IP

What is IP Address?

An IP address is a unique number assigned to every device connected to a network. It works like a home address, telling the network where data should be delivered.

IPv4 (Internet Protocol Version 4)

IPv4 is the 4th version of the Internet Protocol and the most widely used.

Format

- **32-bit address**
- Written as: **192.168.1.10**
- Contains **4 numbers** (0–255 each)

Total Addresses

- **4.3 billion**

Problem

These addresses are running out because the number of internet devices has exploded.

IPv6 (Internet Protocol Version 6)

IPv6 is the **newer, advanced version** created to replace IPv4.

Format

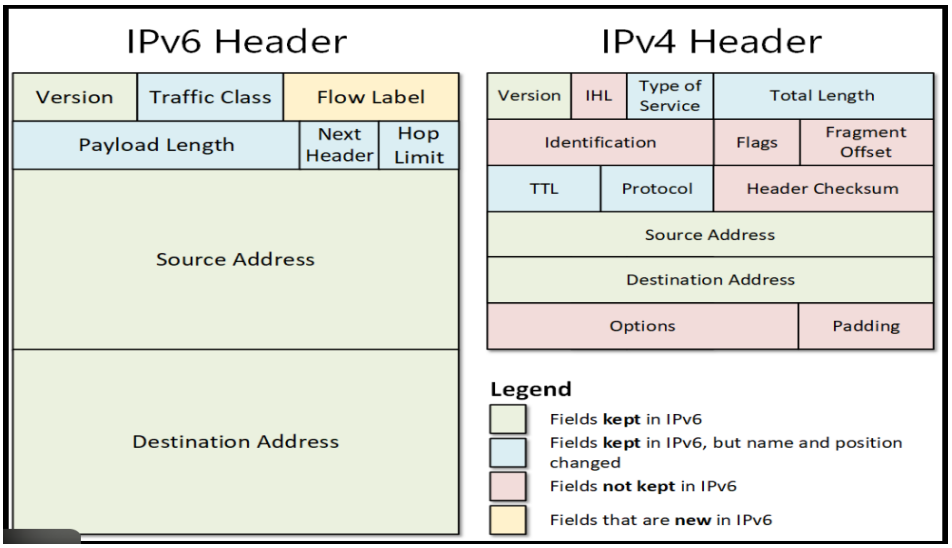
- **128-bit address**
- Example: **2001:0db8:85a3:0000:0000:8a2e:0370:7334**

Total Addresses

- 340 undecillion addresses
  (Literally enough for every device forever)

Benefits

- Faster routing
- More security features
- Supports an unlimited number of devices
- No need for NAT in many cases



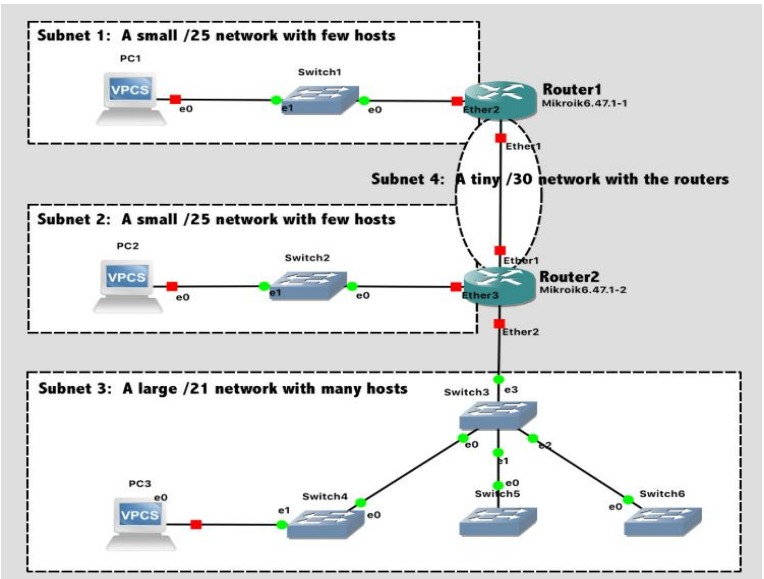
IPV4 Vs IPV6

What is Subnet ?

A **subnet (sub-network)** is a smaller network created **inside a larger network**. Subnetting helps divide a big network into smaller, manageable sections.

Why Subnetting is Used

1. Better performance
2. Better security
3. Efficient IP usage
4. Reduces network traffic
5. Helps organize devices



What Is Network Address Translation (NAT)?

NAT is a technique where a **router** converts **private IP addresses** into a **public IP address** when sending data to the internet.

Why Needed?

Because:

- **Private IPs cannot access the internet directly**
- We have fewer **public IPv4** addresses
- NAT saves millions of public IPs