



Pandora

LIGHTPAPER

Pandora Protocol

Bridging Real-World Assets & Open Finance

Draft V-1.2

1. Abstract

Pandora is a hybrid Open Finance solution for problems faced by both traditional finance and decentralised finance. We envision the transaction of real-world assets on the trustless platform in a borderless economy. Our scalable, interoperable and high throughput infrastructure allows asset owners to convert their real-world illiquid asset to a liquid state.

It enables the asset owner to exchange values such as invoices, purchase orders, real-world assets, NFTs, Digital assets etc., while providing an unalterable and single source of truth for all involved parties. Pandora ecosystem consists of a decentralised, verifiable data model that makes sure about the asset transfer's authenticity from one owner to another.

2. Preface

This is intended to be a technical “vision” summary of one possible direction that may be taken in further developing the blockchain paradigm together with some rationale as to why this direction is sensible. It lays out in as much detail as is possible at this stage of development a system which may give a concrete improvement on a number of aspects of blockchain technology.

It is not intended to be a specification, formal or otherwise. It is not intended to be comprehensive nor to be a final design. It is not intended to cover non-core aspects of the framework such as APIs, bindings, languages and usage.

This is notably experimental; where parameters are specified, they are likely to change. Mechanisms will be added, refined and removed in response to community ideas and critiques. Large portions of this paper will likely be revised as experimental evidence and prototyping give us information about what will work and whatnot. This document includes a core description of the protocol together with ideas for directions that may be taken to improve various aspects.

It is envisioned that the core description will be used as the starting point for an initial series of proofs-of-concept. A final “version 1.0” would be based around this refined protocol together with the additional ideas that become proven and are determined to be required for the project to reach its goals.

3. Introduction

There are roughly around 256 Trillion dollars of real-world assets globally. Crypto market cap grows exponentially in the last few years to 1.07 trillion dollars market cap. Also, it has locked around 30 billion dollars of assets in its vault. All these locked assets are yield generating assets.

Liquidity is the first step to get yield from the locked assets. Stats above clearly show that there are still trillions of dollars of illiquid real-world assets that can be brought to on-chain and make it liquid. And when assets are liquid, then it's easy to generate a yield from it.

Pandora is an interoperable-decentralised protocol that allows users to represent their real-world assets on trustless on-chain and make it available for trade globally.

3.1. Problem

Whether its traditional finance or decentralised finance, with every evolution there, comes to some deadlock as a trade-off. Traditional finance brings issues like a supply-demand problem, time-value issue, inflation, and privacy. Whereas, decentralised finance brings volatility, speed, and UX challenge to get real-world assets on Web3.

3.1.1. CeFi

Traditional finance has been doing an unimaginably great job in connecting traders across the globe through the power of the internet. They have evolved from barter trade to internet banking. Sending money and trading assets is just one click away. But it's still not able to figure out how to monetise real-world assets. And real-world assets market cap is more than trillions of dollars. There are some underlying challenges in every iterated, traditional finance solution.

3.1.1.1. Barter system trade

Mode of doing business has evolved a lot in the last few centuries regarding goods exchange. Previously the trade was happening through the direct swapping of goods which we call as a barter system.

"The original form of trade was barter trade, defined as the direct exchange of goods and services for other goods and services." - Atieno Ndede-Amadi

International Reciprocal Trade Association (IRTA) estimates that the 400,000 participating businesses transacted \$14 billion globally in 2019 — and it is anticipated that the 14 billion trade volume number will grow another 5 to 10% a year. These stats are only for four sectors majorly—retail, corporate, countertrade and complementary currency. There is enough advantage of barter trade in terms of removing intermediaries and ineffective economic depreciation. But there is some disadvantage too.

Two main limitations are Inefficiency in terms of liquidity of assets and fair difficulty in doing an equitable exchange of values between stakeholders. Inefficacy, in terms of liquidity, is the prevalent problem in barter trade. People having fruits may be looking to buy vegetables. But people having vegetables have a lot of fruit, and they are looking to buy clothes. Here it isn't straightforward to trade one to one.

