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Bifrost Finance Whitepaper

Authors: Lurpis, Buffalo

Update: 2021/09/12

Version 1.2.3

1. Project background

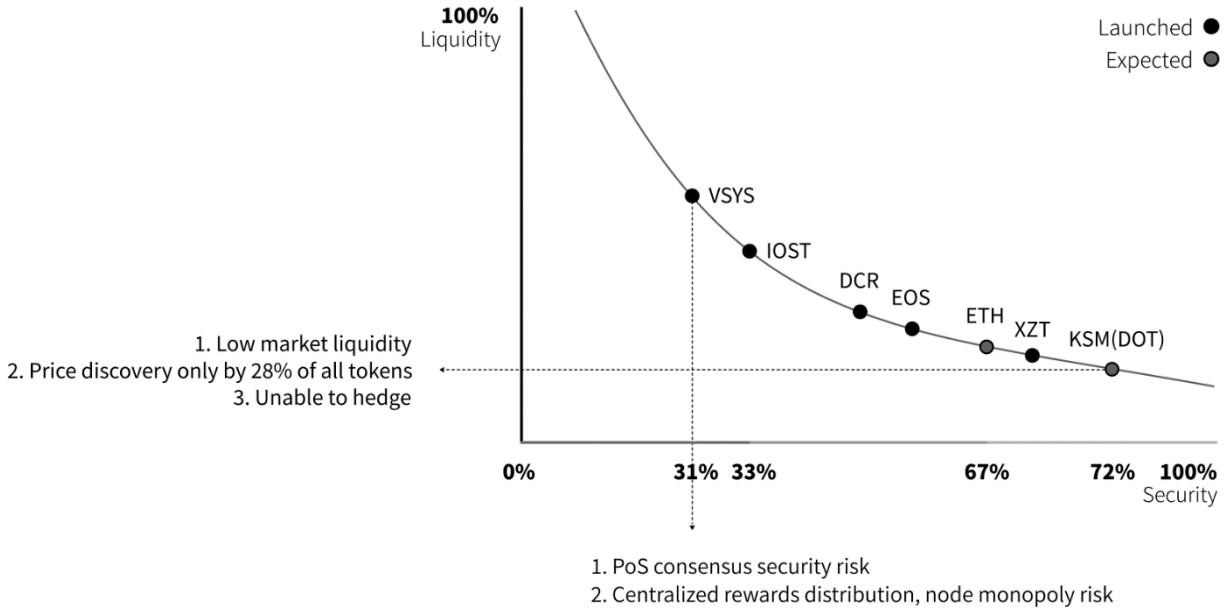
As more and more public chains adopt PoS consensus to improve project availability and decentralization, there are currently more than 100 PoS public chains with a total market value of more than 145.3 billion U.S. dollars. Staking activities and services through the PoS mechanism will generate more than 2.5 billion U.S. dollars in revenue each year. Expectations for the ecosystem development of DeFi, Ethereum 2.0, Polkadot, heterogeneous cross-chain DEX (decentralized exchange), etc., are full of current Crypto market. The two mechanisms of DeFi and Staking are increasingly interactively superimposed on the blockchain landscape, resulting in endless composability, but new problems have also followed. As an example, three typical problem descriptions are given below.

1.1 Competition between Staking and DeFi

Staking & DeFi Competition

Emerging DeFi projects such as liquid mining (Yield-Farming) continue to emerge, and DeFi products may bring users a high annualized rate of return. Since the staking mechanism of PoS requires participants to lock token assets, users must weigh and choose between staking and DeFi. Staking revenue and DeFi revenue will inevitably come into fierce competition. If the DeFi rate of return cannot exceed the lock-up cost of Staking, token holders will choose to participate in Staking. In the reverse situation, token holders will inevitably allocate assets to DeFi activities. Users face difficult choices and desperately need a solution that has the best of both worlds.

1.2 Conflicts between Liquidity and Security

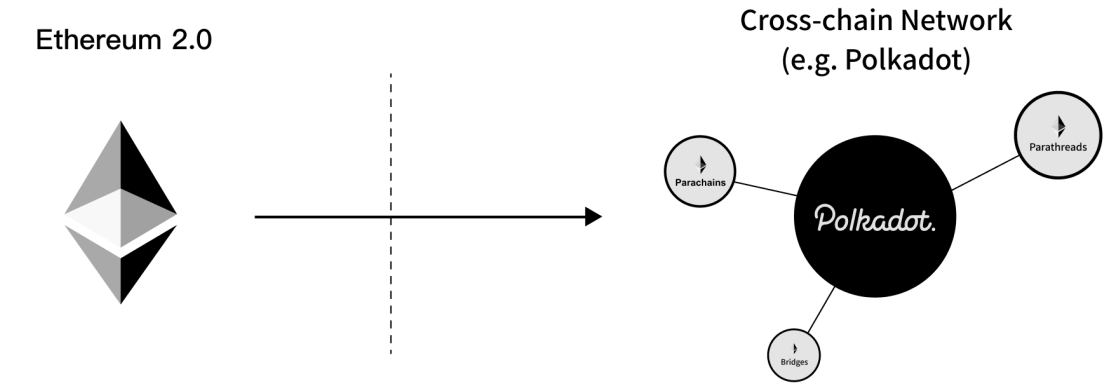


Security & Liquidity Confliction

In a PoS consensus system, the safe and sustainable operation of the system is maintained by the staking mechanism, which means that the liquidity of token assets and the security of the system are in a mutually exclusive state. Increasing the liquidity of staking would have the trade-off of reduced network security. If the staking rate is too low, it will cause PoS consensus security risks. In the reverse situation, most digital assets would be staked and result in insufficient liquidity of assets; secondary market prices can only be expressed through a small

proportion of assets, so there will be violent price fluctuations. For users who are currently staking, they lose liquidity due to lock-up, and cannot hedge against the risk of sharp price fluctuations, causing the opportunity cost of staking to continue to be magnified. This requires a solution that can reduce the opportunity cost of users to participate in staking and at the same time increase the overall staking rate of the PoS public chain.

1.3 Staking and Cross-chain Conflict



Staking & Cross-Chain Confliction

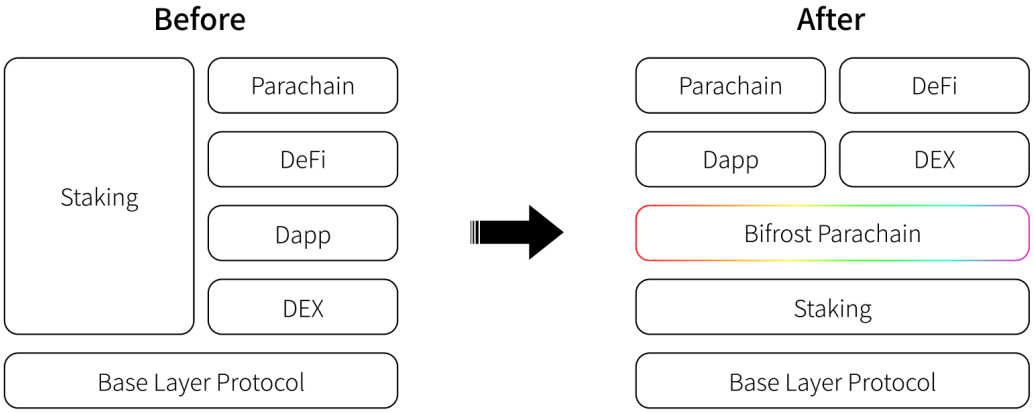
With the launch of star projects such as Cosmos, Polkadot, and Etherem2.0, users will participate in many cross-chain scenarios, and the token asset locking behavior of participating in cross-chain activities will cause users to lose the staking rewards of the original tokens. For example, users send ETH across the decentralized bridge to the Polkadot parachain to participate in DeFi activities. The typical bridge solution is to lock the ETH into the smart contract corresponding to the decentralized bridge, and then release it on the Polkadot parachain, thereby receiving an equal amount of vETH. Since ETH is locked in the bridge contract and does not participate in staking activities, if there is a solution that allows users to hold vETH while obtaining staking rewards on the original chain, the cost of cross-chain activities can be greatly reduced.

