GBBC
Global Blockchain Business Council

INSIGHT REPORT

GLOBAL STANDARDS MAPPING INITIATIVE 3.0
STANDALONE REPORT

CHINA

2022

GSMI UPDATE

COUNTRY SPOTLIGHT: CHINA

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MESSAGE FROM DR. JIAN JIN

As a new engine of global economic development, technological progress and industrial change, the digital economy is playing an increasingly prominent role in the post-pandemic era. Against the backdrop of this great transformation, countries are making efforts to seize the digital economy opportunity for the benefit of their own people and the world, and to take the lead in the changes brought by it. China is vigorously developing its digital economy, with the size growing from RMB11 trillion in 2012 to RMB45.5 trillion in 2021, representing an increase of its share of GDP from 21.6% to 39.8%. The position of the digital economy in the national economy has been consolidated, playing a greater supportive role.

Blockchain, as one of the driving forces of the digital economy and technology, is playing an increasingly critical role. Blockchain builds trust for each participant in a not fully trusted environment without relying on an authoritative intermediary, thus enabling the new way of data flow, asset confirmation and multi-entity collaboration model. Blockchain technology has been developing for more than 10 years since its inception from the Bitcoin payment system in 2008. The Web 3 wave triggered by blockchain technology has swept the world, reshaping the global Internet operation mode, economic mode and governance rules. The metaverse that combines AR/VR, blockchain, artificial intelligence, 5G and other technologies, has broadened the imagination of human beings and allowed them to move forward to a virtual-real integration in the digital world.

China has highly valued the role of blockchain technology in supporting the digital economy. Since 2014, it has issued a huge amount of policies to encourage technological innovation and industrial development of blockchain while standardizing and guiding the healthy and orderly progress of this industry. Meanwhile, it is making proactive efforts to build international-level blockchain infrastructure and collaborate with other countries on an equal, open and win-win footing.

The Alliance for Blockchain Industry, Z-park (ABI) is honored to be invited by the Global Blockchain Business Council (GBBC) to write the GBBC GSMI V3.0 China Report together with the Institute of Digital Finance Innovation at the Zhejiang University. Due to the diverse industrial chains, wide geographic scope, distinct features, and rapid changes of China's digital economy, and time limit, it is hard to cover all aspects of the blockchain industry in China. We have made all efforts to reveal the development history, policy guidelines, industry landscape and prospects of blockchain in China. At the same time, we hope to learn from and communicate with other countries in an all-around way, actively promote multilateral cooperation, and make concerted efforts for the common welfare of people around the world through blockchain technology.

About Alliance for Blockchain Industry, Z-park

Jointly initiated by more than 70 institutions from various sectors of industry, academia and research, the Alliance for Blockchain Industry, Z-Park (ABI) was established in 2016. As a promoter and practitioner of blockchain-enabled digital economy development, it aims to create a platform for blockchain technology and industrial innovation and development with global influence. By August 2022, there had been more than 400 member institutions in ABI.

MESSAGE FROM PROFESSOR MICHAEL SUNG

After a little more than a decade of development since the advent of blockchain technology and the nascent cryptocurrency industry, regulated digital finance applications such as digital currencies and digital securities have now reached an inflection point, with the beginning of mainstream and institutional adoption by the traditional finance world.

Leading the world is China, with the People's Bank of China (PBOC) developing its Digital Currency Electronic Payment (DCEP) initiative since 2014. In October 2019, China announced its intention to launch its Central Bank Digital Currency (CBDC), since then officially named the e-CNY. China realizes that blockchain is the critical next-generation IT infrastructure to build their future smart cities, the key infrastructure of infrastructures that allows the vertical integration of cloud computing, 5G communications, industrial IOT, and AI/big data, with Fintech and other application-level services overlaid on top of the stack.

The world's future digital information technologies and digital finance infrastructure will be increasingly driven by China. Arguably, China is the only part of the world where blockchain applications have been commercialized at scale and adopted by government for cross-border payments, supply chain finance, agricultural finance, trade finance, inclusive finance, and smart city applications. The People's Bank of China (PBOC) is operating a trade finance blockchain running billions of dollars of volume. China Securities Reform Commission (CSRC), China's version of the U.S. Securities Exchange Commission, is implementing infrastructure to register and track all digital securities. Some large international financial institutions are also actively expanding blockchain application scenarios for information sharing, foreign exchange trading, and equity trading. China's nascent non-fungigle token (NFT) market has already scaled beyond the Ethereum mainnet's transactional volume in July of this year.

Thus, contrary to the general sentiment from outside of China that crypto in China is a no go, digital asset adoption in China has been absolutely thriving. There just has to be a clear delineation between unregulated crypto, which has been completely banned, and regulated digital assets, which have been increasingly supported to maintain China's lead in the future world of digital finance. In the latter category, there have been huge amounts of experimentation by financial institutions to tokenize/securitize assets tracked on blockchain. While there is still no regulation around the standardization and scaled exchange of digital securities and related regulated digital assets, this is only a matter of time.

Expect China to continue to lead the world in the scaled adoption of blockchain and regulated digital assets, which will explode after the e-CNY digital currency ecosystem, which will be used to enable settlement of transactions, has been fully commercialized over the next few years. From the underlying blockchain infrastructure all the way to digital securities and NFTs/digital collectibles transacting on top, China has a complete full-stack ecosystem for digital finance innovation that is hard to replicate anywhere else in the world.

About the Institute of Digital Finance Innovation

The Institute of Digital Finance Innovation (IDFI) at the Zhejiang University International Business School (ZIBS) is the leading advanced research institute focused on digital finance in China, with the mission of spearheading global thought leadership and applied research focused on the institutional adoption of regulated digital currencies and digital finance innovation.

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The GBBC would like to thank our partners and supporters who worked tirelessly and enthusiastically over the past months to produce this standalone report as a part of GSMI 3.0.

This report offers an overview of blockchain developments through a lens of policy and business cases in China. Any views expressed reflect the opinions of the authors and not necessarily those of GBBC.

1. INTRODUCTION

This report covers six sections including policy, industry, application, infrastructure, communities, and prospects. It aims to provide a panorama of China's blockchain in a comprehensive, objective, and detailed way, to look into the future development of the industry and provide an opportunity for international cooperation.

The policy section outlines the practical actions taken by Chinese government agencies to pay attention to, study blockchain technology, and comprehensively promote its industrial development since 2014. The section includes policy guidance at the central government level and policies formulated at the local government level in accordance with local industrial characteristics; it also elaborates on China's attitude towards blockchain technology, cryptocurrencies and crypto mining.

In the industry section, this report analyzes in detail the statistics of blockchain enterprises in China and their geographic location, categorizes leading blockchain enterprises according to the number of filings, introduces the investment and financing overview in China's blockchain industry, and presents the development of blockchain industrial parks in China.

One of the signals of the prospering of blockchain technology is the development of the application ecosystem. In the application section, the attitude towards public chain and consortium chain at a national level, and government-led blockchain applications are introduced. At the industrial level, this report introduces the cases and effects of applying blockchain technology in various industries, including the development of central bank digital currencies (CBDCs).

In April 2020, China clarified the scope of "new infrastructure". As a component of the new infrastructure, blockchain is capable of advancing the scaled development of the digital economy in China and connecting the world for empowering the international ecosystem. This chapter introduces four major development paths, goals, real effects, and the endeavors through the case of Xinghuo BIF, China's national blockchain infrastructure.

The alliance section clarifies the blockchain alliances in China, including those formed for specific industries and those based on geographical boundaries, and explains in detail the efforts made by blockchain communities in promoting the development of blockchain technology, implementing industrial applications, and promoting ecosystem growth.

The prospects section summarizes the development of China's blockchain industry as a whole, its advantages, challenges it faces, and calls for friendly and in-depth cooperation with countries around the world to jointly promote the development of the global blockchain industry.

2. POLICY

2.1 Overview

With the rapid development of global blockchain technology and industry, the Chinese government is also continuously developing policies for the supervision of blockchain and related activities.

In general, China encourages the technological innovation and industrial applications of blockchain and explores the development of new governance mode based on blockchain technology. In contrast, it resolutely cracks down and strictly prohibits aspects such as cryptocurrencies and crypto mining.

As early as 2014, the Chinese government began to research blockchain technology and listed it in the 13th Five Year national strategic plan as a frontier technology. After years of exploration and development, in October 2019, blockchain technology was recognized by President Xi Jinping who directed that the innovative development of blockchain technology should be accelerated. In March 2021, the 14th Five-Year Plan of China listed blockchain as the one of the priorities of digital economy. In 2022, the 2nd year of the 14th Five-Year Plan, a series of favorable policies on blockchain at national and local levels were released to facilitate the development of this industry.

In the meantime, China decisively cracked down on cryptocurrenciy activity, stating its relevance to financial stability and environmental protection. For example, back in 2013, China issued a notice on preventing the risks of Bitcoin and other tokens and made it clear in the notice that virtual currencies represented by Bitcoin do not have monetary properties and fall under the category of virtual commodity. Over the next few years, the Chinese government introduced different preventive policies in response to the financial risks posed by virtual currencies such as Bitcoin. The ban on mining virtual currencies is considered by China to be a critical step in the endeavor of lowering carbon emissions and carbon neutrality in China and the world.

2.2 Central Government Level

2.2.1 Preliminary Exploration and Research Preparation
The Chinese government's study of blockchain technology dates back to 2014, when the People's Bank of China set up a study group on digital fiat currency (e-CNY) to conduct specialized research on the issuance framework, key technologies, flow environment, and relevant international experience. In 2016, the People's Bank of China established its Digital Currency Institute, which developed the first-generation prototype of a digital fiat currency. As of the end of 2017, the Bank began to organize commercial agencies to jointly conduct R&D experiments on e-CNY.

Meanwhile, the Ministry of Industry and Information Technology released the White Paper on China's Blockchain Technology and Application Development in October 2016, the first official guiding document, which has recognized the value of blockchain technology and promoted its development in China.

As of the end of December 2016, the State Council of China published the National Information Technology Plan during the 13th Five-Year Plan, which lists blockchain technology as the strategic and frontier technology.

On January 10, 2019, the Cyberspace Administration of China released the Provisions on the Administration of Blockchain Information Services, coming into effect since February 15, 2019. The Provisions require blockchain information service providers to provide information such as service categories, forms, application fields, and server address to the Office of the Central Cyberspace Affairs Commission for registration and recording. The provisions aim to clarify the information security management responsibilities of blockchain information service providers, standardize and advance the sound development of blockchain technology and relevant services, and avoid security risks in blockchain information services. Thereby, it provides an effective legal ground for the provision, use, and management of blockchain information services.

