



Unit 6: Application Layer

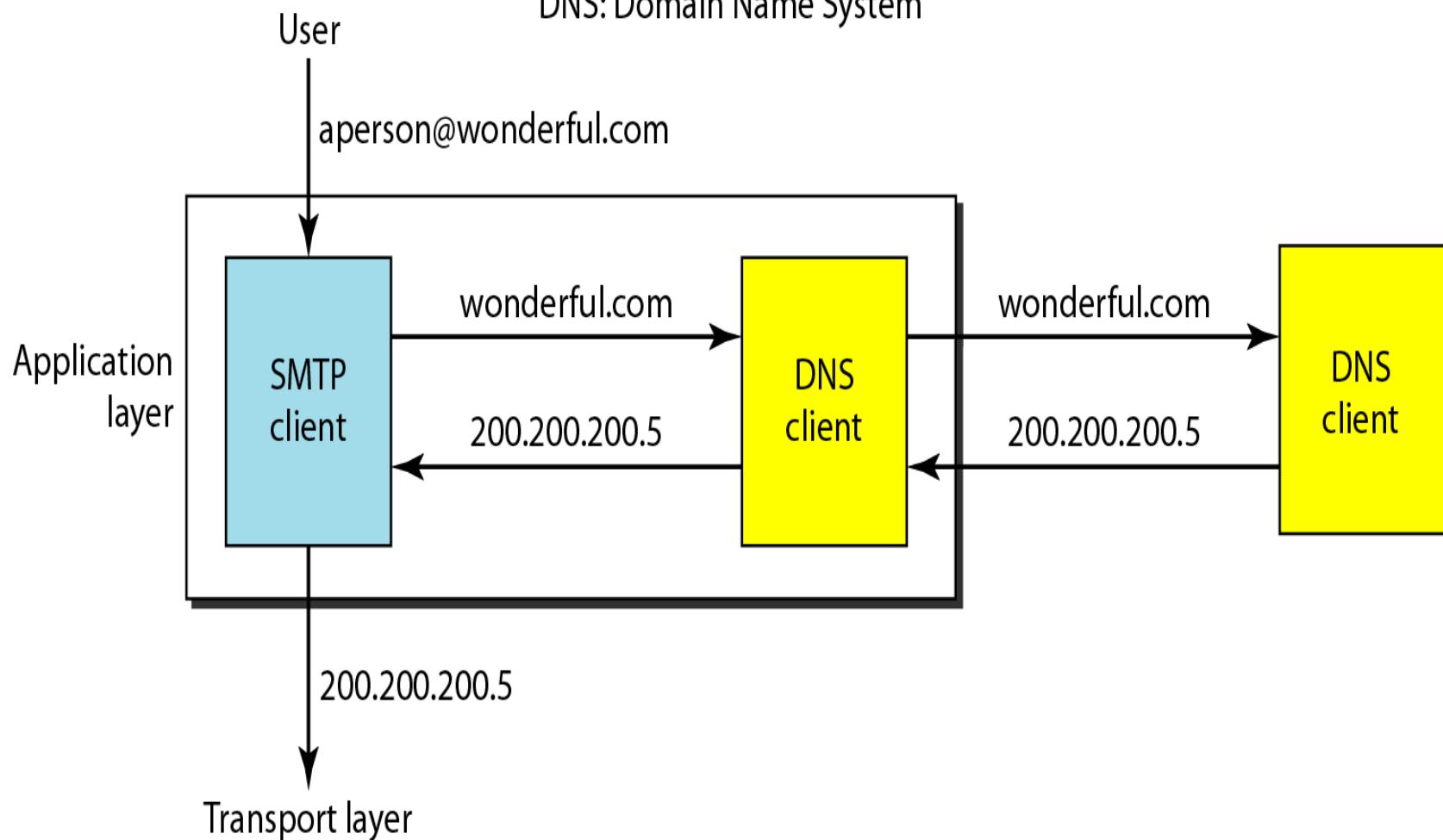
DNS (Domain Name Space)

- Client/server programs divided in two categories
 - Directly used by user (email)
 - DNS is supported program that used by the other programs like email

Using the DNS service

SMTP: Simple Mail Transfer Protocol ([e-mail](#))

DNS: Domain Name System



Cont...

- 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; however, the IP protocol needs the IP address.
- The DNS client program sends a request to a DNS server to map the e-mail address to the corresponding IP address.
- To identify an entity, TCPI/IP protocols use the IP address. 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.
- Solutions:
 - Host file (name and address) on each host
 - Host file in single computer and allow to access centralized information to every computer that needs to mapping.
 - Divide this huge amount of information into smaller parts and store each part on a different computer.
 - Host that needs mapping can contact the closest computer holding the needed information. (Method used by DNS)

