WHITE PAPER

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1 Origin

1.1 From nothing to something

"Human minds are made of selfish genes," which is instinct.

"Collaboration based on deep cognition is the key to distinguishing humans from other species." This is evolution.

The universe begins with the Big Bang, starting with the basic rule "One". Just like Tao which is the originator of the universe, then it gives rise to Yin and Yang, and Yin and Yang give rise to heaven, earth, and people and they give rise to all the worldly things. The infinite power of the basic rules is self-evident. Only the eternal rule "One" can evolve into the vastness universe.

Life also comes from the initial rule "One". The earth was formed nearly 4.6 billion years ago. Single-celled organisms appeared 3.5 billion years ago, multi-cellular organisms appeared 900 million years ago, humanoids appeared 7 million years ago, and Homo sapiens appeared 200,000 years ago. Individual, human, earth, solar system, galaxy, the universe, in this chain, each of the latter is composed of countless formers. When we trace back to the front of the chain, individuals can be further subdivided into the basic components of the universe, organs, cells, molecules, and atoms; atoms can be further divided into several layers to elementary particles. These most basic particles follow some basic laws of interaction. To see a world in a single one flower, one leaf.

Unique "one", overall "one"

Each living thing is an independent individual, and each has its system. Due to the limitation of matter and energy, the primary goal of each individual's internal mechanism is to continue life, so people are born with the self-centered operation, and biological evolution has made life more complex and more genetic information. The material and energy are constantly updated within each individual, but at the same time, the material and energy are exchanged with the environment to form individual metabolism, population ecology, and biological ecology. The internal collaboration of the population is also the result of countless years of evolution, and is integrated into the innate genes and acquired inheritance. Therefore, the bee colony can build complex honeycombs, migratory birds collectively migrate, and wolves hunt.

Unique "one"

Human beings are at the top of life evolution on the earth and have a much higher IQ

than other living things. The powerful thinking ability of mankind coupled with efficient information tools (languages, words) has precipitated a strong human civilization and formed a common pursuit of humankind, making human creativity truly unlimited, and can actively change and create the world. This is not the ability of a single person, but the ability of the entire human being.

Overall "one"

Human beings have become more powerful through their constant knowledge of the universe and the creation of new things, and their ability to create new things has also grown stronger. From stone, bronze, iron, steam, electricity to information, tools are getting more powerful. Humans create the world more and more relying on intelligence rather than physical strength make things work as humans intended. Based on the original rules of the universe, human beings have created a new set of rules, and continue to increase the transformation and integration of the original universe. In the whole process, the basic system of human society itself plays a fundamental role. The continuous evolution and development of the social system are aimed at coordinating and inspiring everyone to play their role and bring the best effect to the entire human race. The social system reflects the interests of people and is fair and just in social cognition in each period.

1.2 Parallel world

The computer world is a "parallel world" created by humans based on the physical world. Earlier humans invented the abacus, slide rule, the mechanical computer, etc., all of which were driven by humans and machinery. The underlying calculations of modern computers are logical. Although calculation and logic are inseparable, logic is not equal to mathematical calculations. Mathematical calculations can achieve addition and multiplication, and logic is mainly NOR or NOT. Binary inventions combine logic and mathematical calculations to transform mathematical calculations into logical operations. But these are just theories. Until the design of binary digital electronic circuits and the application of logic, combining binary operations with electronic devices to achieve logical operation functions, this is the realization of electronic computers. It successfully connects the human mind with the physical world, making it possible for the human mind to operate independently of the human; at the same time, humans digitize and encode various information in the physical world into binary, and can also translate binary into physical signals through inverse coding. The "parallel world" is on.

A single computer is like a single person with limited capabilities. The advent of Internet technology has completely changed this pattern. Internet technology originated from the technology supported by the US Department of Defense, which was later the Internet communication protocol TCP / IP. Computers use this protocol

to interconnect and communicate. In the beginning, the main purpose of computers was not for personal use, but to solve important problems such as military and scientific research. On the commercial Internet, with a huge number of personal computers, the upper layers gradually evolved into application scenarios such as searching, social networking, and online shopping. With the development of the mobile Internet, big data, AI, and the IOT, basic human behaviors have begun to be integrated into the computer world, and the "parallel world" of human beings has begun.

The "parallel world" social system

The "parallel world" has developed to this day, basically using a subset of some systems in the human physical world, but the sovereignty, interests, and physical world of the "people" in the "parallel world" have undergone fundamental changes. Although human beings around the world have been constantly exploring, such as antitrust, data subjects, privacy protection, etc., no good solution has been found. The "parallel world" actually consists of a fragmented and possibly suddenly disappearing world. It is a world controlled by a small number of people. The definition of "human" interests is very primitive, and it is even more difficult to reflect fairness and justice. The Internet giants that used to cooperate, freedom, share, and anti-monopoly have become larger monopolies for their commercial interests, monopolizing the vast majority of the interests that should belong to users themselves, and vying for users' time, behaviors, thoughts, and endless data, and these are closed in their platforms to achieve the purpose of locking users on their platforms, and even use these, in turn, to manipulate and harm users. The development of social productive forces and production relations is the fundamental reason for the development of social systems. At present, these have seriously prevented the further improvement of human production collaboration efficiency, and also inhibited the improvement of human innovation efficiency. Therefore, it is necessary to reconstruct the basic rules in the parallel world.

1.3 New starting point

In the "parallel world", we hope that a low-level system can give us a fairer and hopeful future and that "people" are no longer "puppets." In the new world, the underlying system can clearly define the interests of each "person" and provide a soil environment for the evolution of fair and just rules. This is a credible world. Everyone has an "I" that is constantly accumulating and growing. This "I", "you", "it" cooperates "based on different" rules and extends to the physical world. In this way, human beings can collaborate more confidently, instead of engaging in intrigue and mischief.

All this changed the moment we met the blockchain, and a new world began.

What is a blockchain? Until now, there has not been a unified answer that is satisfactory to everyone. There are three main reasons. First, the origin of the blockchain. The blockchain is developed from the Bitcoin system. People who believed in and studied it earlier focused more on financial properties, and then slowly focus on technology. People only realized that Bitcoin is only the first blockchain application, so it has a relatively large influence; the second is Blockchain involves a lot of content, including sociological content such as finance and social organization, as well as natural science content such as computer and cryptography. Different researchers will classify it at different levels for discussion, and there will be different discourse systems. The third is that the current development of the blockchain is in a stage of contention among hundreds of different factions, and no one can persuade others. These reasons have led to the confusion of ordinary users' understanding of the blockchain, and it has also been used by some people for false publicity.

Looking at the basic development of blockchain through some typical systems, you may understand the past and think about the future.

The Bitcoin system is open-source software designed based on Satoshi Nakamoto's thesis (named "a peer-to-peer electronic cash system", late 2008). Users build a peer-to-peer network system based on this software. Bitcoin is based on a specific algorithm on this network system. (Consensus Algorithm, PoW). A constant amount of encrypted digital assets generated by this algorithm. This algorithm encourages nodes in a peer-to-peer network to form an immutable distributed ledger to confirm and record all bitcoin transfer payment behaviors. Based on the asymmetric encryption algorithm, the account system allows bitcoin to be transferred only by real (mastery private key) owners.

Ethereum is an open-source blockchain platform with smart contract functions based on the Ethereum white paper design (early November 2013). The Ethereum system handles smart contracts by providing virtual machines. Compared with the Bitcoin system, it allows users to runs a more complex business than trading.

Hyperledger Fabric is a consortium chain open-source architecture that provides a modular architecture that allows components to be plug and play, such as node users and consensus algorithms. It was launched by the Linux Foundation at the end of 2015, and early on, companies such as IBM contributed code.

These three systems, one is the origin of the blockchain, one is the iconic system of the blockchain from a single function to support secondary development, and one is the iconic system of the consortium chain. The first two are public chain systems that allow users to become nodes in the system network without permission. The consortium chain is a node that needs permission to join the system.

Basic design logic of early blockchain systems

In a blockchain system, a node generally refers to a network computer running a blockchain system program. The user spontaneously purchases a server, installs a running system, and connects to the system network. Usually, each node runs the same program; these nodes are connected through point-to-point network communication technology. No permission means that the nodes of this system are spontaneously built by the user, not a centralized individual or company. As long as someone runs the node and joins the system network, this system will continue to run and cannot be controlled by specific people; the need for permission means that the system is determined by a certain individual or organization and is controlled by these nodes.

From the timeline point of view, there is a public chain that does not require permission, and then a consortium chain that requires permission, which is an extension of blockchain technology and an extension of business scenarios. The basic idea of a public chain system is to form a system by nodes that do not need permission to run the same program. The difference between a centralized system is obvious. Ordinary users can participate in the construction of the system at any time, and the right to run the system is no longer a single subject. The consortium chain system and the center that requires permission the main difference between the two systems is that the right to run the system is no longer a single subject, but multiple subjects run together, but ordinary users cannot participate.

The blockchain uses a consensus algorithm to ensure that the information recorded by different nodes is the same. The algorithm mechanism is written in the code of the blockchain system, and each node operates according to this mechanism; the algorithm ensures that in each round, these nodes write the same data to their respective systems and is stored in blocks, at the same time, the previous round of blocks on the node is also recognized by cryptography and chain structure, and a verifiable chain is formed relationship, and ultimately ensure that the tamper-resistant blockchain stored by each node is the same. The consensus algorithms mainly used by public chains are PoW, PoS, DPoS, etc., and the main consensus algorithms of the consortium chain are raft, pbft, etc., because the number of nodes is relatively fixed and the security is relatively controllable, so these consensus algorithms of the alliance are classic algorithms in traditional distributed algorithms.

The traditional consensus algorithm is mainly solved by communicating with each other multiple times, but the number of supported nodes is limited. By introducing an economic mechanism (PoW algorithm), Bitcoin can effectively solve the problem of node decentralization, but it reduces the efficiency of consensus. The consensus algorithm of the economic mechanism also solves the problem of the motive force of public chain nodes. Setting up nodes has to pay costs, but there is no centralized

organization in the public chain system to pay for everyone, and there cannot be such an organization (otherwise the public chain The system will be controlled by this organization), so the public chain nodes can only rely on voluntary, while the nodes of the consortium chain and the upper-level service providers are generally the same organization and have clear business logic. The Bitcoin consensus algorithm is integrated into the decentralized economic mechanism It not only solves the problem of the number of nodes and security but also encourages nodes to join voluntarily. This innovative design has created blockchain technology.

Judging from the previous concepts, products, and logic of these blockchains, they are very limited. What the "parallel world" needs is a never-ending trusted core engine that provides operational support for the "parallel world". The engine runs on it and cannot be changed the various rules of the engine, the current and historical status of the engine can be verified and always trusted. "Parallel World" redefines "people" and redefines the underlying system based on this engine. This engine is our definition of blockchain.

2 Thinkium World

2.1 Thinkium New World

The birth of a new world

The world refers to all the collections in a certain time and space, usually the earth and the universe. Human beings have created a "parallel world" outside the physical world, but the "parallel world" is more like a simple extension of the physical world, full of uncertainty, time and space chaos.

