

## Computer Network

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# DNS

## Domain Name System

- TCP/IP **protocols** use the **IP** address, which uniquely **identifies** the connection of a host to the Internet.
- **People** prefer to use **names** instead of numeric addresses.
- A **directory** system in the Internet can map **names** to **IP** addresses like **telephone** directory.
- Internet is so **huge** today, a **central** directory system **cannot hold** all the mapping.

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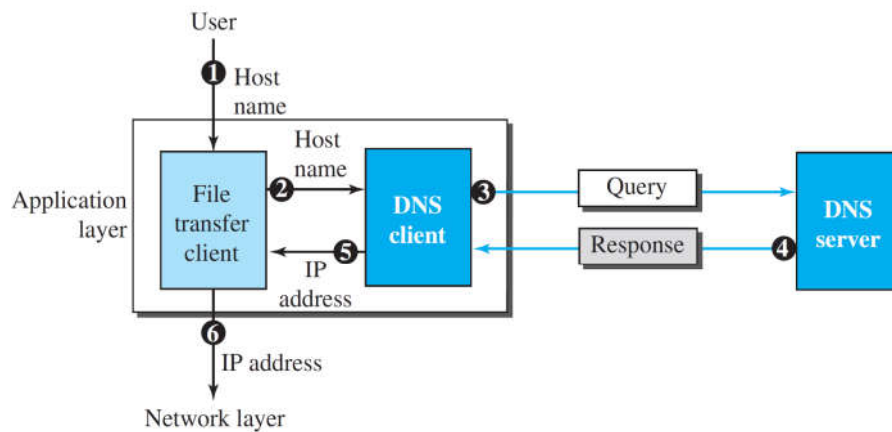
## Domain Name System cont.

- If the **central** computer **fails**, the whole communication network will **collapse**.
- A **better** solution is to **distribute** the information among **many** computers in the world.
- the **host** that needs **mapping** can **contact** the **closest** computer holding the needed information.
- This method is used by the **Domain Name System (DNS)**.

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## The Mapping Process in Domain Name System

### *Purpose of DNS*

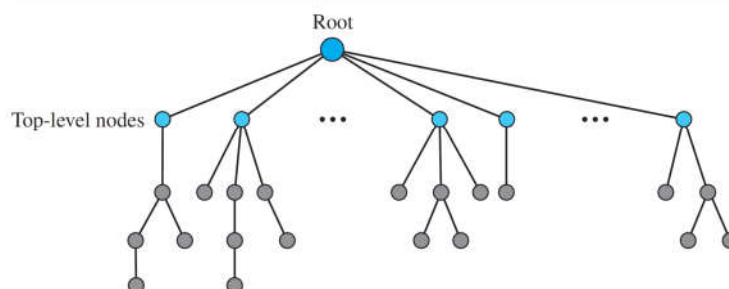


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## Domain Name Space

In **Domain Name Space** design the names are defined in an **inverted-tree** structure with the **root** at the top (max 128 Levels – 0 - 127).

### *Domain name space*



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## Domain Name Space cont.

### Contents:

#### 1- Label:

- Each node in the tree has a **label**.
- **Maximum** of **63** characters.
- The **root** label is a **null** string.
- **Children** of a node have **different** label

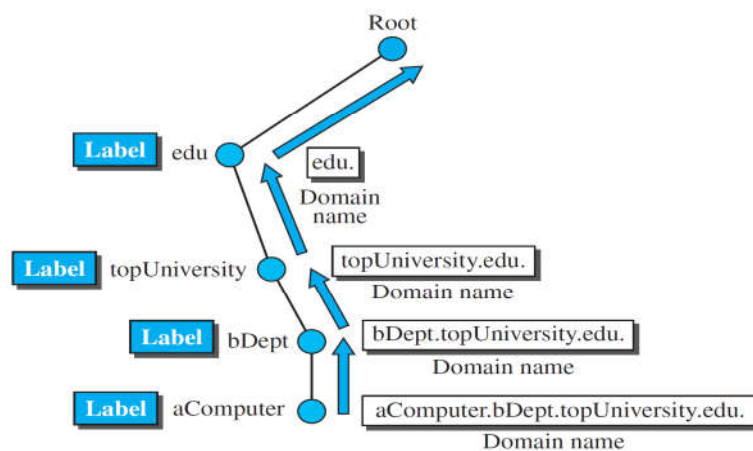
#### 2- Domain Name:

- Each node in the tree has a domain name
- **Domain name** is a sequence of labels separated by dots (.)

