Research on the Technology of Assign IP Address to the Connected Computer Based IPV9

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***Abstract*—With the widely application of Internet and the distribution is not reasonable in the beginning, the IPv4 address space is becoming less and less and there are fewer available IP addresses, in order to expand the address space, IPv6 was appeared, but it did not consider the network security in the first designing and have some shortcomings, it has not widely used in the world in its 20 years. LETF proposed some basic dreams of IPv9 in 1994, and looked forward to the idea of network in the 21st century. However, due to the lack of research results of basic theories, technical problems of address exhaustion and layering, and development costs and other factors, it failed publicly. The IPv9 working group was disbanded in 1997. On the basis of previous studies, Chinese scholar and research team proposed a new Internet architecture by using the decimal system (or the whole digital code) to assign IP addresses to the connected computers. This paper will research on the countless address of the new generation Internet - IPV9, and describe the characteristics of the new technology**

Keywords-Internet; IPV9; Representation; Characteristics

I. THE EMERGENCE OF THE NEW GENERATION OF THE INTERNET

IPv4 is the most widely used protocol on the Internet, and its address space is 232. In the early stage of the Internet, due to the underestimation of the development trend of the Internet, IP allocation was unreasonable, and IP resources were very limited. By 2010, there was no address that could be allocated.

In order to solve the problem of insufficient addresses, researches proposed IPv6, IPv6 has 2128 addresses in theory, however, only one-eighth of the addresses can actually be allocated to end users. That is, the number of addresses that can be actually allocated is only 2125, which is equivalent to 1037. At present, 128 barcodes are already having 128 bits, and it cannot be covered, so IPv6 have some considerable limitations. In 1998, Chinese researcher proposed IPV9 — A method of using whole digital code to assign address for computer. In order to distinguish from IPv4 and

DOI: 10.21307/ijanmc-2019-046

IPv6 in the United States, the V in IPV9 proposed by China is uppercase, not lowercase.

The patent for IPV9 includes three technologies: a new address coding design, a new addressing mechanism and a new address architecture design. These technologies constitute the core technology system at the bottom of the new generation IP network. The new network framework designed on this basis can form a network system that is connected and compatible with existing networks (Internet using IPv4 and IPv6 technologies).

IPV9 is not a simple upgrade of IPv4 and IPv6, and its number of addresses is 10256. The massive address of IPV9 can meet the needs of domain name address resources for human activities in 750 years, and it is the simplest domain name address system.

In 2011, the authoritative professional institutions of the US government have confirmed legally and technically that China has the core technology of sovereign network with independent intellectual property rights under the IP framework. This is the patented technology of IPV9 which is different from the existing technology of the US Internet. The official patent name is "Method of using whole digital code to assign address for computer".

The IPV9 protocol uses 0-9 Arabic digital network as the virtual IP address and uses decimal as the text representation method, which is a convenient way to find online users. IPV9 has a large number of assignable IP addresses, and the maximum number of address bits is 2 ×2048. In order to improve efficiency and facilitate end users, some addresses can be used directly as domain names, which is the cornerstone of the future digital world. At the same time, IPV9 is also called "New Generation Security and Reliable Information Integrated Network Protocol" because it uses the classification and coding of the original computer network, cable broadcast television network and telecommunication network.

IPV9 obtained Chinese patent in 2001 (CN98 1 22785), and has obtained authorized patents successively in more than ten countries and regions, including South Africa, Turkey, Kazakhstan, Russia, South Korea, North Korea, Hong Kong, Canada, Singapore, Australia, Mexico and Norway. IPV9 applied for US patent in 2004. It was issued seven times of "non-final rejection opinion" and six final rejections by the US Patent Office. During this period, it was repeatedly criticized by senior members of the US IETF and famous American IT companies. In December 2011, the US Patent and Trademark Office officially issued a patent certificate numbered US 8,082,365, and clearly stated in its approval notice that the appraisal report provided by the applicant was “very convincing”. In December 2011, the US Patent and Trademark Office officially issued a patent certificate numbered US 8,082,365, and clearly stated in its approval notice that the appraisal report provided by the applicant was "very convincing".