The Thinkium world (hereinafter referred to as Thinkium or the new world) is a new world born from the chaotic "parallel world". The origin is the Thinkium core engine that supports this world. This is the different "blockchain" we have been looking for. To support this world, the Thinkium core engine must be powerful enough to not only be able to run continuously and credibly, but also to support the growth, evolution, and change of this world without restriction.

The new world has underlying meta-space-time rules, and is executed by the Thinkium core engine and radiates to anywhere in the world. The new world starts from the origin, evolves and grows based on the meta-rules. The entire process is completed and tamper-proof in accordance with the time axis, forming stability the four-dimensional space-time. The new world has created countless upper-level rules based on the evolution of the underlying meta-rules, the stable execution of the Thinkium core engine to ensure the growth and prosperity of Thinkium.

The traditional "parallel world" cyberspace is fragmented, and human information and thinking are stored in different fragmented spaces, and the fragmented space may disappear at any time. Time can be modified at any time in the "parallel world", and information at any time can be arbitrary tampering, the "subject" in the world can be arbitrarily destroyed. All this no longer happens in Thinkium, so that the world of human thought is no longer chaotic. All human thoughts grow in order and efficiently in Thinkium, and together create countless classic information and ideas. The entire Thinkium is highly unified and coordinated, and therefore makes humans prosperity in the physical world.

Thinkium core engine

The Thinkium core engine is the core and source of Thinkium. Before the birth of the new world, it was a set of mechanisms created by "designers" and implemented in computer languages. After the first computer runs the Thinkium core engine, the new world begins to be born, becoming that "one". As more and more computers run the

Thinkium core engine, the new world becomes more powerful and stable. The Thinkium core engine condenses all joined computers into a trusted computing platform, providing the Thinkium world with sustainable trusted computing operation capabilities. When Thinkium starts running, it allows humans to formulate new rules on the underlying rules through the secondary development interface, and it will coordinate and manage these rules and the underlying computing resources while providing an interactive interface.

The new world will inevitably have a large number of entrepreneurs and developers to reconstruct and upgrade the existing "parallel world" rule system logic, and will also generate countless new businesses. Therefore, a scalable, secure, trusted, and easy-to-use engine is required to carry various rules, assets, data, and business logic, and support massive applications and users. It is necessary to design the system from a higher dimension and further perspective.

The core engine of Thinkium is designed to learn from predecessors. With the support of a "human heart" that never gives up, it incorporates an understanding of the objective world, expectations of human society, respect for human nature, and the desire for technology and iterates continuously.

During the design of Thinkium's core engine, we temporarily followed the traditional "public chain" concept to describe its basic logic. The Thinkium core engine runs countless public chains which includes the upper and lower layers. The lower layer is the bottom of the public chain. The basic rules are defined to ensure that the consensus of each node on the chain can be reached. The upper layer is the application layer. Various business logic rules are deployed for business scenarios. From the perspective of collaboration, a public chain is a group of people who have reached a common understanding and follow a set of behavior rules. From a construction perspective, they can become the builders of this public chain without permission. From a usage perspective, everyone can create accounts under its control and use on-chain services. From an economic perspective, it is necessary to create an economic mechanism that supports its never-ending operation.

Bitcoin created the first application; many people emulate, but needed to establish a new blockchain network. Ethereum made it easy to issue digital currencies. Many people tried to deploy business on Ethereum, but were limited by performance and build their own blockchain which create the coexistence of large number chains, and further conducive to the cross-chain technology. However, there are huge differences between chains, high interoperability costs, and the insufficient scalability, which limits the development space. This led to the "three dilemmas": difficult to build a chain, difficult to cross-chain, and difficult to expand.

First, it is difficult to build a chain, and a single chain cannot meet the actual needs.

Therefore, many different chains need to be built. Currently, the cost of building a chain is high, and it needs to bear huge R & D costs and security risks. Hacker attacks often occur. Second, it is the difficulty for cross-chain; many blockchains did not consider inter-chain communication at the beginning of its design, resulting in cross-chain interaction difficulties, difficult to form a unified blockchain network and a prosperous ecosystem. After the emergence of cross-chain technology, it is also because of its own performance that the development of cross-chain ecological applications is limited. Finally, it is difficult to expand the chain, and blockchain projects are facing a fatal problem of network performance (TPS), which directly determines the complexity of service that can be carried and the user sacle.

The Thinkium core engine solves the decentralized, consistent, and scalable "impossible triangle" problem. That provides a perfect solution to the "three dilemmas" for the industry public chain, and it is called "the public chain of the public chain". This solution allows anyone to independently and freely build various industry public chains, which have interoperable and scalable basic capabilities. It will promote efficient collaboration in all areas of society, and ultimately produce greater social and economic value.

Thinkium is an open world, and its rules will be extended one after another, affecting the physical world. In many scenarios, the extension of the rules requires the coexistence of a centralized system, a consortium chain, and a public chain. The Thinkium core engine is based on a unified protocol that can support the trusted fusion of the consortium chain and the public chain. On the one hand, the public chain and the consortium chain synchronize with each other with limited data to prove that the data is trustworthy; on the other hand, the consortium chain can also ensure itself the privacy of the data, which must be accessible only with authorization. Such a structure can well connect the two world rules while using the blockchain, it is in line with the current business, legal and other rules of the physical world to ensure that more scenarios land.

2.2 Thinkium Ecology

Thinkium provides a free, equal, open and fair environment for all subjects, and provides a very friendly "interface" for each subject and respect the "rights" of each subject in Thinkium.

Different subjects in Thinkium interact based on different rules and extend to the physical world. As more subjects and rules are added, the relationship between these subjects and each other becomes more complicated. We call it the Thinkium ecosystem, which is also the current main content of Thinkium at this stage.

2.2.1 Thinkium ecological overview

Thinkium ecology follows natural growth and evolution, and members of the ecology promote and restrict each other.

The underlying system is the support system of the blockchain. It provides storage, computing, and communication capabilities for the entire ecosystem. It runs rules written and encrypted by chain developers and provides developers with a secure, trusted, and convenient operating platform. Developers do not need to construct or fork code from scratch, avoiding the huge cost burden of the underlying blockchain technology development, and can develop industry public chains, distributed business applications, DAO applications, general tools, etc. by calling system contracts or open interfaces.

With the participation of a batch of developers, the Thinkium ecosystem will expand a wider range of applications, and various distributed business and DAO applications will emerge, such as decentralized social, media, search, entertainment, games, E-commerce, renting houses, travel, etc. generate more energy, more users, more assets, more demand, and promote ecological development.

In Thinkium ecosystem, personal data belongs to users. All personal behaviors, information, data, and other digital assets are effectively protected and stored in a distributed data center. Any institution or individual must obtain authorization to read it. Assets are stored on the chain in the form of tokens and can be freely circulated throughout the ecology, which can be verified, traced and exchanged at any time.

Each user becomes an ecological resident through the private key ID. Not only can he use various applications more autonomously and securely, but can also collaborate within the ecosystem in a way that does not rely on geographical restrictions and individual trust. Based on the token incentive mechanism, users form a distributed economy, which fully interacts and circulates within the ecology, and evolves into a huge shared ecological value network, which reflects and develops with the real world and becomes a "map" and extension of it.

2.2.2 Thinkium ecosystem structure

The Thinkium ecosystem is open, motivating and attracting more and more members to participate, mainly including the following components.

Underlying system: It is the supporting system of the entire Thinkium ecosystem. It runs a variety of immutable rules and procedures in a distributed manner and is responsible for data storage, information interaction, and verification. It provides a secure, convenient, and efficient deployment environment to support mass

applications and user development.

Industry public chain: It is a collection of industry blockchain infrastructure built on the Thinkium core engine. Through the establishment of various industry basic rules and token issuance, organizations, people, programs, etc. cooperate fairly based on these rules, reduce costs, efficient creation and reconstruction of the industrial ecology.

Consortium chain: It is built for the distributed business. Distributed commercial entities can build it themselves or lease it through the bass platform. By specifying multiple pre-selected nodes as bookkeepers, the generation of each block is owned by all the pre-selected nodes jointly decide to perform information interaction with the bottom layer of the Thinkium core engine, and any third party can access and query through authorization.

General tools: It is a variety of smart contracts, cross-chain protocols, industry protocols, node software, wallets, D-store, DAO tools, developed by developers based on the needs of users or the services they want to provide., trading software, etc., provides a working framework or related support for personal applications or upper-level scenario applications.

DAO application is a large-scale transplantation of aboriginal universal tools and the generation of new species through the open interfaces of the Thinkium core engine or the industry public chain. Through the development of iterative mass APP, Web, applets, PC products, etc., to provide users with personalized services.Accounts, data, and assets are on the chain and control by users, and they can freely choose the application for data migration through the private key.

Datacenter: It is the core hub of distributed business and DAO applications. It stores, analyzes, calculates, and distributes the data generated by ecological users in the process of use. It is controlled by an independent data chain and allows users to use blockchain rules. The data rights and interests are effectively protected. Any subject calling data needs to be authorized by its owner and pay the corresponding compensation

Token: refers to the digital equity certificates that can be circulated in the Thinkium ecosystem, including the underlying assets TKM, the issuance of the industry's public chain, and the tokens issued by distributed commercial entities, which can be directly transferred and traded within the Thinkium ecosystem through cross-chain technology.

Chain developer: refers to the R & D personnel or scientific research institutions that participate in the development, iteration, and maintenance of the underlying system of

the blockchain, or provide related technical services;

Application developer: refers to an organization or individual who develops based on a contract or an operating platform. It provides development tools to complete the development of software or tools including industry public chains, general tools, DAO applications, and distributed business applications.

Node: Refers to a network computer running a blockchain system program. It can be divided into three types: data nodes, consensus nodes, and ordinary nodes by purchasing servers, installing operating systems, and connecting to the system network. Data nodes are responsible for all data in the chain in which they are located, storage and the interaction of information between chains. Consensus nodes are responsible for the calculation, packaging, and consensus of their chain. Ordinary nodes only carry services and do not participate in consensus. Nodes from data storage, packaging transactions, generating blocks, or other processes can get TKM reward.

Community: It is the entrance and important promoter of Thinkium ecology. Every enterprise or individual can form its own community to carry out or provide node deployment, public chain development, application development, user promotion, ecological consulting, financial investment and other ecological construction work. Or collaborate with developers to promote the application and allow more people to participate in the co-construction of the application through a participating and motivating market solution.

Users: Including holders of ecological asset tokens and users of various applications. Each user can join different communities according to their own capabilities and preferences, provide services for the ecology, collaboratively create or participate in ecological construction, and are fair based on their contribution’s fair rewards.

2.3 Design Principles of Thinkium World Mechanism

Thinkium has its underlying basic rules and regulations, as well as new rules and regulations based on the evolution and formulation of basic rules and regulations. The evolutionary growth of Thinkium and the changes in the setting of the system are inseparable.

Institutions are the result of the combined effect of endogenous evolution and artificial design. "Natural" evolution and conscious design play a very important role in the generation and evolution of many institutions. They are complementary rather than competitive. In Thinkium, the evolution of the system alone can sometimes take too long and cost too much. It is necessary to use new system designs to correct errors, correct them, and promote new development.

