer however is low, Geth having 88% of the node share. Half of these nodes are in centralized cloud providers, while the other half are hosted in dedicated data centers and on-premise infrastructure. In terms of geographical distribution, the node operators are distributed across 14 different countries.

Current [node operators](#) include infrastructure providers such as Allnodes, Blockspace, Simply Staking, Kiln, HashQuark (HashKey Group), Figment, Consensys, Blockdaemon, among others. These node operators use from 1 000 to 10 000 keys (i.e. validating nodes).

Lido has been testing during Q1 2023 DVT – Distributed Validator Technology – that will bring more decentralization to Lido's node operators, [allowing anyone to participate](#) as a node. This is an important step to further diversify and decentralized the Lido node infra.

**Private key management:** stakers don't need to deal with node key management. Node operators submit the keys to the Lido DAO for the validator nodes that they manage.

**Decentralization:** Lido has approximately [22% of all staked](#) ETH and around 75% off all LSD protocols market share. Despite Lido controlling a large portion of staked ETH, the Lido DAO has been moving towards a more decentralized node model. [The 29 node operators](#) are fairly large institutions, meaning that they are more prone to be "regulatory/compliant," which leads them to use OFAC-enforcing MEV clients. On the other hand, Lido has been exploring technologies such as DVT – Distributed Validator Technology – which will allow permissionless onboarding of node operators. One of these examples is the [pilot with Obol](#) (a DVT technology provider), which also demonstrated improved resiliency of the nodes.



# Lido

In addition to this, it was [announced](#) on June 8th, the [Lido DAO](#) opened applications to onboard 10 new node operators, which should improve client diversity and bring more diversification, as well as help with keeping the node operators staking percentage under the 1% total stake soft cap. per operator, which was defined by the Lido DAO to limit node operator centralization.

**Lido**  
@LidoFinance

Following the launch of Lido V2, the Lido Node Operator Sub-Governance Group (LNOSG) has suggested a new onboarding round for the Lido on Ethereum protocol.

[research.lido.fi](#)  
Announcement: Onboarding for Ethereum (Wave 5)  
Following the successful launch of Lido V2 and requests from the community to expand the Node Operator set, the...

5:22 PM · Jun 12, 2023 · 20.1K Views

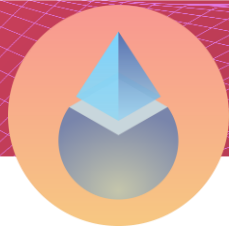
21 Retweets 5 Quotes 84 Likes 6 Bookmarks

Q4 2021  
14 Node  
Operators

Q4 2022  
29 Node  
Operators

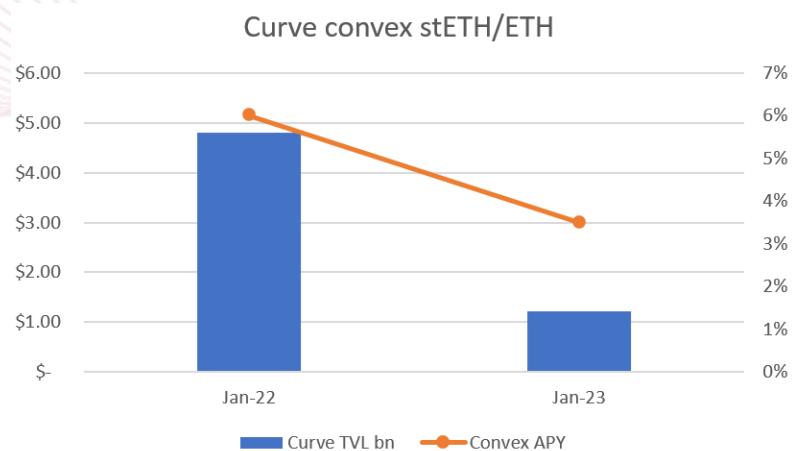
Q4 2023  
39 Node Operators  
(expected)

2024?  
DTV  
Implementation



# Lido

**Incentives and incentivized yield:** Lido incentivized stETH-ETH Curve pools to create more liquidity for the pair and help the stETH price going closer to the ETH price (as they were not directly pegged). However, since the Shanghai upgrade, stETH can be redeemed 1:1 for ETH, which reduces the need to incentivize Curve pools.



**Staking routers:** Lido v2 includes a modular architecture with staking routers. Staking routers will allow allocating resources (i.e. validating nodes) across different modules. Developers can develop modules that include DVT, reputation scoring, permissioned/permissionless, for certain clients, or scoring systems. The end game is to provide Lido with increased diversity, decentralization, resilience, and openness. However, this will also require the active participation of the developer community to materialize.

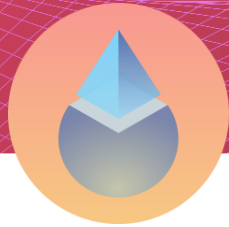
**DVT:** Lido is testing the implementation of DVT. I'd add that DVT compatible LSD protocols end up offering a validator launchpad where small node operators can also enter the space.

**Permissioned/less:** Lido is currently permissioned with 29 professional node operators. As mentioned, Lido is moving to a more permissionless model by integrating DVT and staking routers. Lido has piloted with both [SSV](#) and [Obol](#).

**Custodial-non-custodial:** Lido is a non-custodial solution, meaning that the protocol will not hold the custody of user's funds.

**Slashing protections:** both stakers and node operators are subject to slashing risks. However, the Lido DAO does have a slashing insurance fund that can be activated as a [self-insurance](#). In April 2023, the [Lido DAO voted](#) for using the insurance fund to cover the slashing of the RockLogic [slashing incident](#). As per April 2023, the insurance fund has approx.. \$11.11 million.

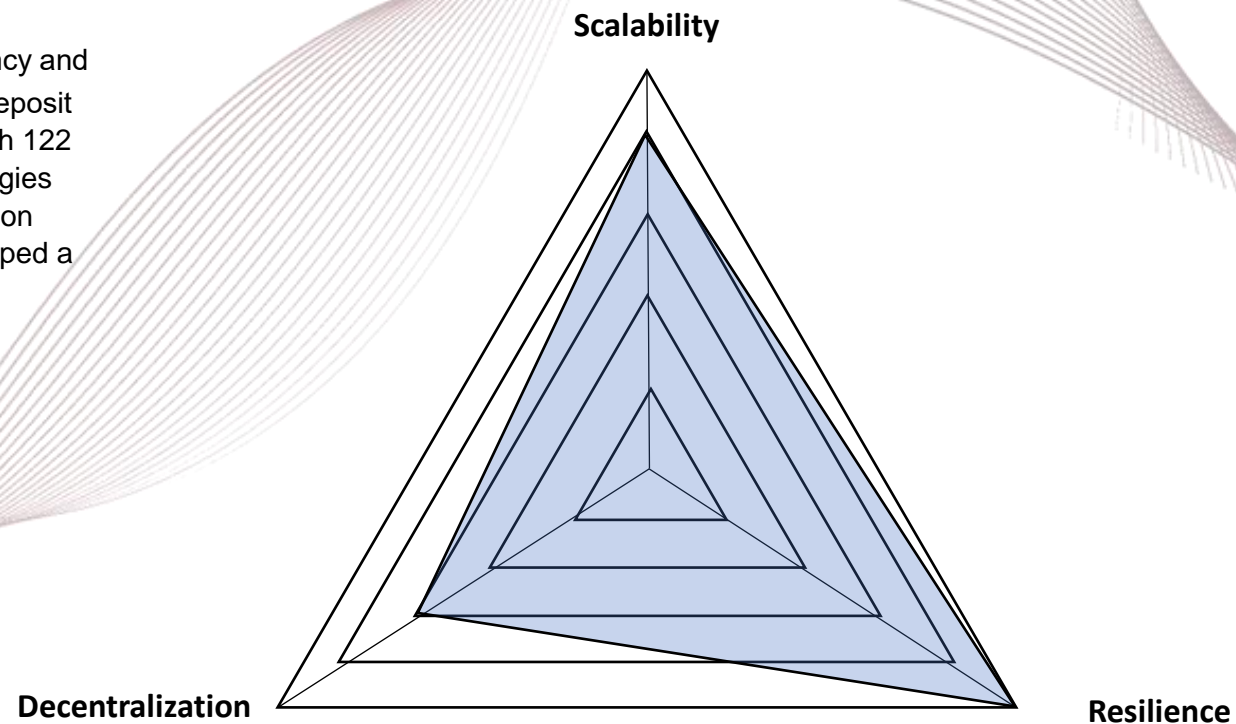




# Lido

**DeFi and LSDfi compatibility:** stETH is currently accepted in 122 different DeFi protocols, from lending protocols, derivatives, DEXs, asset management and others, giving it high usability, liquidity, and capital efficiency.

**Capital efficiency:** Lido's stETH offers a great level of capital efficiency and the users can easily "have their cake and eat it at the same time." Users that deposit ETH, receive a highly liquid token – stETH – that, as we saw, is compatible with 122 DeFi protocols. For maximum capital efficiency, some users use looping strategies that involve for example staking ETH on Lido for, stETH, depositing the stETH on Alchemix to get an ETH loan and stake this ETH back on Lido. This can be looped a number of times, but users need to have into account smart contract risks.



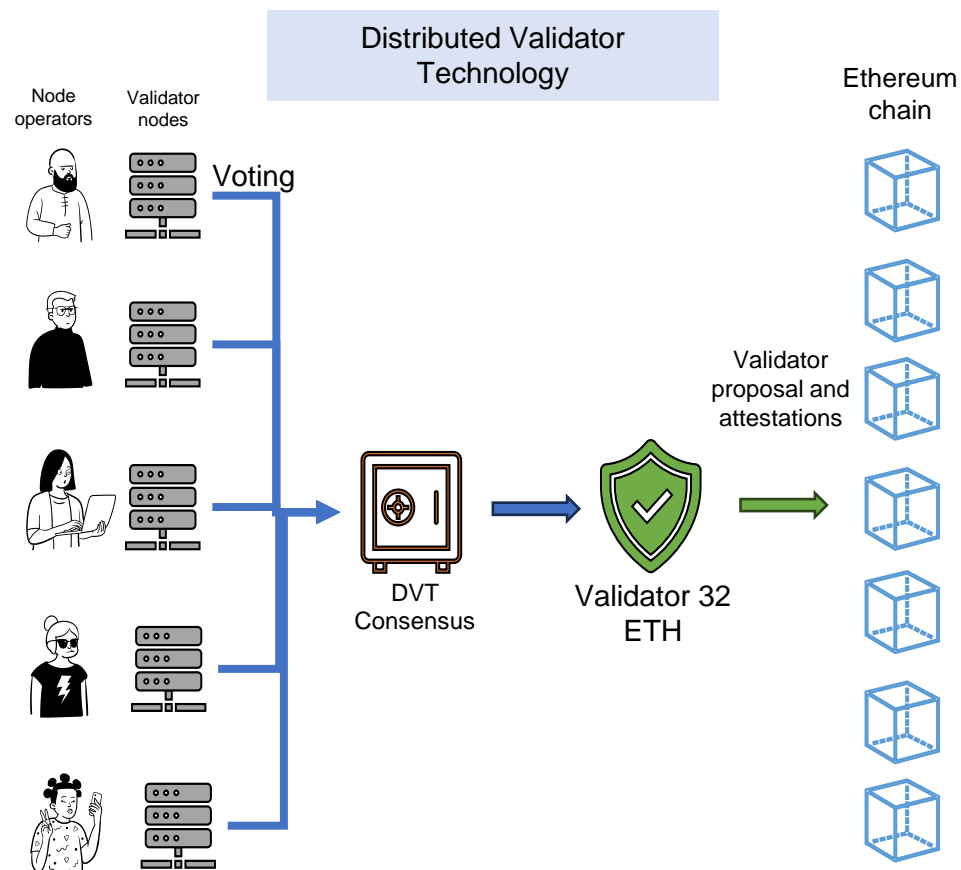
## The tech leveling up staking. What exactly is DVT?

