iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VII **Month of publication:** July 2022

DOI: https://doi.org/10.22214/ijraset.2022.44968

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Wireless and Mobile Computing

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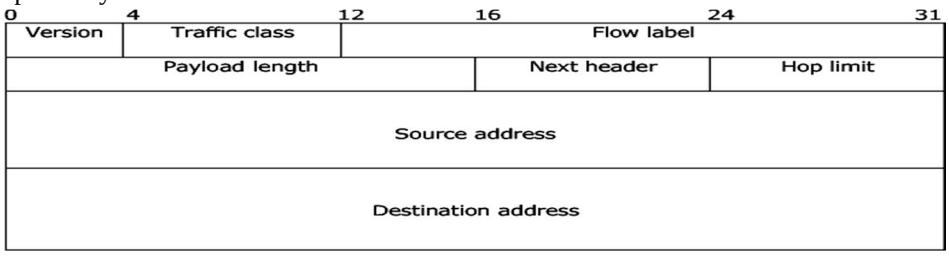
Abstract: The Internet is common and widely use technology in nowadays. It is changing the way we interact with each other, the way we do business, the way we educate. Each machine on the net is given a 32-bit address. With 32 bits, a maximum of about four billion addresses is possible. Though this is a large a number, soon the Internet will have TV sets, and even pizza machines connected to it, and since each of them must have an IP address, this number becomes too small.
For this we need a ipv6 technology in which we can use unlimited Ip address for our work.

I. INTRODUCTION

Ipv6 is sometimes called as next generation internet protocol or IPng. This version is approved by the Internet engineering steering group and made a proposed standard on November 17,1994. The code set of ipv6 protocol was made an IETF Draft standard onAugust10,1998.
Internet Protocol Version 6 is abbreviated to IPv6 (where the "6" is being assigned a version number 6). The previous version of the Internet Protocol is version 4 (referred to as IPv6).

II. CHANGES FROM IPV4 TO IPV6

1) *Longer Address Fields:* The length of address is extended from 32 bits to128 bits. Theoretically, the address space can support up to 3.4 xlO38hosts.
2) *Simplified Header Format:* The header format in IPv6 is simpler than that of IPv4. Some of the header fields in IPv4 such as checksum, IHL, identification, flags, and fragment offset do not appear in the IPv6 header.
3) *Flexible Support for Options:* The options in IPv6 appear in optional extension headers that are encoded in a more efficient and flexible fashion than they were in IPv4.
4) *Flow Label Capability:* IPv6 adds a "flow label" to identify a certain packet "flow" that requires a certain QOS.
5) *Security:* IPv6 supports built-in authentication and confidentiality.
6) *Large Packets:* IPv6 supports payloads that are longer than 64K bytes, called jumbo payloads.
7) *Fragmentation at Source only:* Routers are not allowed to fragment packets. If a packet needs to be fragmented, it must be done at the source.
8) *Traffic Class:* This field specifies the traffic class or priority of the packet. The traffic class field is intended to support differentiated service.
9) *Payload Length:* This indicates the length of the data (excluding header). With 16 bits allocated to this field, the payload length is limited to 65,535bytes.
10) *Next Header:* The field identifies the type of the extension header that follows the basic header. The extension header is similar to the options field in IPv4 but is more flexible and efficient.
11) *Hop Limit:* This field replaces the TTL field in IPv4. The name now says what it means: The value specifies the number of hops the packet can travel before dropped by a router.
12) *Source address and Destination address:* The source address and the destination address identify the source host and the destination host respectively.



IPv6 Basic Header

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Network

A. Addressing

The IPv6 address is 128 bits long, which increases the overhead somewhat. However, it is almost certain that the huge address space will be sufficient for many years to come. The huge address space also gives more flexibility in terms of address allocation. IPv6 addresses are divided into three categories:

1) *Unicast Addresses:* They identify a single network interface.
2) *Multicast Addresses:* They identify group of network interfaces, typically at different locations. A packet will be sent to all network interfaces in the group.
3) *Anycast Addresses:* They also identify a group of network interfaces. However, a packet will be sent to only one network interface in the group, usually the nearest one.

