NETWORK PROTOCOLS & SECURITY
23EC2210 R/A/E

Topic:

DOMAIN NAME SYSTEM (DNS)

Session - 31

DNS

- DNS is short name for Domain Name Service or Domain Name System.
- It is an application layer protocol.

Purpose:-

- DNS is a host name to IP Address translation service.

- It converts the names we type in our web browser address bar to the IP Address of web servers hosting those sites.

DNS

- The need for Domain Name Service arises due to the following reasons:

  - IP addresses are not static and may change dynamically. So, a mapping is required which maps the domain names to the IP Addresses of their web servers.

  - IP Addresses are a complex series of numbers. So, it is difficult to remember IP Addresses directly while it is easy to remember names.

Types of Domain name spaces

- The name assigned to machines must be unique.

- Name space map each address to a unique name in two ways

  - Flat name space

  - Hierarchical name space

Types of Domain name spaces…

Flat name space:

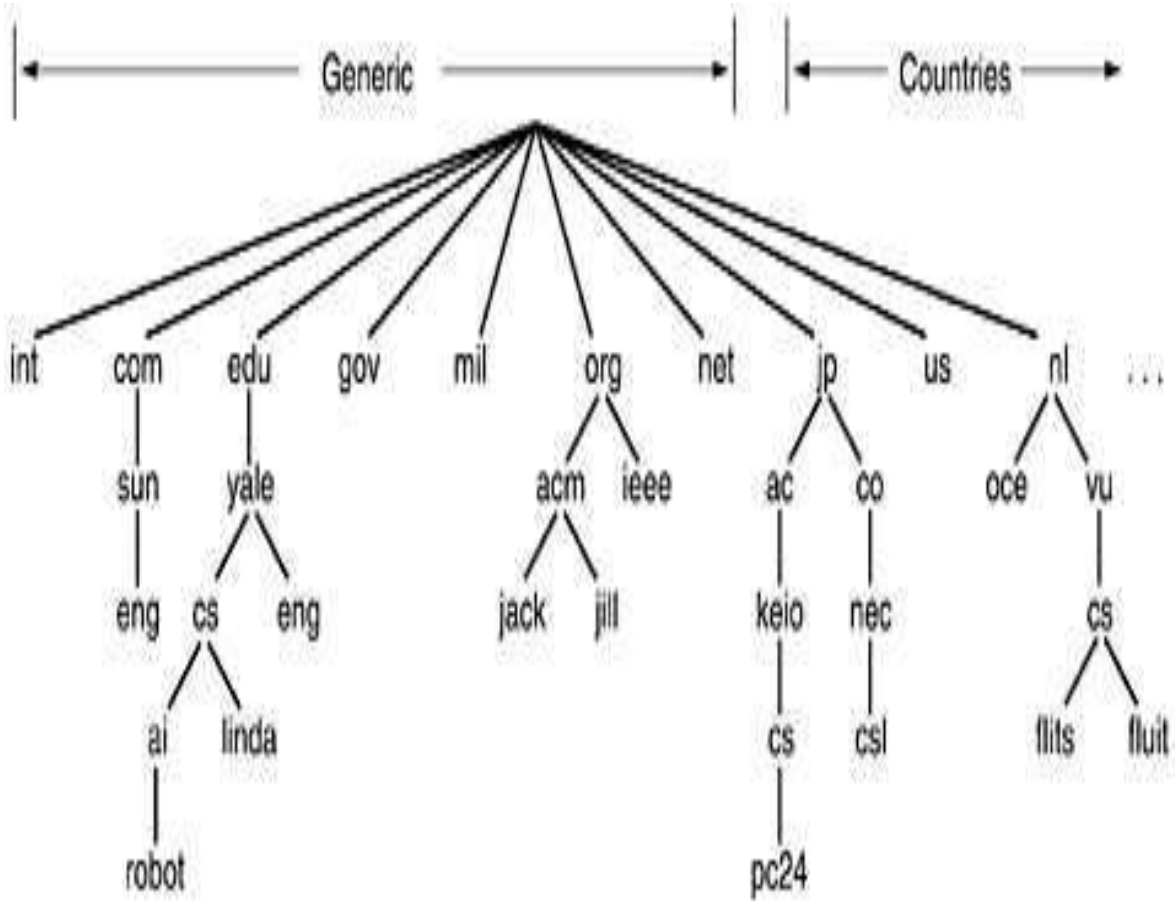
- A name in this space is a sequence of characters without structure.
- A name may or may not have a common section.
- It cannot be used in internet.

Hierarchical name space:

- Each name has several parts.
- The first part define the nature of the organization.
- The second part define the name of the organization.
- The third part define departments in the organization and so on.
- The central authority assigned only the first two parts of the name space and the rest of parts are assigned organization itself.

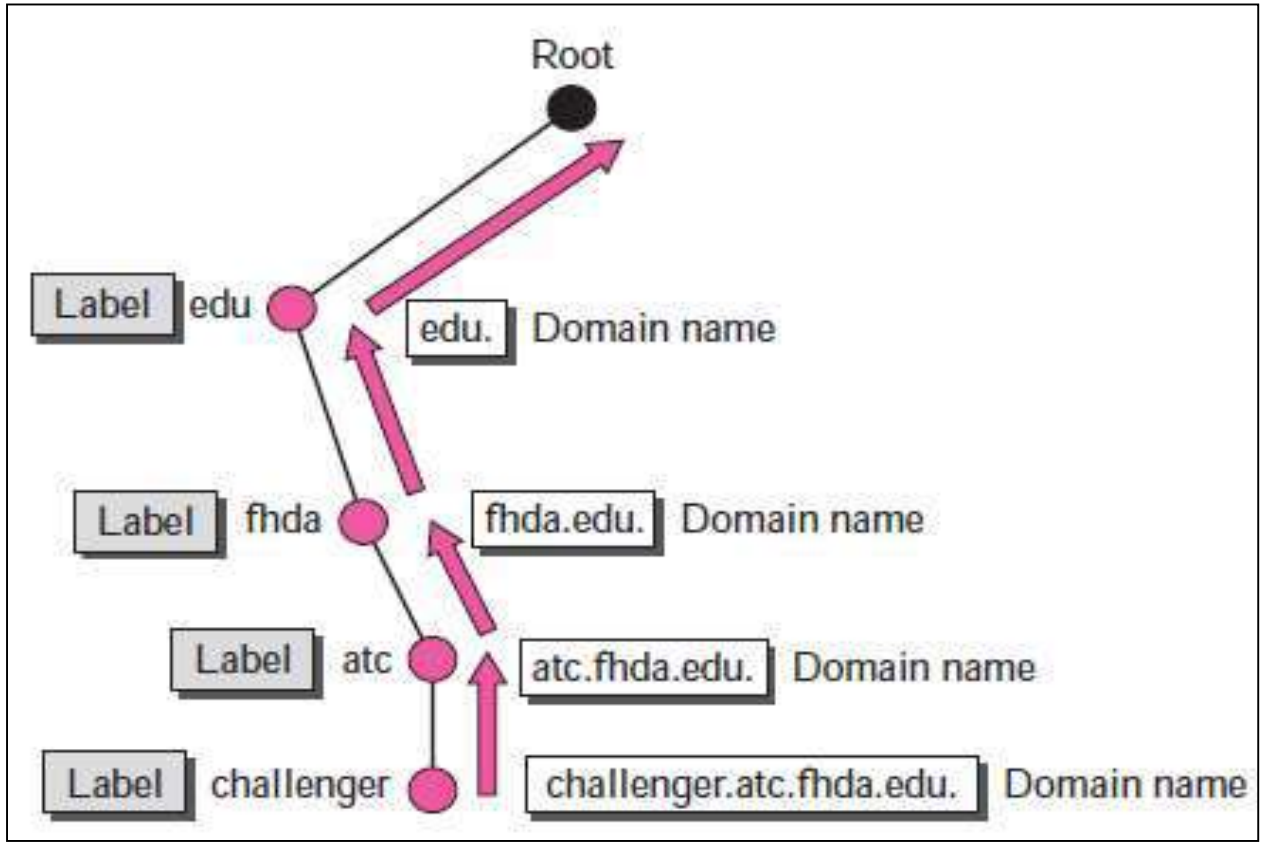
The DNS Name Space

- The Internet is divided into over 200 top-level domains, where each domain covers many hosts.
- Each domain is partitioned into subdomains, and these are further partitioned, and so on.
- All these domains can be represented by a tree, as shown in Figure.



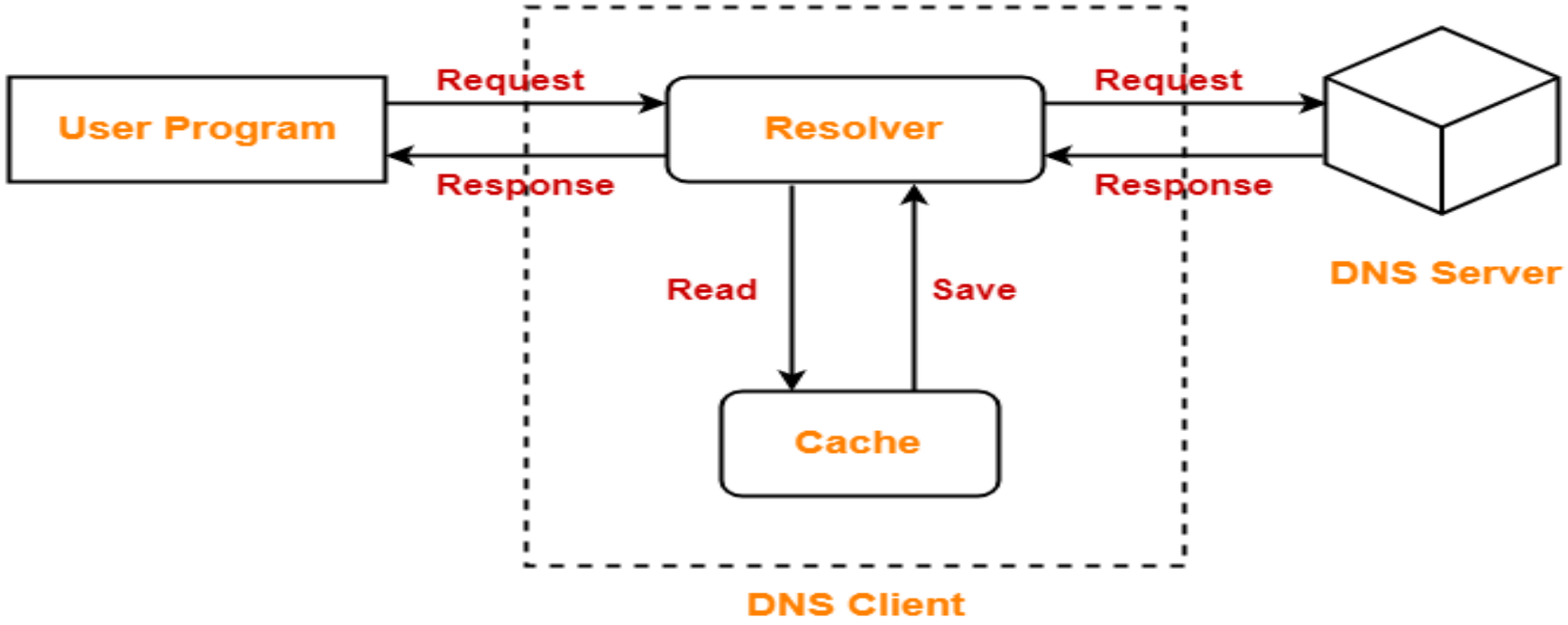
Domain Names and Labels

- Each node in the tree has a label, which is a string with a maximum of 63 characters.
- The root label is a null string (empty).
- A full domain name is a sequence of labels separated by dots.
- The domain names are always read from the node up to the root.
- Finally, it end with null (root node).



DNS Resolution

- DNS Resolution is a process of resolving a domain name onto an IP Address.