Distributed Validator Technology solves, in part, the node operator centralization risks. Multiple LSD protocols, including Lido, RocketPool, StakeWise, Stader, Stafi, Swell, NodeDAO, and Stakehouse (i.e. almost all) are planning or piloting using DVT.

Some of these LSD protocols are partnering with DVT protocols like Obol, SSV and Puffer. In a nutshell, what they do is to provide a permissionless distributed validator network where anyone can join a validator cluster and contribute to securing the network. These validators can have little or no stake on the network and they can contribute to staking pools. This is done via multi-sig validator clusters, MPC technology, Shamir's Secret Sharing and threshold signing. Gluing everything together, multiple nodes can contribute to one shared validator.

One of the advantages of DVT is the added redundancy which greatly reduces the chances of slashing if a validator goes offline.

Another advantage is allowing for "squad staking." For example, a group of 4 friends each with 8 ETH can deploy each a node and contribute to the validator.







# Coinbase Wrapped Staked ETH

**Category:** Pooled staking (DEX)

**Summary:** Coinbase cbETH is the Coinbase LSD token. As per July 2023, there's \$2.13 billion in cbETH AUM and 13.4% LSD market share. The product is available to Coinbase customers directly from the exchange website (which requires the user to be KYC'd) and also available to non-Coinbase customers through decentralized exchanges. Coinbase is the single node operator of the validating nodes, making it a fairly centralized. Users can always redeem cbETH for ETH. Coinbase uses a mint/burn mechanism similar to [cTokens](#) to keep the cbETH/ETH rate that reflects the yield paid to the staking pool.

Although we didn't cover Binance's BETH in this report, all other DEX LSD tokens work in a pretty similar manner. BETH has \$135 million in TVL and it is integrated with few DeFi protocols.

**Token use and type:** rewards are paid every 3 days to cbETH users. As a cToken, the token accrues rewards and penalties. These rewards are automatically re-staked to compound rewards.

**Commission/fee:** Coinbase gets a 25% cut from the generated yield. This is the highest fee across all LSD options covered in this report.

**Node operators:** Coinbase is the sole node operator. In terms of validator diversity, Coinbase tries to keep some validator diversity by hosting the validators in different geographies and dividing their nodes across the 5 consensus clients.

**Decentralization:** cbETH is centralized in one single node operator. Coinbase has 13.4% of the LSD market, which corresponds to 5.76% of all staked Ethereum, i.e. around \$ 2.13 billion. Coinbase cbETH is probably the most centralized LSD token among the top LSD tokens.

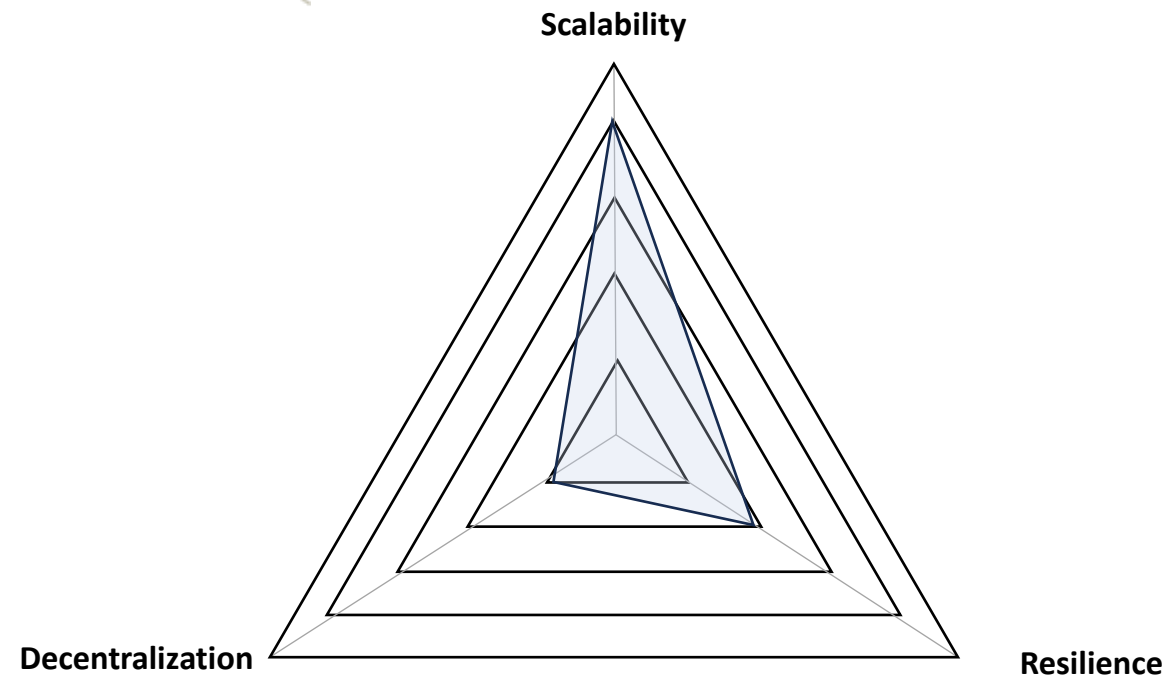


# Coinbase Wrapped Staked ETH

**Custodial-non-custodial:** Although users can hold cbETH on their own wallets, Coinbase has full control of all the validator keys. At the time of writing the report, that translates into Coinbase managing over 70,000 node keys.

**Slashing protections:** Although there's no slashing insurance associated to cbETH, Coinbase [will cover slashing](#) events, unless these slashing events are outside Coinbase's control.

**Inactivity protection:** according to Coinbase's T&C's, Coinbase will cover any inactivity slashing related to Coinbase's infrastructure.





# Rocket Pool

**Category:** Pooled staking (DeFi)

**Summary:** Rocket Pool is the OG LSD. Founded in 2016, its main goal is lowering the ETH staking technical and financial barriers while improving validator decentralization. Rocket allows users to stake any amount starting from 0.01 ETH and receive liquid rETH tokens. On the other hand, Rocket Pool is the biggest permissionless LSD protocol, allowing anyone to join as a validating node. While the minimum to be a validator was 16 ETH until the Atlas upgrade on April 2023, which reduces the node requirement to 8 ETH.

Rocket Pool works with a mini pool model, where new node operators need to create a “mini pool” by bonding 8 ETH, which is matched with additional 24 ETH from LSD stakers. This reduces the requirements to run a validating node while allowing anyone to stake any amount of ETH.

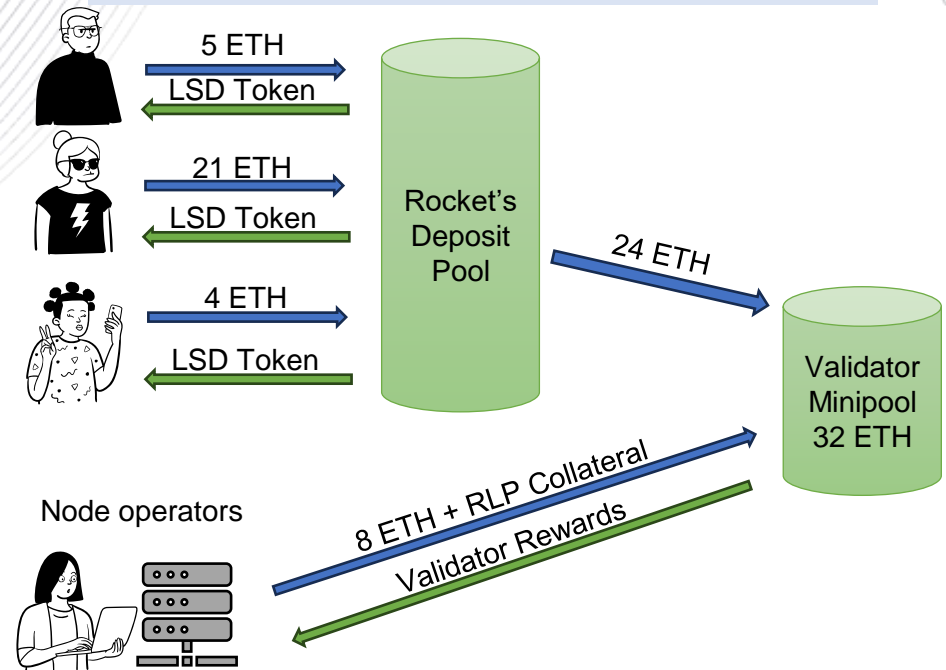
By running two 8 ETH minipools instead of one 16-ETH minipool, the capital requirement for operating a validator is significantly reduced, resulting in higher returns for both the node operator and the rETH stakers. It is worth noting running two 8 ETH minipools can provide up to 18% more rewards.

Rocket pool mini-pools encourage node operators to join the network as the capital requirements are lower and the rewards are higher.

Rocket pool is one of the protocols that has grown the fastest since the Chapella upgrade, with a 94% growth 2 months after the upgrade.

**Token use and type:** rETH is a reward-bearing token (i.e. a cToken), that automatically accrues staking rewards based on the Rocket Pool staking rewards. rETH can be traded for ETH at any time. There are approx.. 14 000 rETH token holders. Being a non-rebasing token, its integration with DeFi protocols is much easier.

## Rocket Pool Permissionless Node Mechanism







# Rocket Pool

**Commission/fee:** Validators can either stake 16 ETH or 8 ETH. The first pays 20% from the generated yield, while the second pays 14%. This incentivizes node operators that have 16 ETH or more to create 2 “8 ETH mini pools” and run 2 nodes instead of 1.

**Node operators:** Rocket Pool also provides probably the most comprehensive node [Grafana dashboard](#) that facilitates nodes to track their progress, status and health checks. NOs also need to deposit an amount of RPL tokens as collateral. To participate, operators need to provide a minimum of 10% of the borrowed amount of ETH and a maximum of 150% of the bonded amount of ETH. This drives the demand for RPL token and creates another utility for the token: node collateral. On the other hand, adds an entry barrier to validators.

Node Operators receive 3 types of rewards: staking rewards (100% of their staking rewards), commissions (15% of the yield generated by rETH depositors), and RLP rewards that come from locking RLP as collateral.

**Private key management:** The private keys are created by the node operator using Ed25519 EdDSA digital signature and stored in the node.

**Decentralization:** Rocket Pool is permissionless and trustless, meaning that anyone can join as a node operator. Rocket Pool has 2800 node operators that manage a total of [23 000 validator nodes](#) at the time of the writing, making it one of the most decentralized LSD option.

Rocket Pool governance is distributed across 2 DAOs: Oracle DAO (oDAO) and the Protocol DAO (pDAO) and nearly [600 members](#) participate in the voting. The governance model includes a “power scoring” that gives more influence to smaller token holders. Similarly to quadratic voting, this helps balancing the power across voters.

**Incentives and incentivized yield:** automatic reward distribution to node operators was enabled with the Atlas upgrade, allowing node operators to set up a threshold that will automatically distribute the node rewards.

**DVT:** Rocketpool node operators are fairly well distributed from scratch. However, they can still benefit from DVT to minimize [slashing risk and correlation risk](#). In the future, DVT can also help to lower node entry requirements.

