The Metabase Network

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Summary

The design prototype of Metabase Network is based on Bitcoin, in which the consensus mechanism is provided through PoW, with a performance (thousands of TPS) far beyond the traditional PoW. At the same time, Byzantine Fault Tolerance (BFT) Mechanism also allows for the consistency problems in a scenario where a few nodes do evil (messages can be forged). Considering the performance and security, we have introduced "protocol cross-chain" mechanism, allowing the cross-chain operation of all Blockchains under the same protocol and VM mecahnism of the same data model. That is, it allows developers to build and publish their contracts on the chain. This mechanism is similar to Smart Contract and Wasm, meaning that a hybrid operation of multiple virtual machines can be supported.

Metaverse is a public Blockchain created to build the basic data of metaverse (Meta) data. Metabase will appear as linking virtual to reality. Surrounding facilities, including the metaverse, are also very important. We will build a complete ecosystem in multiple cycles.
For example:

In the first phase, we will create a base chain that holds the metaverse data;

In the second phase, we will allow the data of multiple metaverse projects in parallel in the metaverse data chain, which can allow the data of each metaverse project to run independently;

In the third phase, we will allow the metaverse to apply logic on the chain through VM,

which allows the complex metaverse logic to run safely in the Blockchain;

In the four phase, we will offer more on-chain development kits such as seamless access to metaverse application and games. We will offer SDK-similar toolkits and modular metaverse Demo facilities to give your app access to Metabase Network as quickly as possible;

In the fifth phase, we will provide more metaverse peripheral services, such as metaverse data collection facilities, metaverse data storage facilities, metaverse application acceleration facilities and so on;

After these are done, we will have bigger and endless goals for the metaverse.

Catalogue

0 Introduction

Since the birth of digital currencies, digital currencies based on Blockchain technologies have boomed. Cryptocurrencies need to be generated based on various consensus mechanisms, and mining is the cornerstone of the entire cryptocurrency industry. PoW is the most decentralized consensus mechanism, and the most well-known projects such as BTC and ETH are PoW algorithms. With ETH coming to PoS, it also means that ETH's PoW is coming to an end, and the removal of graphics cards is attracting attention. Therefore, the currency of new PoW algorithm is about to appear that will balance the computing power of GPU with CPU. There will certainly be a new PoW power in the future.

Metabase Network is a new architectural public chain implemented from scratch, completely different from all existing PoW public chains. With mature and heterogeneous cross-chain protocols, cross-chain transactions with any public chain can occur without any parallel or third-party chain. Therefore, Metabase Network can be used to construct decentralized exchange, wallet, DeFi and NFT. Metabase Network can realize the ultra-high TPS of PoW. The algorithm is more balanced as the computing power of GPU is not much higher than that of CPU in mining. Metabase Network is intended for all user groups with individual PC and CPU/GPU professional mining machines, and therefore will achieve a more decentralized mining mechanism.

1. Market Background

1.1 Blockchain Break the centralized market pattern

Blockchain is the underlying technology of digital cryptocurrency represented by Bitcoin, which integrates distributed data storage, point-to-point transmission, consensus mechanism, encryption algorithm and other computer technologies. It is considered to be another disruptive innovation in the Internet era. With the rapid development and

popularization of Bitcoin, Blockchain technology has shown an explosive growth, which has attracted high attention from government departments, financial institutions and social media. Due to its huge breakthrough in data storage and information transmission, Blockchain is likely to fundamentally change the existing economic and financial operation mode, and may even cause a new technological innovation and industrial change around the world.

Blockchain is a kind of chain data structure composed of data blocks concatenated in time sequence, and an untampered and unforgeable distributed ledger assured by cryptology. The Blockchain is a distributed bookkeeping system essentially. Crypto digital assets (such as Bitcoin) are the digital assets or currency carried on this system in a digital form, i.e. crypto digital assets are just a characterization of bookkeeping. Blockchain is the underlying set of distributed, encrypted and credible accounting system and liquidation system.

As a disruptive technology, Blockchain is leading a new round of technological and industrial changes in the world, and is expected to become the "source" of global technology and model innovation, and promote the great change of the transformation of "information Internet" to "value Internet". Therefore, Blockchain is seen as the fourth technological revolution following steam engines, power and the Internet.

1.2 Natural advantage of Blockchain

Open type: Based on Blockchain systems using open-source programs, open rules and high engagement, the Blockchain data is open to all, except that the private information of the parties to the transaction is encrypted. Anyone can query blockchain data and develop related applications through open interfaces, and the whole system information is highly transparent.

Distributed type: The distribution characteristic of Blockchain, also known as decentralization, is the most basic feature of Blockchain. In a conventional centralized network system, the destruction of a central node can paralyze the entire system. For Blockchain networks, there is no centralized hardware or management body due to the distributed accounting and storage. The rights and obligations of any node are equal. The data blocks in the system are jointly maintained by the nodes with maintenance functions throughout the system. A node attacked cannot destroy the entire network.

Anti-tampering: Once the information of the Blockchain system is verified and added to the Blockchain, the data on the chain are backed up in each network node, and will not be deleted, resulting in a high cost of attacking the whole network, thus ensuring that the data in the Blockchain network are difficult to tamper with and only credible.

Hidden safety: Although all the data recording and update operation procedures in the Blockchain system are disclosed to the whole network nodes, the private information of its traders is processed through Hash encryption, that is, the data exchange and transactions are anonymized. Crycryption is simply a process of converting the original information through an algorithmic means, and the receiver of the information can decrypt the secret text through the secret key to obtain the secret key. Blockchain uses many well-established encryption algorithms to ensure the reliability and security of the system.

1.3 Value of Blockchain

What is the value of the resulting Blockchain? In fact, this can conclude from the characteristics of the Blockchain: The features of decentralization, point-to-point transaction and tamper-proofing can achieve the machine trust; The characteristics of irreversible transaction and information encryption can realize value transfer; In addition, smart contracts can also be implemented by point-to-point information and non-tampering.

Machine trust

For example, due to the lack of a third-party central organization on the Blockchain, it relies entirely on point-to-point and tamper-free trading mechanisms to ensure the trust of both sides. The tamper-proof nature of Blockchain technology has changed the way of centralized credit creation, reduced costs and established credit through mathematical principles rather than centralized credit institutions.

Value delivery

Blockchain is the first network to achieve value delivery: On the one hand, simple value delivery allows digital assets to circulate freely on the Blockchain; On the other hand, the issuance of tokens makes financing more convenient, while holders can also enjoy the whole ecosystem of services.

Smart contract

This provision, recorded in computer language rather than legal language, means the combination of electronic contracts with Blockchain technology. When a pre-programmed condition is triggered, a smart contract enforces the corresponding contract terms.

1.4 Investment opportunities in the Blockchain market

Since the establishment of the Bitcoin digital currency platform in 2009, the Bitcoin system has operated steadily, automatically realizing the process from issuance to transaction circulation. At the same time, Blockchain, as a basic support technology, has gradually been independently applied to more scenarios, and has produced a variety of digital currencies based on this concept, such as Litecoin, Ethereum, Ripple and so on. Bitcoin, Ethereum and various derivative digital asset markets with Blockchain as the underlying technology have experienced explosive development. The market currently has more than 1,300 digital assets, an economy of more than $600 billion, and maintains exponential growth, with huge market potential.

In 2015, with the concept of smart contract platform brought by Ethereum Open Source Project, the registration and transfer of different types of assets and contracts were realized, facilitating the distribution and circulation of digital currency, and enriching the type of digital currency. Especially since the beginning of 2017, various tokens have emerged one after another through ICO, bringing a new round of prosperity in the digital currency market. By June 2018, there were nearly 1300 types of currencies in Coinmarketcap, with a total market value of more than US $500 billion. We expect that the value of Blockchain digital assets will far exceed the total value of assets on the statutory basis.

1.5 Blockchain consensus mechanism development

The self-trust of the Blockchain is mainly reflected in the users distributed in the Blockchain who do not need to trust the other party of the transaction or trust a centralized organization. The transaction can be realized only by trusting the software system under the Blockchain protocol. The premise of this self-trust is the Blockchain consensus mechanism (Consensus). In a market of mutual distrust, the necessary and sufficient condition for all nodes to reach an agreement is that each node will spontaneously and honestly abide by the pre-set rules in the agreement, judge the authenticity of each record, and finally record the true records into the Blockchain out of consideration of maximizing its own interests.

In other words, if the nodes have their own interests and compete with each other, these nodes can be hardly conspired to deceive you, which is particularly evident when the nodes have public credibility in the network. Blockchain technology uses a set of consensus-based mathematical algorithms to establish a "trust" network between machines, so as to make a brand new credit creation through technology endorsement rather than centralized credit institutions.

The consensus mechanism of Blockchain today can be divided into four categories: proof of work (PoW), proof of stake (PoS) and delegate proof of stake (DPoS).

Proof of work (PoW)

PoW is the proof of workload, which is a requirement that must be met when generating a new transaction information (namely a new block) to be added to the Blockchain. In a Blockchain network constructed based on PoW, the ability of the nodes to compete for the accounting power by computing the numerical solution of the random Hash, and to obtain the correct numerical solution to generate the blocks is a concrete manifestation of the node computing power. PoW mechanism has the advantage of complete decentralization, where nodes can freely access the Blockchain with PoW consensus. The well-known Bitcoin networks apply proof of workload mechanisms to produce new currencies.

Proof of stake (PoS)

In 2012, a netizen called Sunny King launched Peercoin. The cryptocurrency was used to issue the new currency using PoS and PoS was used to safeguard the network security. This is the first application of PoS in the cryptographic electronic currency. Unlike requiring the certifier to perform calculations, PoS requires the certifier to provide ownership of cryptocurrency. PoS operates that when a new block is created, miners need to create a "currency power" transaction that sends some coins to the miners themselves in a predetermined proportion. PoS reduces the difficulty of mining of each node according to the proportion and time each node owns and the proportion of the algorithm, thus accelerating the speed of finding random numbers.

This consensus mechanism can shorten the time required to reach a consensus, but still essentially requires nodes in the network for mining operations.

Delegate proof of stake (DPoS)

DPoS is a new consensus mechanism to guarantee network security. While trying to

solve the traditional PoW and PoS mechanisms, it can also counteract the negative effects of centralization by implementing technology-based democracy.

