

Kopio Protocol Litepaper

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1. Introduction

Kopio is a novel synthetic asset protocol that enables creation of synthetic assets. The assets are called Kopio Assets and they give exposure to an underlying asset without owning it. Kopio Assets are overcollateralized or backed by an equivalent amount of the underlying asset at all times.

The fundamental model of Kopio is inspired by the collateralized debt position (CDP) introduced by MakerDAO in their decentralized stablecoin DAI. It is an overcollateralized lending contract where deposited collateral value is used to back the borrowing of other assets. The model has proved its resilience in the DeFi ecosystem for years.

Kopio expands on this concept with two distinct CDP models, complemented by the ability to acquire Kopio Assets outside of borrowing, enabling a capital efficient market for each Kopio Asset.

2. Overview

The protocol allows whitelisted collateral asset deposits. The collateral is used to mint new Kopio Assets, incurring debt that locks the partial or full value of the collateral. The debt is repaid by burning the minted Kopio Assets out of circulation, unlocking the collateral backing it.

Both CDP models in Kopio use this same general process. An individual collateralized debt position (ICDP) works on an account basis while the shared collateralized debt position (SCDP) is a global, pooled position that allows native exchange of Kopio Assets.

Kopio Assets can be directly created outside of a CDP if a reputable representation of the underlying asset exists on-chain. In this case, the underlying is wrapped to an equal amount of the Kopio Asset, which can then be unwrapped by burning the Kopio Assets.

Finally, the protocol includes a special stable asset, ONE, to onboard stablecoins into the system without overcollateralization or liquidations.

2.1 Terminology

This section explains concepts used later in this document.

2.1.1 Collateral Factor (cFactor)

cFactor is a fraction between 0 and 1, used to calculate the Risk-Adjusted Price of a

collateral asset. Higher asset volatility means it could have a lower collateral factor, reflecting increased risk.

2.1.2 Kopio Asset Factor (kFactor)

kFactor, ranging from 1 to infinity, determines the Risk-Adjusted Price of a Kopio Asset. Higher kFactor signifies greater risk in the underlying asset.

2.1.3 Deposit/Collateral Value

Deposit value is determined by the price, quantity, and cFactor of a collateral asset.

For example, if a CDP holds 1,000 USDC at a price of \$1.01 and cFactor of 0.99, the deposit value is \$999.90. Multiple assets contribute to the total deposit value.

2.1.4 Debt Value

Debt value is driven by the price, quantity, and kFactor of a borrowed kAsset.

If a CDP borrows 1 kTSLA at \$1,000 with a kFactor of 1.05, the debt value is \$1,050. Total debt value combines various borrowed assets.

2.1.5 Collateral Ratio (CR)

CR is the ratio of a CDP's total deposit value to total debt value. For example, if a CDP has \$250 of collateral value with \$100 of debt the resulting CR is 250%.

2.1.6 Minimum Collateralization Ratio (MCR)

MCR is the minimum CR required to borrow new Kopio Assets. A CDP with a CR at or below MCR cannot create new Kopio Assets.

2.1.6 Liquidation Threshold (LT)

LT is the CR at which liquidations can occur. If a CDP's CR falls below LT, it can be liquidated up to the maximum liquidation ratio (MLR). This is equal to or below the MCR.

For example, with MCR at 150%, LT at 140%, and MLR at 141%, a CDP becomes liquidatable when its CR drops below 140%. It can then be liquidated such that the CR after liquidation is 141% or the MLR.'

3. Individual Collateralized Debt Position

An individual collateralized debt position allows an account to create new Kopio Assets. Each account has control over the management and risk of the position, meaning it can be isolated with a single collateral and debt asset, or a diverse strategy with multiple assets.

The same minimum collateralization ratio and liquidation threshold applies to all positions. The collateralization ratio of a position must be above the MCR to mint Kopio Assets; this ratio is increased when debt is repaid or more collateral is deposited.

A collateralization ratio below the MCR does not make a position liquidatable. This happens when the ratio is below the liquidation threshold, which is lower than the MCR.

3.1 Liquidation of an ICDP

Anyone can liquidate a position under the liquidation threshold by repaying debt of the position, increasing its collateralization ratio. The repayment value, plus a liquidation incentive, is seized from the collateral deposits and sent to the liquidator. The liquidator decides which asset to repay and the collateral asset to seize in return.

The liquidation incentive is a percentage that increases the seized value, it is configured per collateral asset.

