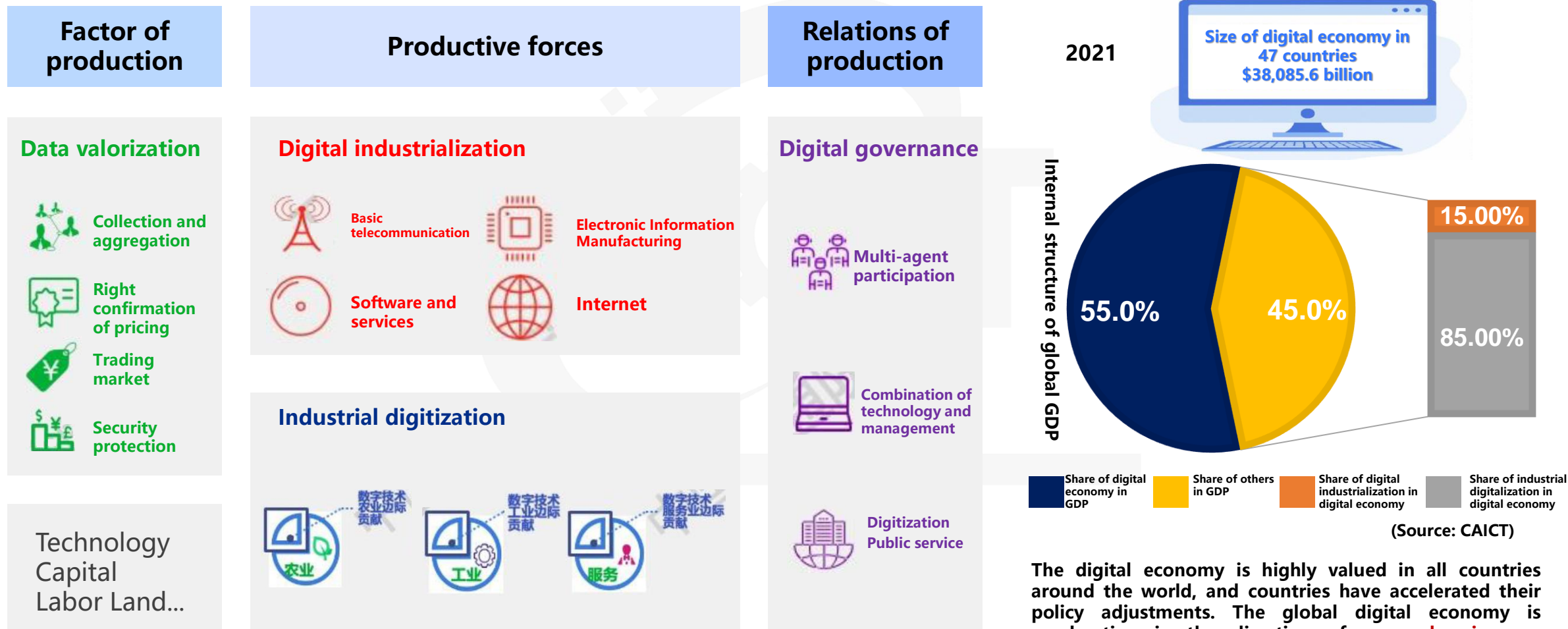# CAICT 中国信通院

Digital China and International Practice Sharing of New Infrastructure

Xiaoyu You

Institute of Industrial Internet & Internet of Things

Digital Infrastructure I Builder I Operator I Innovator

The digital economy is a **more advanced economic stage** after agricultural economy and industrial economy. With digital knowledge and information as the **key factor of production**, **digital technology innovation** as the core driving force, and **modern information network** as the important carrier, the digital economy is a new economic form which constantly improves the digital and intelligent level of traditional industries, and accelerates the reconstruction of economic development and government governance mode through the deep integration of digital technology and the real economy.

Factor of production

Data valorization

- Collection and aggregation
- Right confirmation of pricing
- Trading market
- Security protection

Technology Capital Labor Land...

Productive forces

Digital industrialization

- Basic telecommunication
- Electronic Information Manufacturing
- Software and services
- Internet

Industrial digitization

数字技术农业边际贡献　农业

数字技术工业边际贡献　工业

数字技术服务业边际贡献　服务

Relations of production

Digital governance

- Multi-agent participation
- Combination of technology and management
- Digitization Public service

