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Introduction and need of IPv6

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ABSTRACT

Day-to-day the number of Internet users is increasing rapidly. One IP address is assign to the each host, but there are limited addresses in IPv4. So, to resolve addressing problem new IP addressing technique IPv6 is now. IPv6 is advance and improved version of previous IP version. This paper is giving the introduction and need of IPv4 and comparing with IPv4. We will discuss the great and various features of IPv6 over IPv4.

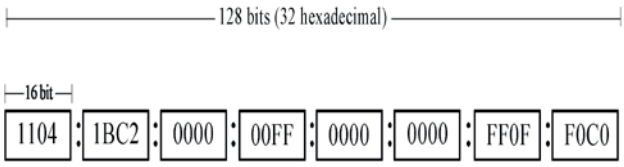
INTRODUCTION

IPv6 stands for Internet protocol version 6, it is also called Internet protocol for next generation (IPng). In the early 1990s, the Internet Engineering Task Force (IETF) realized that a new version of IP would be needed. IPv6 is a second standard protocol of Network layer. Ipv6 follows IPv4 for computer communication across the Internet and other computer networks. IPv6 offers several undefined function to evaluate next step Internet protocol. It is an advance version of IPv4, there is various improvements in IPv6 like increased address size, extensible header, flow lables, integrity of communication and the ability to preserve the confidentiality.

The IPv6 protocol was then fully standardized at the end of 1998 in REC 2460, which defines the header structure. IPv6 resolve many of the deficiencies in the current IPv4 protocol. IPv6 creates tremendous way of communicating that IPv4 cannot support

Format and Address space

An IPv6 address consists of 16 bytes (octets), it is 128 bit long. For reliability IPv6 uses hexadecimal colon notation. In this notation, 128 bits is divided into eight section, each 2 bytes in length. Two bytes in hexadecimal notation required four hexadecimal digits. Therefore, the address consists of 32 hexadecimal digits with every four digits separated by a colon.



IPv6 hexadecimal format address is very long, many of the digit are zeros. So we can abbreviate the address. The leading zeros can be dropped, not the trailing zeros. Above address is abbreviated like

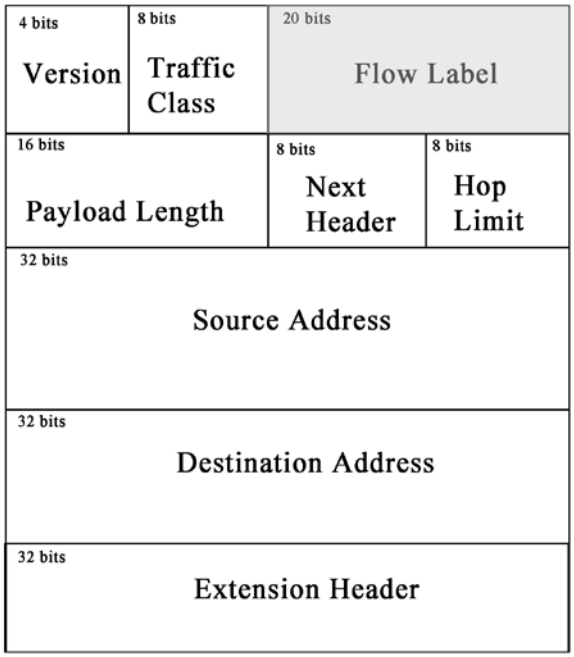
1104 : 1BC2 : 0 : FF : 0 : 0 : FF0F : F0C0

If there are more zeros in abbreviated address we can do more abbreviation, like

1104 : 1BC2 : 0 : FF : : FF0F : F0C0

IPv6 has a much larger address space 2128 addresses are available. The designers of IPv6 divided the address into several categories. A unicast address defines a single computer. The packet sent to a unicast address must be delivered to that specific computer. IPv6 defines two types of unicast addresses

with specific type prefix: geographic-based unicast address (100) and provider-based unicast address (010). Multicast addresses (1111 1111) are used to define a group of hosts instead of just one. A packet sent to a multicast address must be delivered to each member of the group. An anycast address like a multicast address, also define a group of multicast address. However, a packet destined for an anycast address is delivered to only one of the member of the any cast group, the nearest one. The addresses start with eight zeroes (0000 0000) are known as reserved address. The subcategories reserved address are Unspecified, Loopback, Compatible, Mapped. Local addresses are used when an organization want to use IPv6 protocol without being connected to the global Internet, they provide addressing for private networks. Two types of addresses are defined for these purposes: link local address, site local address.



