

# Stackswap: Decentralized Finance on Bitcoin via Stacks blockchain

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## ABSTRACT

Stackswap is a decentralized finance (Defi) platform that offers products that enable users to exchange and launch tokens, mint and trade NFTs, and borrow algorithmic stable crypto-currencies, on the Bitcoin network. Leveraging the Stacks blockchain, we aim to create a next-generation DEX operating on top of the Bitcoin network and support the growth of Defi on Bitcoin.

## 1 INTRODUCTION

Stackswap is a protocol built on the Stacks layer that targets the liquidity and potential growth of Defi systems on Bitcoin. Stackswap introduces an ecosystem of products in conjunction with its native Stackswap token (STSW) to expand the types of activities that users can participate in. These products include token incentives, NFT marketplace, token launchpad, and more. With this suite of products, Stackswap aims to be the go-to application for Bitcoin-based Defi. Stackswap can act as a central incubator where ideas can be exposed to a large base of users and advocates.

In this paper, readers can expect to learn the mechanisms that make a Defi platform on Bitcoin possible. In addition, they can dive deeper into the calculations that create an improved DEX, one that can create lasting value for Defi on Bitcoin.

## 2 PROTOCOL OVERVIEW

Stackswap is an automated market maker (AMM) protocol implemented on the Stacks Blockchain as a smart contract. Inspired by AMM models like Uniswap, Sushiswap, PancakeSwap, and Curve Finance, it is a

protocol aimed at decentralization, open-source, and censorship resistance. Stackswap depends on its creative approach to running protocols and constructing token economics. The STSW token is the native governance and utility token of the Stackswap platform.

Stackswap consists of two types of participants. Participants are categorized as liquidity providers and traders.

- Liquidity Provider (LP): LPs supply liquidity into the protocol's pools. They receive fees and governance tokens as rewards.
- Trader: Traders are users who trade tokens in the protocol's liquidity pools. For each transaction, a percentage of the transaction amount is paid as a fee for using the platform and LPs liquidity.

## 3 CORE CONCEPTS

### 3.1 Swap

Users can exchange Stacks protocol-based tokens with each other through swap functions. A given token  $x$  can be immediately exchanged for token  $y$  through the swap function. At this time, the exchange price is determined by the ratio between tokens  $x$  and  $y$  in the liquidity pool. There is also an opportunity for arbitrage if token prices for tokens  $x$  and  $y$  within the liquidity pool differ from prices from external channels or pools.

Similar to Uniswap v2 [1], the marginal price  $p$  excluding fees at time  $t$  can be found by dividing the reserves of

token  $x$  by the reserves of token  $y$  in a given pool of two tokens:

$$p_t = \frac{r_t^x}{r_t^y}$$

### 3.2 Pool

Liquidity Providers (LPs) provide token liquidity to the pool and allow our Swaps to function. LPs receive LP tokens in return, earning incentive rewards from transaction fees. This transaction fee is calculated by a percentage of the total transaction volume within the pool.

As the reserves of token  $x$  and token  $y$  change through user swaps, and the ratios between the two tokens change, liquidity providers who remove their liquidity after a period of time may receive a different exact amount of tokens  $x$  and  $y$ .

### 3.3 Token Launchpad

The token launchpad allows non-programmers to quickly enter the Bitcoin blockchain ecosystem by providing an easy-to-use interface to create and list tokens. Not only can users create tokens, they can take advantage of PoXL [2] mining and stacking user interfaces on Stackswap without a single line of code.

Token projects launched from the Token Launchpad have the added benefit of creating tokens that have already been audited, negating the lengthy and costly auditing process.

Projects and their teams can utilize the Stackswap DEX to leverage the Defi ecosystem even without much technical prowess. They can find the resources they lack—funding, experience, or personnel—to kickstart their projects. With more time and as Stackswap creates more partnerships, these projects and teams can get matched with online and offline accelerators and funds.

### 3.4 LP Token Farming

The liquidity provider receives token farming incentives based on their contribution to the liquidity supply.

The annual profit rate (APR) for a user for a pool  $A$ , where  $r$  is the total reward allocated to farms over a year,  $m$  is the multiplier assigned to the specific pool, and  $C$  is the total locked value in all farms is calculated as:

$$APR = \frac{r \times m_A}{C}$$

As such, the total profit generated by amount  $P$  in pool  $A$  is calculated as:

$$Profit_A = \frac{r \times m_A}{C} \times P_A$$

The total weighted capital  $C$  for LP tokens locked into multiple pools can be calculated as:

$$C = \sum_{i=0}^n m_i \times C_i$$

, where  $m_i$  denotes the multiplier for a pool and  $C_i$  the capital (in LP tokens) locked in for that pool.

