

DNS, which stands for Domain Name System, is a fundamental technology used to translate human-readable domain names into machine-readable IP addresses. It acts as a distributed and hierarchical database that maps domain names to IP addresses, enabling us to access websites and other resources using familiar domain names instead of remembering numerical IP addresses.

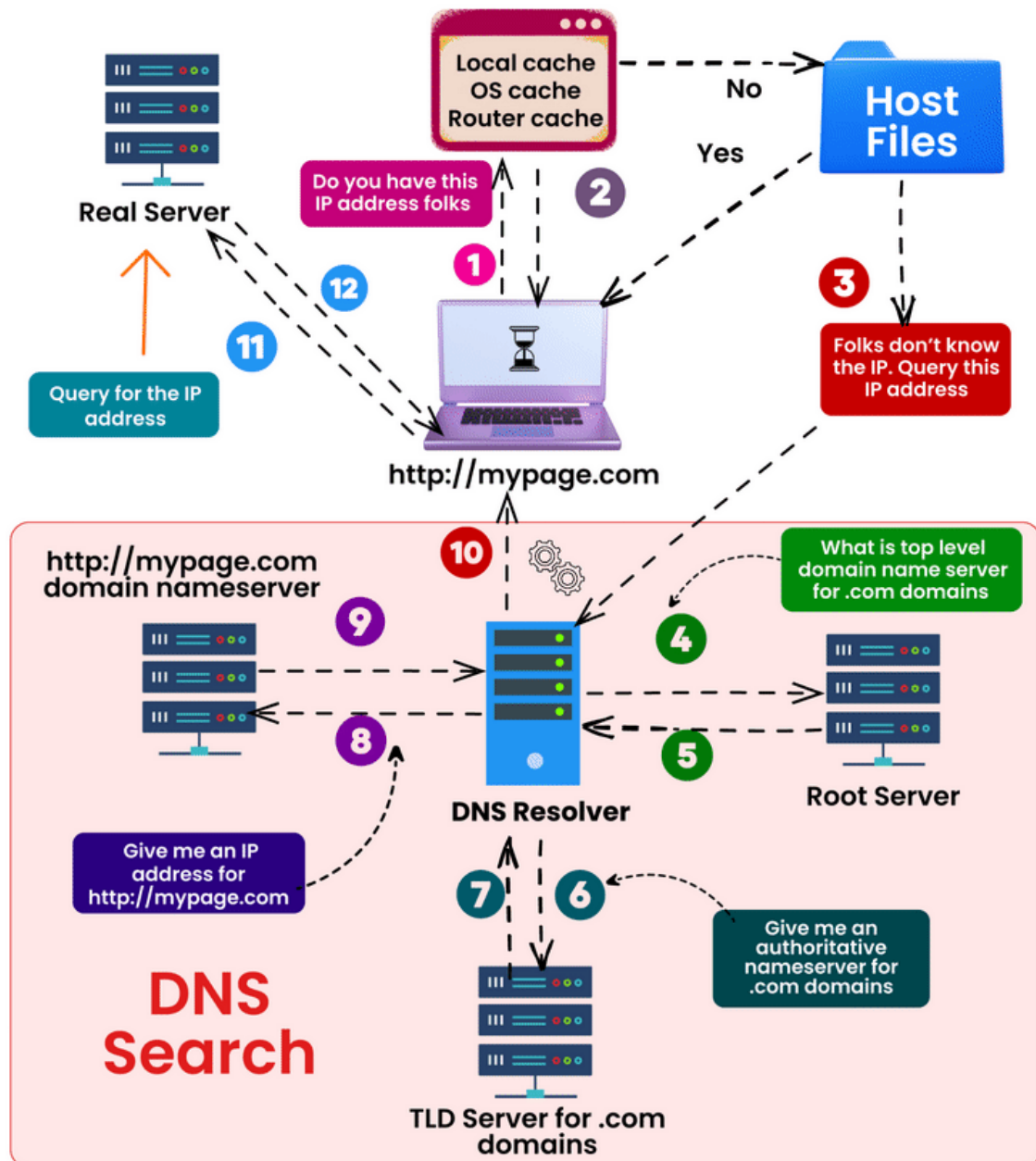
Here's an overview of how DNS works:

- **Request Initiation:**
 - When you enter a domain name (e.g., www.example.com) into your web browser or any other application that requires internet access, the first step is to resolve that domain name into an IP address. The application sends a DNS lookup request to a local DNS resolver.
- **Local DNS Resolver:**
 - The local DNS resolver is typically provided by your Internet Service Provider (ISP) or configured manually. It acts as a middleman between your application and the rest of the DNS infrastructure. The resolver maintains a cache to store recently resolved domain names and their corresponding IP addresses, which helps speed up future lookups.

HOW DNS WORKS



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- **Caching and Recursive Query:**
- The local DNS resolver first checks its cache to see if it already has the IP address for the requested domain name. If the information is present and hasn't expired, it returns the IP address to the requesting application, and the process is complete. This caching mechanism

reduces the need for repeated lookups and improves overall DNS performance.

- **DNS Resolution Process:**
 - If the local resolver doesn't have the IP address in its cache, it becomes responsible for finding the answer. It starts a recursive query process to resolve the domain name.
- **Root DNS Servers:**
 - The local resolver begins by contacting one of the 13 Root DNS servers. These servers are distributed worldwide and are the top-level of the DNS hierarchy. They store information about the authoritative name servers for top-level domains (TLDs) such as .com, .org, .net, etc.
- **TLD DNS Servers:**
 - The Root DNS server responds to the local resolver with the IP address of the TLD DNS server that manages the specific TLD of the requested domain (e.g., .com TLD server).
- **Authoritative DNS Servers:**
 - The local resolver then queries the TLD DNS server, which responds with the IP address of the authoritative DNS server for the requested domain (e.g., example.com). The authoritative DNS server is responsible for storing the actual DNS records for that domain.
- **DNS Record Retrieval:**
 - Finally, the local resolver queries the authoritative DNS server for the specific domain name's IP address. The authoritative DNS server replies with the correct IP address, which is then returned to the requesting application.
- **Caching the Result:**
 - The local resolver caches the IP address it received from the authoritative DNS server, so future queries for the same domain can be answered more quickly.
- **Data Transmission:**
 - With the IP address obtained from DNS resolution, the application can now establish a connection to the corresponding server and request the desired web page or resource.

This process occurs behind the scenes every time you access a website or use any internet resource that relies on DNS. It ensures that we can

use human-friendly domain names to access the vast and interconnected network of devices and servers that make up the internet.