# What is IPv6?

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The most common version of the Internet Protocol currently in use, IPv4, will soon be replaced by IPv6, a new version of the protocol. The well-known IPv6 protocol is being used and deployed more often, especially in mobile phone markets. IP address determines who and where you are in the network of billions of digital devices that are connected to the Internet.

IPv6 or Internet Protocol Version 6 is a network layer protocol that allows communication to take place over the network. IPv6 was designed by Internet Engineering Task Force (IETF) in December 1998 with the purpose of superseding the IPv4 due to the global exponentially growing internet users.


The next generation Internet Protocol (IP) address standard, known as IPv6, is meant to work in tandem with IPv4, which is still in widespread use today, and eventually replace it. To communicate with other devices, a computer, smartphone, home automation component, Internet of Things sensor, or any other Internet-connected device needs a numerical IP address. Because so many connected devices are being used, the original IP address scheme, known as IPv4, is running out of addresses.

## IPv4 vs IPv6

The common type of IP address (is known as IPv4, for “version 4”). Here’s an example of what an IP address might look like:

```
25.59.209.224
```

An IPv4 address consists of four numbers, each of which contains one to three digits, with a single dot (.) separating each number or set of digits. This group of separated numbers creates the addresses that let you and everyone around the globe to send and retrieve data over our Internet connections. The IPv4 uses a 32-bit address scheme allowing to store 2^32 addresses which is more than 4 billion addresses. To date, it is considered the primary Internet Protocol and carries 94% of Internet traffic. Initially, it was assumed it would never run out of addresses but the present situation paves a new way to IPv6, let's see why? An IPv6 address consists of eight groups of four hexadecimal digits. Here's an example IPv6 address:

```
3001:0da8:75a3:0000:0000:8a2e:0370:7334
```

This new IP address version is being deployed to fulfil the need for more Internet addresses. With 128-bit address space, it allows 340 undecillion unique address space.

*IPv6 support a theoretical maximum of 340, 282, 366, 920, 938, 463, 463, 374, 607, 431, 768, 211, 456. To keep it straightforward, we will never run out of IP addresses again.*

The next iteration of the IP standard is known as Internet Protocol version 6 (IPv6). Although IPv4 and IPv6 will coexist for a while, IPv6 is meant to work in tandem with IPv4 before eventually taking its place. We need to implement IPv6 in order to proceed and keep bringing new gadgets and services to the Internet. We can only move forward with an innovative and open Internet if we implement it, which was created with the needs of a global commercial Internet in mind.

## Types of IPv6 Address

Now that we know about what is IPv6 address let's take a look at its different types.

- **Unicast addresses :** Only one interface is specified by the unicast address. A packet moves from one host to the destination host when it is sent to a unicast address destination.
- **Multicast addresses** It represents a group of IP devices and can only be used as the destination of a datagram.
- **Anycast addresses** The multicast address and the anycast address are the same. The way the anycast address varies from other addresses is that it can deliver the same IP address to several servers or devices. Keep in mind that the hosts do not receive the IP address. Stated differently, multiple interfaces or a collection of interfaces are assigned an anycast address.

## Advantages of IPv6

- **Faster Speeds:** IPv6 supports multicast rather than broadcast in IPv4.This feature allows bandwidth-intensive packet flows (like multimedia streams) to be sent to multiple destinations all at once.
- **Stronger Security:** IPSecurity, which provides confidentiality, and data integrity, is embedded into IPv6.
- Routing efficiency
- Reliability
- Most importantly it's the final solution for growing nodes in Global-network.

- The device allocates addresses on its own.
- Internet protocol security is used to support security.
- Enable simple aggregation of prefixes allocated to IP networks; this saves bandwidth by enabling the simultaneous transmission of large data packages.

## Disadvantages of IPv6

- **Conversion:** Due to widespread present usage of IPv4 it will take a long period to completely shift to IPv6.
- **Communication:** IPv4 and IPv6 machines cannot communicate directly with each other.
- **Not going backward Compatibility:** IPv6 cannot be executed on IPv4-capable computers because it is not available on IPv4 systems.
- **Conversion Time:** One significant drawback of IPv6 is its inability to uniquely identify each device on the network, which makes the conversion to IPV4 extremely time-consuming.
- Cross-protocol communication is forbidden since there is no way for IPv4 and IPv6 to communicate with each other.

## Differenece Between IPv6 and IPv4

| IPv6 | IPv4 |
|---|---|
| IPv6 has a 128-bit address length | IPv4 has a 32-bit address length |
| It supports Auto and renumbering address configuration | It Supports Manual and DHCP address configuration |
| The address space of IPv6 is quite large it can produce $3.4\times10^{38}$ address space | It can generate $4.29\times10^{9}$ address space |
| Address Representation of IPv6 is in hexadecimal | Address representation of IPv4 is in decimal |
| In IPv6 checksum field is not | In IPv4 checksum field is available |

| IPv6 | IPv4 |
| --- | --- |
| available | |
| IPv6 has a header of 40 bytes fixed | IPv4 has a header of 20-60 bytes. |
| IPv6 does not support VLSM. | IPv4 supports VLSM(Variable Length subnet mask). |

## Frequently Asked Question on IPv6 – FAQs

**what is IPv6?**

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**What are benefits of using IPv6 rather then IPv4?**

*IPv6 supports multicast rather than broadcast in IPv4.This feature allows bandwidth-intensive packet flows (like multimedia streams) to be sent to multiple destinations all at once.*

**How is IPv6 address represented?**

*IPv6 is represented by the below representation*

*1000:0ac3:22a2:0000:0000:4b3c:0504:1234*

**Who is more secure IPv4 or IPv6?**