



# Simple Mail Transfer Protocol

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# Overview

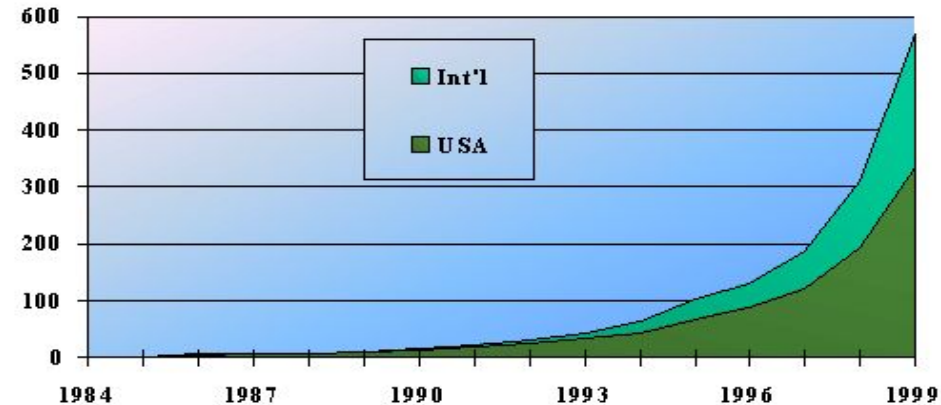
- Introduction
- Message Breakdown
- Sample Messages
- Extensions
- MTA's and Mailbox Protocols

# Email Statistics

- 31 billion emails are sent daily, expected to double by 2006
- Email generates about one billion Gigabytes of new “information” per year
- Spam accounts for about 40% of all email traffic

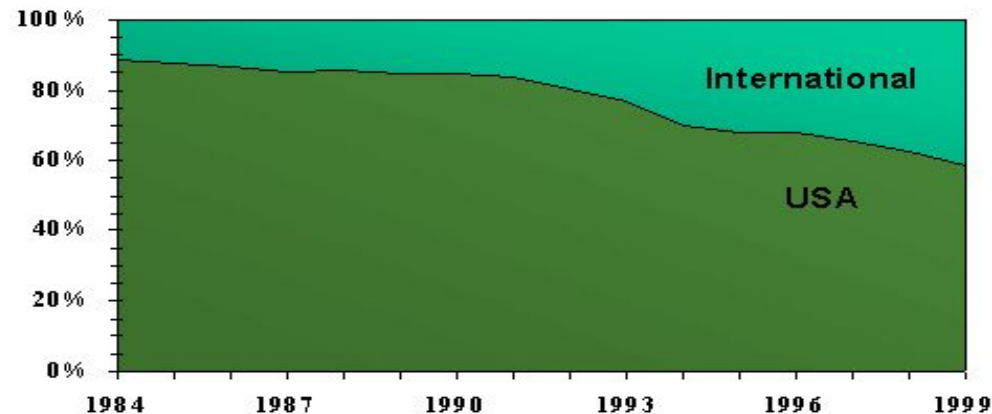
<http://www.spamfilterreview.com>

**Millions of Mailboxes Worldwide  
1984 - 1999**



Source: Messaging Online

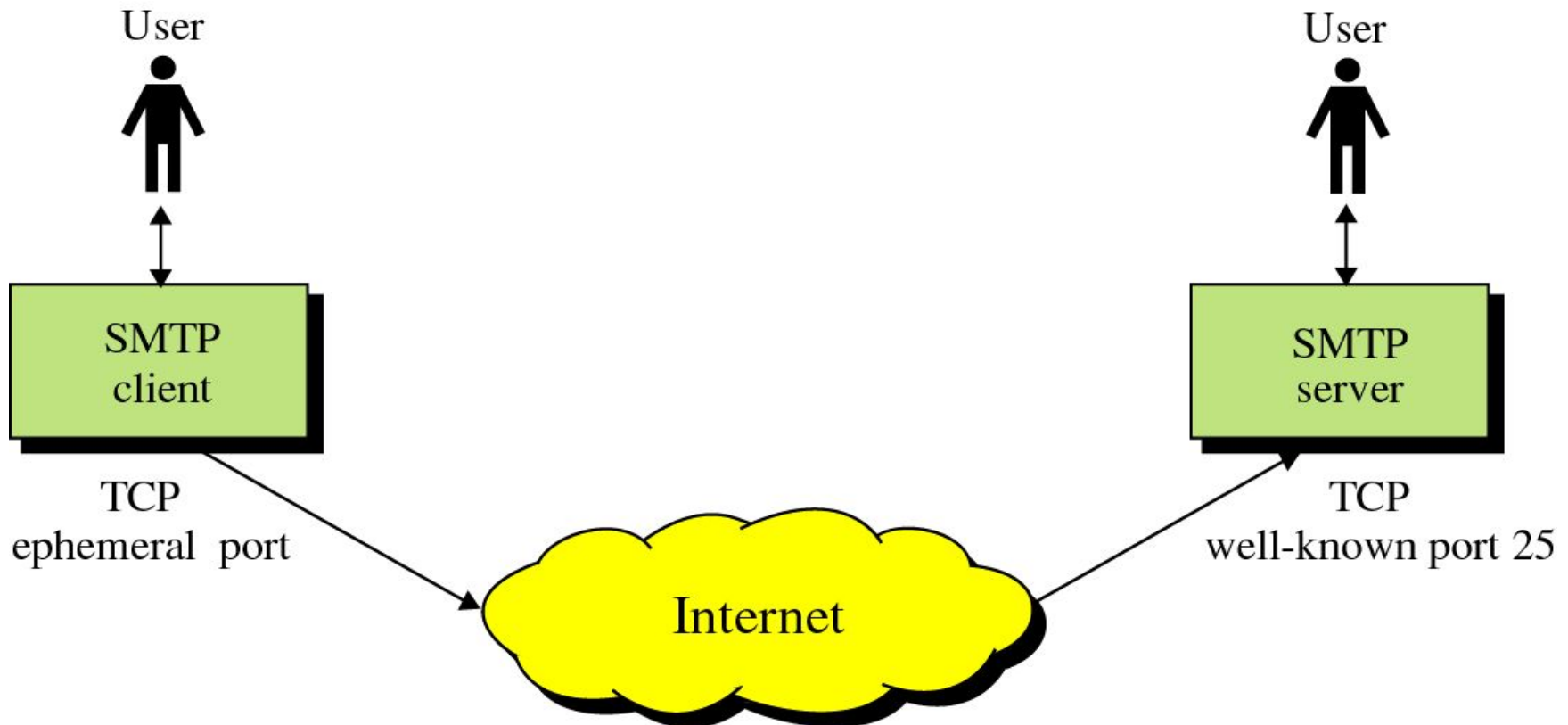
**Distribution of Mailboxes Worldwide  
1984 - 1999**



