

Application Research of Decimal Network Technology

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Abstract—The current Internet technology is IPv4 Protocol suite, and it is completely developed by the U.S. the IPv4 protocol address space is 232, and it has some shortcoming with the development of the Internet, and IPv6 Protocol suite proposed to expand the address of IPv4, but the two protocols are not compatible, which brings certain difficulties to the final application. The decimal network standard working group of Ministry of Industry Information Technology of China has researched about the future network for more than twenty years since 2001 and developed a whole set of decimal network system, and completed the future network IPV9 series. This paper introduces the basic technology of decimal network and its related applications. The practical application shows that the decimal network has realized the characteristics of "autonomous, controllable, high-speed and compatibility".

Keywords—IPv4; IPv6; IPV9; Autonomous Network

I. THE GENERATION OF DECIMAL NETWORK

Nowadays, the network is highly valued by all countries in the world. The core of Internet technology is IPv4 and IPv6, and it is developed by the United States. The IPv4 protocol address space is 232, and it has some shortcoming with the development of the Internet, in theory, IPv6 has 2128 addresses, but only one eighth of the

addresses can be assigned to end users, so IPv6 also has certain limitations.

Decimal network working group joint Shanghai network information technology company in the field of a new generation of new Internet and the future network for more than 20 years of research since its inception in August 2001, developed a complete set of network framework system, completed the future decimal network with Chinese independent intellectual property rights. This creative new achievement has strong support from China's ministry of industry and built the world's second network system. The technology has been completely tried in Shandong Tai'an City medical ecological domain construction, Jilin Province Political and Legal Committee system, Beijing University of Posts and Telecommunications, Xi'an University of Technology and other units, achieved good results, truly achieve the goal of "autonomy, safety, high speed, compatibility".

In 2001, a number of Internet experts in the United States published an article declaring that IPv6 technology could not solve the old structural problems, but only showed the failure of the incremental improvement route. Instead, they must adhere to the principle of "Clean Slate Design" and Design a new network without

relying on the support of the existing network with a new thinking.

'Future network' is a standardization project in the field of ISO/IEC international standards, it is a technical terms. Its purpose is to use new architecture method to develop a new network system independent of the existing Internet. Achieve safer, more economical, faster, more flexible, and more able to meet the technical goals of the new era.

In April 2007 Xi 'an meeting, the international standards organization ISO/IEC decided to launch the Future Network international standard research plan, determined that the Future Network is the English Future Network, abbreviated as FN, clearly shows that the Future Network is independent of the Internet.

On February 25, 2011. ISO JTC1, SC6 WG7, 6N14848 document response to the United States national member body 6N14510 document. pointed out that the future Internet is a new design of the future network. Future network does not necessarily rely on IP network, but is a hybrid network composed of IP communication and virtual reality circuit mixed communication. Besides, after discussion on the name change of WG7, WG7 changed the working group name to FN Future Network.

On June 1, 2016, the Ministry of Industry and Information Technology of China issued the relevant industry standards for IPV9 implementation in the country: SJ/T11605, SJ/T11604, SJ/T11603, SJ/T11606. This marks after 20 years of research and development, China really has the independent research and development of mature network of decimal mother root, root, from the N Z named 13 root name server system, the core backbone routers and user router product series, built with

independent intellectual property rights, independent and compatible with the Internet computer communication network.

II. DECIMAL NETWORK SYSTEM

Decimal network is also called the future network, referred to as IPV9; the whole system has a perfect network server system. China successively in Shanghai, Beijing, Jilin, Zhejiang, Shandong, Chongqing, Hunan construction completed the future backbone network, through the tunnel technology and the current IPv4 public network connection, complete the testing and commissioning, implements the able fully compatible with IPv4 and IPv6, through a dedicated router and related plug-ins, can be done in mainstream Windows operating system on the network switch and visits, do not need to modify existing hardware and software system, can realize able to IPv4 network access. The national future network structure is shown in Figure 1.