2021

Size of digital economy in 47 countries $38,085.6 billion

Internal structure of global GDP

55.0%　45.0%

15.00%　85.00%

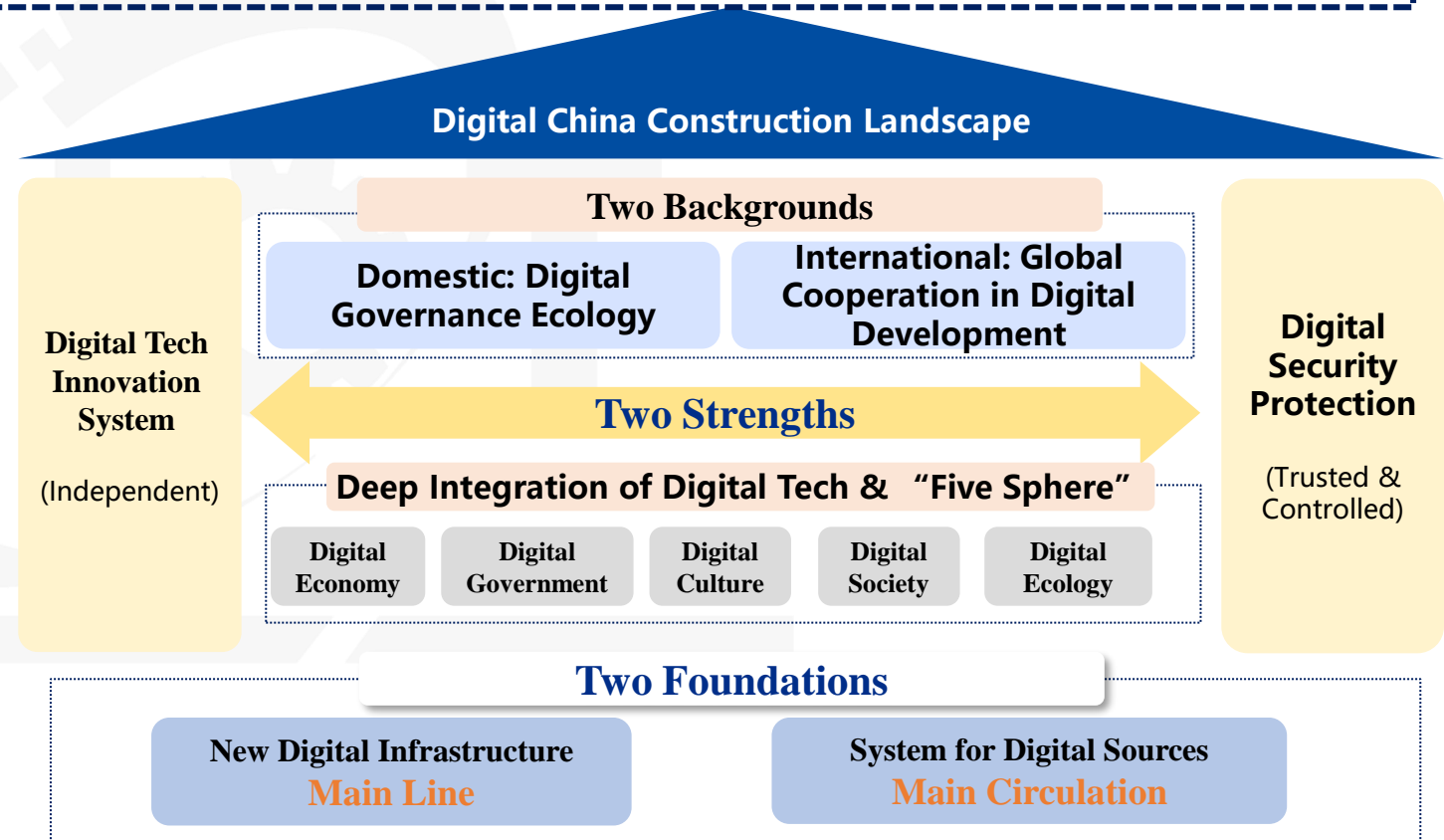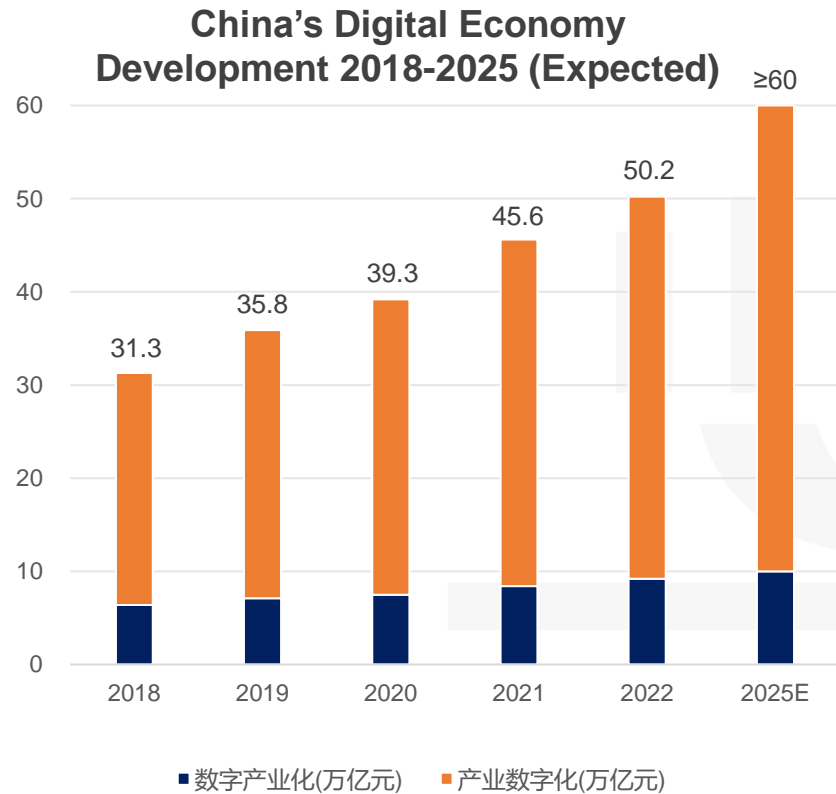| Share of digital economy in GDP | Share of others in GDP | Share of digital industrialization in digital economy | Share of industrial digitalization in digital economy |

(Source: CAICT)

The digital economy is highly valued in all countries around the world, and countries have accelerated their policy adjustments. The global digital economy is accelerating in the direction of **comprehensiveness, intelligence and greening**.

"Four Characteristics" Framework of Digital Economy

To lay a strong material and technological foundation for Chinese modernization, Chinese President Xi Jinping called for efforts to adapt to and lead the new round of scientific and technological revolution and industrial transformation, seek high-quality development in the promotion of **new industrialization**, and integrate the construction of a manufacturing powerhouse with the development of the **digital economy** and **industrial informatization**.

September 2023, an instruction on pushing forward new industrialization

China's Digital Economy Development 2018-2025 (Expected)

Bar chart values:
- 2018: 31.3
- 2019: 35.8
- 2020: 39.3
- 2021: 45.6
- 2022: 50.2
- 2025E: ≥60

Legend: ■ 数字产业化(万亿元) ■ 产业数字化(万亿元)

Source: CAICT

Digital China Construction Landscape

Digital Tech Innovation System (Independent)

Two Backgrounds
- Domestic: Digital Governance Ecology
- International: Global Cooperation in Digital Development

Two Strengths

Deep Integration of Digital Tech & "Five Sphere"
- Digital Economy
- Digital Government
- Digital Culture
- Digital Society
- Digital Ecology

Digital Security Protection (Trusted & Controlled)

Two Foundations
- New Digital Infrastructure **Main Line**
- System for Digital Sources **Main Circulation**

Source: A Plan for the Overall Layout of China's Digital Development

Industrial Internet Identifier Resolution System

The **Industrial Internet**, highly valued by Chinese government, is a crucial part of new infrastructure, with the **network system** laying its foundation and the **identifier resolution system** playing a pivotal role.

- Following the State Council guidance on deepening the development of industrial Internet in the "Internet + advanced manufacturing industry", **CAICT** was entrusted by the MIIT to initiate a specialised project on **the construction of the national top-level nodes (Phase I)**, to build an open, integrated and unified identifier resolution system to promote the development of the Industrial Internet.

