Analysis of the Industrial Internet Industry Chain and Supply Capability Analysis of Key Links Within Jiangxi Province

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Abstract. In 2022, China's industrial internet industry has exceeded 1.2 trillion yuan in scale, providing strong support for high-quality economic and social development. This milestone signifies that China's manufacturing industry has entered a comprehensive acceleration phase of digitalization. It is of a great importance for Jiangxi Province to clarify the key aspects, development trends, and supply capacity of the industrial internet industry chain. This is crucial for promoting the construction of the "Number One Development Project" for digital economy, as it supports the transformation and upgrading of Jiangxi's manufacturing industry and drives high-quality development.

After analyzing the background and current situation of the industrial internet industry, this report breaks down the integrated solutions in relevant industrial internet cases. It also combines the interview results with basic telecommunications companies to outline the framework of the industrial internet supply chain. This framework consists of four main supporting industries: industrial internet platforms and new industrial software, new industrial networks and identification, industrial automation, and industrial internet security. Additionally, the subcategories of industrial intelligence and analysis form the fifth aspect. Based on these five key areas, the report further examines the supply capacity at the national and provincial levels and provides recommendations for future development.

Keywords: Industrial internet industry chain · supply capability · Industrial internet platform

1 Introduction

Recently, the Industrial Internet has entered a new stage of application practice promotion from concept exploration. As an outcome of the deep integration of the new generation of information technology and manufacturing, the Industrial Internet can promote the formation of a new manufacturing and service system, which can optimize the allocation efficiency of resource elements and create various products and services (Li, & Yang, etc. 2023). The Industrial Internet has gradually become a key support for the innovative development of the digital economy, an important part of new infrastructure construction

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and a key path to promote the deep integration of the digital economy and the real economy (Qin, & Chen, etc. 2020). With the policies that give support to the Industrial internet released in China, the industrial Internet industry ecology continues to prosper, and the downstream application terminal market is in a great demand.

This year, the scale of China's industrial Internet industry has exceeded the trillion yuan, signified that the digitalization of China's manufacturing industry has entered a stage of comprehensive acceleration (ChinaDaily 2023). The scale has an obvious increase in automation of industrial connectivity industry. Basic capabilities of network continuously grow, and the application and platform innovations are active. There is a breakthrough in the field of identification resolution. Security in industrial internet is getting more attention ((ChinaDaily 2023). With the background, clarifying the boundaries of industrial internet industry and the supply capabilities are the basis of the supporting to the transformation and upgrading in manufacturing, and construction of modern economy systems in high quality as well. It is significant that understanding the trend of industrial internet development in important parts. This report is mainly oriented to the field of industrial Internet. By the field research, questionnaire survey, interviews, based on the solutions provided by basic telecom companies, it will redefine the structure of the industrial Internet industry chain.

2 Analysis of the Industrial Internet Industry Chain

2.1 Background of Industrial Internet Industry Development

By the connectivity between people, machines, and things, and the combination of all factors, industry chains, and value chains, the industrial internet achieve the perception, transmission, integration, management, and analysis of various types of data, which enable diagnosis, prediction, guidance, and forming decision feedback (Karmakar, & Dey, etc. 2019).

Based on the industrial internet industry chain distribution, it includes six major sectors: equipment layer, network layer, platform layer, software layer, application layer, and security system. The network, platform, and security systems are the three major components of the industrial Internet, with the network serving as the foundation, the platform as the core, and security as the safeguard (Khan, & Rehman, etc. 2020).

In the current, with the country's vigorous development of the Industrial Internet, the scope of its industry chain is gradually expanding, extending from direct industries (network, platform, security) to gradually penetrate various fields.

"The network" includes network interconnection, data interoperability, and identification resolution systems. Its purpose is to build a low-latency, highly reliable, and widely covered infrastructure for the Industrial Internet, enabling seamless data transmission across industrial stages (Chen, & Zheng, etc. 2021). "The platform" includes industrial software, data modeling, industrial big data, equipment resource management, cloud infrastructure etc. It connects to devices and applications, utilizing massive data aggregation, modeling analysis, and application development to support industrial production methods, business model innovation, and efficient resource allocation (Qin, & Chen, etc. 2020). "Security" involves six aspects: device security, control security, network security, data security, platform security, and application security. By establishing an industrial

