SYNTHR: Interoperable omnichain liquidity

Ashwin Krishna Radhakrishnan Ritwik Rudra Vithuran Karvannathasan

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I. Introduction

While we're witnessing a rapid increase in the adoption of blockchain technology and decentralized financial applications, we are also seeing an upsurge in the number of blockchain networks. Multiple blockchains will continue to emerge due to the need to address diverse use cases, scalability challenges, governance preferences, interoperability requirements, and regional considerations. However, for this multi-chain landscape to prosper and have large-scale retail adoption, we must provide users with an environment that enables them to move assets between different blockchain networks with the highest degree of security and capital efficiency.

A. Million blockchains

Although a theoretical concept, the potential for a million blockchains is a testament to blockchain technology's vast possibilities and scalability. With advancements in blockchain development and the growing demand for decentralized solutions, the concept of a million blockchains represents a future where numerous networks coexist, each serving unique purposes and communities. This expansive ecosystem would provide unparalleled flexibility, allowing organizations, industries, and individuals to create and customize their blockchain networks tailored to their needs. This decentralized landscape would foster innovation, enable interoperability between blockchains, and empower individuals with greater control over their digital assets and data. While the idea of a million blockchains may seem ambitious, it showcases the boundless potential of blockchain technology to revolutionize industries, reshape economies, and decentralize systems on an unprecedented scale.

B. Multi-chain conundrum

The multi-chain landscape offers a lot of opportunities for users to maximize yield. Still, it can be a tricky environment to navigate, especially when migrating assets from one chain to another. Unlike bridges, atomic swaps have emerged as the most efficient way to move assets between chains through increased security by eliminating the need for third-party custody of funds during the exchange process. However, no atomic swap exchange addresses the issue of value transfer in a comprehensive way.

Current atomic swap solutions can be fundamentally analyzed using the following framework:

1. **Asset solvency:** High-quality liquid assets or illiquid native tokens? Liquid collateral ensures high solvency for the synthetic/wrapped assets used for atomic swaps.
2. **Consensus layer:** A native consensus layer or an aggregation of multiple independent consensus layers? Multiple independent consensus layers offer higher security and deter collusion between core contracts and validators.
3. **Liquidity model:** Omnichain liquidity, conventional aggregation of fragmented pools, or a hub-and-spoke liquidity model? A synchronized pool of omnichain synthetic assets enables slippage-free cross-chain transactions, making multi-chain liquidity provisioning LP-friendly.
4. **Governance:** Trustless minting of synthetic or wrapped assets backed by a centralized collateral vault? Decentralized governance ensures system transparency.
5. **Support ecosystem:** Utility and quality of the ecosystem, if any, supporting the atomic swap implementation, such as external DEX operations, liquidations, etc.
6. **DEX pairs:** Stable pairs, pegged-asset pairs, or regular asset pairs? Pegged-asset pairs have low intrinsic impermanent loss and slippage, making them capital-efficient and LP-friendly.

C. SYNTHR: Cross-chain value transfers

SYNTHR will use highly solvent and omnichain synthetic assets to power capital-efficient, secure cross-chain transfer of value and provide users, developers, and ecosystems with access to slippage-free interoperability and omnichain liquidity.

How will SYNTHR benefit users?

1. It will enable DEX aggregators to perform low-slippage native-asset cross-chain swaps without bridges.
2. Developers can plug into SYNTHR's interoperable omnichain liquidity layer to create seamless omnichain applications.
3. SYNTHR will enable users to stake ETH, USDC, or USDT as collateral, mint highly solvent and omnichain synthetic assets, add them to liquidity pools on partner DEXs, and earn boosted APRs through protocol revenue and farming rewards.

How will SYNTHR be different from other synthetic asset protocols?

1. syASSETS will be backed by ETH, USDC, or USDT as collateral, ensuring high solvency.
2. SYNTHR will enable users to mint at a c-ratio of 150%, ensuring high capital efficiency.
3. SYNTHR's gas-optimized omnichain architecture will enable the protocol to carry out on-chain tracking of multi-chain collateral and debt values, cross-chain liquidations, unify multi-chain collateral, and mint a fully backed omnichain syASSET on any chain against the total value of unified multi-chain collateral in a trustless manner.
4. SYNTHR will use multiple independent consensus layers to validate all cross-chain communication and deter collusion between core contracts and relayers, ensuring the highest degree of security for cross-chain transactions.
5. SYNTHR's non-cascading liquidation mechanism will ensure that all under-collateralized syASSETS are burnt and removed from the system.
6. SYNTHR will run external DEX operations to ensure that the DEX prices of syASSETS remain pegged to their oracle prices, enabling the protocol to guarantee last-mile capital efficiency in its interoperable omnichain liquidity layer.

D. SYNTHR: 24/7 access to global financial assets

One of SYNTHR's long-term objectives will be to advocate trustless access to global financial assets using highly solvent synthetic assets. Regulatory constraints currently prevent individuals from emerging economies from participating in developed market equities. These individuals are further burdened with lengthy KYC disclosures, a lack of asset custody and fractional ownership options, and high fees. SYNTHR will empower users from underserved regions to gain exposure to various international financial assets with full custody, slippage-free trading, a retail-friendly, non-custodial UX layer, and 24/7 support.

II. Protocol specifications

SYNTHR will enable users to create and manage omnichain synthetic assets using oracles and general message-passing protocols, provide in-situ yield-generating opportunities, and would allow developers to plug into the protocol's interoperable omnichain liquidity layer to create applications with omnichain use-cases.

A. Overall architecture

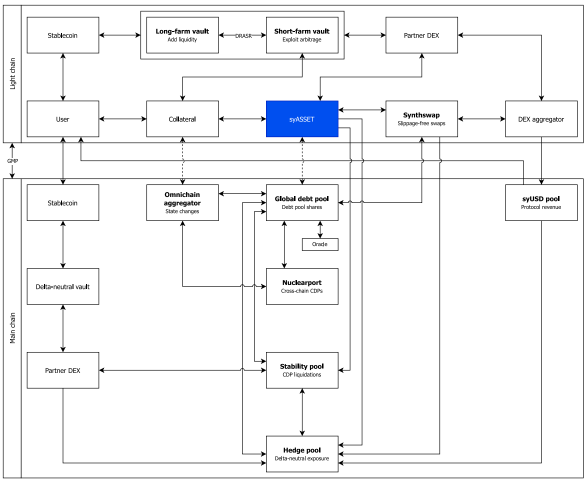

Figure 1: syASSET interacts with SYNTHR's omnichain ecosystem of modules.

The protocol will start with users depositing highly liquid assets such as ETH, USDC, or USDT as collateral. Users can mint synthetic tokens (syASSETS) against their collateral by posting collateral at an average c-ratio of 150%. Synthetic assets will be issued against overcollateralized loans to ensure the robustness and solvency of the SYNTHR ecosystem. Synthswap, SYNTHR's native slippage-free DEX, will enable the swapping of syASSETS. Due to its lack of dependency on user-deposited liquidity, synthswap will achieve higher capital efficiency than traditional AMMs. Synthswap will power the trading of syASSETS by minting and burning with the help of on-chain oracles and a global debt pool. Synthswap, in conjunction with nuclear port, will also facilitate omnichain CDP issuance and enable DEX aggregators to perform low-slippage cross-chain swaps, making SYNTHR composable with the overall DeFi ecosystem. SYNTHR will also offer the opportunity to generate yield externally by adding liquidity to syASSET pools on partner DEXs or internally by leveraging the protocol's long-farm vault, short-farm vault, and delta-neutral strategies powered by the hedge pool and stability pool. The long-farm vault will generate returns by adding liquidity to syASSET/ASSET pools on DEXs and through syASSET/ASSET LP farming rewards. The long-farm vault will strategically deploy capital when earnings can be maximized. The short-farm vault will generate returns by taking advantage of the price arbitrage between a higher DEX price and the lower oracle price of a syASSET. Funds deposited into the short-Farm vault will be used as collateral to mint syASSETS at oracle prices, which will subsequently be sold on partner DEXs at higher prices, generating arbitrage profits for the vault depositors. Since the entire process will be managed by protocol-governed arbitrage bots, short-farm vault participants will only be required to add funds. In contrast, the bots will oversee the allocation of funds towards the minting of different syASSETS and the eventual distribution of profits in proportion to deposits. The hedge pool will be used to implement delta-neutral strategies to hedge against debt appreciation. The debt pool may comprise assets that appreciate, negatively affecting the c-ratio for CDP holders. Therefore, to prevent liquidation risks, holders can deposit their syASSETS into this pool to maintain parity with the debt pool. Lastly, users can deposit syASSETS into the stability pool to earn yield as liquidated collateral. The stability pool will generate stable returns–while reducing tail risk–by collecting penalty fees from CDP liquidations. The stability pool will play a critical role in the liquidation process, acting as the primary participant in the process, bolstering protocol health and decreasing insolvency risk during turbulent market conditions.

B. syASSET CDPs

Collateralized debt positions, or CDPs, are placeholder tokens representing a form of collateral against which assets can be minted. In the case of MakerDAO, ETH is used as a CDP to mint DAI tokens. CDPs are useful for token holders who do not want to realize the sale of an asset but use its value for financing activities. A house, for example, can be put up as collateral with a bank to get a low-interest loan. CDPs are overcollateralized to protect lenders if the CDP's value falls below the value of the outstanding debt. Since the DeFi ecosystem does not have a credit score system, CDPs tend to have c-ratios of at least 150%. SYNTHR will allow users to deposit ETH, USDC, or USDT as collateral and mint syASSETS with c-ratios up to 150%. Users can mint syUSD, swap it for other synthetic assets on the platform, lend syUSD, or deposit syUSD into vaults to earn passive yield.

1. Yield-bearing collateral

SYNTHR users will also be able to stake highly liquid, yield-bearing assets from some of the largest ecosystem projects as collateral, mint syASSETS, and take advantage of several yield-generating opportunities within the protocol while continuing to earn a yield on the collateral. For example, users can deposit ETH/USDC Curve LP tokens as collateral to mint syUSD, then deposit the syUSD into the stability pool to earn yield while benefiting from the price appreciation of ETH and LP rewards on Curve.

2. Debt pooling model

The MakerDAO and Mirror Protocol approaches to synthetic assets involve the minting of synthetic assets against overcollateralized CDPs; however, the liquidity in both approaches is derived from users minting synthetic assets and depositing them into traditional AMM liquidity pools. The main problem with this model is the low capital efficiency of AMMs, which is why protocols like Mirror rely on inflationary tokenomics to incentivize liquidity providers. This inflationary tokenomics comes at the cost of jeopardizing the longevity of the protocol. Synthetix v2 was the first to introduce the debt pool model, which utilizes the CDP model more efficiently. When a user locks their CDP and mints syUSD, the user creates debt within the system, which the user is now a partial owner of. In this case, the debt is syUSD, which stays at par with the US dollar. Debt pooling eliminates the need for AMMs by allowing syUSD to be swapped with other synthetic assets within the debt pool without any slippage. This enables traders to make unlimited swaps within the debt pool with high capital efficiency. However, the debt pool model also has a few drawbacks. Since stakers of SNX become shareholders of the global debt pool, the volatility of debt can cause unpredictable changes to the c-ratios. This is because if trader A swaps syUSD for sETH, the debt pool now holds sETH, which is volatile; if sETH increases, then the debt pool's value relative to trader A's collateral SNX also increases, posing a liquidation risk. Furthermore, creating synthetic assets against assets that are not highly liquid poses a serious challenge. SYNTHR will take the Synthetix v2 model and build on it; users will not be limited to staking only one asset but will have the option of staking a wide range of highly liquid assets such as ETH, USDC, or USDT as collateral. These CDPs will then mint synthetic assets on SYNTHR, such as syUSD, syBTC, syETH, etc. Placing highly liquid assets as collateral will greatly reduce liquidation risks and avert potential death spiral events akin to Terra (LUNA). This will also not force users to risk capital to buy an asset they might not want to hold. However, similar to the Synthetix v2 debt pool model, SYNTHR users minting synthetic assets will be issued debt pool share tokens representing their share of the debt pool. An increase in the value of the debt pool may result in changes to the c-ratios and, in turn, the debt owed. This will be an important parameter for users to track since not meeting the 120% minimum threshold c-ratio will result in CDP liquidations. To solve debt volatility, SYNTHR will natively implement a hedge pool, miming the composition of the entire debt pool. By using the hedge pool, users will be able to protect themselves against debt pool risks.

