CS6111- Computer Networks

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Preparatory Content

Year/ Sem/Batch: III/V/P

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Domain Name System

DNS

DNS is something which you use without knowing on a daily basis

How??

You type www.annauniv.edu in a browser and you get the Homepage of Annauniv. How does this happen? Well….Internally "DNS" is something without which it wouldn't be possible for this to happen.

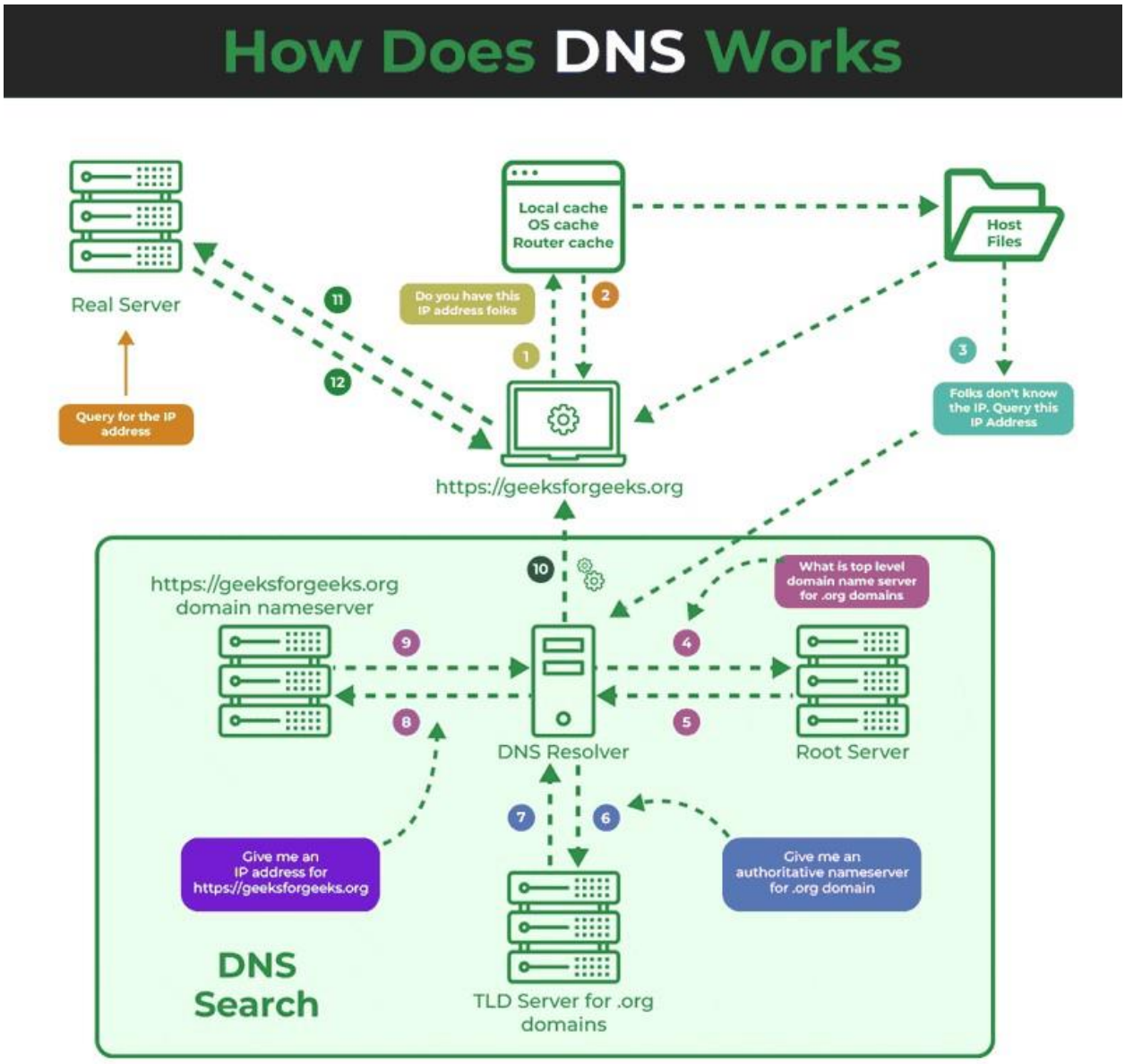
DNS, to put it in simple words, is a mapping mechanism which maps the URLs(components) to IP Address (You will learn about IP Address in Module 6 in detail)

The Domain Name System (DNS) is like the internet's phone book. It helps you find websites by translating easy-toremember names (like www.example.com) into the numerical IP addresses (like 192.0.2.1) that computers use to locate each other on the internet. Without DNS, you would have to remember long strings of numbers to visit your favorite websites.

