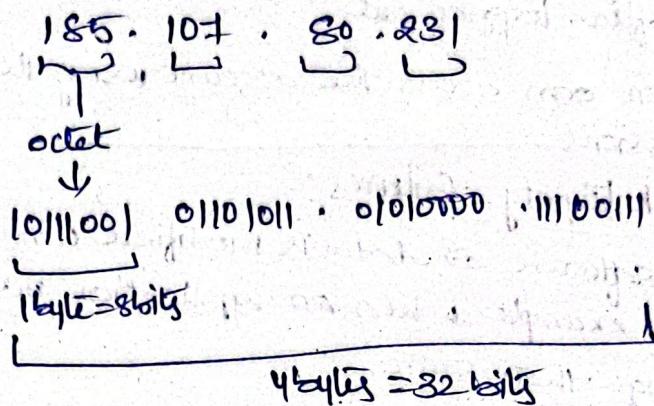


## IPv4:

The IPv4 is the fourth version of the Internet protocol used to identify devices on a network using 32-bit numerical address. It helps in sending and receiving data between devices over the Internet.

- \* It uses 32-bit address which allows about 4.3 billion unique address.

### IPv4 Address Format



- \* The IPv4 addresses are written in decimal format with dots (for example: 185.107.80.23)

- \* Each device on a network must have a unique IPv4 address to communicate.

- \* The IPv4 helps in routing data packets from source to destination.

- \* When the data is sent in the form of packets each containing source and destination IP address.

- \* Due to limited address, IPv4 often uses NAT (Network Address Translation).

- \* The IPv4 supports unicast, broadcast and multicast communication.

- \* The IPv4 is simple and widely used and still forms the base of most internet networks.

## IPv6:

The IPv6 (Internet Protocol Version 6) is the latest version of the Internet protocol that uses 128-bit addressing to uniquely identify the devices on a network and enable secure effective communication over the internet.

- \* It is the newer version of IP addressing.
- \* It uses a 128 bit address which provides a very large number of unique addresses.

2001:0DB8:0004:0001:0000:0000:0000:FO0A

16 bits 16 bits : 16 bits

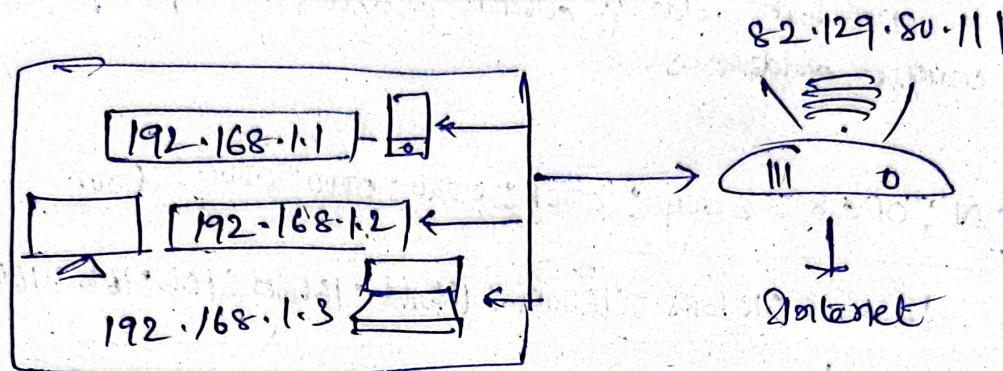
128 bits

- \* The IPv6 addresses are written in hexadecimal format and separated by colons for example: 2001:db8::1
- \* The IPv6 was introduced to solve the address shortage problem of IPv4.
- \* It allows direct communication between devices without using NAT.
- \* The IPv6 supports automatic address configuration making network setup easier.
- \* It has built-in security features such as IPsec.
- \* The IPv6 uses a simpler header structure, which improves routing efficiency.
- \* The IPv6 uses a simpler design for modern networks including mobile devices and IoT.

## Public IP Address

It is an IP Address that is assigned by an Internet Service provider and used to Identify a device directly on the Internet.

