Internet Protocol and its Variants

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ABSTRACT -- Analyzing and comparing famous versions of internet protocol these are IPv4 and IPv6, is our goal. The invention of IPv6 means there were some imperfections and flaws in IPv4. We have made a feature-by-feature comparison and contrast of IPv6 versus IPv4 and have reached to a point that IPv6 offers many exceptional openings for increasing a network architectures efficiency and efficacy. We can say that, there is a competition going on between these protocols, as they are not directly compatible, and network providers and users are being forced to determine whether to support one or both protocols for various network services. The new form of IP, (i.e. IPv6), constitutes a push to defeat the inalienable impediments of IPv4, all together for the new convention have the capacity to react to the new needs as they shape today in the Internet. We have talked about different examination issues while porting an IPv4 application to IPv6 with concentrate on issues that an application designer would confront as opposed to a total API reference. IPv4 has the most far reaching utilization for traditional Internet applications, this may of the its initial development in late nineteen seventy. IPv6 is overhauled adaptation IPv4, in view of numerous lessons learned as the IPv4-based Internet developed and was utilized as a part of unanticipated ways.

Key words- Internet protocol, IPv4, IPv6,

INTRODUCTION
IP deliver term alludes to the locations characterized by IPv4. IP addresses being used are IPv4 and IPv6 characterizing IP address in an unexpected way. In 1979 IP rendition number 5 was doled out to trial Internet Stream Protocol, which was not alluded to as IPv5 coming about to variant hole. IP address of IPv4 is 32 bits long and there are 232 real IP addresses. All the usable locations of IPv4 are now allotted, leaving just around 1.3 billion locations for the development of the system. Thus, open IPv4 addresses have turned out to be generally short, constraining numerous clients and a few associations to utilize a Network Address Translation (NAT) to outline single open IPv4 deliver to various private IPv4 addresses. Regardless of the possibility that NATs advance reuse of the private address space they damage the essential outline standard of the first Internet of having all hubs an interesting, all inclusive reachable address, anticipating genuine end-to-end availability for a wide range of systems administration applications.

Components OF IPv6
The IPv6 is the successor of IPv4 and has a few focal points over IPv4 and is by and large broadly utilized these days.

Bigger Address Space
As IPv6 is 128 piece, we can have up to 340 trillion locations which is excessively. Along these lines we feel these IP locations will never get devoured totally.

Basic Header for Router Efficiency
The exemplification is more straightforward and less demanding than that of IPv4. The reason is that IPv6 does not have any checksum subsequently lessens the weight of preparing for other endpoint gadgets.

Decrease In Utilization OfDevice
IPv6 does not have idea of communicate which decreases usage of gadgets in the same subnet.

State full and Stateless Auto setup
EVALUATING IPV4 AND IPV6
IPv6 is an automated adaptation of IPv4. Excluding prioritized delivery of traffic, IPv6 has fewer fields to action and fewer decisions to accomplish in forwarding an IPv6 packet. Unlike IPv4, the IPv6 header is fixed size (40 bytes), which allow routers to process IPv6 packets faster. Additionally, the hierarchical and abbreviate addressing structure of IPv6 global addresses means that there are less routes to analyse in the routing tables of alignment and Internet backbone routers. The aftereffect is traffic that can be forwarded at higher information rates, leading to higher performance for tomorrow’s high-bandwidth applications that use various information types. IPv6 has been designed to hold
security (IPsec) and mobile (Mobile IPv6, optional) some times.

**Table**

<table>
<thead>
<tr>
<th>IPv4</th>
<th>IPv6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed in 1974 by IETF</td>
<td>Developed by IETF in 1998</td>
</tr>
<tr>
<td>Ip4v address is 32 bit</td>
<td>IPv6 address is 128 bit (four times more)</td>
</tr>
<tr>
<td>Has issue with IP address depletion, due to Address shortage (32 bits)</td>
<td>Has sufficient address to cater the needs of future as well (128)</td>
</tr>
<tr>
<td>IPv4 header is 20 bytes</td>
<td>IPv6 header is 40 bytes (double)</td>
</tr>
<tr>
<td>IPv4 header has 13 fields and is more complicated</td>
<td>IPv6 header has 8 fields and is less complicated to IPv4</td>
</tr>
<tr>
<td>IPv4 uses concepts of Classes, namely Class A through F.</td>
<td>IPv6 has no Classes.</td>
</tr>
<tr>
<td>Subnet Mask is used in IPv4</td>
<td>Prefix Length is used in IPv6.</td>
</tr>
<tr>
<td>No Built-in Security mechanism. IPsec is optional</td>
<td>Has Built-in Security Encryption and Authentication included.</td>
</tr>
<tr>
<td>The IPv4 address is represented in dotted decimal</td>
<td>The IPv6 address is represented in Hexadecimal and uses colon separate d notation</td>
</tr>
<tr>
<td>IPv4 is still used widely</td>
<td>IPv6 is gaining familiarity but still behind IPv4.</td>
</tr>
<tr>
<td>Addresses are of types: Private, Public and Multicast</td>
<td>Address are of Global, Unicast and Any cast type.</td>
</tr>
<tr>
<td>For DNS the A record is used</td>
<td>For DNS the AAAA record is used</td>
</tr>
<tr>
<td>Checksum available in IPv4 header.</td>
<td>No Checksum in IPv6 header.</td>
</tr>
<tr>
<td>Uses ARP to map a IP address to a MAC address.</td>
<td>Uses Neighbour Discovery Protocol (NDP) in place of ARP.</td>
</tr>
<tr>
<td>Manual configuration is required or need to use DHCP</td>
<td>Address can be configured automatically</td>
</tr>
<tr>
<td>Packet flow is not identified</td>
<td>Uses the Flow Label to identify the Packet Flow.</td>
</tr>
<tr>
<td>Uses Broadcast addresses</td>
<td>Uses link local Scope all node multicast address</td>
</tr>
<tr>
<td>Number of addresses: $2^{32}$</td>
<td>Number of addresses: $2^{128}$ (340 trillions)</td>
</tr>
<tr>
<td>The sending host and the router do the fragmentation</td>
<td>Here only hosts do the fragmentation and not the routers</td>
</tr>
</tbody>
</table>

