
Palette
The blockchain for NFT
Hashpalette
White Paper Version 1.0

Palette White Paper

01 | Summary

"Palette" is a blockchain network for issuing, managing and distributing digital items. Users are free to transfer ownership of digital items and utilize them in applications.

In the past, the advent of the Internet brought information into the digital space, and now with the advent of Bitcoin, the digitization of currencies is about to be realized. Furthermore, with the advent of Ethereum, various values beyond currencies have begun to circulate on the Internet. On the other hand, since Ethereum is used in various business areas and business models, issues such as soaring gas fees and instability due to fluctuations in supply and demand are also recognized.

Palette allows digital items to be handled as Non-Funjible Token (NFT) on its own blockchain, Palette Chain. The Palette Chain is a blockchain specifically designed for the issuance, management, and distribution of digital items in the entertainment field, and has been designed to fit business models. Furthermore, Palette Chain can be connected to multiple blockchains, including Ethereum, and can function as a cross-chain platform that serves as a hub for the issuance and distribution of NFTs.

Palette Token (PLT), a cryptocurrency, will be issued to ensure the stable operation of the Palette as a decentralized platform. By developing foundations for NFT and cryptocurrency, we aim to bring an update to the content industry which Japan takes pride in with blockchain technology.

02 | About Project

2.1 | Background

The content industry has been positioned as an important area of Japan's soft power and has been promoted as one of Japan's global attractions. The media and content sector accounts for 47% (50.5 billion yen) of the total investment by Cool Japan Fund, a public private fund established in 2013 under the initiative of the Ministry of Economy, Trade and Industry.

While the content industry is expanding, the economic and social system is undergoing irreversible changes towards a “new normal” due to the global epidemic. It is important to consider how the content industry should respond to digitalization. We believe that blockchain technology can be used as an important means to bring out the charm of content as digital items with the changing life style.
In September 2017, a new technical standard was proposed on Ethereum, an open-source blockchain. With this new technical standard, the digital data which has been easily replicable, can now be represented in a unique way. Digital data issued using this standard is called non-fungible tokens (NFTs). In the same year, CryptoKitties was released and has since become a hit. It is a game for raising digital cats and each CryptoKitty is a non-fungible token (NFT). After that, many applications that utilize NFTs have been also released.

1: Official homepage of Cool Japan Fund, https://www.cj-fund.co.jp/about/company.html（Retrieved June 22, 2021）
2: Prime Minister's Office Intellectual Property Strategy Headquarters, "Intellectual Property Promotion Plan 2020-After the New Corona Intellectual Property Strategy for "New Normal", May 27, 2020
3: ERC: Non-fungible Token Standard #721, https://github.com/ethereum/eips/issues/721

2.2 | Why NFT Matters

The world view that Palette aims at is to utilize the power of NFT to visualize the various values which are produced every day and to express them as economically valuable assets by circulating them on the blockchain.

With the advent of the Internet, real-world information has been brought into the digital space as widely shared and replicable. Content fields such as manga, sports, and music, which Palette focuses on, are shared in the digital space. By distributing and circulating these contents as NFTs on the blockchain, we believe that we can express the economic value of digital data which has been difficult to be recognized in a new way, and find new markets in this area.

We also believe that NFTs will play an important role in the development of digital spaces such as VR. The recent epidemic of infectious diseases has dramatically increased the amount of time people spend living online, blurring the line between the real and the digital. In an age where people are spending more and more time in the digital space, I believe that what will be important is the texture of information as an "actual thing" which does not actually exist though. By issuing information as an unreplicable "actual thing" on the blockchain, the digital space will feel more like the real world, and I believe that the real and the digital will coexist as inseparable entities in the future. In such a world, daily economic activities will be recorded on the blockchain, and a network of robustness and value will be made visible by NFT.

Specifically, we believe that NFT will enable digital items to acquire three major characteristics, which are data uniqueness, secure and transparent secondary distribution, and interoperability among services. We believe that these features will create new networks and values in the society with NFT clarifying the ownership of digital items, which used to be just data that could be reproduced on the Internet.

2.2.1 Data uniqueness

One of the reasons why digital items have not become widespread in the midst of digitization is that it is difficult to guarantee the uniqueness of an item because existing digital data can be easily duplicated or altered, making it difficult for users to feel that they own the item. When data can exist in a form that cannot be duplicated or tampered with, digital items will gain value as "actual thing" like actual products, then a new world view will be created.

In NFT, each token is given unique data corresponding to the ID and service, and this is proved on the blockchain to guarantee uniqueness. Although NFTs are digital items, they are published and recorded on the blockchain, so there is no need to stay in an app or game. In other words, if the service ends, the NFT will not disappear and will exist on the blockchain.

2.2.2 Secondary distribution safety and transparency

Another feature of blockchain is the secure secondary distribution of digital items. When considering the secondary distribution of digital items, there are various issues. First, determine the authenticity of digital items. Since all the history of NFT issued on the blockchain can be traced and checked, it can be confirmed that whether it is an item

that does not go through authenticity or illegal transactions. In addition, in secondary distribution transactions, escrow services are usually required because digital items and money must be sent to each other. However, digital items issued on the blockchain can securely send NFTs and cryptocurrency at the same time through smart contracts without going through the escrow service.

Real money trading (RMT), which buys and sells digital items, is widely carried out mainly in the game industry, and its market size is said to be over 260 billion yen [4]. By utilizing NFT, we believe that it will be possible to create a new market by guaranteeing improved ownership of digital items and safe secondary distribution outside the game industry.

4: ChillStack, Inc., "RMT Market Analysis Report", August 28, 2019

2.2.3 Mutual use between services

In addition, you can develop multiple apps that can use published NFTs, so you can use the same NFT for different services. In other words, by using blockchain, it is possible to bring digital items directly owned by oneself to different services and apps and use them, instead of owning digital assets only within a specific service. For example, by issuing fan club membership as an NFT, it is expected that the history and contributions of multiple fan clubs can be managed collectively, and that items issued as an NFT within a certain service can be used in different games.

In addition, the Palette can interoperate with multiple public blockchains such as Ethereum, allowing NFTs to move freely between different blockchains. Therefore, NFTs published on the Palette can also be used in applications on Ethereum.

Currently, people are spending more time in the digital space as they work toward "new normal." Establishing a content economic zone in a digital space where there are no geographical conditions and promoting user retention is an important issue. Palette sees NFTs, which exist as "actual things" by ownership on the blockchain, as a new community means between content and its users in the digital space. We also believe that co-creation between economic zones will be promoted if people own NFTs and move between different economic zones.

2.3 | NFT Market Expansion and Use Cases

NFT was proposed as a new token standard on Ethereum, an open source blockchain in September 2017, and became a hot topic in December of the same year when NFT of a service called CryptoKitties was traded for an amount exceeding 10 million yen[5]. In CryptoKitties, the one and only Kitty (cat character) is compatible with each NFT, and although it is a digital item, it can be cultivated with the feeling of being a unique pet.

Following the success of CryptoKitties in 2018, we can see that the release of services utilizing NFTs on Ethereum is expanding rapidly (Fig. 1). From around June 2018, when market services such as OpenSea[6] that enables safe secondary distribution of NFTs began to be developed, the number of NFT contracts registered on Ethereum began to gradually increase, and from December 2017. By November 2020, the average monthly growth rate has increased by 15.53%[7].

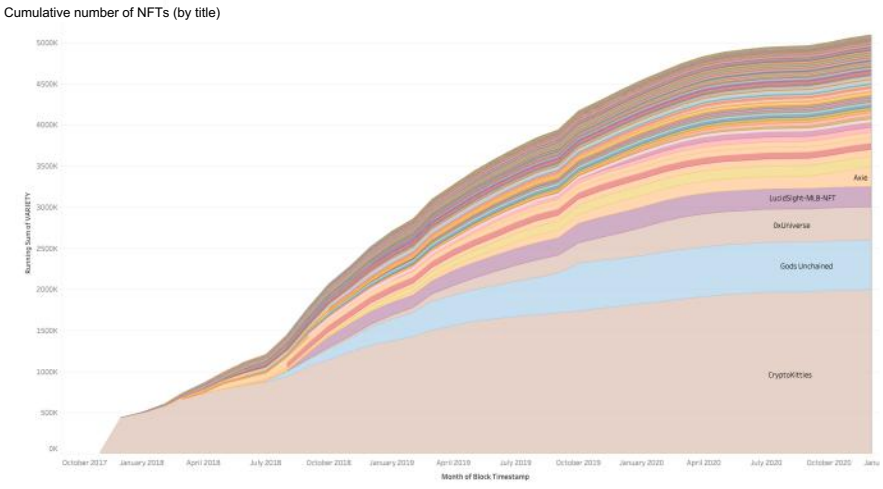

Figure 1. Cumulative number of NFTs issued on Ethereum

5 : Kitty Explorer, https://www.kittyexplorer.com/prices/
6: OpenSea, https://medium.com/opensea/offer-crypto-for-your-favorite-collectibles-16f07908b214
7: From May 2020, the number of issued NFTs is slowing down temporarily due to soaring gas prices on Ethereum

As mentioned above, the use cases of NFTs on Ethereum have expanded since 2017, and DeFi applications such as Compound and Uniswap have become widespread in 2020[8], and the demand for transactions on Ethereum is increasing.

Under such market conditions, multiple blockchains that specialize in use cases such as NFT and entertainment areas have appeared. An example is the blockchain Flow developed by Dapper Labs, the provider of CryptoKitties. As of May 26, 2021, "NBA Top Shot," which is a typical example of an application built on Flow, has sales of over $ 700 million (about 76 billion yen) and has reached 1 million users[9]. In addition, projects focusing on NFT such as LINE blockchain[10] and WAX blockchain[11] have appeared.

Despite these market conditions, knowledge related to blockchain is also important for the development of services using NFTs. Given that free and easy issuance and sales of NFTs have been realized, concentration on service development using NFTs is difficult. Just as the development of secondary secondary markets such as OpenSea improved user convenience and supported the expansion of NFTs, the development of NFT-related services will be facilitated and the new market of NFT will be expanded by developing a platform for issuing and selling NFTs.

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8 : https://www.boj.or.jp/research/wps_rev/rev_2021/data/rev21j03.pdf, Bank of Japan Review, April 2021

9 : https://www.coindeskjapan.com/109980/, May 26, 2021

10 : https://blockchain.line.me/ja/whitepaper/

11 : https://on.wax.io/wax-io/

03 | Challenges and Solutions

3.1 | Challenges

As mentioned above, there is great potential for the market to be realized by the spread of NFTs, but in the entertainment area where Palette are focused, there are still issues to be solved at present for further market expansion, and the main example is Ethereum. So, I think there are four major issues.

3.1.1 Instability of gas fees

Currently, the Ethereum blockchain used in major applications such as NFT uses ETH, which is a cryptocurrency, as a payment method. The ETH required as a fee is determined based on supply and demand, and the fee rises as the network becomes congested.

Ethereum is designed as an open-access, general-purpose blockchain and is known for its wide range of use cases, including new cryptocurrency issuance, decentralized finance (DeFi), and NFT. In particular, gas fees, which have soared due to demand from DeFi applications with high unit prices, are unacceptable for applications that handle NFTs with relatively low unit prices, and may be inconvenient for both users and businesses.

3.1.2 Deterioration of user experience due to gas fees

Despite the soaring gas fees, we believe that the fact that users have to own cryptocurrency such as ETH and pay gas fees in order to use applications related to NFT is also an issue from the viewpoint of convenience. In recent years, proposals have been made to respond to soaring gas fees such as layer 2 technology and side chains, but in the NFT area, we believe that a design in which the user experience does not include paying gas fees is also important.