II. TEXT REPRESENTATION OF THE IPV9 ADDRESS

The paper developed a representation of the IPV9 address, including the "parenthesis" notation, the "bracket" decimal representation, and the "brace" decimal notation.

A. The Parentheses Notation

Since the default length of the IPV9 address is 256 bits, there are still many bits in each segment, whether it is 4 or 8 segments. For example, when using 8 segments, each segment still has 32 bits. This will result in the following situation in one segment:

……]00000000000000000000000000110100]……

……]01011111111111111111111111111111]……

Such a situation not only makes the input cumbersome, but also tends to have fewer or more bits, which makes the user inconvenient because of dazzling. For convenience, the expression "parentheses"——（K/L） has been introduced. Where "K" represents 0 or 1, and "L" represents the number of 0 or 1. So the above two examples can be abbreviated as:

……]（0/26）110100]……

……]010（1/29）]……

B. The Bracket Decimal Representation

1) Representation of different digits of IPV9 address

a) 2048 bits are represented by "[ ]". 2048 bits in "[ ]" are expressed in decimal, and the length can be indefinite. The "[]" can be omitted when writing in the browser.

The representation of the 256-bit IPV9 address is "y[y[y[y[y[y[y[y ", Each y in the address represents 32 bits and can be expressed in decimal, which is 232 =4294967296, so every y is a 10-digit decimal number. Although the range of digits in decimal is 0~9, it is stipulated in the paper that the range of the first digit from the left of y can only be 0~4, so that no overflow occurs.

An example of this method is as follows:

0000170170[0000062062[0000000000[0000000000[0000000000[0000000000[0000210210[0000422422

In the address representation, multiple consecutive zeros on the left of each decimal number can be omitted, but the all-zero decimal number needs to be represented by a zero. For example, the above address can be written as:

170170[62062[0[0[0[0[210210[422422

To further simplify the representation of the address, a consecutive all-zero fields in the address can be replaced with a square bracket [X] (X is the number of segments of the all-zero field). For example, the above address can be abbreviated as:

170170[62062[4][210210[422422

Another example:

0[0[0[0[0[0[0[1,can be abbreviated as [7]1

0[0[0[0[0[0[0[0,can be abbreviated as [8]

2) Type of IPV9 address

There are five types of IPV9 addresses, which are described below.

a) Full IPV9 address

The full IPV9 address is the form: Y[Y[Y[Y[Y[Y[Y[Y, where Y represents a decimal integer from 0 to 232 = 4294967296.

b) IPV9 address compatible with IPv4

The form of this address is: Y[Y[Y[Y[Y[Y[Y[D.D.D.D, where Y represents a decimal integer from 0 to 232 = 4294967296. D represents a decimal integer between 0 and 255 in the IPv4.

c) IPV9 address compatible with IPv6

The form of this address is: Y[Y[Y[Y[X:X:X:X:X:X:X:X, where Y represents a decimal integer from 0 to 232 = 4294967296. X represents a hexadecimal number from 0000 to FFFF in the IPv6.

d) Special compatible address

In order to upgrade from IPv4 and IPv6 to IPV9 smoothly, some compatible addresses are designed in this paper. Among them, some of the IPv6 addresses are compatible addresses designed to be compatible with IPv4 addresses. In order to transition these addresses to IPV9 addresses smoothly, special treatment has been done in this paper: add the appropriate prefix before this part of the address. In order to make their representations more intuitive and avoid errors caused by negligence in writing, a shorthand approach was introduced:

y[y[y[y[x:x:x:x:x:x:d.d.d.d

Where, each y represents an address of 32 bits and is expressed in decimal. Each x represents a 16-bit IPv6 address, expressed in hexadecimal. Each d represents an 8-bit IPv4 address, expressed in decimal. For example:

0[0[0[0[14714747[1199933[223556889[147258369

It can be written into:0[0[0[0[E0:877B:12:4F3D:D53:3519:3.198.252.1

or:[4]E0:877B:12:4F3D:D53:3519:3.198.252.1

For another example: 0[0[0[0[0[0[0[562159487

It can be written as:

::33.129.223.127.