Source: Messaging Online

# SMTP

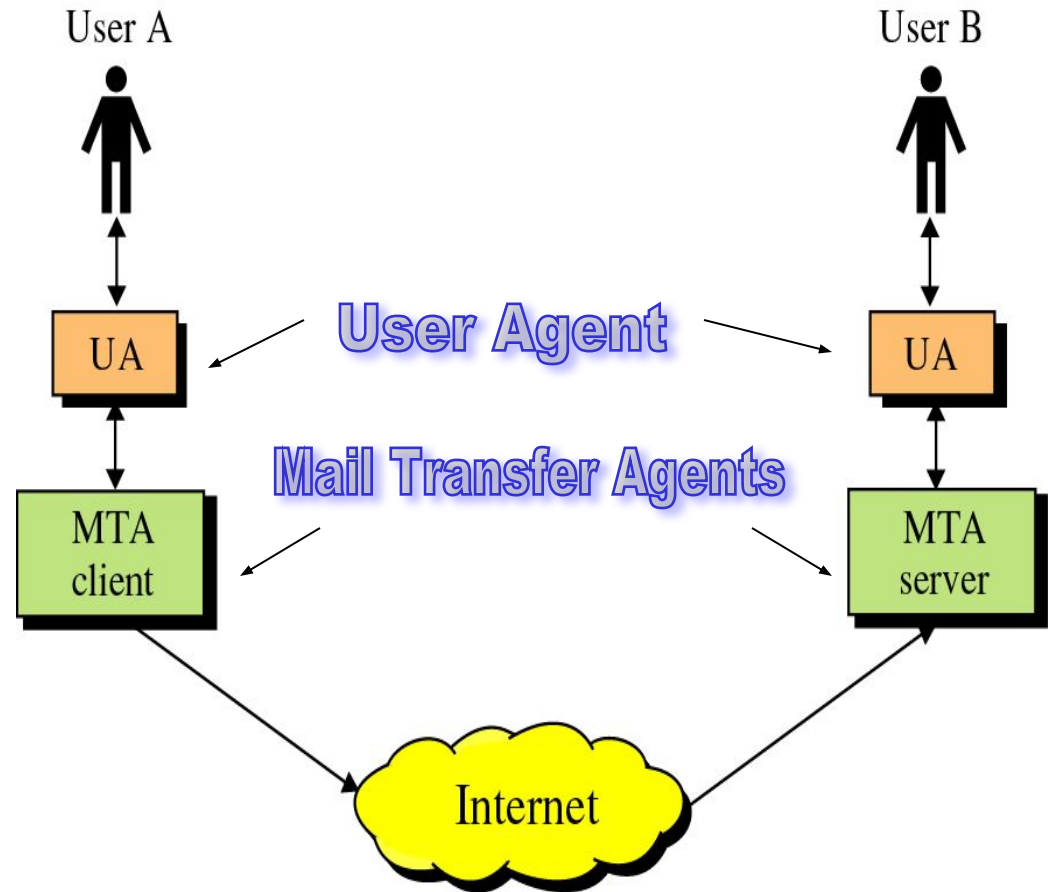
- Originated in 1982 (rfc0821, Jon Postel)
- Goal: To transfer mail reliably and efficiently