2.2.2 Strengthening Industrial Promotion in the Medium Term
On October 24, 2019, during the 18th group study session of the Central Political Bureau, President Xi Jinping pointed out that the development of blockchain technology and industrial innovation should be accelerated with the independent innovation of core blockchain technologies as a critical breakthrough. This again marked a milestone in its development, further recognizing the importance of blockchain technology to China's digital economy and industrial transformation, and since then, China's blockchain industry has been on the fast track.

In April 2020, the National Development and Reform Commission clarified the scope of "new infrastructure" and incorporated blockchain as "new information infrastructure" into the category of new infrastructure, once again stressing the prominent position of blockchain technology in the development of the national digital economy.

2.2.3 Rising to Strategic Prominence During the 14th Five-Year Plan Period
In March 2021, the State Council issued the Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 of the People's Republic of China (hereinafter referred to as the 14th Five-Year Plan). The Plan includes blockchain, along with cloud computing, big data, Internet of Things, industrial Internet, artificial intelligence, virtual reality, and augmented reality, as seven key industries of digital economy, while pointing out the development direction and future goals of blockchain in China.

The 14th Five-Year Plan clearly proposes to promote blockchain technological innovation including smart contracts, consensus algorithms, cryptographic algorithms, and distributed systems; develop blockchain service platforms and application solutions in the fields of FinTech, supply chain management, and government affairs services with a focus on consortium blockchains; and improve regulatory mechanisms. In summary, the development of blockchain in China takes blockchain technological innovation, application development, and the improvement of regulatory mechanisms as the key tasks in this Five-Year Plan period, and emphasizes the development of consortium blockchain-based FinTech applications.

Under the guidance of the 14th Five-Year Plan, in May 2021, the Ministry of Industry and Information Technology and Cyberspace Administration of China issued the Guiding Opinions on Accelerating the Promotion of Blockchain Technology Applications and Industrial Development. The Guiding Opinions clarify that by 2025, the comprehensive strength of China's blockchain industry will reach an advanced level, with the industry taking shape. Blockchain applications will integrate into multiple fields of economy and society. A number of well-known solutions in product traceability, data circulation, and supply chain management will be cultivated, and scenario-based demonstration applications will be formed. 3-5 internationally competitive key enterprises and a number of innovative leading enterprises will be fostered, and 3-5 blockchain industry development clusters will be created. Preliminary standard systems of blockchain will be established, a professional talent team to support industrial development will take shape, and the blockchain industrial ecosystem will be improved. Blockchain effectively underpins the strategies of empowering China through manufacturing, network power, and the digital economy, playing an important role in promoting the modernization of the national governance system and capacity. By 2030, the comprehensive strength of the blockchain industry will continue to improve, and the scale of the industry will further grow. By deeply integrating with the Internet, big data, artificial intelligence and other new generation information technology, blockchain will be universally applied in various fields. A number of leading enterprises and industrial clusters at the international level will take shape, with complete industrial ecosystems. Blockchain will become essential for building a country strong in manufacturing and networks, developing the digital economy, and modernizing the national governance system and capacity.

2.2.4 Ministries Actively Responding to the Nation's Call for Blockchain Development

Various departments of China's central government have actively responded to the national Five-Year Plan and vigorously promote the application of blockchain in multiple fields and the cultivation of the industrial ecosystem. According to public data, as of the third quarter of 2022, ministries issued 75 blockchain-related policies; for example, the Ministry of Industry and Information Technology and Cyberspace Administration of China organized to apply for a blockchain innovation and application pilot. The National Development and Reform Commission took the lead in regulating virtual currency mining practices, the People's Bank of China promoted the building and application of blockchain technology standards in the financial industry, and the Ministry of Education promoted the cultivation of blockchain talents.

The following table shows the blockchain policies issued by ministries from China:

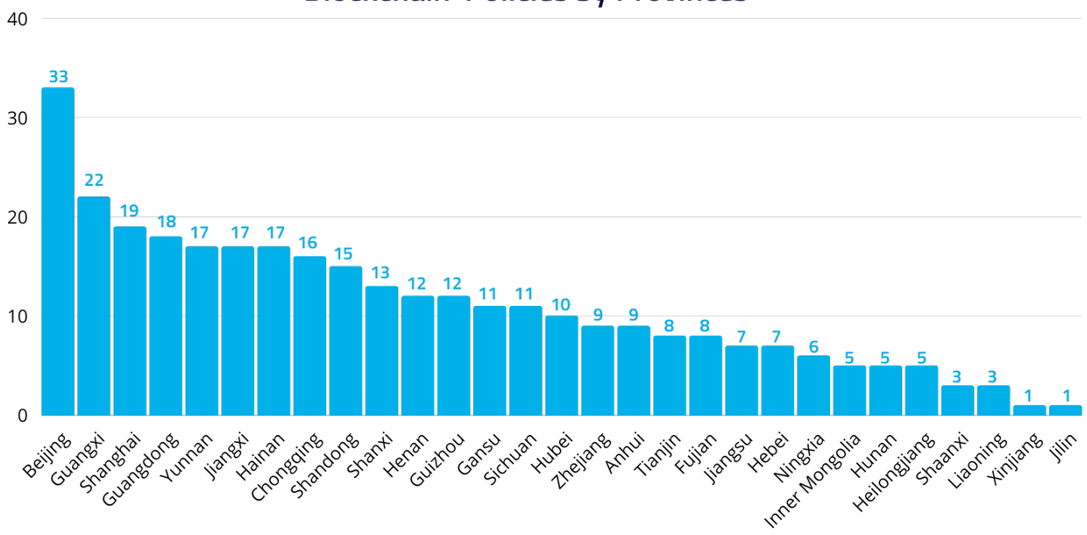
Ministries	Issuing Policies	Brief Introduction
The Supreme People's Court of the People's Republic of China	Opinions of the Supreme People's Court on Strengthening Blockchain Application in the Judicial Field May 2022	This document specifies broad standards – for the building of blockchain platforms by people's courts of China and general standards for blockchain judicial applications. In addition, it proposes four common uses of blockchain technology: enhancing judicial legitimacy, improving judicial effectiveness, strengthening judicial coordination, and supporting economic and social governance.
	Rules of Online Litigation of People's Courts August 2021	It is officially implemented, stipulating the scope of the validity of evidence storing via blockchain and clarifying the validity of presumption of immutable data stored in the blockchain after it is uploaded. Meanwhile, it establishes the rules of authenticity audits after and before the blockchain-stored data is on chain.
Ministry of Agriculture and Rural Affairs of the People's Republic of China	Guiding Opinions on Expanding Multiple Functions of Agriculture and Promoting High-Quality Development of Rural Industries November 2021	Use of blockchain and other technologies to accelerate the construction of network systems, front-end warehouses, and logistics facilities, and introduce modern information technology into all steps of agricultural production, processing, and marketing. At present, blockchain has gradually integrated into agriculture, rural areas, and farmers, and has been implemented in subdivisions such as agricultural product traceability, agricultural finance, and targeted poverty alleviation for farmers.
National Radio and Television Administration	Blockchain-based Content Audit Standard System (Version 2021) April 2021	The blockchain-based content audit standard system aims to promote the healthy and sustainable development of media content. From the actual development of content audit business, it covers the blockchain-based content audit system, business process, security, management, and other aspects, to promote the standardized construction and operation of the blockchain-based content audit system. The system is divided into four categories, including system, business, security, and management, with a total of 13 standards.
National Bureau of Statistics	Statistical Classification of the Digital Economy and its Core Industries (2021) June 2021	The classification incorporates blockchain into the scope of the digital economy industry, meaning that the status of blockchain in the digital economy is further confirmed.
Ministry of Transport of the People's Republic of China	Notice on the Implementation of Reefer Container Port and Maritime Services Enhancement Actions May 2022	Promotes the deep integration of blockchain and other new generation information technology with cold chain logistics.
	Guideline for the Construction of Blockchain-based Electronic Platform for Imported Dry and Bulk Cargo Inbound and Outbound Operations June 2022	Promotes the application of blockchain technology in water transportation.
Ministry of Education of the People's Republic of China	Notice on the Results of Filing and Approval of Undergraduate Programs in 2021 February 2022	At present, 22 general higher education institutions in China offer "blockchain engineering" for undergraduate students
	Catalog of Vocational Education Programs (2021) March 2021	Set a total of 19 first major categories, 97 secondary majors, and 1,349 third-level majors. Among them, blockchain technology application majors are designed for the new occupation of blockchain engineers and technicians.
Ministry of Industry and Information Technology of the People's Republic of China	Call for Typical Blockchain Application Cases in 2022 September 2022	The directions of the call include: innovative technology and products, blockchain + real economy, blockchain + livelihood services, blockchain + smart city, blockchain + government services. The submitted cases should meet the requirements of relevant national laws, regulations, and industrial policies. Theyhave been implemented with achievements, with high technical level, distinctive industrial or regional characteristics, and a mature business model. They are also highly typical, demonstrative, innovative, and replicable; fully reflect the technical characteristics and application scenarios of blockchain; and have strong reference and promotion value for relevant industries or enterprises.
	Approval of the construction of the National Blockchain Development Pioneer Zone September 2022	The Ministry of Industry and Information Technology has officially approved the construction of national blockchain development pioneer zones in four cities, namely Wuhan, Suzhou, Zhengzhou, and Kunming. The approved zones will enjoy national support for the development of blockchain at a local level.

2.3 Local Government Level

From 2016 to September 2022, 29 provinces across the country issued 319 blockchain-specific policy documents related to blockchain development, covering various industries or sectors such as government data sharing, finance, supply chain, logistics, healthcare, and agriculture. In terms of quantity, Beijing, Guangxi, and Shanghai issued a larger number of blockchain policies.

Blockchain has been written into the Report on the Work of the Government by many local governments. 26 provinces (cities) have included the development of blockchain technology in the 14th Five-Year Plan and the Plan for Digital Economy. Guangdong, Shandong and Zhejiang provinces have proposed to build blockchain technology highlands according to local conditions. Jiangsu Province focuses on the application of blockchain in urban governance, while Beijing emphasizes building blockchain as an innovative industry. Shanghai, on the other hand, leverages its advantages of internationalization in developing blockchain. Chongqing is committed to building blockchain research institutes.

