

MiniSwap

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Abstract. We introduce MINISWAP to enable a connected network of DeFi ecosystems. MINISWAP provides a decentralised platform for exercising financial products.

MINISWAP introduces MINI as its token to establish the ecology and reward to liquidity providers and traders. The total number of MINI supplies is 1 billion. The tokens are mined in two phases. In the first phase, 157 million MINI will be given to the initial supporters to setup the ecology in 30 rounds. After this setup phase, all participants can obtain MINI through a transaction-fee-mining model. Each time a MINISWAP transaction with fee f ETH is processed, tokens worth $2f$ ETH will be created. Tokens worth $2f$ are distributed to the trader and the liquidity providers. The transaction fee f will be used to buy MINI from the pool, where half of the obtained MINI will be distributed to all MINI holders and the rest half of tokens (worth $0.5f$) will be destroyed to keep the value of the token.

This whitepaper describes the overall design of MINISWAP, which will be launched in four phases, namely ecology establishment, MINISWAP as a decentralised exchange, empowering MINISWAP with DeFi, and enabling a network of DeFi ecosystems.

1 Introduction

Since the introduction of Bitcoin [4], over 5,000 cryptocurrencies have been deployed with a total market capitalization of over US\$264 billion [1]. Within a single day, the volume of trading cryptocurrencies can be as high as over US\$114 billion [1]. Many exchange platforms have been created to provide convenient services for users to trade their coins. However, a vast majority of them are centralised platforms and require access to users' private keys. In other words, users would have to fully trust the services provided by the exchange platforms. Generally, such a strong trust cannot be established and this also contradicts to the design principle of a decentralized financial system.

Decentralised exchange (DEXes) services are proposed to resolve such a problem. Users with DEXes can purchase and sell digital properties without the need to trust a centralised entity. In 2019, there were over 250 DEXes which equated to a total trading volume of approximately US\$2.4 billion, in the entire year [2]. This is a very small number compared to the centralised exchanges, where the daily trading volume on average is over US\$50 billion [5]. In addition, most of these DEXes are based on the adopted atomic swap protocol. This

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method enables two parties to automatically exchange their own cryptocurrencies without trusted third parties. However, weaknesses of the atomic swap protocols, such as the long confirmation latency and unfairness of trading, have been identified [3].

We introduce MINISWAP, an open-source and interoperable platform to enable decentralised applications, financial primitives, and a network of ecosystems. We will launch MINISWAP in four stages.

In the first stage, we bootstrap our platform by initialising the ecology establishment funds and introducing our *Establishment Reward*. Anyone can join our program to become an important part of the MINISWAP ecosystem and earn MINI. The earlier a supporter joins, the more coins the supporter will gain as reward for their support.

In the second stage, we will launch MINISWAP GENESIS, an Ethereum-based decentralised and automated trading platform. It enables the exchange of any pair of tokens supported by the Ethereum ecosystem, by building a liquidity pool. MINISWAP GENESIS adopts the transaction-fee-mining model to effect the MINI issuance. All participants, including traders, liquidity providers, and MINI holders, will obtain MINI for their contribution as trading rewards, reserving rewards, and community rewards, respectively.

In the third stage, we will launch MINISWAP DEFI, by empowering MINISWAP GENESIS with a variety of decentralised financial products, such as options and futures. This will build up MINISWAP as an ecosystem rather than just a liquidity pool service for exchange service.

In the last stage, we will launch MINISWAP GLOBAL, by enabling MINISWAP DEFI to communicate across distributed ledgers. This will also be done through a decentralised and automated manner. MINISWAP GLOBAL will enable a network of ecosystems and allow traders from different blockchain platforms to trade seamlessly.

2 Overview

Entities. We consider four types of users, namely *initial supporter*, *trader*, *liquidity provider*, and *MINI holder*. Initial supporters are the one joining in the first stage to help the establishment of MINISWAP ecology. Anyone can be a supporter by transferring coins into the MINISWAP smart contract. Traders create normal transactions to exchange any pair of tokens via MINISWAP entities. For example, a user exchanging ETH with USDT is a trader. Liquidity providers deposit a pair of tokens into the liquidity pool according to policies defined by the contract. For example, a user who deposits X unit of ETH and Y unit of USDT, such that $X = f(Y)$ for some function $f(\cdot)$ as defined in the MINISWAP contract, is a liquidity provider. Anyone holding MINISWAP coins is a MINI holder.