The Industrial Internet identifier resolution system, as **a new type of national infrastructure**, connects to global industry and serves domestic infrastructure in various industries and sectors to promote the application and development of the identifier ecosystem.
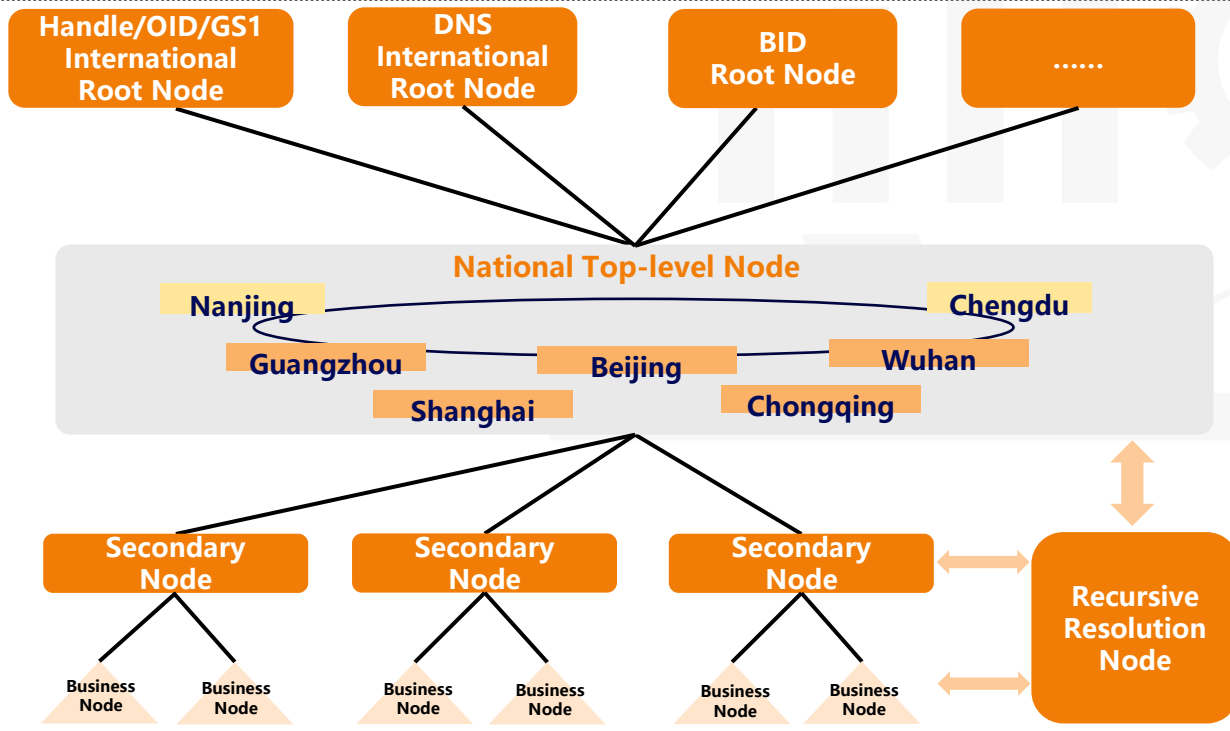
Node Construction by April 1st, 2024

- ☐ **Five top-level nodes** are online and running stably, with the **Nanjing and Chengdu disaster recovery nodes** starting construction.
- ☐ **344** secondary nodes are online and in trial operation, covering **31** provinces (autonomous regions/municipalities) and **46** industries.
- ☐ The number of business nodes connected exceeds **400,000**.

Identifier Application by January 4, 2024

- ☐ The registration volume of identifiers has exceeded **468.3 billion**, with more than **32.18 million** active identifier carriers deployed.
- ☐ The daily identifier resolution volume of the top-level nodes exceeds **160 million** times.
- ☐ **18** major application scenarios for identifiers have been explored:

• Supply Chain Management	• Device Management	• Product Ledger Management
• Product Lifecycle Management	• After-sales management	• Credit system
• Product traceability	• Warehouse Management	• Intellectual Property
• Sharing and Delivery of Digital Assets	• Anti-counterfeiting & anti-smuggling	• Marketing
• One Product One Code Identification Settlement	• Government regulation	• Encoding Service
• Identity Verification	• Logistics Monitoring	• Intelligent Manufacturing

Improved Identifier Ecology

Around the Industrial Internet identifier resolution, actively expand partners in the fields of terminal devices, middleware, applications, security, and vertical industry integration, forming a joint force to create an **"identifier industry ecosystem"**.

Basically Built Identifier Public Service Capability

Access to 13 industry application sub-platforms

8 major public service support capabilities

National Top-level Node diagram: Handle/OID/GS1 International Root Node, DNS International Root Node, BID Root Node, ... ; National Top-level Node (Nanjing, Chengdu, Guangzhou, Beijing, Wuhan, Shanghai, Chongqing); Secondary Node; Recursive Resolution Node; Business Node.

Xinghuo BIF | "Main chain + Sub-chains" for a Connected Chain Network

- **A permissioned public blockchain integrating DID technology with SSI philosophy;**
- Xinghuo BIF adopts an open construction model, providing foundational identifier services to connected blockchain networks, thereby offering interoperability **across blockchains, regions, and industries**, and building an intelligent and trustworthy **value internet** for the new era.
- Through a "main chain + sub-chains" architecture and the sharding technology, it allows the integration of homogeneous and heterogeneous blockchains, to connect the "isolated" nodes, enabling **multi-chain collaboration**, constructing a **nationwide chain network**, and extending its influence **internationally**.
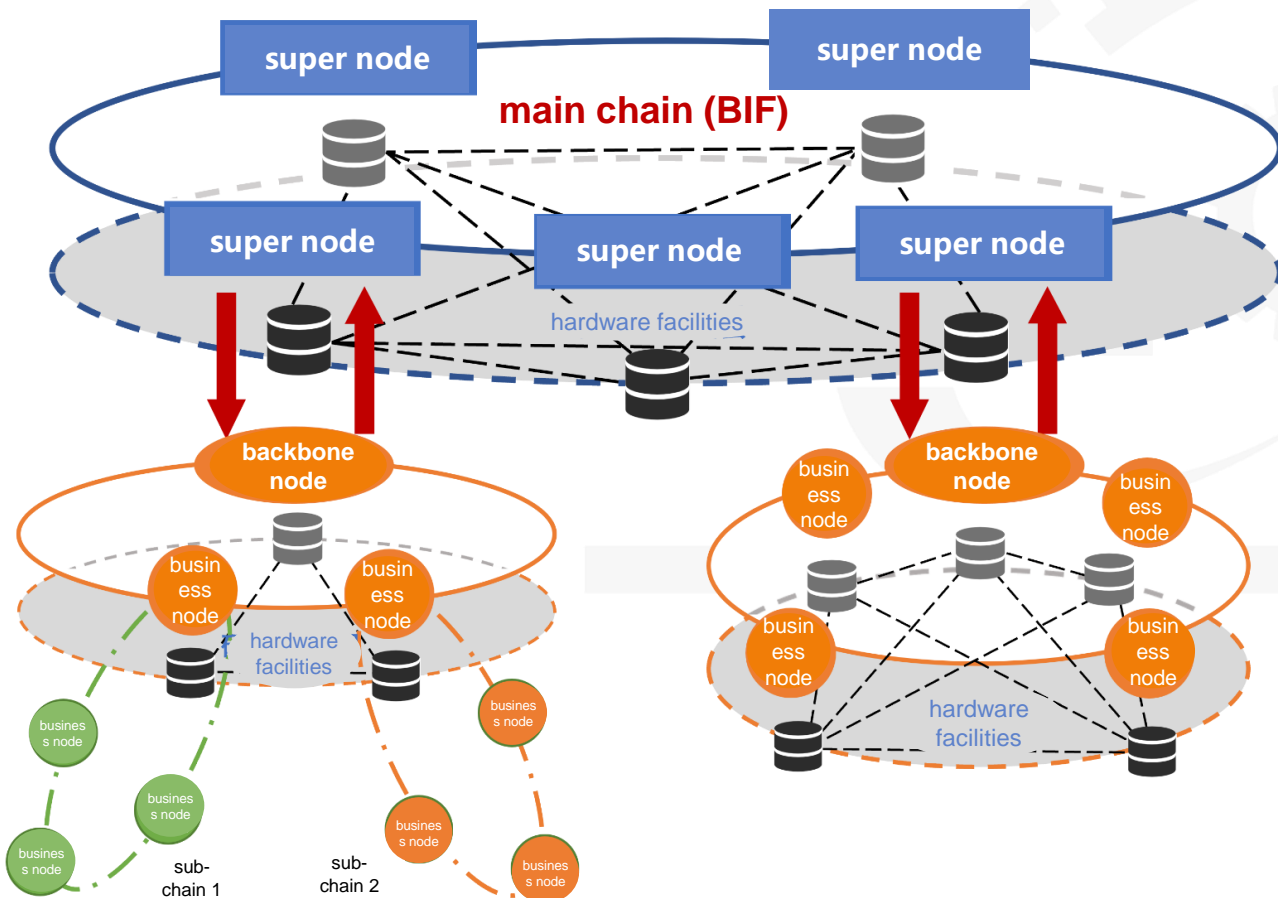
- **Main Chain**: Composed of **super nodes** and **international super nodes**, offering public services to backbone nodes, responsible for managing chain clusters, public data scheduling, and anchoring digital assets.

