**IP ADDRESS:**

An **Internet Protocol (IP) address** is the unique identifying number assigned to every device connected to the internet. An IP address definition is a numeric label assigned to devices that use the internet to communicate. Computers that communicate over the internet or via local networks share information to a specific location using IP addresses.

IP addresses have two distinct versions or standards. The Internet Protocol version 4 (IPv4) address is the older of the two, which has space for up to 4 billion IP addresses and is assigned to all computers. The more recent Internet Protocol version 6 (IPv6) has space for trillions of IP addresses, which accounts for the new breed of devices in addition to computers. There are also several types of IP addresses, including public, private, [static, and dynamic IP addresses](https://www.fortinet.com/resources/cyberglossary/static-vs-dynamic-ip).

Every device with an internet connection has an IP address, whether it's a computer, laptop, IoT device, or even toys. The IP addresses allow for the efficient transfer of data between two connected devices, allowing machines on different networks to talk to each other.

### **How does an IP address work?**

An IP address works in helping your device, whatever you are accessing the internet on, to find whatever data or content is located to allow for retrieval.

Common tasks for an IP address include both the identification of a host or a network, or identifying the location of a device. An IP address is not random. The creation of an IP address has the basis of math. The Internet Assigned Numbers Authority (IANA) allocates the IP address and its creation. The full range of IP addresses can go from 0.0.0.0 to 255.255.255.255.

With the mathematical assignment of an IP address, the unique identification to make a connection to a destination can be made.

## **What is a port?**

A port is a virtual point where network connections start and end. Ports are software-based and managed by a computer's operating system. Each port is associated with a specific process or service. Ports allow computers to easily differentiate between different kinds of traffic: emails go to a different port than webpages, for instance, even though both reach a computer over the same Internet connection.

## **What is a port number?**

Ports are standardized across all network-connected devices, with each port assigned a number. Most ports are reserved for certain [protocols](https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/) — for example, all [Hypertext Transfer Protocol (HTTP)](https://www.cloudflare.com/learning/ddos/glossary/hypertext-transfer-protocol-http/) messages go to port 80. While [IP addresses](https://www.cloudflare.com/learning/dns/glossary/what-is-my-ip-address/) enable messages to go to and from specific devices, port numbers allow targeting of specific services or applications within those devices.

## **How do ports make network connections more efficient?**

Vastly different types of data flow to and from a computer over the same network connection. The use of ports helps computers understand what to do with the data they receive.

Suppose Bob transfers an MP3 audio recording to Alice using the File Transfer Protocol (FTP). If Alice's computer passed the MP3 file data to Alice's email application, the email application would not know how to interpret it. But because Bob's file transfer uses the port designated for FTP (port 21), Alice's computer is able to receive and store the file.

Meanwhile, Alice's computer can simultaneously load HTTP webpages using port 80, even though both the webpage files and the MP3 sound file flow to Alice's computer over the same WiFi connection.

**MAC ADDRESS:**

* MAC address is the physical address, which uniquely identifies each device on a given network. To make communication between two networked devices, we need two addresses: **IP address and MAC address.** It is assigned to the NIC (Network Interface card) of each device that can be connected to the internet.
* It stands for **Media Access Control**, and also known as **Physical address, hardware address, or BIA (Burned In Address).**
* It is globally unique; it means two devices cannot have the same MAC address. It is represented in a hexadecimal format on each device, such as **00:0a:95:9d:67:16.**
* It is 12-digit, and 48 bits long, out of which the first *24 bits are used for* ***OUI****(Organization Unique Identifier),* and *24 bits are for NIC/vendor-specific.*
* It works on the data link layer of the OSI model.
* It is provided by the device's vendor at the time of manufacturing and embedded in its NIC, which is ideally cannot be changed.
* The **ARP protocol** is used to associate a logical address with a physical or MAC address