

# WHITTEPAPER



## **Abstract**

This whitepaper will provide insight into how the Pollen protocol functions on a technical level while introducing new features unique to the Pollen governance model. We aim to showcase the Pollen governance model, protocol, its design function, and the mathematics employed. We introduce new concepts and incentive layers for both investors and liquidity providers (LP's).

## **Disclaimer**

All of the information presented in this whitepaper is tentative and is subject to change at any time. None of the information herein should be construed as legal, accounting, or investment advice of any kind. This document does not represent a solicitation for investment, nor does it represent an offering or sale, public or private, of any kind of financial instrument, security or otherwise, in any jurisdiction. This whitepaper is provided for informational purposes only, with the intention to describe Pollen's prospective protocol and governance model.

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# Introduction

Pollen DeFi helps any crypto enthusiast achieve a self-custodial, and user-friendly asset management experience by introducing a comprehensive multi-platform trading suite.

This trading suite is a set of decentralized protocols with three pillars:

- **Pollen Virtual** acts as a virtual asset management environment and trading arena. Users can enhance their trading skills in a risk-free virtual space, join communities (**Leagues Pro**) and participate in trading competitions (the **CryptoBowl**). This innovative approach not only educates users but also fosters a community of skilled traders.
- **Decentralized Exchange (DEX)** provides users with the ability to seamlessly swap, trade, and rebalance their crypto asset holdings. This decentralized exchange experience empowers users, eliminating the need for intermediaries and offering a secure environment for managing their digital assets.
- **Pollen Pods** is a non-custodial native mobile wallet and personal asset management protocol. Tailored for both beginners and experienced users, Pollen Pods offers a secure and user-friendly entry point into the dynamic world of crypto markets. Its intuitive interface simplifies the complexities of decentralized finance, providing users with advanced trading features, including stop-loss and limit orders, geared towards seasoned traders.

The platform has introduced two new assets to the Avalanche and Polygon ecosystems: the PLN utility token and the vote-escrowed powered vePLN governance token. PLN token holders have the ability to create, manage, or delegate virtual portfolios to earn rewards and play a role in governing the Pollen DAO.

Continuing with the whitepaper, the section titled **Your Multi-platform, DeFi Portal** describes the features of each of the above-mentioned products. Each subsequent section dives deeper into the inner mechanics of these products, namely **Pollen Virtual**, **Pollen Virtual Leagues Pro**, **Pollen Pods**, and **Pollen DEX**. The **PLN Tokenomics** section explains the PLN token supply, distribution, burning and issuance mechanisms, and the Pollen DAO governance structure. Finally, the **Conclusion** section encapsulates Pollen DeFi's overarching vision, providing a comprehensive summary of the platform's mission and aspirations.

# Your Multi-platform DeFi Portal

Leveraging Pollen's brand and user centric approach, we are currently building out a suite of five revolutionary products that are in various stages of development, all tightly governed by a Decentralised Autonomous Authority.

## Pollen Virtual

Pollen Virtual helps crypto beginners enhance their trading skills in a risk-free virtual space and crypto veterans achieve higher returns by introducing a virtual asset management environment and trading arena. This innovative approach not only educates users but also fosters a community of skilled traders.

Participation in the Pollen Virtual environment is straightforward: users acquire the PLN token on exchanges and create their virtual portfolio. Users with well-performing virtual portfolios receive PLN tokens as rewards.

Pollen Virtual has a reputation algorithm that identifies top performers based on sophisticated statistical analyses. The algorithm uses the performance of Users virtual portfolios to assign them a score. This enables Pollen Virtual to create a *Leaderboard* of top performers.

The Pollen Virtual Leaderboard not only allows Users to gauge their skills with respect to peers, but also unlocks an additional feature called *Delegation*.

Delegation means that Users can delegate their PLN to top performers without giving up ownership of their holdings. This has advantages for all users: novice ones enhance their learning experience by learning through observation, while more advanced ones can boost their PLN rewards.

Pollen Virtual has the vision to reward contributors within the community with a merit-based system. This product is complete and fully functioning within the Pollen multi-platform DeFi portal.

## Pollen Leagues PRO

Leagues Pro allows organizations to curate trading communities and cultivate a sense of community on the Pollen Virtual platform.

Pollen brings a competitive spirit to DeFi with Pollen Leagues and the more business-focused Leagues PRO offering. Both of these trading competition products offer users the chance to compete in trading leagues.

However, Leagues PRO is a specialized version of Pollen Leagues that caters to businesses, allowing projects and entities to organize and run their own leagues on Pollen. Leagues Pro is already fully implemented within the Pollen multi-platform DeFi portal.

## CryptoBowl

The CryptoBowl injects a competitive spirit into Pollen Virtual by enabling Leagues Pro organizations to compete in trading tournaments. This fully on-chain trading competitions platform allows Leagues Pro organizations to compete with one another. Leagues benefit from a community-building platform that fosters growth and provides various revenue streams.

As everything is on-chain and transparent, including winner selection, CryptoBowl participants have full visibility as they pit their skills against opponents.

The CryptoBowl is currently being carefully tested on both Polygon and Avalanche testnets.

## Pollen DEX

Pollen DEX is a fully featured exchange that allows users to easily buy, sell, swap, and manage their crypto assets. As a decentralized exchange aggregator, Pollen DEX prioritizes user-friendliness and accessibility while incorporating advanced functionalities for professional traders, ensuring a seamless trading experience within the DeFi ecosystem.

Pollen DEX provides a full suite of features including buy and sell orders, swap and a multitrade portfolio rebalancing feature.

Pollen DEX makes complex trading simple, seamless and level. It incorporates all the expected features of a centralized exchange, including fiat onramps, within a decentralized environment. Currently in active development, this product will soon be released for community testing.

## Pollen Pods

Pollen Pods is an iOS and Android mobile crypto wallet, with a built-in AMM (Automated Market Maker) and automated portfolio manager that allows users to buy, swap and manage crypto assets.

This non-custodial wallet serves as a secure gateway to volatile crypto markets. Pollen Pods is designed with extreme user-friendliness, catering to both novice and advanced users. This roadmapped item incorporates unique features, such as stop-loss and limit orders, that enhance accessibility and offer users complete control over their assets while navigating the complexities of the DeFi ecosystem.

## Pollen DAO

Pollen is a bespoke DAO protocol that operates on a self-executing governance proposal mechanism, ensuring that proposals approved by the community are seamlessly implemented without the need for centralized intervention. This decentralized governance model empowers our community to actively participate in shaping the future of Pollen, aligning with the principles of true decentralization. The DAO is complete and fully functioning within the Pollen multi-platform DeFi portal.

# Pollen Virtual - Deep Dive

With the Pollen Virtual protocol, asset management is democratized, and the decision-making process is fully decentralized, allowing for greater community control. The Pollen protocol utilizes collective decision-making, user portfolio signals, and governance mechanisms to create a participatory token economy.

Pollen's open protocol and merit-based system rewards and empowers the brightest minds in its community. The protocol harvests crowd intelligence by allowing community members to stake PLN tokens in virtual portfolios that are exposed to asset prices.

Virtual portfolios represent a collection of 'virtual allocations. That is, a user decides what assets should be included in their virtual portfolios and their corresponding allocation weights.

The protocol's reputation algorithm identifies the best performers and uses this information to award PLN governance tokens, inform asset pools and optimise the delegation process.

By fully decentralising governance and introducing a merit-based reputation and rewards system, the platform crowdsources market intelligence to optimise the asset pool allocations.

Figure 1 provides a schematic description of the Pollen Virtual protocol.

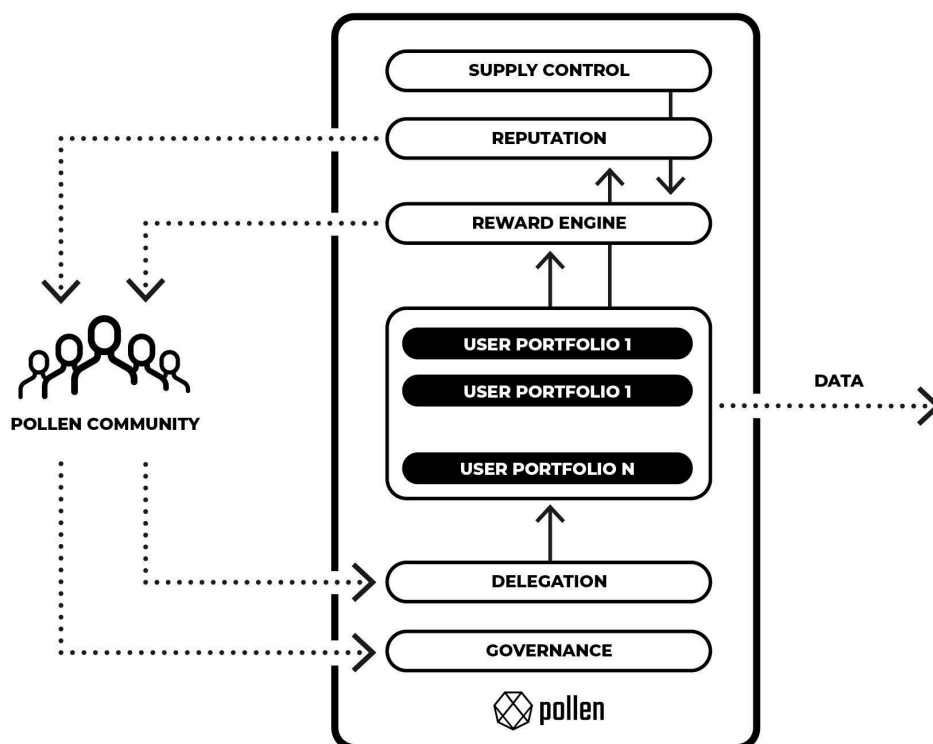


Figure 1: Pollen Virtual schematic description. The Pollen Community uses the PLN token to manage virtual portfolios, to delegate to top performers and to govern the protocol through the Pollen DAO. Virtual portfolios create market signals that can be sold to interested external parties.



# Virtual Portfolios

Virtual portfolios represent a collection of 'virtual allocations'. That is, a user stakes PLN tokens and decides what assets should be included in their virtual portfolios and their corresponding allocation weights. These virtual portfolios generate signalling data that can be used to inform the composition of fully backed asset pools.

Portfolios may be rebalanced at any time and when a user rebalances or closes their portfolio, the reward/penalty in PLN is calculated by measuring the initial and final values of the portfolio. When the user's virtual portfolio performs well, the protocol awards them with PLN tokens and their reputation improves. Conversely, when the user's virtual portfolio performs poorly, the protocol penalises the user by requiring them to forfeit PLN tokens and their reputation weakens.

Figure 2 describes the dynamic of virtual portfolios.

