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UNIT-V

APPLICATION LAYER

DNS - The Domain Name System :

Although programs theoretically could refer to hosts, mailboxes, and other resources by their network addresses, these addresses are hard for people to remember. Nevertheless, the n/w itself understands only numerical addresses, so some mechanism is required to convert the ASCII strings to n/w addresses.

However when thousands of minicomputers and PCs were connected to the net, everyone realized that the approach could not continue to work forever. To solve these problems, DNS (Domain Name System) was invented.

The essence of DNS is the invention of a hierarchical, domain-based naming scheme and a distributed d/b system for implementing this naming scheme. It is primarily used for mapping host names and e-mail destinations to IP addresses but can also be used for other purposes. DNS is defined in RFCs 1034 and 1035.

To map name onto an IP address, an application program calls a library procedure called the resolver, passing it the name as a parameter.

The resolver send 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.

Armed with the IP address, the program can then establish a TCP connection with the destination or send it UDP packets.

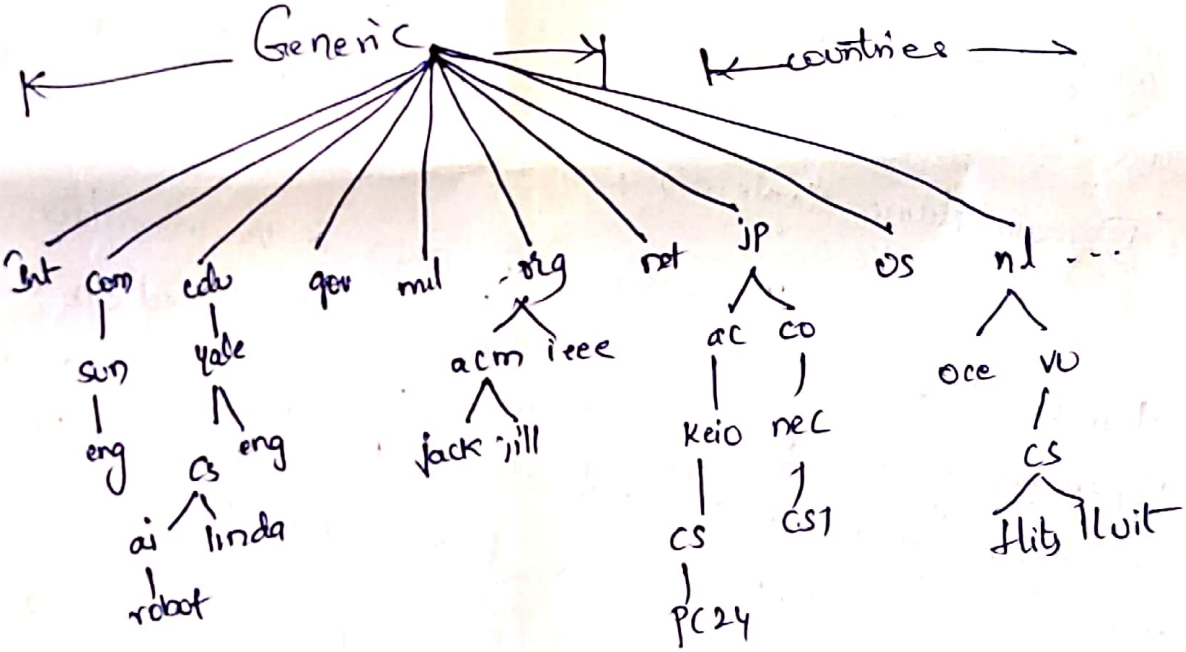
The DNS Name space :

Managing a large and constantly changing set of names is a non trivial problem.

Conceptually, the internet is divided into over 200 top-level domains, where each domain covers many hosts. Each domain partitioned into sub domains and these are further partitioned and so, on. All these are represented by a tree.

The leaves of the tree represent domains that have no subdomains. A leaf domain may contain a single host, or it may represent a company and contain thousands of hosts.

fig. A portion of the Internet domain name space.



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. For a single host, the most common resource record is just its IP address, but many other kinds of rr also exist.

A resource record is a five-tuple. Although they are encoded in binary for efficiency, in most expositions, rr are presended as ASCII text, one line per rr.