The second major issue with the barter system is a fair exchange of value. It's challenging to price the product and swap as fair value agreed by both parties. Every time whenever there is a trade, traders need to assess the value of assets. And asset quality is a function of time, geographic region and many other external factors. It isn't easy to agree on each asset's standard price in barter trade to come to mutual agreement.

3.1.1.2. Unlimited supply of Fiat money

The fiat currency system was introduced to solve the issue of barter trade. Fiat currency comes with the faith of its holders and the virtue of a government declaration.

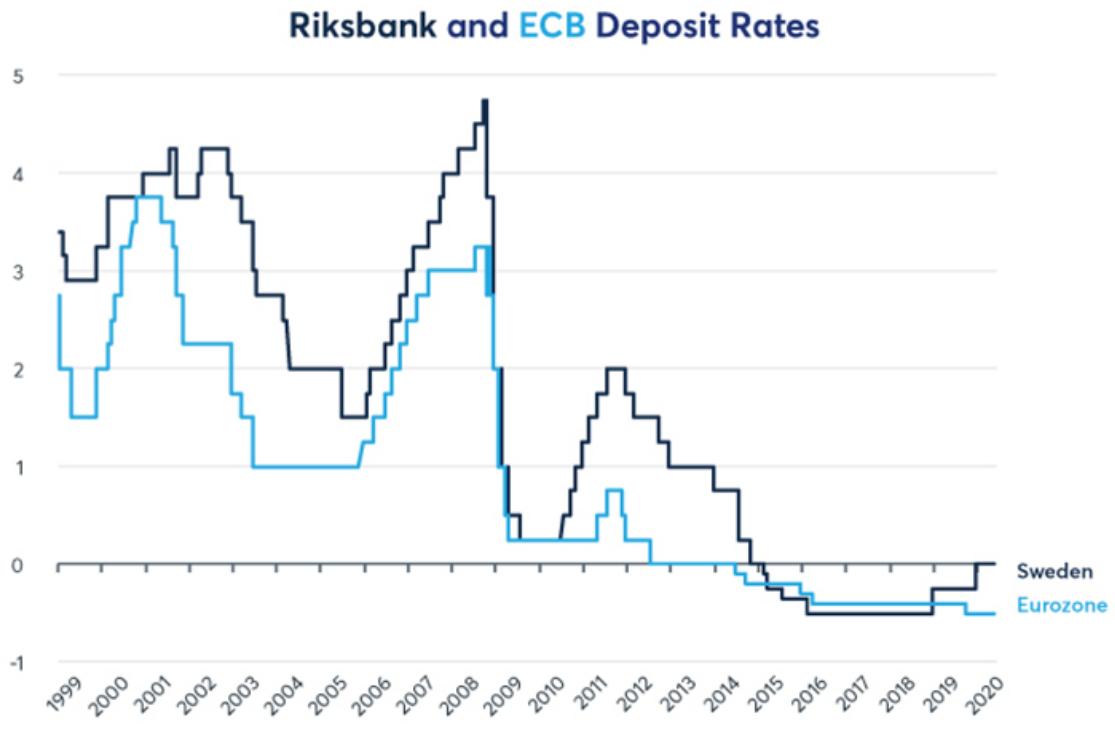
It acts as a storage medium for purchasing power and an alternative to the barter system. It allows people to buy products and services as they need without having to trade one asset with another asset, as was the case with barter trade.

It gave people the ability to store purchasing power; through which they can make plans with ease and create specialized economic activities. Undoubtedly it was able to bring liquidity for a significant volume in an asset across the globe. But over some time, some flaws started to be visible as a sign of inefficiency in the fiat ecosystem.

The value of fiat money is dependent on how a country's economy is performing, how the government is governing itself, and the effects of these factors on interest rates. A country experiencing political instability is likely to have a weakened currency and inflated commodity prices, making it hard for people to buy products as they may need.

Critics of fiat money argue that the limited supply of gold makes it a more stable currency than the fiat money with an unlimited supply.

3.1.1.3. Negative yield generating fiat money



The recent economic crisis forced fed to print more and more money to bring stability in the ecosystem, ultimately resulting in the surplus supply.