Name space

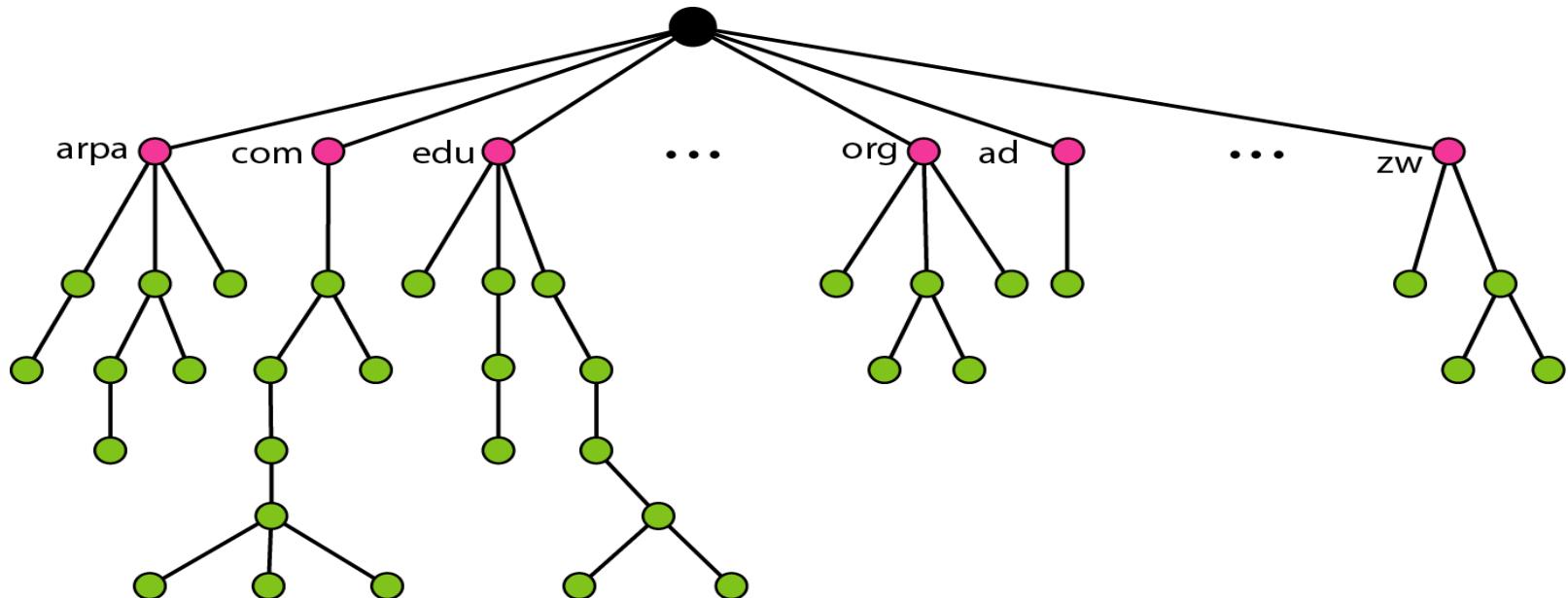
- *To be unambiguous, the name must be unique because the addresses are unique .*
- *Mapping name with address can be done using two ways:*
 - Flat Name Space
 - Hierarchical Name Space
- **FLAT NAME SPACE**
 - A name is assigned to an address
 - Disadvantage
 - It cannot be used in a large system such as the Internet because it must be centrally controlled to avoid ambiguity and duplication.

Hierarchical Name Space

- Name is made of several parts
 - First part defines Nature of the organization, second part defines Name of an organization, third part defines Departments in the organization, and so on.
- Example:
 - Two collage and one company call one computer ***Challenger***
 - 1st college name *vnsgu.edu*
 - 2nd college name *bmiit.edu*
 - Company given name *smart.com*
 - *challenger.vnsgu.edu*
 - *challenger.bmiit.edu*
 - *challenger.smart.com*

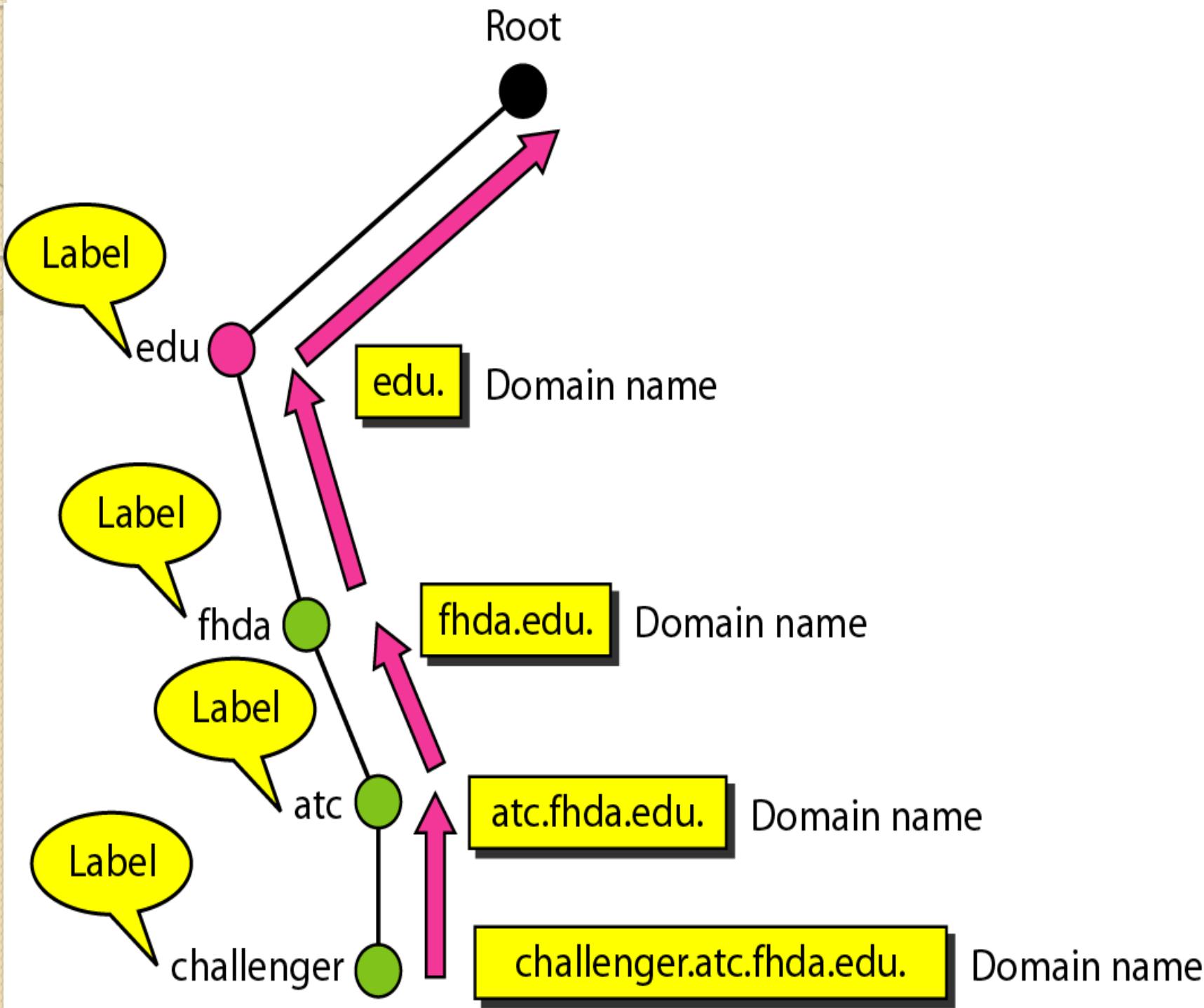
DOMAIN NAME SPACE

- 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.