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Resource Records (contd..)

The format is :

Domainname Time_to_live class Type value

fig:- The Principal DNS resource record types for IPV4.

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 email
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.

- Name Servers

To avoid problems associated with having only a single source of info., the DNS name space is divided into non overlapping zones. Normally, a zone will have one primary name server, which gets the info. from a file on its disk, and one or more secondary name servers, which get their info. from the primary name server. To improve reliability, some servers for a zone can be located outside the zone.

fig: Part of the DNS name space showing the division into zones.

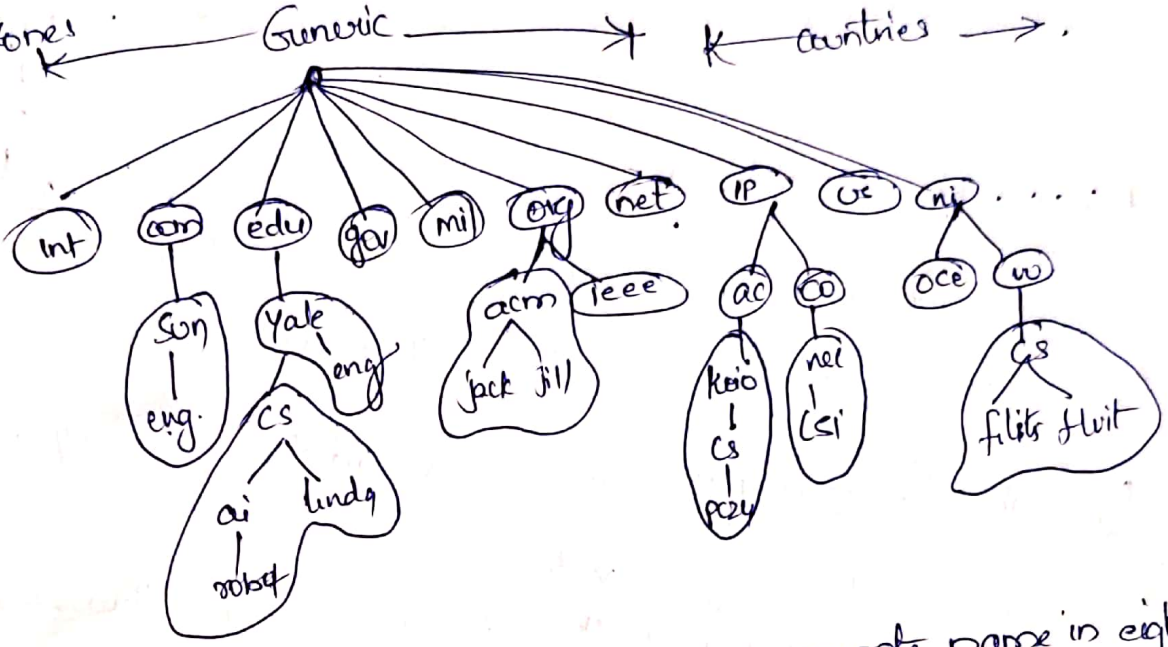
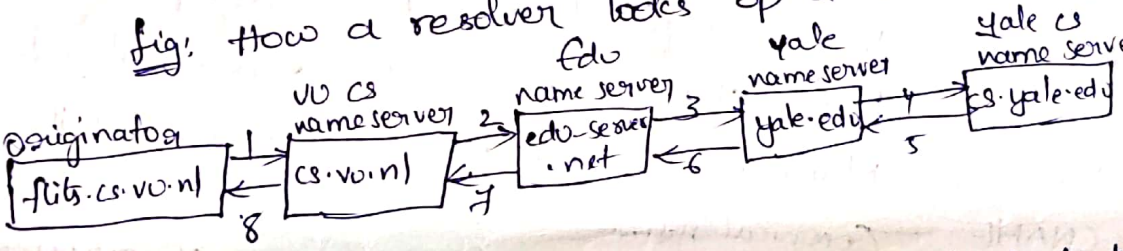


fig: How a resolver looks up a remote name in eight steps.



While DNS is extremely important to the correct functioning of the Internet, all it really does is map symbolic names for machines on to their IP addresses. It does not help locate people, resources, services, or objects in general. For locating these things, another directory service has been defined called LDAP (Light weight Directory access protocol).