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Sorts OF IPV6 ADDRESSES: IPv6 has three sorts of cations, which can be arranged by sort and degree:
- Unicast addresses.
- A parcel is conveyed to one interface.
- Multicast addresses.
- A parcel is conveyed to numerous interfaces.
- Any cast addresses.
- A parcel is conveyed to the closest of various interfaces (as far as directing separation).

IPv6 Datagram Packet Format

Before learning IPv6 datagram header and fields, I prescribe you to learn IPv4 datagram header the diverse fields in IPv4 datagram header too. IPv6 has a significantly less complex parcel header contrasted and IPv4, by including just the data required for sending the IP datagram. IPv4 has a settled length header of size 40 bytes. Settled length IPv6 header enables the switches to handle the IPv6 datagram parcels all the more productively. The accompanying figure demonstrates the structure of IPv6 datagram bundle.

We may partition IPv6 datagram bundle header as three sections.

1) IPv6 datagram parcel header.
2) Extension Header.
3) Upper Layer Protocol Data.

IPv6 datagram parcel has additionally augmentation headers of shifting lengths. On the off chance that augmentation headers are available in IPv6 datagram bundle, a Next Header field in the IPv6 header focuses the primary expansion header. Every expansion header contains another Next Header field, indicating the following augmentation header.

The last IPv6 datagram bundle expansion header focuses the upper layer convention header (Transmission Control Protocol (TCP), User Datagram Protocol (UDP), or Internet Control Message Protocol (ICMPv6)). There is no "choices" in IPv6 datagram bundle header, which was available in IPv4 header.
switches the IPv6 parcel can travel. This Hop Limit field is like IPv4 Time to Live (TTL) field. This field is normally utilized by separation vector directing conventions, such as Routing Information Protocol (RIP) to counteract layer 3 circles (steering circles).

• Source Address: The span of the Source Address field is 128 bits. The Source Address field demonstrates the IPv6 address of the wellspring of the parcel.

• Destination Address: The measure of the Destination Address field is 128 bits. The Destination Address field demonstrates the IPv6 address of the goal of the bundle.

Examination between IPv4 Header and IPv6 Header

DISCUSSION

Since IPv4 and IPv6 cannot be merged the two there are various options to successfully run them in parallel. Dual stack, allows running both protocols simultaneously on an interface of a device by tunnelling IPv6 over IPv4 and vice versa. Network Address Translation-Protocol Translation (NAT-PT) is used by Cisco for translation of IPv4 to IPv6 and vice versa. For simplification of host configuration, IPv6 supports both State full address configuration i.e. address configuration in the presence of a DHCP for IPv6 (DHCPv6) server as well as stateless address configuration such as address configuration in the absence of a DHCP server. Even if there are other mechanisms to support interoperability of IPv4 and IPv6 they are short-term solutions. IPv6 is likely to replace IPv4 by 2019, but IP will remain the base technology of the Internet until 2030. Recent IPv4 implementations are either manually or automatic configured using DHCP. With a huge address space offered by IPv6, the Internet Service Providers will have sufficient IP address to allocate unique IP address to every device [6-22]. U.S. stakeholder groups to transition to IPv6 will be approximately $73 billion over the period 1997 to 2025 [23-40]. China, with over 200 actor users, has the better Internet alive installed abject in the apple and added users than accessible IPv4 addresses. China’s Next Generation Internet Project (CNGI) [3] includes IPv6 courage construction, appliance development, promotion, and standards participation. China’s arrangement already spans over 300 academic, industrial, and government analysis campuses aural the country and as well includes all-embracing IPv6 analytical points. The 2008 Olympics provided the government with a befalling to advertise a all-embracing IPv6 accomplishing that included aggregate from aegis cameras to taxis. Hong Kong Shanghai Banking Corporation’s (HSBC) adoption of IPv6 in China [5] is further evidence of the technology’s momentum. Other nations in the region leading with IPv6 usage include Japan and Korea. In 2007, Australian government prepared its IPv6 implementation strategy for government agencies. The strategy proposed that all government agencies implement IPv6 capable hardware and platforms by 2012 to operate dual-stack IPv4/IPv6 environments by 2015[4].

CONCLUSION

IPv6 is going to be the protocol of Next Generation Network as major applications for IPv6 are yet to surface. With more than US $350 trillion forecasted to be invested over the coming 30 years in providing basic infrastructure there are lots of scope in research in ICT for the development of a connected society. Governments and enterprises must band together for effect and faster adoption of IPv6. The steps for migration to IPv6 include careful attention to device capabilities, system architecture, scalability, management and service provider.

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