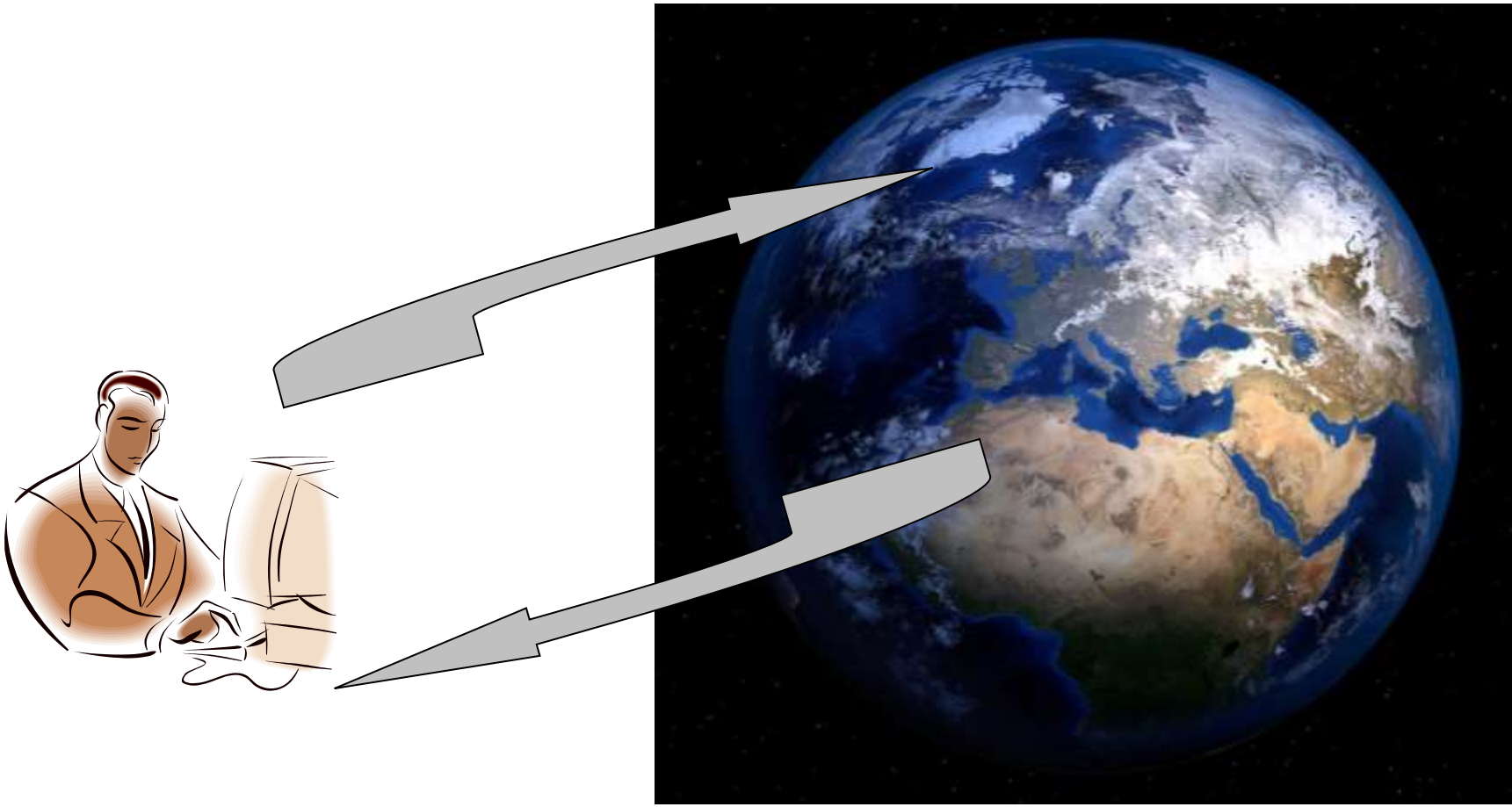
DOMAIN NAME SYSTEM



What is DNS

1. The Domain Name System (DNS) is the phonebook of the Internet.
2. Humans access information online through domain names, like nytimes.com or espn.com.
3. Web browsers interact through Internet Protocol (IP) addresses.
4. DNS translates domain names to IP addresses so browsers can load Internet resources.

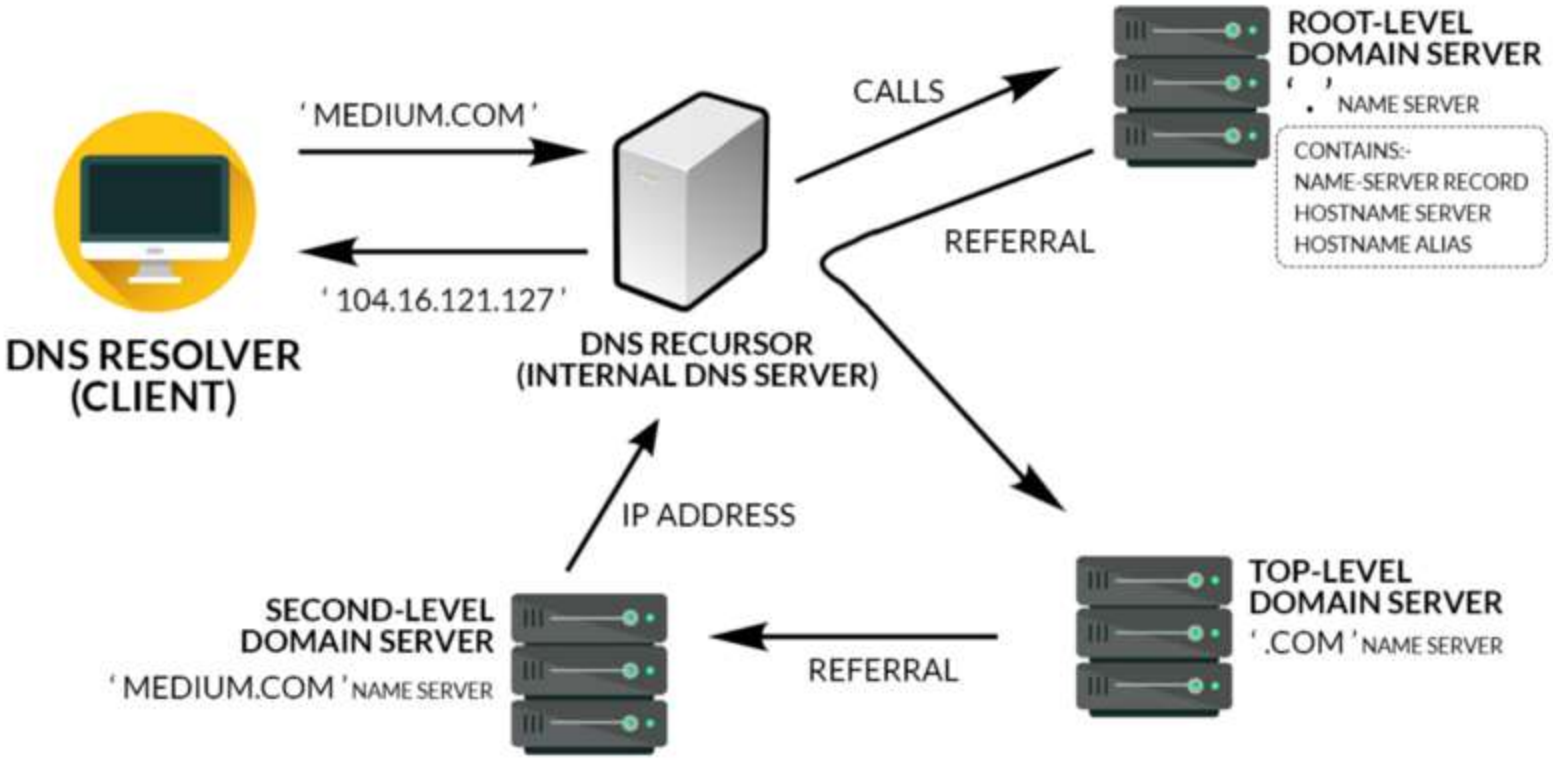
4 DNS SERVERS

• DNS recursor - The recursor can be thought of as a librarian who is asked to go find a particular book somewhere in a library.

• Root nameserver - The root server is the first step in translating (resolving) human readable host names into IP addresses.

• TLD nameserver - The top level domain server (TLD) can be thought of as a specific rack of books in a library.

• Authoritative nameserver - This final nameserver can be thought of as a dictionary on a rack of books, in which a specific name can be translated into its definition. If the authoritative name server has access to the requested record, it will return the IP address for the requested hostname back to the DNS Recursor (the librarian) that made the initial request.

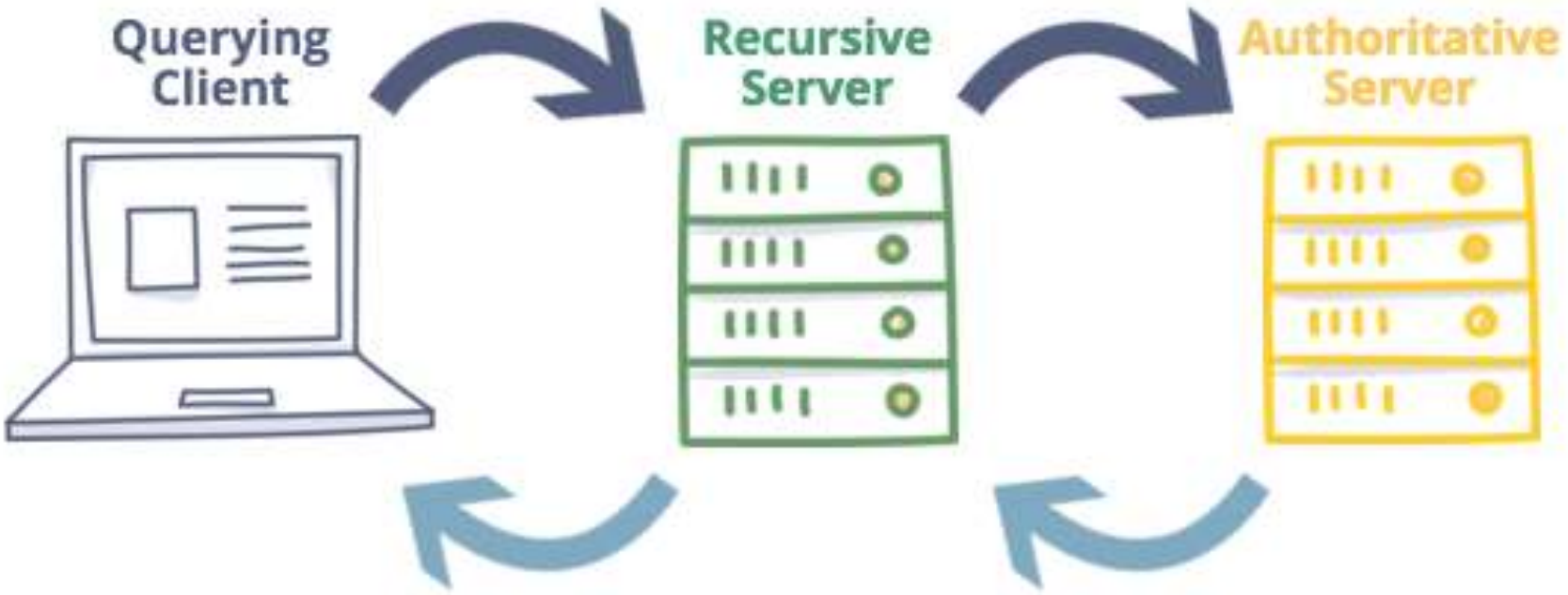

ROOT-LEVEL
DOMAIN SERVER
' . ' NAME SERVER
CONTAINS:-
NAME-SERVER RECORD
HOSTNAME SERVER
HOSTNAME ALIAS
CALLS
REFERRAL
' MEDIUM.COM '
' 104.16.121.127 '
DNS RESOLVER
(CLIENT)
DNS RECURSOR
(INTERNAL DNS SERVER)
IP ADDRESS
TOP-LEVEL
DOMAIN SERVER
' .COM ' NAME SERVER
REFERRAL
SECOND-LEVEL
DOMAIN SERVER
' MEDIUM.COM ' NAME SERVER

Authoriative vs. Recursive

Authoritative DNS servers ***store the "maps" of your domain names to IP addresses. This domain name to IP mapping is usually configured by system administrators.***

A person that is visiting web sites asks Recursive DNS servers for the lookups.

Recursive DNS servers ***than ask the necessary Authoritative Name Server for the answer. Then the Recursive name server will give this answer to the person needing the information.***


Querying Client
Recursive Server
Authoritative Server

Steps in a DNS lookup ?

There are typically 8 steps in a DNS lookup,

1. A user types ‘example.com’ into a web browser and the query travels into the Internet and is received by a DNS recursive resolver.

2. The resolver then queries a DNS root nameserver (.).

3. The root server then responds to the resolver with the address of a Top Level Domain (TLD) DNS server (such as .com or .net), which stores the information for its domains. When searching for example.com, our request is pointed toward the .com TLD.

