

## What is DNS?

**DNS (Domain Name System)** is like the **phonebook of the internet**.

Humans use domain names like:

[www.google.com](http://www.google.com)

But computers communicate using IP addresses like:

142.250.193.78

**DNS translates (resolves) domain names into IP addresses**, so your browser can connect to the correct server.

## How DNS Works – Step-by-Step

### 1. User Enters a URL

You type [www.google.com](http://www.google.com) into your web browser.

### 2. Browser Checks Cache

Your browser and system first **check their local DNS cache**.

If the IP is already known, it skips the rest and connects.

### 3. Request Sent to DNS Resolver (Recursive Resolver)

If it's **not cached**, the request goes to your ISP's **DNS resolver** (also called **recursive resolver**).

This server's job: **find the IP address for the domain**.

### 4. Resolver Contacts Root DNS Server

The resolver asks the **root DNS server**:

"Where can I find .com domains?"

Root server responds:

"Ask the **TLD server** for .com domains."

### 5. Resolver Contacts TLD Server

The resolver asks the **TLD (Top-Level Domain) server** for .com:

"Where is google.com?"

TLD responds with the address of the **authoritative name server** for google.com.

## 6. Resolver Contacts Authoritative DNS Server

This **authoritative server** knows the actual IP of [www.google.com](http://www.google.com).

It replies:

["www.google.com = 142.250.193.78"](http://www.google.com = 142.250.193.78)

## 7. Resolver Returns the IP

The resolver gives the IP address to your **browser**.

## 8. Browser Connects to the Website

Your browser now uses the IP address to **contact the website's server** and load the page.

## Visual Summary:

You → Browser → Local Cache → DNS Resolver → Root Server → TLD Server → Authoritative Server → IP Address → Website

## Types of DNS Servers Involved

### Server Type              Role

**DNS Resolver**              Asks others, collects answer (used by ISP)

**Root Server**              Directs to correct TLD (.com, .net, etc.)

**TLD Server**              Knows where .com or .in domains are

**Authoritative Server** Final source of domain's IP address

## Real-Life Analogy

Think of DNS like asking a librarian for a book:

1. You give the name of the book (domain)
2. She checks her references (DNS servers)
3. She finds the shelf number (IP address)

4. You go to the shelf and pick the book (connect to website)

### **Bonus: What is DNS Caching?**

To speed things up, DNS results are **stored temporarily** in:

- Your **browser**
- Your **OS (like Windows/macOS)**
- Your **router**
- Your **ISP**

So the next time you visit the same site, the system can **skip DNS lookup** and connect directly.