*Figure 1* denotes an example schedule of when users can expect to be able to claim rewards and reclaim their LP tokens after the lock period is concluded.

### 3.5 Staking

STSW stakers are rewarded with vSTSW tokens, which are also used as a form of proof of the user's stake position. vSTSW can only be used on the Stackswap platform, and can be used as voting power. Equal amounts of STSW staked will receive different amounts of voting power (vSTSW) depending on the length of the stake period. Users who lock in their STSW tokens with a longer staking period will receive more vSTSW tokens as reward.

Users can stake their STSW to receive vSTSW tokens, which are used as proof of staking (similar to LP tokens), and are non-transferrable. As such, users who wish to unstake their STSW token must have the corresponding amount of vSTSW tokens in their wallets. In essence, this will make vSTSW non-transferable in order to guarantee that the same wallet will be able to facilitate unstaking on the Stackswap platform.

vSTSW token holders will also gain the right to create proposals, vote on important governance proposals, and receive additional STSW tokens as reward. For equal amounts of STSW staked, the stake with longer lock periods will receive higher rewards in the form of vSTSW. Based on initial policy, calculations for vSTSW returns for STSW staked are as follows:

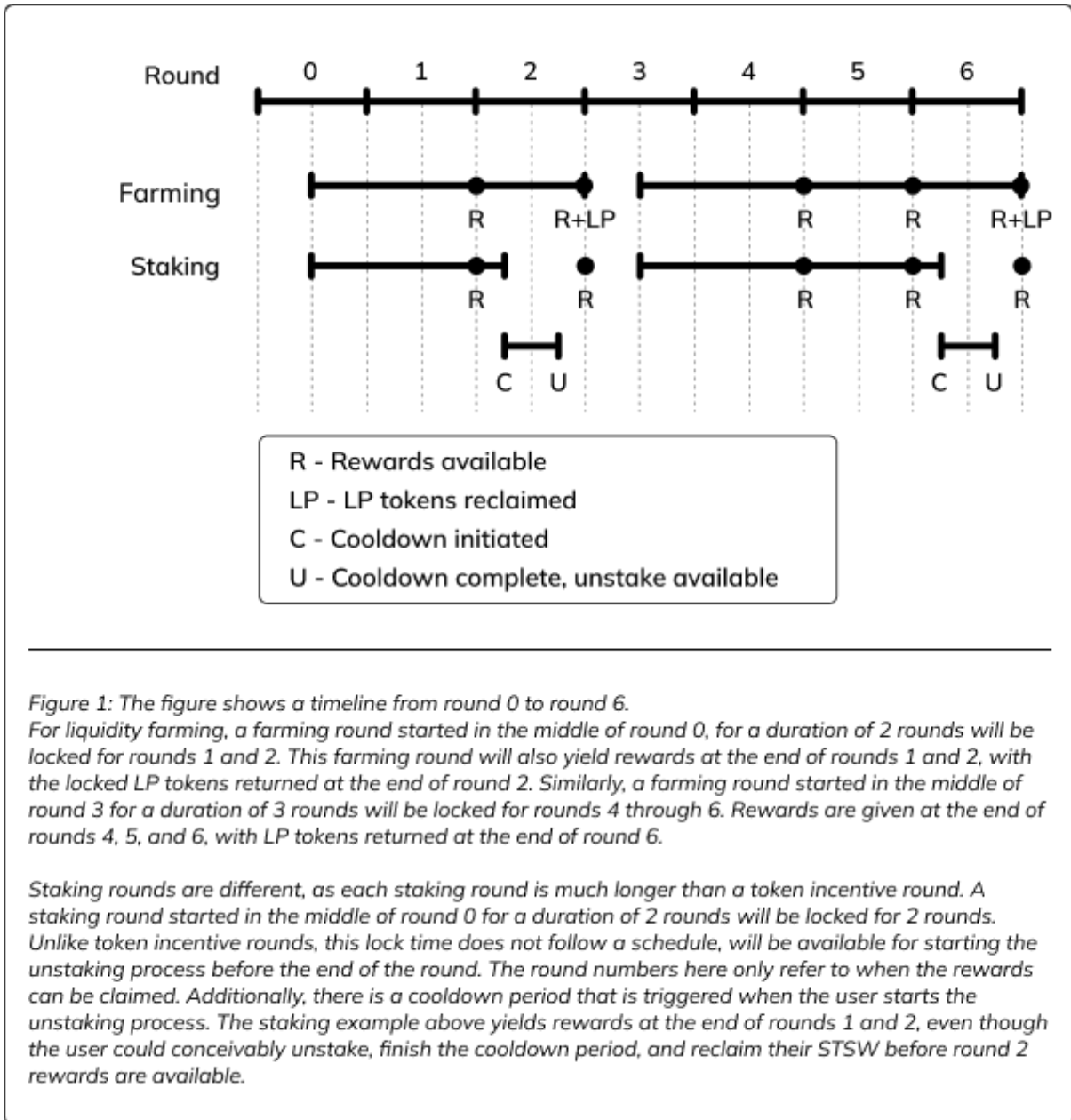
$$vSTSW = STSW \times 2^{\frac{n}{12}}$$

vSTSW denotes the amount of governance tokens awarded to stakers, STSW the amount of STSW tokens staked, and  $n$  the number of months the user has chosen to lock for staking.