According to the shortcoming of existing TCP/IP protocol, designed the future network IPV9 system. A new transmission theory that uses a three-tier network to transmit telephone and cable data directly, without affecting the existing four-tier network transmission. The link is established and the transmission is completed until the link is removed. Under the research and design of the system framework, the overall design of the system is completed, and the root server system of the system is designed and implemented.

TCP/IP/M solves the high quality real-time media communication problem of three networks (communication network, radio network and Internet) from the network bottom structure, thus providing a smooth network environment for the future network. The new network model can realize the lofty ideal of the future network.

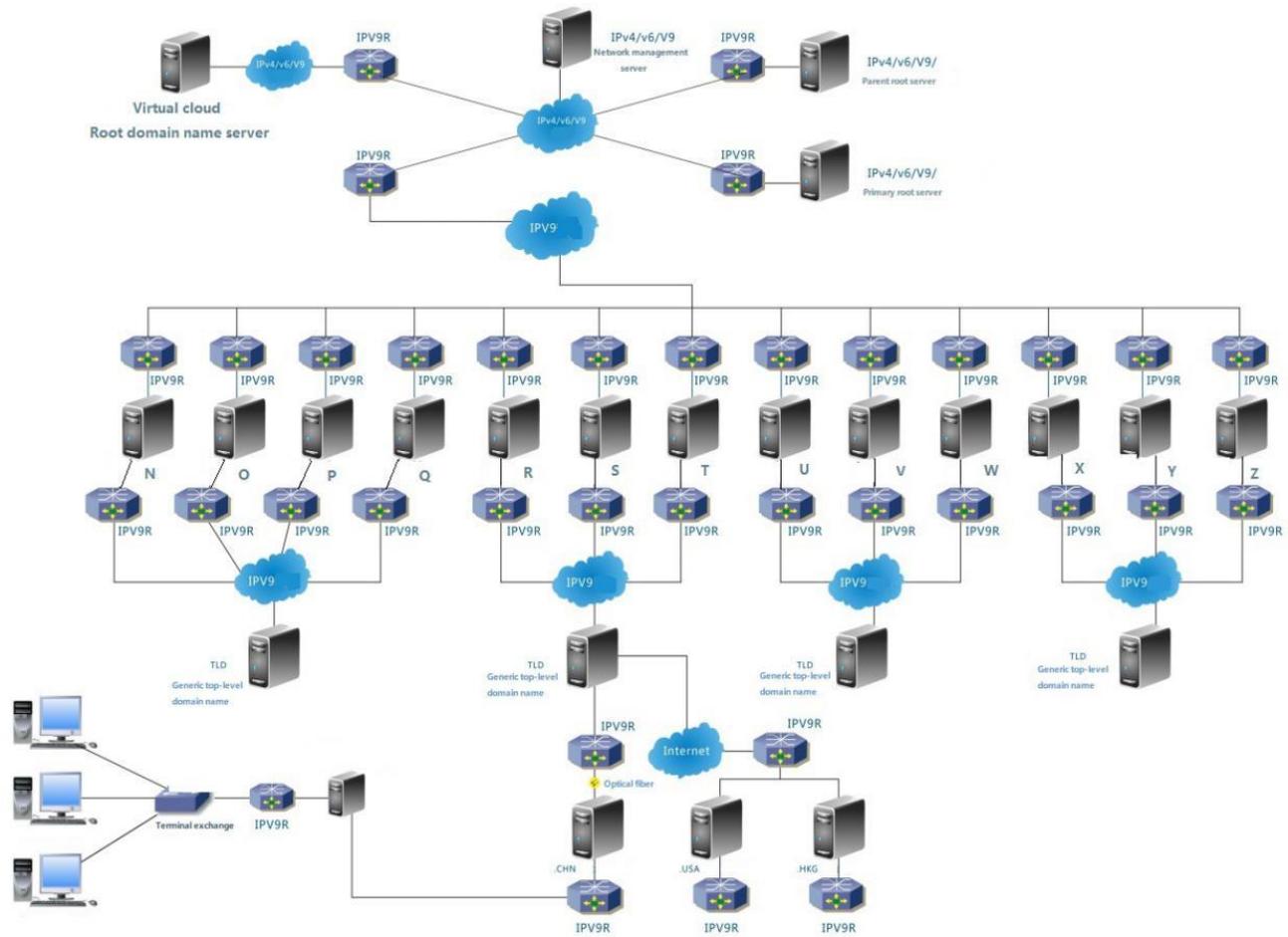


Figure 1. Decimal network root server system structure

III. FEATURES OF DECIMAL NETWORK

Decimal network is a new generation of network architecture researched and developed by Chinese scholars. It has complete autonomy and control, huge address space, safe and high-speed large-code stream transmission, low distributed resolution delay, and extremely low communication cost. It is compatible with current Internet systems.

A. Independent root server system

The intellectual property rights of decimal network and digital domain including based on 'The Networked Computers with full decimal algorithm distribution method of address', 'the

able/future network N ~ Z root name server " and "Method for allocation of address among computers acceding to network by using full digital code", which constitutes the IPV9 decimal network address space, 13 root domain name server and 239 countries top-level domain name server.

Decimal network default 256-bit address, can achieve 2048-bit address, can be compressed on both sides, recycling use, can be like the telephone system fixed length not positioning, positioning indefinite length in order to reduce and save unnecessary costs, increase efficiency, fully meet the needs of a long period of network development.

B. Digital Domain Name System

In the Digital Domain Name System (DNS), IPv4 and IPv6 are resolved in the United States, while IPV9 is set by each country, which avoids the restriction of IP addresses and makes it cheaper for countries to use domain names. Able decimal network using digital domain technology, reduces the difficulty of network management, the address of the vast space and the increase of security mechanism, solves the existing IPv4 is facing many problems, its automatic configuration, service quality and advantages in aspects of mobility support can meet the needs of the different levels of various equipment in the future.

C. Routing Technology

