

IP Addresses in AWS

In AWS, **IP addresses** play a crucial role in managing communication between resources, such as instances, load balancers, and databases. Here's an overview of the key IP types and their uses in AWS:

Types of IP Addresses in AWS

1. Private IP Address:

- Assigned to an instance within a Virtual Private Cloud (VPC).
- Used for internal communication between resources in the same VPC or on-premises network (via VPN or Direct Connect).
- Private IPs are retained when the instance is stopped and restarted.
- Format: IPv4 or IPv6, depending on VPC configuration.

2. Public IP Address:

- Automatically assigned to instances launched in a public subnet (optional for private subnets).
- Used for internet access or external communication.
- Released when an instance is stopped and restarted unless it is associated with an Elastic IP.

3. Elastic IP Address (EIP):

- A static, public IPv4 address that you can allocate and associate with an instance.
- Persistent across instance restarts.
- Useful for applications requiring consistent public endpoints.

4. Elastic Network Interface (ENI) IPs:

- Each ENI can have multiple IP addresses (primary and secondary).
- Useful for hosting multiple applications or creating fault-tolerant architectures.

5. IPv6 Address:

- Supported in VPCs for dual-stack configurations (IPv4 and IPv6).
- Globally unique and does not require NAT for internet access.
- Format: xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx.

Key Concepts and Features

1. Primary and Secondary IPs:

- Each network interface has a primary private IP, and you can add secondary private IPs.
- Useful for hosting multiple websites or applications on a single instance.

2. Elastic IPs and High Availability:

- An Elastic IP can be remapped to another instance in case of failure, ensuring high availability.
- Best practices include releasing unused Elastic IPs to avoid costs.

3. IP Addressing in Subnets:

- Each subnet is associated with a CIDR block (e.g., 10.0.0.0/24).
- IPs within the CIDR block are allocated dynamically to instances.

4. **Public and Private Subnets:**

- Instances in a **public subnet** can communicate with the internet directly using public IPs.
- Instances in a **private subnet** need a NAT Gateway or NAT instance for internet access.

5. **Route 53 and Elastic IPs:**

- You can associate an Elastic IP with a domain name using Amazon Route 53 for easy access.

Monitoring and Troubleshooting

- Use **Amazon VPC Flow Logs** to monitor IP traffic.
- Check **security groups** and **network ACLs** for IP-specific rules.
- Use **ping** and **traceroute** for debugging connectivity issues.