

**mSTABLE**



**Meta Vaults:  
Composable Yield  
Architecture**



**LITEPAPER**

# **Index**

Abstract	02
A retrospective	03
Yield ecosystem overview	04
On and Off-chain Components	05
On-Chain: Meta Vaults	06
Type of Vaults	08
Basic Vaults	08
Multi Asset Vault	09
Meta Vault	10
Off-chain: Rebalancer	11
Conclusion	12

# Abstract

**This Litepaper identifies and suggests a solution to a problem that exists in the current decentralised finance (DeFi) ecosystem: fragmentation of yield.**

Users have too many choices when it comes to yield-bearing contracts and often are not able to profit from a wide variety of yield products: the ecosystem is complicated, research is time-intensive and it is costly to allocate positions to multiple yield sources. Every user has to solve this on their own behalf, with varying success.

The proposed smart contract architecture solves this at a protocol level: A Meta Vault™ that is composed of other yield-bearing Vaults, which allows users to earn a yield from diversified sources of yield with only one contract to interact with. A Meta Vault is also adaptable to market conditions by shifting the allocation of assets from one underlying Vault to another allowing users to benefit from new yield sources with no switching cost while remaining diversified and protocol agnostic.

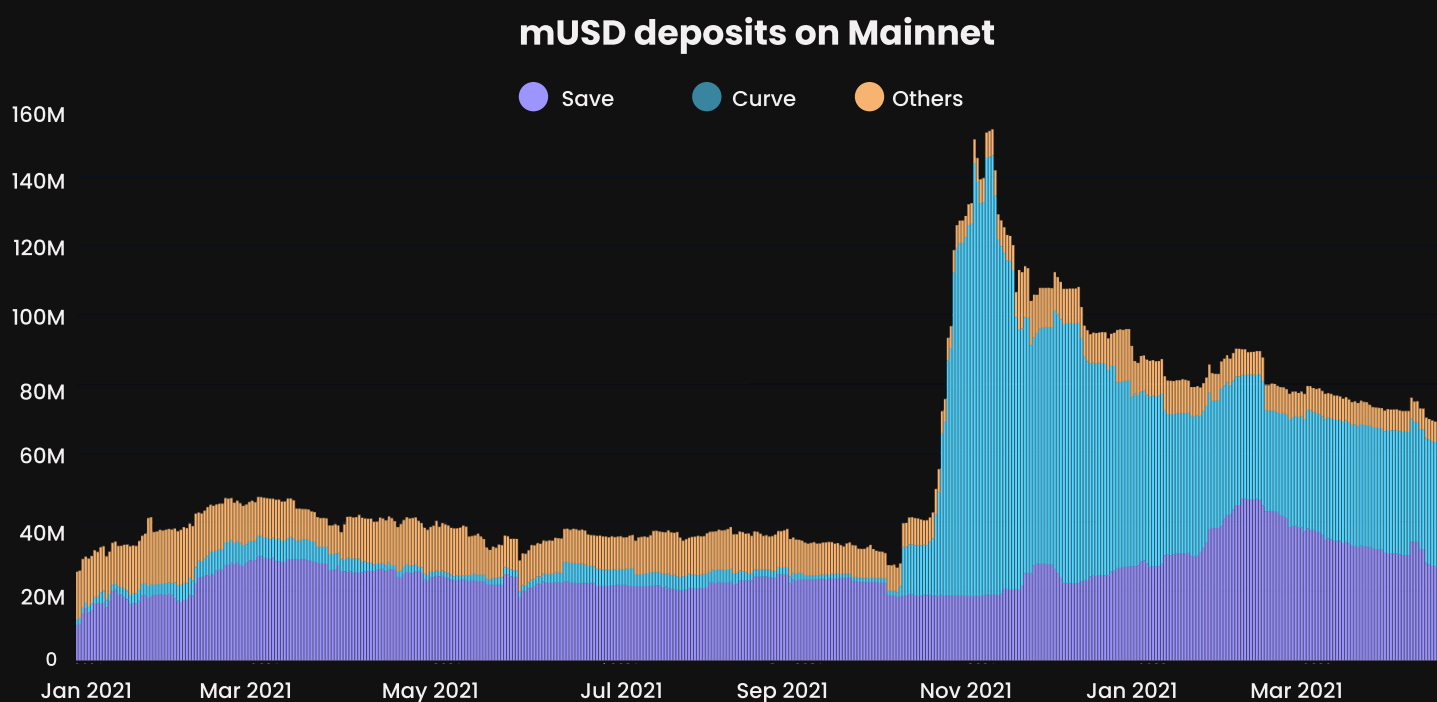
The highlighted Meta Vaults are the first step to fundamentally move the ERC-4626 standard forward and allow for the creation of new products that are easier for users to interact with, while also allowing protocols to have easier access to composable yield. This could spark a whole new set of products for managed or automated, diversified, and adaptable yield-bearing vaults.