The debt pool shares to be issued or burnt when minting or burning syUSD will be calculated using the following formula:

$$Shares = Total\ shares \times \frac{syUSD}{Total\ debt\ pool}$$

Where $total\ shares$ represents all debt pool share tokens issued and $total\ debt\ pool$ represents the syUSD value of the debt pool at the time of minting or burning, to issue or burn a corresponding amount of debt pool shares.

The debt percentage and debt owed in the form of syUSD will be calculated using the following formula:

$$Debt\ percentage = \frac{User\ balance}{Debt\ share\ total\ supply}$$

$$Debt\ owed = Debt\ percentage \times Total\ debt\ pool$$

Let's consider the following example: There is $50,000 worth of syUSD in the debt pool, which is owned by trader A, who also owns 100 debt pool shares, which represent 100% of the debt pool. Trader B locks their collateral and mints ten syBTC worth $50,000, assuming BTC is trading at $5,000. In this scenario, trader B is also issued 100 debt pool shares since the value of syBTC is equivalent to syUSD's already in the debt pool. The total debt pool, with a value of $100,000, now contains ten syBTCs worth $50,000 and syUSD worth another $50,000. There are 200 debt pool shares, with 100 shares owned by each. Based on the following calculations, we can see that traders A and B each own 50% of the debt pool and owe $50,000 each to the debt pool.

$$Shares = 200 \times \frac{50{,}000}{100{,}000}$$

$$= 100$$

$$Debt\ percentage = \frac{100}{200}$$

$$= 50\%$$

$$Debt\ owed = 50\% \times \$100{,}000$$

$$= \$50{,}000$$

Let's assume that BTC increases in value and is now trading at $10,000; the ten syBTC in the debt pool are now worth $100,000, which corresponds to a total debt pool value of $150,000 ($100,000 of syBTC and $50,000 of syUSD). Now, let's analyze the amount of debt each participant owes. If trader B, who owns 50% of the total debt pool, wants to leave the system, they can do so by burning only 7.5 syBTC out of the 10 syBTC owned by them. Trader B owes $75,000 in debt, which corresponds to 50% of $150,000, i.e., the revised total debt pool value, and because each syBTC is now worth $10,000. This particular scenario leaves trader B with a profit of 2.5 syBTC. Trader A, holding $50,000 worth of syUSD, suffers a capital loss of $25,000 in the form of debt owed to the system. Since they, too, own 50% of the total debt pool, trader A will either have to buy and burn $25,000 worth of debt or risk getting liquidated and losing their collateral. The trader A situation is a common problem for synthetic asset protocols that use the debt pool model. SYNTHR will provide built-in debt pool hedging tools to help users protect themselves against debt volatility. Users can deposit their syASSETS into the protocol's hedge pool in exchange for hedge tokens. The hedge tokens are debt mirror tokens, miming the debt pool's overall composition by rebalancing themselves every two days. Unlike Synthetix v2, SYNTHR debt mirror tokens will be collateralized by syASSETS. To take advantage of yield generation, the syASSETS from the hedge pool will be deposited into the stability pool, providing the protocol with ad hoc solvency and profiting from the liquidations of unhealthy CDPs. Referring to the earlier example, when trader B's ten syBTC increased the total debt pool by 50%, the debt mirror token, too, would have rebalanced itself to reflect the 50% increase in debt. If trader A had swapped his/her $50,000 worth of syASSETS for hedge tokens, the value of their hedge tokens too would have increased in value by 50%, or $25,000, and to prevent liquidation, trader A could have sold their debt mirror tokens at a profit to top up their collateral or to pay the outstanding debt of $25,000 to meet the c-ratio. Similarly, trader B may experience similar debt volatility challenges due to the increase in the value of debt due to the syBTC price rise. Such a situation may even subject Trader B to incremental liquidation risks. Therefore, trader B can also use the hedge pool to eliminate directional risk. Since trader B minted syBTC, they are, therefore, synthetically long on BTC, and as a hedge, trader B can buy debt mirror tokens to hedge himself/herself against the price movement of syBTC. If syBTC falls in value, trader B's debt becomes cheaper, and the debt mirror tokens become cheaper by an equivalent amount. And if syBTC increases in value, even though their debt becomes expensive, so does the value of their debt mirror tokens. If executed properly, traders can mint syASSETS, swap them for hedge tokens, and earn rewards through yield generation programs while taking no directional risk.

3. **Stability pool, liquidations, and recovery mode**

The stability pool will play a pivotal role in ensuring system solvency by squaring off undercollateralized syASSETS using stability pool deposits and generating returns for its depositors through the liquidation process, which will be enacted in the event the c-ratio drops below the threshold requirement, and the user fails to make appropriate adjustments. All syASSETS will be minted at a minimum c-ratio of 150% and liquidated below 120%.

Note: During recovery modes, the protocol will have the option of temporarily increasing the minimum threshold c-ratio higher than the usual 120% to improve the weighted average c-ratio of the entire protocol.

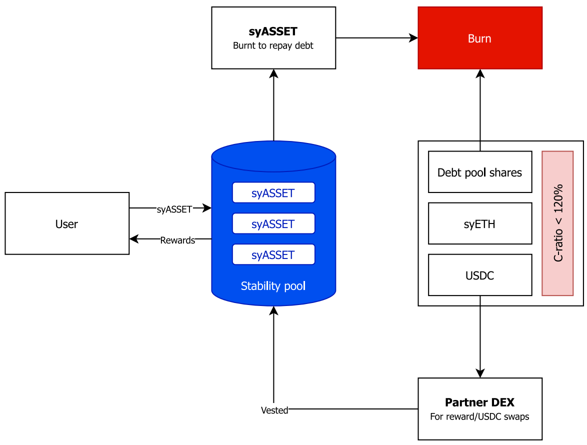

Figure 2: Stability pool liquidating an unhealthy syETH CDP backed by USDC as collateral.