DPoS is similar to the board vote. The mechanism has a real-time equity voting system, just like the system always holds a general meeting where all shareholders vote for the company's decisions. The decentralization of the Blockchain established based on DPoS mechanism relies on a certain number of representatives, not the entire users. In such a Blockchain, all the nodes vote to elect a certain number of node representatives, and they will act on behalf of all the nodes to confirm the block and maintain the orderly operation of the system. At the same time, all the nodes in the Blockchain have the power to remove and appoint representatives at any time. If necessary, all nodes can disqualify the current node representatives by voting, re-elect new representatives, and achieve real-time democracy.
DPoS can greatly reduce the number of nodes participating in the verification and accounting, so as to achieve the second-level consensus verification. However, the consensus mechanism cannot solve the problem of Blockchain application in business, because the consensus mechanism cannot get rid of the dependence on tokens, and does not need tokens in many commercial applications.

Practical Byzantine Fault Tolerance PBFT

PBFT is a state machine copy replication algorithm, where a service is modeled as a state machine, and the state machine is replicated at different nodes of a distributed system. A copy of each state machine saves the state of the service and also implements the operation of the service. The set composed of all copies is represented by the capital letter R, and each copy is represented by an integer from 0 to | R | - 1. For convenience of description, suppose | R | = 3F + 1, where f is the maximum number of copies that may fail. Although there can be more than 3f + 1 replicas, additional replicas do not improve reliability in addition to reducing performance.

1.6 Unique advantages of PoW

Although PoW mechanism is not suitable for commercial applications, its unique advantages are also the main reason why it becomes a mainstream formula mechanism. PoW adds the computing power of each node into the transaction authentication of the network. Based on PoW competition mechanism, if they want to do evil in the Blockchain network, they must master the absolute computing power of the whole network, otherwise they all need to face the computing power competition from others. In theory, nothing in the whole network can be tampered with unless someone can master more than 51% computing power of the whole network. This makes the network decentralization stronger and the evil cost of nodes higher.

On the other hand, as the most decentralized consensus mechanism, the most well-known projects such as BTC, ETH are all based on PoW algorithms. With ETH coming to PoS, this means ETH's PoW is coming to an end, and the graphics card gets much attention. Therefore, the currency of new PoW algorithm is about to appear that will balance the computing power of GPU with CPU. There will certainly be a new PoW power in the future.

2. Project Introduction

2.1 Introduction to Metabase Network

Metabase Network is a metaverse application ecological platform based on Blockchain technology, which is building a multi-domain integrated digital public chain integrating metaverse, digital assets, DeFi, NFT, DApp wallet, decentralized exchanges, and PoW mining. Through a professional technical team, it is possible that PoW public chain can accommodate thousands of TPS starting from the public chain's safety, efficiency, carrying capacity and processing capacity, and combining the cross-chain technology. Excellent VM will allow the ecology to highly customize their own business logics. Professional SDK and surrounding facilities will also make it simple to access to metaverse and other ecologies. Benefiting from these capabilities, Metabase Network makes it simple to use metaverse and Blockchain, allowing everyone to find everything they want from metaverse.

2.2 Value orientation

Metabase Network's ultimate vision is to reshape the value of the Blockchain industry. By establishing the connection between different Blockchain ledgers, Metabase Network will integrate Blockchain industry resources to create a series of excellent metaverse public chains from various ecological perspectives, which can enable Blockchain lovers around the world to jointly maintain the big blockchain ecosystem we have created.

Metabase Network is an infinitely extensible basic public chain with distributed technology as the core; With metaverse and Blockchain as the infrastructures, it is also a basic public chain serving C-end and B-end users relying on the related technologies, data, products, and scenarios of the participants. Core public chain can effectively support asset release, transfer and exchange. The internal smart contract can directly support the complex logic operation of metaverse, the chain operation of the business model, and the operation of the financial core business logic. The personalized business scenarios can be customized through the parallel chain, and bundled (anchor) in the main chain to achieve a variety of parallel chain applications.

Metabase Network is making an unprecedented attempt. While considering the high performance of the Blockchain, it also considers the security through PoW mechanism. Above all, we will take the metaverse as the core to build a new Blockchain public network. This is the ability that any metaverse does not have and an ability to link reality to the virtual world, not limited to an application itself. This is similar to MySQL in the Internet that carries the mission of metaverse infrastructure.

2.3 Design mission

Flexible and easy-to-use Blockchain infrastructures

Metabase Network will provide intact modularization development for developers and users. Developers and users don't need to research underlying technical details including the cryptology, consensus mechanism, storage mode, etc. and adopt simple and rapid programmable environment to directly connect the business application, thus reducing the commercial cost of Blockchain.

Adaptive massive Blockchain application scene

At the actual application level, Metabase Network will achieve the transfer across

account book through modularization, multi-chain parallel, intelligent contract and other operation mechanism and provide an infrastructure for the application of digital asset based on digital currency. The bearing value and delivery value of blockchain are maximized, as well as the development of blockchain's equal and open concepts in the public blockchain.

Commercial implementation of high-performance drive Blockchain

Extreme high requirements are proposed to the performance in the application of all walks of life. Metabase Network devotes to solving the performance limitation problem of existing Blockchain, and allows the operation mechanism with multi-chain parallel according to the parallel extension protocol and more efficient value transmission protocol to meet the TPS performance demands for infinitely extended application.

Balance of data transparency and confidentiality

For the institution, the data confidentiality and security are extremely important, while the openness and transparency of Blockchain concern the institution. Metabase Network will carry out the rational construction of framework and support many protocols with technology to guarantee the confidentiality and security of business data and practically solve the balance of data transparency and confidentiality.

2.4 How to combine the metaverse

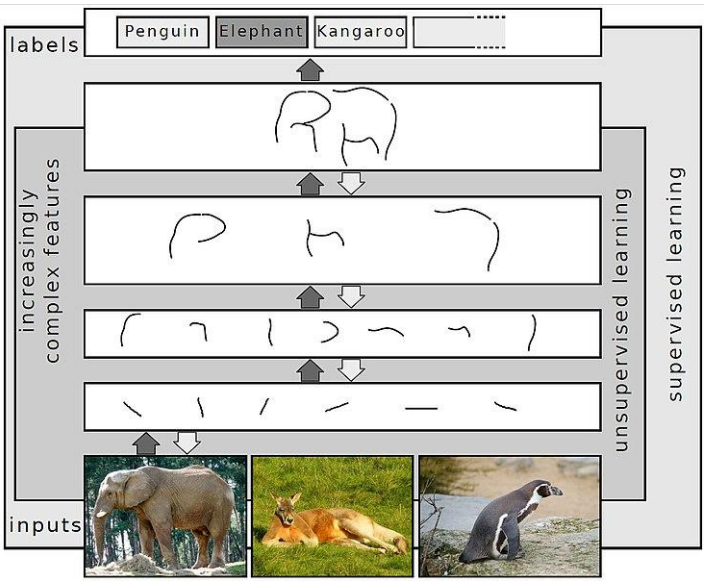
Currently, metaverse is applied in Blockchain in the form of game in general, such as Blockchain game and NFT. We think such practice substitutes concept. Actually, metaverse is all-inclusive and shall be the combination of VR, AI, BlockChain, big data, 5G communication, wearable equipment, etc. instead of a game or an application. Metaverse shall also contain many elements: identity, friends, sense of immersion, low latency, diversification, anytime and anywhere, economic system and civilization. Simply speaking, metaverse shall be a new digital world, which would gradually make the real and virtual border dim. Namely, you live both in real life and virtual world, and everything created by you in virtual world can also be enjoyed in real world, is that very amazing?

Of course, among those technologies, the key technology is AI, VR, Wearable device and BlockChain.

Artificial Intelligence(AI):

AI is the abbreviation of Artificial Intelligence. How do we interact with the people or object in the virtual world? AI auxiliary system must be adopted for control. The more advanced AI is closer to the experience of real world. It not only can let users experience the interaction without difference in the real world, but also can let users construct their own scenes and logic in the virtual world. All of those are not far from us.

A simplest multi-layer abstract learning model can deepen our understanding in AI.



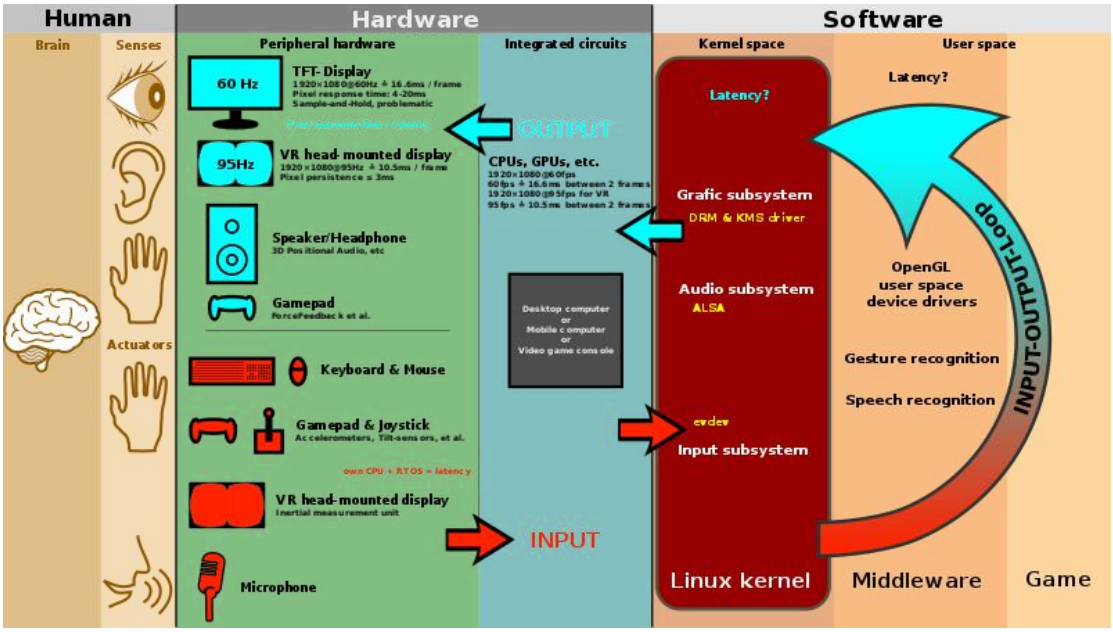
Virtual Reality(VR):

VR, as the abbreviation of Virtual Reality, can connect the digital world and the physical world, and can feel the digital world through sense organ of people, even can be connected through brain-computer interface or chip implantation in the future. Thankfully, VR has been applied in many fields, and Brain Computer Interface(BCI) also conducts the systematical research under the operation of many international companies. We believe we can witness the occurrence of brain-computer interface soon.

Wearable device:

Wearable devices include the glasses, gloves, other sensor suites, etc., which can be experienced at the PlayStation and other platforms because they are very common, and not rare, greatly reducing the birth time of metaverse.

Through this picture, we can easily understand how to interact with the virtual world through wearable devices.