1.4 Mission and vision of the Bifrost project

The Bifrost project was created to solve the above-mentioned staking problem. Its mission and vision is to provide liquidity for as many staking assets on the chain as possible (Staking, Collateral, PLO, cross-chain locking...), and become more Connectors between chains. The project first uses the staking scenario as an entry point to provide liquidity through the issuance of asset derivatives. After continuous iterative research and development, it will adapt to all scenarios involving staked assets on the chain in the future. The Bifrost project has obtained the Web3 Foundation Grant and is a member of the Substrate Builders Program. It is one of the 15 core members of the Web3 Bootcamp incubator. It has obtained the Web3 Foundation and Wanxiang Blockchain Laboratory in technology, product, capital, legal affairs, and ecosystem Comprehensive support in cooperation and other fields.

2. System Architecture

The Bifrost network provides an intermediate abstraction layer between staking and the application layer, so that the staking behavior and application layer behavior originally built on the underlying architecture of the public chain change from a parallel and mutually exclusive relationship to a vertically compatible relationship, thereby solving staking and DeFi, the mutual exclusion of cross-chain activities. Through the Bifrost parachain, users can deposit Tokens for staking into vTokens at any time, and then Bifrost's cross-chain interaction module uses the collected Tokens to perform staking operations on the original chain. Each PoS Token will correspond to a different vToken, such as bridged Polkadot token DOT, corresponding to vDOT, and Ethereum token ETH to vETH. Simply put, by providing the liquidity of vToken, it is possible to take into account the liquidity of the original chain assets and the security of the original chain system. Users who hold vTokens can participate in staking on the original network, and use vTokens to participate in DeFi and cross-chain activities, and no longer conflict with staking benefits.



A Layer Between Staking and Applications

Bifrost as a Middle Layer

2.1 Implementation plan

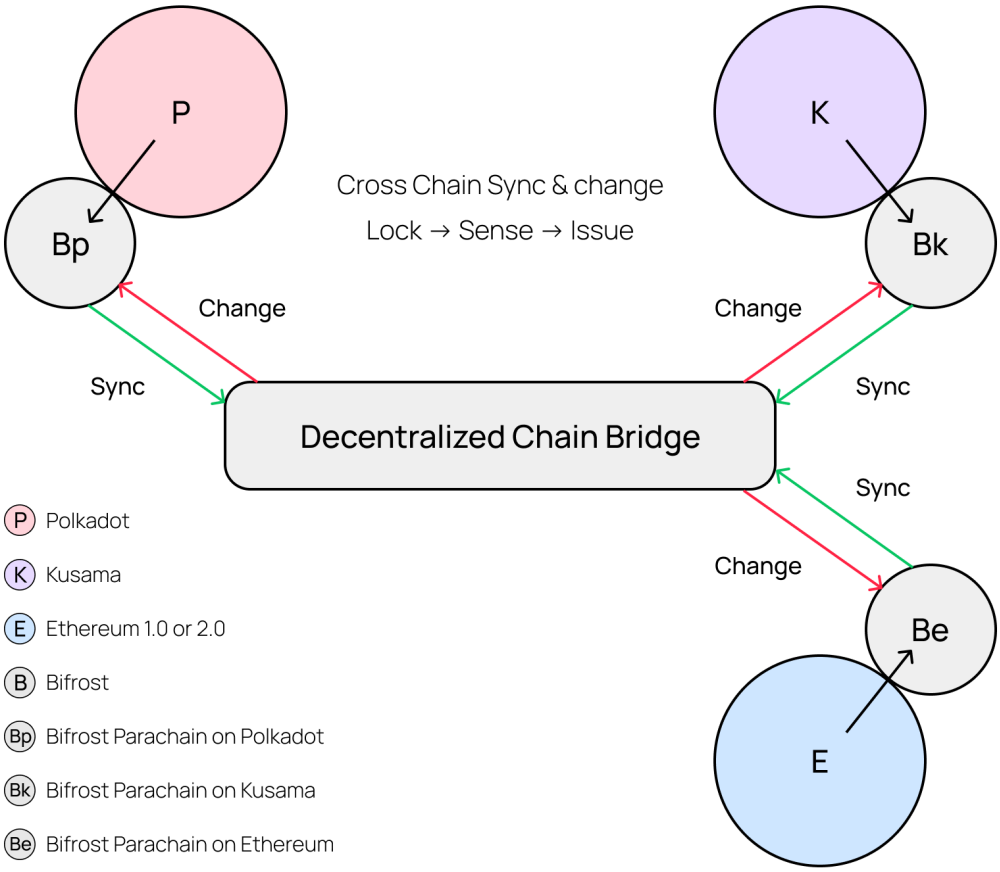
From the perspective of system implementation and landing operation, Bifrost is a decentralized heterogeneous cross-chain system and multi-chain connector that provides liquidity for the staked assets of multiple PoS public chains. Bifrost is developed based on the Substrate framework and belongs to the Polkadot ecosystem project. It achieves business landing and continuous safe operation in the form of Polkadot and Kusama parachains, sharing the consensus security provided by Polkadot and Kusama and community users. When Bifrost provides collateral liquidity for multiple PoS public chains, the consensus security risk of these public chains was also partially transferred to Bifrost.

If the Bifrost consensus security attack cost is lower than the original PoS consensus security cost, hackers will intentionally attack the Bifrost network to complete the original PoS network attack. Only when the Bifrost consensus security is not lower than the original PoS network, the Bifrost protocol can provide staking liquidity for other PoS networks under objective conditions. Maintaining a sufficiently secure independent PoS consensus system is expensive and has a long precipitation and evolution cycle. Taking Cosmos as an example, based on the current 72% staking rate and 8.09% yield, the annual inflation rate is about 5.8%. It requires approximately 15,344,540 ATOM (approximately $83,474,302) for annual network security maintenance costs. If the ecosystem is not vibrant enough, the network utilization

rate is low, the value capture ability is insufficient, and high inflation is likely to push the entire system into a death spiral.

When the PoS public chain is operated independently, the upper limit of the assets that the network can safely carry must be lower than the market value of its tokens. If the total amount of assets locked in the network exceeds the market value of its tokens, hackers will be motivated to launch an attack, leading to the loss of assets. This will not only cause the demise of the project, but also cause chain attacks on other consensus systems it supports. Therefore, the Bifrost system at the current stage does not run an independent PoS consensus network, and is prepared to operate in a parachain to share the consensus security provided by Polkadot or Kusama. Bifrost will pay a reasonable range of consensus security fees by bidding for the Polkadot Parachain slot, avoiding the high cost of running the PoS network independently, and ensuring that the assets locked in the Bifrost network are more secure, so that the Bifrost ecosystem can develop sustainably and healthily.

If you look at the Bifrost system from the perspective of the top-level architecture, you can decompose Bifrost into a collection of proxy modules deployed on each PoS public chain. These modules are implemented through parachains, parathreads, and smart contracts, and are interconnected through a decentralized bridge system, all deployed and working together. In the Ethereum and Polkadot ecosystems, a large number of projects are developing a decentralized chain bridge system. Bifrost will choose the best chain bridge to connect. Bifrost is also developing its own chain bridge system as an alternative. Due to the adoption of the Substarte framework for development, Bifrost, like Polkadot, can perform effective on-chain governance and fork-free upgrades, which is very conducive to the rapid iterative advancement of the Bifrost project.



Top View of Bifrost System

If you take Bifrost's chain bridge solution in the picture above as an example, in the specific implementation, users can transfer funds from the Polkadot platform (P) to the Bifrost Parachain (Bp), and perform the lock (Lock) operation on the Bp network. After the centralized bridge system senses (Sense), it will release (Issue) the same amount of funds in the Bifrost Parachain (Bk). In this way, the cross-chain fund transfer is completed and the unified accounting of BNC tokens is realized. The chain bridge's own decentralization and consensus are determined by multi-asset staking by users on Bp, Bk, and Be.