- **Sub-chain**: Composed of **backbone nodes** and **business nodes**, designing and operating for different business scenarios.

- **Super Node:** Responsible for the stable operation of the main chain, executing main chain consensus, and equipped with functions such as public data sharing management, cross-chain gateway, qualification review, and chain cluster management.

- **Backbone Node:** Responsible for the connection between sub-chains and the main chain, able to anchoring to the main chain, supervising sub-chains, deploying smart contracts, and enabling sub-chains to interact with the main chain through backbone nodes for cross-chain operations.

- **Business Nodes**: Responsible for the operation of specific sub-chains, collaborating with backbone nodes to execute consensus and business operations.

Progress of Primary chain and sub chains construction
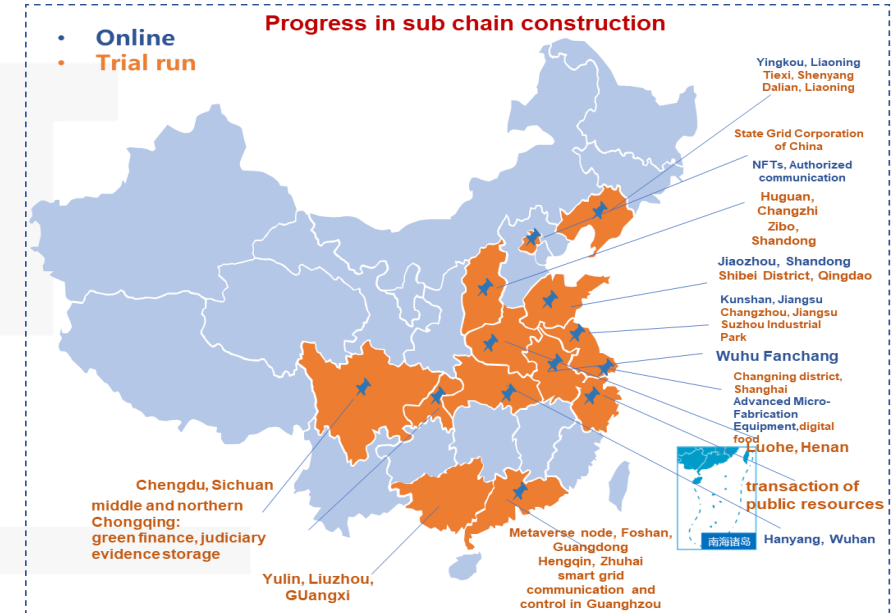
Progress in super nodes construction

Signed：Shenyang, Chongqing, Beijing, Jinan, Wuhan, Xiamen, Liuzhou, Suzhou, Chengdu, Shanghai, Guangzhou
Intended：Kunming, Shenzhen
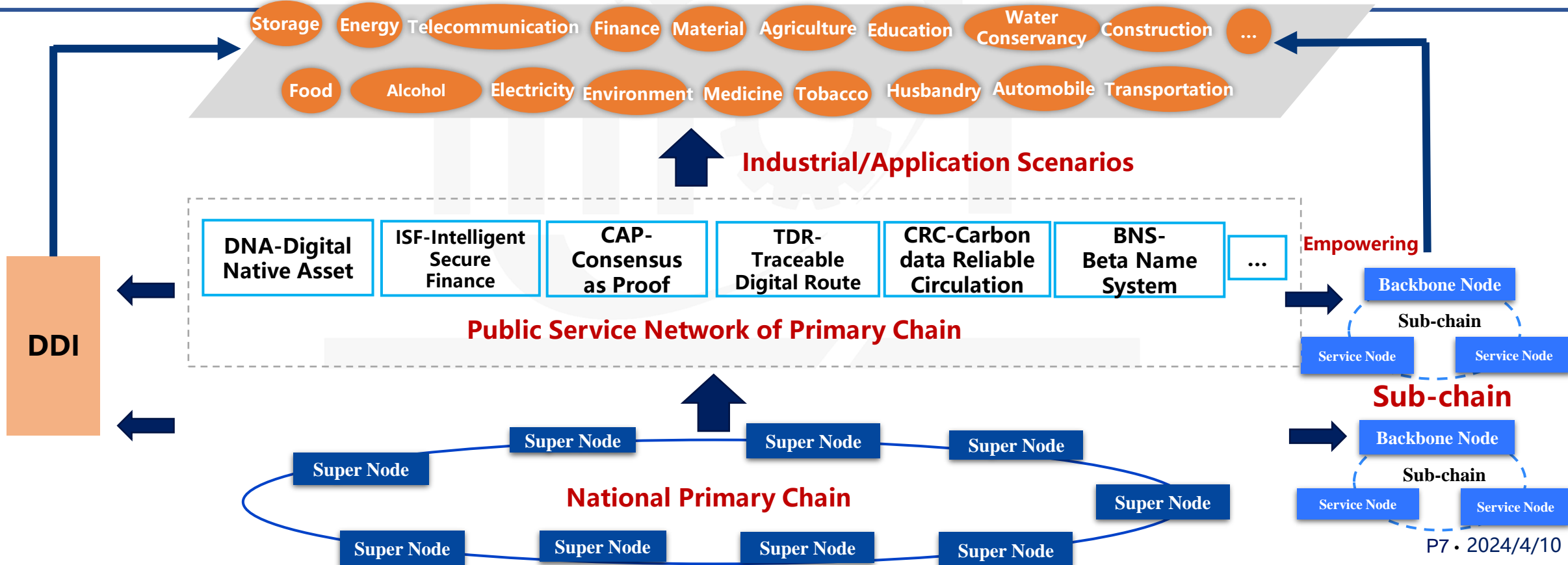**In progress**：Hangzhou, Xinjiang, Changsha, Zhengzhou, Changchun