3.1.3 Lack of cross-chain infrastructure

The third issue is that the cross-chain infrastructure is not well organized to allow NFTs to move freely between different blockchains. One of the attractions of NFT is that even digital items issued and sold in a certain application can be widely distributed via the blockchain, not just within the service. Therefore, it is possible to use the same NFT for multiple services. Here, if we can move freely between various blockchains, not just Ethereum, it is thought that the expansion of the economic zone centered on NFTs will be further promoted.

3.1.4 Governance on blockchain

The fourth issue is about the governance on updating the blockchain specifications. Ethereum, a general-purpose open source platform, has diverse stakeholders with different incentives due to the existence of applications in a wide range of areas as use cases. In addition, the developer community and the entities that operate many Ethereum nodes are widely dispersed and updates of the specifications need consents from multiple parties. Therefore, it is generally difficult to update the blockchain design or add functions specifically for NFT and entertainment areas.

3.2 | Solutions

To address these issues, Palette proposes to use a private chain specialized for NFTs instead of issuing NFTs on Ethereum. Private chain refers to the case where the administrators of the blockchain network are limited. At Palette, Palette Consortium which is composed of many companies will build a consortium-type private chain "Palette Chain" in charge of operating the blockchain.

Ethereum can be used as a blockchain platform with unlimited uses, and has the properties of a general-purpose computer. Therefore, while various applications exist and the economic zone expands, it is over-engineered for specific areas such as NFT. Just like the invention of game machines for personal computers, we believe that blockchains specialized in NFT and entertainment will be the solution.

Figure 2. Image changing from general purpose (left) to area specialization (right)

By using the Palette chain, we believe that we can provide the following solutions to the four issues mentioned in the previous section.

3.2.1 Stabilization of gas fees

At Palette, we use the Palette Chain, which is a blockchain specialized in the entertainment field as for Ethereum, which is a decentralized world computer. Applications built on the Palette Chain are focused on the entertainment areas, so it is possible to avoid instability of gas fees due to applications such as DeFi which generates transactions with high gas fees and high frequency.

3.2.2 Gasless design for general users

At Palette, gas fees for NFT transfers are free so that users can purchase and send NFTs without using any cryptocurrencies including PLT. Cryptocurrency and NFTs are both assets issued on the blockchain, but they do not necessarily have to coexist. Palette helps make NFTs more widespread by free charge of gas fees.

3.2.3 Development of cross-chain infrastructure

At Palette, it is possible to transfer from the Palette Chain to multiple blockchains including Ethereum. A cross-chain module called Poly Network is used to connect the Palette Chain and other block chains. Users are free to move NFTs between blockchains such as Ethereum, Neo and Ontology.

3.2.4 Governance by consortium

At Palette, the Palette Consortium governs changes of Palette Chain specifications. Palette is a blockchain network optimized for content distribution using NFT, and it is possible to make decisions specific to that application. Members of the consortium, who are also Palette's stakeholders will carry out decentralized governance on gas fee system and cross-chain design.

When using a private chain including a consortium type such as Palette, there is a demerit that the characteristics as a decentralized system are lost because the blockchain is operated centrally compared to a public blockchain such as Ethereum. Therefore, Palette will build a decentralized consortium with cryptocurrency as a reward. In Palette, crypto assets serve as an incentive for participants participating in the consortium to operate the private blockchain in a decentralized manner. In addition, by distributing different contents on the same blockchain, we aim to promote collaboration that transcends the boundaries of contents and expand the economic zone while enhancing the network effect.

04 | The big picture of the project

Palette is a decentralized NFT platform consisting of three players: users, Palette Consortium, and content holders. The Palette Consortium operates the Palette Chain, which is a private blockchain, providing the functions of issuing, distributing, and secondary distribution of NFTs.

4.1 | Token Economy Overview

By using the Palette Chain, content holders will be able to publish their own content as NFTs on the blockchain. When issuing an NFT, PLT will be paid as gas fee. Users can get NFTs of the content they support from the content holders. In addition, by holding a cryptocurrency, PLT, users can participate in blockchain governance through the Palette Consortium through the voting function, and can earn the PLT required to purchase NFTs as a reward. The Palette Consortium manages the Palette Chain in a decentralized way and can receive the gas fee as a reward which is paid by the content holders when issuing NFTs.

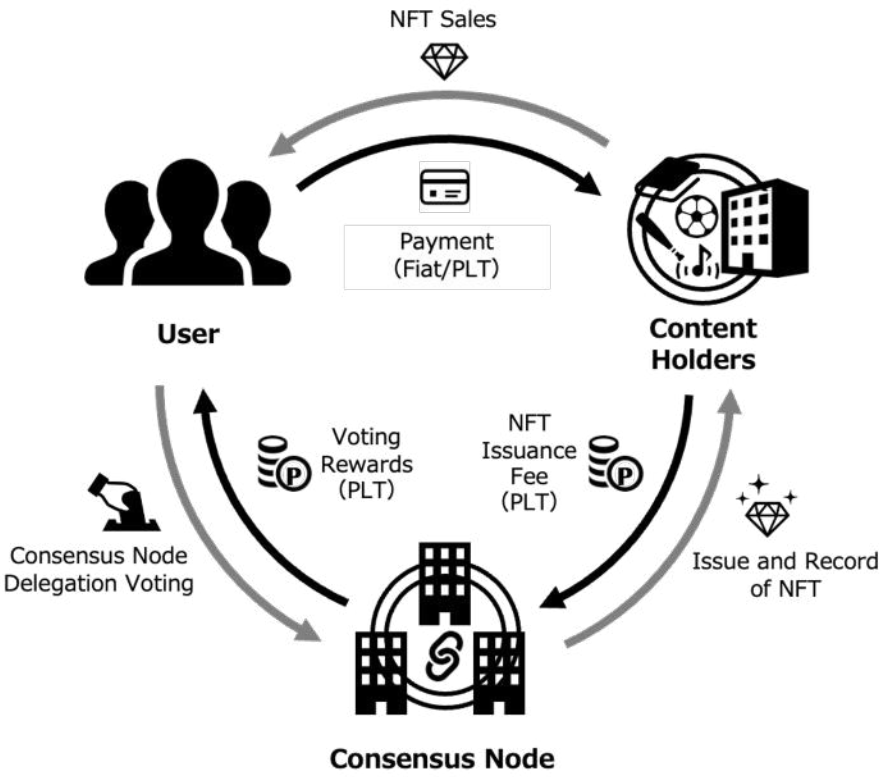


Figure 3. Overview of the Palette ecosystem

4.2 | Issuance and Recording of NFTs

NFTs in the Palette ecosystem are issued on the Palette Chain, a consortium-type private chain. The Palette Chain uses the Proof of Authority (PoA) as a consensus algorithm which is operated stably by multiple reliable companies.

When the content holders publish a new NFT, PLT is paid as fees and the Palette Consortium generates the NFT on the blockchain. The PLT paid here is stored in the Palette reward pool managed by the smart contract. In addition to the fee income from using the blockchain, a part of the total amount of PLT issuances will be allocated to the Palette reward pool as an ecosystem reward at the initial stage of launch, and will be used for the stable operation of the Palette Chain. Each company participating in the consortium will earn management fees from the Palette compensation pool according to the amount of PLT they hold.

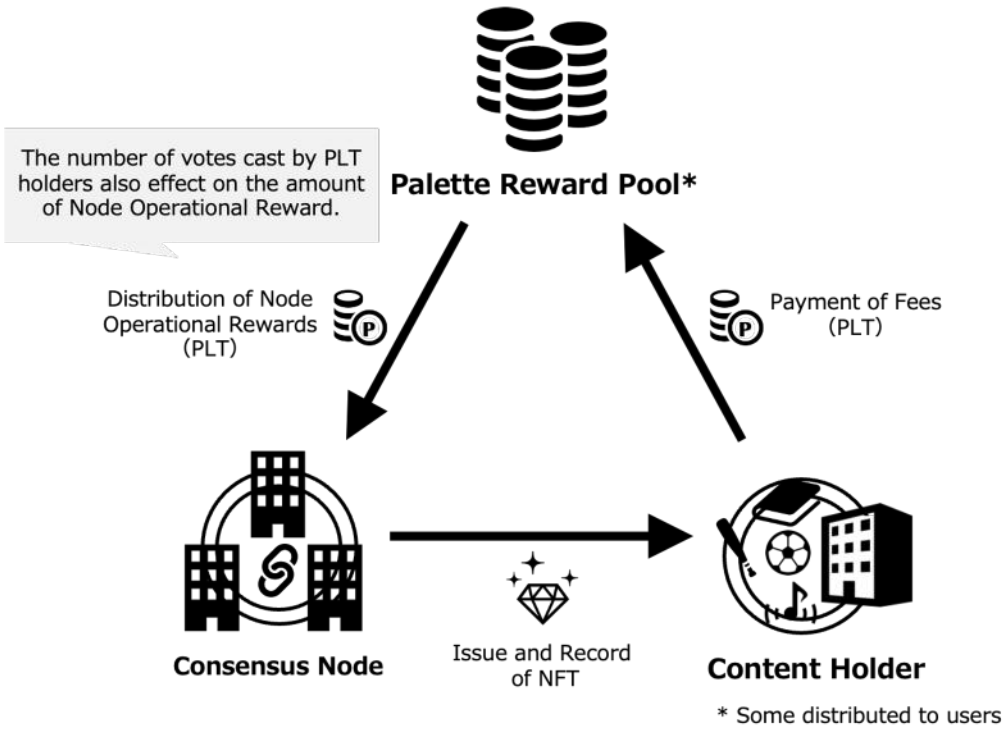


Figure 4. Issuance and recording of NFTs on the Palette Chain

4.3 | Sales and Distribution of NFT

Content holders can freely distribute and sell NFTs issued on the Palette Chain to users on their own services. Even in the distribution of NFTs, the history is recorded on the Palette Chain. In addition, users can exchange, buy and sell NFTs, and such secondary distribution is processed while maintaining transparency on the Palette Chain.

As an NFT primary distribution service from content holders to users, we released a test product of "Comikabu" specialized in the manga field in May 2020, and 5,000 NFTs were sold out in 6 days. Comikabu issues NFTs on Ethereum, and the secondary distribution of the issued NFTs is realized in collaboration with external services such as miime and OpenSea. In the future, we plan to publish NFTs of manga and other contents on Palette Chain. When content holders publish NFTs on the Palette Chain and release application services that utilize them, Palette will also implement a grant program to support application construction.

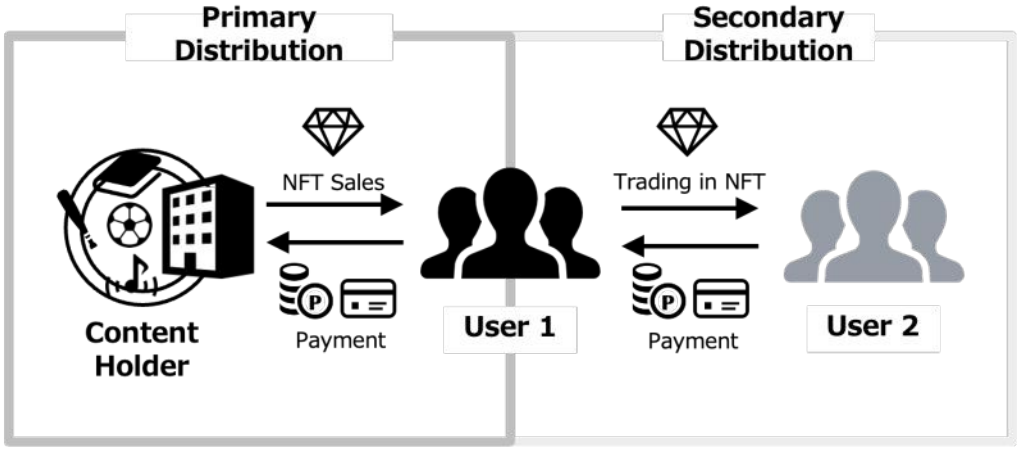


Figure 5. Sales and distribution of NFTs on Palette Chain

4.4 | Participation in Palette Chain's Governance

PLT holders can delegate their PLT to specific members of the Palette Consortium and participate in the governance of the Palette Chain. Delegation refers to locking your PLT to a specific node. As explained in detail in Chapter 5, the ecosystem rewards that nodes participating in the Palette Consortium receive in PLT are proportional to the amount of PLT each node has. That is, a node can earn more rewards by being delegated a PLT from a PLT holder.