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- 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. DNS requires that children of a node have different labels, which guarantees the uniqueness of the domain names
- Domain Name
 - Each node in the tree has a domain name. 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.
 - The last label is the label of the root (null). This means that a full domain name always ends in a null label, which means the last character is a dot because the null string is nothing.
- Fully Qualified Domain Name
 - If a label is terminated by a null string, it is called a fully qualified domain name (FQDN)
 - An FQDN is a domain name that contains the full name of a host. It contains all labels, from the most specific to the most general, that uniquely define the name of the host
- Partially Qualified Domain Name
 - If a label is not terminated by a null string, it is called a partially qualified domain name (PQDN).
 - A PQDN starts from a node, but it does not reach the root.
 - It is used when the name to be resolved belongs to the same site as the client



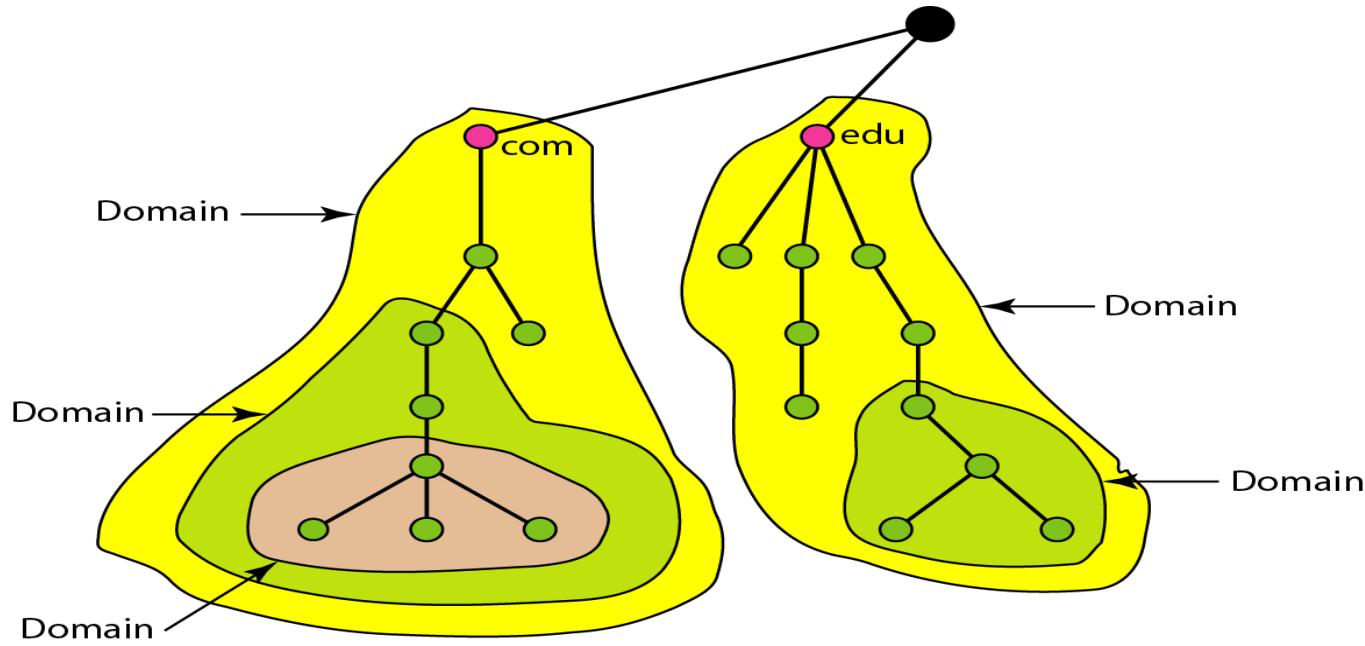
FQDN

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

PQDN

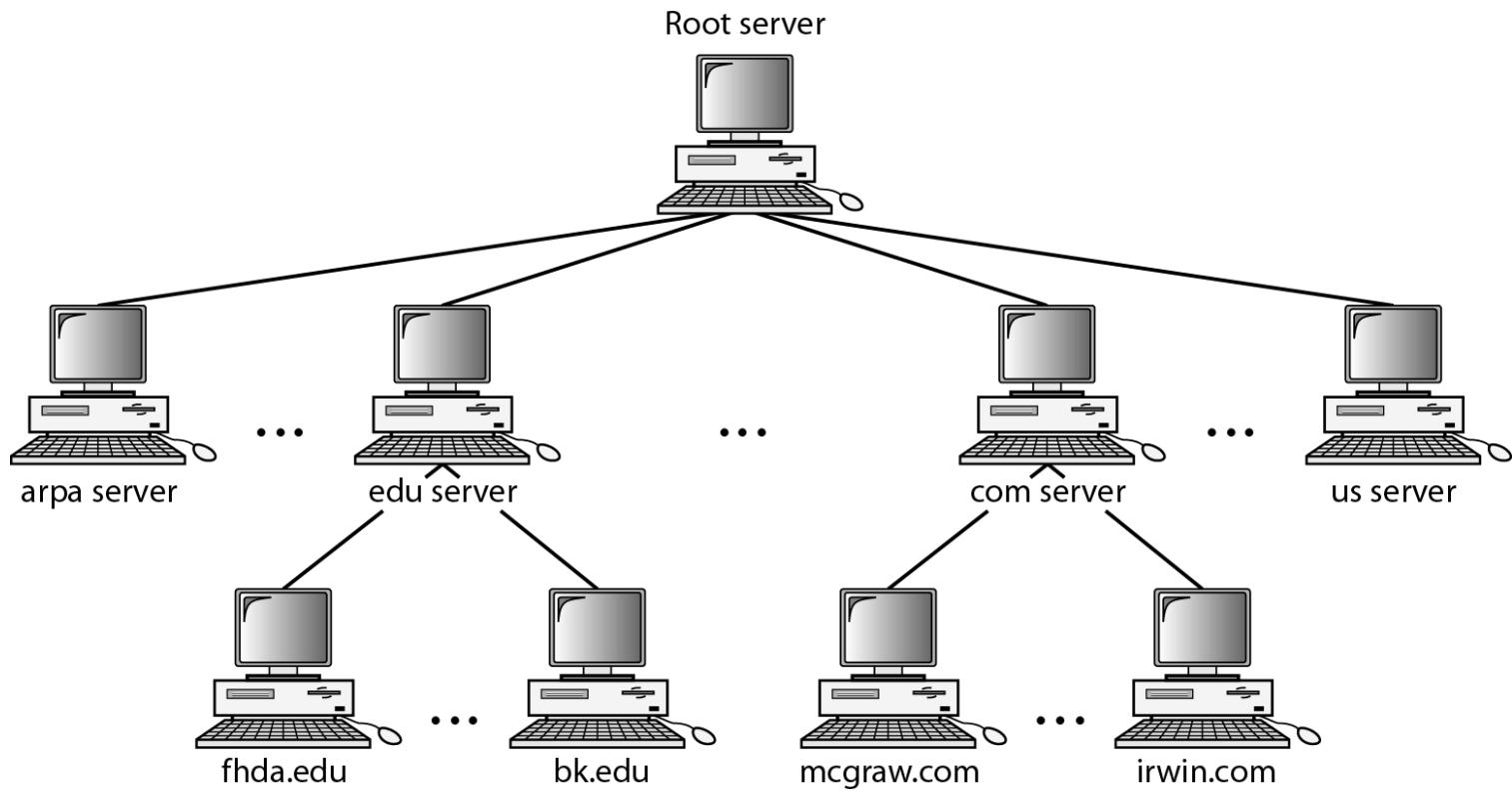
challenger.atc.fhda.edu
cs.himme
www

- Domain:
 - A domain is a subtree of the domain name space
 - The name of the domain is the domain name of the node at the top of the subtree.
 - domain may itself divided into domains (subdomains as they are sometimes called).

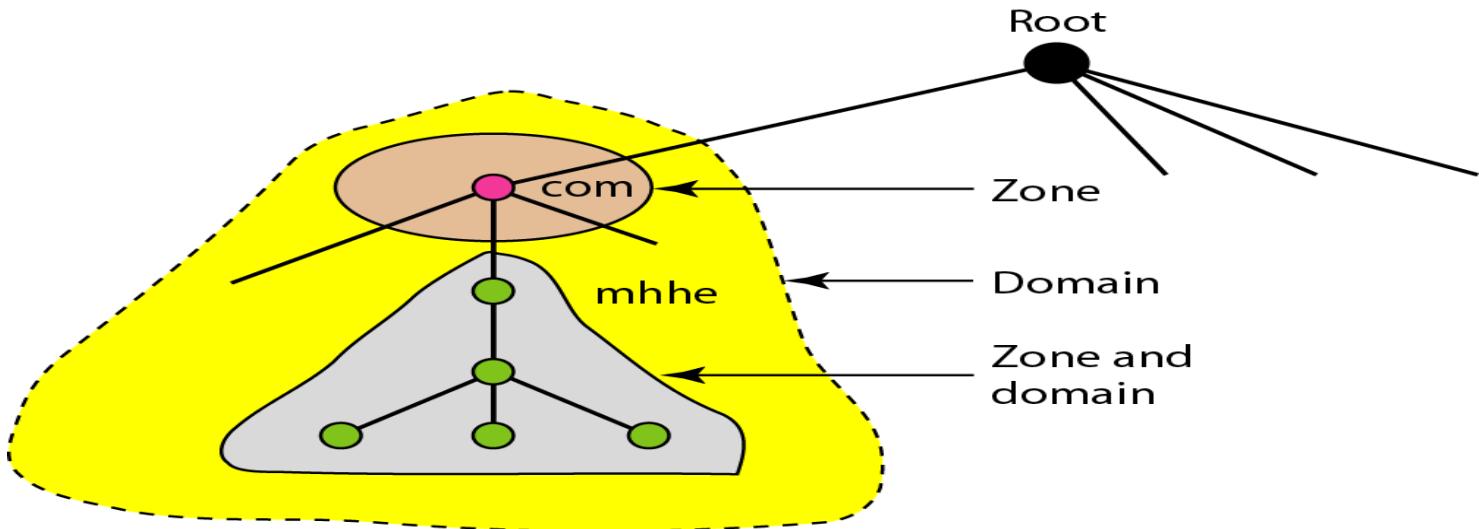


DISTRIBUTION OF NAME SPACE

- *The information contained in the domain name space must be stored. However, it is very inefficient and also unreliable to have just one computer store such a huge amount of information.*



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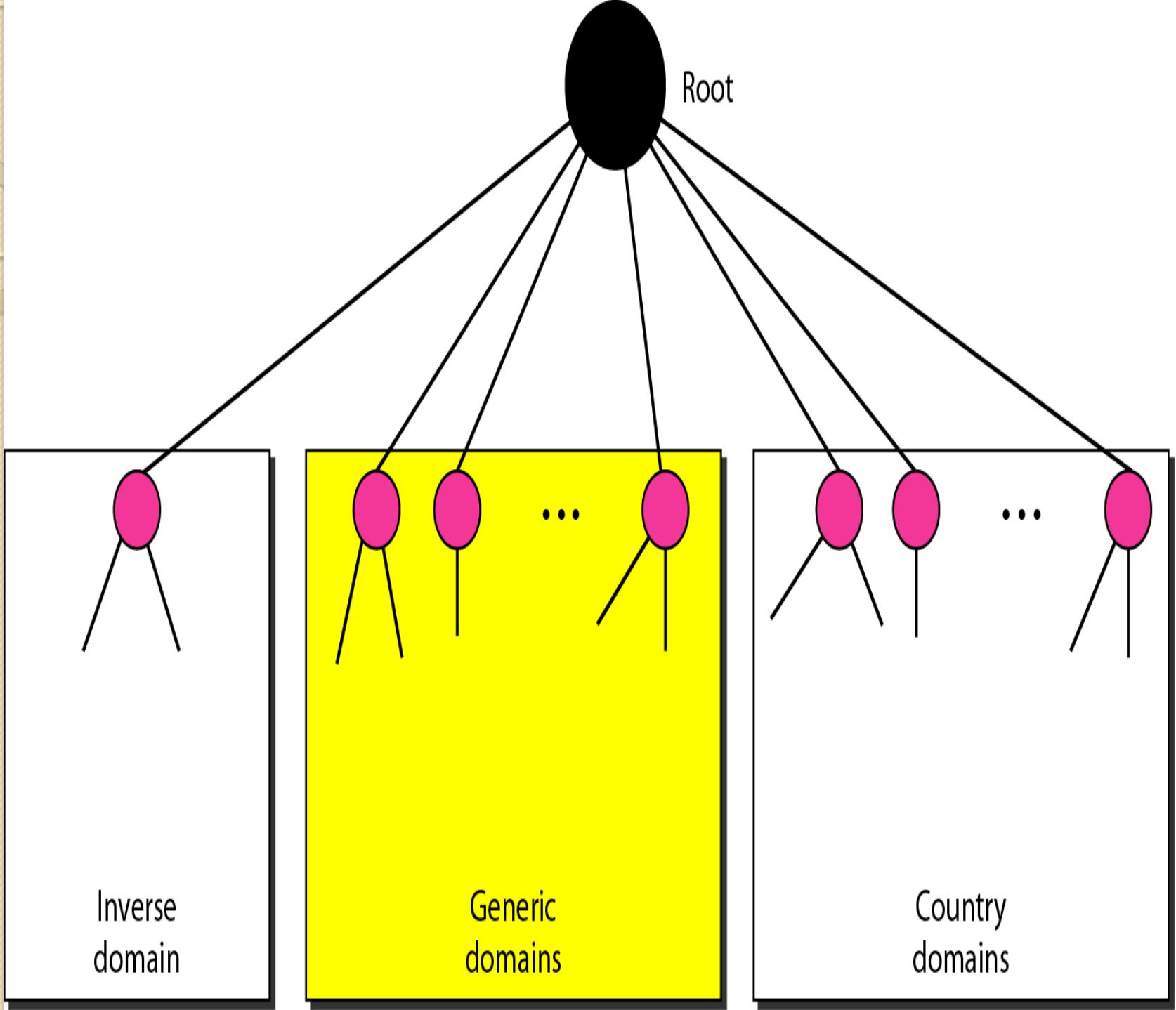
- Complete domain name hierarchy cannot be stored on a single server, it is divided among many servers. What a server is responsible for or has authority over is called a *zone*.
- If a server accepts responsibility for a domain and does not divide the domain into smaller domains, the *domain* and the *zone* refer to the same thing.