# SMTP

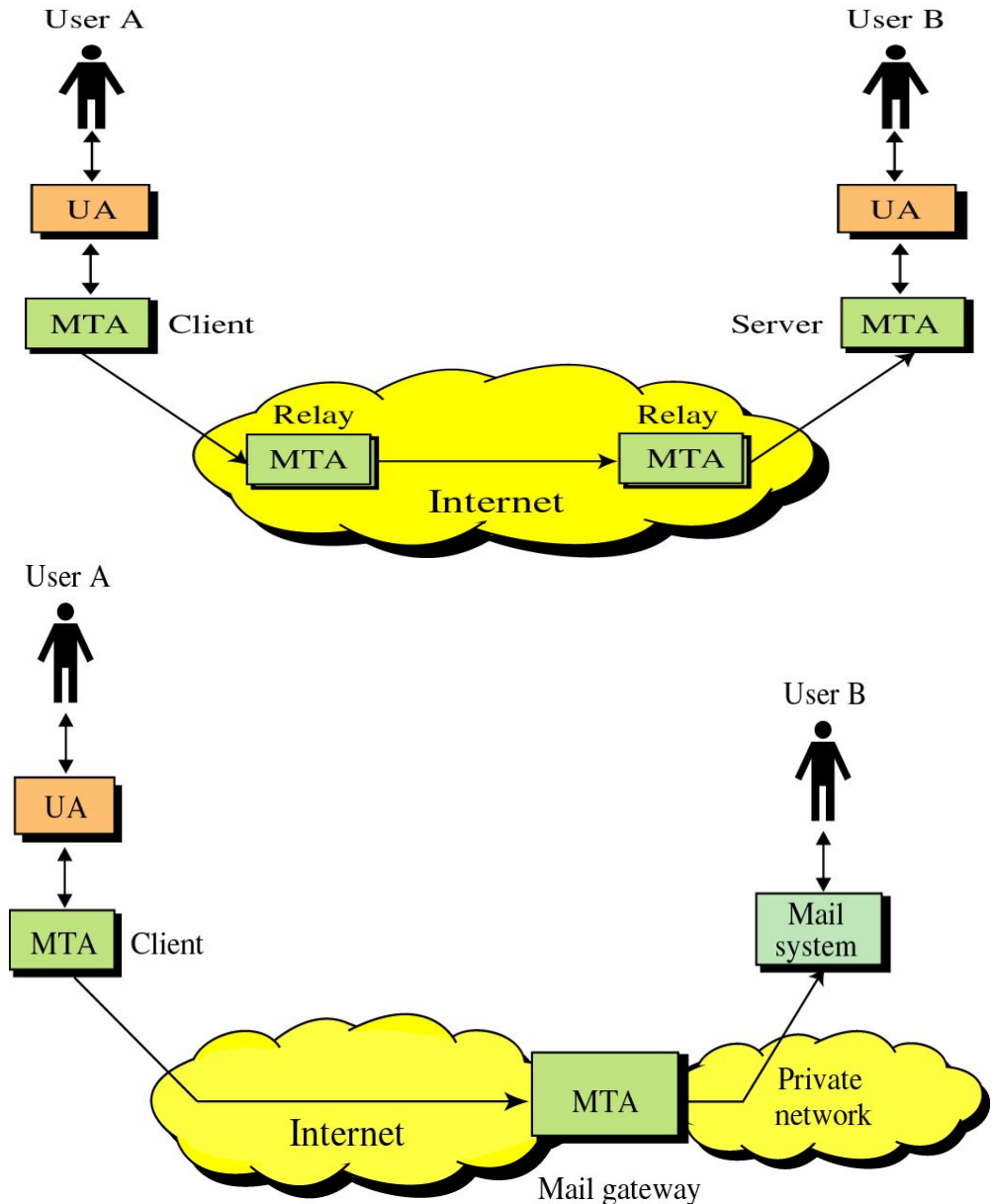
■ SMTP clients and servers have two main components

- User Agents – Prepares the message, encloses it in an envelope. (Eudora for example)
- Mail Transfer Agent – Transfers the mail across the internet



# SMTP

- SMTP also allows the use of Relays allowing other MTAs to relay the mail
- Mail Gateways are used to relay mail prepared by a protocol other than SMTP and convert it to SMTP



# What is Mail?

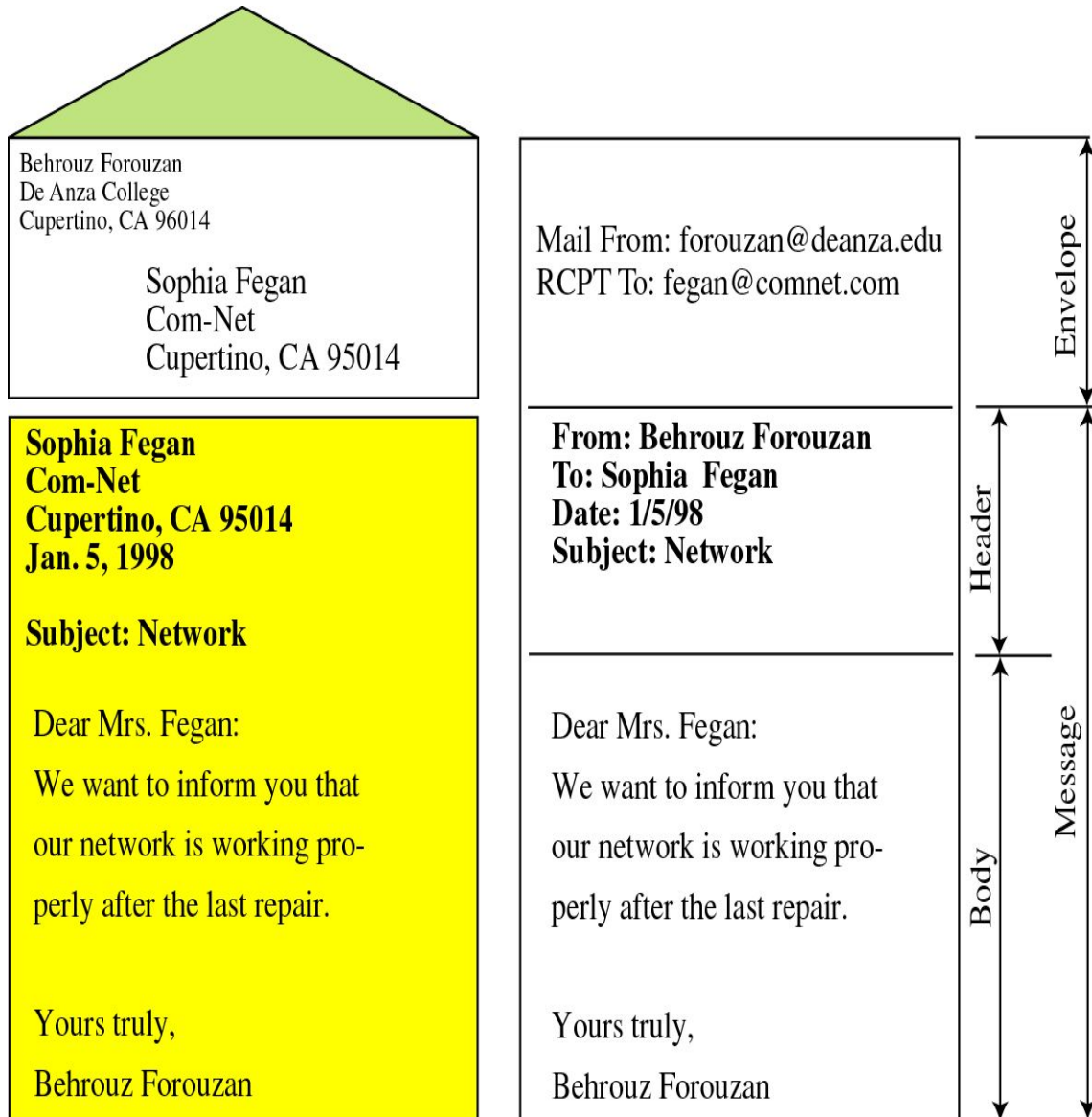
- Mail is a text file

- Envelope –

- sender address
- receiver address
- other information

- Message –

- Mail Header – defines the sender, the receiver, the subject of the message, and some other information
- Mail Body – Contains the actual information in the message