4. Shared Collateralized Debt Position

The shared collateralized debt position allows different accounts to deposit into a single position. These pooled deposits are utilized as liquidity for zero-slippage swaps where Kopio Assets can be exchanged to an equal value of another Kopio Asset.

For example, Kopio Assets borrowed using the ICDP can be swapped to another Kopio Asset, translating to a short position on the borrowed asset. Conversely, using ONE or synth wraps to obtain Kopio Assets for a swap allows any Kopio Asset to be acquired without borrowing.

The shared position concentrates the liquidity of Kopio Assets while liquidity providers and traders avoid the downsides of a regular AMM, such as slippage, impermanent loss and fragmented liquidity. Accounts can participate in the SCDP as a depositor, trader and/or a liquidator.

4.1 Deposits

Shared deposits back debt accrued from swaps, which means deposits can be fully or partially locked at any given time. When the collateral is not used as backing anymore, it can be withdrawn.

The depositors are incentivized from swap fees, which are distributed equally and converted to the deposited assets. The fees are not used as collateral, meaning they can be claimed at any time and cannot be seized in a liquidation.

4.2 Swaps

Any account can utilize the collateral pool by swapping Kopio Assets it owns for an equivalent value of another Kopio Asset, minus a fee.

The account receives the desired Kopio Assets either as newly minted ones – incurring debt to the SCDP – or from available protocol owned collateral resulting from prior exchanges.

The assets provided by the trader in a swap contribute to repaying any outstanding debt tied to the specific asset.

4.2.1 Protocol Owned Collateral

Now, introducing the concept of protocol owned collateral: In the scenario where the asset has no existing debt, the provided assets become temporary deposits within the SCDP, marked as protocol owned collateral.

This temporary deposit serves as valid collateral subject to liquidation and a reservoir for subsequent swaps, offering an alternative to minting new assets and enhancing the efficiency of the protocol's capital utilization.

4.2.1 Fees

Swap fees are configured per asset and direction, thus the final fee percentage depends on the asset pair and direction taken.

4.3 Risk and Mitigations

Control of the SCDP is distributed amongst all participants. This comes with unique dynamics and risks the participants should be aware of.

4.3.1 Overall Depositor Risk

Most notable risk to the SCDP is depositors being unable to fully manage their risk, leaving them to rely on the protocols risk mitigation parameters. Since depositors are the counterparty for each trade, they bear the risk of adverse selection and rapid changes to the debt composition which might lead to liquidations. Because of this, the protocol is committed to align the incentives as such.

To mitigate risk of the depositors, the MCR used for the SCDP has a large difference to the liquidation threshold. As collateral is utilized by arbitrary trading and depositors can withdraw any non-utilized collateral, it shouldn't be a concern to hit the MCR.

4.3.2 Debt Composition

As the debt composition is more or less in flux, it can lead to overall volatility which can be difficult to hedge. Protocol has configurable limits for the debt quantity of each asset, expected to be very low for new assets.

Further action can be taken by disabling specific swap direction for an asset pair, after which trades only happen in the direction that repays undesired debt.

4.3.3 Order Flow and Debt

In an ideal scenario the order flow of trades is balanced at all times, meaning debt is equally generated and repaid. In reality, the market sentiment can skew the order flow such that the majority of trades create debt, likely to lead into a scenario where the collateral is fully utilized for a longer period.

Traders are blocked from swapping in the direction of the market without an increase in collateralization of the SCDP, which also hinders the depositor yield.

Protocol can resolve extremes the same way as with the debt composition.

4.4 Liquidation Process

If the collateralization ratio of the SCDP falls below the liquidation threshold, anyone can repay debt owed, seizing an equal value plus incentive from the shared collateral. Any protocol owned collateral is seized before depositor assets.

The seized value is equally reduced from each depositors, eg. if a liquidation seizes 10% of all collateral, each depositor loses 10% of their principal deposit.

Anyone can liquidate the SCDP, it is incentivized by a configured liquidation incentive percentage for each debt asset. It increases the seized value when the asset is repaid in a liquidation. This compensates the liquidator for the effort while enabling control on the assets likely to be repaid.

5. Assets

Collateral assets and Kopio Assets have to be ERC-20 compliant tokens, which means they are supported by existing wallets and smart contracts. Assets also need price feeds from the supported oracle networks.

New assets are evaluated case-by-case with individual configurations and monitoring according to the purpose and risk profile.

5.1 Collateral Assets

Any asset with required price feeds can be a collateral asset, including Kopio Assets. However, any external collateral asset should be a reputable and popular asset with high liquidity to ensure reliable overall collateralization during volatility.

