

Understanding IPv4 Network Network Addressing, Subnet Subnet Masks, Default Gateway & DNS

A guide to the fundamental concepts that power power internet connectivity and network communication.

What is an IPv4 Address?

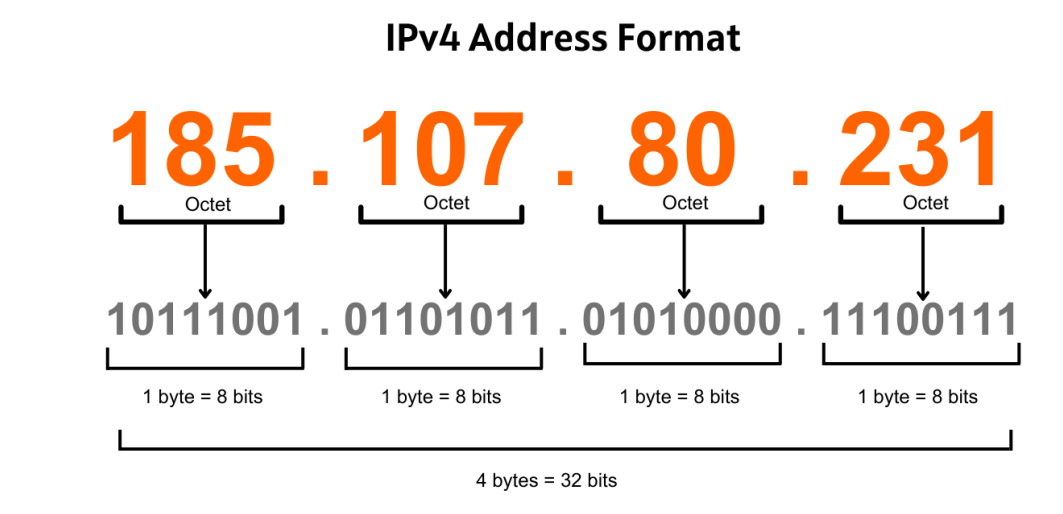
A unique 32-bit number assigned to every device on a network.

Written as four decimal numbers (octets) separated by dots, e.g., **192.168.0.1**.

Like a phone number for your device, enabling it to send and receive data.



Anatomy of an IPv4 Address



An IPv4 address consists of of two critical parts that work together to route data data correctly:

1

Network ID

Identifies the network your device belongs to

In our example **192.168.1**.10, the first three octets **(192.168.1**) represent the network portion

2

Host ID

Identifies the specific device on that network

In our example 192.168.1.**10**, the final octet (**10**) (**10**) identifies the unique device

This division allows networks to be organized hierarchically and enables efficient routing.

What is a Subnet Mask?

A 32-bit number that separates the network portion from the host portion of an IP address.

Written like an IP address, e.g., **255.255.255.0** (also called a **/24** mask).

Determines which devices are on your local network and which are outside it.

The mask is applied through a bitwise AND operation with the IP address to extract the network ID.



How Subnet Masks Work: Example

IP Address

192.168.1.10

Binary: 11000000.10101000.00000001.00001010

Subnet Mask

255.255.255.0

Binary: 11111111.11111111.11111111.00000000

The mask's 255 octets mean those parts of the IP are fixed network bits. When applied:



Network Portion

192.168.1.0



Host Range

Devices from 192.168.1.1 to 192.168.1.254



Direct Communication

All devices in 192.168.1.x can talk directly

DNS Settings: Translating Translating Names to IPs IPs

What is DNS?