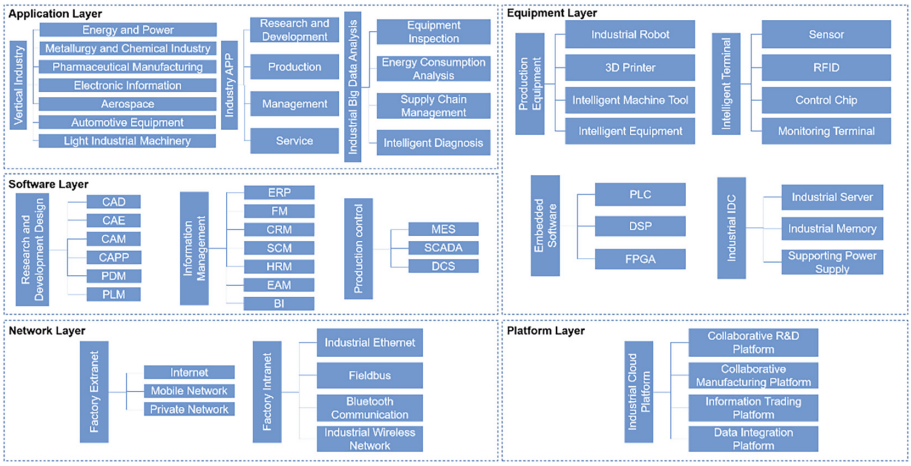

Fig. 1. Industrial Internet industry chain

Internet security protection system, it effectively identifies and defends against various security threats, mitigates multiple security risks, and promotes the development of industrial intelligence (Serror, & Hack, etc. 2020).

Penetration industry refers to an industry achieving high efficiency by direct industry empowerment. The Industrial Internet can connect production information with demand information, to maximize resource efficiency and develop the collaborative development of industrial ecosystems (Agenda 2015). Examples of penetration industries include agriculture, forestry, animal husbandry, fisheries, mining, manufacturing, construction, wholesale and retail trade, finance, real estate, education, and more. For instance, in the power industry, by accessing real-time data from sources, grids, and loads through an Industrial Internet platform and utilizing big data analysis and modeling, it becomes

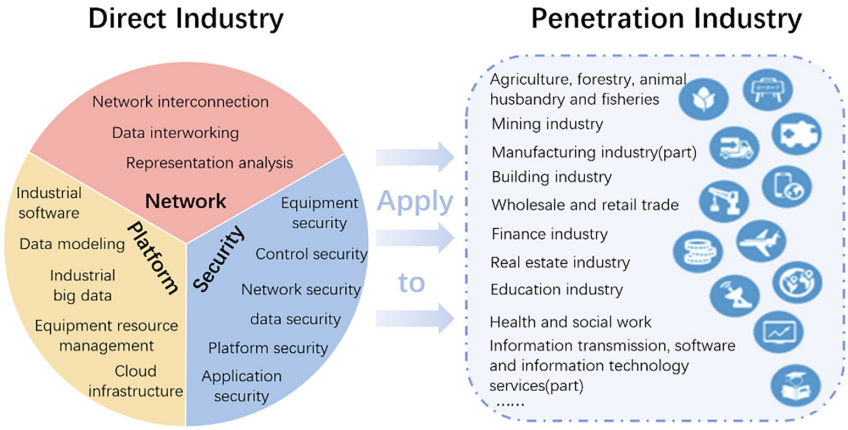

Fig. 2. Architecture of Industrial Internet industry

possible to effectively address issues such as remote maintenance of power equipment and integration of new energy into the grid (Wang, & Ma, etc. 2020) (Fig. 2).

2.2 Current Status of Industrial Internet Development

The comprehensive improvement of new-generation information technology has significantly enhanced the processing capability of industrial data, leading to the continuous expansion of industrial boundaries, as well as the growth of industry scale and entities. The intelligent devices used in industry analysis are getting increased such as sensing and control, and industrial software fields (Gilchrist 2016). Meanwhile, the emergence of new stages such as edge computing and industrial Internet platforms has become an important breakthrough for traditional industries to move towards networking, digitization, and intelligence (Zhang, & Ming 2022).

According to relevant official calculation, the scale of China's industrial Internet industry exceeded 1.2 trillion yuan in 2022, providing strong support for high-quality economic and social development (Fan 2023). This milestone signifies that the digitalization of China's manufacturing industry has entered a phase of comprehensive acceleration. The network's basic capabilities continue to improve, the scale of industrial interconnection expands rapidly, and identification resolution achieves systematic and breakthrough progress. There is a strong innovation atmosphere in platforms and applications, and industrial Internet security has received significant attention (Fan 2023). The enhanced understanding of the industrial Internet by various sectors. Particularly in Jiangxi Province, clearing understanding of the industrial Internet's supply capacity are crucial. It is the core task that grasping important aspects and development trends of the industrial Internet industry chain, which support the transformation of the manufacturing industry at the provincial level and promote high-quality development.

2.3 Analyzing the Supply Capacity of the Industrial Internet Industry Chain

Based on the typical cases released by the Industrial Internet Industry Union, combined with the excellent cases of "Blossom Cup Competition" 5G + Industrial Internet, 211 exampled cases have been compiled in Jiangxi province. The existing supply capacity of the industrial Internet industry chain can be derived from integrated solutions. It covers aspects such as network, platform, security, including upstream software and hardware basic support, the integration of midstream industrial Internet solutions, and downstream integration and services. This builds a brand-new manufacturing and service system that covers the entire industry chain and value chain, providing a pathway for the development of industrial digitization, networking, and intelligence. However, it can be seen from the process of breaking down integrated solutions that the division between the supply side and the customer side according to the content in Fig. 1 no longer meets the actual development needs. Therefore, based on the research, there will be a new industrial Internet supply industry chain architecture that can be built. Data is the core element through the entire industry chain which drive both the direction and the implementation capability. The existing industrial Internet overall solutions cover the perception, transmission, integration, management, and analysis of data, forming a closed loop of data (Wan, & Tang, etc. 2016). Starting from traditional manufacturing, combined with

capabilities such as edge computing and intelligent analysis, it continuously drives the upgrading of traditional industries and gives rise to new industries.

