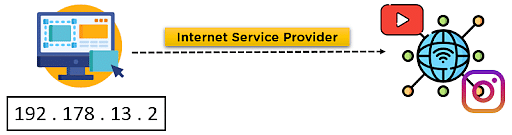
What is an IP Address?

An Internet Protocol address (IP address) is a set of rules and a method designed to allow a device to access the Internet and serve as a unique identification medium.



An Internet protocol address (IP address) is designed to have a unique combination of numbers and periods, such as 192.178.13.2. This combination of numbers acts as the system's identity when it connects to the Internet to access data.

Further, in this tutorial on ‘IPv4 vs IPv6’, you will examine the need to understand the difference between IPv4 and IPv6 when assigning system addresses.

## What is IPv4?

IPv4 is a version of the IP address used by most devices. It has two sections: the host address and the network address. This version was introduced by DARPA in 1981. Its 32-bit integers are expressed in decimal form. The IPv4 is presented by four numbers in the range of 0-255 that are then separated by dots. The range of numbers is converted to 0 and 1 so that the computers can understand it. For instance, an IPv4 address can be created as 178.163.132.60.

## Address Format for IPv4

The most common format of IPv4 is the dotted decimal. It looks like x.x.x.x, where every x is a value below 255. For instance, if we consider the 128.11.3.31 IP address. Then, the binary digits for the address will be the following:

128 = 10000000

11 = 00001011

3 = 00000011

31 = 00011111

IPv4 Drawbacks

While IPv4 is useful, it also comes with its own set of drawbacks. Some of these are as follows:

* Complex Configuration: IPv4 requires DHCP or manual configuration to assign addresses. Due to its complexity, it is prone to errors and can also be incredibly time-consuming.
* Limited Address Space: IPv4 has a limited number of addresses. This is not enough for the large number of devices connecting to the Internet daily.
* Security Concerns: IPv4 lacks some of the built-in security features required today. Thus, it is more vulnerable to attacks and needs extra security measures.
* Inefficient Routing: IPv4's structure makes routing more complex, which can slow down data transmission and increase latency.
* Reduced Performance: IPv4 utilizes broadcasting to communicate with several devices on a network. This unnecessary network traffic decreases its performance.
* Fragmenting Packets: IPv4 permits routers to fragment packets. It increases the chances of data being corrupted or lost, leading to inefficiencies.
* Limited Support: IPv4 provides limited Quality of Service (QoS) support. It prioritizes only certain kinds of data, affecting the performance of several real-time applications.

What is IPv6?

IPv6 is the better version of IP addresses. A 128-bit hexadecimal address delivers a large address space with a simple header. The Internet Engineering Task Force first introduced this version of IP addresses in 1995, and it was designed to be better than IPv4.

Address Format for IPv6

The IPv6 address is formed in a bunch of eight hexadecimal numbers that are separated by the colon. For instance, it can be something like the following:

AC02 : FE10 : 5423  8976 : DCAB : E102 : 8254 : F320

Difference Between IPv4 and IPv6

Go over the following points to understand what is the difference between IPv4 and IPv6.

|  |  |  |
| --- | --- | --- |
| Particulars | IPv6 | IPv4 |
| Fields | IPv6 has eight fields that are separated by a colon. | IPv4 has four fields that are separated by dots. |
| Length of Address | IPv6 is a 128-bit address. | IPv4 is a 32-bit address. |
| Number of IP Addresses | IPv6 has a larger number of IP addresses. | IPv4 can only have a limited number of addresses. |
| Classes | The IPv6 does not have any class of address. | IPv4 has five different classes of addresses: Class A, Class B, Class C, Class D, and Class E.  Note: While IPv4 initially had address classes, modern IPv4 networks mostly use CIDR. |
| Virtual Length Subnet Mask (VLSM) | IPv6 does support VLSM, typically using CIDR notation. | IPv4 supports the VLSM, which means that it can transform IP addresses into subnets of varied sizes. |
| Address Space | This version generates 340 undecillion unique addresses. | This version generates only 4.3 billion unique addresses. |
| Address Configuration | The IPv6 supports manual, auto-configuration, DHCP, and renumbering. | On the other hand, the IPv4 only supports the DHCP and manual configuration. |
| Security Measures | The IPSEC has been developed in the IPv6 for security purposes. | Security depends on the application using IPv4. This version of the IP address does not have a security feature.  Note: IPSec can also be used with IPv4. |
| End-to-End Connection Integrity | End-to-end connection integrity is achievable in IPv6. | However, end-to-end connection integrity is not achievable in IPv4. |
| Fragmentation | Fragmentation is performed only by the senders | Meanwhile, fragmentation is performed by both the forwarding routers and the senders. |
| Address Representation | The address is represented in the hexadecimal form in IPv6. | The address is represented in decimal form in IPv4. |
| Checksum Field | The IPv6 protocol does not use header checksums. | IPv4 has a checksum field. |
| Packet Flow Identification | This IP version uses the flow label field in the packet flow identification header. | However, IPv4 does not have a way to identify packet flow. |
| Encryption and Authentication | The IPv6 provides both authentication and encryption. | However, the IPv4 does not provide authentication and encryption. |
| Transmission Scheme | IPv6 is multicasting that delivers efficient network operations. | IPv4 is broadcasting.  It also supports unicast and multicast. |
| Number of Octets | The IPv6 has eight fields, and every field has two octets. So, the total number of octets is sixteen. | The IPv4 has four octets. |