**Permissioned/less:** Rocketpool is a 100% permissionless pool.

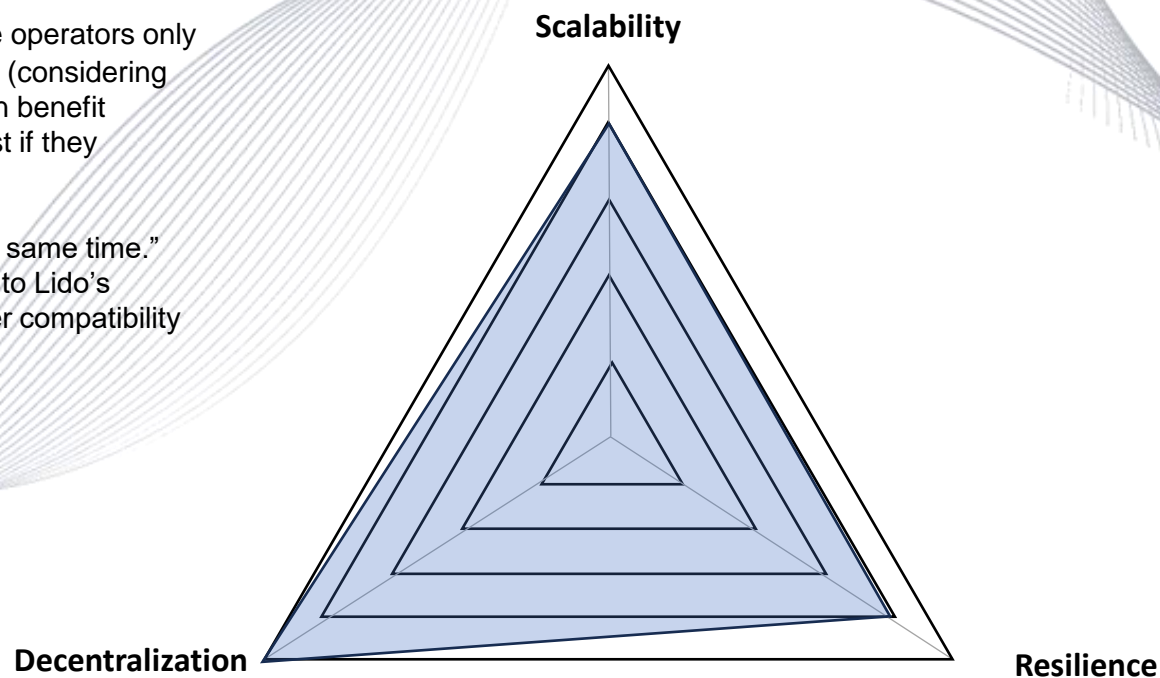


# Rocket Pool

**Slashing protections:** Rocketpool minipools are collateralized by the collateral posted by the node operator in ETH and RLP token. This collateral is used to cover any slashing. However, if the collateral is insufficient to cover the slashing, (very rare situation), rETH will incur socialized losses.

**Capital efficiency and DeFi compatibility:** requiring the node operators only 8 ETH can be seen as a big accomplishment from the capital efficiency perspective (considering that a solo staker would have to deposit 32 ETH). Moreover, the node operators can benefit greatly from the low staking requirement, which enables them to accumulate interest if they choose to do so.

On the other hand, rETH also allows users to easily “have the cake and eat it at the same time.” When it comes to DeFi, rETH is accepted in 64 different DeFi protocols. Compared to Lido’s stETH, rETH is a reward-bearing token that doesn’t need rebasing, thus it has better compatibility with DeFi protocols without the need of being warped to accrue rewards.







# Frax Ether

**Category:** Pooled staking (DeFi)

**Summary:** The issuer of the FRAX stablecoin is also climbing up the ranks of the top LSD staking platforms with its product Staked Frax Ether (sfrxETH). FRAX staked ETH TVL rose by 72% within the first 2 months after the Chapella upgrade, being in this aspect a top performer just behind Rocket Pool.

Frax encompasses a number of products that evolved primarily from the FRAX stablecoin: an AMM, Fraxlend, and Ferry (a cross-chain bridge). In this section we will focus primarily on Staked Frax Ether.

Being an OG in the decentralized stablecoin ecosystem (well, at least the protocol has been fairly stable since it's launch in Dec. 2021), Frax developed a significant ecosystem around its stablecoin FRAX that now expands its use cases to the LSD space.

Frax offers one of the highest LSD yields and facilitates the staking process to users who want to access ETH liquid staking. In recent months it gained enough traction to claim 2.4% of the market share, making it 4 largest LSD protocol.

**Token use and type:** Frax Ether token model is similar to Stakewise V2. There are 2 tokens: frxETH, which acts as a stablecoin soft-pegged to ETH (analog to wETH), and sfrxETH, the staked token that accrues yield. The rewards earned by the validators are distributed to the sfrxETH holders. Similarly to rETH, sfrxETH value goes up over time. The token can be used in different DeFi protocols, including Fraxlend (sfrxETH has, of course full compatibility in the Frax ecosystem).

sfrxETH and frxETH are interchangeable. To stake ETH on Frax, users need first to mint frxETH and then stake it to receive sfrxETH. sfrxETH is an ERC-4626 vault token that represents a fractionalized ownership of the staking yield-bearing vault.

**Commission/fee:** Frax charges a 10% commission. This commission is divided between 2% to a slashing insurance fund and 8% distributed to Frax shareholders (FXS).

**Rewards:** Having a 10% fee, sfrxETH ends up paying one of the best yields among its LSD peers (from staking yields, tips and MEV boost). Additionally, frxETH and sfrxETH can also earn additional boosted rewards from Curve pools.



# Frax Ether

**Commission/fee:** Frax charges 10% commission. This commission is divided between 2% to a slashing insurance fund and 8% distributed to Frax shareholders (FXS).

**Rewards:** Having a 10% fee, sfrxETH ends up paying one of the best yields among its LSD peers (from staking yields, tips and MEV boost). Additionally, frxETH and sfrxETH can also earn additional boosted rewards from Curve pools.

**Node operators:** Whenever a deposit pushes the minter balance over 32 ETH, the contract automatically spins up a new validator. The Frax core team is the main node operator of the validating nodes, making it quite centralized from the validator's perspective. Additionally, all Frax validators (almost 6000), are running only 2 clients: 80% Lighthouse and 20% Prysm. Being these two clients the most used in the market, Frax doesn't add much to client diversity.

Frax has plans to move to a more decentralized option similar to Rocketpool. This update will come with V2, which should happen within Q3 2023.

Of the almost 6000 validating nodes, around 200 are "awaiting for ETH," meaning that they can be activated as soon as 32 ETH is pooled from the minter. This means that Frax could easily spin up new validating nodes with no delays if a big actor deposit up to \$12 million.

**Decentralization:** at the time of writing the report, Frax is the only node operator, where the nodes are operated by the team.



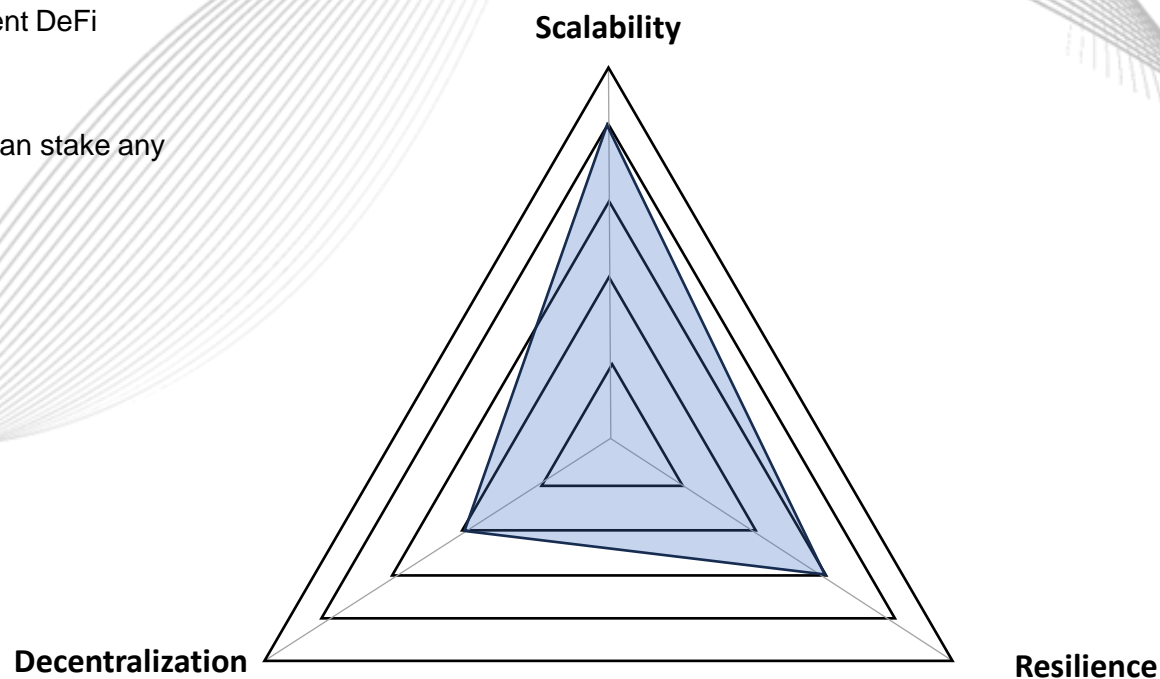
# Frax Ether

**Permissioned/less:** Frax plans to become permissionless in the future. However, there's one single node operator at the time of writing this report.

**Slashing protections:** 2% of the rewards are included in a slashing insurance fund.

**DeFi and LSDfi compatibility:** sfrxETH is compatible with 23 different DeFi protocols.

**Capital efficiency:** validator nodes are not managed by users but users can stake any amount of ETH.







# Ankr

**Category:** Pooled staking (DeFi)

**Summary:** Ankr is an infrastructure protocol with an LSD offering. In a nutshell, Ankr is a suite of decentralized products and infrastructure marketplace that covers a number of different products for Web3 and DeFi.

Ankr's main product is to connect a decentralized network of nodes with Web3 developers in a decentralized marketplace.

Ankr offers infrastructure and RPC service for [37 different chains](#), AppChains, and chain scanners, but we will be focusing on the LSD side of the protocol. On the LSD side, Ankr offers LSDs for Ethereum, Polygon, BNB, Fantom, Avalanche, Polkadot and Kusama.

Users that stake ETH receive ankrETH which is a rewards bearing token that accrues rewards by increasing in value in relation to ETH. ETH staking on Ankr has a TVL of \$84 million that comes from 7000 depositors. There's no minimum staking amount.

Ankr offers ample APIs and SDKs that allow developers to easily integrate with Ankr's liquid staking and crowdloan services.

**Token use and type:** ankrETH is a reward-bearing token that accrues value daily. ankrETH holders can swap the LSD token to ETH on a DEX or unstake/redeem 1:1. Unstaking takes 4 days but users can opt for a flash unstake that allows for instant release of funds with a 5% commission.

**Commission/fee:** Ankr takes a 10% fee from the staking rewards. The fees are distributed across node providers, security audits and other needs to support project.

**Node operators:** Ankr staking is currently distributed across 3 node operators, being Ankr and 2 other providers that are only known to the team. The Ankr team plans to [implement DVT and a validator hub](#) marketplace which will bring more decentralization with the future upgrade. This might include SSV and Obol.





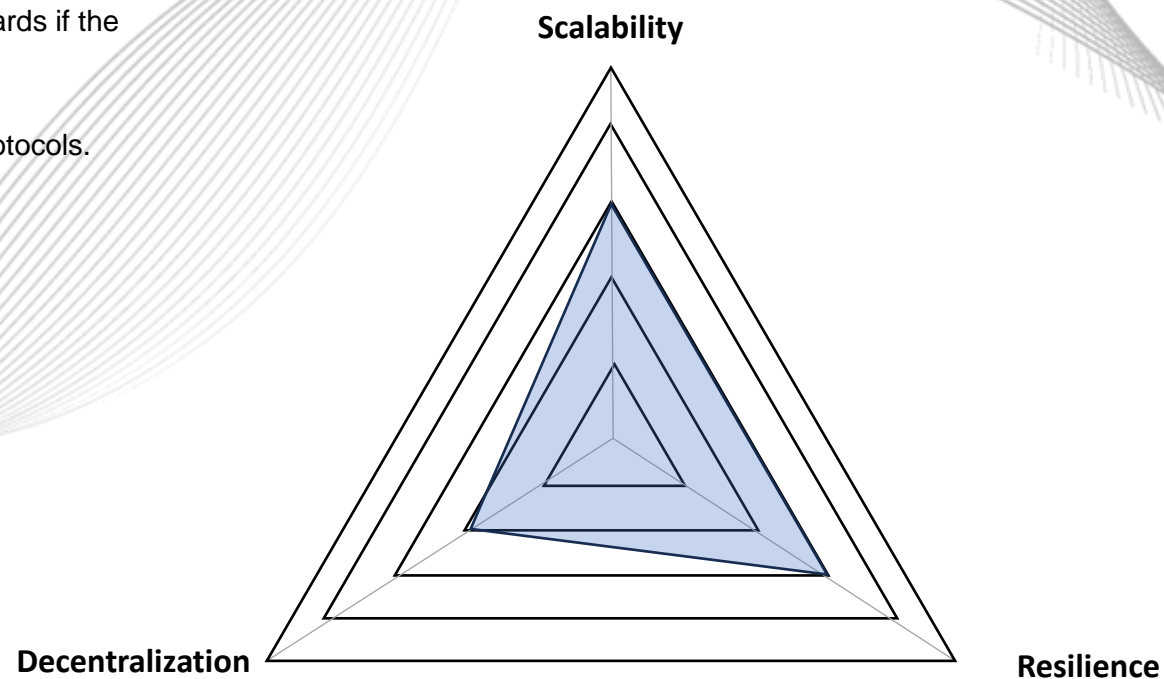
# Ankr

**Decentralization:** as previously mentioned, there are only 3 node operators at the time of the writing. They are concentrated on 2 clients: Lighthouse and Prysm.