After breaking down integrated solutions and interviewing with basic telecommunications companies, it can be observed that the industrial Internet industry is gradually consisted of four main supporting parts: industrial Internet platforms, new industrial software, new industrial networks and identification, industrial automation, and industrial Internet security. Due to the requirements of intelligent analysis and value mining of the entire industry system, there is also a subcategory, industrial intelligence, and analytics applications, which continuously evolves into a separate industry segment. Therefore, this report mainly analyzes the industrial Internet industry chain from the above five modules and focuses on analyzing the supply capacity at the national and provincial levels for its key elements. The specific framework is shown in the figure below (Fig. 3):

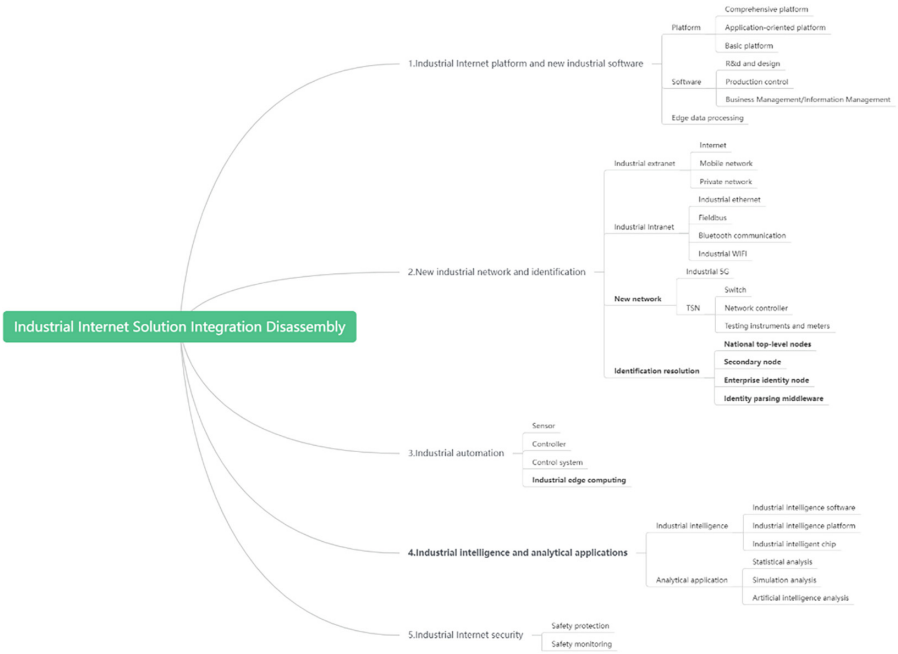

Fig. 3. Industrial Internet Solution Integration and Decomposition Mind Map

3 Analysis of Supply Capacity in Key Segments of the Industrial Internet Industry Chain

3.1 Industrial Internet Platforms and New Industrial Software

Till the end of 2022, China has nurtured more than 240 influential industrial Internet platforms. Among them, there are more than 28 cross-industry and cross-domain platforms, which have effectively promoted data interoperability and resource coordination

throughout the product lifecycle, various stages of production, and the supply chain (China Daily 2023). This has accelerated the digitalization of enterprises. Five industry public service platforms have been established to provide support for the application of 5G technology in industrial enterprises. In more than ten key industries such as automotive and mining, over 4,000 projects have been implemented, accelerating the popularization of 20 typical application scenarios such as collaborative research and development design and remote equipment control (China Daily 2023). This has effectively promoted enterprise quality improvement, cost reduction, and efficiency enhancement.

Based on the functionality of the platforms, they can be classified into three types:

- Application-oriented platforms: Key development platforms for industrial SaaS layers, represented by enterprises such as UFIDA, Kingdee Co, Baoxin Software Co, Oracle, and PTC. These platforms are mostly reconstructed by industrial software companies using PaaS development capabilities to obtain production site and remote equipment operation data and provide cloud-based application services.
- Integrated platforms: Comprehensive platforms that cover the complete edge layer, IaaS layer, industrial PaaS, and industrial SaaS layers, represented by companies such as Siemens Co, Haier Co, Midea Co, Sany Co, Xugong E-commerce Co, Schneider Electric, and China Aerospace Science and Industry Corporation. These platforms are generally developed by equipment automation and manufacturing companies, making full use of industrial experience to form complete innovative solutions on open platforms. They not only provide platform services to industry enterprises but also extend to other industries in line with the development of cross-industry and cross-domain platforms actively promoted by the country.
- Foundational platforms: Key development platforms for industrial IaaS layers, mainly represented by ICT companies such as Microsoft, Google, Alibaba, Huawei, Baidu, and Tencent. Foundational platforms are general technology platforms primarily established by ICT companies, providing infrastructure cloud services. Through cooperation with software and automation vendors, they reconstruct software application forms to help enterprises migrate data to the cloud.

