IPV6 ADDRESSES

PURTI
MCA, NET QUALIFIED,FEROZEPUR,PUNJAB
Email: purti_shrivastav@yahoo.com

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ABSTRACT *TCP/IP protocols are used to send and receive data, voice and audio datagram or packet over the internet. IPv4 is the basis of TCP/IP protocols. IPv6 is the future of the ip addressing. IPV6 has many advantages over IPv4. The basic framework of IPv6 was defined by Internet Engineering Task Force. This paper provides an introduction to IPv6, header format. It also explain some benefits of IPv6.*

Keywords: *IPV6, TCP/IP, IETF, IANA, TCP, UDP, ICMPv6, TTL, PDU*

I. INTRODUCTION

The Internet Engineering Task Force (IETF) is the organization that is responsible for defining the Internet Protocol standards. When the IETF developed IPv4, the global expansion of the Internet and the current Internet security issues were not anticipated. In IPv4's original design, network security was only given minor consideration. In the 1980s, when IPv4 was developing, the "Internet" was constructed by a set of cooperative organizations.

With the rapid growth of the Internet after commercialization in the 1990s, it became evident that more addresses would be needed to connect devices than the IPv4 address space had available.Then the IETF realized that a new version of IP would be needed, and the Task Force started by drafting the new protocol's requirements. IP Next Generation was created, which then became IPv6 (RFC 1883). IPv6 is the second network layer standard protocol that follows IPv4 for computer communications across the Internet and other computer networks.

IPv6 is acknowledged to provide more address space, better address design, and greater security and support for mobile devices. IPv6 also include an important feature: a set of possible migration and transition plans from IPv4.

An IPv4 address is a 32-bit address that uniquely and universally defines the device (for example, a computer or a router) to the Internet. This IP address is unique that is no two devices on the internet can have the same address at the same time. Each 32-bit IP address is divided into two main parts: the network number and the host number. The network number identifies a network and the host number identifies a host on that network.A protocol such as IPv4 that defines addresses has an address space. An address space is the total number of addresses used by the protocol. If a protocol uses N bits to define an address, the address space is 2^N because each bit can have two different values (0 or 1) and N bits can have

2^N values. IPv4 uses 32-bit addresses, which means that the address space is 2^{32} or 4,294,967,296 (more than 4 billion). This means that more than 4 billion devices could be connected to the Internet. The IP address space is managed globally by the Internet

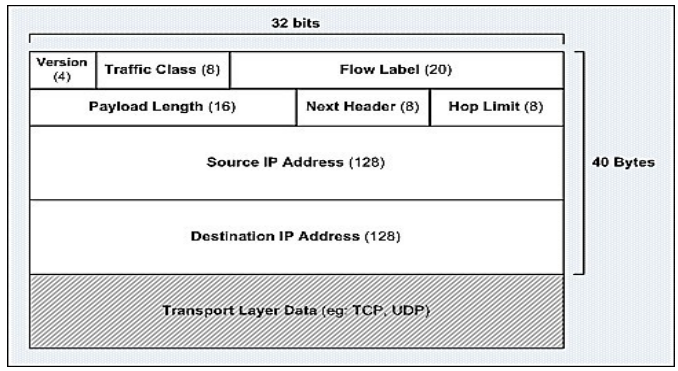
Assigned Numbers Authority (IANA).

An IPv6 address is of 128 bits long. The address is divided into eight sections of 16 bits in length. Each

16 bit section is represented by four hexadecimal digits. A colon is used to separate every four hexadecimal digits. This way, the address consists of 32 hexadecimal digits.

II. METHODS AND MATERIAL

Header Format of IPv6



The fields in the IPv6 header are:

Version – 4 bits are used to indicate the version of IP and is set to 6.

Traffic Class – Indicates the class or priority of the IPv6 packet. The size of this field is 8 bits. The Traffic Class field provides similar functionality to the IPv4

Type of Service field.

Flow Label – Indicates that this packet belongs to a specific sequence of packets between a source and destination, requiring special handling by intermediate IPv6 routers. The size of this field is 20 bits. The Flow Label is used for non-default quality of service connections, such as those needed by real-time data (voice and video). For default router handling, the Flow Label is set to 0. There can be multiple flows between a source and destination, as set to 0 and the Jumbo Payload option is used in the

Hop-by-Hop Options extension header.

