MUSE FINANCE

Concept Paper - Ver 1.0

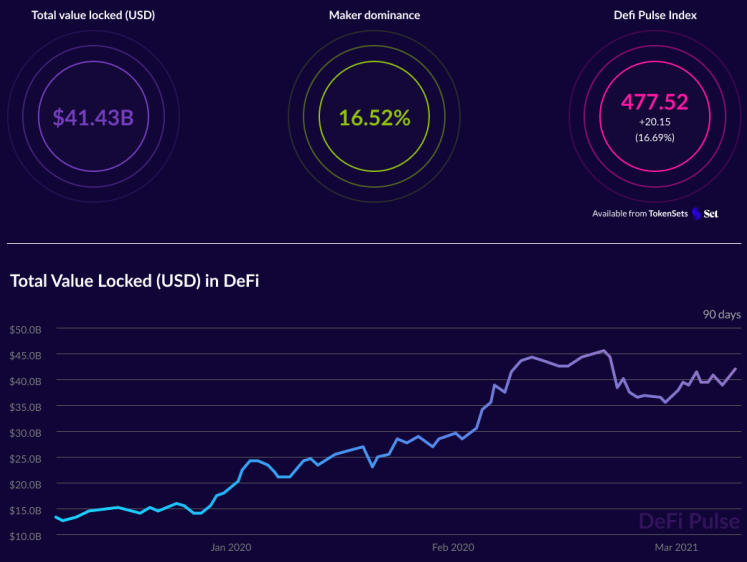
Authored by Shogo Ishida

1. Introduction

1.1. Executive Summary

The growth of the decentralized finance (DeFi) ecosystem in 2020 has been explosive, despite DeFi being an almost unknown concept in 2019. According to data from DeFi Pulse, while it took close to two years for DeFi deposits to reach USD 1 Billion in Total Locked Value (TVL) as of Q4 2019, it took less than six months (March to July 2020) for DeFi TVL to spike from ~USD 550 million to ~USD 4 billion (~727% increase). On 14 March 2021, the DeFi TVL saw the all-time-high at USD 45.97 billion (Source: defipulse.com).

A snapshot of Defi industry overall as on 25 March 2021:



Numbers derived and chart created based on the data from www.defipulse.com

The market cap of Proof-of-Stake (PoS) protocols as on 29 March 2021 is USD 450 billion and USD 127.66 billion locked in staking (Source: stakingrewards.com). In August 2020, it was forecasted that the value of staked assets would potentially surpass USD 100 billion in the next three - five years with the increasing adoption of PoS grows, but it was achieved within one year.

In traditional PoS staking, users are locked into contracts for a predetermined amount of time. In some cases, users must wait through an unstaking period before assets are returned to user wallets.

Currently, project token holders are faced with the daily dilemma that the token they hold might not have any yield mechanisms built into it e.g proof of stake rewards, or that the yield is not attractive enough compared to other project tokens, or if they do constant trading instead.

DeFi has successfully incentivized users to create large liquidity pools for DEXs and lending protocols for ERC20 tokens, hence making user experience as smooth as a centralized platform. Muse.Finance extends the same line of thinking into another type of yield generating assets, blockchain rewards provided by Proof of Staking ("PoS") blockchains. The staking reward is usually a fixed percentage in terms of the number of tokens staked. This creates a stable yield for token holders, and an appreciation opportunity when token price rises.

- By enabling the illiquid staked tokens to be transferable, ensures sufficient token in circulation and efficient price discovery on DEX
- Users can trade the staked tokens to secure their profit on the spot, avoiding the 7–28 days unbounding process (this however is due to on-chain security consideration against long-range attack)
- For users to have other ways of generating financial revenue other than staking reward while receiving staking reward
- Bridge between non-ERC20 chain and ERC20 chain in the beginning, and eventually enable to connect assets to many other chains
- Lending and leverage trading opportunity while staking

As we see a number of PoS blockchains are being more accepted in the market, Ethereum, the second largest PoW blockchain has launched its PoS beacon chain, marking its shift to PoS. Other blockchains such as Polkadot, Oasis, Solana also create constant double digit returns.

Therefore, Muse.Finance is brought here to enable a liquid PoS platform which can integrate erc20 DeFi ecosystem with Ethereum 2.0, starting from Caradano and expanding to Polkadot, Solana, Oasis, Terra, Centrality, etc.

1.2. Muse.Finance Overview

Muse.Finance will link non ERC-20 assets with ERC-20 ecosystem, allowing the owners of staked assets on platforms such as Cosmos, IRISnet, Cardano, etc. to participate in lending, liquidity mining, yield farming which will also benefit staking service providers for generating more revenue lines.

Muse.Finance is planning to issue a liquidity token called mToken (originated by Muse.Finance) to construct a pool with DEX which will allow the users to get the yield generating assets like mATOM, mADA, mIRIS, etc. carrying unit value and able to yield farming with the Muse.Finance platform.

In order to accomplish this, we will build bridges between the Ethereum network and other networks. We will then issue wrapped Token (ERC-20 token) in the Ethereum network to registered Ethereum addresses of users who stake ATOM, ADA, IRIS, etc. in each of the networks.

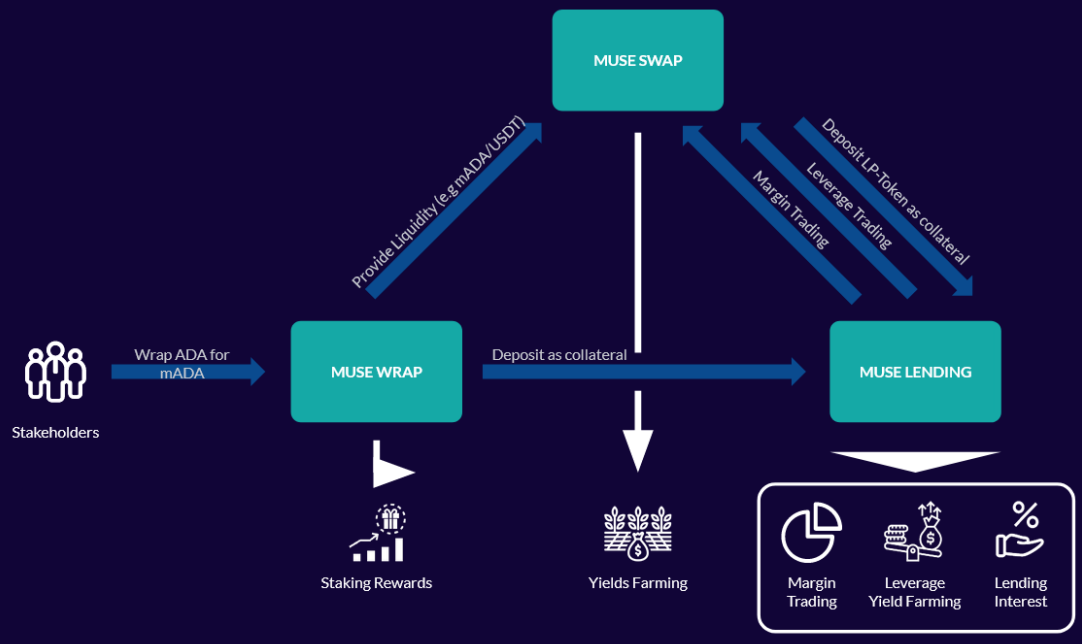
Let's take a look at a particular example for Cardano Network. In order to support the conversion from ADA to mADA in the Ethereum Network, we will build a relayer and bridge modules that will handle token deposit/redeem logic (ETH Smart-Contract and Cardano relayer). This allows users to convert from ADA in the Cardano network to mADA in the Ethereum network.

mADA holders will receive a reward proportional to the holding amount of mADA and the holding duration. The reward will be paid in mADA. The system will allow users to redeem mADA at any time with minimum delay.
For the sake of clarity, and as we are to launch this product starting from ADA token, all the information below would use ADA as an example. However, as mentioned, our target is not only ADA but all PoS tokens.