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## Domain Name Space cont.

*Domain names and labels*

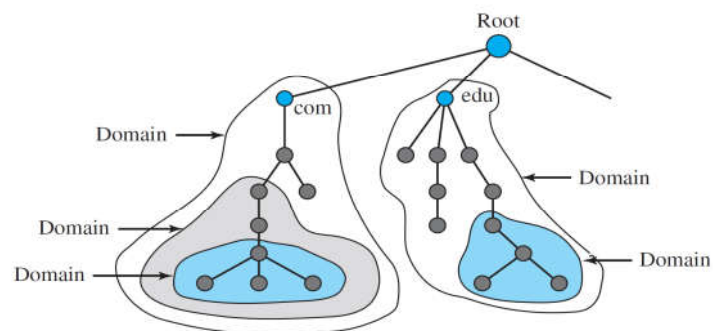


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## Domains

Domain: A domain is a subtree of the domain name space.

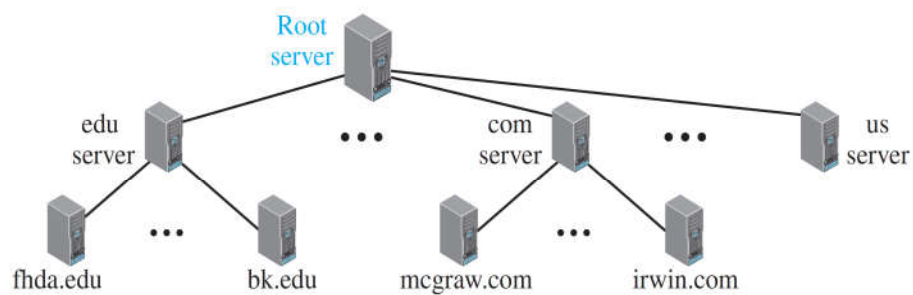
*Domains*



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## Hierarchy of Name Servers

*Hierarchy of name servers*



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## Root Server

- A **root server** is a server whose zone consists of the whole tree
- A **root server** usually **does not store** any information about domains but **delegates** its authority to **other** servers, keeping **references** to those servers.

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## DNS in the Internet

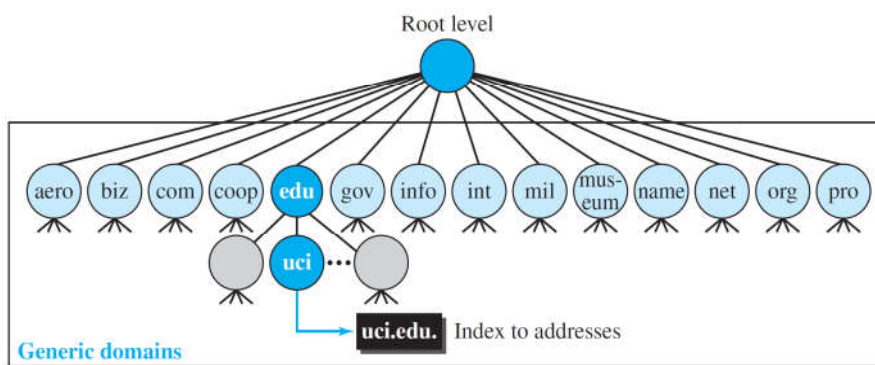
### *Generic Domains*

- The **generic domains** define registered hosts according to their generic behaviour.
- Each node in the tree defines a domain, which is an **index** to the domain name space database.

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## Generic Domains

*Generic domains*



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## Generic Domains Labels

*Generic domain labels*

Label	Description	Label	Description
<b>aero</b>	Airlines and aerospace	<b>int</b>	International organizations
<b>biz</b>	Businesses or firms	<b>mil</b>	Military groups
<b>com</b>	Commercial organizations	<b>museum</b>	Museums
<b>coop</b>	Cooperative organizations	<b>name</b>	Personal names (individuals)
<b>edu</b>	Educational institutions	<b>net</b>	Network support centers
<b>gov</b>	Government institutions	<b>org</b>	Nonprofit organizations
<b>info</b>	Information service providers	<b>pro</b>	Professional organizations

