Comparison Of IPv4 & IPv6

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1. Abstract

Nowadays IPv6 over IPv4 tunnels are widely used to form the global IPv6 Internet. This paper demonstrates the two tunnels and show when to immigrate from IPv4 to IPV6.Then the risks of immigration are discussed.

2. Introduction

Today IPv6 over IPv4 tunnels are widely used to connect large regional IPv6 networks, because it is relatively hard to construct an international or cross-continent native IPv6 network. This makes the characteristics of IPv6 over IPv4 tunnels very vital to the performance of the global IPv6 Internet.

Migrating from IPv4 to IPv6 in an instant is impossible because of the huge size of the Internet and of the great number of IPv4 users. Moreover, many organizations are becoming more and more dependent on the Internet for their daily work, and they therefore cannot tolerate downtime for the replacement of the IP protocol. As a result, there will not be one special day on which IPv4 will be turned off and IPv6 turned on because the two protocols can coexist without any problems. The migration from IPv4 to IPv6 must be implemented node by node by using Auto configuration procedures to eliminate the need to configure IPv6 hosts manually. This way, users can immediately benefit from the many advantages of IPv6 while maintaining the possibility of communicating with IPv4 users or peripherals. Consequently, there is no reason to delay updating to IPv6.In this paper we are going to investigate the IPV6 and the IPV4 and when to decide to immigrate to IPV6.

3. INTERNET PROTOCOL VERSION 4 (IPV4)

Internet Protocol version 4 (IPv4) is the fourth version of the Internet Protocol (IP) and it is the first version of the protocol to be widely deployed. Together with IPv6, it is at the core of standards-based internetworking methods of the Internet. IPv4 is still by far the most widely deployed Internet Layer protocol. It uses a 32 bit addressing and allows for 4,294,967,296 unique addresses.

Even though the name seems to imply that it's the fourth iteration of the key Internet Protocol, version 4 of IP was the first that was widely used in modern TCP/IP. IPv4, as it is sometimes called to differentiate it from the newer IPv6, is the Internet Protocol version in use on the Internet today, and an implementation of the protocol is running on hundreds of millions of computers. It provides the basic datagram delivery capabilities upon which all of TCP/IP functions, and it has proven its quality in use over a period of more than two decades.

4. INTERNET PROTOCOL VERSION 6 (IPV6)

Internet Protocol version 6 (IPv6) is a version of the Internet Protocol (IP) intended to succeed IPv4, which is the protocol currently used to direct almost all Internet traffic.

IPv6 stands for Internet Protocol version 6 also known as Ipng (IP next generation) is the second version of the Internet Protocol to be used generally across the virtual world. The first version was IPv4. IPng was designed to take an evolutionary step from

IPv4. It was not a design goal to take a radical step away from IPv4. Functions which work in IPv4 were kept in IPng. Functions which didn't work were removed.

The Internet operates by transferring data between hosts in packets that are routed across networks as specified by routing protocols. These packets require an addressing scheme, such as IPv4 or IPv6, to specify their source and destination addresses. Each host, computer or other device on the Internet requires an IP address in order to communicate. The growth of the Internet has created a need for more addresses than are possible with IPv4.

Like IPv4, IPv6 is an internet-layer protocol for packetswitched internetworking and provides end-to-end datagram transmission across multiple IP networks. While IPv4 allows 32 bits for an IP address, and therefore has 232 (4 294 967 296) possible addresses, IPv6 uses 128-bit addresses, for an address space of 2128 (approximately 3.4×1038) addresses. This expansion allows for many more devices and users on the internet as well as extra flexibility in allocating addresses and efficiency for routing traffic. It also eliminates the primary need for network address translation (NAT), which gained widespread deployment as an effort to alleviate IPv4 address exhaustion.

