Electronic Mail

- Electronic mail is a method of exchanging digital messages.

- E-mail systems are based on a store-and-forward model.

- E-mail computer server systems accept, forward, deliver and store messages on behalf of users,

- Email users need to connect to e-mail server, with a network-enabled device for the duration of message submission or retrieval.

ARCHITECTURE

Entities in the Email System:

- **Client – who sends the email (sender)**
- **Server – who receives the email (receiver)**
- **Mailbox – Area where the emails are stored**
- **User Agent (Client) – application used to prepare and send Email**
- **User Agent (Server) - application used to retrieve and read Email**

USER AGENT

UA is the first component of email system. It provides service to the user to make the process of sending and receiving a message easier.

Services provided by a User Agent:

A UA is a software program that composes, reads, replies to, and forwards messages. It also handles mailboxes.
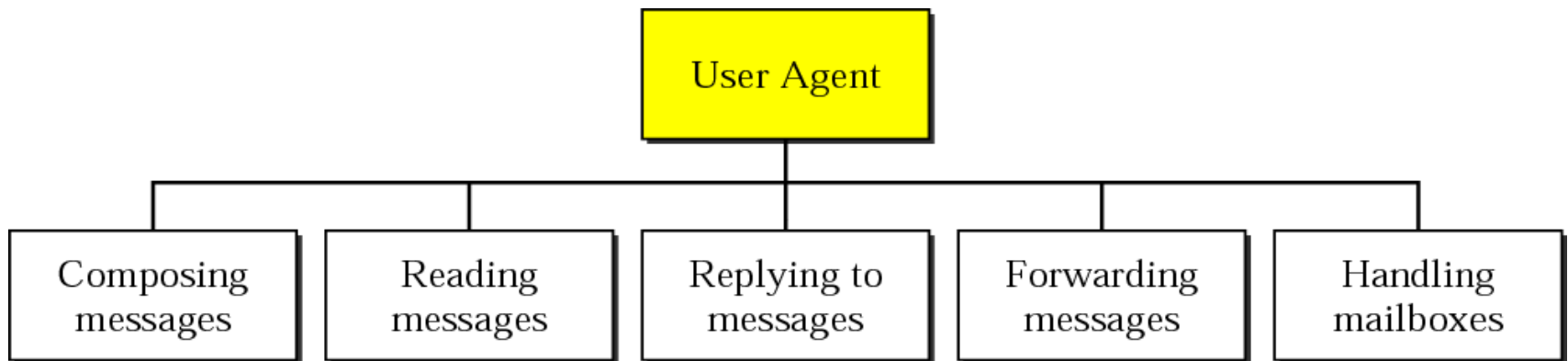
- Composing Messages:- UA helps the user to compose the email message to be sent out. UA provide a template on the screen to be filled in by the user.

- Reading Messages – when a user invokes a UA, it first checks the mail in the incoming mailbox. UAs shows a one line summary of each received mail.

- Replying to messages – UA allows the user to reply to the original sender or to reply to all recipients of the message.

- Forwarding Messages - sending the message to the 3rd party.

- Handling Mailboxes – UA creates 2 mailboxes : inbox and outbox. Each box is a file with a special format that can be handled by the UA.

# Message Transfer Agent[MTA]

- MTA is a computer process or software agent that transfers email messages from one computer to another.