Diagram 1: Quantity Distribution of Blockchain Policies by Provinces



3. INDUSTRY

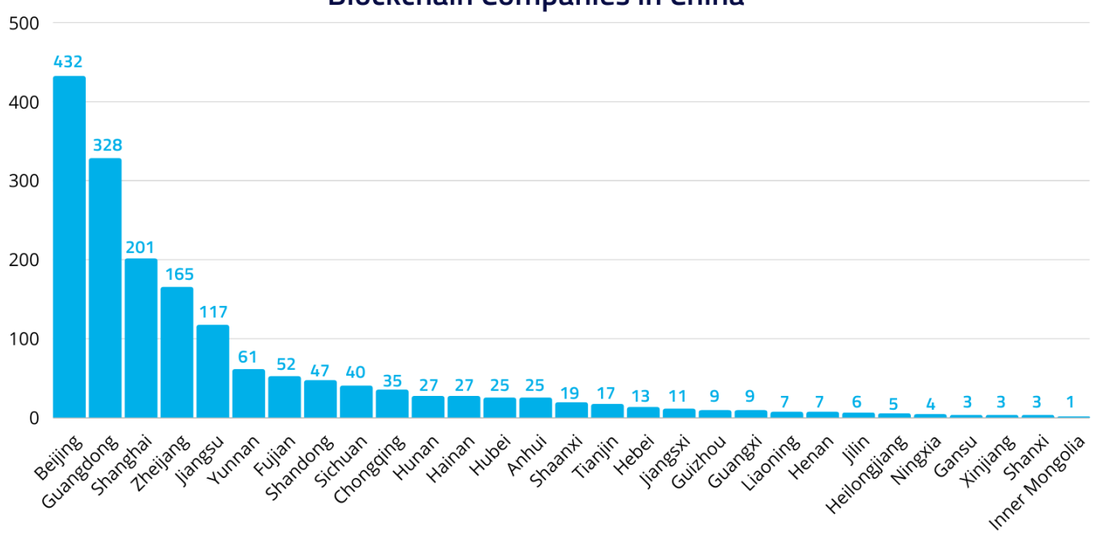
3.1 Overview

After the preliminary assessments and exploration of the blockchain industry, the top-level design of blockchain development in China has been improved and the corresponding policy outcomes have been set out since 2021. China's blockchain industry has entered a new development stage, with an increasingly improved industrial foundation and environment. First, the overall scale of China's blockchain industry has steadily expanded and the number of enterprises has grown rapidly; second, the industrial structure, with consortium chains as the core, has stabilized; third, the leading enterprises have accelerated the speed of vertical layout and traditional industrial entities have actively deployed blockchain technology; fourth, the construction of industrial parks has continued to move forward.

3.2 Amount of Blockchain Enterprises

According to the data center of the China Academy of Information and Communications Technology (CAICT), as of September 2022, there were 1,698 blockchain enterprises in China, mainly concentrated in three provinces or municipalities, namely Beijing, Guangdong, and Shanghai. Additionaly, Zhejiang, Jiangsu, and Yunnan take the leading position in terms of the number of blockchain enterprises. Among them, 38 new blockchain enterprises were founded in China in 2022, most of which are startups related to digital collections and the Internet.

Diagram 2: Provincial Distribution of Blockchain Companies in China

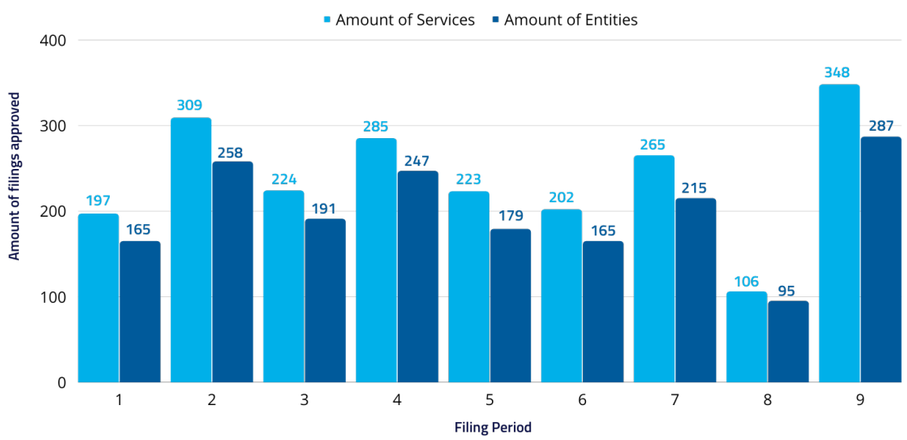


3.3 Situation of Enterprise Filing

By July 2022, the Cyberspace Administration of China had released nine versions of lists of blockchain services filing to conduct blockchain activities. According to the statistics of the filings, China currently has a total of 2,159 blockchain services filed, with 1,530 entities applying for blockchain service filings, involving 1,460 enterprises, 68 institutions, and 2 individuals.

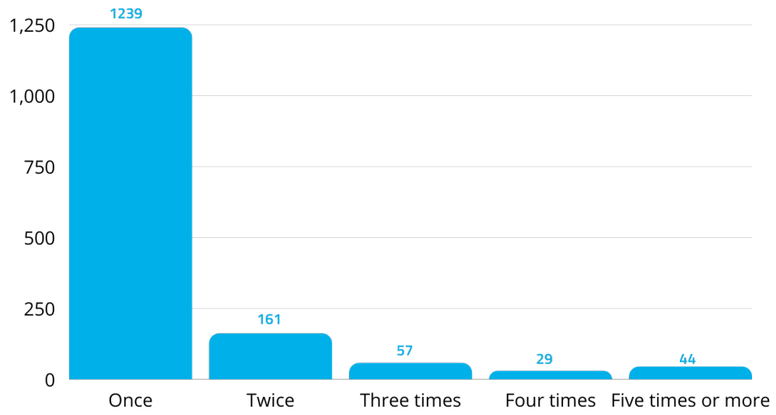
The number of enterprises filing for blockchain activity approval and the number of filing services in each batch are shown in the figure below.

Diagram 3: Amount of Approved Filings of Blockchain Entities and Services in China



Among the 9 service filings, 80% of the filing entities made one blockchain-related service filing, and 44 entities reached 5 or more blockchain-related service filings.

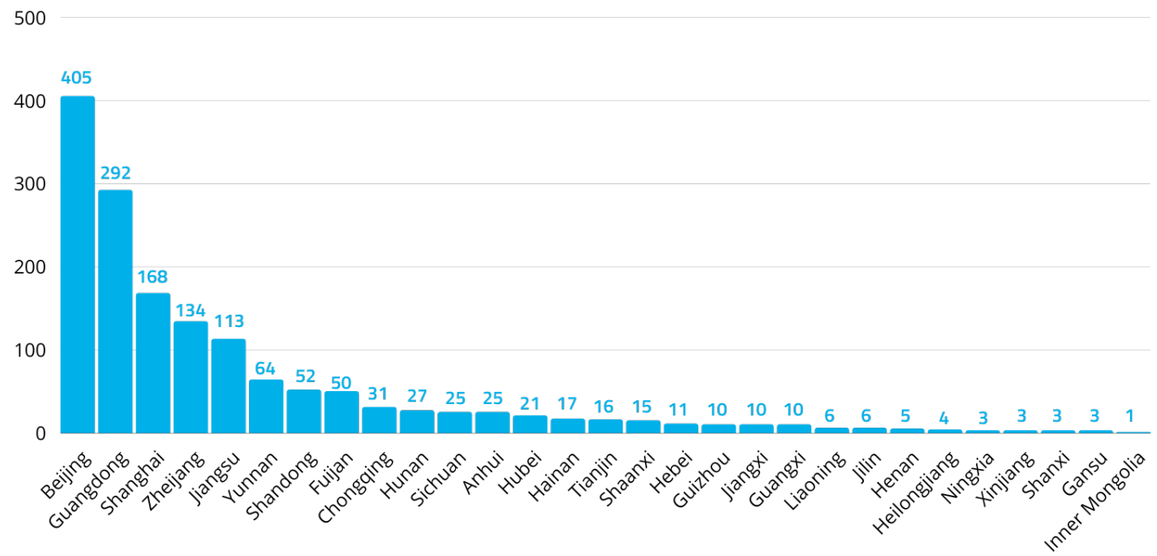
Diagram 4: Filing Frequency of Blockchain Services



3.4 Geographical Distribution of Blockchain Enterprises

The distribution of blockchain service providers is obviously tiered, with 405 and 292 enterprises in Beijing and the Guangdong Province respectively, belonging to the first tier; 168, 134 and 113 in Shanghai, Zhejiang Province, and Jiangsu Province respectively, falling into the second tier; and less than 100 in the remaining provinces, belonging to the third tier.

Diagram 5: Regional Distribution of Blockchain Companies With Approved Filings



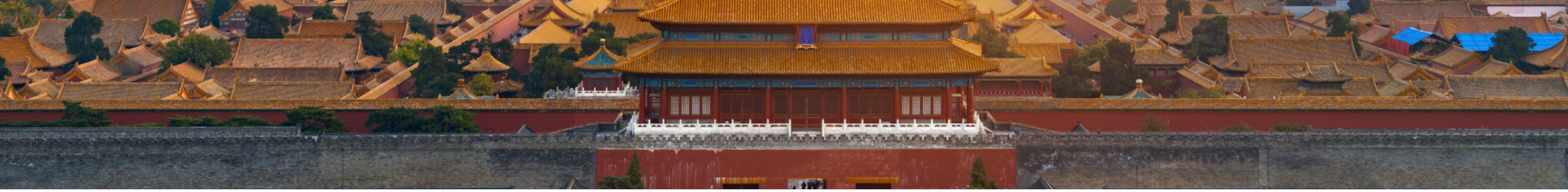
3.5 Top Blockchain Enterprises

According to the blockchain filings of the Cyberspace Administration of China, 44 enterprises with strong capacities of blockchain technology development and application have applied for filing services over five times.

These include large state-owned group enterprises such as Ping An Group, CITIC Group, China Merchants, and China Mobile; Internet companies such as Ant Chain, JD, and Alibaba; and blockchain software service enterprises such as Jiangsu Rongze Information Technology, YG Soft, Gao Shan Tech, and Hyperchain.

