Application Layer Protocols

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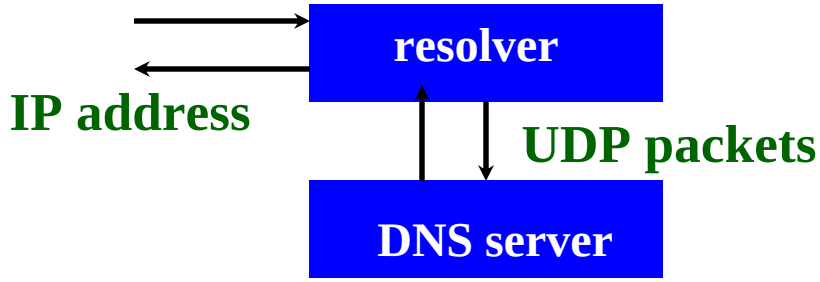
Domain Name Systems

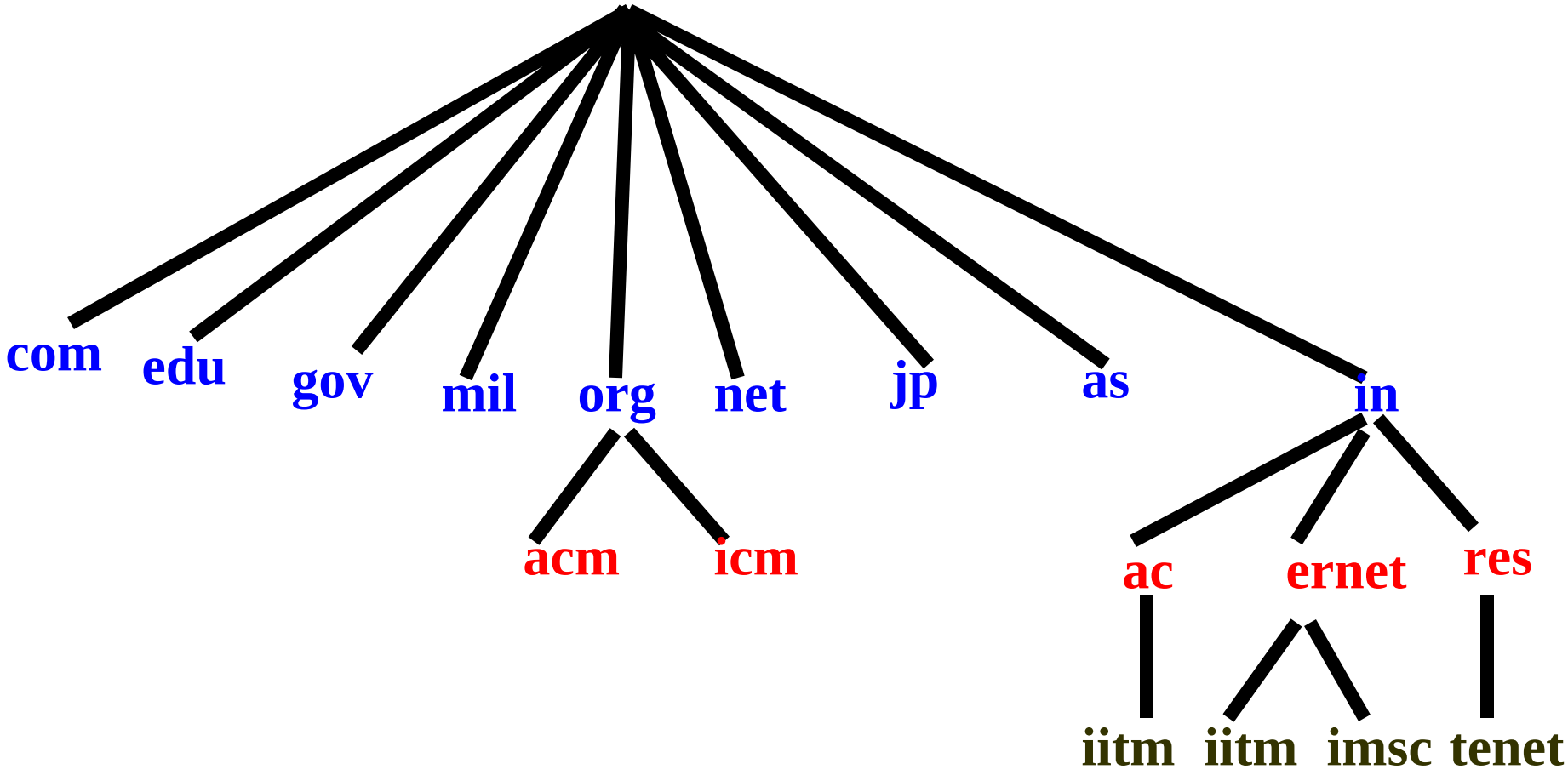
- Originally hosts text fetched by all machines at night
  - Exploding Internet
  - Impractical
- Hierarchical domain based naming scheme
  - distributed DBMS for implementing the same

