SECTION – B

FTP & SMTP

Outline of the talk

- **FTP**
- **SMTP**

FTP

- FTP is a widely used protocol for reliable transfer of files.
- It uses TCP as a transport for reliability.
- It uses " out of band" control
- It is stateful

File Transfer Protocol (FTP)

TCP control connection
port 21

TCP data connection
port 20

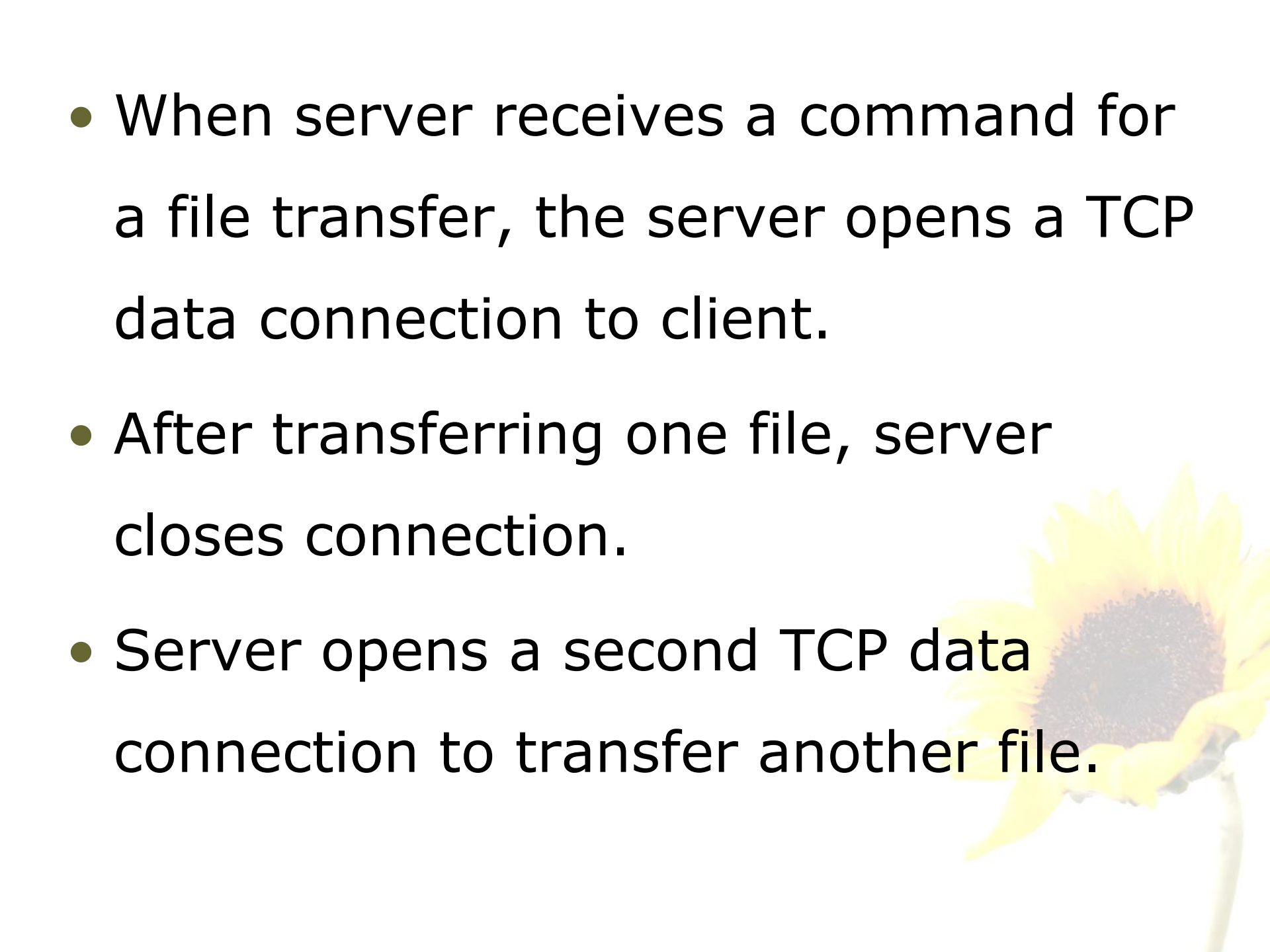
FTP
client

FTP
server

File Transfer Protocol (FTP)

- FTP client contacts FTP server at port 21, specifying TCP as transport protocol.
- Client obtains authorization over control connection.
- Client browses remote directory by sending commands over control connection.

- When server receives a command for a file transfer, the server opens a TCP data connection to client.
- After transferring one file, server closes connection.
- Server opens a second TCP data connection to transfer another file.



- Control connection: “out of band”
- FTP server maintains “state”:
  - Current directory
  - Earlier authentication

FTP Sample Commands

- Sent as ASCII text over control channel.
- USER username
- PASS password
- LIST return list of file in current directory.
- RETR filename retrieves (gets) file.
- STOR filename stores(puts) file onto remote host.

