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THAPAR INSTITUTE
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Course: Computer and Communication Networks

Topic: Address Resolution in DNS

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Outline of the lecture

- Domain Name System
- Resolution

✓ *Resolver*

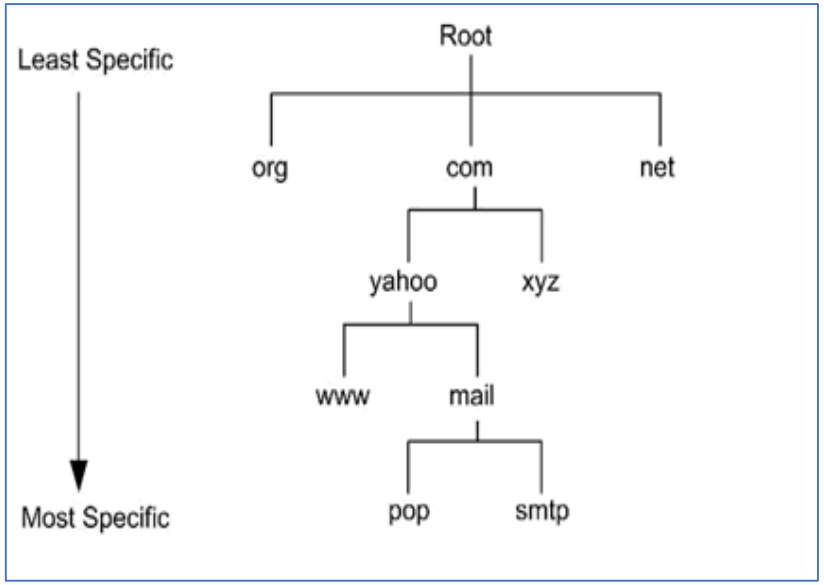
✓ *Mapping Names to Addresses*

✓ *Mapping Addresses to Names*

- Types of resolution
- DNS Messages
- Dynamic domain name system
- Encapsulation

Domain Name System

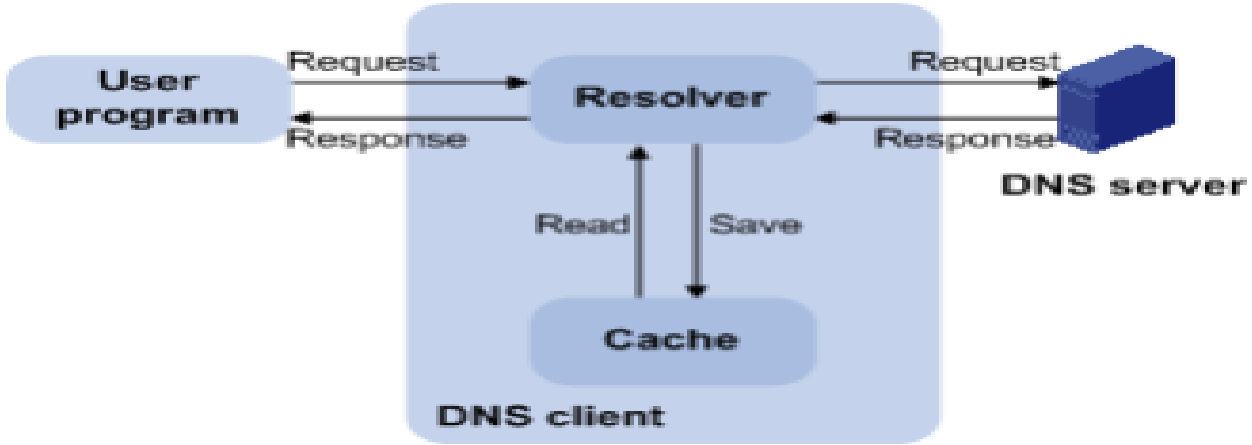
- Domain Name Server (DNS) is a standard protocol that helps Internet users discover websites using human readable addresses. Like a phonebook which lets you look up the name of a person and discover their number, DNS lets you type the address of a website and automatically discover the Internet Protocol (IP) address for that website.
- The Domain Name System (or DNS) converts human readable domain names (like: www.google.com) into Internet Protocol (IP) addresses (like: 173.194.39.78).
- Host names are divided into several pieces called domains. Domains are designed in a hierarchical structure.
- The top-level domains refer to the type of organization to which the network belongs, and subdomains further identify the specific network on which the host is situated.



