Stakehouse Protocol and Multichain ETH

Position Paper

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Abstract

Stakehouse is a non-custodial automated market maker implemented for the Ethereum Consensus layer and staked ETH on Ethereum's Execution layer. It is designed for users to reuse their staked capital and its yield in a permissionless way for further decentralized financial primitives (DeFi). Compared to other mechanisms currently available for staked asset liquidity, the Stakehouse protocol abandons any price peg or oracle dependency. Instead, it relies on the atomic dependency of minted tokens with the staked assets at the validator level. Stakehouse provides granular tracking of staked ETH performance in relation to minted derivatives in real-time.

Introduction & Mission

The Stakehouse protocol is a ground-up new smart contract framework built as a public benefit infrastructure around the Ethereum Deposit Contract and serving the Ethereum ecosystem at large. The architecture utilizes self-organizing registries to enable multichain asset portability of staked ETH without intermediaries. As a truly non-custodial and autonomous liquidity abstraction protocol, the Stakehouse protocol has no rent-seeking capability on its users' assets.

The core mission of Stakehouse is to expand the economic bounds of Ethereum Proof of Stake to bring its benefits to the Ethereum ecosystem and its rollups. We believe that access to Ethereum staking is fundamental for building sustainable and fair financial inclusion products allowing high-impact social primitives to emerge. The Ethereum ecosystem will become a breeding ground of value-based coordination for permissionless markets. Stakehouse is intended, designed, and built as a neutral public infrastructure aligned with Ethereum's ethos of serving long tail users. Everyone should have permissionless access to ETH staking and validation markets. Staking and its benefits should be as easy, if not easier, than sending and receiving a token in DeFi.

Mechanics Synopsis

Stakehouse is an automated asset liquidity manager for registered staked ETH validators. The mechanism design is based on the general constant of elasticity substitution. This prioritizes fungibility of tokens with atomic dependency on a per ETH basis within a validator for all minted derivative tokens. Stakehouse operates under the notion that capital efficiency comes from inventory reusability; all in protocol assets are fungible. Protocol tokens are minted in two categories dETH and SLOT. Each token represents its unique production functionality in the Ethereum proof of stake Consensus layer. This gives a productivity factor for a validator or group of validators' staked ETH and is composable in any way that a user desires.

Stakehouse has three categories of users:

- Passive Users - Those who can't afford to, or choose not to stake 32 ETH, but would like to gain access to staking rewards. They can do this by acquiring and holding dETH or SLOT directly. Alternatively, they could interact with a protocol that is composing these tokens.
- Stakers - These are solo stakers, DAOs, institutions, or any capital deployer who are looking for additional benefits beyond the traditional process of staking with the Ethereum Deposit Contract. These participants will have a safe and easy route for staking a validator in 60 seconds, and will enjoy the increased optionality of getting in on the base layer of Stakehouse.
- Active Users: This can be any user or a protocol that wishes to actively participate, arbitrage, or simply use the staked ETH rewards for additional yield opportunities. The further Stakehouse gets out of sync, the more advantageous it is for market arbitrageurs to acquire ETH redemption rights or validator rights at a discount. DeFi protocols will gain an edge on competitors by incorporating multichain derivative ETH and blockspace ownership tokens.

Stakehouse Protocol and Registry Model Construct

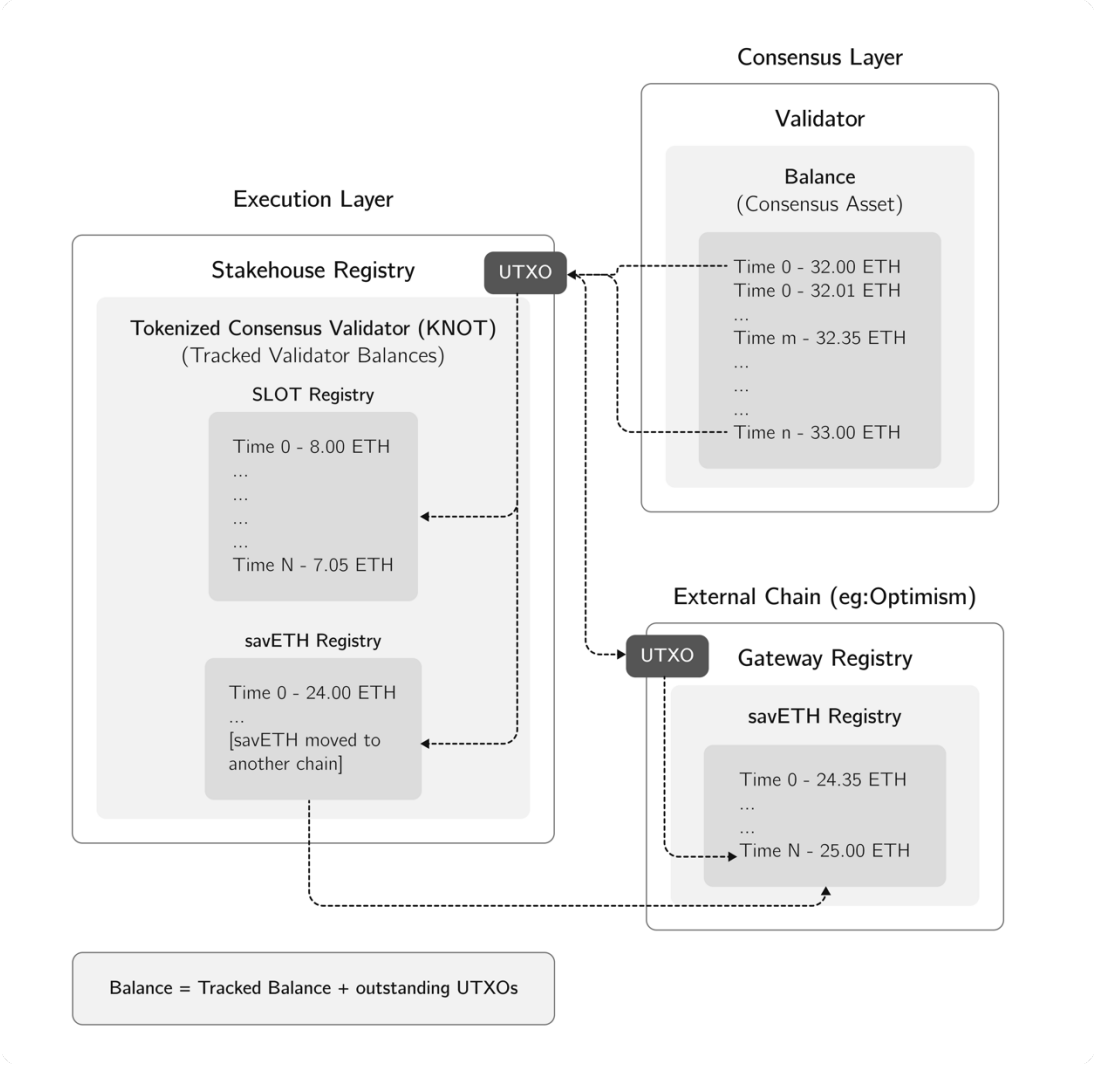
The registry model ensures asset ownership traceability for every deposit as a mintable token that can be verified instantly from an Ethereum node in isolation. A user's mintable asset within a registry represents an optimistic UTXO that is spendable. Any financial protocols can perform arbitrary operations locally without incurring gas-intensive smart contract operations.

Decentralized Finance (DeFi) has transitioned through a few operating models. It started with simple peer-to-peer transactions and evolved into peer-to-contract. Peer-to-contract results in assets being pooled by default, and requiring constant maintenance to avoid issues such as impermanent loss. In a UTXO accounting model, tracking of assets moving between users is recorded as inputs and outputs. The last registered output is used as input for future transactions. With UTXO, a tamper-proof attestation is maintained to preserve the continuity of the input/output sequence on a commonly agreed singleton. A classic example of a UTXO

implementation can be seen with Bitcoin. Ethereum differs by recording the entire network state using the Account Model for better programmability of asset transfers. The Account Model brings easier storage and better forensics for asset movement in its entirety. This is all thanks to Ethereum's blockchain node data structure.

Every honest Ethereum node maintains a record of the subset of all state changes at all times. In technical terms, the blockchain state is synced in every full node. When a new block is added to the chain, it triggers a state transition where the affected blockchain state is updated accordingly. Regardless of which node you are querying, they all give the same blockchain state data that has reached consensus. Registry contracts leverage the Ethereum Account Model that is derived from the network state and creates a collection of nano ledgers on top. These nano ledgers track asset movement and their inputs and outputs. This exposes the multithreaded computation capability for nano ledger metadata off-chain. Stakehouse is a mechanism-based design that enables staked ETH liquidity abstraction on multiple blockchains through this new state propagation model. There are no additional consensus requirements for the registry to work as it is implemented in line with the existing EVM and standard EIP compliant structure.

Given the nature of the registry as an asset tracking mechanism from its nano ledger, a user with assets in a registry can always exercise spending rights for their assets. The key here: *if there is an unspent optimistic UTXO in the registry, then there is a token a user can mint*. Registries can be connected together in a multichain world, enabling the creation of a UTXO for spending. This spending can be done on any destination blockchain, introducing highly portable assets. Users never lose custody of their assets while interacting with registries because their assets are segregated. Unlike a blockchain, the registry has no synchrony assumption; it allows a user to reconcile the asset state and current balances from its respective blockchain node at any time - this can be referred to as rates and rights.



Key Concepts and Tokens in Stakehouse

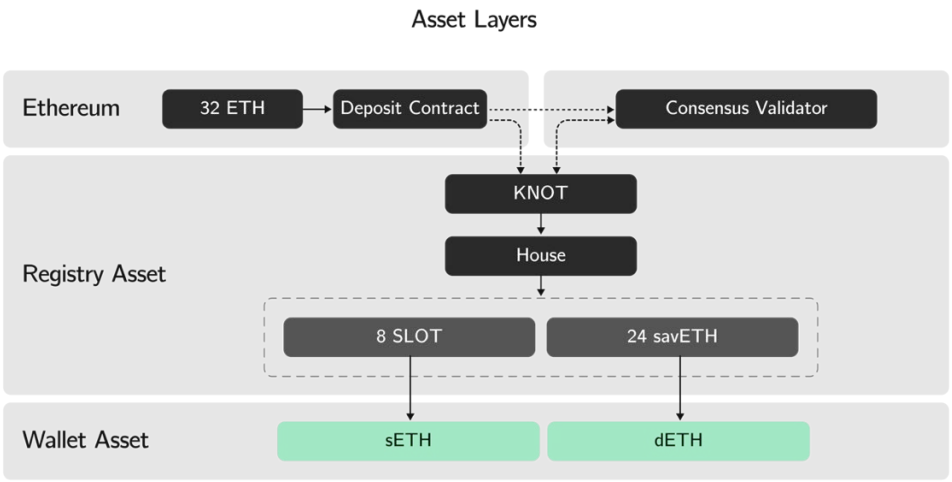
Stakehouse protocol enables indirect cross-chain communication for its registered assets residing in a different blockchain. At present, this is the only protocol aside from “Cross-chain atomic swap”, that has a fully trustless disintermediated cross-chain mechanism. However, the Stakehouse protocol is unique in many aspects and very different from cross-chain atomic swaps. These swaps primarily facilitate trade between tokens on two blockchains using HTLC (Hashed Timelock Contract) as a two-way virtual safe. Stakehouse enables an asset’s value residing on one blockchain to be reusable on multiple blockchains. Once an asset has been registered in the Stakehouse registry contracts, it exposes a UTXO for the asset. Then the state of the asset is only ever updated to a newer state, and never to an older state. The state of Stakehouse moves forward in time, never backward. When the UTXO terminates and the registry closes, the asset position is removed permanently. This enables fully programmable multichain asset management with atomic portability and redeemability guarantees.