*Figure 1* denotes an example schedule of when users can expect to be able to claim rewards and reclaim their STSW tokens after the lock period is concluded.

### 3.6 vSTSW Token

Voting rights are awarded in the form of vSTSW for each event of staking STSW tokens. The staking cannot be canceled until the end of the staking contract period. At the end of the staking contract period, the user can reclaim their staked STSW to their wallet. In the act of reclaiming their staked STSW, the user's vSTSW held will be burned, along with the corresponding voting rights. This triggers the cooldown operation, which prevents the user from staking their tokens for a fixed amount of time. If the user does not reclaim their STSW tokens at the end of the staking contract period, they will retain their vSTSW in perpetuity until they decide to claim their STSW tokens.



### 3.7 AI DAO

The onset of Bitcoin and blockchain technology has inspired many to automate trust and create permissionless systems. We believe that automation of blockchain governance can be further enhanced by involving AI in the process.

An optimal Artificial General Intelligence (AGI) agent's action [3] may be expressed as below:

$$a_t := \underset{a_t}{\operatorname{argmax}} \sum_{o_t} \dots \max_{a_m} \sum_{o_m} [r_t + \dots + r_m]$$

$$q: U(q, a_1 \dots a_m) = o_1 r_1 \dots o_m r_m \quad 2^{-\operatorname{length}(q)}$$

, where  $a_t$  denotes an action at a discrete time step  $t$ ,  $r_t$  a reward at  $t$ ,  $o_t r_t$  an observation of reward at  $t$ , and  $U$  a monotone Universal Turing Machine [2].

At every discrete timestep  $t$ , a population of heterogeneous AI agents approximating an optimal AGI agent seek to maximize  $r$  over a time horizon by a self-evolving ensemble algorithm. The objective function to derive  $r$  is also subject to change by the population themselves [4]. Since the computational cost makes it prohibitive to operate entirely on the current iteration of the Stacks blockchain, we are forced to resort to a hybrid on/off-chain solution as now. With improvement of the base blockchain technology, it may be possible to execute the entire code directly on the blockchain in a transparent manner in the future.

### 3.8 Voting

To participate in governance voting, the user must stake their STSW tokens to the Stackswap protocol. When the user stakes their token in the operation described above, they will obtain vSTSW, which represents their right to vote. In essence, vSTSW represents tokenized voting power, but voting power is not granted directly to STSW.

### 3.9 AI Market Forecast & User Assistance

No form of 'weather forecasts' exist for the Defi market, yet there is a need for it due to the volatility users are exposed to. To enhance yield and lower risk, the protocol provides its top-of-the-line prediction data to those to meet the criteria. We utilize AI to save decision-making time and reduce risks. Under the hood, our recursive self-improving agents [5] rigorously analyzes the Defi market data in a way that cannot be accomplished with common AI methodologies such as deep learning, and can do it all in real time.

The problem with deep learning, for example, is that there is no methodology that responds well to the fast-changing market conditions that are common in Defi. We rely on algorithm generation by AI to tackle this problem, and this method has been tested on the market to prove its resilience.

AI market forecasts may assist trading in both AMM and order book exchange by providing price-movement forecasts, recommending optimal order price, and more.

#### 3.10 NFT

The Non-Fungible Token, or NFT [6], market has shown explosive growth during recent years. We have created a backward-compatible NFT protocol to estimate the value of an NFT as a collateral by embedding a portion of transaction fees tied into itself. When an owner decides to 'burn' the NFT they own, they immediately get an algorithmic stable cryptocurrency stored within the NFT. In order to increase the adaptation of our new NFT protocol, we have deployed AI artists to generate NFT art based on topics the AI found interesting on the internet, which allow us to sidestep the task of recruiting artists to our platform.