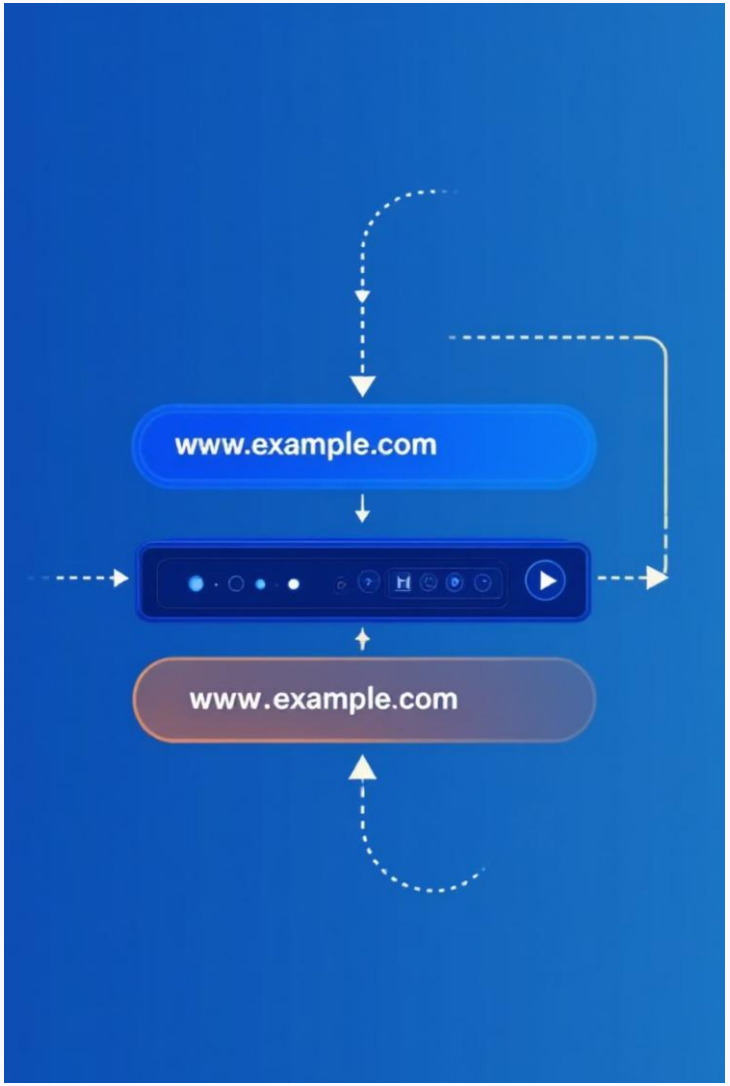
DNS (Domain Name System) servers convert human-human-friendly domain names (like www.google.com) www.google.com) into IP addresses computers can can understand.

How Your Device Uses DNS

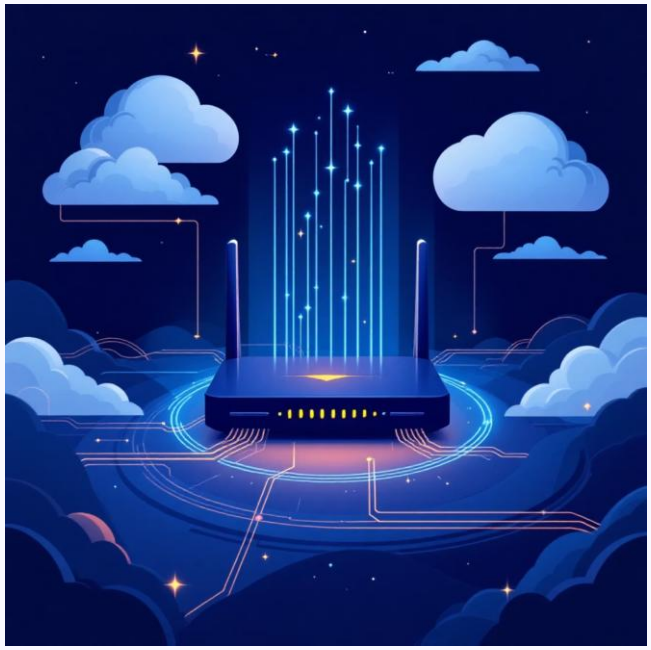
Before connecting to a website, your device queries queries DNS servers to find the corresponding IP corresponding IP address.

DNS Server Configuration

DNS IPs are often provided by your ISP or set set manually (e.g., 8.8.8.8 for Google DNS).



Default Gateway: Your Network's Exit Door



The **default gateway** is the IP address of the router that router that connects your local network to other networks, including the internet.

When your device wants to reach outside its subnet, it subnet, it sends data to the default gateway.

Example: Router IP **192.168.1.1** is typically the default default gateway for devices on the 192.168.1.x subnet. subnet.

Without a default gateway configured, your device would device would be limited to communicating only with with devices on its local subnet.

Putting It All Together: How Your Device Communicates

Your device relies on four key networking components to communicate effectively:

IP Address

e.g., **192.168.1.10**

Your device's unique identifier on the network

Subnet Mask

e.g., **255.255.255.0**

Defines your local network boundary

Default Gateway

e.g., **192.168.1.1**

Router that connects to outside networks

DNS Servers

e.g., **8.8.8.8**

Translates domain names to IP addresses

Local traffic goes directly to devices on the same subnet, while external traffic is routed through the default gateway with DNS resolving domain names.

Visualizing Network Communication

Local Communication

Devices with IPs 192.168.1.x communicate directly with each other without going through the gateway

Internet Access

Traffic destined for external networks (like the internet) is routed through the default gateway (192.168.1.1)

Domain Resolution

DNS servers convert domain names to IP addresses so your browser can connect to websites