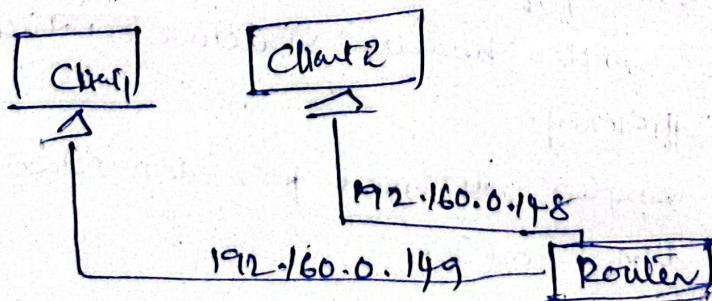
### public vs private



- \* The public IP addresses are globally unique.
- \* They allow devices to communicate over the Internet.
- \* The public IPs are assigned by ISPs.
- \* They can be accessed by from anywhere on the Internet.
- \* The IP addresses are limited in number.

## Private IP Address

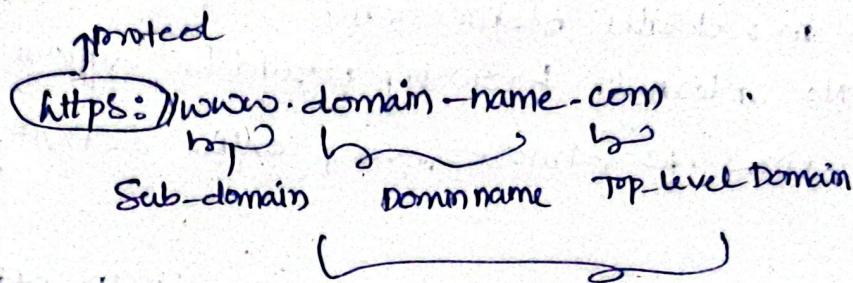
- \* The IP addresses are used in home, office and college networks.
- \* They are assigned by owners or local administrators.



- \* The private IPs cannot be accessed directly from the Internet.
- \* The same private IP ranges can be reused in different networks.
- \* Common IP private ranges include 192.168.x.x, 10.x.x.x, and 172.16.x.x.

## Domain Name & Domain Structure:

The domain name is a human-readable name used to identify a website on the internet and the domain structure shows how domain names are organized in a hierarchical manner.



Root Domain (what you can register)

- \* The domain names are used instead of remembering IP addresses.
- \* It makes websites addresses into different levels.
- \* The rightmost part is called the Top-level domain (TLD).
- \* Common TLDs include .com, .org, .edu, .in.
- \* The middle part is the Second-level Domain usually the website name.
- \* Subdomains are optional and appear on the left side.
- \* The domain structure follows a hierarchical tree format.
- \* Each domain is unique on the internet.

Eg:

www.college.edu,

edu is the top-level domain, college is the main domain name and www is subdomain.

## Importance of DNS:

The DNS (Domain Name System) is a system that translates domain names into IP addresses so that computers can locate websites on the internet.

- \* It converts domain names into IP addresses.
- \* It removes the need to remember numerical IPs.

- \* The DNS works like a phonebook of the internet.
- \* It helps browsers find the correct server.
- \* The DNS makes internet usage faster and easier.
- \* It supports load balancing and reliability.
- \* The DNS helps in website redirection.
- \* Without DNS, internet browsing would be difficult.
- It DNS is essential for almost every online activity.

Eg:

When you type www.google.com, DNS finds the its IP address and connects your browser to Google Server's.

Port

The port is a numerical identifier used in computer networking to specify which service or application should receive the incoming or outgoing data on a device.

- \* The port works along with an IP address to identify a service.
- \* It ports work together with IP addresses to deliver data correctly.
- \* One device can use multiple ports to run different services at the same time.
- \* The port numbers range from 0 to 65535.
- \* The common services use standard ports, such as HTTP(80) and HTTPS(443).

Eg:

When you open a website in a browser your computer connects to the server's IP address using port 80 (HTTP) or port 443 (HTTPS).  
 → This port number tells the server that the request is for web page data, not for email or file transfer.

## Protocol :

- \* The protocol is a set of rules that defines how data is sent and received over a network.
- \* The protocol ensure that devices understand each other during communication.
- \* The different protocols are used for different types of services.
- \* It protocols controls data format, timing and error handling.
- \* Without protocols, network communication would not be possible.

Eg :

When you open a website your browser uses the HTTP or HTTPS protocol to request and receive web pages from the server.