BlockChain:

Blockchain technology is the most important link. In case of no blockchain, the combination of AI, VR and Wearable device can only be deemed as a game or an application actually because the value created in application can't be embodied in the physical world. But the blockchain makes everything become different. It can map your fruit of labor in virtual world into the Blockchain system to verify your workload at any time and any place. As long as everyone recognizes such value, all values created in the application of virtual world can be cashed in physical world, for example, I build an exquisite house in virtual world by controlling 3D printing equipment, and then the same house as the virtual world can be printed through true building 3D printer in the real world. If certain user has such demand and issues the printing demand, the user can obtain the Token pricing USD 100,000 once completion of printing. In the real world, is USD 100,000 paid after a house with exquisite design is obtained? Does the creator harvest the award equal to USD 100,000? Are they beneficiaries? Let's further think the demander not only has a house in the real world, but also maps in the virtual world. If he needs to decorate the house, can others further provide the decoration design scheme in the virtual world? Do all those mapped designs and schemes have value? Can all of them can be cashed? In the future, can the demand publisher use the house in the virtual world? Can even demander sell the house as NFT?

As you see, the imaginary space of metaverse can be infinite, which depends on your imagination. We even can understand as below: as long as there is a corresponding interface (such as the 3D building printing equipment as mentioned in the above) in the real world, we can duplicate in real world. While the value of product created in the digital world depends on the value of creation, so does the construction equipment. Can we give play to our imagination in the farm and pasture?

The combination method of metaverse depends on everyone in the real world. Blockchain system of Metabase Network is a linked interface provided for the digital virtual world and the real physical world. Such interface is just the one that Metabase Network wants to do. Therefore, Metabase Network is not only a Blockchain, but also an intact metaverse ecology.

3. Ecological Governance

3.1 Ecological application

(1) Metaverse

Currently, the metaverse is at the prototype stage. It would be caught in the application of metaverse in general, but doesn't pay attention to the infrastructures of metaverse. From the perspective of the development history of internet, the infrastructures of metaverse and the base materials of buildings are equally important because the magnificent building can't be built without good base materials. You also can't program excellent software without good software development environment because you need to spend many time for some trifle things, even you obtain the expected results. The infrastructures of metaverse are the same as the infrastructures of software development. Metabase Network will provide a set of very convenient metaverse development infrastructure for metaverse. Please amplify

your thinking infinitely.

(2) New financial payment system

Replacing the foundation based on internet financial system, such financial system owns completely open and Trustless ability. Metabase Network can achieve rapid and effective payment, and P2P payment Blockchain can replace the expensive, slow and bank-driven process at present. The intervention of blockchain can solve the trust problem very safely and effectively.

(3) DeFi (Decentralized Finance)

The high Gas fees about Ethereum can be solved through the existing Ethereum intelligent contracts and tools. Developers can implant its existing DApp based on Ethereum in short time to greatly improve performance and reduce cost, including DeFi application program, especially Uniswap and other DEXs. Because expensive Gas expenses overshadow trading amount, and transfer of assets to Metabase Network (bridging of them) would greatly reduce Gas fees.

(4) Wallets

The developer community will construct an easy-to-use wallet mobile application program based on the seamless connection from DApp to browser. Users can interact with DApp on browser and more future equipment, and safely keep its secret key in mobile wallet.

(5) Decentralized exchange

Due to the inherent cross-link ability, Metabase Network can let you create a decentralized exchange very easily. Everyone can do it because you only need to easily get such ability through heterogeneous and homogeneous cross-chain technology of Metabase Network, especially the homogeneous cross-chain technology even can be directly embedded into existing any wallet with OnChain ability for decentralized trading without development. Such ability is inherent.

(6) Blockchain game

Encrypted currency isn't the only case of Blockchain technology. The game industry is considered as a kind of form of digital asset where new scene and business opportunity will occur. Based on the existing scene in the game worlds such as user community, virtual commodity trading, token settlement, etc., Blockchain technology decentralization, security, non-tampering, flexibility, anonymity, etc. are perfectly applicable to the game industry. The existing user community, platform and channel are deemed as the bonus Blockchain game after efficient startup, and the game is deemed to take the lead in implementing blockchain application. The metaverse game is more suitable for our expectation because we are born for metaverse.

(7) NFT forging

NFT is the unique and non-interchangeable assets built on chain. NFT is creating

interesting case in the digital arts, collections, ticket services, game, digital ownership, etc. Every NFT owns its own trackable and immutable unique properties. NFT artists can directly sell its works to collectors. The authenticity and quantity of cast works can be verified by anyone at any time. The platform can also set up the function that the loyalties are collected in the future resale event. The ownership certificate is easily verified to record the ownership, domain name and other assets.

(8) Electronic voting

Voting is a process with process integrity. If the voting result is correct, a transparent process is necessary for guarantee. In this way, everyone can believe this result is correct. The possibility to smoothly intervene anyone's voting willingness or prevent their votes from being counted, shall not exist. Metabase Network provides guarantee for the voting process integrity based on the Blockchain technology. It can be used for governance and on-chain voting, and provide a kind of free open democratic method. When every voting can be verified and tamper-proofing, users would know how to submit their own votes and include in the results, which is essential to participation and is correct for the small-scale community, petition and local governance (DAO) because there is not any restriction basically at larger community (such as national election) for the purpose of effectivity. The voting is very easy, is allowed to be anonymous, and is very cheap (no elimination of anyone) due to scalability for users. Its ideal function can operate in smartphone. The voting must be traceable at any time. Any entity can review the voting. Through the rapid and cheap processing, our platform is very suitable for many different fair and transparent voting procedures. Now, the demand for such technology is more obvious than any time. We are very happy to see new innovation Blockchain voting on platform related to digit and digit technology.

(9) Community currency

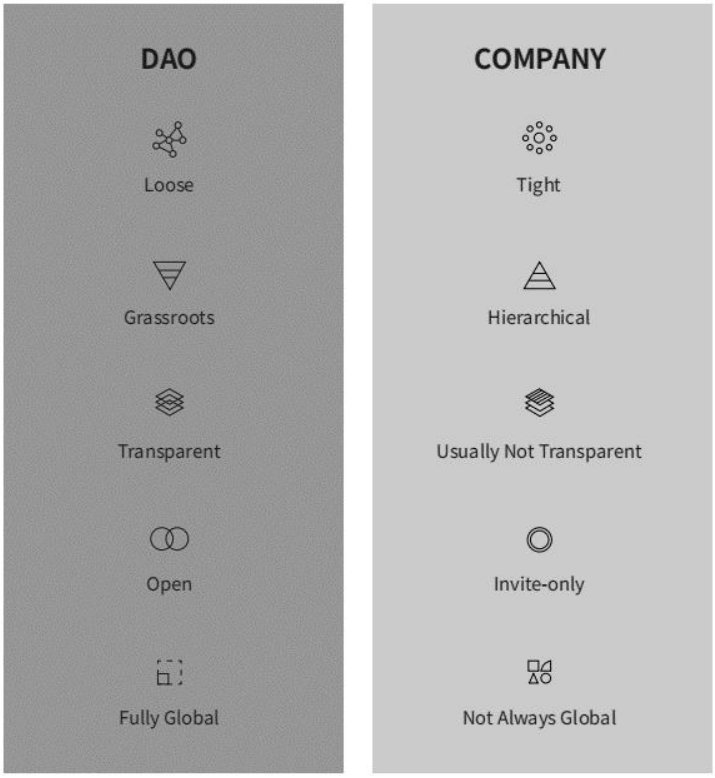
The community integration currency (CIC) belongs to the local currency and service used to pay commodity. CIC can't replace the national currency; They are the supplementary currency used to support the local trade. CIC provides the media of daily expenditure and trade, and allows to save the interaction currency (may be volatile or scarce) of citizens and large-scale enterprises, and the government authority except for direct community. CIC supports and empowers the community creation work to develop social plan, and supports trade infrastructures by establishing decentralized local bank business.

3.2 Decentralized governance (DAO)

Decentralized chain operation of Metabase Network can't do without the governance of DAO. DAO, as a decentralized voluntary association, keeps running through intelligent contract, and encodes transaction and rules on Blockchain, with various unique strengths, to achieve openness and fairness, unmanned intervention and independent operation, but lacks the legal entity.

Metabase Network will ensure the release and development of own ecological application till the establishment of Metabase Network community which is enough for the completely decentralized self-maintenance. DAO government of Metabase Network ecology

adopts the token incentive mechanism. The token will be used as the value storage carrier to capture and solidify the ever-increasing value of protocol network.



3.3 Decentralized ecological management system

As a decentralized ecology, Metabase Network's management framework is completely supported by completely transparent decentralized autonomous system. Through the structure, every Metabase Network participant can clearly understand all technology building and value circulation in ecological basis to fully reflect the public trust of Blockchain.

All decisions in Metabase Network are based on the public voting decision of token holder, and all technology updates are announced by community. Such completely decentralized management system will completely avoid centralized management malpractice of traditional institution, which provides trustless risk solution for dictatorship of centralized management layer, data tampering, alone decision of platform trend, etc.

4 Technical Architecture

4.1 Hierarchical structure

The system architecture of public blockchain of Metabase Network has six layers - data layer, network layer, consensus layer, incentive layer, contract layer and application layer.

Data layer

Based on the high redundant storage mechanism of Blockchain, blockchain storage generates certain influence on the expandability and performance of Blockchain. Metabase

Network framework is designed with multilevel node system. Different storage strategies (distributed accounting) are selected according to different node applications. Accounting node: The core role of Metabase Network is responsible for participating in the consensus mechanism and manufacturing block with the entrustment of the Metabase Network. Full node: It is responsible for saving the complete data, but not participating in the consensus and intercepting and rebroadcasting the trading. The ordinary users directly access to the data through the interface or client, but doesn't save data. The advantage of multi-layer node system lies in that not all nodes are expected to participate in the account keeping (mining), storage of the complete data and rebroadcasting of the transaction. Because not all nodes have the common demands and hope to save the complete data. Metabase Network design makes the entire system have the clear role assignment, and the professional node is responsible for the professional thing, which not only saves energy, but also improves the efficiency of the entire system.

Network layer

P2P Protocol supports the data transmission and signaling exchange of various nodes in the blockchain network and is the important communication guarantee of reaching the data distribution or consensus mechanism. Metabase Network system design supports the configuration of multiple P2P protocols, communication mechanism and serialization mechanism and conducts the flexible protocol use according to the different scene demands. In respect of community safety, secure communication protocols such as HTTPS, TLS, WSS (Secure Web sockets), etc. can be supported flexibly, and VTP and VHTTP are researched and developed to reach certain guarantee for the efficiency and safety of public Blockchain. The certification integration of OAuth can be expanded and supported on foreign service interface of platform application.