The c-ratio will be calculated using the following formula:

$$C - ratio = \frac{Total\ collateral}{Total\ debt}$$

Where $total\ collateral$ represents the total collateral staked by the user, and $total\ debt$ represents the full value of syASSET issued against it. For example, $30 of debt against $100 of collateral will have a c-ratio of 333%. In the event of a liquidation, the underlying collateral will be liquidated, and an amount of syASSET corresponding to the outstanding debt, along with the debt pool shares, will be burnt from the stability pool's deposits. In exchange, the collateral from the liquidated CDP, minus a protocol liquidation fee of 10%, will be transferred and proportionally distributed to the stability pool participants. Since liquidations will occur below the c-ratio of 120%, stability pool participants will receive $120 worth of collateral minus a flagger fee, a liquidator fee, and a liquidation penalty for every $100 worth of debt burnt using the stability pool deposits, making a risk-free rate of return on their deposits.

Consider the following example: trader A deposits $120 worth of USDC as collateral. A c-ratio of 150% will allow trader A to mint up to $80 worth of syETH, but trader A decides only to mint $50 worth of syETH.

Alongside syETH, a corresponding number of debt pool shares worth $50 are also issued. Let's assume that trader A's debt pool shares (DPS) increase by 65% in value and that their corresponding debt is now worth $82.50. If the protocol decides to go into recovery mode, trader A will risk being liquidated for not meeting the minimum initial c-ratio of 150%.

$$\frac{\$120\ worth\ of\ USDC}{\$82.5\ worth\ of\ DPS} = 145\%$$

Suppose the protocol does not go into recovery mode, resulting in trader A not partially liquidating their position or topping up their collateral. Still, the value of debt pool shares increases by another 22% to $100.65. Since the c-ratio is below the minimum threshold c-ratio of 120%, trader A's CDP will be marked for liquidation.

$$\frac{\$120\ worth\ of\ USDC}{\$100.65\ worth\ of\ DPS} = 119\%$$

As part of the liquidation process, $100.65 worth of syASSETS will be burnt from the stability pool to relieve the debt pool of bad debt, and $108 worth of USDC will be distributed proportionally to the stability pool participants. Protocol liquidations will be triggered if the c-ratio falls below 120%. Since this is not a desirable state for the protocol, SYNTHR will have multiple layers to avert such a situation. One such measure will be the recovery mode, which will be used from time to time to improve the overall fiscal health of the protocol. During recovery mode, collateral top-ups and partial liquidations will be encouraged, and all CDPs, starting from the least collateralized, 120%, all the way up to 150%, will be marked for liquidation. Liquidations will continue until the protocol's weighted average c-ratio reaches 130%; the regular liquidation process will consider a minimum threshold c-ratio of 120%.

Note: Stability pool rewards, vested over six months, will be given out in the protocol's native token. As a result, collateral from CDP positions will be swapped before distribution.

C. Oracles

Oracles are the backbone of DeFi because they allow conventional financial tools to be built on permissionless and censorship-resistant blockchains. At the heart of it all, smart contracts alone cannot pull data directly from sources outside the blockchain (off-chain data). Oracles enable sharing information originating outside the blockchain with smart contracts in a permissionless and censorship-resistant manner. For instance, oracles can relay the price of oil traded on the CME futures exchange, allowing protocols to create synthetic assets that track the price of oil. Oracles are also crucial to the lending and borrowing markets, as they're responsible for relaying asset collateralization data to the automated systems. Oracles are not just limited to feeding pricing data; they can also provide data about live events. Prediction markets use oracles to facilitate speculators' bets on real-world events. Will Trump win the 2024 election? Will the FED raise interest rates by more than 50 bps this month? Who will win the World Cup this year? Oracles have limitless potential in the blockchain world because it is important for blockchains to interact with data outside the blockchain ecosystem. SYNTHR, too, will require truly decentralized oracles to be fully censorship-resistant, especially since some of the oracle services available today are centralized. Data feeds are intermediated by third parties known as validator operators. These operators manage validator nodes for a particular oracle service. Such oracle service providers can be Chainlink, Band Protocol, Tellor, or Uma's optimistic oracle. Although each oracle service is unique, the underlying infrastructure is similar. Protocol node operators run validator nodes that pull data from external APIs and then push this data to smart contracts. Validator nodes are incentivized using reward tokens to provide accurate data. Providing incorrect data results in penalties in the form of rewards being slashed. Most oracle services can be controlled or censored since several validators run them. Additionally, the SEC or the CFTC can legally force independent node operators to stop providing data feeds to prevent users from using certain protocols. To avoid censorship and manipulation of oracles, SYNTHR will only use truly decentralized oracle services to ensure a censorship-resistant and trustless DeFi ecosystem.

1. On-chain and off-chain assets

The most common application of oracles is to provide pricing information for on-chain assets to various DeFi protocols. Decentralized lending and borrowing protocols like Aave rely on Chainlink oracles to feed their smart contracts with the price of BTC from Coinbase, Binance, and CME Bitcoin futures; aggregating pricing information is important to deter manipulation. SYNTHR will use oracle price feeds in several scenarios, such as using ETH price feeds to determine the amount of syUSD a user will be able to mint by staking ETH as collateral, calculate and track the c-ratio of the CDP, and select the amount of syUSD to be burnt by the Stability Pool in the event of a liquidation. Oracle price feeds will also be used to price and mint off-chain syASSETS; for instance, to successfully price and mint syXAU, oracle validator nodes will be required to provide the price of gold from major derivative exchanges such as CME, COMEX, and ICE clearinghouses. In conclusion, oracles can be used for all financial assets, even those heavily regulated, such as stocks, currencies, bonds, ETFs, and commodities. However, since these assets are highly regulated, optimistic oracles may be used to avoid forced de-listing due to regulator intervention.

2. Debt pool tracking

SYNTHR will use oracles to track the size of the global debt pool as a sum of all assets issued across chains. This value will then calculate the user's debt based on the debt pool shares owned. Oracles will form the foundation for the cross-chain functionality of syASSETS by enabling the effective functioning of the nuclear port and the omnichain aggregator.

$$C: Chain\ debt = \sum_{i=0}^{n} P_i \times N_i$$

Where P represents the current price of the syASSET and N represents the total syASSET issuance on chain i.

$$G: Global\ debt = \sum_{j=0}^{n} C_j$$

Where C represents $chain\ debt$ on chain j.