## A retrospective

mStable launched in early 2020 before decentralised finance (DeFi) summer with a new concept to solve among other goals the fragmentation of same-pegged assets.

At that time, numerous of these assets existed and mStable introduced the novel concept of Meta Assets (mAssets), which combine multiple same-pegged assets into one.

However, the DeFi landscape changed and continues to change at a rapid pace; more stable assets emerge, and mStable's Save product for earning a yield turned out to become the dominant use case of the protocol. So much so that today the majority of users on Ethereum mainnet seek to mint the most popular mAsset, mUSD, just to deposit in either mStable's Save or in the mUSD3CRV (Curve or Convex mUSD/3Pool) pool which receives incentives on its own (see figure).



The initial goal of solving the fragmentation of same-pegged assets morphed with the growth of DeFi into a new set of challenges for DeFi users: **overload with too many options and fragmentation of yield sources.**

Today, there are more yield sources than ever before, and some are highly correlated to market conditions. Many of these new yield sources just repackage or wrap existing yield sources (e.g. Farming). Among these, mStable's Save stands out to this day because it offers an uncomplicated way to earn above-market rate returns on the most popular same-pegged assets in a sustainable and safe fashion.

# Yield ecosystem overview

**Yield aggregation products are essential to decentralised finance (DeFi) users, constantly looking for new opportunities to utilize and optimize their liquidity.**

Moreover, there is strong evidence supporting the product-market fit of yield aggregation projects: minimal reward token emissions to attract and support total locked value (TVL) combined with users' low sensitivity to double-digit performance fees (e.g. 20% in Yearn).

Very little innovation has been seen since the early 2020 DeFi summer Yearn Vaults and food token season. Each of the yield source providers expanded horizontally (i.e scaled by adding more protocols to the pool of resources) with minor specific improvements, and so far, no major innovation encapsulated the yield vertical as a whole (i.e scaled by adding more capacity to the existing building blocks).

More specifically, yield sources are evolving both on the quantitative side (the number of yield sources increasing) and on the qualitative side (the complexity and nature of yield sources strongly diversifying). In this environment of rapidly evolving sources of yield, users are maturing and expressing a general demand for sophistication and more elaborate yield aggregation products.

This demand for yield aggregation products is not solved at the current stage and is left to the user to self-manage, mostly due to the missing standardisation of contract interfaces.