2. Muse Ecosystem

Swapping non-ERC20 to ERC20 (e.g, ADA to mADA) is not something new, but has been done by many existing projects in the Ethereum Defi ecosystem. The Muse.Finance is bringing more value than just a wrapping service. For the sake of clarity, the rest of this document will explain the Muse ecosystem in the particular case of ADA stakeholders.

The diagram below illustrates the ecosystem of the Muse.Finance, in which stakeholders could maximize their profits from their crypto assets.



In the diagram, the ADA stakeholders firstly join the Muse ecosystem by depositing their ADA using the Muse Wrapproduct. ADA stakeholders will get an equivalent amount of mADA, a wrapped token of ADA generated by Muse Wrap. Stakeholders could always get back their ADA by burning mADA at any time and receive the amount of ADA as the exact amount of burnt mADA.

Since the depositing and burning are processed automatically, in a decentralized manner, stakeholders do not need to worry about their assets.

The deposited ADA is staked to the Cardano network to receive staking rewards. These rewards are distributed to mADA holders in accordance with the amount of mADA in their balances. mADA holders could check the amount of staking rewards, and claim their rewards at any time. The rewards are distributed in mADA. So mADA holders are not bothered with swapping their rewards again. Hence, getting staking rewards while still being able to participate in the Defi world is the first benefit of mADA holders in the Muse ecosystem.

mADA holders could use their mADA to become liquidity providers of the Muse Swap, which is an AMM-based decentralized exchange (DEX) similar to Uniswap or Sushiswap. Similar to other DEXes, liquidity providers enjoy the yield farming profits from their assets deposited in the pools (and also suffer the risks). Still, they are able to enjoy the staking rewards proportional to the amount of mADA they added to the pool liquidity. In other words, being a liquidity provider, mADA holders do not give away their staking rewards, but have a chance to earn more income for each unit of their crypto assets. This is counted as the second benefit of mADA holders within the Muse ecosystem.

Furthermore, by adding liquidity to Muse Swap, mADA holders receive some LP tokens corresponding to the amount of mADA added to the pool. Notice that different swapping pools will issue different kinds of LP tokens. They are named differently. For example, the swapping pool between mADA and USDT will issue mADAUSDT token. mADA and USDT are the two component tokens of mADAUSDT. Similarly, the swapping pool between mADA and ETH will issue mADAETH, so on and so forth.

At any time, an LP token could be redeemed to equivalent amounts of its component tokens (e.g., mADAUSDT is redeemed to mADA and USDT). The redeeming follows predefined formulas managed by the pool smart contract. Thus the intrinsic value of LP tokens is transparent to the community.

The transparency of LP tokens's value is the base line so that it could be used as a collateral in a lending platform, say Muse Lending. Using LP tokens as collateral in Muse Lending, LP token holders could borrow other crypto assets without losing the staking rewards as well as the swapping commission bonus counted for their LP tokens. This is the third benefit of mADA holders.

Using this feature, aggressive holders could boost their profits given a fixed amount of assets. They could collateralize their LP tokens (say mADAUSDT) to borrow mADA and USDT. Then they use these borrowed assets to add liquidity to the swapping pool to earn more swapping commission

bonus so on and so forth. Still, they have to be aware of the risk of liquidation when the crypto prices are highly volatile.

The above mentioned benefits are what an ADA holder could achieve by joining the Muse ecosystem. However, the potential of the Muse ecosystem is not limited to those things.

The special design and the tight integration allow the Muse Swap to employ the spare part of its total liquidity as a lending source at the Muse Lending. This luckily does not impact the swapping commission of liquidity providers. The lending interest is distributed fairly to all liquidity providers as an extra bonus to their contribution to the Muse ecosystem.

The lending process is controlled automatically by the Muse Swap smart contract thanks to the decentralized Muse Lending protocols. This is to ensure that the lending activities will not impact the normal operation of swapping pools. Whenever there is a signal of lacking liquidity, the Muse Swap contract would cancel the lending and get back the liquidity to secure the swapping operations.

The lending process is not one-way. The algorithms inside the Muse Swap contract constantly monitor swapping pools' health. When certain criteria are met, they suggest that more liquidity should be added to particular pools to minimize the slippage[1]. The Muse Swap contract uses different assets as collateral to borrow required assets from the Muse Lending to secure the swapping pool.

Thanks to this two-way auto lending process, LP stakeholders are benefited indirectly, say extra lending benefit and reduced risk of impermanent loss.

The integration between Muse Swap and Muse Lending could leverage stakeholder activities. Muse Lending supports leverage yield farming, in which stakeholders collateralize their assets (e.g., mADA, USDT) and ask Muse Lending to add liquidity to Muse Swap on their behalf. The amount of added liquidity could be higher than the collateral.

Moreover, Muse Lending enables its users to do margin trade on Muse Swap in the similar way. In the margin trade mode, a user opens an account within Muse Lending. He then deposits his crypto assets to borrow more tokens to start trading. The collateralized assets and borrowed assets are locked and managed Muse Lending. Muse Lending will do the trades on behalf of users.

Thanks to these uniqueness features, stakeholders could earn more profit per each unit of their crypto assets.

In short, by wrapping ADA to mADA, stakeholders could have following benefits at the same time:

- Staking rewards for each mADA (calculated and distributed via Muse Wrap).
- Swapping commission rewards (yield farming) for providing liquidity to Muse Swap.

[1] High slippage results in high impermanent loss for liquidity providers

- Lending interests for providing liquidity to Muse Lending.
- Margin trading
- Leverage yield farming

3. Our Technology

3.1. Cross-Chain Technology

Cross-chain data exchange is the problem to transfer data from one blockchain (source chain) to another blockchain (target chain). Source chain and target chain could be based on either the same platform (e.g., blockchains that are forked from the Ethereum repository are considered the same platform), or completely different platforms (e.g., Bitcoin and Ethereum).

Among popular names in the cross-chain projects, Cosmos and Polkadot are the two representatives. Cosmos aims to provide SDK to quickly develop blockchains by composing common components (e.g., consensus component) and application-specific components. Since the core components are shared, Cosmos SDK-based blockchains could be able to share data seamlessly. On the other hand, Polkadot aims to link heterogeneous blockchains (e..g, bitcoin, ethereum,...) by treating these existing chains as virtual paralized chains thanks to the relay component inside Polkadot validators.

The key idea of cross-chain data exchange is to employ bridge servers (aka relayer components). A bridge server of two blockchains basically is a combination of nodes in two blockchains. So, a relayer could listen to events happening in both chains, and is able to recreate new transactions in one blockchain that mimic transactions in the other blockchain to forward data (e.g., token transfer) from one chain to another chain. This idea is applied in both Cosmos and Polkadot.

Obviously, depending on the kind of data, additional steps (and components) are developed to complete the exchange process. For example, to transfer tokens from one chain to another chain, the data to broadcast across chain is sender/receiver addresses, and amount of tokens (for account-based chains) or tokens' IDs to send (for UTXO-based chains).

3.2. Decentralization

Decentralization is a very important feature in the blockchain world. Users now no longer need to trust any single entity, but a community. Activities within the Muse.Finance are controlled by decentralized protocols, operated by open source software that removes human interaction while processing transactions, and thus prevents interference from any single entity.