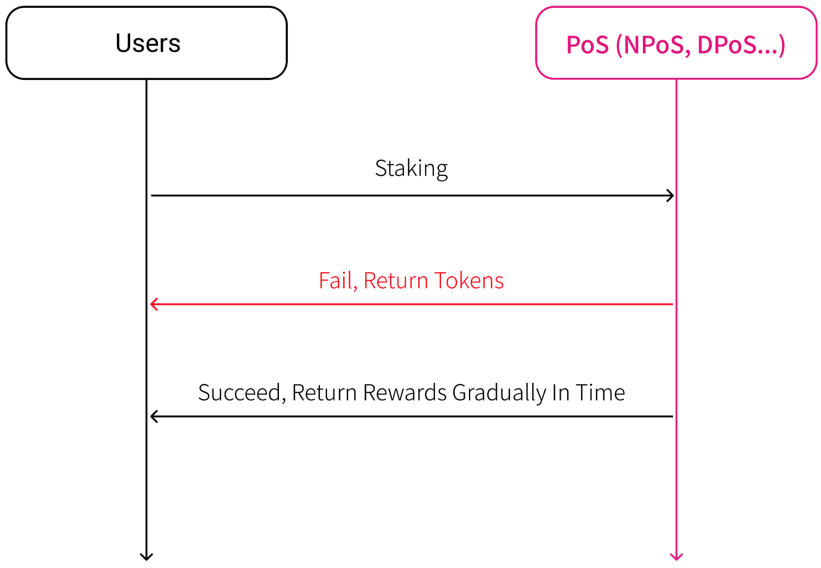
2.2 Staking Service

Bifrost uses secure and decentralized asset cross-chain technology to ensure the security of staked assets and release liquidity through vToken derivatives. By standardizing the interest generation, settlement, and rights conferred on staked assets, liquidity can be provided for

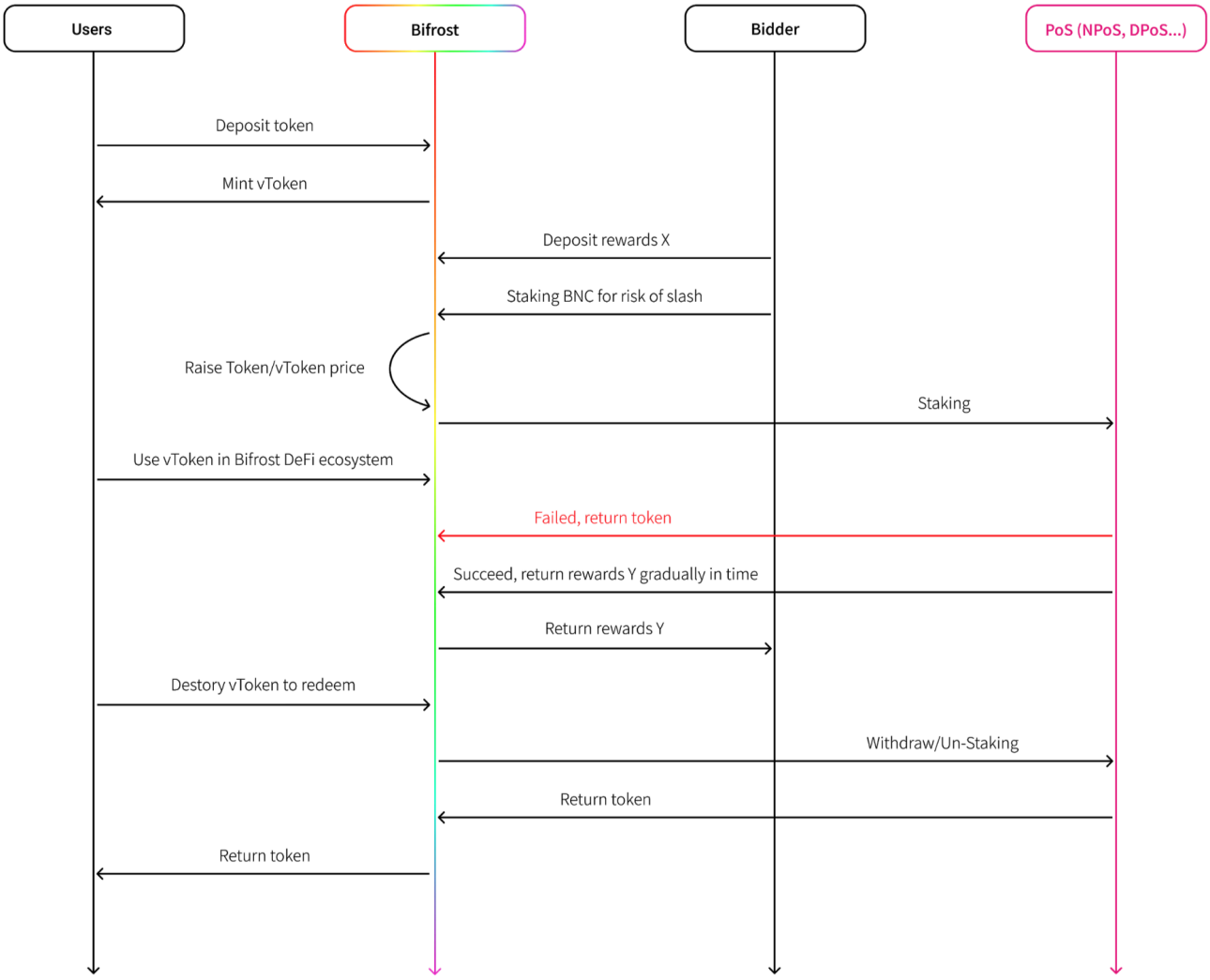
all kinds of staked assets. However, due to the decentralized nature, staked assets need to have three basic characteristics:

- Assets released on chain
- Reward settled on chain
- Ownership proved on chain

The current PoS public chain tokens naturally have the above characteristics and are typical underlying assets for Bifrost to provide stake liquidity. Using stakes to provide liquidity as a market entry point, providing staking standard processes and more flexible financial tools for multiple PoS public chains, releasing asset liquidity, bringing additional benefits and more choices to users, is the core design goal of the Bifrost project. The difference and comparison between direct staking and staking through Bifrost are as follows:



Original Staking

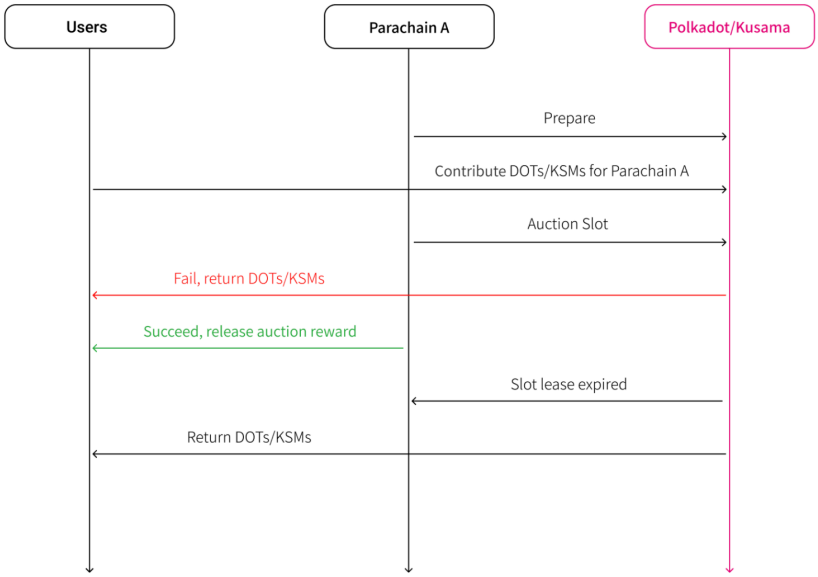


Staking Through Bifrost

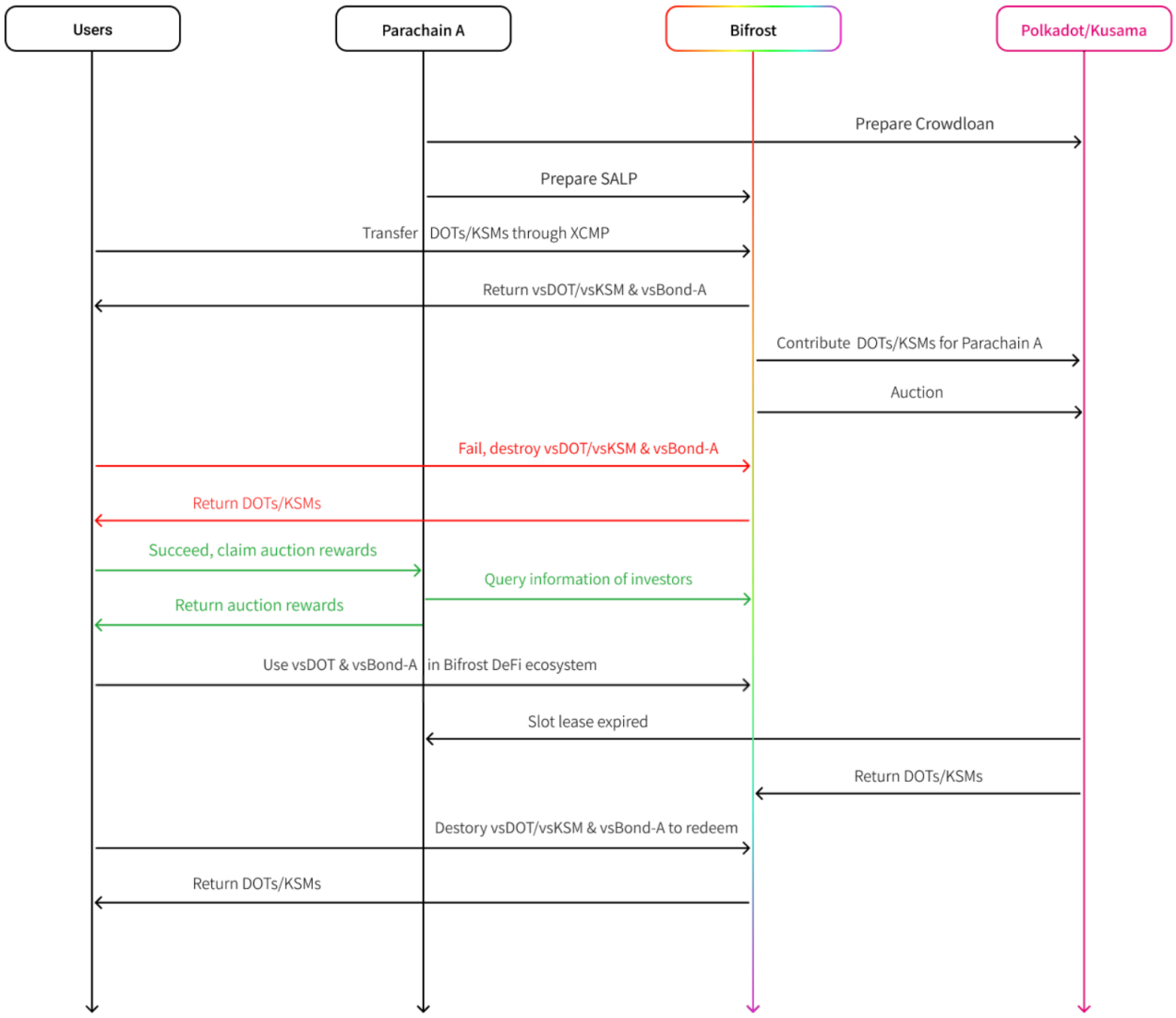
From the perspective of the staking issuer, PoS public chains can be divided into two categories. One is that staking operations must be initiated through external accounts, and the other is that staking operations can be initiated through customizable code modules (smart contracts, parachains). For the first type of PoS public chain, threshold signature technology can be used to simulate an external account, and then multiple operators can perform threshold control. The scale of funds that can be carried is very limited. In order to ensure that multiple operators do not act maliciously, the operator is required to stake a certain amount of assets, and the degree of decentralization is not high enough. For the second type of public chain, the code is automatically controlled to achieve complete decentralization. Bifrost gives priority to supporting the second type of public chain.

2.3 PLO Service

While doing well in the staking business, Bifrost also provides basic support tools for those economic models that have a high degree of similarity to the staking mechanism, and contributes to more ecosystem application scenarios. PLO (Parachain Lease Offering, Crowdloan) is one of the key economic models of the Polkadot ecosystem. It has great comparability and similarity with PoS staking, and is one of Bifrost's priority tools for implementation. The comparison between direct PLO and PLO through Bifrost is as follows:



Original PLO



PLO Through Bifrost

Users participate in the PLO activities of the parachain project through Bifrost, and the Bounding behavior will separate and decouple two types of tokens: vsToken and vsBond-PLO-ID. vsBond-PLO-ID can be transferred to the corresponding parachain through XCMP, and then the parachain will issue rewards to the holders in a way designed by itself, so vsBond-PLO-ID can be regarded as a special kind of bonus reward/incentive. The system designs two pools: 1:1 acceptance pool and 1:x (x <= 1) Bancor pool. If the user holds both vsBond-PLO-ID and vsToken at the same time, and the Slot lease represented by vsBond-PLO-ID has expired, they can participate in the acceptance pool and redeem Token at a price of 1:1. If the user only has vsToken, they can participate Bancor pool, exchange Token at a price of 1:x (x <= 1). Only when the Token is stored in the pool, the user can perform the redemption function normally. When the Slot lease expires, Relaychain will return the tokens to Bifrost,

and the system will put all tokens into the acceptance pool, and then draw 5% of the balance of the acceptance pool into the Bancor pool every day. If the system loses vsBond-PLO-ID or some attackers deliberately hoard vsBond-PLO-ID and are unwilling to sell, vsToken holders can still redeem the Token from the Bancor pool without worrying about the risk that the vsToken cannot be redeemed. The funds injected into the Bancor pool by the system will be gradually released in a linear and smooth mechanism, rather than all at once. This design can prevent unreasonable and large fluctuations in the exchange price of vsToken and Token. In fact, this is equivalent to the system using part of the token to continuously purchase the vsToken held by the user. As long as a 1:x (x <= 1) exchange behavior occurs in the Bancor pool, the Bifrost system will inevitably receive income, and this will go to the network Treasury for network enhancement and community development activities. vsBond-PLO-ID is used as a digital representation of an ownership and does not require high-liquidity transactions. It can be sold through a buy-it-price order. Therefore, the Bifrost system is designed with a mechanism for selling vsBond-PLO-ID, which is similar to the C2C commodity trading in e-commerce platforms. In the market, there is no need to provide trading liquidity through AMM/DEX such as Uniswap/Balancer.

2.4 Token Asset trading and DeFi

Bifrost provides staking liquidity for many PoS public chains, and runs in the parachain mode of Polkadot and Kusama. It is a multi-chain connector, and through PoS, other public chains and DeFi projects enter the Polkadot ecosystem. This strategic positioning determines that the Bifrost network will inevitably carry a rich and diverse asset class. Can be roughly divided into the following categories:

1. A variety of staking derivatives vToken;
2. Multiple PLO derivatives vsToken;
3. Bifrost Native Coin (BNC);
4. Polkadot/Kusama Native Coin (DOT/KSM);
5. Token assets transferred from many parachains on the Polkadot/Kusama network ;
6. Token assets transferred from other public chains through bridges;
7. Token assets issued by smart contracts on the Bifrost network.

These Token assets will inevitably participate in various DeFi applications. AMM/DEX is the most typical DeFi application. Currently, the more popular AMM algorithm implementations include Uniswap, Bancor, Balancer, etc. The Bifrost network has built-in Balancer, Bancor and other sub-modules in the Runtime, which is convenient for users to create and configure multi-asset trading pools. Users can easily exchange various assets in multiple trading pools, or provide trading liquidity to earn transaction fee. Bifrost also integrates the transaction module of Zenlink, an innovative AMM project in the Polkadot ecosystem, to enhance transaction depth and automatically find the best exchange price and path. Bifrost has embedded EVM and WASM sub-modules, and the existing DeFi smart contract code can also be easily transplanted to the Bifrost network to run.

3. Economic model

When designing the Bifrost economic model, the basic principles are to achieve the following goals: :

1、Do the best to be completely decentralized;
2、Reduce the cost of users;
3、Minimize the barriers to entry and node operating costs for block producers (miners, Collactor);
4、Avoid high consensus security maintenance costs;
5、Effectively resist the high slash risk that may occur in the staking mechanism ;
6、Realize the tradable homogeneity of vToken assets and vsToken assets.

Taking these 6 basic principles as the starting point, the Bifrost economic model has carefully designed BNC, vToken, and vsToken:

1、The difference between the Bifrost public chain and other public chains is mainly reflected in the fact that the Bifrost system itself is not loss-making. The more PoS public chains and staked assets supported by Bifrost, the stronger the economic position. The core utility

function of BNC would be based on the basic capabilities that the public chain must have, such as value storage and transfer capabilities, and the ability to deploy smart contract applications.

2、Bifrost will reserve a certain percentage of BNC as payment for the cost of parachain slot bidding or running in parathreads. With the gradual increase in the number of slots, the cost will be significantly reduced compared with the independent operation of the main network.

3、Bifrost has designed a simple and effective coin minting formula that allows vToken and vsToken to automatically contain the token incentives generated by asset staking without additional settlement. This design method is conducive to listing these assets on trading platforms, including centralized exchanges and decentralized DEXs. The trading platform side does not need to consider how to distribute the proceeds to the token holders, and needs to develop the corresponding revenue distribution function to support the exchange and use of vToken and vsToken, so that the liquidity of vToken and vsToken can be easily expanded and strengthened.

