

Exploration and Practice of Constructing Trusted Public IT Systems Using Blockchain-Based Service Network

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Abstract: Blockchain is one of the most influential technologies in the new round of digital economy development. In order to promote the prosperity of the digital economy with blockchain technology, we need to understand the essence of blockchain and the actual demands of relevant business. This paper delves into the nature of blockchain as a broadcast transmission technology from the perspective of technology evolution and analyzes the necessity of building a blockchain-based public Information Technology (IT) system. In addition, this paper analyzes the architecture, characteristics, and applications regarding trusted public IT system construction by drawing on the design ideas and architecture of Blockchain-based Service Network (BSN).

Key words: Blockchain-based Service Network (BSN); broadcast transmission protocols; public Information Technology (IT) systems

1 Introduction

Blockchain^[1–4] is one of the most influential technologies in the new round of digital economy development. However, there are many different views on blockchain in academia and industry. Some researchers think blockchain is a shared ledger^[5, 6] or a new database technology^[7, 8]. However, others believe it is a data tracing technology^[9–11] or a digital currency^[12, 13]. These definitions mentioned above show the extension of the concept of blockchain technology, which only reflects its technical characteristics and application scenarios. To understand the essence of blockchain, we shall step out of the concept and review the development process of information technology.

In human history, every round of information

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Manuscript received: 2023-10-26; accepted: 2023-12-20

revolution has been achieved by changing the ways of information transmission to improve communication efficiency. The invention of the telephone in 1876 led to a qualitative leap in information exchange, which broke through the limitations of time and space for communication between people. However, at early stage, telephones could only support two-way calls and could not meet the needs of multi-person communication. Worse still, this linear mode of information transmission had low efficiency and was prone to errors during communication. With the development of technology, teleconference systems that support multi-person calls have emerged. From the perspective of information dissemination, teleconferences have changed the original linear mode of information transmission into the broadcast mode, which entirely updates the way of information exchange. In 1946, the first computer appeared, followed by the birth of the Internet in the 1970s, also known as the World Wide Web^[14], which triggered a technology and information revolution and ushered in a new era of human civilization. However, the Internet comprises networks connected by individual computers, and its information exchange way is still essentially a linear mode of pairwise transmission.

Let us compare the Internet and blockchain technology with telephones and teleconferences. The great thing about blockchain technology is that it simulates a broadcast transmission mode based on the existing hardware of the Internet, which allows multiple Information Technology (IT) systems to conduct teleconferences and form networks where information can be transmitted and exchanged in all directions. As a result, blockchain users can reach consensus faster and more efficiently. This type of broadcast transmission is an evolution of the Internet and an upgrade in the way of information dissemination, which must meet three principles at the same time: first, the data are transmitted to other people in a broadcast manner; second, the feedback of any data recipient will be broadcast to everyone in the network; third, everyone in the network must simultaneously know that others are receiving the same data. It is easy to see that the broadcast communication mode has the advantages of higher information transmission efficiency, more transparency, decentralization, security, and credibility. In general, the essence of blockchain technology is a decentralized, distributed, open, and transparent information system that utilizes broadcast transmission methods to co-govern the data in terms of structure, traceability, authority, and verification based on consensus.

This paper profoundly explores the nature of blockchain as a broadcast transmission technology from the perspective of technological evolution, analyzes the shortcomings of the existing Internet, and proposes the necessity of building a public IT system based on blockchain. Furthermore, based on the design concept and technical system of Blockchain-based Service Network (BSN) in practice, this paper expounds the fundamental technical architecture, necessary characteristics, and practical applications involved in building a trusted public IT system, which draws a blueprint for the coexistence of public and private domains for the future Internet.

