

# Lybra Protocol

## The First Interest-Bearing Stablecoin

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### 1. Abstract

Our primary objective is to establish eUSD as an interest-bearing, secure, and fully decentralized stablecoin that functions as a genuine crypto bank account for its holders, independent of any government or authority.

By amalgamating LSD yields and generating superior returns through a robust DeFi mechanism, we strive to emerge as the leading ETH staking yield protocol, ultimately promoting the accumulation of ETH and diversified LSD assets.

### 2. Introduction

The Lybra Protocol is a groundbreaking decentralized protocol designed to bring stability to the volatile world of cryptocurrency. Built on LSD (Liquid Staking Derivatives), the protocol initially leverages Lido Finance-issued ETH proof-of-stake and stETH as its primary components, with plans to support additional LSD assets in the future. The protocol's primary objective is to provide the cryptocurrency industry with a safer, more decentralized stablecoin, eUSD, which offers stable interest to its token holders. As a DeFi protocol, Lybra facilitates the minting of eUSD by allowing users to borrow against their deposited ETH and stETH. eUSD, being an ETH-assets-over-collateralized stablecoin, offers users the security and stability necessary for conducting their business with confidence. A distinctive feature of the Lybra Protocol is that users can earn regular stable income by holding minted (borrowed) eUSD, which is powered by the LSD (Liquid Staking Derivatives) income generated from the deposited ETH and stETH. In other words, when users deposit ETH or stETH and mint eUSD against them, they receive a stable income in stETH of approximately 5%, which is converted to eUSD through the protocol and distributed to them.

### 3. How it works

#### 3.1 eUSD Generating Stable Interest

eUSD implements most of the standard EIP-20/ERC20 token methods with slight modifications as follows:

eUSD balances are dynamic and represent the holder's share in the total amount of Ether controlled by the protocol. Account shares aren't normalized, so the contract also stores the sum of all shares to calculate each account's token balance which equals to:

$$eUSD_{Balance(x)} = \frac{shares(x)}{\sum_{i=1}^n Shares(i)} \times eUSD_{TotalSupply}$$