Stakehouse protocol is built to maintain parity between the abstracted liquid position of staked ETH with its underlying validator balances through publicly verifiable on-chain information. As a protocol, it is immutable and fully permissionless. Stakehouse acts as an AMM for staked liquidity and Ethereum consensus validation market syndication at the smart contract level. Execution layer protocols can reuse the rewards, and efficiently coordinate fair and open transaction processing possibilities.

Key Tokens

- **dETH** - Staked ETH that has a claim to rewards earned by its validator from Ethereum Consensus validation.
- **SLOT** - Represents the validator rights for node operations and has a claim to all revenue earned from transaction processing.

Stakehouse enables a user to mint a derivative (dETH) from staked ETH which natively has multichain portability (commonly referred to as "multichain ETH"). Any blockchain where dETH is available has direct access to Ethereum staking and its yield perpetually. DeFi protocols could trade it freely or maintain a shared inventory of dETH in multiple blockchains. dETH has a base accounting guarantee which lies in the Stakehouse registry. Detailed token dynamics are explained below:



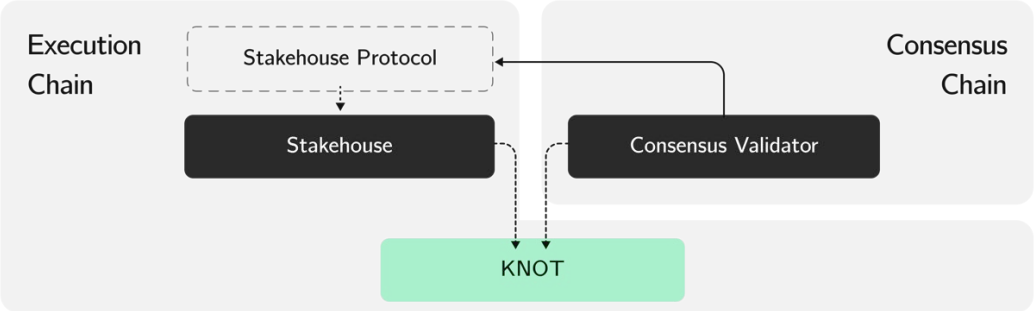
KNOT & Stakehouse

A collection of KNOTs in the protocol is referred to as a Stakehouse (aka house). Where a KNOT is a reference to the abstracted liquidity position of an ETH validator. Anyone can create a house and assign a ticker name (with a maximum of 5 characters) as a representation of aggregated KNOTs. A house is created at the universal level in the protocol which accompanies a unique permanent identifier as coordinates *Example (x,y)*.

A KNOT in the protocol strictly adheres to a set of rules:

- It must be part of a single house.

- To be created, the associated validator must have a minimum induction balance of 32 ETH.
- A KNOT always has a KNOT ID which is its underlying ETH validator BLS Key.
- Its induction shares are split further into two categories (24 + 8), 24 dETH, and 8 SLOT.
- It must have 32 shares at the time of removal from the registry.



The protocol rules enforce that a validator must have a publicly verifiable on-chain receipt from both the Execution layer and Consensus layer to create a KNOT. It will verify two things:

1) The credential of the KNOT with its depositor's data from the Ethereum Deposit Contract on the Execution layer.
2) The validator details and its lifecycle details including the validation rights and activation status from the Consensus layer.

This trustless checkpoint mechanism originating from the base blockchain, establishes the atomic dependency of the KNOT with its underlying validator. This gives the asset further operations in the registry.

A KNOT will progress through 5 lifecycle statuses during onboarding into the protocol:

0) UNBEGUN
1) INITIALS_REGISTERED
2) DEPOSIT_COMPLETED
3) TOKENS_MINTED
4) EXITED

There is an escape hatch option to go from status 2 to 4 in one operation, if a user wishes to rage quit from Stakehouse without partaking in liquidity abstraction. After reaching the TOKENS_MINTED status, the KNOT is considered active in the protocol, and can receive balance reports. It will remain at this stage until the owner(s) decide to rage quit, changing the status to EXITED.

Invariant: A KNOT is a member of a house if and only if its lifecycle status is TOKENS_MINTED or EXITED.

dETH & savETH Registry

dETH:

dETH is multichain ETH. It is a user-owned trustless derivative with atomic dependency to its underlying staked ETH, and is portable and composable with any rollup or L2 without the need for a bridge or intermediary.

dETH plays a vital role in the Stakehouse protocol; It is a key component of the liquidity transmission mechanism for staked ETH's value, and validator consensus rewards. The store of value for dETH to ETH is a nominal rate of 1:1. Therefore, dETH can provide liquidity for the entire Ethereum ecosystem without the need for a deep liquidity pool. dETH is the standard unit of account for curating ETH staking rewards and is brought to supply from a KNOT via the minting of savETH. The supply of dETH never decreases, and it maintains exclusivity to all staking rewards of the KNOT. 24 dETH gets 32 ETH worth of staking rewards - 33% higher than the average ETH within a validator. Starting from the epoch dETH is minted, it can be redeemed for the underlying ETH. This makes it a trustless alternative to ETH or wETH throughout DeFi.

Invariant: dETH minted for a KNOT = 24 + amount of rewards earned by the KNOT.
Invariant: dETH supply never decreases.