Institutional change is a dynamic game process. The result of the previous game constitutes the premise of the latter game. Iterate so that the rules of the latter game are determined by the rules of the previous game accumulation. Thinkium’s basic rules and fundamental systems are embedded in the various upper-level rules of the world, and they form the rules of the rules. The implement ability of surface-level institutional mechanisms stems from the basic meta-system, that is, the outcome of the meta-game determines the follow-up the structure of the game, the player in the former then becomes the performer in the latter.

The finite nature of resources and the infinite nature of desire are a fundamental contradiction in economics, and this contradiction also exists in Thinkium. Governance is needed to set incentive mechanisms and institutional constraints. Under the assumption of "rational people", everyone will consider and make decisions from the perspective of self-interest maximization, which will also make the entire world orderly and better.

In the design of Thinkium's mechanism, there will be the role of "designer" or "governor". Its goal is the goal of the entire Thinkium, which is a consensus, agreement, and rule reached by the users of the Thinkium.

3 Thinkium core engine technology

3.1 System and model analysis

The Thinkium core engine ensures that the same content runs on different computing nodes through a consensus protocol and allows any node to join without obtaining permission. At the same time, an effective system should have the following two basic properties: security, all results are Correct; active, each valid request is processed within a fixed (small) time.

The Thinkium core engine starts with solving problems in real business. It must be able to support massive user-level applications. It must solve the decentralization, consistency, and scalability issues of the public chain, and meet the multi-chain parallel capability and fast transaction confirmation capability, high-frequency transaction carrying capacity, extremely high system security and availability, Turing completeness of smart contracts, high flexibility, and scalability of the system, easy-to-use development capabilities, data privacy protection capabilities, etc.

We define a blockchain model based on transactions, quantify parameter indicators such as decentralization, consistency, system throughput, and scalability, and propose related functions to build a quantifiable blockchain model, and finally design an efficient consensus protocol model.

1. The key to the decentralization of the blockchain system is the decentralization of consensus. There are two main purposes of decentralization: the structure of the system is decentralized so that it will not be invalidated by a few nodes being dropped, betrayed, or attacked; System participants reach consensus, which increases the transparency and credibility of the system and prevents the system from being controlled by oligarchs.

2. Blockchain is a decentralized system. There is no central node to maintain the block set. The consensus algorithm allows different nodes to maintain the same set, to achieve consistency. However, there may be malicious nodes in the system, which will affect the operation of other nodes and the consistency of the entire network. At the same time, due to factors such as network delay and consensus, it is not possible to guarantee strong consistency of the data of the entire network at any time, only weak consistency.

3. The performance of the blockchain system is mainly reflected in the time required for the system to confirm the transaction. Generally, it is characterized by two parameters: the confirmation time (the time required for transaction confirmation) and the throughput (the maximum number of confirmed transactions per unit time can be

completed). The confirmation time is the shortest cycle for a user to make a transaction. If the confirmation time of a system is long, it will cause a poor user experience and limit the system's application scenarios. If the throughput is too small to handle all transaction requests, then some transactions will be blocked or discarded, resulting in increased latency of the entire system. A discussion of performance is only meaningful if the system meets decentralization and consistency. Blockchain systems confirm a transaction and need to ensure that all participants reach consensus to optimize performance, the computational complexity and communication complexity of the consensus algorithm should be improved.

4. When the blockchain system reaches its processing bottleneck, it must discard redundant requests and reduce system availability, so it needs scalability to break through the system limit. Blockchain scalability includes system throughput scalability, load scalability, functional scalability, and update scalability. We designed a model to evaluate the scalability of the blockchain system and analyzed that the blockchain system should achieve scalability through parallelism.

5. The factors of the efficiency of the consensus algorithm mainly include the delay of consensus calculation, the delay of consensus communication, and the delay of the allocation of consensus permissions. To improve the efficiency of the consensus mechanism, the above factors need to be optimized under the premise of ensuring the decentralization and security of the system. By analyzing specific optimization methods, we conclude that in a system with rapidly growing performance requirements, it is still possible to meet the system's performance requirements by increasing the number of chains.

6. Based on the analysis of the theoretical model above, we systematically designed a set of efficient, scalable, decentralized, safe and reliable consensus protocol models. In this model, the blockchain system is a tree structure, and each node of the tree represents a chain, and the non-leaf nodes represent the structural blockchain, which is responsible for consensus on the node-set and block set of the blockchain corresponding to all its child nodes; the leaf nodes represent the transaction blockchain and are responsible for consensus on a subset of transaction data. The number of blockchains is dynamically adjusted as the size of the data transaction set changes. It has been proved that the blockchain system meets the decentralization conditions, and the performance does not decrease with the increase of the number of system nodes and the size of the transaction data set.

3.2 System Architecture

3.2.1 Hierarchical multi-level chain structure

The chain structure of the Thinkium core engine is a hierarchical multi-level chain

structure. The chain is divided into two types: the main chain and the business chain. Each chain is a completely independent system with its status. The main chain acts as the leader and coordination of the entire system. As an entry point and source of trust for the business chain, it records the metadata and summary of the confirmed blocks of each business chain, generates random seeds used in committee elections for all chains, and records the election results. At the same time, from the business, the workload is shared by all business chains and the contract is calculated in parallel using a message-driven protocol based on the Actor model. All nodes in the system maintain the state of the main chain, by updating and verifying the main chain's blocks, nodes can verify that they have included any block data of the business chain in the main chain. This structure has the following main advantages:

• Nodes joining the system only need to obtain the current state of the main chain from a trusted source or rebuild from the genesis block and do not need to synchronize all the data of the entire system, which greatly reduces the load of the entire system.

• The consensus of each chain is executed independently and in parallel, which greatly reduces the network bandwidth and computing processing requirements.

• The main chain can act as the coordinator of the system; it provides cross-chain synchronization and allows the entire system topology to be dynamically adjusted.

• Nodes can use the summary in the main chain and Merkle proof to verify transactions initiated from another business chain. Therefore, the block producer of the business chain does not need any information from other business chains to process inter-chain transactions.

According to different transaction types or business entities, different business chains can be divided for separate operations. They can run independently and completely independently. Cross-chain communication can be carried out through the evidence provided by the main chain. It can also form dependent parent-child relationship chains with dependent links. The child chain inherits some attributes of the parent chain. The currency type of the account balance on this chain, the election method of the chain, etc.

The Thinkium core engine allows each business chain to expand its sub-chain, but in fact, the problem can be solved within three layers. Whether it is the main chain or the business chain, there may be congestion due to too many requests and become slow. When congestion occurs, the chain can be shard to distribute requests to different shards to improve the throughput of the chain. As the number of shards increases, the throughput of the chain increases linearly. The shard itself is also an independently running chain, and there will be a parallel model for cross-shard transaction requests

between shards, which greatly improves the speed of cross-shard transaction execution between shard chains.

This hierarchical and multi-level structure has good flexibility and scalability and can be dynamically adjusted, so each chain will not become a performance bottleneck for the entire network. Also, as the number of chains increases, the overall system's throughput increases linearly without generating too many redundant messages.

3.2.2 four-layer system structure

Based on the above hierarchical multi-level chain structure, a four-layer implementation framework is designed to facilitate the future scalability and upgrade of the system.

The first layer mainly addresses the overall system-wide consensus and is mainly responsible for dividing requests and nodes and assigning different requests to specific committees for processing. All requests are first sent to the task layer, where they will be split and assigned to different committees for parallel processing. Since not all requests can be processed in parallel, they need to be divided according to their type. Besides, all active nodes are registered at the task layer. These nodes are randomly divided into different committees and assigned different requests. We need to ensure that each committee is credible, that is, the proportion of malicious nodes within each committee does not exceed a certain threshold set by the system.

The second layer mainly solves the single-chain consensus problem and needs to process the allocated requests and generate logs. Each committee contains a set of nodes. When the committee receives a given request, it needs to process the request, reach consensus and generate a log. Since each, the trustworthiness of the committee is guaranteed by the upper layer, so this layer only needs to consider how to reach consensus in the committee as soon as possible.

The third layer mainly solves the consensus between multiple chains. The logs and request data generated by each committee are aggregated according to a specific encoding method to form a single log. The goal of the system is to generate a consistent log for each node. Therefore, aggregation algorithms are needed to integrate all the logs generated by the nodes in the committee and reach a unified log. Coding methods are also needed to reduce the storage of each node. Besides, since nodes will join and leave the committee from time to time, it is necessary to make the corresponding from the data layer is synchronized.

The fourth layer is the network layer, which is the basic layer that establishes connections between nodes and provides communication. This layer is the basis of the entire system and establishes communication between computing nodes. Within the

network layer, we can build a multi-layer network with a consensus network layer for each committee.

3.3 Consensus protocol implementation

In the Thinkium core engine, there are three types of nodes in each chain: data nodes, consensus nodes, and ordinary nodes. The data node is responsible for the storage of all the data in its chain and the interaction of information between the chains. The main responsibility of the consensus node is the calculation, packaging, and consensus of the chain. Ordinary nodes do not participate in consensus and verification data and are generally used to carry services. Each participating consensus node is randomly assigned, and they will continue to be re-selected over time.

3.3.1 Committee selection

To resist witch attacks on unauthorized systems that mimic multiple identities, we use a proof-of-stake (PoS) -based election algorithm. In the PoS mechanism, the accounting rights of consensus participants depend on the assets they own. In the consensus algorithm, consensus participants prove their rights and interests by submitting a deposit. The system uses a random algorithm to periodically select a certain number of participants according to the proportion of the deposit to form a committee responsible for block production for a period of time.

Since only the selected committee members are required to participate in each block production, in a multi-chain system, the committees of each chain can coexist and run independently of each other. As the number of nodes in the network increases, more simultaneous operations can be supported sub-chains to efficiently use the resources of the nodes.

The selection algorithm requires the following security attributes.

(1) The honesty ratio of the committee members elected in each election cannot be lower than the security requirements of the consensus algorithm. The algorithm should be fair. The more input each participant has, the higher the probability of being selected.

(2) Committee members should be fluid and unpredictable so that adversaries cannot attack the system by corrupting committee members (assuming the time of corruption exceeds the life of the committee).

First of all, before the election, since all nodes only monitor the main chain, when the next committee needs to be selected, the sub-chain must send a signal on the main chain. The election of all the chains is conducted on the main chain. Through the summary information on the main chain, the main chain can collect the election status

of each chain for summary publication. At the same time, a random seed is periodically generated on the main chain to ensure the randomness of each chain election.

Nodes willing to participate in the consensus need to register on the main chain by sending special types of transactions and pledge requirements. After the main chain releases election information, consensus participants can see the election information on the main chain and use the corresponding random seed and their private key to calculate a verifiable random function value to determine whether they are selected. When a node finds that it has the right to join a chain committee, it first joins the chain's network, sending its ID and verifiable information in it. The random function proves that this information will be recorded by the current committee. At the same time, newly joined committee members need to join the committee's network, synchronize the status of the sub-chain, etc., and use the summary on the main chain for verification, etc. to prepare for participating in consensus. The fairness of the system is crucial to the security of the system: if an attacker can occupy a majority of seats on a committee, there is no way for this committee to produce blocks normally, and it is necessary to ensure that random seeds cannot be manipulated.