Signed | **Intended** | **In progress**

Shenyang
Time-honored brand, original brand and new brand

Chengdu

Chengdu-Chongqing economic circle

Beijing
Global digital economy benchmark city

Jinan
China Computing Valley

Digital Economy Development in Chongqing and Liangjiang New Area

Chongqing

Optics Valley Science and Innovation Corridor Construction

Wuhan

Suzhou
The Yangtze River Delta Ecology and Greenery Integration Demonstration Zone

China–Central Asia–West Asia Digital Economy Corridor

Kunming

Two-wheel-driven modern innovation system

LiuZhou

HongKong

Macau

Xiamen
BRICS partnership on the new industrial revolution

南海诸岛

"International nodes"

Progress in sub chain construction

Online
Trial run

Yingkou, Liaoning
Tiexi, Shenyang
Dalian, Liaoning

State Grid Corporation of China
NFTs, Authorized communication

Huguan, Changzhi
Zibo, Shandong

Jiaozhou, Shandong
Shibei District, Qingdao

Kunshan, Jiangsu
Changzhou, Jiangsu
Suzhou Industrial Park

Wuhu Fanchang

Changning district, Shanghai
Advanced Micro-Fabrication Equipment, digital food

Luohe, Henan
transaction of public resources

Hanyang, Wuhan

Chengdu, Sichuan
middle and northern Chongqing:
green finance, judiciary evidence storage

Yulin, Liuzhou, GUangxi

Metaverse node, Foshan, Guangdong
Hengqin, Zhuhai
smart grid communication and control in Guangzhou

南海诸岛

International super nodes in Macau and Malaysia.

Main Chain Public Services with Enhanced Capabilities

- The Xinghuo BIF public service is based on the underlying technical capabilities, computational power, and network capabilities of the main chain. It is designed to **provide services for B-end users**, aiming to help B-end clients **reduce their construction & operational costs**. The public service connects regulatory resources at the top and serves industrial clients at the bottom, offering services **through API interfaces** to **enhance service efficiency**.

- Example: The **Digital Native Asset Service Network**, targeting digital asset platforms (e.g. digital collectibles platforms), provides industry data for regulators. This service not only reduces the operational costs for the platform operators but also ensures the rights of C-end users.

- Example: The **Intelligent Security Financial Service Network**, primarily serves financial resources (banks, etc.) and asset owners (core enterprises, etc.), addressing the financing challenges faced by small and medium-sized enterprises.

Storage · Energy · Telecommunication · Finance · Material · Agriculture · Education · Water Conservancy · Construction · ...

Food · Alcohol · Electricity · Environment · Medicine · Tobacco · Husbandry · Automobile · Transportation

Industrial/Application Scenarios

DDI

| DNA-Digital Native Asset | ISF-Intelligent Secure Finance | CAP-Consensus as Proof | TDR-Traceable Digital Route | CRC-Carbon data Reliable Circulation | BNS-Beta Name System | ... |

Empowering

Backbone Node

Sub-chain

Service Node · Service Node

Public Service Network of Primary Chain

Sub-chain

Backbone Node

Sub-chain

Service Node · Service Node

Super Node · Super Node · Super Node · Super Node

Super Node

Super Node

Super Node · Super Node · Super Node · Super Node

National Primary Chain

P7 · 2024/4/10

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ASTROn

Build Cross-border Trust with ASTRON

A DID-native public permissioned blockchain from China

Our Vision

Web3	Digital Economy
Dedicated to building a global native DID network and driving Web3 innovation.	Facilitating global collaboration in the digital economy for transformative change.

Digital Identity	Digital Asset	Cross-border trade
		Carbon Neutrality
Digital Wallet	Digital Service	Digital Transformation

Xinghuo Ecosystem

Xinghuo BIF — Beijing, Shanghai, Xiamen, Qingdao, Shenyang, Guangzhou, Wuhan, Chongqing, Liuzhou

ASTRON (Xinghuo BIF Global) — Xiamen, Shanghai, Malaysia, Macau, Germany, Singapore, Saudi Arabia, Hong Kong, Liuzhou

Main Benefits

Connecting
Better connection to China's industries and markets

Trusting
Create cross-border trust with efficiency and low cost

Innovating
Provide infrastructure for technical and business innovation

Enhancing Global Influence of China's Digital Infrastructure

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G20

☐ **Chinese President Xi** highlighted during the **G20 Summit** 2022 that China has proposed the **Digital Innovation Cooperation Action Plan**, welcoming active participation from all parties in promoting the innovative application of digital technology and achieve inclusive sharing of innovation outcomes. In 2023, the construction of **Xinghuo BIF** was listed in the achievements of this Plan.

☐ During the **G20 Digital Economy Working Group meetings**, Xinghuo BIF digital identity was showcased as an example for promoting public service.

数字创新合作行动计划成果清单

2023 年务实合作举措

（三）建设"星火·链网"数字基础设施及应用服务

2020 年，中国正式启动"星火·链网"区块链基础设施建设。"星火·链网"采用开放的建设模式，通过向接入的区块链网络提供标识基础服务进而提供跨区块链、跨区域、跨行业的互通能力，构建数字经济可信基础设施。其超级节点负责骨干节点的接入管理，基于自身资源并通过国家主链为骨干节点提供存证服务、DNA 服务、数字身份服务、账户安全服务等基础公共服务。中方愿同更多国家和地区就"星火·链网"节点建设加强交流合作，共同推动跨境应用服务落地。

BRICS

☐ At the 7th **BRICS Ministerial Meeting on Industry** in 2023, Minister of the MIIT nominated the Xinghuo BIF Super Node.

☐ In the 2023 **New Industrial Revolution Partnership Consultative Group meeting and the BRICS Industrial Internet and Digital Manufacturing Seminar,** the case of Xinghuo BIF was presented to BRICS ministers and experts.