Primary and Secondary Servers

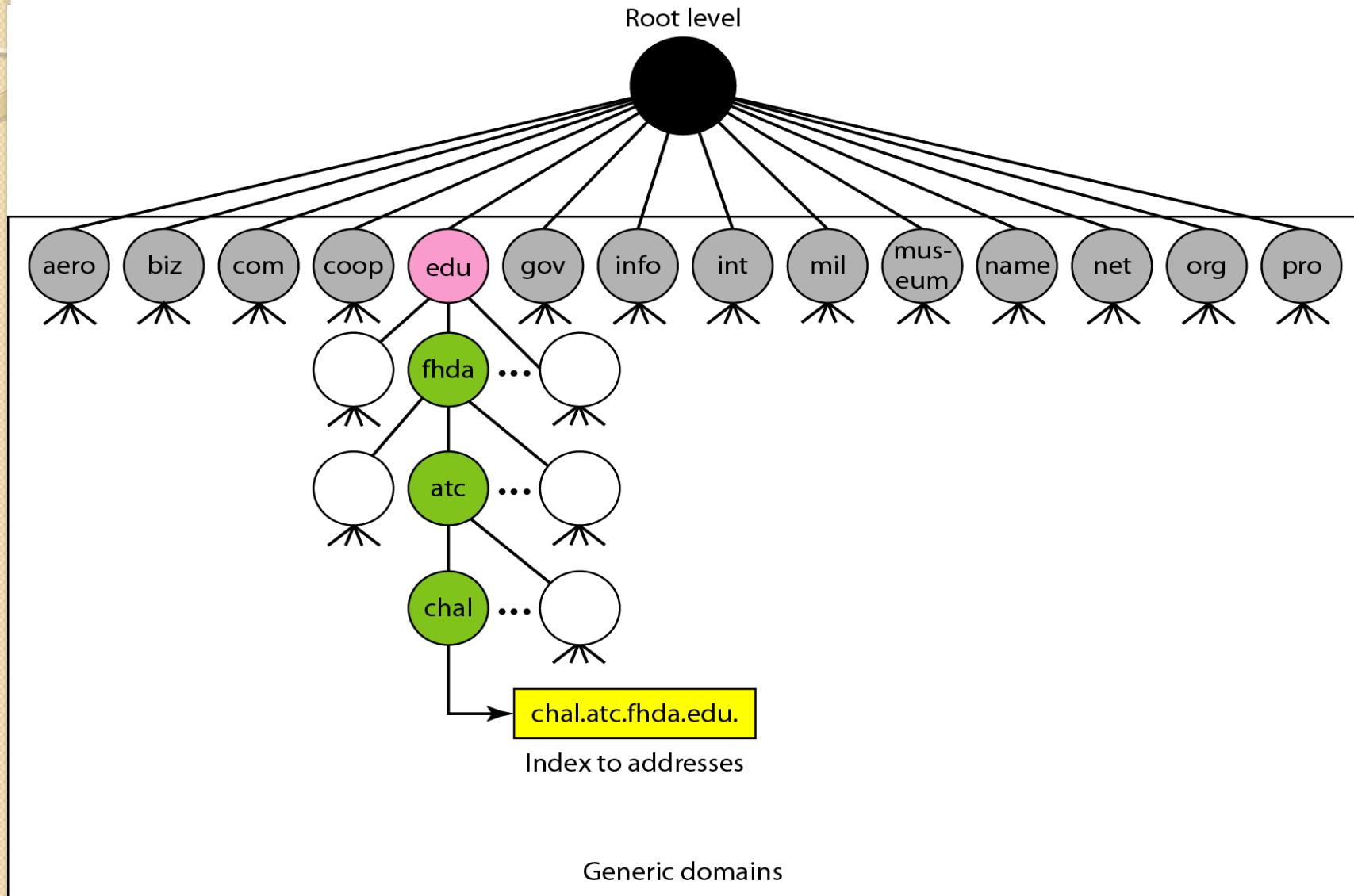
- A primary server is a server that stores a file about the zone for which it is an authority.
- A secondary server is a server that transfers the complete information about a zone from another server (primary or secondary).
- A primary server loads all information from the disk file; the secondary server loads all information from the primary server. When the secondary downloads information from the primary, it is called zone transfer.

DNS IN THE INTERNET

- Generic Domains
- Country Domains
- Inverse Domain
- The **generic domains** define registered hosts according to their generic behaviour.
- The **country domains** section uses two-character country abbreviations.
- The **inverse domain** is used to map an address to a name.