Surplus capital eventually leads to a demand-supply problem. In many countries, there is enough capital in the market but very few places to deploy it and get a positive yield—this overall results in less demand and more capital supply. Banks start giving negative interest on the deposited money.

Although economists argue, a negative interest rate is injected by the government to check the recession.

Overall it affects normal users of the bank. They get a negative return on the money they deposit in banks. The European Central Bank (ECB) deposit rate is -0.5%, the lowest on record. Institutional investors of these countries always look for some mechanism to deploy capital, giving a positive return. Current existing financial tools are inefficient and come with lots of barriers in deploying capital globally.

3.1.1.4. Settlement time and international txn fee

We all are a part of the global economy directly or indirectly. But when it comes to deploying capital or sending money globally than in that case, we have to pay some fee and cost time as well.

The fees charged us are distributed among various centralised stakeholders who help transactions from one country to another. On an average Swift payment, the transaction takes 3-5 days for doing global settlement. If one goes with Visa/Mastercard, then there is a fee of 2-5% easily. Current financial organisations are working on decade-old infrastructure and using outdated tools. Settlement of international traction and tools used to facilitate both need upgradation.

3.1.1.5. Privacy

As more and more companies experience crippling security breaches, the wave of compromised data is on an all-time high.

70 % of 2020 Privacy Study respondents say privacy is a crucial material risk for their financial firms. In 2020 itself there are many times when there is a massive data breach like

Fifth Third Bank, Feb 2020: A financial institution with 1,150 branches in 10 states, claims a former employee is responsible for a data breach, which exposed customers' name, Social Security number, driver's license information, mother's maiden name, address, phone number, date of birth and account numbers.

Peekaboo Moments, Jan 2020: An unsecured database on an Elasticsearch server at Peekaboo Moments.

Microsoft, Jan 2020: A customer support database holding over 280 million Microsoft customer records were left unprotected on the web.

Traditional finance has an advanced lot in machine learning and other technology, but it's still unable to prevent a substantial amount of significant data breach.

3.1.2. DeFi

There are roughly around 256 Trillion dollars of real-world assets globally. Crypto market cap grows exponentially in the last few years to 1.07 trillion dollars market cap. Rise of Ethereum gave immense power to smart contract developer to develop plenty of lending and leverage platform. Because of this, it has locked around 30 billion dollars of assets in its vault.

Although DeFi has done a fantastic job in capturing assets and representing on the chain. But there are still significant portions of assets which are not represented on the chain. There are many reasons for this: high transaction cost, low transaction speed, transaction limited to only one chain, trade limited to the stable coin, UX, privacy and many others.

3.1.2.1. Collateral is limited to crypto only

The stablecoin market has grown from \$5 billion at the beginning of 2020 to around \$22.2 billion today.

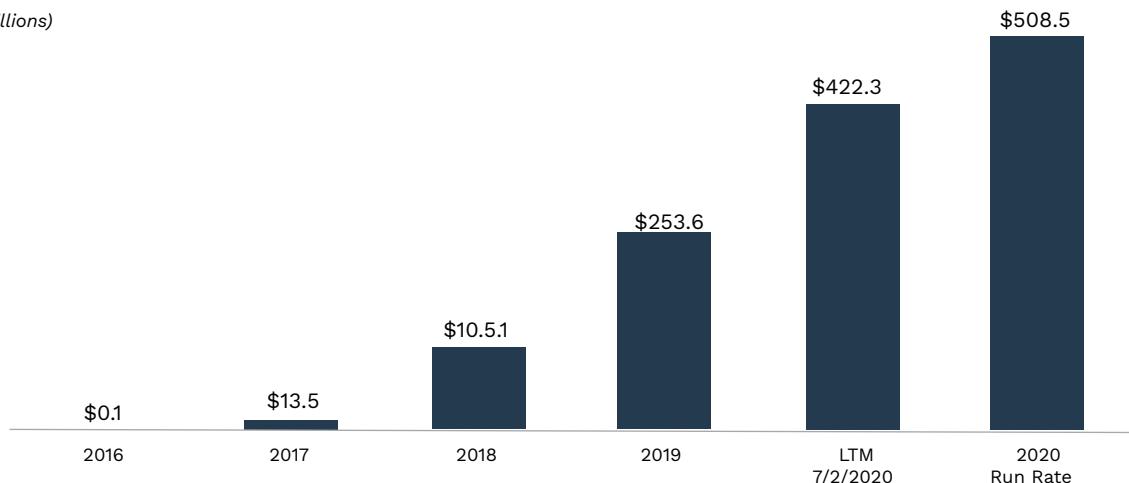
According to data compiled by Messari, the total supply of stablecoin has surged past \$20 billion in Q3 2020.