DNS Resolution…

The steps involved in DNS Resolution are-

1. A user program sends a name query to a library procedure called the resolver.

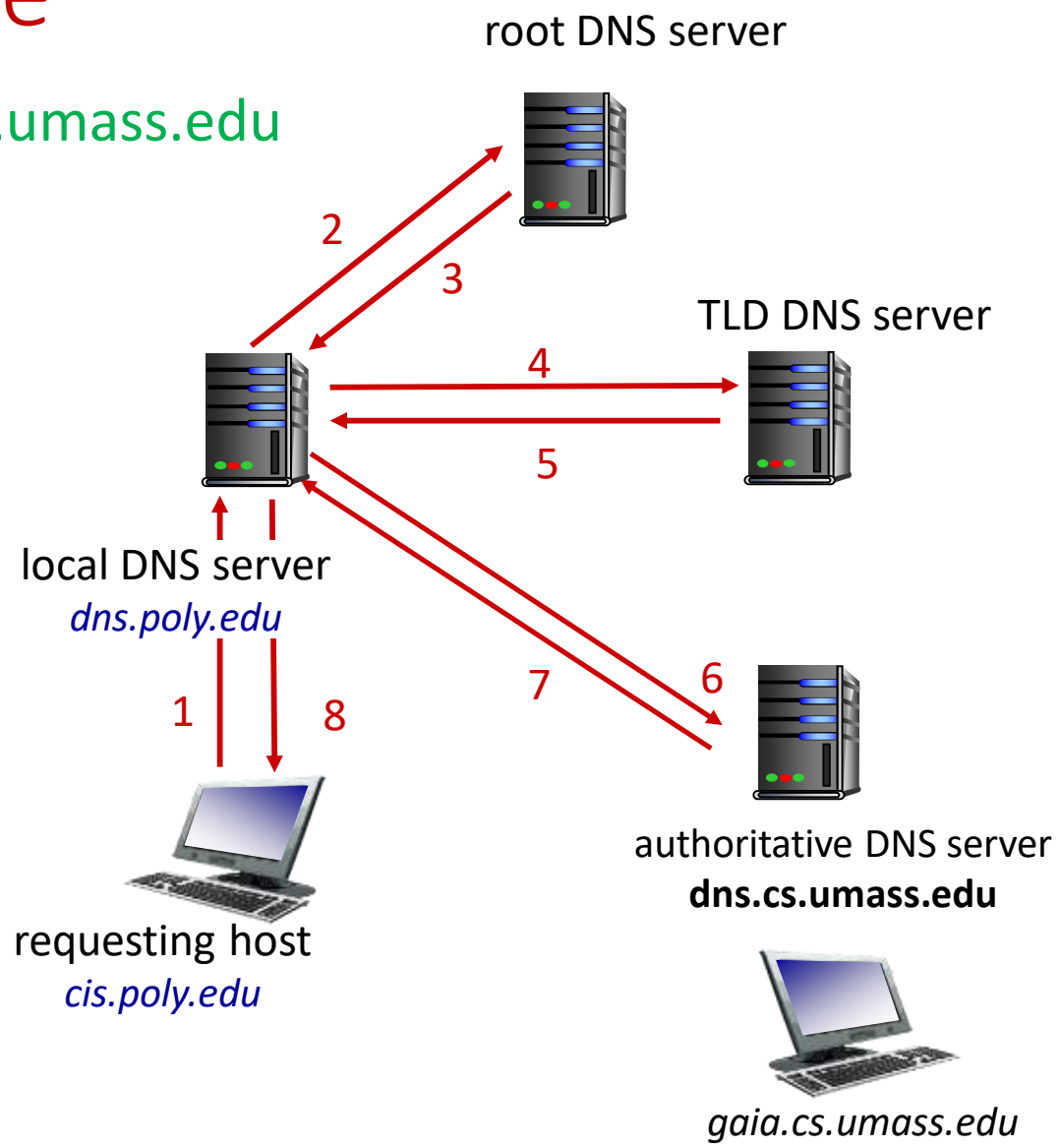
2. Resolver looks up the local domain name cache for a match.
   - If a match is found, it sends the corresponding IP Address back.
   - If no match is found, it sends a query to the local DNS server.

3. DNS server looks up the name.
   - If a match is found, it returns the corresponding IP Address to the resolver.
   - If no match is found, the local DNS server sends a query to a higher level DNS server.
   - This process is continued until a result is returned.