FTP Sample Responses

- Status code and phrase (as in HTTP)
- 331 Username OK, password required.
- 125 data connection already open; transfer starting.
- 425 Can’t open data connection.
- 452 Error writing file.

SMTP

SMTP

- One of the most popular network services, email, is supported by the TCP/IP protocol SMTP.
- System for sending messages to other computer users
- Provides a mail exchange between users.

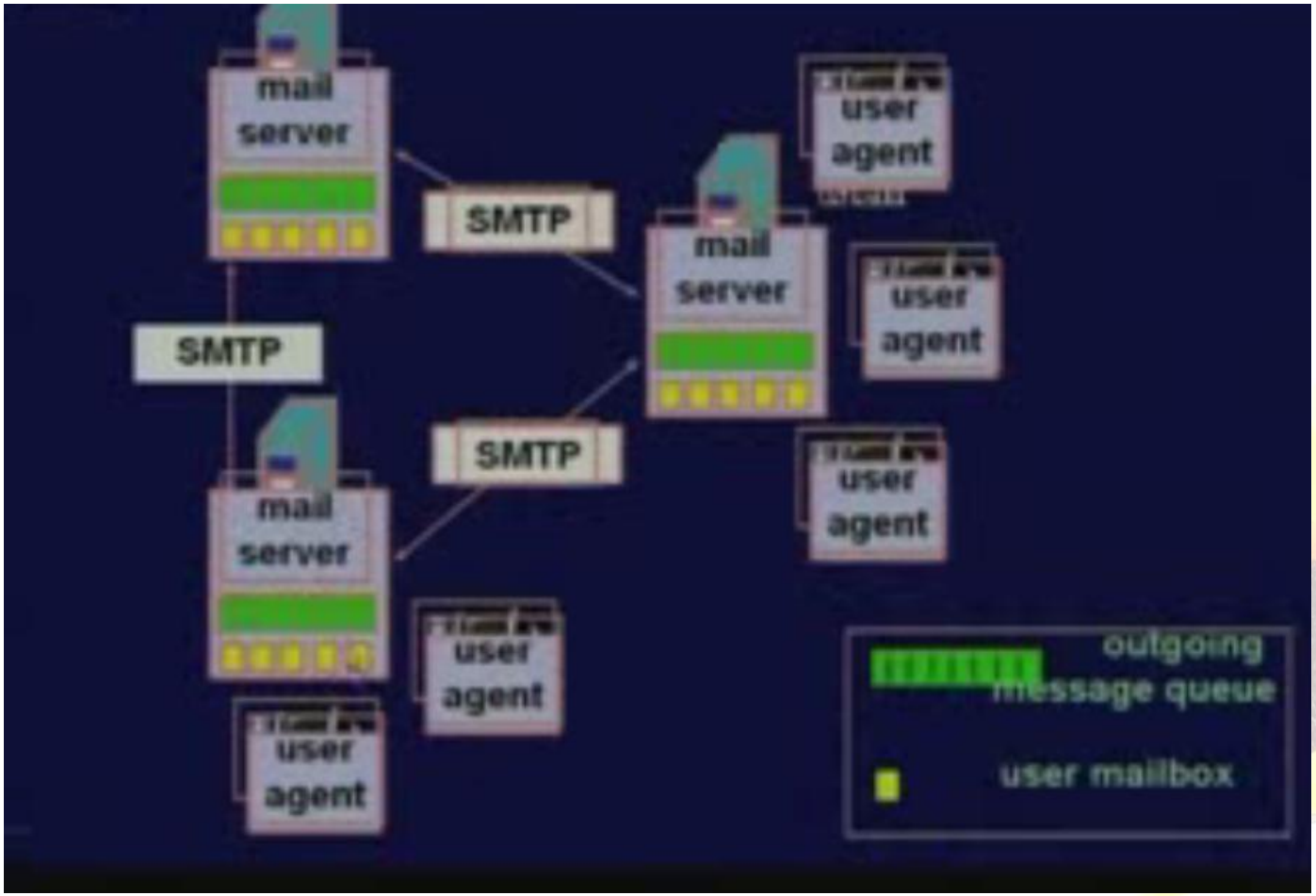
SMTP Supports

- Sending a single message to one or more recipients.
- Sending messages that include text, voice, video or graphics.
- Sending messages to users on networks outside the internet.