Domain Name System (DNS) is a hostname used for IP address translation services. DNS is a distributed database implemented in a hierarchy of name servers. It is an application layer protocol for message exchange between clients and servers. It is required for the functioning of the Internet.

The ultimate Motto of DNS:

Every host is identified by the IP address but remembering numbers is very difficult for people also the IP addresses are not static therefore a mapping is required to change the domain name to the IP address. So DNS is used to convert the domain name of the websites to their numerical IP address.



DNS Servers Involved in Loading a Webpage

Upon loading the webpage, several DNS Servers are responsible for translating the domain name into the corresponding IP Address of the web server hosting the website. Here is the list of main DNS servers involved in loading a Webpage.

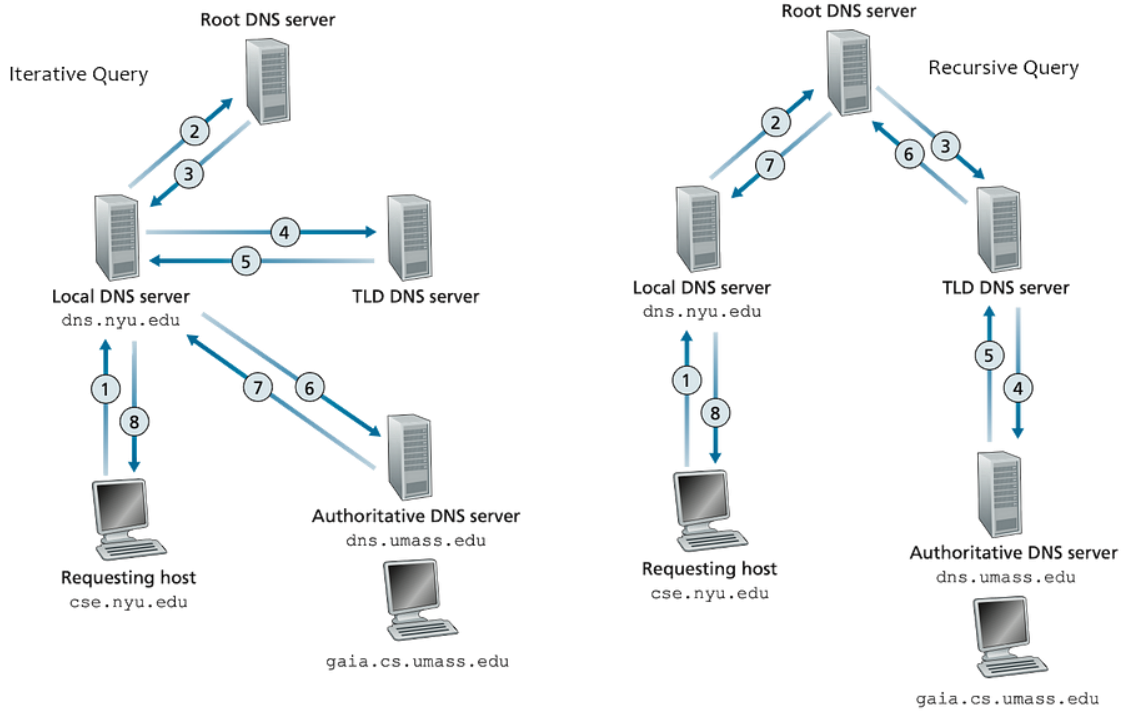
- Local DNS Resolver
- Root DNS Servers

- Top-Level Domain (TLD) DNS Servers
- Authoritative DNS Servers
- Web Server

This hierarchical system of DNS servers ensures that when you type a domain name into your web browser, it can be translated into the correct IP address, allowing you to access the desired webpage on the internet.

Types of DNS

A recursive DNS lookup is where one DNS server communicates with several other DNS servers to hunt down an IP address and return it to the client. This is in contrast to an iterative DNS query, where the client communicates directly with each DNS server involved in the lookup.



The recursive query is between a client and its local DNS server. On the other hand, iterative DNS query is between local DNS server and other DNS servers.