Decentralization in the Muse.Finance is presented by enforcing important events with multisig, in particular. The depositing transactions relayed from the Cardano network are confirmed and signed by at least ⅔ of all Cardano relayers in order to be proceeded.

Another crucial point of decentralization in Muse.Finance is the deposit wallet. The deposit wallet keeps the users' assets. It therefore should not be controlled by a single entity. Ideally, the deposit wallet should be a fully decentralized wallet that no one could manipulate, but the predefined execution logic.

Such a decentralized wallet is a smart contract that could receive and transfer tokens, for example Ethereum smart contract. However many existing blockchains have not supported this feature thus far. Hence, an in-the-middle solution is a multisig wallet.

The multisig deposit wallet is controlled by a group of parties, called the key management consortium. Operations regarding the deposit wallet (e.g., transfer funds) require at least ⅔ of members to agree and sign on transactions.

Members of the key management consortium are elected at the beginning, but could be changed later e.g., a new member joins, and an old member leaves. In this case the deposit wallet will be updated to revoke the private key of the former members, and incorporate the private keys of new members.

There are some approaches for multisig wallets:

- Native multisig wallet supported by blockchains (e.g., Bitcoin),
- Smart contract,
- Advance cryptography techniques (threshold signature, multi-party computation,...)

The first two approaches require a native support from the blockchain platform. For example, the Bitcoin blockchain supports n-of-m multisig scheme, not smart contract; meanwhile, the Ethereum platform supports smart contract, not native multisig wallets.

The last approach, on the other hand, is blockchain independence and thus could be applied for most existing blockchains. However, this approach is complicated and requires more implementation effort.

3.3. Data Security

3.3.1. Confidentiality

Assets deposited to the deposit wallet are well protected. No single entity could manipulate the deposited assets, even the administrators of Muse Wrap's bridges. The minting and redeem

processes are controlled by open source smart contracts. This ensures the equivalent of the deposited tokens and liquidity tokens.

- Liquidity tokens are generated only when corresponding tokens are safely stored in the deposit wallet
- Deposited assets are staked in delegation mode, i.e., funds are always kept in the deposit wallet.
- Users could anytime redeem their liquidity tokens. The redeemed tokens are sent directly to the users' registered wallets. Only users with corresponding private keys could update their registered wallets.

3.3.2. Integrity

The data integrity in Muse Wrap is guaranteed in the asynchronous and distributed manner. Similar to other blockchain platforms, the data consistency and integrity among validators require certain delay to be synchronized. However, thanks to the consensus protocol, the data between nodes of Muse Wrap are synchronized. Any change made to the Muse Wrap requires approval of the majority of validators to proceed.

- Any deposit/redeem transactions in the source/target chain (e.g., Cosmos, Cardano,...) will be eventually relaid to the Muse Wrapping contract, even when all Relayers are temporarily down. When relayers are up, they will be synchronized with deposit transactions from the time they were shut down.

3.3.3. Availability

Availability is considered carefully in the design of the Muse Wrap. There is no single point of failure within the design. The failure of any single component/server will not impact the operation of Muse Wrap.

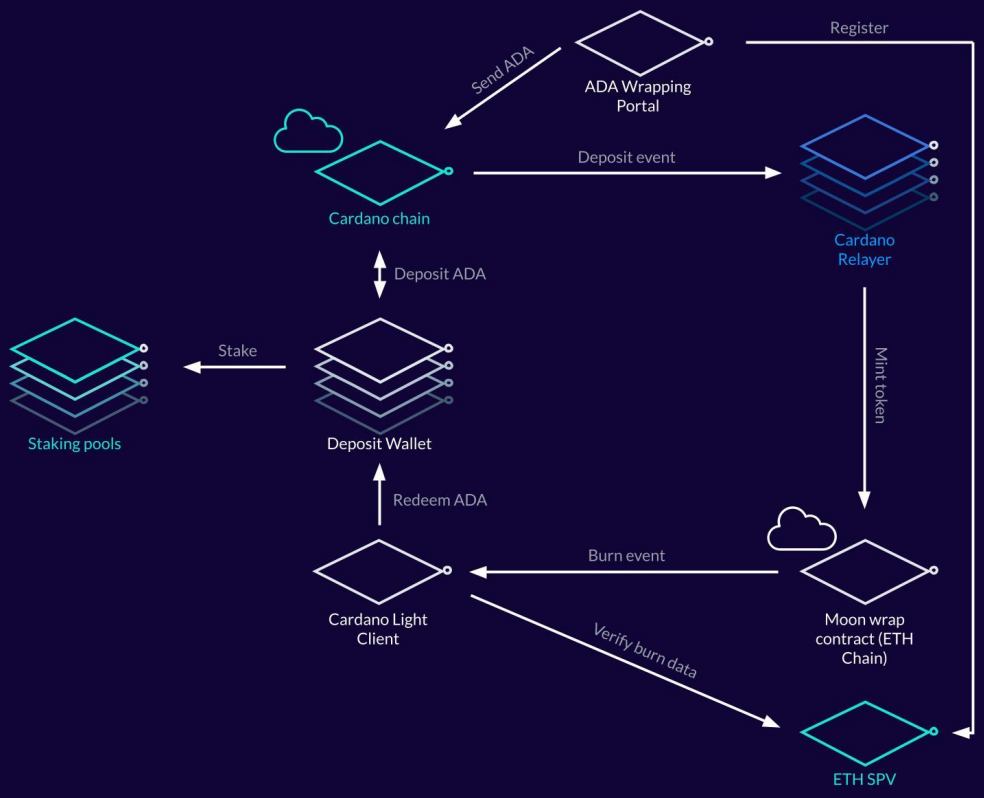
Every component has multiple instances running on different physical servers at different geographical locations. When an instance shuts down, multiple instances with the same functionality will take over. An alert message will be sent to the administrators to repair and restart the failed instance in the shortest possible time. The restart instance will be synchronized with others and get back to normal operation.

4. Muse Product Design

4.1. Muse Wrap / Burn

4.1.1 Technical Architecture

Muse Wrapper: this is the core function of [Muse.Finance] as described in the technology part and the illustration is as below:



This is the bridge function between non-ERC 20 assets and Ethereum ecosystem, and by expanding beyond the bridge function, Muse Wrap, to unlock the liquidity of the ERC20 staked asset class, and jointly contribute to the better Ethereum ecosystem.

The above figure presents the high level architecture of the Muse.Wrap This design addresses the use case as aforementioned that allows users to to transform their ADA, the native token in the Cardano network, into mADA, an ERC20 token. All the operations are done automatically without any human interaction, as well as human interference. This follows the basic principle of the blockchain world: decentralization. In which no single entity could control the operations of the system. All the transactions are logged and could be verified any time by the public community.

All components in the architecture are briefly described in the subsequent paragraphs with Cardano (ADA) as example.

- ADA wrapping portal: is the dApp for ADA holders to wrap/redeem ADA/mADA.
- Cardano chain: is the Cardano public blockchain. In this design, Cardano is a representative for a source chain, which could be replaced by (almost) any chains in practices.
- Deposit wallets: are to keep stakeholders' deposits. The wallets will release ADA to stakeholders when mADA is burnt.The private key of the deposit wallet is controlled by a committee.
- ADA relayer: listens to depositing transactions in the Cardano network to initiate the minting process.
- Muse Wrapping contracts: are the smart contracts for issuing mADA token, and managing the various operations regarding to mADA token e.g., minting, burning
- Cardano light client: listens to burning events of mADA to release ADA token to user wallets.
- Staking pools: are lists of third-parties that provide staking service. The Muse Wrap will stake user deposited tokens to these pools to generate rewards. As of now, only delegated staking is considered. This means the staking assets are still under control of the Muse Wrap, not staking pools.