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. sourcedaddy.com

Resolution

- Mapping a name to an address or an address to a name is called *name-address resolution.*
- *Resolver:* The **resolver** receives a hostname - for example, www.example.com - and is responsible for tracking down the IP address for that hostname. It is also called a recursive **resolver**,



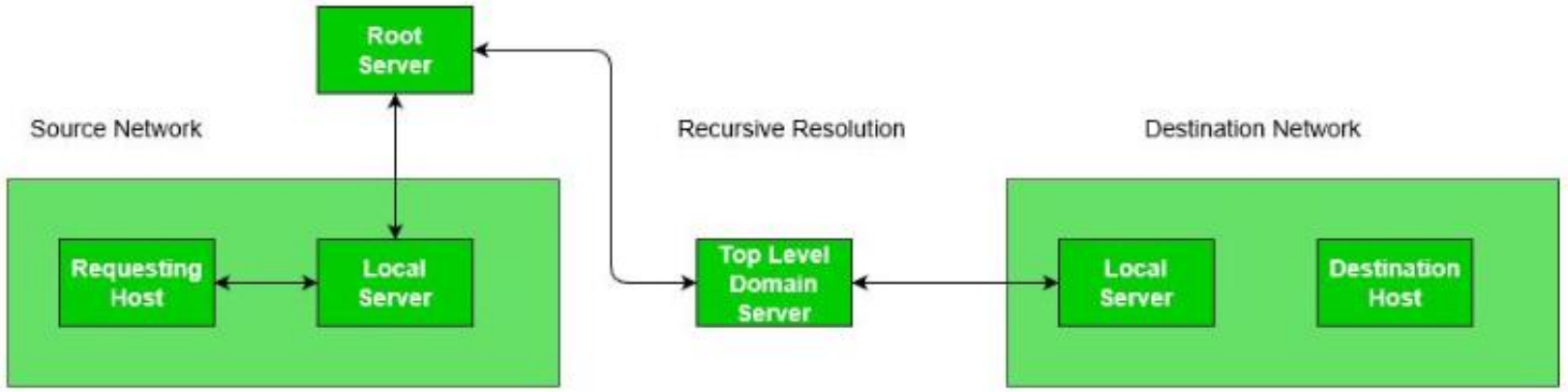
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. sourcedaddy.com 3. https://techhub.hpe.com

- Mapping Names to Addresses: referred to as mapping, is the process of finding the IP address of a computer in a database by using its host name as an index. Name-to-address mapping occurs when a program running on your local machine needs to contact a remote computer.
- the resolver gives a domain name to the server and asks for the corresponding address. In this case, the server checks the generic domains or the country domains to find the mapping.
- Mapping Addresses to Names: A client can send an IP address to a server to be mapped to a domain name.
- If the resolver receives the IP address 132.34.45.121, the resolver first inverts the address and then adds the two labels before sending. The domain name sent is *"121.45.34.132.in-addr.arpa."* which is received by the local DNS and resolved.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication

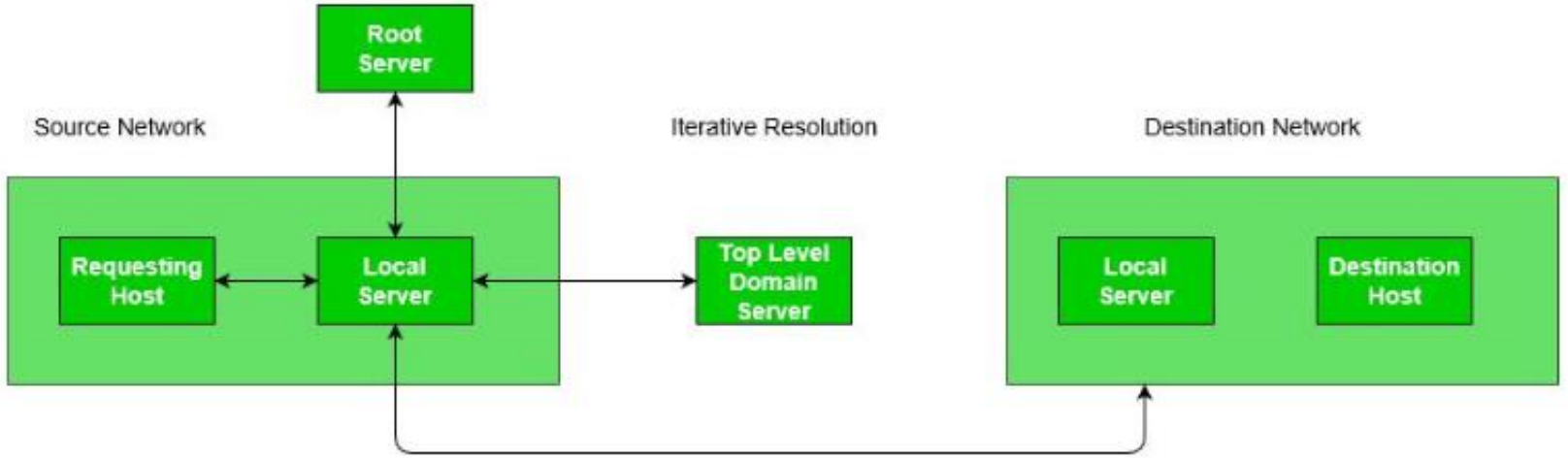
Types of Resolution

- Recursive Resolution : It is just a name for the resolution process use by a name server when it receives **recursive** queries.



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. https://www.geeksforgeeks.org

- Iterative resolution: **it** refers to the **resolution** process used by a name server when it receives **iterative** queries.
- Each server that does not know the mapping sends the IP Address of the next server to the one requested it. Here, client allows the server to return the best answer it can give as a match or as a referral.



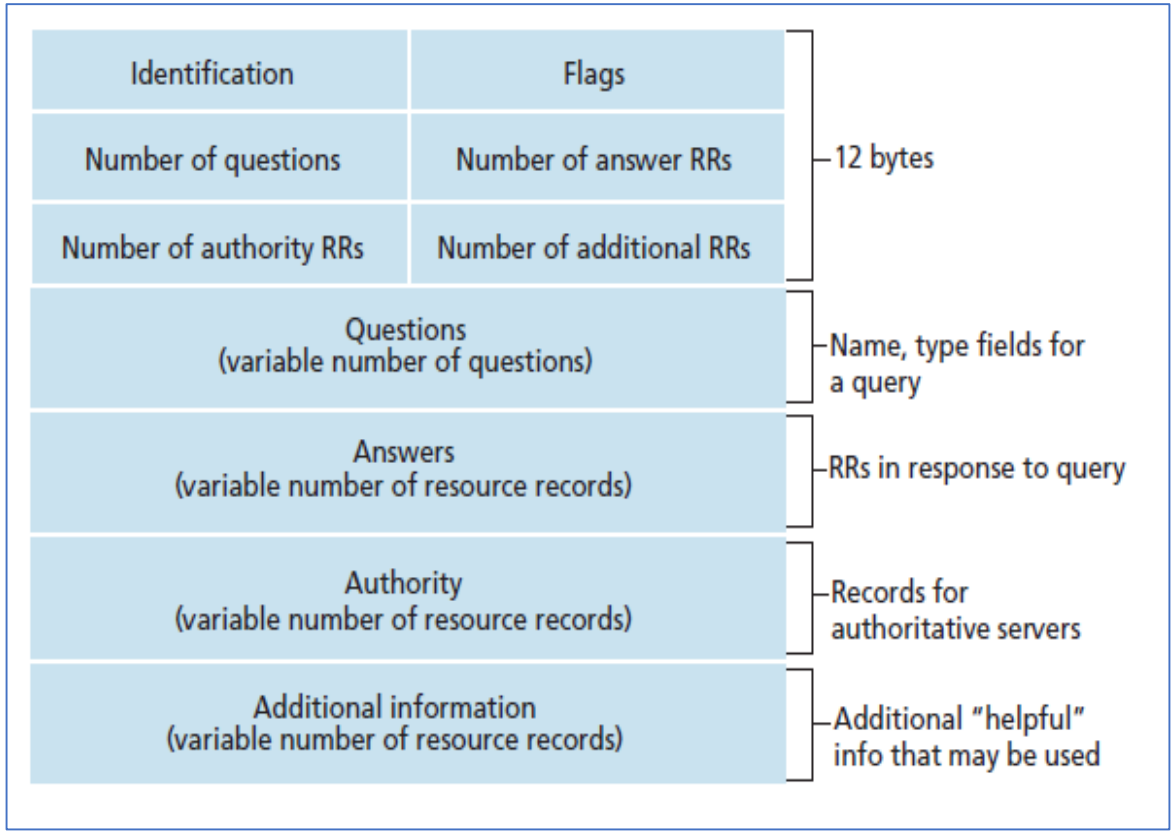
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. https://www.geeksforgeeks.org