Diagram 6: Top 10 Enterprises with Greatest Number of Approved Filings for Blockchain Services

Blockchain entities	Number of services approved
Jiangsu Rongzer Information Technology Corp.	18
Ant Blockchain Technology (Shanghai) Co.,Ltd.	15
YGSOFT Inc.	13
Shenzhen OneConnectSmart Technology Co., Ltd.	11
Hangzhou Qulian Technology Co., Ltd.	10
Beijing TC Union Net	10
Beijing Tongbang Zhuoyi Technology Co.,Ltd	9
Anhui Zhongke Jingge Technology Co.,Ltd	9
Boya RegChain (Beijing) Technology Co.,Ltd	9
China Unionpay Co., Ltd.	8
Hunan Smart Governance Blochain Technology Co.,Ltd	8
Hunan Hexin Anhua blockchain Technology Co., Ltd	8
Anhui Gaoshan Technology Co.,Ltd	8



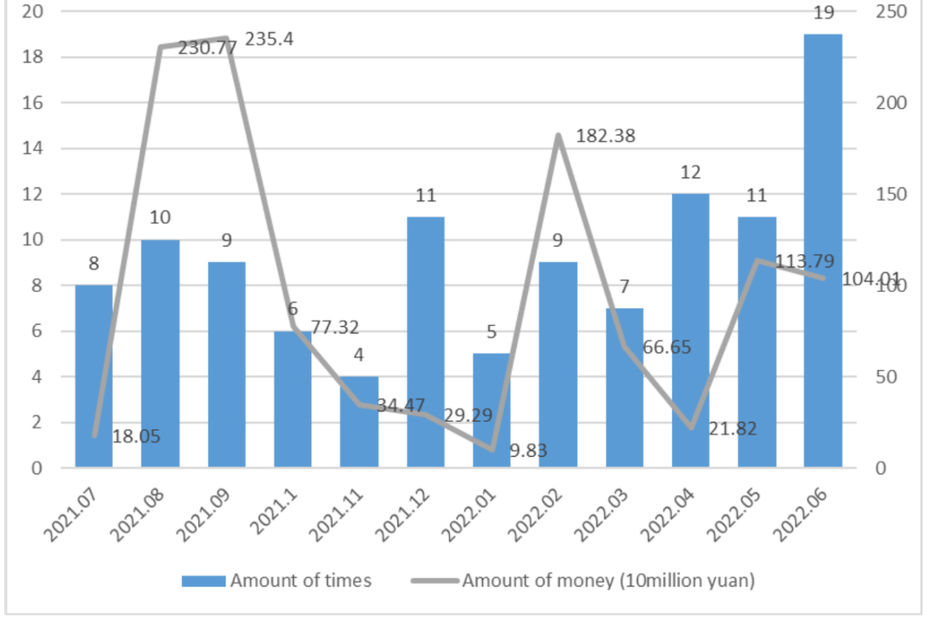
3.6 Investment and Financing

In general, investment and financing in China's blockchain industry has maintained a stable and good momentum. In terms of the number of financing activities according to China's records, 111 financing activities occurred to fund China's blockchain industry from July 2021 to June 2022, of which 82 transactions with a total amount of RMB11.238 billion were publicly disclosed, with the average amount of financing for a single project exceeding RMB 100 million.

According to statistics recorded thus far which have yet to be completed, 48 financing activities occurred in the second half of 2021 in China, with a total financing of RMB6.253 billion, while 63 financing activities occurred in the first half of 2022, with a total financing of RMB4.985 billion. Overall, compared with the second half of 2021, the number of blockchain investment and financing events in China in the first half of 2022 rose by 31.25% year-on-year, but the overall financing amount dropped year-on-year.

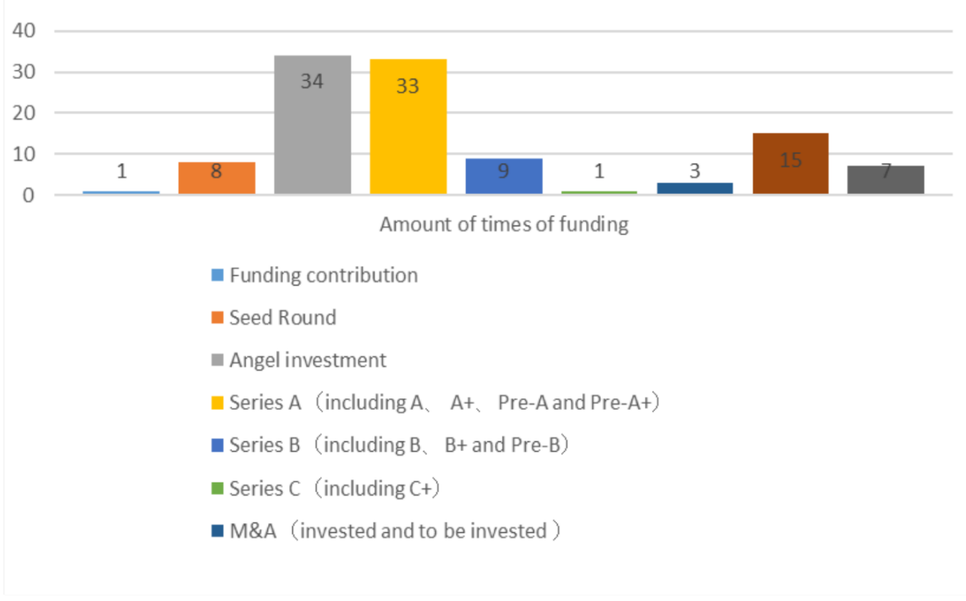
In terms of financing rounds, the capital market has become more favorable to early-stage projects in the past year, with over 60% of financing projects being seed rounds, angel rounds and series A rounds. Among them, angel round and series A round financing accounted for 30.63% and 29.73% respectively, the highest proportion.

Diagram 7: Quantity and Amount of Blockchain Industry in China (1 Jul 2021 - 30 Jun 2022)



Source: Qimingpian

Diagram 8: Distribution of Domestic Blockchain Industry Financing Rounds (1 Jul 2021 – 30 Jun 2022)



Source: Qimingpian

3.7 Industrial Parks

According to the statistics of CAICT, as of September 2022, 55 blockchain industrial parks have been launched in 22 provinces in China, concentrating on four major regions with elements for park development such as rich application scenarios and talent aggregation: Yangtze River Delta region, Pearl River Delta region, Bohai Economic Rim, and Hunan & Guizhou & Chongqing district.

The construction of blockchain industrial parks in China is led by local governments, forming a government-led development model. 75% of blockchain industrial parks in China depend on government, which includes the government-led model and the government and private partnership, or the joint model of universities or research institutions and the government.

Diagram 9: Construction Mode of Blockchain Industrial Parks

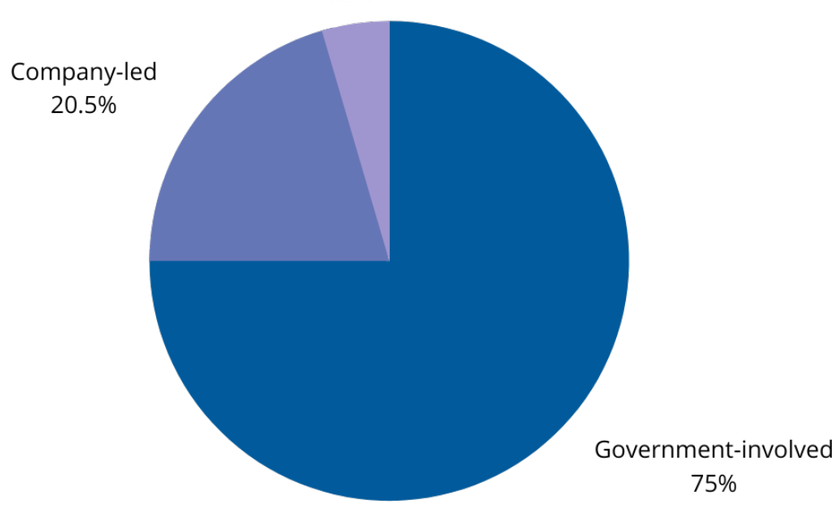
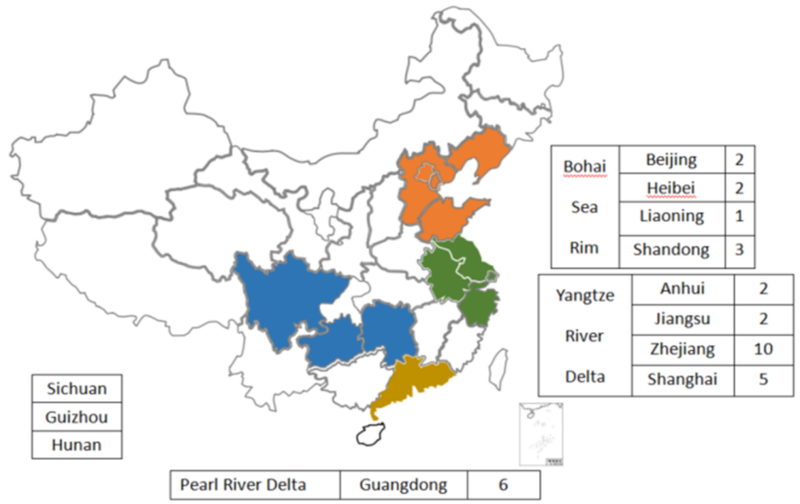


Diagram 10: Number and Geographical Distribution of Blockchain Industrial Parks



4. APPLICATION

4.1 Vigorously Promoting the Innovative Application of Blockchain at the National Level

At the national level, China vigorously promotes innovative applications of blockchain. On January 30, 2022, 16 departments, including the Cyberspace Administration of China, the Supreme People's Court, and the Ministry of Industry and Information Technology, jointly released the list of national blockchain innovation application pilots. The list was nominated by local governments and departments, reviewed by experts, and publicized online. A total of 15 comprehensive and 164 special areas of national blockchain innovation application pilots were identified, covering blockchain in manufacturing, energy, government services/government data sharing, rule of law, tax services, trials, prosecution, copyright, civil affairs, human resources and social security, education, medical care, trade and finance, risk control management, equity market, and cross-border finance. 16 departments jointly pointed out that they would strengthen the organization and coordination, policy and financial support, and guidance and implementation of the pilot work in the region.

4.2 Blockchain Applications in China Are Mainly in the Form of Consortium Chain to Facilitate Multi-sector Development

China adopts the form of consortium blockchains and permissioned public blockchains to develop blockchain applications. As a result, its blockchain applications are mostly focused on the industrial sector, with the functions of promoting the collaboration of multiple parties, enhancing production efficiency, and confirming the ownership of assets online. Since China prohibits cryptocurrencies from public blockchains, applications such as cryptocurrency trading and decentralized finance with public blockchains as the underlying network are periphery at the moment. According to the statistics of CAICT, the main application areas of blockchain in China are mainly in government, finance, traceability, agriculture, justice, carbon neutrality and reducing carbon emissions.

4.2.1 Government Affairs

Governments at all levels in China are proactively promoting pilot projects adopting blockchain for processing data. With the help of blockchain technology, government data can be shared and circulated across departments, which helps improve efficiency, reduce processing documents, and enhance process transparency.

For example, “Quancheng Chain”, the blockchain platform of the Jinan local government, has enabled a trusted flow of government data on chain with blockchain technology and realized streamlined one-stop government services, which has granted a cumulative total of more than 17,000 enterprise business licenses and set the record for the time to start a business at 35 minutes, over 75% shorter than the promised time. This also has reduced the quantity of documents submitted by people by an average of 61%, greatly lessening business processing time and document submission.

4.2.2 Finance

The application of blockchain in finance has transformed credit sales in traditional trade into credible blockchain bookkeeping credentials, effectively addressing the demand for multiparty collaboration across businesses, institutions, and systems in industrial chain finance; establishing digital trust between industry and finance; and facilitating more efficient financial services for the real economy. Blockchain technology applied in the financial sector is rich and diversified in terms of application scenarios, mainly including registration and storage of information for traceability, supply chain finance, asset trading, and insurance. Many blockchain financial application projects are currently transforming existing business for institutions, based on blockchain technology’s potential to address the pain points of these businesses.