Post Office  
Mailbox

**Return-Path:** <Jwatson@cis.udel.edu>  
**Delivered-To:** jwatson@cis.udel.edu

Received: by mail.eecis.udel.edu (Postfix, from userid  
62)

id 17FBD328DE; Wed, 5 Nov 2003 11:27:02

Received: from mail.acad.ece.udel.edu

(devil-rays.acad.ece.udel.edu [128.4.60.10])

by mail.eecis.udel.edu (Postfix) with ESMTP id  
5F41832893 for <Jwatson@cis.udel.edu>; Wed, 5 Nov  
2003 11:27:01

Received: by mail.acad.ece.udel.edu (Postfix, from userid  
62) id 47509456C; Wed, 5 Nov 2003 11:27:01

Received: from

stimp.eecis.udel.edu (stimp.eecis.udel.edu

[128.4.40.17]) by mail.acad.ece.udel.edu (Postfix) with

SMTP id 7C2943D79 for <Jwatson@cis.udel.edu>; Wed, 5  
Nov 2003 11:26:34

**Message-Id:**

<20031105162634.7C2943D79@mail.acad.ece.udel.edu>

**Date:** Wed, 5 Nov 2003 11:26:34

**From:** Jwatson@cis.udel.edu

**To:** undisclosed-recipients: ;

**MIME-Version:** 1.0

**This is a test.**

Post office  
and mail route

Receivers  
Mailbox



# How SMTP works (A-PDU's)

- The Essentials

<b>Keyword</b>	<b>Arguments</b>
HELO	Sender's Host Domain Name
MAIL FROM:	Email Address of sender
RCPT TO:	Email of Intended recipient
DATA	Body of the message
QUIT	

# How SMTP works (A-PDU's)

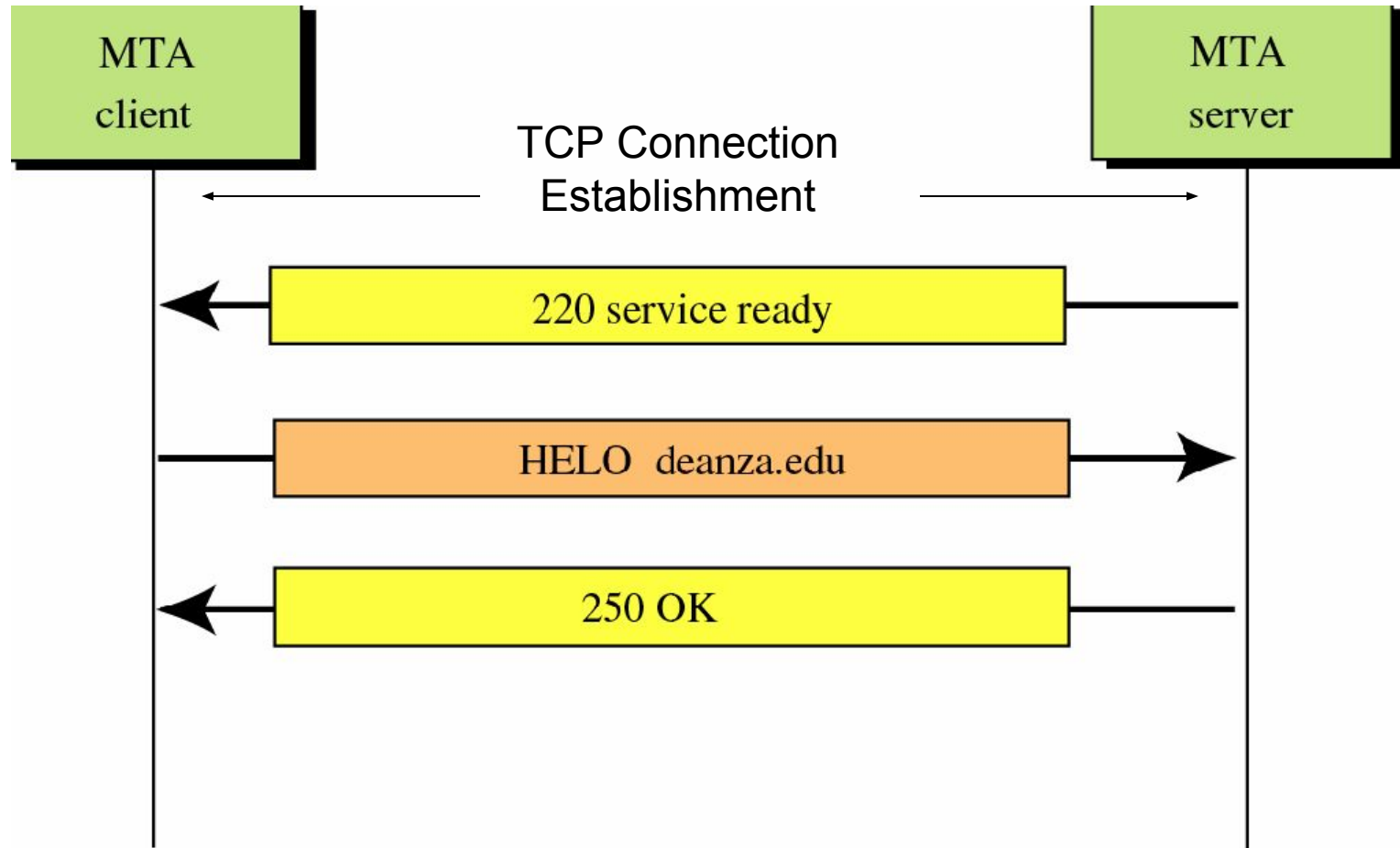
- The Extras

<b>Keyword</b>	<b>Arguments</b>
RSET	
VRFY	Name to be verified
NOOP	
TURN	
EXPN	Mailing list to expand
HELP	Command Name