4.1.2. User flow

This describes a basic flow of a user case of our platform.

- Alice visits the wrapping portal of the Muse Wrap to convert ADA to mADA. At the portal, she provides the amount of ADA to wrap (say, 100 ADA), and the ETH address to receive mADA.
- The portal checks if this is the first time that Alice wrapps ADA from her address, and asks her to sign on the registration transaction to ensure that she consents to both the ADA and ETH address.
    - The registration transaction includes the footprint of her ADA and ETH addresses, as well as the amount of ADA to wrap.

    - If Alice has done a wrapping before, she could opt to ignore the registration transaction to save transaction fee. In this case the Muse Wrapping contract will issue mADA to her ETH address in her last successful wrapping.

- The portal asks Alice to sign in the transaction to move 100 ADA from her wallet to the deposit wallet.
- The Cardano relayers to the deposit transaction and triggers a minting action of the Muse Wrapping contract in Ethereum chain to mint an equivalent amount of mADA tokens to the Alice's ETH address
    - To enhance the security of switching, several (voted) bridge servers should submit the transaction proof to the Muse Wrapping contract to actual release the mADA token
- Alice keeps 100 mADA in her wallet for 10 days. During that time, the staking reward for 100 ADA is 1 ADA. This 1 ADA is added to the deposit address and later be claimed by Alice (see Section 4.4 to see how staking rewards are calculated and distributed)..
- On day 11th, Alice sends 60 mADA to Bob, who hasn't been registered with the Muse Wrap.
- In the next 10 days (day 11th to day 20th), another 1mADA staking reward is deposited. Now, Alice could claim for 1.4 mADA, Bob could claim for 0.6 mADA.
- Bob activates the redeem function of the Muse Wrapping contract (thanks to the wrapping portal) for his 60.6 mADA. He also provides his favourite ADA address. This 60.6 mADA is burnt. After that, 60.6 ADA is delivered to Bob's ADA address.

4.2. Muse Swap (DEX)

4.2.1. The Role of DEX

Muse Swap is one of the three main components of Muse.Finance ecosystem helping the investors swap their tokens to any supported tokens (both ERC20 and wrapped Non-ERC20) on our decentralized exchange built on Ethereum blockchain.

Instead of using order-book strategy, Muse Swap is inspired by the Automated Market Maker (AMM) protocol which has been firstly implemented by Uniswap.

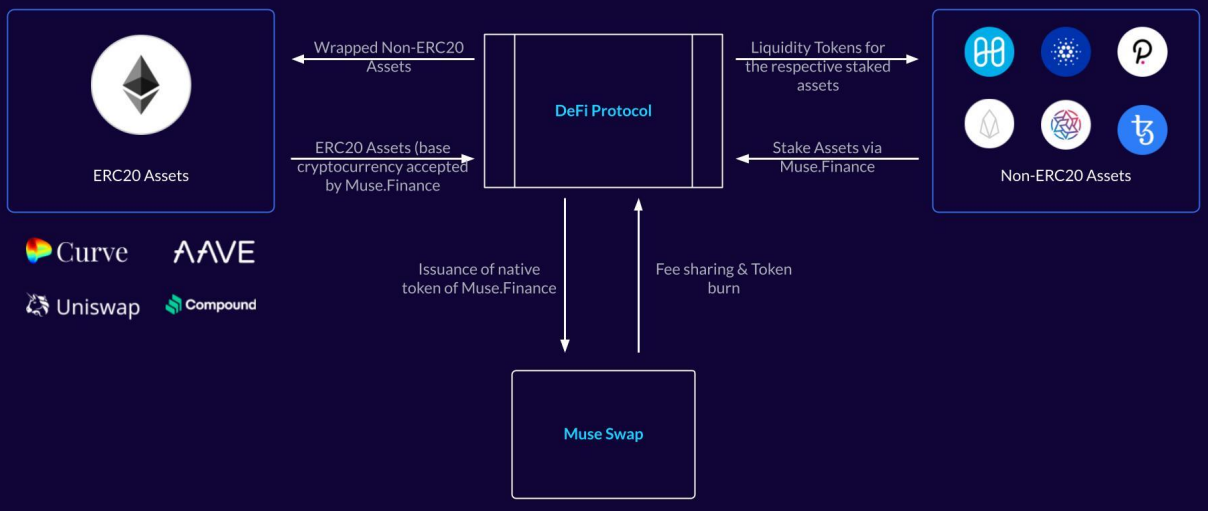
In AMM DEX, the price of assets is calculated by using a mathematical formula which can be different with each protocol. For example, Uniswap is using a constant product formula **x*y=k**, where x and y are the amount of two tokens in a pair and k is the fixed constant. Other protocols such as Balancer or Curve Finance use more complicated formulas but the price is always algorithmically determined.

In Muse Swap, more than two assets in a pool will be supported with weight beyond 50:50.

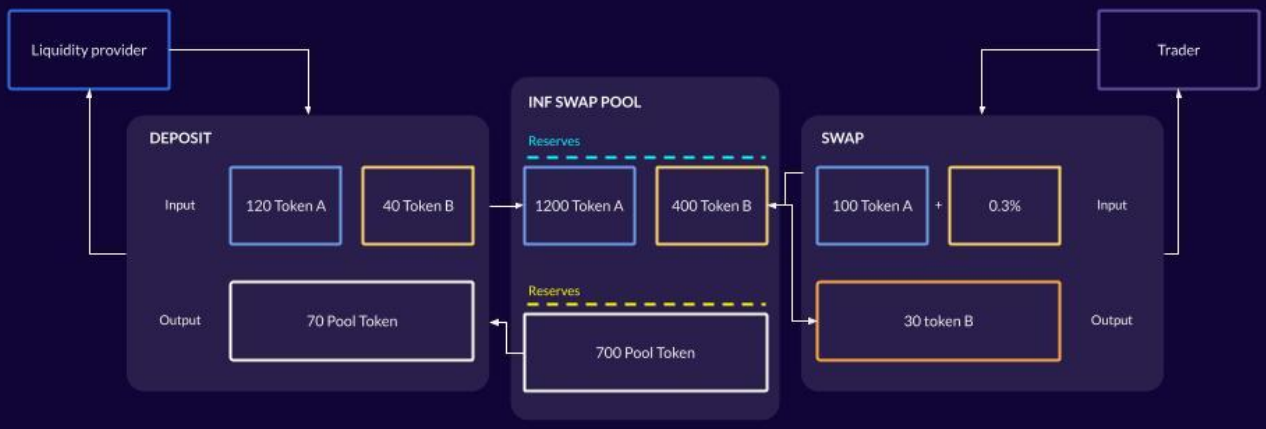
Inspiring from Balancer protocol, Muse Swap uses the constant mean formula $V = \prod_t B_t^{W_t}$

Where:

- t: ranges over the tokens in the pool;
- B_t is the balance of the token in the pool;
- w_t is the weight of the token in the pool;



4.2.2 Technical Architecture of Pool based DEX



Each pool or pair in Muse Swap protocol is a smart contract made up of reserves of two ERC20 tokens.