Consensus layer

Metabase Network adopts the same workload as Bitcoin to verify PoW (Proof- of-Work). A nonce is calculated through mining and is jointly calculated together with block headers for random hash value (Hash opening, N as variant through which the calculation difficulty can be controlled. The larger N means larger difficulty). All of them are the internal principle of "mining".

Incentive layer

The unique consensus mechanism of Metabase Network and the full-node network are not known and the performance isn't influenced by the quantity of nodes, so upper limit isn't set for Metabase Network's consensus node and has the dynamic change, anyone can join at any time to earn bonus.

For every token, in the life-cycle management of financial asset operation on every Blockchain, the complete controllable process management is conducted for the token's submission, deployment, use and cancellation, and the permission management mechanism is integrated for comprehensive safety management of various mechanisms of token operation. The integrity and risk control system of internet financial industry are set through Metabase Network (Token), including P2P, crowdfunding, private placement and

internet financial auxiliary product.

Taking the recent contract as an example, the asset sales contract is agreed through Blockchain token and signature of both parties on the current day within the future designated deadline. Token layer can accurately "translate" the commodity target, participants and commercial activities in true business world into the Blockchain world, and furthest integrate the resources and information of upstream and downstream enterprises, users and government in industry so that the collaboration among all parties can realize true digital and systematic operation and the corresponding value circulation can be executed synchronously, thus reducing the overall cost of industry and even the whole society and improving efficiency. The distributed optimization deployment of resources would inevitably bring birth of various new business models.

Contract layer

Contract layer will be arranged through Smart Contract or Wasm and other virtual machines. Smart Contract was proposed by Nick Szabo in the early 1990s initially, who created such term to substitute "a group of promises designated in digital form, including protocols of each party about promise fulfillment". In 1998, the term was used to describe the objects in permission management service layer of The Stanford Infobus in the system. Such system belongs to a part of Stanford digital library project.

Application layer

The application layer can provide the general trading protocol and support the multilingual integration and function expansion, and would successively support multilingual and universal integrity agreement such as Java, JavaScript, Python, etc. Such set of protocol is not only the integrity agreement about application interconnection finance.

4.2 UTXO model

In the current Blockchain world, there are two record retention methods, namely UTXO model (Unspent Transaction Output) and account model.

Bitcoin adopts the UTXO model, while the Ethereum adopts Account model. Same as the Bitcoin, Metabase Network also adopts the UTXO model. UTXO model can clearly record every transaction process and can trace the source of every capital, so UTXO can solve the "double spending" problem together with the consensus mechanism.

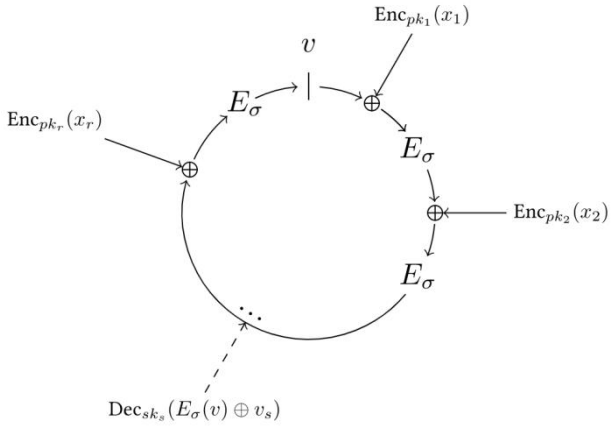
In the UTXO model, transaction only represents the change of UTXO collection. The concepts about account and balance are more abstract based on the UTXO collection. The concepts of account and balance only exist in wallet.

Different from account model, UTXO model calculates the user assets through unexpended output, instead of directly recording the account assets. Every UTXO asset (such as global asset) belongs to the input- output correlation model, in which the input indicates the capital sources, and the output indicates the direction of all assets.

4.3 Homomorphic encryption technology

Just as its name implies, the homomorphic encryption is a form of encryption. It can accept the fully readable text, and then translates it into messy code based on "public key" in

the asymmetric case. More importantly, it can convert the messy code back to the same text based on "private key". Theoretically, you cannot decode encrypted messy code unless you have a "private key". The homomorphic encryption is a special form of encryption. It allows someone to modify an encrypted message in a specific way without being able to read the information. For example, the homomorphic encryption can be applied to numbers to make the encrypted numbers multiplied and added without decrypting the numbers. Plenty of homomorphic encryption technologies are used in the Metabase Network to ensure the privacy and computability of data.



Example: Unpadded RSA

If the RSA public key has modulus e and encryption exponent m, then the encryption of a message $\mathcal{E}(m) = m^e$ is given by n. The homomorphic property is then

$$\begin{aligned}\mathcal{E}(m_1) \cdot \mathcal{E}(m_2) &= m_1^e m_2^e \mod n \\ &= (m_1 m_2)^e \mod n \\ &= \mathcal{E}(m_1 \cdot m_2)\end{aligned}$$

A transaction requiring two or more signatures to be effective is called as multi-signature (multi- sig). To improve the security of user addresses, the multi-signature technology is used for Metabase Network.

The multi-signature is different from single signature. Only single signature is required by the standard transaction, and it means only a private key is required for transaction signature, and then the transfer will succeed. The multi-signature requires the multiple signatures from multiple parties for the transaction.

The multi-signature transaction is sometimes called as M- of- N transaction. M refers to the number of signatures required to validate a transaction, and N refers to the total number of parties relating to the transaction. Example:

1-of- 2: A and B has a common address, and the money in the address can be spent by the signature from either of them.

2-of- 2: A and B has a common address, and the money in the address can be spent by signature by both of them.

Of course, N isn't restricted to 2, but can be 3, 4 and even more, and M is only less than or equal to positive integer of N. Different M and N can apply to different application scenarios. The addresses shared by the parties mentioned above is a multi-signature

address.

The multi-signature address is a special type of address. It's necessary to execute multiple signature transactions to transfer out the assets in the address.

Formally, a digital signature scheme is a triple of probabilistic polynomial time algorithms, (*G, S, V*), satisfying:

- G (key-generator) generates a public key (*pk*), and a corresponding private key (*sk*), on input 1n, where n is the security parameter.
- S (signing) returns a tag, *t*, on the inputs: the private key (*sk*), and a string (*x*).
- V (verifying) outputs accepted or rejected on the inputs: the public key (*pk*), a string (*x*), and a tag (*t*).

For correctness, *S* and *V* must satisfy

```
Pr [ (pk, sk) ← G(1n), V( pk, x, S(sk, x) ) = accepted ] = 1.[16]
```

A digital signature scheme is secure if for every non- uniform probabilistic polynomial time adversary, *A*

```
Pr [ (pk, sk) ← G(1n), (x, t) ← AS(sk, · )(pk, 1n), x ∉  Q, V(pk, x, t) = accepted] < negl(n),
```

where $A^{S(sk,\cdot)}$ denotes that *A* has access to the oracle, $S(sk, \cdot)$, *Q* denotes the set of the queries on *S* made by *A*, which knows the public key, *pk*, and the security parameter, *n*, and $x \notin Q$ denotes that the adversary may not directly query the string, *x*, on *S*.

Multisign content is a binary string. Its length depends on the number of public keys.

Example:

```
       required   keys-length  1st-public-key  1st-key-weight     nth-public-key  nth-key-weight
tmp: |__________|_____________|_________________|________________|...|_________________|________________|
          1 byte      8 byte       32 bytes        1 byte              32 bytes        1 byte
```

- `required` is the least weight sum of signed keys.
- `keys-length` is the length of public keys.
- `nth-public-key` is the public key that could be signed.
- `nth-key-weight` is the weight of this key.

As a public key is 32 bytes, think of it as uint256. Then the keys sequence depends on two little-endian uint256 comparisons.

4.5 Cross-chain structure

The human society has developed from the primitive single tribe mode to the multi-tribe model and different cultural habitats and then countries with different systems. The Internet has developed from the uniprocessor era, multi-computer simple

interconnection and multi-computer LAN to a variety of heterogeneous LAN interconnections, and then the global PC Internet at the end of last century, and finally today's mobile Internet and Internet of Things. The Blockchain has developed from the original 1.0 era represented by the Bitcoin to the 2.0 era represented by the Ethereum integrated with smart contracts, and then various multi-chain (cross-chain) Blockchain products today.

Single-chain structure: The classic Blockchain networks (such as Bitcoin network and Ethereum) are of single-chain structure, and all the businesses and transactions are conducted on the same chain. The advantage of the single-chain structure is that the transaction and consensus process is relatively simple, and it could meet the user demand very well in the early stage of Blockchain development. However, with the development of Blockchain technology and the increasing market demand for Blockchain,

(1) The overall handling capacity and performance are of bottleneck: The Bitcoin only has 7TPS and needs the acknowledgement mechanism of 6 blocks, and the block creation interval of Ethereum also takes 10-20s, seriously hindering the growing business development needs of Blockchain;

(2) The businesses in the chain interfere with each other: The single-chain structure causes congestion throughout the system easily because the individual business is busy. For example, the Crypto Kitties which has become fashionable for a time recently causes the whole Ethereum network is crowded, and many normal transactions fail to be timely handled and confirmed;

(3) Closed network structure: It fails to realize cross-chain interaction between different chains, and meet the business interaction demand between platforms.

Multi-chain structure: To overcome the limitations of single-chain structure, the multi-chain structure is proposed, and its main forms cover multiple parallel chains, main/side chain, etc. It partially meets the business diversification demand, but its flexibility and customization still fall short. As for multiple parallel chains, the function of each chain is generally preset, and it's difficult to meet rapidly changing and diversified business requirements. How to share computing and data resources across multiple chains fails to be well solved, either. As for main/side chain structure, different side chains can be derived pursuant to the business increase and change. However, the consensus of the side chain is closely coupled with the main chain, and the main chain may become the new center and bottleneck.

Metabase Network heterogeneous chain structure: In the traditional Internet, we generally enter the website by entering the web address via browser, and then click the page link to access resources inside or outside the website to get the information. In technical terms, the call access across the network is conducted in the vast Internet. One of the basic protocols of the Internet-DNS (Domain Name System) has made huge contributions behind this. The value Internet constructed by the Blockchain is a vast network cluster worldwide, each Blockchain and each subnet produce the same or different businesses and provide different services, and there are also plenty of cross-chain (domain) requests between

different chain networks. The stable operation of the cluster provides a good value transmission service for mankind. By drawing lessons from successful experience of DNS, Metabase Network puts forward the heterogeneous chain network architecture with a bridge between real world and digital world built to realize the definition, storage, transfer and transformation of resources and assets on the value Internet to promote the integration of value Internet business and traditional Internet business.