Generic Domain

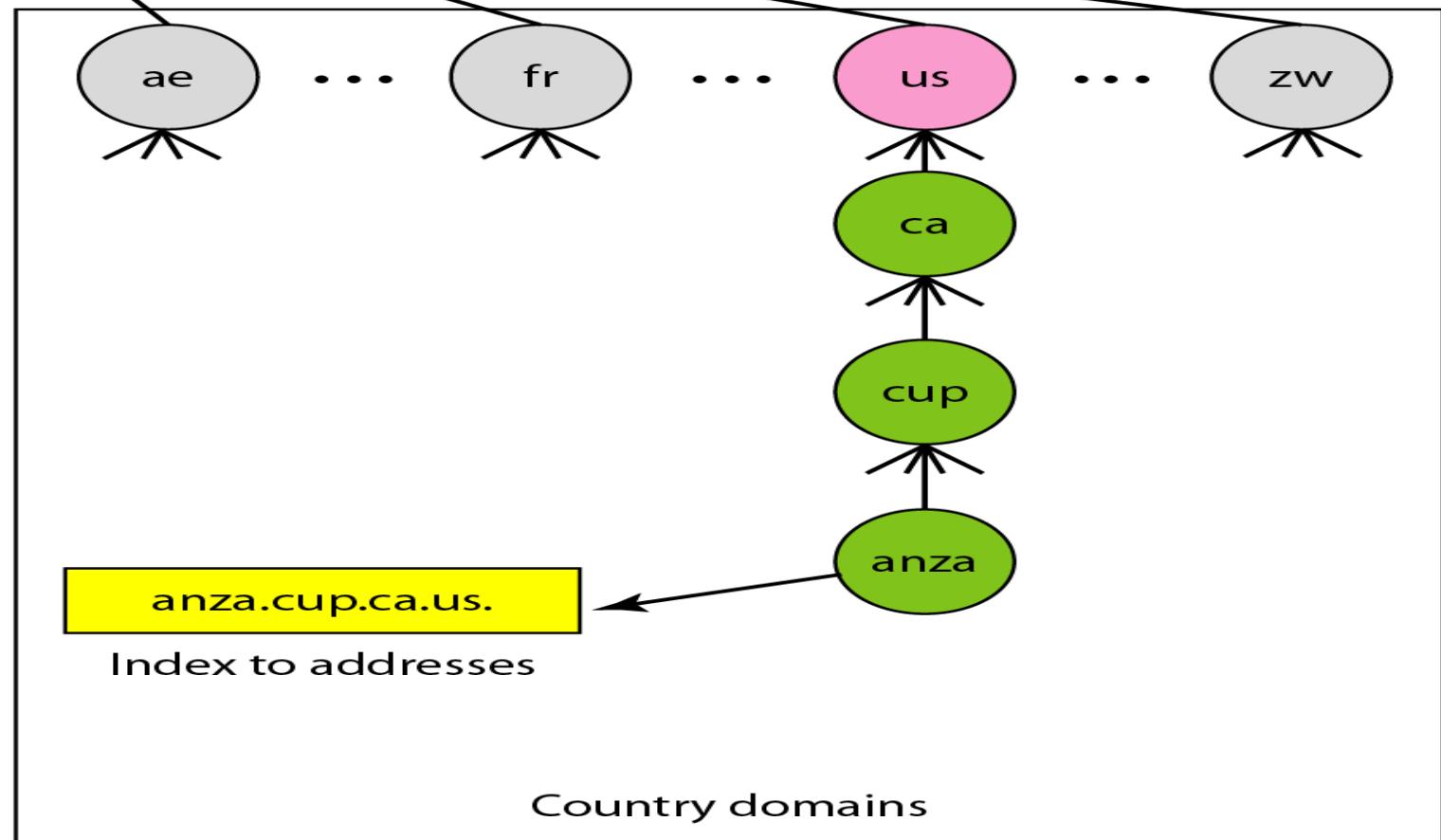


Generic Domain Labels

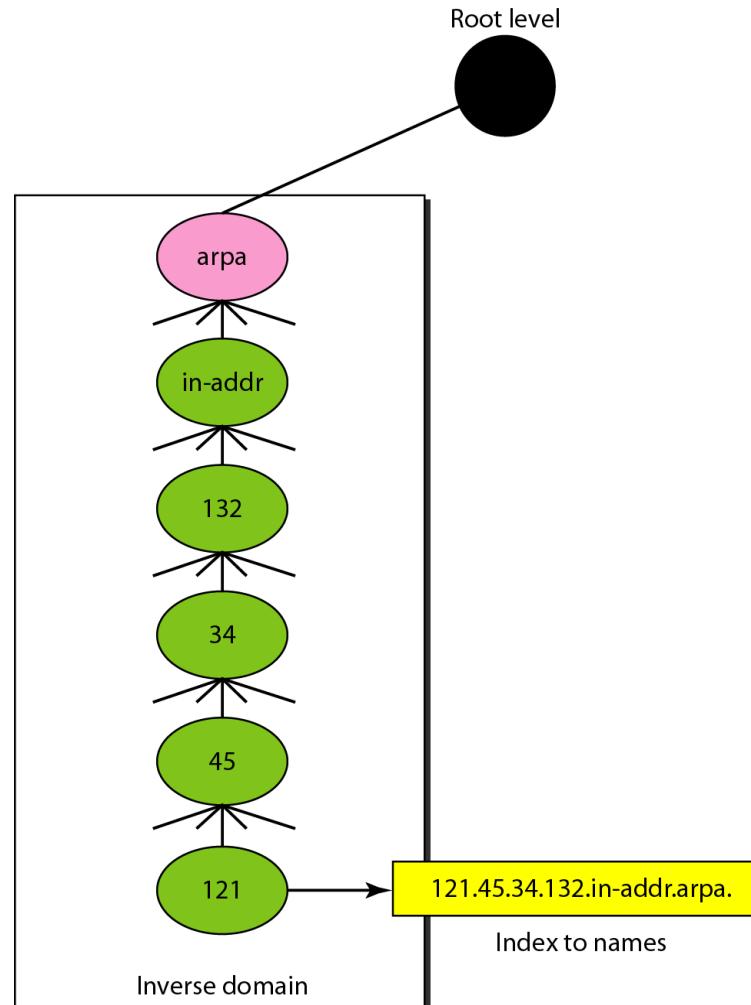
<i>Label</i>	<i>Description</i>
aero	Airlines and aerospace companies
biz	Businesses or firms (similar to “com”)
com	Commercial organizations
coop	Cooperative business organizations
edu	Educational institutions
gov	Government institutions
info	Information service providers
int	International organizations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

Country domain

Root level



Inverse domain

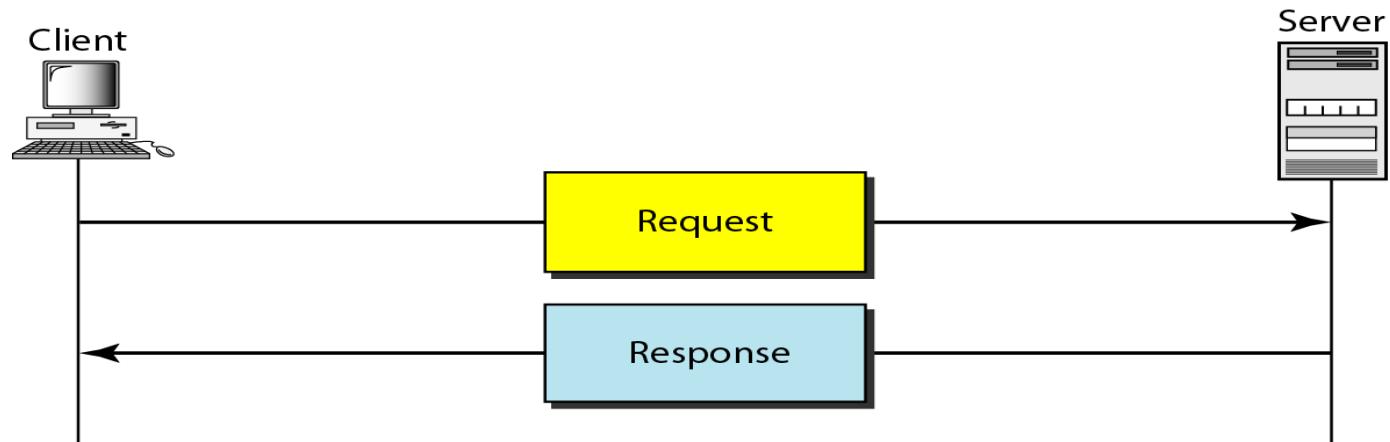


RESOLUTION

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

HTTP

- *The Hypertext Transfer Protocol (HTTP) is a protocol used mainly to access data on the World Wide Web. HTTP functions as a combination of FTP and SMTP*
- **HTTP uses the services of TCP on well-known port 80.**



Methods

<i>Method</i>	<i>Action</i>
GET	Requests a document from the server
HEAD	Requests information about a document but not the document itself
POST	Sends some information from the client to the server
PUT	Sends a document from the server to the client
TRACE	Echoes the incoming request
CONNECT	Reserved
OPTION	Inquires about available options

Status codes

<i>Code</i>	<i>Phrase</i>	<i>Description</i>
Informational		
100	Continue	The initial part of the request has been received, and the client may continue with its request.
101	Switching	The server is complying with a client request to switch protocols defined in the upgrade header.
Success		
200	OK	The request is successful.
201	Created	A new URL is created.
202	Accepted	The request is accepted, but it is not immediately acted upon.
204	No content	There is no content in the body.