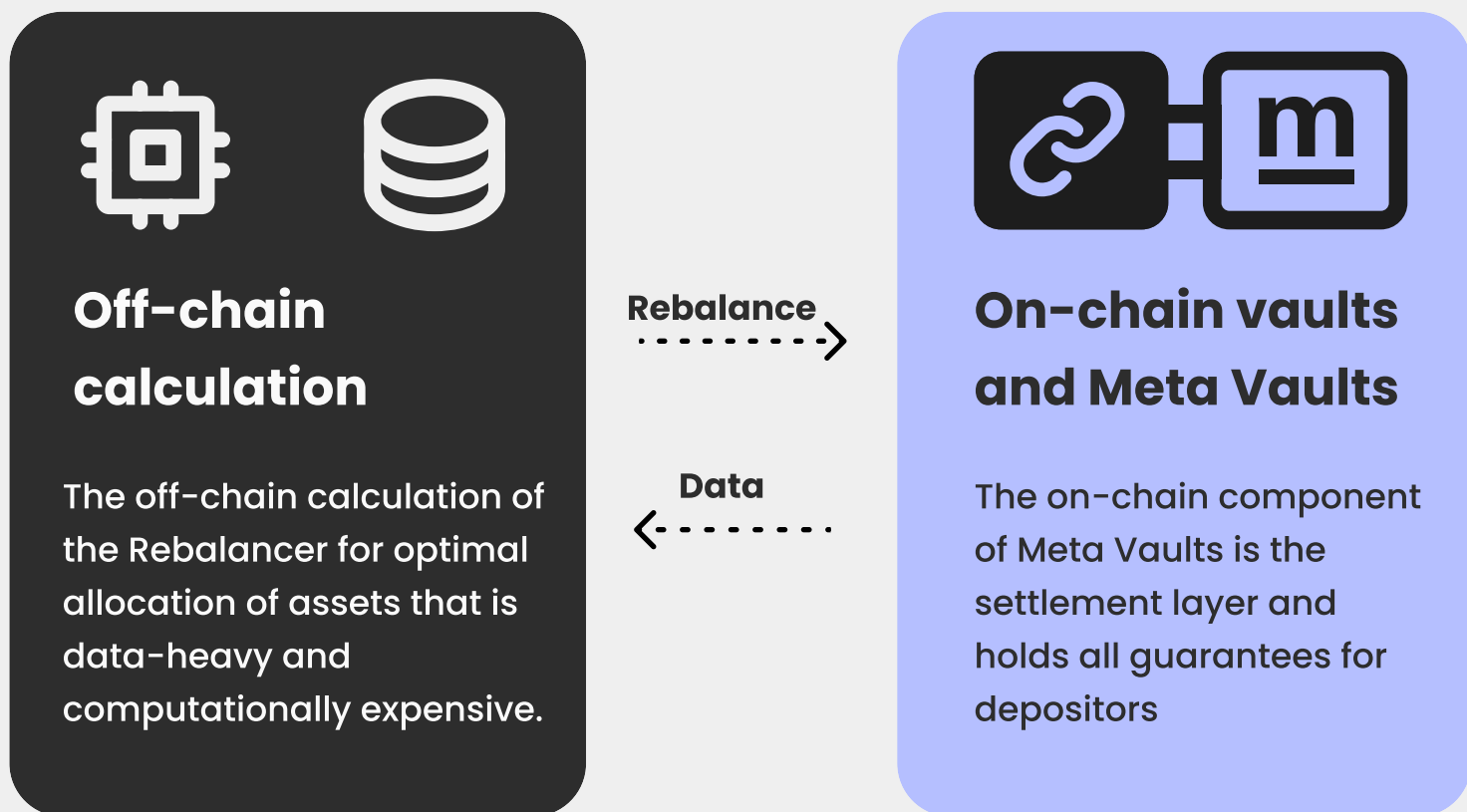
**The Meta Vaults structure described in this Litepaper focuses on an architecture that can solve the yield aggregation on a protocol level and mitigate the fragmentation of yield sources while leveraging the new yield-bearing token standard (ERC-4626) to make composable yielding vaults that are adaptable and diversifiable.**

# Meta Vaults Concept

**Block space is expensive and so is EVM runtime. Computing the optimal allocation of assets for a set of vaults is difficult to incorporate on-chain.**

Separating those two elements allows for far more flexibility, maximum guarantees, and decentralization while not compromising on the complexity of data-driven decision-making.

There are two main components to this:



# On-Chain Meta Vaults

**Meta Vaults combine, compose, and optimise multiple yield sources into standardised vaults and higher-order products while remaining open and interoperable at every layer of the stack. It's vaults all the way down.**

The on-chain architecture is a combination of various vaults which are implemented to conform to the ERC-4626 standard and can therefore be composable with anything that uses this standard. This opens up a lot of possibilities for combining multiple vaults into a Meta Vault.

The Meta Vault is at the top level and the product that a user would normally interact with. It can be a combination of various other vaults that are further described in the **Type of Vaults** section. The Vaults that the Meta Vault uses can also be added and removed, so it is adaptable to new yield sources and market conditions.

The allocation of assets or weights that are deposited in the Meta Vault can be then adjusted by the Vault Manager. The Vault Manager can initiate a rebalance among the existing set of Vaults within the Meta Vault, based on an off-chain calculation or Governance decision. A rebalance is essentially comprised of a withdrawal from one Vault, optionally swapping the asset if necessary and depositing it into another Vault that has been added to the Meta Vault.

