DNS – The Domain Name System

DNS is an acronym for **Domain Name Server**, and is the system used to translate word-based addresses of systems (such as WWW.EXAMPLE.COM) to the numerical IP (Internet Protocol) address of the computer or system that should be located at that address.

It is primarily used for mapping host names and e-mail destinations to IP addresses but can also be used for other purposes.

To map a name onto an IP address, an application program calls a library procedure called the **resolver,** passing it the name as a parameter. The resolver sends a UDP packet to a local DNS server, which then looks up the name and returns the IP address to the resolver, which then returns it to the caller.

- The DNS Name Space
- Resource Records
- Name Servers

The DNS Name Space

A portion of the Internet domain name space.
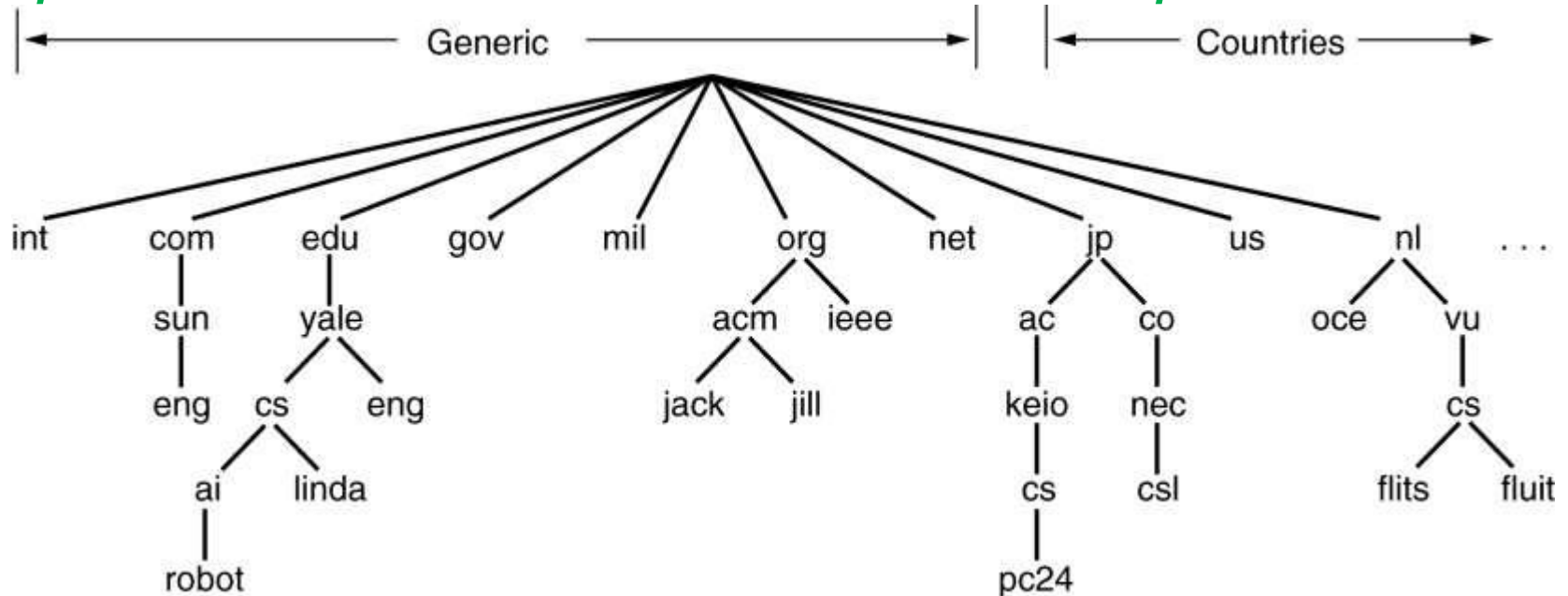
The Internet is divided into over 200 top-level domains, where each domain covers many hosts. The top-level domains come in two flavors: generic and countries. The original generic domains were com (commercial), edu (educational institutions), gov (the U.S. Federal Government), int (certain international organizations), mil (the U.S. armed forces), net (network providers), and org (nonprofit organizations). The country domains include one entry for every country, as defined in ISO 3166.