**Permissioned/less:** nodes on Ankr are currently permissioned.

**Slashing protections:** according to Ankr, users can miss part of their rewards if the node they are staking with is slashed.

**DeFi and LSDfi compatibility:** Ankr is compatible with only 3 DeFi protocols.





# StakeWise

**Category:** Pooled staking (DeFi)

**Summary:** StakeWise has been consistently growing in terms of TVL, although its market share is still just under 1%. The StakeWise non-custodial pool allows users to gather resources, the ETH 32 that are necessary for node operators to stake on behalf of the pool depositors. Node operators can join in a permissionless manner with StakeWise V3. There's no staking minimum for users.

The StakeWise pool allows users to deposit ETH in exchange for sETH2, the LSD token that represents ownership of the staking pool. StakeWise Solo used to allow users to launch solo validators with 32 ETH but this product is no longer available. However, solo validators can still join and contribute to the V3 ecosystem, where anyone can create a vault with 1 or more node operators and users can choose who to take with.

**Token use and type:** the rewards are distributed to the users according to their share in the pool. StakeWise has two different tokens: sETH2, which represents staking ETH and rETH2 which represents the rewards. Both can be redeemed 1:1 and both are ERC20 tokens.

Unlike reward-bearing tokens, for users to compound their earnings, they need to redeem the rewards and re-stake them.

StakeWise tokenomics are likely to change once V3 is implemented..

**Commission/fee:** StakeWise charges a 10% fee on the rewards.

**Node operators:** StakeWise has been operating in a centralized model where it operates the validators from a cloud provider. The other 2 node operators also contribute to the node operators infra. The cloud infrastructure used can scale up automatically if necessary, taking advantage of auto-scaling capabilities provided by the different cloud providers. However, V3 will introduce the possibility for validator nodes to join StakeWise in a permissionless manner. On V3, node operators will be distributed across different vaults (same as mini-pools) and users/stakers will have the capacity to choose from a vault marketplace which vault they would like to use based on the vault score. This score will include client diversification, node performance, collateral, slashing insurance metrics, geographical diversity, and usage of DVT.

The creation of private vaults allows stakers to choose a vault that better fits their profile. For example, while crypto community users can opt for a permissionless vault, institutional users might want to use a private vault with KYC'd validators and OFAC enforcement.





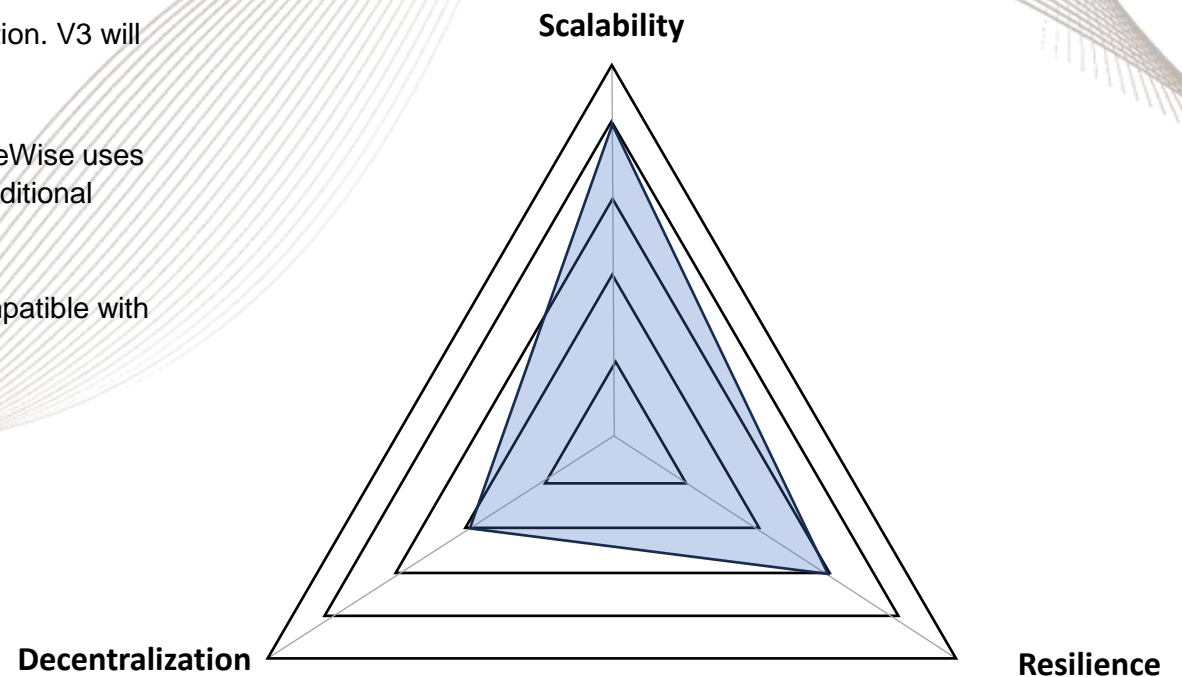
# StakeWise

**Private key management:** StakeWise splits the withdrawal keys into multiple parts using the Shamir's secret sharing, being necessary to have a threshold in order to withdraw balances.

**Decentralization:** at the time of the writing, StakeWise is still mostly centralized and operated on the cloud. However, StakeWise V3 will allow validating nodes to join in a permissionless manner and adopt DVT for added node redundancy and decentralization. V3 will introduce DVT technologies like SSV and Obol.

**Slashing protections:** Taking advantage of the cloud infrastructure, StakeWise uses server redundancy and failovers to ensure the best uptime possible for the nodes. Additional slashing protection is not known.

**DeFi and LSDfi compatibility:** sETH2 is at the time of the writing compatible with 10 DeFi protocols. None of them is a lending protocol.

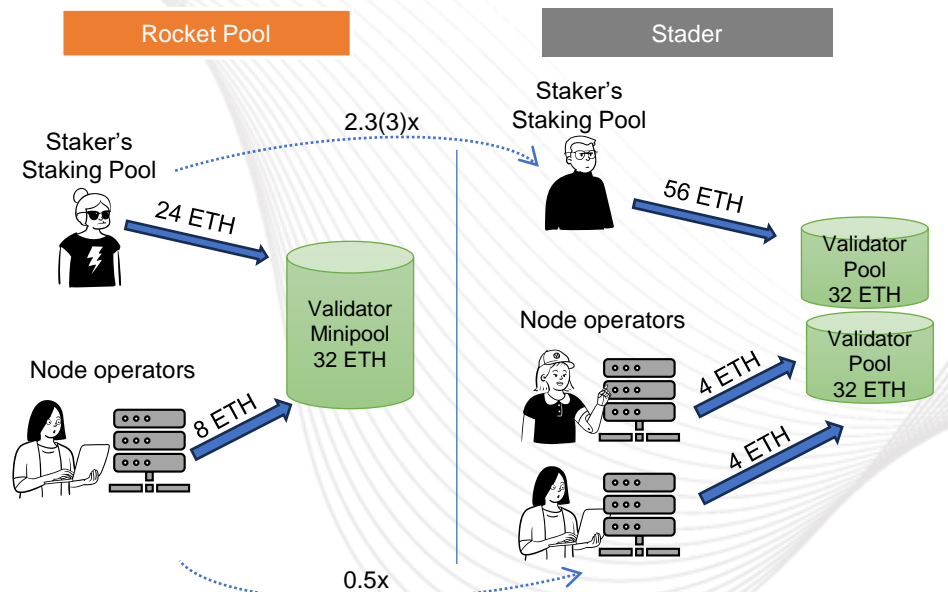




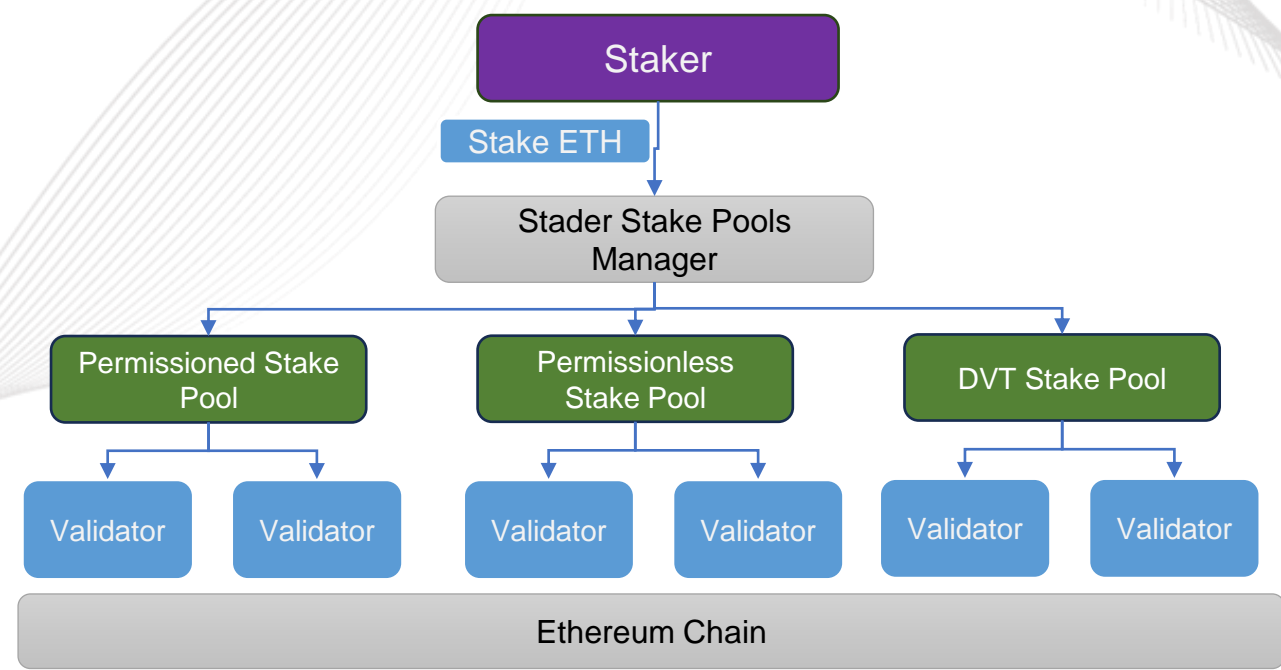
# Stader

**Summary:** Stader is a multichain LSD protocol that started with Terra but expanded to other chains after the Terra/Luna collapse. Although compatible with different chains, Ethereum is likely to become the majority of Stader's TVL in the future. Stader offers a convenient way to stake ETH and maximize staking returns.

Stader is soon launching on ETH with a solution called ETHx which promotes decentralization and scalability of liquid staking solutions by having multi pool and modular applications. Validator operators will be able to stake ETH 4 only to run a validator in the Stader permissionless pools, which is substantially lower than the ETH 32 required to be a solo staker. This is great for node operator capital efficiency and it's in line with their vision of allowing one validator node in every home. Individual validators get additional fee/commission from the 28 ETH staked by users. These permissionless pools are similar to Rocket Pool mini-pools and StakeWise vaults.



Stader pushes validator capital efficiency one step further.