## Meta Vaults have the following benefits:



**Composability** due to its full ERC-4626 support



**Easy on and off ramping** with one asset in and out



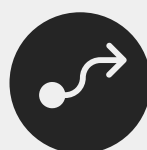
**Accessibility** to yield generating strategies



**Diversity in allocation** to mitigate risk



**Strategy adaptability** for new yield opportunities



**Flexibility for active managing** using data

# On-Chain Meta Vaults

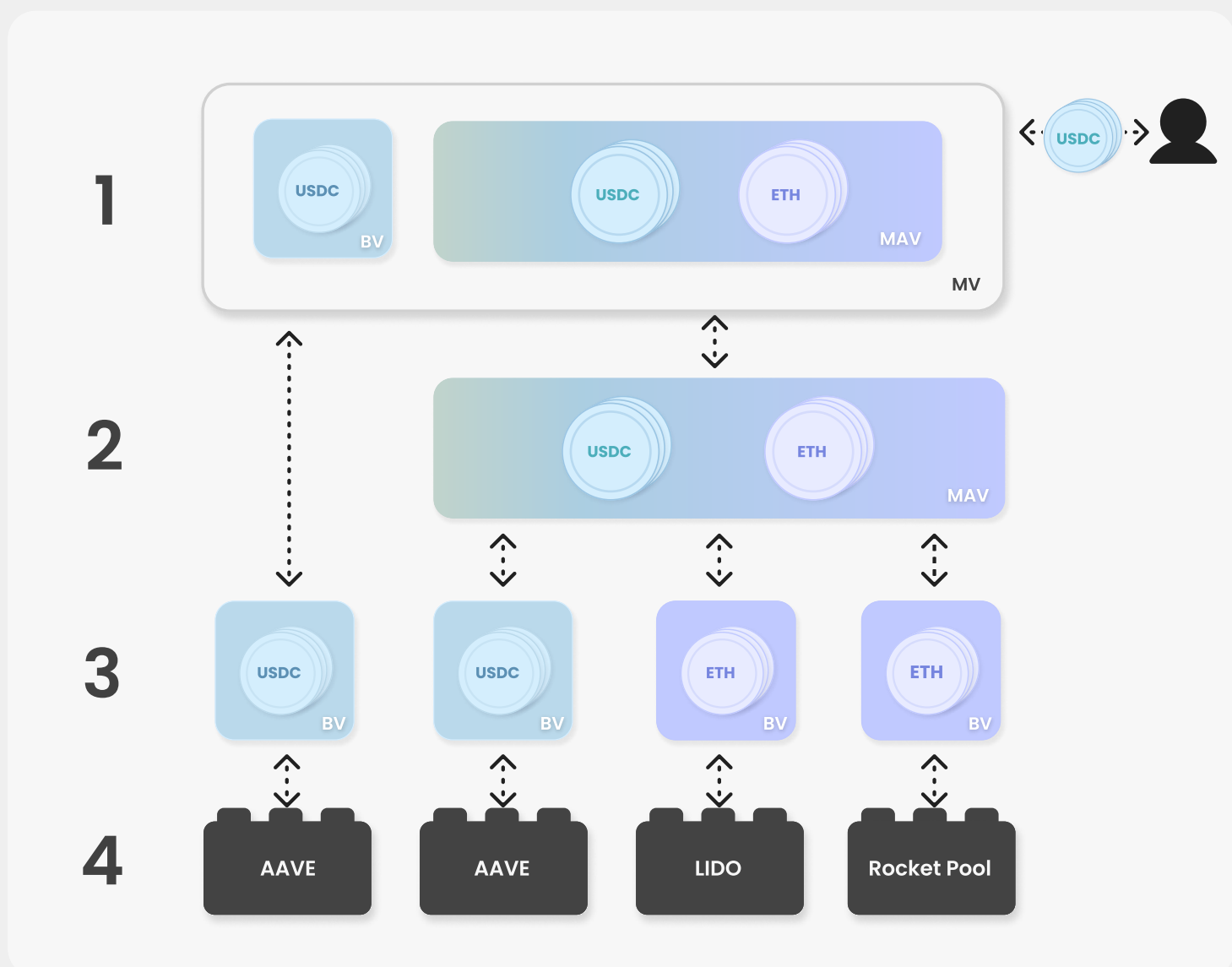
Let's break it down further using an example.

