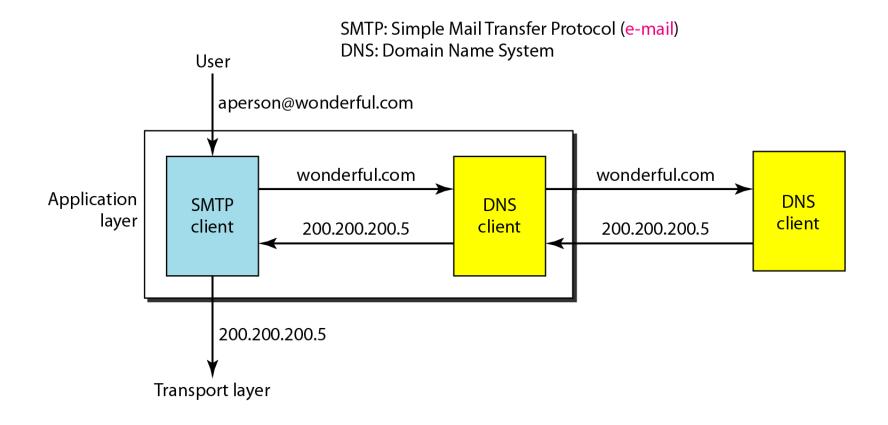


Data Communications and Networking Fourth Edition

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Chapter 25Domain Name System

Figure 25.1 Example of using the DNS service



25-1 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.

Topics discussed in this section:

Flat Name Space Hierarchical Name Space

25-2 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.

Topics discussed in this section:

Label Domain Name Domain

Figure 25.2 Domain name space

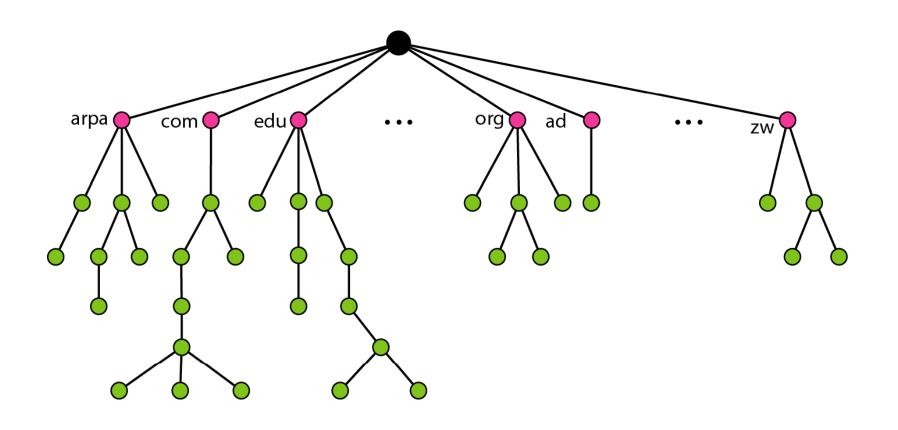


Figure 25.3 Domain names and labels

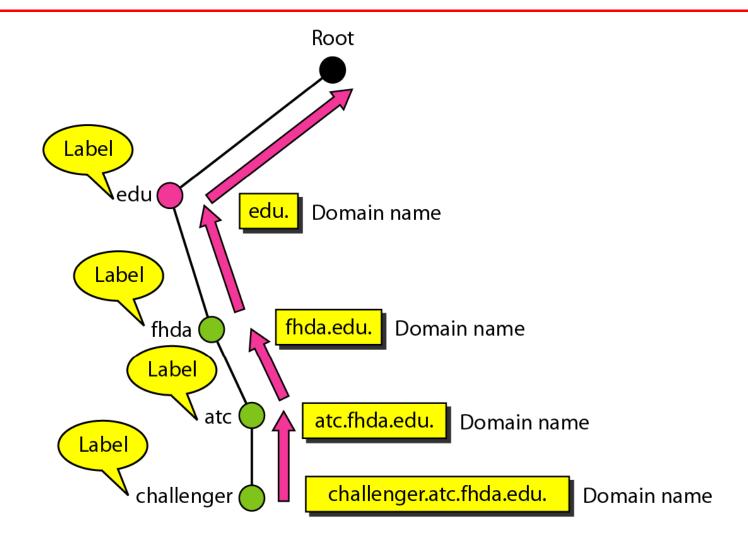


Figure 25.4 FQDN and PQDN WHAT!!?

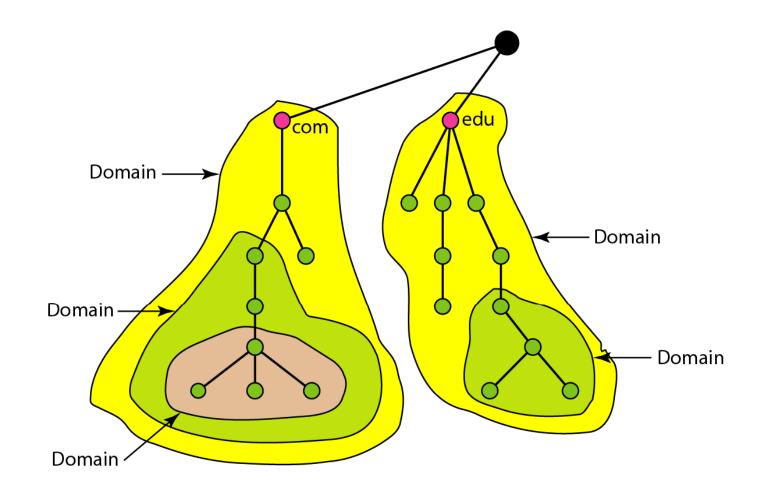
FQDN

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

PQDN

challenger.atc.fhda.edu cs.hmme www

Figure 25.5 Domains



25-3 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. In this section, we discuss the distribution of the domain name space.

Topics discussed in this section:

Hierarchy of Name Servers

Zone

Root Server

Primary and Secondary Servers

Figure 25.6 Hierarchy of name servers

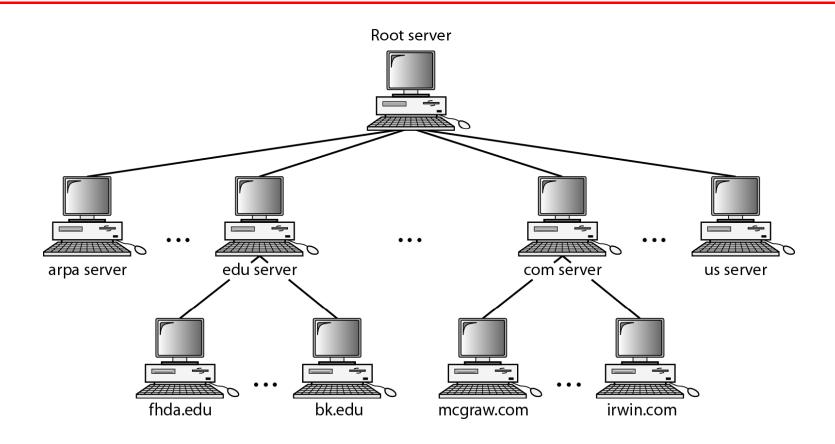
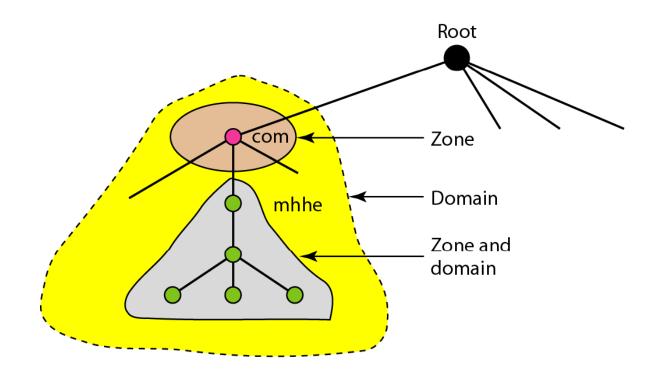


Figure 25.7 Zones and domains





Note

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.

25-4 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 discussed in this section:

Generic Domains Country Domains Inverse Domain

Figure 25.8 DNS IN THE INTERNET

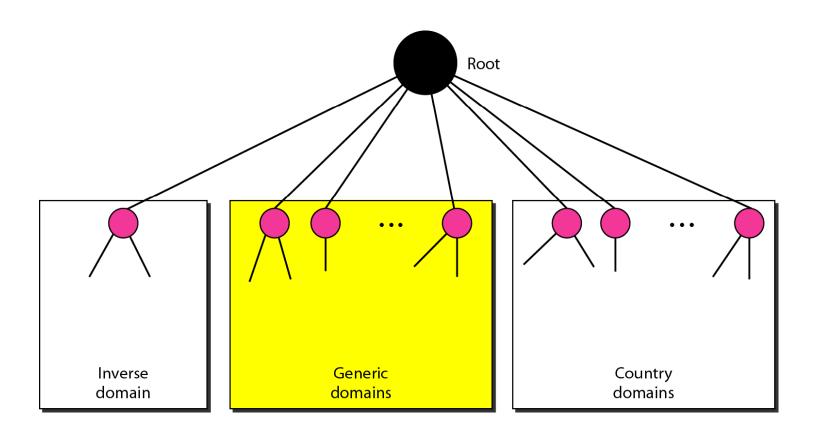


Figure 25.9 Generic domains

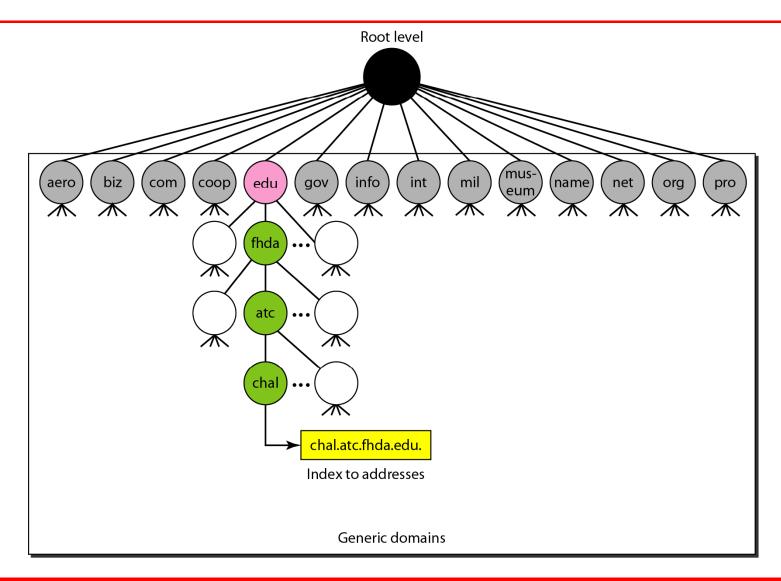


Table 25.1 Generic domain labels

Label	Description	
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	

Figure 25.10 Country domains

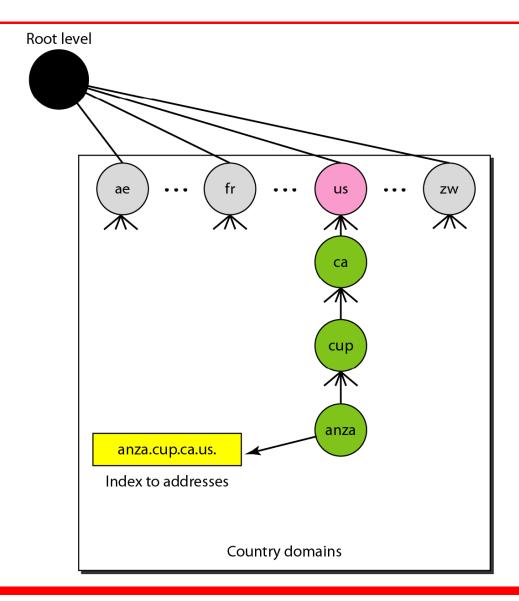
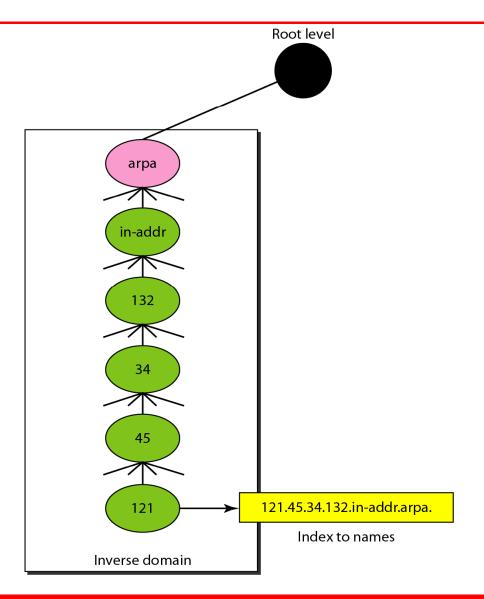


Figure 25.11 Inverse domain



25-5 RESOLUTION

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

Topics discussed in this section:

Resolver
Mapping Names to Addresses
Mapping Addresses to Names
Recursive Resolution
Caching