- An MTA implements in both the client (sending) and server (receiving) portions

MESSAGE TRANSFER AGENT: SMTP

- The actual mail transfer requires message transfer agents (MTAs). The protocol that defines the MTA client (used to send mail) and server (used to receive mail) in the Internet is called Simple Mail Transfer Protocol (SMTP).
- SMTP is used 2 times, between the sender and the sender's mail server and between the 2 mail servers. SMTP defines how commands and responses must be sent back and forth
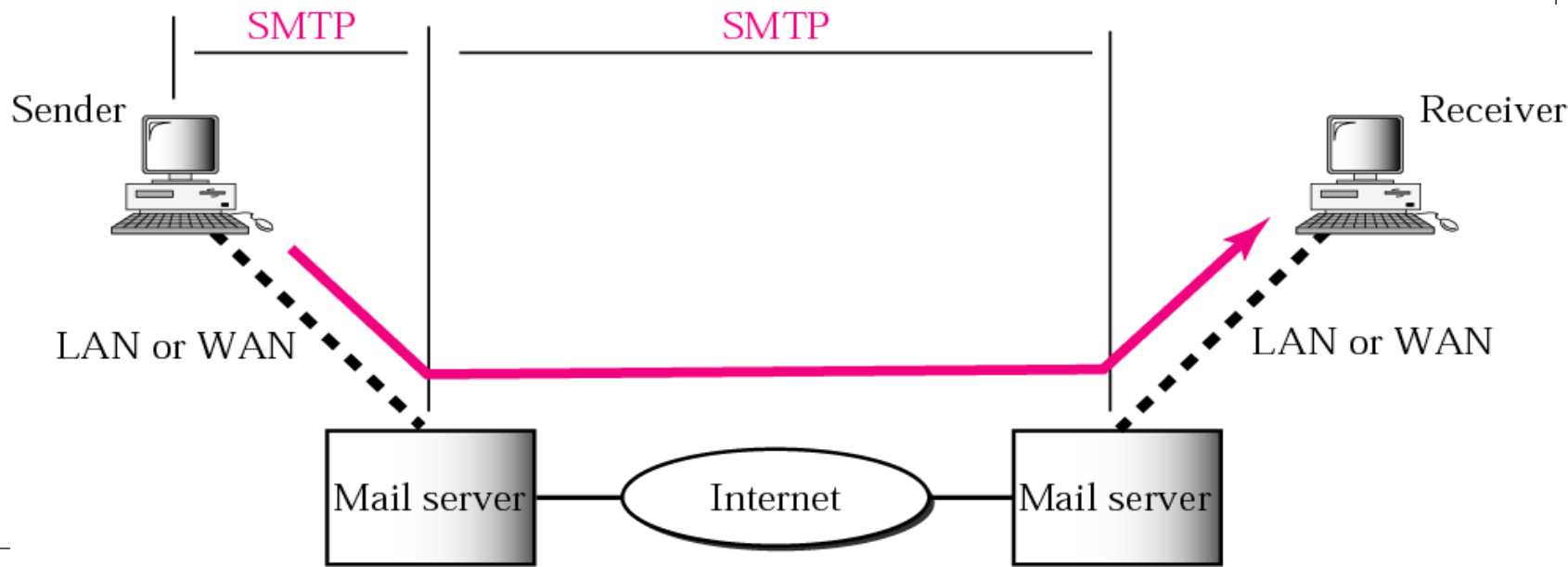
Commands and responses
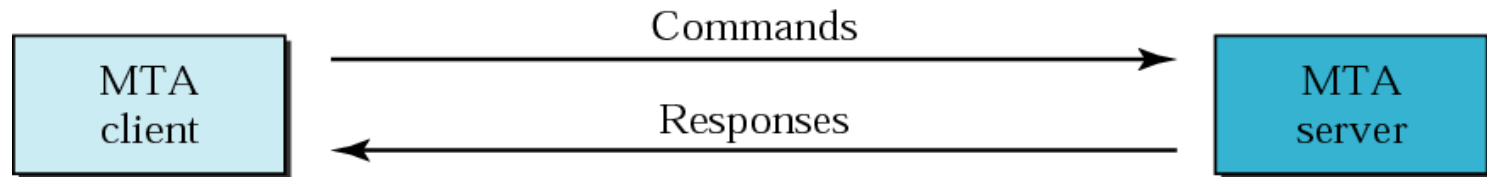
- Commands and responses are used to transfer messages between an MTA client and an MTA server

- Each command or reply is terminated by two-character (carriage return and line feed) end of line token

1. **Commands**   Sent from client to server. It consists of a keyword followed by 0 or more arguments. SMTP defines 14 commands. First five are mandatory

Keyword: argument(s)

Commands

Keyword	Argument(s)
HELO	Sender's host name
MAIL FROM	Sender of the message
RCPT TO	Intended recipient of the message
DATA	Body of the mail
QUIT	
RSET	
VRFY	Name of recipient to be verified
NOOP	
TURN	
EXPN	Mailing list to be expanded
HELP	Command name
SEND FROM	Intended recipient of the message
SMOL FROM	Intended recipient of the message
SMAL FROM	Intended recipient of the message

2. Responses

sent from the server to the client. It is a 3 digit code that may be followed by additional textual information

Code	Description
Positive Completion Reply	
211	System status or help reply
214	Help message
220	Service ready
221	Service closing transmission channel
250	Request command completed
251	User not local; the message will be forwarded
Positive Intermediate Reply	
354	Start mail input
Transient Negative Completion Reply	
421	Service not available
450	Mailbox not available
451	Command aborted: local error
452	Command aborted; insufficient storage

If the first digit is 2, the requested command has been successfully completed and a new command can be started.

If 3, command is accepted but recipient needs more information before completion

If 4, requested command is rejected; command can be sent again.

If 5, rejected and cannot be sent again.

Table 20.5 Responses (Continued)

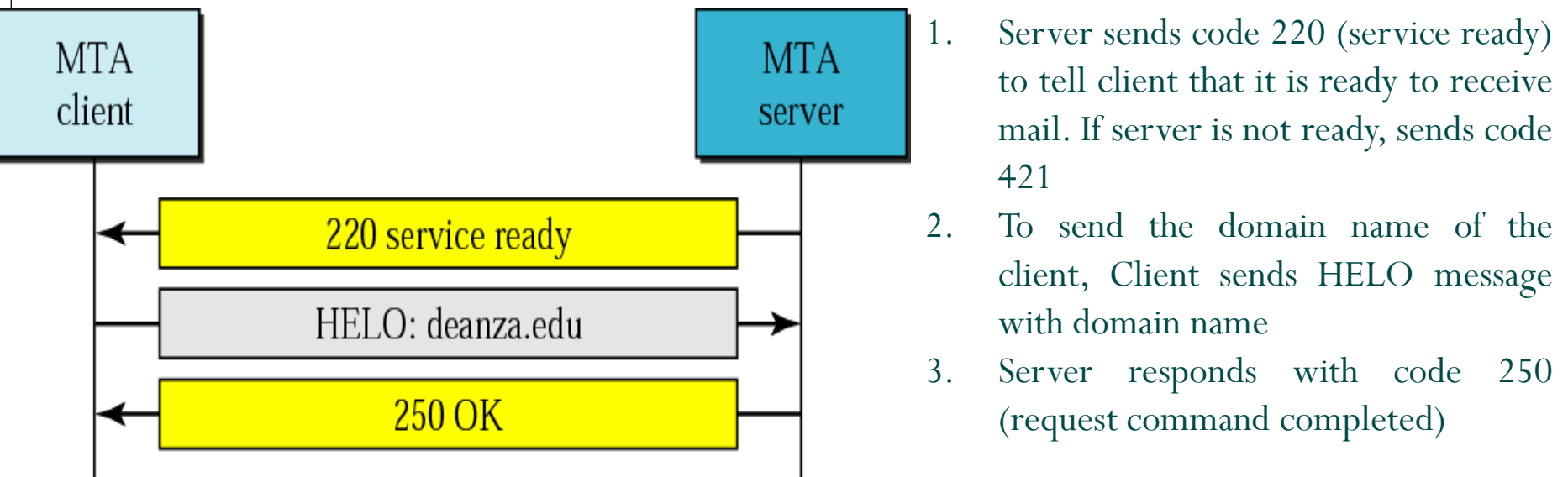|	Permanent Negative Completion Reply
500	Syntax error; unrecognized command
501	Syntax error in parameters or arguments
502	Command not implemented
503	Bad sequence of commands
504	Command temporarily not implemented
550	Command is not executed; mailbox unavailable
551	User not local
552	Requested action aborted; exceeded storage location
553	Requested action not taken; mailbox name not allowed
554	Transaction failed

Mail Transfer Phases

Three phases:

1.   Connection Establishment
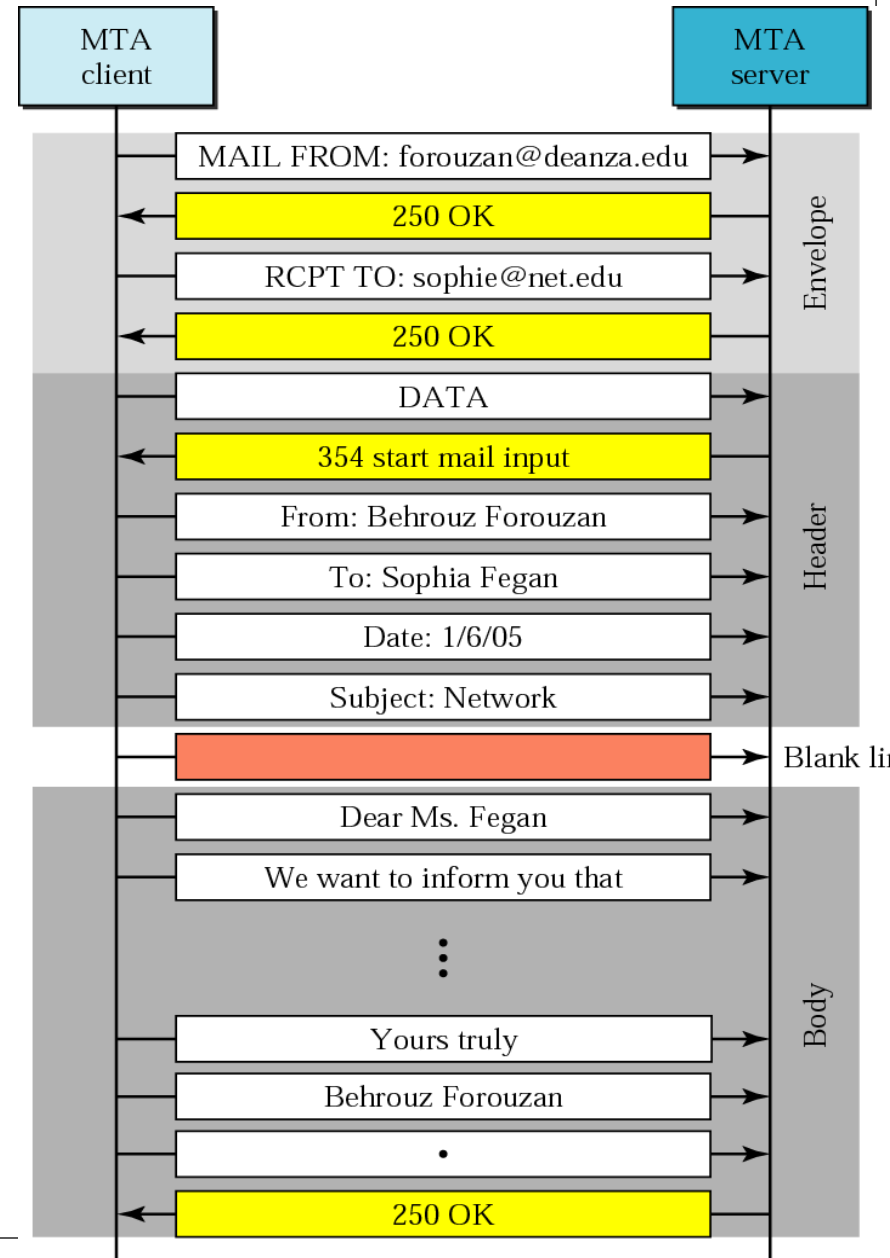
2.   Message Transfer

3.   Connection Termination

1. Connection Establishment

After a client has made a TCP connection to the well known port 25, SMTP server starts the connection phase.

1. Server sends code 220 (service ready) to tell client that it is ready to receive mail. If server is not ready, sends code 421

2. To send the domain name of the client, Client sends HELO message with domain name

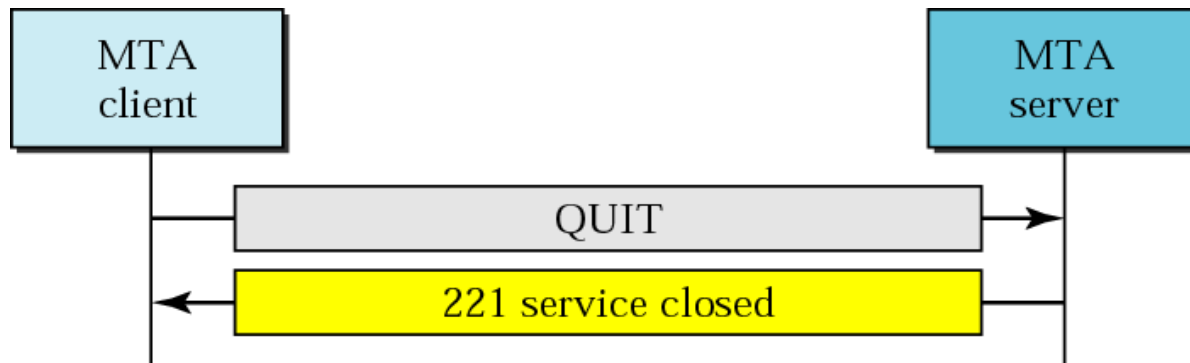3. Server responds with code 250 (request command completed)

2. Message transfer - A single message between one sender and one or more recipient can be exchanged

1. MAIL FROM message with sender email address is used to introduce the sender of the message to the server
2. Server responds with code 250(OK) or other
3. Client sends RCPT TO to introduce the address of the receiver
4. Server responds with code 250 or some other
5. Client sends DATA message to initialize the message transfer
6. Server respond with code 354 (start mail input)
7. Client sends the contents of the message in consecutive lines. Each line is terminated by a 2 character EOL token, and message is terminated by a period
8. Server responds with code 250 or some other

MTA client

MTA server

MAIL FROM: forouzan@deanza.edu

250 OK

RCPT TO: sophie@net.edu

250 OK

Envelope

DATA

354 start mail input

From: Behrouz Forouzan

To: Sophia Fegan

Date: 1/6/05

Subject: Network

Header

Blank lir

Dear Ms. Fegan

We want to inform you that

⋮

Yours truly

Behrouz Forouzan

.