### 3.11 Algorithmic Stable Cryptocurrency

There is an argument that cryptocurrency is more stable than its fiat counterpart [7]. We are a proponent of such a stance and seek to introduce to the users of our exchange a means to trade their riskier assets against a more stable one, and vice-versa. Bitcoin may be an excellent candidate for a storage of wealth, but by having a fixed maximum supply, the scarcity may hinder its effectiveness as a currency as the demand rises. We have introduced an asset-backed synthetic

Bitcoin to solve the problem of scarcity while keeping the Bitcoin's stability as a currency. Users can use various assets, including STSW tokens, as collateral to issue such algorithmic stable cryptocurrency and trade in exchanges as they see fit.

## 4 TOKEN USAGE

### 4.1 Governance (Voting)

vSTSW allows holders to propose and vote on governance proposals to determine future features and/or parameters of Stackswap, the Token Launchpad or Market Forecast with voting weight calculated in proportion to the tokens staked.

The right to vote is restricted solely to voting on features of Stackswap. It does not entitle STSW holders to vote on the operation and management of Stackswap, its affiliates, or their assets or the disposition of such assets to token holders, or select the board of directors of these entities, or determine the development direction of these entities, nor does STSW constitute any equity interest in any of these entities or any collective investment scheme. The arrangement is not intended to be any form of joint venture or partnership.

There will be minimum amounts of vSTSW required in order for users to create a vote proposal, which will open up the operation and direction of the platform up to the Stackswap community.

### 4.2 Staking

Users may stake their token and earn the right to vote (vSTSW), and receive additional STSW tokens as a reward for creating proposals, voting, and contributing to the platform.

### 4.3 Token Launchpad

Once the circulation of STSW reaches maturity, STSW must be used to gain access to the Token Launchpad. As the native platform currency, it will also be used to purchase native tokens issued by projects on the Token Launchpad.

### 4.4 Liquidity Provision

Users can contribute to the protocol by providing their liquidity in the form of STSW. As more entrepreneur projects are launched on Stackswap with STSW, and as the Stackswap team creates a greater array of products for users, the utility of STSW will increase and will support the growth of liquidity pools for users to obtain STSW.

### 4.5 Market Forecast

Selected users will be able to receive the AI market forecast feed by holding a minimum of STSW that will be determined. This will allow users access to the forecast information that has been the work of our founders for many years, and can be obtained with an NFT pass for access.

However, collecting data is essential to the process before this data can be analyzed and used for forecasting. This means that it may be a lengthy process before we reach the point in which we begin to feed data into any algorithm, especially with the current block speed that is available to us.

## **5 MINING & SECURITY**

### **5.1 LP Rewards**

A portion of Community tokens will be allocated to LP Token holders as rewards. For Stackswap to perform its core function of a liquidity protocol, users need to be incentivized to contribute their liquidity for transactions, so the liquidity provider receives STSW rewards based on their contribution to the liquidity supply. Distributing STSW in this manner ensures that the governance token will be distributed primarily to key network contributors and allow them to have a say in protocol parameters.

### **5.2 Staking**

Another portion of the Community tokens will be allocated to the Staking pool. STSW token stakers will be rewarded with vSTSW tokens. vSTSW token holders can use their tokens as voting power, and will also be rewarded additional STSW tokens for their participation in voting.

### **5.3 Security**

We have conducted an internal and external code audit to ensure more stable operation of the Stackswap protocol. More audits are planned to better ensure the safety of the Stackswap protocol for users. All contracts are written in Clarity, an open-source language project that brings smart contracts to Bitcoin. Copies of the audit reports from external code audits can be found on the Stackswap Documentation page.

## References

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## Disclaimer

Stackswap is a decentralized protocol that users can use to create and access liquidity in a peer-to-peer manner, trade SIP-010 compliant tokens, and launch tokenized projects. The Stackswap protocol is made of free, public, open-source or source-available software including a set of smart contracts that are deployed on the Stacks blockchain. Your use of the Stackswap protocol involves various risks, including, but not limited to, losses while digital assets are being supplied to the Stackswap protocol and losses due to the fluctuation of prices of tokens in a trading pair or liquidity pool. Before using the Stackswap protocol, you should review the relevant documentation to make sure you understand how the Stackswap protocol and the relevant smart contracts work and assess the related risks on your own accord. You are responsible for doing your own diligence to understand the fees and risks that are present.

The Stackswap Protocol is provided “as is”, at your own risk, and without warranties of any kind. Although Stackswap developed much of the initial code for the Stackswap protocol, it does not provide, own, or control the Stackswap protocol, which is run by smart contracts deployed on the Stacks blockchain. Upgrades and modifications to the protocol are being managed in a community-driven way by holders of the STSW governance token. No developer or entity involved in creating the Stackswap protocol will be liable for any claims or damages whatsoever associated with your use, inability to use, or your interaction with other users of, the Stackswap protocol, including any direct, indirect, incidental, special, exemplary, punitive or consequential damages, or loss of profits, cryptocurrencies, tokens, or anything else of value.