PLT holders can evaluate the nodes participating in the consortium and distribute more rewards to specific nodes through a delegation mechanism. Therefore, PLT holders, including users, act as auditors of the Palette Consortium and promote the sound operation of the entire Palette Ecosystem.

The delegation mechanism increases the amount of compensation that each company participating in the consortium receives, so it is possible to return part of that compensation to PLT holders at any rate (described later in Chapter 5). Since the rate of return is arbitrarily determined for each company, competition among nodes is also promoted. In addition, if the content holders themselves also participate in the Palette Consortium, various designs are expected, such as distributing their own content's NFT as delegation fee.

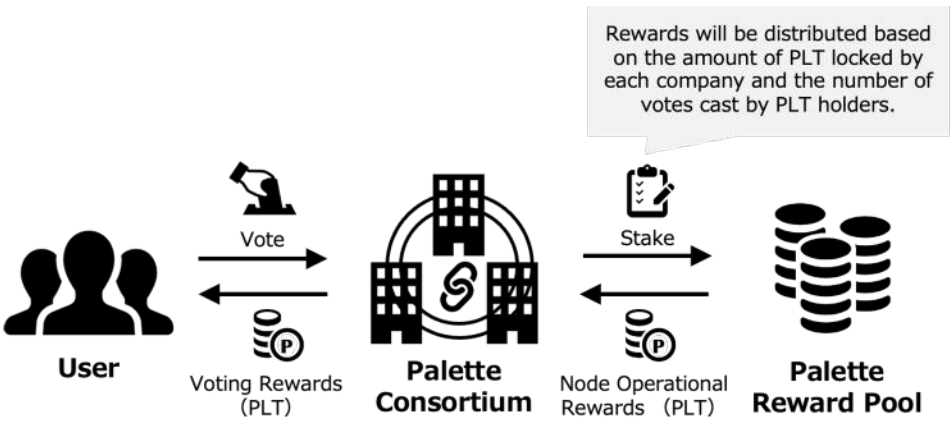


Figure 6. Participation in Palette Chain governance

05 | Technical Specifications

5.1 | Design Overview

5.1.1 Palette Chain

The Palette Chain is a consortium-type private blockchain using Quorum [12] . Quorum is a private blockchain developed by JPMorgan Chase, a major US financial company, based on the public blockchain Ethereum. Also known as a permission-type blockchain, it can manage access rights to the blockchain network and is operated by a specific authorized company.

The Palette Chain limits network participants to palette ecosystem partners (Palette Consortiums), enabling high-speed processing with a small number of nodes while achieving decentralization. Here, the partners who participate in the Palette Consortium are called “members”. At the beginning of the Palette Chain's launch, we plan to operate with more than 10 validator nodes, and we plan to add more nodes as the number of members expands.

12 : Quorum, Github, https://github.com/jpmorganchase/quorum/

■ Overview of Palette Chain

Blockchain name	**Palette Chain**
Technology base	**Quorum**
Main applications	**●Issuance and distribution of NFT** **●Building an application using the issued NFT**
Consensus algorithm	**Proof of Authority, PoA**
Node operator	**Palette Consortium**
Node operation reward	**PLT**
Distribution of rewards	**Rewards will be distributed to participants in the Palette ecosystem as follows:** **●Node management fee: Distributed according to the number of locked PLTs** **- Number of PLTs locked by each member** **- Number of PLTs earned by each member by delegation** **●User reward: Distributed according to contribution to the ecosystem** **The reward distribution system is subject to change at the discretion of the Palette Consortium.**

On the technical operational side, Hashpalette will add new nodes to join the Palette Consortium. However, participating in the Palette Consortium as a new member requires off-chain approval by the consortium and lockup of a certain amount of PLT.

■ Overview of Palette Chain's Reward Design

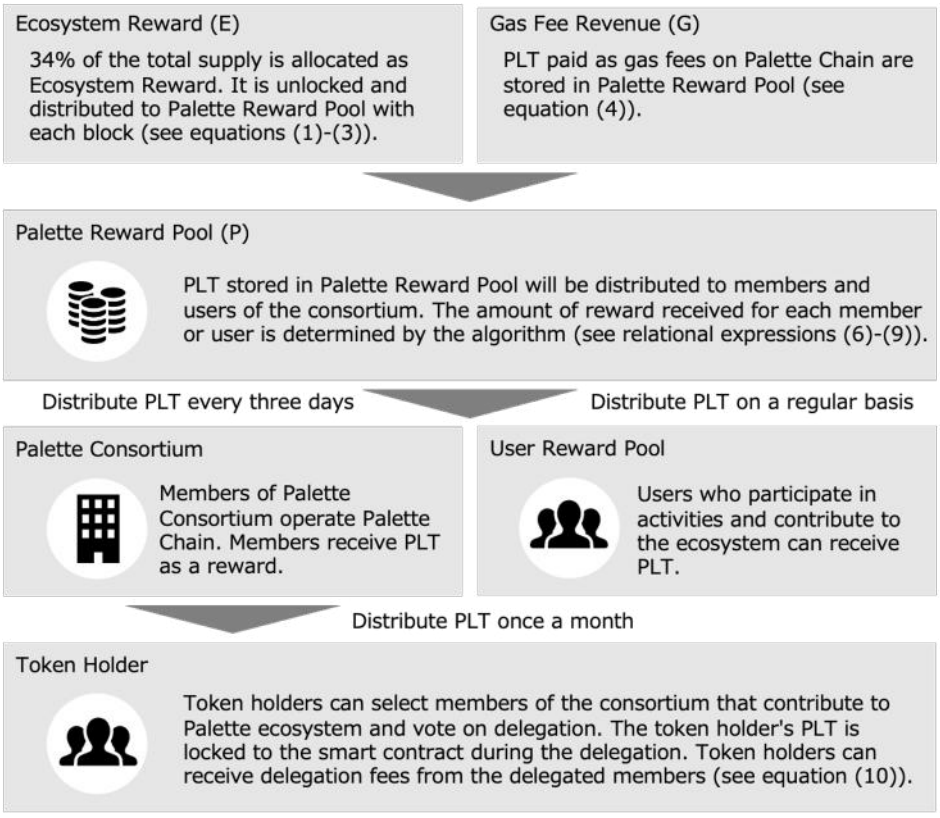
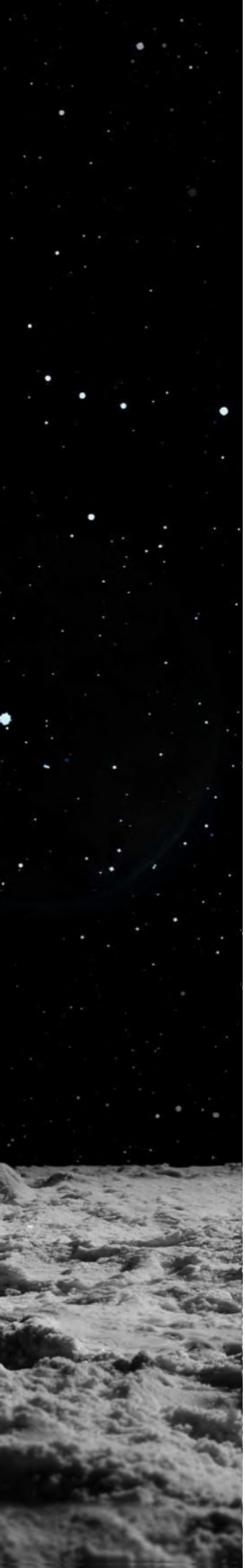


Figure 7. Reward distribution flow on the Palette Chain

5.1.2 Ecosystem rewards

34% (340,000,000 PLT) of the total PLT issuance will be allocated as an ecosystem reward of the Palette Chain and will be distributed to members and users of the Palette Consortium over a six-year period. Each time a block of Palette Chain is generated, a certain amount will be unlocked and transferred to the Palette reward pool. The total number E of ecosystem rewards transferred to the Palette reward pool is expressed by the following relational expression.



$$E = \Sigma e_{block} \quad (1)$$

$$e_{block} = e_{year} \frac{t_{block}}{365 * 24 * 60 * 60} \quad (2)$$

$$e_{year} = 0.34\ CS \quad (3)$$

E : Total number of ecosystem rewards transferred to the Palette reward pool

e_{block} : Total number of PLTs released per block

e_{year} : Total number of PLTs released per year

t_{block} : Block generation time. The default setting at launch is 15 seconds

C : Ecosystem reward constant. 2/9 in 1-3 years after launch, 1/9 in 4-6 years

S : Total number of PLTs issued (1,000,000,000 PLTs)

5.1.3 Gas fee design

To improve the user experience, users can use some transactions in the Palette Chain for free. This means that users who send specific transactions on the Palette Chain do not have to pay gas fees. However, as an incentive to the Consensus Node, we will set gas fees for some of the operations listed below, and the fees incurred will be distributed to the Palette Consortium via the Palette reward pool.

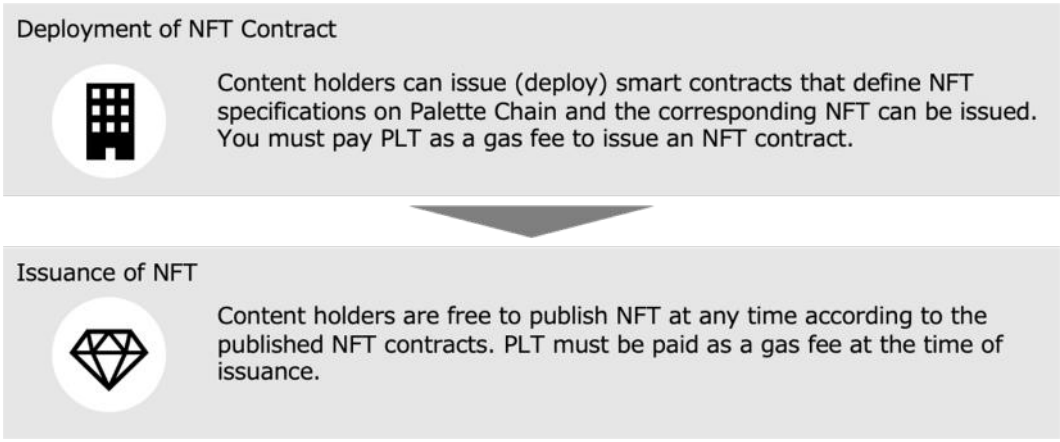


Figure 8. Gas fee design

A gas fee will be charged on the Palette Chain in the following cases.

- ◆ Issuing (deploying) NFT contracts
- ◆ Issuance of NFT

ⅰ. Issuing (deploying) NFT contracts

All NFT projects can issue NFT contracts on the Palette Chain, but you will have to pay a gas fee with PLT.

ⅱ. Issuance of NFT

If the NFT contract is successfully issued, the NFT project can issue a new NFT on the Palette Chain. The gas fee required to issue an NFT will be paid with PLT. Also, since the PLT price is not always constant, the commission fee will be adjusted according to the voting system which will be described later.