  - Map host names and e-mail destination to IP addresses



Now application makes TCP connections to the IP address

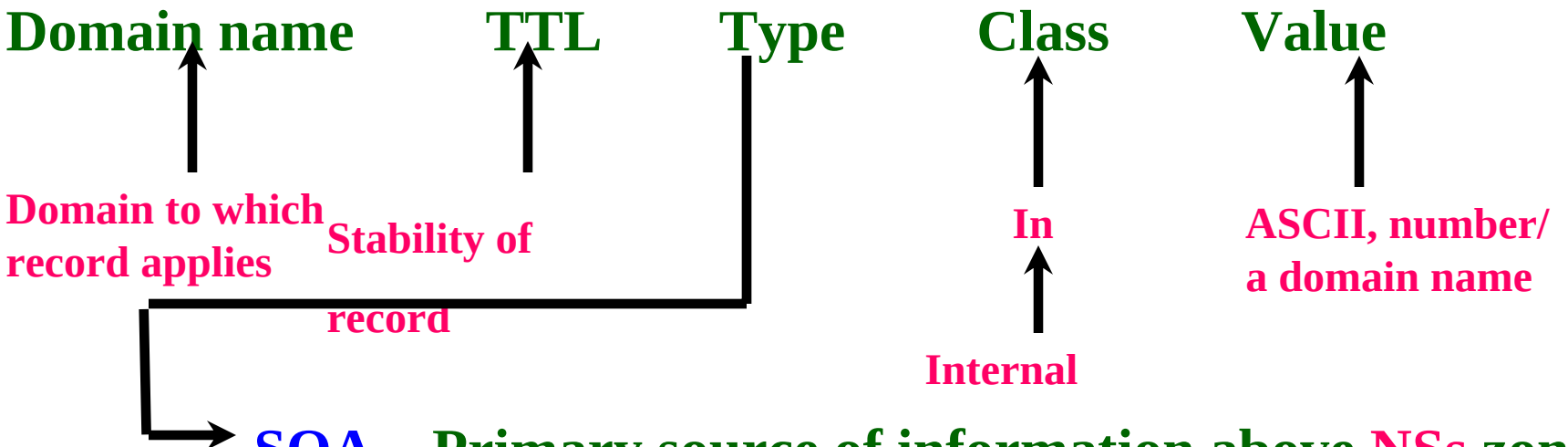
Domain Name System Hierarchy



Domain Name System (contd.)

- **Insertion into the tree**
- **Example: Insert peacock into iitm.ac.in**
- **Permission from admin at iitm.ac.in**
- **Database in the form of resource records for each host/domain**
- **When a resolver gives a domain name to DNS,**
  - **It gets back resource records associated with that name**
  - **Domain name case insensitive**
- **Component can be upto 63 characters long**
- **hyphens allowed**
- *** # ? …… not allowed**

Resource record is a five type:



SOA – Primary source of information above NSs zone

A – IP address

MX – Name of domain prepared to accept email for specified domain

NS – Name server for this domain

CNAME – Aliases for a name: cs.iitm & iitm same domain

Domain Name System (contd.)

