



# Computer Networks

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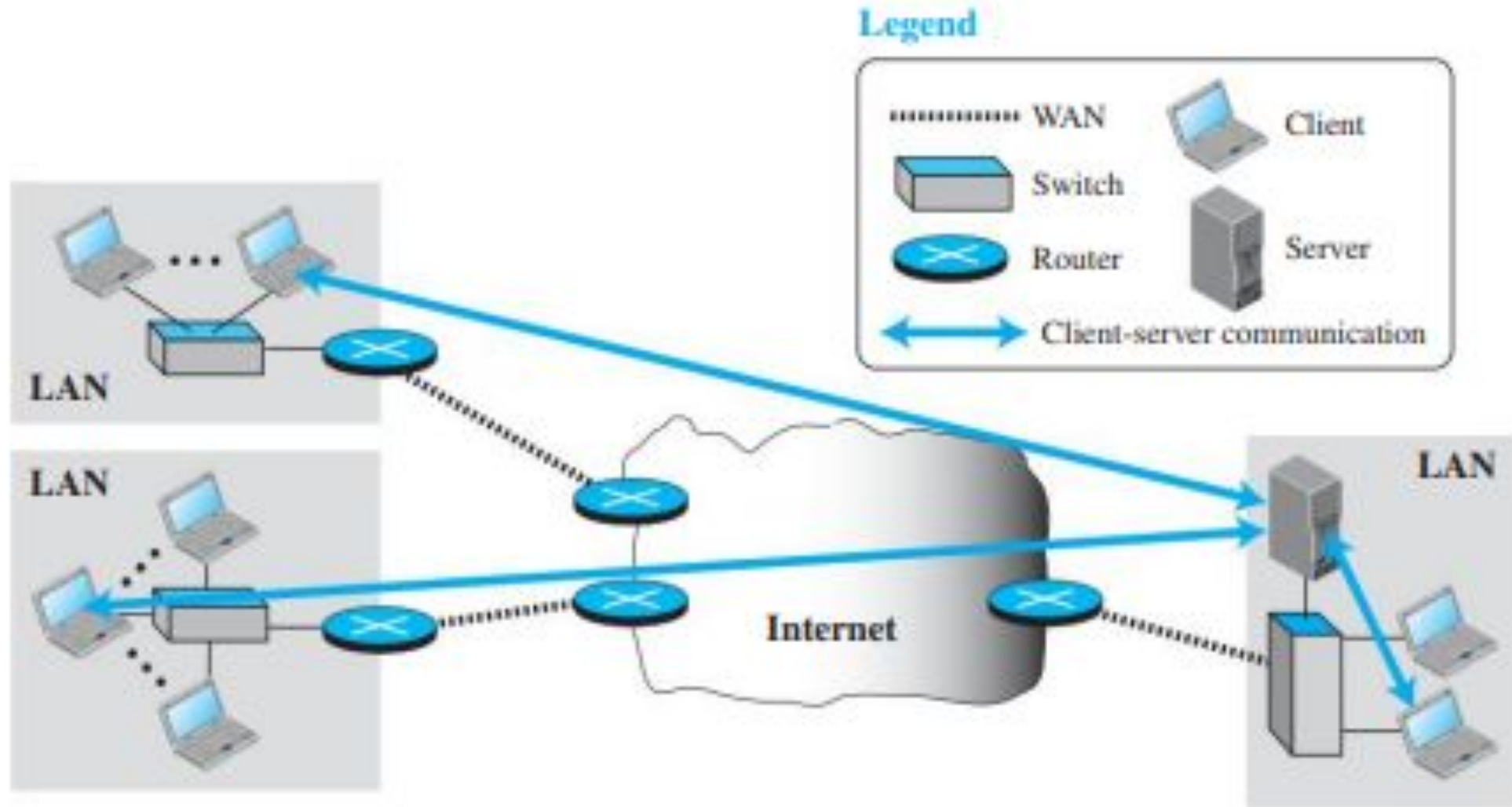
# Unit 5