"::" is a representation of the compressed form in an IPv6 address, and a single contiguous sequence of multiple 0 blocks is represented by a double colon symbol "::". The decimal number 562159487 is expressed in dotted decimal notation as 33.129.223.127.

e) Full decimal address

In order to facilitate the application of the logistics code and the full decimal address, it is recommended to use the category number 5, in the 512th power of 10, according to the application, it is necessary to adopt a fixed length non-positioning method.

f) Full decimal address

IPV9 is compatible with the Internet of IPv4 and IPv6 technology protocols, but IPv4 and IPv6 technology protocols cannot be backward compatible with IPV9. The concept of compatibility is parallel coexistence, which is a gradual and modest transfer of applications and data services, rather than directly replacing or replacing existing protocols.

In order to solve the problem of transition from IPv4 to IPV9 smoothly, up to now, a lot of money has been invested in the Internet, and the transition address of IPV9 has been specially designed. A segment of the address is taken from the IPV9 address space, and about 232 are allocated to allocate IPv4. A small number of changes can be made on the current system to achieve the above objectives, in which IPV9 has a section of J.J.J.J., each J represents a decimal number, from 0 to 28 , that is 0~255. Among them, the previous [7] can be omitted in the middle of the local address, that is, the local user (or designated user) can be directly used by J.J.J.J., and is distinguished from the IPv4 D.D.D.D. In order to transition to full decimal smoothly, you can assign decimals to these users at the same time, so that you don't have to re-address when you improve software and hardware in the future. For example, [7]5211314 can be written as [7]3.48.155.175.

In a local domain IP network, you can write with 3.48.155.175 directly, so that the original terminal can be used. In order for the original user to be compatible with the current user, there should be a new record in the IPV9 DNS record. Any system that uses a transitional IPV9 address can use the original IPv4 system with appropriate modifications. At the same time, the header uses the IPv4 header, but the version number is 9, to distinguish the original IPv4. However, the user terminal in the local domain can use the original terminal device.

- When the category number is 0, the address length is 16 bits, and the physical address of IPv4 will be discarded, and the 16-bit address of the IPv4 host will be used. The representation method is 65535 in decimal or 0-255.0-255 in dotted decimal notation, which is the same as hexadecimal FF.FF;
- When the category number is 1, the address length is 32 bits, indicating that the method is decimal 0-4294967295, and the corresponding character length or dotted decimal 0-255.0-255.0-255.0-255, and hexadecimal FF.FF. FF.FF has the same effect;
- When the category number is 2, the address length is 64 bits, indicating that the method is decimal 10 or the corresponding character length;
- When the category number is 3, the address length is 128 bits, indicating that the method is decimal or the corresponding character length.
- When the category number is 4, the address

length is 256 bits, indicating that the method is decimal or the corresponding character length.

- When the category number is 5, the address length is 512 bits, indicating that the method is decimal or the corresponding character length.
- When the category number is 6, the address length is 1024 bits, indicating that the method is decimal or the corresponding character length.
- When the category number is 7, the address length has no fixed length, indicating that the method is a decimal length or a corresponding character length.

C. Braces decimal

This method represents a 256-bit address divided into four 64-bit decimal numbers and the braces separating them.

This method first divides the 256-bit address into four 64-bit decimal numbers and the braces separating them, and then represents them. The form of the representation is "Z}Z}Z}Z". Each Z represents the address as a 64-bit portion and is represented in decimal. It is used in exactly the same way as Y, and is compatible with Y, and can be mixed. This greatly facilitates the compatibility of these IPv4 addresses in IPV9. For example:

z}z}z}z;

z}z}y]y]y]y;

z}z}y]y]y]d.d.d.d;

z}z}z}y]d.d.d.d;

z}z}z}y]J.J.J.J;

Especially the last address format is most useful. For example:

The address 0}0}0}0]193.193.193.193

It can be expressed like this: {3}0]193.193.193.193

Finally, it should be noted that the use of square brackets and braces in the symbolic representation is not affected. That is, no distinction between "{" and "}", "[" and "]". This definition is taken in view of the fact that this does not cause any side effects and is more user-friendly.