savETH Registry and Indexes

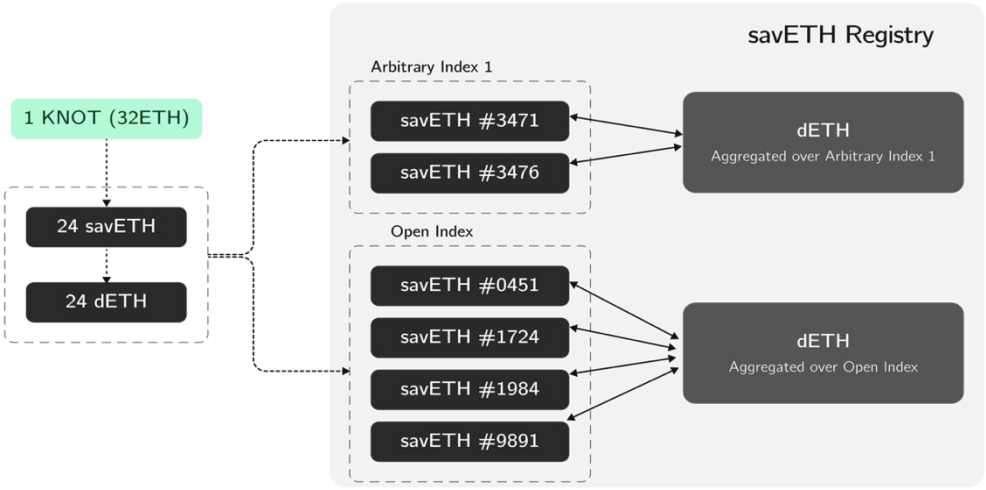
savETH is a share minted when an abstracted liquid position (KNOT) is registered with Stakehouse. To do this a user confirms the balance and eligibility of a validator staked in the Consensus layer. This is a key element in keeping the dual factor registry accounting in order. savETH ensures granular level traceability and accountability; At all times, dETH in circulation on the Execution layer is tracked and accountable with the Consensus layer validator balances. savETH is minted in 24 shares per KNOT, and can be aggregated at multiple levels. savETH is a key component of the layered liquidity structure of the Stakehouse protocol. It enables full fungibility for dETH at the universal level in the protocol, regardless of where it originates. This is a vital part of preventing fragmentation of liquidity whilst ensuring non-dilutionary liquidity support for long-tail users and solo stakers.

savETH's primary purpose is tracking the dETH supply. That includes the initial supply of 24 dETH per KNOT, and all yield generated during the lifecycle of the KNOT(ref: Account manager[1]) until it is removed. It maintains an exchange rate starting at one and monotonically increases as the validator earns Consensus rewards from Ethereum validation.

[1] RV Audit report 1 : Account manager section

Invariant: The savETH to dETH exchange rate never decreases.

savETH is managed by a standalone registry contract named savETHRegistry. The contract exposes all data about savETH issued by the Stakehouse protocol. This makes monitoring the entire inventory of dETH and its associated yield readily available off-chain. This can be done in a deterministic manner via a simple node API call. It can also be curated for better programmability via an indexing service like The Graph, allowing protocols to compute the yield for its users without any gas cost. savETH positions in a user-curated index are maintained when the index owner is utilizing the abstracted liquidity dETH for DeFi opportunities.



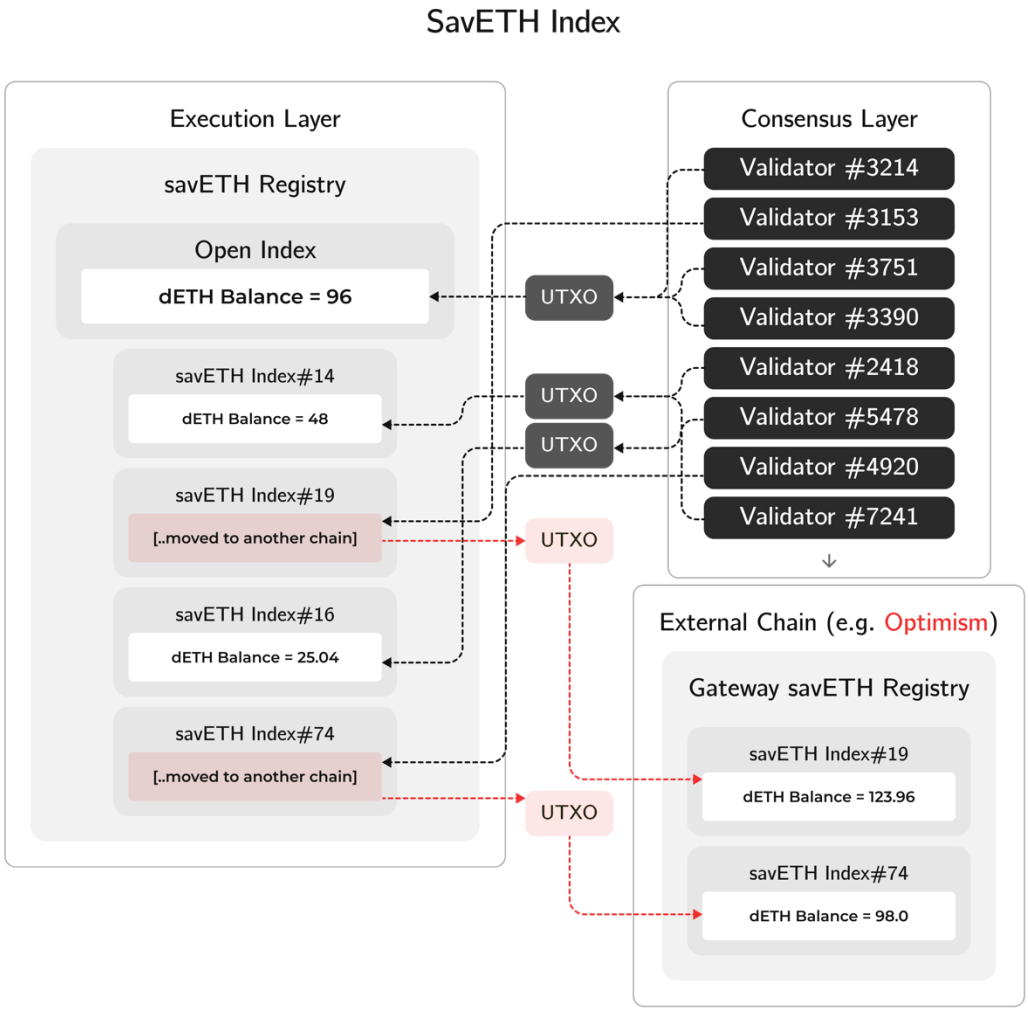
- From a KNOT's inception, savETH always exists as part of an index in the savETH Registry.
- savETH is always identified with an index ID as an isolated yield tranche of a validator's position.
- savETH is composable and easily curated from an index by a market player by paying the exchange rate.
- savETHs can be bundled as a portfolio for its original user providing easier asset management capabilities.

This is a groundbreaking format of yield composability. It is easy to use and has open characteristics of self-enforcing rules.