For example, in May 2017, Bubi Tech launched Bubi Yinuo Industrial Finance - China’s first distributed supply chain financial services platform. So far, the Bubi Yinuo Industrial Financial Blockchain has served over 20 domestic financial institutions, more than 30 large manufacturing enterprises, and over 10,000 suppliers/distributors. Bubi Yinuo has formed a stable and credible business model, with a total of assets on the blockchain of nearly RMB 30 billion.

4.2.3 Justice

Under the top-level policy guidance of the Supreme People’s Court of China, the development of blockchain-based judicial activities on-chain has accelerated, and the application of storing evidence has gradually matured. The integration of blockchain and justice has strengthened the judicial system’s ability to store and secure digital evidence; simplified the process of obtaining evidence, authentication, and cross-examination; and optimized online litigation processing, thus empowering the development of judicial openness and a smart court.

For instance, the Supreme People’s Court took the lead in building the “People’s Court Unified Judicial Blockchain Platform”, with a view to enable full nodes’ consensus of digital data to be witnessed. The whole chain is secure and credible, the whole process is recorded, and the data is difficult to be tampered with, thus solving pain points in litigation practice, such as the difficulties of deposition, forensics, and authentication. At present, it has been applied in the local high people’s courts in Jiangsu, Zhejiang, Tianjin, and Henan provinces, as well as more than 30 judicial institutions such as intermediate people’s courts and online, with over 180 million pieces of data collected online and 43 million depositing businesses.

4.2.4 Traceability

Blockchain technology enables the traceability of the whole chain from the source, strictly controls the quality of goods, realizes immutability once the data is on chain, and ensures the credibility and traceability data. For instance, the quality and safety traceability system of local Chinese herbal medicines for Guangdong-Hong Kong-Macao Greater Bay Area, created by blockchain company Teleinfo, collects the original information of Chinese herbal medicines in various aspects such as production and cultivation, processing and packaging, transportation and circulation, trading, and consumption and uploads data to the traceability platform through blockchain to ensure information authenticity. At the same time, the product is given a unique “Macau Code”, and consumers can scan it to obtain the whole life cycle information of the Chinese herbal medicine, thus forming a traceability system covering standardization of planting, processing, transportation, and circulation.

4.2.5 Agriculture

Digital technology represented by blockchain can efficiently facilitate the transformation of the industry production mode and the rural governance mode and realize targeted poverty alleviation, which is of great significance to the modernization of China’s agricultural system. In the real industrial application and implementations, the whole supply chain management of agricultural products can be further digitalized through the traceability and tamper-proof characteristics of blockchain technology.

For example, in 2021, Tencent released its strategic new product “Tencent Reassurance Platform”, which realizes digital management of the whole chain from the production, circulation, and marketing process of commodities through technologies such as “unique code for unique product” and blockchain, and the platform plans to explore and select 100 quality brands of agricultural products of origin in the next three years.

4.2.6 Reducing Carbon Emission and Carbon Neutrality

The features of blockchain technology can be applied to the transformation of production processes, management model innovation, the multi-link optimization of supply chain and industrial chain in the context of carbon neutrality and reducing carbon emissions, and promotion of trusted collaboration among participating entities, especially in the following three aspects:

First, blockchain can build a timely and trusted carbon regulatory environment. In January 2021, the Ministry of Ecology and Environment issued the "National Measures for the Administration of Carbon Emission Trading (Trial)", which prescribes a three-tier management system of the national carbon market covering national, provincial, and municipality levels, and also specifies the responsibilities of relevant departments at all levels. In Addition, blockchain technology can enhance information transparency and timeliness and reduce information management and supervision costs in applications such as carbon emission rights registration, trading, settlement, carbon emission reporting and verification. Thus, it can build a traceable trading supervision environment for all links in the whole process, enhancing the modernization of government carbon emission regulation and social services.

Second, blockchain can empower the transformation and upgrading of the industry, optimize the production process, promote carbon emission reduction, and improve energy efficiency. Currently, China's carbon emissions are mainly concentrated in energy-intensive industries such as manufacturing, power, and energy. Blockchain is a crucial breakthrough in the digital transformation of traditional industries. With its characteristics of decentralization, verifiability, and tamper-proof nature, it can effectively increase the transparency and reduce the paperwork process in the supply chain, thus greatly bolstering the efficiency of the supply chain. Blockchain technology can build a decentralized infrastructure of trusted and multi-party collaboration, help break the isolated data islands in the industry, and build a new collaborative production system and capacity sharing platform through smart contracts and other technologies. Therefore, it can improve the efficiency of multi-party collaboration, and advance the reduction of overall energy consumption and carbon emission level of society.

Third, blockchain can build a trusted and efficient carbon trading platform and market. Applying blockchain technology to the carbon trading market can realize real-time, transparent, and tamper-proof management of carbon assets and carbon emission rights of high-carbon emitting and energy-saving enterprises, enhance the activity of the carbon trading market, and facilitate a market mechanism with unified carbon pricing. It can build a flexible and interactive carbon asset trading model with multiple parties such as carbon trading entities, trading institutions and governments, realizing the whole process with on-chain data storage and credible sharing from emission rights acquisition, trading, and flow to transaction verification and statistics. In this way, carbon emission quotas can be traded under visible conditions, the flow process can be transparent, and the source of the whole life cycle can be traced.

4.2.7 Digital Collections (NFT)

China's digital collections are different from NFTs overseas in that: first, most of them are based on the consortium blockchain or permissioned public blockchain, while NFTs overseas are based on public blockchains like Ethereum or Solana. Second, China's digital collections have strict restrictions for secondary market transactions (for example, buyers can only transfer digital collections after over 180 days, and most platforms have not enabled secondary transactions). Third, users need to register with real names; fourth, fiat currencies instead of cryptocurrencies are used for payments.

Although China has no relevant policies or regulations on digital collection so far, people in government, industry and academia are actively promoting vigorous development in this sector and guiding the industry toward a healthy path. For example, in April 2022, the National Internet Finance Association of China, the China Banking Association, and the Securities Association of China jointly released the Initiative on Preventing NFT-related Financial Risks. The Initiative affirms the positive value of NFT technology in enriching digital economic models, promoting the development of the cultural and creative industry; it also points out that the industry currently has risks such as speculation, money laundering, illegal finance, etc. It calls on people engaged in this industry to consciously abide by the principle of not conducting illegal behaviors such as providing NFT transactions, settling accounts with cryptocurrencies, and issuing or trading financial products in disguised forms.

In terms of practice, for example, the Lingjing Collection is the digital collection platform constructed on the new national blockchain infrastructure Xinghuo BIF. Officially launched at the end of February 2022, the platform displays digital collections on traditional culture, the equipment manufacturing industry, the latest digital trends for entertainment, and social responsibility. With digital collections as the carrier, it links popular icons, art creators, art institutions, and art lovers to provide high-quality and all-around services in this field. At the same time, Lingjing Collection also provides digital collection solutions such as planning, collection design and distribution, SaaS services, application customization, compliance counseling, brand marketing, and other one-stop solutions for digital collection customers. Since its launch in February 2022, it has worked with dozens of partners such as the CAICT, Artron.Net, Guowenju, Xi'an Museum, and iQiyi, etc., and has launched more than 100 items of digital collections, which are very popular among users and sold out within several seconds after release.

Also, the Open Permissioned Blockchains (OPB) project in China, developed by the Blockchain-based Service Network (BSN) whereby permissioned versions of public blockchains like Ethereum can operate in a compliant way in the mainland while retaining full compatibility with the fully decentralized mainnet abroad. BSN's WenChang Chain has successfully addressed the internet-scale openness and compliance with China's regulatory requirements like fungible token restrictions and KYC. Built by Cosmos core open-source contributor Bianjie and powered by the leading Cosmos/IRISnet tech stack, WenChang Chain features inherent openness and advancement, with an enhanced permission control in the application layer; it also guarantees strong support for the development of distributed applications. Furthermore, WenChang Chain provides a developer-friendly environment that allows enterprises to expediently build Web 3.0 distributed applications for their businesses. In the seven months of commercial operations since March 2022, WenChang Chain has supported over 2,000 business distributed applications (dApps) for various enterprises. On July 22, 2022, WenChang Chain's daily transaction numbers surpassed 1.6 million, 41% more than Ethereum's 1.2 million transaction volume on that same day, and just 20K transactions less than Ethereum's daily all time high transaction volume.

4.3 Steady Progress of the Central Bank Digital Currency(e-CNY)

The most significant CBDC effort in the world to date has been China's Digital Currency Electronic Payment (DCEP) initiative, which has been in development since 2014. The DCEP was an initiative to commercialize China's CBDC, along with the development of a dominant patent portfolio on the use of distributed ledger technologies, digital currency wallets, digital currency management, and payment processing and settlement. In October 2019, China announced its intention to launch its CBDC, since then officially named the e-CNY. The e-CNY announcement in 2019 has catalyzed central banks around the world to follow suit in developing their own CBDC strategies.

The e-CNY is architected as a two-tier system. The first tier is a centralized, account-based system for issuances and redemptions, very similar to how central banks traditionally transmit money to commercial banks. In general, central banks are very wary of disintermediating their commercial banks, which they depend on for transmitting their monetary policy. Thus, the e-CNY's system, as with most other central banks' CBDC implementations, was explicitly designed to keep the intermediation of the country's commercial banks intact, even though in theory it would have been possible for users to have direct accounts with the central bank.

In the second tier, commercial banks are responsible for redistributing the e-CNY as the business and user-facing interfaces to the broader financial ecosystem. The second tier is intentionally open-ended in its approach to blockchain implementation, notably allowing for more decentralized infrastructure such as distributed-ledger or blockchain technology. This two-tier system is both flexible and pragmatic, and other central banks, notably the U.S. Federal Reserve, are researching similar frameworks.

China's e-CNY implementation follows a unique model known as "one currency, two reserves, three centers". In this system:

"one currency" refers to a singular digital currency issued by the central bank;

"two reserves" references the digital currency issuance reserves of the central bank as well as the digital currency commercial bank reserves, corresponding to the two tiers of the e-CNY architecture; and

"three centers" consists of a user registration center, a transaction verification center, and a big data analysis center. The registration center serves to record the owners of CBDC accounts and, in tandem with the verification center, can facilitate the central bank's currency validation function. The big data center can then monitor transactions and safeguard the security of the e-CNY.

The e-CNY provides the same characteristics of portability and speed as electronic payment instruments but allows for a controlled anonymous design which can protect user privacy while still allowing the prevention of illegal criminal activities.

The PBOC is aware of the power of decentralized public ledger technologies and cryptocurrencies to disintermediate its control over the country's money supply. Recently, the central bank explicitly stated new regulation that specifies "no unit or individual shall make or offer tokens or digital tokens for circulation in the market instead of RMB." Effectively, any way to make a synthetic substitution for the e-CNY for settlement is now forbidden. This is the regulatory implementation of the "one currency" principle.