## Application Layer

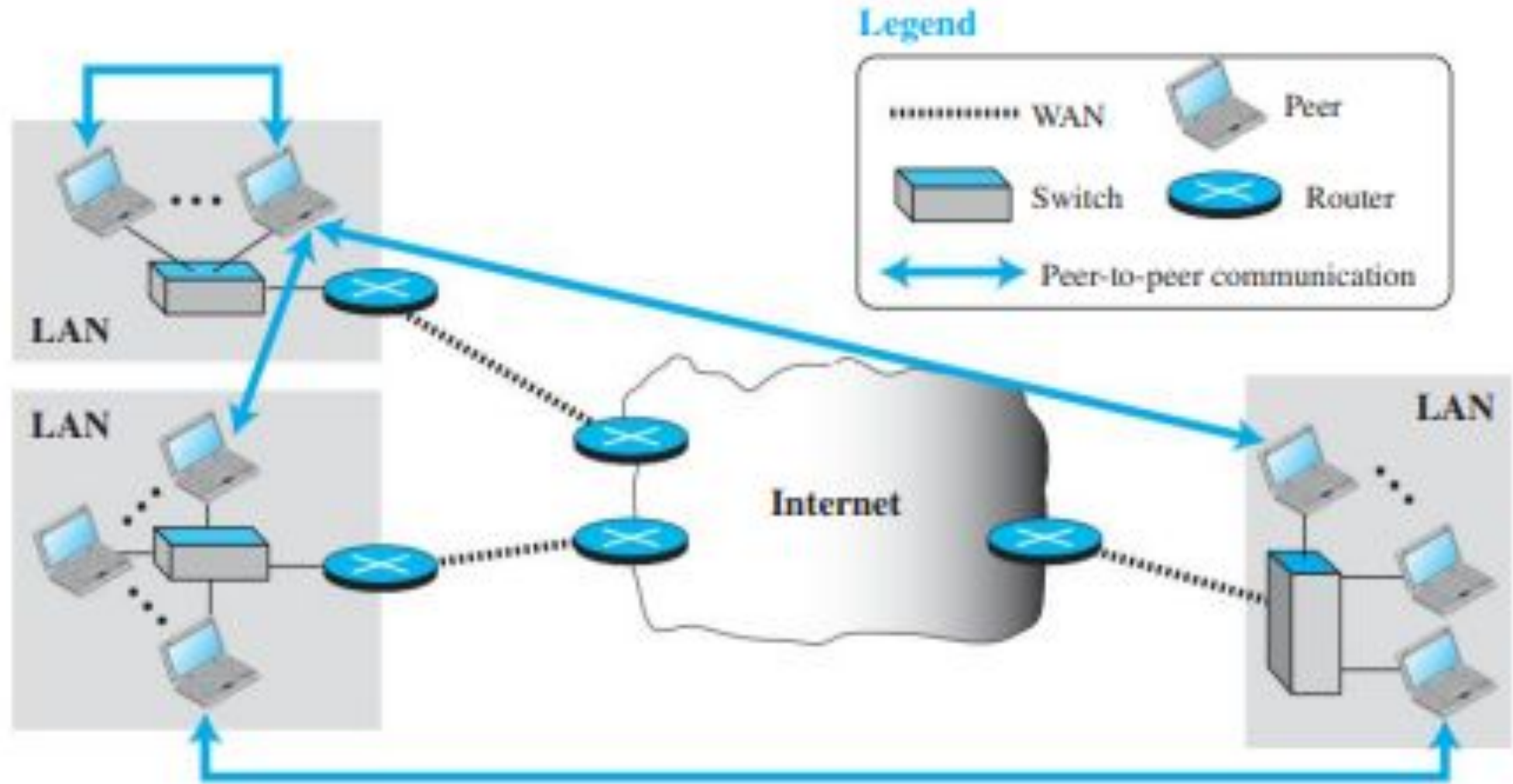
# Contents

- Client Server Paradigm
- Peer to Peer Paradigm
- Communication using TCP and UDP services
- Domain Name System

# Client Server Paradigm



# Peer to Peer Paradigm



# Communication using TCP & UDP Services

- UDP : Doesn't provide acknowledgement of the sent packets. Therefore, it isn't reliable and depends on the higher layer protocols for the same. But on the other hand it is simple, scalable and comes with lesser overhead as compared to TCP. It is used in video and voice streaming.
- TCP : Provides acknowledgement of the received packets and is also reliable as it resends the lost packets. It is better than UDP but due to these features it has an additional overhead. It is used by application protocols like HTTP and FTP.
- SCTP: SCTP provides a connection-oriented, reliable service, but it is not byte-stream oriented. It is a message-oriented protocol like UDP

# Domain Name Server

# *Introduction*

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- There are several applications in the application layer of the Internet model that follow the client/server paradigm.
- The client/server programs can be divided into two categories:
  - Application that directly used by the user, such as e-mail
  - Application that support other application programs.
- The Domain Name System (DNS) is a supporting program that is used by other programs such as e-mail.