Minister Jin Zhuanglong mentioned at the 7th BRICS Ministerial Meeting on Industry that

China is willing to provide the BRICS countries with an **industrial internet super node platform** *to support digital transformation.*

Continued promotion of international voice under key mechanisms

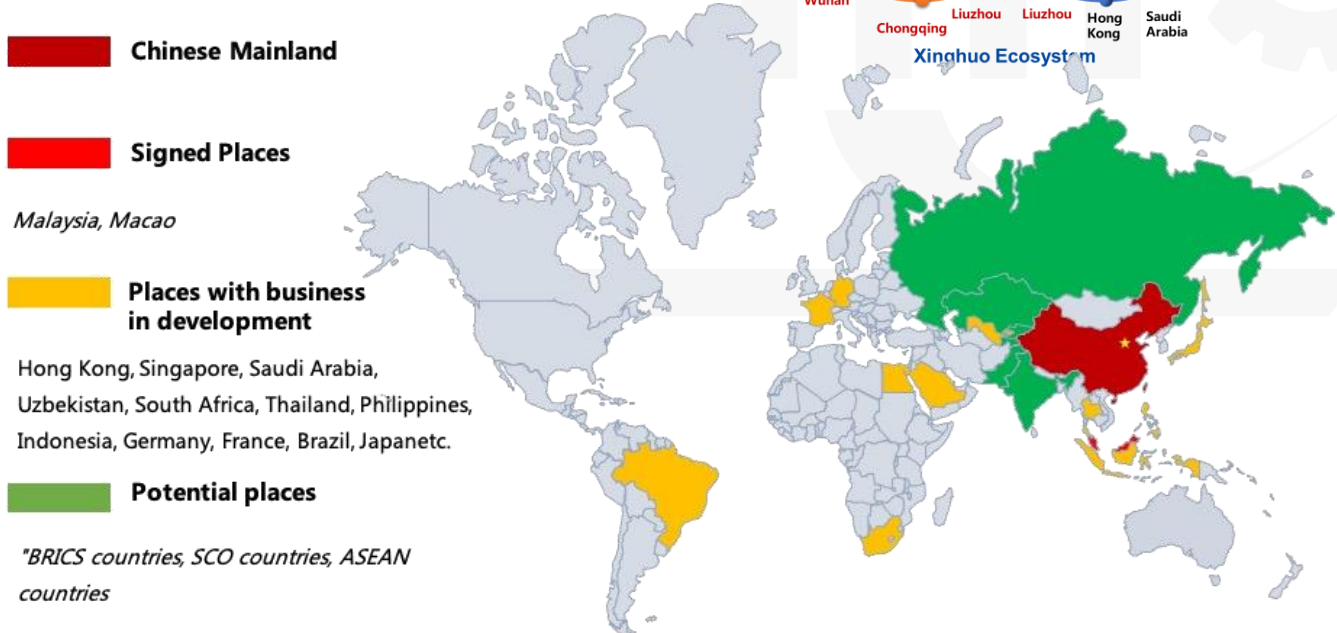| DEPA	GDI	UN	ITU	SCO	APEC	CPEC
DEPA	Global Development Project Pool incubation project	United Nations Digital Compact	International Telecommunication Union (ITU)	Shanghai Cooperation Organization	Asia-Pacific Economic Cooperation	China-Pakistan Economic Corridor

Xinghuo BIF Global Exploration

Keep promoting the international development of Xinghuo BIF

- **ASTRON, the global version of Xinghuo BIF**, was launched, with international super nodes like those in **Malaysia and Macao**, as well as export-oriented super nodes like **Xiamen and Liuzhou** already online for international services. Efforts continue to promote the construction of international nodes in **Hong Kong, Singapore, Saudi Arabia**, and beyond.
- More efforts are made on the basis of **international mechanisms and platforms such as BRICS, G20, SCO, and DEPA**.

ASTRon 星火链网国际

Xinghuo BIF Global: ASTRON

Algorithmic and Self-certifying Trust ROot Network

Chinese Mainland

Signed Places
Malaysia, Macao

Places with business in development
Hong Kong, Singapore, Saudi Arabia, Uzbekistan, South Africa, Thailand, Philippines, Indonesia, Germany, France, Brazil, Japanetc.

Potential places
"BRICS countries, SCO countries, ASEAN countries

Xinghuo Ecosystem
Beijing, Suzhou, Xiamen, Xiamen, Malaysia, Qingdao, Macau, Shenyang, Xinghuo BIF, ASTRON (Xinghuo BIF Global), Germany, Guangzhou, Singapore, Wuhan, Chongqing, Liuzhou, Liuzhou, Hong Kong, Saudi Arabia

Three core application scenarios: cross-border trade, carbon neutrality, and digital identity
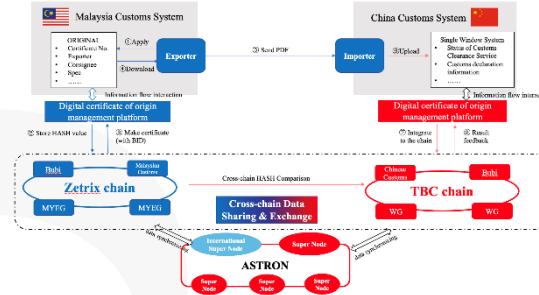
Promote China-Malaysia cross-border applications
- ✓ Cross-border verification platform for certificates of origin
- ✓ Comprehensive service platform for China-Malaysia mutual trade
- ✓ Cross-border driver license verification platform

Construct the Xinghuo Product Quality Certification System
- ✓ Launch the Xinghuo Quality Certification System based on super nodes

Deeper services for transnational enterprises, More established public service capabilities