D. Text representation of the address prefix

The scheme of IPV9 address is similar to the schemes of IPv4 super net and CIDR (classless addressing), which use an address prefix to represent the network hierarchy. On the representation of the IPV9 address prefix, a representation similar to CIDR is used, which has the following form:

IPV9 address / address prefix length

The address of IPV9 is an address written by the IPV9 address notation. The length of the address prefix is the length of consecutive bits indicating the address prefix from the left in the address.

It must be noted that the decimal number is used in the IPV9 address, but the prefix length refers to the binary. Therefore, you must calculate the prefix carefully. However, it is not intuitive in binary numbers. After analysis, it is easier to understand that the IPV9 address prefix is converted to hexadecimal. However, the IPV9 address is still a decimal number. For example:

The address prefix of 200 bits is 1314[0[0[0[224[169[0, which can also be expressed as:

1314[0[0[0[224[169[0[0/200

or 1314[3]224[169[0[0/200

or 1314[0[0[0[224[169[2]/200

or 1314[3]224[169[2]/200

It should be noted that in the representation of the address prefix, the representation of the IPV9 address portion must be legal, that is, the IPV9 address to the left of the slash "/" must be restored to the correct address.

In this address prefix, you can see that the length of the address prefix is 200. Therefore, the prefix is actually the first 6 segments of the entire address plus the first 8 bits of the seventh segment (32×6＋8=200). So the seventh segment of the address is the most critical. This paragraph is expressed in hexadecimal as: ********. Since a hexadecimal digit is equal to 4 bits, the prefix only includes the first two *. Knowing this, you can know that the value of this paragraph is included in 00000000 (hex) ~ 00FFFFFF (hex), which can also be expressed in decimal as 0~16777215.

Alternatively, this paragraph is expressed in binary as: **** **** **** **** **** **** **** ****. Because in the binary, one bit occupies 1 bit, the prefix includes the first 8 *, and the range of the value of this segment is 0000 0000 0000 0000 0000 0000 0000 0000~0000 0000 1111 1111 1111 1111 1111 1111, which can also be expressed in decimal as 0~16777215.

The IPV9 address can be generated by padding 0 to the right of the address prefix, which can also be a real IPV9 address containing the address prefix. For example, the address prefix in the above example can also be expressed as:

1314[3]224[169[a[b/200

Where, a is an arbitrary decimal number in the range of 0~16777215, and b is an arbitrary decimal number in the range of 0~4294967296.

III. FEATURES OF IPV9

The intellectual property of decimal network/digital domain names, including copyrights such as《Overall allocation method for allocating computer addresses with all-decimal algorithms for networked computers》 (Licensed in China in 2004), 《IPV9/Future Network Root Domain Name Server》 and《CHN National Top Level Domain Server》. In addition, it also includes the Chinese patent license "Method for allocating addresses to computers using Internet with full digital code" (obtained in 2001).

These constitute the independent innovation of the complete system of IPV9, including the address space of the decimal network, 13 root name servers, 239 national and regional top-level domain servers. In accordance with the Universal Postal Rules, which are jointly participated by sovereign states under the UN framework. The IPV9 network communication rules, which are protected by Chinese laws and protected by US laws and protected by multinational laws, clearly belong to the public network communication system that is jointly observed by the international community. Any country that respects China's intellectual property rights and the rights of its owners in accordance with the law can use China's IPV9 decimal network/digital domain name network communication rules to build an autonomous and controllable network communication system.

At the ISO/IEC Future Network International Conference, Mr. Xie Jianping announced that China's IPV9 is the common wealth of all mankind and won warm applause from the participants. He won the unanimous vote of the members of the United States, Russia, Canada and other countries. The conclusions of China's IPV9's independent innovation ideas and practice verification have been written into the ISO/IEC, "Name and Addressing" and "Security" in the "Representation and Requirements for Future Network Problems" officially released in 2014.

China's IPV9 has significant features which are described below.

1) China's IPV9 can be compatible with IPv4 and IPv6, and solves the problem of high cost and repeated investment construction caused by IPv6 not being compatible with IPv4. In addition, IPV9 provides a reliable way for applications (users and services) to transition securely, quickly and smoothly to the IPV9 system platform. At the same time, the system is still safe and effective in the face of any cyber attacks that may occur at any time.

