

**CSE 3002**  
**INTERNET AND WEB**  
**PROGRAMMING**

**Module:1**  
**DNS**  
*Domain Name System*

# The overall number of domains registered, by TLD type

Type of TLD	Number of TLDs	Domains registered	Signed zones	Upcoming deletes
<a href="#">New gTLDs</a>	1,248	62,839,600	302,681	6,416,786
<a href="#">Generic TLDs</a>	8	198,747,533	3,278,842	7,391,689
<a href="#">Country TLDs</a>	315	148,821,163	3,815,035	1,831,826
<a href="#">All TLDs</a>	1,571	410,408,296	7,396,558	15,640,301

Source:domainnamestat.com/

## Domains distribution

By TLD type



New generic	15%
Generic	48%
Country	36%

## Top TLDs distribution






By number of registered domains



.com	41.27%
.tk	4.68%
.cn	4.54%
.net	4.00%
.de	3.25%
.org	3.15%
.uk	2.50%
.ru	1.83%
.info	1.80%
Others	32.97%

Source: [domainnamestat.com/](http://domainnamestat.com/)

# Top 5 Domain name registrations, by the country

 Unknown	129,338,599	31.51% <div><div></div></div>
 United States of America	107,169,766	26.11% <div><div></div></div>
 China	36,507,749	8.90% <div><div></div></div>
 Canada	15,115,771	3.68% <div><div></div></div>
 Netherlands	13,003,400	3.17% <div><div></div></div>
Source:domainnamestt.com		



# TOPICS

*Need for DNS*

*Name Spaces*

*DNS in the Internet*

*Resolution*

*DNS Messages*

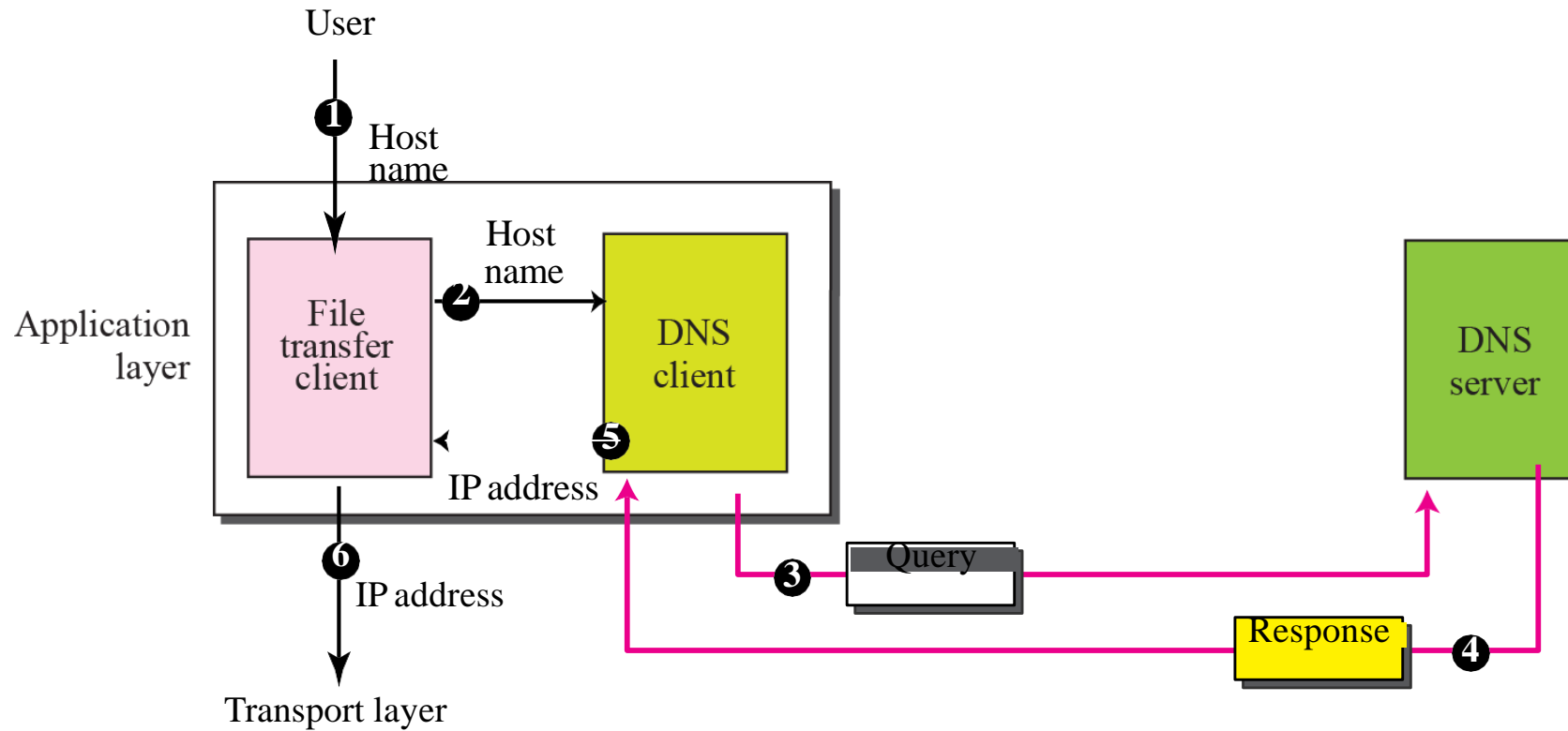
*Types of Records*

*Registrars*

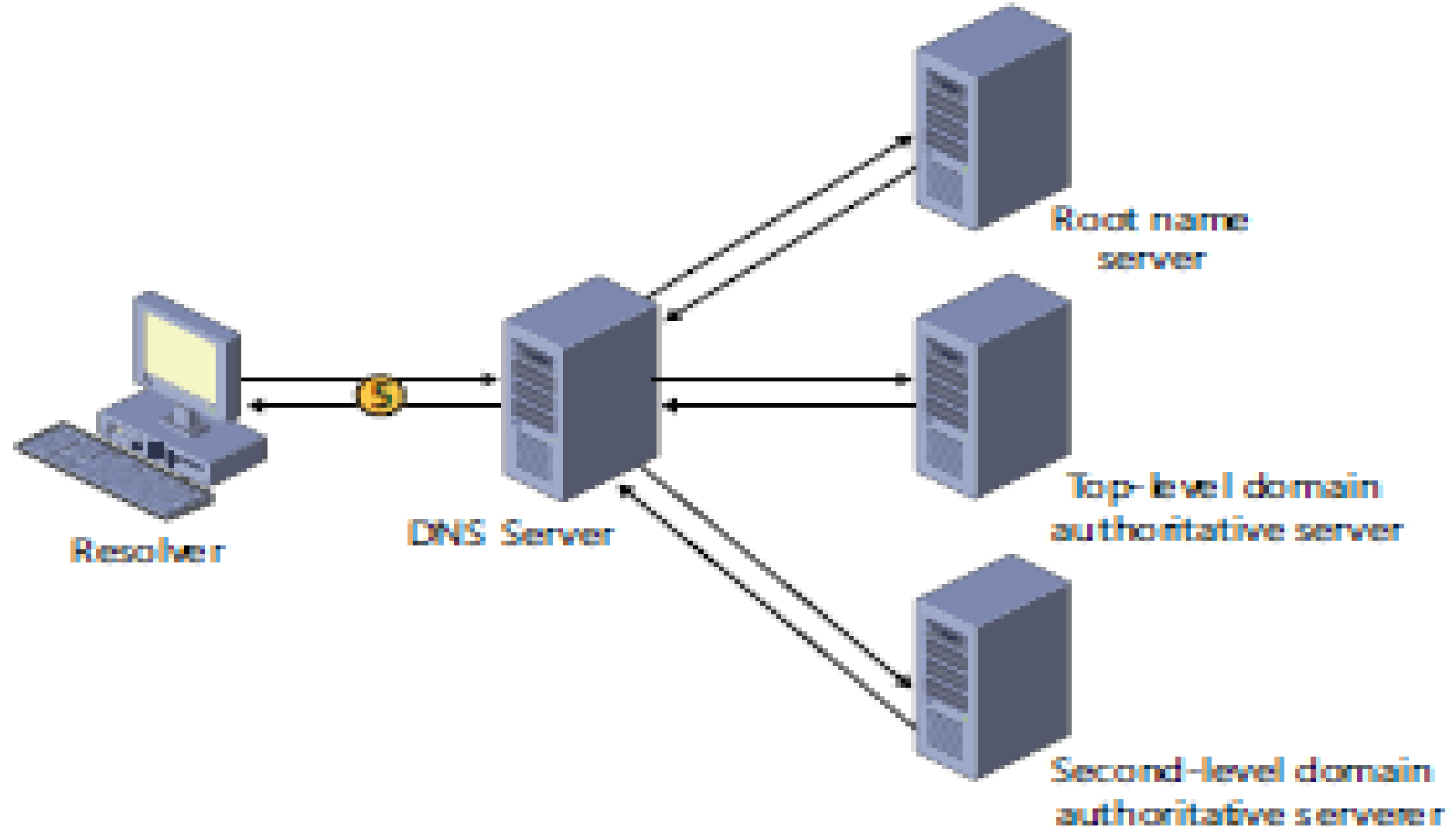
*DDNS*

*Security of DNS*

# PURPOSE OF DNS



# DNS ARCHITECTURE





# NEED FOR DNS

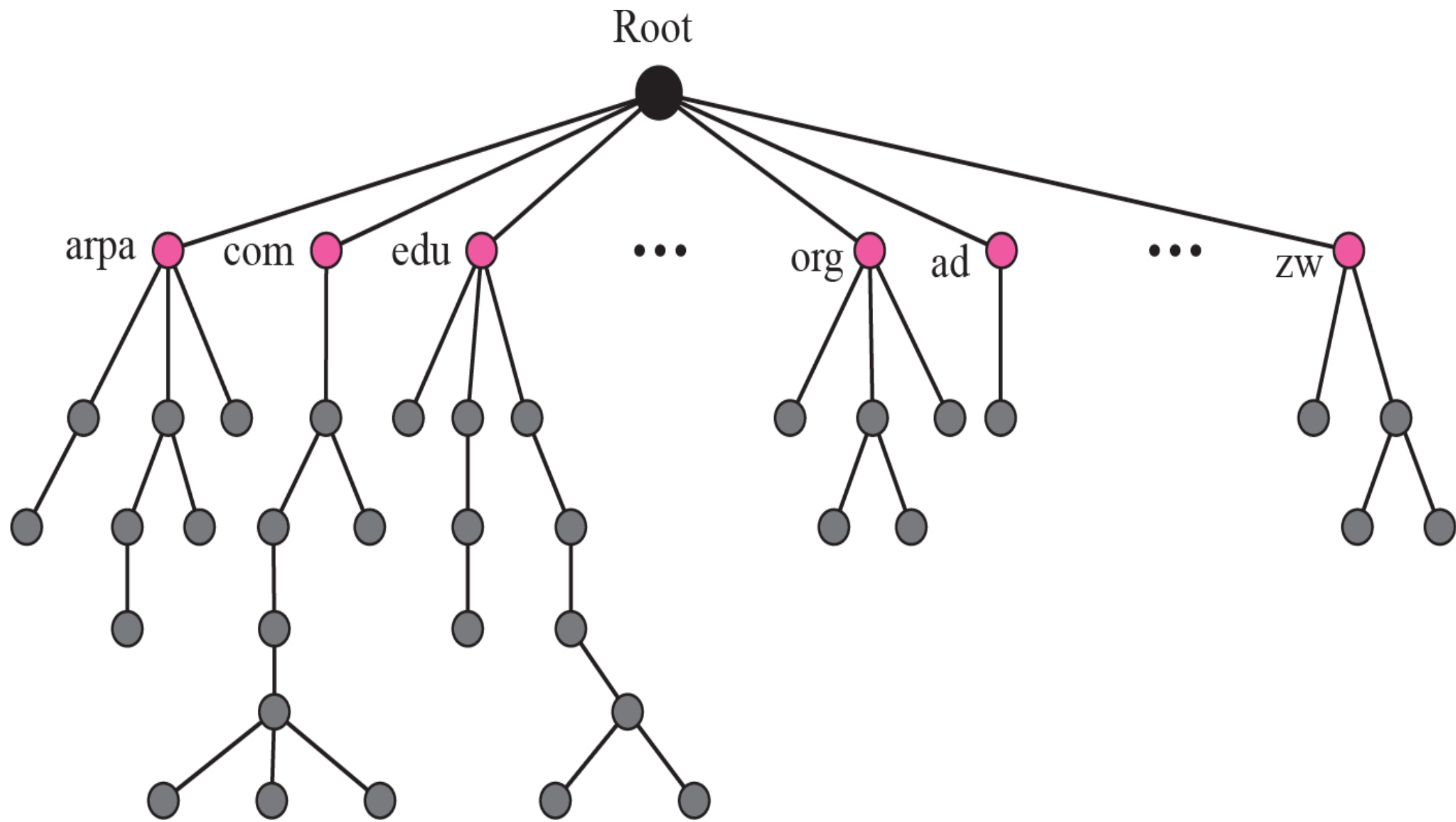
- To identify an entity, TCP/IP protocols use the IP address, which uniquely identifies the connection of a host to the Internet.
- However, people prefer to use names instead of numeric addresses.
- Therefore, we need a system that can map a name to an address or an address to a name.

# NAME SPACE

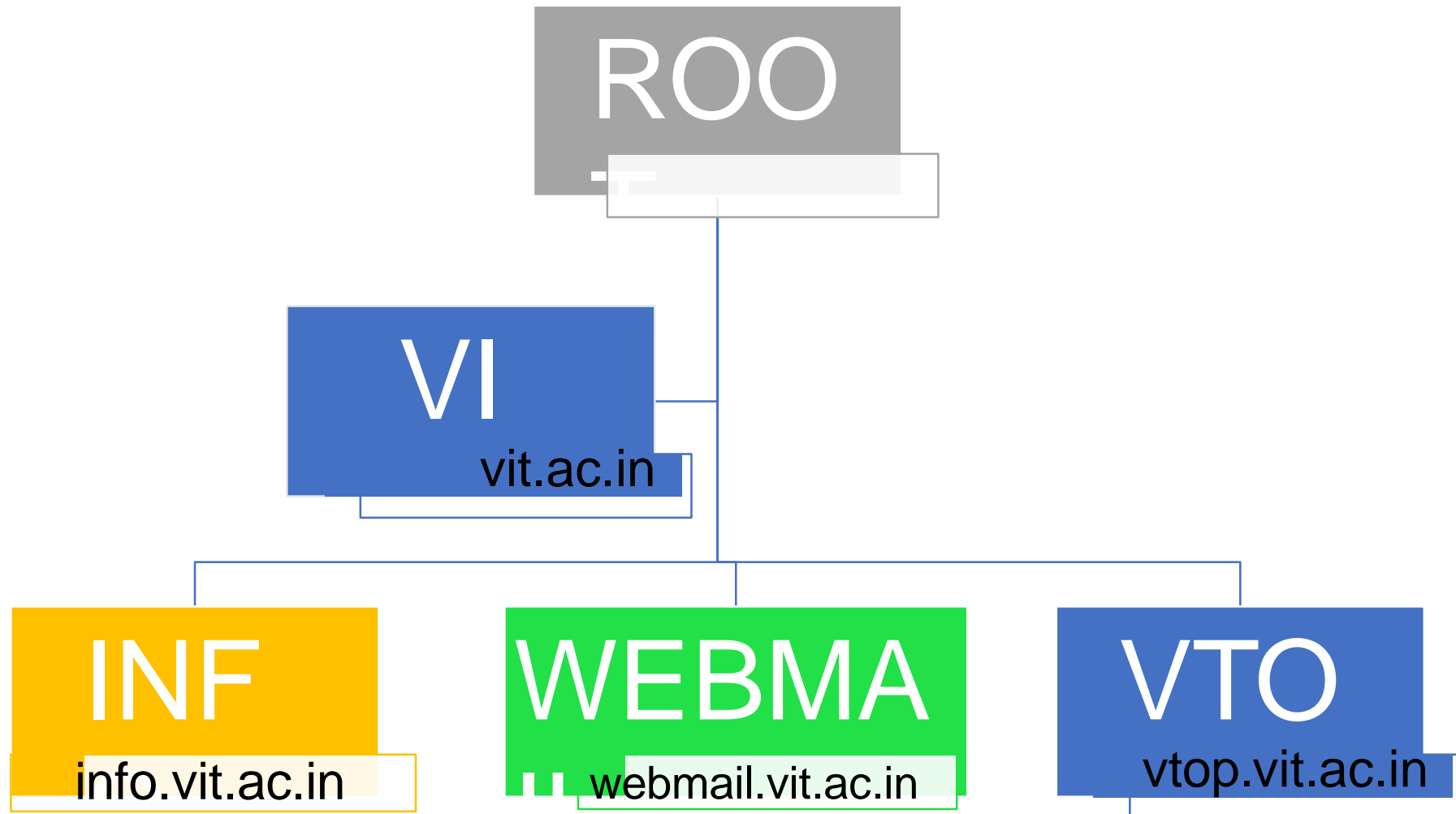
- To be unambiguous, the names assigned to machines must be carefully selected from a name space binded between the names and IP addresses.
- In other words, the names must be unique because the addresses are unique.
- A name space that maps each address to a unique name can be organized in two ways:
  - **Flat**
  - **Hierarchical**

# NAME SPACE

- Flat Name Space
- Hierarchical Name Space
- Domain Name Space
- Distribution of Name Space

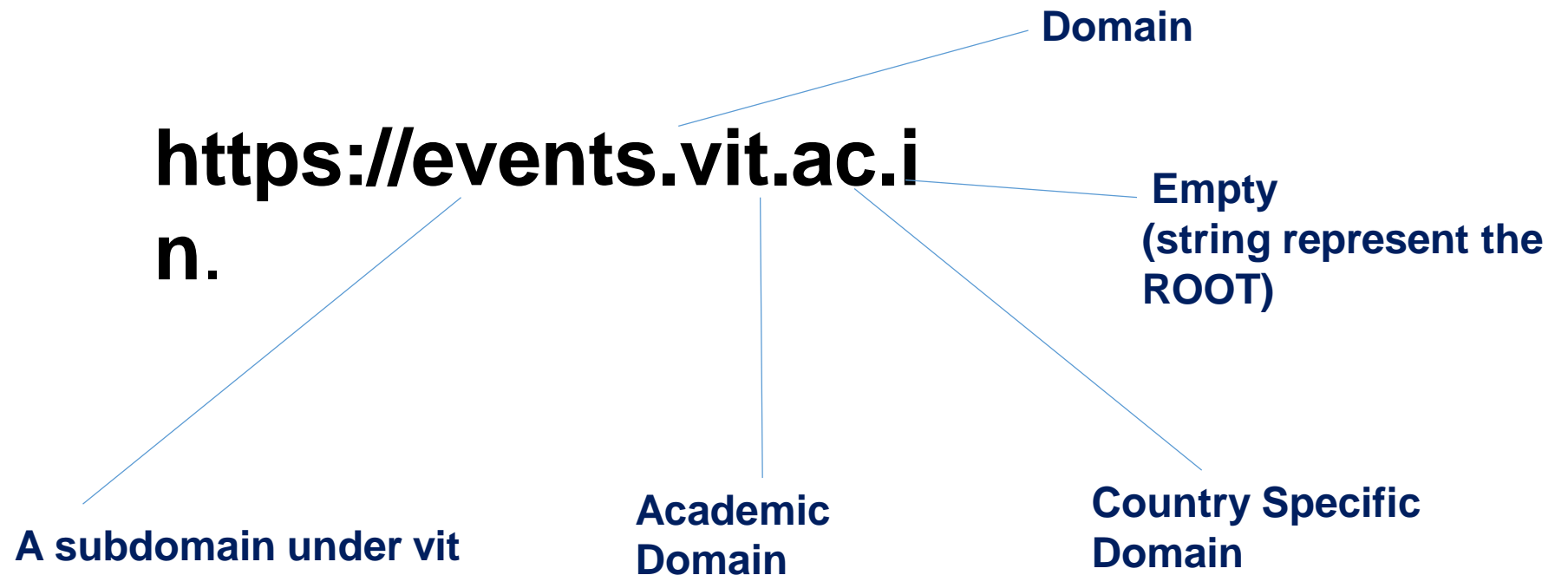


# DOMAIN NAME AND LABEL



# FQDN & PQDN

- A **fully qualified domain name (FQDN)**, sometimes also referred as an absolute domain name, is a domain name that specifies its exact location in the tree hierarchy of the **Domain Name System (DNS)**.



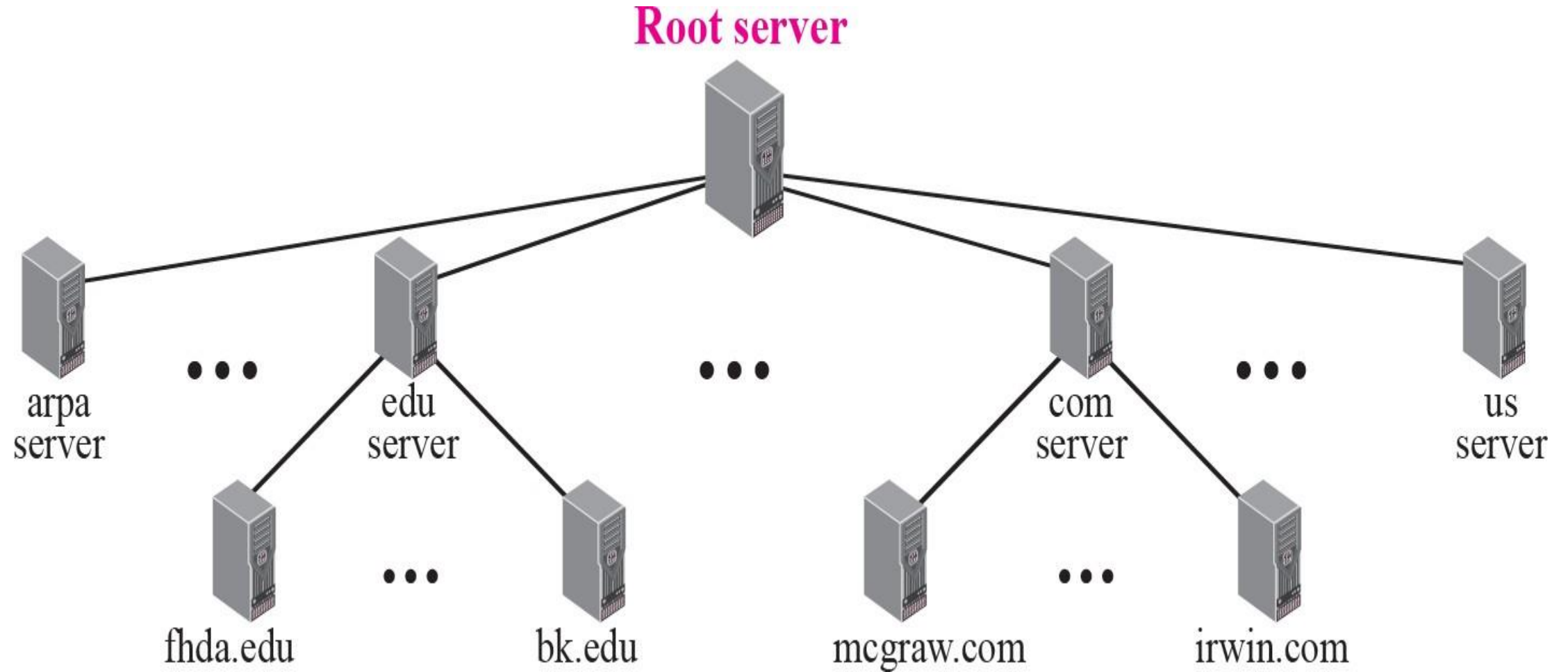
*DNS Domain names can contain characters "a to z", "A to Z", "0 to 9", and "-" (hyphen) only. Other common characters are not allowed.*

# FQDN & PQDN

- A **partially qualified domain name (PQDN)** is a domain name that does not include all the levels between the host and the root node
- A Partially Qualified Domain Name (PQDN) is used to specify a portion of a domain name, normally the host portion of it.
- Example of Partially Qualified Domain Name (PQDN) **vtop**. Usually the computers will add the DNS suffix along with Partially Qualified Domain Name (PQDN) before sending a DNS query for name resolution.

