Task #37121

Session: Web Hosting and DNS

DNS (Domain Name System)

DNS, or Domain Name System, is a decentralized naming system used to translate domain names (e.g., www.example.com) into IP addresses (e.g., 192.0.2.1) and vice versa. Here's a brief overview of DNS:

Mapping Domain Names to IP Addresses: DNS serves as the internet's address book, allowing users to access websites and other internet resources using easy-to-remember domain names instead of numeric IP addresses. It maps domain names to IP addresses, enabling computers to locate and communicate with each other on the internet.

Hierarchy and Distribution: DNS operates in a hierarchical and distributed manner, with multiple levels of servers organized into a tree-like structure. At the top of the hierarchy are the root DNS servers, followed by top-level domain (TLD) servers, domain name servers, and authoritative name servers. This hierarchical structure enables efficient and scalable resolution of domain names.

Resolution Process: When a user enters a domain name into a web browser, their device queries a DNS resolver to resolve the domain name to an IP address. The resolver starts by querying the root DNS servers, which direct it to the appropriate TLD server. The resolver then queries the authoritative name server for the specific domain to obtain the IP address associated with the domain name.

Caching and Time-to-Live (TTL): DNS resolvers cache DNS records to improve performance and reduce the load on DNS servers. DNS records contain a Time-to-Live (TTL) value, which specifies how long the record can be cached by resolvers. When a resolver receives a DNS query, it checks its cache first and only queries authoritative servers if the information is not available or has expired.

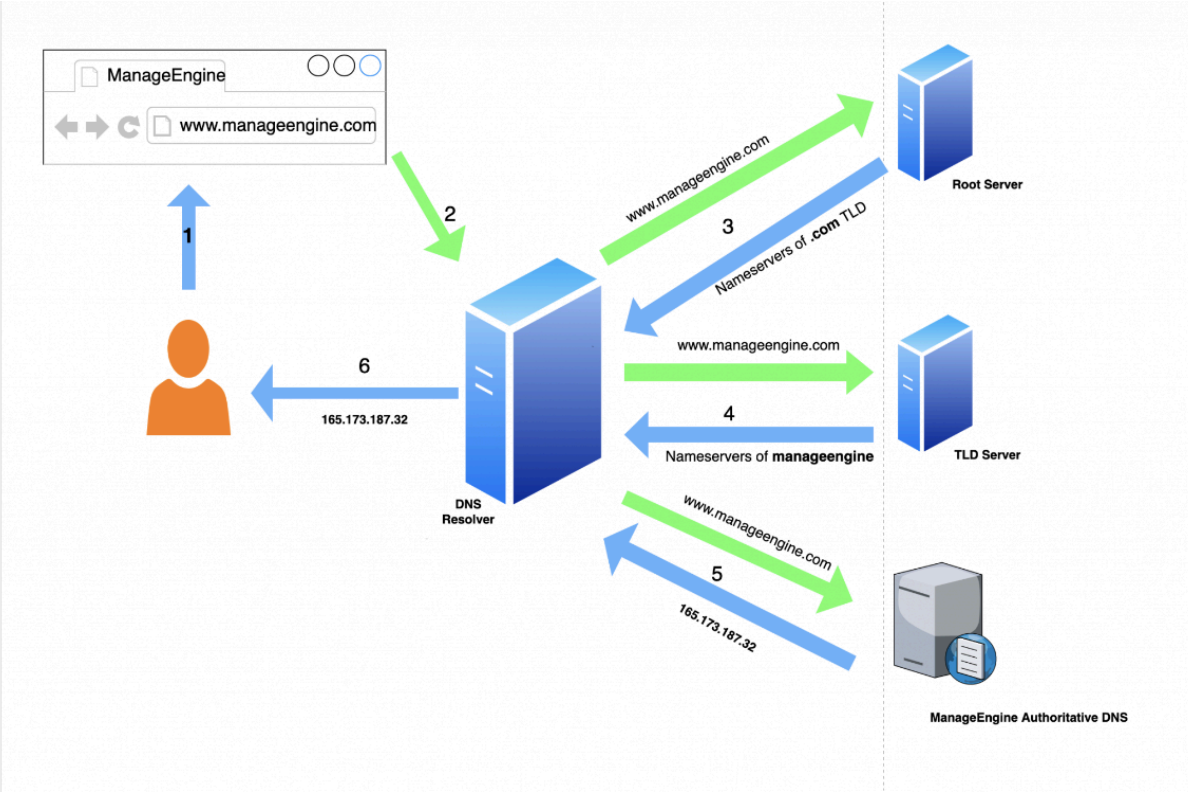
Types of DNS Records: DNS supports various types of records, each serving a different purpose. Common DNS record types include:

- A (Address) records: Maps domain names to IPv4 addresses.
- AAAA (IPv6 Address) records: Maps domain names to IPv6 addresses.
- CNAME (Canonical Name) records: Maps aliases (alternate domain names) to canonical domain names.
- MX (Mail Exchange) records: Specifies mail servers responsible for accepting email for a domain.
- NS (Name Server) records: Specifies authoritative name servers for a domain.

DNSSEC (DNS Security Extensions): DNSSEC is a set of extensions to DNS designed to add security features such as data integrity and authentication to DNS responses. It helps prevent DNS spoofing and cache poisoning attacks by providing mechanisms for validating the authenticity of DNS data

Decoding DNS lookups

The diagram given below explains how the users, DNS resolver, and Authoritative DNS are involved in the process of routing the website accessible on the internet.



1. The user types www.manageengine.com on the browser and hits enter.
2. The browser queries the DNS resolver to translate www.manageengine.com to an IP address. Generally, the DNS resolver caches the DNS records of queries that have been already translated to an IP address via the same resolver as before. The duration of this caching totally depends on the TTL (Time-to-live) configured on the DNS records. The DNS resolver returns the IP address if it has it in the cache, otherwise it will forward the query to the root server.
3. The root servers are maintained by ICANN (Internet Corporation for Assigned Names and Numbers). The root servers hold the nameservers details of the top-level domain (TLD), like .com, .eu, .org, etc. www.manageengine.com belongs to .com TLD, and the root server responds to DNS resolver with the nameservers of the .com domain.

4. The TLD servers are maintained by IANA (Internet Assigned Number Authority). The TLD server responds to the DNS resolver with details of authoritative nameservers for manageengine.com.
5. The DNS resolver forwards www.manageengine.com to the authoritative nameserver holding the DNS records of manageengine.com. The authoritative nameserver responds with the IP address of www.manageengine.com to the DNS resolver.
6. The DNS resolver forwards the final answer to the user and holds the record in the cache till TTL expires.