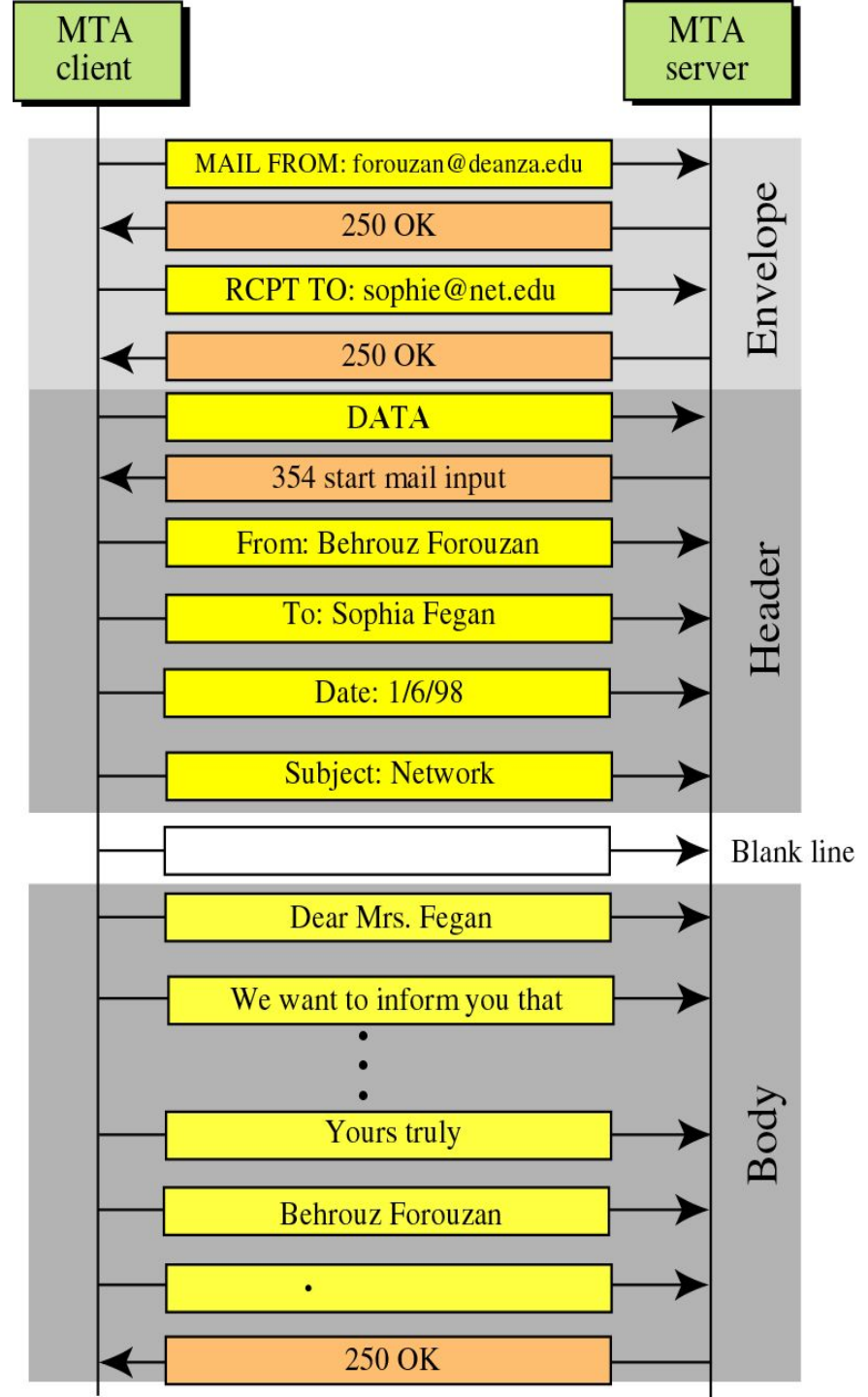
# Status Codes

- The Server responds with a 3 digit code that may be followed by text info
  - 2## - Success
  - 3## - Command can be accepted with more information
  - 4## - Command was rejected, but error condition is temporary
  - 5## - Command rejected, Bad User!