3.3.2 Committee consensus

We assume that there is a partial synchronous communication model within the committee, where an effective Byzantine fault-tolerant algorithm exists, and a tailor-made PBFT variant TBFT algorithm is designed for this purpose. The committee occupies only a small part of the entire network nodes, and they will form a scale of their own smaller networks to reduce the delay of broadcasting so that the block can be produced stably and efficiently. Due to the nature of the PBFT algorithm, when the nodes in the committee meet the weak synchronization hypothesis, the block generation algorithm can run safely with less than half of the malicious nodes. Therefore, under the premise of the security of the election algorithm, the activity, correctness, and uniqueness of each committee's block production can be guaranteed. Our deposit and punishment mechanism makes it costly for members of the committee to do evil, thereby encouraging users not to do evil and reporting other people's malicious behavior.

The execution of nodes can be divided into rounds. Each round consists of three phases: proposal, preparation, and confirmation. State transitions are event-driven. To maintain system activity in the event of a network failure or malicious attack, the local clock may trigger a timeout.

Proposal stage: The head of the committee broadcasts the proposed motion to other committee members.

Preparation stage: After each committee member receives the proposed block, a message containing the signature of the block is broadcast. If a timeout is triggered before the proposed block is received, the committee members sign and broadcast a special message to the other committee members (indicating the leader is flawed).

Confirmation phase: At the end of the preparation phase, each committee member signs and broadcasts a signature received during the preparation phase. Signature aggregation can be used to significantly reduce the message size in the confirmation phase.

Based on the information received during the confirmation phase, each committee member can decide whether an agreement on the block has been reached and broadcast the agreed block or empty block and evidence of its decision.

Penalties for malicious nodes. If a misbehaving node is detected (for example, a node that sends different messages to different nodes at the same stage), the round will be aborted by outputting an empty block. However, misbehaving nodes will be subject to a large amount of economic punishment, making this attack unsustainable. If the number of signatures received during the preparation phase means that most honest committee members have received the same proposed block, committee members may reach an "early consensus": members can use the signature to output the block as proof of the agreement before the confirmation phase (Different form compared to conventional protocols), nodes still need to participate in the confirmation phase.

3.3.3 Security Analysis

Assume N is the number of nodes, n is the expected number of nodes in the committee, m is the number of committees. The number of malicious nodes is λN. when the nodes in the committee that exceed the ratio ρ are malicious nodes and we say the committee election failed. Without loss of generality, we set $N = n \cdot m$. Suppose there is a completely random oracle$O: [N] \to [m]$. Fixed a committee and definition the event where A_i becomes the proportion of malicious nodes in the committee $i > \rho$. Then for each $i \in [m]$ We all have

$$\Pr[A_i] = \sum_{x=\rho n+1}^{n} \frac{\binom{\lambda N}{x} \cdot \binom{(1-\lambda)N}{n-x}}{\binom{N}{n}}$$

With union bound, we can get

$$\Pr\left[\cup_{i\in[m]} A_i\right] \leq m \cdot \Pr[A_i]$$

With proper parameter settings, we can ensure that the probability of an event occurring is negligible.

3.4 Cross-chain messages and verification

In a multi-chain system, cross-chain operations are inevitable. Each chain needs to process some messages generated by other chains. There are two types of cross-chain messages in our system (see Multi-chain parallel later). The first is a message m_i from C_i (Chain i) to C_R (Chain r) which contains C_i a summary of the block. The message m_i is used for the final confirmation of the C_i block, and each block has only one such message. The second is from C_i to C_j external relay message $m_{i,j}$ in $m_{i,j}$ is sent to C_j before it was recorded in C_i on the block.

Before processing these messages, we should first verify them. There are two ways to verify the messages generated by the chain: (1) verify the signature; (2) verify the message hash. Both methods are useful, depending on the type of message. For messages m_i from C_i to C_R, it appends the signatures of members of the C_i and can be used to verify authenticity. Since the committee members of C_i are recorded in C_R, each node in C_R has the public key of C_i's current committee members and can verify the signature of m_i.

For the message $m_{i,j}$ from C_i to C_i, it carries a verifiable proof$\pi_{i,j}$. Before$m_{i,j}$ is sent to C_i, it is recorded on the block of C_i. On the block of C_i, there is a Merkel tree T_i for recording all external relay messages. Prove that $\pi_{i,j}$ refers to the hash value of all sibling nodes on the path from the root of the Merkle tree to its entry. The root hash of T_i is included in the digest of C_i. Since the summary of the C_i block is recorded in the main chainC_R, and each node in C_i is also a node inC_R, each node in C_i can obtain the root hash of T_i and prove by$\pi_{i,j}$.

Does not use signatures for verification $m_{i,j}$ the reason is to prevent C_i circumstances in which committee members are not completely reliable. The messages generated by this block are only C_R It will take effect upon confirmation. However, for the same subchain C_i cross-shard messages, whose verification may be faster, just wait until the summary record is in its subchain C_i, not the main chain C_R.

3.5 Network Algorithm

As a bottleneck for high-throughput blockchains, p2p technology as a potential technology for blockchain networks has attracted more and more attention. In blockchains, due to the need for a large number of data broadcast operations, efficiency and redundancy are the key issues that must be paid attention to in the design of block chain p2p networks.

Traditional blockchain P2P networks (such as Bitcoin and Ethereum) are usually based on unstructured design ideas. When broadcasting, some broadcasting mechanisms are suitable to reduce the problem of message redundancy, but the

requirements for higher throughput and point-to-point transmission will becomes insufficient. In this case, a structured network (such as DHT) is a solution that can be used for further optimization. However, in the blockchain, especially in public chain projects, there is the assumption that nodes can join and exit at will. Frequently changing networks will lead to huge costs for structural maintenance. Therefore, one of the challenges of adopting a structured P2P network is to deal with the instability and uncertainty of complex networks. In the Thinkium core engine, we use structured and non- Combination of structured methods. Some scenarios (such as point-to-point transmission) use a structured P2P network method to reduce redundancy and improve efficiency, while using unstructured transmission as a guarantee of stability.

3.6 Multi-chain Parallel Model

For multi-chain systems, the current single-chain system account models (for example, UTXO or Ethereum accounts) are no longer adapted to new requirements, especially when dealing with a large number of cross-chain operations. We have designed a new account model that allows us to implement complex logic on multi-chain systems in an asynchronous and lock-free manner. In this model, we separate transactions involving a set of accounts into multiple steps in the form of messages. Each message is received by a unique body and executed by the corresponding chain. Eventually all messages are executed to effect the transaction.

We design an Actor-based parallel model as our basic framework. The structure mainly contains the following information:

• Address: The unique identifier of the blockchain account.

• Balance: The current balance of the account.

• Nonce: A scalar value equal to the number of external messages sent from this address.

• Code: Programming logic for processing messages.

• Storage: The internal status of the account, which can be empty.

Each account is controlled by a private key. In the code, the account defines its own processing method for messages it receives, allowing messages to be sent to other accounts, creating new accounts, and modifying internal status. For some canonical messages, each account has the same general processing methods (e.g. "tran" and "add ")

There are two types of messages: external messages and relay messages. External messages are created by an account that signs them with their private key. Relay

messages are generated by the account that executes the send command during execution. These messages in our model support cross-chain propagation.

The message mainly contains the following information:

• From: Address of the sender of the message.

• To: The address of the message recipient.

• Nonce: The scalar value is equal to the number of external messages sent by the sender and is empty for relay messages.

• Input: Specify the input data group for the message call.

• Verification data: a signature identifying an external message from the sender, or a proof of a relay message.

For external messages, it can be verified by signature and nonce. For relay messages, it can be verified by proof.

In our parallel model, for each block on chain C, there are three kinds of messages,

Input messages. These messages are currently unacknowledged and the receiver account is all on the chainC. They can be external messages or relay messages generated by other chains.

Internal relay messages. These are relay messages generated during the execution of the entire block, and the receiver is also located on the chainC, so they will be confirmed on this block.

External relay messages. These are relay messages generated during the execution of the entire block, their receivers are located on other chains, and these messages will be acknowledged by other chains.

We have designed some optimization methods to reduce communication costs and account storage. Compared with other methods that are also used for concurrency, our model has higher flexibility and efficiency.

3.7 Identity and authentication

The Thinkium core engine provides users with a universal, controllable, and secure identity authentication system. The address account of the Thinkium blockchain system is not directly associated with the identity of the user, and supports users to authenticate the account. Authentication methods include: a CA with credibility issues a certificate to the account, issues authentication information on the authentication

subject's information subject, and other account the user account is authorized, etc. The identity authentication information of the account can be stored on the chain and can be quickly queried and accessed; the account owner can add and maintain authentication by himself or grant maintenance rights to other accounts. The Thinkium core engine allows flexible authentication methods. Each account can be authenticated by multiple trust chains. Each method has different levels of trust anchors and security. Users and applications can judge reliability according to their own needs.

Users can use a verifiable claim to verify the identity and other attributes of an account. A verifiable claim is created by the issuer's account signature. The verifiable declaration will be invalidated after the applicant has voluntarily revoked the statement or the validity period of the statement has expired. Except for the issuance and revocation processes, no other issuer is required to participate.

Verifiable claims may contain sensitive information, and users can protect privacy by encrypting verifiable claims. The Thinkium core engine supports three types of declaration methods, allowing users to balance security, cost, and efficiency and choose the protocol that best suits their needs. In the process of implementing verifiable declarations, the blockchain has an immutable nature. Suitable as a trusted and traceable bulletin board.

Clear text statement: The statement is published or saved in clear text without any encryption.

Encryption statement: The content of the statement is encrypted, and the verifier needs the cryptographic information provided by the holder to read it. By using a different key to encrypt each part of the statement, you can only let the verifier every time the statement is presented See the relevant part. It should be noted that if the malicious verifier publicly decrypts the key, the content of the declaration will be made public.

Another method is to use zero-knowledge proof: the holder can optionally prove some properties to the verifier, and the verifier will not get the original text of the statement or any additional information. Zero-knowledge proof can not only prove the value of the attribute, but also prove Functions about attributes, such as propositions such as "price is more than 100 yuan" or "nationality is not the United States". Using interactive random proofs can prevent the verifier from repeating the same to others (proofs are random algorithms that require the holder's participation).

Anonymous statement: Although the encrypted statement can hide the content of the statement, it cannot hide the identity of the holder. Even if the account is not presented during the verification process, the verifier knows that the two verifications are the

same when he sees the same statement twice. If the verifier and issuer collude, they can get all the information that the issuer knows about the holder. In privacy-sensitive applications, an anonymous statement should be used to protect the identity of the holder. Anonymous statement combining zero-knowledge proofs and blind signatures, even if the verifier colludes with the issuer, he cannot distinguish between different claims that meet the verification conditions. IBM's Idemix and Microsoft's U-Prove are two mature open source anonymous certificate protocols. The former is more in line with the needs of anonymous declarations.