In terms of development stages, industrial Internet platforms can be classified into three stages based on the depth of scenario value exploration and the complexity of industrial mechanisms: big data, cloudification, and digital twins. The first stage, big data is based on models and deep data analysis. Industrial Internet platforms achieve significant utility in scenarios such as equipment maintenance, cost management, and process optimization, leveraging data collection and processing (Mukherjee, & Gupta 2022). The second stage, cloudification, focuses on linking upstream and downstream participants and integrating information from various stakeholders in the industry chain. These platforms enable resource allocation, demand integration, and precise deployment (Zhou, & Ming 2021). The third stage, digital twins, involves cross-disciplinary collaborative research and development, accelerating technology iterations. Additionally, 1:1 simulation is conducted for critical processes to increase development efficiency and reduce testing costs (Souza, & Cruz, etc. 2019).

In the area of new industrial software, the domestic market for research and design industrial software is largely dominated by foreign giants. Companies such as Siemens from Germany and PTC from the United States hold over 90% of the market share. This

has resulted in slower progress in cloud-based design software, higher barriers to entry, and higher replacement costs, which lead to slow development of domestic industrial design software providers. In the mid-end and low-end segments of operational and production management software, domestic companies have achieved some competitiveness, but there is still a gap in the high-end segment. For instance, high-end ERP is still controlled by SAP and Oracle. According to publicly available data, SAP's annual revenue in China is 220.42 billion RMB, Oracle's annual revenue is 273.48 billion RMB, UFIDA's revenue is 8.93 billion RMB, and Kingdee Co's revenue is 4.17 billion RMB.

China Telecom's WING Plat Industrial Internet platform, developed by the Industrial Internet Research Institute under Jiangxi Telecom, relies on China Telecom's core capabilities in cloud, network, data, intelligence, and security. It serves as a comprehensive platform that integrates security and environmental integration, production control integration, equipment health integration, supply chain collaboration integration, and emergency management integration to enterprises, industries, and regions. The platform has received numerous national and provincial honors. It is currently deeply involved in the chemical industry both within and outside the province, creating some benchmark scenarios, and promoting them nationwide. The platform provides an industrial digital twin common engine and visualization twin modeling. It has already completed digital twin projects in chemical factories, bringing cost reduction and efficiency improvement to enterprises. In terms of industrial software, it has 137 self-developed industrial software applications that provide industrial software application services. With self-developed PLC cloudification automation detection lines and AI algorithms, it has achieved automated detection, which can save labor costs and improve accuracy and efficiency.

3.2 New Industrial Network and Identification

Industrial Network. Currently, industrial networks mainly focus on the networks within factories, presenting a two-tier, three-level structure. This structure consists of two layers of heterogeneous networks: the factory information network (IT) and the factory control network (OT) (Qin, & Chen, etc. 2020). Within these two layers, the networks are divided into three levels based on the management hierarchy: field level, workshop level, and factory/enterprise level (Cheng, & Zhang, etc. 2020). The network configuration and management strategies are relatively independent between each level (Fig. 4).

SCM stands for Supply Chain Management, MES stands for Manufacturing Execution System, ERP stands for Enterprise Resource Planning, CRM stands for Customer Relationship Management, HMI stands for Human-Machine Interface, SCADA stands for Supervisory Control and Data Acquisition, PLC stands for Programmable Logic Controller, and DCS/FCS stands for Distributed Control System/Field Control System.

At the field level, industrial fieldbuses are widely used to connect field sensors, actuators, and industrial controllers (Sauter 2010). In recent years, there have been field devices that support industrial ethernet communication interfaces. But the direct electrical hardwiring connection to controllers is still prevalent, with wireless communication being used only in specific cases and with low adoption rates (Gangakhedkar, & Cao,

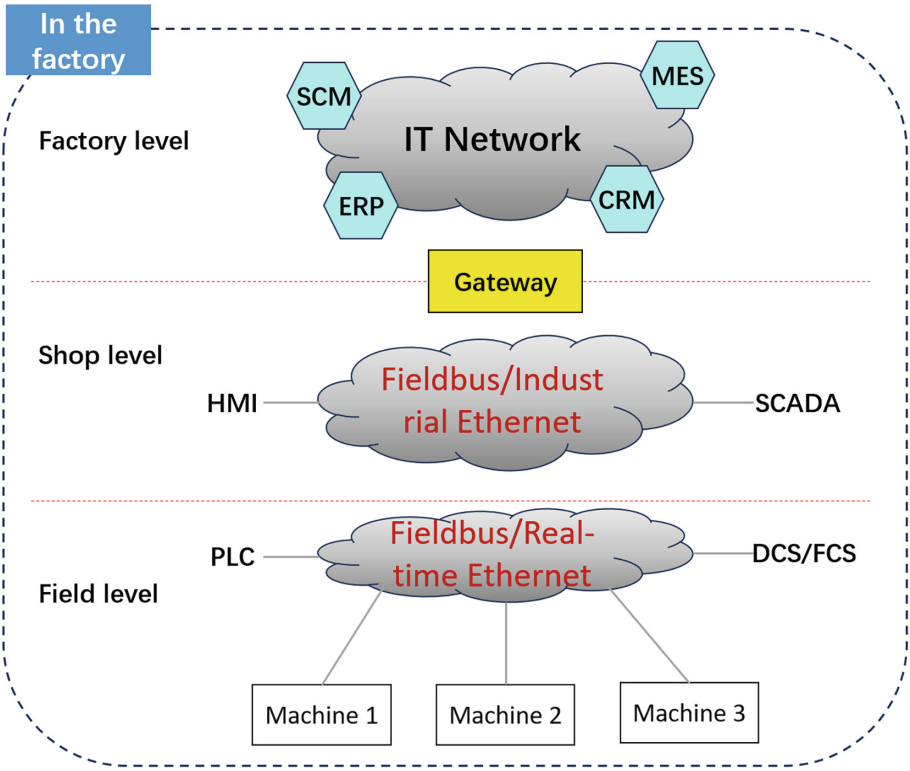

Fig. 4. Industrial Network Interconnection

etc. 2018). This situation greatly limits the efficiency of industrial systems and hinders the implementation of fine control and high-level process management.

The workshop-level network is mainly responsible for communication connections between controllers, between controllers and local or remote monitoring systems, and between controllers and the operations level (Li, & Zhang, etc. 2023). The Manufacturing Execution System (MES) is also deployed at the workshop level to achieve production execution control. Workshop-level networks mostly use industrial Ethernet technology, while some manufacturers use regular ethernet, industrial buses, or proprietary communication protocols for communication between controllers and systems (Martinova, & Sokolov, etc. 2023). Existing industrial ethernet solutions are often modifications and extensions of generic Ethernet, with limited interoperability and compatibility between different industrial ethernet protocols, which restricts large-scale network interconnectivity.

At the factory level, enterprise IT networks usually employ high-speed Ethernet and Transmission Control Protocol/Internet Protocol (TCP/IP) for network connectivity (Kim, & Tran-Dang, etc. 2019). With the construction of smart factories, enterprise IT management and operational systems have a strong demand for real-time implementation of process data and equipment status data from the field (Chen, 2020). It is crucial to deploy communication connectivity for field devices efficiently and conveniently,

using advanced networking technologies to achieve high real-time and reliable data communication between the field and management systems. Solving the integration and communication between IT and OT networks is currently a key issue in the field of factory network systems and technologies.

Jiangxi Mobile Co has established the Nanchang Longqi 5G + Intelligent Factory as a factory-level network case. The project focuses on a "1 + 1 + 4" application system, consisting of a 5G private network to build the Nanchang Longqi network infrastructure, an industrial Internet platform infrastructure, network-driven implementation, and four scenario-based intelligent applications. This implementation greatly improves production efficiency, production line management effectiveness, logistics efficiency, and inventory accuracy, with a 30% increase in logistics efficiency, 20% improvement in production management, 10% increase in capacity, and 20% cost reduction. This project can be replicated and promoted in the production and transportation.

Industrial internet identification resolution. On June 1, 2022, the "Industrial Internet Identification Management Measures" were officially implemented, promoting the standardized and orderly development of the industry. On August 27, 2022, the Ministry of Industry and Information Technology issued the first license to China Academy of Information and Communications Technology (CAICT) for the national top-level node of Industrial Internet Identification Resolution. On November 20, 2022, the second batch of 25 Industrial Internet Identification Application Providers was officially announced. At the same time, more integrated hardware and software identification devices were integrated into the Industrial Internet Identification Resolution system.

The Industrial Internet Identification Resolution system in China is independently developed and possesses strong security and risk resistance. Currently, "5 + 2" (five national top-level nodes in Beijing, Shanghai, Chongqing, Guangzhou, and Wuhan, and two disaster recovery nodes in Nanjing and Chengdu) architecture has been established for identification resolution. There are 284 secondary nodes connected to the national top-level nodes across 31 provinces, covering 40 industries. The cumulative number of registered identifications is 264.22 billion, with over 250,000 connected enterprises. The national top-level nodes handle resolution volume of 450 million times in a daily (Ma 2023). The identification resolution enables the convergence of enterprises from various industries, which can achieve precise integration with production systems and the entire supply chain system. It helps reduce production and operational costs, which will becoming a crucial tool for achieving a unified national market.