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ELECTRONIC MAIL :

- Architechture and services :

The architechture of the email system consists of two kinds of subsystems : ① The user agents, which allow people to read and send email, ② The message transfer agents, which move the messages from the source to the Destination. These are also referred as mail servers

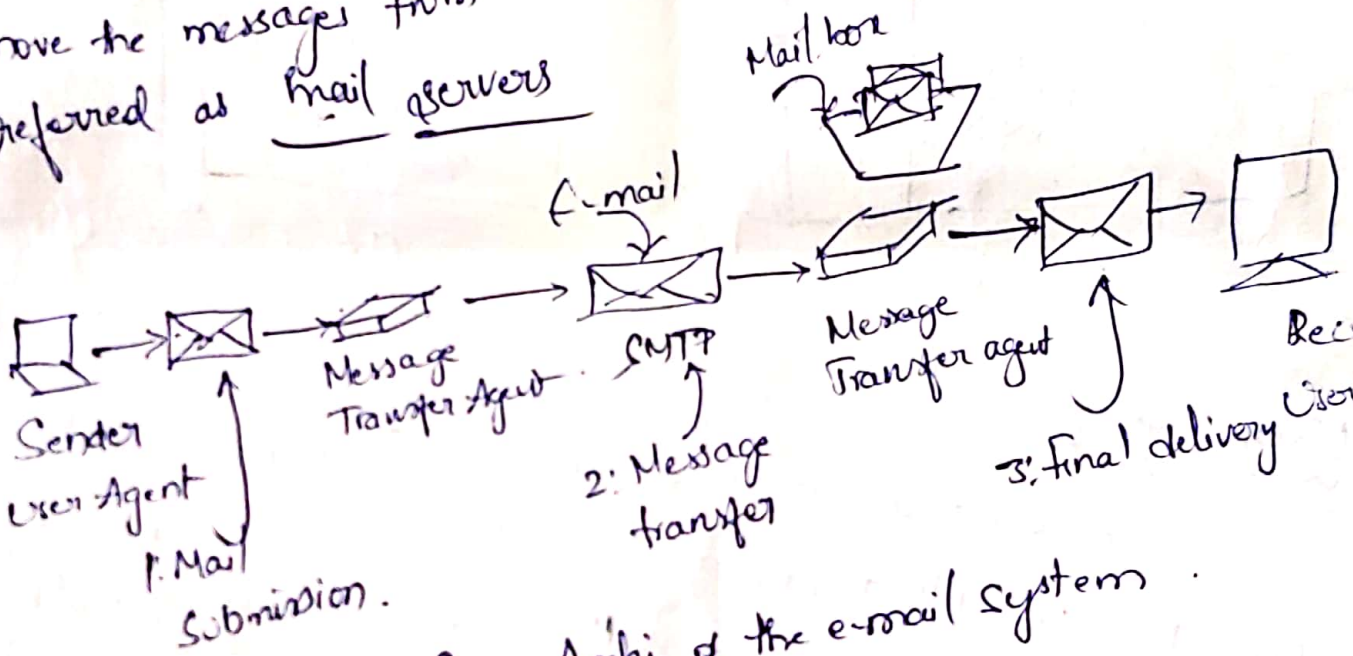
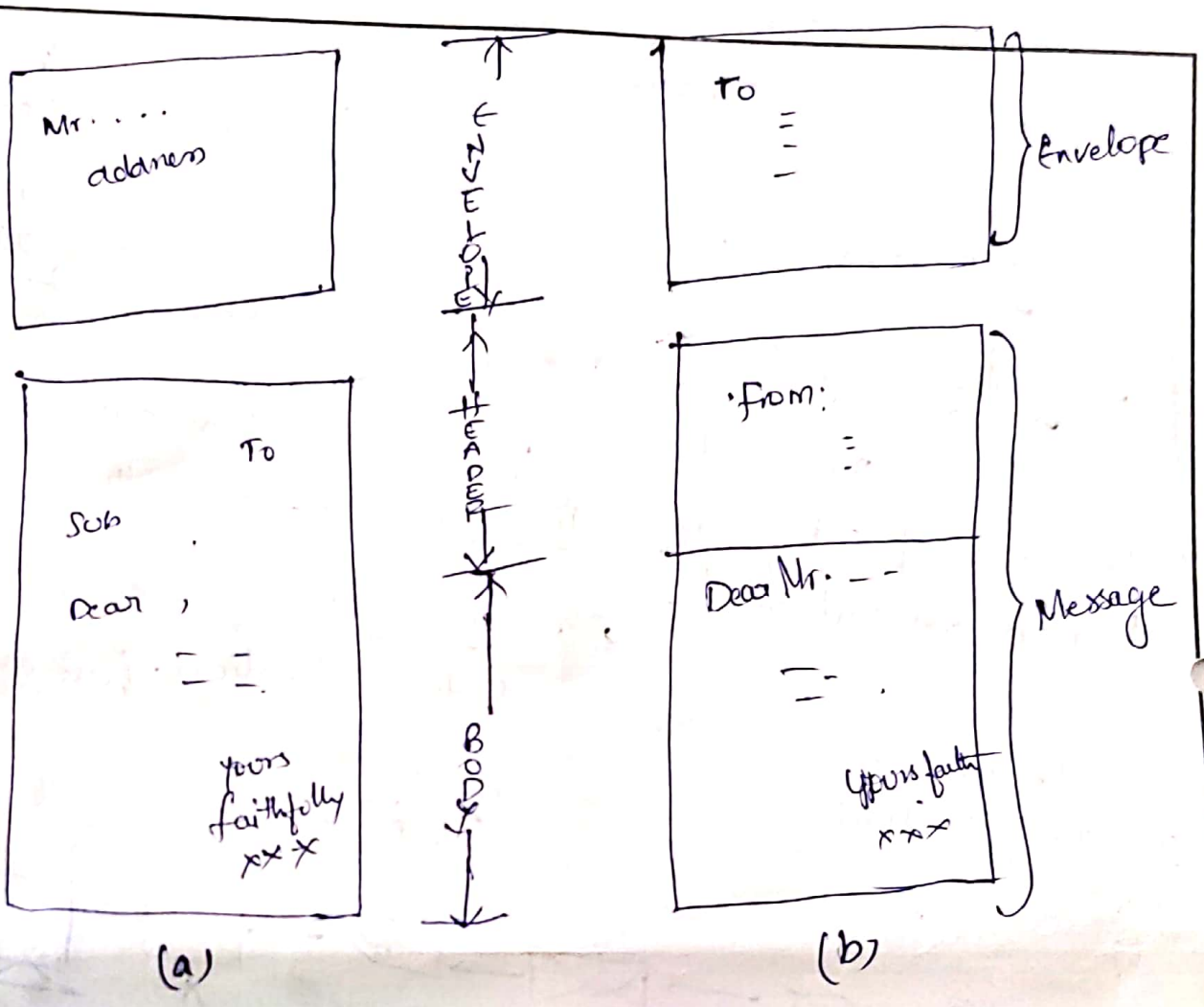