On April 18, 2021, Li Bo, Vice Governor of the People's Bank of China (PBOC), said at a sub-forum of the Boao Forum for Asia that the PBOC is studying the regulatory rules for bitcoin and stablecoins. In the future, any stablecoin that hopes to become a widely used payment instrument will have to be subject to the same strict regulation as financial institutions such as banks or quasi-banks. To ensure that speculation on cryptocurrency assets does not create serious financial risk, cryptocurrency assets in China are investment options that are not currencies per se, but alternative investments, and cryptocurrency assets, if they work, will be considered an investment vehicle or alternative investment.

Recent e-CNY developments

The initial pilot zones set in 2019 for the e-CNY were Shenzhen, Suzhou, Xiong'an, Chengdu, and the Beijing 2022 Winter Olympic Games setting. Since that time, pilots have rapidly scaled to the most important economic zones across China. The second batch of pilot cities announced at the end of 2020 included Shanghai, Hainan, Changsha, Xi'an, Qingdao, and Dalian. In March 2022, the third batch of pilot cities added included Tianjin, Chongqing, Guangzhou, Fuzhou, Xiamen, Beijing, Zhangjiakou, and six cities hosting the Asian Games (Hangzhou, Ningbo, Wenzhou, Huzhou, Shaoxing and Jinhua). The new pilot regions cover seven geographic regions in North, East, South, Central, Southwest, Northwest and Northeast China, reaching major core city clusters in China. Hainan is unique as the only province-wide pilot of e-CNY in China, with the advantages of having both a focus on tourism and consumption and a free-trade zone to provide ideal conditions for exploring e-CNY consumption scenarios and for cross-border payment applications. The Hainan government is developing a cross-border clearing house as an off-shore RMB settlement center to support offshore payments for e-CNY.

China is leading the world as the first major economy in the G20 in scaling the commercialization of its CBDC through large-scale pilots and deployments. Most of the major notable tech companies are all testing e-CNY use cases including retail transactions, e-commerce, bill payment, government services, tax and fee payments, insurance, microfinance loans, and other scenarios. This includes widespread tests on programmability, functionality, online e-commerce usage, endpoints for automatic teller machines and point-of-sale merchants, hardware smart cards (allowing financial inclusion of citizens without smartphones), biometric identification, and stimulus and subsidy dissemination. Payment companies Alipay, WeChat as well as China's four policy banks (Bank of China, ICBC, Construction Bank, and Agriculture Bank) and others have been selected to provide digital wallets for the e-CNY. To date, over 261 million digital wallets have been created and more than US$13.9 billion in total transactions have been completed with scaled use cases and pilots across the country.

Notably, the e-CNY has also been recently piloted for use in high-value business payments. China's existing system for such payments is roughly comparable to the U.S. Fedwire system and is used to facilitate large money transfers with a minimum transaction value of RMB500,000. These pilots indicate that China's e-CNY is undergoing experimentation for wholesale use cases as a potential replacement or complement for China's Real Time Gross Settlement (RTGS) system. This extends the e-CNY well beyond the initial focus of retail use cases such as consumer transactions and small, business-to-business transfers. The PBOC recently announced in December 2021 its intention to test the cross-border payment features of the e-CNY by linking to the Faster Payment System in Hong Kong. Meanwhile, the mBridge project has finished its first phase of development, testing use cases of international trade "with sample transactions spanning 11 industries in the four jurisdictions in transactional value exceeding RMB2 billion (US$315 million)."

China has already cleared over US$5.3 billion in e-CNY transactions and is continuing to scale use cases and pilots across the country. The Beijing Winter Olympics in February 2022 was a critical testbed for e-CNY to test the ability to allow foreign athletes and visitors to be able to create e-CNY wallets and make purchases within the Olympic venues without the need to open bank accounts. The four policy banks issued e-CNY coupon promotions to spur adoption ahead of the Beijing Winter Olympics in 2022, for use cases including public transportation, supermarkets, delivery services, laundromats, and bookstores. At least US$55 million worth of promotions have been conducted across Winter Olympics venues and the rest of the country since Shenzhen's first public test in October 2020. While the whole world expected a commercial e-CNY launch for the Beijing Olympics, the implementation at the Olympics was just another limited-scale demonstration base for the e-CNY.

While China has demonstrated various use cases for the e-CNY, the country still has not figured out how to entice the general public and business sector to fully adopt the usage of the country's CBDC. Given that the entire country has gone nearly fully cashless for years with the dominance of Alipay and WeChat payment systems (each with nearly one billion users each), it is not clear what the e-CNY is adding in terms of functionality or convenience for most of its citizens. It is likely that the full, country-wide commercialization of the e-CNY is still potentially years away, with various technical interoperability, legal, regulatory, marketing, and other business scaling issues to address before mass adoption can be achieved. In February 2022, the Central Bank issued the "Fourteenth Five-Year Development Plan for Financial Standardization", mentioning that "the development of standards for legal digital currency should be promoted in a steady and orderly manner". China is also actively developing international governance rules around important issues such as legal digital currency processes, cross-border data flow, market access, and data privacy protection.

A key challenge for the e-CNY to have a global influence beyond China's borders is how it will be used to settle trade transactions with its trade partners around the world. For this next phase of e-CNY internationalization, the e-CNY must become interoperable with the CBDCs of other countries. Hence, the PBOC is moving toward the development of global CBDC standards and working with other monetary authorities to launch multi-CBDC arrangements, such as the aforementioned mBridge initiative in Hong Kong. Notably, the technology subcommittee of mBridge is headed by the PBOC. A September 2021 report on mBridge published by the Bank for International Settlements (BIS) and participating monetary authorities estimates that the initiative could reduce cross-border payment costs by as much as 50% and cut payment times from a few days to a few seconds. A report from Oliver Wyman finds that using China's e-CNY in trade with Hong Kong may save US$20–40 billion annually.

The eventual use of the e-CNY in cross-border trade and commerce aligns with Beijing's long-term goal to steadily internationalize the RMB over time. Zhou Chengjun, the director of the People's Bank of China's Institute of Research, commented that as the e-CNY is increasingly used for cross-border, business-to-business payments, it may evolve into a dominant regional currency for Asia as well as for other developing regions such as Africa. China's position as a trading powerhouse could position the e-CNY to spur the adoption of global digital payments. Cross-border activity connecting the China Mainland portion of the Greater Bay Area (China's Silicon Valley in the Pearl River Delta which includes the Shenzhen/Guangzhou megacities) to the special administrative regions of Hong Kong and Macau, as well as Hainan, are being actively explored.

4.4 Plan for Web3 and Metaverse

4.4.1 Web3

Blockchain technology has driven the further evolution of the World Wide Web, pointing toward the advent of Web3, which has drawn wide attention from different sectors around the world. Globally, Web3 is in its infancy. In China, the development of the blockchain industry introduced in this report also demonstrates the full efforts made by China to advance a new generation of the Internet.

From the perspective of giving ownership back to users in the form of their online identity and personal data, in the current Web2 era, user identity and personal data are controlled by centralized platforms, causing split digital identity, personal information abuse, hacking attacks, and other risks; meanwhile, Web3 uses the decentralization and tamper-proof features of blockchain to enable users to control their own digital identity with private keys. Through the login of "Connect Wallet", users control their own identity and enjoy personal information protection, and by connecting the "isolated identity island" between different platforms, a real network effect can be realized. For example, the blockchain infrastructure Xinghuo BIF led by the CAICT is the largest digital identity network practice in China so far. By allowing users to create and allocate the blockchain identification bid based on the World Wide Web Consortium (W3C) DID standards, Xinghuo BIF enables users to obtain self-sovereign identity (SSI). It also develops SSI-based applications such as data asset ownership confirmation, logistics traceability, industrial Internet, and so on through integrating the management rules of multi-party collaboration and co-governance.

From the perspective of digital assets, a very important feature of the Web3 network is the introduction of the token incentive mechanism, which encourages nodes to record network transactions to maintain the stability of decentralized networks. Because the tokens issued by project parties such as Bitcoin and Ether do not have the attributes of national fiat currency, their characteristics such as decentralization and anonymity are very easy exploit by criminals for money laundering. The uncertainty of token value has also increased the risk for investors. However, blockchain technology supports the online ownership conformation of physically mapped or native virtual assets, which is a major feature and innovation of the Web3 era. In addition to avoiding the potential threats posed by virtual tokens, China is also proactively exploring and deploying value circulation over the Internet, thereby further tapping the potential of the digital economy. For example, digital collections based on NFT technology are conducive to the online ownership confirmation of cultural and artistic works, so culture can be disseminated more widely; through blockchain technology, carbon emission rights can also be confirmed on the network, which can facilitate value transfer and transactions of carbon emission rights among participants. This can contribute to the development of energy conservation and emission reduction in China.

Shanghai is at the forefront of Web3 developments in China. In July 2022, Shanghai Municipal Government released the 14th Five-Year Plan for the Development of Digital Economy in Shanghai. The plan clearly states that Shanghai is to strengthen the new infrastructure deployment, technological research and development, and application innovation for Web3, and create a future-oriented cyber ecosystem. In terms of advanced deployment, it will conduct cutting-edge exploration of multi-platform OpenID, distributed digital storage, decentralized DNS, end-to-end encrypted communication, and other Web3 key technologies. It plans to build in Shanghai the backbone nodes of Xinghuo BIF, the Web3 new blockchain infrastructure. Furthermore, it will deploy advanced quantum communication, satellite Internet, and seamless linkage of global Internet.

Of course, we also see the risks for investors caused by cryptocurrency instability in Web3, money laundering and dark web activities caused by anonymization, and uncontrollability of illegal content caused by decentralization. Coordination and regulation from China and countries around the world are needed for the new generation of Internet technology to achieve rapid and sound development.

4.4.2 Metaverse

Based on the digital technology construction, the metaverse has built a virtual space which can map the real world while staying independent from it. It is a new application scenario that integrates various technologies such as AR/VR, blockchain, artificial intelligence, big data, 5G, and so on.

As one of the important elements supporting the metaverse, blockchain technology uses features such as decentralization, openness, transparency, and tamper-proof records to build for the metaverse an identity system controlled by the users themselves and supports the economic system where value flows in the cyber space.

China attaches great importance to the development of the metaverse industry. At the policy level, according to the incomplete statistics of CAICT, governments in Beijing, Shanghai, Shenzhen, Xiamen and other places have stepped up the deployment of the metaverse industry, and a series of relevant policies and planning documents relevant to the metaverse have been introduced in a short period of time.