The explicit statement can be placed on the chain publicly (such as the certification of a third-party agency), or it can be kept by the holder and presented when it is used (such as occupation and subordinate information suitable for disclosure). The other two types of declarations are generally held by the holder. The issuer can revoke a statement by issuing a notification on the designated chain, so for a statement that supports revocation, the verifier needs to read the revocation information on the chain to confirm the validity of the statement.

Users and applications can also choose to use verifiable claims outside the Thinkium core engine, which is to be compatible with existing claims and authentication systems. However, in this case, users need to manage and verify the validity of the claims themselves.

3.8 Privacy calculations

In some specific scenarios, user data needs to be calculated on the one hand, and the security and privacy of user data needs to be protected on the. When the data user cannot be trusted, a mechanism needs to be designed so that the user's data is not stolen or Abuse, this is the problem of secure multi-party computing in cryptography. In the process of secure multiparty computing, user input is used in an encrypted form, and no one can obtain input-related information other than the calculation result. The security comes from the cryptographic methods used in it, which can be strictly proved on the premise of the security of the cryptographic components.

The current secure multi-party computing scheme can theoretically implement any algorithm. However, due to the extremely high communication complexity, there is currently no way to apply it on a large scale. However, for some data-sensitive industries, even simple calculations can yield useful results. The most typical examples of this situation are medical and genetic data. With the development of cryptography technology, more feasible application scenarios will appear.

The blockchain is a platform for data publishing and communication, and secure computing provides a way to separate data from computing, which not only broadens the functions that blockchain applications can achieve, but also enables users to better

protect the privacy of data. Using secure computing can implement some functions that need to hide data or identity, such as auctions (hiding auctions other than the highest bid), secret voting, anonymous evaluation, etc. Secure computing allows users to participate in specific calculations with their own data, such as for (For public benefit) data for research or designated purposes can be sold, and at the same time, the calculation party can be prevented from using the data for other purposes or for resale.

Because the communication complexity of secure multi-party computing is high, the calculation process is suitable to be performed off-chain. The steps of initiation, coordination, recording, and payment of the calculation can be performed on the blockchain, and the calculation results can also be chained for subsequent calls. For some applications that need to prove the correctness of the calculation results (e.g. voting, auctions), you can use an auditable secure multi-party calculation algorithm and use the blockchain as a bulletin board: the participants of the calculation record the information during the calculation process on the bulletin board After that, everyone (even those who did not participate in the calculation) can verify the correctness of the calculation process through the information on the bulletin board.

3.9 Development System

The unique development architecture of the Thinkium core engine design hides a variety of obscure concepts and tools for users. It can be integrated into a Thinkium desktop application, making it easy for everyone to get started. At the same time, it also provides developers with Decentralized application and the full-stack SDK required for smart contract development, helping developers to quickly develop target applications.

3.9.1 Thinkium Desktop

The Thinkium core engine provides a standard desktop application—the Thinkium desktop, which has the ability to retrieve, download, and run applications. The desktop can run on PCs and mobile terminals, enabling users to easily use the blockchain on different devices.

（1）Application display

Each Thinkium desktop is connected to the Thinkium public blockchain network, and then reads the data of the D-Store backend on the Thinkium blockchain through Thinkium-API, and finally displays the entire application market on the desktop. Here, not only can users quickly locate Thinkium applications through classification, leaderboards, search, etc., download the applications of interest to the local area, and click and run directly. They can also evaluate and score each application they use.

（2）Application running

The Thinkium desktop includes a Thinkium-desk runtime based on the Thinkium-API. The user downloads the local Thinkium application, which can be directly opened in the Thinkium desktop and run in this environment.

Each Thinkium application is written and packaged in a strictly controlled JavaScript-like language. Each Thinkium application is written and packaged in a strictly controlled JavaScript-like language. The Thinkium application operating environment is responsible for analysis and execution, which includes application interface display, application logic operation, and calls to Thinkium services and traditional Internet services.

3.9.2 Development Framework

The Thinkium core engine has a friendly developer framework, which includes: Thinkium smart contract SDK, a set of tools used by contract developers to quickly debug and develop smart contracts; Thinkium application development SDK, a set of tools used by application developers to quickly develop applications, and It can be published on D-store and run on Thinkium desktop.

（1）Thinkium smart contract SDK

In order to facilitate the use of contract developers, the Thinkium core engine will release a compiler for the smart contract language T, which can compile T language into a virtual machine language to reduce learning costs. In addition to the compiler, the Thinkium smart contract SDK also includes native development libraries, the native development library provides the smart contract with the ability to read the native data of the Thinkium blockchain. The Thinkium core engine will provide the smart contract online IDE and a universal editor plug-in to facilitate the rapid conversion of developers.

（2）Thinkium desktop application development SDK

In order to allow users to use the Thinkium public blockchain in the most convenient way, the Thinkium core engine provides an application development language and operating environment. Using this set of development SDKs, application developers can develop Thinkium decentralized applications just like developing a web application. By using it to encapsulate the functions of the Thinkium public chain API layer, you can call the core capabilities of the blockchain and various published smart contracts, and also access external resources.

Finally, through the publishing tool in the SDK, the code is packaged and released to

the D-Store, so that users can find new applications and use them through the Thinkium desktop. D-Store makes it easier for developers to get the labor income they deserve. At the same time, it can better stimulate the production of excellent Thinkium applications and create a good ecological environment for survival.

（3）API

The API is built on the core capabilities of the blockchain and smart contracts. It encapsulates the underlying interface, smart contracts, and D-Store back-end logic under a standard protocol based on HTTP to provide remote call capabilities. The Thinkium core engine encapsulates functions on the standard interface of the API layer. As long as users use the Thinkium-API, they can obtain the full capabilities of the blockchain through remote calls.

（4）D-Store backend

The D-Store backend not only provides classified indexing and searching of applications, but also can use the blockchain data to count the usage of each application, so as to automatically generate various rankings (such as: latest, hottest, favorite, etc.).The D-Store backstage is deployed with blockchain nodes, which can quickly access block data, and at the same time share the P2P network, forming a decentralized and highly available application store that coexists with the blockchain. D-Store uses a multi-dimensional organization method to solve the scattered phenomenon of smart contracts on the existing public chain. This avoids waste of resources caused by repeated development. At the same time, more users are gathered on the same contract, making the contract Developers gain greater benefits, which in turn leads to higher quality contract functions and is driving the development of blockchain.

4 Building an industry public chain on Thinkium

4.1 Advantages and characteristics

4.1.1 Advantages

Building an industry public chain based on Thinkium's underlying infrastructure has the following three advantages:

First, low-cost construction and focus on your industry. Compared to building the infrastructure completely by itself, customers need to bear high-security risks, while using Thinkium's existing infrastructure to quickly build their public chains, they can focus more on the ecological development, application construction, and community of their public chains construction and other specific areas without having to invest huge energy and financial resources to repeatedly build the underlying infrastructure of the blockchain.

Second, cross-chain interoperability and network effects. Based on the public chain built on Thinkium's infrastructure, there is no need to worry about cross-chain interoperability issues from the beginning. In addition, with the addition and growth of more public chains, continuous precipitation trust data, a strong network effect can be formed between chains, thereby enhancing the competitiveness of all public chains.

Third, the infinite scalability. Thinkium fundamentally solves the problem of infinite scalability based on ensuring consistency and security, opening the ceiling for the ecological development of each public chain on it, and truly allowing the birth of Internet-level blockchain applications.

4.1.2 Features

Thinkium as "the public chain of the public chain"

First, the unification of the bottom layer can reduce the construction and maintenance costs of the public chain.

As the underlying infrastructure, the Thinkium public chain provides a unified bottom layer capability that allows each public chain to run on it; in a layered mode, the Thinkium public chain is constantly upgrading and iterating, enabling all public chains on it, reducing the construction and maintenance costs of the public chain.

Second, independence and freedom develop the industry's public chain ecology.

Although each industry's public chain is built on a unified underlying infrastructure, it does not mean "eat a big pot of rice." Thinkium allows each chain to develop independently and freely, including freely building chains, increasing and reducing the number of nodes, allowing each chain to expand freely shrink.

Third, decentralized development and ecological growth.

In the long run, the public chain should eventually evolve to be free of any centralized organization, develop decentralized ecological nodes in their respective chains, and realize it with the internal incentive system of the public chain. The spontaneous growth of the respective chains and the ecology of the underlying Thinkium public chain will also grow together. Moreover, as long as the minimum requirements are met, the public chain on Thinkium can exist and not perish.

Fourth, infinite extension, opening up the growth ceiling.

With the increase in the complexity of applications on each public chain and the increase of users, it is bound to raise higher requirements for the performance of the chain and storage and other service capabilities. Each industry public chain can linearly expand service capabilities by expanding nodes to meet the development requirements of the industry public chain.

Fifth, cross-chain interoperability, providing a unified, efficient, and iteratively customizable cross-chain interoperability solution.

The public chain is inherently asking for cross-chain interoperability, that is, it can form a richer application ecosystem by accessing data on different chains. Thinkium uses the basic services of the underlying public chain and a unified, efficient, and iteratively customized cross-chain solution to allow users, data, assets, and other inter-chain intercommunications among the public chains on it to fully enjoy the services of each public chain and form each public chain. The network effect between chains lays a solid foundation for a more in-depth society based on blockchain ecological governance.

Sixth, security guarantees, exerting the network effect of security.

Building a blockchain network by oneself needs to bear the underlying security risks of the chain alone. The security of all the chains built on the Thinkium's underlying public chain can develop together and promote each other. That is, when more nodes join the network, the security can be improved synchronously; for smaller or newly built public chains, you can also have the security of large public chains; with the growth of public chains in various industries, the public chain ecology will also grow simultaneously, and security will continue to improve.

4.2 Build an industry public chain

Compared to the traditional method of building a public chain from scratch, building an industry public chain based on Thinkium's underlying infrastructure includes the following six aspects:

First, startup the industry public chain.

Anyone can easily use Thinkium's underlying infrastructure at a much lower cost and time investment than traditional public chain construction methods, by simply setup and development deployment, a complete function and secure industry public chain can be startup. The initiator of the public chain does not need to worry about the huge R & D costs, and does not need to invest a lot of energy in the technical details of the underlying public chain, and avoid the potential security risks faced after the launch. They can focus on the design and development of the upper-level industry rules of the public chain and the ecological construction of the public chain, thereby reducing the barrier to entry for the industry's public chain.

Second, the industry's public chain ecological construction.

In the early stage of the industry's public chain ecological construction, Thinkium's underlying ecosystem allowed industry public chain initiators to use prepaid accounts to directly pay public chain node operating fees on the chain to complete the construction of ecological nodes. After undergoing initial verification and community construction, it can gradually be transformed into a way for the community to build nodes, that is, Thinkium nodes can join by supporting the designated industry public chain, and allow this industry public chain to use more nodes resources to expand the service capabilities of the public chain in this industry.

Third, set the incentive mechanism of the industry public chain.