Example : **vtop**

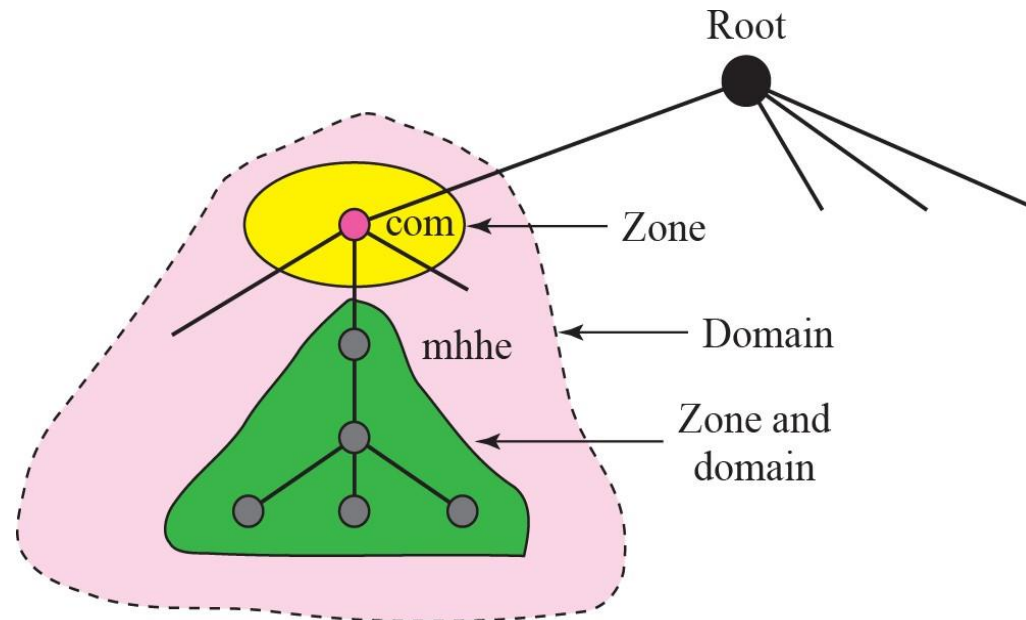
# Hierarchy of name servers





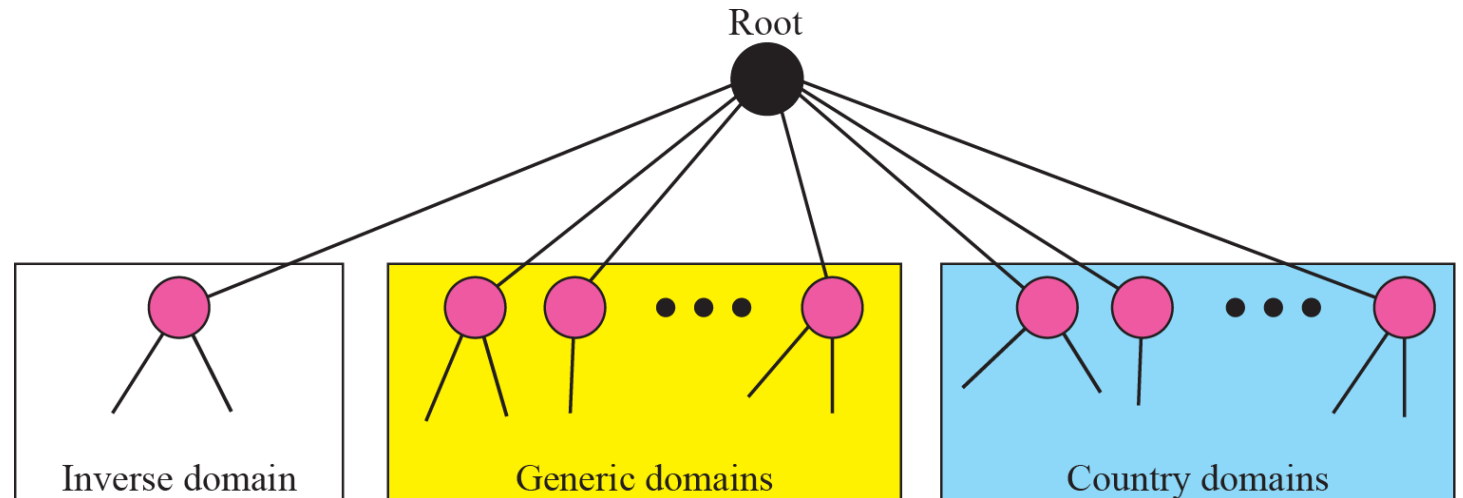
# Zones and domains

- DNS zone refers to a certain portion or administrative space within the global Domain Name System (DNS).
- Each DNS zone represents a boundary of authority subject to management by certain entities.
- The total of all DNS zones, which are organized in a hierarchical tree-like order of cascading lower-level domains, form the DNS namespace.

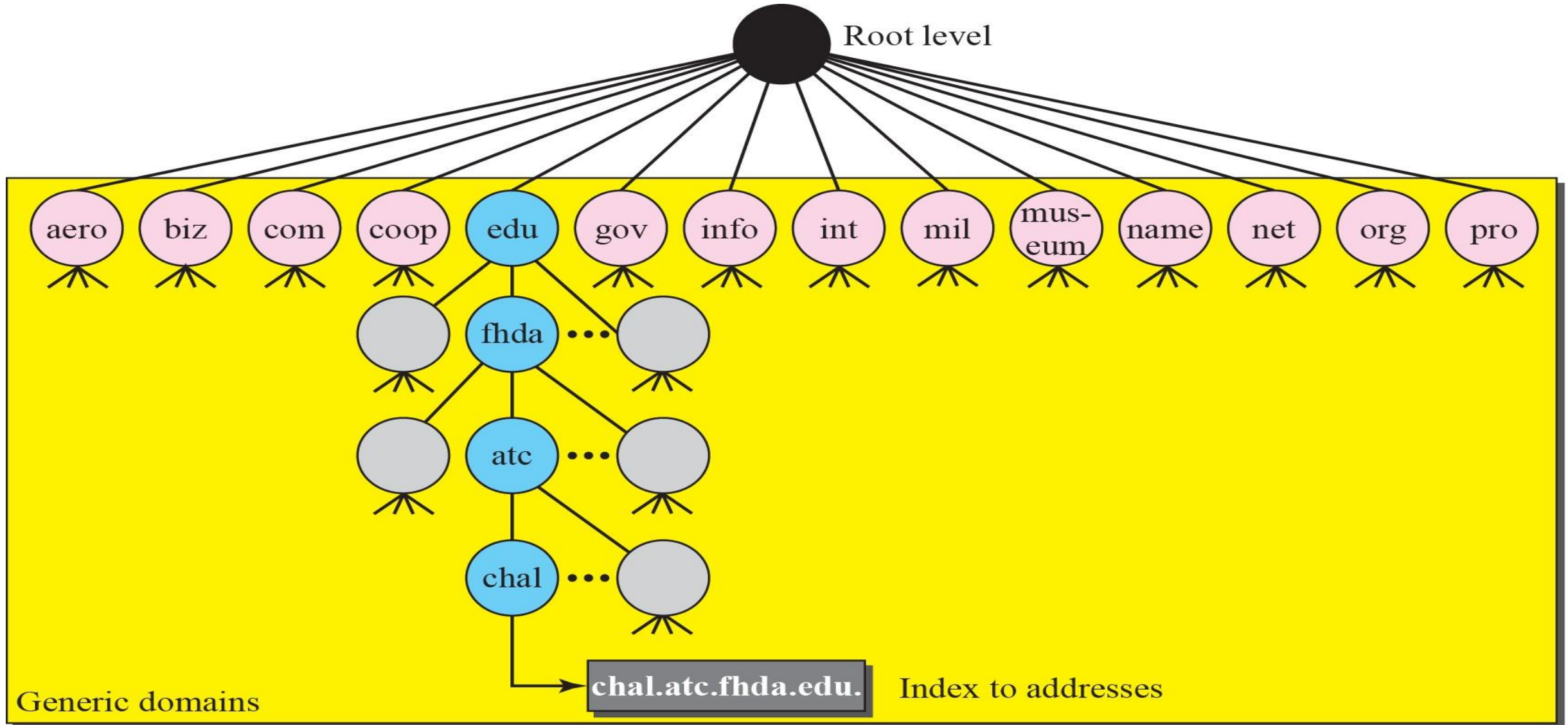


# DNS IN THE INTERNET

- DNS is a protocol that can be used in different platforms.
- In the Internet, the domain name space (tree) is divided into three different sections:
  - Generic domains
  - Country domains
  - Inverse domain



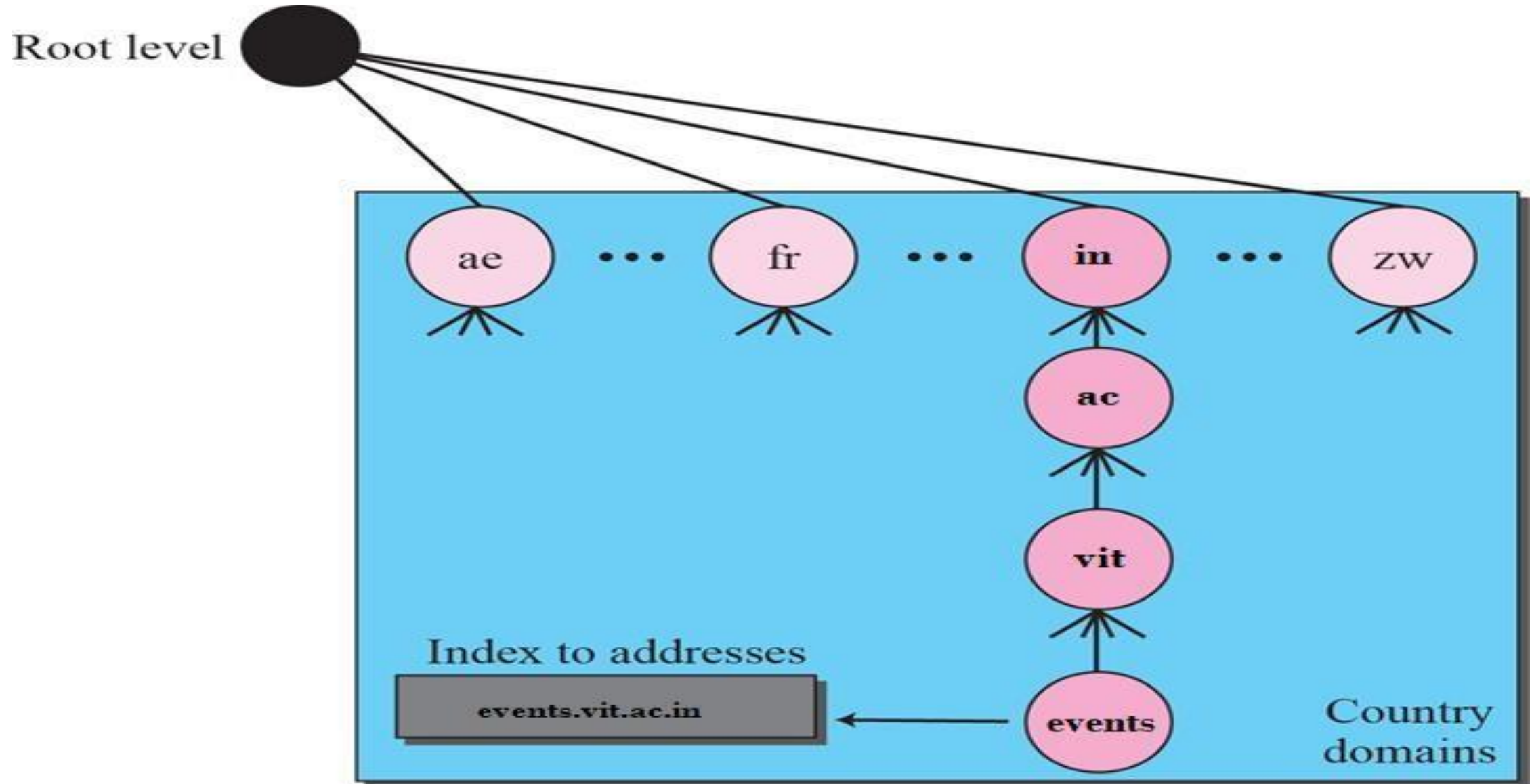
# GENERIC DOMAINS



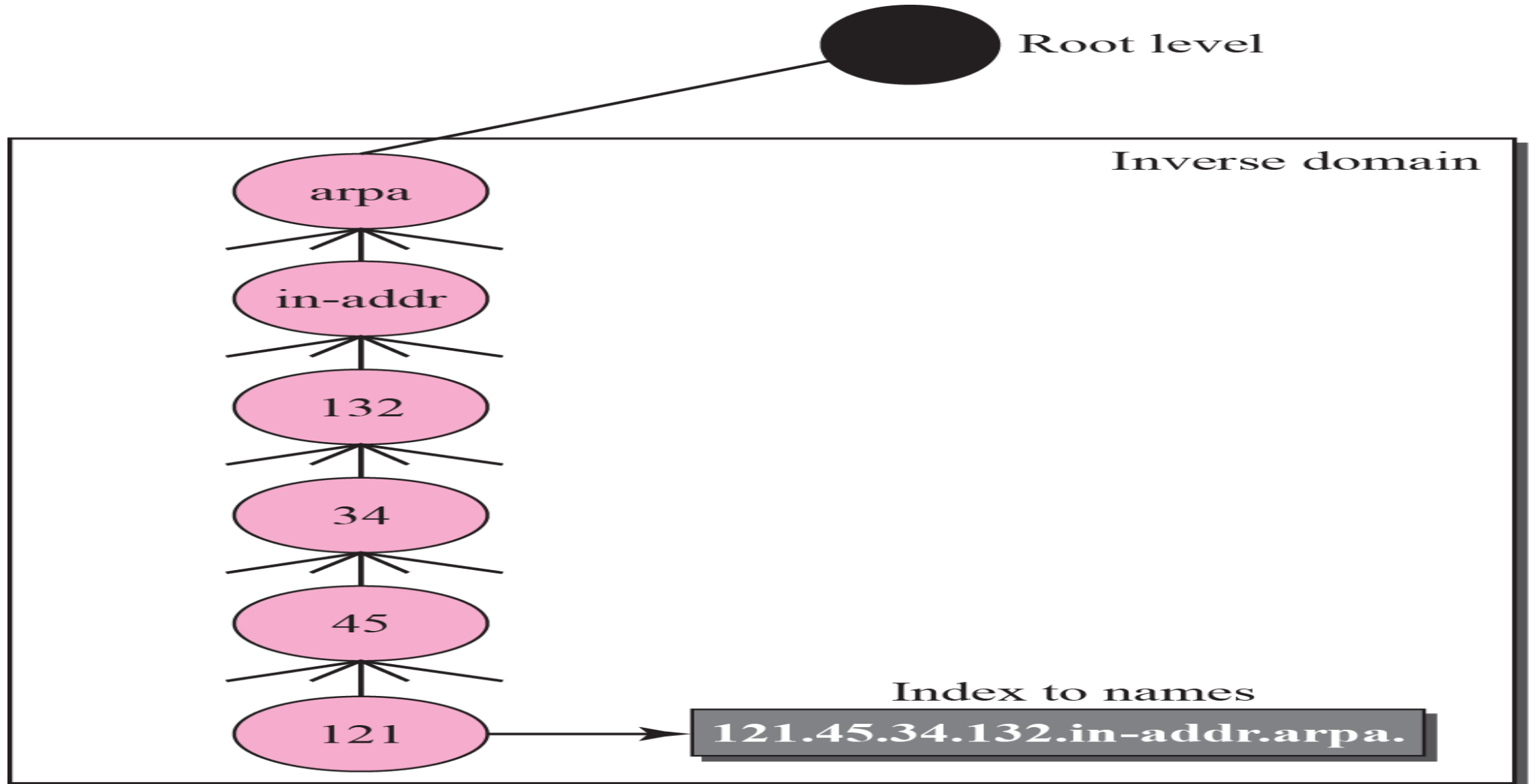
# GENERIC DOMAINS

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

# COUNTRY DOMAINS



# INVERSE DOMAIN

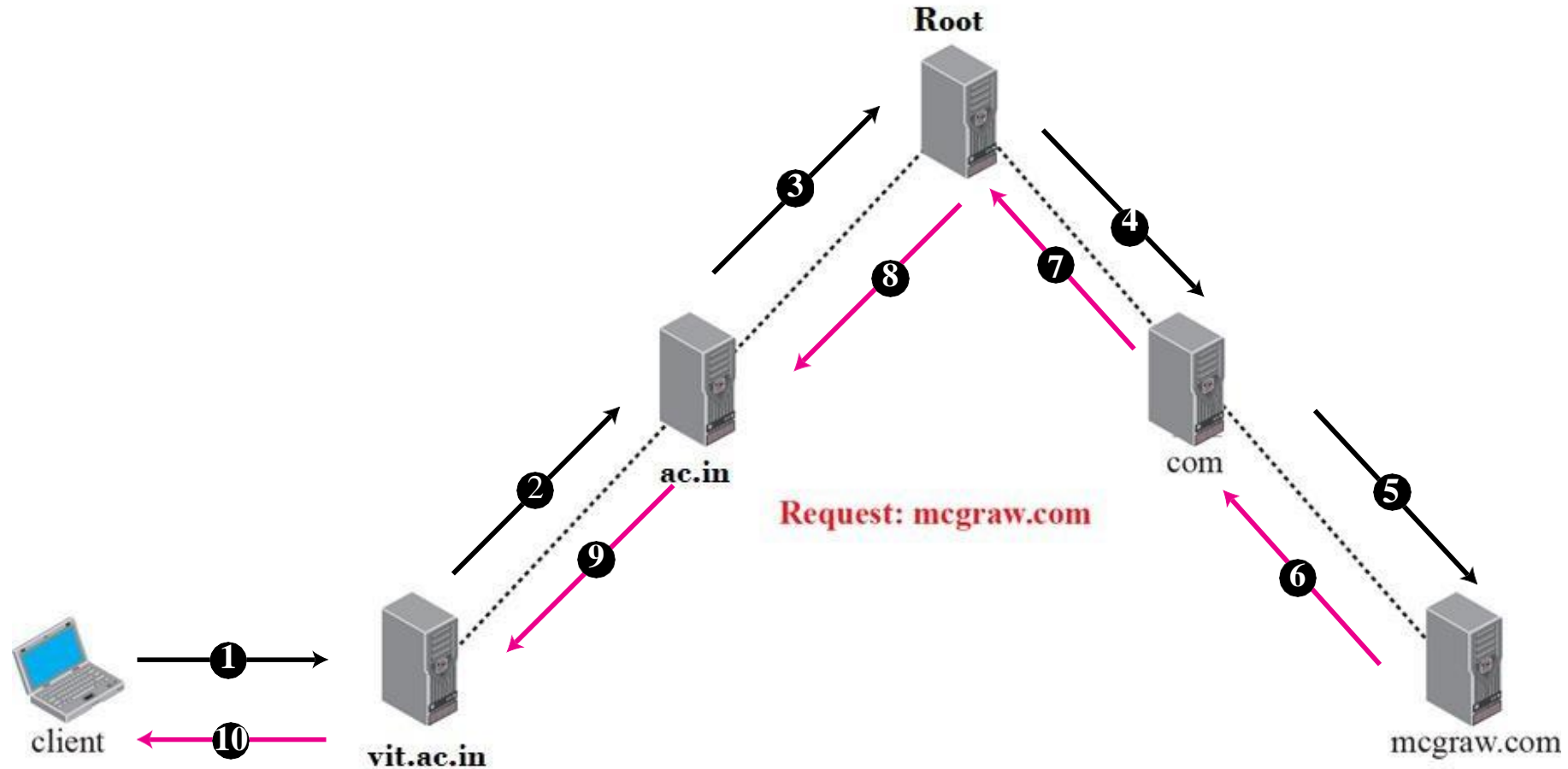