2) China fully controls all the hardware and software of China's IPV9 system, including the allocation, management and resolution services of all root domain names including the parent root domain, the primary root domain, the child root domain and the dependent root domain. Other countries can't get involved in the illegal control of IPV9. It is impossible theoretically to implement network monitoring, modify the system communication routing table, and close the network address switch arbitrarily. Moreover, it is difficult to achieve from a technical point of view.

The IPV9 designed in the paper can enable countries to achieve autonomous control of the root domain name server, which has geographical locations. IPV9 can realize end-to-end direct communication services, can independently build, develop and manage the technical system of domestic cyberspace, and allow countries to cooperate equally and jointly manage the global root domain name resolution system. It is possible to guide and establish a new pattern of the global sovereignty community of destiny. Under the guarantee of the new technical system of IPV9, the realization of future network interconnection, intercommunication, co-management and co-governance between countries has been presented to the sovereign countries of the United Nations.

3) China's IPV9 can determine the level of security, the safety factor, and the power distribution and means of security control. It is fundamentally "not subject to others."

IPV9 treats RFID code as an IP address and allows access to the Internet directly, and ensures that it can be exchanged and resolved autonomously in the nearest place in the country. IPV9 can effectively prevent data from being "forwarded" by the "routing" information of the Internet, avoiding data being forwarded globally by the exchange command of the Internet, and avoiding data being monitored and copied by the Internet network image. It can save a lot of energy and overhead, so IPV9 is both environmentally friendly and safe.

Any user who applies for and is allowed to own the unique domain name and address of China IPV9 can enter the IPV9 network system of China and enjoy the service at the same time, and is protected by the real “real name” of the system. If there is any misconduct or unforeseen circumstances, you can always trace the traces, trace the certification, and lock the evidence so that the "black hand" has nowhere to hide and escape.

4) China's IPV9 start address is 2256 bit, and can manage 22048 bit address. It can be compressed and recycled on both sides. It can be fixed and not positioned like a telephone system to reduce and save unnecessary overhead costs, increase efficiency. It fully meets the needs of political, business, production, learning, and research users in the field of network science for a long period of time. Therefore, it can fully meet the needs of the political, business, production, learning and research users of the future network in the scientific field for a long time. Because of this, the computer's networking scale can be set as needed, and can be widely used in space communications, nano computers, human cells or DNA computer systems.

IPV9 not only goes far beyond the IETF's vision in RFC1606, RFC1607, but also has great advantages compared to IPv6. IPv6 has a 128 bit address, but it can only be unilaterally compressed, not recyclable, and the address is fixed and positioned, the overhead is large, the efficiency is impaired, and the actual address allocation rate is only 0.01-0.03%.

5) China's IPV9 has the basic conditions that must be met by the future network as determined by the ISO/IEC International Organization for Standardization. That is: the basic technical characteristics of the sovereign network; the design flaws and technical disadvantages of the existing networks, including the Internet; and the network is obviously superior to the existing network in terms of controllability, credibility, security and reliability.

Due to the urgent need for network sovereignty, security and response to emergencies, on the basis of IPv4, IPv6 internet, private network, and local area network, the paper proposes that we should boldly try and build IPV9 network with lower investment.

After a period of time, users, applications and services on the existing network can be smoothly migrated to China's IPV9 system, which fundamentally forms the basic protection against attack and anti-virus, and establishes a solid foundation for the transition to a future independent and reliable network.

IV. CONCLUSION

The key technologies of the new generation (IPV9) Internet were introduced in this paper. The text representation of the IPV9 address includes expressions such as "parenthesis" notation, the "bracket" decimal representation and the "braces" decimal representation. The technology is compatible with IPv4 and IPv6, and provides a reliable way to transit to the IPV9 system platform securely and quickly and smoothly based on IPv4 and IPv6.

ACKNOWLEDGMENT

Pre-research Project of 13th Five-year Equipment Development(41402020202). The Industrial research project of Science and Technology Department of Shaanxi Province(Grant No. 2016KTZDGY4-09)

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