Shadows Network

White Paper V1.0

Keywords

Collateralised Stablecoin: Debt the token, in the Shadows system, the DOS overcollateralisation is minted to create a stablecoin xUSD, holding 1 xUSD is equivalent to taking on 1 USD of debt.

Synthetic Assets: Smart contracts build on-chain mirror worlds for real assets, which enables the value of the underlying asset to circulate safely and freely on the chain in the form of debt.

Collateralisation rate: the core data of the synthetic asset agreement, which ensures that the collateral assets backing the synthetic asset can cope with large price fluctuations and prevent systemic risk.

Variable Debt Pool: Synthetic assets issued by DOS collateral minting would be recorded as debt and the change in the price of the synthetic assets would affect the dynamic change in the level of the debt pool, the sum of the debt of all collateralists is what we call the debt pool.

Collateralised Debt Obligations (CDO): Shadows users pledge their debt holdings (synthetic assets) for lending and borrowing, providing more flexible liquidity for investors with different risk appetites.

Debt conversion: A synthetic asset transaction is essentially the conversion of one synthetic asset debt (such as xUSD) into another synthetic asset debt (such as xTSLA) executed by a smart contract.

Abstract

Shadows Network is the underlying network for the DeFi synthetic asset issuance agreement and synthetic asset trading based on Substrate, the backbone of the web 3.0 store of value that will enable the free trading of on-chain assets by anyone, anywhere.

Shadows Network is Polkadot's parallel chain focused on mapping real-world financial assets onto the chain through a agreement, a synthetic asset issuance agreement, and a decentralised trading platform and collateralised lending platform for synthetic assets.

Synthetic assets on the Shadows Network system are underwritten by the native token DOS, and can be issued by locking the DOS collateral into a smart contract.

DOS will be the value connection pipeline for off-chain assets to be mapped onto the chain.

Shadows supports a wide range of synthetic assets such as synthetic stablecoins (xUSD), cryptocurrencies (xBTC) and financial products (xGOLD, xTSLA).

Shadows Network will strive to become one of the Polkadot parallel chains by participating in the parallel chain slot auction. However, even if they are not successful in gaining access to the slot at that time, shadows will count towards the parallel threads to gain cross-chain capability.

Shadows Network consists of three main modules

Synthetic Asset Issuance Agreement

The synthetic assets are secured by the underlying value of the DOS, which the user pledges into a smart contract to create a synthetic asset and incur a DOS denominated debt. In order to unlock their DOS, the user is required to destroy the synthetic asset to settle the debt. Any synthetic asset shall meet a collateral ratio of 800%, below which the collateral cannot be redeemed.

Shadows version V1 supports the production of synthetic assets from DOS collateral.

Version V2 will support BTC, ETH, DOT as collateral via cross-chain and generate debt denominated in BTC etc. The collateral ratio requirement is a minimum of 180%.

Synthetic Asset Transaction Agreement

The exchange of synthetic asset values will be supported by trading agreements.

Shadows trading agreement has several advantages:

1, Based on the design of the debt model, trading in synthetic assets is essentially a conversion of debt, with a smart contract executing the destruction of one asset (debt) and the production of another (debt). With this trading method, there is no need for counterparties or order books, and no need to worry about liquidity or slippage. It allows synthetic assets to be traded simply, safely and efficiently.

2, Through synthetic asset trading, it is possible to trade on an asset without actually holding that asset. This type of trading reduces the friction of asset exchange and allows for quick exchanges between different types of assets, such as Tesla shares, gold, bitcoin and other different assets, thus synthetic assets can help investors reach a wider range of assets.

Debt collateral lending agreement

A lending pool will be available in the Shadows Network system where users can place debt (such as xUSD) into a lending pool smart contract to be lent. The borrower pledges the debt (synthetic assets such as xTSLA) into the lending pool, pays interest and receives a loan of xUSD due to the need for flexible funding liquidity.

There is an automatic balance between supply and demand in the lending pool rates and the interest earnings generated will be allocated in proportion to the xUSD lent in the lending pool.