4. After receiving a response, the DNS client returns the resolution result to the application.

DNS name resolution example

host at cis.poly.edu wants IP address for gaia.cs.umass.edu



Iterated query:

- In iterative DNS query, the client communicates directly with each DNS server involved in the lookup.
- contacted server replies with name of server to contact
- "I don't know this name, but ask this server"

DNS name resolution example

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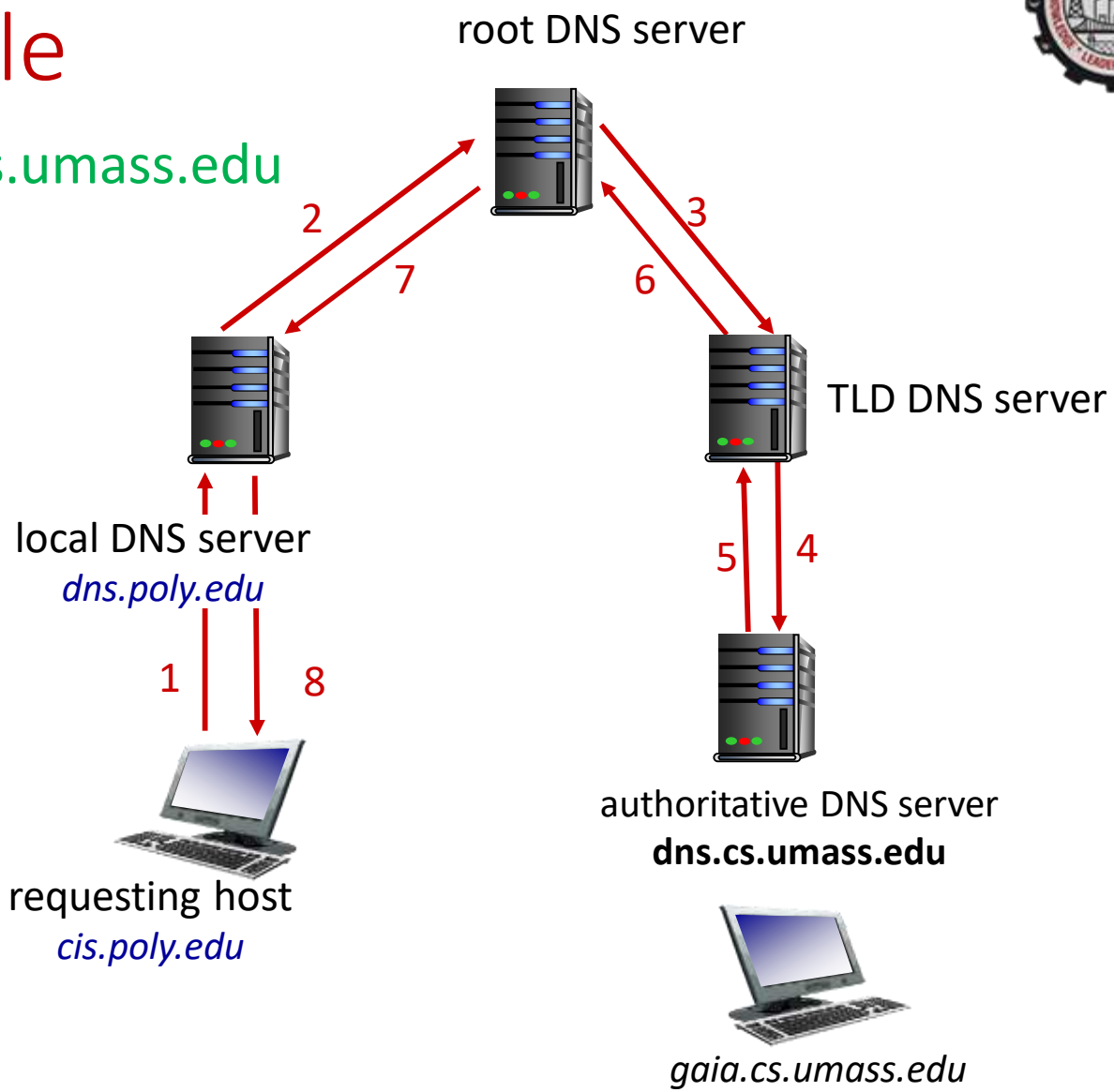

Recursive query:

- 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.
- Each server will query the next level server until the IP address is found and returns the IP address in reverse.

Thank you !