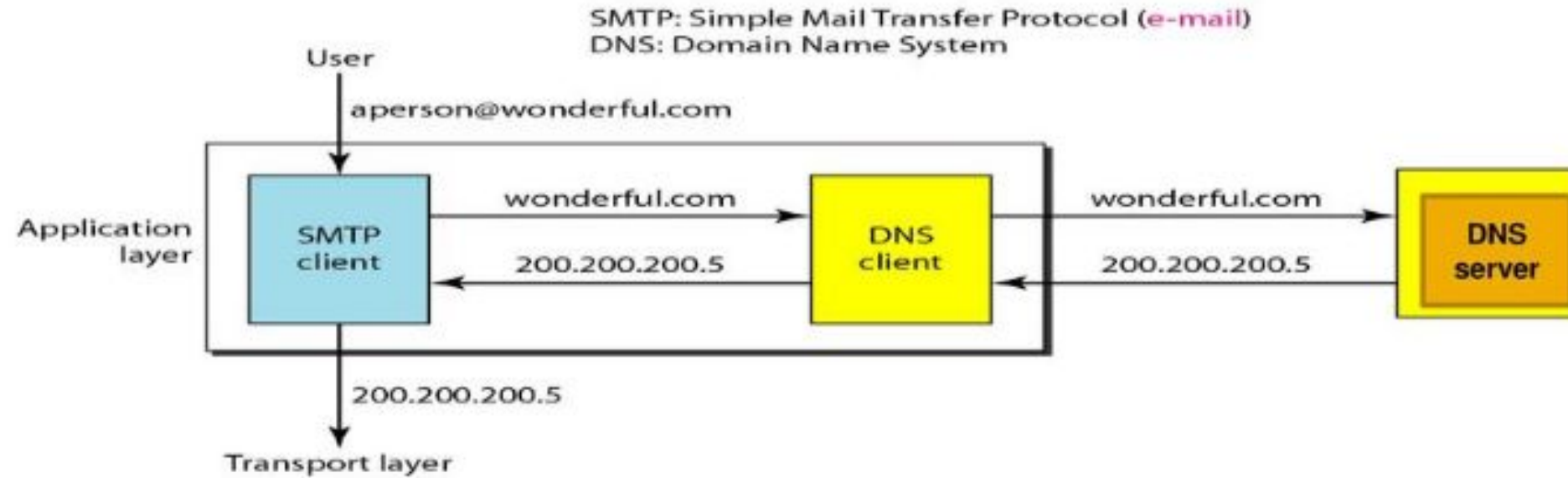


# Introduction

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- ❑ 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, which is the DNS server

## Figure Example of using the DNS service



- Figure shows an example of how a DNS client/server program can support an e-mail program to find the IP address of an e-mail recipient
- A user of an e-mail program may know the e-mail address of the recipient
- The DNS client program sends a request to a DNS server to map the e-mail address to the corresponding IP address
- After that, DNS will response to the client with the IP address

# Hierarchical Name Space

To be unambiguous, the names assigned to machines must be carefully selected from a *name space* with complete control over the binding between the names and IP addresses. Name space can be