This year, part of the growth in stablecoin supply has been driven by the surge in the decentralized finance (DeFi) market. Traders can lock stablecoin into several non-custodial lending platforms to earn a high-yield.

Stablecoin annual transaction volume

Stablecoins are on pace to transact half a trillion dollars this year

(\$ in billions)



As of Jul 12, 2020

Note: Includes USDT,USDC,PAXTUSD,BUSD,HUSD,GUSD,DAI,SAI

Source: CoinMetrics

These locked assets are basically the crypto assets in the form of stable coins. Trillion dollars of assets can be tokenized, including digital and physical assets like car/home/other valuable assets and can be traded.

But, as of now, we can't trade easily any real-world assets with stablecoin.

For taking a loan on the platform mentioned above we have to put the only crypto as collateral. It isn't easy to make the trade by bridging real-world assets on-chain and then trade.

3.1.2.2. Illiquid NFT's

There are some platforms which have shown good early traction of NFT ecosystems like Opensea and Raible. But for them, the biggest issue is the illiquidity of NFT assets for both digital and real-world assets. People create random NFT and put them for sale. It's challenging for a platform owner to bring liquidity to an NFT in the ecosystem. There are many reasons for it. It's straightforward to copy the assets (images/graphics/video) from one platform and sell it on another platform. There is no mechanism to check the authenticity of those listed assets.

3.1.2.3. Inefficient infrastructure for NFT's

Recent Uniswap airdrop and few other events was a clear indication that we need a lower gas fee. Crypto market is tiny compared to the traditional market. So when we are thinking of bringing traditional real-world assets on the blockchain, we need to upgrade a lot in tech terms.

They need to have a low gas fee, high speed and cross-blockchain transaction infrastructure, which is very suitable for real-world tokenization.

3.1.2.3. Data privacy

The DeFi theme is to work on the trustless principle, but when it comes to the bigger institutions, they want some privacy level to safeguard their users and other details.

There are many instances where the user wants to trade assets with privacy. But doing any transactions on an open ledger puts details publically. There hasn't been any such platform which can facilitate such real-world assets trade.

The good thing is that the blockchain as an ecosystem has recently come up with some suitable privacy protocols like Aztec, Zksync and few others. They need to plug and play with the real world assets platform to use big institutions to make the trade on the privacy-protected ledger.

4. Previous Work:

There are few projects in the real-world asset ecosystem like Centrifuge and DMM, which did some fair amount of initial work in the tokenisation space. Both the projects can tokenise the invoice and the automobile sector. For the digital NFT, Opensea and rairble did a fair amount of work, but the challenging issue is to have liquidity for the assets. There are many NFT that are never sold after that listing because people don't find it exciting. But at the same time, there are many such high valued NFT that a single person holds. It restricts other people to own highly valued assets collectively.