Therefore, the PLT transferred to the Palette reward pool as gas fee G is shown below using the NFT contract issuance fee $g_{contract}$ and the NFT issuance fee g_{mint}.

$$G = g_{contract} + g_{mint} \quad (4)$$

G : Total number of PLTs transferred as gas fees to the Palette reward pool
$g_{contract}$: NFT contract issuance fee
g_{mint} : NFT issuance fee

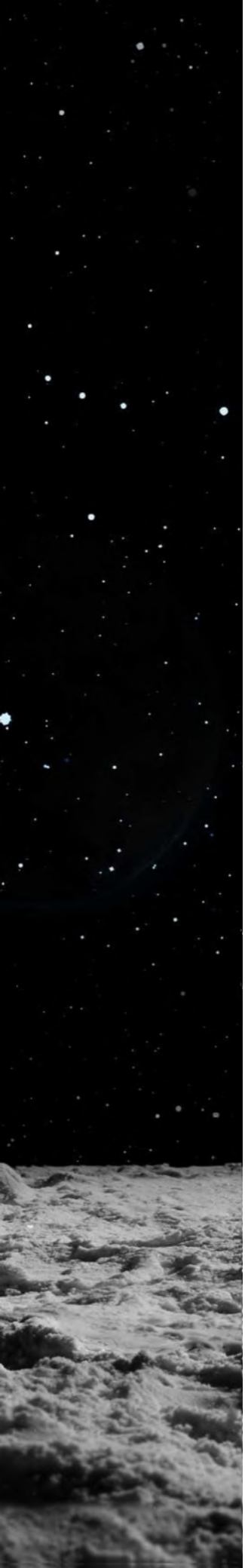
5.1.4 Reward distribution design

The Palette Consortium that operates the Palette Chain can get PLT as a reward from the Palette reward pool. P, the total number of PLTs stored in the Palette reward pool consists of the ecosystem reward E, which uses 34% of the total number of PLT issuance, and the gas fee G collected on the Palette.

$$P = E + G \quad (5)$$

P : Total number of PLTs held by the Palette reward pool
E : Ecosystem rewards transferred to the Palette reward pool
G : Total number of PLTs transferred as gas fees to the Palette reward pool

The PLT stored in the Palette reward pool will be distributed to members and users of the Palette Consortium. Here, the distribution to the consortium members is defined as the node operation reward R_n, and the distribution to the Palette users is defined as the user reward R_u. Node management rewards are distributed to each member of the consortium every three days, user rewards are stored in the user reward pool, and then managed and distributed to users by Hashpalette.



ⅰ. Node management reward

Node management reward R_n are distributed according to the amount of PLT locked by each member. The node management reward $R_{n,i}$ of each member participating in the consortium are calculated by the following relational expression.

$$R_{n,i} = (1-\alpha)P\left(\frac{L_i}{L_{all}}\right) \quad (6)$$

$R_{n,i}$: Target member's node management reward
α : Percentage of Palette reward pools distributed to user rewards (α = 0.20 *)
* α = 0, 6 years after launch
P : Total number of PLTs held by the Palette reward pool
L_i : Total number of PLTs locked up on the target member's node
L_{all} : Total number of PLTs locked up on all nodes

Here, the total number of PLT L_i locked by each member includes the mandate from general users, which will be described later. By contributing to the robustness and transparency of node operation and the activation of the ecosystem, it is possible to collect delegations from users and increase node management rewards. That is, the total number L_i of PLT locked by each member is shown below.

$$L_i = I_i + D_i \quad (7)$$

I_i : Total number of PLTs each member has locked up
D_i : Total number of PLTs delegated by the user

In other words, the node management reward received by each member can be expressed as follows.

$$R_{n,i} = (1-\alpha)P\left(\frac{I_i + D_i}{L_{all}}\right) \quad (8)$$

ii . User reward

In building the Palette ecosystem, users (including businesses) who participate in the platform are important players . As user rewards, a part of the Palette reward pool is allocated according to the following relational expression.

$$R_u = \alpha P \quad (9)$$

R_u : User reward

α : Percentage of Palette reward pools distributed to user rewards ($\alpha = 0.20$)

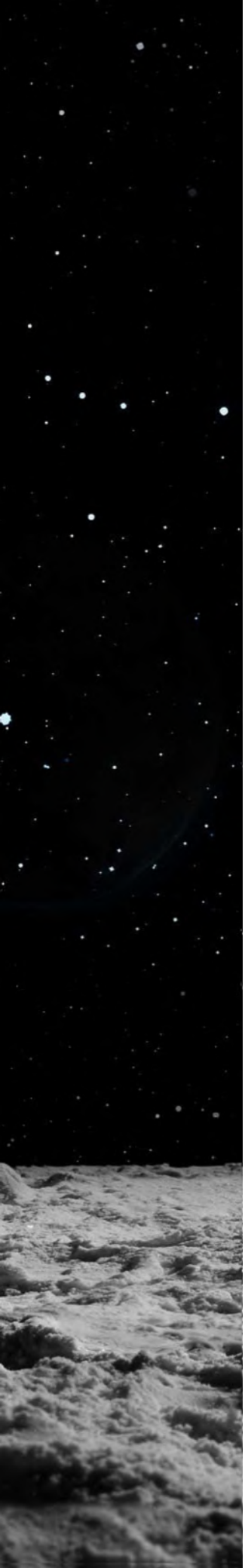
* $\alpha = 0$, 6 years after launch

P : Total number of PLT held by the Palette reward pool

In the long run, we are considering automating the distribution target of user rewards by algorithm, but in the early stage of ecosystem construction, it will be examined and distributed by Hashpalette or the Palette Consortium. In addition, user rewards will be abolished six years after building a self-propelled ecosystem, and direct rewards will be distributed to users only by mandate rewards.

5.1.5 Delegation

Users and general investors participating in the Palette ecosystem can also participate in the governance of the Palette Chain by delegating their PLT to specific members of the Palette Consortium. Here, delegation means to associate the PLT you have with a specific member and lock it on a smart contract.



Node management rewards are proportional to the amount of PLT that members have locked, so more delegated members will receive more rewards. Members can also distribute PLT as a delegation fee to PLT holders who perform delegation. Each member can set any percentage of the PLT received as a node management reward as a delegation reward. The percentage set here can be arbitrarily determined by each member in the range of 0% to 100%.The delegation fee $R_{d,j}$ from the member to the delegating user is calculated by the following relational expression.

$$R_{d,j} = \beta_i R_{n,i} \left(\frac{D_{j,i}}{D_{all,i}} \right) \qquad (10)$$

$R_{d,j}$: Delegation rewards received by users

β_i : Delegation reward return coefficient arbitrarily determined by the target member $(0 \leq \beta_i \leq 1)$

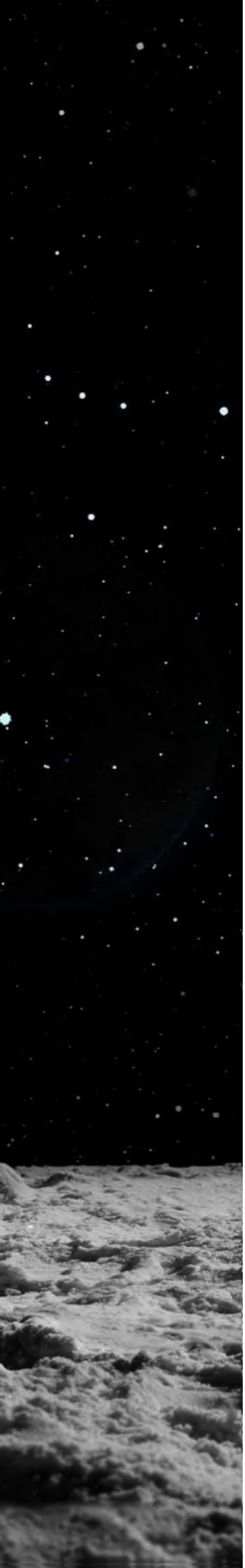
$R_{n,i}$: Target member's node management reward

$D_{j,i}$: Total number of PLTs delegated by the user to the target members

$D_{all,i}$: Total number of PLTs delegated to target members

In this way, the delegation by PLT holders is equivalent to a voting system that affects the distribution ratio of node management rewards distributed from the Palette reward pool to each member in the Palette ecosystem. Governance by PLT holders is expected to increase the transparency and robustness of node operations by members, and members participating in the Palette Consortium will be able to receive more rewards through delegation.

In addition, there is a limit to the amount of PLT each member can be delegated to. Users can be delegated up to four times the amount of PLT that each node locks up on its own.



5.2 | Governance Function

There are two major different ecosystems on the Palette, each with its own governance function. The first is governance by the Palette Consortium, where decisions are made regarding the Palette Chain from which NFTs are issued. The other is governance regarding the issuance of additional PLT. It is managed entirely by smart contracts on Ethereum, independent of the operation of the Palette Chain, and all PLT owners can participate in governance.

The operation of the Palette Chain by the Palette Consortium and the issuance of new PLTs on Ethereum are independent, so the governance of one does not affect the other.

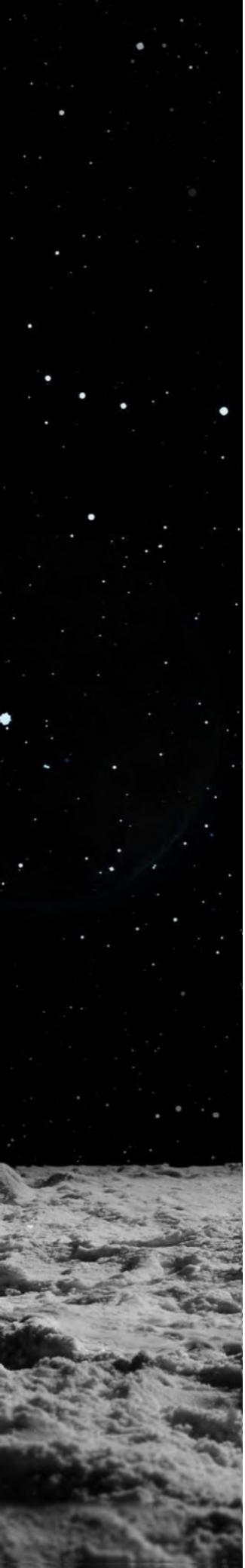
5.2.1 Governance for Palette Chain

Members of the Palette Consortium can participate in the necessary decisions regarding the Palette Chain. Voting targets for Palette Chain include changes of the gas fee structure. Voting takes place through smart contracts on the Palette Chain and is reflected by the approval of more than two-thirds of the members of the Palette Consortium.

Each member can get a voting ticket proportional to the amount of PLT they have locked and participate in governance voting.

5.2.2 Governance for token issuance

PLT will be issued on the Ethereum blockchain as ERC20 tokens with a total amount of 1,000,000,000 PLT at the time of launch of the Palette Ecosystem. Six years after the initial issuance, all PLT will be unlocked, at which point PLT holders will be able to propose new issuance of PLT and vote for approval. Voting takes place on



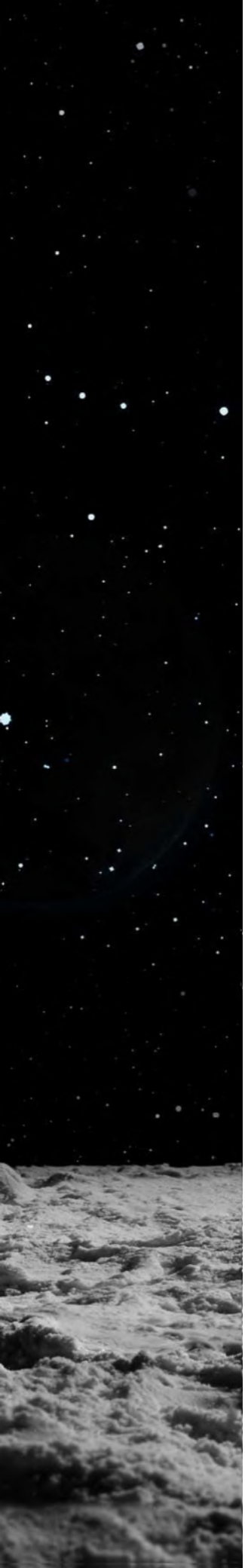
Ethereum smart contracts, and all PLT users can submit proposals and participate in voting. Each stakeholder is given the right to vote according to the amount of PLT held. The proposal will be approved with the approval of at least two-thirds of the valid votes.

5.3 | Cross Chain Technology

As mentioned above, Ethereum and Palette Chain are operated independently as different blockchains, and NFTs and PLTs issued by each blockchain are not interoperable.

Therefore, in the Palette, the cross-chain technology is used to connect Ethereum, which issues PLT, to the Palette Chain, which issues NFT. Users can lock PLT by sending their PLT to smart contracts on Ethereum and use PLT on the Palette Chain as well. The amount of PLT held by each user is recorded on the smart contract, and it is possible to activate the smart contract at any time and retrieve the locked PLT to the address on Ethereum.

By utilizing cross-chain technology, PLT, which is a crypto asset, can benefit from liquidity and price stability on the public Ethereum blockchain, and meanwhile users can use services with PLT and NFT without problems such as gas fees and transaction clogging.



5.3.1 About cross chains

Cross-chain is a protocol for realizing interoperability between blockchains and building the next-generation Internet. Poly Network, a cross-chain protocol used in Palette, is based on side-chain and relay modes and uses a two-tier architecture. Poly Network uses Poly Chain as a cross-chain coordinator and adopts a structure called relayer as a porter of cross-chain information. By solving chain data reliability, security, transaction problems, etc., we have realized a safe, easy-to-use and efficient cross-chain system.

Features of cross-chain technology

- Easy integration
- Cross-chain support for multiple blockchains
- Secure and reliable cross-chain protocol based on cryptography

13: Poly Network, Github, https://github.com/polynetwork

5.3.2 Framework for connecting Ethereum and Palette Chain

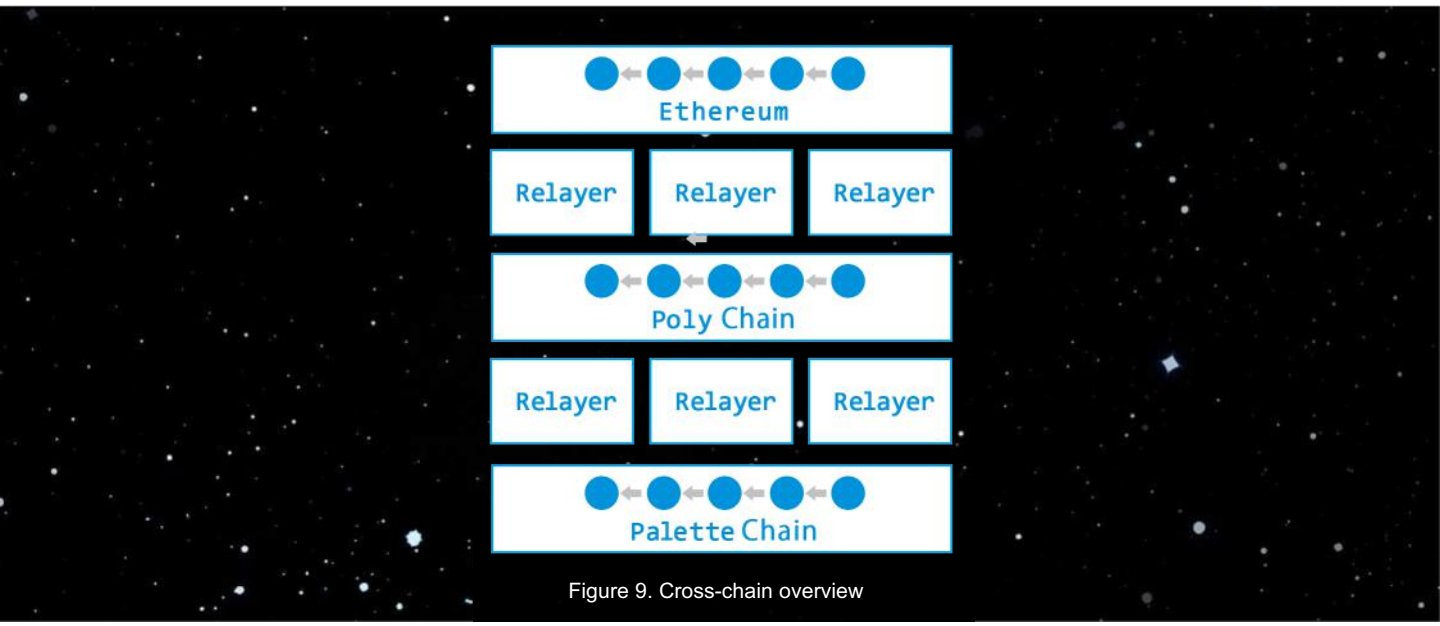


Figure 9. Cross-chain overview

As shown in Figure 9, the cross-chain framework consists of Palette Chain, relayers, Poly Chains, Ethereum relayers, and the Ethereum they work with. The user's proof of transaction on Ethereum is first transferred by relayers to the Poly Chain, and then by each relayer to the Palette Chain.

About each layer

◆Cross-Chain Coordinator: Poly Chain is a key component of the cross-chain ecosystem, validating cross-chain messages and communicating information between relayers.

◆Relayer: Every chain has a relayer that monitors the transactions taking place on the corresponding network. They basically send transaction information to the Poly Chain and connect to the outside world.

◆Palette Chain: Palette Chain is a consortium block-chain and NFT issuing platform. By using a Poly Chain, it is possible to cross-chain with Ethereum.

5.3.3 Flow of PLT tokens from Ethereum to Palette Chain on cross-chain

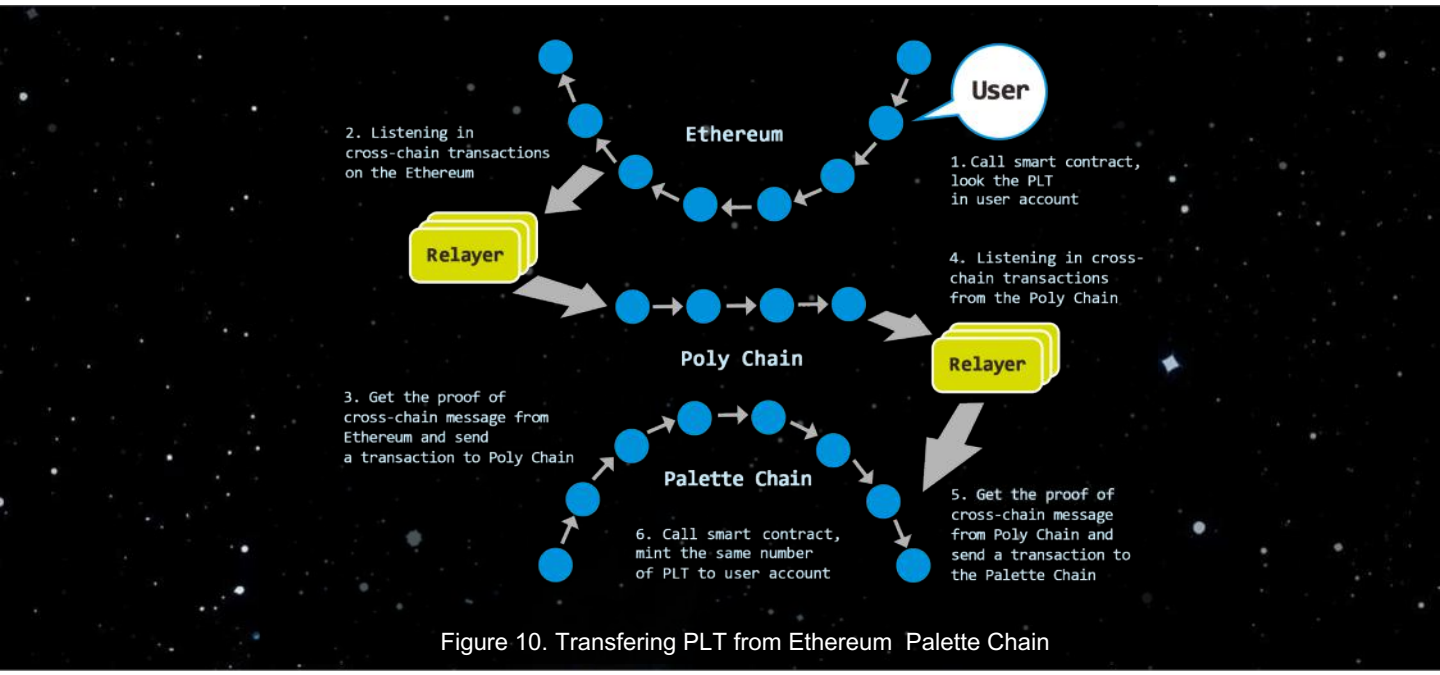


Figure 10. Transfering PLT from Ethereum Palette Chain

The process flow of cross-chain transactions from Ethereum to Palette Chain is as follows.

ⅰ When a user sends a cross-chain transaction to Ethereum, it calls a contract to lock the PLT token to the user account. After checking the user's balance, the user's PLT is locked in the contract and a cross-chain message is generated and stored in the block header of the next block.

ⅱ. Ethereum relayers are constantly checking for cross-chain transactions from Ethereum, and upon receiving a cross-chain message, they will obtain proof of this cross-chain message and send the cross-chain transaction to Poly Chain.

ⅲ. If the cross-chain message is successfully validated, the Poly Chain verifies if the cross-chain transaction is valid then Poly Chain will generate a new cross-chain message.

ⅳ. The Palette Chain relayer confirms the cross-chain transaction from the Palette Chain, and when it receives the cross-chain message, it gets the proof of this cross-chain message and sends the cross-chain transaction to the Palette Chain.

ⅴ. When the Palette Chain receives a cross-chain transaction, it verifies that the cross-chain message is valid. This will call the same contract (PLT) as Ethereum's ERC20 and issue the same amount of PLT to the user wallet on the Palette Chain.

5.3.4 Flow of PLT tokens from Palette Chain to Ethereum in cross chain

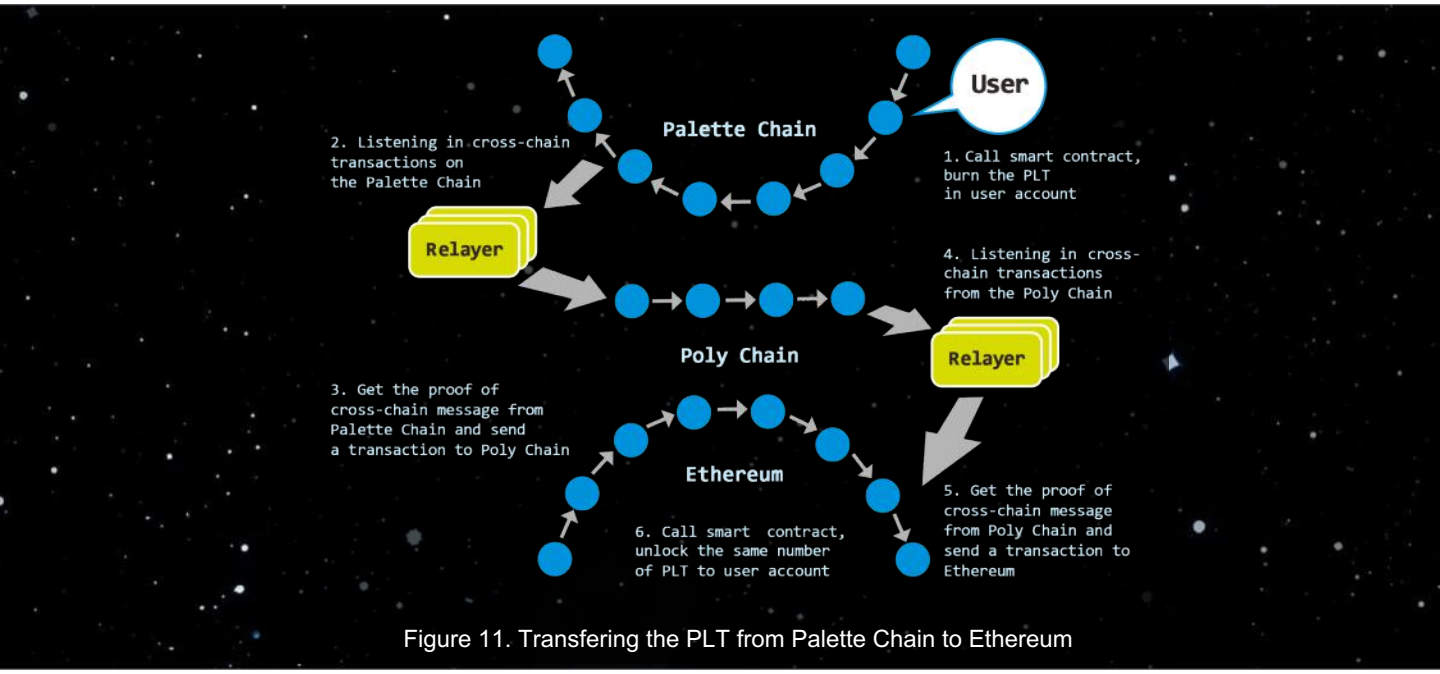


Figure 11. Transfering the PLT from Palette Chain to Ethereum

The processing flow of the cross-chain transaction from the Palette Chain back to Ethereum is as follows.