Design architecture. Figure 1 shows an overview of our design architecture. MINISWAP has its own token, called MINI. The token can be mined in two ways. First, to establish the MINISWAP ecology, each initial supporter can buy MINI

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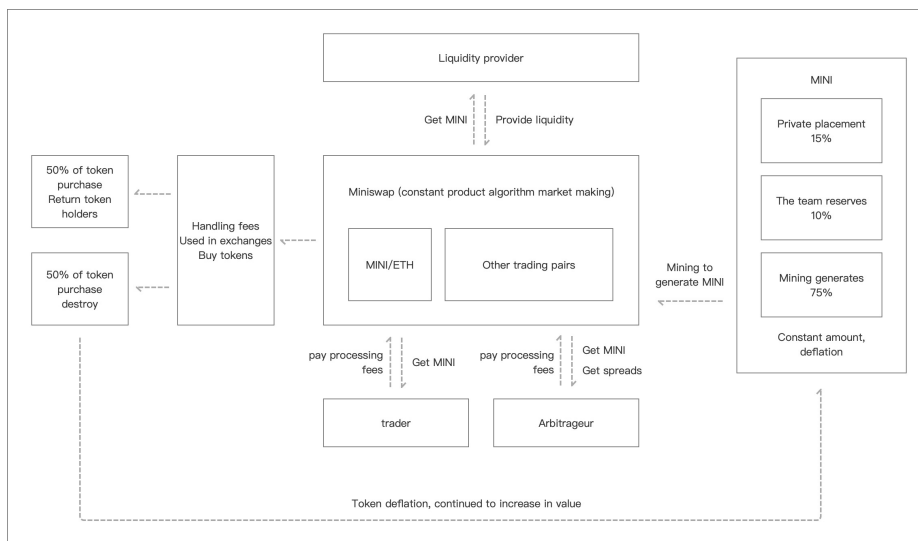


Fig. 1. An overview of MINISWAP.

in different rounds – the price of MINI increases with time (so rounds). Thus, if a supporter joins MINISWAP in an earlier round, then the price of MINI in that round is cheaper than the price in the later rounds. Second, MINISWAP adopts transaction-fee-mining model. Namely, MINI can be mined by creating a valid transaction. Each valid transaction will create a number of MINI according to the fee, which will be detailed in Section 4.3. For each of the transactions, MINISWAP burns a number of MINISWAP tokens, as defined in Algorithm 1. MINISWAP also provides a variety of decentralised financial products, such as options and futures, to all participants. In a later stage, MINISWAP will add the support of cross-chain communications to enable a network of ecosystems supported by different ledgers.

Community Rewards Program. Community Rewards Program provides three kinds of rewards, including establishment rewards, trading rewards and reserving rewards. While the establishment rewards (see Section 3) is only deployed in the first stage to bootstrap the ecology, other rewards (see Section 4) are available throughout the entire life cycle of MINISWAP.

3 Ecology Establishment and Establishment Rewards

We kick-start MINISWAP by initiating MINISWAP ecology establishment funds and rewarding to our community. MINISWAP has a limited supply of 1,000,000,000 MINI, which will be used as start-up capital. These MINI will be given to the community according to the establishment rewards. In particular, 157,000,000 of the total supply will be issued in the form of private placement.

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Establishment rewards are given to the initial supporters of the MINISWAP ecology during the private placement. There are 30 rounds of establishment rewards, where supporters use ETH to exchange MINI. The number of MINI as rewards decreases when a new round starts, i.e., the earlier a supporter joins the system, the higher reward the supporter can obtain. Each round of the private placement has a limited number of MINI available.

Let P_k be the price of MINI in USD at the k -th round, and N_{ETH}^k be the maximum number of ETH MINISWAP accepts at the k -th round. For all $k \in [1, 30]$, we have that

$$P_k = 0.92^{30-k} \cdot P_{30},$$

where $P_{30} = 0.02$ USD is the expected price of the last round of private placement. We also have that

$$N_{ETH}^k = 10(k + 1)$$

and the total number N_{MINI}^k of available MINI at the the k -th round is

$$N_{MINI}^k = \frac{246 \cdot N_{ETH}^k}{P_k}$$

Thus, for the k -th round, an initial supporter with α ETH can buy $\frac{\alpha}{P_k}$ MINI at the price of P_k , as long as the total number N_{MINI}^k of available MINI at the round is not already reached. Figure 2 illustrate the model of MINISWAP establishment rewards.