Body

250 OK

Connection termination

1. Client sends QUIT command
2. Server responds with code 221 or some other appropriate code
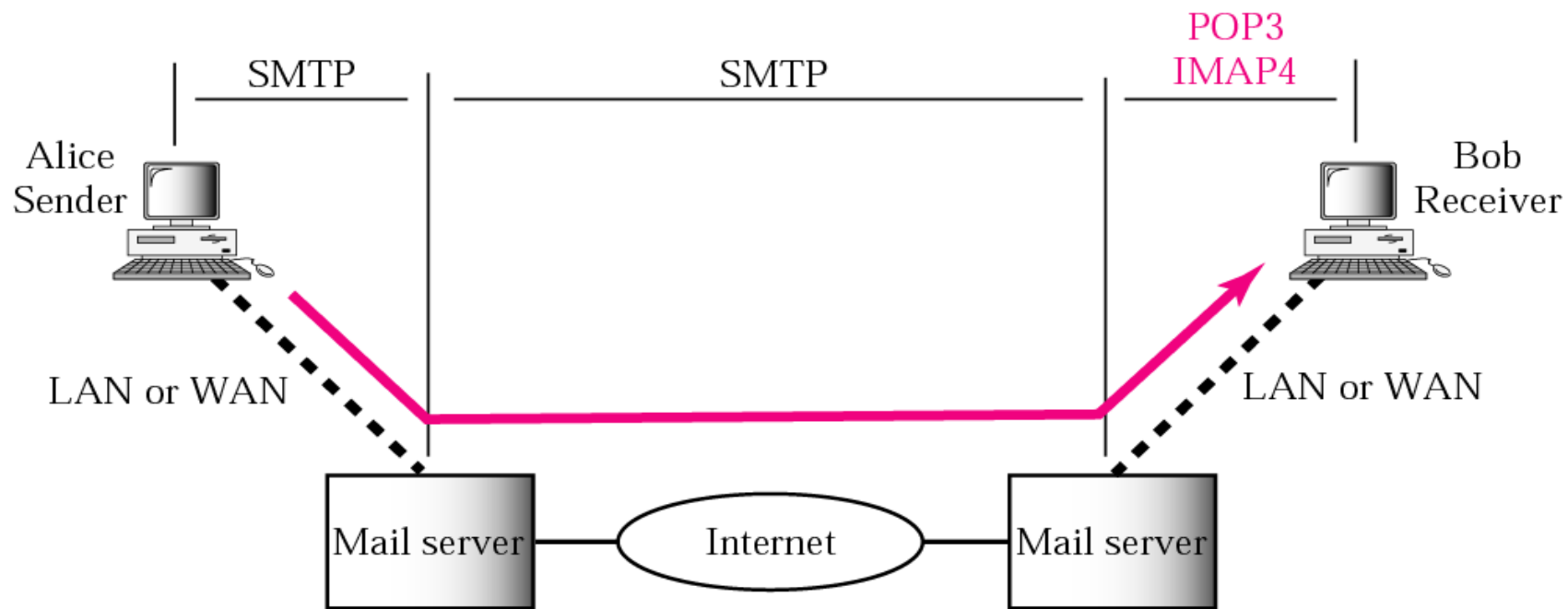
MESSAGE ACCESS AGENT: POP

The first and second stages of mail delivery uses SMTP.

The third stage of mail delivery uses a message access agent; the client must pull messages from the server.

Currently two message access protocols are available:

Post Office Protocol, version 3 (POP3) and

Internet Mail Access Protocol, version 4.

POP3

- Client POP3 software is installed on the recipient computer and the server POP3 software is installed on the mail server.
- Mail access starts with the client when the user needs to download its email from the mailbox on the mail server.

- Client opens a connection to server on TCP port 110. It then sends its user name and password to access the mailbox. The user can then list and retrieve the mail messages, one by one.

- POP3 has 2 modes: delete mode and keep mode
- In delete mode, mail is deleted from the mailbox after each retrieval. In the keep mode, the mail remains in the mailbox after retrieval.

POP3

Mail Server

POP3
server

User Computer

POP3
client

user-name

OK

password

OK

list

email numbers and their sizes

retrieve 1

email 1

retrieve N

email N