SYNTHR – Advanced cross-chain infrastructure

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Foreword

I. **1,000,000 chains**

With blockchains and cryptos gaining popularity, the number of chains is rapidly increasing. Every chain has its own thriving economy, community, culture, and yield-generating opportunities. Users today want the flexibility and freedom to switch between chains.

II. **Liquidity abstraction**

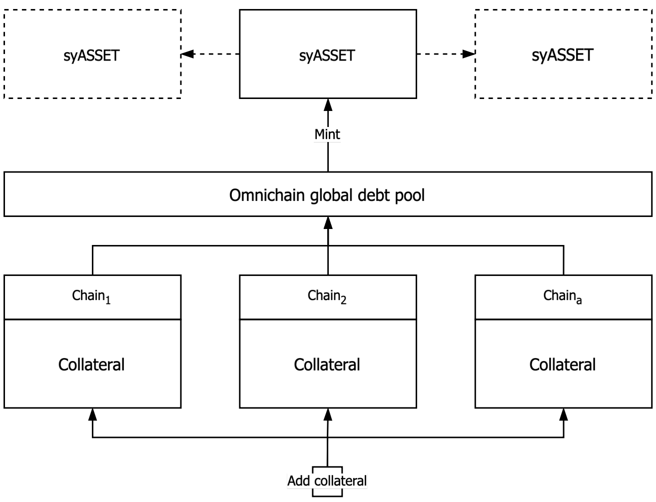
Our mission is to fundamentally reinvent cross-chain liquidity, enabling users to navigate today's multi-chain landscape with exceptional capital efficiency and extreme security. SYNTHR abstracts away the need for bridges and multiple fragmented liquidity pools, ensuring frictionless interoperability.

Protocol

I. **Introduction**

SYNTHR's advanced cross-chain infrastructure powers a novel zero-slippage omnichain transaction environment, enabling you to create omnichain applications and transfer value between chains with exceptional capital efficiency and extreme security.

A. **Omnichain global debt pool**



The omnichain global debt pool aggregates cross-chain collateral and debt balances, enabling you to add high-quality liquid collateral on multiple chains and mint omnichain syASSETS with a high c-ratio, or collateralization ratio. Omnichain syASSETS are essentially overcollateralized debt positions, which form the framework of the zero-slippage omnichain liquidity layer.

$$\sum \text{Collateral balance}_a \cup \sum \text{Debt balance}_a$$

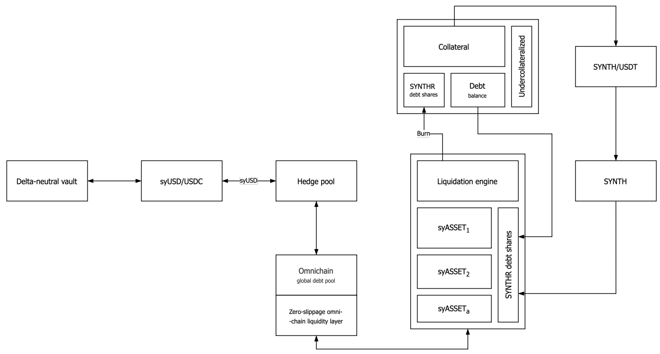
$a = \text{User 1}, \text{User 2}, \text{User 3}, \ldots$

1. **Architecture**

The architecture consists of multiple light chains and a main chain. The main chain exclusively hosts the aggregator contracts, enabling gas-optimized cross-chain synchronicity. This eliminates the need for any off-chain computations to save gas fees and ensures a censorship-resistant framework.

2. **Delta-neutral vault**

The delta-neutral vault utilizes the hedge pool and the liquidation engine to generate delta-neutral yield. The hedge pool mirrors the latest composition of the omnichain global debt pool, ensuring delta neutrality, while the liquidation engine liquidates undercollateralized users to generate real yield and preserve protocol solvency. This protects you from sharp debt balance swings.



Explanation

The delta-neutral vault utilizes its deposits to buy syUSD. The hedge pool swaps the syUSD for the latest composition of the omnichain global debt pool and periodically rebalances itself to preserve its delta-neutral state. The liquidation engine burns the SYNTHR debt shares of liquidated users and redistributes their debt balance.

a. **Flag for liquidation**

$$\text{C} - \text{ratio} \leq \text{C} - \text{ratio}_{\text{Liquidate}}$$

b. **Flagger fees**

$$\frac{a}{\text{Price}_{\text{SYNTH}}}$$

$\succ a = \$10, \$15, \$20, \ldots$

c. **Liquidate**

$$\text{C} - \text{ratio} \leq \text{C} - \text{ratio}_{\text{Liquidate}} \land \text{Time remaining}_{\text{Flag for liquidation}} = 0$$

d. **Liquidation balance**

$$\frac{\text{Debt balance} - \text{Collateral balance} \times \text{C} - \text{ratio}_{\text{Minimum}}^{-1}}{1 - \text{C} - \text{ratio}_{\text{Minimum}}^{-1} \times (1 + \text{Liquidation penalty}_a)}$$

$$\succ \text{Liquidation penalty} = \begin{cases} b, & a = \text{Self} - \text{liquidate} \\ c, & a = \text{Liquidate} \end{cases}$$