Reasons why synthetic assets are needed

Invariably, there are people who are unable or unwilling to hold the initial asset, and synthetic assets meet a more diverse range of our needs. For users with a hedging need, they need stable coins (which are synthetic assets) on the blockchain to facilitate liquidity as opposed to US dollars; synthetic assets often have more financial attributes than the original asset. For instance, there is no interest on holding BTC, whereas holding xBTC anchored to BTC provides an ongoing income.

The demand for synthetic assets stems primarily from trading, gaining exposure to an asset by simulating that asset and thereby gaining a possible opportunity to earn a return. For instance, the shares of Tesla are not available to people in all countries. However, by means of synthetic assets, users can buy synthetic assets of Tesla shares and gain from the upside of Tesla shares, while of course taking the risk of the downside.

Holding DOS benefits

Holding DOS has several benefits as follows:

1, **Issuance of synthetic assets:** DOS is a collateral asset for the generation of synthetic assets within the shadows system and is a working token for access to the shadows system.

2, **Transaction Rewards:** shadows trading agreements generate a transaction fee for each transaction, which is deposited into a transaction fee pool. Transaction fee income is allocated to eligible DOS collateralists on a weekly pro-rata basis.

3. **Collateralised lending:** Users can synthesise DOS into a stable coin, xUSD, and deposit it into the lending pool to earn interest on the lending. Proceeds from the lending pool will also be distributed to lenders on a pro-rata basis.

4, **Synthetic Asset Reward:** Users who participate in the minting of synthetic assets will receive a DOS reward, which will be distributed to DOS collateralists with a DOS collateral ratio of no less than 800% on a pro-rata weekly basis.

5, **Staking rewards:** users holding DOS and participating in staking can receive DOS rewards, which will be distributed on a pro-rata basis once a week.

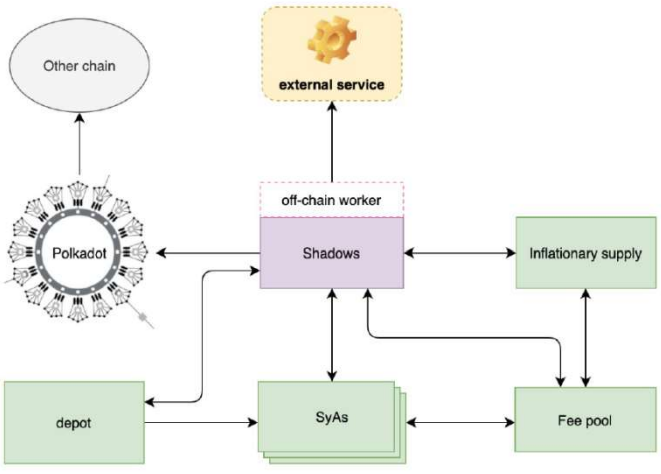
6, **Destruction mechanism:** Transaction fee income and debit pool fee income will be used for destruction according to a fixed ratio of 30% per week, which will be automatically executed by the smart contract, making the total amount of DOS enter deflationary mode.

7, **System Governance:** DOS token holders have the right to vote on system governance, such as new feature additions, agreement upgrades and fixes, etc.

Shadows working mechanism

System structure

Due to the cross-chain nature of Polkadot, the Shadows system supports cross-chain asset synthesis and trading.



Minting Synthetic Assets

The user can cast synthetic assets through the Shadows Synthesis Agreement, where a smart contract locks in DOS as the underlying collateral to cast xUSD and requires a collateral ratio of no less than 800%.

Every time a user pledges DOS to cast a synthetic asset, a DOS-accounted debt is created and added to the debt register, which is stored in xUSD.

After assigning the debt to the DOS mortgagee, Shadows will issue a command to the xUSD smart contract to issue a new amount and add the new amount to the total supply of synthetic assets, then issue the newly minted xUSD to the user's wallet, updating the wallet balance.

As the price of DOS rises, the collateralisation rate increases and the DOS pledged by the user is automatically unlocked by the smart contract execution. Conversely if DOS falls, the collateralisation rate decreases and the user needs to increase DOS to meet the collateralisation rate requirement.

Collateralisation Ratio

The user pledges DOS into the shadows system to cast synthetic assets, creating a DOS-denominated debt that earns a DOS incentive when the pledgee maintains its collateralisation rate at 800%. This over-collateralisation ensures that the synthetic asset is sufficiently collateralised to support significant price fluctuations.