"Enterprise Node + Data Connector," developed by Beijing Institute of Technology, supports the collection of identification data in various modes, including industrial software, production lines, simulation, videos, and RPA. The "Production Line Equipment Identification Data Collection Terminal" developed by Changzhou Riyue Software Co specializes in automotive parts. It digitizes, visualizes, and enables collaboration through active identification carriers, supporting 95% of PLC protocols and 90% of injection molding machines and CNC protocols. The "Intelligent Workstation Based on Active Identification Carrier" developed by Nanjing Dongda Integrated Research Co Ltd, integrates professional barcode scanners and provides various process management functions, including dynamic SOP decomposition, data monitoring, facial recognition, motion capture, and defect monitoring. The "Intelligent Gas Meter Based on Active

Identification Carrier and NB-IoT," developed by China Mobile IoT Co, enhances the security capabilities of gas meters by supporting identity authentication and providing functions such as remote smart meter reading and online monitoring of operational data.

Jiangxi Province has actively built 13 industrial Internet identification resolution secondary-level nodes about the "2 + 6 + N" key industries. It has covered the dominant industries of nonferrous metals and electronic information, as well as the pillar industries of textiles, equipment manufacturing, food, and automobiles. It has also included advantageous industries such as ceramics, semiconductor lighting, traditional Chinese medicine, and energy conservation and environmental protection. This has accelerated the transformation of Jiangxi Province's manufacturing industry towards high-end, intelligent, and green development. The achievements in construction rank 1st in the central region and 9th nationwide. There are 2,224 connected enterprises, ranked 2nd in the central region. The registrations of industrial internet identification resolution have reached 630 million, with the number of cumulative resolutions getting to 3.04 billion times.

Currently, in China even the global, information query capability in the field of industrial internet identification resolution is relatively mature. There will be an increase in data interaction, data authentication, and compliance-related applications. Applications focusing on public nature and trustworthiness, such as authentication and data compliance checks, will generate new application models and business models. However, it is significant to note that there are still some issues in the field of identification resolution which need to be addressed. Such as incomplete information circulation capabilities in various fields, unclear data interaction mechanisms at different levels, lack of unified standards for resource sharing of various elements, imperfect identity authentication at various nodes, weak network protection capabilities, and inadequate management methods. The industry's identification data resource pool lacks mechanisms for cross-enterprise identification discovery. Data dictionary missing can be found and sharing capability is insufficient. The enterprise's identification data resource pool lacks mechanisms for cross-system identification discovery and access permissions as well as the inadequate data and collaboration capabilities. There are various methods for describing identifiable digital objects and data organization. Mapping dictionaries for data semantic identification are missing. The real-time data collection capabilities of identification resolution clients are insufficient. There is lack of flexible control collection methods, secure and reliable collection mechanisms as well. These issues that are necessary to be addressed in future.

Industry Automation. In the traditional field of industrial automation, it includes three aspects: sensors, controllers, and control systems. However, in the rapid development of the industrial Internet, the industrial edge computing industry has begun to take shape and formed a relatively complete industrial chain. Domestic companies have a wide range of product types. New technological products continue to emerge. More and more computing, storage, networking, analysis, and other resources are being transferred to edge devices. Currently, industrial chain composed of Clouding Companies, Operators, Equipment Manufacturers, and industrial automation companies has initially formed. The Cloud-Edge-End form three-tier architecture that is continuously developing. Edge computing is the result of the convergence of CT (Communication Technology) connectivity and IT (Information Technology) computing. Its value lies in the unique value

delivery which is achieved by combining business carried by CT connectivity and IT computing with the integrated service capabilities of Operators.

Jiangxi Unicom Co regards edge computing as an important strategic initiative for developing high value 5G for B2B/B2C services. The company has deployed municipal-level (province, city, and district) edge computing nodes. These nodes serve as entry points, leveraging the connectivity capability of telecommunications (CT) and the computing capability of information technology (IT). Jiangxi Unicom Company collaborates with relevant partners to build an open ecosystem and creatively empower vertical industries. The company provides various and low-latency edge applications, enabling the penetration of 5G application scenarios into "applications and capabilities." It establishes an integrated service capability of "cloud, network, edge, terminal, and industry" to deliver truly valuable B2C applications and capabilities to all users. Now, there are 12 applications deployed within the province. Representative cases: Jiangxi Baisheng Intelligent Technology Co, Ltd. Has provided a high-bandwidth, low-latency, highly reliable, and secure basic connectivity network for smart factory construction by the integration of 5G private network and Mobile Edge Computing (MEC). It has also provided effective network support for interconnection between various production processes and human connectivity in the smart factory. Jiangxi Xinlianxin Chemical Industry Co., Ltd. Has implemented a 5G + Industrial Internet solution by deploying a series of unmanned aerial vehicle (UAV) smart nests. With UAV smart nests as carriers, 5G is utilized as reliable communication for its high-bandwidth and low-latency characteristic. With edge computing as the core, integrating different unmanned aerial vehicles (UAVs) and sensors, utilizing the UAV smart nest visual control platform, a network model is constructed, which achieves cloud-edge collaboration under a comprehensive GIS framework. This enables the development of a grid-based intelligent inspection system that covers the entire power transmission and distribution system, including the transformation and distribution facilities. With edge computing as the core, integrating different unmanned aerial vehicles (UAVs) and sensors, and combining them with the UAV smart nest visual control platform, a network model is constructed that integrates air and ground elements, and achieves cloud-edge collaboration under a comprehensive GIS framework. The system can satisfy the demands of daily and emergency inspection in whole area.

Industrial Intelligence. Industrial intelligence refers to the use of advanced technologies such as artificial intelligence, the IOT, and big data to achieve automation, intelligence, and digitization in industrial sectors (Peres, & Jia, etc. 2020). The industrial intelligence industry has been supported by national policies. With the continuous development of artificial intelligence technology worldwide and the ongoing improvement of digital infrastructure, the market size of the industrial intelligence industry in China reached 989 billion yuan in 2021. It is projected that by 2025, the market size will reach 2.2 trillion yuan.

In China, the industrial intelligence industry suppliers are mainly composed of intelligent sensor and AI chip manufacturers, as well as AI algorithm providers. However, there is still a considerable gap compared to the world's advanced level. As for the design tool field, foreign companies dominate the CAD domain with a market share of over 90%, and almost half percent market share in the CAE domain among the whole

industrial software-related enterprises. In the field of management tools, there is potential for significant breakthroughs in areas such as vision-based systems, edge devices, and specific industrial domains. These technologies can play a crucial role in enhancing management capabilities and efficiency in industrial settings. By leveraging visual data and edge devices, businesses can gain real-time insights, improve decision-making processes, and optimize operations in specific industrial domains.

The industrial Internet platform developed by Jiangxi Telecom Co applies industrial intelligence in security management. Its AI-based big data intelligent analysis security management is a method that utilizes artificial intelligence technology to predict, identify, and respond to security incidents. By analyzing and mining massive amounts of security data, it can identify potential security threats and vulnerabilities. It will take timely measures to prevent and address them, thereby improving the efficiency of security management. The platform has achieved functions such as real-time monitoring of security events, prediction of security events, intelligent analysis, and rapid response.

Industrial Internet Security. New technologies promote the development of security technologies for emerging business models. Security, as a prerequisite and guarantee for the high-quality development of the Industrial Internet, has achieved significant progress. Currently, the pilot work on hierarchical management of network security in industrial Internet enterprises is steadily advancing. The scale of China Industrial Internet network security industry has grown from 1.34 billion yuan in 2017 to 2.72 billion yuan in 2019, with a high compound annual growth rate of 42.3%. At the same time, the security environment of new business models in the industrial Internet is complex and diverse, with security risks presenting a variety of characteristics. The difficulty of identifying security vulnerabilities has increased, further intensifying the security situation. The difficulty of identifying security vulnerabilities has increased, and the security situation has further intensified.

Jiangxi Telecom Co construct the sub-system of the Jiangxi Province Industrial Internet Situational Awareness Platform. The platform will send data to the provincial platform, which achieve the integration with the national platform. The network security level of the industrial Internet platforms, built by Jiangxi Mobile Co and Jiangxi Unicom Co, is at Level 2. Jiangxi Unicom Co is currently building industrial security situational awareness platforms in three cities: Xinyu, Yichun, and Yingtan. Among them, the industrial security situational awareness platform in Xinyu is relatively perfect. 3.06445 million yuan is invested for the platform construction, with a total of 127 asset monitors. More than 500 weekly alarms generated but the rate of disposal over 80%. It supports detailed display of the security assurance capabilities of protective devices. Multiple security probes on the target network are analyzed, displayed, and statistically assessed based on categories such as web application protection, threat detection, gateway protection, endpoint protection, security auditing, and vulnerability. The platform supports data distribution and statistics of comprehensive vulnerability results for assets. It presents an overall view of asset vulnerabilities, distribution of security vulnerability types, analysis of vulnerability levels, top 5 high-risk vulnerability rankings, top 10 vulnerability rankings, trends in the discovery of new vulnerabilities, rankings of high-risk vulnerability types, and comparison of vulnerability levels.