$\succ\succ$ b, and $c = 10\%, 20\%, 30\%, \ldots$

e. **Liquidation rewards**

$$\text{SYNTHR debt shares} \times (\alpha_\infty - \alpha)$$

$$\succ \alpha_\infty = \alpha_{\infty-1} + \frac{\text{Distributable liquidation rewards}}{\sum \text{SYNTHR debt shares}_a} + \beta$$

$\succ\succ \alpha = \text{Infinitely increasing arbitrary variable}$

$\succ\succ\succ \text{Escrow} \lor \text{Burn} \lor \text{Mint} \xrightarrow{\text{Assigns}} \alpha_\infty$

$\succ \beta = \text{Unclaimed distributable liquidation rewards}$

$\succ\succ \text{Burn} \lor \text{Mint} \xrightarrow{\text{Assigns}} \beta$

> a = User 1, User 2, User 3, …

> Distributable liquidation rewards $= \frac{\text{Liquidation balance}}{\text{Price}_{\text{SYNTH}}}$

f. **Liquidator fees**

$$\frac{a}{\text{Price}_{\text{SYNTH}}}$$

> a = \$10, \$15, \$20, …

g. **Self-liquidate**

$$\text{C} - \text{ratio} \leq \text{C} - \text{ratio}_{\text{Minimum}}$$

h. **Withdraw liquidation rewards**

$$\text{C} - \text{ratio} \geq \text{C} - \text{ratio}_{\text{Minimum}} \wedge \text{Time remaining}_{\text{Escrow}} = 0$$

3. **syCHAIN**

syCHAIN is a high-performance EVM-compatible L1 that is based on a novel proof-of-debt consensus framework. You delegate your SYNTHR debt shares to secure syCHAIN, which validates all aggregator state changes and cross-chain messages, bolstering the protocol's trustless framework.

4. **SYNTHR debt shares**

Every time you mint omnichain syASSETS, you generate personal and protocol debt. The omnichain global debt pool, which represents overall protocol debt, works on the model of debt load sharing. This means that all users are collectively responsible for the protocol's solvency. Your SYNTHR debt shares correspond to your ownership of the omnichain global debt pool.

a. **C-ratio**

$$\frac{\text{Collateral balance}}{\text{Debt balance}} \times 100$$

b. **Collateral balance**

$$\sum \$\text{Collateral}_{\text{ab}} + \$\text{Liquidation rewards}$$

> a = axlUSDC/USDC, eETH, rsETH, …

> b = Arbitrum, Avalanche, BNB Chain, …

c. **Debt balance**

$$\sum \$\text{syASSET}_{\text{ab}}$$

> a = syAAPL, syAVAX, syBNB, …

> b = Arbitrum, Avalanche, BNB Chain, …

d. **Debt percentage**

$$\frac{\text{SYNTHR debt shares}}{\sum \text{SYNTHR debt shares}_{\text{a}}}$$

> a = User 1, User 2, User 3, …

e. **SYNTHR debt shares**

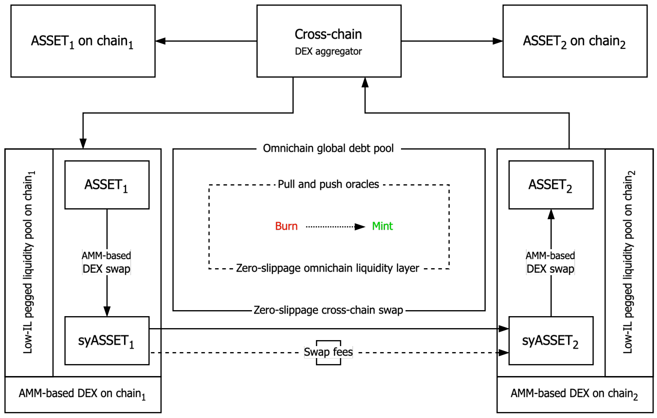
$$\frac{\text{Debt balance}}{\text{Price}_{\text{syUSD}}}$$