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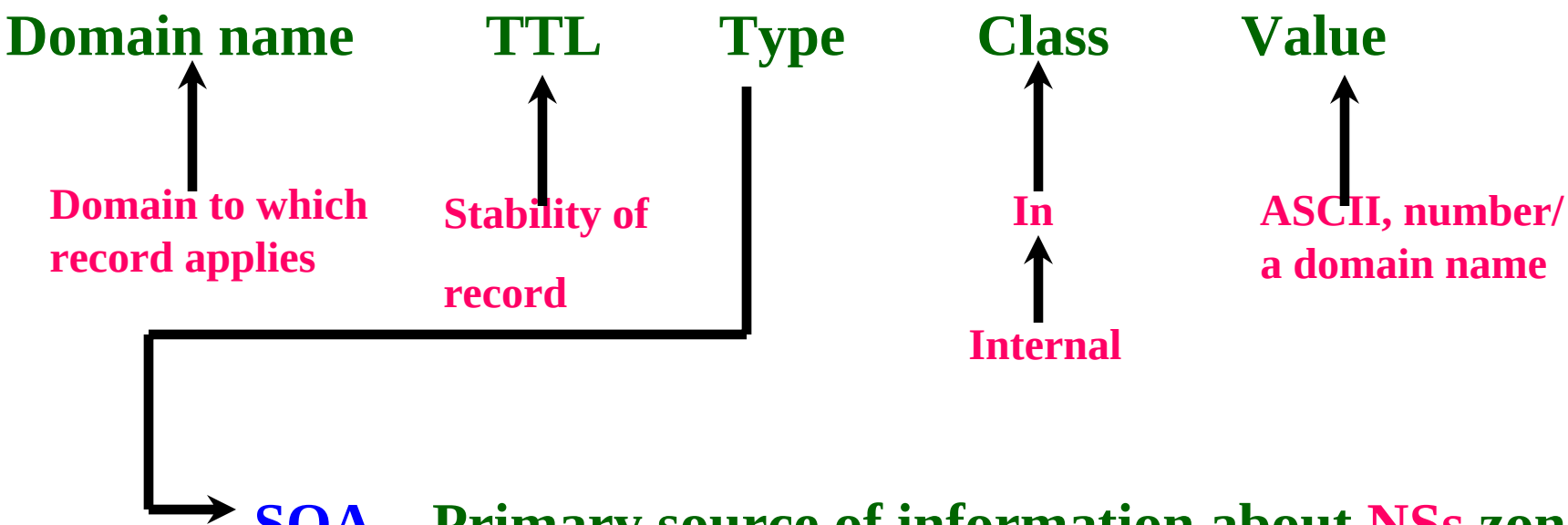

SOA – Primary source of information about NSs zone

A – IP address

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Domain Name System (contd.)

NS – Name server for this domain

CNAME – Aliases for a name: cs.iitm & iitm same domain

PTR – Alias for IP address

MINFO – Pentium III, unix

Mtech 2k.com 86400 IN MX peacock.iitm.ernet.in

Entry in the com dB

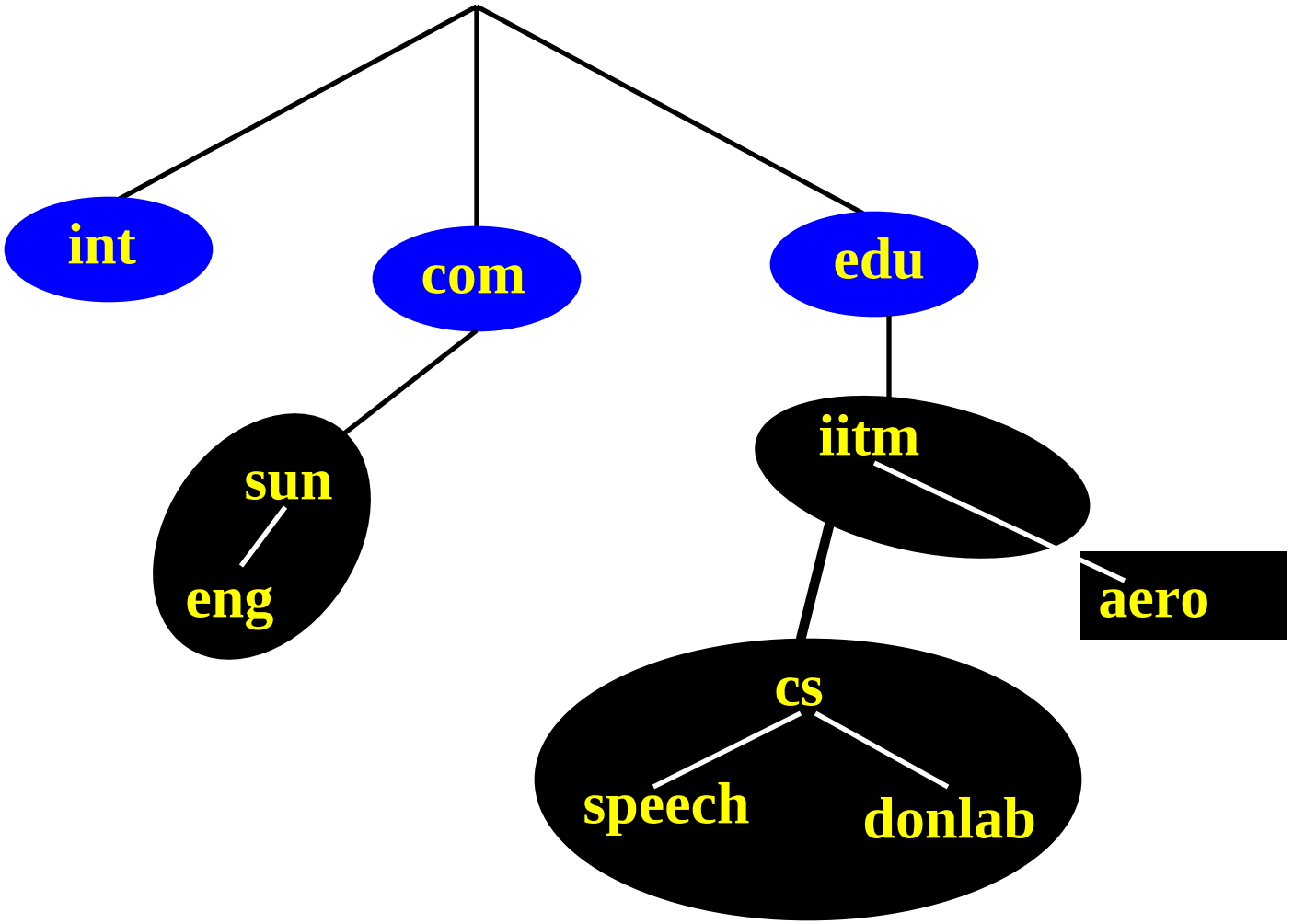
Arrangement with peacock to collect mail delivered to