4 The Suggestions of Development of the Supply Capacity of Key Segments in the Industrial Internet Industry Chain in Jiangxi Province

4.1 General Suggestions to Accelerate the Development of the Industrial Internet

- Based on research and analysis, there is no relevant mechanism in the province that specifically focuses on key core technologies of the industrial Internet, such as Time-Sensitive Networking (TSN), 5G, and edge computing, for the purpose of achieving significant progress and promoting the transformation and dissemination of key technologies and products within the industry. Focusing on key technologies and products can encourage large state-owned enterprises to actively undertake the construction of industry network service platforms during their own digitalization and informatization processes. This can also facilitate the transformation of achievements and promotion within the industrial chain.
- The development of the industrial internet industry within the Jiangxi province, particularly the lack of interoperability between platforms among different companies, which leads to limited collaborative effects. It is necessary to coordinate the construction of an adaptable and validated environment that facilitates seamless integration of industrial internet products, focusing on the integration and interoperability of independent industrial software, identification systems, and edge devices-related data sets.
- With the rapid development of general AI, industrial intelligence can explore the construction of industry-specific common model repositories, guiding the development of open-source communities and creating a public service platform for algorithm and model trading within the province.
- In terms of ecological construction, Jiangxi province has introduced a series of policies for industrial Internet, which can promote the industrial internet and identification resolution system in the assessment of the autonomy rate of state-owned enterprises. Relying on the vast industrial market applications of state-owned enterprises, it can accelerate the iteration of technology and services.
- Promote mechanisms of project allocation and technology transfer to strengthen the alignment and transformation of products with actual needs.
- It is necessary to encourage universities and research institutes to build talent cultivation mechanism and develop independent products. It is significant that strengthen self-reliance and innovation capabilities.

4.2 Specific Recommendations for the Development of Supply Capabilities in the Industrial Internet Industry Chain

- In terms of network construction, it is important to strengthen the connection between supply and demands of new technologies, such as TSN and edge computing within the province. Encourage leading enterprises to conduct pilot demonstration applications of TSN in their respective industries based on their own needs and promote the use of IT-OT integrated network devices for network deployment.

- To strengthen the ecological applications in the field of identification resolution, it is significant to achieve data authorization based on identification. Some technology solutions such as visibility and privacy protection technology can be continuously explored in industrial internet identification field. Encourage the development of software for sharing and integrating identification data for industrial Internet, which can handle the fusion of multi-channel and inconsistent data and ensure the security and interoperability of shared data.
- In the field of new industrial internet applications, companies may face the shortage of talents, especially in some new areas such as digital twins, cloud-based software, and big data processing, etc. There is a lack of common technical standards in terms of technology standards, and there are difficulties in system integration and interoperability among companies.
- In terms of security, promoting collaboration between security companies and industrial enterprises is necessary. Deeply exploring the security needs of industrial environments, application scenarios, and production processes is necessary. Incorporate concepts of zero trust and AI into product development to promote industry validation. Incorporating new technologies such as zero trust and AI into the product development process and promoting industry validation is essential. This involves integrating the concepts of zero trusts and AI. Accelerating the development of industrial Internet security vulnerability databases and other information repositories is crucial. Additionally, exploring the establishment of secure simulation and validation environments is a proactive way to enhance practical response capabilities.

5 Conclusion

In the first part, it is illustrated that the boundaries of the industrial internet industry are continuously expanding with the comprehensive development of new generation information technologies such as edge computing and AI. The expansion of industry scale and entities, the existing industrial chain frameworks no longer meets the actual development demands. From the perspective of the industrial supply chain, the framework of the industrial Internet supply chain can be summarized as a "4 + 1" structure. The "4" refers to the four main supporting industries of industrial Internet platforms, new industrial software, new industrial networks and identification, industrial automation, and industrial Internet security. The "1" refers to the sub-industry of industrial intelligence and analytics.

Based on the previous discussion, the second part of the article provides a detailed analysis of the key supply capabilities of the five major industry chain segments, corresponding to the industrial Internet supply industry chain framework of "4 + 1". In terms of industrial Internet platforms and new industrial software, China has a good foundation in applied, integrated, and foundational industrial Internet platforms. However, the development of new industrial software is still in a slow stage. In terms of industrial networks and identification, China mainly adopts a two-layer and three-tier structure for factory internal networks. At present, there are still issues such as limited system efficiency, restricted interconnection of large-scale networks, and lack of interoperability among integrated networks. China has developed independent industrial internet identification and resolution system, which is characterized by strong security and high resistance to

risks. The system's nodes are widely deployed across the country, and Jiangxi Province is also making significant progress in its construction efforts, ranking among the top in the nation. In the field of industrial automation, industrial automation enterprises have become crucial players in the industrial edge computing industry. Jiangxi Unicom, by the forward-looking deployment of edge computing, has already created several efficient and exemplary cases. In the field of industrial intelligence, there is a clear gap between China and the world's leading edge, and it is urgent to seek breakthroughs in related key areas and break through industry barriers. In terms of industrial Internet security, in recent years, China's industrial Internet security industry has shown a high compound annual growth rate. However, in today's complex security environment and diverse security risks, the discovery of security vulnerabilities becomes particularly important.

Considering the insufficient supply capacity of key segments in the industrial Internet industry chain in Jiangxi Province, the third part of this article proposes relevant suggestions to accelerate the development of the industrial Internet industry. These suggestions include focusing on key technological products, promoting the transformation of achievements, and establishing collaborative model libraries. As for the development of supply capabilities, there are four specific recommendations are provided.

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