Electronic Mail

Three major components:

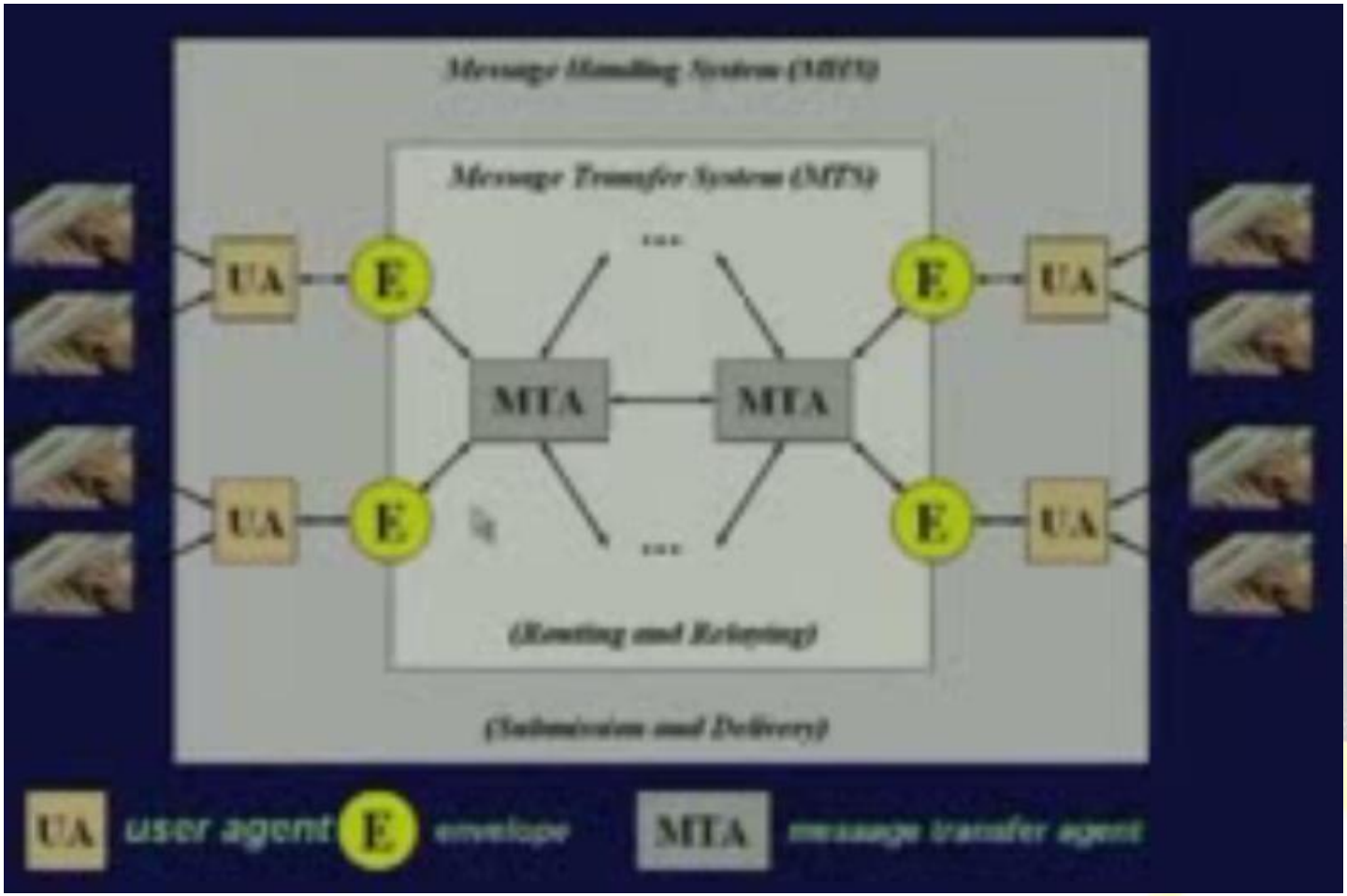
- User agents
  - E.g. Eudora, Outlook, Pine Netscape, Messenger
- Mail servers
  - Incoming, outgoing messages
- Simple Mail Transfer Protocol: SMTP


mail server
SMTP
user agent
mail server
user agent
SMTP
SMTP
mail server
user agent
user agent
outgoing message queue
user mailbox

Components

- User Agent (UA)
  - Prepares the message
  - Creates the envelope
  - Puts the message in the envelope
- Mail Transfer Agent (MTA)
  - Transfers the mail across the Internet