5. LIMITATIONS OF IPV4

Since the 1980s it has been apparent that the number of available IPv4 addresses is being exhausted at a rate that was not initially anticipated in the design of the network. This was the driving factor for the introduction of classful networks, for the creation of CIDR addressing. [3]

Multimedia applications can take advantage of multicast: the transmission of a single datagram to multiple receivers. Although IPv4 has some multicast capabilities, these are optional and not every router and host supports them. With IPv6, multicast is a requirement. IPv6 also defines a new kind of service, called "anycast." Like multicast, anycast has groups of nodes which send and receive packets. But when a packet is sent to an anycast group in IPv6, it is only delivered to one of the members of the group. This new capability is especially appropriate in a fault-tolerant environment: web servers and DNS servers could all benefit from IPv6′s anycast technology. Another aspect of VPNs built into IPv6 is QoS (Quality of Service). IPv6 supports the same QoS features as IPv4, including the DiffServ indication, as well as a new 20-bit traffic flow field. Although the use of this part of IPv6 is not defined, it is provided as a solid base to build QoS protocols. The fifth major goal of IPv6 is VPNs, virtual private networks. The new IPSec security protocols, ESP (encapsulating security protocol) and AH (authentication header) are add-ons to IPv4. IPv6 builds-in and requires these protocols, which will mean that secure networks will be easier to build and deploy in an IPv6 world.

6. ADVANTAGES OF IPV6

With such a huge address space, ISPs will have sufficient IP addresses to allocate enough addresses to every customer so that every IP device has a truly unique address – whether it's behind a firewall or not. NAT (network address translation) has become a very common technique to deal with the shortage of IP addresses. Unfortunately,

NAT doesn't work very well for many Internet applications, ranging from old dependable, such as NFS and DNS, to newer applications such as group conferencing.

NAT has also been an impediment for business-to-business direct network connections, requiring baroque and elaborate address translators to make everything work reliably, scaling poorly, and offering a highly vulnerable single point of failure.[4]

One of the goals of IPv6′s address space expansion is to make NAT unnecessary, improving total connectivity, reliability, and flexibility. IPv6 will re-establish transparency and end-to-end traffic across the Internet. The new IPv6 addresses are large and cumbersome to deal with, so IPv6 reduces the number of people who have to read and write them.

A second major goal of IPv6 is to reduce the total time which people have to spend configuring and managing systems. An IPv6 system can participate in "stateless" auto configuration, where it creates a guaranteed unique IP address by combining its LAN MAC address with a prefix provided by the network router – DHCP is not needed.

Of course, DHCP is still useful for other parameters, such as DNS servers, and is supported as DHCPv6 where needed. IPv6 also offers a middle ground between the two extremes with protocols such as SLP ("Service Location Protocol"), which may make the lives of network managers easier. High-bandwidth multimedia and fault tolerance applications are the focus of the fourth major goal of IPv6.

7. WHEN TO CHOOSE IPV6?

As long IPv4 networks do what you need them to do, let them run. But when an IPv4 network hits the limits for some reason, choose IPv6. IPv6 is mature enough to be used in corporate and commercial networks, as many case studies and deployments worldwide show. High investments in new IPv4 setups, fixes, or complex configurations for IPv4 (especially NATs) should be avoided if possible because they are investments in a technology that will slowly be phased out. When you reach the point where this becomes necessary, evaluate IPv6. Whatever you invest in IPv6 is an investment in future technology. Here's the list of indicators that it may be time for you to consider or integrate IPv6.

Here's the list of indicators that it may be time for you to consider or integrate IPv6 [5]:

- ✓ Your IPv4 network or NAT implementation needs to be fixed or extended.

- ✓ You are running out of address space.

- ✓ You want to prepare your network for applications that are based on advanced features of IPv6.

- ✓ You need end-to-end security for a large numberof users and you do not have the address space, or you struggle with a NAT implementation.

- ✓ Your hardware or applications reach the end of their lifecycle and must be

replaced. Make sure you buy products that support IPv6, even if you don't enable it right away.

8. CONCLUSION

Migrating from IPv4 to IPv6 in an instant is impossible because of the huge size of the Internet and of the great number of IPv4 users. Moreover, many organizations are becoming more and more dependent on the Internet for their daily work, and they therefore cannot tolerate downtime for the replacement of the IP protocol.

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