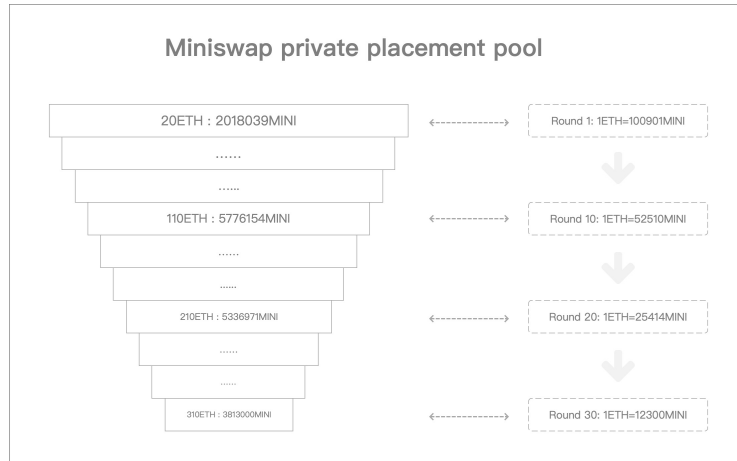


Fig. 2. The model of MINISWAP establishment rewards.

4 MINISWAP as a DEX

MINISWAP GENESIS is an Ethereum-based decentralised and automated trading platform. It leverages two key concepts. The first key concept is a liquidity pool, where liquidity providers adds tokens into the pool and traders exchange any pair of their tokens within the Ethereum ecosystem. The second key concept is transaction-fee-mining, where MINISWAP provides rewards to the trader for each of their transaction. For each transaction processed in MINISWAP, all MINI holders will also obtain a share of the community reward.

4.1 Price Oracle

MINISWAP dynamically adjusts the price of any given pair of tokens. We use the average price over a time period Δt from t_i to $t_{i+\Delta}$ to derive the expected price. This reduces the damage of potential price manipulation from malicious participants and miners. Let N_i^A be the number of token $A \in \mathcal{T}$ available in the liquidity pool at time t_i , where \mathcal{T} is the set of all supported tokens in Ethereum. Let p_i be the price at time t_i . Formally, the price $p_{i,\Delta t}$ of using token $A \in \mathcal{T}$ to buy token B over a period Δ starting from t_i is defined as follows:

$$p_{i,\Delta t} = \frac{\sum N_j^A}{\Delta t \sum N_j^B}, \text{ where } j \in [i+1, i+\Delta t] \quad (1)$$

Any participate can access to this oracle to get an estimation of the price, i.e. the average price of a time interval.

Analysis. To see the benefit of using this weighted price oracle, let's consider that the price $\bar{p}_i^{A,B}$ of using A to buy one unit of B at an isolated time point where we do not apply the accumulation, that is

$$\bar{p}_i^{A,B} = \frac{N_A}{N_B} \quad (2)$$

Similarly, we have that

$$\bar{p}_i^{B,A} = \frac{N_B}{N_A} \quad (3)$$

Now, let's assume an attacker who wants to get profit from the American Call Option from MINISWAP GLOBAL (as presented in Section 6). Let n_A be the number of token A the attacker has to manipulate the price. If the attacker uses all n_A to buy token B at time $i+1$, then the price of token B in A after the trading is:

$$\bar{p}_{i+1}^{A,B} = \frac{N_A + n_A}{N_B - n_B} \quad (4)$$

$$= \frac{N_A + n_A}{\frac{N_A \cdot N_B}{N_A + n_A}} \quad (5)$$

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So the change $\Delta\bar{p}^{A,B}$ of price is

$$\Delta\bar{p}^{A,B} = \frac{N_A}{N_B} - \frac{N_A + n_A}{\frac{N_A \cdot N_B}{N_A + n_A}} \quad (6)$$

$$= \frac{N_A^2 - (N_A + n_A)^2}{N_A \cdot N_B} \quad (7)$$

We can see that when n_a is large, the price changes dramatically. This allows the attacker to gain profit from the options on both asset A and B by manipulating the price. This, in fact, is a special case of our Eq. 1, where we only consider *instantaneous* change within two discrete time point. By using the accumulated value, we reduce the damage of this potential manipulation.