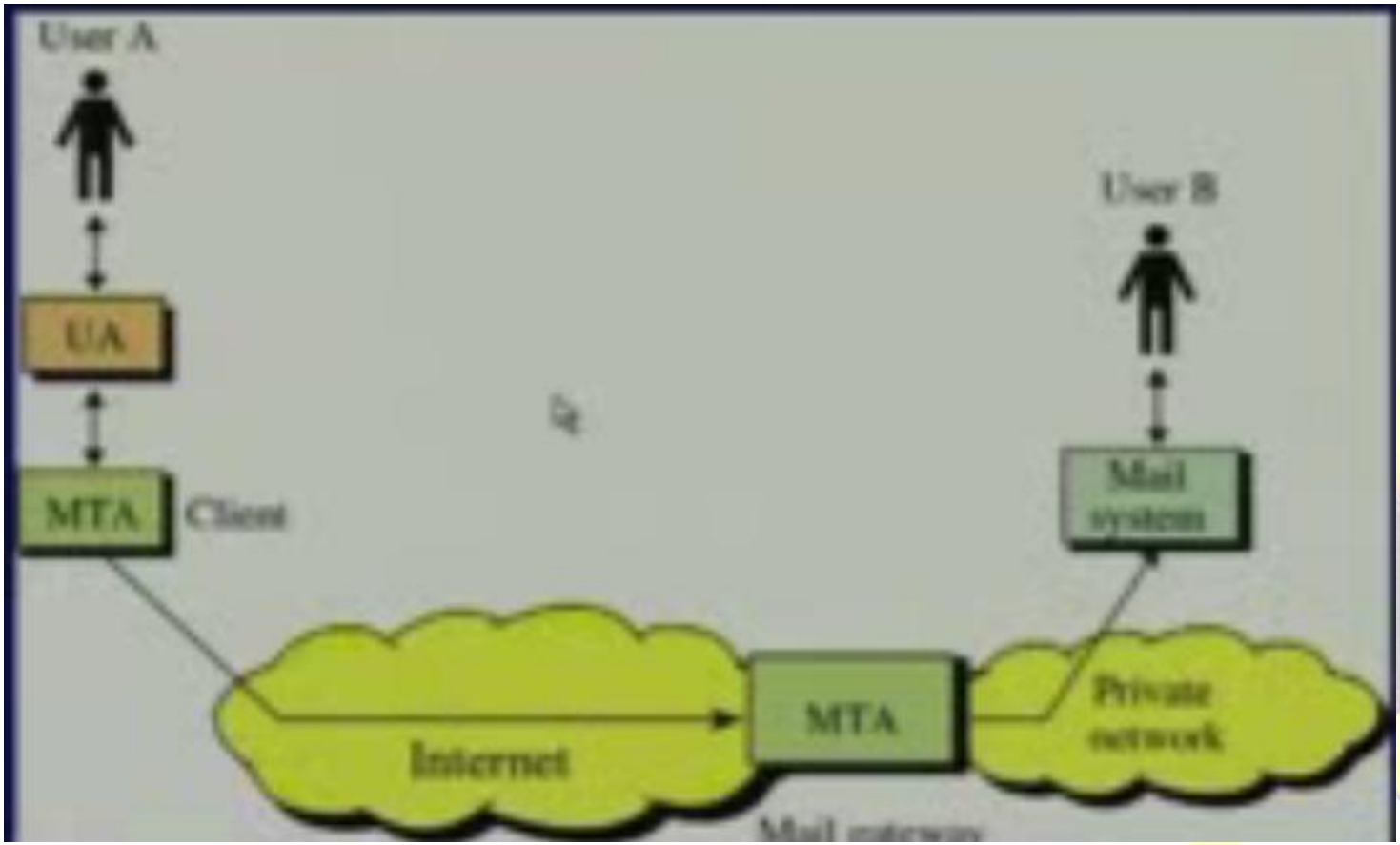
Electronic Mail (II)



Relay MTA

- Mail may be relayed through a number of MTAs.
- Allows system not using TCP/IP to send email to users on other sites.
- Accomplished through a mail gateway, a relay MTA that can receive and send mail prepared by a protocol other than SMTP.