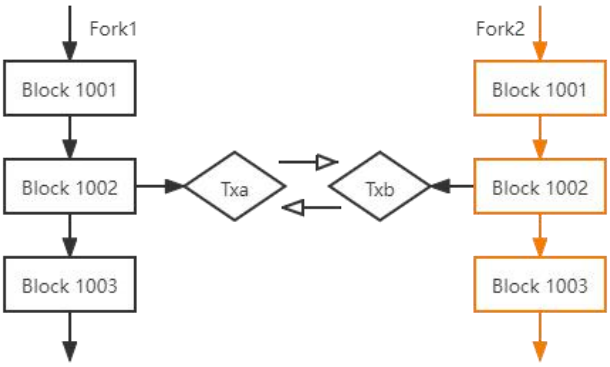
Metabase Network is designed for Blockchain data business requirements, and realizes the confirmation of real right and circulation of data value by building mutual trust and interconnection in a heterogeneous environment to build a secure and credible Blockchain value transformation platform. To solve the problems of scalability and flexibility in the Blockchain system, Metabase Network solves the extensibility problem of single-chain structure by the tree block structure of "secure main chain+ multiple application branch chains".

The TPS performance of the whole network is the TPS sum of the sub-chain performance *n times of bifurcation. The sub-chain TPS theory can achieve infinite TPS extension, and the cross-chain transactions between sub-chains can be very fast, too, even of second response.

Metabase Network fully realizes confirmation of real right and protection of data, and has been advancing the realization of distributed storage and operation of data. While promoting Blockchain empowerment, we are also fully capable of high speed and high scalability based on Metabase Network public Blockchain, build a more perfect and securer scheme for cross-chain asset transaction, and achieve a broader decentralized matchmaking trading model to complete technical reserve for Metabase Network's on-chain ecological construction in the future. We will gradually design a financial module with expansibility, liquidity and compatibility. Starting from the establishment of the decentralized trading system, the closed ecology of different main chains is broken through across the chain, forming a more complete and deeper financial ecological basal layer.

4.6 Cross-chain branch trading

Although different branches of Metabase Network are of mutual independence, they are highly synchronous, and other branch data can be safely cited to be used as a valid certificate to achieve quick cross-branch transaction. As for the cross-branch transaction, both parties need to create a transaction on its own branch, the transaction data includes the transaction certificate of the other party, and the corresponding token needs to be sent to the consistent cross-branch transaction template address of both parties. Normally, the transaction between both parties are recorded at the same block height to different branch blocks, and both parties can retrieve the exchanged token from the transaction template address.



The cross-branch transaction can be used to realize the synchronous value exchange between Metabase Network branches without trust. In the actual application, the businesses can be divided according to related factors such as business process, equipment type, and space and spread out into multiple branches. The equipment interacting frequently hold the same branch token usually and conducts data transactions in the same branch. However, as a business, the need to interact with the equipment that hold other branch tokens also objectively exists. In this case, the cross-branch transaction can realize token exchange between branches. On one hand, the cross-branch transactions can be completed without trust, and the technical principle is used to ensure fairness to both sides; on the other hand, the cross-branch transactions enter the block synchronously between two branch chains, ensuring efficiency and effectiveness. This provides a good underlying technical support for applications such as decentralized exchange and token exchange gateway.

Verification is easy:

(1) Get forks and get balance.

```
metabase listfork
[
    {
        "fork" : "Fork1",
        "name" : "Fork1",
        "symbol" : "Fork1",
        "owner" : "Owner1"
    },
    {
        "fork" : "Fork2",
        "name" : "Fork2",
        "symbol" : "Fork2",
        "owner" : "Owner2"
    }
]
```

```
metabase getbalance
[
    {
        "address" : "Address1",
        "avail" : 100.000000,
        "unconfirmed" : 0.000000
    },
    {
        "address" : "Address2",
        "avail" : 100.000000,
        "unconfirmed" : 0.000000
    }
]
```

(2) Parameter preparation for the exchange between two different forks.

```
# fork1
fork_m:Fork1
# fork2
fork_s:Fork2
# Main address
addr_m:Address1
# Second address
addr_s:Address2
# The lock block height of the fork chain where the Main wallet will be
located
height_m:10000
# The lock block height of the fork chain where the Second wallet will
be located
height_s:10010
```

(3) Add template for the exchange,return a template address.

```
metabase addnewtemplate exchange
{"addr_m":"Address1","addr_s":"Address2","height_m":10000,"height_s":
10010,"fork_m":"Fork1","fork_s":"Fork2"}
Ans: Template001
```

(4) Exchange begins.

```
metabase sendfrom Address1 Template001 5.00 1 -f="Fork1"
Ans: Transaction001

metabase sendfrom Address2 Template001 9.50 1 -f="Fork2"
```

```
Ans: Transaction002
```

4.7 Contract support

Thanks to Metabase Network openness, Metabase Network will allow the use of Smart Contract or WASM for contract writing to be compatible with different ecological applications based on a better compatibility. This measure not only facilitates application portability, but also enables existing Blockchain developers to write modules or overall applications needed by the metaverse directly.

Smart Contract:

Smart Contract is the most widely used smart contract solution in the Blockchain, and its principle is the entire run logic of entering the verification layer for verification by parsing bytecode, calling the underlying API by the injection layer, and completion by the execution via execution layer.

Verification layer:

As for parsing Bytes Code, the verification layer does some verifications of the contract bytecode and passing parameters, including three links-ABI verification, environment inspection and version inspection.

Injection layer:

Some fixed necessary codes (including Gas computation, EnvAPI injection and context construction) for the contract bytecode are injected (providing the internal modules and data of the current environment).

Execution layer:

Execute the contract bytecode and return the result. As for the virtual machine on this layer, it's a must to ensure the same result is gotten no matter what equipment it runs on, when it runs and how many times it runs. The execution time of the virtual machine is no more than the maximum time given by the consensus algorithm to execute the transaction, the corresponding stop mechanism is required, and finally it's necessary to ensure resource isolation between contracts and between contract and host system, and no influence of malicious contracts.

However, it is a pity that Smart Contract isn't perfect, and the constrained coding scheme and execution efficiency of smart contracts are real issues needing to be solved. Moreover, the oracle machine is also an important missing link for smart contracts, thus some external data cannot be acquired via smart contracts. In terms of privacy protection, the smart contracts don't offer an effective solution, either. The introduction of zero-knowledge proof, multi-party computing and homomorphic encryption are effective means.

WASM:

Compared to Smart Contract, WASM has a new bytecode format and an entirely new underlying binary syntax. The compiled code instructions are smaller in size and more portable. WASM can support C/C++/RUST/GO and other languages to write contracts, and then compile the section code to run. The mature underlying standard libraries that these languages have aren't introduced in details here. This is true freedom compared to writing Solidity and allows for more complex logic to be built quickly.

Why is WASM used for development? If you've ever developed a Web application, WASM is a more normative new language standard with stonger performance than JavaScript. The bytecode is machine code smoothing out different CPU architectures, and the performance of Smart Contract isn't comparable to its performance because WASM is very close to machine code.

However, Matabase Network takes the existing Smart Contract and WASM into account, which will make the developer of any language easily access to Metabase Network. This approach has never been more developer-friendly.

4.8 Redundant distributed storage network

The Metabase Network technical team adopts Kad algorithm, DHT, P2P network, TCP protocol and other technologies to construct RDSN Network (Redundancy Distributed Storage Network), namely redundancy distributed storage network. The cloud data storage will become efficient and reliable due to the redundancy distributed node storage network. As for the Metabase Network ecology, the centralized data storage model of traditional service operators is avoided, the value and assets held by ecological users aren't lost, and the application itself can also stay on the chain forever.

RDSN is a set of distributed versioned storage protocol that utilizes Hash- table technology. In the network, the large static data files (such as resource download packages of ecological applications and patches) are divided into fixed size data blocks. And then the data is subject to distributed storage in each resource node in the encrypted form via Data Encryption protocol, and the P2P network is used for quick resource synchronization.

The P2P network built by Metabase Network is realized mainly by Kad algorithm. Kad is a distributed Hash- table (DHT) technology, and the distributed Hash- table service is used by the DHT algorithm in terms of resource number and node number, that is to say that the data is not indexed by filename, but by Hash- table and file content abstract (sha256) fragmentation based on Hash uniqueness. Thus, the search efficiency is improved and the fast and accurate data routing and positioning are realized in the distributed environment. Moreover, all data is subject to redundant backup via Redundancy Replication protocol, averting data integrity being affected on account of single-node file corruption, missing data and network malfunction. In the RDSN framework, the core is the real verification, efficient storage and call of data.

4.9 SPOR point-to-point encryption storage

Metabase Network needs to build a data storage platform that can be encrypted and shared, thus we need to ensure the encrypted and shared files themselves can be proven to

be of storage integrity other than failing to be retrieved after storage firstly. Based on such selection, we need a reliable and effective way to verify file storage integrity and the relevant proof showing it can be retrieved completely.

Metabase Network chooses the representative SPOR algorithm here. This algorithm provides a complete and provably secure theoretical system for verifying the file storage integrity. We can use the storage integrity verification algorithm to provide important auxiliary information for Metabase Network style consensus algorithm to be introduced later so as to achieve organic integration and complement each other's advantages.

The above auxiliary information provides the corresponding weight in the on-chain governance later, that is to say that our governance is not a simple bet or offline governance. We adopted the integrity verification algorithm in the storage to audit the contributions of the storage nodes in the chain, and combined with the online governance method of betting, thereby steadily optimizing and maintaining the system stability.

What distinguishes this method lies in preventing the uncertain factors from disturbing the system stability. SPOR (Sentinel Proof of Retrievability), a traditional POR algorithm, detects the data verifiability by establishing a specific Sentinel. The Sentinel is a block of random value, which can be indistinguishable from the file block through encryption. The SPOR protocol structure contains the following three parts:

1) Establishment stage: As for the verification node V, it encrypts the file F and implants the file fingerprint in any random location of the file F, where the check value of the fingerprint can be randomly constructed. Command F~ to become the file with the fingerprint implantation.

2) Validation phase: To verify the storage node and save the file F, it uses the node V to select the location of part of the fingerprint in $\tilde{F}$, and commands the storage node to return the corresponding fingerprint value.

3) Security phase: Since the file F has been treated with encryption with the random file fingerprint value, it fails to distinguish the fingerprint from a certain part of the original file through the storage node. So we've achieved the following features: Provided that the storage node deletes or changes a part of the file entity, the corresponding part of its fingerprint is more likely to be changed. The verification node queries and verifies sufficient fingerprints before detecting whether the storage node has changed or deleted the file entity.