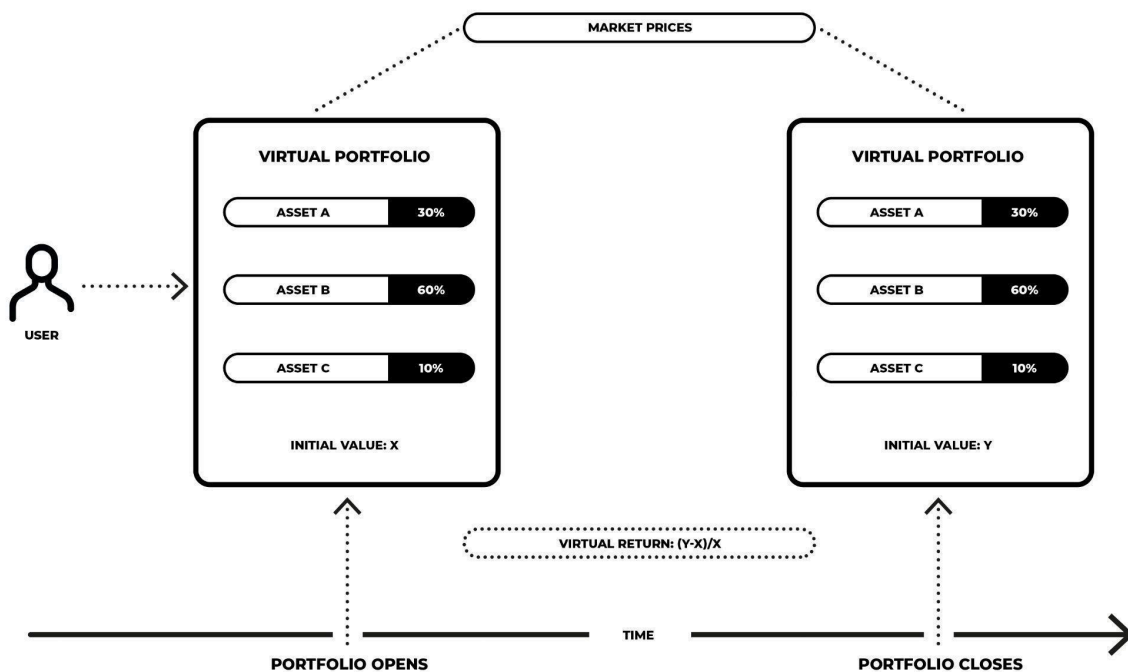


Figure 2. Dynamics of Virtual portfolios - Users open virtual portfolios by selecting a collection of tokens and their respective weights. Both long and short positions are accepted. The virtual portfolio starts with an initial value X. This changes over time as the market prices of the selected tokens change. When the User decides to rebalance or close the virtual portfolio, valued at Y, the virtual return is computed as  $(Y-X)/X$ . This is used to calculate rewards in PLN and update reputation. User skills with regards to predicting the market are measured by returns using market prices without actually being exposed to the underlying assets.

The amount of PLN tokens awarded and forfeited is proportional to the amount of PLN the user has staked and the increase or decrease in the value of the user's virtual portfolio. Further, the amount of PLN tokens awarded and forfeited will vary depending on the current performance of the virtual portfolios across the entire community.

In formal terms, let  $S = \{a_1, a_2, \dots, a_N\}$  be the set of the  $N$  crypto tokens supported by Pollen. The tokens are represented by  $a_i$  and are fully characterised by the evolution over time of their price  $P_i(t)$  and associated base currency, e.g. ETH or USD. We assume that the time-series  $P_i(t)$  is known at discrete samples of time. The interval can be either 1 minute, or 1 hour, or 1 day, or 1 week, etc, but not necessarily equally spaced.

Let  $R_i(t_k)$  denote the one-period return of the asset  $a_i$  between the instants  $t_{k-1}$  and  $t_k$ :

$$R_i(t_k) = \frac{P_i(t_k) - P_i(t_{k-1})}{P_i(t_{k-1})}$$

A User  $U$  is characterised by:

- an initial amount  $V_U(t_0)$  PLN that they want to invest into the family of assets  $S$ .
- a set of weights  $W(t) = W_U(t) = \{w_1(t), w_2(t), \dots, w_N(t)\}$ , such that ,  
 $w_i(t) \in [-1, 1]$  that distributes the amount  $V_U(t_0)$  over each asset

In this context,  $w_i(t_k)$  is said the *weight* of the asset  $a_i$  in the user  $U$  portfolio at time  $t_k$ . We require

$$\sum_{i=1}^N |w_i| = 1$$

Note that weights are allowed to take negative values. This is equivalent to entering short positions in the asset  $i$ . The condition that the sum of the absolute weights has to be 1 models a short position through collateralization.

This is somewhat similar to the mechanisms applied by established lending platforms. In our specific case, the collateralization rate is 1.

The return  $R_U(t_k)$  of the portfolio  $U$  is the weighted sum of each asset return  $R_i(t_k)$  scaled by their contribution  $w_i(t_k)$  into the portfolio:

$$R_U(t_k) = \sum_{i=1}^N w_i(t_{k-1}) R_i(t_k)$$

The value of the User's portfolio at time  $t_k$  is given by

$$V_U(t_k) = V_U(t_{k-1}) [1 + R_U(t_k)]$$

Users must stake PLN when creating a virtual portfolio and then can amend their staked amount each time they modify their asset allocations.

In order to implement the calculation of the virtual return on-chain, considerations on fees and efficiency should be taken into consideration:

- The initial value of the portfolio,  $V_u(t_0)$ , is equal to the number of Pollen tokens used to open the portfolio times the value of each pollen. When the portfolio is open, the number of coins of each asset is calculated and stored as:

$$C_i = \frac{w_i N_p P_{pln}}{P_i(t_0)}$$

where  $t_0$  denotes the time at which the portfolio was open.  $C_i$  is the number of coins of the asset  $i$ ,  $w_i N_p$  is the amount of pollen assigned to asset  $i$ ,  $P_{pln}$  is the price in USD for one Pollen and  $P_i$  is the price of asset  $i$  in USD.

- The final value of the portfolio is calculated as:

$$V_u(t_f) = \sum_i C_i \times P_i(t_f)$$

- Return is then calculated as:

$$\begin{aligned} R_u(t_f) &= \frac{V_u(t_f) - V_u(t_0)}{V_u(t_0)} \\ &= \frac{1}{N_p P_{pln}} \left[ \sum_i C_i P_i(t_f) - N_p P_{pln} \right] \\ &= \frac{1}{N_p P_{pln}} \left[ \sum_i \frac{w_i N_p P_{pln}}{P_i(t_0)} P_i(t_f) - N_p P_{pln} \right] \\ &= \sum_i \frac{w_i}{P_i(t_0)} P_i(t_f) - 1 \end{aligned}$$

This means that instead of saving the number of coins, it is enough to save the value  $w_i/P_i(t_0)$  for each asset in the portfolio, in order to calculate the return.

## Market Benchmark

Users create valuable data through virtual portfolios when their performance surpasses a market benchmark.

A market benchmark can be constructed by market capitalization, for example, by selecting the Top 30 or Top 50 tokens, and defining their weights based on their participation in the total market capitalization of selected assets (e.g., S&P 500, DJIA, CCI30, etc.).

Pollen defines a custom market benchmark because the universe of tokens in which Pollenators can express their market sentiment is restricted.

Therefore, a custom benchmark that considers market capitalization, token availability (e.g., through a wrapped version), and transaction costs is defined. The latter is needed because, whenever the Pollenator rebalances, the smart-contracts need to collect and store additional information to compute the entry/exit positions in the market benchmark and provide an accurate description of a Pollenator reward and skill.

The CCI30 benchmark is used as a reference for the global cryptocurrency market benchmark. Given that Pollen's community opted for an initial deployment in the Avalanche blockchain, the following tokens satisfy the conditions mentioned above: WBTC, WETH, AVAX, BNB and LINK. The objective is to form Pollen's benchmark as a weighted average of these five tokens (or any subset of them) such that the correlation with the broader market is maximized and transaction costs are minimized.

Pollen's market benchmark will be reassessed as the platform is deployed in other blockchains or considerably changes the universe of supported tokens. This is required to provide an accurate representation of the market and make sure that the value created by Pollenators is being fairly measured and rewarded.

## Rewards

Rewards are shared in the protocol's native PLN token with users that have positive virtual returns with respect to the established market benchmark. The rewards are proportional to the virtual returns and the staked PLN tokens in users' virtual portfolios. The amount of rewards shared will vary depending on the current state of the community market and the available funds in the protocol's rewards pool. In periods where the average performance is low, the best performers are incentivized with higher reward amounts, while in market upturns, rewards generated are more conservative.

## Reputation

Reputation measures the ability of a user to make sound investment decisions that are reflected in the returns awarded from their virtual portfolios. In order to avoid confounding variables due to differences in the amount of PLN that users stake, the reputation scores are defined as the compounded return assuming an initial stake of 1 PLN in each virtual portfolio.

This makes the score insensitive to the amount of PLN staked and provides at any point in time an indication of how much value a particular user has been able to generate by adeptly managing their virtual portfolios.

The reputation score can be expressed as:

$$\text{Reputation Score}(t_n) = \prod_{k=1}^n \left[ 1 + (R_u(t_k) - R_m(t_k)) \right]$$

Where  $R_U(t_k)$  is the portfolio's return at each event of rebalancing the portfolio,  $R_m(t_k)$  is the return of the market benchmark (e.g. CCI30 or CRIX), and  $n_u$  is the total number of rebalancing events.

Reputation measures, therefore, the user's ability to outperform the market. The quantity  $R_U(t) - R_m(t)$  is known as *excess return*. As data is emitted from smart contract events, the calculations are executed off-chain, and results are displayed on the Leaderboard webpage.

Additional information regarding the average amount of PLN staked in a virtual portfolio, the amount of PLN awarded, and the amount delegated is provided to the user, enabling them to make informed delegation decisions.

As an example of how the protocol calculates reputation, assume a user joins the platform on 2021-12-28, they acquire PLN and select the following three tokens: AVAX, BTC, and ETH. The initial allocation of the virtual portfolio is 50% into AVAX, 30% into BTC, and 20% into ETH, with assets priced at approximately \$107, \$47588, and \$3800, respectively.

Figure 3 below shows the rebalances performed by this fictitious user (who is assumed to rebalance daily) from 2021-12-28 until 2022-01-03.

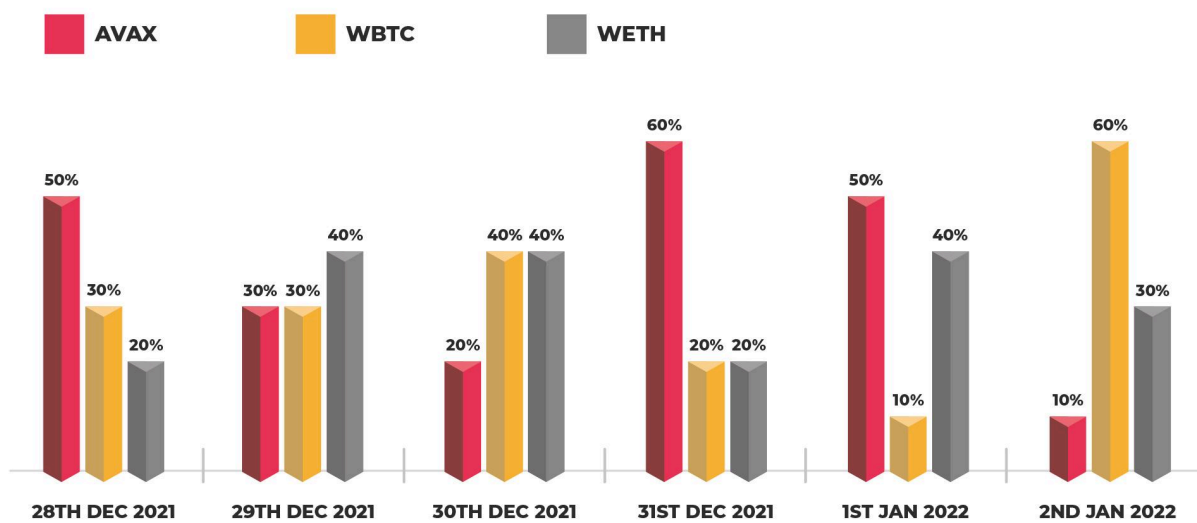


Figure 3: Rebalances of a fictitious user - This user is assumed to change its virtual allocations on a daily basis.