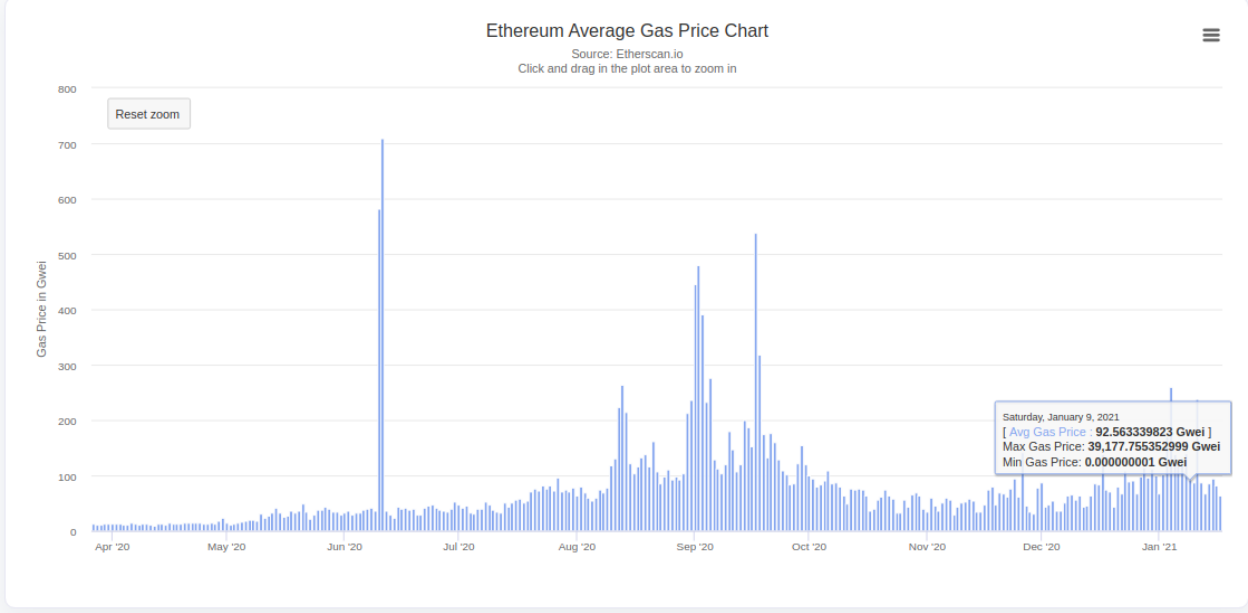
Anyone having liquidity of a pair can deposit to the pool to become a liquidity provider (LP). In return, there are *liquidity tokens* minted and sent back to the provider's address. If it is the first time a pair is created, the LP receives a number of liquidity token equal *sqrt(x*y)* where x and y are the amount of each token. In anytime a LP can claim back the underlying assets by calling a function in the smart contract to burn those liquidity tokens.

Traders can swap their tokens to other tokens. The protocol will calculate the output number of tokens according to the input amount. Each trade will be charged a fee, which is distributed to LPs when they burn their liquidity tokens.

4.2.3. Uniqueness of our solution

(1) Transaction Experiences by reducing the gas costs

Gas is the fuel to run a transaction on Ethereum network in order to pay fees for miners. The DeFi projects provoked "Gas War" on 2020, which is massively increased up to 700Gwei on June 17th 2020 from Etherscan data (https://etherscan.io/chart/gasprice)



In this project, GasToken - a new, cutting-edge Ethereum contract that allows users to tokenize gas on the Ethereum network, will be used to help users save gas when it's expensive.

The logic is simple that users will store gas when it is cheap and use / deploy this gas when it is expensive. Technically, it works by taking advantage of the gas refund while clearing state, storage slots, and deleting contracts with the self-destruct opcode. These operations will be considered creating a negative gas price

- Clearing/self-destructing a contract is -24,000 gas
- Clearing/deleting storage is -15,000 gas

GasToken has two versions for each feature: GST1 (delete storages) and GST2 (delete a contract).

In the first version, the way GasToken works is simple: when gas prices are low, call GasToken contract to mint token by saving data into the GasToken contract's storage. When gas prices are high, you send them back to the GasToken contract for destruction, freeing up the data saved in an earlier step. This new transaction now gets a refund, making it much cheaper to execute than the same transaction that doesn't use GasToken.

The second version technically did the same flow but takes advantage of the gas refund obtained when deleting a whole contract.

Because of the better efficiency in gas saving (https://gastoken.io/#comparison), this project will support GST2 token.

(2)Token Price Adjustment Method

With the current AMM such as Uniswap, LPs supply liquidity to the pool which they take as much profit as possible and let the traders take the arbitrage to push the pool price close to the market price.Beside that, there is another solution to solve this problem without actions of traders.

Uniswap is fixing the ratio 50:50 between tokens in all pools. Muse Swap is fairly more flexible. Pools do not need to follow this 50:50 ratio. It could be specified at the time a pool is created. The selected ratio will remain unchanged for a pool after that.

The following paragraphs will analyze the differences between the token ratios.

Let assume that there is a pool of two tokens mADA and USDT. Current market price of mADA is 0.2$ The initial supply of mADA-USDT pool is 2000$, which means there is 5000 mADA and 1000 USDT.

Pool Tokens	Price	Amount	Value	Weight
mADA	0.20$	5000	1,000$	50%
USDT	1$	1000	1,000$	50%

When the price of ADA rises up 40% across multiple exchanges, so the price of ADA is now 0.28$ but the price in the DEX is not reflected yet, which normally creates an arbitrage opportunity for traders.

We can use an external oracle like Chainlink to determine the difference between pool price and market price and then adjust the weight of each token in the pool accordingly. In this example, the weight of mADA will increase so that the pool price reaches closer to market price.

Pool	Price	Amount	Value	Weight
mADA	0.28$	5000	1,400$	58%
USDT	1$	1000	1,000$	42%

As you can see, the weight of 2 tokens is automatically modified.

4.3. Muse Lending

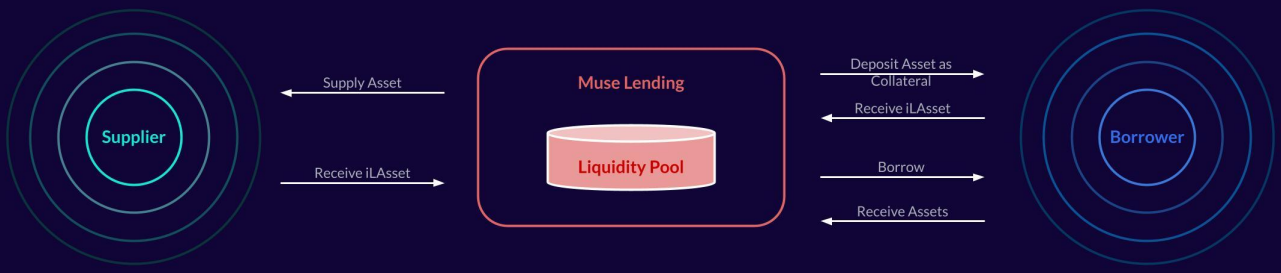
4.3.1. Dynamic Management of Liquidity Offering in the Muse Swap Asset Pools

Muse.Finance is innovating on the design of the asset pool on the Muse swap, which will allow the assets deposited as liquidity providers that can be supplied for the lending purpose. This design

will generate extra interests from the users of the protocol, and improve the asset efficiency in the liquidity pool.

Both Muse Swap pool and Muse Lending pool are controlled by a smart contract named Assets Manager. Once liquidity providers deposit assets into the Muse Swap, the Assets Manager contract will transfer a proportion (15% at the launch) of their liquidity to the Muse Lending pool. This ratio could be changed later depending on the voting of the token holders.

4.3.2 Technical Architecture



Muse Lending platform is inspired by Compound.Finance protocol which is the leading platform for lending and borrowing cryptocurrency.

Each asset pool will be handled by a contract name iLToken like cToken in Compound.

iLToken is a ERC20 token.

When a supplier deposits 1 ETH into the Muse Lending application, he will receive a 1 iLETH token and earn the iLETH interest rate. The supplier can also redeem his asset by converting 1iLETH to underlying token.