2 Development Trend of Information Systems

In the early days of the Internet, interconnection and sharing were its core concepts^[15]. The Internet's original intention was to facilitate information transmission between individuals. Everyone can share their own information, which others can access and

utilize. However, with the rapid development of the Internet, some large corporations have risen and begun to control the direction of its development, leading to a trend towards centralization^[16]. There are two reasons behind this centralization trend, i.e., technical and commercial factors. Managing and distributing data has become increasingly difficult due to the increasing amount of information on the Internet and the complexity of technology. Therefore, centralized institutions are necessary for managing and accrediting the data, which ensures that data can be distributed and utilized efficiently. Commercial factors have also contributed to the centralization of the Internet. Large corporations monopolize markets and control user data to gain profits, further strengthening the centralization trend of the Internet. As a result, the concept of interconnection and sharing gradually faded on the Internet, and privatization became the mainstream. However, privatization leads to various problems, making it imperative to create public IT systems.

2.1 Problems of private information systems

Because the vast majority of data on the Internet are stored in the databases of large companies, the Internet can be considered as a private system from the perspective of data acquisition and storage. Aiming to gain business benefits, these companies possess massive amounts of user data and utilize it for commercial purposes through various algorithms and analysis techniques. Undeniably, by ceding data rights, users can enjoy the convenience of the Internet as better digital services and products can be accessed more efficiently. Meanwhile, these large companies that control the data can also expand their scales and achieve rapid growth. This model has reached an equilibrium within a certain period, resulting in the vigorous development of the Internet economy over the past decade or so. However, when large companies continuously try to seize more data rights from users and repeatedly break the boundaries of equilibrium to meet their reckless growth needs, the drawbacks of the privatized Internet become more apparent.

Firstly, on the privatized Internet, because data are controlled and monopolized by a few large companies, data transparency is severely compromised where data sources, processing methods, and usage purposes are non-transparent. Users cannot know the source and collection methods of the data, making it difficult to judge its authenticity and accuracy. They cannot

understand the algorithms and methods used to process the data, which makes it hard to judge the objectivity and impartiality of the results. Worse still, users cannot know what the data is used for, so it is not easy to know whether it infringes upon their legitimate rights and interests.

Secondly, on the privatized Internet, all data are stored by large companies and used for advertising and other commercial purposes without users' full knowledge and consent, violating user privacy and rights. Moreover, the unclear data ownership brings up many policy, legal, and technical issues, such as how to ensure data security and reliability, who should be responsible for data security, and under what circumstances personal data can be collected, stored, and used.

Thirdly, on the privatized Internet, the large companies, which control the vast majority of user data and algorithms, are unwilling to share, making it difficult for other institutions and individuals to obtain similar data resources. The restriction on data openness and interoperability affects the Internet's openness and hinders its innovation and further development.

Fourthly, on the privatized Internet, all data are stored in the back-end databases of a few large companies, which will be controlled and restricted by a single entity permanently. Once these companies go bankrupt or dissolve, users face the risk of data loss or damage.

2.2 Advantages of public IT systems

In order to solve the problems of the privatized Internet, this paper argues that a new way of building IT systems and applications will emerge. Compared with the current mainstream private IT systems controlled by a single entity or company, the new IT systems will be deployed in a public environment and managed by multiple users with equal rights. This information system can be called a "public IT system". Specifically, the public IT system exchanges and shares data in a distributed public environment based on distributed cloud and blockchain technology. It does not rely on a single company's private servers and databases. Under this construction mode, multiple users can jointly manage IT systems and applications with equal data rights. Without data monopoly, the system is more open and transparent. Compared with private information systems, the advantages of public IT systems are as follows:

(1) Data are sharable and open in public IT systems, and data transparency is improved. All users can access and use the same data with equal rights. The public can scrutinize and evaluate the data quality and data authenticity, which helps distributed systems continuously evolve towards trusted networks and trusted systems.

(2) Data can be transferred more efficiently between multiple applications and systems since they are shared and exchanged in a public environment. Moreover, data interoperability is improved, which makes it more convenient for users to use and manage.

(3) In public IT systems, multiple users can manage and control IT systems and applications collaboratively. There is no single entity or company monopolizing data, which protects users' data ownership and use rights.

(4) Data can be stored longer in public IT systems. Since a single entity does not control user data, it will not be affected by the company collapse or dissolution.

Public IT systems represent a new way of building information systems and applications. They are expected to develop into a mainstream trend, bringing users more openness, transparency, security, and efficiency. Users can establish personal databases on public IT systems, use private keys to manage their data, and decide whether to allow other IT systems to access and invoke the data. Using technologies such as privacy computing, users can better protect their data privacy and security, helping avoid data abuse and leakage by those companies. This type of personal database is usually built on a public network with many users so that personal data cannot be destroyed and deleted by a few companies or entities. Meanwhile, with the evolution of business and technology, all countries will promote relevant laws and regulations for public IT systems to regulate industry development in the future.

2.3 Two-layer structure of the future internet

Although private IT systems have some problems, they still have advantages, such as better customizability, security, and stability. They can better meet the specific needs of enterprises or institutions. Therefore, enterprises will still use private IT systems and applications in the future. On the contrary, IT systems and applications built in the public environment have better transparency and interoperability, which can better serve public interests. Therefore, more public IT

systems and applications will likely appear. For example, Metaverse, Web3, and other novel applications will be constructed on public IT systems. As a result, the future Internet will be divided into private and public domains. In order to achieve higher-quality services, some data and applications will be stored in a private environment, and the others will be saved in a public environment according to different business needs.

The coexistence of public and private domains can bring many benefits. Data can be more easily obtained, understood, and validated, and its quality, reliability, and value will be improved. Meanwhile, when data become more ubiquitous as public resources, people will obtain more opportunities to use them, which can encourage innovation and improve the quality of products and services. Better still, the coexistence of public and private domains can also promote fairness and openness, encouraging more people to participate in and contribute to socio-economic development.

Therefore, the future Internet will also be divided into two layers (as shown in Fig. 1). The first layer is the current Internet, also called the private layer. It serves the private IT systems currently dominant worldwide and controlled by a minority of Internet companies. The second layer is the new public layer of the Internet, serving the public IT systems. As technology gradually matures, applications with high requirements for data transparency, interoperability, ownership, and sustainability will migrate to the public layer of the Internet.

The two-layer structure will also change the design logic of information systems. Based on blockchain and

distributed technology, public IT systems can be built in a public environment in the future, which will be owned, shared, and co-governed by multiple parties with equal rights. All data and operations in public IT systems are transparent. Users can manage their data through private keys and genuinely have control and ownership of personal data. With the popularity of distributed technology applications and public IT systems' emergence and rapid development, the number of open and transparent distributed networks will increase. The emergence of new technologies, such as distributed identity and authentication, network-wide distributed Domain Name System (DNS), and distributed cloud technology, will connect all these public distributed networks to form a new layer on the top of the Internet.

3 Construction Mechanism of BSN

3.1 Concepts

BSN^[17] is the world's largest and world-leading blockchain infrastructure platform developed and owned by China. Based on blockchain technology, BSN provides distributed cloud infrastructures to help traditional cloud service providers, data centers, and enterprises build a dedicated or joinable public distributed information network, where blockchain is used as an operating system to manage various distributed applications, systems, and cloud resources.

From the beginning of its design, BSN was developed based on the aim of building distributed cloud infrastructure^[18]. By providing distributed cloud management software, BSN can establish distributed

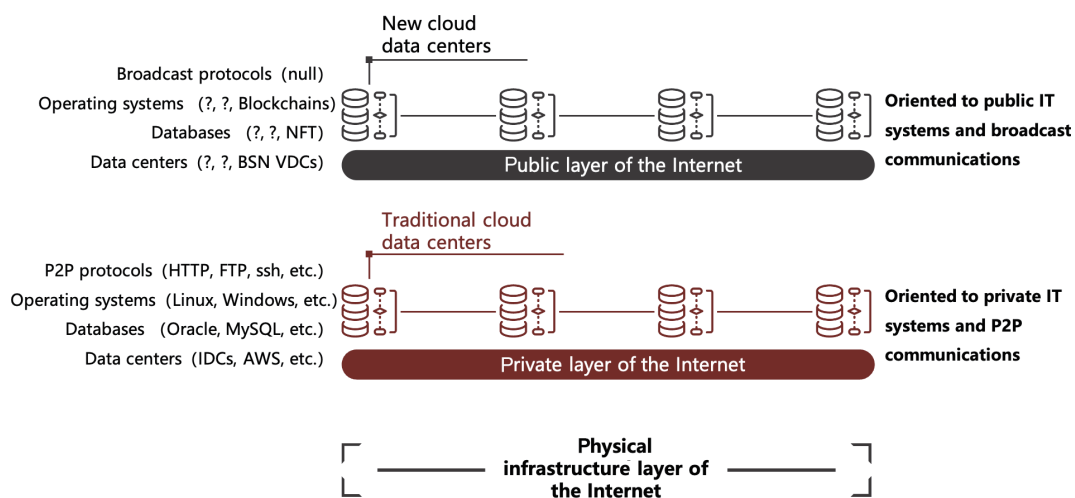


Fig. 1 Structure of the two-layer Internet.

cloud environments (also known as the BSN private network) parallel to traditional cloud environments in any private or public cloud. Meanwhile, BSN has launched distributed cloud service networks (also known as the BSN public network), where enterprises and individuals can set up their own data centers to join the network and freely build and manage their distributed applications. Similar to the Internet, all BSN virtual and physical data centers and cloud environments are connected through communication protocols to form a global BSN network.

3.2 Design ideas

The design ideas of BSN can be summarized as “one core, two directions, six services, and seven principles”.

3.2.1 One core: Serving digital development

BSN gives full play to the role of blockchain in promoting data sharing, optimizing business processes, reducing operating costs, improving collaboration efficiency, and building a trustworthy system. BSN effectively reduces blockchain deployment and operation costs by providing a one-stop blockchain operating environment and node-refined computing, storage, and networking services. Moreover, through intelligent gateways and prefabricated chain code mechanisms, BSN effectively reduces the technical threshold of blockchain application development. BSN uses blockchain technology to promote larger-scale interconnection among data, information, funds, talents, and credit information. It ensures the orderly and efficient flow of production factors within the region, promoting the development of the digital economy, smart city, and digital government.

3.2.2 Two directions: Co-management and co-governance

Instead of being controlled by a specific individual or company, the service networks are jointly managed by the BSN alliance to ensure the orderly operation of the service networks and build a sustainable network development ecosystem.

3.2.3 Six services: Multi-cloud services, multi-portals, multi-frameworks, multi-networks, multi-regions, and multi-agencies

The six service capabilities of BSN are as follows:

- **Multi-cloud services:** Users can freely deploy applications using the resources of any cloud service provider and can even deploy multiple nodes of an application on data centers possessed by different cloud

service providers.

- **Multiple portals:** Different users can join the identical open permissioned blockchain from different portals.

- **Multi-frameworks:** BSN can perform cross-chain data interoperation between different frameworks by formulating unified blockchain framework adaptation standards.

- **Multi-networks:** As a public infrastructure, BSN supports free access by users on any public network.

- **Multi-regions:** BSN is deployed globally as a public infrastructure, allowing applications to be deployed in different regions as needed.

- **Multi-agencies:** As a public infrastructure, BSN supports multi-agency access and business collaboration.

3.2.4 Seven principles: Autonomy, publicness, scalability, open source, multi-portals, low cost, and security

The seven principles followed by BSN includes:

- **Autonomy:** BSN is a public infrastructure that China’s organization independently develops and controls network access rights. It realizes unified management and adaptation of multiple frameworks, and implements componentized cross-chain technology, distributed storage technology, and integrated development environment. BSN has created a fully functional blockchain-integrated ecosystem, including chain construction, utilization, expansion, cross-chain, and management.

- **Publicness:** Instead of an utterly commercial project, the research, design, construction, and operation of BSN are based on the idea of building a public infrastructure. BSN connects data center resources through blockchain development environments and protocols, and supports national and industry standards regarding encryption algorithms and information security technology.

- **Scalability:** BSN allows all data centers and cloud service resources that meet security and configuration requirements to apply for and join the service networks.