Figure 4 below shows the (actual) daily returns of the assets in USD over the same period. This example considers CCI30 as the market benchmark.

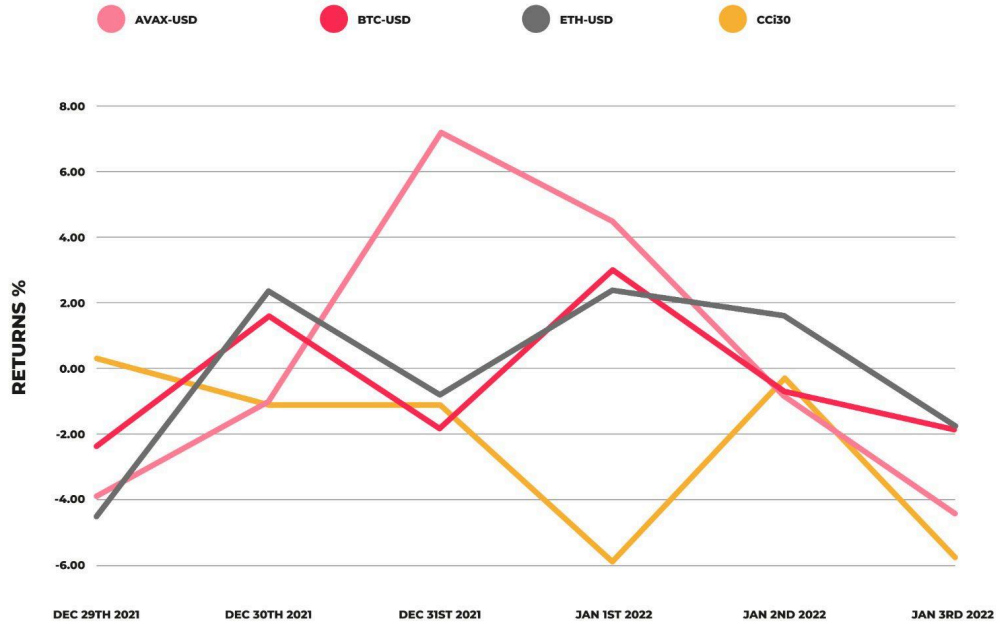


Figure 4: Performance of virtual portfolio composition and market benchmark.

User reputation is calculated using a two-step process: computation of the virtual portfolio return and the market benchmark return (both at the time of rebalancing).

The virtual portfolio return is computed by the weighted average of the assets returns (see *Virtual Portfolios* section for details).

The excess return is the difference between the virtual portfolio return and the market benchmark return.

Figure 5 below compares the virtual portfolio return (in red) with the market benchmark return (in yellow) - each daily, which is assumed to coincide with the event of rebalancing for the sake of simplicity (see the *Onchain Return Calculation* section for details).

The dusty red areas highlight the periods when the virtual portfolio outperforms the market, and therefore the user reputation increases in this period. The user reputation decreases in the slate grey areas because the virtual portfolio return is below market benchmark return.

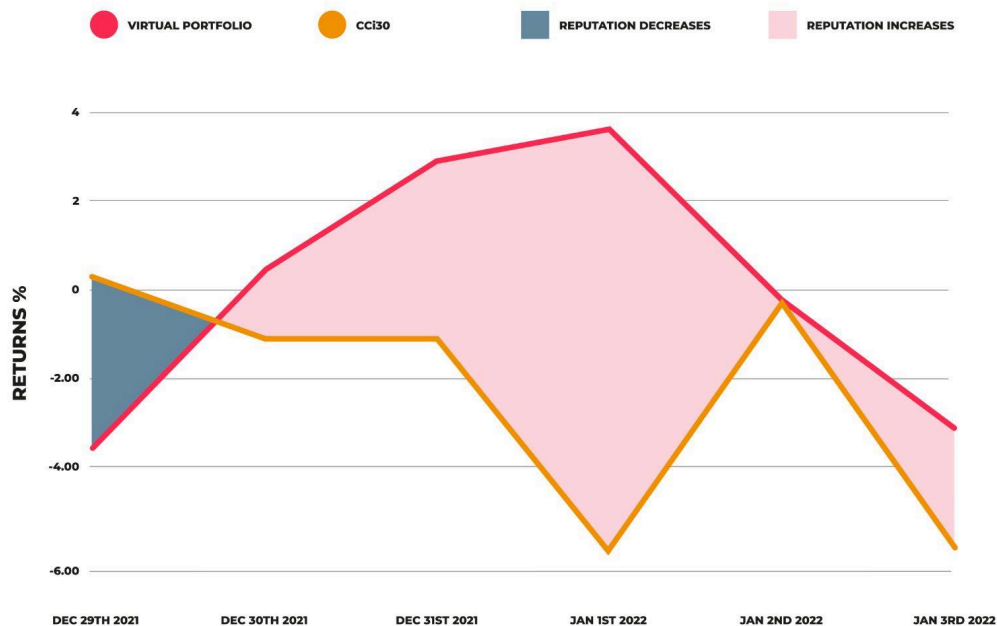


Figure 5. Performance of the aggregated virtual portfolio against the market benchmark. Dark regions depict periods in which the market benchmark performed better than the virtual portfolio. The reputation score of the user decreases in these periods. Conversely, light regions depict periods in which the virtual portfolio outperformed the market benchmark. The reputation score of the user increases in these periods.

Precisely, reputation is computed by compounding the initial amount of one PLN by the excess return whenever the user rebalances his virtual portfolio. Table 1 below shows the reputation per date (i.e., rebalancing events) and how it was computed.

DATE	REPUTATION	COMPOUNDING
28th DEC 2021	1.000	—
29th DEC 2021	0.992	$1.000 \times (1-0.794\%)$
30th DEC 2021	0.976	$0.992 \times (1-1.619\%)$
31st DEC 2021	1.014	$0.976 \times (1+3.943\%)$
1st JAN 2022	1.014	$1.014 \times (1-0.075\%)$
1st JAN 2022	1.007	$1.014 \times (1-0.621\%)$
2ND JAN 2022	0.987	$1.007 \times (1-2.030\%)$

Table 1. Evolution of the reputation score for a fictitious user. The percentage values in the compounding column come from the difference between the virtual portfolio performance against the market benchmark over the same period. Positive values indicate that the virtual portfolio beat the market benchmark.

## Crosschain and LayerZero

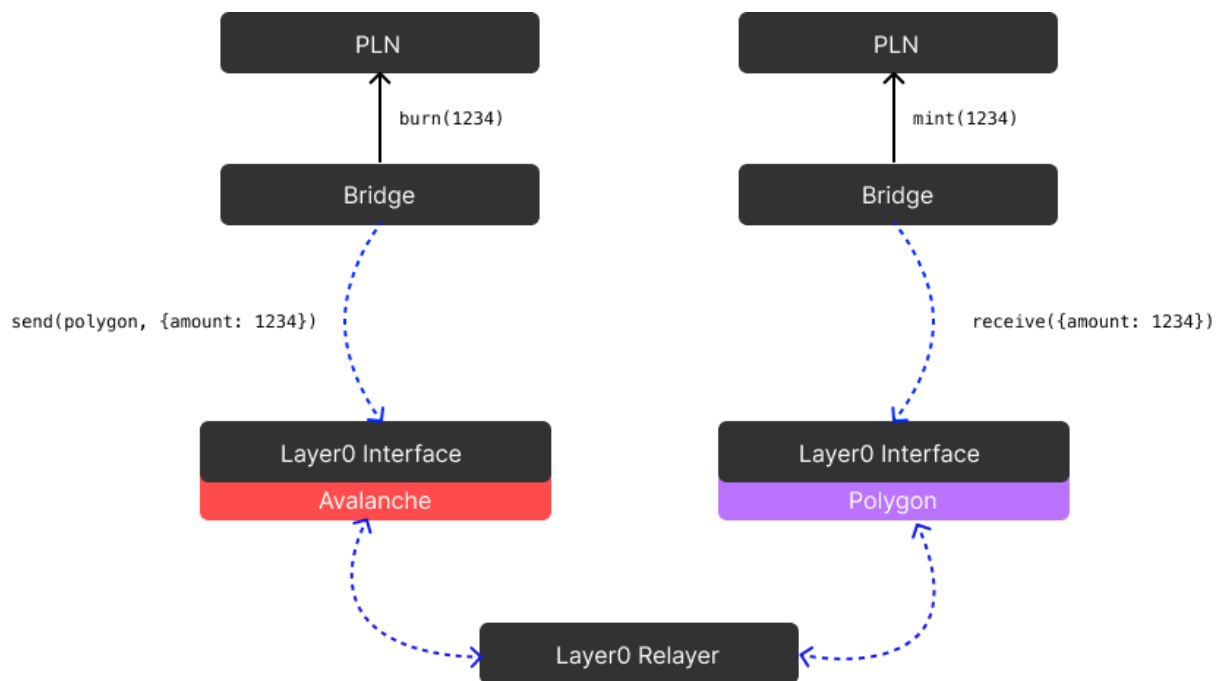


Figure 6: Diagram that shows how PLN is transferred from Avalanche to Polygon.

The bridge is implemented as a standard PollenDAO module. It has the ability to mint or burn Pollen tokens.

When a user signs a transaction ordering tokens to be transferred, the tokens are burned on Avalanche and the Bridge, using Layer0 infrastructure, sends a message containing the amount transferred to its equivalent on the Polygon network. Upon receiving the message Polygon Bridge mints the equivalent.

## PollenSkill

The PollenSkill algorithm estimates the investment skill of players through the use of Bayesian inference.

The algorithm assumes that investing skill follows a normal distribution. The skill of a user is updated whenever they rebalance. This creates an interesting dynamic. A player's skill is described by both a mean and a variance. The more rebalancing a player is doing, the more certainty we have around estimating their skill.



The final score is measured in points that arise as a comparison of a player against all other players. This comparison is more impactful when a player's variance is lower.

Players are incentivized to rebalance when they have positive returns. Therefore, a player might forgo rebalancing when experiencing negative returns, to avoid reducing the estimation of his skill. However, other players will rebalance more, reducing the estimation error of their skill, and accruing more points, as a result. A player who doesn't rebalance often, will have his points gravitate towards 0.