Diagram 11: Metaverse Policy by Region in China

Region	Date	Policy Name	Contents
Beijing	February, 2022	Eight Measures on Accelerating the Innovation-led Metaverse Development of the Sub-city center in Beijing	Accelerate the in-depth integration of the metaverse-related technologies in different sectors; promote the transformation and upgrading of industries; focus on fields such as culture, tourism, and business; enhance the capacity of the metaverse on industrial spaces; and create a "1+N" industrial innovation cluster.
Shanghai	February, 2022	Action Plan for the Development of the Metaverse Industry	Build the North Bund into a demonstration area for the development and application of metaverse, focusing on the "six ones": cultivate and introduce one group of enterprises with high-quality application of metaverse; establish one group of enterprises with high-quality application of metaverse; create one batch of innovation centers on hardware technology; build one good digital economy ecosystem; create one batch of model projects on metaverse scenario applications; establish a party building alliance in the metaverse industry.
Chongqing	April, 2022	Action Plan for the Innovation and Development of Metaverse Industry in Yubei District (2022-2024)	Seize the new development opportunities for digital economy and metaverse, create the "Metaverse Pioneering Pilot Zone" and "Metaverse Eco-Industrial Park", and build a governance and industrial development system of metaverse. Strive to establish a new model, a new service and new a form of metaverse in fields such as industry, transportation, cultural tourism, commerce, trade, education, medical care, exhibitions, and government affairs by 2024 and make visible progress in the R&D and application promotion of the metaverse .
Wuxi	January, 2022	Development Plan for Metaverse Ecological Industry in Taihu Bay Science and Innovation Belt Leading Zone	Focus on the integration of application leadership and scenario-driven models in the promotion of the in-depth application of the metaverse technology in various fields; promote the coordinated development of different steps and entities in the upstream and downstream of the metaverse industry; accelerate the integrated and innovative development of the metaverse with other technologies, including integrated circuits, blockchain, artificial intelligence, cloud computing, etc.
Xiamen	March, 2022	Three-year Action Plan for the Development of Metaverse Industry in Xiamen (2022-2024)	Implement major scientific research projects centering on key technologies in key areas of metaverse. Strengthen coordination at ministerial, provincial, and municipal levels, and actively strive for the deployment of major national and provincial scientific and technological projects and realize implementation. Encourage enterprises, universities, and research institutes to adopt the "horse racing mechanism" and the ranking method to conduct cooperative research on key metaverse technologies such as NFTs, AR/VR, brain-computer interface, smart chips, and intelligent algorithms; and support frontier technological breakthroughs of the metaverse.
Hangzhou	May, 2022	Metaverse Industry Policy of Qiantang District	Mainly focus on five major plans including talent introduction, space guarantee, fund assistance, echelon construction, and synergistic innovation. If a high-level talent comes to Qiantang district to establish a metaverse industry project, he/she will be given up to RMB10 million as startup capital and R&D subsidy, and a maximum of three-year rent subsidy for 1,000 square meters of space. Businesses in highly needed fields of the industry with particularly prominent capabilities will be given a maximum funding of RMB100 million.
Shenyang	June, 2022	Action Plan for the Innovation and Development of Metaverse Industry in Heping District	Strive to build by 2024 a new model of "industry-university-research-application-government-finance" for the development of metaverse industry, build an innovation ecosystem of metaverse industry, and build the first district in Northeastern China for the innovation and development of metaverse. Focus on the seven core technologies of metaverse, namely, blockchain technology, interactive technology, video game technology, network and computing technology, artificial intelligence technology, Internet of Things technology, and tool software technology.

Source: The China Academy of Information and Communications Technology

As for enterprises, Tencent has invested in many AR, VR, and blockchain companies with business relevant to metaverse, such as "the top stocks of metaverse," Roblox, Epic Games, Immutable X, and so on. Meanwhile, Tencent established in, June, 2022, the "Extended Reality (XR)" department, entering the metaverse industry via this game. ByteDance acquired PICO, China's Virtual Reality manufacturer with largest market share, at the price of RMB 5 billion in August 2021, and announced that they would cooperate with Qualcomm to develop the "Global Extended Reality". Baidu released in 2021 the VR 2.0 industrialization platform based on Baidu Brain, and later launched a social networking app called "XIRANG", with the aim of developing metaverse. According to Baidu, it will build a multi-person interactive virtual world which recognizes identity, crosses virtual world and display, and can sustain permanently. Alibaba established an XR laboratory to explore the future operating system under the next-generation architecture of integrated cloud networks and focus on the research of a new-generation of mobile computing platforms.

China's deployment in the industrial metaverse has also been carried out in an orderly manner. As the neural network of the industrial metaverse, the development of the industrial Internet has entered into maturity. China has built a unified data identifier resolution system for its industrial Internet, which consists of five top nodes, distributed in places like Beijing and Guangzhou, and over 200 secondary level nodes in different sectors and regions across the country. As of October 2022, there were 242 secondary level nodes across the country connecting into national top-level nodes. The secondary level nodes, which have been connected to the national top nodes, are distributed in 29 provinces (autonomous regions, municipalities), covering 38 industries, with a total of over 201.6 billion registered IDs in the industrial Internet. The accumulated number of connected enterprise nodes has exceeded 190,000. The daily resolution volume of national top nodes is about 130 million. Over 10.41 million active identifier carriers have been deployed, which has created a good data condition for the development of the industrial metaverse.

Virtual-real integration has become a major trend in the development of the Internet, but at present, the metaverse industry is still in its early development stages, and thus is still far from scaled production. China's vigorous development of the blockchain industry will also promote early deployment and industrial development of the metaverse. With the close integration of the metaverse technology and the real economy as the main direction, China will greatly promote scientific and technological breakthroughs and innovations in the core areas of metaverse industry, facilitate the vigorous development of China's digital economy, and cultivate the new driving force, new business, and new models of China's metaverse industry. China intends to also lead a new round of scientific and technological revolutions and industrial changes, promote relevant standards setting for the metaverse industry, facilitate the industrialization of the metaverse, and introduce metaverse to industries.

5. INFRASTRUCTURE

5.1 Overview

On April 20, 2020, the National Development and Reform Commission of China first proposed the scope of "new infrastructure", which includes information infrastructure, integrated infrastructure, and innovative infrastructure. Blockchain falls into the category of information infrastructure.

China attaches great importance to the significant role of new infrastructure in promoting the digital economy, improving people's living standards, and advancing its modernization drive. The "new infrastructure" will build a fundamental network that will underpin China's new economic growth, greatly accelerate China's new economy, and facilitate the formation of short-term and long-term economic growth impetuses.

Blockchain infrastructure is a public chain network with extensive access, public service capabilities and flexible deployment, along with network service facilities composed of cross-chain systems connecting to the blockchain. Blockchain infrastructure in the narrow sense is a distributed trusted platform consisting of a number of nodes that comply with the predetermined consensus mechanism; blockchain infrastructure, in a broad sense, refers to the market-based configurations which support regulated and efficient data flow as data becomes the new production factor, thereby promoting the building of large-scale trusted collaborative networks.

5.2 Implementation Path

The large-scale blockchain infrastructure is still in its early development stage. Different organizations, institutions, and enterprises have chosen different entry points to fully leverage their own advantages to build a large-scale blockchain infrastructure. The building of China's blockchain infrastructure shows four development paths, namely the ecosystem path driven by the open-source community, the network path of the building of the domain nodes, the business path which prioritizes industry, and the platform-based path led by public services. After years of development, these four paths have also shown a certain degree of interweaving and new evolution.

Diagram 12: Development Path for Blockchain Infrastructure

5.2.1 Driven by Open-Source Community

Blockchain emerged from open-source community. It is technology-driven and aims to build a trusted ledger in the digital world. It provides open, transparent, and auditable underlying operation logics for ecological networks. Path One which has benefited from the collaborative model of open source and openness, attracts a large number of investors and contributors to jointly promote the prosperity of the community ecosystem. The standard specifications formed are recognized globally, providing services for most public innovative applications. China attaches great importance to the benefits brought by open-source developments. In October of 2020, the Openatom Foundation announced the establishment of the first blockchain open-source working group in China to promote the management of these. As the leading company of the working group, the Internet giant Baidu released the open-source platform XuperChain, which features high performance, security, and expandability.

5.2.2 Subregion Construction

The public service platform of the blockchain infrastructure with domain as the entry point aims at advancing the coordinated development of regions. Based on the geographical boundaries, it provides designated services to a certain area such as a province or city. The main services include government data management, regional digital identity, ticket management, public resource transaction services, and so on. Most cases in Path Two have large overall planning and long construction cycle. With the continuous expansion of network scale, it will play an important role in the digital transformation of the industry. Xinghuo BIF is a blockchain infrastructure built with the support of the Chinese government. Since its official launch in 2020, it has completed the building of parts of nodes, which essentially covers areas with fast economic development and high information-reliant levels in China, such as Beijing, Tianjin, Hebei and the Yangtze River Delta.

5.2.3 Development Oriented to Industry Application

The blockchain business system is built in accordance with business needs. It solves the long-existing problems in the field by constructing a set of industrial management paradigms. Generally, it is co-constructed by representatives from the industry, enterprises, and alliances, with the focus on fields such as finance, supply chain, and government affairs. Path Three usually requires a high starting point, but its development trend is largely impacted by hot issues and scenarios. Therefore, it is susceptible to business limitations and fails to distinguish business category and integrate with Path One and Path Two. The State Grid Corporation of China has built the largest blockchain infrastructure in the field of power energy “State Grid Chain”, which enables the full-process information of green power production, transactions, and absorption to be on-chain and provide trusted support to the secure power data communication and external coordination.

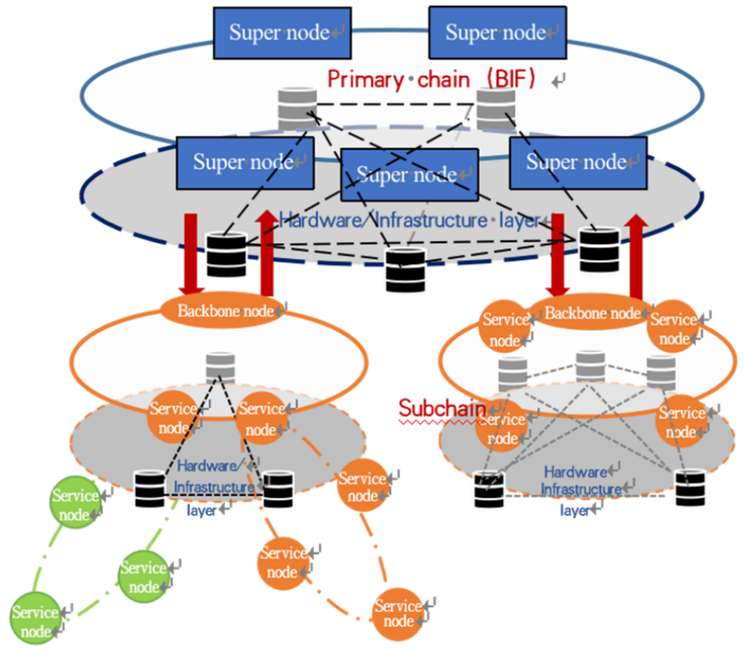
5.2.4 Public Service Platforms

Blockchain infrastructure public service platforms, which aim to provide cross-chain services, focus on cross-chain information transmission services between different blockchains or decentralized applications. With the continuous maturity of cross-chain technology and enrichment of products, two typical modes, namely thecross-chain system provider model and self-constructed chain model, have gradually formed. Path Four’s understanding of common technologies such as cross-chain is susceptible to the influence of the actual operation demand of existing facilities. Therefore, most cross-chain platform projects are also using the development model of Path One to strengthen the right of speech. Meanwhile, some Path Two practices have conducted integration with Path Four in the top-level architecture design. For example, the cross-chain platform created by Hyperchain Technology Company is a specialized platform of cross-chain services, which can support three types of cross-chain operations: asset exchange, data sharing and service complementarity. Starting from the expandability of blockchain, Xinghuo BIF supports cross-chain services for digital IDs and digital native assets, realizing the access of different heterogeneous underlying chains through backbone nodes.