For example, assume that we have:

```
getTotalMintedeUSD() -> 1000 eUSD
```

```
sharesOf(user1) -> 100
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sharesOf(user2) -> 400

Therefore,

balanceOf(user1) -> 2 tokens which corresponds 200 eUSD

balanceOf(user2) -> 8 tokens which corresponds 800 eUSD

Since balances of all token holders change when the amount of total supplied eUSD changes, this token cannot fully implement ERC20 standard: it only emits Transfer events upon explicit transfer between holders. In contrast, when total amount of pooled Ether increases, no Transfer events are generated: doing so would require emitting an event for each token holder and thus running an unbounded loop.

getTotalMintedeUSD() is implemented in contract Lybra.sol and returns the total circulation calculated based on time and baseAPY, with the return value as follows,

The rebase mechanism enables the number of eUSD held by users to increase automatically over time by baseApy.

For example, assume that we have:

getTotalMintedeUSD() -> 10000 eUSD

sharesOf(user1) -> 1000

sharesOf(user2) -> 4000

baseApy -> 2%

lastReportTime -> 2023/3/15 00:00:00

now -> 2024/3/15 00:00:00

Therefore:

getTotalMintedeUSD() -> 10200 eUSD

balanceOf(user1) -> 2 tokens which corresponds 2040 eUSD

balanceOf(user2) -> 8 tokens which corresponds 8160 eUSD

### 3.2 Collateral Rate

The collateral rate is the ratio between the dollar value of your collateral in the Lybra Protocol Vault and your loans in eUSD. The equation is:

$$R_{collateral} = \frac{Deposited_{ETH} \times Price_{ETH}}{Borrowed_{eUSD}}$$

The collateral rate fluctuates over time as the price of ETH changes. You can influence the rate by adjusting your collateral and/or debt — i.e., adding more ETH collateral or paying off some of your debt.

Only when the collateral rate is below safeMintRatio is minting process permitted.

User will probably be liquidated if the collateral rate exceeds the badMintRatio.

### 3.3 global Collateral Rate

The global collateral rate is the ratio of the total value of all collateral in the protocol to the total supply of eUSD. The equation is:

$$Global_{collateral} = \frac{\sum_{i=1}^n Deposited_{ETH}(i) \times Price_{ETH}}{\sum_{j=1}^m Borrowed_{eUSD}(j)}$$

Global Collateral Rate falls below 150%, any user with a collateral rate below 125% may be fully liquidated. In this scenario, the liquidator only needs to pay X eUSD to obtain X \* (current collateral rate - 1%) from the liquidated borrower (minter), while the Keeper's reward remains at 1%.

### 3.4 eUSD Interest Rebase Design

When stETH balance increases through LSD or other reasons, the excess income is sold for eUSD to be distributed to all eUSD holders. According to the above equation, the additional stETH is exchanged for eUSD based on the current price, and the eUSD shares of the previous holder are destroyed. As a result, the balances of other eUSD holders increase due to the decrease in total shares.

Increment of eUSD per share =

$$I_{eUSD} = \frac{(B_{stETH} - D_{ETH}) \times P_{ETH} \times T_{shares}}{T_{shares}^2 - T_{shares} \times \frac{(B_{stETH} - D_{ETH}) \times P_{ETH} \times T_{shares}}{T_{eUSD}}}$$

\* $T_{eUSD}$  = eUSD Total Supply

\* $T_{shares}$  = eUSD Total Shares

\* $B_{stETH}$  = stETH Balance of eUSD Contract

\* $P_{ETH}$  = ETH Price

\* $D_{ETH}$  = User deposited ETH Amount

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#### For Example,

Alice deposits \$135,000,000 ETH and mints 80,000,000 eUSD

Bob deposits \$15,000,000 ETH and mints 7,500,000 eUSD

**Current eUSD circulation** = 80,000,000 + 7,500,000 = 87,500,000

**Current collateral** = \$135,000,000 + \$15,000,000 = \$150,000,000 stETH

**1 year later,**

LSD income = \$150,000,000 \* 5% = ~\$7,500,000 stETH

Bob uses his holding 7,500,000 eUSD to buy the increased stETH

**Service Fee** during the past 1 year = eUSD circulation (i.e. 87,500,000) \* 1.5% = 1,312,500 eUSD

**Dividends** 7,500,000 eUSD - 1,312,500 eUSD = 6,187,500 eUSD is distributed among all eUSD holders (aka. Alice)

**Current situation:**

Alice's collateral = \$135,000,000 ETH, debt = 80,000,000 eUSD, holding 80,000,000 + 6,187,500 = 86,187,500 eUSD  
**eUSD APY** =  $6,187,500 / 80,000,000 = \sim 7.734\%$

Bob's collateral = \$15,000,000 ETH, debt = 7,500,000 eUSD, holding 0 eUSD, and holding \$7,500,000 ETH

**Current eUSD circulation still** = 87,500,000

**Current collateral still** = \$135,000,000 + \$15,000,000 = \$150,000,000 ETH

### 3.4 Liquidation

When the global collateral ratio is  $\geq 150\%$ , users with a personal collateral ratio below 150% could be liquidated, with a maximum liquidation amount of half of their

$$\text{Liquidation Amount} = \frac{\text{Borrowed}_{eUSD}}{2}$$

At this point, the liquidator (composed of liquidation providers and keepers) will repay X eUSD on their behalf, and receive stETH amount =

$$\text{Liquidator Revenue}_{stETH} = \frac{x \times 110\%}{\text{Price}_{ETH}}$$

When the global collateral ratio is  $< 150\%$ , users with a personal collateral ratio below 125% can be fully liquidated, with a maximum liquidation amount equal to their borrowed eUSD(user).

At this point, the liquidator (composed of liquidation providers and keepers) will repay X eUSD on their behalf, and receive stETH amount =

$$\text{Liquidator Revenue}_{stETH} = \frac{x \times \text{Deposited}_{ETH}}{\text{Borrowed}_{eUSD}}$$

The chart below illustrates the variation of liquidation profits with changes in the global collateral rate:

