Networking Services

Intro to Network Services

Name Resolution

Name Resolution in Practice

Dynamic Host Configuration Protocol

Network Address Translation

VPNs and Proxies

IP address is 32 bits binary numbers (e.g. 10.10.1.1), which is hard to human read (Same to MAC address, 48 bit binary numbers)

Domain Name

The term we use for something that can be resolved by DNS

Domain Name System (DNS)

A global and highly distributed network service that resolves strings of letters into IP addresses for you

There are five primary types of DNS servers:

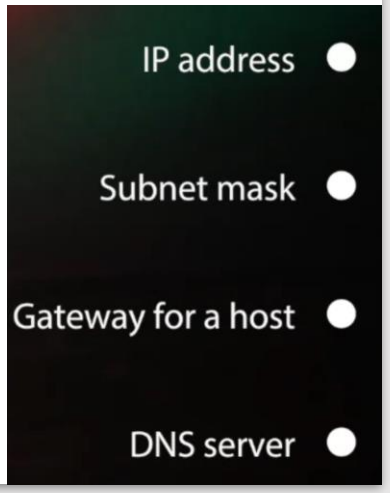
1: Caching name servers

2: Recursive name servers

3: Root name servers

4: TLD name servers

5: Authoritative name servers

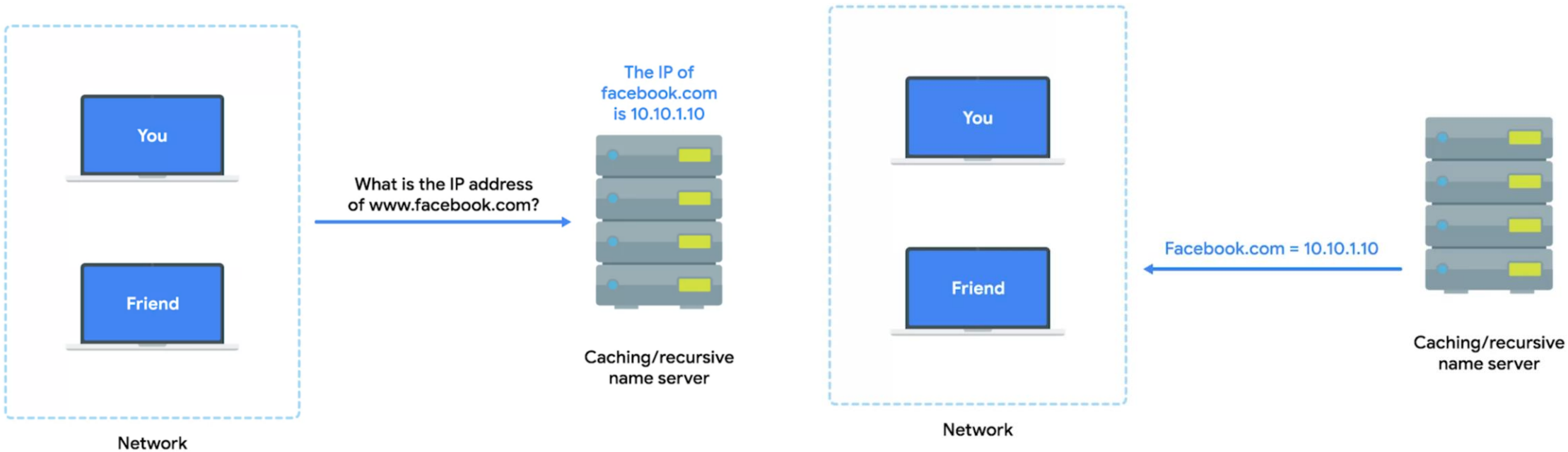


Recursive name servers

Perform full DNS resolution requests

Caching and recursive name servers

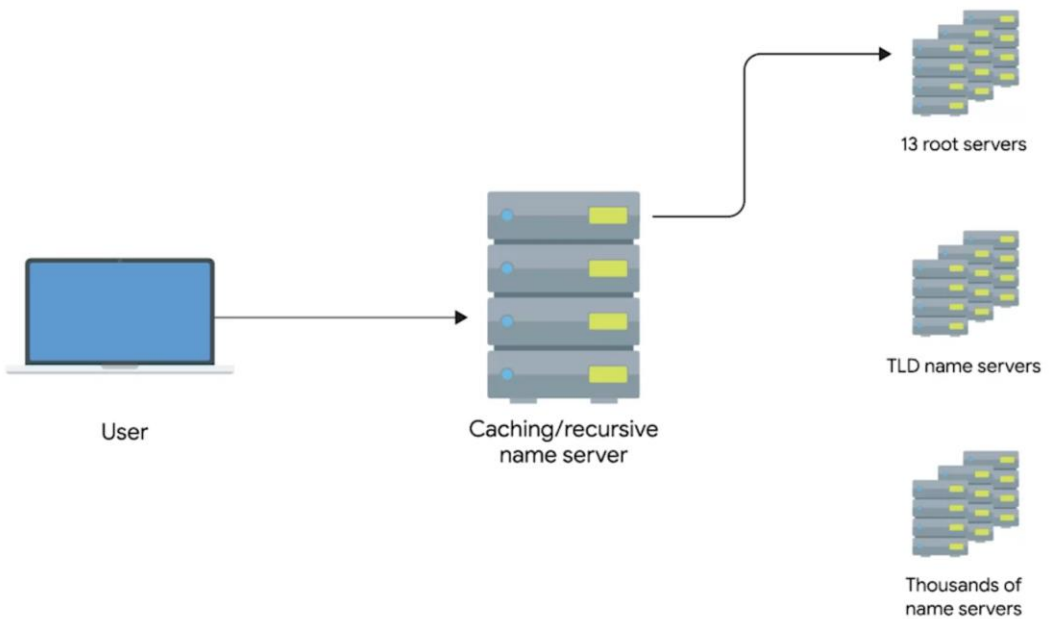
Purpose is to store known domain name lookups for a certain amount of time


You
Friend
Network
What is the IP address of www.facebook.com?
The IP of facebook.com is 10.10.1.10
Caching/recursive name server
You
Friend
Network
Facebook.com = 10.10.1.10
Caching/recursive name server

Time to live (TTL)

A value, in seconds, that can be configured by the owner of a domain name for how long a name server is allowed to cache an entry before it should discard it and perform a full resolution again

How to establish a recursive name resolution
1. Connect to 13 root name server (distributed across globe via anycast)

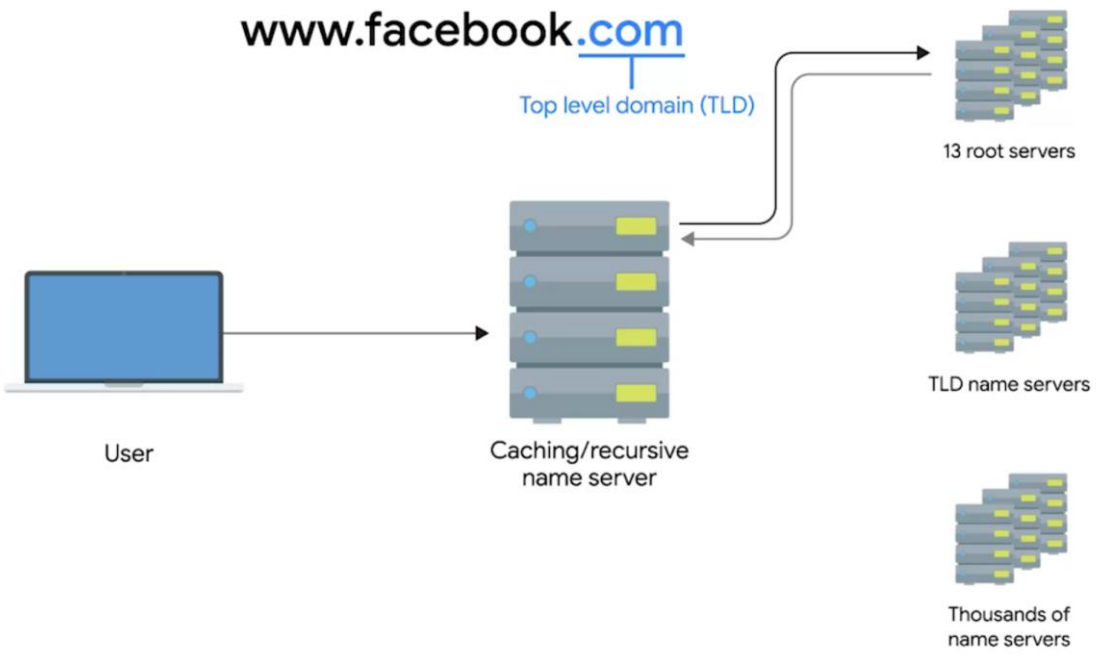


Anycast

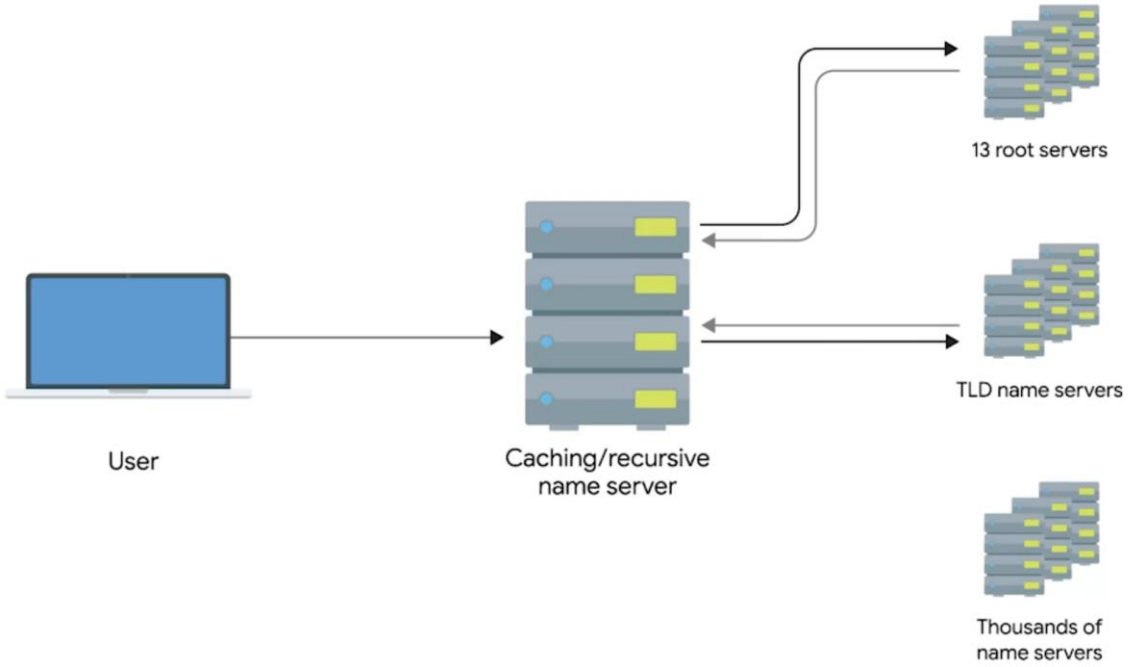
To a same IP address but actually route to different destination using parameters

A technique that's used to route traffic to different destinations depending on factors like location, congestion, or link health