- **Open source:** BSN follows the blockchain open source development concept. Data center software codes must be open source, and the operating mechanism must be transparent to everyone.

- **Multi-portals:** BSN adopts a multi-portal strategy to avoid monopoly and exclusivity. Any cloud service provider joining the network can build its service portal

to manage its developers and service products.

- **Low cost:** The most important purpose of BSN is to reduce the cost of the deployment, operation, maintenance, and supervision of blockchain applications, which helps promote the popularity and development of blockchain technology.

- **Security:** The construction of BSN strictly follows the physical and network security requirements of level 3 or above specified in the relevant national information security technology standards and ensures the redundant deployment of key nodes to keep the system’s availability.

3.3 Goals

BSN is aimed at a public infrastructure for distributed technology applications and is committed to continuously reducing the application costs, technical thresholds, and supervision difficulties of distributed technology. In terms of technology, BSN uses blockchain as an operating system in a distributed cloud environment and continues to promote the construction of new distributed operating systems. BSN provides a fertile ground for distributed technology innovation and accelerates its popularity and application by continuously breaking through technical bottlenecks and comprehensively innovating the cognition and application models. In terms of application, BSN is committed to accelerating the industrial integration of distributed technologies, injecting new momentum into the digital transformation. The applications of BSN strongly support the development of China’s digital economy and governance.

In the long run, as social needs change and

technology evolves, the traditional Internet will inevitably be unable to meet users’ demands fully. The emergence of public IT systems will integrate distributed technology into the existing technology systems. The public IT systems will become a global exploration direction in the future. Therefore, the long-term goal of BSN is to establish a new public layer on the Internet to provide services for various types of distributed applications in diverse industries.

4 Application of BSN

4.1 Technical architecture of BSN

The construction of BSN is based on the mechanism mentioned above, which consists of public city nodes, technology platforms, service portals, and operation and maintenance systems. The technical architecture is shown in Fig. 2.

Public city nodes are the basic operating units of BSN. Its primary function is to provide system resources such as access control, transaction processing, data storage, and data computation for blockchain applications. The owner of each public city node is a provider of cloud resources or data centers. After the owners install the public city node software in the cloud environments and complete the network access process, a public city node on BSN can be built. Then, the application publisher can retrieve the node in the portal and purchase its resources for application deployment.

The BSN technology platform can be regarded as the operating system for blockchain applications. There are a variety of blockchain frameworks around the world, each of which has its consensus algorithms,

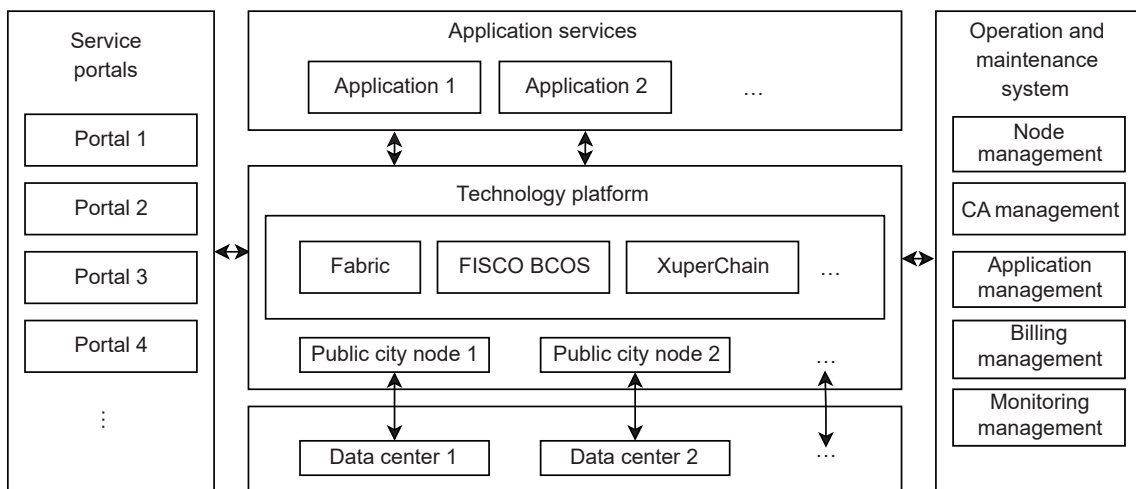


Fig. 2 Technical architecture of BSN.

transmission mechanisms, and developer tools. BSN has established framework adaptation standards to ensure that each technology platform based on permissioned blockchains should comply with a series of standards, such as cryptography algorithms and gateway Software Development Kits (SDKs), before accessing BSN.