Mteck2k.com

Send mail for Mtech2k.com to peacock.iitm.ernet.in

Dial up and collect mail

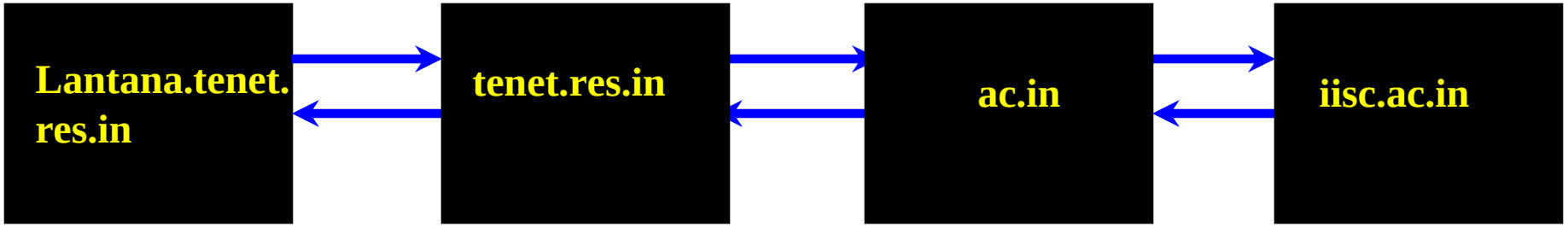
Domain Name System (contd)



Each zone contains some part of the tree and authoritative name server for that zone

Domain Name System (contd.)