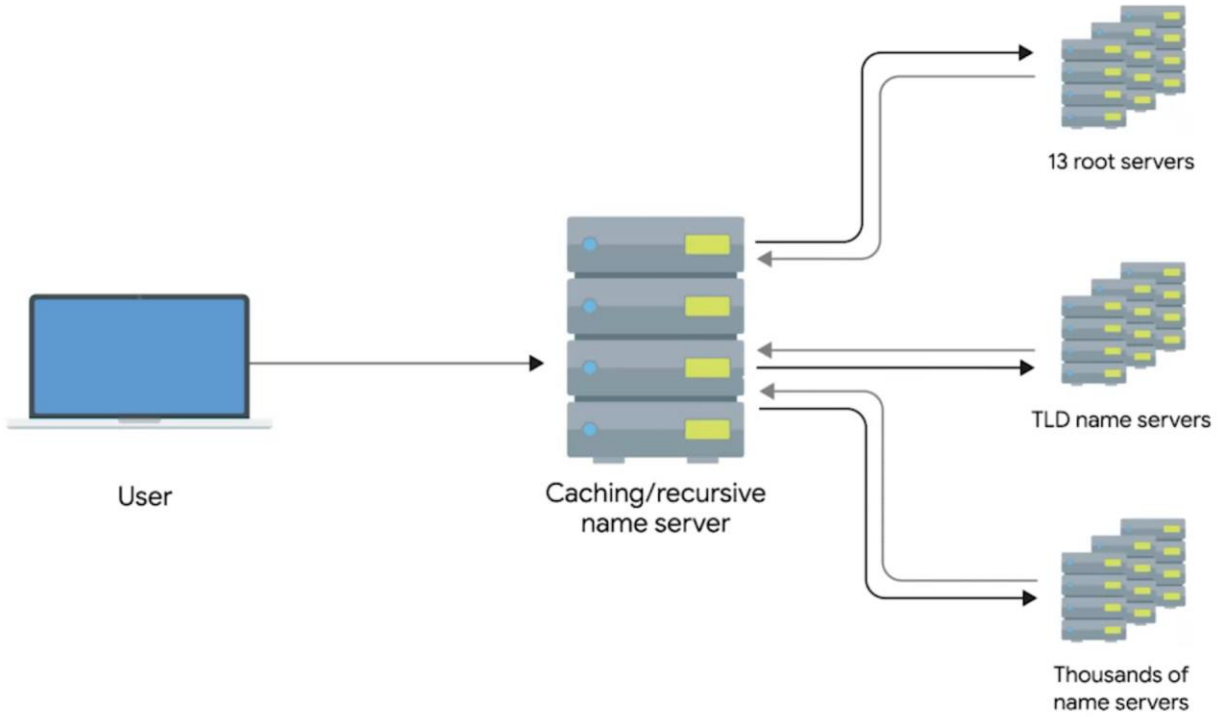
2. Root server return the information about what's the TLD (Top Level Domain) server it should look for