5. Solution

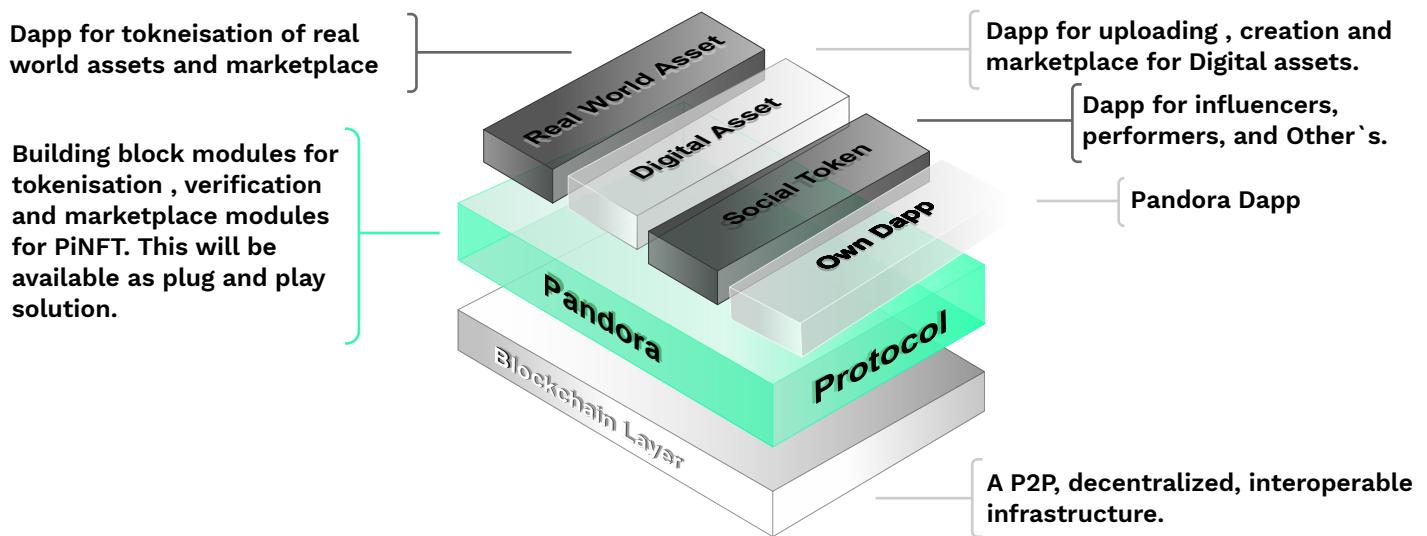
NFT ecosystem needs a trustless, p2p decentralised platform where assets can be tokenized and validated about their authenticity at the same time.

To meet the above need, we are building Pandora Protocol which is completely decentralised, interoperable, high throughput, trustless and p2p. The whole pandora architecture is very modular, making developer life easy for plug and play with the protocol.

The theme of Pandora is to bring liquidity to real-world assets as well as digital assets.

6. Tech Architecture

Pandora is a customer-centric ecosystem. Things designed, made here are moved step by step, keeping our customer intact to our ecosystem. We are releasing our product on BSC (Binance Smart Chain); later, we will be moving on the Polkadot network for an interoperable solution. Our goal is to provide an interoperable network where anyone across the globe can create an asset on one chain and get it validated or traded by someone on another chain. We are achieving all these in a step by step way, which we discuss in our roadmap section.



Pandora stack consists of 3 different layers.

1. **Pandora chain:** A self-sovereign interoperable chain where any assets can be tokenised and traded. It can be of Web2 ecosystem or Web3 like ethereum, Polkadot, Cosmos or any other chain.
2. **Pandora SDK/Protocol:** SDK would be a complete suite of all features that can be plugged and played to any existing application and spins the functionality. Developers can also create an application from scratch by integrating this SDK in their dapp.
3. **Pandora Dapps:** A dapp built for users. It will be used by those who want to tokenised tier real-world assets and wish to participate in the trade of those tokenised assets.

6.1 Pandora Parachain

Pandora chain: A self-sovereign interoperable chain built primarily for tokenisation of assets and inducing liquidity in them. Speed, transaction cost, and privacy are three main focus areas for this chain because all three things differ for the tokenisation use case compared to other use cases. The theme for building this chain is to provide customisable feature services for institutional investor and tokenised user. Since this chain is interoperable, one can easily do cross-chain asset transactions across Ethereum, Binance, Polkadot, Cosmos and other ecosystems.

6.1 SDK

The Pandora Software Development Kit (SDK) is a set of standardised tools or ‘modules’ that can be used to create a marketplace and other use cases to exchange real-world assets.

Developers can create an application from scratch by integrating this SDK in their dapp in plug and play manner.