4、Bifrost distributes BNC to incentivize users to perform actions such as minting and staking vToken, vsToken, providing transaction liquidity, executing transaction packaging (Collactor nodes), and reserves a part of BNC as a Slash insurance fund. These designs can effectively guarantee the sustainable and healthy development of Bifrost's ecosystem.

3.1 Bifrost Native Token (BNC)

The native digital cryptographically-secured utility token of the Bifrost mainnet (**BNC**) is a representation of attributed functions specified in the protocol/code of the Bifrost network, and which is designed to be used solely as an interoperable utility token on the network. The initial total supply is 80,000,000. Currently, the BNC is issued as digital tokens on the the Bifrost testnet for early community building and testing ahead of the mainnet development, and will be migrated to tokens on the mainnet when the same is eventually launched. Currently, BNC does not have a transfer function, it will be opened by community voting after the Bifrost network is launched.

BNC is a non-refundable functional utility token which will be used as the medium of exchange between participants on the Bifrost network. The goal of introducing BNC is to provide a convenient and secure mode of payment and settlement between participants who interact within the ecosystem on the Bifrost network, and it is not, and not intended to be, a medium of exchange accepted by the public (or a section of the public) as payment for goods or services or for the discharge of a debt; nor is it designed or intended to be used by any person as payment for any goods or services whatsoever that are not exclusively provided by the issuer. BNC does not in any way represent any shareholding, participation, right, title, or interest in the Company, the Distributor, their respective affiliates, or any other company, enterprise or undertaking, nor will BNC entitle token holders to any promise of fees, dividends, revenue, profits or investment returns, and are not intended to constitute securities in Singapore or any relevant jurisdiction. BNC may only be utilised on the Bifrost network, and ownership of BNC carries no rights, express or implied, other than the right to use BNC as a means to enable usage of and interaction within the Bifrost network.

3.1.1 Token functionality

- **Liquidity commission for derivatives**：Users which perform Bifrost network transfers, transactions, staking and other behaviours need to pay certain transaction fees to support the maintenance of the network. Bifrost provides Flexible Fee module to support various asset payment fees, such as BNC, DOT, vDOT, KSM, vKSM and other assets. All these digital assets may be used to pay network fees, and in order to form a closed-loop economy, the collected digital assets used to pay the handling fee will be converted into BNC to be held in the Treasury to support network development and distribution of incentives.
- **Collateral** : In order to guarantee a minimum level of service standards by nodes, all participating nodes will be required to stake BNC as collateral to obtain votes from the asset of Staking pool, while increasing the cost of Slash. Slash collateral will be increased or decreased based on the node's performance score.
- **Governance function** : In order to promote community governance for the network, BNC would allow holders to propose and vote on governance proposals to determine features and/or parameters of the Bifrost network as well as network improvements, with voting weight calculated in proportion to their token holdings, for example

technical committee decisions, network improvements, node election. For the avoidance of doubt, the right to vote is restricted solely to voting on features of the Bifrost network; the right to vote does not entitle BNC holders to vote on the operation and management of the Company, its affiliates, or their assets, and does not constitute any equity interest in any of these entities.

3.1.2 Incentive Model

Depending on the development progress, the usage of reserved funds may be adjusted from time to time; but Bifrost will not make a zero-cost airdrop and any incentive will capture some network value.

- **vToken Minting Incentive**: vToken liquidity is the most significant utility value that Bifrost can offer and is core to the network's services, 11.25% of the TOTAL BNC being used to reward users who mint vToken.
- **PLO (Parachain Lease Offering):** Successful PLO would create great benefits and opportunities for the entire Bifrost network. Bifrost will release 17.5% Token in total to reward the group that had helped in various ways to enable Bifrost to participate in the PLO.

3.1.3 Participants

- **Validator** : A Validator randomly assigned for parachains, which role is a Validator in Polkadot or Kusama network, will execute Bifrost business code and perform block final state validation.
- **Collator** : Responsible for collecting user call data and transmitting query information, Collator will generate blocks and submit them to Validator for final verification.
- **Bidder** : Elected by proposition referendum as a bidder who can bind the address of the node that needs to be voted on, has the right to bid for votes in the Bifrost voting pool. They will be disenfranchised if Slash level or limits are triggered.
- **Asker** : Vote rights provider.
- **Council** : Council performs three main governance tasks: proposing referendums, cancelling uncontroversially dangerous or malicious referendums, and electing technical committees.

- **Technical Committee** : Technical Committee can work with the Bifrost Council to develop emergency referendums that can be voted on and implemented quickly. These emergency referendums are only used in emergency situations.
- **Sudo** : Super Admin, with the ability to manipulate any parameter on the network, to adjust the direction of the network during the testing phase, and to remove Sudo privileges through a referendum once the Bifrost mainnet is stable.

3.2 BNC Distribution and Unlocking

The goal of BNC distribution is to make the Bifrost network more decentralized, build the market size of staking derivatives vToken, and incentivize the liquidity market of staking derivatives vToken. Every aspect of BNC distribution is critical to the healthy development of the Bifrost Agreement and its ecosystem.

In order to ensure the development of Bifrost's function, launch and ecosystem development, different parts of the BNC allocation will have different proportions of lock-up time, and the allocation for the BNC team will also be linearly unlocked 180 days (half a year) after Day0 (circulation day), and continue Unlocked in two years.

Token Allocation

Distribution of Tokens			Share	Price	Tokens	Funds	Vesting
Ecosystem	Kusama PLO (tentative)	3.75%	50%	-	40,000,000	-	Locked for governance
	Polkadot PLO (tentative)	13.75%					
	vToken Mint Incentive	22.50%					
	Collator Incentive	5.00%					
	Slash Insurance Fund	5.00%					
Founders and Team			20%	-	16,000,000	-	TGE 0% unlocked, unlock starting 6 months after TGE, unlocked every month, divided into 24 months to unlock
Seed Round I			6%	$0.06250	4,800,000	$300,000	TGE 25% unlocked, the remaining 75% unlocked every day 0.25%, 300 days unlocked
Seed Round II			4%	$0.09375	3,200,000	$300,000	
Strategic Round			2%	$0.31250	1,600,000	$500,000	TGE 30% unlocked, the remaining 70% unlocked every day 0.23333%, 300 days unlocked
Private Round			3%	$0.43750	2,400,000	$1,050,000	
Marketing & Community Build			3%	-	2,400,000	-	No vesting
Mint Drop			2%	-	1,600,000	-	
Treasury (Foundation)			10%	-	8,000,000	-	Locked for governance
Total Supply 80,000,000 BNC							

BNC Distribution

BNC are designed to be utilised, and that is the goal of the BNC distribution. In fact, the project to develop the Bifrost network would fail if all BNC holders simply held onto their BNC and did nothing with it.

In particular, it is highlighted that BNC: (a) does not have any tangible or physical manifestation, and does not have any intrinsic value (nor does any person make any representation or give any commitment as to its value); (b) is non-refundable and cannot be exchanged for cash (or its equivalent value in any other digital asset) or any payment obligation by the Company, the Distributor or any of their respective affiliates; (c) does not represent or confer on the token holder any right of any form with respect to the Company, the Distributor (or any of their respective affiliates), or its revenues or assets, including without limitation any right to receive future dividends, revenue, shares, ownership right or stake, share or security, any voting, distribution, redemption, liquidation, proprietary (including all forms of intellectual property or licence rights), right to receive accounts, financial statements or other financial data, the right to requisition or participate in shareholder meetings, the right to nominate a director, or other financial or legal rights or equivalent rights, or intellectual property rights or any other form of participation in or relating to the Bifrost network, the Company, the Distributor and/or their service providers; (d) is not intended to represent any rights under a contract for differences or under any other contract the purpose or pretended purpose of which is to secure a profit or avoid a loss; (e) is not intended to be a representation of money (including electronic money), security, commodity, bond, debt instrument, unit in a collective investment scheme or any other kind of financial instrument or investment; (f) is not a loan to the Company, the Distributor or any of their respective affiliates, is not intended to represent a debt owed by the Company, the Distributor or any of their respective affiliates, and there is no expectation of profit; and (g) does not provide the token holder with any ownership or other interest in the Company, the Distributor or any of their respective affiliates.