Assume that a file contains b blocks: $F[1], \ldots, F[b]$. It needs four steps for the encoding function:

- **Correction:** We divide the file F into parts containing k blocks. For each part, we adopt *(n, k, d)* the correction code C to expand each part into n blocks and generate a new file $F' = F'[1], \ldots, F'[b]$, including $b' = bn/k$ blocks.
- **Encryption:** We apply the symmetric key password E to F', and obtain a new file F''. The files require to be restored when the storage node deletes or damages the file block, it needs to independently encrypt the data block, namely, the password can be independently run on the text block.
- **Create file fingerprint:** Command: For f:$\{0,1\}j \times \{0,1\}* \rightarrow \{0,1\}l$ it refers to a simple one-way function, then a set of file fingerprints $\{a\omega\}\omega$=1s can be calculated

by $a\omega = f(k, \omega)$. Apply the above file fingerprints to F'', so we can obtain the file F''.

- **Replacement:** Command: In g:{0,1}$j \times \{1, \ldots, b' + s\} * \rightarrow \{1, b' + s\}$, it refers to a pseudo-random permutation. We apply g to the file F'', and obtain the output file F~.

5 For developers

5.1 SDK Support

Software Development Kit, referred to as SDK, provides the platform with great supports. Because we want to add more ecological properties, and SDK support must be high-performance, stable, and secure. We'll split the version of the interface available to the SDK and isolate the interface, so as to ensure that the Interface is backward compatible, simple and easy to use, and provide complete documentation. Since the SDK is complicated, it's essential to design some general and overall elements of the SDK from the beginning in the pursuit of its development.

The platform will provide SDKs as per different scenarios, such as: Node Wallet SDK, Explorer SDK, Pool SDK, Wallet Signature SDK, DApp SDK, etc.

Node Wallet SDK:

For Node Wallet SDK, it is an Interface providing access to the underlying Wallet. For example, if you want to establish your own Metabase Network node and provide some blockchain services, the Node Wallet SDK musted be used to perform some data to access and provide the upper-level Interface to the outside world, which is something that a third-party service must do. For instance, provided that you want to make a decentralized exchange, how to check the user's balance? Normally, it's to add all the amounts in unspent lists under the corresponding addresses, then you'll obtain a Restful style interface:

```
listunspent
Usage:
  listunspent <"address"> (-n=max) (-a=$amount$) (-if="file")
  Return a JSON object listing unspent utxo by user specifying arguments
address, maximum unspents and an input file containing list of multiple
addresses.

Arguments:
 "address"      (string, required) address to receive the unspent
 -n=max         (uint, optional, default=10) maximum unspents
 -a=$amount$    (double, optional, default=0.0) amount unspents
 -if="file"     (string, optional) list of multiple addresses

Request:
 "param" :
 {
   "address": "",
```

```
  "max": 0,
  "amount": 0.0,
  "file": ""
 }

Response:
 "result" :
 {
  "addresses":           (array, required, default=RPCValid)
  [
    {
      "address": "",      (string, required) address to list unspent
      "unspents":         (array, required) list of address owner
      [
        {
          "txid": "",     (string, required) txid
          "out": 0,       (uint, required) tx output point
          "amount": 0.0,  (double, required) amount
          "time": 0,      (uint, required) time transaction made
          "lockuntil": 0  (uint, required) lockuntil
        }
      ]
      "sum": 0.0          (double, required) sum of unspent amount
    }
  ]
  "total": 0.0            (double, required) total of unspent amount
 }
```

If the users need to query data like block height, trade information, etc., they also need to query through a similar Restful interface. This is the meaning of the existence of the Node Wallet SDK.

Explorer SDK:

The browser query related SDK, which will be listed in the corresponding functions in the blockchain browser query. The most commonly used are some statistical functions, which are often very energy-consuming, but the blockchain browser can better offer this information, such as: the sum of Tokens in the blockchain, the total number of transactions in the blockchain, the latest price of some Tokens, the latest node capacity, the amount of nodes in the current network, and so on.

For example, this is a query of the amount of nodes Interface:

```
Request:
https://metabase.explorer.domain/api
  ?module=stats
```

```
   &action=nodecount
   &apikey=ApiKey

Response:
{
   "status":"200",
   "message":"",
   "result":{
      "Date":"2021-01-01",
      "TotalNodeCount":"1009"
   }
}
```

Pool SDK:

Mining Pool SDK plays a very important role in monitoring the operation of your mining machine or your income through remote tools. For example, which helps you obtain the information of your single user and multiple users from the Pool SDK, the income of a single address, the income of multiple addresses, and the computing power of the miner in the past 24 hours, etc.

If this is an Interface requesting the computing power data of the mining machine in the past 24 hours:

```
Request:
https://metabase.pool.domain/api/
    ?currency=MNT
    &user=User1
    &worker=Worker1

Response:
{
    "hashrate_history": {
        "2021-01-01T12:50:00Z": 4245,
        "2021-01-01T13:00:00Z": 4262,
        "2021-01-01T14:10:00Z": 4176,
        ...
    }
}
```

Wallet Signature SDK:

Wallet Signature SDK is commonly used in many applications, which include OnChain Wallet, decentralized exchanges, Metaverse game chain signatures, hardware wallet signatures, other OnChain applications, etc. It can be described as the essence of the chain,

which allows all developers to easily integrate their applications with the blockchain through this SDK without excessive development costs.

For instance, our construction of a Transaction can be simplified to:

```
func TestTXBuilder(t *testing.T) {
  w := TW{T: t}
  createTX := "TX1"
  tx, err := TXBuilder().

  SetAnchor("00000000c0d1bbb15e012202r337214d1e1c853ccac3eff0f41a70").
      SetTimestamp(1609434055).
      SetVersion(1).
      SetLockUntil(0).

  AddInput("3ee1c1281f7c93afdc32dd0b3fb6cd911b22a3017e34123180ccace181
", 1).
      SetAddress("Address1").
      SetAmount(12.34).
      SetFee(0.001).
      Build()
  w.Nil(err)
  encodeTX, err := tx.Encode(Serializer, false)
  w.Nil(err).Equal(createTX, encodeTX)
}
```

Given that TXBuilder has completed all the work of Transaction construction. Only by inputting can you complete the Transaction construction. Compared with the complicated steps like selecting Txid, constructing Vout, Sign, Encoding, etc., this has become awesomely simple.

DApp SDK:

Through DApp SDK, it can provide a convenient access window for light applications accessing to DApp. For instance, if the user wants to directly implant the corresponding HTML5 program in a DApp to obtain blockchain execution capabilities, he/she can easily implant it in WebView, the steps can be seen as follows.

First, the user needs to import the module,

```
import MetabaseWebView from '@metabase-fe/webview'
```

Make environmental judgments,

```
if (MetabaseWebView.isMetabaseEnv()) {
  MetabaseWebView.navigator.setTitle('I am Android')
}
```

And conduct further operation, like completing a signature request.

```
const clickHandler = async () => {
  if (!isConnected) return
  const signer = library.getSigner(account)
  try {
    const result = await signer.signMessage(MESSAGE)
    setResult(result)
  } catch (err) {
    if (err?.errorCode === 1001) {
      return alert('You canceled signature.')
    }
    alert(err.message)
  }
}
```

For the web developers who want to easily access DApp development, they can easily complete a web application with blockchain capabilities, which may only take them a few hours.

5.2 Modular support

In the Metabase Network ecosystem, we'll provide you with abundant modularized functions. Maybe you fail to understand what modularity means at the present moment, but you must have heard of cloud computing. The big modules of cloud computing can roughly fall into: Computation, storage, database, security, network, CDN, big data analysis, etc. Actually, these modules can be further subdivided. For example, computation can also fall into: Virtual shared servers, virtual dedicated server, batch processing servers, bare metal servers, serverless computing, etc.

Pursuant to the description of the cloud server, it roughly reveals that which modules the Metaverse blockchain platform contains. Our preliminary understanding includes: Node data collection/analysis/query module, blockchain browser data display module, mining pool data collection/analysis/query module, signature module in embedded/mobile device/high-performance computer, GPU/FPGA acceleration module, dedicated chip acceleration module, data collection/caching/packaging module, offline signature transaction module, general contract module, protocol encapsulation module in the application, etc. These modules are merely a part of the metaverse blockchain platform. We will unveil the new problems encountered in metaverse and the modules to be split in the future. What significantly distinguishes these modules from the cloud computing is that they will be open sourced without any charge. Because blockchain is a completely open community, and we also hope that you can join us to make your own contribution to modular construction.

Let's briefly analyze these modules,

Node- data Collection/Analysis/Query Module

As the node data increase every second with many applications sensitive to data delay, it must be troublesome and annoying to collect and analyze data from the full nodes of the blockchain. For instance, it will encounter especially prominent problems when the node unexpectedly stops or rolls back when inquiring some valid data. How to ensure that the data is non-repetitive, non-missing, and valid is very challenging for our development work, which is also a common difficulty that every developer must be confronted with. In addition, if there are requirements for timeliness, it will definitely be a systematic project, rather than a simple tool that can replace it. I believe developers can understand what we mean. If these are already provided in the open source community, will it make your development more proficient?

Explorer- data display Module

The method of collecting and analyzing blockchain explorer data applies to the collection and analysis of node data. So the blockchain explorer mainly features its function of query and display, contains the said blockchain explorer SDK, and is also based on the display module. Namely, the display module can contain the SDK, does this facilitate you to understand the function of the display module? It starts with UI-based display, which is also a significant function of the display module.

Mining pool data collection / analysis /query module

The mining pool data mainly refer to the mining machine-related data, which surely include your mining income data. This is also a problem that many developers are very concerned about, and it involves the receiving and distribution of Token. In case that this is a module that often has calculation errors, will it be a very troublesome thing? Furthermore, as it comes to the mortgage of the token, the income of the mining pool is also associated with the token mortgage of the miners. This is also the data that the mining pool needs to focus on. If you need to do all these data yourself, it will be considerable work.

Signature module in embedded / mobile device / high-performance computer

Various devices need different signature capabilities, For example, it requires a low-power, high-latency signature method in embedded devices, and the signatures in mobile devices can be completed in milliseconds. In high-performance computers, multiple signatures can be concurrently completed. These capabilities have different requirements for the signature module with diversified programming language supports. For example, it must be C/C++ or some cross-compiled language in the embedded system, while the common languages like Golang can be used in the mobile device, whose security issues needed to be considered by us such as the support of encryption chips and encryption hardware. We mainly need to consider how to conduct parallel computing in high-performance computers. It must be multi-threaded, which is different from the requirements of the previous two, so are you willing to waste considerable time for this?