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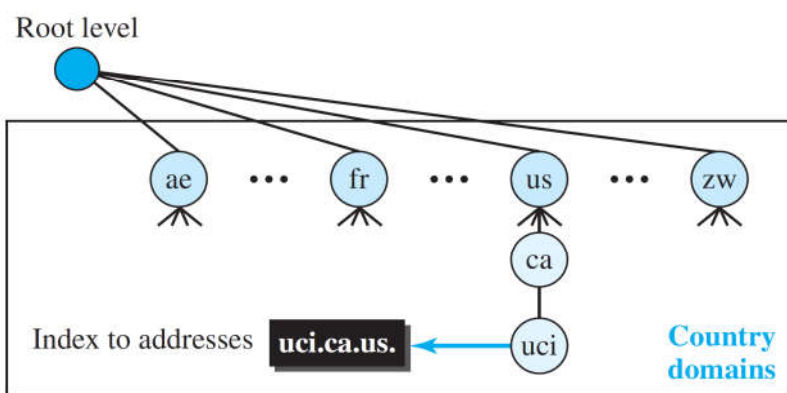
## Country Domains

- The **country domains** section uses two-character country abbreviations.
- For Example: The address *uci.ca.us.* can be translated to University of California, Irvine, in the state of California in the United States.

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## Country Domains cont.

*Country domains*



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## Resolution

- Mapping a name to an address is called *name-address resolution*.
- A **host** that needs to map an **address** to a name or a name to an address calls a DNS **client** called a *resolver*.
- The resolver accesses the **closest** DNS server with a mapping request.
- If the server **has** the information, it **satisfies** the resolver;
- otherwise, it either **refers** the resolver to other servers or asks other servers to provide the information.

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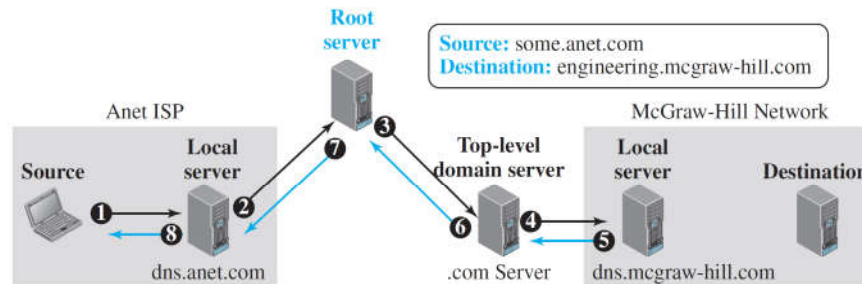
## Resolution Types

- A resolution can be either **recursive** or **iterative**.

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## Recursive Resolution

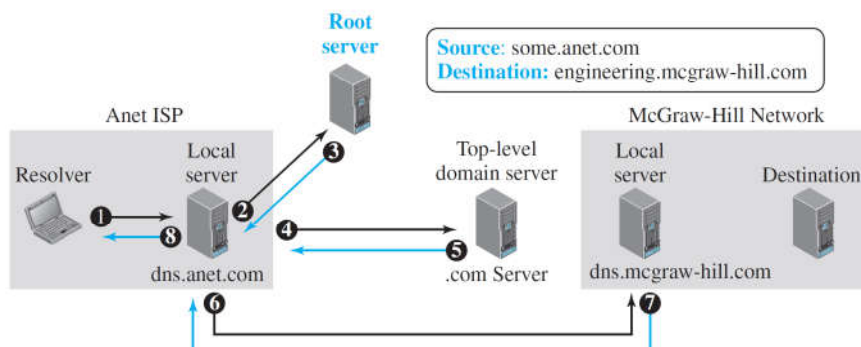
*Recursive resolution*



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## Iterative Resolution

*Iterative resolution*



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## Domain Name Caching

- 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.
- To inform the client that the response is coming from the cache memory and not from an authoritative source, the server marks the response as *unauthoritative*.

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## DNS Resource Records

- The zone information associated with a server is implemented as a set of resource records. In other words The name server stores a database of *resource records*.
- A *resource record* is a 5-tuple structure:
- (Domain Name, Type, Class, TTL, Value)

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## DNS Resource Records cont.

- **Domain name:** is what identifies the resource record.
- **Value:** is the information kept about the domain name.
- **TTL:** is the number of seconds for which the information is valid.
- **Class:** the type of network; we are only interested in the class **IN** (Internet).
- **Type:** is how the value should be interpreted.

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**Table 26.13** *Types*

<i>Type</i>	<i>Interpretation of value</i>
A	A 32-bit IPv4 address (see Chapter 18)
NS	Identifies the authoritative servers for a zone
CNAME	Defines an alias for the official name of a host
SOA	Marks the beginning of a zone
MX	Redirects mail to a mail server
AAAA	An IPv6 address (see Chapter 22)

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