Similar to the Internet, BSN adopts a multi-portal strategy. After joining BSN, enterprises with relevant resources, such as cloud service providers or technology platform owners, can apply to establish service portals. The service portals can be a separate Blockchain as a Service (BaaS) website or adding BaaS functions on the existing cloud service portals. Developers can purchase service network resources within the service portals to publish and manage blockchain applications.

The BSN operation and maintenance system is a centralized scheduling and management system, including functions of node management, application management, billing management, Certificate Authority (CA) management, and monitoring management. After the cloud service providers add cloud resources to BSN, the operation and maintenance of the public city nodes are managed uniformly by BSN, and cloud service providers only need to manage the hardware and network. The system adopts a loose coupling design model, ensuring blockchain applications will not be affected when the system fails.

4.2 Service system of BSN

The services provided by BSN includes two major

systems: the private network and the public network (as shown in Fig. 3). The BSN private network, also known as the enterprise-level BSN distributed cloud management platform, establishes a distributed cloud environment based on blockchains and supports deployment in various Internet Data Centers (IDCs), public clouds, and private clouds. The BSN public network consists of the BSN-DDC basic network and the BSN Spartan network. The BSN-DDC basic network is a public distributed cloud service network with open permissioned blockchains oriented to the domestic market. It provides free and open-source data center services. In contrast, the BSN Spartan network is a public distributed cloud service network composed of non-cryptocurrency public blockchains oriented to the overseas market. It provides free, open-source, and anonymous data center services.

4.2.1 BSN private network

The BSN private network or the BSN distributed cloud management platform, is a professional cloud environment management software used to manage distributed systems and blockchain applications. Oriented to governments, enterprises, and institutions, the BSN private network deploys a private distributed network environment based on the BSN technology within their existing public clouds, private clouds, or Local Area Networks (LANs). This environment parallels traditional cloud management environments that only support centralized applications. Using multiple blockchain frameworks as the operating system, the platform can perform fully automated billing, operation, and maintenance across the cloud

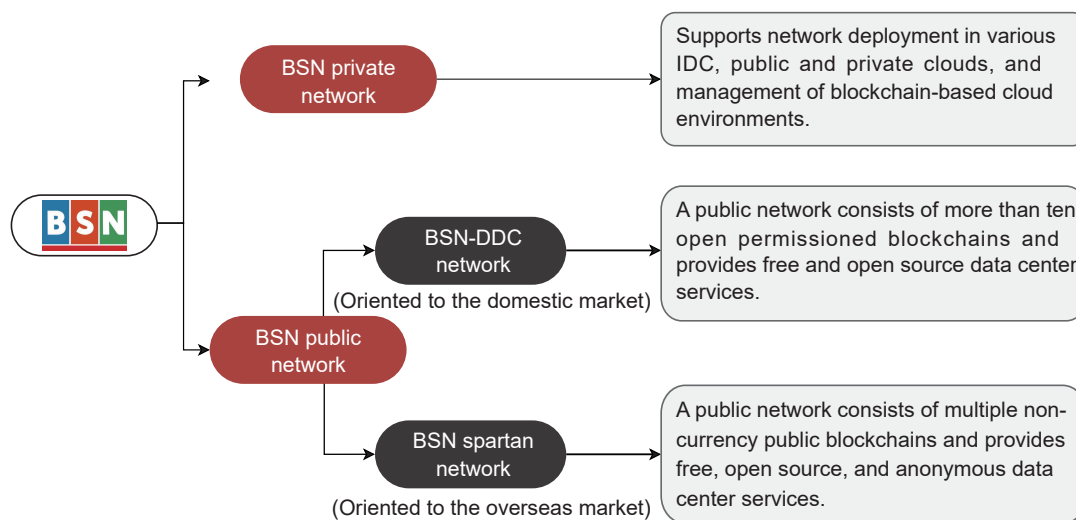


Fig. 3 Service system of BSN.

resources, systems, nodes, applications, and BaaS layers.