As the price of DOS or synthetic assets fluctuates, it affects changes in debt in the debt pool and thus each mortgagee's collateralisation rate will follow suit. Once the collateralisation rate falls below 800%, the collateraliser will not receive a DOS bonus, and will not receive a transaction fee bonus until the collateralisation rate is restored.

Once the collateralisation rate falls below a specified threshold, the collateralised DOS will not be redeemable and the mortgagor may adjust its collateralisation rate by destroying some of its synthetic assets or replenishing its DOS.

Dynamic Debt

The user incurs debt when pledging DOS to create synthetic assets. The user's debt will increase or decrease depending on the exchange rate and availability of synthetic assets in the network.

For instance, if all synthetic assets in the system are synthetic gold (xGOLD) and the price of xGOLD falls by 50%, the debt in the system will be reduced by 50% and the debt of each mortgagee will be halved.

In another case, when only half of the synthetic assets in the system are xGOLD and the other half are xTSLA, when the price of gold increases by 50% and the price of TSLA shares remains unchanged, the total debt in the system and the debt of each risk taker will increase by a quarter.

Counterparties

All users of the DOS who use the collateralised casting synthetic asset to incur debt are counterparties to the synthetic asset trading platform. The collateralised casting synthetic asset receives an incentive to also take on the risk of debt volatility in the system.

We illustrate how debt is calculated and why DOS mortgagees are counterparties to the synthetic trading platform with the following example:

1: Zhang San and Li Si pledge $50,000 worth of DOS minted in xUSD, at which point the total debt in the network is $100,000, at which point Zhang San and Li Si each take on 50% of the debt in the system.

2: Zhang San uses all of his xUSD holdings to buy xGOLD, while Li Si continues to hold xUSD.

3: The price of xGOLD rises by 50%, so the value of Zhang San's total position becomes $75,000, of which Zhang San's $25,000 profit brings the network's total debt to $125,000.

4: Zhang San and Li Si are still respectively responsible for 50% of the network's total debt, i.e. $62,500 each. When the value of Zhang San's xGOLD is subtracted from his $50,000 debt, a profit of $12,500 is made; while Li Si's position is still worth $50,000, but his debt has increased by $12,500, i.e. Li Si's loss is $12,500.

Trading synthetic assets

In the Shadows Synthetic Asset Trading Agreement, trading in synthetic assets is primarily an interaction with a smart contract, with no order book and no counterparty. The trading of synthetic assets for the Shadows system involves simply converting debt from one synthetic asset to another by a smart contract, so that users do not have to worry about liquidity issues.

We describe the process of trading synthetic assets with the following example, taking xUSD trading xGOLD as an example:

1: Destroy the source synthetic asset xUSD and reduce the xUSD balance at that wallet address, then update the total xUSD supply in the shadows system.

2: Calculate the exchange rate based on the price of xGOLD and determine the amount to be exchanged. And charge a transaction fee of 0.3% and send this transaction fee in xUSD to the transaction fee pool to be used as an incentive for all DOS collateralists.

3: The remaining 99.7% is issued by a smart contract for the target synthetic asset xGOLD and updated to the wallet balance.

4: Lastly the total supply of xGOLD in the shadows system is updated.

System Incentives

There are 3 types of incentive rewards available in the system:

1: The user receives a 0.3% fee when trading synthetic assets and sends it to the transaction fee pool as an incentive for DOS mortgagees.

The transaction fee incentive is allocated based on the percentage of debt issued by each mortgagee. For instance, if a mortgagor has issued 10,000 xUSD of debt and the debt pool is 1,000,000 xUSD, and that mortgagor's debt represents 10% of the total debt pool, the reward pool has 100 xUSD of transaction fee income at that point and that mortgagor receives 10 xUSD when the reward is distributed.

2: DOS holding bonus, the mortgagor will receive a weekly DOS holding bonus, which is derived from the output of the DOS pool, and the amount of the bonus will be distributed according to the percentage of the total debt pool held by the mortgagor.

3: Lending pool rewards, where the lender receives a weekly reward for the proceeds of the lending pool. For example, if the mortgagee lends 100 x USD into the lending pool, the total size of the pool is 10,000 x USD, the lender holds 1% of the total pool, the interest earnings of the pool is 50 x USD, and the lender will receive 0.5 x USD of the lending interest earnings when the lending rewards are distributed.