The process of borrowing will take 2 main steps. For the first step, the borrower must deposit funds to cover the loan and the system gives him a capability to borrow one asset based on the value of each asset. The borrower then makes a loan in the next step by calling to the smart contract along with the amount of asset.

When a wallet's Borrow limit is exceeded(Borrow Limit Used over 100%), anyone can permissionlessly repay loans at a discount in return for the underlying collateral assets by making a liquidation call to the smart contract to liquidate the collateral and get a bonus.

4.3.3 Interaction with DEX

In addition to the above mentioned innovative design of lending, Muse Lending has a close interaction with Muse Swap. Thanks to this interaction, Muse Lending provides more utilities to its users as following:

- Staking reward from mToken (e.g., mADA)
- Margin trading
- Leverage yield farming

(1) Staking rewards from mToken

The Muse Swap contract continuously monitors the status of its liquidity pool, and it will automatically lend a portion of the assets to Muse Lending. If the lending assets are mToken, the staking rewards are claimed to the Muse Lending contract. These rewards are then forwarded to Muse Lending's users. For more details about how rewards are redistributed, please refer to Section 4.4.

(2) Margin trading

Users of Muse Lending can experience margin trading thanks to the integration between Muse Swap and Muse Lending. For the clarification, these users are denoted as margin traders.

Each margin trader has a special account, managed by Muse Lending. By adding collateral, margin traders can borrow crypto assets which have higher value than their collateral. The borrowed assets however cannot be withdrawn out of the Muse Lending. Instead, Muse Lending will execute trading orders on borrowed assets on behalf of margin traders. Profits and/or loss are credited to margin traders' accounts.

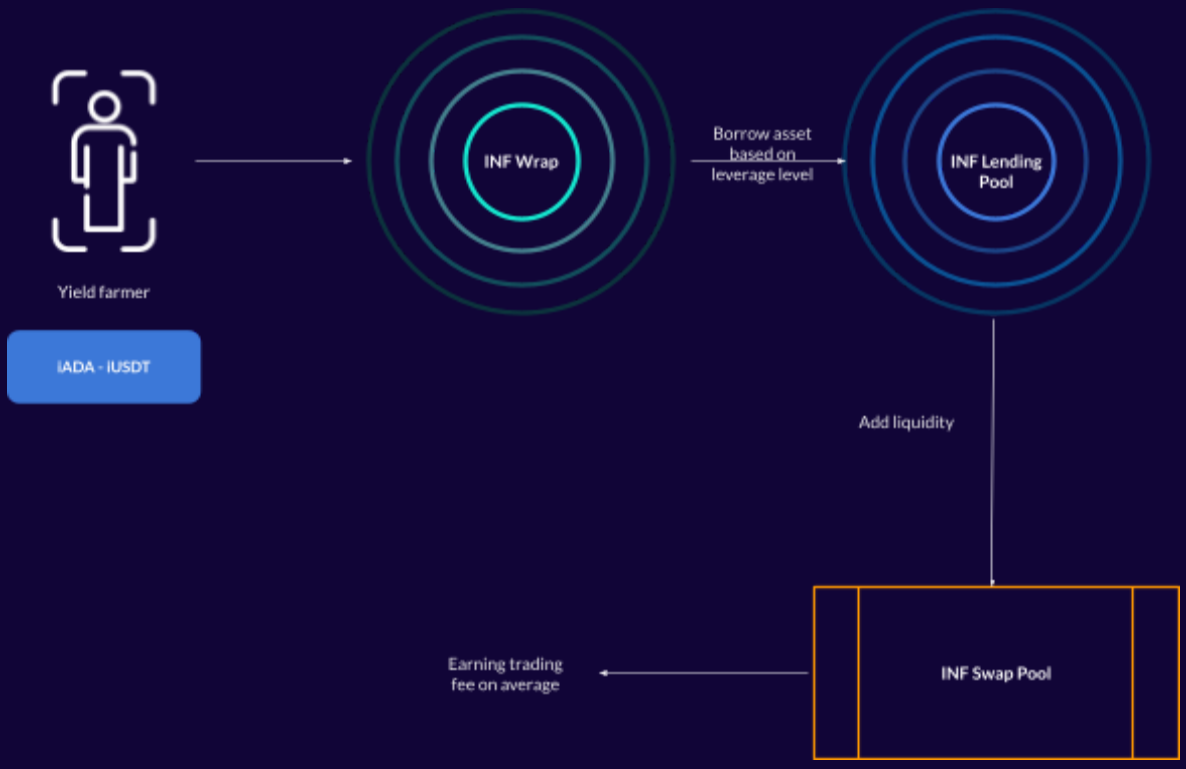
To withdraw tokens, margin traders have to finalize their loan (with interests).

If the lending interest gets higher than the available balance, the margin trading account will be liquidated. The liquidation is done thanks to off-chain liquidation bots. These bots will constantly check if any margin trading account should be liquidated, and submit transactions to notify Muse Lending. Muse Lending will do a double-check before doing liquidation. Bots who submit the liquidate transactions are then rewarded.

(3) Leverage yield farming

Leverage yield farming works exactly the same as margin trading. Here instead of trading, Muse Lending, on behalf of the users, uses the borrowed assets to add liquidity to Muse Swap. The returned LP-tokens corresponding to the added liquidity are managed by Muse Lending.

The following figure describes the flow of leverage yield farming in the Muse ecosystem. In which, yield farmers first wrap their crypto assets for mTokens (e.g., mADA) at Muse Wrap to join the Muse ecosystem. Next they deposit their mTokens at Muse Lending as collateral to increase their assets. Finally, they ask the Muse Lending to act on their behalf to add liquidity to the Muse Swap. The yield farming profits are paid back to Muse Lending, which in turn redistributed to farmers.



In addition to that, if the yield farmer has only one asset but still wants to do farming, the system also supports to optimally swap this asset to another asset, so that he always has enough liquidity of a pair.

As Muse Lending adds liquidity to Muse Swap on behalf of farmers, the returned LP tokens are sent to Muse Lending. Muse Lending will credit these tokens for its farmers, but it takes the control of the tokens to secure the liquidity of the lending pools.

When the total value of LP-tokens goes below the lending interest, the users' accounts are liquidated in the same way as margin traders.

4.4 Staking Reward Distribution in each stage

As aforementioned, staking rewards are distributed to mADA holders. The rewards are not only for direct mADA holders (who have mADA 'physically' in their wallet), but also for indirect mADA holders. Indirect mADA holders are people who own mADA, but deposit their mADA into Muse Swap's pools (i.e., liquidity providers), or collateralize their mADA in Muse Lending for borrowing, margin trading, or leverage yield farming. The following subsections describe how staking rewards are distributed to (direct and indirect) mADA holders

4.4.1 Holder of mADA

Staking reward is calculated by the Muse Wrap smart contract, and is claimed implicitly or explicitly by mADA holders. The staking reward function of Muse Wrap is designed to achieve to following goals and criteria:

- Require minimum data and efforts to calculate staking rewards for stakeholders.
- Simplify the reward distribution to stakeholders, and eliminate any hidden cost for the network operators (e.g, who participate in maintaining Muse Wrap such as ADA Relayer and/or ETH Relayer operators).
- Reward calculation and distribution are trackable and provable.
- Enable stakeholders to calculate and claim their staking reward at any time.

To better illustrate how this works, let us analyze it in a particular case of ADA/mADA where stakeholders deposit their ADA tokens to get back their counterpart mADA tokens in the Ethereum network.

The mADA token is an ERC20 token. Thus we name the smart contract behind this token mADA contract. Per each ADA deposited, the mADA contract mints an mADA token plus an extra invisible token, called SADA. SADA is the hidden gem recorded in stakeholders' accounts by the mADA contract to calculate the equivalent ADA of the minted mADA.