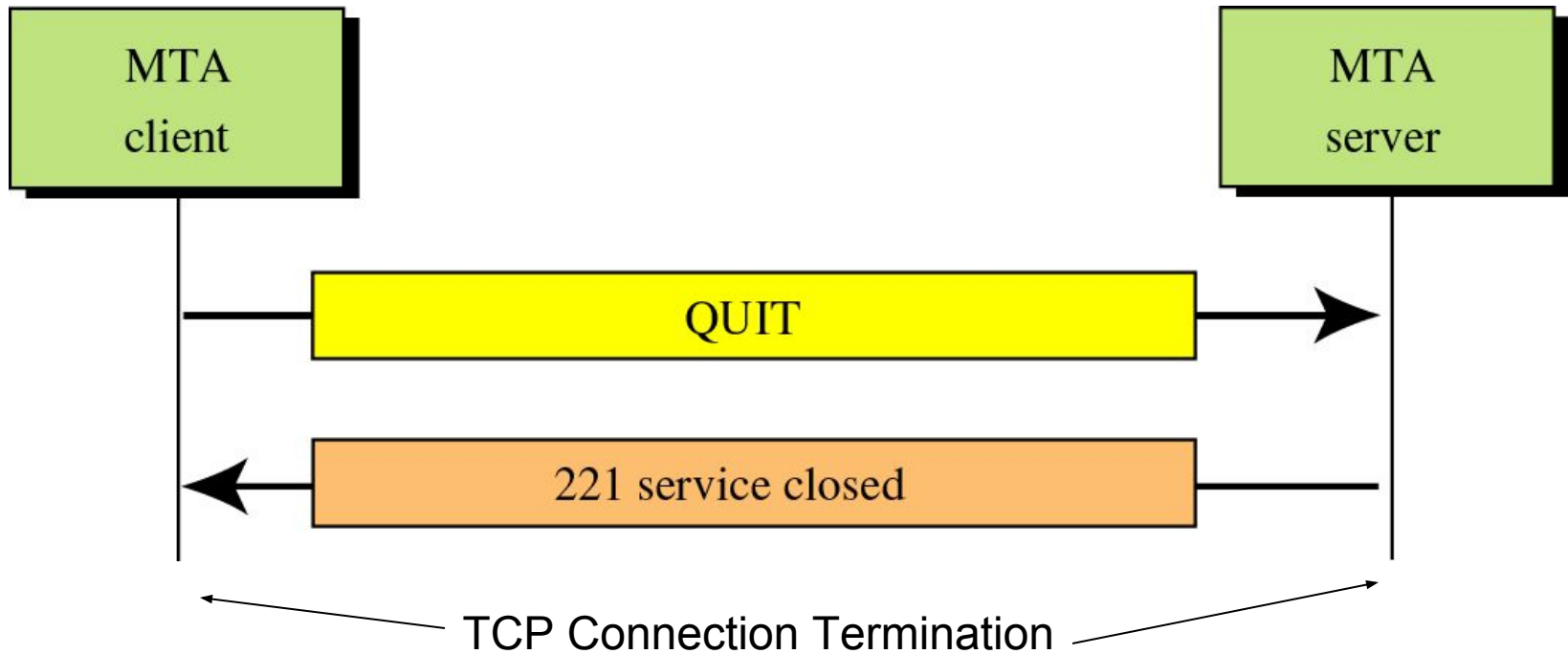
# Connection Establishment



# Message Progress



# Connection Termination



# Problems with SMTP

- No security
  - Authentication
  - Encryption
- Current Solutions:
  - VRFY command
  - Signature
- Only uses NVT 7 bit ASCII format

# E-mails can be forged.....

HELO stimp.eecis.udel.edu

MAIL FROM: carberry@cis.udel.edu

RCPT TO: amer@cis.udel.edu

DATA

From: Dr. Sandra Carberry

To: Dr. Paul Amer

Subject: CISC856

Dr. Amer,

By department decree all students in your CISC856 TCP/IP class are hereby to be given automatic A's.

Thank you,

Dr. M. Sandra Carberry

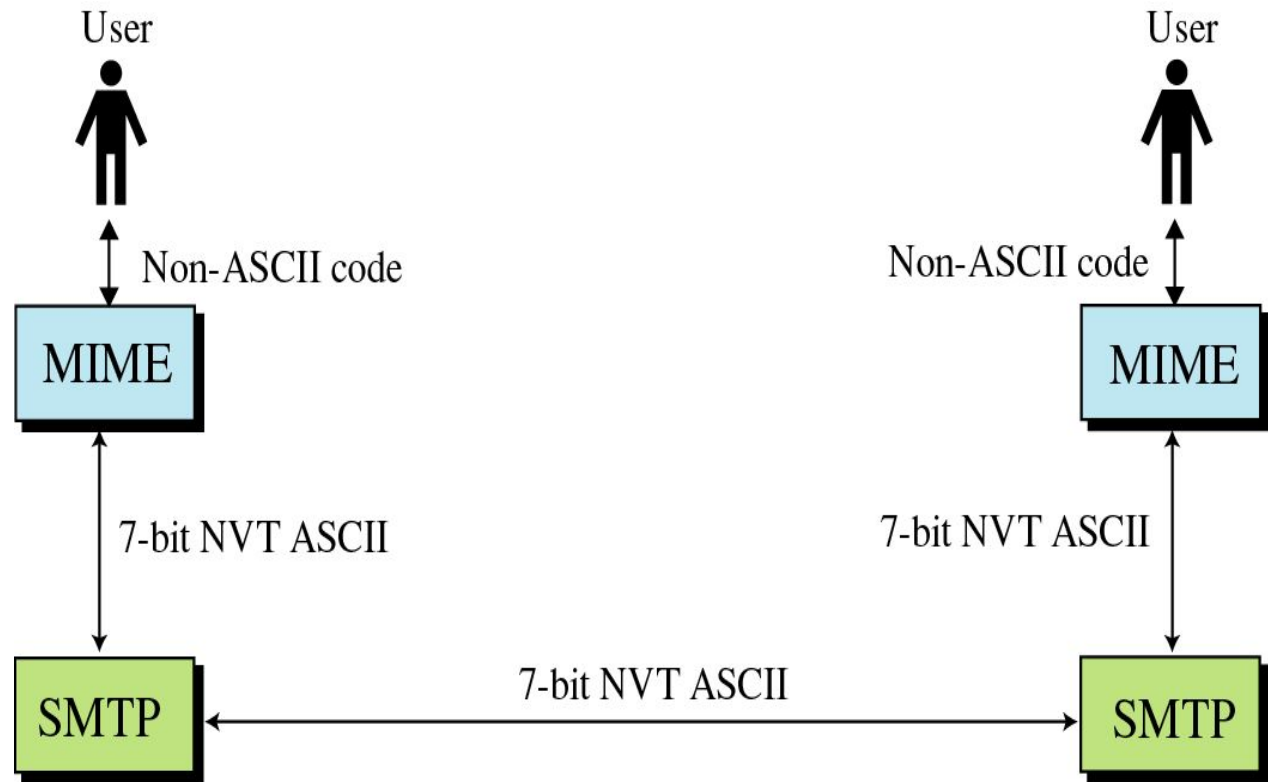
.