Next Header – Indicates either the first extension header (if present) or the protocol in the upper layer PDU (such as TCP, UDP, or ICMPv6). The size of this field is 8 bits.

Hop Limit – Indicates the maximum number of links over which the IPv6 packet can travel before being discarded. The size of this field is 8 bits. The Hop Limit is similar to the IPv4 TTL field except that there is no historical relation to the amount of time (in seconds) that the packet is queued at the router. When the Hop Limit equals 0, an ICMPv6 Time Exceeded message is sent to the source address and the packet is discarded.

Source Address –Stores the IPv6 address of the originating host. The size of this field is 128 bits. Destination Address – Stores the IPv6 address of the current destination host. The size of this field is 128 bits. In most cases the Destination Address is set to the final destination address. However, if a Routing extension header is present, the Destination Address might be set to the next router interface in the source route list.

III. RESULTS AND DISCUSSION

IPv4 Header Fields and Corresponding IPv6 Equivalents

IPv4 Header Field	IPv6 Header Field
Version	Same field but with different version numbers.
Internet HeaderLength	Removed in IPv6. IPv6 does not include a Header Length field because the IPv6 header is always a fixed size of 40 bytes. Each extension header is either a fixed size or indicates its own size
Type of Service	Replaced by the IPv6 Traffic Class field.
Total Length	Replaced by the IPv6 Payload Length field, which only indicates the size of the payload.
Identification Fragmentation Flags Fragment Offset	Removed in IPv6. Fragmentation information is not included in the IPv6 header. It is contained in a Fragment extension header.

Time to Live	Replaced by the IPv6 Hop Limit field.
Protocol	Replaced by the IPv6 Next Header field.
Header Checksum	Removed in IPv6. In I6, bit-level error detection for the entire IPv6 packet is performed by the link layer.
Source Address	The field is the same except that IPv6 addresses are 128 bits in length.
Destination Address	The field is the same except that IPv6 addresses are 128 bits in length.
Options	Removed in IPv6. IPv4 options are replaced by IPv6 extension headers.

Addressing

IPv6 offers three types of addresses: unicast, anycast and multicast. There is no broadcasting in IPv6, this function is being replace by multicast address.

Unicast: Unicast address is an identifier for a single interface and is delivered to the interface identified by that interface. Load sharing over multiple physical interfaces can be obtained by assigning unicast address or a set of unicast addresses to multiple physical interfaces, if the implementation treats the multiple interfaces as a single interface.

Anycast: Anycast address is an identifier for a set of interfaces, however packet sent to this address is delivered to only one of the interfaces identified by that address, possibly the nearest one.

Multicast: Multicast address is an identifier for a set of interfaces. Packet sent to a multiple address is delivered to all interfaces identified by that address.

The next-generation IP, or IPv6, has some benefits over IPv4 that can be summarized as follows:

Larger address space. An IPv6 address is 128 bits long.

Better header format. IPv6 uses a new header format in which options are separated from the base header and inserted, when needed, between the base header and the upper-layer data. This simplifies and speeds up the routing process because most ofthe options do not need to be checked by routers.

New options. IPv6 has new options to allow for additional functionalities.

Allowance for extension. IPv6 is designed to allow the extension ofthe protocol if required by new technologies or applications.

Support for resource allocation. In IPv6, the type-of-service field has been removed, but a mechanism has been added to enable the source to request special handling of the packet. This mechanism can be used to support traffic such as real-time audio and video.

Support for more security. The encryption and authentication options in IPv6 provide confidentiality and integrity ofthe packet.

IV.CONCLUSION

IPv6 has many benefits over IPv4 i.e large address space, support for real time audio and video streaming, security etc. Despite of these advantages it will take time to migrate from IPv4 to IPv6 because companies and industries don't want to upgrade their devices because of their cost and other technical issues. Another issue is that backbone routers are using IPv4 addresses and they need to change their routing tables. Since the rapid growth of internet in few decades the need of IPv6 is must because IPv6 meets the needs of new markets such as mobile, personal computing devices, network entertainment and device control. Security and scalability are the major concerns, thus we must implement IPv6 as soon as possible.

V. REFERENCES

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