Mail Gateway

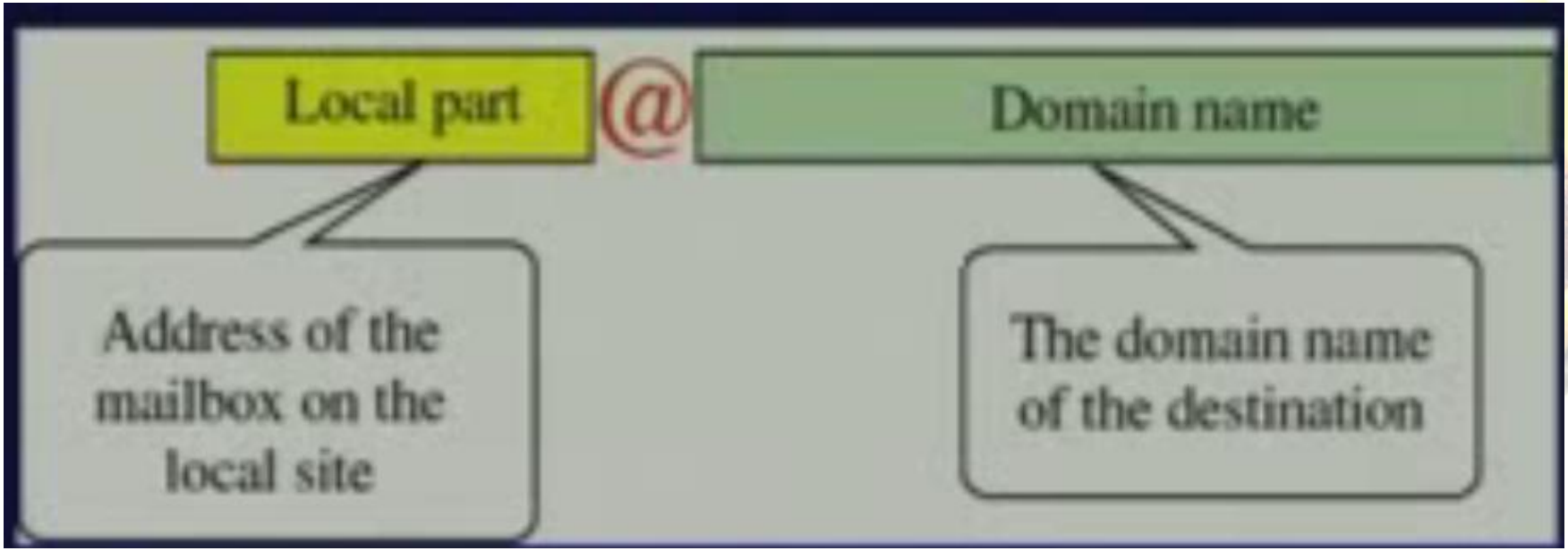


Addresses

- A unique addressing system
- Consists of two parts

Addresses

- A unique addressing system
- Consists of two parts



Parts

- Local Part defines the user mailbox, where mail is stored for the user.
- Domain Name, is the name of the host used as the mail exchanger.

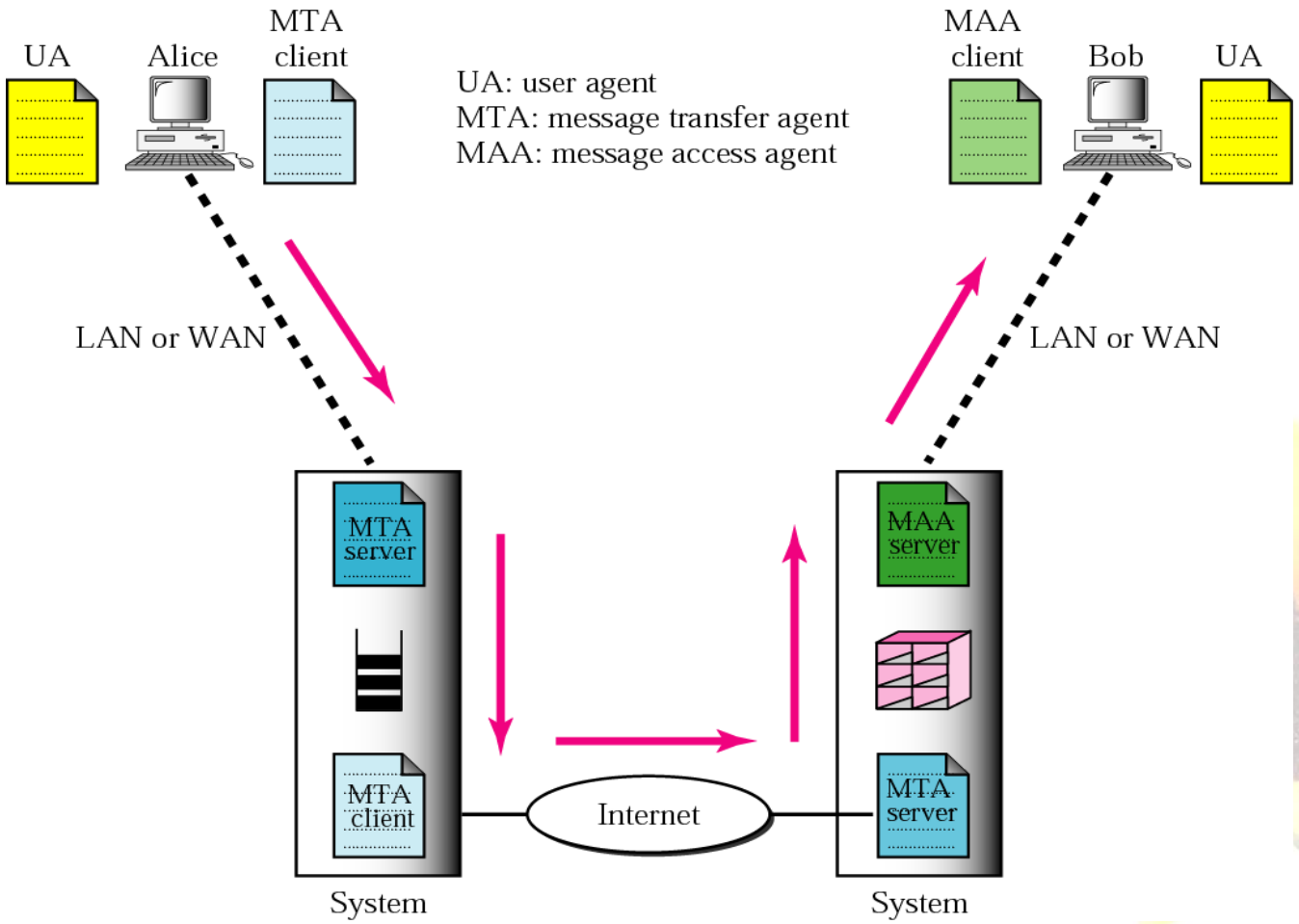
Delayed Delivery

- Message do not necessarily have to be delivered immediately.
- Can be delayed at the sender site, receiver site, or the intermediate servers.