4.2.2 BSN public network

The BSN public network includes the BSN-DDC network for domestic users and the BSN Spartan network for overseas users.

The BSN-DDC network is a public distributed cloud service network jointly built by the BSN development alliance with professional companies providing blockchain technology services. Oriented to the domestic market, the BSN-DDC network integrates multiple open permissioned blockchains as operating systems to develop and operate distributed applications. It provides essential infrastructure for developing and applying technologies such as blockchain and Non-Fungible Token (NFT).

The BSN Spartan network is a public infrastructure network based on the lightweight BSN Spartan data center software, which is open source, free, and anonymous for anyone to install. Within the data center, the nodes of several non-cryptocurrency public blockchains can be installed and accessed. By removing the cryptocurrencies from the public blockchain layer, the BSN Spartan network provides non-cryptocurrency public blockchain services to all IT systems worldwide to develop applications based on this public IT system infrastructure effectively.

4.3 Technical characteristics

BSN has unified the adaptation and management of the core blockchain technology, providing users with large-scale distributed cloud environments to build and run various distributed applications.

4.3.1 Integration and adaptation of multiple blockchain frameworks

The compatibility and diversity of technology are the primary concerns of BSN. BSN has added almost all mainstream blockchain frameworks globally into the system, capable of adapting and managing dozens of open-source and commercial blockchain frameworks. BSN has formed an optimal practice standard for blockchain framework management.

4.3.2 Orchestration and scheduling of heterogeneous cloud resources

BSN can achieve lifecycle management of blockchain operating environment resources based on mainstream OpenStack and Kubernetes cluster technologies, and realizes automatic resource allocation, scaling orchestration, load optimization, monitoring analysis,

and operation maintenance based on various heterogeneous clouds. BSN can unify almost all mainstream cloud resources into a virtual environment management system with the capability of automatic management and deployment.

4.3.3 Cross-chain communication between homogeneous and heterogeneous blockchains

With the widespread application of blockchain technology, the need for data sharing between different blockchain applications is becoming increasingly urgent. BSN implements cross-chain communication based on the relay chain cross-chain mechanism and meets the requirements for information validity, security, and transaction in the cross-chain communication process. BSN supports cross-chain transaction management and processing of multiple homogeneous and heterogeneous blockchains within and without the platform. In addition, BSN supports unified chain identity (ID), Relayer management, automatic deployment, and cross-chain contract management.

4.3.4 Extensible Public Key Infrastructure (PKI) system

BSN supports various encryption algorithms. When communication authentication, transaction processing, and application access are required, BSN provides services of CA issuance, update, discard, and verification functions for the blockchain networks within the platform. The trusted interconnection of various blockchain applications is realized through the root key issued by the national authority and cross-chain technology.

4.4 Applications

BSN has been widely recognized. Its technical mode and development concept have been included in the “14th Five-Year Plan” and “New Infrastructure Plan” for many provinces (such as Yunnan, Hainan, etc.) and cities (such as Hangzhou, Wuhan, etc.). BSN has built many benchmark projects for the industry based on the BSN private network and achieved remarkable application effects. BSN has deployed private networks in 13 provinces (including Heilongjiang, Guangdong, etc.) and cities (including Changsha, Ningbo, etc.). The networks provide reliable blockchain public service capabilities for the digital economy development of various provinces and cities. In addition, based on BSN technology and facilities, China’s first cross-border trade blockchain private network between Shenzhen

and Singapore was officially completed and implemented in September 2021 under the cooperation of Government Services and Data Management Bureau, Commerce Bureau of Shenzhen Municipality, and Singapore Infocomm Media Development Authority (IMDA). Based on the single window business of Shenzhen South Electronic Portal, BSN technology is used to build a fundamental infrastructure network for cross-border data encryption, storage, transmission, and mutual recognition between Shenzhen and Singapore. It ensures that the cross-border trade data between Shenzhen and Singapore can be securely encrypted, managed, monitored, authorized, and transmitted, effectively improving the facilitation of cross-border trade. In the future, this model can be replicated in other ports in China and trade scenarios between different countries. Furthermore, flexible application networking among data centers will be available.

