

Private IP Addresses (Local/Internal Use)

Definition:

A **private IP address** is used **within a private network** (like home, office, school). These addresses **cannot be accessed directly from the internet**. They are designed for **internal communication** only.

Used For:

- Connecting devices inside the same LAN
- Example: PC to printer, phone to router, file sharing between computers
- Assigning IPs using DHCP in routers
- NAT (Network Address Translation) converts private IPs to public for internet access

Key Characteristics:

- Not routable on the internet
- Must be translated to a public IP (via NAT) to access websites
- Free to use (no registration or cost)

Private IP Ranges (Defined by RFC 1918):

IP Class	Range	Total IPs	Example
Class A	10.0.0.0 - 10.255.255.255	~16 million	10.0.0.5
Class B	172.16.0.0 - 172.31.255.255	~1 million	172.16.100.50
Class C	192.168.0.0 - 192.168.255.255	~65,000	192.168.1.1

These IPs are **used only inside networks**, like your **Wi-Fi at home**. For example:

- **Router IP:** 192.168.0.1
- **Your PC:** 192.168.0.10
- **Your Phone:** 192.168.0.11

All are private and communicate inside the network.

Public IP Addresses (Global/Internet Use)

Definition:

A **public IP address** is assigned by **ISPs (Internet Service Providers)**. It is **globally unique** and used to **identify your device on the internet**.

Used For:

- Hosting websites, servers, services
- Accessing the internet from your home or business
- Devices like web servers, DNS servers, etc.

Key Characteristics:

- Routable on the internet
- Must be globally unique
- Assigned by regional internet registries (e.g., APNIC, ARIN, RIPE)

Examples of Public IPs:

Type	IP Address	Description
Google DNS	8.8.8.8	Public DNS server by Google
Facebook	157.240.22.35	Public IP of Facebook.com
Your home	39.57.200.50	Assigned by your ISP for internet use

Your **Wi-Fi router** gets a **public IP** from your ISP. Inside your home, all devices use private IPs, but they connect to the internet using the router's **public IP** via NAT.

Key Differences: Private IP vs Public IP

Feature	Private IP	Public IP
Visibility	Only within local network	Visible on the internet
Accessibility	Not accessible from outside	Accessible from anywhere
Assigned by	Your router (or manually)	ISP or network provider
Example	192.168.1.10, 10.0.0.5	8.8.8.8, 142.250.190.78
Cost	Free to use	May require payment (ISP assigned)
Routable over Internet	❌ No	✅ Yes
Used For	LAN communication, internal setups	Web hosting, internet communication

Simple Real-Life Example:

Home Network Example

- **Router's Public IP:** 39.57.200.50 (assigned by ISP)
- **Inside your home:**
 - PC → 192.168.0.10
 - Phone → 192.168.0.11
 - Printer → 192.168.0.12
 - All these use **private IPs**, and your **router uses NAT** to allow them to share the single public IP to access the internet.

Why It Matters (Especially for CCNA and Network Engineers):

- Private IPs are critical for **network design and scalability**
- Understanding **NAT** and **IP addressing** is essential for real-world setups
- IPv4 address space is limited, so private IPs help save global address space
- Helps configure routers, firewalls, DHCP, VPNs, and more

Class A (0-127) Class-B (128-191) Class-C (192-223)

10.0.0.0/8	*In Class C 256 private
10.0.0.1/8	
10.0.0.2/8	
...	
10.0.0.255/8	
...	
10.255.255.255/8	
1 → Total = 16777216	
	Total = 65536 private address
192.168.0.0/24	
192.168.0.255/24	
192.168.1.0/24	
192.168.1.255/24	
...	
192.168.255.255/24	

In Class B 16 network are private.
16-31

172.16.0.0/16	
172.16.0.1/16	
172.16.0.255/16	
172.16.1.0/16	
...	
172.16.255.255/16	

$\therefore 16 \times 2^{16} = 1048576$
address

Subnetting:-

Subnetting mean Create small network from one block.

* Subnetting is important for to save the wastage of IP address.

