

Domain Name System (DNS)

Last Updated : 15 Feb, 2025



The Domain Name System (DNS) translates human-readable domain names (e.g., `www.google.com`) into machine-readable IP addresses (e.g., `142.250.190.14`), enabling internet communication

- It enables computers to locate and communicate with each other on the internet.
- Functions as a **hierarchical, distributed database**.
- Queries pass through multiple levels:
 - **Root server**
 - **Top-Level Domain (TLD) server**
 - **Authoritative server** (stores the specific IP address).
- Ensures seamless website access using easy-to-remember names instead of numerical IP addresses.

How Does DNS Work?

- When we type a website like <https://www.geeksforgeeks.org> in our browser, our computer tries to find the IP address.
- First, it checks the local cache (our browser, operating system, or router) to see if it already knows the IP address.
- If the local cache doesn't have the IP, the query is sent to a DNS resolver to find it.
- DNS resolver may check host files (used for specific manual mappings), but usually, it moves on.
- Resolver sends the query to a Root DNS server, which doesn't know the exact IP address but points to the TLD server (e.g., .org server for this example).
- TLD server then directs the resolver to the authoritative nameserver for geeksforgeeks.org.
- Authoritative nameserver knows the exact IP address for geeksforgeeks.org and sends it back to the resolver.
- Resolver passes the IP address to our computer.

Types of Domain

There are various kinds of domains:

- **Generic Domains:** .com(commercial), .edu(educational), .mil(military), .org(nonprofit organization), .net(similar to commercial) all these are generic domains.
- **Country Domain:** .in (India) .us .uk
- **Inverse Domain:** if we want to know what is the domain name of the website. IP to domain name mapping. So DNS can provide both the mapping for example to find the IP addresses of geeksforgeeks.org then we have to type

Domain Name Server

The client machine sends a request to the local name server, which, if the root does not find the address in its database, sends a request to the root name server, which in turn, will route the query to a top-level domain (TLD) or authoritative name server. The root name server can also contain some **hostName** to IP address mappings. The Top-level domain (TLD) server always knows who the authoritative name server is. So finally the IP address is returned to the local name server which in turn returns the IP address to the host.

DNS Lookup

[DNS Lookup](#), also called DNS Resolution, is the process of translating a human-readable domain name (like `www.example.com`) into its corresponding IP address (like `192.0.2.1`), which computers use to locate and communicate with each other on the internet. It allows users to access websites easily using names instead of remembering numeric IP addresses.

- DNS Lookup starts when a user types a domain name into their browser.
- The query goes through a series of servers: the DNS resolver, Root server, TLD server, and authoritative server.
- Each server plays a role in finding the correct IP address for the domain.
- Once the IP address is found, the browser connects to the website's server and loads the page.

DNS Resolver

DNS Resolver is simply called a DNS Client and has the functionality for initiating the process of DNS Lookup which is also called DNS Resolution. By using the DNS Resolver, applications can easily access different websites and services present on the Internet by using domain names that are very much friendly to the user and that also resolves the problem of remembering IP Address.