# DNS RESOLUTION

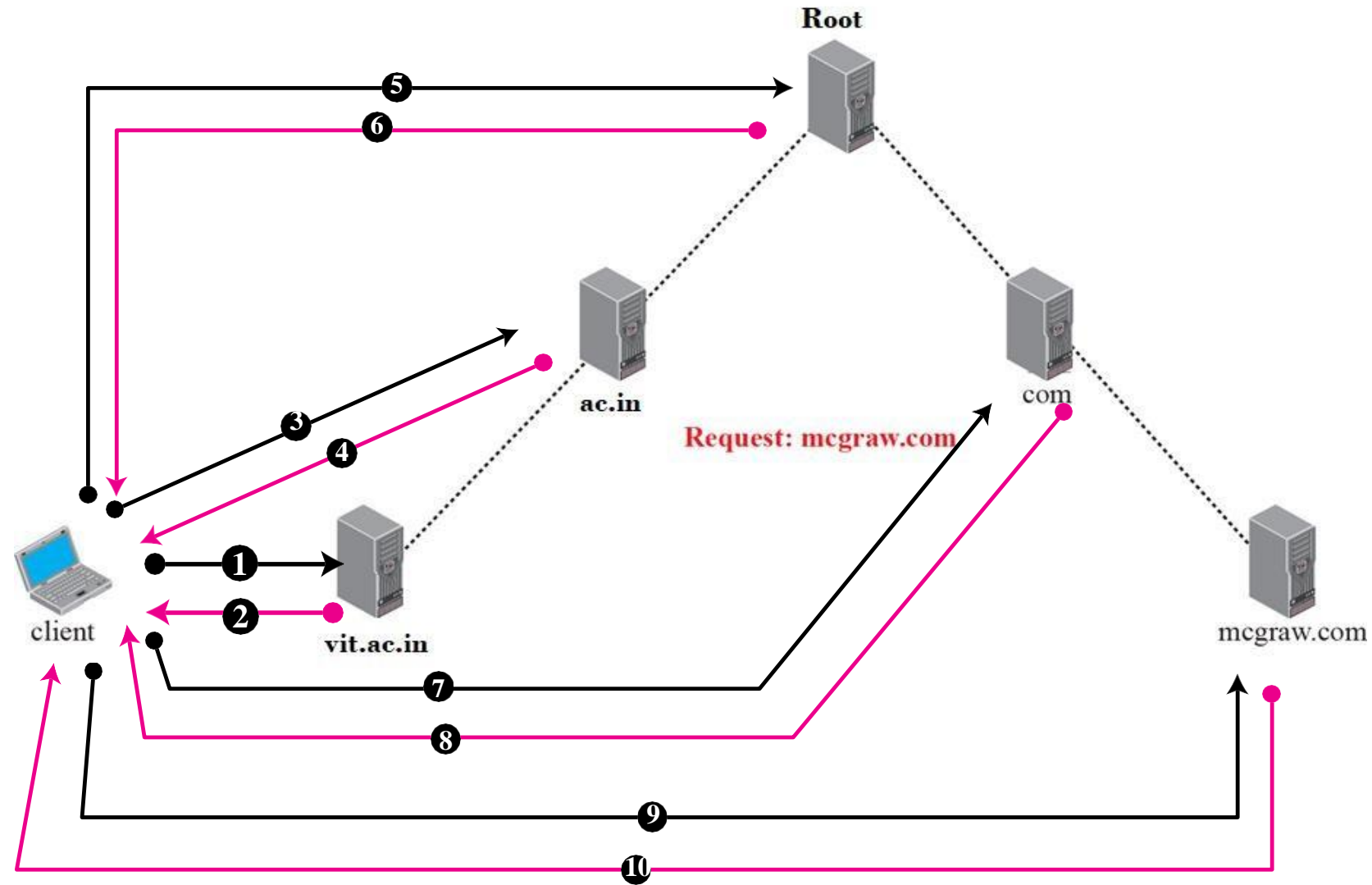
- Mapping a name to an address or an address to a name is called name-address resolution.
- ✓ Resolver
  - Mapping Names to Addresses
  - Mapping Addresses to Names
- ✓ Recursive Resolution
- ✓ Iterative Resolution

