Research and compare between IPv4 Address and IPv6 Address.

IP address is an identification for a device/system in a network. The following discusses two versions of IP addressing, IPv4 and IPv6. Ipv4 scheme was introduced first and is being taken over by Ipv6, the main differences are as below:

1. In IPv4 the address is represented as decimals and separated by dots where as in IPv6 it is represented in hexadecimal format separated by colons which makes it alpha-numeric.

Example:

IPv4 Addressing

108.31.83.50 this can be written as 10110100.00011111.01010011.00110010 in binary.

IPv4 makes use of classful and classless addressing, classful is divided into five classes A,B,C,D and E where each class is allotted a range of addresses. Classless addressing is supported by variable length subnetting (VLSM). Packet header is of 20 Bytes long

IPv6 addressing

3124:0001:0020:0000:00CD:4567:0007:0008 this can be further simplified as 3124:1:20::CD:4567:7:8

IPv6 does not have classful addressing, subnetting is used to manage network sizes. Packet header is simplified and is 40 bytes long

2.Address Space: The most important feature is the address space, IPv4 is of 32 bits as compared to IPv6 which is 128bits.This allows IPv4 to have a limited number of IP addresses up to a few billions whereas Ipv6 allows unlimited number of Ip addresses. Ipv4 uses NAT to overcome the limitations of IP address, IPv6 does not use NAT and provides end to end connectivity due to its large address space.

3. Configuration: Ipv4 is configured manually or via DHCP which uses a DHCP server to assign Ip address.IPv6 has autoconfiguration which is a plug and play mechanism, it generates a local link address that checks for the uniqueness of the address which is then assigned to the device.

4.Routing: IPv6 provides efficient routing as compared to IPv4 due to elimination of checksum in the header as the link layer consists of built in checksum and error control bits. This reduces checksum calculation after every hop. The routing tables are smaller in IPv6 as compared to Ipv4.

5. Security: IPv6 has built in IPsec as compared to Ipv4 optional security feature. IPv6 consists of two security headers Authentic header and encapsulating security payload which provides data integrity and confidentiality.

6.QoS: Quality of service is delivered in IPv6 as compared to IPv4. Applications like VoIP are heavily reliant on Quality of service as they are sensitive to network performance. IPv6 provides better QoS due

to the classification of traffic in different compartments and provides better traffic management of the packets.

7. IPv4 uses 0.0.0.0 as un-specified address and IPv6 uses :: for the same. For loopback 127.0.0.1 is used by Ipv4 and ::1 is used by IPv6.

8. Protocols: With the upgraded in the IP versions the protocols need to be upgraded in order for the protocols to understand IPv6 format. The following are a few examples of the protocols that have being updated.

IPv4	IPv6
ARP(Address resolution Protocol)	NDP (Network Discovery protocol)
RIP	RIPng
OSPFv2	OSPFv3
BGP	MP BGP4
SNMP	Does not work on SNMP

9.Both IPv4 and IPv6 supports unicast and multicast however broadcast has been replaced by anycast in IPv6.

Broadcast in IPv4	Anycast in IPv6
Broadcast does not use specific destination address, when a message is broadcasted it reaches all device connected inside the same network. Eg: 192.168.10.255 is the broadcast address of the network 192.168.10.0	Anycast is available in IPv4 but it is mainly designed for IPv6.It is known as one-to-one of many as the destination address maybe for a single user in a group of users sharing the same destination address.

Due to lack of IP addresses and enhanced features there is an ongoing migration to IPv6 which provides large address space, security along with fast and reliable communication.