• Other new generic domains added later include biz (businesses), info (information), name (people's names) pro (professions), aero (aerospace industry), coop (co-operatives), and museum (museums).

- Each domain is named by the path upward from it to the (unnamed) root.

- Domain names can be either absolute or relative. An absolute domain name always ends with a period (e.g., eng.sun.com.), whereas a relative one does not.

- Domain names are case insensitive, so edu, Edu, and EDU mean the same thing. Component names can be up to 63 characters long, and full path names must not exceed 255 characters.

Resource Records

- Every domain, whether it is a single host or a top-level domain, can have a set of resource records associated with it.

- When a resolver gives a domain name to DNS, what it gets back are the resource records associated with that name. Thus, the primary function of DNS is to map domain names onto resource records.

- A resource record is a five-tuple. Although they are encoded in binary for efficiency, in most expositions, resource records are presented as ASCII text, one line per resource record. The format we will use is as follows:

Domain_name Time_to_live Class Type Value

Resource Records

Type	Meaning	Value
SOA	Start of Authority	Parameters for this zone
A	IP address of a host	32-Bit integer
MX	Mail exchange	Priority, domain willing to accept e-mail
NS	Name Server	Name of a server for this domain
CNAME	Canonical name	Domain name
PTR	Pointer	Alias for an IP address
HINFO	Host description	CPU and OS in ASCII
TXT	Text	Uninterpreted ASCII text

Resource Records

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; Authoritative data for cs.vu.nl
cs.vu.nl.          86400   IN   SOA     star boss (952771,7200,7200,2419200,86400)
cs.vu.nl.          86400   IN   TXT     "Divisie Wiskunde en Informatica."
cs.vu.nl.          86400   IN   TXT     "Vrije Universiteit Amsterdam."
cs.vu.nl.          86400   IN   MX      1 zephyr.cs.vu.nl.
cs.vu.nl.          86400   IN   MX      2 top.cs.vu.nl.

flits.cs.vu.nl.    86400   IN   HINFO   Sun Unix
flits.cs.vu.nl.    86400   IN   A       130.37.16.112
flits.cs.vu.nl.    86400   IN   A       192.31.231.165
flits.cs.vu.nl.    86400   IN   MX      1 flits.cs.vu.nl.
flits.cs.vu.nl.    86400   IN   MX      2 zephyr.cs.vu.nl.
flits.cs.vu.nl.    86400   IN   MX      3 top.cs.vu.nl.
www.cs.vu.nl.      86400   IN   CNAME   star.cs.vu.nl
ftp.cs.vu.nl.      86400   IN   CNAME   zephyr.cs.vu.nl

rowboat                    IN   A       130.37.56.201
                           IN   MX      1 rowboat
                           IN   MX      2 zephyr
                           IN   HINFO   Sun Unix

little-sister              IN   A       130.37.62.23
                           IN   HINFO   Mac MacOS