# RECURSIVE RESOLUTION





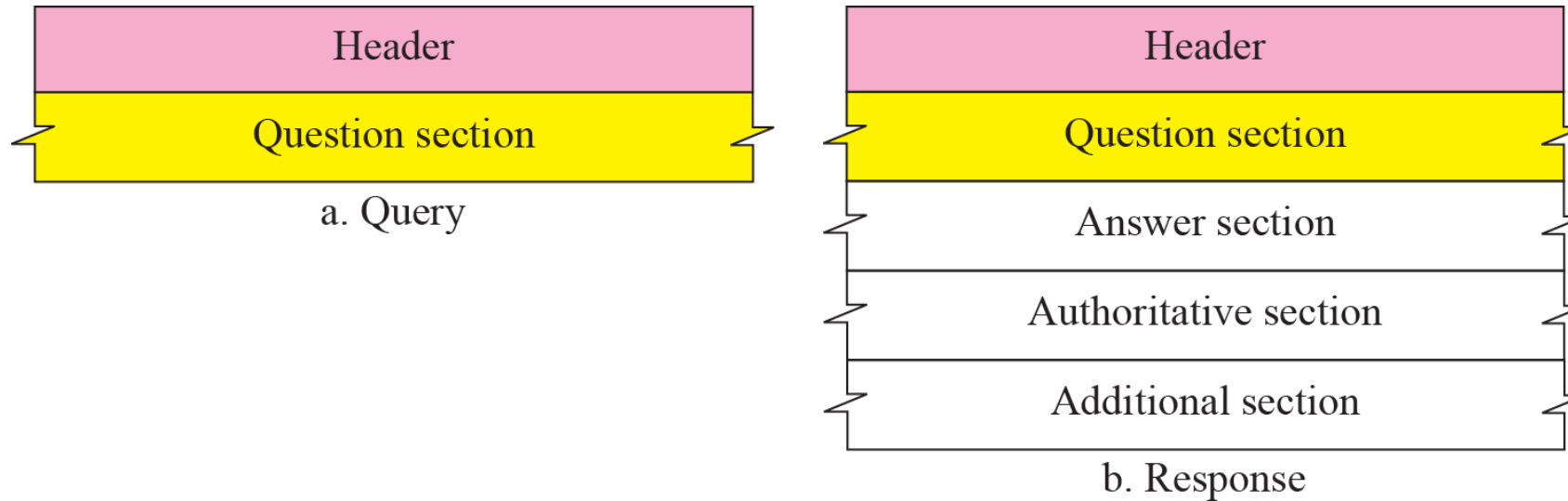
# ITERATIVE RESOLUTION



# DNS MESSAGES

- DNS has two types of messages:
  - Query
  - 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.

# QUERY AND RESPONSE MESSAGES

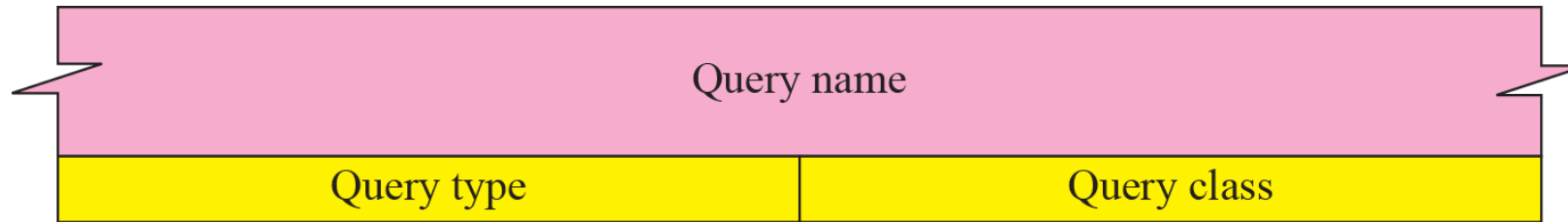


# TYPES OF RECORDS

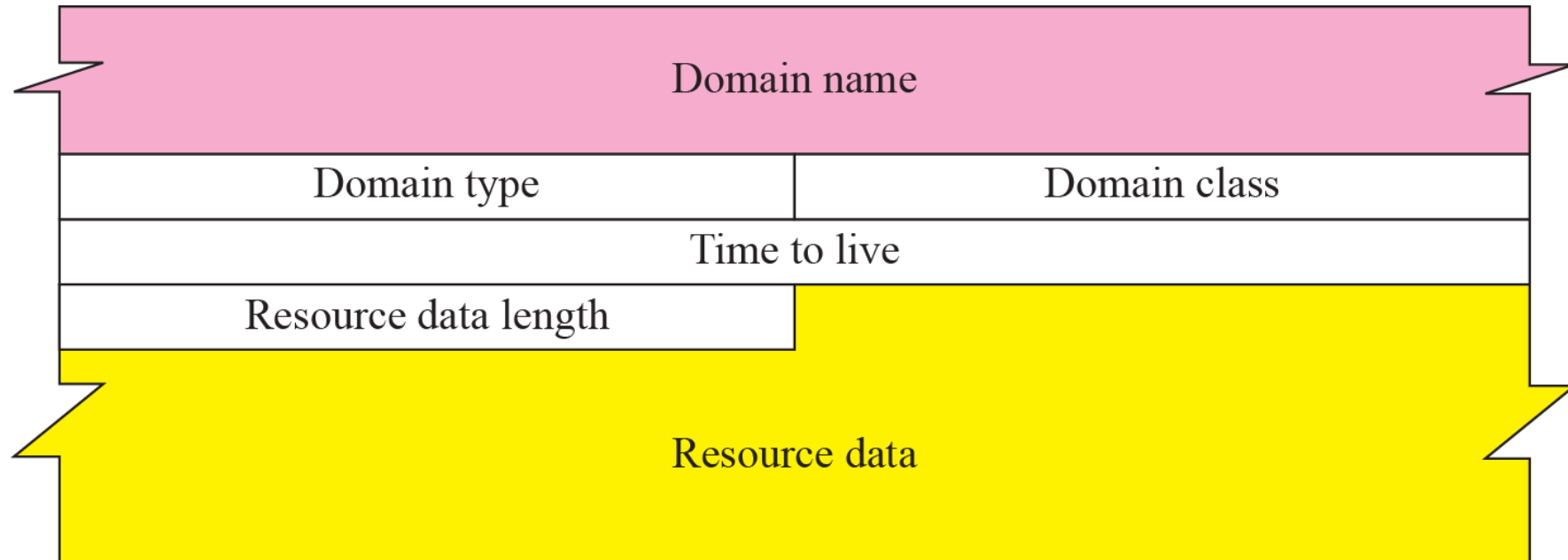
- As we saw in the previous section, two types of records are used in DNS. The question records are used in the question section of the query and response messages. The resource records are used in the answer, authoritative, and additional information sections of the response message.

- ✓ Question Record
- ✓ Resource Record

# QUESTION RECORD FORMAT



# RESOURCE RECORD FORMAT



# REGISTRARS

- How are new domains added to DNS? This is done through a registrar, a commercial entity accredited by **ICANN**. A registrar first verifies that the requested domain name is unique and then enters it into the DNS database. A fee is charged.

***ICANN - Internet Corporation for Assigned Names and Numbers***

# DDNS

- In DNS, when there is a change, such as
  - adding a new host
  - removing a host
  - changing an IP address
- The change must be made to the DNS master file.
- The DNSZmaster file must be updated dynamically.
- The Dynamic Domain Name System (DDNS) therefore was devised to respond to this need.



# SECURITY OF DNS

- DNS is one of the most important systems in the Internet infrastructure;
- Applications such as Web access or e-mail are heavily dependent on the proper operation of DNS.
- DNS can be attacked in several Ways.
- To protect DNS, IETF has devised a technology named DNS Security
- (DNSSEC) that provides the message origin authentication and message integrity using a security service called Digital signature