The incentive mechanism is related to the survival and development of the industry public chain. The industry public chain sets its own joining rules by issuing its own public chain currency (such as staking, PoW, PoC, establish its own mining machine ecology, etc.), design incentive distribution rules based on its token to encourage more users to participate in the ecological construction. As the Thinkium underlying consensus mechanism has been resolved, therefore, they can focus on the design of the incentive mechanism at the upper level of the industry public chain without worrying about the impact on the underlying consensus algorithm, so as to build a more flexible and attractive incentive mechanism and promote the development of the industry's public chain's own ecology.

Fourth, share the basic services of the underlying public chain.

The industry public chain can make full use of Thinkium's underlying services that continue to precipitate and iterate, such as ID systems, asset transactions, social services, data services, etc., to enrich the depth and breadth of its own on-chain services. It will connect users, data, assets in the Thinkium ecosystem with its own industry public chain services, and accelerate the industry's public chain growth.

Fifth, the growth of the industry public chain token.

From the user's perspective, because the industry public chain built on the underlying infrastructure of Thinkium has the ability of smooth user and asset cross-chain communication, community users can use on-chain service and consume public chain token, they can also benefit dividends from other public chains of the entire Thinkium ecosystem.

From a service perspective, due to the convenient cross-chain data communication, rich application service scenarios can be constructed, improving the service depth and stickiness of the public industry ecosystem of the entire industry, and increasing the scope and frequency of public chain token.

From a technical perspective, not only does the security of the industry public chain continue to strengthen with the prosperity of the Thinkium ecosystem, but also because the service capacity of the industry public chain can be linearly expanded, allowing more users to join the industry public chain ecosystem, The birth of large-scale Internet-level applications in the chain provides technical guarantees and clears obstacles for the value growth of public blockchains.

Sixth, the governance of the industry's public chain.

Each industry's public chain can carry out the governance of the industry's public chain according to its own development pace. From the perspective of the development of the industry's public chain, it often goes through internal test verification, external testing, mainnet launch, and subsequent iterations, during which problems will be continuously discovered and resolved.

During the internal test verification phase, industry public chain builders can choose to roll back or close and rebuild the new chain to repair or modify the rules on the chain. After the mainnet is launched, Thinkium's industry public chain can govern the entire industry public chain through the basic community governance rules or custom governance rules provided by Thinkium's underlying infrastructure.

5 Thinkium distributed business

One of Thinkium's design goals is to build and support the real-world business. Its technical characteristics determine that it can perfectly support the high-concurrency processing of complex tasks, allowing the blockchain to more efficiently carry large-scale transactions and users. The application operation makes it possible to implement a blockchain commercial project that was originally due to limited technology maturity.

The underlying infrastructure and basic services built by Thinkium can be compared to a mutual trust business collaboration engine, which has spawned a trusted, secure business environment. In such a business environment, users, data, and assets interoperability, greatly reducing the cost of distributed collaboration across business entities, can also promote more adequate market competition, improve the degree of information matching and collaboration between supply and demand sides, and achieve multilateral incentive compatibility. The entire business ecosystem is more prosperous, orderly and sustainable development.

5.1 Definition of Distributed Business

Distributed commerce is another evolution of business. Based on the evolution and development of individual needs and the establishment of a trusted business world. Based on blockchain technology, it can greatly reduce collaboration costs, promote value creation, and be more beneficial to the development of each individual in society. It is a new business form.

Distributed commerce is a new type of production relationship based on blockchain technology. Multi-party business entities are based on the blockchain trusted network and the rights of new digital entities, and code business logic and distribution rules. Each entity conducts organizational management, collaborative production, business promotion, and settlement of interests through transparent rules that can be enforced and automatically enforced. Participants in any business activity have fair, equitable, trustworthy and secure collaboration and transactions, and ultimately achieve joint construction, a win-win and highly collaborative social production and life goal.

Three characteristics of distributed commerce:

First, data becomes the "main body" and a very important asset, and ownership and interaction records can be recorded and traceable on the chain to ensure that the content and process of collaboration and transactions are credible and secure.

In the Internet era, once the data produced is easily copied and disseminated, the

rights of individual users cannot be guaranteed, and even privacy is violated. A large amount of data and interaction records are monopolized by centralized platforms, which seriously hinders the flow of information. The data created by users can only be used by enterprises for free.

Blockchain technology first solves the problem of the right and traceability of digital assets. The subject of the property rights of the data is confirmed, and the process information of collaboration and transactions is recorded on the chain which cannot be tampered with. Anyone who wants to obtain data can directly exchange data with the data subject without going through any third-party platform. Therefore, blockchain-based business collaboration is credible.

Second, based on trusted business collaboration and value exchange, transaction costs will inevitably be greatly reduced.

From the perspective of back-end production collaboration. Based on pre-defined industry rules, the collaboration subjects are recorded on the public or consortium chain. Upstream and downstream companies can access the required information in real-time and securely through the chain, and cooperate with centralized production. The system and the IOT synchronize data, which can achieve "automated production node collaboration across the entire network", not only reduces the information communication cost of multiple parties involved in collaboration but also makes the cooperation more reliable. Transaction settlement is performed automatically based on smart contracts, which can reduce financial costs and greatly improve production collaboration efficiency.

From the perspective of front-end market transactions: On the one hand, through the close community relationship, the decision-making cost of users to obtain valuable information is lower; on the other hand, based on trusted user data on the chain and transparent transaction rules, the transaction costs can also be greatly reduced. Besides, based on the token economy system, the interests of participants are bind together, and more business cooperation can be generated, such as co-branding and co-construction of services; consumers can become promotion ambassadors and investors on the supply side, brand designer, after-sales service, etc., which can greatly reduce the costs and strengthen the community relationship. This is difficult to achieve in Internet e-commerce.

Third, based on the credible distribution rules on the chain, the transparent execution process, and the token economic incentive mechanism, the participants can eventually form a true community of commercial interests.

In the Internet era, user data is concentrated on major Internet platforms, and the platform is the biggest winner. The "Matt effect" makes it increasingly difficult for

small and medium-sized enterprises and self-employed businesses to do business. The user's personal needs cannot be met well. Although new models such as social e-commerce and IP e-commerce have gradually emerged, they are still only superficial and cannot solve the credit problems of centralized organizations or individuals.

Blockchain completely solves the User trust issues and the credibility of rule execution. The benefit distribution rules under the traditional model are automatically executed based on on-chain contracts and the information is transparent, and multilateral commercial entities have obtained benefits. In addition, based on the token economy system, economic activity is no longer friction or competition between each other, but instead becomes a business completed through cooperation. The zero-sum game in traditional commerce and internet commerce will eventually be replaced by a win-win situation in the blockchain era, promote the sustainable development of business ecology.

5.2 Development path of distributed commerce

5.2.1 Thinkium Distributed Business Ecology

Thinkium's distributed business ecosystem is a business ecosystem based on the Thinkium blockchain infrastructure. It is an important window for the blockchain to link people and the physical world, including on-chain native business and off-chain business.

All user subjects, data, and assets participating in the business ecosystem are recorded on the underlying public chain. Each user subject is an account on the chain, which can be a person, a machine, or a virtual subject. Combined with Thinkium data authorization and protection system, the data belongs to users and becomes an important personal asset. Based on Thinkium's underlying infrastructure, data interaction between cross-chain and cross-application can be achieved, avoiding traditional "data islands" between different business ecosystems in internet commerce and generate more and greater business value.

Case: How will pencils that meet the individual needs of each student operate in a distributed business ecosystem?

First，business Scenario: Pencils are daily consumables for students. Every student expects to buy pencils that meet their personal preferences and often change their needs.

Loyal users multiply quickly and spontaneously form a distributed community: Suppose a student (Elsa) buys a custom pencil from the Disney movie Frozen series,

and it will be easy to recommend it to other students (Kitty, Nimo, etc.) spontaneously, and form multiple Student communities on different topics, such as the Frozen community, My Little Pony community, etc. Community members will have more exchanges around topics including movies, TV, books and other related topics, etc. Merchants can also generate new business growth points based on community needs.

Third, the fission effect of the community under the incentive mechanism: recommending orders to get rewards, all online behaviors are automatically accumulated as credit points, which can "make money", and can also be "investors". For example, if an enterprise adds or expands a certain series of pencil production lines, it can issue a token for the production line for market circulation, and users who obtain the token can share future operating income with the manufacturer; the owner and the merchant reach a consensus and establish " Promote smart contracts for cooperation ", the community KOL comes with" Second Occupation ".

Fourth, "Market-production-supply chain" node-wide automated collaboration: Supply-side service providers are authorized to access IM information, analyze it in structured data, and assist supply-side business decision-making. The personalized needs of pencils are automatically synchronized to the merchant's back-end management system, and structured information related to pencil needs is accessed on the chain. Various manufacturers of pencils, upstream raw material suppliers, paint and other supporting material suppliers, Disney IP copyright parties and other commercial entities can access market information, the downstream partner needs and order information at any time with authorization. Scheduling information and logistics needs, and respond instantly.

Fifth. Rules for automatic settlement and distribution: After the current pencil production line is completed, the smart contracts on the upstream and downstream enterprise chains are automatically executed to complete the digital asset transfer settlement.

Sixth, corporate financing is transparent and credible, and supervision is more convenient: a company in the pencil industry needs to raise funds, and financing institutions can establish financing contracts with credible dynamic operating data on the chain, and even set financing incentive mechanisms based on the dynamic operating results on the chain; All enterprises can issue tokens based on their quantitative assets and conduct "self-financing", and token assets can flow freely in the ecology. At the same time, social and government regulatory agencies can implement legal and tax supervision by accessing open and transparent information on the chain.

Thinkium has done a lot of research, exploration, and practice from multiple fields, and is committed to providing the underlying technology infrastructure while

empowering the entire business ecosystem, supporting distributed e-commerce, distributed finance, distributed production collaboration, and distributed large-scale commercial applications such as organizations and distributed virtual economies have been implemented. Users participating in the business ecosystem include developers, consumers, manufacturers, suppliers, brand owners, financial organizations, and regulatory agencies. Participate in equal and free business activities under certain business rules, exert their respective contributions and talents, and benefit from them.

The following outlines several typical business applications based on the Thinkium distributed business ecosystem.

（1）Distributed e-commerce

Distributed e-commerce refers to a trusted and affirmative supply and demand network based on Thinkium blockchain technology. In this mutual trust network, the behaviors of each participant are assessed according to the standards of consensus, and at the same time, they can be autonomous per under the rules of consensus collaborate and exchange value.

This is a new type of "demand-supply" relationship. User data of all participants is recorded on the chain, and the supplier (value creator) of the goods or services can directly communicate, collaborate and exchange value with consumers through a trusted community. The concept of consumption as an investment makes the two parties close community of interests. In such a new mutual trust distributed e-commerce network, the collaboration friction between the participating parties has been greatly reduced, and the collaboration efficiency has been greatly improved. The trusted collaboration network and real ID system built on Thinkium make the value of each role more reasonably allocated and continuously stored, to achieve their capability upgrade and role transformation.