4.2 Liquidity Pool

MINISWAP provides liquidity for any pair of assets through a liquidity pool. MINISWAP stores reserves of any two assets ($A, B \in \mathcal{T}$) of a linear relationship, as follows:

$$N_t^A \cdot N_t^B = K, \quad (8)$$

where K is a pre-defined constant.

Liquidity providers contribute their tokens into the pool according to the linear relation, i.e., for each of the token A to be reserved, the liquidity provider needs to also put some token B into the pool according to the defined relationship.

Traders can exchange any pair of assets available in MINISWAP. The exchange of assets can be done seamlessly with no confirmation delay through a contract enabling atomic transactions. Let n^A be the number of asset A the a trader wants to spend to buy asset B and f be the transaction fee of this transaction, then the trader will obtain n^B of asset B , as defined below.

$$n^B = N_t^B \cdot \frac{K}{N_t^A + n^A - f} \quad (9)$$

4.3 Mining and Reward Sharing

Transition-Fee-Mining. For each recorded transaction with transaction fee f ETH in MINISWAP, a number of MINI equivalent to $(\lambda_1 + \lambda_2) \cdot f$ ETH will be created and the fee f will be used to trade with MINI within MINISWAP, where λ_i is the reward parameter for $i \in [1, 2]$. The transaction fee is 0.3% of the transferred value. We will detail the reward parameters and the distribution of mined MINI as reward to all participates later.

There is an upper limit on the number of MINISWAP can be mined each day. Let S be the height of block containing the first transaction in MINISWAP, Y be the current block height, and X be the interval (approximately a month)

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of mining reward adjustment w.r.t. number of blocks on Ethereum. Loosely speaking, the maximum daily (calculated based on the number of blocks) mined MINI is calculated as follows:

$$\text{Max}(0.7 \lfloor \frac{Y-S}{X} \rfloor \cdot C_1, C_2),$$

where $C_1 = 500,000$ and $C_2 = 18,000$.

Reward Sharing. For each recorded trading in MINISWAP, all MINI holders, liquidity providers, and traders will also obtain a share of the reward. Let p be the accumulated average price of MINI in ETH to swap f ETH with MINI. Let R_1 be the reward to trader; R_2 be the reward to liquidity provider; and R_3 be the reward to MINI holder. Let $\lambda_i \in [0, 2]$ be the reward parameter for $i \in [1, 2]$, such that $\lambda_1 + \lambda_2 = 2$. We define the reward to different participants in Algorithm 1.

Algorithm 1 Reward sharing algorithm

Input:

Reward parameter: λ_i for $i \in [1, 2]$;
 f : transaction fee;
 p : accumulated average price of MINI in ETH;
 X : total number of MINI in the pool;
 Y : the total number of ETH in the pool.

Output:

R_1 : reward to trader;
 R_2 : reward to liquidity provider;
 R_3 : reward to MINI holder.

```
1:  $i = 1$ 
2: while  $i < 4$  do
3:   if  $i = 3$  then
4:      $R_i = \frac{f \cdot \lambda_i}{p}$ 
5:   else
6:      $R_i = \frac{f}{2p}$ 
7:   end if
8:    $i + = 1$ 
9: end while
10: Destroy  $R_3$  MINI ▷ Transfer  $R_3$  MINI to a burn address
11:  $X = X - 2 \cdot R_3$ 
12:  $Y = Y + f$ 
```

For R_2 and R_3 , everyone shares the reward proportionally. Intuitively, when a transaction containing fee f is processed:

- A ratio λ_1 of the fee f will be returned to the trader, in MINI, as its trading reward. The default value of λ_1 is “1”, namely **the trader will obtain 100% of its transaction fee as reward.**