Aliases

- SMTP allows one name, an alias, to represent several different email addresses (one-to-many aliases expansion.)
- A single user can be defined by several different email addresses (many-to-one alias expansion).

Entire email system



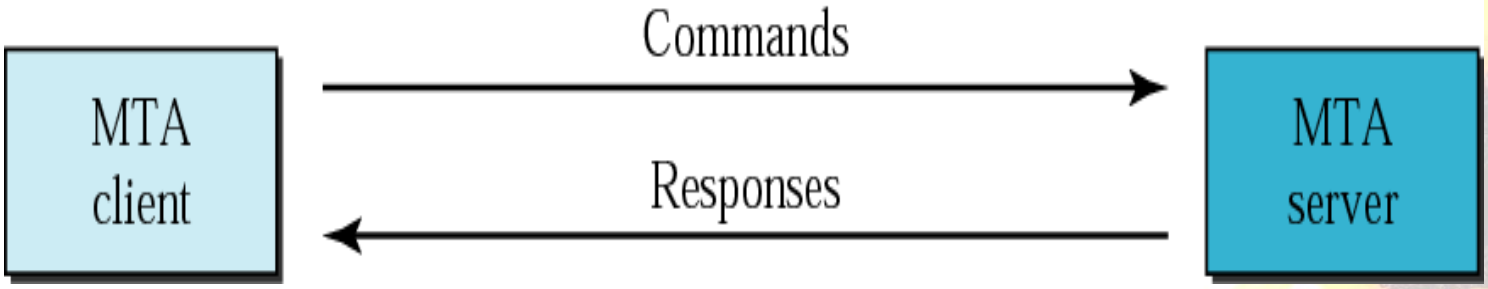
Mail message format

- SMTP: protocol for exchanging email msgs.
- RFC 822: standard for text msg format:
  - Header line e.g.
    - To:
    - From:
    - Subject:

      different from SMTP (commands)
    - Body
      - The “message” ASCII characters only.

Commands & Responses

- SMTP uses commands and responses to transfer mail b/t an MTA client and an MTA Server

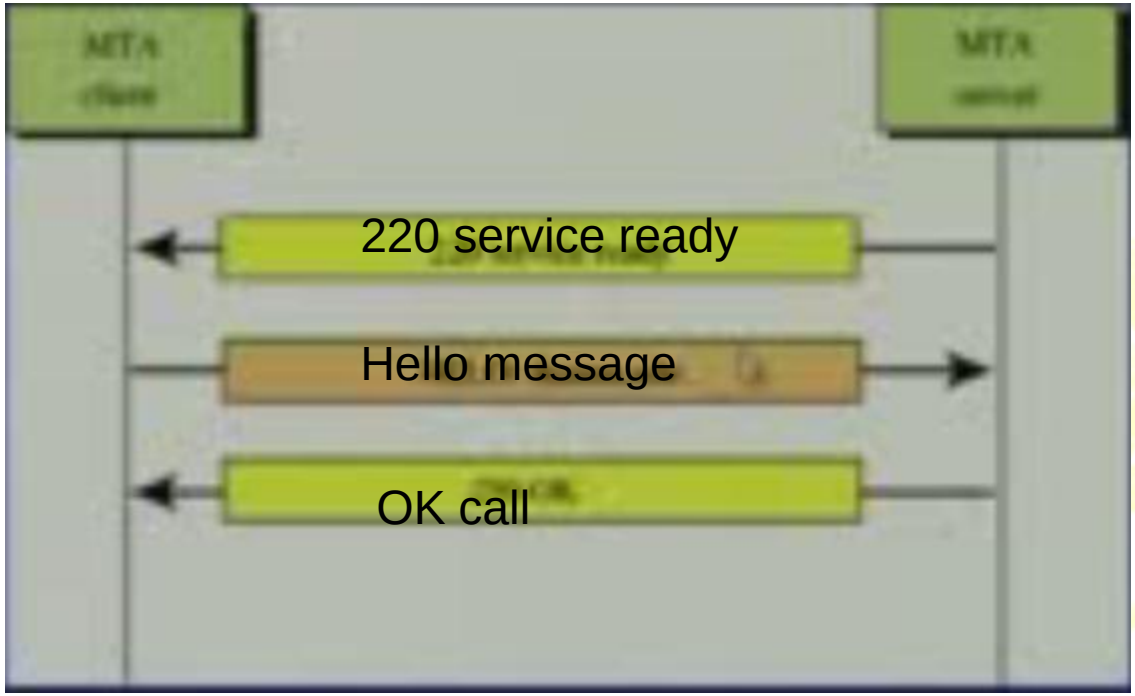


Mail Transfer Phase

- The process of transferring a mail message occurs in three phases.
  - Connection establishment
  - Mail transfer
  - Connection termination

Connection establishment

- Client makes a TCP connection to the well-known port 25, the SMTP Server starts the connection phase.