Consumers (users): At the same time, they are also multiple roles such as marketing promoters, brand designers, content producers, service providers, and investors, and enjoy multiple benefits. First, based on the on-chain traceability system, consumers can obtain products and services of better quality. Second, users can accumulate points for various consumption and promotion behaviors and obtain tokens. Based on the token economic system, they can participate in the benefits of brands and malls. Dividends; third, the user's data assets are confirmed, cross-mall, cross-brand owners, and cross-business applications are authorized to use, security is guaranteed, and data assets are realized in various ways; fourth, users are free to choose to participate in community co-construction and branding Co-construction, co-construction of services, etc., to gain more benefits by contributing; for example, community members perform a more specialized division of labor, give play to their expertise in design, service, selection, etc., and create content and services. It can be assessed and play greater

value in distributed business networks.

Supply-side: especially many small and medium-sized enterprises, direct suppliers of origin, self-employed, small brand owners, etc. First, the supplier directly contacts the customer, and the marketing cost is greatly reduced. At the same time, the supplier can focus more on the product itself. Second, it used to be marketing before selling and then collecting money. The supplier's cash flow is more plentiful and the settlement method is more credible. Third, the supplier has refined the user community and provided more value-added services by providing more value-added services. Fourth, the financing logic has undergone substantial changes. The supplier uses the actual business results as a brand endorsement to obtain lower-cost credit services. Fifth, zero-cost distributed brand building and service building. Through the mechanism of sharing revenue, members of the community are encouraged to participate in co-brand building and service co-building. Meet the individual needs of consumers.

（2）Distributed production collaboration

Distributed production collaboration refers to the integration of the supply side based on Thinkium blockchain technology to form a network-wide collaborative and efficient operation of R & D, manufacturing, and manufacturing networks. In raw materials, production, processing, design, R & D, pricing, brand promotion, and other links, each participant collaborates autonomously to provide products and services and determine the final benefits according to the value of their respective contributions.

This is a new type of production collaboration network relationship. Each supplier and service provider in the collaboration network is an independent production node, and its production and operation data can be stored and managed in a centralized server. Key business data, settlement information, node information and summary can be recorded on the chain and authorized access, to form a high degree of interconnection on the chain between each supply-side and demand side. Dynamic data regulation and precise matching, to achieve production and customization are required. Upstream and downstream can achieve cooperation without a large number of communication costs and physical contracts and can realize dynamic collaborative production of the supply chain, mutual payment settlement, and automatic completion according to consensus rules and agreements on the chain. The payment period of the supplier's payment can be greatly shortened while ensuring sufficient production efficiency and extremely low waste of resources. Besides, based on the credible relationship between upstream and downstream, and the sharing, transparency, and credibility of demand-side information, Manufacturers can obtain upstream material supply in advance utilizing goods financing, and upstream can also lock downstream orders by issuing tokens and token asset circulation. The parties to the industrial cooperation

form a multi-party mutually beneficial and credible production alliance.

Utilizing the underlying infrastructure of the Thinkium blockchain, business entities can split their business according to their own business needs, placing part of the business that must be strictly confidential in a trusted consortium chain, and placing another part of the business that needs to be circulated on a larger scale. In the industry public chain, it can meet the needs of confidentiality and business on-chain. The blockchain technology landing path of commercial entities will be greatly shortened by the emergence of Thinkium, which can attract more business entities to participate in the blockchain revolution.

（3）Distributed Finance

Distributed finance refers to the provision of a license-free financial service ecosystem based on Thinkium. The occurrence of any financial activity does not require any centralized authority. It can be done directly on both the supply and demand sides and can be used by anyone.

Distributed finance based on Thinkium's underlying infrastructure can achieve:

(a) Allow financial services to be completed under intermediaries. The general public's needs for financial services include: savings, loans, transactions, insurance and other financial services, which can be implemented in DAPP applications developed on Thinkium, and support mass users to achieve high-efficiency Financial Services.

(b) Assets on the chain can be freely interchanged. Assets on the public chain of any industry based on Thinkium can flow freely within the Thinkium ecosystem without being restricted by asset types, regions, industries, etc., which can make the entire distributed finance more efficient. Not only higher than the efficiency of traditional financial services, but also higher than any related applications in the field of distributed finance, and truly realize decentralized finance.

(c) Help promote large-scale distributed business ecosystems to create better products and services. For example, for some small, medium and micro-enterprise brands or individual operators, their credit and value can be more accurately measured based on trusted operating data recorded on the chain To make it easier to obtain financial services to promote productivity; for participants in the supply chain involved in production collaboration, upstream and downstream can solve the problem of financing difficulties and expensive financing for small and medium-sized enterprises through goods financing.

(d) Reduce corporate financial costs and financial risks. Since every transaction in the supply chain production collaboration and commodity market circulation can occur

and be confirmed on the chain, it can save a lot of financial settlement costs such as reconciliation in traditional business; at the same time, it can reduce corporate receivables risk, improve the efficiency of corporate capital turnover.

(e) The transparency of financial liquidity provides a good basis for financial supervision.

（4）Distributed Virtual Economy

In the virtual world of the Internet, digital assets belong to a centralized platform organization. In a distributed virtual economy, digital assets such as account systems and data truly belong to users, so more possibilities can be born. For example, traditional game development is mainly centered on the center in a distributed virtual economy, assets in the game are confirmed on the chain, and gold coins and points in the game can communicate with each other inside and outside the game, thereby building an open game ecosystem. Organizations or individuals can be based on The existing game further develops derivative content, and even if the original game development organization has been shut down, there is an opportunity to continue to maintain the operation and iteration of the game.

Thinkium's linear and scalable technical characteristics can support the birth of Internet-level gaming applications in a distributed virtual economy.

5.2.2 Thinkium Distributed Business Roadmap

Distributed commerce is an inevitable trend of future commercial development. At present and in the future, traditional commerce, Internet commerce, and distributed commerce will coexist with each other. Internet commerce and distributed commerce will continue for a long time.

Combining a large amount of practical and theoretical research, Thinkium is committed to providing low-level blockchain technology services to ecological participants while enabling low-level infrastructure to enable ecological landings and large-scale commercial applications. At present, Thinkium's distributed commercial landing has been started. It will go through the following stages:

The first phase: solid foundation and community activation, the focus includes:

(1) Establish a strong and stable underlying business infrastructure environment, including Thinkium's underlying infrastructure and underlying core basic services;

(2) Simultaneously start the construction of Thinkium ecological communities in various regions of the world.

At present, this stage has been initially completed, the underlying core basic services are being improved, and the technical conditions for building the industry's public chain and consortium chain are also available. Individuals, community organizations, technology developers, and developer communities in various regions of the world can participate in the construction of Thinkium's underlying ecological nodes and the development of underlying universal tools.

The second stage: based on the principle of "unit value density on the chain", priority is given to focusing on industries or industry information with a sufficiently high unit value density for the global large-scale commercial landing, and the industrial ecological community will be simultaneously constructed. Unit value density refers to, the value of unit bytes (storage), including assets, collaboration

Distributed e-commerce; the core data of Internet e-commerce is transaction order information, information about users and merchants on both sides of the transaction, product and service page information, etc. The unit value density of these data is very high, and the value contribution to the real economy is also very large. The Change of Consciousness of "User Data Asset Return"

Distributed finance; the core data of finance is transaction information and account information. The unit value density of financial data is very high, and the requirements for security and confidentiality are also very high. It is related to the natural attributes of the blockchain and the power of Thinkium's underlying infrastructure. The technical capabilities also match very well.

Distributed games; the core data of the game are props, gold coins, points, and other assets and user information, and the unit value density of virtual assets is very high; moreover, user assets in traditional Internet games are relatively closed, and different games cannot communicate with each other, and users The demand for open liquidity of assets cannot be met, which is very easy to achieve in the blockchain world.

Distributed content copyright; content includes text, video, audio, patents, etc., its copyright information has a high unit value density and requires high security and confidentiality. Based on Thinkium, it is possible to build a proprietary public sector industry chain, the content data can be stored on a centralized server, and the content information digest is recorded on the chain through the hash. The property rights subject is uniquely identified and cannot be tampered with. The property rights use process can be traced back.

The third stage: Deep integration of cutting-edge information technologies such as artificial intelligence, big data, and the Internet of Things, so that more valuable assets, data, and information worldwide can be efficient in the public chain ecology of various industries based on Thinkium's unified underlying infrastructure

Interconnection and interoperability allow the full integration of the blockchain to penetrate the global and entire social and industrial economy. With the development of ecological communities in various industries, the underlying ecology of Thinkium is also more prosperous.

5.2.3 Thinkium distributed e-commerce solutions have been launched

Based on the following four factors, Thinkium's first enabling field is the online retail industry, that is, distributed e-commerce.

First, the core data of e-commerce is transaction information and user information. Its "unit value density" is very high. Its "unit value density" is very high, and the input-output rate of the chain is high.

Second, the scale of e-commerce users and transactions is large enough that the asset on-chain can be more valuable to each user in the society. In traditional Internet e-commerce, ownership of user data assets did not get the return it deserves.

Third, after the e-commerce core data is put on the chain, the traffic will automatically flow to higher-value products. "Whose products and services are good; the traffic will go freely." Being well satisfied can also solve the problem of financing difficulties for a large number of small and medium-sized enterprises and individual operators;

Fourth, the close integration of e-commerce and the real economy can create greater socio-economic value.

At present, the distributed e-commerce community in Asia has started, and the first distributed e-commerce system has begun to run. Thinkium-based distributed e-commerce landing solutions include on-chain infrastructure, distributed business system platforms, and distributed e-commerce community organizations.

Complete on-chain infrastructure, including the underlying public chain, underlying public chain basic services, industry public and alliance chains, and data storage of on-chain information. The underlying public chain basic services include a decentralized account system, a decentralized asset trading platform, a decentralized instant messaging service, and a decentralized industry public chain construction.

The distributed e-commerce system platform consists of three parts:

(1) Set the total amount of issuance of tokens, determine the issuance mechanism of tokens, and manage them; for example zero pre-mining mode or early sale and mining mode.

(2) Set promotion rules, incentive methods, incentive strategies, and other incentive

mechanisms, including the promotion of consumer rebates, behavioral asset exchange tokens and token equity rules, etc. to ensure revenue sharing;

(3) Make sure that product order information, product details, inventory information, payment methods, preferential measures, and other product and service information are recorded on the chain to ensure that the transaction is executable, the transaction is performed by real performance, and the information before and after the transaction is consistent.

Distributed e-commerce community organizations. Users participating in the construction of Thinkium's underlying ecological community can freely participate in various business activities on it and become seed users in the distributed e-commerce community; meanwhile, users of traditional e-commerce can also be moved to In the blockchain world, participating in distributed e-commerce can not only have a trusted digital ID in the blockchain world but also share more ecological benefits and share the digital asset benefits brought by Thinkium's ecological prosperity.

6 Thinkium Ecological Development and Governance

6.1 Thinkium Ecological Development

6.1.1 Dynamic model

The Thinkium world from scratch, from simple to complex, from the underlying architecture to the public chain, from the system contract to the upper-layer application, will form an interconnected, interacting, interdependent, and automated ecosystem with an automatic adjustment mechanism. The regulation mechanism is the dynamic model of Thinkium's ecology.