ⅰ. When the user sends a cross-chain transaction to the Palette chain, the Palette chain calls the contract to write the PLT to the user account. After checking the user's balance, the contract incinerates the PLT of the user account, generates a cross-chain message and stores it in the block header of the next block.

ⅱ. The Palette Chain relayer is constantly checking for cross-chain transactions from the Palette Chain, and when it receives a cross-chain message, it gets proof of this cross-chain message and sends the cross-chain transaction to the Poly Chain.

ⅲ. Poly Chain verifies that the crosschain message is valid and generates a new crosschain message.

ⅳ. Ethereum Relayer constantly confirms cross-chain transactions from Poly Chain, and if it receives a cross-chain message, it will obtain proof of this cross-chain message and send the cross-chain transaction to Ethereum.

ⅴ. If Ethereum receives a cross-chain transaction, check the validity of the cross-chain message. After confirmation, call the PLT contract to unlock as many PLTs as incinerated on the Palette Chain.

Also, when connecting from the Palette Chain to Ethereum using the cross chain, the tokens that can be moved are not limited to cryptocurrency such as PLT. It is possible to lock the NFT issued on the Palette Chain to the smart contract on the Palette Chain and issue the corresponding NFT on Ethereum.

Therefore, users can not only receive NFT primary and secondary distribution services on the trading platform built on the Palette Chain, but also move NFTs on Ethereum and trade on NFT exchanges on Ethereum such as miime and OpenSea.

5.4 Palette Token (PLT)

5.4.1 Issuing blockchain: Ethereum

Ethereum, a public blockchain, is used to issue the crypto asset PLT used in the Palette. Ethereum was conceived by Vitalik Buterin in 2013 and was academically organized by Gavin Wood et al [14]. After that, a test product was launched in 2015, and it is an open source distributed application construction platform that has been continuously operated since then.

Blockchain can be broadly classified into public chain and private chain. The public chain is accessible to everyone from the Internet, and the authority to generate transactions and blocks is open to everyone. On the other hand, in a private chain, the authority to approve transactions is limited to a specific node, and it operates in a closed community.

14: Buterin, V., 「Ethereum white paper」, GitHub repository, 22-23.

For the issuance of PLT, the adoption of public blockchain is expected to improve the liquidity and price stability of PLT, and also to promote the participation of a wide range of users beyond the ecosystem in the network.

When comparing Ethereum with other blockchains, PLT is issued taking into consideration the number of network users participating in the ecosystem, the degree of activity of the community, the activity of application development, and the fact that the development environment is in place. We have adopted Ethereum as the technical foundation for the application.

5.4.2 Technical standard ：ERC20

The PLT issued on Ethereum adopts Ethereum's original token standard called ERC20. ERC stands for Ethereum Request for Comments and represents individual token standards by assigning numbers to new implementation proposals on Ethereum. ERC20 was proposed and discussed by Vitalik Buterin et al. [15] [16], and published in 2015 [17]. Since then, ERC20 has been used as a typical token standard when issuing new crypto assets on Ethereum [18].

5.4.3 Utility

Palette Token (PLT) is a cryptocurrency issued on Ethereum, and in the Palette ecosystem, PLT mainly has the following utilities.

Utilities related to Palette Chains ：

- ◆Payment of NFT issuance fee
- ◆Payment of Palette Chain node management fees
- ◆Delegation to members of the Palette Consortium

Built on a Palette Chain

Applications related utilities ：

- ◆ Buy NFT
- ◆ Granting rights by holding PLT
- ◆ Subscription payment

15: https://github.com/ethereum/wiki/wiki/Standardized_Contract_APIs/499c882f3ec123537fc2fccd57eaa29e6032fe4aStandardized_Contract_APIs
16: https://github.com/ethereum/EIPs/issues/20
17: https://github.com/ethereum/EIPs/blob/master/EIPS/eip-20.md
18: https://etherscan.io/tokens

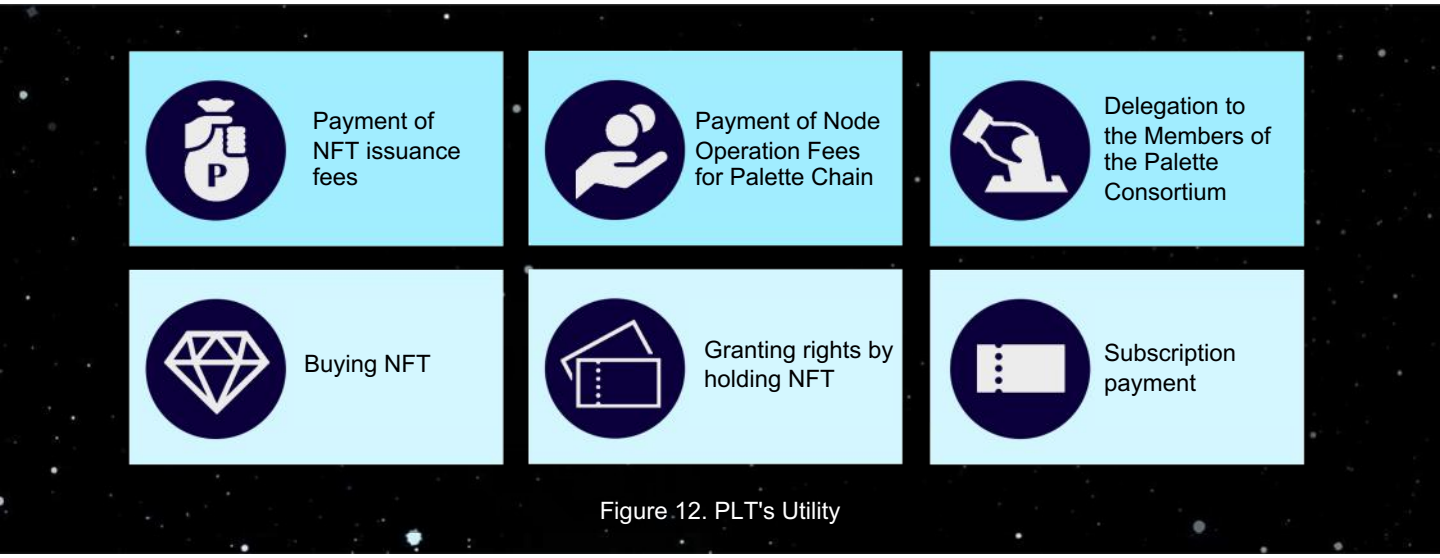


Figure 12. PLT's Utility

In addition to these utilities, content holders participating in the Palette ecosystem can build their own applications that leverage NFTs, in which case PLT utilities may also be added.

ⅰ. Payment of NFT issuance fee

When a content holder issues an NFT on the Palette chain, the fee must be paid by PLT. The PLT used for payment is stored in the Palette reward pool and then distributed to members of the consortium as node operation fees for the Palette chain. All movement of these PLTs takes place on the Palette chain.

If the amount of NFTs issued increases as the Palette ecosystem expands, the revenue of the Palette reward pool will increase. In the early stages of launching the ecosystem, we are also considering paying the cost equivalent to the NFT issuance fee on behalf of the content holder by using the marketing cost that is part of the IEO sale.

ⅱ. Payment of Palette chain node management fees

As mentioned above, the PLT stored in the Palette reward pool is distributed as a node operation reward to the Palette consortium that operates the Palette chain. PLT acts as an economic incentive to keep the Palette chain stable.

As mentioned earlier, more content holders will join the Palette ecosystem and issue NFTs to increase revenue in the Palette reward pool. In other words, assuming that the total number of nodes operated by the Palette consortium is constant, the node operation fee of each member will increase as the amount of NFT issuance increases.

iii. Delegation to members of the Palette Consortium

As mentioned above, each member can increase the node management fee by being delegated by a general PLT holder. Here, since each member is willing to receive more delegation from the users, there is an incentive to compete among the members by adjusting the partition coefficient β of the delegation fee to the users. Here, PLT holders can delegate PLT by selecting the member who can bring them the highest delegation rewards. In addition, the PLT earned from the delegation reward can be used for delegation again.

iv. Buy NFT

With the service built on the Palette chain, it is possible to make payments using PLT in addition to Japanese yen payments using credit cards. In applications released on the Palette chain, there is no fee for PLT payment, so it is possible to set a discount rate compared to credit card payment.

PLT acts as a payment method for seamless value transfer in the Palette ecosystem.

v. Granting rights by holding PLT

Applications on the Palette Chain can grant specific rights to PLT holders. Accounts (users) who meet the PLT holding conditions can use the rights set for each service.

The following is an example of PLT holding conditions and confirmation method.

- ◆ Have a wallet linked to the service account provided by the application on the Palette
- ◆ Must have more than the standard amount of PLT in the wallet

By checking the wallet balance linked to the service on the Palette Chain, you can confirm the possession of PLT. It is possible to grant specific rights to accounts that have been confirmed to have PLT.
The number of PLTs held, the duration of holding, and the confirmation method may differ or change depending on the service.
Examples of rights granted include access to pre-sale of NFTs and voting tickets for community voting.

vi. Subscription payment

Applications on the Palette Chain can implement PLT subscription payments. Users can use the subscription services provided by each application by paying for PLT.

5.5 | Non-Fungible Token (NFT)

5.5.1 Issuing blockchain : Palette Chain (Quorum)

We choose Ethereum, a public blockchain, as the PLT issuance platform, while we choose Quorum, which is an optimized version of Ethereum as a private chain, as the technical platform for NFT issuance. Quorum is a private blockchain developed by US financial giant JP Morgan Chase.

Ethereum, the basis of Quorum, has been extensively researched since its launch in 2015 and can use smart contracts and token standards that allow for flexible design. In the Palette chain, in addition to PLT, by using the token standard called PRC721, which will be described later, it is possible to issue tokens that can record various information for each work.

5.5.2 Issuance standard : PRC (Palette Chain Request for Comments) 721

The NFT issued on Ethereum uses a typical token standard called ERC (Ethereum Request for Comments) 721. In the Palette chain, PRC721 is implemented as the same specifications as Ethereum's ERC721, and NFT is issued according to this standard.

In the Palette, NFT records the user's contribution to the content holder and also realizes secondary distribution. This is a token standard implemented on Ethereum, but it is also reflected in the Palette chain.

Prior to the proposal of ERC721, Ethereum could only handle alternative tokens (fundable tokens) using the ERC20 standard. However, with the advent of ERC721, each token can contain unique metadata, and each token can be represented as unique. In addition, the Palette Chain inherits the contents corresponding to OpenZeppelin's ERC721 library commonly used in Ethereum.