As an example 4BF5:0000:0000:0000:BA5F:039A:OOOA:2176 can be shortened to 4BF5:0:0:0:BA5F:39A:A:2176

Binary prefix	Types	Percentage of address space
0000 0000	Reserved	0.39
0000 0001	Unassigned	0.39
0000 001	ISO network addresses	0.78
0000 010	IPX network addresses	0.78
0000 011	Unassigned	0.78
0000 1	Unassigned	3.12
0001	Unassigned	6.25
001	Unassigned	12.5
010	Provider-based unicast addresses	12.5
011	Unassigned	12.5
100	Geographic-based unicast addresses	12.5
101	Unassigned	12.5
110	Unassigned	12.5
1110	Unassigned	6.25
1111 0	Unassigned	3.12
1111 10	Unassigned	1.56
1111 110	Unassigned	0.78
1111 1110 0	Unassigned	0.2
1111 1110 10	Link local use addresses	0.098
1111 1110 11	Site local use addresses	0.098
1111 1111	Multicast addresses	0.39

B. Provider-based Address Format

Notice the hierarchical structure of this address format. The first level is identified by the registry ID. The next level identifies the Internet service provider that is responsible for assigning the subscriber IDs. Finally, each subscriber assigns the addresses according to the subnet IDs and interface IDs.

The local addresses are used for a collection of hosts that do not want to connect to the global Internet because of security and privacy concerns.

There are two types of local addresses: link-local addresses and site-local addresses. The link-local addresses are used for a single link, while the site-local addresses are used for a single site. The local addresses are designed so that when an organization decides to connect the hosts to the global Internet, the move will be as painless as possible.

C. IPv6 Security

The current Internet has a number of security problems and lacks effective privacy and authentication mechanisms below the application layer. IPv6 remedies these shortcomings by having two integrated options that provide security services. These two options may be used singly or together to provide differing levels of security to different users. This is very important because different user communities have different security needs.

D. IPv6 Quality-of- Service Capabilities

The Flow Label and the Traffic class fields in the IPv6 header may be used by a host to identify those packets for which it requests special handling by IPv6 routers, such as non-default quality of service or "real-time" service. This capability is important in order to support applications, which require some degree of consistent throughput, delay, and/or jitter. These types of applications arecommonly described as "multi- media" or "real-time" applications.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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E. Current IPv6 Specifications

Internet Control Message Protocol: IPv6 uses ICMP as defined for IPv4, with a number of changes. The resulting protocol is called ICMPv6. ICMPv6 is used by IPv6 nodes to report errors encountered in processing packets, and to perform other internet-layer functions, such as diagnostics (ICMPv6 "ping"). ICMPv6 is an integral part of IPv6 and must be fully implemented by every IPv6 node.

F. Hop by Hop Options

The presence of Hop-by-Hop option in an IPv6 datagram informs the router that the contents of this path datagram are of interest to the router and to handle any control data accordingly.

G. MTU Discovery

When one IPv6 node has a large amount of data to send to another node, the data is transmitted in a series of IPv6 packets. It is usually preferable that these packets be of the largest size that can successfully traverse the path from the source node to the destination node. This packet size is referred to as the Path MTU (PMTU), and it is equal to the minimum link MTU of all the links in a path. IPv6 defines a standard mechanism for a node to discover the PMTU of an arbitrary path.

H. Header Compression

1) Improve interactive response time
2) Allow using small packets for bulk data with good line efficiency
3) Allow using small packets for delay sensitive low data-rate traffic
4) Decrease header over head.
5) Reduce packet loss rate over loss links.

I. Packet Tunneling

A packet is encapsulated and carried as payload within an IPv6 packet. The resulting packet is called an IPv6 tunnel packet. The forwarding path between the source and destination of the tunnel packet is called an IPv6 tunnel. The technique is called IPv6 tunneling.