Notwithstanding the BNC distribution, users have no economic or legal right over or beneficial interest in the assets of the Company, the Distributor, or any of their affiliates after the token distribution.

To the extent a secondary market or exchange for trading BNC does develop, it would be run and operated wholly independently of the Company, the Distributor, the distribution of BNC and the Bifrost network. Neither the Company nor the Distributor will create such secondary markets nor will either entity act as an exchange for BNC.

3.3 Ecosystem

BNC provides the economic incentives which will be distributed to encourage users to contribute and maintain the ecosystem on the Bifrost network, thereby creating a win-win system where every participant is fairly compensated for its efforts. BNC is an integral and indispensable part of the Bifrost network, because without BNC, there would be no incentive for users to expend resources to participate in activities or provide services for the benefit of the entire ecosystem on the Bifrost network.

BNC will reserve 50% of the tokens as incentives for the entire ecosystem to ensure that the Bifrost network can be implemented and can continue to operate in a healthy manner. Including vToken minting (incentive), PLO slot auctions, Collator incentive, Slash insurance.
Given that additional BNC will be awarded to a user based only on its actual usage, activity and contribution on the Bifrost network, users of the Bifrost network and/or holders of BNC which did not actively participate will not receive any BNC incentives.

3.3.1 vToken incentives

vToken incentives are divided into three parts: Minting incentives, Liquidity incentives, and Staking incentives. To develop a self-sustainable, closed-loop economy, all the fees (network fees, transaction fees, transfer fees, minting fees etc) collected by the network would be re-distributed as incentives for active contributors within the ecosystem.

Minting incentive : Projects will be incentivised with BNC grants in order for them to mint vTokens on the Bifrost network. The total amount of vToken minted on the network is critical to its liquidity and core to the services thereon, so vToken minting will be the key distribution link of BNC. Please refer to section 3.4.5 for specific distribution rules and formulas.

Liquidity incentive : Users would need to be incentivised to play the role of liquidity providers and who hold vTokens for providing liquidity in the system's own transaction pool. As compensation for opportunity costs as well as potential impermanent losses, these liquidity providers which help to promote adoption of the Bifrost network by staking assets to liquidity pools would be rewarded with BNC token incentives (i.e. "liquidity mining"), according to each user's relative contribution after various adjustment and correction parameters. Part of the tokens are also reserved in the system to reward developers for developing, deploying, and operating other various trading tools (such as Uniswap). The specific reward rules, reward quantity, and reward duration are governed by community voting. The proportion of the BNC share of the system pool and the third-party transaction pool is equal to the proportion of the sum of the respective community voting scores and the total score.

Staking incentive : The Bifrost network is simply a blockchain protocol which does not own or run any computing/storage servers, so third-party computing resources are required. Participants such as Validators execute Bifrost business code and perform block validation, and Collators collect user call data and transmitting query information as well as generate blocks for verification by Validators. Providers of these services / resources would require payment for the consumption of these resources to maintain network integrity, and BNC will be used as the native network currency to quantify and pay the costs of the consumed computing resources.

3.3.2 Parachain Lease Offering (PLO, Crowdloan)

Only projects that have obtained parachain slots can become Polkadot and Kusama parachains, achieving shared security, relaying cross-chain and other characteristics. According to the Parity strategy, the Kusama network will have priority over Polkadot to open the parachain slot auction function, and at the same time, the parachain slot It will be opened in phases and will be auctioned with the number of DOT locked warehouses. Parachain slots have a lease time of 6 months to 24 months. Bifrost plans to bid for at least 4 years of parachain slots. Bifrost will reserve a total of 6.875% (50% * 13.75%) BNC is used for the auction of Polkadot parachain slots, and 1.875% (50% * 3.75%) of BNC is used for the Kusama

parachain slot auction, DOT and KSM for Bifrost parachain slot locks will have the right to earn BNC, and Bifrost will also give full play to its own business characteristics to provide users with the liquidity of parachain lock DOT/KSM vsDOT and vsKSM (Voucher Slot DOT/KSM). At present, the specific auction rules of Polkadot Parachain still exist Uncertainty, specific PLO participation rules will be announced after the launch of Polkadot Parachain auction rules.

3.3.3 Collator

When Bifrost connects to the parachain and goes online on the main network, it will support Collator to provide services. In order to incentivize Collator with higher quality and a wider range of services, the agreement will motivate BNC based on the workload provided by Collator, and the system will reserve an ecosystem. 2.5% of BNC as Collator incentives.

3.3.4 Slash Insurance Fund（SIF）

The Bifrost network will reserve 2.5% of the BNC as Slash system insurance funds. When risk control measures such as Vote Bidder mortgage and public insurance funds fail, the system will reserve 2.5% of BNC as Slash insurance funds for compensation. Slash is usually designed as a gradual penalty. Generally, a partial amount of penalty will be imposed when illegal operations (such as missing blocks or lost blocks) are triggered multiple times. Therefore, Bifrost will exhaust the supported PoS network Slash rules and warn or penalise based on the severity. The bidder, becoming a bidder, will need to stake a certain amount of BNC as the Slash insurance money. Since the bidder actively obtains the right to vote, he should be penalised for losses caused by his Slash. Therefore, when a Slash occurs, the bidder will first Deducted from the staked BNC. If the Slash scale is large and the amount staked by the bidder is not enough to pay the Slash penalty, it will be deducted from the public insurance money, and all vToken holders will bear the Slash risk. When the Slash insurance money is less than 0, it will be locked from the pool. At this time, the minting price of vToken appears to fall, and all vToken holders share the risk of Slash. If the overall Slash reaches 10% of the total Token, the relevant Token agreement will enter the emergency stop phase. The original token of staking will be redeemed. At the same time, the voting and staking function will be suspended. The vToken minting price will no longer change. Users can redeem the vToken into the

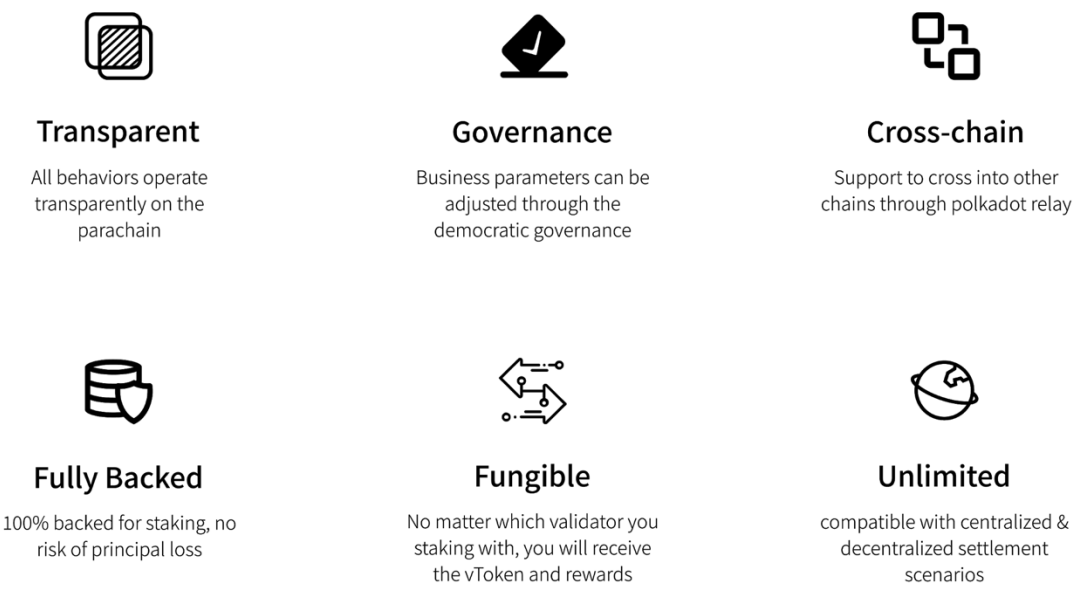
original token at any time. The system will investigate the cause of the slash and prevent the loss from further expanding. After the investigation is completed, the agreement can be restarted again through a referendum. For public chains with a one-time penalty of 100%, Bifrost will check the nodes and require their own staking amount to be no less than 55% before they can follow up with no more than 45% of the shares, so as to prevent the nodes from deliberately causing large Slash behavior.

Improve Slash's anti-risk ability through the following：

- Slash information submission and verification (with reward and penalty mechanism, like fishman)；
- The Risk Control Committee.；
- Rank risk controls；
- Vote Bidder Slash Collateral；
- Slash Public Insurance Fund；
- Slash System Insurance.