- ▣ Flat name space

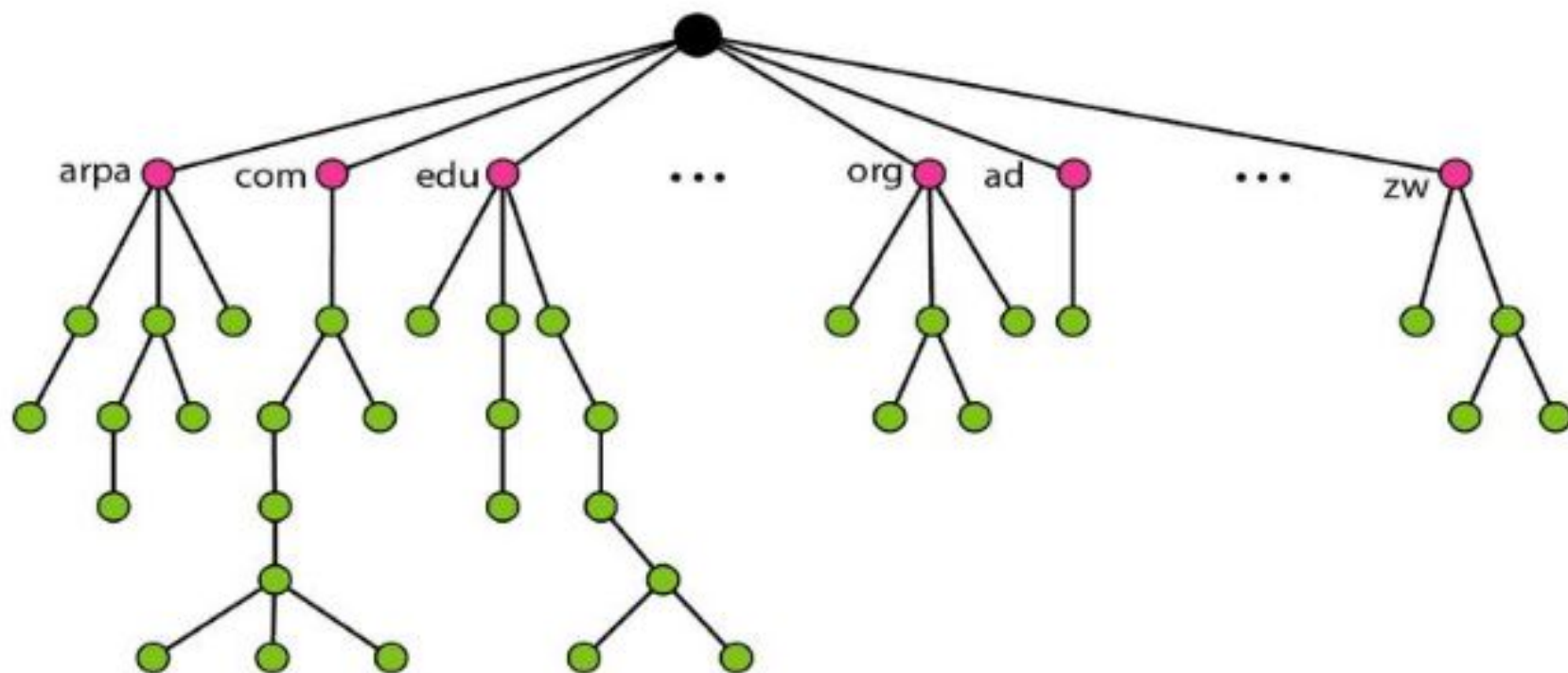
- A name is assigned to an address.
- A name in this space is a sequence of characters without structure.

- ▣ Hierarchical name space

- In a hierarchical name space, each name is made of several parts.
- The **first** part can define the nature of the organization, the **second** part can define the name of an organization, the **third** part can define departments in the organization, and so on.

# DOMAIN NAME SPACE

To have a hierarchical name space, a domain name space was designed. In this design the names are defined in an inverted-tree structure with the root at the top. The tree can have only 128 levels: level 0 (root) to level 127.





# DOMAIN NAME SPACE

## □ Label :

- ▣ 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 string).

## □ Domain Name:

- ▣ Each node in the tree has a domain name. A full domain name is a sequence of labels separated by dots
  - Fully Qualified Domain Name
  - Partially Qualified Domain Name

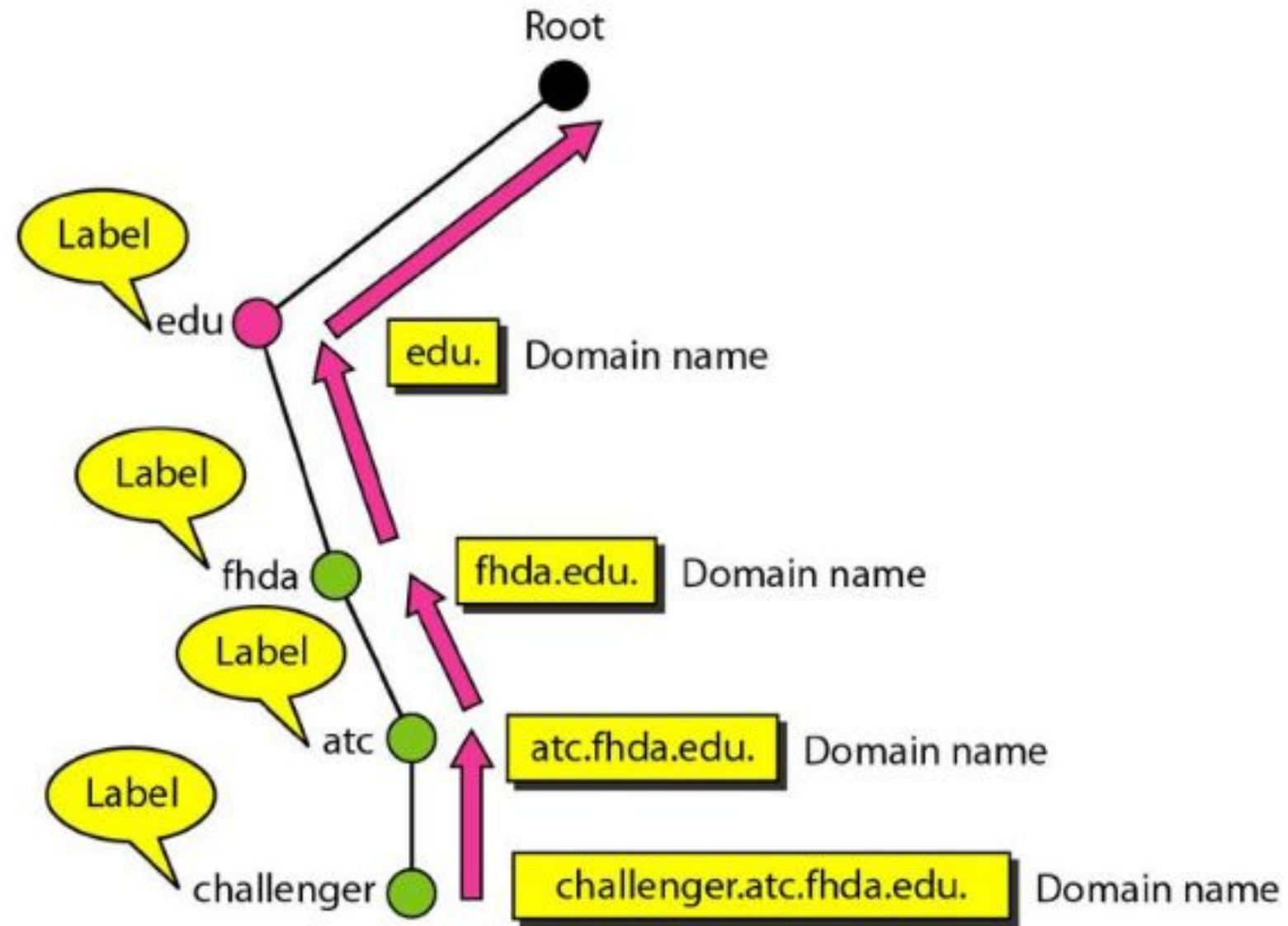
FQDN

challenger.atc.fhda.edu.  
cs.hmme.com.  
www.funny.int.