Why do we need so many kinds of signature modules? To meet the demands of different conditions, of cource,such as the embedded signature module. You can implant it into your IC card , then you can make Blockchain payment with your IC card. This kind of IC card fits if you wish to use the Token generated from the metaverse. Or you can implant a mobile

device signature module into your mobilephone. It enables you to collect and pay in Metaverse Game and Metaverse Application. This process can be achieved Onchain and offline. It can realize cross-platform back-up. So it's very safe. Or, You can implant the high-performance computing module into your metaverse application background to build Block data uplink. For example, when you shop on Amazon, if you are permitted to uplink the block, then Amazon needs to build a signature for each consumption in the background and upload the data to the blockchain. This is a service that requires huge signature capability,similar to serverless computing in cloud services.

GPU / FPGA accelerating module

There is an significant feature of the Blockchain that all data in it can be fully backed up in each node, which brings great pressure to the data verification, especially in cross chain transactions of multiple chains. For example, one chain can generate 1000 transactions per second,that is 10000 transactions for 10 chains. The question is,if every server is powerful enough to support so many transactions? Here we consider accelerating through PCIE boards such as GPU or FPGA. But not everyone knows how to optimize this kind of acceleration,so we provide acceleration modules.

Acceleration module for dedicated chips

In the future, there will be more and more data and higher performance requirements, same for the acceleration module. In the end,we may have to accelerate through dedicated chips, such as ASIC. We also hope to provide PCIE cards to be compatible with your computer. Therefore, we will also provide a complete set of software accelerated access module, which supports seamless connection with your metaverse applications.

Data collecting / caching / packing module.

Currently, there are still many problems to be solved in the Blockchain scenarios, such as a large amount of data uplink under the low-power situation, which does not meet the design requirements of the low-power scenario. For example, we have a sensor to monitor the temperature of the Antarctic glacier. In this situation,we can not provide high-power signature, because these kind of devices are unattended and high power-consuming. We can not transmit a large amount of real-time data, but still hope to have temperature data samples of more than 1000 times in 24 hours. And besides,we would like the data being signatured. What should we do then? In this case,data caching and packaging are indispensable. These data flows will be encrypted locally through an encryption chip. When the data is accumulated to a certain amount, it will be sent out. For such a module, we need to provide an encryption calculation module for the encryption chip and an encryption scheduling module for the sensor controller. All of these as a whole can be treated as a data collecting / caching / packing module.

Offline signature transaction module

It will be common in the metaverse for Offline signature transactions. For example,we are on a task that requires interaction with someone in another physical world,carrying our own devices. What should we do when there is no network or with severe network delay? In

the Internet era, we normally keep users offline until the network is smooth and let both parties initiate requests again. Actually this is very unfriendly. While it can be solved through the offline signature transaction module of the metaverse blockchain, because metabase network is based on the UTXO transaction mode. Therefore, the transaction of offline data can be completed through local transaction,in which the network is not necessarily required. After the network is restored, the offline signature transaction will be automatically synchronized to the blockchain network for confirmation.

General contract module

In the metaverse, there are many general functions at the bottom, so we can abstractly regard them as modules, which can simplify developers' contract development. For example, there are some gambling scenes in the metaverse game. If A pays a token to B and requires him/her to do a task,A's token will be easily transferred to B's account once the agreement between them is reached. But if one of them breaches the contract, it may lead to contract arbitration. This kind of situation can be very common. We can also apply it to the decentralized e-commerce. You do not need to programme these contract modules by yourself in the future,and can use open-source general modules.

Protocol encapsulation module in application

Protocol encapsulation is based on cross chain requirements, such as decentralized trading, which can be applied to different applications of metaverse or decentralized exchanges. For example,to realize interoperability between e-commerce applications and game applications in metaverse, and build a bridge between applications in the Internet world. It is simple for intercations between two apps. But if it is for interworking amoung 100 applications, it is almost an impossible job. Therefore, we need protocol cross chain, and the protocol encapsulation module in the application is necessary. It can greatly simplify the cross chain construction between different applications in the metaverse, even by passing a few parameters.

5.3 Metaverse ecological support

Metaverse is not just a field,or simply a software. It includes all aspects of our daily life,such as wearable devices / sensors, games,as well as fields we know less about such as agriculture and industry,etc. . A complete set of data security is also required.

Now here are some examples of the combination of various industries with software or hardware in the metaverse ecology.

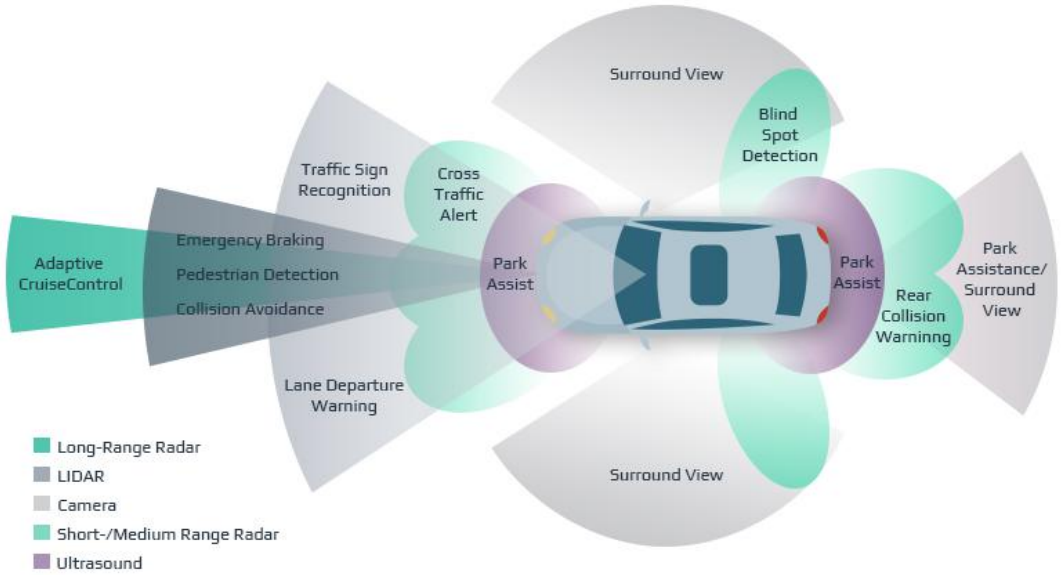
Wearable devices / Sensors

I believe we all have access to the wearable devices, such as Playstation handles and VR glasses in our home.

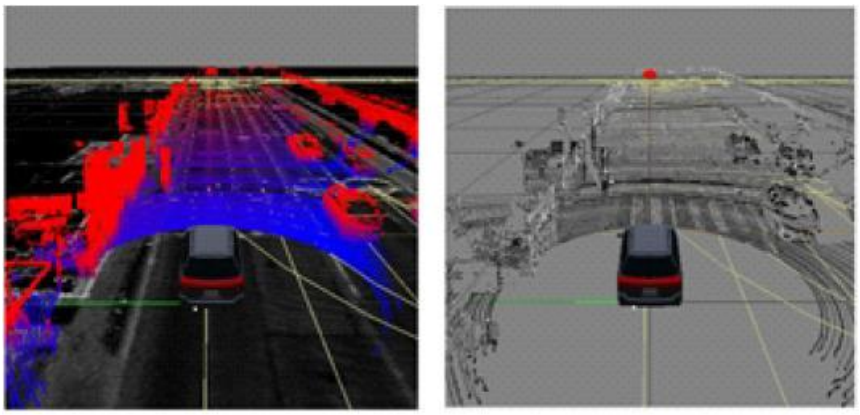
These are wearable devices and can be used to complete the interaction and feedback of information by transmitting various signals, which is only the basic operation in the metaverse. In the virtual world, sensors play a vital role. It controls your body move, the pressure of your handle, the rotation angle and direction of the glasses, and the contact or distance with an object, etc.

The sensors in metaverse are much more than this. For instance,many people who drive cars for the first time actually have a fear of driving, which is also an important factor leading to some traffic accidents during the driving. So what can we do to get more driving experience without facing traffic accidents? This can be achieved by the metaverse.

If you say that you can increase driving experience through driving games, probably we can not deny. It is true that you can get more experience in some games with body feel similar to the real world. But this is far from enough. If driving in the metaverse is based on the real physical world, then the first thing we need to do is to collect the data of the physical world. So how to collect these data? By automobile sensors. Here below are the sensors in a car.



Including ultrasonic radar, camera, short-range and long-range radar. These sensors can help you a lot during your dricing,changing lanes and parking. And they can also collect all information of the road to build a stereoscopic scene. If these data are collected continuously, a road driving environment exactly the same as that in the physical world can be built in the virtual world. We can even get information of vehicle fault, traffic accident, road maintenance and road changes, etc., which is difficult to simulate for driving games. This is an advanced AI driving scene mapped out through the physical world. With these information,we can make interactions in the game through wearable devices. By simulating the surrounding environment, user driving habits, traffic accidents and road information, the simulation sensor can judge whether there is a traffic accident, whether a safe distance is maintained, or whether traffic regulations are followed, etc.



(a) Measured 3D Point Cloud around the zebra crossing (The color difference is height)

(b) Measured Infrared Reflectivity for (a) (The color difference is a laser intensity)

Apart from these,the data collected can be used as the original data module for automatic driving. We do not need to do simulating tests in the physical world for a car,because numerouse tests and trainings can be completed in the driving apps in the metaverse. All is the same as the real world. And this can bring us much more benefits than we can imagine.

Game

Games are the most direct application of metaverse and the best practice of combining VR with wearable devices. There are more and more blockchain games now,

Because the best way for the presence of virtual world is gaming. Metaverse games can be regarded as a parallel world of the real physical world.

Games enable us to experience the prototype of the metaverse in the simplest way. For example, if the value of characters and props in a game can be recognized by all players, it means that these game props have circulation value. We only need to anchor the corresponding game props through the blockchain, so that the hash value of game props has unique authentication. Then we can freely circulate in the blockchain by virtue of the game props authentication on the blockchain. And we can turn them into cash or convert them into equivalent items on other platforms, which makes the game have the value nature of metaverse.

Agriculture

The development of agricultural planting can also rely on the metaverse, in which agriculture not only simulates the planting process through AI, but also expands the economic benefits of the farm through interactiosn with end users. Traditional agriculture realizes its value through planting,purchasing and distributing. In the metaverse, planting data can be obtained through various sensors, and then crops can be mapped in the metaverse through sensors. Wholesalers or end users can buy futures in advance through wholesale and retail. Realization can be achieved in advance. Or provide agent planting for end users, which is a new plating form in agriculture. End users can not only find the products they subscribed for in the metaverse, but also resell them. They can turn

agricultural products into circulating goods at any time.