3. TLD server returns the name lookup with what authoritative name server to contact



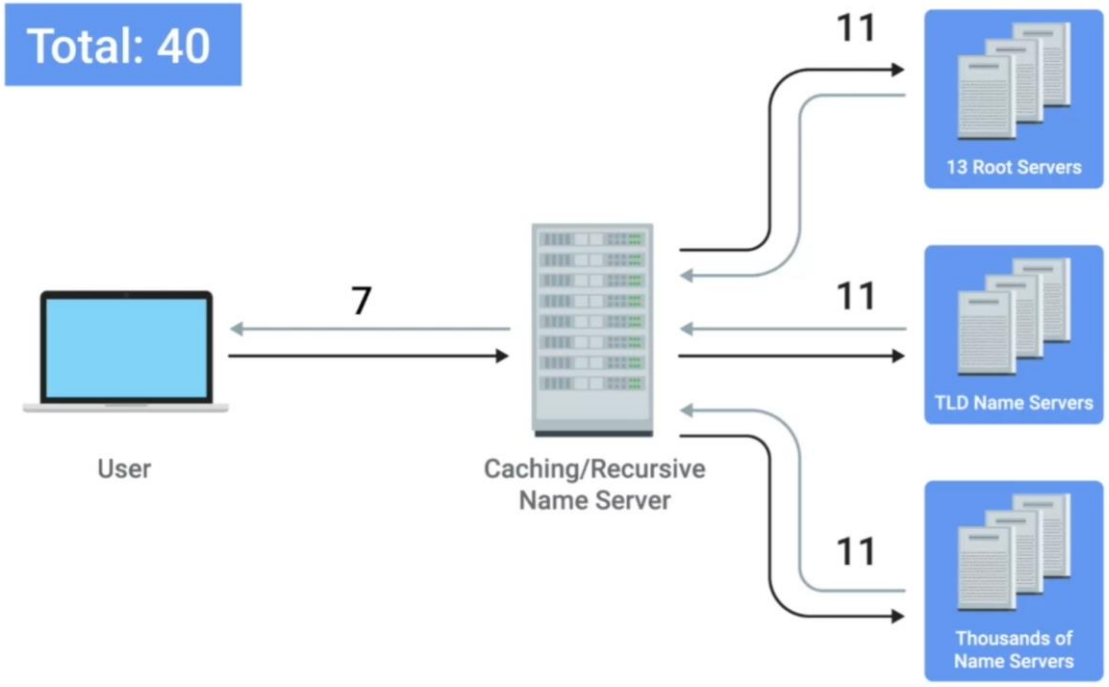
4. Authoritative name server returns the actual IP address



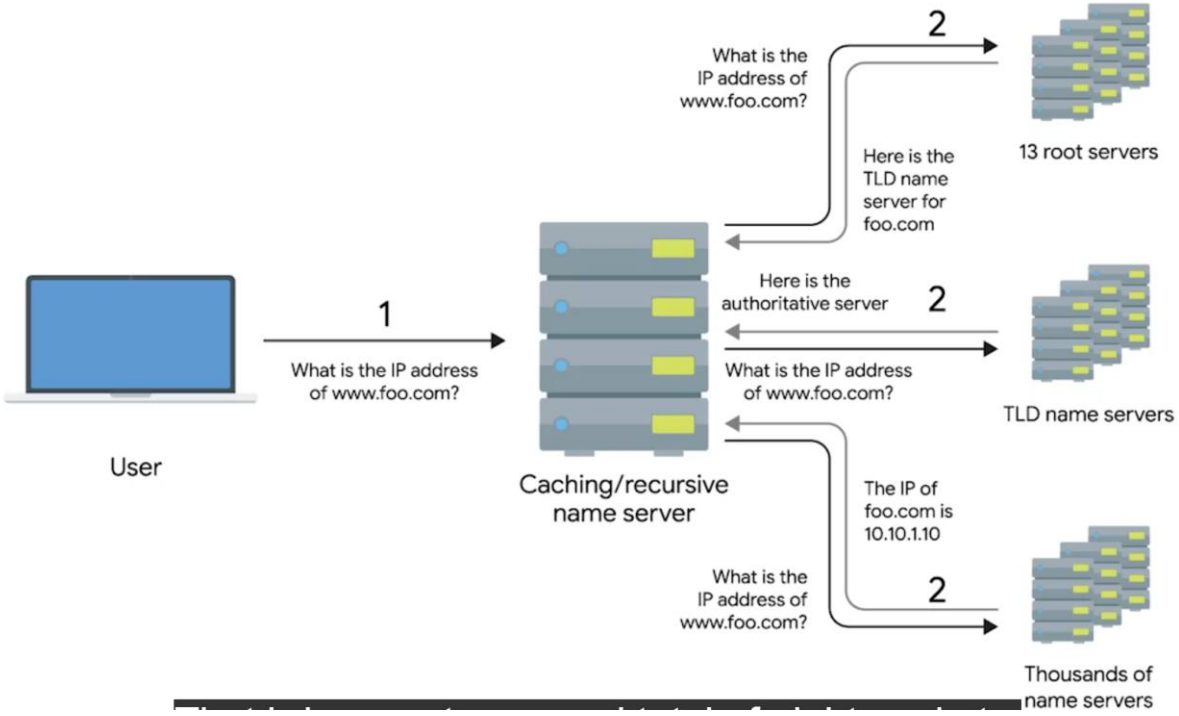
DNS is a application layer that use UDP as the transportation layer