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- MINISWAP also gives MINI of value $\lambda_2 \cdot f$ to liquidity providers to reward its contribution. The default value of λ_2 is also “1”, namely **liquidity providers will obtain a proportional share of the transaction fee in MINI**. The share is based on the ratio of assets a liquidity provider has in the liquidity pool.
- MINISWAP will use the transaction fee to trade with MINI. Half of the obtained MINI (of value f) will be sent to a burn address and the other half will be distributed to all MINI holders proportionally. **So for each transaction, MINISWAP uses the fee to trade with MINI, burns 50% of the fee in MINI and distribute 50% of the fee to the MINI holders.**

5 Empowering MINISWAP with DeFi

At the third stage of MINISWAP, we will introduce MINISWAP DeFi to enable a variety of decentralised financial products. This will create an ecosystem of MINISWAP with rich features. MINISWAP DeFi will start from support American Options as the first financial product.

An American Option [6] is a financial contract. It enables a buyer to purchase or sell an asset at a pre-defined price no later than an agreed time. The pre-defined price is called *strike price* (SP) and the agreed time is called an *option cycle*. As contracts are not always available, an option cycle defines the available time for a listed option. MINISWAP DeFi provides eight different option cycles, including 1 minute, 3 minutes, five minutes, 15 minutes, 30 minutes, 1 hour, 12 hours, and 24 hours.

Each option has an intrinsic value (IV). Intrinsic value is the difference between the option’s strike price and the current price (CP) of the underlying market. For call options, intrinsic value is calculated by subtracting the strike price from the underlying price. Similarly, the intrinsic value of put options is calculated by subtracting the underlying price from the strike price.

A premium is the price that a buyer needs to pay for buying N options. It is also the maximum amount of money a buyer can lose.

$$\text{premium} = N \times \text{intrinsic value}$$

Algorithm 2 Profit and loss calculation

```
1: premium =  $N \times$  intrinsic value
2: break-even price = intrinsic value + underlying price
3:  $R$  = current price – break-even price
4: if  $R > 0$  then
5:   User has a profit of  $N \cdot R$ 
6: else
7:   User has a loss of  $\text{Min}(-R \cdot N, \text{premium})$ 
8: end if
```

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When a user exercise the contract at any time (no later than an agreed time), Algorithm 2 calculates this users profit and loss, in our call option. For example, when a user choose to buy 2 BTC option at BTC price 7000 USDT and intrinsic value 8.16 USDT. The premium is 2×8.16 USDT = 16.32 USDT and the break-even price is 7000 USDT + 8.16 USDT = 7008.16 USDT. If the user chooses to exercise the option, then we have the following scenarios:

- If the current BTC price $P \leq 7000$ USDT, the the user has a lose of 16.32 USDT;
- If 7000 USDT $< P < 7008.16$ USDT, then the user has a lose of $2 \times (7008.16 - P)$ USDT;
- If $P = 7008.16$ USDT, them the user neither has a lose nor a gain;
- If $P > 7008.16$ USDT, then the user has a profit of $2 \times (P - 7008.16)$ USDT).

MINISWAP DEFI also provides insurance services to participants. A participant of MINISWAP DEFI can leverage this insurance service to reduce its lose. Each insurance has a specified price range where the insurance would cover.

For example, a short seller purchases one BTC option with 10 minutes option cycle, underlying price of 5000 USDT, and intrinsic value of 12 USDT. The break-even price is be 4988 USDT and the premium is 12 USDT. If this investor uses 1 USDT to buy an insurance of 5 USDT at the price range from 4990 to 4995 inclusive, then if the strike price is within the range, the insurance will provide maximum 5 USDT to the user. If the price is not within the range, then the calculation of the users profit or loss is as normal.

6 A Network of DeFi Ecosystems

We will launch MINISWAP GLOBAL in the fourth stage, by enabling MINISWAP DEFI to communicate across distributed ledgers. This will make MINISWAP a decentralised, interoperable, and automated platform for trading a vast variety of financial products provided by different ledgers. MINISWAP GLOBAL will enable a network of ecosystems and allow traders from different blockchain platforms to trade seamlessly.

The initial plan is to enable a mixture of Cosmos-like solution and Atomic Swap [3]. The former will be suitable for traders desiring fast confirmation and the latter can be done in a pure distributed peer-to-peer manner. More details will be released in the upcoming update of the whitepaper.

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