The SDK is in a continuous development phase, which will bring all end to end functionality of real-world exchange. Development of SDK is done in the test-driven development process. With the help of the SDK, the developer can

- Create new assets.
- Onboard any organisation and other employees.
- Conduct relevant cross-check of an asset.
- Tokenize NFT
- Buy/Sell/Lend/Swap NFT
- create a market for NFT
- Bring liquidity from Pandora ecosystem and many other features.

6.3 Dapp

Pandora dapps are the first user-centric application developed by developers. There are two different dapps getting developed using Pandora Protocol.

1. Pandora Box
2. Pandora KylyX

On Pandora Box, dapp Asset owners can tokenize any assets and then put it on the marketplace. It can digital assets or real world assets NFT.

But on Pandora KylyX, the user can request any validator to validate any assets cross-platform. On KylyX there will be a list of validators who are specialised in validating certain kinds of assets. Any user can request validation, and the asset will get validated.

There are a certain set of validators who can validate the assets and make them a verifiable asset. Once the asset is verified, then it is liquid in the state. Later asset owners can sell, swap, lend with other users. This dapp is currently developed on the BSC ecosystem. Later, this dapp will be imported to our interoperable-decentralised network.

7. Pandora Ecosystem

NFT ecosystem needs a trustless, p2p decentralised platform where assets can be tokenised and validated about their authenticity at the same time.

To meet the above need, we are building Pandora Protocol which is completely decentralised, interoperable, high throughput, trustless and p2p. The whole pandora architecture is very modular, making developer life easy for plug and play with the protocol.

The theme of Pandora is to bring liquidity to real-world assets as well as digital assets.

Our Pandora stack is entirely modular and easy to use features. We have categorised different users based on their rights to get the best return from the platform. We have categorised different users based on their rights to get the best return from the platform. Some of our participants are

1. Asset Owner
2. Asset validator
3. Assets (Real world assets/Digital assets)
4. Charmer
5. Reputation provider

7.1.1. Asset Owner

Asset originator is the one who owns the asset. Asset owners can liquidate the asset via swap, transfer, lend and leverage. To be an asset owner, one needs to create an account and put the relevant details about themselves and their asset.

7.1.2. Asset Validator

Participants who validate the asset just are called as asset validators. Asset validator will be the one to take the risk if the asset owner defaults the assets. The validator will get yield and extra interest invalidating any set of assets. Asset owner ideally chooses a trustable validator. Also, in the worst-case scenario, if the validator does a bad transaction, then the validator profile will be impacted for further validation.

7.1.3. Other participants

A few other participants like nominator, insurer, and charmer will be included in the later stage to make whole asset monetization and transfer efficiently and in an automated way.

The job of nominator will be to act as a validator of first phase validator. The nominator will assess the quality of the validator in terms of the asset they are validating and operating.

Whereas, the job of charmer & insurer will come to work in dispute resolution time. It will work as an oracle for dispute resolution.

7.2. Liquidity induction in NFT

Liquidity is a major issue for any NFT Platform. To solve liquidity, we are coming up with an innovative way of inducing liquidity in real-world and digital asset NFT. Pandora is developing PiNFT where any NFT can be converted in the ERC 20 token format and tradeable on the cross-chain platform. Also, this fungible token will be used for borrowing, lending and generating the yield from the DeFi ecosystem. Details about liquidity induction via PiNFT will be released via the Pandora article.

7.3. NFT fractionalization

Pandora will also have the feature of fractionalization of NFT where one valuable NFT will be fractioned, and the subsequent part will be sold to other parties. Fractioned NFT will be further traded on NFT DEX.

Think of your YouTube channel credentials. Few subscribers want to buy a portion of the ownership in your channel since they realized your channel's potential. They can't buy the complete channel credentials because of a few reasons.

1. It will cost lots of money to buy the complete assets since the credible account is very valuable in itself.
2. Original creator shares will be diluted, and he/she can start another channel. This won't be a good business model for the new buyer because every buyer wants creator skin also in the game.

There are several benefits for both NFT creator and NFT buyer when we are doing fractionalization of NFT like

1. Creator skin will be in the game, and they can incentivize by upselling the fractioned share of their assets as they keep working on.
2. Many people can be the fractioned owner of any assets. This will bring more participation and reach a wider range of audiences.
3. Since there are multiple buyers/sellers so liquidity won't be an issue.
4. Centralization of ownership will be replaced by fractionated ownership of assets.

