

# High Level Technical Overview of Vessel Protocol

Vessel tokens aim to represent the value of an underlying mutual fund akin to an ETF token, and as a result we can assume the following:

$$\text{value of vessel token} = \left( \sum_{i=1}^n \text{ratio of token } i \text{ in fund} \right) * \text{value of vessel token}$$

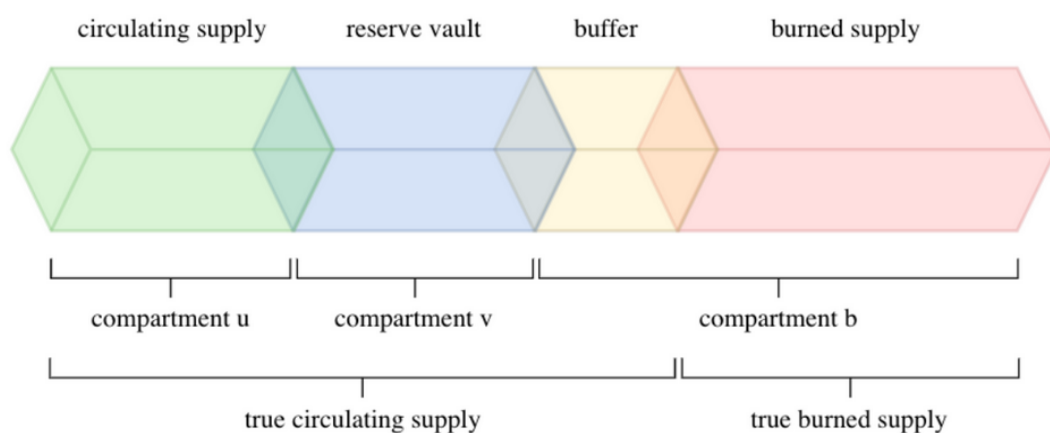
Let us now also represent the change in the value of the vessel token and the change in value of the underlying mutual fund between two epochs, which are currently affixed to 7 days:

$\Delta t$  := inter-epoch change in vessel token value

$\Delta w$  := inter-epoch change in underlying fund's value

The fundamental aim is for  $\Delta t$  to mirror  $\Delta w$  to the highest degree possible, however before we proceed it is important to note that the current iteration of the protocol is loosely coupled, something we aim to fix with our second iteration based on Seigniorage shares.

Currently,  $\Delta t$  mirrors  $\Delta w$  by relying on altering the supply of the token and assuming supply is unitary elastic (i.e. a percentage change in supply results in an equivalent percentage change in price of an asset), which is an ideal scenario. To that end, at the end of an epoch, tokens are either minted or burned from the circulating supply. Please refer to the diagram below:



In the above figure, compartment u is representative of user supply, compartment v is representative of a reserve vault of assets, and compartment b is representative of the burn compartment.

In the event that tokens are to be burned, tokens are thus to be placed into compartment b. Throughout an epoch, taxes shift tokens from u -> b and, should the deltas not match, additional tokens are burned from the compartment of reserve tokens in the vault v -> b.

In the event that tokens are to be minted, they are to be placed back into circulating supply. The true circulating supply consists of compartments u and v, and as a result, tokens are transferred b -> v and, if the vault is full (its ratio is maximally 1:1 with the supply held by the users), v -> u.

In order to avoid the rather wild possible fluctuations (as is common in the world of cryptocurrencies) at the early stages of the protocol release, rebalancing won't be computed for four epochs in an "accumulation" stage and all transfers between compartments will be capped at a ratio relative to the size of compartment |v|. This ratio will grow until it gradually reaches its maximum value and the price behaves in a more stable manner as the user base grows to its core adopters.

The buffer in compartment b is representative of the accessible portion of the burn wallet that can be utilised to mint the burned "buffering" supply back into circulation if needed. It is affixed at  $|b| - \frac{1}{4} * \Sigma$  (all transaction taxes).

What results is something akin to a wrestling match between the compartments whilst trying to mimic the price action of the underlying fund to the best possible degree. Some important things to consider include our voting algorithm which is available in our yellowpaper to allow the fund and allocations within it to be shaped, the emphasis that this is, once again, a loosely coupled system aimed at deflation equally as much as it is at value mirroring, and the fact that we are shifting to a Seigniorage-based system to fully mirror the value of the fund in "real time."

The persistent deflationary pressures that are in-built to the protocol are automatic staking rewards for holding through reflection mechanisms (the background is quite long and thus in the yellowpaper) and a tax on all transactions to further incentivize holding. The tax serves to bolster the locked liquidity on a DEX of the token supply, to reward users, and to burn tokens into the burn compartment as mentioned above.

Lastly, Vessel can be deployed on any EVM-based network, however interactions with the smart contract cannot be called at any arbitrary time from within itself without the use of third party services such as Chainlink Keepers, and as a result rebalancing the epochs must be done externally. An incentivization scheme to involve the community has been created for this purpose, whereby the first wallet to trigger the smart contract call to rebalance the token after an epoch ends in a new epoch will be rewarded with 0.01% of the Vessel supply as per the diagram below:

