Review of Development and Application of Future Network (IPV9)

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I. INTRODUCTION

In 28 June, 2019, general secretary Xi Jianping proposed to accelerate the construction of the "BRICS Institute of Future Networks" at the informal meeting of the BRICS leaders on the eve of the G20 in Osaka, Japan. Which received a unanimous approval by the leaders of the BRICS countries, this is the first time that president Xi mentioned "future network" in his previous public speech. It shows that after more than ten years of researches and practices, the international technology of the "Future Network" which promoted by the International Standards Organization ISO/IEC since 2007 has been highly recognized by the Chinese government. It will soon become the core technology concept that guiding the innovation and development of China's information and communication technology, and will provide a powerful impetus for the development of the international standards of "future network" and related industry chains.

II. THE CONCEPT AND DEVELOPMENT OF "FUTURE NETWORK"

"Future Network" is a specific term, which represents a computer network standardization project in the field of ISO/IEC international standards since 2007. Its mission is to develop a new network system that is independent of the existing Internet with an empty cup design and a new architecture approach. It will achieve safer, more economical, faster, more flexible, and more capable of meeting the technical requirements of the new era, with more than 15 years of research and it will put in preliminary commercial around 2020.

The basis for whether it can be called "future network" internationally is the definition given by the International Standards Organization. One of the conditions is that the address length must be at least longer than 2 to the power of 128. Since 2007, the United Nations International Standards Organization ISO/IEC has been developing and formulating the "Future Network" international standard, and released nine technical standards reports of the ISO/IEC Future Network TR 29181 series(Among them, the report TR 29181-2*Name and Addressing* and TR 29181-5 *Safety* were completely led by Chinese experts and were completely led by Chinese experts and were publicly approved to release in 2014.) discussed the problem of the existing Internet network and proposed the technical requirements of the future network. According to the agreement of the WTO Agreement, in the case of existing ISO/IEC international standards, the relevant policies and regulations of each country should be consistent with the international standard specifications. Therefore, the international standards of

the ISO/IEC future network should be the basis to delimit the type of future networks in each country.

In 2014, the academician of the Chinese Academy of Sciences set up a consulting research topic "Future Network Architecture and Its Security", comprehensively discussed the technical characteristics of the future network security architecture, and demonstrated the feasibility of the future network. After the argumentation by the Chinese Academy of Sciences Committee, the President of the Chinese Academy of Sciences submitted a report to the State Council in July 2015, proposing to set up a major project for the future internet of the thirteenth Five-Year Plan and use the willpower of the state to promote future network research. This report should be the most authoritative statement of the Chinese scientific community on the future network, and should be the basis for defining the future network in China. In June 2016, the Ministry of Industry and Information Technology released the standard of future network/IPV9 electronic industry.

The basic purpose of the future network is to be able to survive independently without parasitic on the Internet (but it can compatible with the Internet), thereby improving the sovereignty, survival and control cyberspace in countries around the world. and there is no "Internet", indicating that the future network does not use the technology of internet, not just the upgrade of the Internet. Some domestic researchers have translated the future network into "Future Internet", and some even translated "Next Generation Internet IPv6" into "Future Internet", which will cause the future network to be mistaken for the Internet high-speed intelligent project. There will be administrative disputes with Internet agencies such as the IETF. The use of the term "Future Network" by the International Standards Organization ISO/IEC indicates that there is no affiliation with the Internet, and there is no dispute over its jurisdiction, avoiding the misunderstanding of "the combination of internet and new generation of

information technology such as 5G, internet of Things, cloud computing, big data, and artificial intelligence is future network"

III. CHINA ATTACHES GREAT IMPORTANCE TO "FUTURE NETWORK"

Among the BRICS countries, China is the most active and contributing member of participate the ISO/IEC future network international standards. as the former Ministry of Information Industry, established an expert working group leader unit of "decimal network standard work group "and" Overall Design of the New Generation of Security and Controllable Information Network Technology Platform" around 2001, led the project to be responsible for the future network/IPV9 protocol standard proposal and the implementation of the new generation of secure and controllable network platform design, planning and demonstration projects. , achieved very outstanding achievements. Therefore, the BRICS countries can be given more support and assistance in terms of standards, theory, technology, industrial development and application. The most important thing is that China should provide the future network technology architecture plan that reflects China's wisdom, advanced and feasible, to the BRICS Future Network Research Institute, including technical solutions that can reflect China's complete network sovereignty and security architecture.