Therefore, the PollenSkill algorithm creates a constant tension between determining how other players will perform and forecasting one's portfolio performance. This will lead the protocol to a dynamic adaptation, as users adjust their investment styles in order to be able to better demonstrate their trading skills.

The table below shows a high level structure (from a game theoretic perspective) of how the system works. The player can find themselves in the following matrix. The notation [x,y] means that the player can encounter any range of outcomes.

The interesting part of this matrix is that waiting yields very uncertain results, due to the volatility of the market. Performance in volatile markets is generally seen as a marker of trading skill.

	<b>Wait</b>	<b>Rebalance</b>
<b>Negative returns</b>	[-3,+1]	-1
<b>Positive returns</b>	[-1,+3]	+1

PollenSkill follows the conjugate Normal-Inverse Gamma model, which estimates the mean and the precision (inverse of variance) of the user's returns simultaneously. The new model has the following parameters:

- $\mu_0$ : The prior mean (expected returns)
- $\nu$ : The number of pseudo-observations. This variable represents the number of observations that we assume we have seen before the user actually experiences returns.
- $\alpha$ : This is one of the two parameters required by the Gamma distribution
- $\beta$ : The second parameter of the gamma distribution

The posterior of the model is defined as the NormalGamma distribution. So, we assume that

$$\text{Skill} \sim \text{Normal Gamma}(\mu_0, \nu, \alpha, \beta)$$

The final points are calculated as

$$\text{Points} = \mu - \frac{\beta}{\nu(1 - \alpha)} = \mu - \sigma$$

The update equations are the following:

$$\begin{aligned}\mu' &= \frac{\nu\mu_0 + n\mu}{\nu + n} \\ \nu &= n + \nu \\ \alpha &= \alpha + \frac{n}{2} \\ \beta &= \beta + \frac{1}{2} \sum (x - \mu)^2 + \frac{n\nu}{2(n + \nu)} (x - \mu)^2\end{aligned}$$

And we define as  $n$  the new number of observations (real observations, not pseudo-observations), as  $\mu$  we define the mean of the data (in this case the returns of a player).

The initial parameters of the model are:

- $\mu_0 = 0$ , we assume that a random user (without knowing anything about them) will have 0% return
- $\nu = 15$ , this parameter is set to 15 to factor in user portfolio rebalancing into the prediction
- $\alpha = 2$ , parameter set based on observations
- $\beta = 5$ , parameter set based on observations

The interpretation of *skill* under this model is “*the minimum expected return for a user with more than 85% probability*”.

## Delegation

In addition to users creating their own virtual portfolios, they also have the option to delegate a portion of their PLN tokens to other members of the community (i.e., delegates). Users that delegate (i.e., delegators) are then awarded or must forfeit PLN tokens depending on the performance of the delegate’s virtual portfolio.

Delegates receive 20% of returns generated (although this percentage can change via governance voting in the future), producing a passive yield for delegators. Delegators are profitable when delegates are profitable. Conversely, delegators forfeit PLN tokens when their delegates perform poorly. Delegators have the option to undelegate at any time.

# Pollen Virtual Leagues - Deep Dive

Pollen Leagues is a unique feature that allows users to participate in specialized virtual leagues with different token sets and revenue-generating opportunities. Users can create their own portfolios for each league, and the reputation of the top ten performers in each league determines the overall reputation of the league.

Leagues can provide collective wisdom around specific niche markets by allowing long and short positions and a broad portfolio of investable assets. The platform also has plans to extend delegation functionality to enable knowledge sharing between top performers and their followers, ultimately benefiting the quality of collective intelligence.

Leagues within Pollen offer various opportunities for revenue generation through sponsorships, token sets, and user types, among others. Each league has its own portfolio of investable assets, allowing for collective wisdom around niche markets and a broad range of positions, including long and short positions.

Participants can earn rewards through delegation, sponsorship, and other league apps, which can be reinvested in the league or used for other purposes. Leagues also provide an opportunity for educational knowledge sharing between top performers and their followers, further improving the collective intelligence of the community.

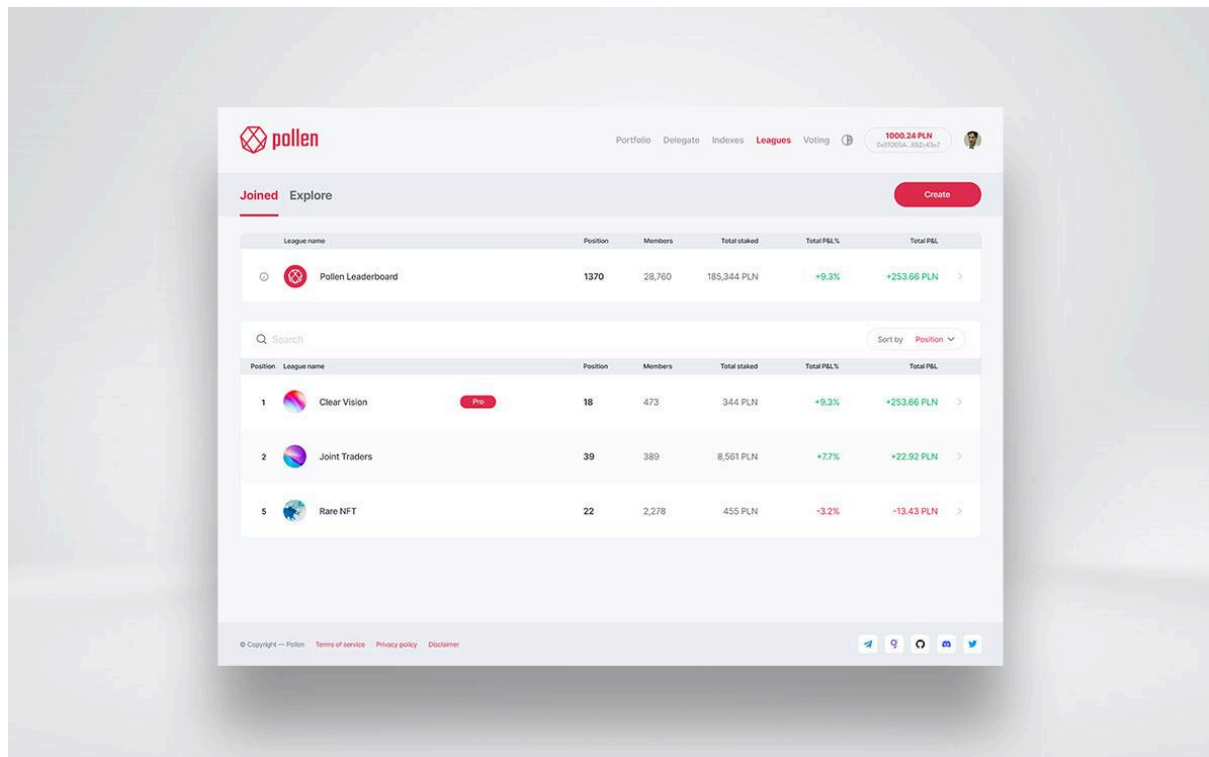


Figure 7: Pollen Leagues main webpage.

In addition, the reputation of the top 10 performers in each league determines the overall reputation of the league, which can be compared to other leagues. This allows for inter and intra-league competition and encourages continued participation and improvement. Leagues

will eventually support assets not available on the Pollen Virtual platform e.g. GameFi guild tokens, ECO climate tokens, derivatives, tokens representing real assets or collectibles.

Plans are in place to extend delegation functionality enabling an educational aspect through knowledge sharing between the top performers inside a league and their followers; a community that collectively improves will significantly benefit the quality of their collective intelligence.

Overall, Pollen Leagues provides a platform for users to participate in various leagues with different investable digital asset types, earn rewards, and improve their collective intelligence through knowledge sharing and competition.

## Leagues Pro

Pollen Leagues Pro is a specialized version of Pollen Leagues that caters to businesses, allowing projects and entities to organize and run their own leagues on Pollen. Each PRO league will, in essence, be a 24/7 trading championship run by the league organizer, complete with its own prize.

It also offers additional features such as NFT ticketing, the ability to mint reward NFTs, and conduct trading competitions. This platform is designed for crypto businesses and projects to build and engage with their communities, foster collaboration, and drive revenue.

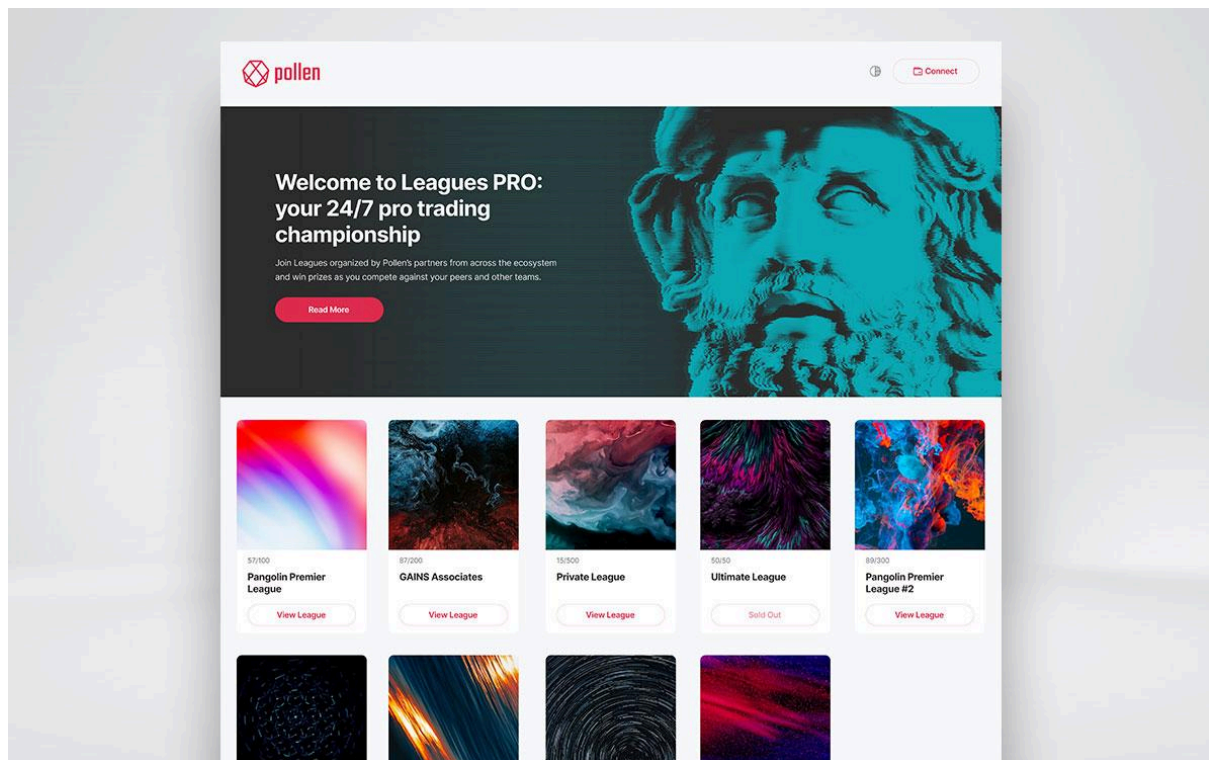


Figure 8: Pollen Leagues webpage.