Invariant: savETH supply ≤ dETH in the open index.
Invariant: savETH supply = 0 ⟺ dETH in the open index = 0.

Since dETH has multichain composability, there is a rigid asset management policy in place regarding state integrity and how savETH is maintained. There is a default index per blockchain. For example, Etheruem has an open index. When Stakehouse protocol enables

extended liquidity for any rollup, there will be subindexes for that blockchain. The cardinal rule for savETH requires it to be part of an index. It can only exist on one chain at a time and is always reconcilable with the Consensus layer validator balance and its liquid position balance.



The savETHRegistry is core to Stakehouse balance sheet liquidity reconciliation of dETH in circulation. savETH can be referred to as "near stake" in the Stakehouse protocol; its nearness of liquidity is about an epoch, (approx 6.4min) accruing yield from validation in an ideal scenario. savETHRegistry is key to meet the obligation of a KNOT and its dETH share with its underlying validator balance at stake. It follows an equal-weighted isolation rule of 24 shares each for aggregation within an index in the protocol. savETHRegistry issues each 24 share batch along with a KNOT, and removes it upon its termination; Termination includes burning the related supply of dETH from circulation. The savETHRegistry exposes an exchange rate liquidity ratio with dETH at a KNOT level. The market can curate and index savETH for market-weighted portfolios. For example, offering fixed rate yield products from ETH staking rewards.

savETH Indexes are a curated position of savETH shares, and they follow a set of attributes for easy aggregation.

- An index has a single ECDSA owner that can approve ownership transfer via the approved spender mechanism.
- An index spender can transfer one of the user's indexes to a different user like a Liquidity Agent.
- Each index can have any amount of savETH from any KNOT.
- An index always aggregates dETH associated with the total savETH. Any decrease in its inventory will make it open for the market to replace it with another savETH
- As a portfolio of curated KNOT savETH, index assets are fully fungible and tradable
- Indexes' assets are always moved through a common path via the Open Index. This is the default index for the protocol, and is akin to the open market.
- No savETH ever remains without an associated index, and therefore does not exist outside of the savETH registry.

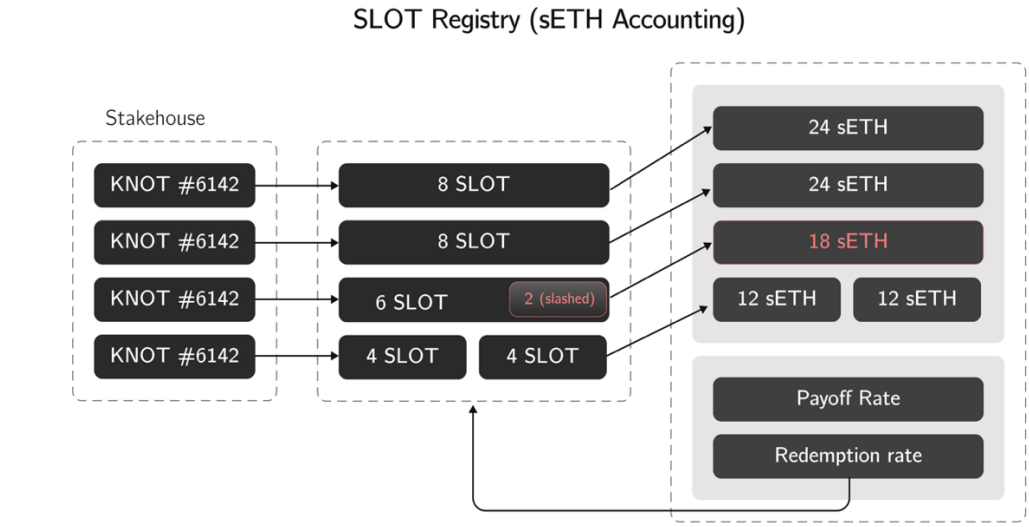
SLOT & SLOT Registry

SLOT tokens represent the controlling interest in a validator (KNOT) for its node operations. They are minted at the time of the KNOT creation along with savETH. It takes a role in the active management of the validator, and its off-chain node activities. All revenue outside of the consensus rewards are exclusive to SLOT token holders.

- SLOT tokens are issued as a batch of 8 SLOT per KNOT.
- A KNOT needs to maintain the 8 SLOT balance to be considered healthy.
- SLOT is the risk-bearing share of the KNOT and is slashable by the open market. Slashing results in a balance reduction of SLOT.
- Anyone can report validator leakage or slashing to Stakehouse, where it gets immediately reflected as SLOT token reduction.
- SLOT tokens are grouped at a house level, and their unit of account is maintained by sETH tokens.
- sETH tokens are fungible only at a house level and issued with an induction exchange rate of 3:1 - ETH: SLOT.
- SLOT tokens are maintained by SLOTSettlementRegistry smart contract.

SLOT tokens offer tokenized fractional ownership of validator revenue. It gives users the ability to partake in the Ethereum transaction ordering marketplace. This is a key element to bringing a more democratized and fair ordering through an open market mechanism for protocols and users. At the moment, MEV is a looming existential problem at various levels. It closely resembles shadow censorship of protocol activities on the Execution layer. SLOT tokens will provide full visibility of validator behavior with on-chain tamper-proof data. It also provides superfluid syndication of the transaction ordering market for blockspace

validators with programmability. This enables democratized validation lobby markets for protocols and users.



SLOT is a mechanism that makes Stakehouse highly capital efficient, and it works under par to a superior basis at the house level. This ensures the common interest of a house is always maintained. It carries reflexivity properties from its built-in feedback loop that amplifies house inefficiency. This inefficiency incentivizes the market, and opens up arbitrage opportunities for cashflow positions. House KNOTs for transaction ordering, and blockspace production are the key driver for these opportunities.

The 8 SLOT minted when a KNOT joins a Stakehouse are split into two groups.

- **Collateralized SLOT (4)** is retained within the protocol as collateral in the user's vault. These protect the protocol against slashing events that can originate from any Consensus layer node.
- **Free Floating SLOT (4)** is given to the user in the form of house sETH and is tradable. They are issued with an induction exchange rate of 3:1 (12 sETH for 4 SLOT).