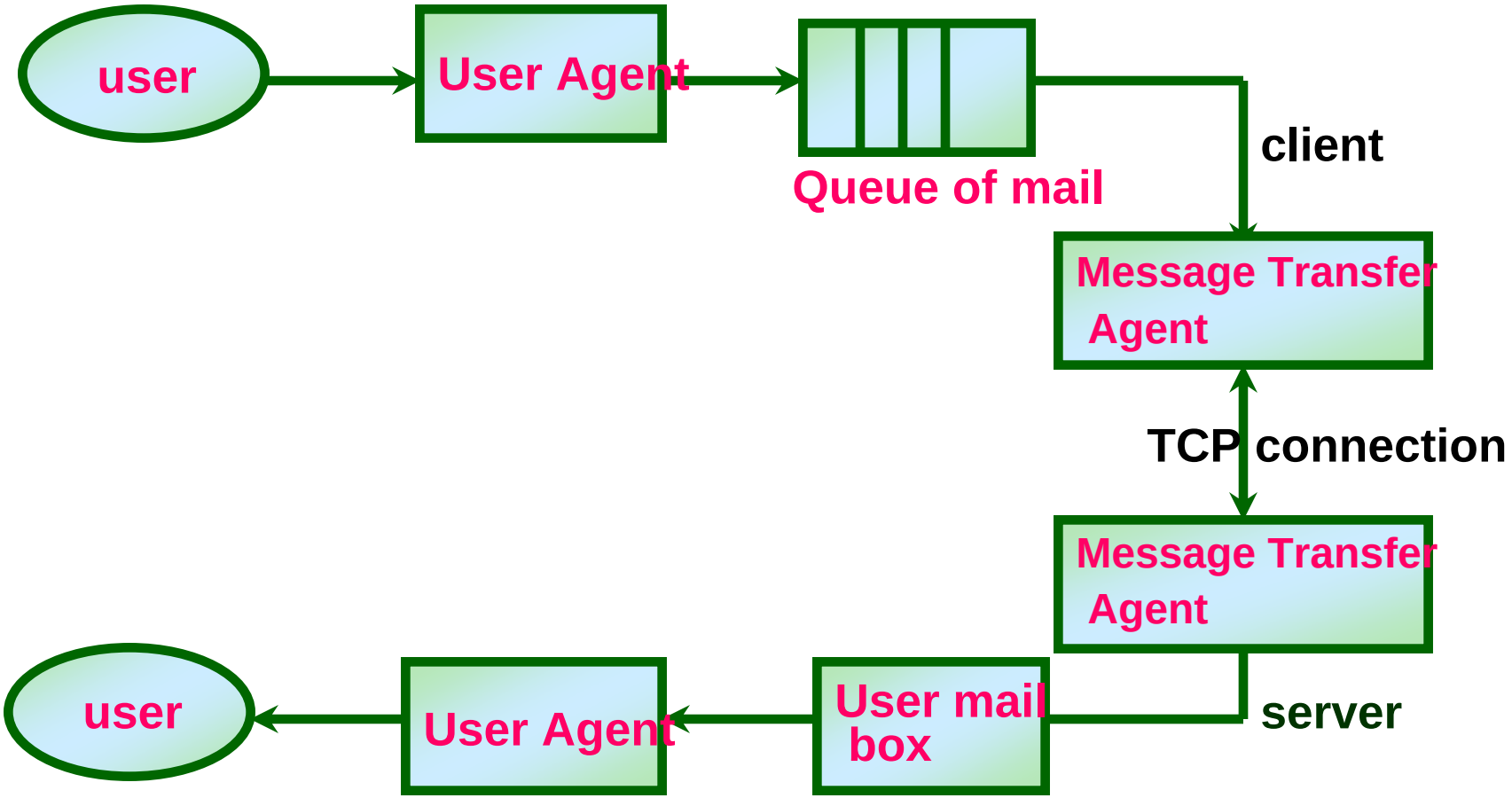
To reach hamsadwani.iisc.ac.in



Recursive query

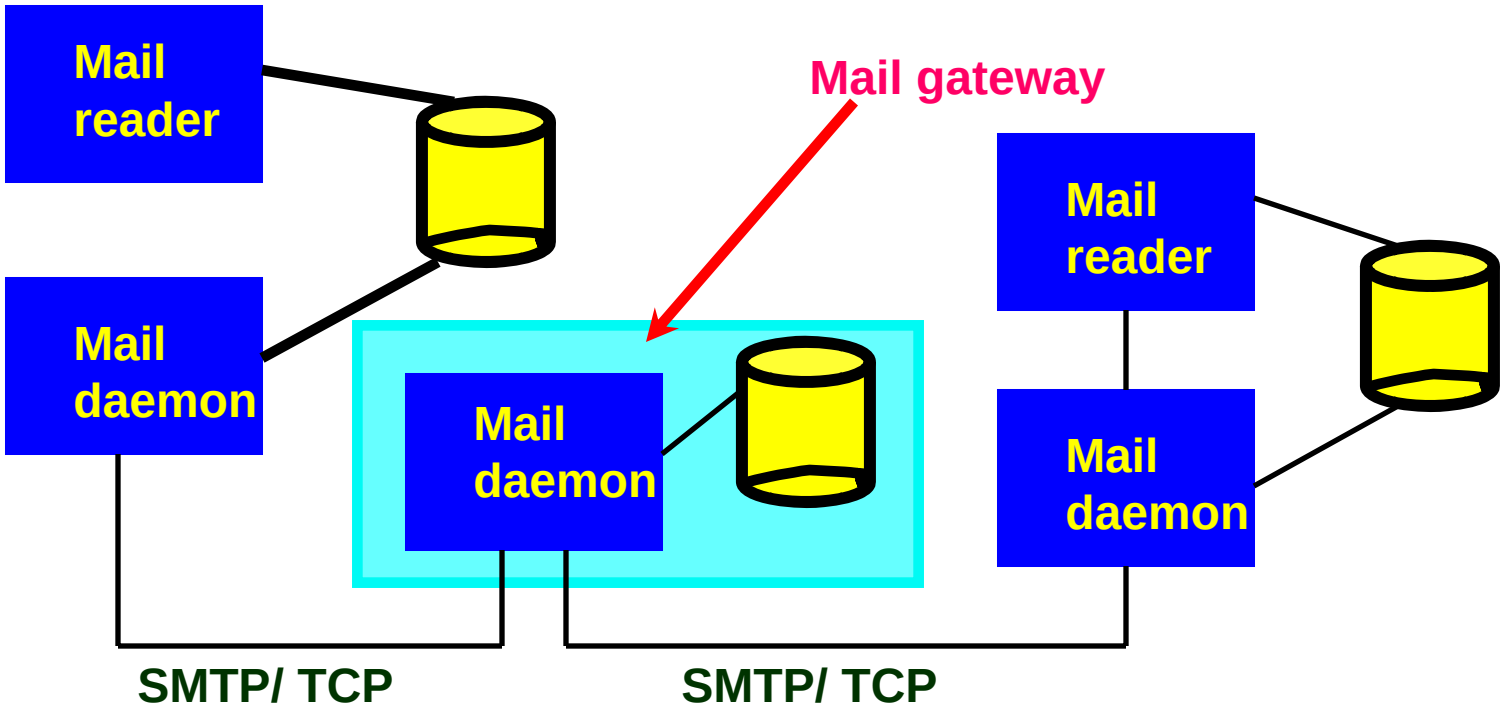
- **Results obtained are cached for the future**
- **The reason why TTL field is used**

Simple Mail Transfer Protocol (SMTP)



SMTP (contd)

Mail Transfer using a mail gateway



SMTP (contd.)