5.1.1 Types of Collateral Assets

The following is an example list of possible collateral assets:

- **Native Cryptocurrencies:** Assets native to the underlying blockchain, eg. ETH.
- **Stablecoins:** Assets pegged to a stable fiat currency eg. USDC, DAI.
- **Wrapped Cryptocurrencies:** Wrapped representation of a native cryptocurrency eg. WETH.
- **Synthetic Assets:** Protocol assets being supplied back to the protocol as collateral eg. kETH, kXAU.
- **Liquid Staking Derivatives:** Popular liquid staking tokens eg. stETH, rETH

5.2 Kopio Assets

A synthetic asset or Kopio Asset in the protocol is a derivative tracking the price of another asset or group of assets. This exposes the holder to an external asset without owning it. New Kopio Assets are minted as regular ERC-20 tokens and can be freely used outside of the protocol.

Each Kopio Asset is evaluated, deployed and configured separately. One asset could be swappable in the SCDP but not mintable from the ICDP, or one is depositable as collateral into an ICDP while another is not.

5.2.1 Types of Kopio Assets

The following provides a list of example Kopio Asset types:

- **Stocks:** Assets traded on traditional exchanges eg. AAPL, TSLA.
- **Commodities:** Liquid commodities such as gold, silver, oil.
- **Synthetic Crypto Assets:** Synthetic representation of crypto assets eg. ETH, BTC.

5.2.2 Stock Splits and Stock Merges

Kopio Assets handle stock splits and merges gracefully. Asset balances can be rebased using a positive or a negative rebase index. This adjustment instantly reflects in the account balances and protocol valuations and no user action is required.

5.2.3 Dividends

The synthetic assets created through the protocol do not pay any dividends.

5.3 Asset Valuation

The protocol denominates all values in USD. The prices are obtained from one or more oracle providers which determine the price from multiple sources.

Each asset has a primary and a reference price source which correspond to different oracle networks. Deviation is measured before using the primary price. If the deviation is higher than the configurable percentage threshold, any action is rejected, which is also the case for a stale or missing price and when an L2 sequencer is down.

5.3.1 Supported Oracle Networks

Currently the protocol supports the following oracle networks: Pyth, Chainlink, and API3.

6. ONE

ONE is a special stable Kopio Asset in the protocol. It is created through a vault mechanism to enable a capital efficient entrypoint for stablecoins like USDC without the drawbacks of a CDP system such as overcollateralization and liquidations.

6.1 A Multi-Token Vault

A multi-token vault is a novel ERC-4626 derivative by Kopio. It allows depositing one or more external assets to receive an equal value of vault shares, represented as regular token balance. The shares can be burned out of circulation to receive an equal value of the deposits in return.

A vault share represents a right to redeem an equal value of deposited assets available in the vault. This means the exchange rate of one share is equal to the total value of deposited assets divided by total supply of shares. Deposited value is tracked using price feed configuration for each deposit asset.

6.2 The ONE Vault

ONE has its own vault contract, the ONE vault. It only accepts stablecoin deposits, which could be eg. bridged USDC and native USDC, this would mean ONE mirrors the price and volatility of USDC. If DAI was added, and deposits consisted of 50% DAI, 25% USDC, 25% USDC.e, 1 ONE would represent exactly 0.5 DAI, 0.25 USDC and 0.25 USDC.e..

7. Direct Conversion/Synth Wraps

Whenever an underlying asset has a reputable representation on-chain it can be enabled for direct wraps between the Kopio Asset, which is called a synth wrap.

A simple example of this would be allowing Ether or Wrapped Ether to be directly converted into a Kopio Asset representing Ether.

8. Conclusion

The Kopio Synthetic Asset Protocol is a nuanced approach to synthetic assets with a flexible architecture revolving around risk mitigation and capital efficiency, catering to various use cases.

The dual CDP model offers versatility and amplified liquidity, allowing anyone to engage in strategic action using a common ruleset. Different levels of control, participation and incentives ensure depositors and traders can collaborate seamlessly.

The stable asset ONE, introduces an alternative to traditional stablecoin entry points. The multi-token vault used by ONE is a seamless way to engage in a stable Kopio Asset without the constraints of overcollateralization or fear of liquidation.

With ONE and synth wraps, the protocol significantly increases its capital efficiency while reducing friction, further enabling an accessible and predictable liquidations market that is fundamental to the protocol.

To ensure robust asset valuations, Kopio integrates prominent oracle providers like Pyth, Chainlink, and API3. Using multiple sources for validation fortifies the protocol against inaccuracies and latency, allowing for a reliable experience.