Now, President Xi mentioned the "future network" on international occasions for the first time in public, and it is clearly calling for the acceleration of the construction of the "BRICS Institute of Future Networks" project. This is a long-awaited and inevitable event for our research team that has long been engaged in the future of network technology research and development of international standards. For more than 20 years, China's technical team of "decimal network standard work group" and the "Overall Design of the New Generation of Security and Controllable Information Network Technology Platform", under the long-term planning and guidance

of the party and the government, under the leadership of the expert group leader Xie Jianping, with the spirit of innovation, advancing with the times, and struggling hard. We have made breakthroughs in future network/IPV9 cyberspace, root name server, IPV9 Taishan operating system and legal digital currency anchor technology: The design, planning, construction and the implementation of demonstration projects of the new autonomous safety and controllable network. The engineering implementation technology has been mastered and can be interconnected with the existing IPV4/IPV6 Internet. China has built a computer communication network with independent intellectual property rights and network sovereignty which is independent of the US Internet but compatible with the US Internet. It forms the most basic element of China's fifth territorial cyberspace sovereignty.

In 2000, Shanghai General Chemical Technology Research Institute researched the IPV9 protocol and digital domain name top-level domain name server under the support of the Shanghai Municipal Government, and passed the IPV9 network protocol expert appraisal of the team led by Academician Shen Changxiang. In 2007, as an integral part of China's national ISO membership, participated in the standard formulation of ISO/SC6 future network standard formulation, led the "name and address", "safe" technical reporting standards, and obtained the recognition and support from ISO standard organization, the National Standards Committee and the Ministry of Industry and Information Technology. China has proposed a hybrid communication scheme of IP communication and virtual real circuit and a method of address encryption/first verification and post-communication for the technical defects of IPv4/IPv6.It breaking through the United States' Intellectual property monopoly on the Internet TCP/IP protocol and become an important part of the ISO technical report of the International Standards Organization. In the second vote of the ISO/IEC future network standard in 2014, members of China, the United States, Russia, Canada all voted in favor. In June 2016, the Decimal Network Standards Working Group led to formulate the industry standards of six future network/IPV9 electronics and the Ministry of Commerce issued by the Ministry of Industry and Information Technology and the Ministry of Commerce.

IV. THE PLANNING AND CONSTRUCTION OF "FUTURE NETWORK"

A. Planning of future network/IPV9

Due to the achievements of China's future network and the new generation Internet (IPV9), the State Council has incorporated the future network and the new generation Internet into the medium and long-term (2012-2030) planning of major national science and technology infrastructure construction.

In November 2017, the General Office of the CPC Central Committee and the General Office of the State Council of the People's Republic of China issued a focus statement for the implementation of the demonstration application of the future network:

a) Build an independent technology industry ecology, strengthening the technology innovation of network front-end, and accelerating the construction of major scientific research infrastructure.

b) Accelerate the construction of national future network test facilities, and actively carry out trial verification and application demonstration of new network technologies and new applications.

c) Further accelerating the new internet architecture, and basic technology innovations such as new addressing and routing, endogenous network security, and network virtualization Innovate, strengthen the experimental verification and application demonstration of new technologies and new applications of the network, continuously improve the productivity transformation level of innovation achievements, significantly enhance the independent innovation capability of network

information technology, and form the first-mover advantage of network technology in the future.

Currently there are four communication methods in the world. The first three are invented by Westerners: telegraph, telephone, and IP packet switching. The fourth communication method is a hybrid method of circuit and IP packet switching (TCP/IP/M), which was invented by the Chinese. The first three communication methods are inherently unsafe. The method invented by China has established a new way of secure communication and solved the key technologies of network security communication.

B. Construction of Future Network / IPV9

1) *China has built a research system and industrial system of future network/IPV9:*

a) Hardware: core router, edge router, IPV9-IPv4 protocol conversion router, embedded router, client, Beidou/GPS network timing server, IPV9 protocol NTP timing service, V9-enabled application terminal, IPV9 firewall,IPV9/ IPV4 VPN server.

b) Software: IPV9 network management system, IPV9 automatic distribution application access system,IPV9 operating system,IPv4 and IPV9 address and network management,IPV9 windows protocol stack, Windows system IE browser IPV9 plug-in.

c) Domain Name System.

d) The parent root server, root name server, the top-level domain name server, the IPV9 reverse resolution server and the second-level domain name server.

At present, China has built demonstration projects in Beijing, Shanghai, Shandong, Jiangsu, and Zhejiang that have IPV9 address space, root name server and IPV9 backbone optical cable system, which can replace the Internet network management signaling imported from the United States through the Pacific Ocean cable. The national military-civilian integration IPV9 backbone optical cable and Gateway MSC is under construction.

2) *The construction goals of future network / IPV9:*

a) Based on the IPV9 autonomous network, build a self-controllable and secure network that connect the Communist Party of China, Politics, Military and Civilian, safeguard China's cyberspace sovereignty, and accelerate the promotion of domestic controllability of cyberspace Achieve trusted network entity authentication and authentication, trusted management, content supervision and other functions, lay the foundation for the construction of national big data center to build national integration, and provide safe and reliable information services for the decision-making of the Party Central Committee and the Central Military Commission's combat training department.

b) China has already had the independent intellectual property rights of root name server and address space, it has realized a historic transformation from renting to autonomy, it shows that China has the ability to build a second computer network with independent intellectual property rights and a national integrated national big data center, and change the situation that the cyberspace security strategy politically by other countries.

c) Form the national cyberspace territory and network strategic depth system, improve the level of cyber operation management, improve the ability to maintain cyberspace security, and accelerate the promotion of cyberspace domestically controlled alternatives.

3) *Introduction to typical applications of future network/IPV9:*

a) *The application of 5G-future network/IPV9 movie network release application:*

Now the 5G network of China Unicom Beijing and China Mobile Suzhou have been directly connected through the IPV9 fiber routing backbone node of Beijing University of Posts and Telecommunications and the IPV9 national backbone optical cable network, and achieved the world's first time End-to-end

500Mbps to 1000Mbps speed on May 21 this year. On the IPV9 national backbone network +5G local access/5G core network, the digital film program network distribution work was successfully carried out (the data capacity of each movie was about several hundred GB), and the national network distribution of Chinese movies was first entered in the new era of "one hour", we will continue to carry out the intelligent work of the theater centered on the IPV9. The first realization of the future network / IPV9 + 5G + broadband ultra-high-speed video business proved the future network / IPV9 can play a major role in the process of solving the amazing problem of our famous entrepreneur Ren Zhengfei "5G development is slow, the current network structure is not good, and the network speed is only 20/30Mbps during the day. "And it can also prove that network/IPV9+5G is also suitable for remote 8K TV service, remote medical service and remote AR/VR broadband ultra-high speed video service.

b) "Health Taian " IPV9 Big Data Platform:

"Health Tai'an "IPV9 big data platform project relies on the existing backbone optical cable and user transmission access network of Shandong Broadcast Network Co. Ltd. Tai'an Branch, using IPV9 network technology to upgrading and construction, cover the medical and health institutions of the city, county, township and village levels and the medical insurance bureau, the administrative department and the finance bureau of Tai'an, and further expand to families and individuals. The bandwidth meets the requirements of healthy Tai'an big data business and can be sustainable. The expansion realizes compatible security operation between IPV9 network and IPV4 network (also realizes logical security isolation between IPV9 and IPV4 and IPV6 networks).At present, two 40G and six 10G IPV9 backbone routers and 300 (by the end of this year it will rise to 3000) IPV9 thousand M user routers have been used, and Feicheng has begun to deploy to the village health center. The project is doing the third-level system certification, the project is applying

for the third-level system certification, and the specific network protection measures and operations are in compliance with ISO27001 requirements.

For the Tai'an Municipal Government, on the domestically-controlled and controllable security network, the medical institutions of 3,000 village-level health centers will be connected to the IPV9 Tai'an Metropolitan Area Network (including the Tai'an Finance Bureau and Medical Insurance Department).It is necessary that supervising the bills of medical treatments for all patients, by the bureau of finance. In the past, every October, Tai'an's financial subsidies of one billion yuan per year were used up (because of excessive drug use and opaque drug purchase). Now use the financial subsidy program to block the black hole of medical expenses waste. The Tai'an Municipal Finance Bureau also requires that all the information of each medical unit should be unified in the "Big Health Cloud", which facilitates the access of doctors and patients' information, the sharing and utilization of information, and enables citizens to enjoy convenience and cost-saving benefits. Allowing citizens to enjoy the convenience of medical information sharing and the benefits of cost reduction, and also fully and effectively display the performance of the government-established medical security system. Such as the rapid and real-time verification of medical insurance reimbursement bills and redemption, this protects the quality of citizens' life.

V. CONCLUSION

In the 36th collective study of the Political Bureau of the CPC Central Committee in 2016, General Secretary Xi Jianping emphasized that it is necessary to accelerate the independent innovation of network information technology. He pointed out that network information technology is the world's most concentrated investment in R&D, the most active innovation, the most widely used, and the largest technological innovation field and it can promote technology in other fields, and it is the competitive

high ground for global technological innovation, and it is the competitive high ground for global technological innovation. We must comply with this trend, vigorously develop core technologies, strengthen the security of key information infrastructure, and improve the network governance system. We must firmly control the core technology independent innovation, break through the cutting-edge technologies and core technologies with international competitiveness of network development, accelerate the promotion of domestically controlled independent control plans and build a safe and controllable information technology system.

China is a socialist country. We firmly believe that under the leadership of the Party Central Committee with General Secretary Xi Jianping as the core, we will surely win the final victory of the national cyberspace sovereignty battle and building a community of human destiny. Although the road ahead is difficult, We have the future network intellectual property and root name

server system that have the network core, and have built the future network/IPV9 industrial ecosystem and several typical demonstrations engineering.

We hope that China will vigorously develop China's information and communication industry and the national digital economy industry on the basis of the development of the future network/IPV9, and provide services for the development of the BRICS countries and the development of countries along the "Belt and Road".

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