laserjet                   IN   A       192.31.231.216
                           IN   HINFO   "HP Laserjet IIISi" Proprietary
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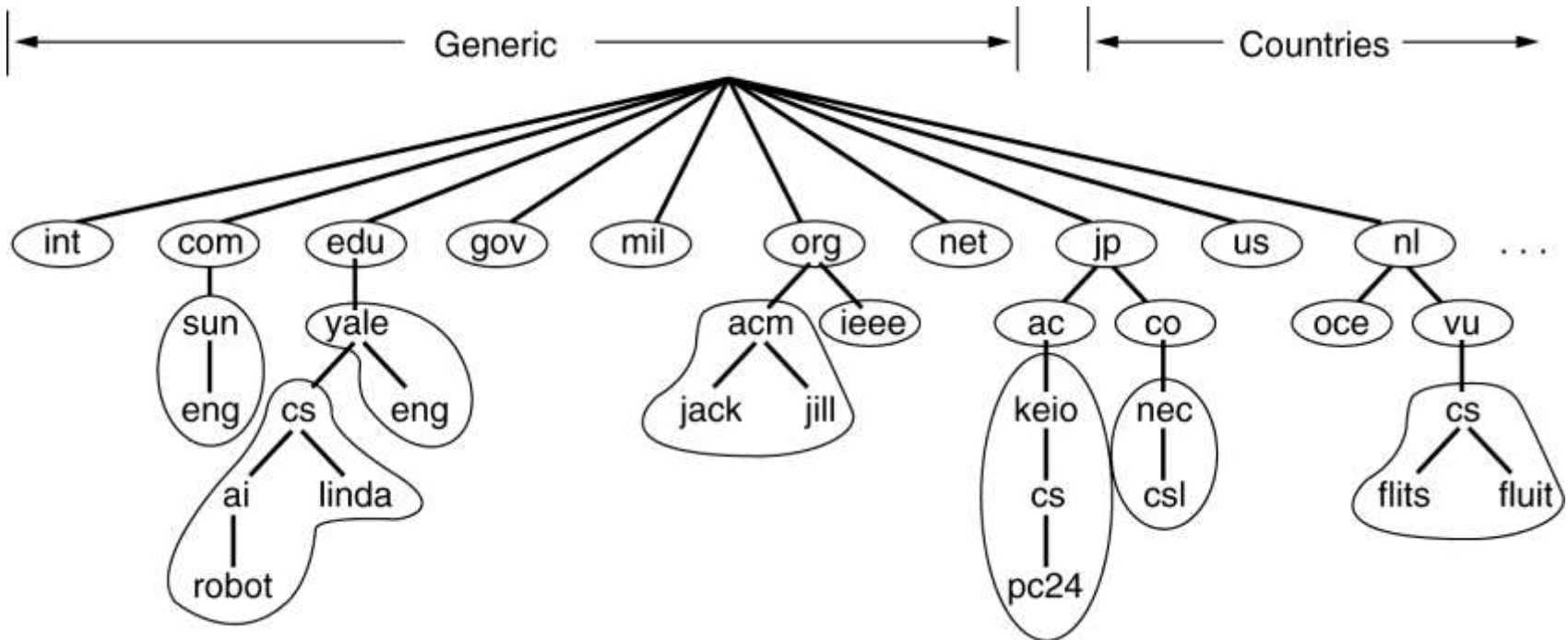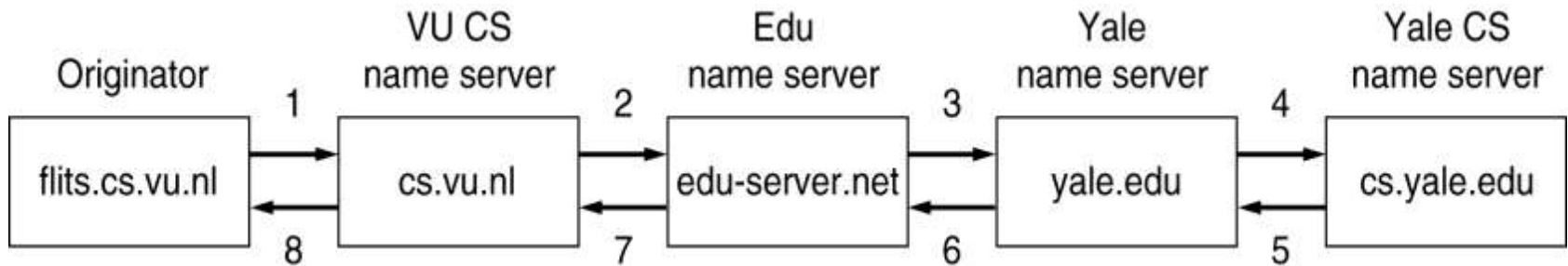
A portion of a possible DNS database for *cs.vu.nl.*