Similar to Pollen Leagues, each league in Leagues Pro has its own portfolio of investable assets, allowing for collective wisdom around niche markets and a broad range of positions, including long and short positions.

Leagues Pro provides businesses with a simple-to-use rev-gen and marketing tool, enabling them to harness and measure members' collective trading intelligence, and generate revenue and rewards for all involved. Additionally, Leagues Pro offers businesses the opportunity to collect and sell league trading data externally, custom branding to match their visual identity, and advertising space on the league homepage for additional revenues.

With Leagues Pro, businesses have exclusive access to the league's rankings, market predictions, and top traders, and the ability to purchase top-performing assets directly via Pollen.

Moreover, ongoing opportunities to earn rewards and sell NFT prizes are available, with a percentage share of league data sales revenue.

## CryptoBowl

Building upon Pollen's LeaguesPRO offering, the CryptoBowl is a fully on-chain trading competition platform that allows trading communities to compete head-to-head in a powerful display of skill, strategizing, and success. Leagues benefit from a community-building platform that fosters growth and provides various revenue streams.

As everything is on-chain and transparent, including winner selection, CryptoBowl participants have full visibility as they pit their skills against opponents.

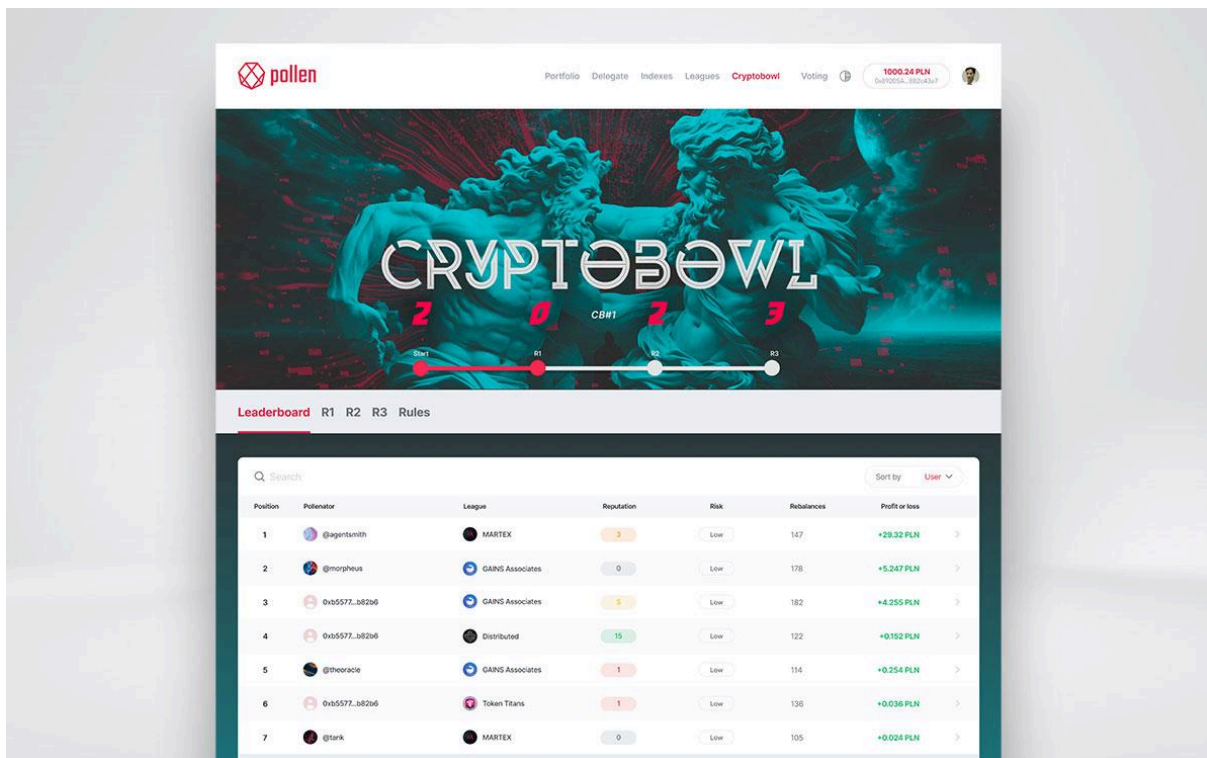


Figure 9: CryptoBowl webpage.

# Pollen Pods - Overview

Pollen Pods is a non-custodial wallet with a built-in AMM and personal asset management protocol that offers users a safe and user-friendly way to access volatile crypto markets while retaining full sovereignty over their assets. Its approach to extreme user friendly design aims to onboard novice users with unique features such as stop loss and limit orders for advanced users. Pollen Pods provides user friendly and seamless access to the DeFi ecosystem in an intuitive fashion with complexity abstracted.

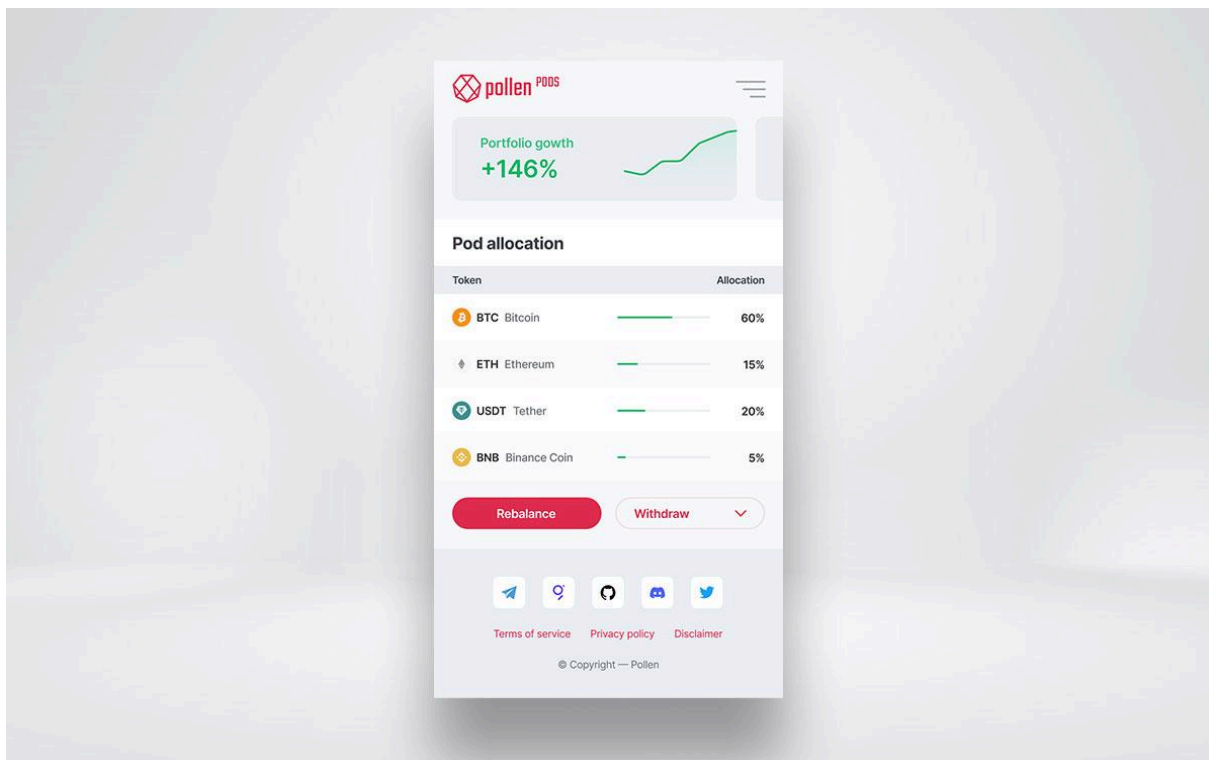


Figure 10: Pollen Pods webpage, mobile version.

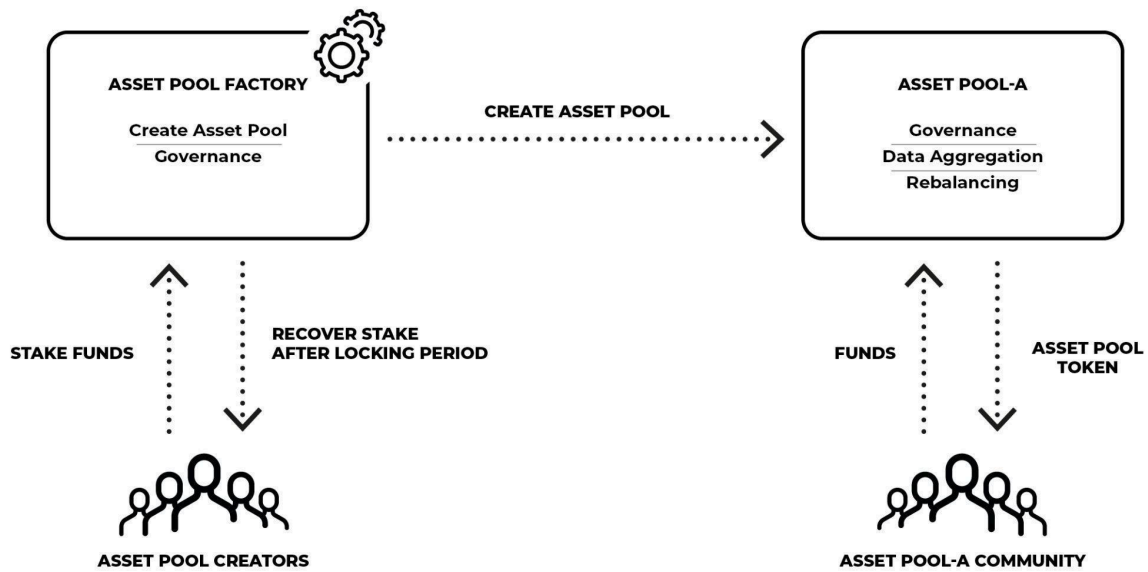


Figure 11:

## Architecture

The Pollen Pod factory smart contract empowers users to launch their own asset pools, which are fully backed and can be managed either manually or by subscribing to a crowdsourced data aggregation algorithm provided by the Pollen DAO. Using virtual portfolio data aggregated from reputable Pollenators, Pollen Pods determine the optimal rebalancing strategy for their asset pools, based on different risk profiles and investment strategies.

While PLN tokens do not directly influence the decision-making process of a Pollen Pod Asset Pool, users can still choose to supplement their investment strategies with data from the Pollen community's virtual portfolios. The Pollen Pods system architecture is designed to minimize complexity and gas costs, ensuring a seamless user experience. To rebalance, Pollen Pods use DEXs, swaps, and other liquidity providers to buy and sell assets, with a central smart contract collating trades from all Pollen Pod smart contracts and rebalancing assets every 24 hours. Future updates may include multi-chain asset solutions to optimize gas fees and other portfolio rebalancing approaches.