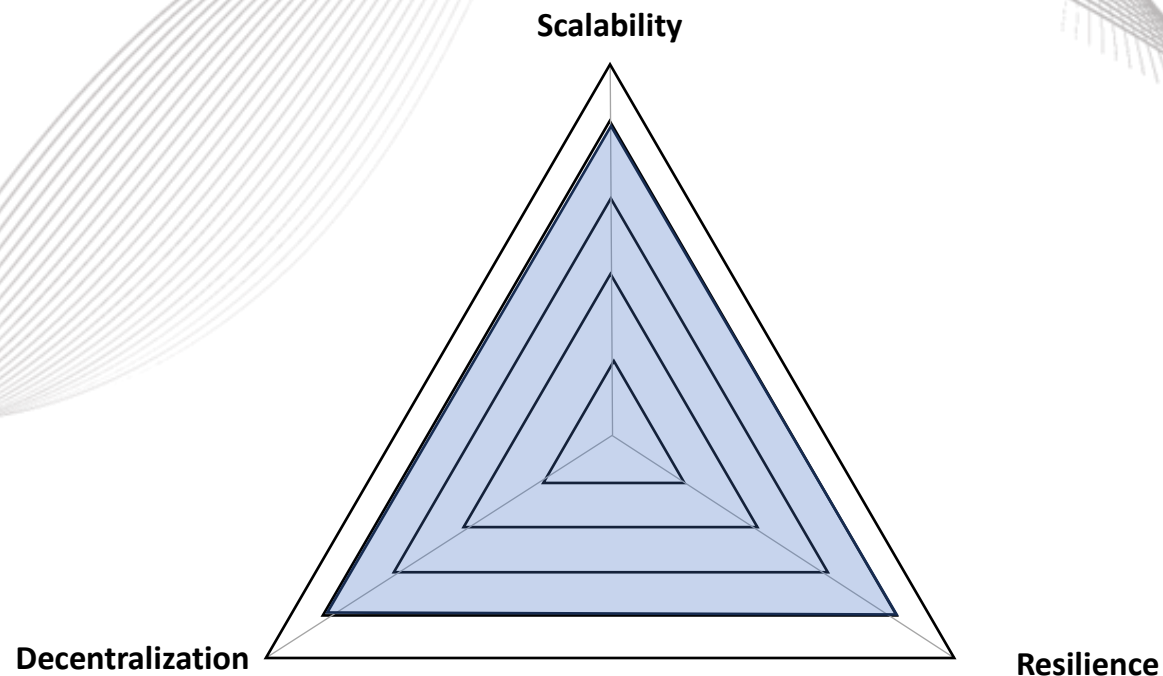


# Stader

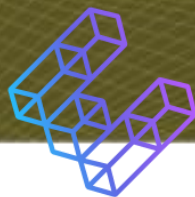
Stader will be using SSV's DVT infrastructure for improved resiliency and decentralization. Permissioned pools will also be created for high-performance validator operators and institutions to be able to participate in a more regulatory-compliant manner (e.g. OFAC).

Stader takes 10% of the staking rewards, where 5% are put towards the StaderDAO, which gives additional utility to the Stader token. In addition, node operators need to bond 0.4 ETH worth of SD tokens per validator.

ETHx is currently in Beta testnet.







# Ether.fi

**Category:** Pooled staking and delegated staking (DeFi)

**Summary:** Almost all LSD protocols claim to be decentralized but Ether.fi seems to be on the right path for a fully decentralized staking network where the stakers keep control of their keys. Ether.fi already attracted approx. \$50 million in TVL to its incentivized early adopters program. Is Ether.fi the coolest project in the LSD space? Well, at least Ether.fi saw a 69% growth in the 2 months post-Chapella.

The 4 differentiators of Ether.fi are directly correlated to the values of the Ethereum community:

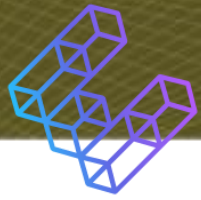
- Decentralization
- Staker's control over their keys
- Real yield maximization
- Node services marketplaces (similar to mini-pools and vaults), which is part of the roadmap but not implemented yet. Additionally, Ether.fi also offers Delegated Staking which resembles a decentralized version of Staking as a Service.

Ether.fi uses NFTs in a clever way. For every 32 ETH staked, 2 NFTs are minted: a T-NFT and a B-NFT. The T-NFT is transferable and represents a 30 ETH interest on the validator. The B-NFT or Bonded NFT represents the remaining 2 ETH and can be used as a slashing insurance NFT.

Ether.fi also plans to offer stakers with a loyalty PFP NFT that will evolve according to the rewards and membership tier of the user.

Currently, the minimum staking amount is 0.1 ETH.

Ether.fi is running their EAP – Early Adopter Program – allowing users to deposit ETH, wstETH, rETH, sfrxETH, cbETH to earn bonus points that will give them access to boosted rewards. The goal is to bootstrap the initial liquidity.




# Ether.fi

**Token use and type:** Ether.fi's LSD token eETH is a reward-bearing token.

**Commission:** 0% during the EAP phase. The commission will increase after the EAP phase.

**Private key management:** Ether.fi's delegated staking allows users to stake multiples of 32 ETH and control their keys - similarly to Staking as a Service provider. The main difference, in this case, is that everything is done in a decentralized and permissionless manner.


In this case, the staker keeps control of the private keys and receives the 2 NFTs mentioned above that represent its stake. The T-NFT can be transferred/liquidated (which brings liquidity to the staker), while the B-NFT is a soul-bonded token. The node operators will also keep their own node operator keys.

 ether.fi ✓  
@ether.fi

Right now, there are ~7,700 nodes running Ethereum; half are based in the US. Of these, half are in a single data center in Virginia, 20 minutes from the white house & CIA HQ.

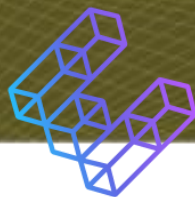
This needs to get better, and Operation Solo Staker helps fix it.

COUNTRY	Count	Percentage
Total	7719	(100%)
United States	3495	(45.28%)
Germany	952	(12.33%)
Singapore	375	(4.86%)
United Kingdom	343	(4.44%)
Japan	279	(3.61%)
South Korea	212	(2.75%)
Canada	196	(2.54%)
France	182	(2.36%)
Ireland	181	(2.34%)



Map Satellite

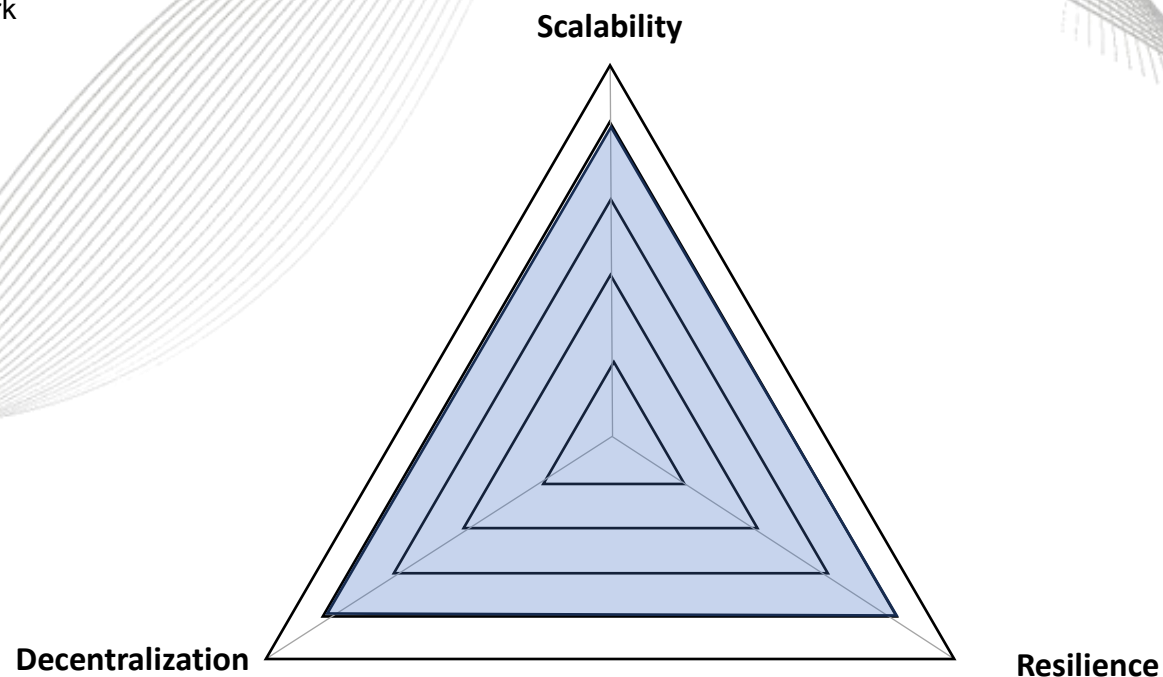
Google Keyboard shortcuts Map data ©2023 Terms of Use



# Ether.fi

**Node operator:** node operators can join in a permissionless manner. Ether.fi offers [comprehensive documentation](#) and a user-friendly UI to help new operators join with new validating nodes.

At the time of the writing, Ether.fi is running a promotion called “[Operation Solo Staker](#)” where in partnership with Obol, dappnode and Avado, they offer the users the hardware (node), and the capital necessary to start a full node. In exchange, node operators need to commit to operating the node for 3 years. This is part of the efforts of the protocol to keep the validator network decentralized since its very start.







# Stafi

**Category:** Pooled staking (DeFi)

**Summary:** Stafi provides LSDs for multiple chains, including Ethereum, Polkadot, Kusama, Polygon, BNB, Solana, Cosmos, IrisNet, Chihuahua, and Carbon. Stafi is a decentralized protocol built on Substrate, and it's part of the Polkadot ecosystem. Ethereum stakers are able to stake any amount starting from 0.01 ETH. Stafi connects stakers with validator nodes, giving priority to “well-performing” nodes.

**Token use and type:** Stafi's rTokens (rETH) are reward-bearing tokens. Its exchange rate is always positively correlated to the staking income. Once users stake ETH, Stafi automatically mints new rETH for the user (do not confuse it with RocketPool's rETH). [1:1 unstake](#) is already available. rETH is also available for swap in multiple exchanges.

**Commission/fee:** Stafi offers one of the lowest commission fees in the LSD space: 5%. The revenue from the fees is distributed across the FIS token holders (70%), Stafi treasury (20%), and Stafi team (10%).

**Node operators:** Stafi has committed to decentralization since day one and Stafi run their own validating nodes. Stafi offers two options for validators – permissionless solo validators and permissioned trusted validators. The permissionless option allows anyone to join as a validating node by depositing 12 ETH to register the node. Stafi rETH pool will allocate the remaining 20 ETH to the validator. The “trusted validator” option allows the node operators to join with zero ETH but they are KYC'd and sign legal agreements.

**Private key management:** the staking contract is managed using MPC – Multi-Party Computing and multi-signature. 21 fragments of the staking contract are distributed across unspecified validators. 16 out of 21 are necessary to recover the private key. Additionally, the nodes that have the keys are rotated every 6 hours.