J. Domain Name System

Current support for the storage of Internet addresses in the Domain Name System (DNS) cannot easily be extended to support IPv6 addresses since applications assume that address queries return 32-bit IPv4 addresses only. To support the storage of IPv6 addresses we define the following extensions:

1) A new resource record type is defined to map a domain name to an IPv6address.
2) A new domain is defined to support lookups based on address.
3) Existing queries that perform additional section processing to locate IPv4 addresses are redefined to perform additional section processing onbothIPv4andIPv6addresses.

K. Transition Mechanisms

The IPv6 transition mechanisms are a set of protocol mechanisms implemented in hosts and routers, along with some operational guidelines for addressing and deployment, designed to make transition the Internet to IPv6 work with as little disruption as possible. The IPv6 transition mechanisms provide a number of features, including: Incremental upgrade and deployment, Minimal upgrade dependencies, Easy Addressing, Low start-up costs and many more.

L. Routing

Routing in IPv6 is almost identical to IPv4 routing, except that the addresses are 128-bit IPv6 addresses instead of 32-bit IPv4 addresses..

With very straightforward extensions, all of IPv4's routing algorithms (OSPF, RIP, IDRP, ISIS, etc.) can be used to route Ipv6

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M. Renumbering

Router Renumbering ("RR") is a mechanism, which allows address prefixes on routers to be configured and reconfigured almost as easily as the combination of Neighbor Discovery and Address Auto configuration works for hosts. It provides a means for a network manager to make updates to the prefixes used by and advertised by IPv6 routers throughout a site. Neighbor Discovery.

N. Autoconfiguration

The auto configuration process includes creating a link-local address and verifying its uniqueness on a link, determining what information should be auto configured (addresses, other information, or both), and in the case of addresses, whether they should be obtained through the stateless mechanism, the stateful mechanism,or both.

O. Mobility

A globally unique Home-Address is assigned for every Mobile Node. That address identifies the mobile node to other nodes. The Home-Address could include some ownership information which may be used e.g. for generation of accounting records. A Mobile Node must be able to communicate directly with nodes that do not implement mobility functions. This restriction is somewhat loosened presently: every node should implement some mobility functions.

P. IPv6 over Different Media

1) IPv6 over Ethernet
2) IPv6 over FDDI
3) IPv6 over PPP
4) IPv6 over Token Rin
5) IPv6 over Arc ne
6) IPv6 over ATM
7) IPv6 over Frame Relay
8) IPv6 over IP Tunnels

Q. Network Management

This is use mostly to overcome problem occurred in ipv4. ipv6 protocol was prepared to handle. IPv4 was made for only small network . IPv6's has more capabilities handle larger sizes network.

R. IPv6 - Enabled Applications

Chat software, DNS, Firewalls, FTP, Games, IPsec, Java, Mail, Mobile IPv6, Monitoring Tools, News, Patch Sites, Socket software, Web servers and client

S. Host Implementations By

Apple, BSDI, Bull, Digital, Epilogue, FreeBSD, FTP Software, Hitachi, HP, IBM, INRIA, Interpeak, Linux ,Mentat, Microsoft , NetBSD, Nokia, Novell, NRL, NTHU, OpenBSD, Pacific Softworks, Process Software, SICS, SCO, Siemens Nixdorf, Silicon Graphics, Sun, UNH, and WIDE.