Message Transfer

- After connection establishment a single message between sender and one or more recipients can be exchanged.

Connection Termination

- After the message is transferred the client terminates the connection.

SMTP : final words

- SMTP uses persistent connections
- SMTP requires message (header & body) to be in 7 bit –ASCII
- SMTP Server uses CRLF. CRLF to determine end of message.
- SMTP is a “chatty” protocol

MIME – Multipurpose Internet Mail Extensions

- SMTP is a simple mail transfer protocol.
- It can send in NVT 7 bit ASCII format only.
- It cannot directly send binary files (e.g. video or audio)
- MIME is an extension to SMTP which allows non-ASCII data to be sent through SMTP

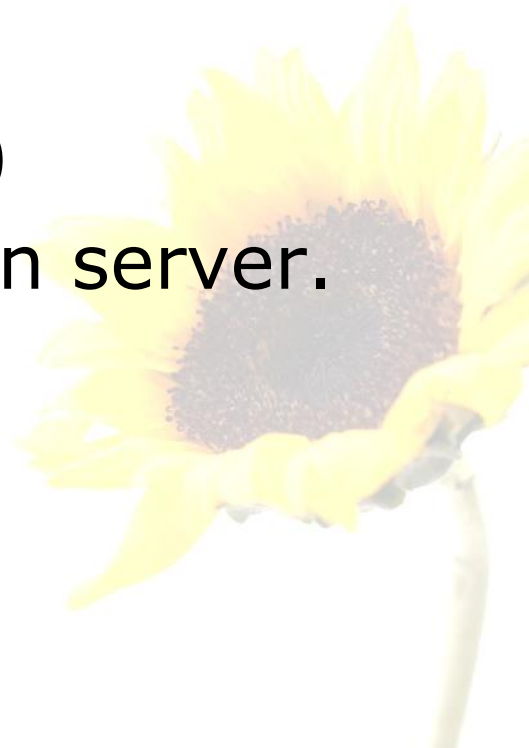
POP3

Mail Access Protocols

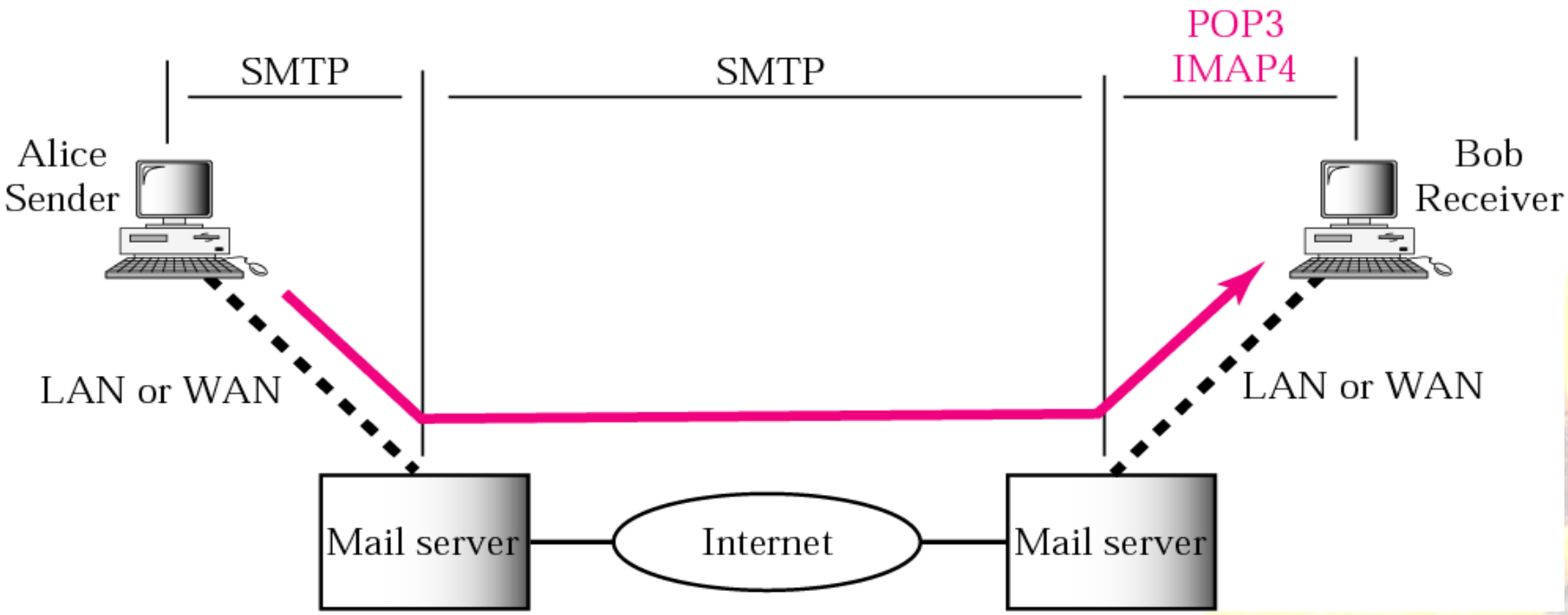
- SMTP is a push protocol. How will use access emails?
- Mail access protocol: retrieval from server.
- Allows mail stored in mailboxes to be accessed by the recipient.