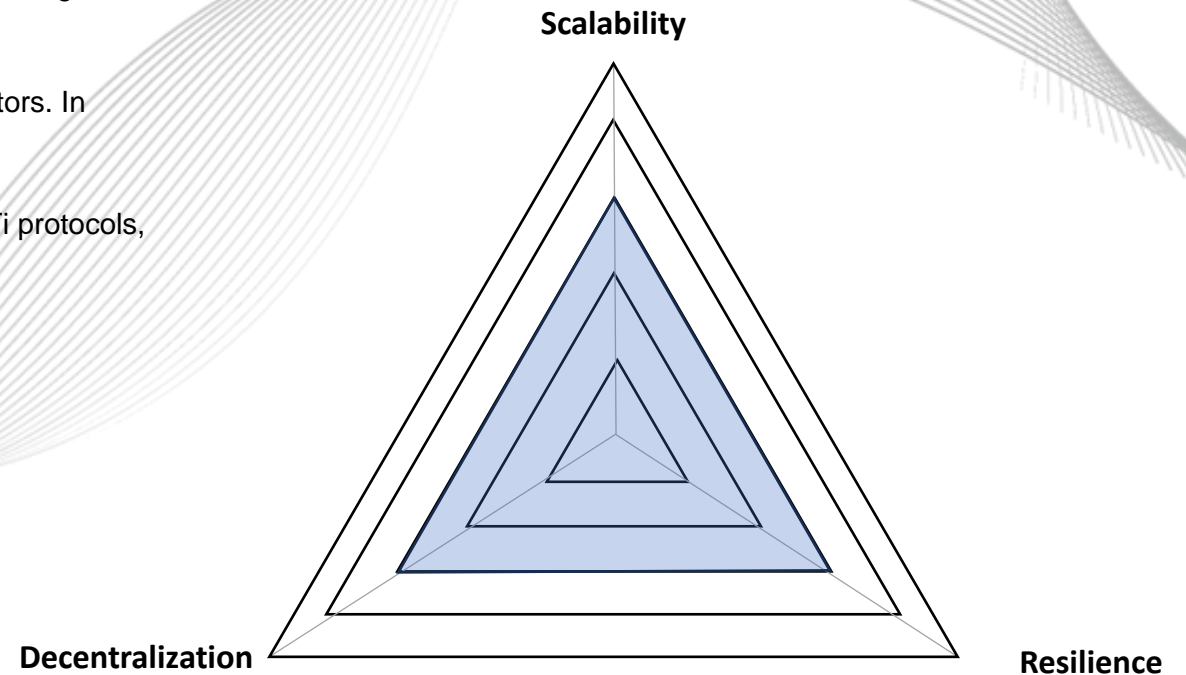
# Stafi

**Decentralization:** According to [Rated](#), the majority of the Stafi validators use one single client – Prysm.

Stafi governance is currently discussing the [implementation of the DVT](#) infrastructure SSV. This proposal would improve the decentralization and security of the protocol, as well as reducing the entry barrier for new validators.

**Slashing protections:** the ETH staking pool is distributed to multiple validators. In case a validator is slashed, the impact on the staking pool will be minimal.

**DeFi and LSDfi compatibility:** rETH is compatible with close to 10 DeFi protocols, being the main ones Pendle, Uniswap, Balancer, Curve, Aura, Convex, and Camelot.





# Swell

**Category:** Pooled staking (DeFi)

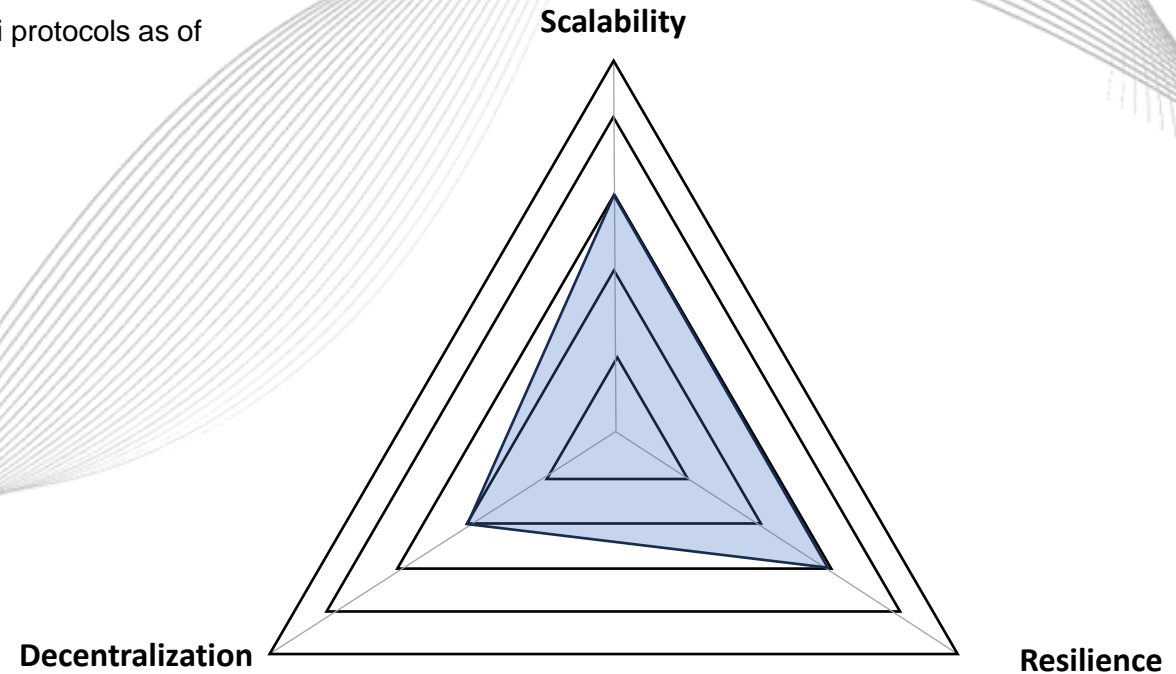
**Summary:** Swell is a non-custodial ETH LSD protocol. It went live in Q2 2023 and it has been running an early adopter program to bootstrap liquidity. As of June 2023, it has attracted close to \$40 million in liquidity. There's no minimum staking amount and Swell aims to be a fully decentralized and permissionless staking network using DVT technology. However, it started with a permissioned validator set where node operators are vetted.

**Token use and type:** Swell's swETH token is a reward bearing token. Similarly to other LSD protocols, the rewards accrued include rewards/penalties from the Consensus Layer, MEV and tips from the Execution Layer. The amount of swETH doesn't change but its value changes. The SWELL governance token is not available yet but it will be used for the DAO community, governance and to incentivize growth.



**Commission:** as of the time of the report, Swell has been running a 0% fee promotion. Once the promotion is finished, a 5% commission will be applied. This commission will be necessary to attract new node operators.

**DeFi and LSDfi compatibility:** swETH is compatible with 9 DeFi protocols as of June 2023.







# NodeDAO

**Category:** Pooled staking (DeFi)

**Summary:** NodeDAO is one of the most recent LSD protocols in the space. Since the start, NodeDAO strived to be a decentralized validator system, although it started with a “trusted validator set.”

NodeDAO uses HashKing (an aggregator) to manage the node operators from different Web3 infrastructure providers – ChainUp Cloud and XHash and more. The protocol is also in the process of integrating with SSV's DVT technology for better decentralization and any person can easily create a validator node. There are 2 options for users: nETH and vNFT. nETH is LSD similar to Lido. vNFT is non-custodial and similar to other Staking as a Service providers. Users can also become an operator and create the validator node themselves.

Once the user creates a node and deposits the 32 ETH, he can mint an NFT that represents the node's staking.

**Token use and type:** nETH is a reward-bearing token that accrues value over time.

NodeDAO provides nETH that allows validators to access liquidity or exit without the need to queue. Similar to stETH, nETH can be transferred on the secondary market. Another option is called vNFT. The vNFT is minted when an individual validator joins the network, and it represents the 32 ETH in a node.

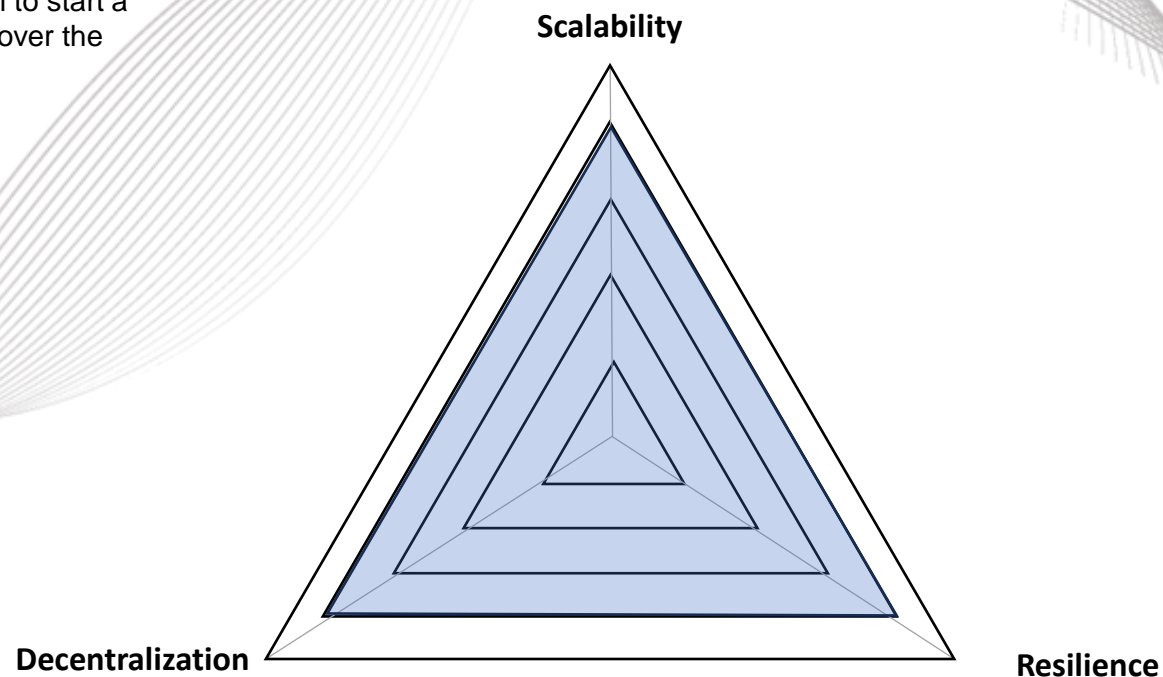




# NodeDAO

**Commission/fee:** NodeDAO allocates 10% of execution layer income to the NodeDAO treasury, 20% of execution layer income to the operator and the rest to the stakers.

**Node operators:** Being a permissionless network, node operators can join either through ChainUp Cloud and XHash or individually. NodeDAO [requires 1.1 ETH](#) as collateral to start a node, which is odd, considering that according to Stader, [4 ETH are necessary](#) to cover the majority of slashing risks.





# Stakehouse - Blockswap

**Summary:** Stakehouse protocol is a smart contract-based Staked ETH operating system for programmable staking. Using state replication, the protocol maintains an immutable record of continuous individual validator balances. All smart contracts including the state replication are a ground-up new design that allows for intent-based cross-domain by synching the consensus layer deposit with execution layer derivatives.

Stakehouse is a primitive which is the basis of many Ethereum applications including liquid staking, multichain ETH staking, MEV management, Blockswap Cloud, LSD as a service, and an Ethereum staking CRM. It is also natively compliant with all Ethereum infrastructure, execution & consensus clients, and DVT, and does not require a protocol upgrade.

Current applications of Stakehouse:

- Solo/Institutional Stakers: Stakehouse provides NAV tracking and UX for easy staking with key generation, portfolio management & customization, DeFi compatibility, and no pooling of assets.
- LSD Networks: Three staking options including MEV Staking, Protected Staking, and Node Operator Staking.
- LSD as a Service: Users can create their own LSD Network and collect a commission using the Stakehouse smart contracts. It includes fully customizable with KYC and token gating.
- Fren Delegation: Enables ETH stakers to liquid stake and provide ETH to a specific validator. This can be a tool for influencers and community members to get liquidity sourced specifically for their validator.
- Compound Staking: Stakehouse staking allows node operators to compound the number of validators they are operating.
- Stakehouse Monitoring: Providing 100% accountability and tracking of staked ETH movements complete with node operator health, MEV rewards, issuance, and index performance.

**Token use and type:** dETH - Derivative ETH always maintains 1:1 with ETH in a validator. It earns a full validator's staking rewards on only 24 dETH; Up to 33% more than the staking rate.

SLOT Tokens - Represent validator ownership and collect all MEV and tips on only 8 tokens and offer up to a 400% increase MEV on a per ETH basis.