- ✓ **SIEMENS**: To address the EU's CBAM new regulations, a **product carbon footprint service platform** is constructed to achieve credible transfer of carbon footprints along the supply chain.
- ✓ **SAP**: The enterprise distributed digital identity system DIM is plugged to Xinghuo BIF; with Microsoft **ION** and German **IDUNION**, it becomes a global distributed digital identity provider for SAP.
- ✓ **PANASONIC**: Jointly build the "Energy Battery Public Service Platform."
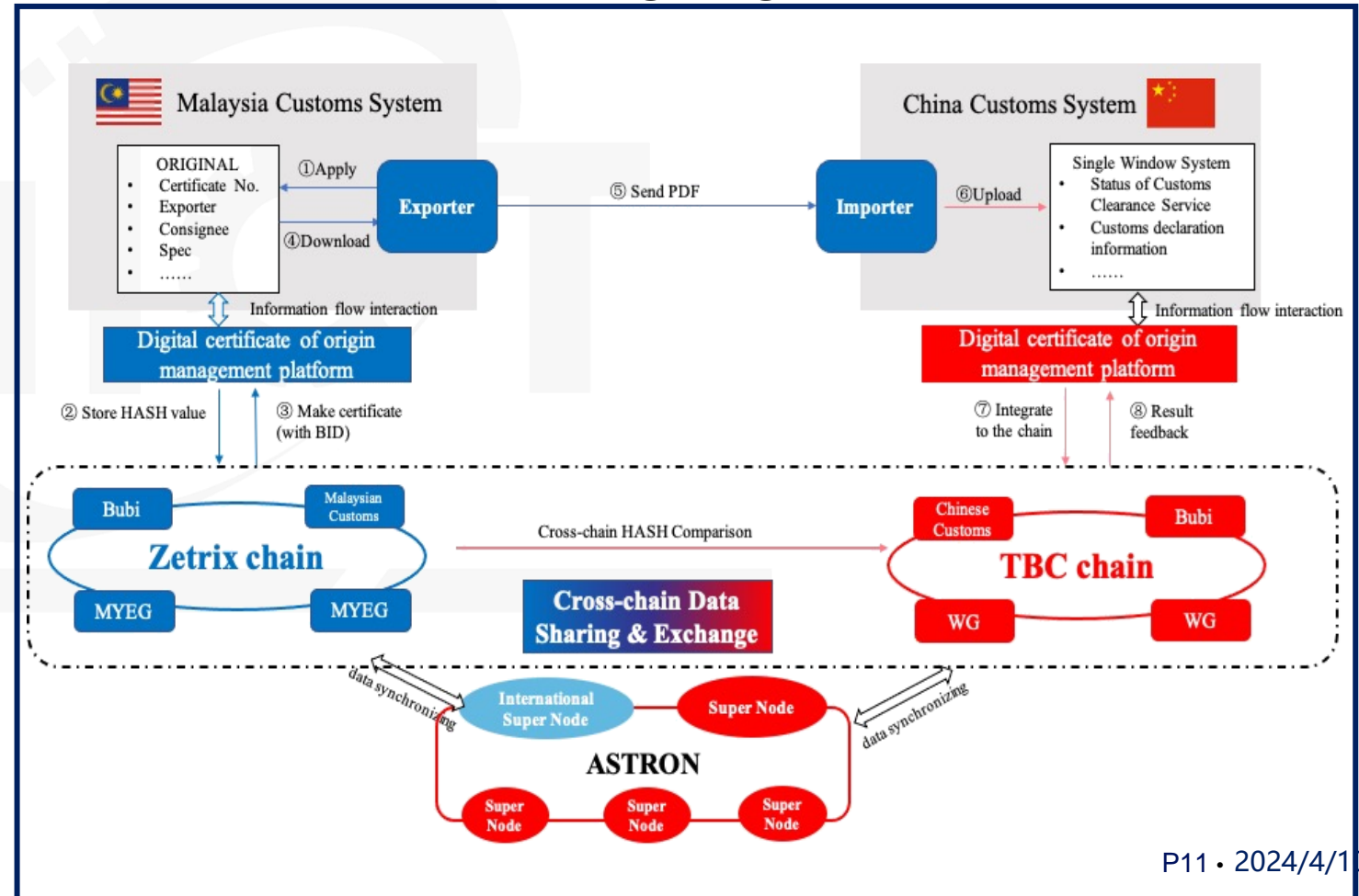- ✓ **BNS**: Provide Web3 name service based on Xinghuo BIF.

- The original paper-based certificate is transformed into an electronic verification by blockchain technology, which **improves the accuracy and efficiency of cross-border verification, reduces costs, and accelerates customs clearance**;
- The customs systems of China and Malaysia pay close attention to cross-border data flow and strictly control the flow of original data. At present, they plan to **use HASH value in blockchain to verify the digital certificate of origin cross-chain transfer**.

Original Method

Mail or Phone

Exporter → Importer

Apply for certificate | Print the certificate

Submit
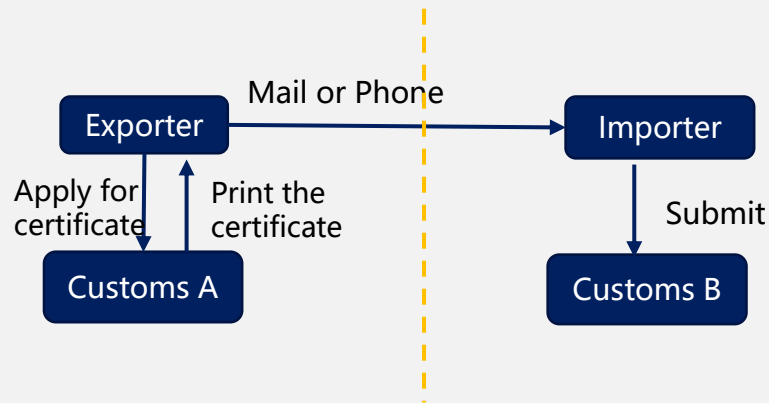
Customs A   Customs B

Customs of the importer cannot transmit the certificate information in a short time, nor find an effective way to verify paper certificates, resulting in long period, high cost and inefficient customs clearance.
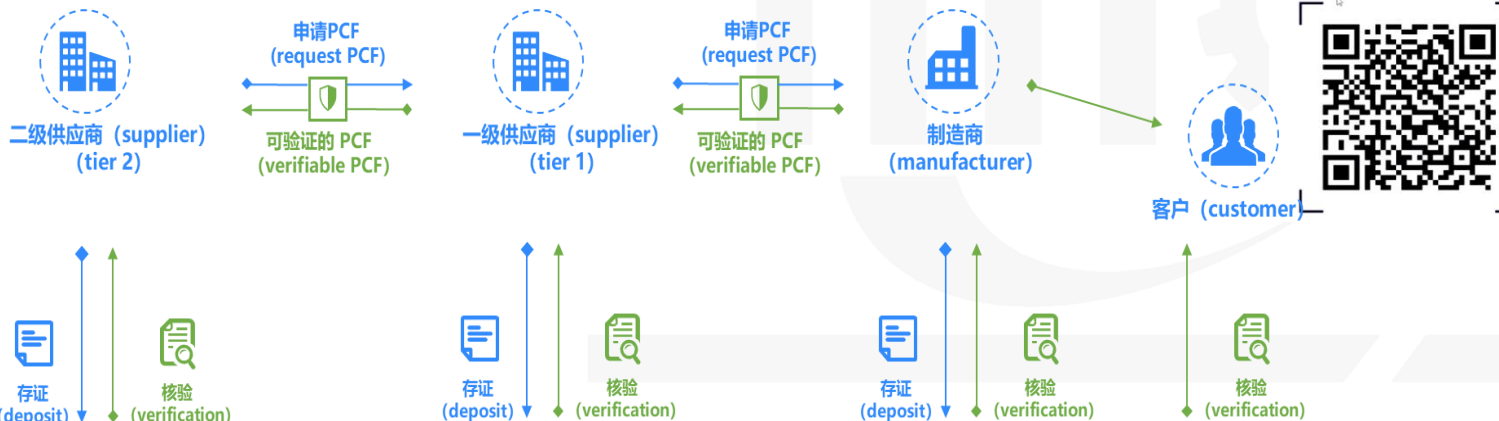
Using Xinghuo BIF

Malaysia Customs System

ORIGINAL
- Certificate No.
- Exporter
- Consignee
- Spec
- ......

①Apply
④Download

Exporter → ⑤ Send PDF → Importer

China Customs System

Single Window System
- Status of Customs Clearance Service
- Customs declaration information
- ......