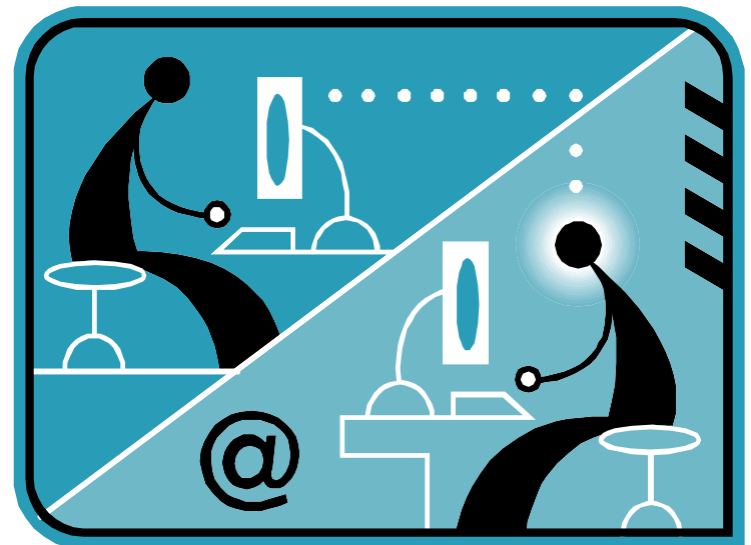# Name Servers

Name Servers

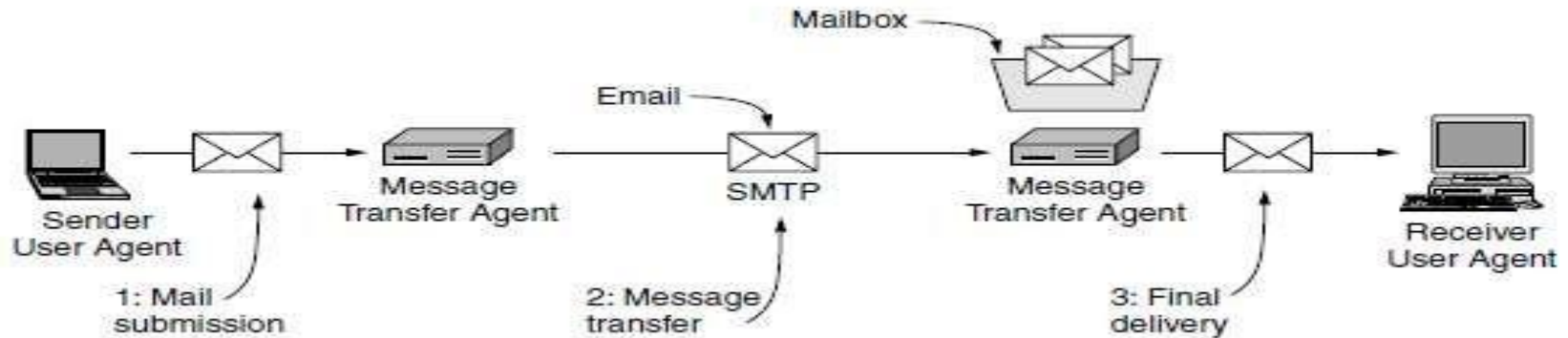How a resolver looks up a remote name in eight steps.

Electronic Mail

E-mail is short for electronic mail and is used to send & receive messages over the internet

- Architecture and Services
- The User Agent
- Message Formats
- Message Transfer
- Final Delivery

Architecture and Services

Basic functions

- Composition
- Transfer
- Reporting
- Displaying
- Disposition

Email architecture consists of two kinds of subsystems: the **user agents, which allow** people to read and send email, and the **message transfer agents (mail servers), which move the** messages from the source to the destination.

- Composition refers to the process of creating messages and answers.

- Transfer refers to moving messages from the originator to the recipient

- Reporting has to do with telling the originator what happened to the message

- Displaying incoming messages is needed so people can read their e-mail.

- Disposition is the final step and concerns what the recipient does with the message after receiving it.

- The user agent is a program that provides a graphical interface, or sometimes a text- and command-based interface that lets users interact with the email system. It includes a means to compose messages and replies to messages, display incoming messages, and organize messages by filing, searching, and discarding them.

- The act of sending new messages into the mail system for delivery is called **mail submission.**

- The message transfer agents are typically system processes. They run in the background on mail server machines and are intended to be always available. Their job is to automatically move email through the system from the originator to the recipient with **SMTP (Simple Mail Transfer Protocol). This is the message** transfer step.

- Message transfer agents also implement **mailing lists, in which an identical** copy of a message is delivered to everyone on a list of email addresses.

- **Mailboxes store the email that** is received for a user. They are maintained by mail servers. User agents simply present users with a view of the contents of their mailboxes.

- A key idea in the message format is the distinction between the **envelope and** its contents. The envelope encapsulates the message.

- The message inside the envelope consists of two separate parts: the **header** and the **body.** The header contains control information for the user agents. The body is entirely for the human recipient.