fig: Archi. of the e-mail system.

User agent is a program that provides a graphical interface, or sometimes a text & a command-based interface that lets users interact with the email system. The act of sending new messages into the mail system for delivery is called mail submission



User Agent

A user agent is a program sometimes called an email reader) that accepts a variety of commands for composing, receiving and replying to messages, as well as for manipulating mail boxes.

Eg:- Google gmail, Microsoft outlook, Mozilla Thunderbird, AppleMail

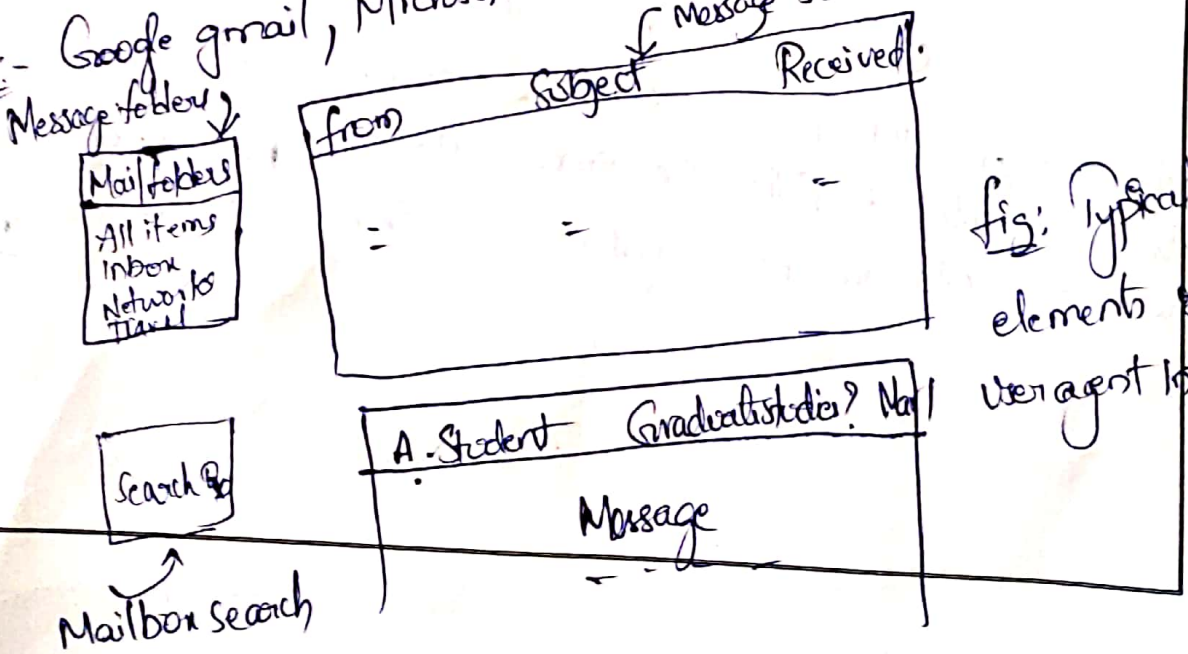


fig: Typical elements of the user agent interface.

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Message formats:

RFC 5322 – The Internet Message format

- Messages consists of a primitive envelope, some no. of header fields, a blank line, and then the message body.
- Each header field consists of a single line ASCII text containing the field name, a colon, and, for most fields, a value.

Header	Meaning
To:	Email address of primary recipients
cc:	" Secondary "
Bcc:	" Blind Carbon Copies
from:	person or people who created this message
Sender:	Email address of the actual sender
Received:	Line added by each transfer agent along the route.
Return-Path:	Can be used to identify a path back to the sender

fig: RFC5322 header fields related to message transport

- MIME – The Multipurpose Internet Mail Extension:

It is widely used for mail messages that are sent across the Internet. MIME defines five new message headers

Header	Meaning
MIME-Version :	Identifies the MIME version
Content-Description :	Human-readable string telling what is in the message
Content-Id :	Unique identifier
Content-Transfer-Encoding	How the body is wrapped for retransmission.
Content-Type	Type and format of the Content.

fig: Message headers added by MIME

The ASCII encoding of binary data is called base64 encoding. In this scheme, groups of 24 bits are broken up into four 6-bit units with each unit being sent as a legal ASCII character.

The coding is 'A' for 0, 'B' for 1 ... followed by 26 lowercase letters, the 10 digits & finally + and / for 62 and 63 respectively

== & = sequences indicate that the last group contained only 8 or 16 bits, respectively.

For msgs, that are almost entirely ASCII but with a few non-ASCII characters, base64 encoding is somewhat inefficient. Instead, an encoding known as quoted-printable encoding is used. This is a 7-bit ASCII, with all the char. above 127 encoded as an equals sign followed by the character's value as two hexadecimal digits.

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fig:- Mime Content types and Example subtypes.

Type	Example Subtypes	Description
text	plain, html, xml, css	- Text in various formats
Audio	basic, mpeg, mp4	- sounds
Image	gif, jpeg, tiff	- Pictures
Video	mpeg, mp4, quicktime	- Movies
Model	vrml	- 3D model
application	Octet-stream, pdf, javascript, zip	- Data produced by applications.
message	http, rfc 822	- Encapsulated msg.
Multipart	mixed, alternative, parallel, digest	- Combination of multiple types