PQDN

challenger.atc.fhda.edu  
cs.hmme  
www

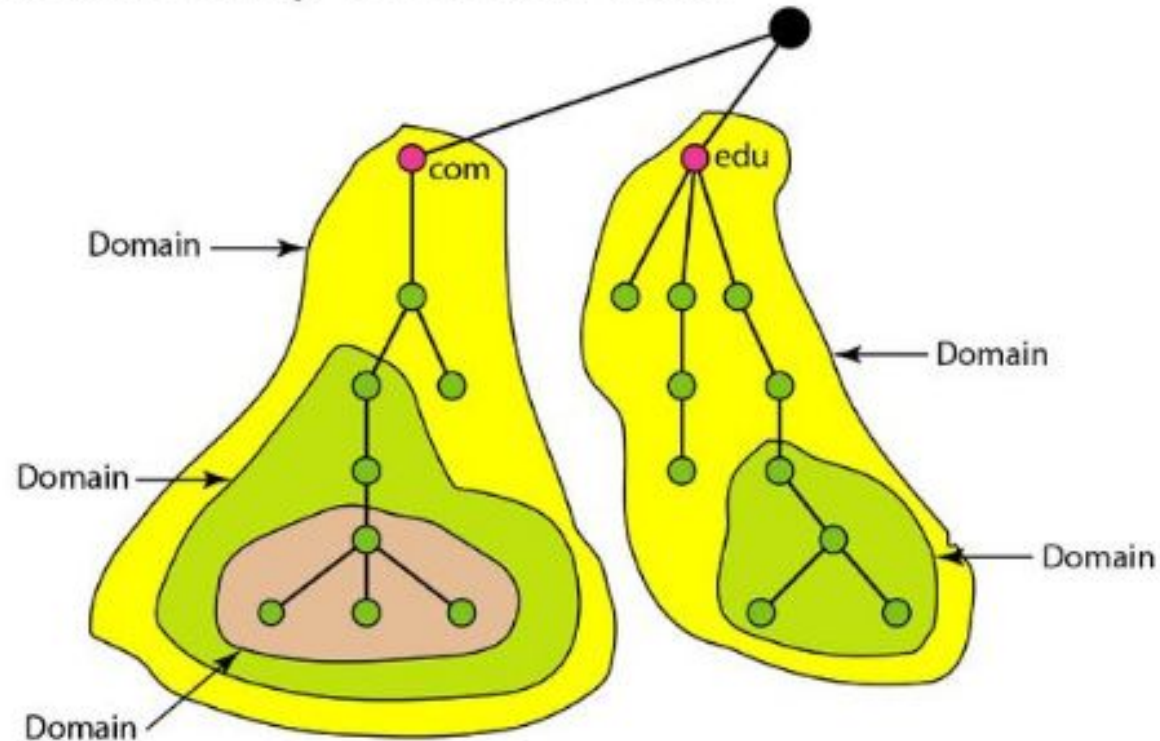
**Figure** *Domain names and labels*



# DOMAIN NAME SPACE

## □ Domain :

- ▣ A **domain** is a sub tree of the domain name space.
- ▣ The name of the domain is the domain name of the node at the top of the sub tree.

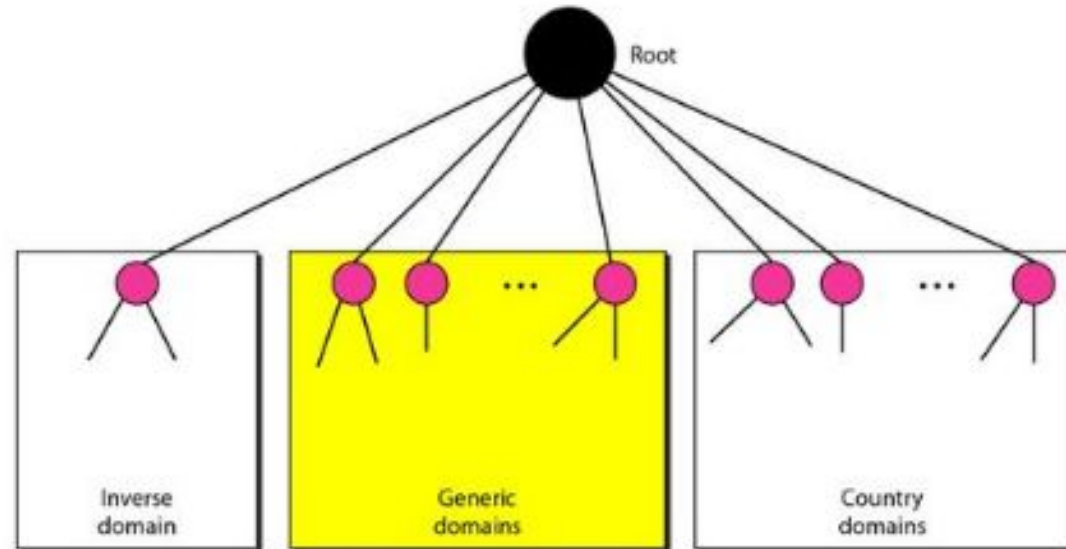


# DNS IN THE INTERNET

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, and the inverse domain.