> $\text{Price}_{\text{syUSD}} == \$1$

Explanation

Let's consider an example to understand how SYNTHR debt shares work. Trader A mints 50,000 syUSD worth \$50,000 and receives 50,000 SYNTHR debt shares, while trader B mints 10 syBTC worth \$50,000 and receives 50,000 SYNTHR debt shares. The omnichain global debt pool, worth \$100,000, consists of 50,000 syUSD, 10 syBTC, and 100,000 SYNTHR debt shares, with traders A and B each owning 50%. Let's say that the price of syBTC doubles, which means that the 10 syBTC are now worth \$100,000 and the omnichain global debt pool is worth \$150,000, split equally between traders A and B. Trader A can exit the protocol by burning the 50,000 syUSD plus an additional 25,000 syUSD, while trader B can exit the protocol by burning 7.5 out of the 10 syBTC. Now, let's consider a different scenario in which trader A utilizes the hedge pool to ensure delta neutrality. The hedge pool swaps the syUSD for the latest composition of the omnichain global debt pool, which is 50% syBTC and 50% syUSD. Trader A, who now effectively holds 5 syBTC and 25,000 syUSD, can exit the protocol without any losses by burning them.

B. **Omnichain syASSETS**



The zero-slippage omnichain liquidity layer utilizes a combination of pull and push oracles to burn and mint omnichain syASSETS, enabling zero-slippage cross-chain swaps. This generates protocol revenue in the form of swap fees, which the protocol distributes to its stakeholders. The omnichain global debt pool acts as the counterparty for all zero-slippage cross-chain swaps, while the combination of pull and push oracles ensures price feed accuracy and reliability.

Explanation

Cross-chain DEX aggregators utilize the zero-slippage omnichain liquidity layer to perform low-slippage native asset swaps.

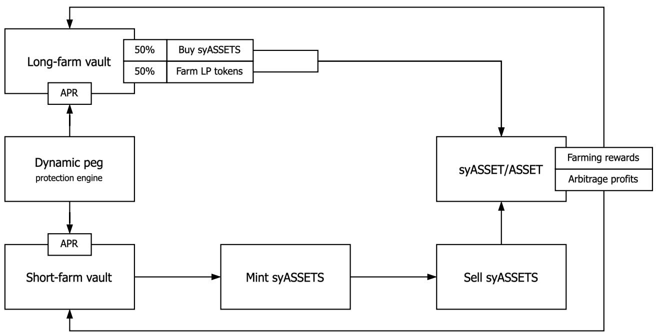
- **Step 1:** The cross-chain DEX aggregator utilizes a low-IL pegged liquidity pool on an AMM-based DEX to swap ASSET_1 for syASSET_1 on chain_1.

- **Step 2:** The cross-chain DEX aggregator utilizes the zero-slippage liquidity layer to swap syASSET_1 on chain_1 for syASSET_2 on chain_2.

- **Step 3:** The cross-chain DEX aggregator utilizes a low-IL pegged liquidity pool on an AMM-based DEX to swap syASSET_2 for ASSET_2 on chain_2.

1. **Dynamic peg protection engine**

The dynamic peg protection engine utilizes the long and short-farm vaults to preserve parity between the DEX and oracle prices. The long-farm vault buys omnichain syASSETS and farms LP tokens when the DEX prices are lower, while the short-farm vault mints and sells omnichain syASSETS for price arbitrage profits when the DEX prices are higher.



Explanation

The dynamic peg protection engine toggles the long-farm vault APR based on the DEX price discount, making it less or more attractive to achieve the desired result.

$$y = x + 0.3 \text{ for } x \leq 3 \longrightarrow \text{linear curve}$$

$$y = \frac{x^2}{4} \text{ for } 3 < x \leq 6 \longrightarrow \text{quadratic curve}$$

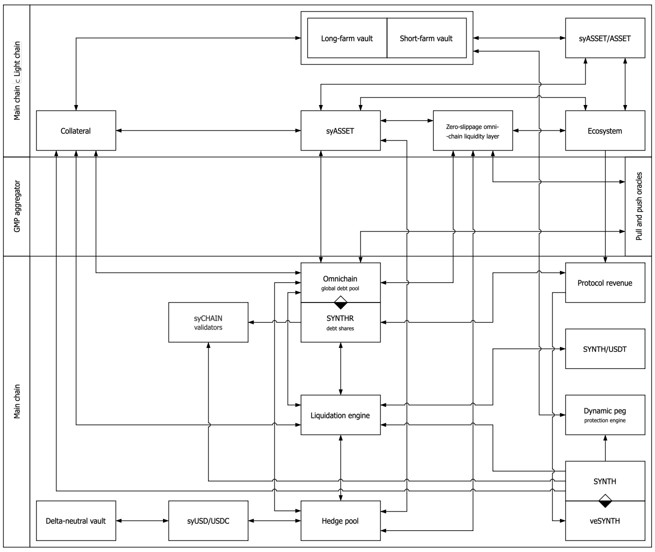
$y = \frac{x^3}{10}$ for $6 < x \leq 10 \longrightarrow$ cubic curve

$\succ x =$ DEX price discount bound to $0\% \leq x \leq 10\%$

$\succ y =$ Long − farm vault APR bound to $0\% \leq y \leq 100\%$

2. **GMP aggregator**

The GMP aggregator utilizes multiple independent consensus layers to validate cross-chain messages, ensuring democratic and trustless cross-chain finality. This creates an operational barrier between the core contracts and relayers, preventing collusion between the two.