Individual syASSET debt will be tracked by calculating the total issuance amount of the syASSET across various chains multiplied by its current market price.

$$S: syASSET\ debt = P \times \sum_{j=0}^{n} N_j$$

Where P represents the current price, and N represents the total syASSET issuance on chain$j$.

D. Synthswap: Slippage-free swaps

Slippage is defined as the difference between the expected price of a trade and the executed price of a trade. In an order book system, slippage tends to be higher during periods of high volatility or if the financial product has poor liquidity and order depth. Slippage is a cost to the trader because they either buy at a small premium or sell at a small discount to meet liquidity. While limit orders allow traders to circumvent this problem on centralized exchanges, traditional AMM-driven decentralized exchanges still face this issue. Slippage is a common problem with conventional AMMs based on the $x * y = k$ model with liquidity bands ranging from 0 to infinity. These AMMs are capital-deficient because the liquidity of the trading pairs is spread across an infinite number of prices, which limits price discovery. The result of this inefficiency is high slippage for the user. SYNTHR will use the debt pool model to mint and burn assets at oracle price feeds, enabling instant order execution and slippage-free trades. Unlike traditional AMMs, the debt pool model allows high-volume trades without volume or liquidity requirements. Synthswap, the protocol's internal slippage-free DEX, will enable users to swap syASSETS by simultaneously minting and burning syASSETS, i.e., Swapping one form of debt for another at oracle price feeds. SYNTHR's capital efficiency will attract large trading volumes to the platform, leading to an upsurge in trading fees for the protocol.

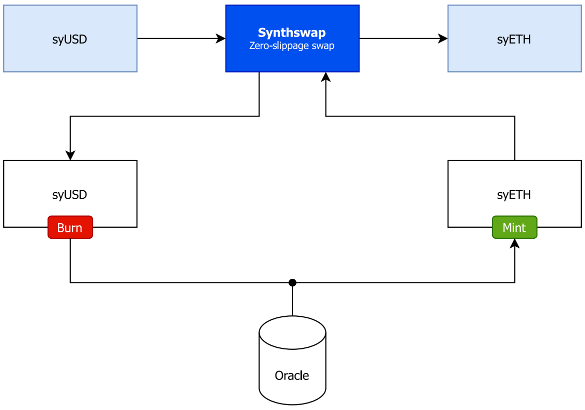

Figure 3: Synthswap swapping syUSD for syETH using the ETH/USD oracle price feed.

How will SYNTHR prevent front-running?

1. SYNTHR will only use highly liquid collateral or short-tail assets to back all synthetic assets.

2. SYNTHR will restrict syASSETS to only highly liquid assets with mature markets.

3. SYNTHR will aggregate price feeds from oracles, TWAP feeds from large DEXs, and direct price feeds from CEXs.

4. SYNTHR will work with oracles that use an on-demand price update model instead of a push model, ensuring that every transaction will use a recent off-chain price instead of the last on-chain update pushed by the oracle itself, i.e., low-latency price feeds.

E. Omnichain implementation

SYNTHR's gas-optimized omnichain architecture will enable on-chain tracking of multichain collateral and debt values, allowing the protocol to unify collateral across all deployments and mint a fully backed syASSET on any chain in a trustless manner. This will help create omnichain CDPs, facilitate low-slippage cross-chain atomic swaps, and provide a more capital-efficient alternative to AMM-based bridges.

1. Main chain and light chains

SYNTHR's aggregator, core contracts, and execution logics will be housed on a gas-optimized main chain, and the collateral pools and syASSET contracts will be deployed across a network of light chains. The main chain will be responsible for aggregating the values of collateral and syASSETS across all chains and executing all state changes. This architecture will enable the minting of a fully collateralized omnichain syASSET on any chain against a pool of distributed multi-chain collateral. Assessing alternative routes, a point-to-point architecture with the aggregator deployed on every chain will require all aggregators to be updated after every transaction, making it gas-intensive to perform transactions. While off-chain computation of collateral and debt values is an option, it comes at the cost of trust censorship. SYNTHR's split architecture will only require the aggregator on the main chain to be updated for every cross-chain transaction, creating a gas-efficient and trustless cross-chain transaction environment. The divided architecture will also provide an added layer of security, helping the protocol localize risk by cutting off any compromised chain from the overall network.

2. Cross-chain communication

SYNTHR will create a modular cross-chain messaging architecture by aggregating multiple independent general message-passing (GMP) protocols to ensure democratized, trustless, valid delivery and secured cross-chain finality. This will enable users to choose their preferred consensus layer, use more than one consensus layer, or select the most gas/time-efficient path for relaying cross-chain messages. Using independent consensus layers will deter collusion, foster trustlessness, and de-risk the protocol's dependency on one consensus layer.

3. Nuclearport: Omnichain CDPs

The nuclear port module will leverage the omnichain aggregator to create omnichain CDPs against a unified pool of collateral as opposed to fragmented and siloed pools, providing users and DEX aggregators with a zero-slippage environment to bridge assets as opposed to AMM-based bridges that have intrinsic slippage. Users can stake collateral on a source chain and mint the syASSET on a destination chain; the debt pool shares and state changes will be managed on the main chain.

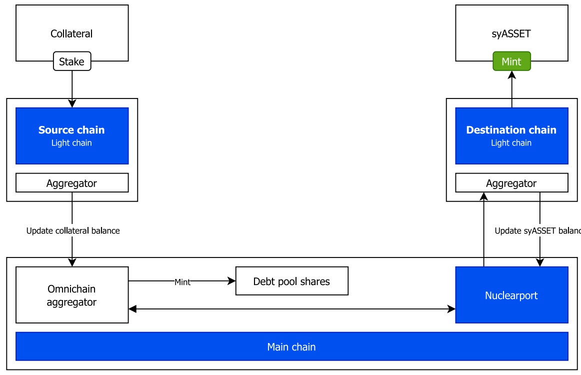

Figure 4: Nuclearport creating an omnichain CDP using a unified collateral pool.