**1. Meta Vault:** The Vault that users would use. It's ERC-4626 compliant and offers deposits and withdrawals from and to one single asset.

**2. Multi-Asset:** Vault aggregate multiple ERC-4626 compatible Vaults into one Vault. This Vault is not compliant with ERC-4626 because it accepts multiple assets for deposits.

**3. Basic Vault:** Wrapper for Vanilla protocols to allow interactions following the ERC-4626 standard (This step can be skipped in the future as more and more protocols follow the ERC-4626 standard).

**4. Vanilla:** (existing non-ERC-4626 Vaults) protocols earn a yield when depositing an asset. These are at this stage not compliant with the ERC-4626 standard.





# Type of Vaults

**A Basic Vault is the simplest building block for composable yielding Vaults.**

It follows the ERC-4626 standard and accepts exactly one asset (e.g. USDC) and sends back shares of the Vault. Upon redemption, the asset is sent back and the shares are burned. The asset that is deposited can then be used in a strategy to generate yield. In a simple case, a lending market such as Aave can be integrated or wrapped to deposit the asset into the market and earn a return. In a more elaborate strategy, the Vault itself can have the functionality to earn a return.

A Basic Vault might also have additional functionalities to adjust the function of this component, depending on the use case and the requirements. Such additional functionalities could include a cache, a cap on deposits, a fee, etc.

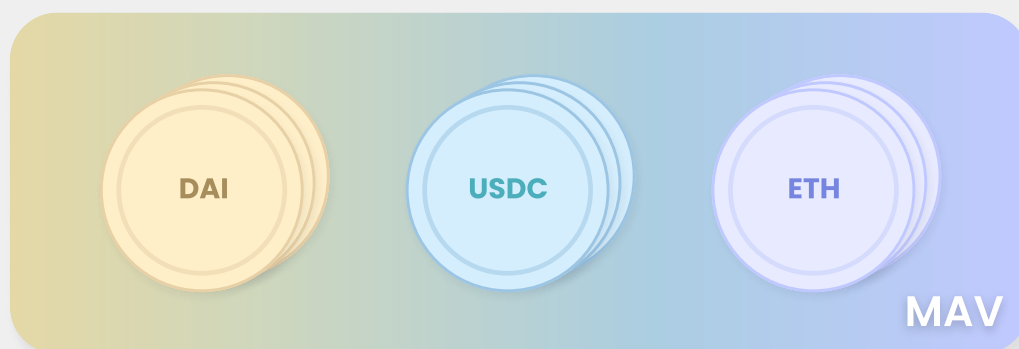


# Type of Vaults

**A Multi Asset Vault is a layer that can aggregate multiple yield sources into one.**

This Vault could accept diverse assets like USDC, DAI, WETH etc, and use various underlying yield sources at the same time (other Basic Vaults or any other ERC-4626 compliant contracts in the ecosystem). This allows for the creation of composite strategies for yield diversification. This Vault is similar to the ERC-4626 standard but has slight modifications to handle multiple assets.

A Multi Asset Vault could also allow adding and removing underlying Vaults, making it adaptable to incorporate new yield sources or remove stale opportunities. Additionally, it can rebalance the assets among the used Vaults, which in most cases requires a swap in assets. Other capabilities can be added as well, such as a cache, a cap on deposits, a fee, etc.