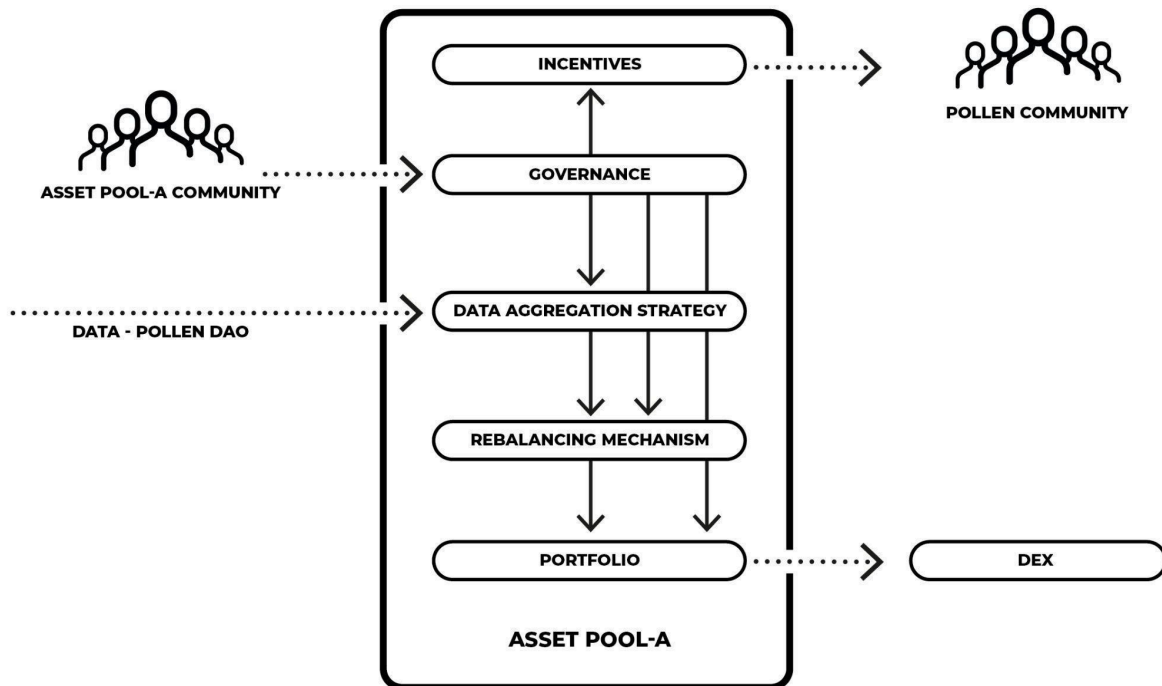


Figure 12:

The Pollen Pods system architecture is designed to reduce complexity and gas costs to provide a seamless user experience.

In order to rebalance, Pollen Pods use decentralized exchanges (DEXs), swaps, and other liquidity providers to buy and sell assets. A central smart contract that collates trades from all Pollen Pod smart contracts and rebalances assets every 24h.

Multi-chain asset solutions to optimize gas fee usage and other improvements will likely be added as well. Other portfolio rebalancing approaches can be added in the future.

## Pollen Pods Example

Suppose that a Pollen Pod is created to track BTC, ETH, FTM and AVAX. The Pod vault is rebalanced once a day.

At some pre-defined moment, Pollen DAO aggregates the signals of the Top Pollenators and suggests the following composition: BTC: 40%, ETH: 16% FTM: 20, AVAX: 24%

This Pollen Pod has 3 users:

- User A deposits \$2000 and decides to distribute them among BTC, ETH, FTM.
- User B deposits \$1000 and decides to distribute them among BTC, ETH, AVAX.
- User C deposits \$1000 and decides to distribute them among BTC, ETH, FIL.



However, as FIL is not recommended by Pollen, the user has to indicate the desired allocation. For the sake of this example, suppose the user decides for 10%. The remaining 90% of user C's holding will be splitted between BTC and ETH in proportion to the DAO's recommendation.

All users partially followed the recommendation provided by the Pollen DAO. Their allocations would be proportional to the DAO's suggestion, accounting for the personalized inclusions and removals. The table below shows the allocation of each user.

User	Holdings (\$)	BTC (%)	ETH (%)	FTM (%)	AVAX (%)	FIL (%)
A	2000	53	21	26	0	0
B	1000	50	20	0	30	0
C	1000	64	26	0	0	10

The Pods' vault would be composed of 5 tokens: BTC, ETH, FTM, AVAX and FIL. In this particular example, the vault's distribution is computed by:

$$w_{\text{tkn}} = \frac{H_A \times w_{\text{tkn}}^A + H_B \times w_{\text{tkn}}^B + H_C \times w_{\text{tkn}}^C}{H^A + H^B + H^C}$$

where  $H_A$ ,  $H_B$ ,  $H_C$  and  $w_{\text{tkn}}^A$ ,  $w_{\text{tkn}}^B$ ,  $w_{\text{tkn}}^C$  indicate the amount held by and the individual allocation of, respectively, users A, B and C.

As an example, this is how the BTC allocation is decided in the Pod's vault:

$$w_{\text{BTC}} = \frac{2000 \times 53 + 1000 \times 50 + 1000 \times 64}{4000} = 53.89$$

The general formula is

$$w_{\text{tkn}} = \frac{\sum_{u \in \text{Users}} H_u \times w_{\text{tkn}}^u}{\sum_{u \in \text{Users}} H^u}$$

Token	Suggested allocation (%)	Effective allocation (%)	Allocation (\$)
BTC	40	54.89	2195.49
ETH	16	21.95	878.20
FTM	20	13.16	526.32
AVAX	24	7.5	300

<b>FIL</b>	0	2.5	100
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>4000</b>

Although FIL was not originally recommended by the Pollen DAO, the vault allocation to FIL (2.5%, \$100) corresponds to the exact amount of funds, in stablecoin terms, that the user C has allocated to it (10%, \$100). Therefore, the funds of users A and B are not exposed to FIL.

Users who share the same investment profile and tokens of interest are better off joining a Pollen Pods in order to save on transaction costs and benefit from data coming from Pollen DAO.

## Data Aggregation

Pollen allows users to create virtual portfolios backed with native PLN tokens. Portfolios are only exposed to the price of the assets, not to the real assets.

The protocol aggregates data from the following sources:

1. The list of assets that the user includes
2. The amount of PLN tokens staked in each virtual portfolio
3. The portion of tokens assigned to each asset in the portfolio

The protocol generates additional data from virtual portfolio performance and the timing of user actions.

Users are incentivized and encouraged to delegate to the top performers to optimise the system and maximise returns. As a consequence, virtual portfolios offer a unique crowdsourced dataset that reflects varying community investment theses based on varying risk profiles.

By performing historical price analyses, these risk profiles inform well-established risk and return models grounded in Modern Portfolio Theory (MPT). Pollen's data aggregation algorithms provide probabilistically optimised returns compared to automated bots and similar techniques (based on technical analysis) or with traditional optimization (based on stand-alone random generation of multiple portfolios).

Reputation plays a fundamental role in measuring and informing the data aggregation process used within the protocol's asset allocation and portfolio rebalancing mechanisms.

Let  $\{w_1(t_k), w_2(t_k), \dots, w_N(t_k)\}$  define a user's allocation at time  $t_k$ . The simplest data aggregation method is the weighted average of the users' allocation scaled by reputation:

$$x_i(t_k) = \frac{1}{\sum_W \text{Rep}_W(t_k)} \sum_U \text{Rep}_U(t_k) w_i(t_k)$$

The reputation metric captures the actual amount a user was able to produce solely based on their decisions. That is, the higher the reputation, the better the user manages their virtual portfolio. Therefore, we should expect that an allocation of assets that sets more weight to users with a higher reputation should capture more rewards.

Pollen plans to make aggregate data available to the broader DeFi ecosystem via the Cross-Chain Interoperability Protocol (CCIP) so that other projects may benefit from the market signals generated.

This incentive will include Leagues' specific aggregate signals to generate specialist market feeds.

# Pollen DEX Overview

Navigating the exciting yet complex world of cryptocurrencies and modern finance can be a rollercoaster. That's why Pollen DeFi is here to simplify your web3 trading experience. Whether you're a trading rookie or a seasoned veteran, our new suite of products is tailored for every user through the current financial revolution and beyond.

Users often find themselves caught in the dilemma of choosing between Centralized Exchanges (CEX) and Decentralized Exchanges (DEX), each with its unique set of pros and cons. But what if you didn't have to choose?

Pollen DeFi represents the perfect balance between CEX and DEX, harnessing the advantages of both worlds under one roof. We believe in providing users with a seamless, all-encompassing solution that combines the best features of centralized and decentralized exchanges.

	CENTRALIZED EXCHANGE	DECENTRALIZED EXCHANGE	POLLEN
User Friendly	✓		✓
Safety & Security	✗	✓	✓
Advanced Features	✓		✓
Deep Liquidity	✓		✓
Anonymity	✗	✓	✓
Self Custody	✗	✓	✓
Customer Support	✓	✗	✓
A Way to Practice	✗	✗	✓

There's no doubt that the future of finance is decentralized, but if we're going to change the world in any meaningful way within a short timeframe, we're going to need better tools for the everyday user.

Pollen DEX bridges the gap, offering the best of both worlds in the evolving landscape of decentralized finance.

# DEX Architecture

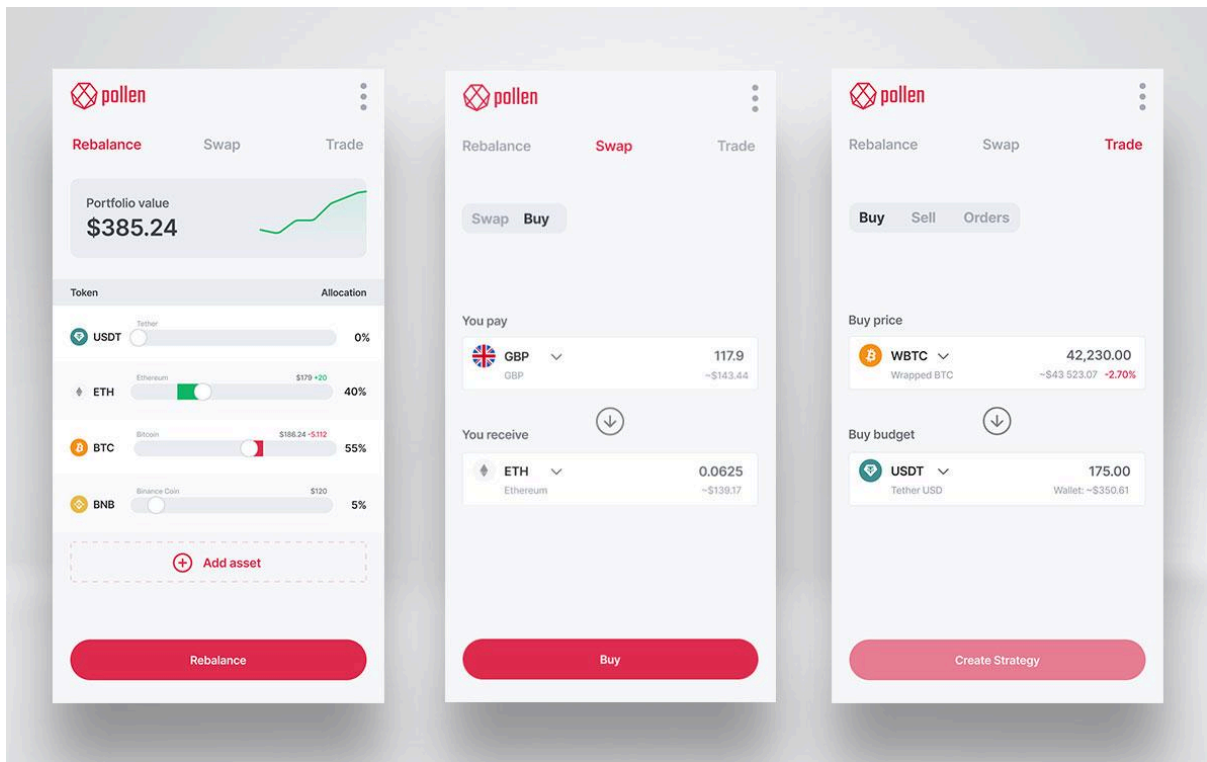


Figure 13: Pollen DEX webpages, mobile version.