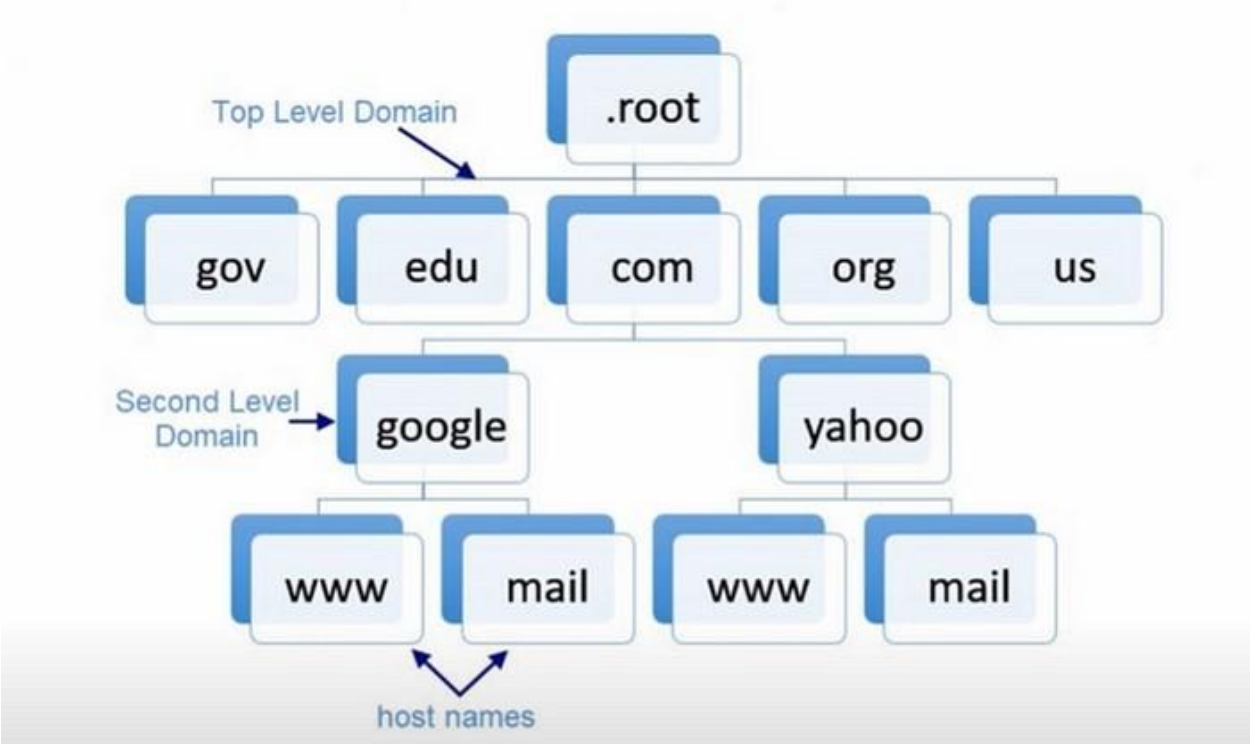
The iterative DNS lookup doesn't require name resolution as any DNS server can provide the name resolution if known or respond with a referral to the server with name resolution known.

Let's take an example to see both of these in action —

Suppose you want to go to www.google.com, you type it in the url field in your brower, → the browser then checks if there is any previous name resolution for this address — first in your browser's cache memory and if not found, it checks in a text file called hosts C:/Windows/System32/drivers/etc/hosts

Now assume that there is no record in either of these locations, the computer then talks with the local DNS server asking for the IP address of www.google.com. This is the recursive query in where you computer(DNS client) talks with the local DNS server.

If the local DNS server doesn't have a record for name resoltion for the site, it talks with the other higher level DNS servers in the network which can provide a refferal for the IP address. This is the iterative query.



As a DNS server finds the name resolved for the IP address we requested, it replies the client with the IP address and the browser stores the information in memory and the next time you look for www.google.com you can avoid the whole process because you have it in memory.

For coding part,

Every request / response between two hosts (be it Recursive or Iterative) is a normal communication which you have already implemented.

Practice communication with mediator (Implementing DNS is more like that)

You should be able to implement a series of connections between hosts (Recursive or Iterative)

Execution

You are tasked with implementing both recursive and iterative DNS resolution methods for the domain www.annauniv.edu in a lab setting.

Recursive DNS Resolution:

- Explain how a recursive DNS resolver works when querying the domain www.annauniv.edu.
- Outline the steps taken by the recursive resolver from the root DNS server to the authoritative DNS server for annauniv.edu, and finally obtaining the IP address for www.annauniv.edu.
- Implement a code that simulates the recursive DNS resolution process.

Iterative DNS Resolution:

- Explain how an iterative DNS resolver operates when querying the domain www.annauniv.edu.
- Detail the steps performed by the iterative resolver as it interacts directly with each DNS server in the hierarchy (root, TLD, authoritative) without expecting intermediate DNS servers to perform the lookup on its behalf.
- Implement a code that demonstrates the iterative DNS resolution process.

Compare and contrast the efficiency and use cases of recursive and iterative DNS resolution based on your implementation results.

Spot

Implement the same question which you did for execution but with the concept of cache mechanism.
That is, take at least one DNS Server and maintain a cache for the same and when a query is performed on it, it should first search the Cache and if not found, it should proceed with querying the further servers.
Implement this for only Recursive Implementation.