Mail Access Protocols

- POP: Post office Protocol (RFC 1939)
  - Users cant create folders on mail server.
- IMAP: Internet Mail Access Protocols (RFC 1730)
  - More features(more complex)
  - Manipulation of stored msgs on server.
  - HTTP: hotmail Yahoo mail etc.

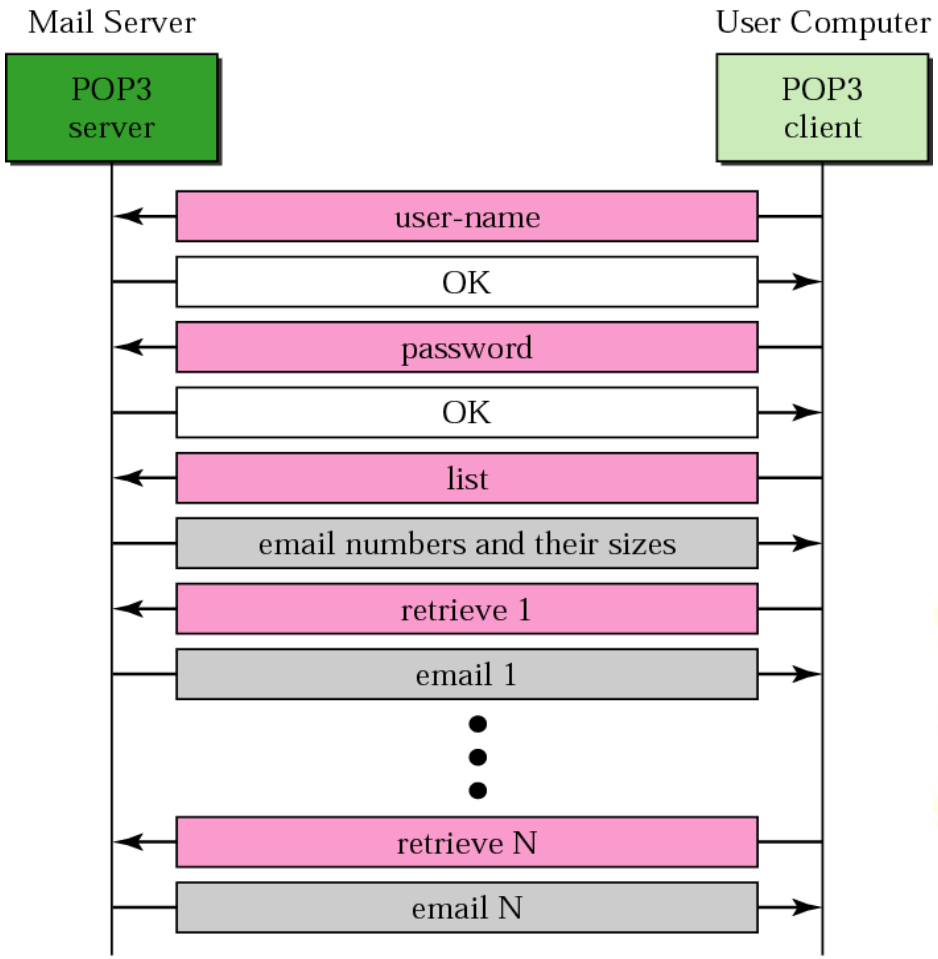


POP3 & IMAP4


SMTP
SMTP
POP3
IMAP4
Alice
Sender
Bob
Receiver
LAN or WAN
LAN or WAN
Mail server
Internet
Mail server

POP3

- Post Office Protocol (version 3)
- Is simple and limited functionality.
- Consists of client software and server software.
- The server performs password authentication.
- The server software allows the client software to access the recipients mailbox.


Mail Server
User Computer
POP3 server
POP3 client
user-name
OK
password
OK
list
email numbers and their sizes
retrieve 1
email 1
retrieve N
email N

IMAP4

- Internet Mail Access Protocol (verison 4)
- Stores users mail in the server so that it can be accessed from multiple locations.
- It is able to address mails not just by arrival but by attributes.
- More features than POP3
- Can check email header prior to downloading.
- Can search contents of email prior to download.

IMAP 4

- Can partially download email.
- Can create, delete or rename mailboxes on the server.
- Can create a hierarchy of mailboxes in a folder for email storage.