The BSN-DDC network is currently compatible with multiple open permissioned blockchains, including Tai'an Chain, Zunyi Chain, Jiuquan Chain, etc., which provides extremely low-cost blockchain services for enterprises, individuals, and organizations. Its application scenarios cover various fields such as government affairs, culture and tourism, finance, manufacturing, agriculture, commerce, etc. Since its release on January 25, 2022, the BSN-DDC network business has been developing rapidly. Over 1500 platforms and enterprises have registered on the BSN-DDC network and created over 32 million accounts, generating nearly 5 million official Distributed Digital Certificates (DDCs) and over 30 million NFTs. The daily transaction volume of the entire network remains stable at about 1 million units. In 2022, the total number of transactions on the chain exceeded 150 million times, with more than 13.5 billion requests for DDC official gateways. On June 29, 2022, the BSN-DDC network ushered in a milestone moment. For the first time since its official operation, the daily transaction number of the production environment applications on a single day exceeded Ethereum. On that day, the daily transaction volume of the BSN-DDC network reached 974 517 times, while the daily transaction volume of Ethereum was 938 166 times. In addition, BSN has laid out 56 regional data centers of the BSN-DDC network nationwide to serve nearly 2000 blockchain application enterprises. There are over

35 million users and over 1 million active blockchain transactions daily.

In September 2022, the BSN spartan network for the international market was officially launched, supporting enterprises in traditional fields to apply blockchain technology without using virtual currencies. BSN supports one-way cross-chain from the domestic BSN-DDC network to the foreign Spartan network. Cross-chain technology based on BSN can promote the export of Chinese artists' works overseas. For example, the works of Chinese artists can be encapsulated as NFTs and published on OpenSea. Saudi Aramco, the world's largest oil production company, has utilized the BSN cloud management platform to carry out supply chain management in Saudi Arabia. The integration of information, funds, and logistics is achieved by uploading data to the blockchain, including supply chain data from upstream and downstream enterprises, third-party warehousing and logistics, etc. The efficiency of supply chain management is highly improved. Hong Kong and Shang Hai Banking Corporation (HSBC) has used BSN to establish a B2B payment network to handle the issues of virtual currency risks, transaction data integrity, and transparency. Other issues encountered when using blockchain technology in payment and settlement, trade finance, and supply chain can also be solved. It improves the efficiency and security of the payment process. In addition, the governments of the United Arab Emirates, Turkey, Bahrain, and other countries have used BSN to promote applications such as digital identity authentication and medical information sharing.

BSN uses blockchain technology to empower the development of China's digital economy and provides experience for the practice of blockchain applications. BSN is committed to formulating standards and technical specifications in the blockchain domain. In 2022, BSN participated in the drafting of essential industry standards four times, and submitted seven technology patents and 18 software copyrights, which has set a benchmark for the development of blockchain technology.

5 Conclusion

In this paper, we have analyzed blockchain's essence from the broadcast transmission technology perspective. As the existing Internet has apparent

shortcomings, it is necessary to construct a public IT system based on blockchain. Therefore, We have proposed the architecture, characteristics, and applications regarding trusted public IT system construction by drawing on the design ideas and architectures of BSN.

In the future, with the development of the new public layer of the Internet and public IT systems, a new industry will emerge, which will bring great opportunities for distributed operating systems and databases. BSN will be committed to building a new Internet public layer leading by China via continuously upgrading the key technologies and standards, making China the birthplace of the next round global information revolution. We hope more partners will join BSN to promote the globalization of Chinese technology.

Acknowledgment

This work was supported by the National Social Science Fund of China (No. 22&ZD153).

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