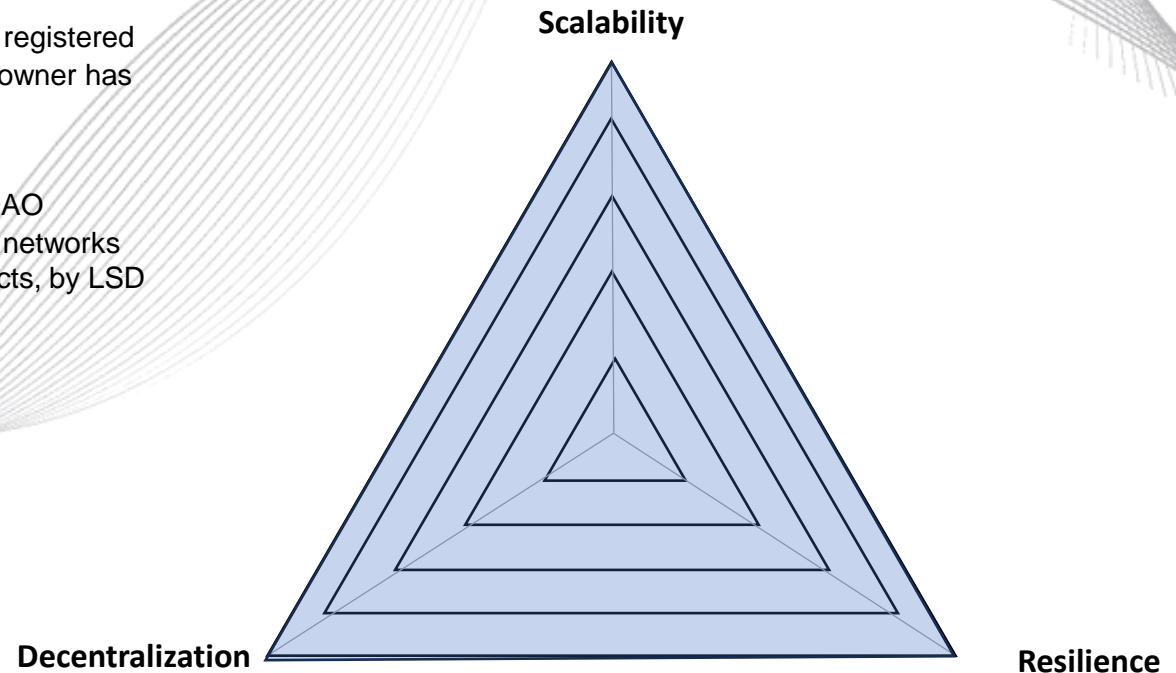
# Stakehouse - Blockswap

**Commission/fee:** Stakehouse collects zero commissions, but LSD owners can set whatever commission they want.

**Node operators:** Up to the LSD Networks that build on Stakehouse, many are permissionless. Stakehouse is 100% compatible with all Ethereum infrastructure including clients and DVT out of the box.

**Private key management:** Encrypted on the Ethereum blockchain and registered with Stakehouse to provide granular level tracking of every asset. Only the validator owner has access.

**Incentives and incentivized yield:** Blockswap governance allow DAO participants to vote on creating incentives and bribes to bring more users to the LSD networks created within Stakehouse. These incentives can be either sponsored by other projects, by LSD creators or by Blockswap.





# LSD Wars and the Emergence of LSDfi

## What is LSDfi (or LSDs of LSDs)

LSDfi might be a broad term that defines any DeFi protocol (including DEXs, Lending and Derivatives), that interacts with LSDs. However, in this section, we will narrow down the LSDfi definition to DeFi protocols that work mostly with LSD protocols by aggregating them and contributing to the decentralization of Ethereum staking, as well as boosting LSD rewards.

LSDfi protocols aim to bring a better user experience for stakers. They encourage validator decentralization by promoting LSD platform competition. Protocols such as unshETH aim to work as a liquidity aggregator and distribution that is materialized by tokenizing different LSD platforms in a single token (for example, the unshETH token).

By aggregating different LSD tokens, unshETH creates an Ethereum Benchmark Interest Rate. This might resemble LSD indexes like IndexCoop's Gitcoin Staked Ethereum Index, but there are fundamental differences. While a "Staked Ethereum Index" has a weighted distribution according to the size of the LSD (for example, stETH has a higher allocation), on LSDfi protocols like unshETH, the rate doesn't represent the LSD derivatives according to their market share but according to parameters that are defined through governance and that aim to increase the LSD decentralization or increase staking rewards for users.

In addition to the protocols below, other protocols such as [Pendle](#) are also quite popular among LSD users. However, given that Pendle is not natively an LSDfi protocol, we will not cover it in this section. Similarly, [Tenet protocol](#) and [Lybra Finance](#) are building stablecoins that is backed by a basket of LSD tokens in a Collateralized Debt Position model that can also make some contributions to decentralize the LSD space.



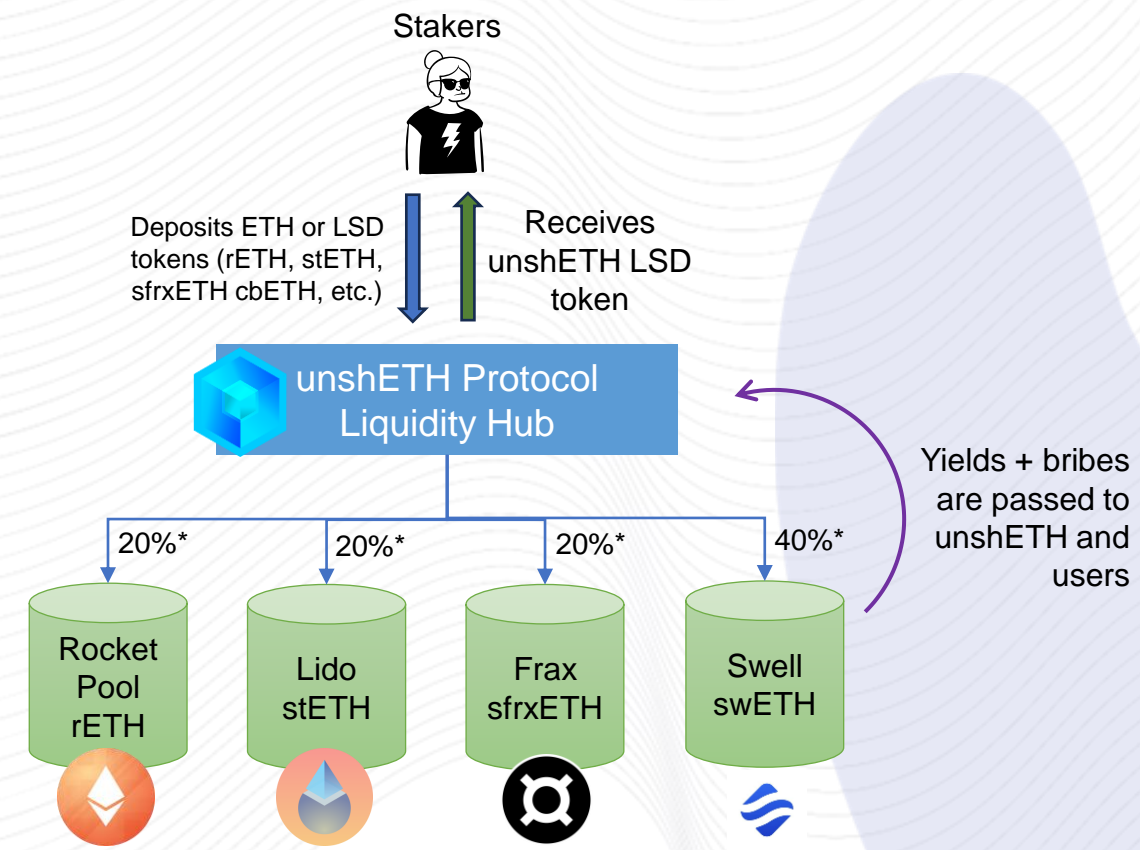


unshETH's product can be sum up as incentivized LSD liquidity. UnshETH and LSDfi platforms desire to be liquidity hubs from LSD protocols. LSD protocols are incentivized to join the protocol to have access to liquidity. Newer LSD protocols can benefit from the liquidity bootstrapped by unshETH (which incentivizes decentralization). New LSD players can be the big beneficiaries of these incentives to have access to liquidity.

unshETH has so far onboarded 6 different ETH LSD tokens, including sfrxETH, rETH, wstETH, cbETH, ankrETH and swETH. When a user deposits ETH into the protocol, the funds are distributed across these different LSD protocols according to a target rate that is defined by the protocol's governance process.

**Projects get TVL = target rate \* unshETH TVL**

By distributing the TVL across different LSD protocols, unshETH promotes LSD protocol diversification and validator decentralization.



\*percentages are merely illustrative



USH holders (unshETH governance token) vote on which LSDs to include and how much weight to give them over time, making it a more democratic process rather than giving more weight to the already big LSD protocols.

As unshETH is still a very young DeFi protocol, it has incentivized farming and additional rewards to users that get involved in the governance process. And provides additional incentives to stakers. These rewards will later be boosted by the LSD protocols itself similarly to how Convex and Cure work together. LSD protocols will be able to bribe the unshETH pool by paying incentives that will increase the yields in order to get a higher allocation.

unshETH is a protocol that aims to further validator decentralization by creating a marketplace for staked ETH liquidity in which LSD protocols can compete for ETH by offering the best yield.

UnshETH is an interesting tool to move away from centralization (like Lido controlling 75% of the nodes) and allow stakers to stake in a more decentralized and fair manner, while also being rewarded for that.





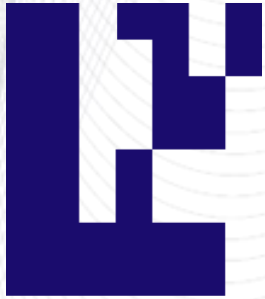
## Tapio Finance

Other protocols such as [Tapio](#) - Building tapETH - are also a synthetic asset pegged to ETH and backed by ETH/LSD stable pools generating the better APR for ETH. Although not live yet, Tapio promises to create a derivative – tapETH – that is backed by a stable pool containing different LSD/ETH pairs from DEXes (including Curve). This could be stETH/ETH, cbETH/ETH, rETH/ETH, and sfrxETH/ETH.

tapETH can be minted by depositing ETH or an LSD tokens and tapETH yield will reflect not only the yield from the underlying LSDs but also swap fees from the DEX pools, redemption fees and other token incentives like farming.

Some LSDs have a rebase model, others are a reward bearing token, others pay interest in a different token (which is the case of frxETH and sfrxETH). tapETH can solve this fragmentation. It's almost like a synthetic LSD that holds other LSDs. Perhaps we can call it an LSD of LSDs.

The Tapio ETH testnet will be launched in Q3 2023 and the Tapio governance token and v token will be launched probably around Q4 2023.



## EigenLayer

Bringing staking derivatives to a new level  
Restaking and shared security models

EigenLayer brings a new shared security layer to the blockchain. In a nutshell, users can stake their ETH and stake it again with EigenLayer, in order to “use” the Ethereum security to secure other services. EigenLayer is the major first project bringing a shared security marketplace to the Ethereum ecosystem allowing users to use the security of Ethereum and share the security with other protocols. Vitalik Buterin outlines well how re-staking mechanisms can bring useful use cases or even put the Ethereum chain at risk in his May 31<sup>st</sup>, 2023, [blog post](#) “Don't overload Ethereum's consensus.”

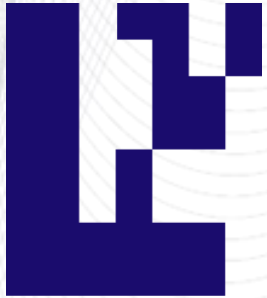
Eigen comes from German and means “your own.” EigenLayer is unlocking a world of super fluid staking (popularized by Osmosis) which is the idea that the stake happens first on the application and then on the protocol. This aims to be “your” own layer where developers can build anything by accessing a shared security marketplace on the top of Ethereum. L2s and other dApps can also create new chains that dApps can use by riding the Ethereum security via EigenLayer.