Basic idea is as follows: the user has an amount of USDC on his account. Say a solid **\$1000**. He can swap it for tokens using an approach known from Pollen Virtual. Only here we don't bet LONG/SHORT. Here, we set how much of that initial **\$1000** gonna be swapped for this or that tokens.

When swapped token price increases or decreases it is reflected on the interface sliders which adjust percentages accordingly.

**NOTE:** Take a look at [this gist](#) where I analyse percentage and price changes rebalance-by-rebalance.

On the first rebalance user has USDC set for **100%**.

I'm right now in the initial phase of writing a smart contract's proof-of-concept. If it pans out then I think it can be a pretty solid product (at least during the bull market).

## DEX Rebalancing

Suppose a Pollen user connects with Pollen DEX a wallet with  $2X$  USDC. The user wants to exchange half of it for ETH, i.e.  $X$  USDC.

The price of ETH in USDC is represented by  $P_{ETH}(t)$ , where  $t$  denotes a timestamp. This price dictates the number of ETH tokens the user obtains by exchanging  $X$  USDC.

Every exchange incurs transaction fees. Let  $f$  represent it. It is assumed to be fixed and has units of %.

The user receives the following number of ETH coins

$$c_{ETH}(t) = \frac{(1 - f)X}{P_{ETH}(t)}$$

The exact number of coins depends on  $t$ , because ETH price in USDC terms changes over time. Once the exchange happens, the number of coins does not change anymore. We can denote it as  $c_{ETH}$ .

The following table summarises the user wallet right after the exchange through Pollen DEX is confirmed:

Name	Price (USDC)	Quantity (tokens)	Value (USDC)	Percentage (%)
USDC	1	$(1 - f)X$	$(1 - f)X$	$\frac{(1-f)X}{(1-f)X + c_{ETH} \cdot P_{ETH}(t)}$
ETH	$P_{ETH}(t)$	$c_{ETH}$	$c_{ETH} \cdot P_{ETH}(t)$	$\frac{c_{ETH} \cdot P_{ETH}(t)}{(1-f)X + c_{ETH} \cdot P_{ETH}(t)}$

As mentioned above, prices over time, and so do the tokens value in USDC terms. Table above is therefore dynamic. Values and percentages change over time, as price changes on exchanges.

## DEX Copy Trading

Here we look at a user's metmask transactions, and use the same rational/ formulae as Pollen virtual. All calculations are executed on the frontend, ensuring a seamless and user-friendly experience.

This approach involves several factors and employs three risk tiers:

1. **Profit Duration Factor:** Profits are factored by duration, providing a view of the profitability over time.
2. **Support Asset Focus:** The system factors in support assets exclusively, enhancing precision in signal evaluation.
3. **Trade Volume Analogous to Rebalances:** The number of trades is considered, analogous to the rebalancing concept, offering insights into the user's active participation.

#### **Risk Tiers:**

- Low Risk: top 200 supported assets by coinmarketcap
- Med Risk: top 400 supported assets by coinmarketcap
- High Risk: top 1000 supported assets by coinmarketcap

The initial Pollen DEX release will support Ethererum, Polygon and Avalanche expanding to other networks

As Pollenators manage tokens using Pollen DEX, their actions generate signals reflecting their market views. Pollen DEX establishes a marketplace for these signals, offering an opt-in feature for Pollenators to engage in copy trading.

In this marketplace, Pollenators sell their signals at a self-determined price. Users purchase signals based on their confidence in the honesty of the Pollenators. Payments are made upfront, ensuring the protection of Pollenators' information until after the purchase. Users retain the flexibility to cease following specific Pollenators if they suspect dishonesty. This mechanism essentially means users are acquiring the reputation of Pollenators, while Pollenators enhance their reputation by effectively managing their holdings. The DEX Copy Trading feature on Pollen DEX thus fosters a transparent and trust-driven environment for signal trading within the DeFi ecosystem.

Pollen DEX introduces a Leaderboard to assist users with their due diligence. This is intended to provide users with enough information to be confident that Pollenators are acting honestly. Users should note that signals come directly from the Pollenators' wallets. Therefore, Pollenators are, by default, also exposed to the signals that they are selling.

The Leaderboard contains the following information about each Pollenator who opted in for copy trading:

- **Holdings:** the USDC amount the Pollenator has in his wallet. The greater the amount, the more the Pollenator is exposed to the signals he sells, and the more confident a user can be that the Pollenator is acting honestly.
- **Portfolio Risk Score:** a score based on the historical volatility of the Pollenator's portfolio
- **Assets Risk Score:** a score based on the type of assets the Pollenator trades:

- Low risk: top 200 supported assets by coinmarketcap
- Med Risk: top 400 supported assets by coinmarketcap
- High Risk: top 1000 supported assets by coinmarketcap
- **Number of followers:** how many users follow the Pollenator. The more followers, the more a user can be confident that the Pollenator is providing satisfactory results.
- **Duration:** for how long is the Pollenator trading with this account.
- **Performance:** a comparison against one or multiple market benchmarks.
- **Frequency:** how often the Pollenator rebalances his portfolio.

Copy trading is implemented as a notification system. Users are notified once trading signals are triggered via email, Telegram, and Pollen App notification. Users pay to retrieve the information and are responsible for performing the trade if they wish to do so. This allows Pollen DEX users to retain full custody of their assets.



# PLN Tokenomics

## Supply control

Supply control is achieved by an algorithmically defined tracking and virtual issuance schedule.

In periods where rewards minted are low, rewards issuance increases, recalibrating with the theoretical issuance schedule. In periods where rewards minted are high, rewards issuance decreases to stay in sync with the theoretical issuance schedule.

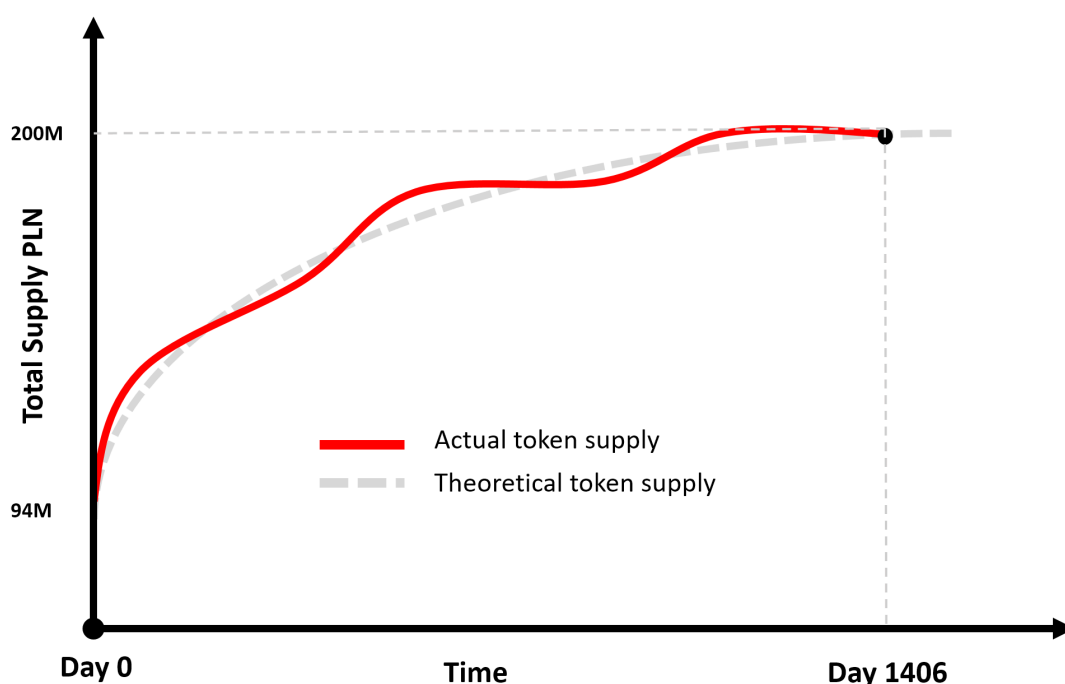


Figure 14: Theoretical token supply and expected supply controls curve. After day 1406 the issuance schedule will be decided by governance voting.

The rewards released and penalties imposed are parametrized such that Pollen becomes more attractive compared to the market. For example, it issues more rewards in bullish market conditions and fewer penalties in bearish conditions.

This ensures that the total PLN token supply, capped at 200M for the first 1406 days, is never exceeded and helps create a healthy token economy for the protocol. The total supply is split into two, 180M is given as rewards to the users for their performance and 20M is reserved for locked vePLN rewards.

An algorithmic procedure that compares the “actual” rewards and penalties runs periodically. This algorithm relies on a theoretical minting curve:

$$M(t) = 94M + (2.1004 I_1 + 0.44505 I_2 + 0.1348 I_3 + 0.055 I_4) \times t$$

where,  $I_k$  is 1 for year k and 0 for the rest of the years.

The minting curve affects the total rewards and the total returns through the parameters  $a(t)$  and  $b(t)$  below, such that:

$$a(t) \times \text{Total Rewards} - b(t) \times \text{Total Penalties}$$

This ensures the PLN tokens that are awarded do not exceed the token supply.

## Issuance Curve

The curve is defined as a piecewise linear function with three segments. The first segment has a higher slope to incentivize early adopters and to help bootstrap the protocol. Each segment is a linear function where  $a_i$  is the designated slope for the year  $i$ :

$$\text{supply}(t) = a_i \times t + b$$

Current implementation allows selecting the parameters ( $a$  and  $b$ ) for the first 1400 days in periods of 365 days by the admin or governance with the sole restriction that there should not be more than 200M tokens before 1400 days.

Given a particular boost on rewards, this implies a vertical shift in the actual supply. This is only for visualisation as different users will likely have different boost values depending on the amount of time that they lockup the tokens.