Debt Pools

When a Shadows user casts or destroys synthetic assets, the system keeps track of the debt pool and each mortgagor's debt by updating the Cumulative Debt Increment Ratio. This calculates the proportion of a DOS mortgagee's debt in the debt pool at the time of its last minting or destruction, as well as changes in debt caused by other mortgagors entering or leaving the system. The system uses this information to determine each mortgagor's debt at any future point in time, without having to actually record changes in each mortgagor's debt.

Through updating the Cumulative Debt Increment Ratio on the Debt Register, the system can track the percentage of debt for each user.

If a mortgagor destroys all debts, their debt issuance data in the Debt Register will be set to 0 and they will no longer be part of the debt pool.

Destroying debts

When a user wants to exit the system or reduce the debt and unlock the pledged DOS, the debt must first be repaid. When the collateralisation rate is below 800%, the collateralised DOS cannot be unlocked for redemption.

For instance: If a user pledges DOS and minted 10 x USD, when he wants to redeem the DOS, he must destroy the 10 x USD before he can unlock the pledged DOS and redeem it. If the debt pool fluctuates during the pledge period and the individual debt changes, the pledgor will need to destroy more or less debt than when the xUSD was minted.

The process of destroying debt by smart contract:

1: The Shadows smart contract determines the balance of the mortgagor's debt and removes it from the 'debt register'.

2: The required xUSD amount is destroyed and the total xUSD supply is updated along with the xUSD balance in the user's wallet.

3: Redeem these DOS by destroying the xUSD and setting the balance to be transferable.

Liquidation mechanism

If the mortgage ratio falls below 800%, the mortgagee will not receive the transaction fee bonus. A liquidation mechanism has also been introduced to avoid systemic risk. When the collateral ratio falls below 250%, the system will indicate the risk of liquidation. If the collateral ratio is not increased within a certain period of time, the collateral will be liquidated.

A "deposit liveness period" is introduced here: the collateral can be added to the collateral during the active period (e.g. 4 hours) to avoid liquidation. Upon expiry of the period, if the collateral ratio is still below 250%, then any DOS holder can initiate liquidation of the collateral, and the liquidator will receive a percentage of the proceeds in case of a successful liquidation.

Treasury

There will be a treasury fund within the Shadows system as a risk fund to prevent the use of the treasury fund for compensation in the event of systemic risk, in order to reduce losses and risks to system users.

Cross-chaining

Shadows will operate as a Polkadot parallel chain (parallel threads). Therefore Shadows will have cross-chain compatibility relative to the synthetic asset protocols of Ethereum and EOS. Having the ability to offer cross-chain asset collateral, such as users can pledge BTC, ETH to mint synthetic assets is a massive advantage. Cross-chain compatibility opens the way to new markets and gaining new users.

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Off-chain worker

The value of all synthetic assets in the Shadows system needs to be captured from below the chain and then submitted to the chain. This is normally done through Oracles. Oracles are external services that are typically used to listen for blockchain events and trigger tasks based on conditions. When these tasks are executed, the results are submitted to the blockchain in the form of a transaction. While this approach works, it still has some shortcomings in terms of security, scalability, and basic efficiency.

In order to make off-chain data integration more secure and efficient, we are going to use the off-chain worker provided by Substrate. The off-chain worker subsystem can perform long-running and potentially non-deterministic tasks (e.g. web requests, encryption and signing of data, random number generation, CPU-intensive computation, enumeration/aggregation of on-chain data, etc.), which can be found in: https://substrate.dev/docs/zh-CN/knowledgebase/learn-substrate/off-chain-workers

Devlopment Plan

- 2021-Q1 Launch of Shadows V1 with the support of DOS collateralized synthetic assets
- 2021-Q2 Participate in the Polkadot Parallel Chain Slot Auction,launch of V2 version with the support for cross-chain asset synthesis and trading
- 2021-Q3 Launch of V3 version with the support for synthetic assets collateralized lending
- 2022-Q1 Transition of Shadows system to DAO model governance
- Long-term planning Synthetic asset (derivative) futures trading, leveraged trading

Official website:www.shadows.link

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