- **Mail server: Example: lantana**
  - **Need mail on bhairavi**
- **Recipient machine must be up**
  - **Otherwise gateway delivers later**
- **User may use POP3 (Post Office Protocol)**
  - **Fetch mail from server to local host**

SMTP (contd.)

- **User agent: mail, elm, pine**
- **Message Transfer Agent: Sendmail**
- **Commands used to send mail:**
- **HELO, MAIL, RCPT, DATA, QUIT**
- **mail –v hema@tenet.res.in**

SMTP (contd.)

- **HELO – Identify client**
- **MAIL From: hema@bharavi.iitm.ernet.in**
- **……. sender ok**
- **RCPT To: hema@tenet.res.in**
- **rcpt ok**

SMTP (contd.)

- **DATA**
- **Enter mail end with a dot on a line by itself**
- **Mail accepted**
- **Quit**

SMTP (contd.)

- **Additional Commands:**
  - **RSET – about the current mail transaction**
  - **VRFY – Lets client ask the sender to verify recipients address without sending mail.**
  - **NOOP – From server respond with and ok**
  - **EXPN – Expand a mailing list**

SMTP Format

- Message Format: (RFC 822)
  - header
  - body
  - Originally body – simple text
  - MIME extension – permits all sorts oftext
  - <Msg Header>
  - Series of CRLF
  - Header separated from body by a blank line
  - **Header line:**
    - **<Type, Value> pairs separated by a column**

Format (contd.)

- Example
- To:
- Subject:
- From:
- CC:
- RFC 822 – Supports audio, video, images, word, docs etc

MIME Format

- MIME: *Multipurpose Internet Mail Extensions*
- MIME – Version: Version of MIME being used
- Content Description:
- A human readable description of what's in the message
- Content Type: Type of message
- Example: Still images: image/gif, image/jpeg

MIME (contd.)

- **Text:**
  - **text/rich text**
  - **marked up texts**
- **Application:**
  - **application/postscripts**
  - **application/network**
- **Also enables structuring of multiport type**
  - **- Message carrying more than one data type structures**

MIME Encoding

- **Mechanism for encoding:**
  - **Email contains only ASCII**
  - **Encoding – base 64**
  - **Map three bytes of original into 4 ASCII characters**
  - **Each 6-bit maps to a valid ASCII character (uc, lc, 10 digits + and /)**

MIME (contd.)

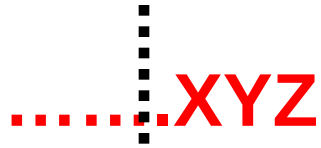
- **Example:**
- **MIME – Version: 1.0**
- **Content Type: multiport/mixed**
- **boundary = " …..XYZ"**

MIME (contd.)

- **From: hema@tenet.res.in**
- **To: 1Mtech@peacock.iitm.ernet.in**
- **Date: Tue, 23 Apr 2002 09:00:00 …….XYZ**
- **Content – Type: text/ plain; char set = us – ASCII**
- **Content Transfer – Encoding: 7 bit**
- **Here is the picture and draft report:**
- **hema**
- **……. XYZ**
- **Content – Type: image/ jpeg**
- **Content Transfer – Encoding: base 64**

MIME (contd.)

Unreadable encoding of picture



Content Type: application/ postscripts:

name = “draft.ps”

Content Transfer – Encoding: 7 bit

Readable encoding of a PS document