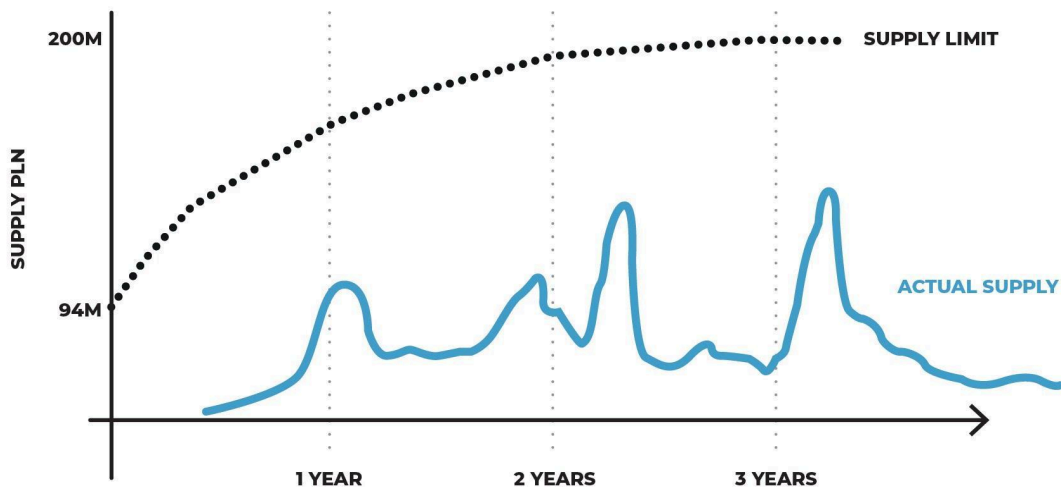


Figure 15: Expected supply curve of the PLN token, based on the usage of the protocol.

## Governance

As we've discussed, PLN token holders inform the Pollen protocol by means of their virtual allocations in their virtual portfolios. Additionally, PLN token holders can lock their PLN tokens and create voter escrow PLN tokens or what we refer to as vePLN. Users that opt to lock their PLN tokens in return for vePLN tokens receive three benefits:

1. Up to 20% boosted rewards on the performance of their virtual portfolios depending on the lock period
2. A share from a pool equal to 10% of the total circulating supply as a reward for locking their PLN.
3. Governance rights in which vePLN token holders can issue and vote on Pollen Improvement Proposals (PIPs) to improve the protocol

Rewards and voting power are higher for longer locks, and they decay over the term of the lock, thereby incentivizing users to extend their lockup periods. Users have the option to relock their PLN in order to reset and again increase their boosted rewards and voting rights thereby offsetting the decay. In this way users express long-term confidence and support in the protocol and are rewarded for doing so.

## Governance Architecture

Let's take a closer look at how this works in the contracts:

1. When a Pollenator locks up their PLN to create a virtual portfolio, the protocol issues them vePLN tokens that they can use to govern the Pollen DAO. They can set the lockup period for any amount of time with a minimum of one week and a current maximum of 4 years. You can learn more about the issuance schedule in the Supply Control section of this lite paper.
2. The longer a Pollenator's lockup period the larger the boost to their reward issuance while still adhering to the supply limit curve
3. The Pollenator's vePLN tokens are non-transferable ERC-20s and represent the Pollenator's voting rights. Voting rights and the boosted rewards decay over the period of the lock. I.e., users must continue to extend their lock-ups in order to maintain higher-levels of boosted rewards and increased voting power.

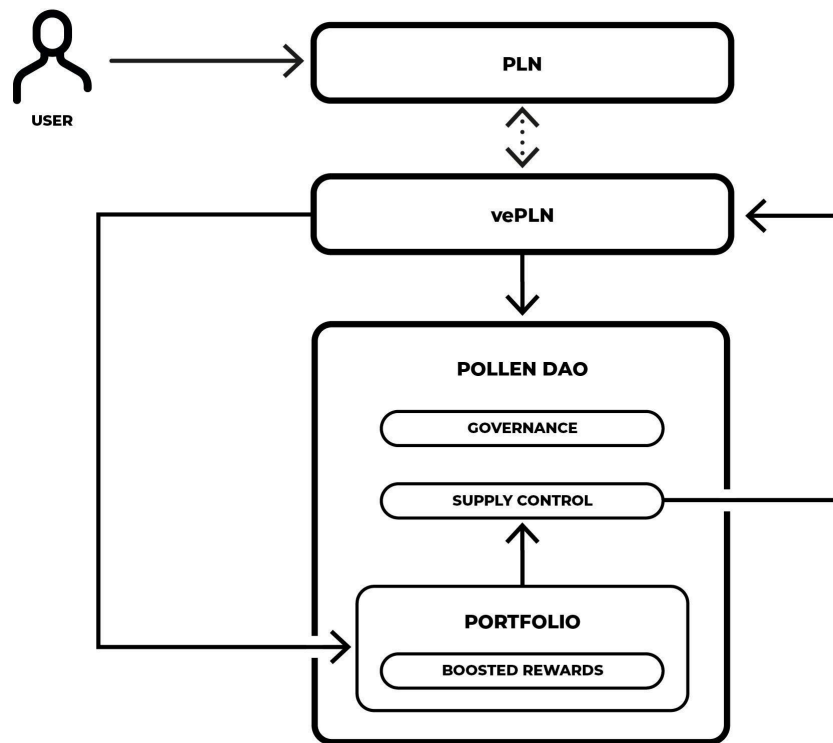


Figure 16: Architecture of Pollen Governance.

## Rewards

Concerning boosted rewards for Pollenators that lockup their PLN in return for vePLN, the boosted rewards are a percentage of the increase to the rewards they've earned. The boost or extra rewards are received when rewards are claimed. That is, when Pollenators rebalance or close their virtual portfolios.

Further, the rate of the boost decays inline with the decay associated with voting rights over the term of the lockup. As more PLN tokens are locked, the rate of PLN rewards that will be issued decreases.

Lastly, the protocol extends vePLN token holders to rewards similar to staking. That is, as new PLN is minted, vePLN token holders will get as a reward, a share from a pool of tokens equal to 10% of the total circulating supply. This way vePLN token holders get less diluted compared to others if the supply is inflationary and end up with an even bigger share if the supply is deflationary.

## Voting Rights

The vePLN tokens empower Pollenators with voting rights. Rather than using the amount of tokens locked as voting power, the Pollen DAO assigns the voting power in relation to the amount of time that the user will be committed to the platform after voting for a proposal. That is, a user should be willing to confront the outcomes of the proposals for which they are voting.

Voting power is designed to be a combination of the amount of PLN tokens locked and the remaining time in the lockup for those tokens. This represents and directly models the level of commitment that users with voting rights have when it comes to governing the protocol. This idea stems from the Aragon Minime Token, later modified by the Curve team for their protocol:

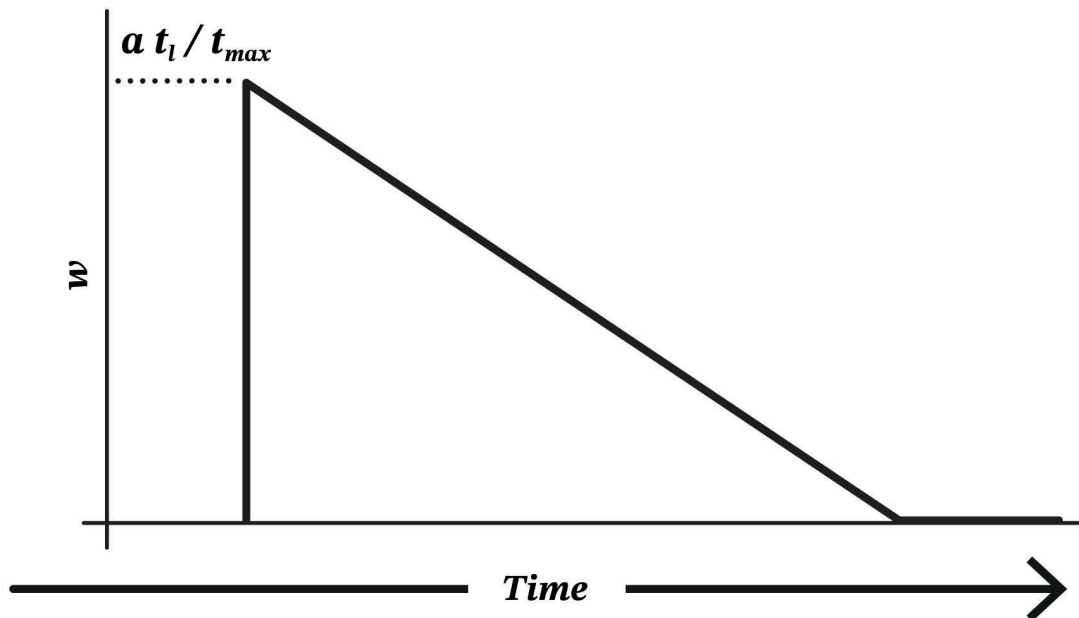


Figure 17: The curve shows the voting power ( $w$ ) decreasing linearly with time such that the less time left in a Pollenator's lockup, the less voting power they have. Users have the option to extend lockup periods at any time to retain as much voting power as they can.

# Conclusion

Pollen's core mission has been to provide a safer way to participate in the decentralized finance ecosystem. To accomplish this, we have developed a suite of products that embody our vision. These include Pollen DEX and Pollen Pods, which reflect our commitment to user sovereignty and safety.

**Pollen DEX:** Pollen's non-custodial exchange empowers users to swap, trade, and rebalance their crypto asset holdings without the need for intermediaries. In doing so, we provide a safe, transparent, and accessible environment that aligns with the principles of true decentralization.

**Pollen Pods:** Pollen Pods takes the mobile wallet experience to the next level. Users can maintain control and sovereignty over their assets with a built-in automated market maker (AMM) and a sophisticated personal portfolio manager. Our protocol, proven to outperform the markets, ensures that users can access the benefits of DeFi without compromising security or autonomy.

**Pollen Virtual:** Pollen Virtual is a trading arena with specialized virtual leagues, users can tap into collective wisdom around niche markets, engaging in both inter and intra-league competitions. This collaborative approach not only enhances user engagement but also fosters a sense of community within the Pollen ecosystem.

**CryptoBowl:** The CryptoBowl is a platform that injects a competitive spirit into Pollen Virtual by allowing Leagues Pro organizations to engage in trading tournaments. This fully on-chain trading competition promotes community-building and serves as a community growth platform that offers a number of revenue streams for participating leagues.

**Pollen DAO:** Pollen has a bespoke DAO protocol that operates on a self-executing mechanism, ensuring that proposals approved by the community are seamlessly implemented without the need for centralized intervention. This decentralized governance model empowers our community to actively participate in shaping the future of Pollen, aligning with the principles of true decentralization.

Pollen aims to provide safe and accessible DEX and wallet tooling, enabling even novice users to harness the transformative power of DeFi. We believe in empowering individuals with the tools they need to confidently navigate the complex landscape of decentralized finance.

Pollen aims to make DeFi better for everyone and be a benchmark in the rapidly maturing Web 3.0 token economy.