4. Composability and atomic swaps

SYNTHR's omnichain implementation will enable cross-chain DEX aggregators to initiate and execute low-slippage native-asset swaps using Synthawap's atomic swap framework and the nuclear port module.

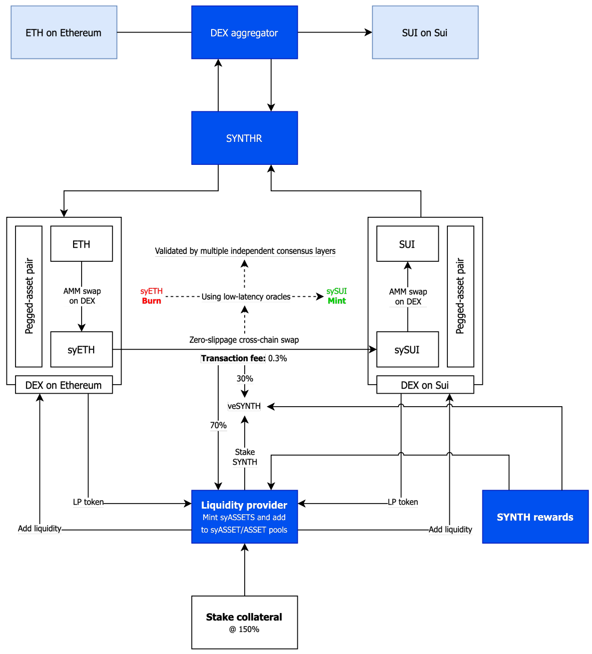

Figure 5: DEX aggregator executing an atomic swap between ETH and SUI.

Let's consider the following example of a user swapping ETH for SUI to illustrate the workings of atomic swaps:

1. DEX aggregator will swap ETH for syETH on Ethereum.

2. Synthswap will swap syETH for sySUI on Ethereum.

3. Nuclearport will swap sySUI on Ethereum for sySUI on Sui.

4. DEX aggregator will swap sySUI for SUI on Sui.

All the above steps will occur in a single transaction known as an atomic swap, resulting in reduced MEV and front-running attack vectors. syASSET/ASSET LP farming rewards will incentivize users to fund pegged-asset pairs with low intrinsic impermanent loss on partner DEXs to ensure high liquidity for syASSET/ASSET pools.

How will SYNTHR be different from bridges?

1. **Slippage-free:** The core cross-chain transaction on SYNTHR occurs in a zero-slippage environment, unlike AMM-based cross-chain solutions with intrinsic slippage.

2. **Instant:** SYNTHR will work with multiple general message-passing protocols to offer instant and guaranteed cross-chain finality.

3. **Secure:** SYNTHR will aggregate multiple general message-passing protocols to offer trustless, valid delivery with the highest level of security.

How will synthswap's cross-chain atomic swap implementation differ from other atomic swap protocols?

1. **High solvency:** All syASSETS will be backed by ETH, USDC, or USDT at a c-ratio of 150%.

2. **Independent consensus layer:** SYNTHR will integrate with multiple independent general message-passing protocols to ensure gas-optimized, trustless, valid delivery and the highest degree of cross-chain security.

3. **Omnichain liquidity:** SYNTHR will create a unified pool of synchronized liquidity by aggregating collateral across all chains, enabling the protocol to mint a fully-backed syASSET on any chain, eliminating the need to bridge assets to a hub chain to carry out exchange transactions successfully. This will render the core cross-chain transaction slippage-free. The protocol's omnichain architecture will enable liquidity providers to provide leveraged liquidity across multiple ecosystems against collateral on a single chain.

4. **Decentralized:** SYNTHR will enable anyone to stake, mint, and add liquidity to syASSET/ASSET pools on partner DEXs and earn a share of protocol revenue.

5. **Support ecosystem:** SYNTHR's syASSETS will be supported by an ecosystem of modules such as DRASR (dynamic peg-protection using long and short-farm vaults to ensure that the DEX prices of syASSETS remain pegged to their oracle prices), stability pool (non-cascading liquidations), front-running prevention mechanisms, etc.

6. **Pegged-asset pairs:** Pegged-asset pairs on DEXs have a low intrinsic impermanent loss and slippage, making them capital-efficient and LP-friendly.

F. DRASR framework: Engineered price stability

The dynamic rewards allocation for spread reduction, or DRASR, is a framework designed to keep oracle and DEX prices at parity. DRASR will dynamically toggle long and short-farm vault rewards to arbitrage DEX inefficiencies and reduce spreads between oracle prices. DEX quotes for syASSETS, ensuring high capital efficiency during atomic swaps.

1. DEX price is less than the oracle price

The long-farm vault will allocate half its deposits towards executing a large buy order on the DEX. It will subsequently deposit the other half and the newly purchased syASSET into the DEX's liquidity pool to earn syASSET/ASSET LP farming rewards. This dynamic relationship is similar to that of perpetual funding rates.

2. DEX price is greater than the oracle price

The DRASR framework will disincentivize long-farm vault depositors by lowering long-farm vault APRs, making short-farm vault APRs more attractive. The short-farm vault will generate returns by routing its stablecoin deposits to protocol arbitrage bots that will simultaneously mint and sell the syASSET on the DEX. Profits generated from exploiting this arbitrage opportunity will be distributed to the depositors as rewards.