The main roles included in this dynamic model include ecological nodes, business entities in various industries, community construction contributors, community communicators, developers, DAPP users, investors, etc. Thinkium's native digital assets are the key to connecting the economic activities of various characters in the model, and also an entry ticket for each user to enter the ecological community.

The Thinkium ecological node is the basic builder of its public chain. By continuing staking, it provides the necessary resources such as computing power, storage, and networks, and provides the ecosystem with contract and transaction verification and data storage services in exchange for more asset incentives. The users of the services provided by the nodes are the commercial entities of Thinkium's distributed commerce. They need to pay for a certain amount of natively digital assets to achieve their commercial purposes. The terminal community users in the ecosystem use DAPP services and distribution commercial activities, etc., also need to consume more native digital assets. With the prosperity of Thinkium's distributed business ecosystem, more and more community users are participating in the ecosystem, and the demand for native digital assets is also growing. With a constant total amount of assets, its value can obtain continuous growth, which brings the impetus for the continued value appreciation of assets to various roles in the entire ecology and ultimately promotes the continued prosperity of the entire ecology.

Thinkium's seed users are also Thinkium's ecological promotion and evangelists, providing the user base and node construction foundation for the subsequent industry public chain launch. As the community user fission grows, more users' open and transparent governance rules through the chain the corresponding rewards are obtained through incentive mechanisms and nodes are added and run, and the number of nodes gradually increases. As the cost of the industry public chain is getting lower and lower, the security of the underlying public chain is getting higher and higher, and

the industry public chain and applications are implemented and users and more and more data on the chain.

The growth of public chains in various industries has also brought Thinkium's own more nodes and users, which can provide better security and performance, and also provide the basis for cross-chain integration and development. Thinkium continuously improves the underlying infrastructure of the public chain, precipitates general public chain deployment, governance, and application rules, and improves cross-chain technology and on-chain asset transactions, so that users on each chain can easily use the public chain of any industry in the entire Thinkium ecosystem. Public chains can use data on other chains to broaden the ecological application scope of its own and enrich their ecological applications. They can guide the establishment of incentive mechanisms to allow other community users to try to use their on-chain services and encourage their community to participate in cross-chain basic services such as asset exchange and improve the liquidity of public chain assets. Therefore, community users can easily use other on-chain services while holding their assets, and can also improve their industry public chain. The holding rate of assets, the user's assets can be freely and seamlessly exchanged between the various chains, and at the same time, it also reflects the exponential growth of the entire Thinkium underlying public chain ecology.

Thinkium eventually forms a large ecosystem of openness, sharing, co-construction and co-governance with all its participants, and together it brings greater value to the development of the entire society, commerce, industry, economy, and individuals.

6.1.2 Development Path

Phase 1: Construction of the underlying infrastructure

The initial Thinkium was an operating system establishment, built by a small number of community user deployment nodes, and used by global chain developers for the architecture and programming of the blockchain core system. After more than three years of cooperation between scientific researchers and global community efforts. Nowadays, Thinkium has completed the deployment of more global nodes, automatically running into a huge network operating system, and completed the successful test of unlimited and scalable performance based on ensuring distributed, secure, and evolved into a never-ending trusted computer.

Phase 2: the implementation of the industry public chain application

Thinkium continuously improves and reduces the threshold for the establishment of industry public chains, precipitates general public chain deployment, governance, incentives, and application rules, and attracts more and more industry organizations or

developers to build and organize industry public chains based on Thinkium's underlying infrastructure and organize The community in the industry conducts public chain node deployment, industrial application landing, application token issuance, etc., and at the same time realizes information exchange, value exchange, and user sharing between multiple chains, giving the entire ecosystem a more tenacious vitality. Thinkium has become a real meaning blockchain infrastructure.

Phase 3: Thinkium Digital Life

Thinkium Ecosystem with the landing of various native and traditional applications, people have started to create their own digital identities, consume or collaborate based on various rules, and have various on-chain assets, and each asset can be transferred on the chain to continuously generate value to promote the formal entry of humans into a trusted life on the chain. Thinkium's ecological users have grown exponentially. Thinkium will completely rely on the underlying technology to ensure the credible implementation of the rules of the new world of blockchain and rely on the government, laws, and regulations and a center link the old world of endorsement platforms to endorse.

6.1.3 Ecological future

Thinkium leads us into a brand-new world, a world of distributed autonomous systems. In this new world, the untrustworthy virtual world becomes rule-based, and each person or thing can have its own digital identity. Your growth, learning, work, life, assets, activity tracking, etc. are truly recorded on the chain, and all data is effectively protected; you can use all kinds of applications or tools in this world with great confidence, Buy all kinds of goods or services you need, manage your various assets or information, and start your own digital life; you can also join various communities, participate in business collaboration based on various rules, and link more people or things (machines), Provide better products or services for others, and get corresponding Token rewards as compensation. Even become the maker of rules in a certain field, issue their industry public chain or scenario applications, and organize upstream and downstream industries or communities in the supply chain to create, create products or services that belong to this world, output more energy and value, link the physical world and Thinkium, and jointly promote a new economic system in a trusted society, the establishment of the rule of human society gradually.

The future of Thinkium ecology belongs to everyone, every ideal and intelligent creator and contribution value can join in to edit his own life and contribute his strength. At the same time, each contributor will be in the process of ecological construction. Gain huge wealth.

6.2 Thinkium Ecological Governance

6.2.1 Significance of ecological governance

The Thinkium ecosystem is unowned but available to everyone. It is a typical "public product" that requires continuous maintenance and upgrades. The open system builds a global ecology that can be participated by all walks of life. There is both competition and cooperation in the ecology. There are both independent individual operations and overall cooperation that affect each other. The particularity of Thinkium's ecology requires scientific and perfect ecological governance to solve the issue of public product efficiency, to ensure the continuous iterative upgrade of technology and the development and prosperity of ecology, to coordinate the competition and cooperation within the ecosystem to make the ecological operation stable and orderly, and to ensure the common interests Implementation.

6.2.2 Principles of Ecological Governance

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6.2.3 Ecological governance system

The Thinkium ecosystem adheres to the concept of "co-construction, co-governance, and sharing". The foundation is mainly responsible for the formulation of ecological governance systems and decision-making mechanisms, the development of Thinkium's underlying infrastructure technology upgrade iterative schemes, the formulation of Thinkium Ecology in the global market development planning scheme, the development of dispute disputes and problem solutions in ecological development, and ecological development. The formulation of incentive and punishment plans, the formulation of emergency plans for major ecological issues, and other major decisions; as the executive agency for daily governance, proactively propose proposals for iterative technological upgrades and ecological development, implement and supervise major decisions, and maintain the underlying system , Service ecology, collaborative ecological competition and coordination issues and other daily affairs management.

(1) Thinkium Foundation

The Thinkium Foundation is responsible for the official body and daily execution agency of ecological governance. The Foundation is mainly responsible for the formulation of ecological governance systems and decision-making mechanisms, the formulation of Thinkium's underlying infrastructure technology upgrade iteration plans, and the formulation of Thinkium's ecological development plan in the global market. The formulation of major disputes and solutions to ecological development, the development of ecological development incentives and punishment programs, the formulation of major ecological problems emergency plans, and other major decisions; and as the executive agency of daily governance, it actively proposes iterative technological upgrades and ecological development. Propose a plan to implement and supervise daily affairs management such as major decision-making, maintenance of underlying systems, service ecology, and collaborative ecological competition and coordination issues.

The Thinkium Foundation is a non-profit organization, whose members are composed of technical geeks, network nodes, and enterprises in various industries, ecological users, or academic institutions. T The foundation has a board of directors as a daily executive agency, and a board of supervisors is responsible for the supervision and management of the foundation. Professional committees can be established within the foundation to improve the professionalism of governance. Each professional committee can propose governance solutions corresponding to professional fields to submit decisions through the foundation, and can also participate in the service and guidance of professional ecological development.

(2) Professional community self-organization

The Thinkium ecological governance organization method advocates and encourages the establishment of various ecology, participants, or professional autonomous organizations, such as developer committees, network node committees, user committees, industry public chain or application committees, and technical committees. Ecological governance encourages various professional exchanges between self-organizations, supports this self-organization to submit proposals to the foundation for Thinkium's underlying infrastructure or ecological development, and the foundation submits to decision-making bodies for voting decisions to jointly promote ecological development and prosperity. Professional committee autonomy is the lubricant and professional guarantee for Thinkium's ecological governance.

(3) User community

In the way of governing the Thinkium ecosystem, empowering users, allowing and encouraging users to actively participate in ecological affairs, advocating the cultivation and enhancement of users' willingness, ability, and participation methods to participate in ecological governance, and building a user community to facilitate user participation in governance. Users can suggest solutions for ecological development，can vote on major ecological development improvements as well.

In Thinkium's ecological governance organization, the foundation takes the lead and guides the solution of the "agent problem" and "free-riding" of public products and at the same time provides guidance for ecological evolution. It is the basic subject of ecological governance; specialization is the autonomy of the committee. On the one hand, it can provide professional technical support for the evolution of ecological governance, and on the other hand, it can help provide planning needs and directions for ecological evolution; while the user community is the foundation of the ecology, and the participation of users makes the ecology meaningful and valuable. Construct a governance and cooperation network governance method based on foundations, professional committee autonomy, and user communities, cooperate, and complement each other, for the prosperity of Thinkium's ecosystem.

7 Thinkium Covenant

528 years ago, Christopher Columbus led three ships and 90 sailors bravely set sail to discover the New World, which greatly expanded the space and boundary of human survival and development.

58 years ago, John Fitzgerald Kennedy said eloquently: In the next decade, we will send humans to the moon, and we choose to go to the moon not because it is simple, but because it is difficult. Since then, human exploration steps into the moon.

Three years ago, several tech geeks from around the world reached a consensus because of their belief in "changing the world with technology." Thinkium was born. Thinkium redefines "people" and redefines through a never-ending trusted core engine low-level rules, and radiate to any part of the world, helping every participant in "free, equal, open, and just" Thinkium new world in return for growth and value.

The emergence of Bitcoin has opened the door to the blockchain world for us, leading the development of the blockchain field for twelve years, and also igniting the wealth dream of a few people. In the Thinkium world, each has an ideal and wisdom, talented value creators and contributors are free to join various ecosystems, edit their digital lives, and contribute their strengths. At the same time, they have huge wealth, and there is no longer a limit to the path to dream realization.

"Great career begins with dreams". The realization of dreams is a little bit of growth. The process of growth will not always be so smooth. Bamboo will use the first 4 years to grow only 3cm, and every day from the fifth year 30cm in length. Foresight, perseverance, and courage are the qualities of the creator.

Sowing is instantaneous, rooting, germination, and growth are long, but each step is solid, the growth process is iterative and evolved, and each small segment in the process is self-improvement. Today's Thinkium is still a small bud, the near future will be a small tree, and then there will be more trees, which will eventually be a forest.

Everyone has eyes, but not everyone has a vision. Everyone has both hands, but not everyone can seize the opportunity. Everyone has a chance, but not everyone dares to pursue their dreams. Welcome to the new world of Thinkium!