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

5. The TLD server then responds with the IP address of the domain's nameserver, example.com.

6. Lastly, the recursive resolver sends a query to the domain's nameserver.

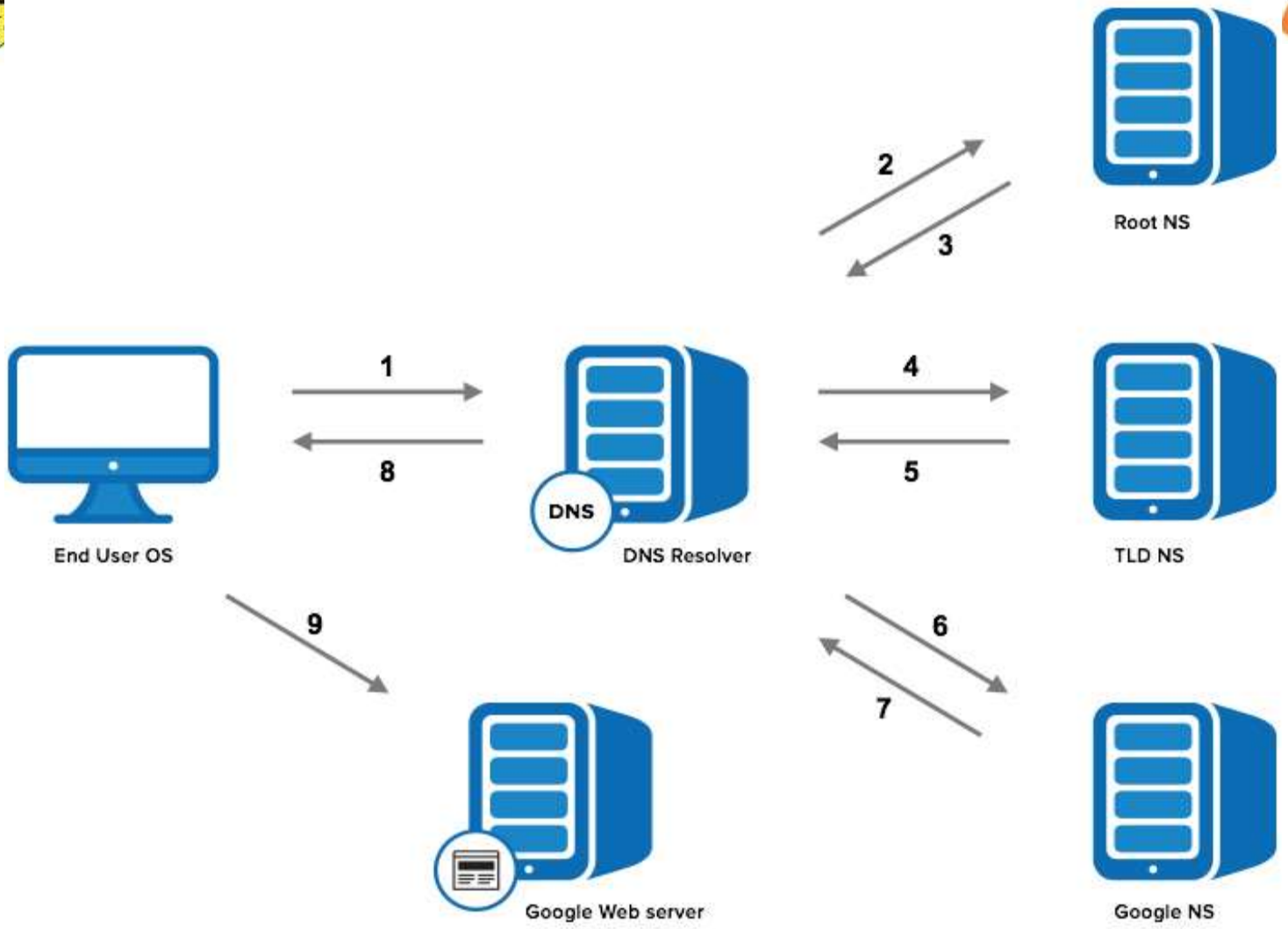
7. The IP address for example.com is then returned to the resolver from the nameserver.

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

After that,

9. The browser makes a HTTP request to the IP address.

10. The server at that IP returns the webpage to be rendered in the browser (step 10).


Root NS
2
3
1
8
4
5
DNS
End User OS
DNS Resolver
TLD NS
9
6
7
Google Web server
Google NS

DNS Resolver

- DNS resolver is the first stop in the DNS lookup, and it is responsible for dealing with the client that made the initial request.

- The resolver starts the sequence of queries that ultimately leads to a URL being translated into the necessary IP address.

DNS Queries

A typical DNS lookup 3 types of queries occur.

By using a combination of these queries, an optimized process for DNS resolution can result in a reduction of distance traveled.

1. **Recursive query** - In a recursive query, a DNS client requires that a DNS server (typically a DNS recursive resolver) will respond to the client with either the requested resource record or an error message if the resolver can't find the record.

2. **Iterative query** - In this situation the DNS client will allow a DNS server to return the best answer it can. If the queried DNS server does not have a match for the query name, it will return a referral to a DNS server authoritative for a lower level of the domain namespace. The DNS client will then make a query to the referral address. This process continues with additional DNS servers down the query chain until either an error or timeout occurs.

3. **Non-recursive query** - Typically this will occur when a DNS resolver client queries a DNS server for a record that it has access to either because it's authoritative for the record or the record exists inside of its cache. Typically, a DNS server will cache DNS records to prevent additional bandwidth consumption and load on upstream servers.

Thank you