5.5.3 Use of NFTs in applications

NFTs can be issued and transferred on the Palette Chain. NFTs issued by content holders can be purchased and used in applications provided by each company, and can also be used as a marketing tool by each company through free distribution. Furthermore, since the NFTs issued by each content holder exist in the same standard and on the same blockchain, system cooperation is easy. Therefore, mutual use between contents is also possible.

Applications on the Palette Chain are assumed to be decentralized exchanges for NFTs and new application services by content holders. To facilitate application development by content holders, we plan to implement a Palette grant program to support development costs and promote the expansion of the ecosystem available to NFTs.

We are also planning to develop a secondary trading function that allows you to buy and sell NFTs with an application on the Palette Chain. The transfer of NFT in the secondary transaction is done on the Palette Chain, and the user does not have to pay the gas fee, so it is possible to manage and trade NFT without preparing cryptocurrency and managing private keys.

In addition, content holders can also add the function to transfer NFTs from the Palette Chain to Ethereum using the cross-chain technology described above. Therefore, NFTs issued by the Palette Chain can be used by applications outside the Palette Chain such as Ethereum.

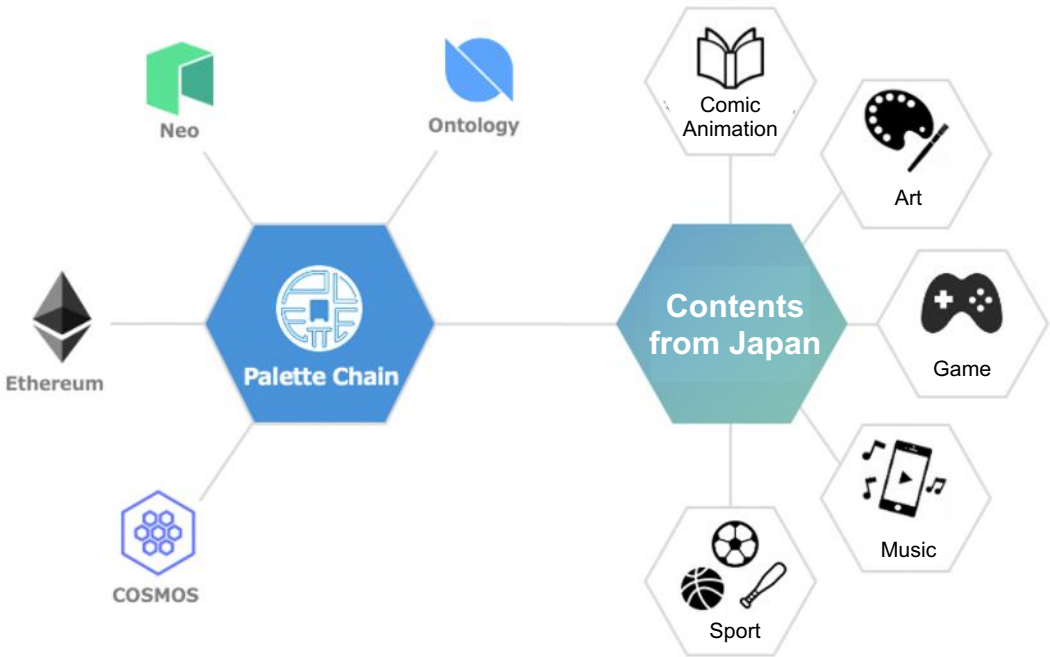


Figure 13. Image of cross-chain

06 | About PLT

6.1 | Token Sale (IEO) Overview

PLT is issued on the Ethereum blockchain based on the ERC20 standard, and falls under the so-called "No. 1 cryptocurrency" stipulated in Article 2, Paragraph 5, Item 1 of the Amendment Fund Settlement Law.

Sales of PLT will be carried out on "Coincheck IEO", an IEO platform operated by Coincheck. Details are as described in "Token Sale (IEO) Overview" below.

The usage status of the funds raised by IEO will be published regularly on the website of the issuer, Hashpalette Inc.

■ Token Sale (IEO) Overview

Token name	Palette token（Palette Token）
The issuer	Hashpalette Inc.
Ticker	PLT
Token standard	ERC20（Can be cross-chained to Palette Chain）
Legal position	The so-called "No. 1 cryptocurrency" stipulated in Article 2, Paragraph 5, Item 1 of the Revised Funds Settlement Law
Total number of issues	1,000,000,000 PLT
IEO sales volume	230,000,000 (23% of total issuance)
IEO practitioner	Coincheck IEO（Operator: Coincheck, Inc.）
How to sell	Selling in Initial Exchange Offering (IEO) format* Please check the Coincheck website for details.
Intended purchasers	Users who applied from "Coincheck IEO"(Need to open an account at Coincheck)
Schedule	July 1 Start of purchase application July 15 End of purchase application July 20 Lottery and delivery of Palette Token July 27 Coincheck will start handling Palette Token

6.2 | Distribution of PLT Holders

6.2.1 Initial distribution of PLT

The entire amount of PLT is issued at the time of token sale, and after issuance, it is distributed in the following proportions. Node management fees distributed to validator nodes participating of the consortium are paid through the Palette reward pool.

- **23% (230,000,000 PLT) : Investor ownership (IEO sales)**

  All quantities sold at IEO will be distributed in the market without lockup.

- **34%（340,000,000 PLT） : Ecosystem rewards**

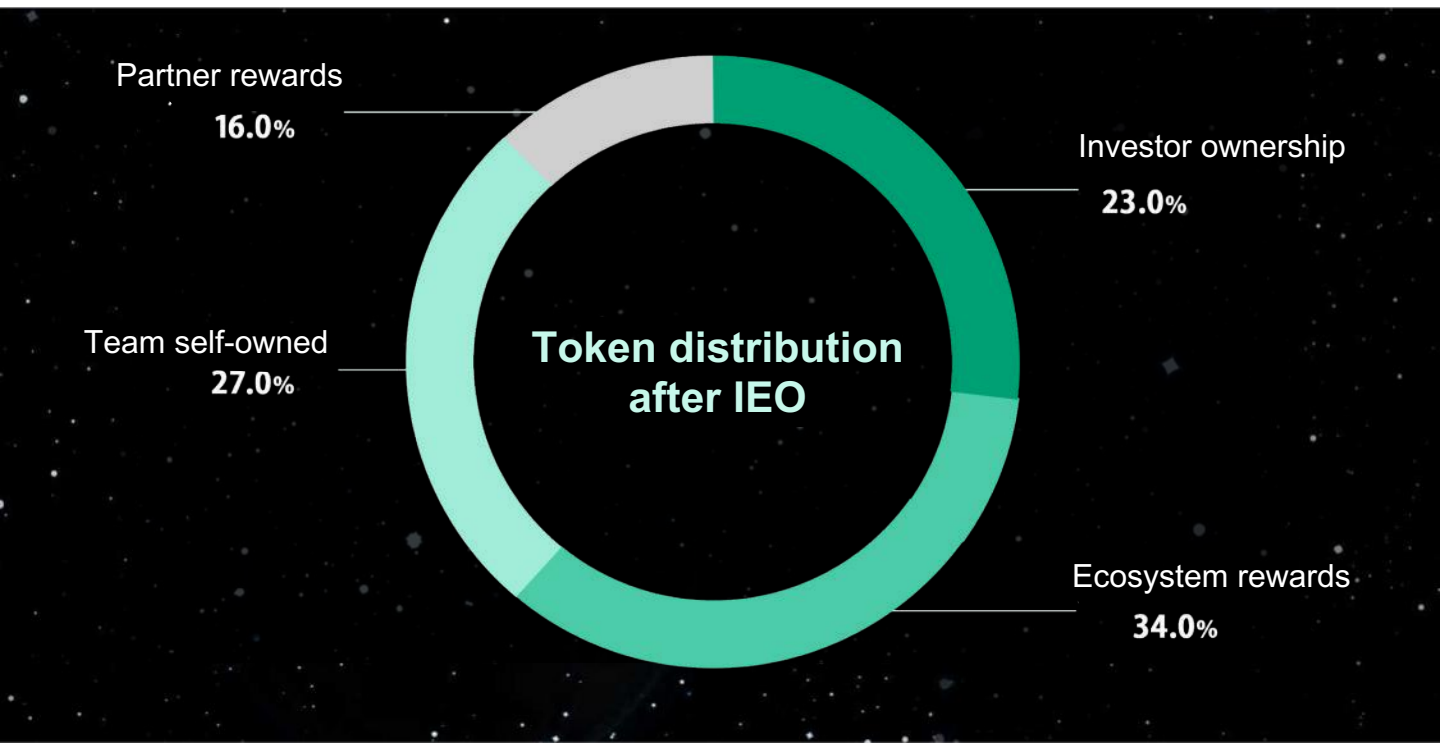
  It will be distributed to the Palette reward pool and will be distributed to the consensus nodes that operate the nodes and the users who participate in the ecosystem.

- **27%（270,000,000 PLT） : Team self-owned**

  It is used as an incentive for development teams and shareholders.

- **16%（160,000,000 PLT） : Partner rewards**

  It is used as an incentive to encourage content holders and users to participate in the Palette and expand the ecosystem.



6.2.2 Use of funds raised

The breakdown of the uses of the funds raised by IEO is as follows.

- **35% : Palette Grant Program, PGP**

  It is used in the "Palette Grant Program" that supports development funds to promote the development of applications that utilize NFTs issued using Palette.

- **28% : Marketing**

  It is used to expand the users of the Palette ecosystem and acquire new content that uses the Palette.

- **12% : Contractor**

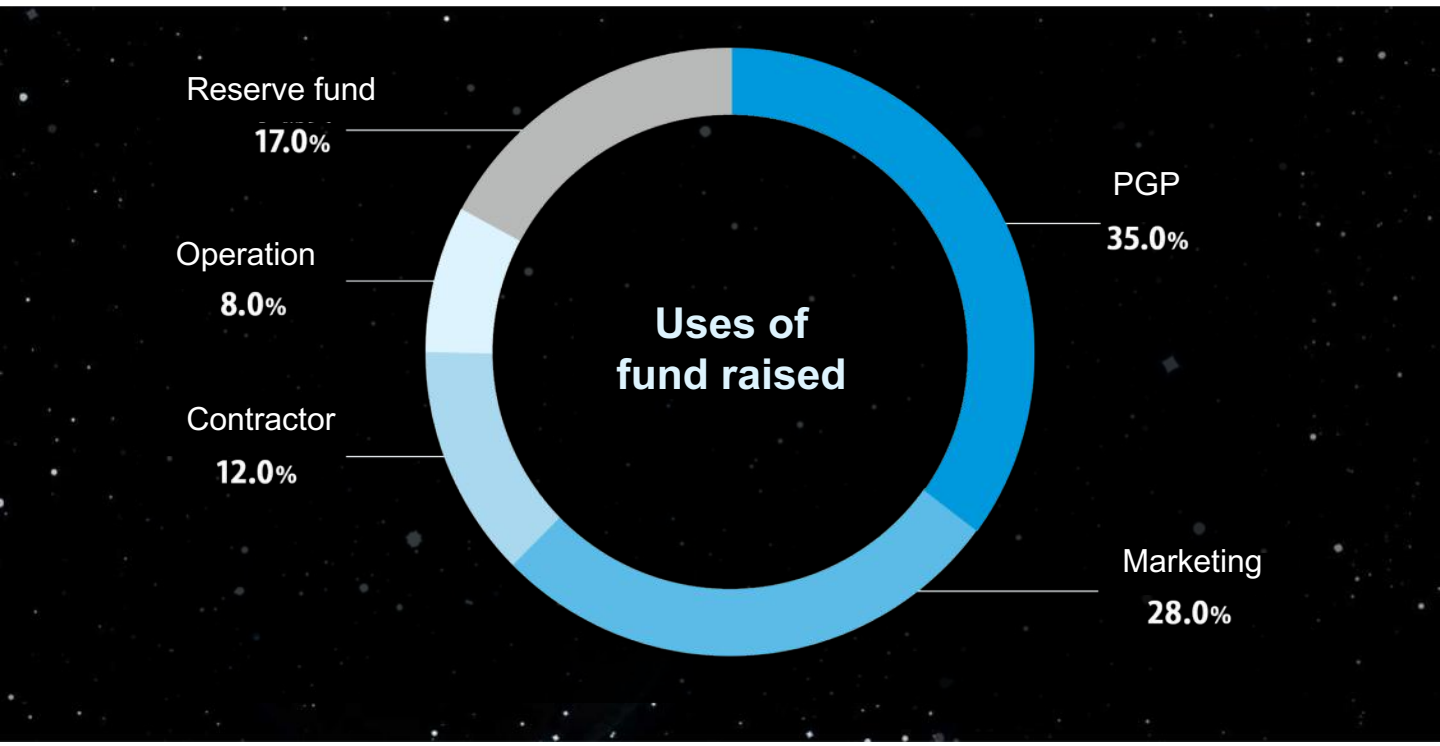
  It is used to pay to external companies such as cryptocurrency exchange companies, accountants and lawyers, which are necessary for the stable operation of Palette.

