

# CS 640 Introduction to Computer Networks

## Lecture 4

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## Today's lecture

- E-mail
  - Overview
  - Message format
  - SMTP
  - IMAP/POP

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## Internet apps: application, transport protocols

Application	Application layer protocol	Underlying transport protocol
e-mail	smtp [RFC 821]	TCP
remote terminal access	telnet [RFC 854]	TCP
Web	http [RFC 2088]	TCP
file transfer	ftp [RFC 959]	TCP
streaming multimedia	proprietary (e.g. RealNetworks)	TCP or UDP
remote file server	NFS	TCP or UDP
Internet telephony	proprietary (e.g. Vocaltec)	typically UDP

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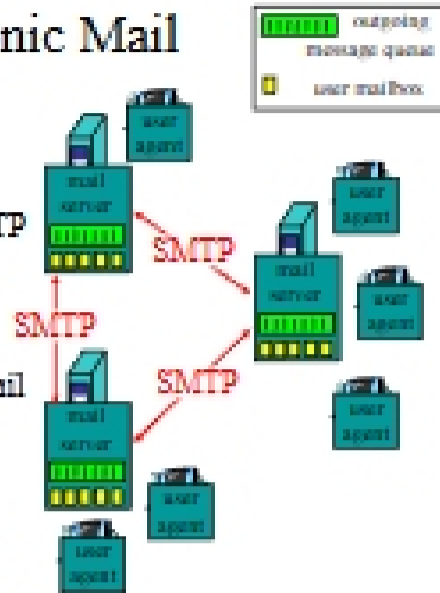
## Electronic Mail

### Three major components:

- user agents
- mail servers
- simple mail transfer prot.: SMTP

### User Agent

- a.k.a. "mail reader"
- composing, editing, reading mail messages
- e.g., Eudora, Outlook, pine, Netscape Messenger
- outgoing, incoming messages stored on server



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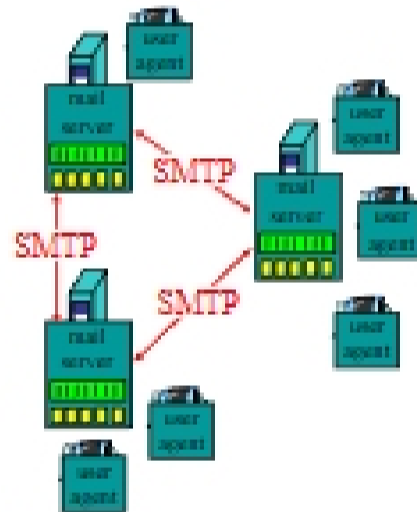
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## Electronic Mail: mail servers

### Mail Servers

- **mailbox** contains incoming messages (yet to be read) for user
- **message queue** of outgoing (to be sent) mail messages
- **SMTP protocol** between mail servers to send email messages
  - client: sending mail server
  - "server": receiving mail server



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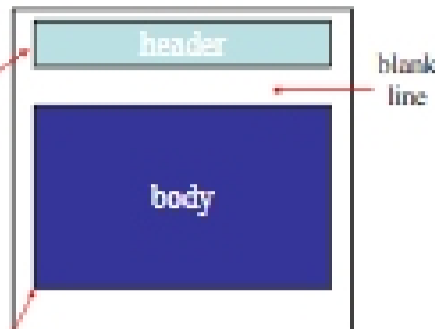
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## Mail message format

SMTP: protocol for exchanging email messages

RFC 822: standard for text message format:

- header lines, e.g.,
  - To:
  - From:
  - Subject:*different from SMTP commands!*
- body
  - the "message", ASCII characters only



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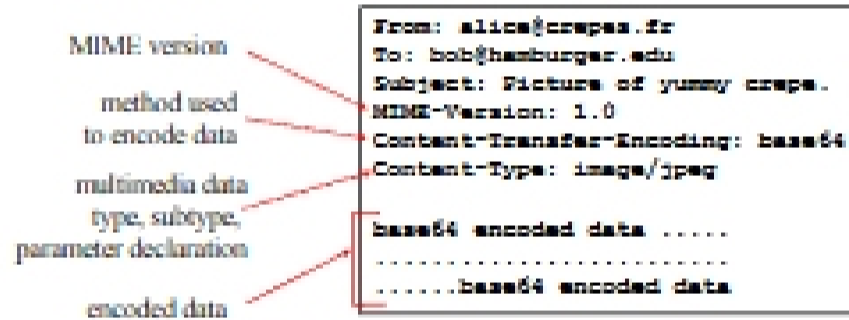
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## Message format: multimedia extensions

- MIME: email format extension, RFC 2045, 2056
- additional lines in msg header declare MIME content type



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## MIME types

Content Type: type/subtype; parameters

### Text

- example subtypes: plain, html

### Image

- example subtypes: jpeg, gif

### Audio

- example subtypes: basic (8-bit mu-law encoded), 32kadpcm (32 kbps coding)

### Video

- example subtypes: mpeg, quicktime

### Application

- other data that must be processed by reader before "viewable"
- example subtypes: msword, octet-stream

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