## Topics

**Generic Domains**  
**Country Domains**  
**Inverse Domain**





# DNS IN THE INTERNET

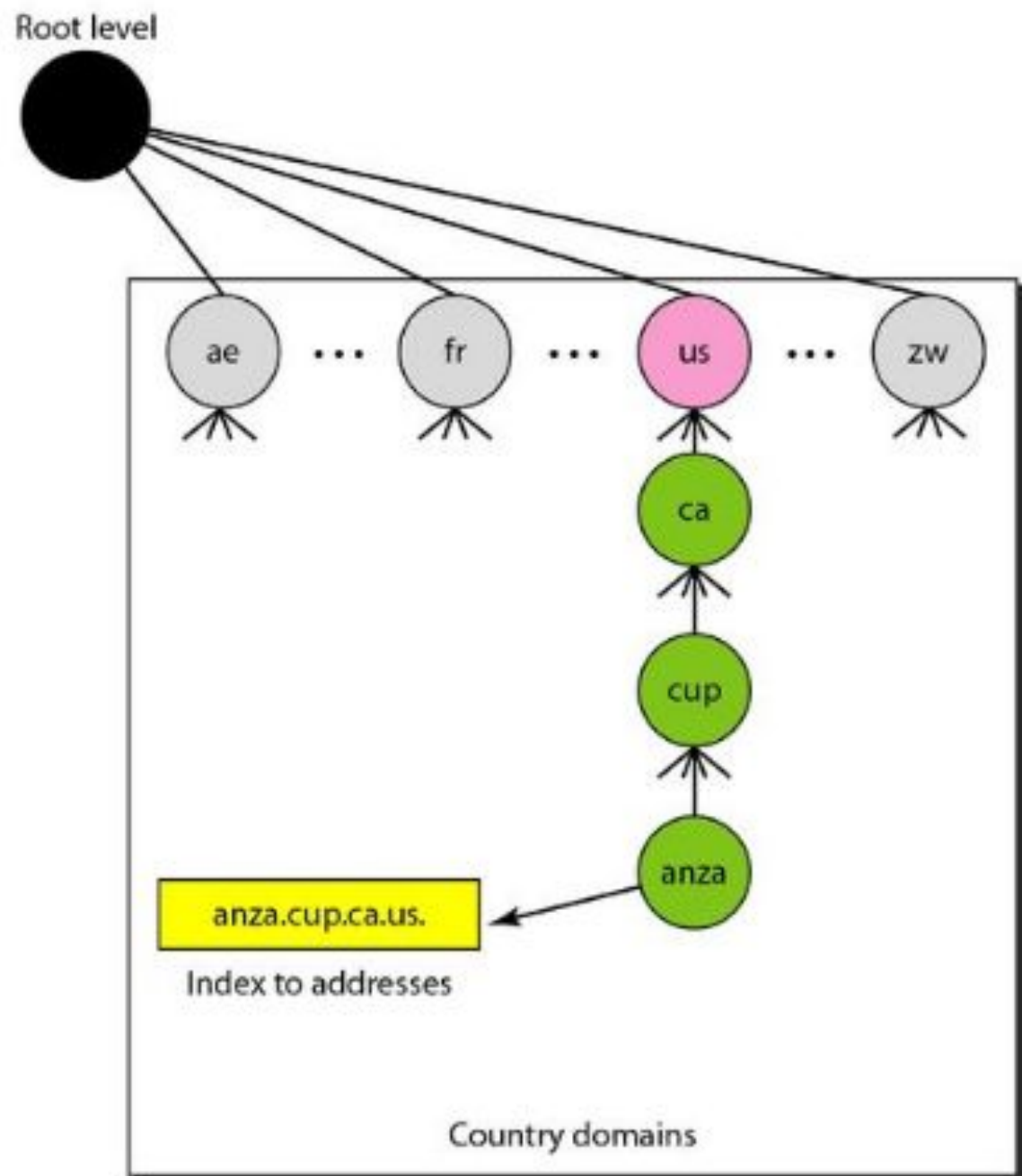
## 1. Generic Domains

- The **generic domains** define registered hosts according to their generic behavior. Each node in the tree defines a domain
- Example : .com , .gov

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

## 2. Country Domains

- The country domains section uses two-character country abbreviations (e.g., us for United States).
- Second labels can be organizational, or they can be more specific, national designations.
- The United States, for example, uses state abbreviations as a subdivision of us (e.g., ca.us.).