The mADA contract maintains a conversion rate, called *S-rate*, to calculate the equivalent ADA per SADA. At the beginning, S-rate is set to 1.0. When some ADA tokens are deposited, it is defined as the ratio between the total amount of deposited ADA and total amount of minted SADA.

When staking rewards are generated, those rewarded ADA tokens are deposited without minting any mADA nor SADA. As the total deposited ADA increases and the total minted SADA remains unchanged, the S-rate increases. As a result, 1 SADA after depositing ADA stake reward is equivalent to more ADA than before depositing. In this fashion, the staking reward is distributed to stakeholders seamlessly whenever they claim or burn their mADA.

Since the amount of minted mADA always equals the amount of deposited ADA, stakeholders could always calculate their claimable staking rewards by taking the difference between the equivalent ADA of their SADA and the amount of mADA. This reward could be claimed at any time. Stakeholders will receive extra mADA in their wallet after claiming their staking reward.

For a better understanding, let us analyze an imagined scenario which is described in the following table.

Time	**Event**	**Deposited ADA/Minted mADA(SADA)**	**Stakeholders' accounts**

1	mADA contract initialized	Deposited ADA: 0 Minted mADA: 0 Minted SADA: 0 S-rate: 1.0	
2	Alice deposits 1000 ADA, receives 1000 mADA, 1000/1.0 = 1000 SADA	Deposited ADA: **1000** Minted mADA: **1000** Minted SADA: **1000** S-rate: 1.0	Alice: **1000** mADA, **1000** SADA
3	Bob deposits 2000 ADA, receives 2000 mADA, 1000/1.0 = 2000 SADA	Deposited ADA: **3000** Minted mADA: **3000** Minted SADA: **3000** S-rate: 1.0	Alice: 1000 mADA, 1000 SADA Bob: **2000** mADA, **2000** SADA
4	30 ADA staking reward generated	Deposited ADA: **3030** Minted mADA: 3000 Minted SADA: 3000 S-rate: **1.01**	Alice: 1000 mADA, 1000 SADA Bob: 2000 mADA, 2000 SADA
5	Alice claims her reward (1000 SDA * 1.01 - 1000 mADA = 10 mADA)	Deposited ADA: 3030 Minted mADA: **3010** Minted SADA: 3000 S-rate: 1.01	Alice: **1010** mADA, 1000 SADA Bob: 2000 mADA, 2000 SADA
6	Charlie deposits 1000 ADA, receives 1000 mADA, 1000/1.01 = 990.01 SADA	Deposited ADA: **4030** Minted mADA: **4010** Minted SADA: **3990.01** S-rate: 1.01	Alice: 1010 mADA, 1000 SADA Bob: 2000 mADA, 2000 SADA Charlie: **1000** mADA, **990.01** SADA
7	40.3 ADA staking reward generated	Deposited ADA: **4070.3** Minted mADA: 4010 Minted SADA: 3990.01 S-rate: **1.0201**	Alice: 1010 mADA, 1000 SADA Bob: 2000 mADA, 2000 SADA Charlie: 1000 mADA, 990.01 SADA
8	Bob claims his reward (2000 SADA * 1.0201 - 2000 mADA = 40.2 mADA)	Deposited ADA: 4070.3 Minted mADA: **4050.2** Minted SADA: 3990.01 S-rate: 1.0201	Alice: 1010 mADA, 1000 SADA Bob: **2040.2** mADA, 2000 SADA Charlie: 1000 mADA, 990.01 SADA

In this table, the first column, Time, is the virtual milestone which denotes certain points in time. The second column, as its name suggested, describes events that happen. The next columns present the data within the mADA contract, which is the total amount of deposited/minted tokens and S-rate (the third column), and the balances of stakeholders (the last column).

- At the beginning, time 1, the mADA contract is deployed. There is no ADA deposited and neither mADA/SADA minted. The S-rate is set to 1.0 by definition.
- Time 2, Alice deposits 1000 ADA. The mADA contract minted 1000 mADA and 1000 SADA (=1000 mADA/1.0) for Alice. The numbers within the mADA contract are then updated accordingly.
- Time 3, Bob deposits 2000 ADA. Similarly, the mADA contract minted 2000 mADA and 2000 SADA for him.
- Time 4, there 30 ADA of the staking rewards are generated. These ADA are added to the depositing wallet. But it does not generate any new mADA nor SADA. The total amount of deposited ADA increases to 3030. Thus the S-rate is set to 1.01 (=3030/3000). At this time, 1000 SADA of Alice is equivalent to 1010 ADA (=1000 x 1.01), and 2000 SADA of Bob is equivalent to 2020 ADA (=2000 x 1.01).
- Time 5, Alice claims her staking reward. As aforementioned, her claimable reward is 10 ADA (=1000 SADA x 1.01 - 1000 mADA). There are 10 mADA newly minted and distributed to Alice's account. Her balance now includes 1010 mADA and 1000 SADA. After this operation, her claimable reward is reset to 0 (= 1000 SADA x 1.01 - 1010 mADA). Still, the claimable reward of Bob is 20.
- Time 6, Charlie deposits 1000 ADA. The mADA contract mints 1000 mADA for him, but only 990.01 (=1000 mADA/1.01) in accordance to the S-rate value.
- Time 7, there additional 40.3 ADA of staking rewards are generated. Similar to Time 4, these ADA are deposited without generating mADA/SADA. The S-rate is now set to 1.0201 (=4070.3 / 3990.01). The claimable rewards of Alice, Bob, and Charlie are 10.1 (1000 SADA x 1.0201 - 1000 mADA), 40.2 ADA (2000 SADA * 1.0201 - 2000 mADA), and 9.91 ADA (990.01 SADA x 1.0201 - 1000 mADA) respectively.
- Time 8, Bob claims his rewards of 40.2 ADA.

When a stakeholder transfers (or burns) his mADA, the mADA contract first automatically claims all claimable reward for this stakeholder before transferring (or burning) the tokens. Next, the mADA contract transfers (or burns) mADA and an equivalent amount of SADA such that the ratio between mADA and SADA within the stakeholder's account is the same after transferring (or burning).

4.4.2 LP token holder

By depositing mADA to Muse Swap's pools, the mADA tokens are transferred to the pool contracts. The staking reward is then distributed to the pool contracts instead of mADA holders. Furthermore, the Muse Swap smart contract keeps monitoring pools' activities and takes the spare part of the liquidity to the Muse Lending for extra interests.

Both staking rewards and lending interests are distributed to the Muse Swap contract, and then redistributed to LP token holders in the similar way that Muse Wrap does. LP token holders could any time check for their claimable rewards, and claim to their wallets. The reward is distributed in the same tokens of the liquidity. For example, LP token holders of pool mADA/USDT will receive staking rewards in mADA (directly transferred to their wallet when claiming), and lending interests in mADA and/or USDT.

In order to that, the Muse Swap generalizes the technique applying in Section 4.4.1. When stakeholders add liquidity to the pool mADA/USDT, besides minting mADAUSDT token, the Muse Swap mint extra tokens for the amount of mADA and USDT added to the pool. Also, it maintains two additional ratios called mADA-rate and USDT-rate. These ratios are similar to SADA , which are used to calculate the rewards (both staking rewards and lending interests).

Rewards (staking and lending interest rates) are automatically claimed and transferred to LP token holders when they transfer their tokens to another account. Or they could explicitly submit a reward claiming transaction to do so.

4.4.3 Lending Collateral

mADA holders could deposit their tokens to Muse Lending. The deposit could be either for lending (i.e., liquidity), or for borrowing (i.e., collateral). In both cases, mADA holders still have their staking rewards.