5.3 Xinghuo Blockchain Infrastructure & Facility

Xinghuo BIF is an important example of national blockchain infrastructure guided by China’s policies. It has both the characteristics of wide coverage of Path Two and the cross-chain interconnectivity of Path Four. Xinghuo BIF adopts an open construction model to provide Decentralized Identifiers DID basic service, facilitating interconnectivity among different blockchains, regions and sectors, and building a smart and trusted Internet of Value in the era of the digital economy. The primary designing principle of Xinghuo BIF is to fully support the latest DID standards (BID), stress test the coexistence of multiple chains, transfer from permissioned public blockchain to public chains, and gradually build the Web3 of China to better serve the utilization of data elements and digital economy development.

Diagram 13: Structure of Xinghuo Blockchain Infrastructure & Facility



Xinghuo BIF is a permissioned public blockchain, meaning any company can access blockchain services based on Xinghuo BIF. Authorized parties can build and operate the Xinghuo BIF nodes. Through double-layer architecture design and sharding technology, Xinghuo BIF strikes an effective balance between the performance and large-scale scenarios of blockchain, thus improving the effectiveness of blockchain applications.

The main chain of Xinghuo BIF is composed of supernodes and international supernodes. It provides public services for backbone nodes and is responsible for the management of chain group nodes, public data scheduling, and digital assets anchoring. Super nodes are responsible for the stable operation of the main chain, perform main chain consensus, and have various functions such as public data sharing management, cross-chain gateways, qualification review, chain group management, and so on.

The sub-chain of Xinghuo BIF consists of backbone nodes, which independently design and operate business according to different business scenarios. The backbone nodes are responsible for the connection between the sub-chain and the main chain. It has functions such as anchoring the main chain, supervising the sub-chain, and deploying smart contracts. The sub-chain is connected with the mainchain through backbone nodes to perform cross-chain interactions.

Currently, Xinghuo BIF has established supernodes such as Beijing, Shenyang, Chongqing, Jinan, Wuhan, and Xiamen. It is also promoting the construction of international supernodes in Malaysia and Singapore to provide services to the world, facilitate the establishment of an international community, and constantly promote exchanges and development. Five backbone nodes, namely, Yingkou, Kunshan, Jiaozhou, Hanyang, and Wuhu Fanchang have also been officially launched. In terms of cross-chain interconnectivity, China Unicom Chain, China Merchants Bank's open license chain, Inspur "Yunzhou Chain", Bubi Yinuo Financial Chain, and other industry blockchains, together with many regional blockchains such as the Sichuan provincial blockchain infrastructure "Shuxin Chain" and Guangxi "Gui Chain", have all been connected to Xinghuo BIF.

6. COMMUNITIES

6.1 Overview

Alliances and communities play a very important role in the development of China's blockchain industry. China's blockchain communities aim to leverage the strength of multiple parties such as government agencies, well-known enterprises, research institutes, and universities. Together they play an active role in exploring cutting-edge blockchain technologies, promoting application development and implementation, building a blockchain industry ecosystem, supporting the formulation of relevant government policies, and advancing the internationalization of China's blockchain industry.

6.2 Typical Cases

According to the incomplete statistics of CAICT, there are nearly 20 very active blockchain alliance organizations in China at present. China's blockchain alliances and communities present the characteristics of diversity and segmentation. Some are established to promote the development of regional blockchain, such as the Sichuan Blockchain Association and the Shanghai Blockchain Technology Association; some are industry-oriented blockchain alliances, such as Copyright Blockchain Alliance, Distributed Digital Identity Industry Alliance, etc.; others focus on specific projects, such as the BSN Development Alliance.

6.2.1 Alliance for Blockchain Industry, Z-park(ABI)

Jointly initiated by more than 70 institutions from various sectors of industry, academia, and research, the Alliance for Blockchain Industry, Z-Park (ABI) was established in 2016. As a promoter and practitioner of blockchain-enabled digital economic development, it aims to create a platform for blockchain technology, industrial innovation, and development with global influence. By August 2022, there had been more than 400 member institutions in ABI, encompassing state-owned enterprises, research institutes and universities, Internet companies, and blockchain enterprises. An international member network with wide regional coverage, extensive industrial scope, and full coverage of supply and demand sides has formed.

ABI sets up eight major working groups and multiple industry promotion committees with member institutions as the main body. It systematically carries out blockchain technology research, standard setting, ecosystem cultivation, application promotion, and international cooperation.

In 2021, ABI held the first "Xinghuo Cup" blockchain application contest, which was jointly initiated by CAICT, Beihang University, Beijing University of Posts and Telecommunications, Hyperledger, State Grid Blockchain Technology (Beijing) Co., LTD, and other research institutes, universities, and enterprises. The contest aimed to discover and incubate a batch of high-quality blockchain projects with strong application capacity and innovation potential. The contest covered six divisions, including eastern, western, southern, northern, central, and Hong Kong, Macao, Taiwan, and overseas regions, attracting over 200 companies and university teams from China and abroad to participate in the competition.

ABI has established good cooperative relationships with more than 30 core technology organizations, industrial alliances, and well-known universities, including the International Organization for Standardization (ISO), Global Blockchain Business Commission (GBBC), Hyperledger, Blockchain Association of Singapore (BAS), Distributed Identity Foundation (DIF), World Leading Scientists Association (WLSI), Global Energy Network Foundation (EWF), British Blockchain Association (BBA), Pakistan Blockchain Association (PBI), and others. ABI and multiple organizations among them have jointly created a series of brand activities of "Linking the World -- Blockchain Dialogue between China and the World", continuously enhancing domestic and international exchanges and cooperation in this field.

6.2.2 Trusted Blockchain Initiative (TBI)

TBI was launched in April 2018 by CAICT together with 158 companies. As an industrial cooperation mechanism jointly initiated by domestic and foreign blockchain-related enterprises and scientific research institutions, its purpose is to promote the basic and core technological research and implementation of the industrial application of blockchain, formulate trusted blockchain standards, support government decision-making, and promote healthy development of the blockchain industry. Since its inception, the number of TBI member institutions has reached more than 500, and over 20 themed working groups have been established, including technical standards, industrial applications, policies and regulations, a special sector for the media, and international cooperation.

As the industry's leading blockchain testing and evaluation system, it has become the first system of its kind, in both China and abroad, which fully covers the technology and application integration of blockchain. It is the leading and most representative testing and evaluation system for blockchain products in China. CAICT is responsible for the series "Trusted Blockchain Testing and Evaluation". It has conducted testing and evaluation for five consecutive years and completed more than ten international and domestic standards on the testing and evaluation of blockchain. This mainly covers nine types, including basic function, performance, security, BaaS, codes, government affairs application, supply chain finance, evidence storing and traceability application, involving over 300 testing items to form a complete blockchain testing and evaluation system. It has provided services to a total of more than 60 blockchain enterprises and completed more than 130 evaluation items. After four years of development, the trusted blockchain testing and evaluation has witnessed the growth of China's blockchain products and the enrichment the industrial ecosystem. It has gradually become a benchmark for the development of the blockchain industry.

6.2.3 DID-Alliance

DID-Alliance, or DIDA, was a non-profit social organization co-initiated by Zhongchao Blockchain Technology Research Institute and Feitian Integrity Technology Co., Ltd., and was jointly built by more than a dozen institutions such as Baidu, Xita Technology, and Tencent Cloud. Adhering to the basic vision of "making the digital world trusted and connected", DIDA takes "jointly building distributed digital identity infrastructure to create a new digital ecosystem featuring credibility and openness" as its major mission.

DIDA's work involves in-depth research into distributed digital identity technology which includes: decentralized public key infrastructure (DPKI), cryptography and credentials, and the exploration of application scenarios for distributed digital identity; building a cooperation and exchange platform, organizing the cooperation of industry, universities and research institutes, and promoting the industrial application of distributed digital identity; building a distributed digital identity network in China; and aligning with the international distributed digital identity.

7. PROSPECTS

In the 14th Five-Year Plan of China, blockchain is listed as one of the seven key industries of the digital economy, manifesting the fact that the Chinese government highly values and vigorously promotes the innovative development of blockchain technology, industry, and governance.

The panorama of blockchain development in China shows that this technology has surpassed the basic engineering development period and is shifting towards multi-level integration and innovation, for business-driven optimization. The basic functional architecture of the blockchain has become stable, and it has become a consensus of the industry to optimize engineering technology to meet the needs of business scenarios. The accelerated integration of the blockchain into the real economy has strongly supported the major national strategies, with the application boundaries continuously expanding. The depth and breadth of blockchain applications have continued to improve, and the value of blockchain has been reflected in key national strategic areas such as smart agriculture, judicial evidence storing, pandemic prevention and control, and digital government, as well as achieving carbon reduction and carbon neutrality, ultimately providing a new driving force for the digital transformation of various sectors.

Meanwhile, China has made steady progress in the international cooperation of blockchain, including cooperation on standards setting, projects, ecosystem and intergovernmental cooperation. For example, the Central Bank Digital Currency(CBDC) project of China has joined the multiple central bank digital currency bridge (mCBDC Bridge) project led by the BIS Innovation Hub (BISIH). Along with the Hong Kong Monetary Authority, the Central Bank of Thailand, and the Central Bank of the United Arab Emirates, China has explored and achieved payment versus payment(PvP) settlement of cross-border transactions with CBDC pairs, thus facilitating foreign exchange under cross-border trade scenarios. Trusple, a blockchain-based cross-border trade platform based on Antchain, has secured cooperation with 41 trading and ecosystem partners from 13 countries and regions. Its first partners include BNP Paribas, Citibank, DBS Bank, Deutsche Bank, Standard Chartered Bank, and others.

Looking into the future, China will continue to unswervingly support the technological innovation, industrial development, and the upgrading of governance models for blockchain, while adhering to internationalized development and embracing cooperation with more blockchain partners around the world.

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