⑥Upload

Information flow interaction

Digital certificate of origin management platform

② Store HASH value   ③ Make certificate (with BID)

Digital certificate of origin management platform

⑦ Integrate to the chain   ⑧ Result feedback

Bubi   Malaysian Customs
Zetrix chain
MYEG   MYEG

Cross-chain HASH Comparison

Chinese Customs   Bubi
TBC chain
WG   WG

Cross-chain Data Sharing & Exchange

data synchronizing

International Super Node   Super Node
ASTRON
Super Node   Super Node   Super Node

data synchronizing

■ **The credible evidence service of SiGREEN platform achieves trusted accounting and traceability of enterprise product carbon footprints, enhancing the competitiveness of export enterprises in carbon inventory and verification, and efficiently meeting overseas requirements for carbon footprint disclosure.**

✓ **Targeted users:** Chinese enterprises exporting products to the EU
✓ **Core capabilities:** Meet the product carbon footprint calculation requirements and methodologies under ISO14067 and CBAM standards.
✓ **Core value:** Through blockchain and DID technologies, produce credible transfer and verification of product carbon footprint reports along the supply chain.

Historical Development, Missions and Vision

CAICT 中国信通院

1957
China Academy of Posts and Telecommunications of the former Ministry of Posts and Telecommunications

1998
China Academy of Telecommunication Research of the former Ministry of Information Industry

2014
China Academy of Information and Communications Technology

CAICT 中国信通院

1994
China Academy of Telecommunication Scientific Research and Planning of the former Ministry of Posts and Telecommunications

2008
China Academy of Telecommunication Research of the Ministry of Industry and Information Technology

MISSIONS	Think-tank and enabler for innovation and development in the information society
POSITIONING	Top specialized think-tank for the government, innovation and development platform for the industry
VISION	Boosting prosperity with virtues and expertise

Research Areas and Business Units

Four Research Areas： Combining Soft and Hard Sciences

COMMUNICATIONS *ICT Technology*	DIGITALIZATION *Digital Development*	SECURITY *Cyber & Digital Security*	POLICY *Economics and Policy*
5G/6G, Future Networks, Cloud Computing, Big Data, Artificial Intelligence, Block Chain, Quantum Information ……	Industrial Internet, Energy Internet, Smart City, Digital Health, IoV, Fintech, Smart Education, Digital Villages ……	Cybersecurity, Data Security, Digital Security, Security of Industry Chain and Supply Chain, Electromagnetic Space Security ……	Digital Economy, Industrial Economy, International Trading, Public Policies, Laws and Regulations ……

Six Business Units：Integrated Development

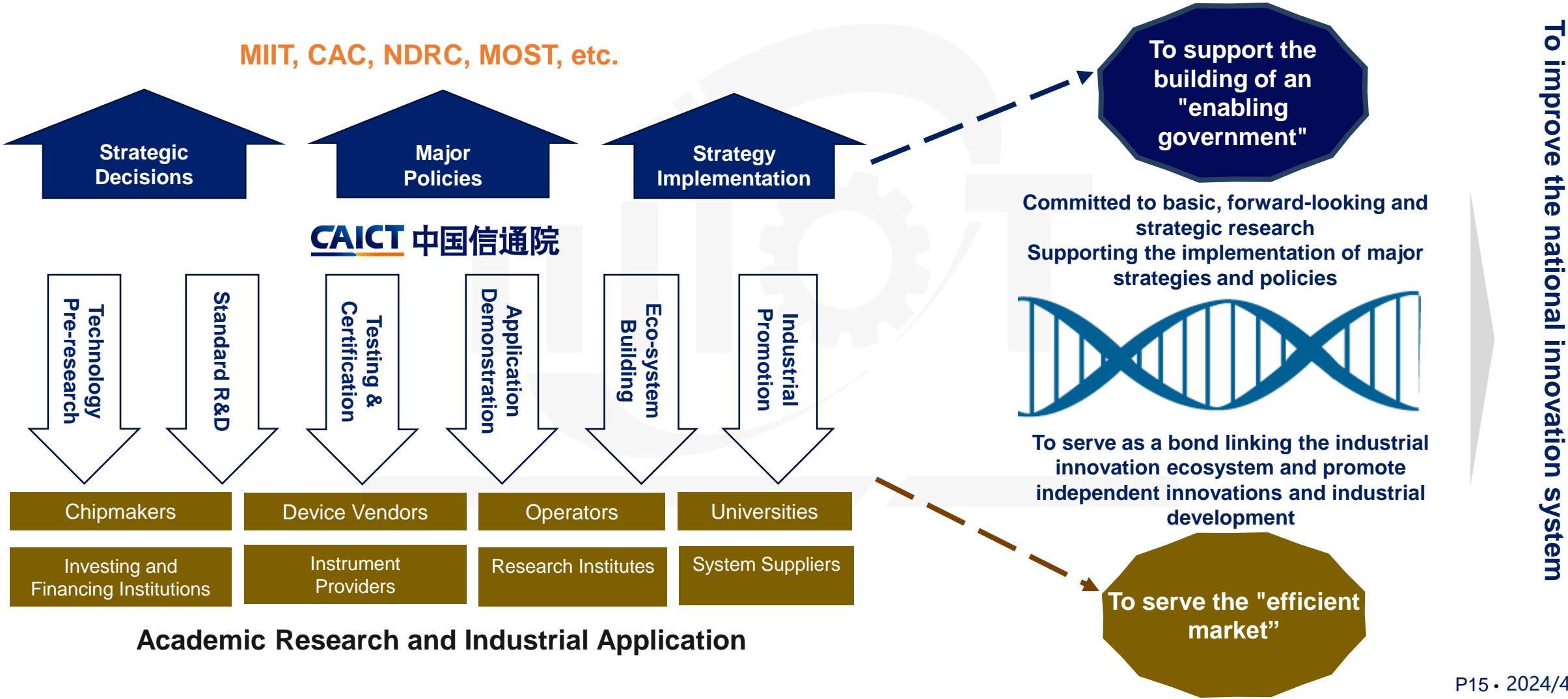| Decision-Making Support	Technical Trials	Testing & Certification	Consultancy Services	Public Platform	Regulatory Support

Innovation and Development Platform for the Industry

- CAICT is the only ICT innovation platform in China that integrates strategy & policy research, new technology research, standard development, testing and certification, and industrial promotion.

MIIT, CAC, NDRC, MOST, etc.

Strategic Decisions

Major Policies

Strategy Implementation

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Technology Pre-research

Standard R&D

Testing & Certification

Application Demonstration

Eco-system Building

Industrial Promotion

Chipmakers

Device Vendors

Operators

Universities

Investing and Financing Institutions

Instrument Providers

Research Institutes

System Suppliers

Academic Research and Industrial Application

To support the building of an "enabling government"

Committed to basic, forward-looking and strategic research
Supporting the implementation of major strategies and policies

To serve as a bond linking the industrial innovation ecosystem and promote independent innovations and industrial development

To serve the "efficient market"

To improve the national innovation system

Thank you for your attention!

Contact me: youxiaoyu@caict.ac.cn