To achieve this, what Eigen does is to leverage the root of trust – staking Ethereum – and supply it to anybody who wants to build a new consensus protocol (oracles, data availability, bridges, MEV management, etc.). Stakers can opt in to EigenLayer and validate not only Ethereum blocks but also other services (dApps, oracles, L2s, bridges, etc) built on the top of EigenLayer. To do so, validators will have to run the clients of these additional services that they are securing. This will open up additional use cases for DeFi. Additionally, Eigen can allow dapps to have some granularity and stake only with decentralized nodes for example and these nodes can earn additional rewards.

EigenLayer and similar products will greatly increase Ethereum's modularity and while greatly increase share security across L1, L2s and dApps. It will, in certain aspects, resemble Cosmos Interchain Security model or Polkadot shared security.

In the future, stETH can be used inside EigenLayer (other than ETH). Lido and EigenLayer also plan to explore integrations. Eigen can take an LSD token letting users to get yield cascade, e.g. yield from stETH + yield from EigenLayer. EigenLayer can improve the yield profile of ETH. Note that the Eigen allows any tokens on the Ethereum ecosystem to be staked.





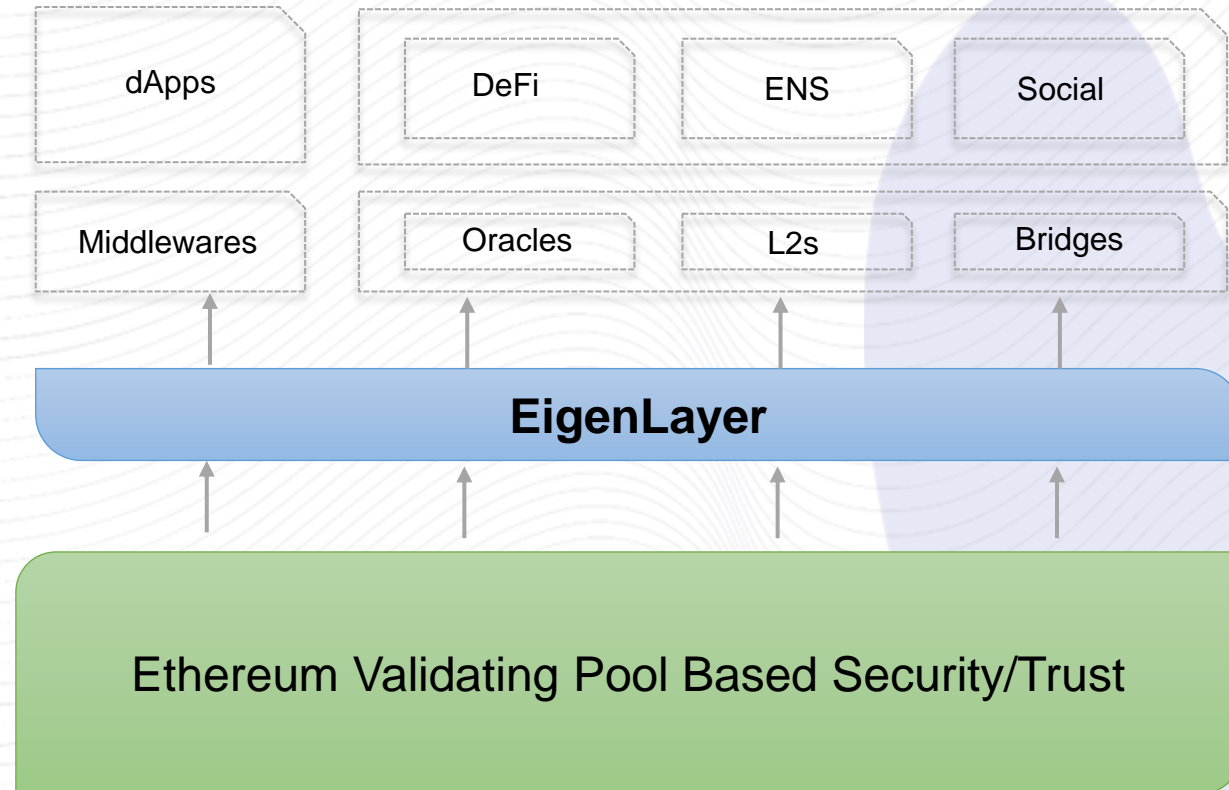
## EigenLayer

Bringing staking derivatives to a new level  
Restaking and shared security models

Stakers might need to accept additional risks in restaking mechanisms, as they are securing more than one network/application.

According to the founder Sreeram Kannan, restaking validation risk is endogenous. By securing different protocols, can lower the overall risk. Which is different from DeFi protocols like LP pools offer in terms of risk.

Finally, the cherry on the top of the cake for EigenLayer is that it can add additional incentives that add additional demands for things like decentralization, which could be positive to further incentivize the decentralization of various dApps and networks including Ethereum.



## Conclusion

### Are we witnessing the birth of a trillion-dollar sector?

The LSD market is rapidly evolving, and new players with innovative technologies have been joining the market and gaining traction over the last few months. LSD protocols are trying to attract new users by providing seamless integrations with DeFi but also by adhering to the decentralization narrative. Better LSD decentralization can be achieved with DVT and by lowering the entry barrier to node operators.

In the future, we can foresee fierce competition across the LSD market to grab a piece of the multi-billion-dollar growth. Why?

- Around \$140 billion worth of ETH are staked every day and these numbers are not slowing down.
- Ethereum staking growth is accelerating fast and in 2 years, the percentage of staked ETH can reach 45% of the circulating ETH, which will represent hundreds of billions of dollars. This will foster the LSD growth.
- As ETH staking alternatives mature and LSDs get battle tested, users will gain more confidence to stake their ETH holdings. In a rational market, in the long term, the total ETH staked should be close to 100%.
- Among all LSD protocols, Rocket Pool has been growing the fastest in the last few months. On the other hand, Coinbase's cbETH has been losing market share. This shows that the decentralization ethos matters for the community.
- In the medium term, Ethereum staking is a 100's of billion dollars opportunity. In the long term, it has potential to represent a one trillion-dollar opportunity, once ETH staking reaches 90% of the circulating supply and ETH price \$10,000.
- The sector will bring numerous opportunities for developers, investors and users.
- LSDfi will gain significant importance in the LSD space by sourcing liquidity, promote decentralization, shared security and boost yields.
- After flipping DEXs in terms of TVL, LSD will continue to be the main DeFi sector in the coming years.

## Appendix

### The validator exit process – key metrics

While partial withdrawals (for example, withdrawing the validator rewards) take 2 to 5 days, full withdrawals are not as fast. To unstake the validator and retrieve the 32 ETH, the validator signs a VoluntaryExit with its private key message and broadcasts it to the network. The validator then joins the exiting queue.

There are a few reasons why the parameters force validators to wait in the exit queue to exit the network voluntarily:

- Allow enough time for misbehaving validators to be slashed before exiting.
- Avoid a large percentage of validators leaving the network simultaneously, which could lead to a sudden decrease in security.
- Avoid a large number of validators joining in a short period which could open doors to 51% attacks.
- Regulate the security of the consensus layer by using a churn limit mechanism.

There's a churn limit to the number of validators that can leave the network in each epoch (1 epoch = 32 blocks = 6.4 min) specified in the parameters:

Churn Limit =  $\max(4, \lfloor \text{active\_validators}/65536 \rfloor)$

In the extreme case that all validators decide to leave, the impact would be as this table:

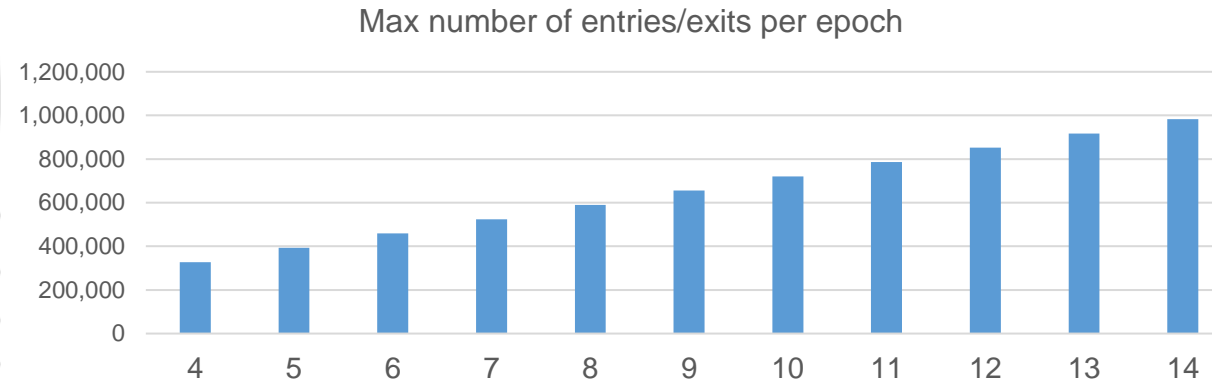
Validators limit	Exits per epoch	Number of epochs	Time (days)	Max Circ. Supply increase YoY
>327,680	4	81,792	363	4.2%
393,216	5	81,920	422	5.07%
458,752	6	95,104	470	5.91%
523,882	7	106,026	512	6.75%
572,000	8	115,276	539	7.37%
589,668	8	115,276	549	7.60%
654,936	9	123,573	581	8.44%

As we can see, the churn limit (which works both for new entries and exits) greatly limits the speed at which churn can happen. This is great for network resiliency and stability, but it's also great news for LSD protocols that bring more liquidity to the staking process.



**Appendix**

**The validator exit process – key metrics**



The chart above shows the exit queue, i.e. the maximum number of entries/exits per epoch, assuming that the number of validators is the same (i.e. equivalent number of nodes join the network, maintaining, for example, the number of nodes around 572 000, which corresponds to up to 8 entries/exits).

Validators queuing	Days required to exit
<b>5,000</b>	2.78
<b>10,000</b>	5.56
<b>15,000</b>	8.33
<b>20,000</b>	11.11
<b>25,000</b>	13.89
<b>28,000</b>	15.56
<b>30,000</b>	16.67

The table above shows the number of days required to complete the exit (i.e. clear the queue) according to the number of validators exiting.

## Disclaimer

The information contained in this document has been compiled by HashKey Group (as defined below) from sources believed to be reliable, but no representation or warranty express or implied is made by HashKey Group, its affiliates or any other person as to its fairness, reasonableness, reliability, accuracy, completeness or correctness. All illustrations, examples or forward-looking information (if any) contained in this document have been provided in good faith for illustrative purposes only as of the date of this document, and are not intended to serve as, and must not be relied upon as, a guarantee, an assurance, a prediction or a definitive statement of fact or probability. Whilst efforts are made to ensure the accuracy and completeness of the information contained in this document at the time of publication, errors or omissions may occur. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. HashKey Group reserves the right to correct any errors or omissions, and to change or update information at any time without prior notice.

Each legal jurisdiction has its own laws regulating the types of investments and/or services which may be offered to its residents and/or in its jurisdiction, as well as the process for doing so. As a result, certain investment products or services discussed in this document may not be eligible for sale or offered in some jurisdictions. This document is not an offer to sell or a solicitation of an offer to purchase any investments or services. Unless otherwise specified, HashKey Group does not hold itself out to be licensed to carry on regulated activities in any jurisdiction. Additionally, providing this material is not, and under no circumstances should be construed to act as a regulated business in any jurisdiction by any person or company that is not legally permitted to carry on such regulated business in that jurisdiction.

Nothing in this document constitutes legal, accounting, or tax advice, and you are advised to seek independent legal, tax and accounting advice prior to acting upon anything contained in this document. The contents of this material have not been reviewed by any regulatory authority. Investors are advised to exercise caution in relation to any investments or services in relation to this document. If you are in doubt about any of the contents of this material, you should obtain independent professional advice.

To the full extent permitted by law, neither HashKey Group nor any of its affiliates accepts any liability whatsoever for any direct or consequential loss arising from any use of this document or the information contained herein. No information contained in this document may be reproduced or copied by any means without the prior written consent of HashKey Group.

“HashKey Group” is a brand name to describe any one or more entities of the group companies composed of HashKey Digital Asset Group Limited and its Affiliates.



# HASHKEY

▶ Capital

[hashkey.capital](https://hashkey.capital)

[ir@hashkey.com](mailto:ir@hashkey.com)