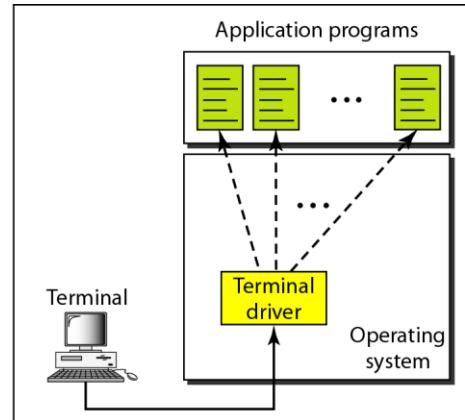
Cont...

<i>Code</i>	<i>Phrase</i>	<i>Description</i>
Redirection		
301	Moved permanently	The requested URL is no longer used by the server.
302	Moved temporarily	The requested URL has moved temporarily.
304	Not modified	The document has not been modified.
Client Error		
400	Bad request	There is a syntax error in the request.
401	Unauthorized	The request lacks proper authorization.
403	Forbidden	Service is denied.
404	Not found	The document is not found.
405	Method not allowed	The method is not supported in this URL.
406	Not acceptable	The format requested is not acceptable.
Server Error		
500	Internal server error	There is an error, such as a crash, at the server site.
501	Not implemented	The action requested cannot be performed.
503	Service unavailable	The service is temporarily unavailable, but may be requested in the future.

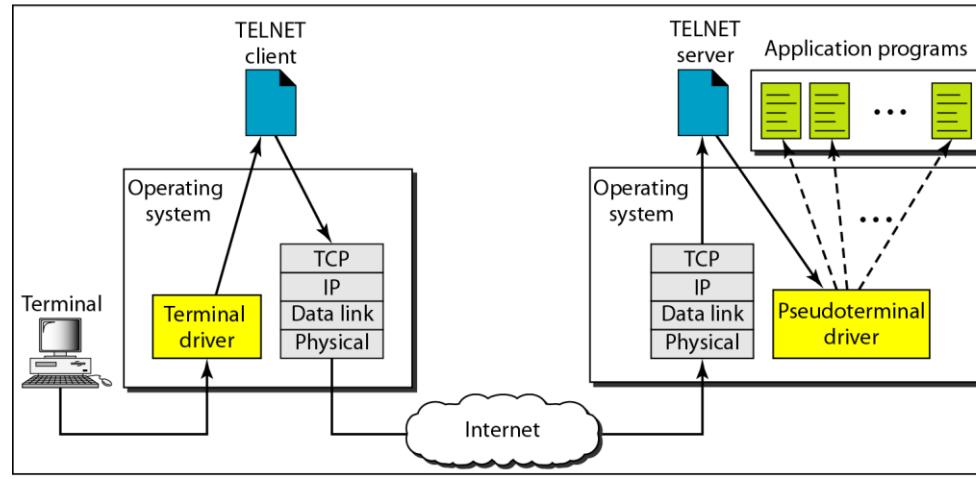
REMOTE LOGGING

- *It would be impossible to write a specific client/server program for each demand. The better solution is a general-purpose client/server program that lets a user access any application program on a remote computer.*
- **TELNET is a general-purpose client/server application program.**

Local and Remote Login



a. Local log-in



b. Remote log-in

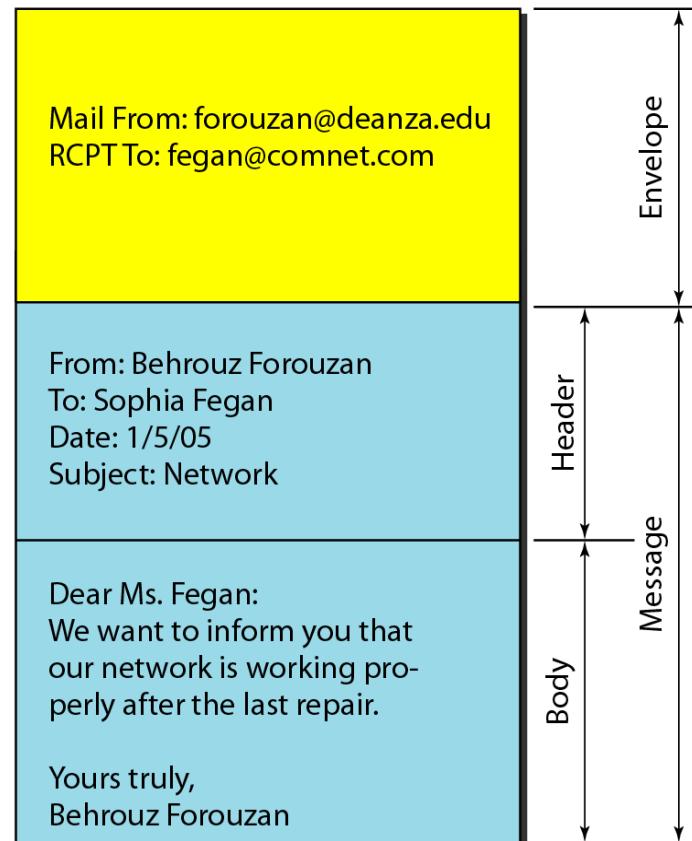
Electronic Mail

- *One of the most popular Internet services is electronic mail (e-mail). The designers of the Internet probably never imagined the popularity of this application program.*

Format of Email



a. Postal mail



b. Electronic mail

Email Address