Invariant: Every KNOT has at most 4 collateralized SLOT at any given time.

sETH is an ERC20 token associated with a specific house, and maintains an atomic dependency with SLOT. In practice, all SLOT in circulation is represented by sETH. sETH is always issued at an induction exchange rate of 3:1. To remove a KNOT from the house and exit the liquidity position, all sETH must be burned at the redemption rate.

When a validator is penalized in the Consensus layer, the lost ETH can be reported via the Balance Reporter causing the SlotSettlementRegistry to slash the same amount of collateralized SLOT. A user (either the KNOT's original owner or someone else) can then restore part or all of the slashed SLOT by depositing ETH. The ETH is used to top up the

KNOT's balance in the Consensus layer, and the SlotSettlementRegistry assigns the same amount in collateralized SLOT. The SLOT is kept within the KNOT's vault for the user who topped up.

The option of topping up slashed SLOT allows users other than the original owner to acquire a share of ownership of the KNOT. SLOT owners are slashed in the order that they acquired SLOT for that specific KNOT. This means that SLOT owned by the original owner will be slashed first, if this collateral runs out, then the other collateral owners will be slashed in order.

SLOT also exports a **variable exchange rate**: $\frac{\text{dETH minted in the house}}{\text{SLOT minted in the house}}$

If any validator within a house is not earning any Consensus rewards, the exchange rate equals the induction exchange rate of 3:1 (24 dETH per KNOT / 8 SLOT per KNOT). As rewards are accrued for KNOTs in the house, this exchange rate will increase above 3. The exchange rate ignores slashing; Therefore the denominator will always equal 8 × the number of KNOTs.

This exchange rate can be used to calculate a user's active balance in sETH. For example, a house with an average of 28 dETH minted per KNOT, will have an exchange rate of $\frac{28}{3} = 3.5$. A user that is issued 12 sETH tokens (4 SLOT) from such a house will have an active balance of 3.5 × 4 = 13 sETH.

Since sETH is issued and redeemed at the effective rate of 3:1, the variable exchange rate is mainly designed for external use. It acts as a tracking indicator of the performance of the house, and can be easily queried or monitored by the market off-chain.

SLOT keeps a meta-effective balance tracker of ETH at stake, and its lifecycle earnings. Stakehouse calculates the adjusted active balance of a validator by subtracting the sum of all top ups from its active balance. Here, "top up" refers to any deposit made via the Ethereum Deposit Contract to the validator, excluding the initial deposit of 32 ETH, and any deposit made as part of topping up slashed SLOT.

A KNOT can be kicked if the SLOT balance is reduced by 4, or a Consensus layer slashing event is reported (not leakage). The Account Manager smart contract keeps track of the last seen active balance in the Stakehouse, which is used to calculate how much a KNOT should be slashed. SLOT also plays a vital role for a user that is removing their stake from Stakehouse voluntarily. The smart contract enforces a redemption rate mechanism to ensure the house will be cleared fully when the last KNOT needs to be settled.

sETH Redemption Rate: dETH minted in the house / current SLOT balance in the house

Circulating SLOT House Balance: (8 × number of KNOTs in the house) - total slashed at the house level

Intuitively, if all KNOTs in the house are healthy, the redemption rate will equal the exchange rate. Therefore, the 4 collateralized SLOT for the KNOT are enough to meet the redemption threshold and exit. If there is a slashing reported in the house on a KNOT, the collateralized SLOT owners will need to top up the same amount of slashed SLOT from a slashed KNOT before they can remove their own KNOT. This gives collateral owners an incentive to contribute to restoring the health of the house.

Continuity and Trustless Recovery Through Common Interest Protocol

The Common Interest Protocol (CIP) allows anyone who holds more than 2 collateralized SLOT of a KNOT to request the KNOT's Consensus Layer signing key, and assumes the control of validator node management. The intention is that if the original owner of a KNOT does not do a good job and the KNOT loses more than 2 collateralized SLOT, then someone else can top up the slashed SLOT, request the KNOT's signing key, and then run the validator or rage-quit the KNOT. Common Interest Protocol is a standalone system that has interdependence to the Stakehouse protocol but remains independent for its operation. A reasonable way to reference CIP, is to think of it as an ondemand trustless validator signing key recovery mechanism for Stakehouse KNOT collateralized SLOT holders.

There is a clear separation of concern between validation continuity and trustless recovery in the Stakehouse protocol. Validation continuity has a broader scope and is handled by the in-protocol mechanism through collateralized SLOT vault dynamics. As explained above, the redemption rate of a house is a critical factor in ensuring the continuous monitoring of its health and efficiency. It exposes an inversely proportional payoff rate assigned to every SLOT (sETH) associated with the house for market reflexivity. Trustless recovery has a narrower scope; Focusing on a KNOT that requires immediate access to the validator signing key for its node administration such as patching up vulnerabilities, node reassignment, or performing a voluntary exit from the Consensus layer.

The validation continuity mechanism is inspired by the *discouragement attack paper*[2] by Vitalik Buterin. It leverages the Stakehouse registry's continuous public monitoring feature and arbitrage opportunities. These opportunities are brought to life by SLOT slashing and the in protocol top-up mechanism providing large incentives for a market actor to engage. SLOT tokens' high earning potential from Ethereum network transaction ordering will outweigh any long-range attack. SLOT slashing and top-ups are permissionless, where every KNOT's on-chain validator balances are publicly available for anyone using from Ethereum nodes.