QUIT



# Extensions to SMTP

- MIME – Multipurpose Internet Mail Extensions
  - Transforms non-ASCII data to NVT (Network Virtual Terminal) ASCII data
    - Text
    - Application
    - Image
    - Audio
    - Video



# MIME Headers

- Goes between the Email Header and Body
  - MIME-Version: 1.1
  - Content-Type
  - Content-Transfer-Encoding
  - Content-Id
  - Content-Description

# MIME Headers

- Content-Type – Type of data used in the body of the message
  - Text – plain, unformatted text; HTML
  - Multipart – Body contains multiple independent parts
  - Message – The body is whole mail message, part of a message, or a pointer to a message

# MIME Headers

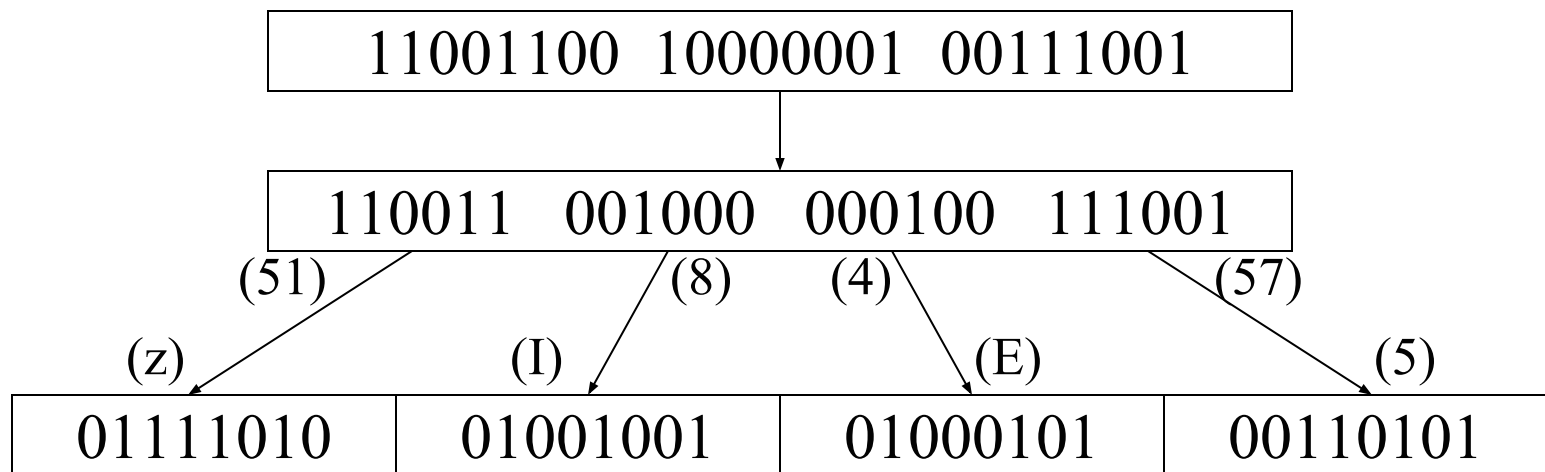
- Image – The message is a stationary image (JPEG or GIF)
- Video – The message is an animation (Mpeg)
- Audio – The message is 8 kHz standard audio data
- Application – The message is a type of data not previously defined

# MIME Headers

- Content-Transfer-Encoding – The method used to encode the messages
  - 7 bit – no encoding needed
  - 8 bit – Non-ASCII, short lines
  - Binary – Non-ASCII, unlimited length lines
  - Base64 – 6 bit blocks encoded into 8-bit ASCII
  - Quoted-printable – send non-ASCII characters as 3 ASCII characters, =##, ## is the hex representation of the byte

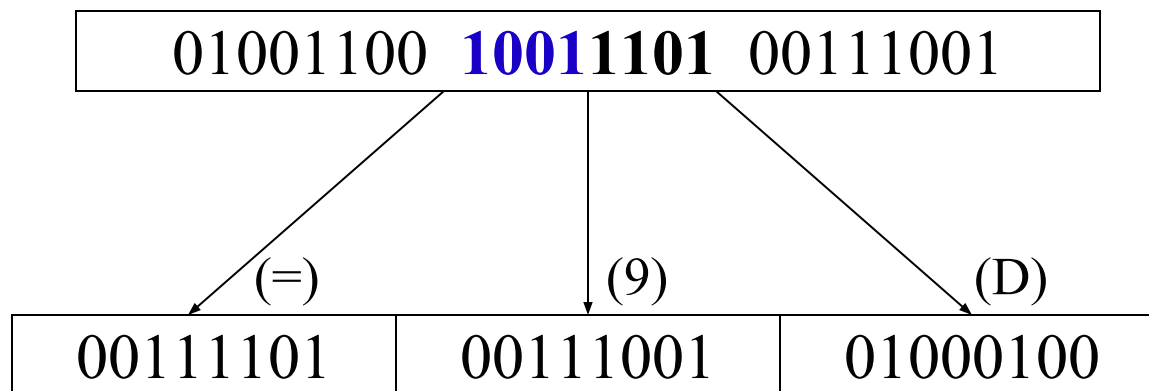
# Base64 Encoding

- Divides binary data into 24 bit blocks
- Each block is then divided into 6 bit chunks
- Each 6-bit section is interpreted as one character (Table 22.5 in Text), 25% overhead



# Quoted-Printable Encoding

- Used when the data has a small non-ASCII portion
- Non-ASCII characters are sent as 3 characters
- First is '=', second and third are the hex representation of the byte



# MIME Headers

- Content-Id – Uniquely identifies the whole message in a multiple message environment
- Content-Description – defines whether the body is image, audio, or video



## **A Multipart, Encoded MIME Message**

From: joe\_luthier@plucknplay.com

To: lchae@mfi.com

Subject: Info on Gibson guitar

MIME-Version: 1.0

Content-Type: multipart/mixed; boundary=17

- 17

Content-Type: text/enriched; charset="us-ascii"

Content-Transfer-Encoding: 8bit

Content-Description: Greetings

As promised, I'm getting back to you about the Gibson Southern Jumbo guitar you were Interested in. I've enclosed a spec sheet on the guitar, which is in Microsoft Word.