Decimal network routing table is very small, the address assignment follows the principle of geographical spatial clustering, which makes the decimal network router using a record can be said of a country, region, subnets and a specific geographic location. It sharply reducing the length of the router centrally by the table and cleanliness, improves the speed of the routing table to forward data packets.

Such as the address of Shanghai is 86 [21 [5] / 96, then in other router at the same level as long as a point to 86 [21 [5] / 96 addresses routing can be realized to Shanghai municipal IPV9 address routing. According to this logic, between country and country, just need a routing, such as the route to China for 86/64. IPv4 routing table is great and very irregular, IPv6 routing table is smaller than IPv4, but IPv6 routing table does not contain the geographic information.

D. Security

The technology of encryption and authentication are significantly improved of IPV9 compared with IPv4, and the encryption technology proposed by IPV9 is difficult to

decipher on the physical level, so the confidentiality performance has been significantly improved. And IPV9 is an Internet protocol with independent intellectual property rights, which bring great guarantee to the national security.

E. Automatic address configuration

Decimal network added to the variable length address automatic configuration support, which is the improvement and extension of the IPV9 DHCP protocol and make the network management more convenient. At the same time, IPV9 support multicast and ISO/IEC C6 future network "naming and addressing" TCP/IP/M model. Decimal network address length has a variety of options, which achieve 16, 32, 64, 128, 256, 512, 1024 address length change, according to different use scenarios to choose the most appropriate address length, reduce routing overhead.

Decimal network addresses add geo-location information, personal and industry ID information, achieve the unique binding of IP address and personal information.

IV. DECIMAL NETWORK FEATURES

A. Add the concept of region and country

IPV9 is managed by country and region and the information flow is reasonable. Realize the end to end communication according to the needs. Achieve low cost, high efficiency, save the network expenses, achieve green environmental protection.

B. Realize the unification of electronic tag and bar code

The huge address capacity of IPV9 realizes the uniqueness of address allocation, and he integration of IP address, digital domain name, electronic tag and barcode coding technology extends the network to every corner that sensor

technology can reach. When the radio channel of RFID electronic tag is interfered, the bar code can also be identified. China's unique bar code and RFID electronic tag technology will greatly reduce the global manufacturing and logistics industry management costs.

