

What is an IP Address?

An **IP address** is a **unique number** assigned to every device in a network. It helps in **identifying** and **locating** devices.

👉 Example:

192.168.1.1 — looks like this (used in local networks)

It works like:

- **House Address** → Helps the postman deliver a letter to your house.
- **IP Address** → Helps the internet deliver data to your device.

Types of IP (Based on Version)

There are **two main versions** of IP:

- ◆ **IPv4 (Internet Protocol version 4)**
- Oldest and most common version.
- Uses **32-bit** address.
- Written as 4 numbers separated by dots → example: 192.168.1.10
- Each number (called **octet**) ranges from 0 to 255.
- Total possible addresses: **4.3 billion**

✓ Example: 192.168.1.1, 10.0.0.5

◆ **IPv6 (Internet Protocol version 6)**

- New version developed because IPv4 addresses are running out.
- Uses **128-bit** address (many more addresses!).
- Written in hexadecimal (a–f + numbers).
- Example: 2001:0db8:85a3:0000:0000:8a2e:0370:7334
- Provides **security, faster routing, and more scalability.**

🏠 4. Types of IP (Based on Usage)

◆ **Private IP**

- Used **inside a local network** (like at home, office, school).
- Cannot be accessed directly from the internet.
- Example: 192.168.x.x, 10.x.x.x, 172.16.x.x – 172.31.x.x

👉 Used for: Computers, Wi-Fi routers, printers, etc.

◆ **Public IP**

- Used **to connect to the Internet.**
- Given by your **ISP (Internet Service Provider)**.
- Example: 103.25.231.55

👉 Used by: Websites, servers, or your router's external connection.

◆ Static IP

- IP that **does not change**.
- Used for **servers, CCTV, websites, etc.**
- Assigned manually.

◆ Dynamic IP

- IP that **keeps changing** automatically by **DHCP**.
- Used for **normal users** and home connections.

✿ Classes of IP (IPv4)

When IPv4 was first made, addresses were divided into **5 classes (A to E)** to organize networks based on their **size** (number of hosts).

Class	Range (1st Octet)	No. of Networks	Hosts per Network	Example	Used For
A	1 – 126	128	16 million	10.0.0.1	Very large networks (e.g., big companies, ISPs)
B	128 – 191	16,384	65,000	172.16.0.1	Medium-sized networks (e.g., universities)
C	192 – 223	2 million+	254	192.168.1.1	Small networks (homes, offices)
D	224 – 239	—	—	—	Used for Multicasting
E	240 – 255	—	—	—	Experimental / Research use

⚠ Note:

- 127.x.x.x is reserved for **loopback (testing)** — like 127.0.0.1
- Private IP ranges exist inside A, B, and C classes.

🎯 Why IP Classes Were Made

The **IP classes** were created to:

1. **Organize networks** of different sizes.
 - Big companies need many IPs → Class A.
 - Medium → Class B.
 - Small → Class C.
2. **Simplify routing** — routers could easily identify the network size.
3. **Efficient allocation** of IP addresses.

However, class-based system caused **wastage of IPs** (for example, a Class A network gives millions of IPs even if company needs only 10,000).

So now we use **CIDR (Classless Inter-Domain Routing)** — which gives more flexible subnetting.