II. **Protocol revenue distribution**

- Protocol operations
- SYNTHR debt shares
- veSYNTH

III. **Real yield**

A. **Farming rewards:** SYNTH

$$\text{Distributable farming rewards} \times \frac{\text{Staked balance}}{\sum \text{Staked balance}_a} + \alpha$$

$\succ \alpha =$ Unclaimed distributable farming rewards

$\succ\succ$ Stake LP token $\vee$ Unstake LP token $\xrightarrow{\text{Assigns}} \alpha$

$\succ a =$ User 1, User 2, User 3, …

$\succ$ Distributable farming rewards = Tokenomics rewards $\text{distribution}_{\text{Per block}}$

B. **Liquidation rewards:** SYNTH

[Protocol, I, A, 2, e]

C. **Minting rewards:** syUSD

SYNTHR debt shares $\times (\alpha_\infty - \alpha)$

$$\succ \alpha_\infty = \alpha_{\infty-1} + \frac{\text{Distributable minting rewards}}{\sum \text{SYNTHR debt shares}_a} + \beta$$

$\succ\succ \alpha =$ Infinitely increasing arbitrary variable

$\succ\succ\succ$ Mint $\vee$ Burn $\vee$ Withdraw minting rewards $\xrightarrow{\text{Assigns}} \alpha_\infty$

$\succ \beta =$ Unclaimed distributable minting rewards

$\succ\succ$ Mint $\vee$ Burn $\xrightarrow{\text{Assigns}} \beta$

$\succ a =$ User 1, User 2, User 3, …

$\succ$ Distributable minting rewards = Protocol revenue $\text{distribution}_{\text{Per epoch}}$

D. **veSYNTH rewards:** SYNTH and syUSD

$$\text{Distributable veSYNTH rewards} \times \frac{\text{veSYNTH}}{\sum \text{veSYNTH}_a}$$

$\succ a =$ User 1, User 2, User 3, …

$\succ$ Distributable veSYNTH rewards $= (\alpha + \beta)_{\text{Per epoch}} + \gamma$

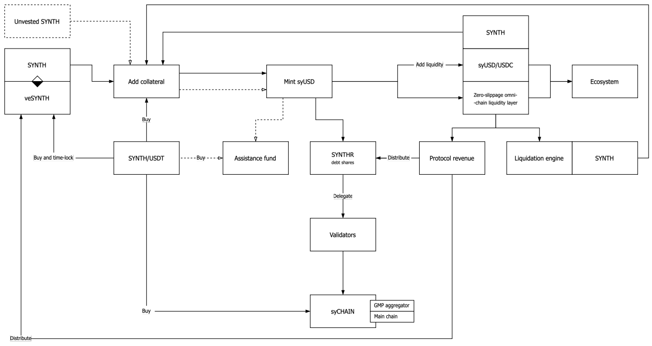
$\succ\succ \alpha =$ Tokenomics rewards distribution

$\succ\succ \beta =$ Protocol revenue distribution

$\succ\succ \gamma = \sum \text{Unclaimed distributable veSYNTH rewards}_a$

$\succ\succ\succ a =$ User 1, User 2, User 3, …

IV. **SYNTH utility**



- Collateral
- Farming rewards
- Flagger fees
- Gas fees
- Liquidation rewards
- Liquidator fees
- veSYNTH rewards
- veSYNTH

V. **veSYNTH**

Time-lock SYNTH for veSYNTH.

$$\text{SYNTH} \times \frac{\text{Time} - \text{lock}}{4 \text{ years}}$$

$\succ$ Time − lock = $\text{Timestamp}_{\text{Unlock date}} - \text{Timestamp}$

A. **veSYNTH benefits**

- Early access to ecosystem private sales.
- Exclusive airdrops from ecosystem protocols.
- Protocol governance and boosted voting power.

B. **veSYNTH rewards**

- **Protocol revenue distribution:** syUSD
- **Tokenomics rewards distribution:** SYNTH

Risk mitigation

I. **Consensus layer risk**

[Protocol, I, B, 2]

II. **Insolvency risk**

- [Protocol, I, A]
- [Protocol, I, A, 2]

III. **Oracle risk**

[Protocol, I, B]

IV. **Security risk**

The protocol conducts periodic bug bounty programs, performs regular external and internal audits, and provides comprehensive protocol insurance.

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