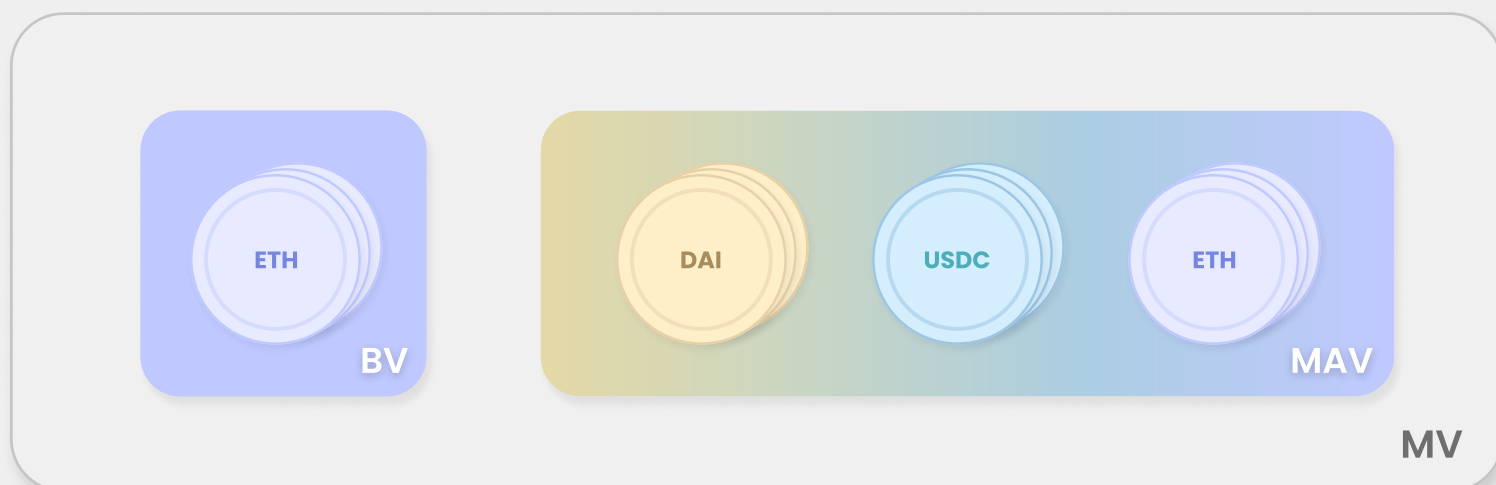


## Type of Vaults

**A Meta Vault is composed of either Basic Vaults, Multi Asset Vaults, other ERC-4626 compliant contracts, or any combination of them.**

Unlike the Multi Asset Vault, this the Meta Vault is ERC-4626 compliant and therefore offers the users the easiest path to allocate their assets or for protocols to integrate - one asset in and out using a standardised interface.

A Meta Vault is also adaptable and allows adding and removing underlying Vaults. Additionally, it can rebalance the assets among the used Vaults. Other capabilities could include a cache, a cap on deposits, a fee, etc.



# Off-chain rebalancing calculation

**The other side of the architecture is the off-chain Rebalancer. This is a way to efficiently calculate the optimal amount to allocate to a Vault that is used within the Meta Vault or Multi Asset Vault.**

The Vault Manager can initiate these rebalancing transactions in order to optimise the return for the Vaults or to keep the Vault diversified.



## Rebalancing with target weights

Shifts the allocation from one vault to another vault in order to follow a set of target weights. The weights themselves can be adjusted such as exposure increases for one Vault and decreases for another.



## MAX-Yield Rebalancing

The main goal is to allocate the assets to a set of Vaults in order to maximise the yield. For this, the on-chain data needs to be monitored and based on fluctuations in return or other deposits, balances shifted among the set of Vaults.



## Active Management

A very hands-on strategy is to actively manage the allocation of the Vaults. This would allow for hand-picked allocation to opportunities before they are noticeable in a market or for diversification of yield.

Other strategies can be incorporated as well as the Vaults are agnostic and allow for any decision to be reflected in the Vaults allocation.

## Conclusion

**The described architecture of Basic Vaults, Multi Asset Vaults and Meta Vaults is a first step to innovating with the ERC-4626 standard by extending the functionality and combining multiple ERC-4626 yield-bearing Vaults into one while preserving the ERC-4626 interface at the top level.**

It allows for building new products that can use multiple and diversified yield sources that are also adaptable to market conditions. This could empower a wide range of new yield strategies that can be either actively managed or automated.

At the same time, it abstracts the complexities away from users or protocols that want to earn a competitive yield without the need to be constantly monitoring the market and moving and adjusting allocations. Users and protocols would simply interact with these novel Meta Vaults and the set of underlying Vaults would generate the yield on their behalf.

This concept leans further into an easy to use "Savings Account for DeFi" that could potentially power the next wave of startups focuses on DeFinTech (Decentralised FinTech). This set of Vaults solves the fragmentation of yield and forms a new savings layer for DeFi that vertically integrates yield products.