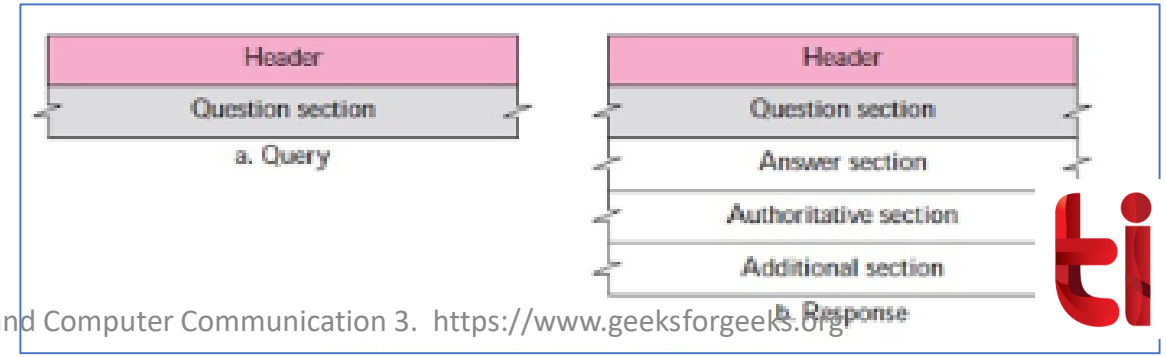
- **Caching:**
- Each time a server receives a query for a name that is not in its domain, it needs to search its database for a server IP address.
- When a server asks for a mapping from another server and receives the response, it stores this information in its cache memory before sending it to the client.
- Reduction of this search time would increase efficiency.
- DNS handles this with a mechanism called caching.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. https://www.geeksforgeeks.org

DNS Messages

- DNS has two types of messages: query and response.
- Both types have the same format.
- The query message consists of a header and question records;
- the response message consists of a header, question records, answer records, authoritative records, and additional records.





Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication 3. https://www.geeksforgeeks.org/

Dynamic domain name system (DDNS)

- It provides a database containing relations between domain and numeric addresses, but this database may be updated on request by the domain owner.
- The server is available in the domain address regardless its actual IP number.
- The DNS master file must be updated dynamically. The Dynamic Domain Name System (DDNS) therefore was devised to respond to this need.
- The primary server updates the zone. The secondary servers are notified either actively or passively.

Encapsulation

- DNS can use the services of UDP or TCP using the well-known port 53. UDP is used when the size of the response message is less than 512 and for more than 512 bytes, a TCP connection is used.
- Two scenarios

✓If the resolver has prior knowledge that the size of the response message is more than 512 bytes, it uses the TCP connection.

✓If the resolver does not know the size of the response message, it can use the UDP port.


Thank You