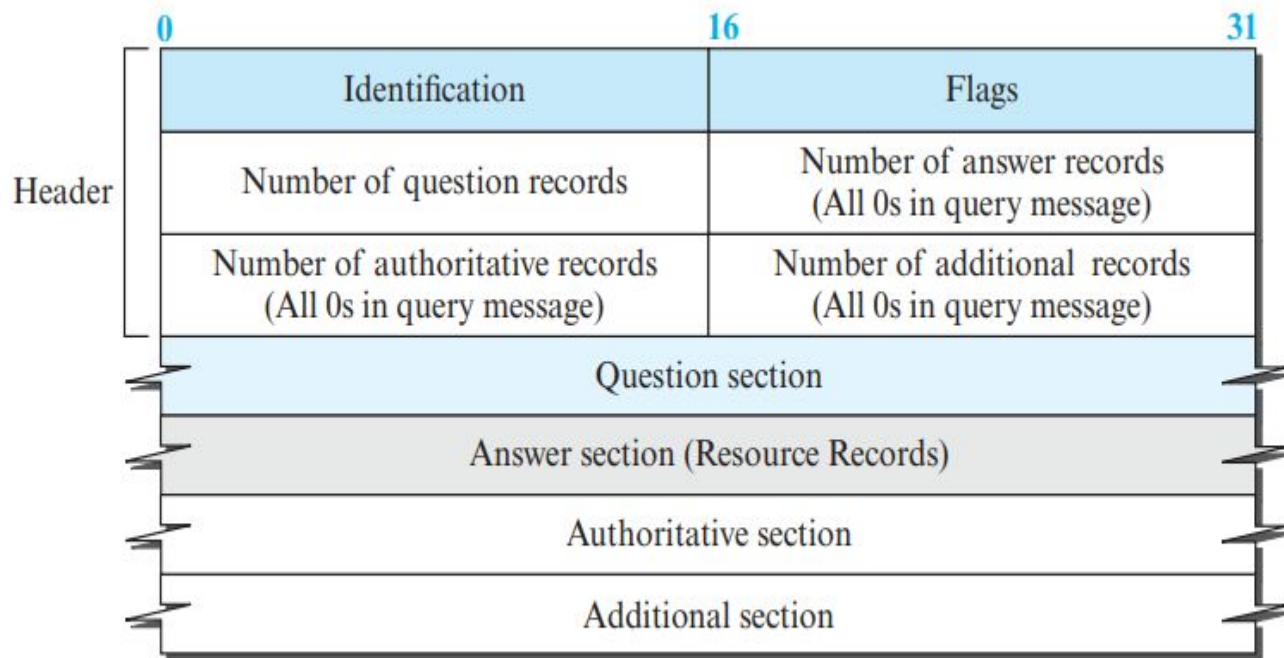
### 3. Inverse domain

- ▣ The inverse domain is used to map an address to a name. This may happen, for example, when a server has received a request from a client to do a task.
- ▣ Although the server has a file that contains a list of authorized clients, only the IP address of the client (extracted from the received IP packet) is listed.

*Mapping a name to an address or an address to a name is called name-address resolution.*



**Figure**     *DNS message*



**Note:**

The query message contains only the question section.  
The response message includes the question section,  
the answer section, and possibly two other sections.

The identification field is used by the client to match the response with the query.

The flag field defines whether the message is a query or response. It also includes status of error.

The next four fields in the header define the number of each record type in the message.

The question section, which is included in the query and repeated in the response message, consists of one or more question records. It is present in both query and response messages.

The answer section consist of one or more resource records. It is present only in response messages.

The authoritative section gives information (domain name) about one or more authoritative servers for the query.

The additional information section provides additional information that may help the resolver.

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**Thank you**