Figure 25.12 Recursive resolution

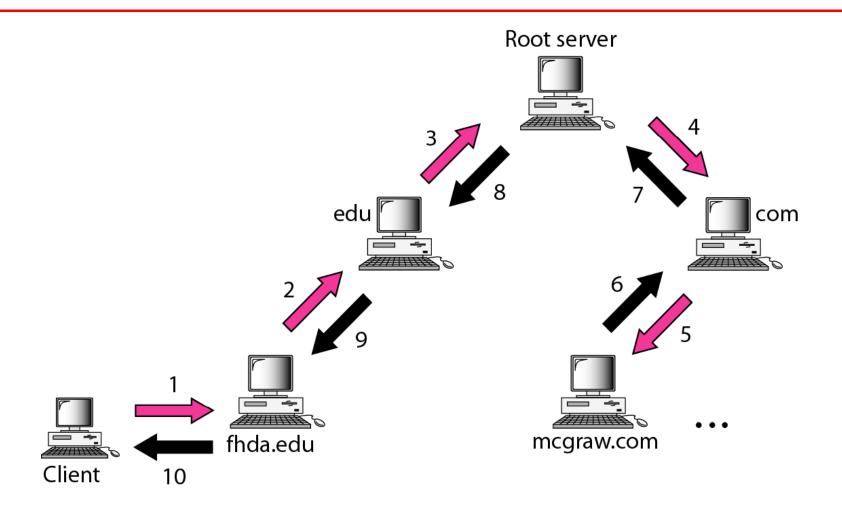
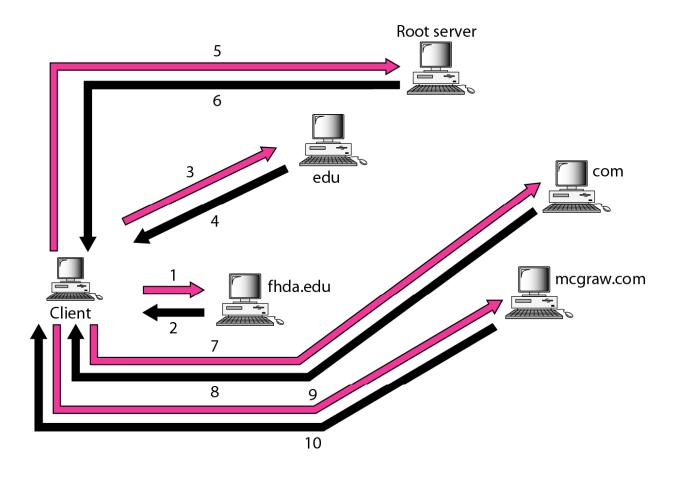


Figure 25.13 Iterative resolution gives the best data that will help the client



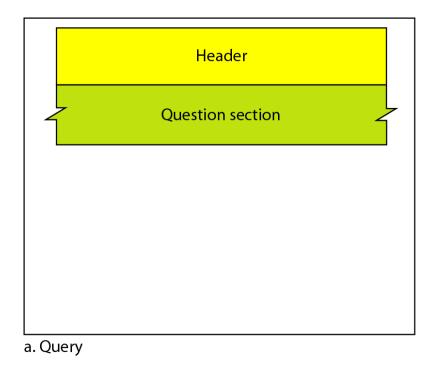
25-6 DNS MESSAGES

DNS has two types of messages: query and 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.

Topics discussed in this section:

Header

Figure 25.14 Query and response messages



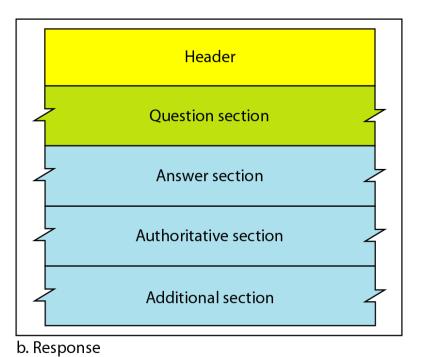


Figure 25.15 Header format

Identification	Flags
Number of question records	Number of answer records (all 0s in query message)
Number of authoritative records (all 0s in query message)	Number of additional records (all 0s in query message)

25-7 TYPES OF RECORDS

As we saw in Section 25.6, 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.

Topics discussed in this section:

Question Record Resource Record

25-8 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.

25-9 DYNAMIC DOMAIN NAME SYSTEM (DDNS)

The DNS master file must be updated dynamically. The Dynamic Domain Name System (DDNS) therefore was devised to respond to this need. In DDNS, when a binding between a name and an address is determined, the information is sent, usually by DHCP to a primary DNS server. The primary server updates the zone. The secondary servers are notified either actively or passively.

25-10 ENCAPSULATION

DNS can use either UDP or TCP. In both cases the well-known port used by the server is port 53. UDP is used when the size of the response message is less than 512 bytes because most UDP packages have a 512-byte packet size limit. If the size of the response message is more than 512 bytes, a TCP connection is used.



Note

DNS can use the services of UDP or TCP using the well-known port 53.