Industrial

Metaverse can be widely used in industrial scenarios. For example, factories can simulate the whole production process according to industrial sensors, and the production process is completely synchronized with the real physical world in the metaverse world, which allows producers to observe the industrial production process in real time. In the same way, they can complete production scheduling anywhere. Technicians can complete the pre-inspection of the equipment at any place, even the commissioning and fault repair of the equipment with the help of a remote third-party equipment. It is similar to 5G remote surgery,which has gradually matured now.

With the digitization of industrial production, factories can show production data to purchasers or end users. This allows purchasers to complete orders directly in the metaverse,and end users can also participate in the supervision of production process. And financial institutions can provide corresponding financial services for enterprises according to the factory's production data. These are advantages that traditional industrial production does not possess.

Data security

There are also many risks in the metaverse ecology, such as data leakage and asset loss. Data leakage involves privacy safety, while asset loss directly leads to property loss. Neither of them are acceptable to us. So data security is very important. In the Internet world, our data is stored in the servers of Internet companies and the security of data is guaranteed by Internet companies,causing many data leakage accidents all over the world every year. This is the risk of centralized data storage. For the government, it’s like transparent. Same to the assets. Your assets are stored in the bank, and they can be used on anything at any time for the bank. Of course, this situation will occur in some banks with poor credit. But it is enough to prove that your assets are actually unsafe. So we need to be cautious about our digital assets in the metaverse.

In the metaverse, it is very safe to store your brief information through the blockchain, because no one except yourself can decrypt the data stored in the blockchain. But you need to ensure that your private key is not stolen with some security means. In the blockchain, your digital assets are also managed by your private key, The benefits of private key management are also very obvious, that is, anyone must obtain your data and assets under your authorization.

In fact, blockchain data security in the metaverse has become our own job, that is to say, the security of data and assets depends on ourself. Although free to data and assets, we also have risks accordingly,because not everyone has a strong sense of security. And therefore, hardware encryption and multi-layer security verification are also essential. In the future, metabase network will also provide you with a variety of secure private key storage methods.

For the storage of large files or other data, the blockchain will not store them for you. Therefore, we need to have other storage schemes and protocols accordingly. We can ensure the security of large files through decentralized storage media or decentralized backup,

which will be safer than cloud storage and private cloud, because large files on the blockchain are self insure. In case of a local loss, we can not only recover them in a variety of methods, but also can obtain liquidated damages from the lost party. This is much better than the storage scheme provided by Internet companies.

6. Release Plan

6.1 Metabase Network Token

The total number of metabase network tokens issued is 21 million, including 1.05 million private placement. The first release is 510,000, and 262,500 every month in the following 2 months, 20 seconds for each block. 1 Token is awarded for each block, and halved for every 9,975,000 blocks until all tokens are excavated.

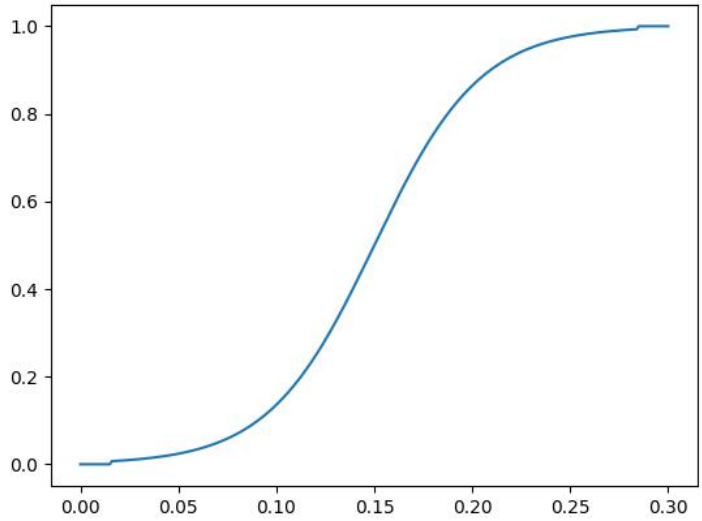
6.2 Mortgage mining

Design concept

1. During the chain mining, there is a fund pool. If there is no mortgage, 20% of the money is dug out and 80% of the money enters into the fund pool. When there is mortgage mining, then a certain proportion is taken from the fund pool according to the amount of mortgage. According to the practical rules, the chain encourages the three ore pools to produce blocks, so it is designed to mortgage the currency with 30% of the circulation, which can not contribute to the capital pool.

2. In order to prevent a large number of currency dumping, the mortgaged currency can be circulated when it is mortgaged in each mine. But there will be a certain locking period for 100 days when it is transferred to the non mortgaged address, and 1% of the currency will be taken every day.

The specific mortgage curve is:



Mortgage (percentage of circulation)	Profit (percentage of fund pool)
0.00	0.00
1.00	0.00

2.00	0.80
3.00	1.16
4.00	1.67
5.00	2.40
6.00	3.44
7.00	4.91
8.00	6.96
9.00	9.78
10.00	13.57
11.00	18.52
12.00	24.77
13.00	32.28
14.00	40.85
15.00	50.00
16.00	59.15
17.00	67.72
18.00	75.23
19.00	81.48
20.00	86.43
21.00	90.22
22.00	93.04
23.00	95.09
24.00	96.56
25.00	97.60
26.00	98.33
27.00	98.84
28.00	99.20
29.00	100.00
30.00	100.00

The function is a logistic growth model. To konw more about the principle of the

function, refer to the following address:

https://en.m.wikipedia.org/wiki/Logistic_function

Generalized logic function, also known as Richards growth curve:

$$f(t;\theta_1,\theta_2,\theta_3,\xi)=\frac{\theta_1}{[1+\xi\exp(-\theta_2\cdot(t-\theta_3))]^{1/\xi}}$$

The $\theta_1,\theta_2,\theta_3$ is real number, ξ is arithmetic number. The flexibility of curve f is attribute to parameter ξ : (i) If ξ =1, then curve will be simplified as logic function, and (ii) If ξ =0, then curve will converge to Gompertz function. Separately represent to final earning figures in model $\theta_1,\theta_2,\theta_3$.

Data declaration:

1. When mortgage is less than or equal to 1.5%, then should be counted by zero mortgage, and only 20% mining earnings is available.

2. When mortgage is equal to or larger than 28.5%, then should be counted by 30% mortgage. In this way, all the mining earnings and money from cash pool are available.

6.3 Ecological consumption

The ecological mortgage consumption

Most of ecological applications in Metabase Network have their own parallel chain, and that chain needs to be generated by mortgage enough ecological digital property, to further reduce the circulation of Metabase Network.

Not only parallel chain needs mortgage, but also the metaverse mall, metaverse game and other applications. For example, if a trade occurs in metaverse mall, then a certain amount of digital property should be mortgaged as security deposit, which means the larger mall turnover, the digital property mortgaged in trading would be larger. Furthermore, the props purchasing, publishing are all via digital property, as well as the trading process, which will make the circulation of Metabase Network even smaller.

Circulating consumption

Those applications with big consumption of digital property will make the Metabase network digital property circulating works, and will cause the number of digital property holders increase dramatically. This way not only helps consume the digital property, but also make the user to be investor. For example, metaverse game needs large quantity of props bought by digital property, no matter through digital property or not, game player will buy those props. If players use digital property, then it will further increase the liquidity of digital property, and also the circulation consumption. Finally, the circulating will cause the deflation of digital property. In the future of metaverse application scenarios, Metabase Network will encourage all metaverse applications use digital property as value circulation, which is one of character of metaverse.

7. Appendix

7.1 Risk warnings

There are various risks during the process of developing, maintaining and operating the Metabase Network, and some of risks are out of those Metabase Network developer's control. Besides the other content in this white book, hope our participator can read carefully and accept below risks.

Market risk

The price of Metabase Network is closely related to the situation of the entire encryption assets market. If the market situation is downward as a whole, or exposed to other uncontrollable factors, then the price of Metabase Network may still be undervalued in a long run, even though the prospect of Metabase Network is quite good in nature.

Supervision risk

Since the development of blockchain is still in the early stage, and there is a lack of regulatory documents for preconditions, transaction requirements, information disclosure requirements, lockdown requirements and other requirements in relation to the process of capital-raising of block chain in the countries worldwide. In addition, it's not clear that how the regulatory policies will be implemented. These factors may create an uncertain influence to the development and liquidity of the project. However, the blockchain technology has become the primary target of supervision by the major countries in the world. If the regulatory body interferes or exerts influence, then the Metabase Network application or Metabase Network may be impacted, such as restrictions on the use of laws and regulations, sales of electronic Metabase Network, or Metabase Network may be restricted, hindered or even directly terminating the development of Metabase Network applications.

Competing risks

At present, there are many projects in the field of blockchain, so the competition is fierce in strong market and project operation pressure. Whether the Metabase Network Token project can break through in many excellent projects and get widely approval, which is not only related to its own team ability, vision planning, but also affected by many competitors and even attacks in the market. In the meantime, it is possible to face vicious competition.

The risk of brain drain

Metabase Network gathers together a talent team with both vigor and strength, and attracts the senior practitioners in the field of blockchain and experienced technical developers. In the future development, we can not rule out the possibility that the core personnel leave and the conflict within the team, leading to the negative impact on Metabase Network Token as a whole. the accelerated development of cryptography or the development of technology, for example, the development of quantum computer, may bring cracking risk to Metabase Network platform, which may cause the loss of Metabase Network. In the process of project updating, there may be loopholes, which will be repaired without delay once found, but it cannot be guaranteed that it will not have any impact. Besides the risks mentioned in this white book, there also have some other risks that founding team

didn’t mentioned or expected. In addition, other risks may also arise suddenly, or arise in the manner of a combination of various risks that have been already mentioned. The participants shall fully understand the background of the team before making a decision, know the integrated framework and thinking of the project and participate rationally.

7.2 Disclaimer

This document shall be only used for the purpose of conveying information, whose content shall be only for reference and not constitute any trading suggestion, solicitation or invitation for Metabase Network and related companies to sell stocks or securities. This document shall not constitute nor be understood to provide any act of purchase and sale, and it shall not be a contract or commitment in any form. Considering the unpredictable circumstances, the objectives set out in this white paper may change. Though the team will strive to achieve all the objectives set out in this white paper, all individuals and groups who purchase Metabase Network will be at their own risk. Partial content of the document may be adjusted in the new white paper with the progress of the project. The team will make the updated content known to the public through publishing an announcement or the new white paper on the website. This document only for those specific objects who want to know the information of this project, not for the use of invest guidance or contract, neither commitment in any aspect.