C. Realize the unity of multiple codes

IPV9 combines telephone number, mobile phone number, domain name and IP address, IPTV, IP phone into one number, which not only integrates domain name and IP address, but also realizes the integration of global unique identification codes of people or things, is a solution and application platform for the future information society and realizing the future network.

D. Realize the real name system online

IPV9 realize real-name Internet access and protect the privacy rights of customers. A certain number of anonymous addresses can be opened separately for visitors to use. However, in terms of design and technology, anonymous address users are not allowed to enter public networks and credit networks such as banks, governments, social welfare and commodity circulation.

E. Address encryption function

IPV9 design address encryption, which extend the security protection to the network layer, greatly improve the national information security. IPV9 communication protocol is better than IPv4 protocol in address space, quality of service, security and other aspects. IPV9 protocol can replace IPv4 protocol and become the communication protocol of network interconnection.

The address representation and header structure of IPV9 protocol datagram is different from that of IPv4 or IPv6 protocol, so in the future, the datagram header of network protocol will not be

recognized by IPv4 or IPv6 system, and will not be propagated directly in these systems. Therefore, the future network protocol communication, the data message will not be directly propagated to other protocols network, so that the data propagation range is controlled, to a certain extent, improve the security of communication.

V. DECIMAL NETWORK APPLICATIONS

At present, China has built lines in Beijing, Shanghai, Shandong, Jiangsu and Zhejiang, with IPV9 address space, root domain name server and IPV9 backbone optical cable system demonstration projects, and is building a national civil-military fusion backbone optical cable. At present, IPV9 network has been tested and applied, and good test data has been obtained.

A. Healthy Tai'an big data ecological domain construction

"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).

B. 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, and the national network distribution of Chinese movies was first entered in the new era of "one hour".

C. The System of Jilin Provincial Political and Legal Commission

In 2016, Jilin Provincial Political and Legal Commission used the website www.jlzf.chn to access the IPv4 Internet service, configured the English domain name server in the IPv4 environment, and obtained the URL address of the corresponding service. Deploy IPV9 layers, nodes and devices in the computer room of the Political and Legal Affairs Committee of the NPC, join the IPV9 network management system, and serve as the node of the backbone IPV9 network.

Judging from the system operation of Jilin Provincial Committee of Political and Legal Affairs, IPV9 English domain name addressing access speed is fast and accurate, access security is very high, and IPv4 to IPV9 conversion protocol friendly, access is smooth. Protocol configuration has a good interface, simple and easy to understand, easy to operate.

D. Method for accessing IPV9 resources in IPv4 environment

Most of the current network environment that is based on IPv4, the .chn domain name network of IPV9 can be accessed through most of the current computer browsers and mobile browsers support access such as Firefox, Google Chrome, Microsoft Edge, 360 Extreme Browser, etc. Safari, Baidu browser. Before using a browser to open the web site, need to network DNS Settings, Point to the IPV9 domain name resolution server with the addresses 202.170.218.93 and 61.244.5.162.

Before visiting, list several typical IPV9 websites, as shown in Table 1 below.

TABLE I. PART OF IPV9 WEBSITE INFORMATION

Website domain name	Web resources	Resource management	Resources address
http://www.v9.chn	.chn portal website	Decimal Network Standards Working Group	Shanghai Municipality
http://em777.chn	Decimal Technology Introduction Site	Shanghai Decimal Network Information Technology Co. Ltd	Shanghai Municipality
http://www.xav9.chn	Xi 'an decimal portal website	Xi 'an Decimal Network Technology Co. Ltd	Xi 'an
http://www.xa.chn	V9Research institute portal website	Xi 'an Weijiu Research Institute Co. Ltd	Xi 'an
http://www.hqq.chn/	Red Flag Canal craftsmen website	Xi 'an Decimal Network Technology Co. Ltd	Xi 'an
http://www.zjsjz.chn	Zhejiang decimal portal website	Zhejiang Decimal Network Co. Ltd	Hangzhou
http://www.zjbdth.chn	Beidou Tianhui	Beidou Tianhui Information Technology Co. Ltd	Hangzhou

Once the DNS setup is complete, the chn website could be browser (recommend Firefox or Google Chrome). Enter <http://www.ijanmc.chn> to access the IPV9 website, as shown in Figure 2.