3. DRASR formula

The following equations will represent the DRASR framework for the long-farm vault rewards:

$$y = x + 0.3, with\ x \leq 3$$

$$y = x^2/4, with\ 3 < x \leq 6$$

$$y = x^3/10, with\ 6 < x \leq 10$$

Where y represents the reward ratio in percentage bound to $0\% \leq y \leq 100\%$ and x represents the discount attached to $0\% \leq x \leq 10\%$. The chosen formula will split the reward rate into three parts. When the discount increases from 0% to 3%, the reward curve will increase linearly; if the discount exceeds 3%, the steepness of the reward curve will increase quadratically, and after a discount of more than 6%, it will increase cubically. The maximum reward rate will be achieved with a syASSET discount of 10%. The three-part split is designed to control token inflation by dynamically adjusting the reward ratios to counteract any syASSET price misalignments. While there won't be a need to incentivize price rebalancing through the issuance of large amounts of tokens during low discounts, incentives through token inflation will be required during steep discounts to avoid potential negative syASSET price spirals. The greater the syASSET price discount, the faster the steepness of the reward curve increases. For 60 epochs, i.e., 60 months, 80 million SYNTH tokens (13.4% of the total supply) will be allocated for syASSET/ASSET LP farming rewards, including the long-farm vault incentive program. If there aren't any syASSET discounts for an entire epoch, the long-farm vault depositors will earn a reward of 0.3% of the tokens allocated. Should the discounts increase, the DRASR mechanism will correspondingly increase the reward relative to the discount, limited to a maximum of 100%. All unutilized tokens from each epoch will be transferred to the next one.

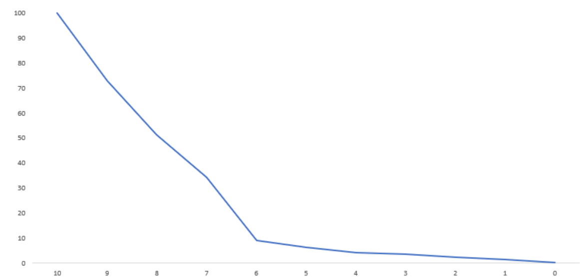

Figure 6: Long-farm vault reward percentages (y-axis) versus syASSET discount percentages (x-axis).

G. Vaults

Vaults will be essential to the protocol, serving as plug-and-play entry points to the ecosystem. Due to their user-friendly experience, vaults will play a critical role in onboarding the next billion users to DeFi. One-click vaults will enable users to earn yield on their deposited assets seamlessly.

1. Long-farm vault

The long-farm vault will maximize capital efficiency by allocating capital to liquidity-starved syASSETS. The DRASR framework will automatically adjust rewards so that there is always an incentive for the long-farm vault to give its deposits towards the most capital-deficient syASSETS. By toggling incentive programs, the protocol will be able to achieve high pricing stability. Depositors of the long-farm vault will have 50% of their liquidity routed to partner DEXs to buy a syASSET trading at a discount to its oracle price. The remaining 50% will add liquidity to the syASSET/ASSET pool on the partner DEX. Rewards accumulated from trading fees will be distributed to depositors. Once the syASSET is returned to parity with its oracle price, the long-farm vault liquidity will be pulled from the syASSET/ASSET LP position and converted back to stablecoins. This process will be repeated for all partner DEXs and syASSETS to ensure capital efficiency across all syASSET/ASSET pools. Long-farm vault depositors will be rewarded in SYNTH tokens depending on the extent of the variation between oracle and DEX prices. The bigger the spread between the oracle and DEX prices, the larger the SYNTH token rewards. The SYNTH token rewards, set to a maximum by the DAO, will dynamically reduce to zero once parity is attained.

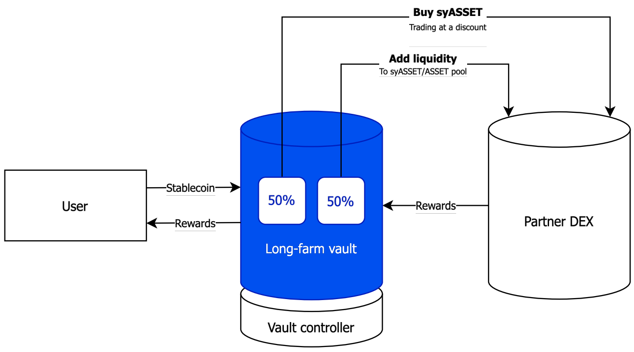

Figure 7: Long-farm vault farming syASSET/ASSET LP tokens to generate returns.

2. Short-farm vault

Like the long-farm vault, the short-farm vault will also help the protocol maximize capital efficiency and achieve price stability. At times, a syASSET may trade at a premium when the demand for the asset is higher than normal. The short-farm vault will seamlessly rotate liquidity to prevent premiums across all syASSETS. By arbitraging syASSET premiums, syASSET prices will become more stable, and depositors will earn rewards due to keeping syASSET prices pegged.

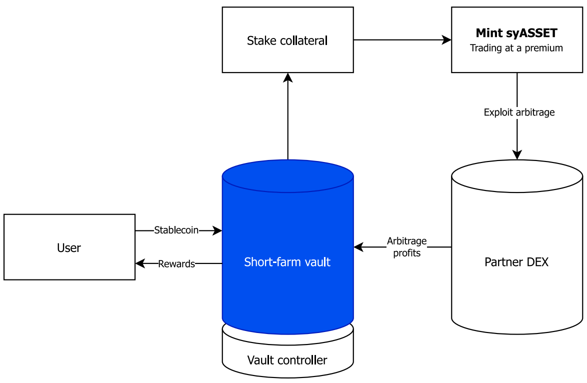

Figure 8: Short-farm vault exploiting arbitrage opportunities to generate returns.

3. Delta-neutral vault

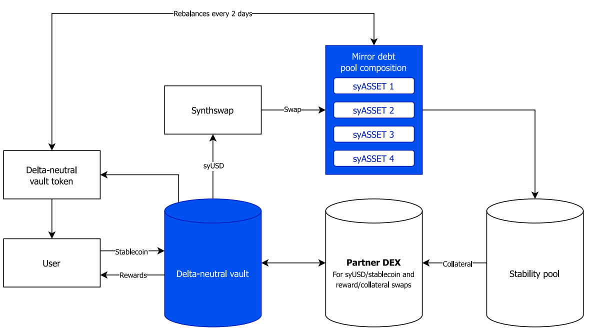

Figure 9: Delta-neutral vault using the stability pool to generate returns.

Minting syASSETS creates new debt, which, when subjected to volatility based on the price movements of the underlying assets of the debt pool, makes liquidation risks for debt pool owners. The delta-neutral vault will enable users to leverage yield-generating opportunities provided by the protocol without exposing themselves to any debt pool risk. Users will deposit stablecoins into the delta-neutral vault, swapping the deposits for syUSD using a partner DEX. The syUSD will then be swapped via the synthswap module for delta-neutral vault tokens that will mirror the debt pool composition. These tokens will rebalance every two days to mimic the composition of the global debt pool. These syASSETS will be deposited into the stability pool to generate returns from protocol liquidations.