3.4 Voucher Token（vToken）

Voucher Token, or vToken, as a secondary digital asset on Bifrost, is a type of Polkadot or Substrate Based general-purpose asset minted by users through the Bifrost network using Staking assets. vToken represents the bundled ownership and reward right of the original Staking assets (now locked as collateral). The Staking rewards generated by Staking is an alternative frangible asset with trading liquidity, which can unlock the liquidity of the original Staking or even become a new Staking asset to help users doing leveraged transactions. vToken also has six features, including traceability, governance, cross-chain, full reserve, alternative and full scenario.



3.4.1 Reward Settlement Forms

How to ensure the decentralized generation of the derivative rewards while making it more simple to provide liquidity, adding derivatives compatibility scenarios is the core question. Therefore, the reward settlement form of vToken is designed to be compatible with both centralized and decentralized scenarios. In centralized scenarios, vToken is available to be used or converted without extra development by a third party. For those users who host vToken in centralized hot wallet or cold wallet can still get the rewards generated by vToken without loss. This is due to the fact that vToken eliminates the traditional transaction settlement form on chain and adopts the **vTokenmint Price Up** method to complete the settlement of vToken rewards. Therefore, in order to avoid the later users' sharing of previous users' rewards, users entering from different periods will follow the current vTokenmint price.

Parameters

- $vToken_{mint\ price}$
- $vToken_{mint}$
- $Token_{staking}$
- $Token_{staking\ rewards}$
- $vToken_{yield}$
- $vToken_{redeem\ price}$
- $vToken_{holding\ days}$

Formula

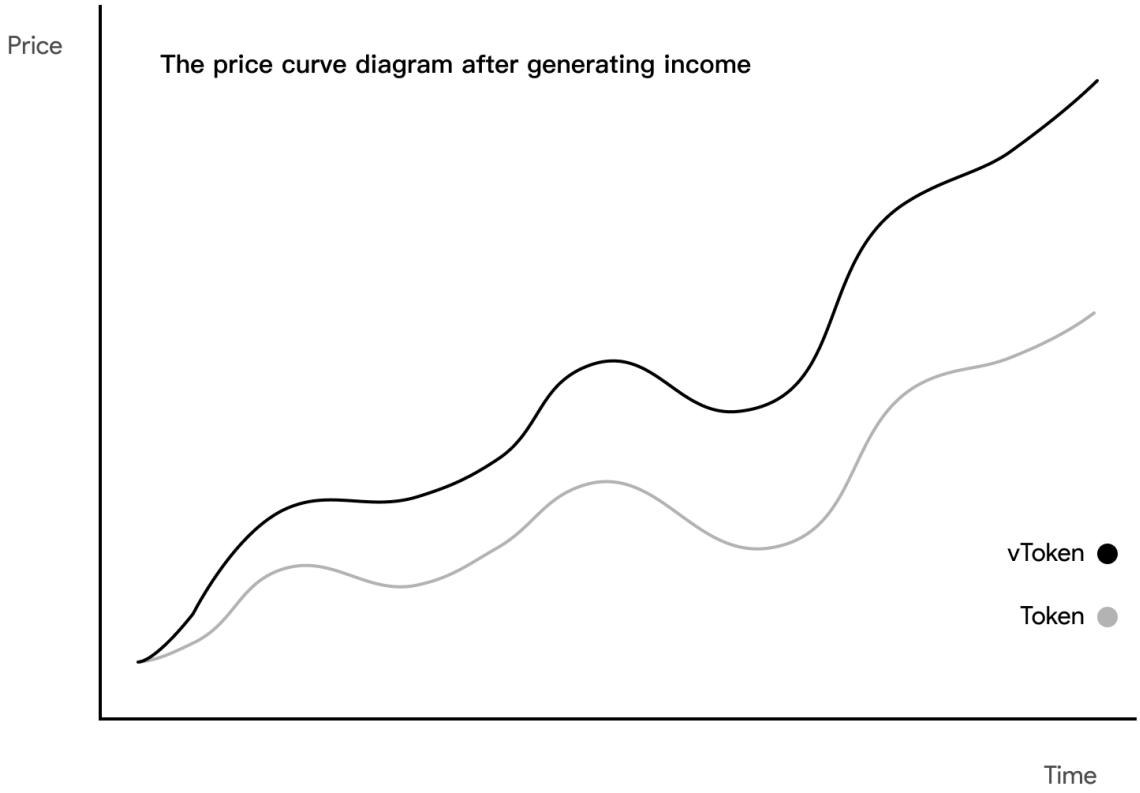
- $vToken_{mint\ price} = Token_{staking} \div vToken_{mint}$
- $vToken_{mint\ price} = 0.01\ Token$
- $vToken_{mint} = Token_{staking} \div vToken_{mint\ price}$
- $vToken_{mint\ price} = \left(Token_{staking} + Token_{staking\ rewards}\right) \div vToken_{mint}$
- $vToken_{yield} = \left(vToken_{redeem\ price} - vToken_{mint\ price}\right) \div vToken_{holding\ days} \times 365$

Case A: User A mints 1000vDOT with 0.01 Token Mintprice that converted by 10 DOT in Bifrost. Original DOT through the Voucher Notary and Voucher Bidder game to complete Staking, which will generate 0.5 original DOT reward after one week. Note, the reward DOT generated by Staking does not correspond to the minting of new vDOT, the Mintprice is raised from 0.01 Token to 0.0105 Token (10.51000). At the moment, 1000 vDOT can redeem 10.5 DOT, the extra 0.5 DOT is the Staking reward awarded to user A for one week's participation.

Case B: According to Case A, the Mintprice has risen to 0.0105 Token. Now, user B can mint 952.380952381 vDOT (vToken accuracy is 1012) by 10 DOT with current mintprice of 0.0105 Token and he will receive 0.5 DOT reward after one week of Staking. Therefore, the original mintprice will raise from 0.0105 Token to 0.011025 Token (10.5952.380952381), which means that 952.380952381 vDOT can redeem 10.5 DOT now, the extra reward of 0.5 DOT is the Staking reward awarded to user B for one week's participation.

The similarity of vToken and Token price curve

- **X： Time**
- **Y： Price**



3.4.2 Reward Generation

When assets from Bifrost protocol’ s Staking Pool enter the Voting Pool, there will be two methods entering to the Voting Pool, by Bidding Vote (default) or Self Governance. The voting right that corresponds to the original token can be received by the bidder from the bidding vote. In this way, user’ s voting rights are represented through Bifrost that assigns the vote to the highest bidder at a specific time. In essence, this method changes the original model of Staking reward from reward ledger into "pay first, let later", which standardizes Staking incentives from different PoS public chains and bypassing the restrictions brought by different reward rules.

Voting Right Market

The election mechanism has abandoned the reward-sharing model, if Validators wants to enter the Validator set of Bifrost, they have to make a yield bid at first, which means that they transfer information to the protocol what proportion of the reward is willing to give to Stakers for who uses the agreement. If the bid is 10% and is finally accepted by the protocol, the

Validator will share the reward as 10% to the protocol no matter what the actual return rate is. "Shareholder Votes For Sale" provides more extension and demonstration for the function.

- Bidder offers < Staking incentives, analogous to bidder allocation commission > 0% There is network profit, users can get normal rewards.
- Bidder offers = Staking incentives, analogous to bidder allocation commission = 0% There is no network profit, users get the highest reward of the original chain.
- Bidder offers > Staking incentives, analogous to bidder allocation commission < 0% There is an allowance, users get higher reward then original chain.

According to the requirement of voting right in the market, the binding vote might have different results. Normally, the Staking rewards that are generated by users nomination will be released after Validators deducting the commission, Validators become a bidder under the form of binding vote. Offer high and low fluctuation will be according to the market demand and rational judgment to the market, bidders may get profits from users' Staking rewards while setting the offer below the range of Staking rewards. When the market demand for voting rights is strong, bidders will pay extra to get votes, and users will get the extra rewards from the bidder as the Staking reward. In this case, the Staking rewards obtained by users will be higher than the maximum reward on the original chain.

Self Governance

Users will skip bidders' offer process and choose specific bidders to trade based on their own decisions. However, the reward still needs to follow the Bifrost reward distribution rules, insurance fund and channel fund shall be deducted accordingly.