T. Router Implementations By

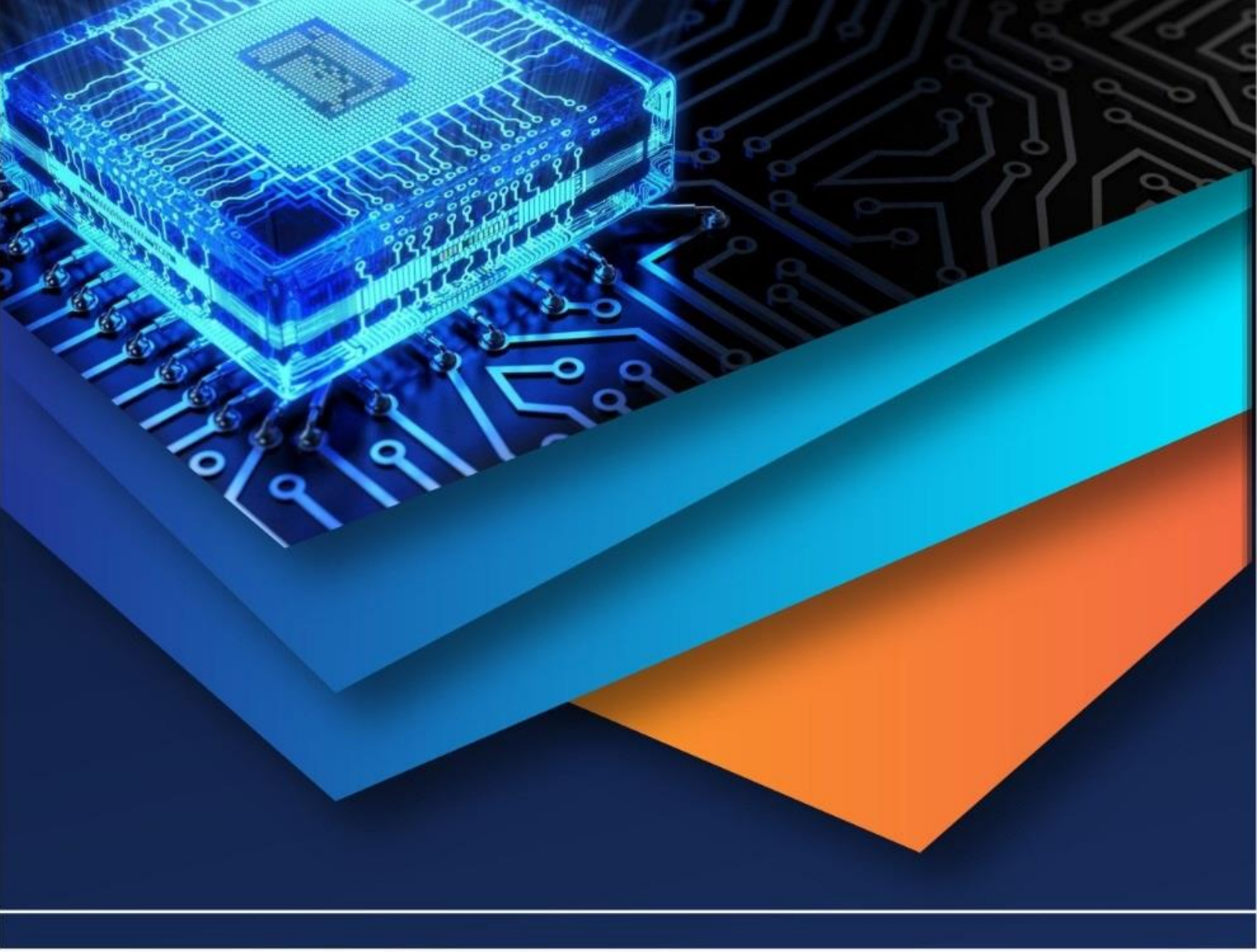
3Com, 6WIND, Bay Networks, Cisco Systems, Digital, Hitachi, IBM, Merit,Nokia, NTHU, Sumitomo Electric, and Telebit Communications.

III. CONCLUSION

When IPv4 address space will run out. Address re-use is a short-term solution that restricts facilities. Address re-use mechanisms work for people who only use e-mail and the Web. With IP Version 6 (IPv6) there will be no scarcity of addresses. IPv6 is a version of IPv4 with no limit address space. It has its characteristics own. The IPv6 network will use as unlimited Address. Address assignment and network maintenance will become more manageable and face of an ever-expanding IPv6 network.

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