IPv6 header

In IPv6 header new field is flow label, 20 bit flow label field to identify specific flows needing special quality of services. Flow classified had been based on 5-tuples source address, destination address, and protocol type and port number of transport. Some of this field may be unavailable due to fragmentation, encryption or locating them past extension headers. Routes use source address + flow label to identify distinct flows, each source chooses its own flow label value. When no special QoS requested, value of flow label is 0.

NEED OF IPv6

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IPv6 vs IPv4

There is various reasons and benefits to use IPv6 over IPv4

- **i.** IPv6 provides better peer-to-peer connectivity than IPv4, new application like video conferencing, multi-user online games, file sharing, VoIP requires real end-to-end connectivity with unique IP address.
- **ii.** IPv6 have simple header structures leading to faster routing as compared to IPv4, feature of the IPv6 header structure is that the extension header allows for more flexible protocol inclusions than what IPv4 does. In contrast, IPv6 extension headers have no such restriction on the maximum size.
- **iii.** IPv6 provides better security than IPv4, IPsec is a major protocol requirement and is one of the factor in ensuring that IPv6 provides better security than IPv4, IPsec contains a set of cryptographic protocol for ensuring secure data communication and key exchange. The main protocol used are Authentication header (AH), Encapsulating security payload (ESP), Internet key exchange (IKE).
- **iv.** IPv6 gives better Quality of Services (QoS) than IPv4, new field of IPv6 header called Flow label that defines how particular packets are identified and handled by the routers. The flow label field allows packets that belongs to a particular flow it ensures the better QoS and more efficient delivery of information from one end to another without the possibility of it being modified by intermediate system. This ensures a high degree of QoS especially for peer-to-peer application like VoIP and other real time.
- **v.** IPv6 provides better multicast and any cast abilities than IPv4, IPv6 has a large multicast address range that limits the degree to which the information packet have now to be propagate and significantly improves the network efficiency. In any cast services packets are not sent to all the nodes in the network but only to the nearest reachable member.
- **vi.** IPv6 offers better mobility features than IPv4, with IPv6 mobility support is mandatory by the use of mobile IPv6 (MIPv6). Route optimization is a built-in feature for mobile IPv6. Further feature like

neighbor discovery and address auto-configuration allow mobile nodes to function in any location without needing the services of any special router. There is no ingress-filtering problem in mobile IPv6 because the correspondent node uses the Care-of address as the source address. IPv6 through its large address space ensures that each mobile device can have its own unique IP address.

vii. IPv6 provides larger address space than IPv4, IPv4 uses 128 bit for addressing nearly 340 billion billion billion billion unique addresses. From these numbers, it can be seen that with IPv6 it is possible to provide billion of addresses to each person and ensure that any device that has to be connected to the internet have a unique IP address.

viii. IPv6 offers easy administration and auto-configuration, IPv6 offers DHCPv6 which is an auto configuration similar to IPv4 DHCP. IPv6 offers stateful and stateless address auto configuration. IPv6 provides capabilities so that network renumbering can happen automatically means auto configuration of each host and routers. Another useful administrative feature of IPv6 is its multihoming technique. This ensures for greater reliability of services, as there is more than one path from the host to the destination.

CONCLUSION

With the great feature of IPv6 as compared to IPv4, IPv6 declared as better Internet protocol version than any former version. IPv6 resolves all the problems that was encountering in IPv4. In IPv6 no need of NAT because it has large address space so no concept of private address, because of this peer-to-peer connection/communication is possible between host and server. Not only large address space IPv6 has more many good feature like better security, auto-configuration of host, large multicast and any cast address space.

So now, this is time to deploy IPv6 over IPv4, at present days only some country, organization, institute are using IPv6, it does not mean that IPv6 is not good but the deployment of IPv6 is not so easy. There are some deployment issues in IPv6 over IPv4, because we cannot just close or remove IPv4 and apply IPv6, so it is a process to interchange IP address format without break any connection. So IPv6 is better internet protocol, it working very gently and we should use IPv6 now.

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