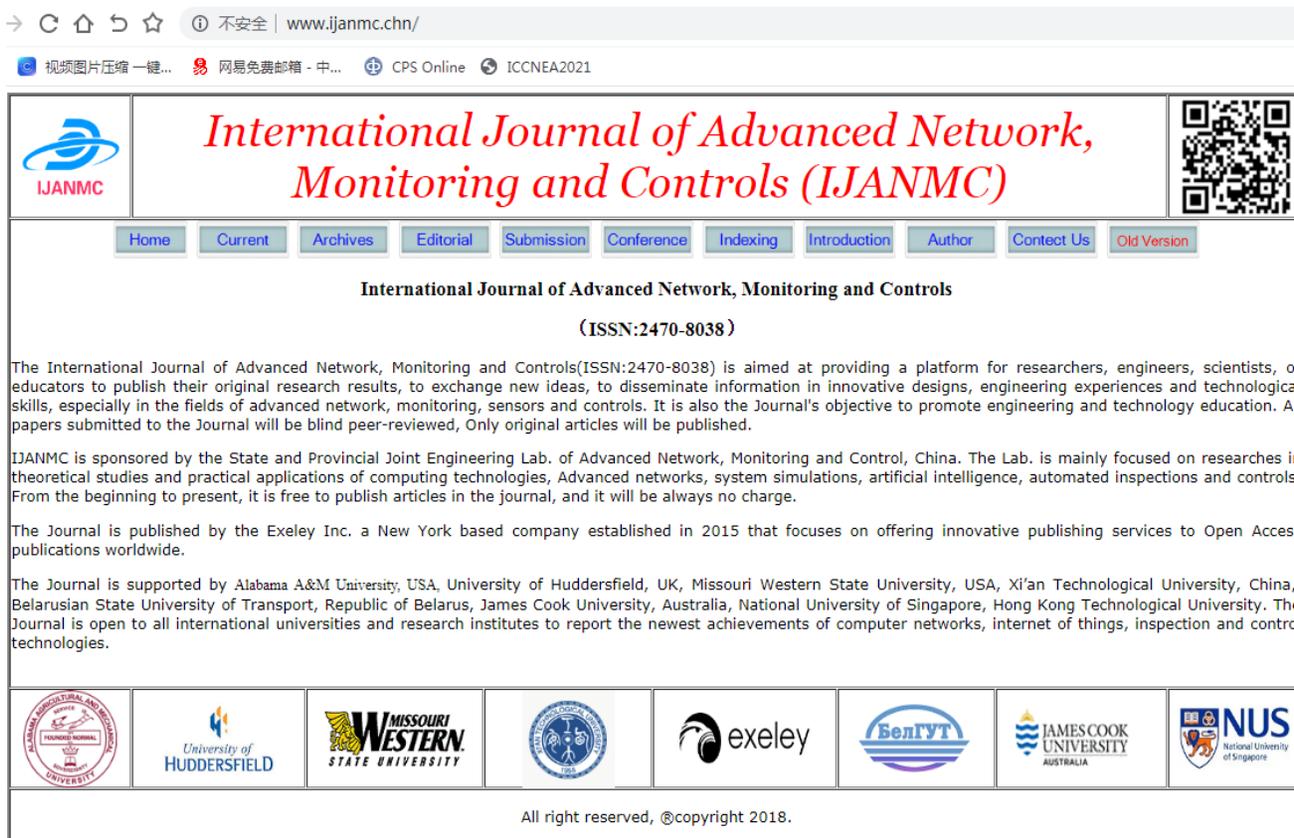


Figure 2. Home Page of ijanmc

Because the future network is still in the experimental operation stage, the application points need to be further expanded, and the experimental data need to be further obtained, so the possible problems and treatment methods of big data concurrency continue to be studied in depth. It is believed that with the continuous improvement of decimal network technology and the introduction of relevant national policies, China's autonomous controllable network will surely benefit thousands of households.

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