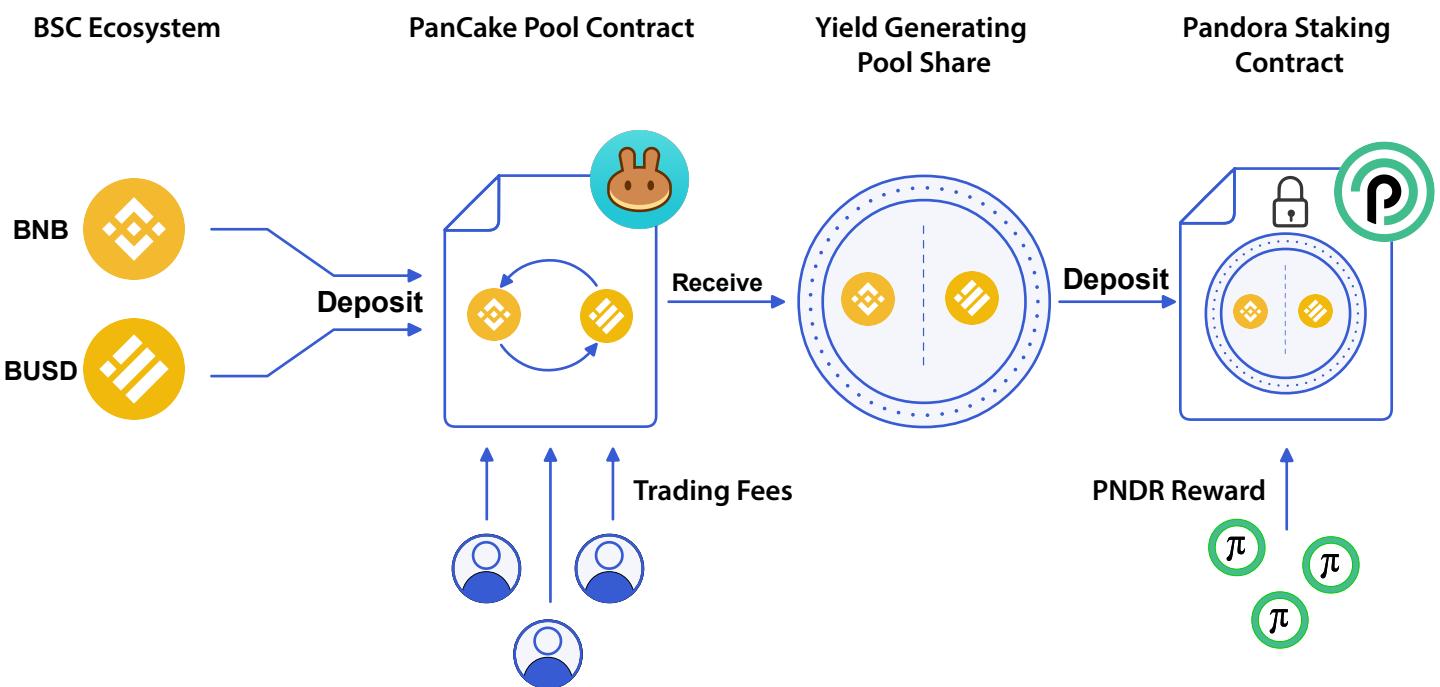
7.4. Yielding

The Pandora platform also provides the yield farming Robo-advisory for its users that runs a portfolio of yield farming strategies from a single liquidity pool.

Key features of Pandora Liquidity Pool are:

- Capture growth across the DeFi products with a single deposit.
- The diversified portfolio of yield farming strategies to reduce smart contract risk and yield volatility.
- Automatic portfolio rebalancing to optimise risk-adjusted yield.
- Optimised gas savings mechanism on withdrawal fee and rebalance fees compared to independent manual yield farming.

Pandora will have sets of smart contracts that will run Rebalancing mechanism overtime to get the best yield.