4. User-created vaults

Like Yearn vaults, user-created vaults will have the flexibility of parameter customization, enabling SYNTHR users to create and manage their strategies to maximize returns. Users can create custom vaults with different syASSET mixes involving automated yield farming, lending, and borrowing activities to maximize the return on assets. These vaults will be able to interact with other vaults or modules, not limited to the SYNTHR ecosystem. Vault creators will also earn a performance fee from other users depositing funds into their custom vaults.

III. Governance and revenue distribution

The governance and revenue distribution models will be devised so that all stakeholders benefit sustainably from the long-term growth of the protocol.

A. veSYNTH: Vote-escrowed SYNTH

The ve-model will enable token holders to time-lock their tokens in exchange for protocol revenues and governance rights.

The veTOKEN model will offer the following benefits:

1. Encourage long-term decision-making.
2. Greater incentive alignment across protocol participants.
3. Improved supply and demand dynamics.

The weighted voting power of vote-escrowed time-locked tokens will be represented using the following formula:

Instead of voting with a token amount a, tokens will be locked in a voting escrow for a selectable lock time t_1 where $t_1 \leq t_{max}$ and $t_{max} = 4\ years$. After locking, the time left to unlock will be $t \leq t_1$.

$$w = a \times \frac{t_1}{t_{max}}$$

Where w represents weight.

Vote-escrowed tokenomics will allow token holders to time-lock their tokens for the following benefits:

1. **Protocol revenue:** Access to real multi-chain yield.
2. **Protocol governance:** Influence gauge weights for syASSET/ASSET LP farming rewards, revenue distribution, syASSET listing proposals, etc.
3. **Additional benefits:** Boosted syASSET/ASSET LP farming rewards, bribes to influence protocol governance proposals, and airdrops from #BUIDLonSYNTHR protocols.

B. Revenue distribution

SYNTHR's sustainable recurring revenue model will ensure the protocol is well-placed to absorb market shocks. The goal of the protocol is to be fiscally solvent and community-led and reward participants invested in the long-term success of the protocol.

The protocol's revenue distribution model will be as follows:

1. 10% will be deposited into the stability pool via the hedge pool to ensure that a minimum liquidity threshold is always available for protocol liquidations.

2. 30% will be distributed to veSYNTH holders, making the native token a real-yield accrual token backed by actual protocol revenues.

3. 60% will be distributed to liquidity providers depositing collateral and minting syASSETS, making the protocol a source of real yield.

Note: Revenue distribution rewards will be given in the protocol's native stablecoin, syUSD.

C. Permissionless listing of syASSETS

Establishing the SYNTHR DAO will facilitate the permissionless listing of syASSETS, allowing the community to vote on asset classes such as equities, fixed income, FX, and more. Before initiating a poll, users can discuss potential proposals on the SYNTHR forum page, fostering open dialogue and community engagement. Once a proposal gains majority consensus within the community, users holding veSYNTH can submit and vote on SYNTHR improvement proposals (SIPs). These SIPs will serve as a means to suggest and introduce new syASSETS into the ecosystem. Voting options will typically include yes, no, or abstain. For an SIP to be approved, it will require a majority of yes votes and a quorum threshold of 30% participation. Upon reaching the quorum threshold and achieving the necessary votes, the SYNTHR development team will collaborate with oracle service providers to establish price feeds, minting new contracts with unique token addresses representing the syASSETS approved by the DAO.

IV. Risk factors

SYNTHR recognizes that external factors beyond its control can impact the protocol's functioning. However, SYNTHR will proactively establish essential frameworks to identify and mitigate potential threats to ensure a secure environment. It will minimize vulnerabilities by diversifying the services it relies on and conducting regular audits. Additionally, SYNTHR will actively engage with DeFi insurance platforms to safeguard users from smart contract exploitation, fund losses, and de-pegging of assets.

A. Price feeds and market data oracles

SYNTHR recognizes the importance of reliable and accurate price feeds to ascertain the net present value of syASSETS. As blockchain and cryptographic systems do not possess inherent knowledge of external factors like the S&P 500 price or the EUR/USD exchange rate, SYNTHR will rely on battle-tested oracles to communicate prices and market data. However, addressing the potential risks associated with compromised oracles, which could manipulate contracts, is crucial. The oracle problem extends beyond financial contracts and has garnered significant attention for finding effective solutions. Companies like Oraclize and SmartContract offer authenticated feeds using TLSNotary or Town Crier specifications, sometimes leveraging Intel SGX's trusted hardware systems. Additionally, proposals for combining multiple authenticated data feeds have emerged; for instance, price feeds like BTC/USD may be obtained from various exchanges and weighted based on trading volume. While these technologies mitigate the risk of oracle manipulation, counterparties are still likely to tamper with the feeds by selecting only a few sources. Therefore, to further enhance security, SYNTHR may consider implementing Uniswap v3 time-weighted average price (TWAP) oracles for syASSETS representing on-chain assets, aiming to diversify the oracles used.

B. Smart contract vulnerabilities, ecosystem risks, and de-pegging of syASSETS

SYNTHR will utilize smart contracts to automate and execute various tasks, including lending, borrowing, staking, minting, burning, depositing, and withdrawing crypto assets, all in a trustless manner. However, it's important to acknowledge that, like any software, smart contracts can potentially contain bugs, vulnerabilities, or exploits that may result in losing funds despite rigorous audits, due diligence, and insurance measures. These vulnerabilities could even lead to the de-pegging of syASSETS, causing them to deviate from their underlying assets. Moreover, during periods of extreme market volatility or unforeseen events, certain blockchain networks may experience congestion, which could impact critical infrastructure such as Infura, query services, APIs, and oracle services, potentially affecting the functionality of SYNTHR. Additionally, using syASSETS by other protocols or decentralized applications (DApps) can introduce additional considerations. For example, if a DeFi bridge connecting different blockchain networks encounters an exploit, it could result in the de-pegging of syASSETS.

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