Trustless recovery has a few sets of rules managed by on-chain CIP smart contracts and an off-chain Zero Knowledge-Safebox managed by ECC threshold signing protocol. This has a hybrid encryption scheme; The signers are represented by Stakehouse SLOT owners

themselves in its permissionless version for decryption request signing via CIP contracts. Its contracts will process the request for decryption based on the requester's active SLOT token balance. CIP has no access to an asset owned by the Stakehouse, nor does it have any other privileges to interfere with the Stakehouse. Its only involvement is with a community signer for their house or Stakehouse efficiency at large assessed by their earning reputation. CIP needs to attain a critical mass to have sufficient decentralized signers in the system to have sybil resistance to any unforeseeable manipulation. Hence the recovery is enabled with a semi trusted Distributed Key Generation (DKG) committee at the genesis. This exists until the Stakehouse attains a release candidate (RC) that could provide at least 100 guardians with a minimum of one SLOT. Each must be from a combination of a unique KNOT and ECDSA to sufficiently exit to the community. As CIP only accepts collateralized SLOT owners for both decryption and signers, there is a progressive permissionless path for enabling; This is considering the fact that any validator leakage of more than 2 ETH will take a year under current stake growth. A recent security model assessment is available on our *recent audit*[2], and the detailed specification of CIP can be found in the Common Interest Protocol paper.

CIP serves as SLOT owner's first refuge for an immediate opportunity to mitigate validation inefficiency of node maintenance while simultaneously encouraging other SLOT owners to actively contribute to this signing network. They are encouraged to serve their own self interest in limiting their SLOT(sETH) payoff rate decay caused by the second-order effect of the slashing of a house's KNOT. From a generalized perspective, it enables a community mount response for Stakehouse validators to more easily coordinate to fight back against attacks, by saying "I'm willing to join only if enough others join at the same time to defeat this attacker with me."[3].

Voluntary Exit and Redeemability (Rage Quit)

Permissionless protocols must have a built-in system that will ensure a **"right to exit"** for its users - something commonly referred to as a Rage Quit. The Stakehouse protocol facilitates anytime exit through its Rage Quit adapter. A KNOT's lifecycle status will become EXITED in the Stakehouse registry and its liquidity position permanently removed. Users who wish to leave Stakehouse can exercise their right to exit anytime, 24/7 starting on day 0. The underlying validator can still continue its staking operation unhindered on the Consensus layer as long as it holds its validation rights. The Rage Quit option is vital in a black swan event where every KNOT could enforce a coordinated response for a global settlement of Stakehouse protocol liquidity removal in aggregate. This could be done by independently removing KNOTs without any intermediary. Any Rage Quit execution results in the termination of the optimistic UTXO attached to the KNOT. Meaning that Stakehouse protocol derivatives can never be minted again. A KNOT that has Rage Quit and is no longer validating, will be able to apply to withdraw the ETH attached to a validator on the Consensus layer. Thus, Rage Quit is a fundamental requirement to exercise redemption rights over the staked asset.

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[2] RV audit : Common Interest Protocol – Security Model

[3] Discouragement paper

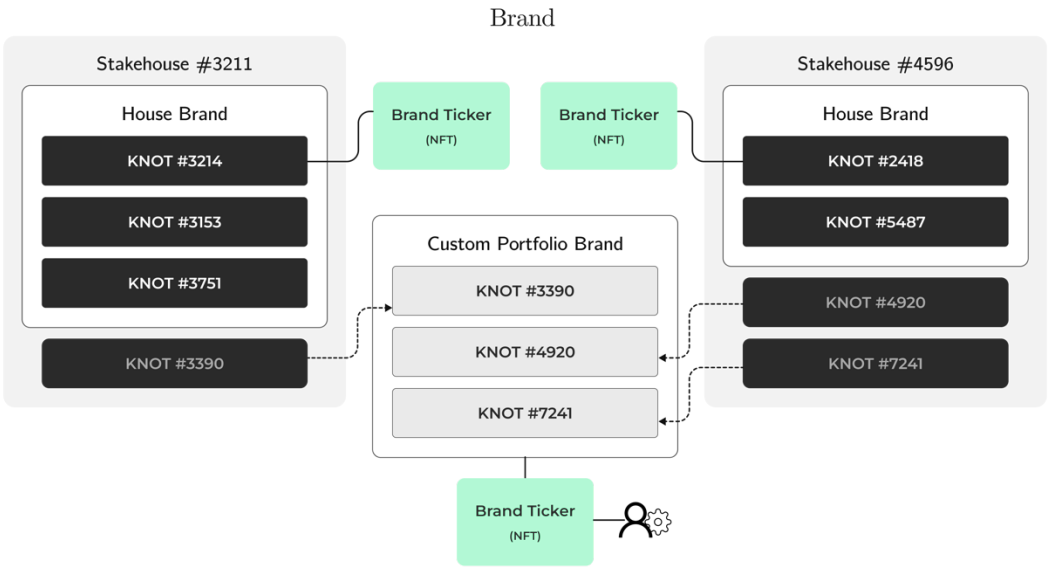
In order to kick off a Rage Quit, a protocol user must report the latest balance of a KNOT and burn all its tokens including the sETH, dETH, SLOT, and savETH. Should a KNOT have less than the full 8 SLOT tokens due to protocol slashing, the protocol will enforce an ETH top-up and queue flush for the KNOT. This will restore the full SLOT balance, which will satisfy the redemption conditions prior to the exit. The minimum top-up is set by the Ethereum Deposit Contract at 1 ETH; All ETH that is added to the KNOT's validator will be collected by the Rage Quit function.

If a user holds all of the derivative tokens associated with a KNOT, then that user can Rage Quit by themselves using the rageQuitKnot function. If the KNOT's assets are split between different users, rage quitting is enabled through multiPartyRageQuit. This requires additional coordination to aggregate the signature of all stakeholders of the KNOT. Once all signatures are verified and the tokens are burned, an address designated by the stakeholders is assigned for withdrawing the entire balance of the KNOT validator. This can happen when withdrawals are enabled post-merge. In all cases, after a Rage Quit has been performed, the same validator is prohibited from reentering the Stakehouse registry under the same credentials. All of its history remains on the Consensus layer and execution layer forever.

Interoperable Governance: Brands and Communities

Ethereum is a mesh of communities coalescing around common values such as node runners coming together for client diversity, DeFi offering yield, purpose-driven DAOs, etc. A brand in the Stakehouse protocol is commonly referred to as a staking collective, and is able to have its own community rule for social coordination within the house. This brings harmony and purpose to its advancement and continuous growth. The brand enables a *value-based gated community token tooling for Stakehouse users to grow together with representation*.

KNOTs have dual representation in the protocol, firstly being associated with a house and then with a brand. When a house is created, it creates its own brand identified by a three to five letter ticker- eg: STAKE. For users adding a KNOT to a house, they have the option to either create their own brand for themselves and organize around that brand ticker, or join any of the existing brands. Brands are not house exclusive. So KNOTs from many houses can coexist under a brand as a shared collective portfolio.



When a new brand is created, the creator receives an NFT with its ticker and the ID of the founding KNOT. This NFT represents ownership of the brand, and also allows the owner to customize the brand description and image URI.

The automated collective collaboration model of Stakehouse brands can act as a sybil resistance DeSoc governance mechanism for a single or nested community with shared ideals. It's more of a Schelling point of stakers activities that echo and amplify their voices at various levels for societal significance. A user can switch their associated brand at any time, however, their history of brand participation is preserved in the registry and serves as a tamper-proof composable credential for on-chain reputation. Intuitively, provenance and gatekeeping enable on-chain Know-Your-Community features. This allows a house to bring hygiene on who they accept to the house/brand. Institutions can therefore ensure the highest levels of compliance across the board.

Generally, brands will encode relationships by exposing connected KNOTs with strongly held social commitments, credentials, and affiliations of stakers on-chain. The social encoding allows collaborative communities to come together bottom up, as emergent properties of each other to cocreate plural network goods and intelligences. This can be done at a range of scales.

Brands and associated KNOT tokens are managed by the plug-and-play Community Central registry contract. The registry can additionally pave the way for extended rights and governance mechanisms that reward trust and cooperation, while protecting networks from capture, extraction, and domination through programmable incentives for an extended multichain DAO ecosystem.

Rollup Centric Ethereum Future and ETH

Gateways and Multichain Trustless Liquidity Management

The rollup centric future of Ethereum is the most advantageous short to mid-term solution for scaling a blockchain's use cases in a permissionless way. Users who want to use rollups need to deposit their asset to rollup's contracts in Ethereum and withdraw back their assets once their transactional needs are fulfilled. In a generalized way, rollups are off-chain execution environments with shared security from the Ethereum base layer. However, the rollup economy comes with a base cost for this derived security guarantee. This is referred to as data publication, rollups require continually paying this cost to Ethereum to commit their compressed data proof into Ethereum for onchain data availability. If we look at the rollup economy, it has three categories of stakeholders: *users, operators (who validate rollup transactions locally), and the base layer (Ethereum)*.

From a cost perspective:

User cost = (Ethereum data publication fee + Rollup operator fee + Rollup transaction fee)

Operator cost = (Rollup operator cost + Ethereum data publication cost)

This can be used to formulate a rollup operating budget for its applications' sustainable growth and sustainability. If a rollup operator has a negative budget balance, their operations are running at a loss and it's unprofitable for them to serve the rollup. This will result in them stopping services. Every rollup shall have an active short to long-term strategy for keeping the operating budget balance for their sustainable growth. This is likely executed with their native issued network token emissions for incentivizing long operator leases.

Ethereum blockspace is a scarce resource with continuous high demand. Post-merge Ethereum produces blocks at a 12 second constant interval. This will make transaction cost dynamics and validator payments more metered and predictable from a resource allocation perspective. On top of blockspace scarcity with constant production intervals, EIP1559 market fees will bring more advanced transaction queue pricing to the market. Rollups need to maintain a sufficient amount of ETH at stake to maintain enough blockspace access for their data publication. Otherwise, it will affect their budget balance adversely if they rely on the open market to procure blockspace. The fees will skyrocket for a small window.

Stakehouse is built as post-merge compliant, and Ethereum rollup centric future focused. Its SLOT tokens bring programmable transaction ordering and blockspace leases on a token level. It is essentially a meta lightweight proposer builder separation logic that enables long-term futures contracts for rollups executed on smart contracts. Validators can get paid automatically when the original staker validation rights are actively monitored and remarketed by market participants as blockspace inventory. As the registry contracts are off-chain friendly, the Ethereum ecosystem can have high-frequency auctions locally for SLOT tokens, and settle

payments on-chain. This brings another factor into play, rollups need native ETH liquidity for their ecosystem growth that can be served via dETH and its Gateway contracts.

Gateways are savETH index liquidity bookkeepers; These assets can be ported externally from Ethereum. A user or protocol can curate savETH to a gateway index, and export dETH to a destination blockchain/rollup without any bridges. This will allow rollups to have a strategic method to maintain their liquidity and security budget. Optimally, having a balanced portfolio of dETH and SLOT, that can secure growth capital for applications with fast track withdrawals and long lease blockspaces for data publication cost. We have seen a myriad of auto rebalancing and strategy based protocols in DeFi for yield optimization in the last two years. With Stakehouse protocol, it will be easy for a DAO or protocol to have a multichain fixed income strategy. It allows a rollup to have a more resilient network by incentivizing monetary policies. Ethereum is a builder's heaven and innovation breeding ground. Stakehouse is built for builders as a fully permissionless and immutable protocol from day one.

Disclaimer

This document is not final; hence the title "position paper," is for general information purposes only. It does not constitute investment advice or a recommendation or solicitation to buy or sell any investment and should not be used in the evaluation of the merits of making any investment decision. The opinions and analysis reflected herein are subject to change or update without being updated. This paper reflects the current opinions of the authors and is not made on behalf of Blockswap Labs, or its affiliates, and does not necessarily reflect the opinions of Blockswap Labs, Blockswap Foundation, or their affiliates, or individuals associated with them. You may refer to Stakehouse documentation for the latest published information.

Appendix:

[1.] Discouragement attack, by Vitalik Buterin: https://github.com/ethereum/research/blob/master/papers/discouragement/discouragement.pdf

[2.] Stakehouse smart contracts audit, by Runtime Verification: https://github.com/stakehouse-dev/Audits/blob/main/Runtime_Verification_Stakehouse_Smart_Contracts_Audit_Report.pdf

[3.] General Stakehouse documentation: https://docs.joinstakehouse.com/