An [IP address](https://www.geeksforgeeks.org/difference-between-private-and-public-ip-addresses/) represents an Internet Protocol address. A unique address that identifies the device over the network. It is almost like a set of rules governing the structure of data sent over the Internet or through a local network. An IP address helps the Internet to distinguish between different routers, computers, and websites. It serves as a specific machine identifier in a specific network and helps to improve visual communication between source and destination.

**IP address structure:**

IP addresses are displayed as a set of four digits- the default address may be 192.158.1.38. Each number on the set may range from 0 to 255. Therefore, the total IP address range ranges from 0.0.0.0 to 255.255.255.255.

1. [**Network ID**](https://www.geeksforgeeks.org/finding-network-id-of-a-subnet-using-subnet-mask/)**–**  
   It is the part of the left-hand IP address that identifies the specific network where the device is located. In the normal home network, where the device has an IP address 192.168.1.32, the 192.168.1 part of the address will be the network ID. It is customary to fill in the last part that is not zero, so we can say that the device’s network ID is 192.168.1.0.
2. **Hosting ID–**  
   The host ID is part of the IP address that was not taken by the network ID. Identifies a specific device (in the TCP / IP world, we call devices “host”) in that network. Continuing with our example of the IP address 192.168.1.32, the host ID will be 32- the unique host ID on the 192.168.1.0 network.

**Version of IP address:**

Currently there are 2 versions of IP addresses are in use i.e IPV4 and IPV6

1. [**IPV4**](https://www.geeksforgeeks.org/what-is-ipv4/)**(Internet Protocol Version 4):**It is the first version of Internet Protocol address. The address size of IPV4 is 32 bit number. In this Internet Protocol Security (IPSec) with respect to network security is optional. It is having 4,294,967,296 number of address still we are seeing a shortage in network addresses as the use of network & virtual devices are increasing rapidly.
2. [**IPV6**](https://www.geeksforgeeks.org/internet-protocol-version-6-ipv6/)**(Internet Protocol Version 6):**It is the recent version of Internet Protocol address. The address size of IPV6 is 128 bit number. In this Internet Protocol Security (IPSec) with respect to network security is mandatory. It allows 3.4 x 10^38 unique IP addresses which seems to be more than sufficient to support trillions of internet devices present now or coming in future.

**IP Address Types:**  
There are 4 types of IP Addresses- Public, Private, Fixed, and Dynamic. Among them, public and private addresses are derived from their local network location, which should be used within the network while public IP is used offline.

1. [**Public IP address**](https://www.geeksforgeeks.org/difference-between-private-and-public-ip-addresses/)**–**  
   A public IP address is an Internet Protocol address, encrypted by various servers/devices. That’s when you connect these devices with your internet connection. This is the same IP address we show on our homepage. So why the second page? Well, not all people speak the IP language. We want to make it as easy as possible for everyone to get the information they need. Some even call this their external IP address. A public Internet Protocol address is an Internet Protocol address accessed over the Internet. Like the postal address used to deliver mail to your home, the public Internet Protocol address is a different international Internet Protocol address assigned to a computer device. The web server, email server, and any server device that has direct access to the Internet are those who will enter the public Internet Protocol address. Internet Address Protocol is unique worldwide and is only supplied with a unique device.
2. [**Private IP address**](https://www.geeksforgeeks.org/what-is-apipa-automatic-private-ip-addressing/)**–**  
   Everything that connects to your Internet network has a private IP address. This includes computers, smartphones, and tablets but also any Bluetooth-enabled devices such as speakers, printers, or smart TVs. With the growing internet of things, the number of private IP addresses you have at home is likely to increase. Your router needs a way to identify these things separately, and most things need a way to get to know each other. Therefore, your router generates private IP addresses that are unique identifiers for each device that separates the network.
3. [**Static IP Address**](https://www.geeksforgeeks.org/advantages-and-disadvantages-of-static-ip/)**–**  
   A static IP address is an invalid IP address. Conversely, a dynamic IP address will be provided by the [Dynamic Host Configuration Protocol (DHCP) server](https://www.geeksforgeeks.org/dynamic-host-configuration-protocol-dhcp/), which can change. The Static IP address does not change but can be changed as part of normal network management.  
   Static IP addresses are incompatible, given once, remain the same over the years. This type of IP also helps you get more information about the device.
4. **[Dynamic IP address](https://www.geeksforgeeks.org/difference-between-static-and-dynamic-ip-address/)–**  
   It means constant change. A dynamic IP address changes from time to time and is not always the same. If you have a live cable or DSL service, you may have a strong IP address. Internet Service Providers provide customers with dynamic IP addresses because they are too expensive. Instead of one permanent IP address, your IP address is taken out of the address pool and assigned to you. After a few days, weeks, or sometimes even months, that number is returned to the lake and given a new number. Most ISPs will not provide a static IP address to customers who live there and when they do, they are usually more expensive. Dynamic IP addresses are annoying, but with the right software, you can navigate easily and for free.

**Types of Website IP address:**  
Website IP address is of two types- Dedicated IP Address and Shared IP Address. Let us discuss the two.

1. [**Dedicated IP address**](https://www.geeksforgeeks.org/advantages-and-disadvantages-of-dedicated-ip-addresses/)**–**  
   A dedicated IP address is one that is unique for each website. This address is not used by any other domain. A dedicated IP address is beneficial in many ways. It provides increased speed when the traffic load is high and brings in increased security. But dedicated IPs are costly as compared to shared IPs.
2. [**Shared IP address**](https://www.geeksforgeeks.org/introduction-of-classful-ip-addressing/)**–**  
   A shared IP address is one that is not unique. It is shared between multiple domains. A shared IP address is enough for most users because common configurations don’t require a dedicated IP.

**IP Address Classification Based on Operational Characteristics:**  
According to operational characteristics, IP address is classified as follows:

1. [**Broadcast addressing**](https://www.geeksforgeeks.org/difference-between-unicast-broadcast-and-multicast-in-computer-network/)**–**  
   The term ‘Broadcast’ means to transmit audio or video over a network. A broadcast packet is sent to all users of a local network at once. They do not have to be explicitly named as recipients. The users of a network can open the data packets and then interpret the information, carry out the instructions or discard it. This service is available in IPv4. The IP address commonly used for broadcasting is 255.255.255.255
2. [**Unicast addressing**](https://www.geeksforgeeks.org/internet-protocol-version-6-ipv6/)**–**  
   This address identifies a unique node on the network. Unicast is nothing but one-to-one data transmission from one point in the network to another. It is the most common form of IP addressing. This method can be used for both sending and receiving data. It is available in IPv4 and IPv6.
3. [**Multicast IP addresses**](https://www.geeksforgeeks.org/difference-between-unicast-and-multicast/)**–**  
   These IP addresses mainly help to establish one-to-many communication. Multicast IP routing protocols are used to distribute data to multiple recipients. The class D addresses (224.0.0.0  to  239.255.255.255) define the multicast group.
4. [**Anycast addressing**](https://www.geeksforgeeks.org/introduction-of-anycast-routing/)**–**  
   In anycast addressing the data, a packet is not transmitted to all the receivers on the network. When a data packet is allocated to an anycast address, it is delivered to the closest interface that has this anycast address.