Muse Lending will mint a lending token (say, iLADA) that plays the similar role of mADAUSDT. Liquidity providers use this token as the proof to claim back their mADA as well as lending interests.

Notably, when mADA is transferred to borrowers' accounts, the staking rewards are then distributed to borrowers. The liquidity provider will receive less staking rewards (or no rewards at all if all mADA tokens are borrowed). To compensate this, Muse Lending should consider this situation and adjust to lending interests accordingly. The staking rewards are then paid back to liquidity providers via the higher lending interests.

4.4.4 How to claim staking reward

All products in the Muse ecosystem (Muse Wrap, Muse Swap, and Muse Lending) allow stakeholders to check the amount of claimable rewards at any time thanks to special methods in their smart contracts.

There are two ways to claim the staking rewards. For the first option, stakeholders conduct a staking claim transaction explicitly to the smart contracts in accordance with their tokens. For example, mADA holders claim rewards from Muse Wrap contract, mADAUSDT holders claim rewards from Muse Swap, and iLADA holders claim rewards from Muse Lending.

For the second option, when stakeholders move tokens out of their account (could be either transferred or burnt). The staking rewards are claimed automatically and transferred directly to stakeholders' accounts.

Stakeholders will receive staking rewards in mADA in all cases, except burning mADA tokens. In this situation, unclaimed staking rewards are distributed as ADA and transferred directly to stakeholders' accounts.

4.5 B2B Solution for partnered Validators

Validators are taking an essential role in decentralization and security of each blockchain. However, the revenue of validators is limited due to low staking reward commission trend. To solve this problem and invite 3rd party to this ecosystem, we would like to propose a B2B service which allows other validators to create a wrap/burn pool that is connected to their staking validator through our platform. These wrap/burn pool that is connected to other validators will issue the same mADA which therefore increase the total wrap and issue amount of mADA. This would lead towards increasing the whole ecosystem. The benefit of each validators is that the in general, staking pool that wraps a token can have higher staking commission. We intend to provide new revenue stream to low-profit validators who are actually contributing to the blockchain industry.

Specifically,

(1) Provide a Wrapping website/dApp for each Validator.

(2) Each validator markets the respective website/dApp.

(3) Increases the staking quantity of the validators by allowing users to pool-in.

(4) The token to wrap and to issue are the same LADA

(5) Have the Validator promote our DEX and Lending at the same time

(6) Validators will have a financial benefit as they will receive more staking fees from this pool. Moreover, these validators could have their stake assets wrapped into liquidity for swapping and/or lending. Thus, validators could enjoy extra profits from swapping commission fees, and/or yield farming in the ecosystem.

* Pools will be created for each Validator (respectively MS1, MS2, MS3, etc.)

4.6. Liquidity Mining and Staking

[45%] of the total Muse Tokens will be generated by liquidity mining and staking. The Muse tokens minted by staking will come from the asset pools in the Muse-wrapper and Muse-swap functions.

The Muse tokens minted via liquidity mining will be born into the Muse-Swap Alpha Pool and Muse-Swap Pool at the later phase. After the launch of the Muse crosschain network, non-Ethereum assets can also be staked on the Ethereum ecosystem and get liquidity mining rewards.

Initially, [40%] of the daily minted tokens will be given as staking rewards, and [60%] as liquidity mining rewards. Over time, the community can vote via the governance token to adjust the daily allocation.

5. Risk Management

5.1. Contract Audit

5.2. Dynamic Collateral Management, Collateral Ratio and Overcollateralization

6. Disclaimer

This concept paper (“concept paper”) is prepared by [Muse.Finance] (the “Company”) may be amended from time to time without notice. This concept paper is intended to provide general Museormation and is not meant to be exhaustive, comprehensive or authoritative. Structures and programs may undergo changes without notice to adapt to market conditions.

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The risks described below, and or other additional risks presently regarded to be immaterial actually materialise, the commercial viability of Muse.Finance and its features and services may be materially and adversely affected and could result in the destruction of Muse.Finance tokens and/or the termination of the development or operation of the Muse.Finance and its features and services.

1. Muse.Finance and its associated ecosystem solutions are under development and may undergo significant changes before they are released or implemented. While the Company intends for Muse.Finance and its associated ecosystem solutions to function as described in this concept paper, the Company may have to make changes to various features or specifications of Muse.Finance or its associated ecosystem solutions. During the course of development, the Company may also run into difficulties including financial, resourcing or technical difficulties. This may create the risk that Muse.Finance or its associated ecosystem solutions may not meet the expectations users may have and this may adversely impact Muse.Finance, its associated ecosystem solutions and the potential utility of Muse.Finance.

2. While Muse.Finance has a vision of making the Muse.Finance solution fully autonomous with community decision making using transparent and fair governance processes, in order to increase

development speed and react faster to environmental challenges, many initial decisions will be made in a centralized manner. This includes decisions about token listings, protocol variable adjustments, use of funds, use of tokens and industry partnerships.

3. The products and services that are offered by third parties through Muse.Finance may be subject to applicable laws and regulation in the relevant jurisdictions and may create the risk of Museringing such laws and regulations. This may negatively impact Muse.Finance, its associated ecosystem solutions and the potential utility of Muse.Finance.

4.The sale of Muse.Finance and/or its associated ecosystem solutions may fail, be abandoned or be delayed for a number of reasons, including lack of interest from the public, lack of funding, or lack of commercial success or prospects. (e.g. caused by competing projects).

5. Muse.Finance, the sale of Muse.Finance and/or its associated ecosystem solutions are based on blockchain technology which is still in a relatively early development stage. Muse.Finance is intended to represent a new capability on emerging technology that is not fully proven in use. Any malfunction, flaws, breakdown or abandonment of the underlying blockchain technologies used by Muse.Finance may have a material adverse effect on Muse.Finance, the sale of Muse.Finance and/or its associated ecosystem solutions. As the technology matures, new capabilities may dramatically alter the usefulness of Muse.Finance or the ability to use or sell them. The functionality of Muse.Finance is complex, will require enhancements and product support over time, and full functionality may take longer than expected. The full functionality of Muse.Finance is not yet complete and no assurance can be provided of such completion.

6. It is possible that certain jurisdictions will apply existing regulations on, or introduce new regulations addressing, blockchain technology, which may be contrary to Muse.Finance and/or its associated ecosystem solutions and which may, inter alia, result in substantial modifications of the overall ecosystem strategy relating to Muse.Finance and/or its associated ecosystem solutions, including termination and the loss of Muse.Finance.

7. The tax treatment and accounting of Muse.Finance is uncertain and may vary amongst jurisdictions. You must seek independent tax advice in connection with purchasing Muse.Finance, which has the possibility of resulting in adverse tax consequences.

8. The value of tokens or cryptocurrencies may fluctuate significantly over a short period of time as a result of various factors including market dynamics, regulatory changes, technical advancements, and economic and political factors. Due to such volatility, the Company may not be able to fund development of Muse.Finance and/or its associated ecosystem solutions, or may not be able to maintain Muse.Finance in the manner that it intended.

9. It is possible, due to any number of reasons including, but not limited to, an unfavourable fluctuation in the broad cryptographic token market, decrease in Muse.Finance utility, the failure of commercial relationships, or intellectual property ownership challenges, that the Muse.Finance may no longer be viable to operate and the Company may dissolve or be wound up or face an uncertain or changing regulatory regime.

10. Cryptographic tokens such as Muse.Finance are a new and relatively untested technology. In addition to the risks noted above, there are other risks associated with your purchase, holding and use of the Muse.Finance that the Company cannot anticipate. Such risks may further materialise as unanticipated variations or combinations of the risks set out above.