- **8% : Operation**

  It is used to reward the management staff.

- **17% : Reserve fund**

  It will be stored as a reserve expense.



In addition, the use of funds raised may be adjusted within the following range after the amount of funds raised by the IEO has been finalized.

◆ 35-41% : Palette Grant Program, PGP

◆ 28-31% : Marketing

◆ 9-12% : Contractor

◆ 6-8% : Operation

◆ 13-17% : Reserve fund

6.2.3 Lock up and unlock PLT

Lockups will be set for all tokens except those held by investors and those held by partners, and the lockup will be released in stages. Six years after the initial issuance, all tokens will be unlocked and the total amount of 1,000,000,000 PLT will be distributed.

◆ **23%（230,000,000 PLT）：Investor holding**

- There is no lockup on investor holdings sold by IEO. After the token is sold, the entire amount will be distributed to the market.

◆ **34%（340,000,000 PLT）： Ecosystem rewards**

- All ecosystem rewards will be released over 6 years. A certain amount of PLT is unlocked according to the block of the Palette chain, and it is transferred to the Palette reward pool each time. First of all, 67% of the total amount of ecosystem rewards will be released for 3 years after launch. After that, the unlocked amount per block will be halved, and 33% of the total amount of Ecosystem reward will be released in the next 3 years.

◆ **27%（270,000,000 PLT） : Team self-owned**

- From 6 months after the token is sold, it will be released evenly in 10 batches every 3 months.

◆ **16%（160,000,000 PLT） : Partner reward**

- It is given to individuals / corporations who participate in the Palette each time.

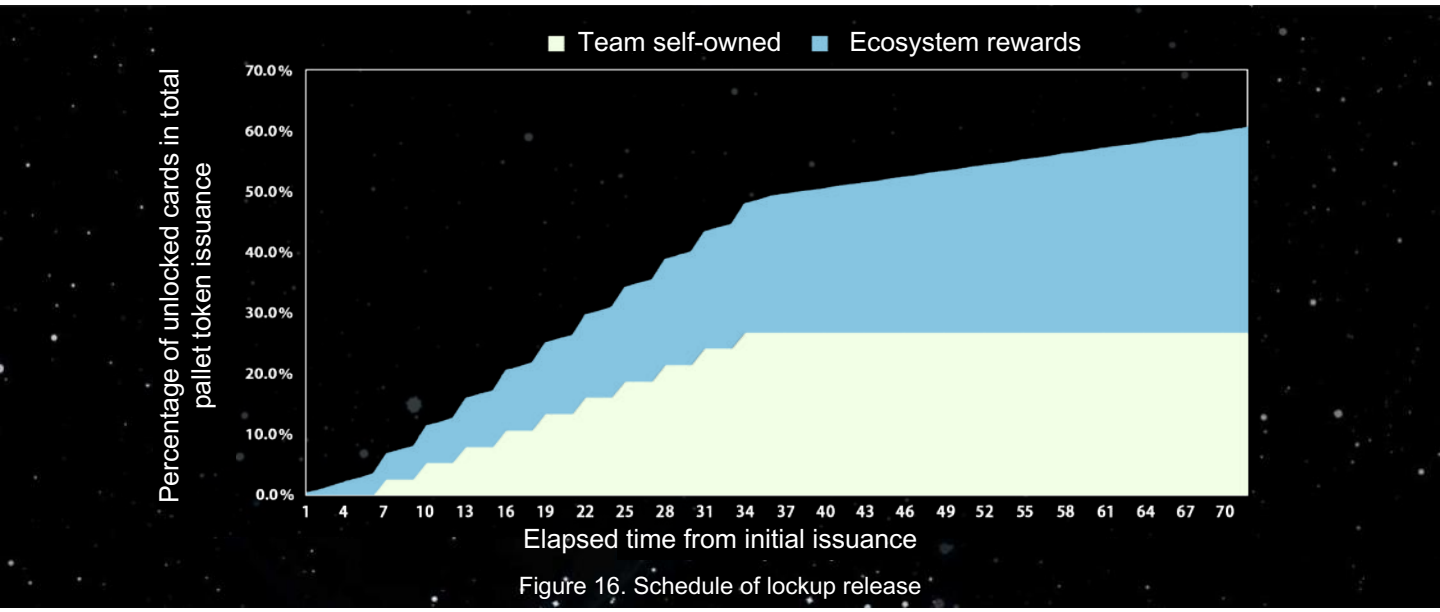


Figure 16. Schedule of lockup release

07 | Roadmap

Palette started closed testing in November 2020, confirming stable blockchain operation and completion of NFT issuance and relocation. From March 2021, a total of 12 consensus nodes, including 4 of the world's top tier blockchain projects, 3 currency exchanges, and companies operating manga services and game services, will jointly operate a test net. In the future, the increase in consensus nodes is expected to further improve decentralization and ecosystem sustainability. After the IEO, the main net will be officially launched and development will proceed according to the roadmap.

Figure 17. List of consensus nodes

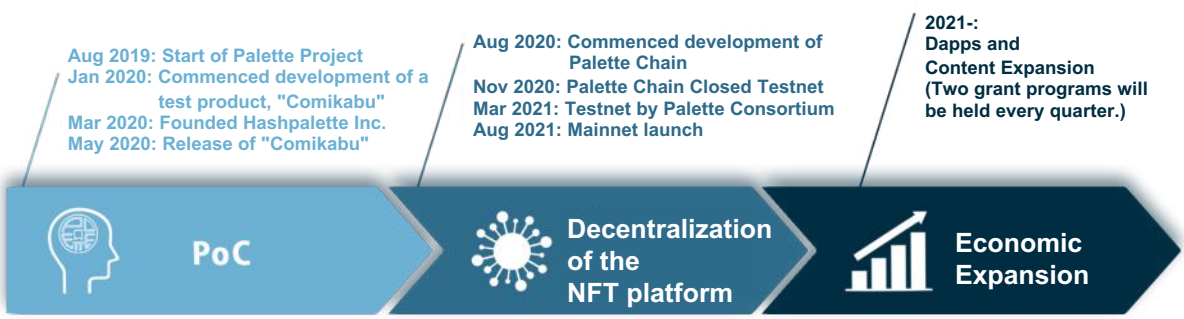
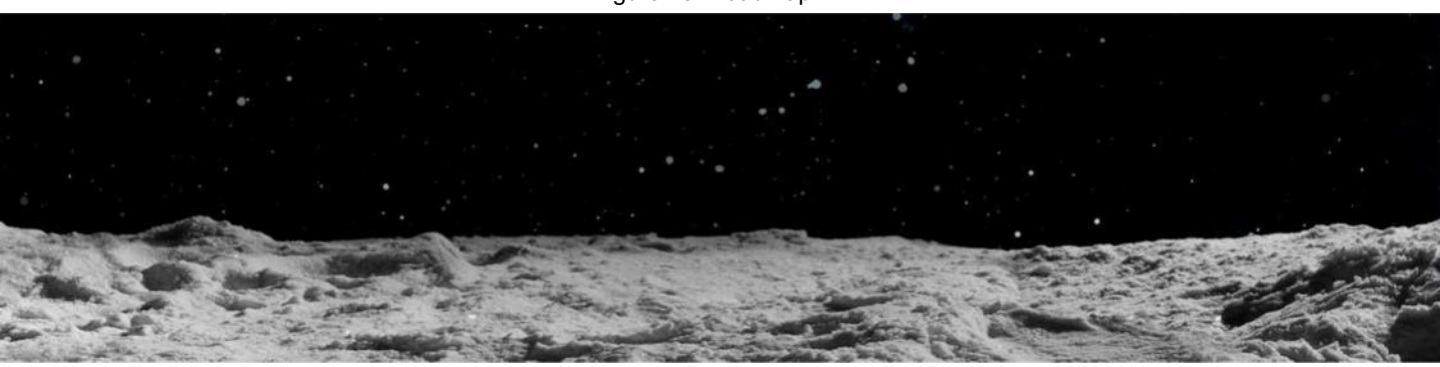


Figure 18. Roadmap



08 | Team

Jointly with HashPort Inc., which has a wealth of development and consulting experience in blockchain-related fields, and Link-U inc., which is a leading company in the e-book field centered on manga and is listed on the First Section of the Tokyo Stock Exchange, Hashpalette Inc. which was established in Japan, will be the operating body of this project.

■ Hashpalette Inc.

CEO ： Seihaku Yoshida, Hiroki Matsubara

Date of establishment ：March 2, 2020

Head office ：〒107-0062 5-17-2 Minami Aoyama, Minato-ku, Tokyo

Business content ： R & D of blockchain technology

URL ：https://hashpalette.com/

Seihaku Yoshida

Co-founder / Representative Director Co-CEO

After graduating from the Faculty of Law, Keio University in 2013, he joined the Boston Consulting Group in 2016. He is engaged in projects in Japan and China as the youngest Venture Architect (investment and business development manager) in the Tokyo office at BCG Digital Ventures, the company's digital business development division. He founded HashPort Co., Ltd. in 2018 and became CEO. In addition to providing consulting systems to major domestic cryptocurrency exchange companies, he also supports the expansion of many projects in Japan, including IOST, Enjin, Qtum, Tron, Tezos, Ontology, and Neo. He is also a collaborative researcher at the University of Tokyo Graduate School of Engineering and a collaborative research member at the Keio University Global Research Institute " Cryptocurrency Research Project".

Hiroki Matsubara

Co-founder / Representative Director Co-CEO

After gaining experience at Rakuten, CyberAgent and Dentsu, he founded Link-U Co., Ltd. in August 2013 and became president in December 2014. He has a track record and strengths in the fields of "ebooks" and "video distribution." It provides one-stop server development, application development, and operation, and provides manga app "Manga One" in collaboration with Shogakukan and "Pocket Language" jointly developed with NHK.

■ HashPort Inc.

HashPort is developing its business as a solution provider that supports the social application of blockchain with the mission of "digitizing all assets". We provide new cryptocurrency handling related services and consulting services to many companies in Japan, including cryptocurrency exchange companies. We also provide accelerator programs to support the success of leading overseas blockchain projects in Japan, and have succeeded in deploying many projects in Japan.

CEO ： Seihaku Yoshida

Date of establishment ：July 13, 2018

Head office ：〒113-8485 7-3-1 Hongo, Bunkyo-ku, Tokyo University of Tokyo South Clinical Research Building No. 360

Business content ：Consulting business, system development business

URL ：https://hashport.io/

■ Link-U inc.

With the management philosophy of “solving the problems of the world with technology”, Link-U is developing a one-stop server platform business which combines data distribution based on an original server designed in-house and an AI solution that appropriately stores, analyzes, and processes the data.

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Date of establishment ：August 20, 2013

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Business content：Server platform business

URL ：https://www.link-u.co.jp