I guarantee that you'll love it!

- 17

Content-Type: application/octet-stream

Content-Transfer-Encoding: base64

Content-Description: Spec sheet saved as MS Word file

- 17 -

# MIME Example

Date: Wed, 04 Apr 2001 00:11:37 -0400  
From: Meghna Naik <mnaik@UDe1.Edu>  
MIME-Version: 1.0  
To: stoweg@hotmail.com  
Subject: =?gb2312?B?1tDOxA==?= title  
Content-Type: text/plain; charset=gb2312  
Content-Transfer-Encoding: 7bit

a body text, blah, blah

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```
Date: Wed, 04 Apr 2001 00:11:37 -0400
From: Meghna Naik <mnaik@UDe1.Edu>
MIME-Version: 1.0
To: stoweg@hotmail.com
Subject: 中文 title
Content-Type: text/plain; charset=gb2312
Content-Transfer-Encoding: 7bit
```

a body text, blah, blah

# Mail Transfer Agents

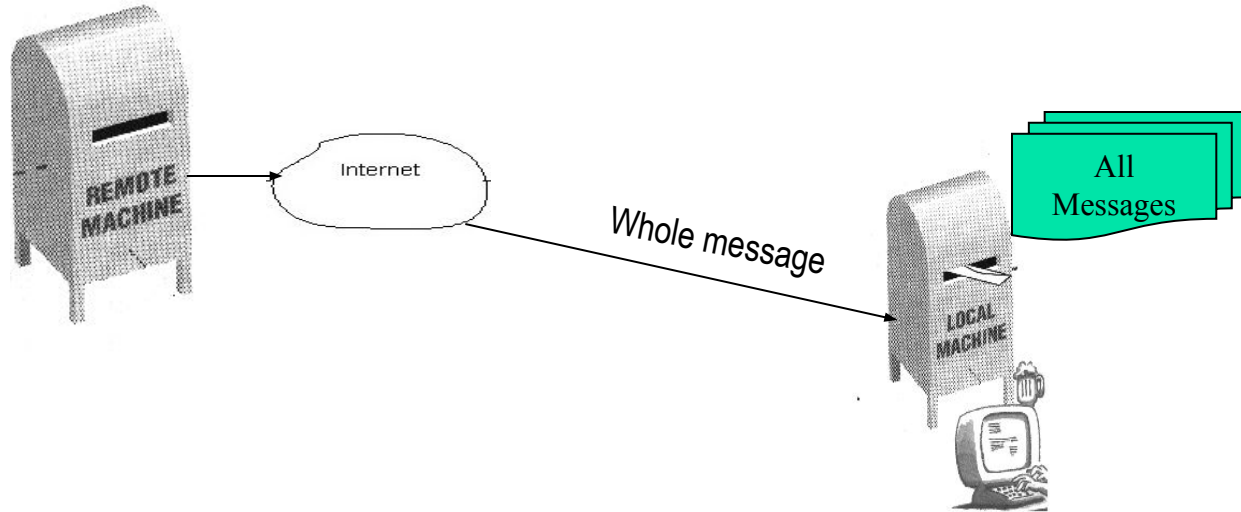
- MTAs do the actual mail transfers
- MTAs are not meant to be directly accessed by users.
- MMDF
- SENDMAIL

# Mail Access Protocols

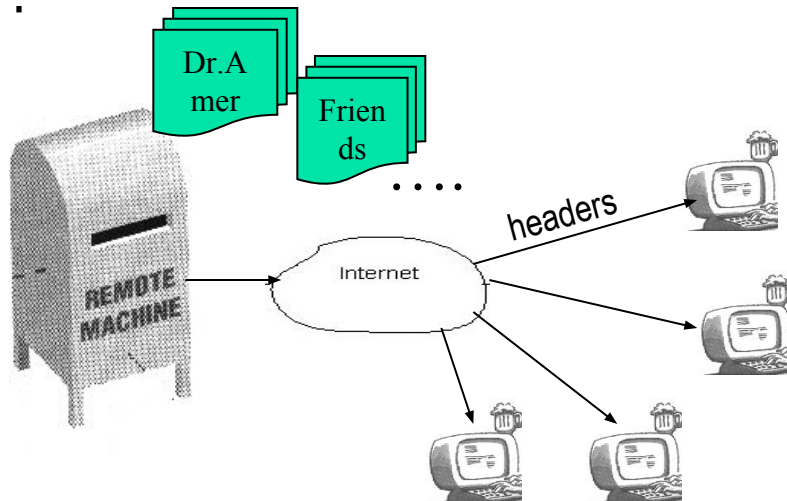
- The MTAs place the email in the user's mailbox
- The Mail Access Protocols are used by the users to retrieve the email from the mailbox
  - POP3
  - IMAP4

# POP vs. IMAP

POP3:



IMAP:



# Post Office Protocol v3

- Simple
- Allows the user to obtain a list of their Emails
- Users can retrieve their emails
- Users can either delete or keep the email on their system
- Minimizes server resources

# Internet Mail Access Protocol v4

- Has more features than POP3
- User can check the email header before downloading
- Emails can be accessed from any location
- Can search the email for a specific string of characters before downloading
- User can download parts of an email
- User can create, delete, or rename mailboxes on a server

# References

- SMTP - Kevin Pinzhoffer
- SMTP - Sreedevi Sampath
- RFC0821 – Jonathan Postel
- RFC0822 – David Crocker
- RFC1521 – Borenstein, Bellcore, Freed
- E-mail Explained – Sendmail.org
- TCP/IP Protocol Suite – Behrouz Forouzan