Reward Structure：

- 1%-5% for Slash Insurance, Risk allocation when collateralized funds by Validators are Slashed, floating based on Slash history.
- 3% for Channel Fund, released according to channel contributions.
- Remainder flows to the original Tokemint pool and will be distributed as incentives for users who have actively participated in the ecosystem.

3.4.3 Retain Governance Right

Token holders can choose a particular bidder to execute corresponding Token governance right without any condition while they mint vToken. If they do not choose a particular bidder, the governance right will enter the bidding market by default.

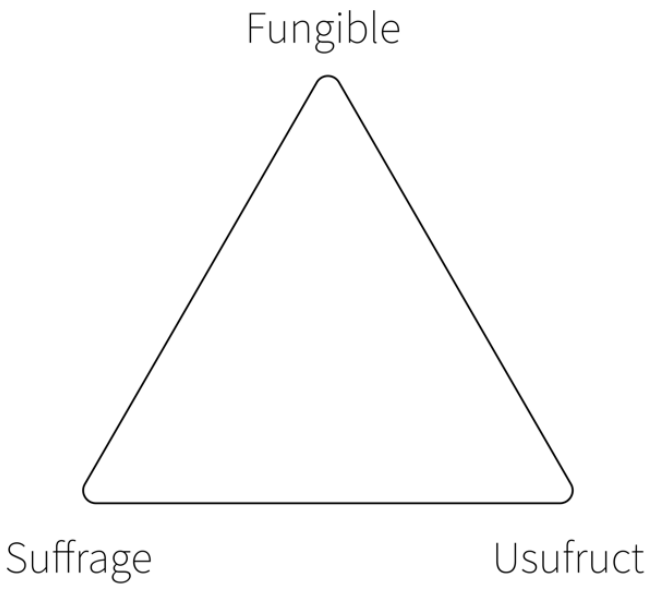
3.4.4 Impossible Triangle of Derivatives

Governance Vote Right of Original Chain Token holders choose the Validator, just like in a representative democracy, the election of an MP. Each Token represents a vote, the vote right belongs to the Token holder. Staking derivatives as the interlayer should inherit the right for users to choose Validators on their own. However, this might be a serious problem that derivatives are non-fungible, which means that users who choose different Validators will get different derivatives.

Fungible Token holder selects any Validators to generate the same proceeds, implementing different Tokenmint derivatives by different holders have the same governance right. Fungible Staking derivatives have better liquidity, but Token holders might face Tragedy of Commons by eliminating the Slash risk for choosing Validators thus overall Staking reward will decrease.

Right Expression Staking derivatives can inherit the proceeds from Staking collateral while liberating the liquidity of Staking. When Staking derivatives are transferred, their proceeds and redeemed right will be transferred accordingly.

In Bifrost Impossible Triangle of Derivatives, In order to provide better liquidity of Staking derivatives, the protocol design focuses more on the two aspects of fungible and expression of rights. By default, users' original chain voting rights are delegated to Bifrost protocol by means of vote price bidding. Meanwhile, users can still choose the particular bidder to delegate when they have special needs.



Impossible Triangle of Derivatives

3.4.5 vToken Minting Incentives

In the Bifrost economic model, 18,000,000 BNC (Bifrost Native Coin) accounting for 22.5% of the total amount of BNC will be reserved as vToken minting incentives. The incentive period is set to be linearly released for ten years, and the output is halved every two years. Distribution is based on the value of user vToken minting , In order to encourage users to be more proactive in minting vToken with their native project tokens, homogeneity and liquidity.

Minting incentive distribution algorithm

The specific incentive algorithm adopts the partition model, which is carried out according to the rounds. Each coin transaction in each round shares the total amount of incentives released in this round according to the proportion of the coin amount to the total amount of the round. General process：

1、Suppose that each block currently releases N BNCs for minting rewards, of which D BNCs are dedicated to vToken minting behavior ;

2、Record the maximum value of minting transactions in this round. If there is no larger minting amount in the X blocks after it, then this round of settlement will be carried out (X is a constant, such as 50, and its specific value needs to be on the testnet Make sure after thorough testing) ;

3、The number of blocks Y in this round is uncertain (Y >= X + 1), the mint will share the total BNC reward of Y*D ;

4、The Bifrost network supports vTokens corresponding to multiple Tokens, and each currency is divided into N BNCs according to the score ratio mechanism ;

5、Different tokens compare the amount of mint according to the number of convertible BNCs;

6、Scoring mechanism: community voting forms the basic score S of vToken, users can adjust the weight by staking M BNCs, please refer to the design of Staking incentive part. The scoring formula is S+F(M), F is the logarithmic function of M, F(M) = $log_2\ (M - 512)$。SUM is the sum of the scores of all currencies, D / N = (S+F(M)) / SUM。

3.4.6 vToken Channel Funds

When vToken minting is carried out through the Bifrost protocol, you can choose to pass the minting channel parameters, which will record the contribution value of the channel provider according to the minting amount. 3% of the staking revenue structure will be used as channel gold by all channel providers based on their own contributions. The proportion of contributions is allocated. When the proportion of channel contributions is high, more channel funds can be obtained, which encourages the Bifrost vToken minting protocol to be integrated into entry channel systems such as wallets, Dapps, and exchanges. With the occurrence of coin trading, the contribution value of channel providers will continue to increase until a referendum proposal is made every six months to clear it. Whenever there is a bid from Bidder, Bifrost will conduct a settlement and allocate 3% of the channel funds to channel contributors whose channel value ranks within 256. 256 is the initial parameter set by the system, which can be changed through community voting.

4. Conclusion

Bifrost's short-term goal is to provide users with a unified business abstraction layer between multiple well-known PoS public chains, as well as multiple parachains and relay chains in the Pokadolt ecosystem, and to provide decentralized, secure, and standardized Configurable

financial tools to build a rich and flexible asset staking voting rights market. Bifrost's vision goal is to become a link between multiple chains, strengthen the ecosystem environment construction of the entire blockchain industry, and help promote the popularization and deep evolution of DeFi technology.

5. References

[1] Gavin Wood, "Polkadot, Substrate and Ethereum", https://medium.com/polkadot-network/polkadot-substrate-and-ethereum-f0bf1ccbfd13

[2] Markus Brill, Rupert Freeman, Svante Janson, Martin Lackner, "Phragme´n' s Voting Methods and Justified Representation", https://pdfs.semanticscholar.org/1843/c728cb56caf908247f8473b17734299cd24a.pdf

[3] Jeff Burdges, Alfonso Cevallos, Peter Czaban, Rob Habermeier, Syed Hosseini, Fabio Lama, Handan Kilinc Alper, Ximin Luo, Fatemeh Shirazi, Alistair Stewart, Gavin Wood, "Overview of Polkadot and its Design Considerations", https://eprint.iacr.org/2020/641.pdf

[4] Web3 Foundation, "The Polkadot Host Protocol Specification", https://github.com/w3f/polkadot-spec/releases

[5] Vitalik Buterin, Virgil Griffith, "Casper the Friendly Finality Gadget", https://arxiv.org/pdf/1710.09437.pdf

[6] Colin Schwarz, "Ethereum 2.0: A Complete Guide. Casper and the Beacon Chain", https://medium.com/chainsafe-systems/ethereum-2-0-a-complete-guide-casper-and-the-beacon-chain-be95129fc6c1

[7] Dan Larimer, "DPOS BFT — Pipelined Byzantine Fault Tolerance", https://medium.com/eosio/dpos-bft-pipelined-byzantine-fault-tolerance-8a0634a270ba

[8] Jae Kwon, Ethan Buchman, "Cosmos: A Network of Distributed Ledgers", https://www.chainwhy.com/upload/default/20180628/d849f659762a2fbbd2685f9b37c5d24c.pdf

[10] Victor Allombert, Mathias Bourgoin, Julien Tesson, "Introduction to the Tezos Blockchain", https://arxiv.org/pdf/1909.08458.pdf

[11] Yossi Gilad, Rotem Hemo, Silvio Micali, Georgios Vlachos, Nickolai Zeldovich, "Algorand: Scaling Byzantine Agreements for Cryptocurrencies", https://eprint.iacr.org/2017/454.pdf

[12] ConsenSys, "Ethereum 2.0 Staking Ecosystem Report", https://cdn2.hubspot.net/hubfs/4795067/Codefi/Ethereum%202.0%20Staking%20Ecosystem%20Report.pdf
[13] Loizos Leracleous, "Shareholder Votes for Sale", https://hbr.org/2005/06/shareholder-votes-for-sale