7.5. Proof of Reputation

Pandora will have a reward and slash mechanism for its users. For this, we are using the Decentralised Identity layer map for each user. If the validators game the user while validating the assets, they can put the mark for slash on the validator profile. Next time when new users want to get validated their assets then they will see the remark put by previous users. This will work for the user also from the validator side. One thing to note here, Pandora is not going to reward or slash any user. It will be done by only those participants who are interacting with each other. Pandora is just a decentralised platform facilitator.

7.6. Oracle

When it comes to trade of real-world assets or digital NFTs, oracle plays a significant role. The oracle vertical of Pandora will allow the NFT to use external data/systems as a mechanism for minting/burning NFTs, trading peer-to-peer and checking state. As of now, we are incorporating the existing oracle solution Chainlink.

Consider the playing cards NFT where there are many football players competing against each other. In a real-world asset scenario, the physical card won't be updated. And it's challenging to buy a card after every match if we want to play with the latest updated card.

To mitigate the issue, the user can play with tokenized NFT cards which will be updated regularly. To update, the system needs to get input from the outside ecosystem, which needs to be trustless via the oracle.

8. Risk & mitigations

The following risks have been identified as risks to the stability of the PNDR Ecosystem.

- **New Economic Model:** Economics keeps evolving, and Pandora DAO will be doing best to upgrade with any latest change. Also, there is some economic uncertainty during a disaster; Pandora DAO will make relevant decisions according to its outcome. The goal here is to make the whole real-world asset exchange efficient.
- **Smart Contract Bugs:** Possibility of any bug in the smart contract can bring the ecosystem down, no matter how much code-review has been done on the smart contracts. Our mainnet contract will be audited contract with the recognised audited firm. However, there are chances of having bug there also.
- **Liquidity:** Low liquidity can be a challenge for the ecosystem.
- **The collapse of Yield Provider:** If under any circumstances or because of any reason, if the yield provider collapsed, the ecosystem will collapse as well.
- **Centralisation of PNDR Token:** Once the Pandora ecosystem is converted into a DAO ecosystem, most decisions will be made by PNDR ecosystem. Therefore the centralisation of PNDR tokens will cause the decisions to be one-sided, which might not possibly result in the best outcome.
- **The collapse of the Price Feeds:** The price feeds are a crucial piece for the Pandora Ecosystem to determine the market's situation, which is essential once we introduce the yield farming and stable currency generations in Pandora Ecosystem. Any collapse in these price feeds would cause the PNDR vaults to make decisions on the incorrect data.

8.1 DAO & Governance

One of the Pandora Ecosystem's core beliefs is that every stakeholder in the ecosystem should participate in the decision-making continuously, without having to rely on or trust anyone. The members will be initially sourced from the core team and community members and is composed of owners of the governance utility token, which holds voting rights based on ownership within the ecosystem's continuous approval voting system for new features and direction, resulting in a democratic and decentralized structure

9. Roadmap

The technical roadmap for Pandora is progressive and can be categorized as five significant developments.

- Adding support for more categories of real-world assets, which can further back the system and yield token holders.
- Integrations and APIs that will allow for existing tools to hook into Pandora, granting the project more users & exposure for asset exchange and yield generation.
- Improving the treasury management function to become more efficient & transparent as the ecosystem matures.
- Implementation of the Pandora DAO, which can govern the protocol, fund development, add assets and receive rewards. This will also help in mitigating the risk during dispute resolution.
- Releasing Pandora network and onboard other asset management startups on it through various tools and API.

10. Conclusion

Pandora is designed to solve the crucial problem of once again allowing global citizens to earn interest on their money. While initially focused on holders of digital assets, we believe the ability to earn interest with a fully-transparent view into the backing, and over collateralized income streams will provide another reason for those in the fiat world to join the BSC community.

References

Centrifuge whitepaper: https://centrifuge.io/centrifuge_os_white_paper.pdf

DMM whitepaper: <https://defimoneymarket.com/DMM-Ecosystem.pdf>

EY - Tokenization-of-assets : https://assets.ey.com/content/dam/ey-sites/ey-com/en_ch/topics/blockchain/ey-tokenization-of-assets-broschure-final.pdf

Chainlink: <https://blog.chain.link/create-dynamic-nfts-using-chainlink-oracles/>