1. UDP is connectionless,

TCP protocol cause too much traffic in DNS connection, so we prefer UDP

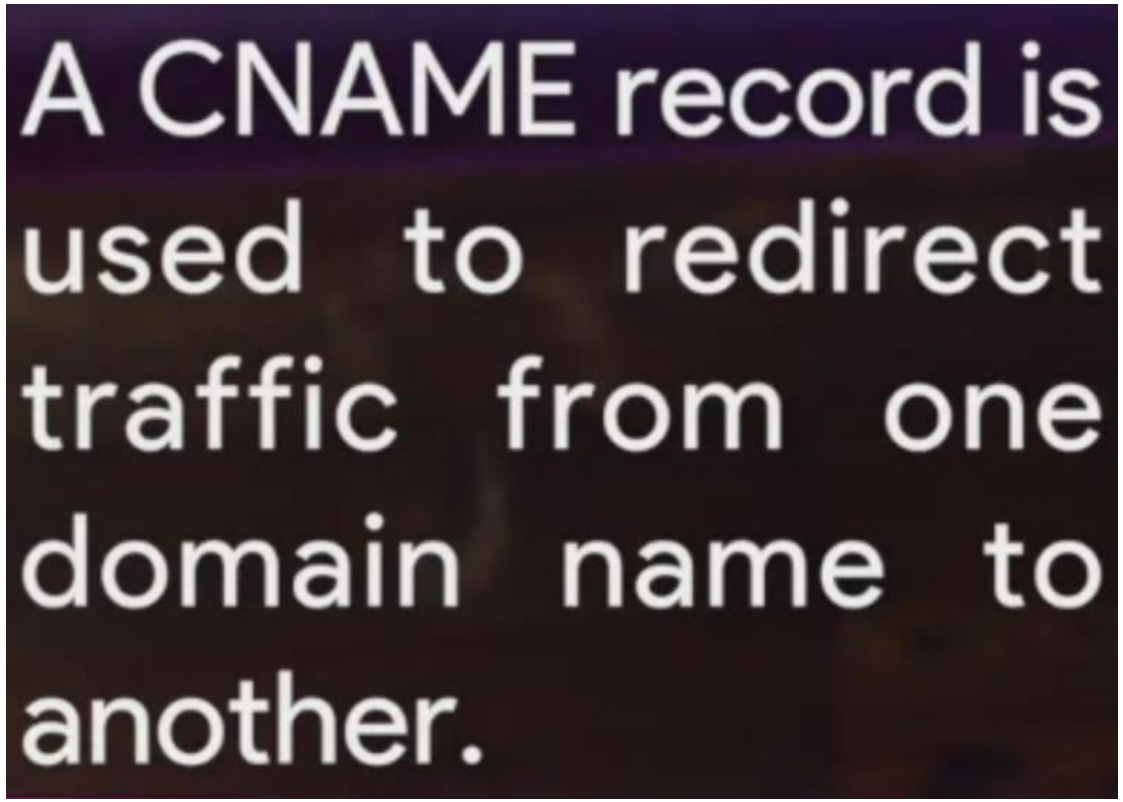


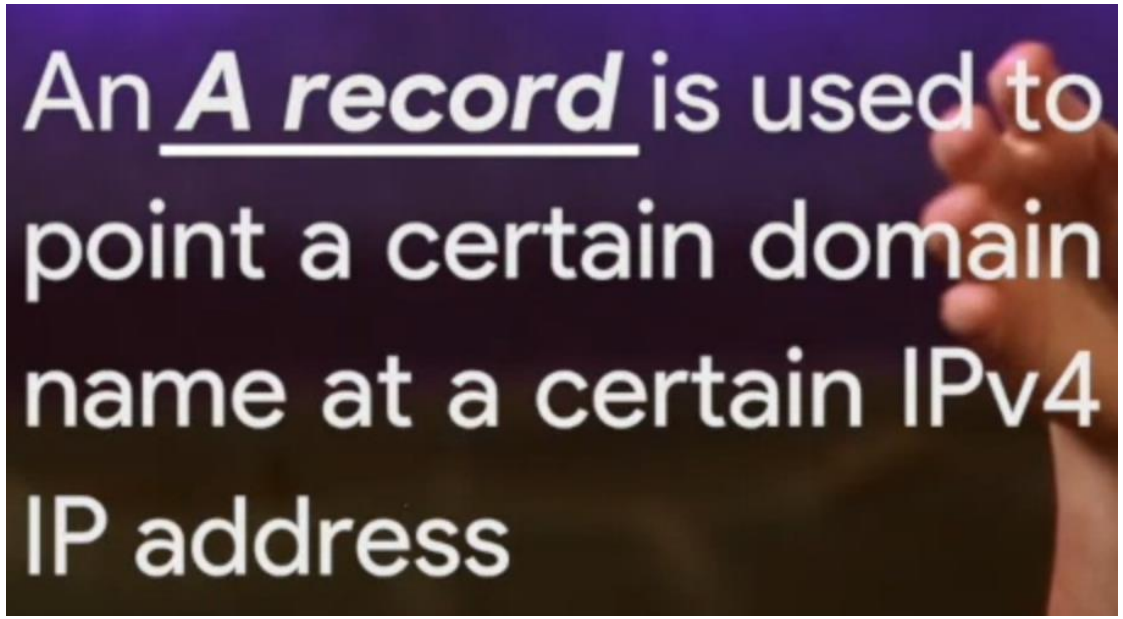
TCP



UDP

DNS Round Robin: A single domain name can have multiple A records (multiple IP address).
Which is used to balance the traffic volume through those A-records.
For example, for www.google.com, it may get a lot traffic, we could set 4 A records (10.1.1.1/10.1.1.2/10.1.1.3/10.1.1.4) to this domain name,
Q-A record: same to A record (IPV4) but IPV6 address





SRV record: direct to service server
Txt record:

CNAME (canonical name) use to redirect google.com to www.google.com
MX-record (mail exchange) : deliver email to mail server

A DNS address is composed by 3 parts:
Take www.google.com as the example, this last one is TLD (.com), the middle part called domain (google). WWW is the subdomain, also called host name

Top level domain (TLD)

The last part of a domain name

Examples:
.de
.edu
.com
.cn
.net

There are several vanity TLD hold by ICCAN(The Internet Corporation for Assigned Names and Numbers)

Domains

Used to demarcate where control moves from a TLD name server to an authoritative name server

Fully qualified domain name (FQDN)

When you combine all of these parts together, you have what's known as this

DNS can technically support up to **127 levels** of domain in total for a **single fully qualified domain name**.

DNS zones

Allow for easier control over multiple levels of a domain

If we separate three office into their own zone, we need to set up four authoritative server. One of largecompany.com, and one for each subdomains.

DNS zones

Allow for easier control over multiple levels of a domain

Zone files

Simple configuration files that declare all resource records for a particular zone

Start of authority (SOA)

Declares the zone and the name of the name server that is authoritative for it

NS records

Indicate other name servers that might also be responsible for this zone

Pointer resource record (PTR)

Resolves an IP to a name

Reverse lookup zone files

These let DNS resolvers ask for an IP and get the FQDN associated with it returned