How does the Domain Name System (DNS) lookup work?

ALEX XU

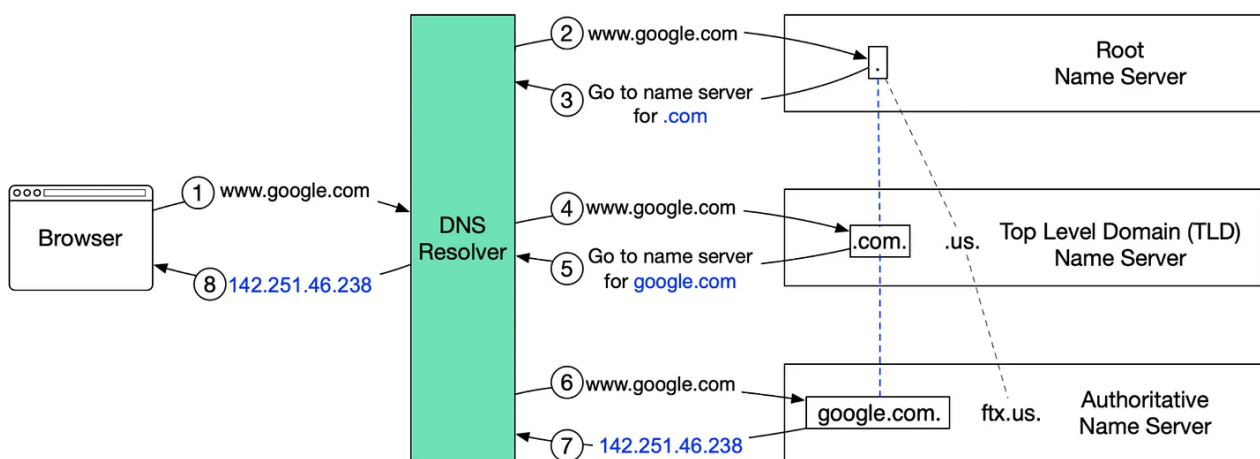FEB 10, 2022

♡ 41   💬 1   ⟳   Share   •••

How does the Domain Name System (DNS) lookup work?

DNS acts as an address book. It translates human-readable domain names (google.com) to machine-readable IP addresses (142.251.46.238).

To achieve better scalability, the DNS servers are organized in a hierarchical tree structure.

| How does DNS resolve IP

There are 3 basic levels of DNS servers:

1. Root name server (.). It stores the IP addresses of Top Level Domain (TLD) name servers. There are 13 logical root name servers globally.

2. TLD name server. It stores the IP addresses of authoritative name servers. There

are several types of TLD names. For example, generic TLD (.com, .org), country code
TLD (.us), test TLD (.test).

3. Authoritative name server. It provides actual answers to the DNS query. You can
register authoritative name servers with domain name registrar such as GoDaddy,
Namecheap, etc.

The diagram below illustrates how DNS lookup works under the hood:

1. google.com is typed into the browser, and the browser sends the domain name to
the DNS resolver.

2. The resolver queries a DNS root name server.

3. The root server responds to the resolver with the address of a TLD DNS server. In
this case, it is .com.

4. The resolver then makes a request to the .com TLD.

5. The TLD server responds with the IP address of the domain's name server,
google.com (authoritative name server).

6. The DNS resolver sends a query to the domain's nameserver.

7. The IP address for google.com is then returned to the resolver from the
nameserver.

8. The DNS resolver responds to the web browser with the IP address (142.251.46.238)
of the domain requested initially.

DNS lookups on average take between 20-120 milliseconds to complete (according to
YSlow).

If you enjoyed this post, you might like our system design interview books as well.

SDI-vol1: https://amzn.to/3tK0qQn

SDI-vol2: https://amzn.to/37ZisW9

---

41 Likes

1 Comment

Write a comment...

Ghost   May 24, 2022

Hi Alex, Could you also add info about recursive resolver and/or iterative resolver?

♡ LIKE   💬 REPLY   ⬆ SHARE   ...

© 2023 ByteByteGo · [Privacy](#) · [Terms](#) · [Collection notice](#)
[Substack](#) is the home for great writing