SMTP

Mobile Computing

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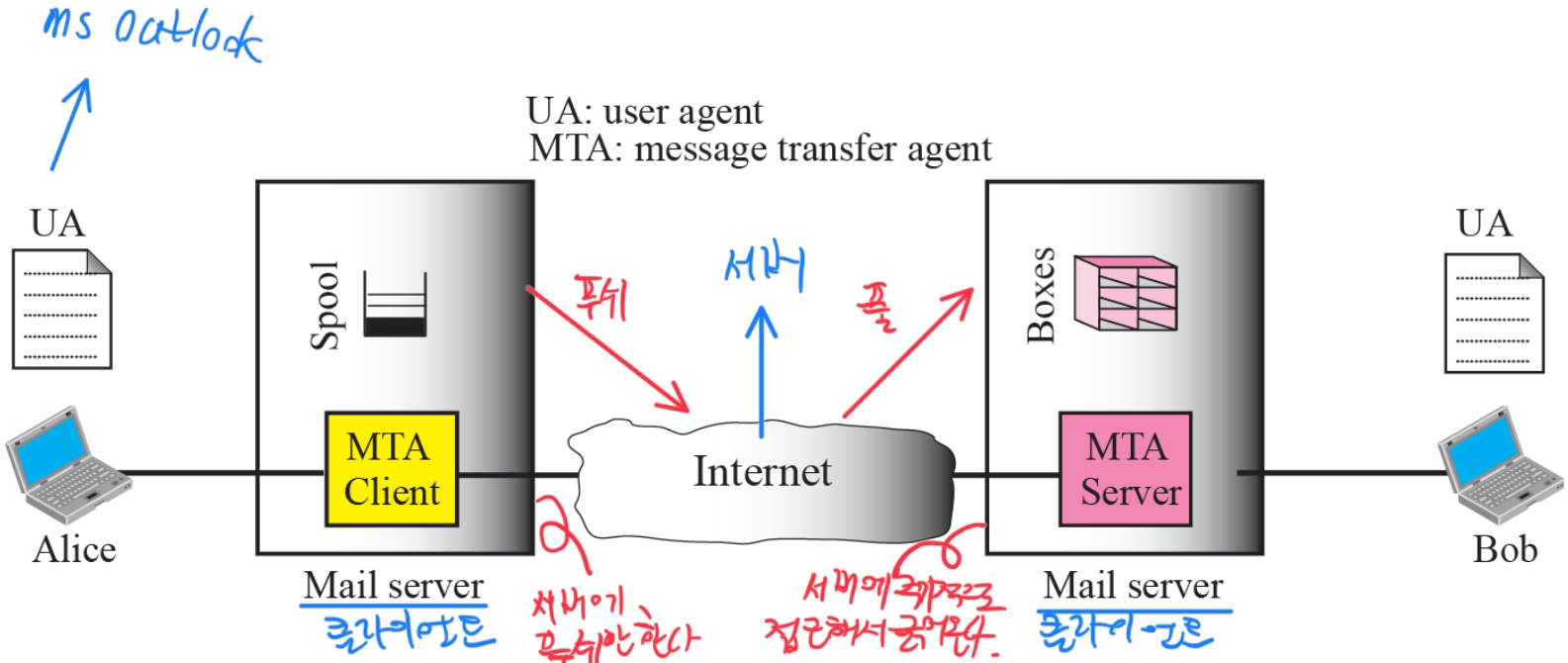
SMTP overview

- SMTP clients and servers have two main components
  - User Agents (UA): Provides service to the user to make the process of preparing the message.
  - Mail Transfer Agent (MTA): Transfers the mail across the internet
  - Analogous to the postal system in many ways



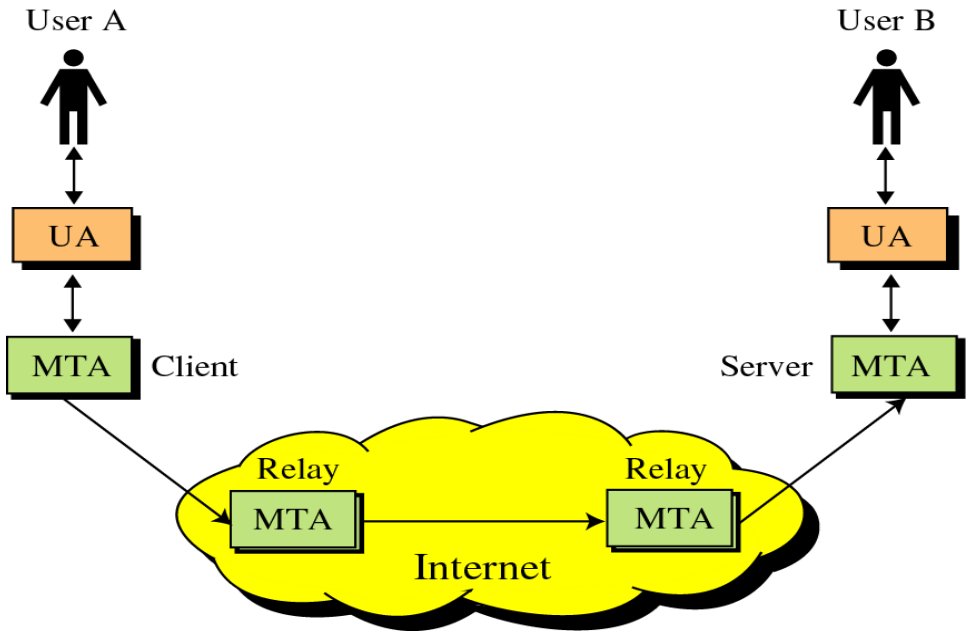
Message Transfer Agent

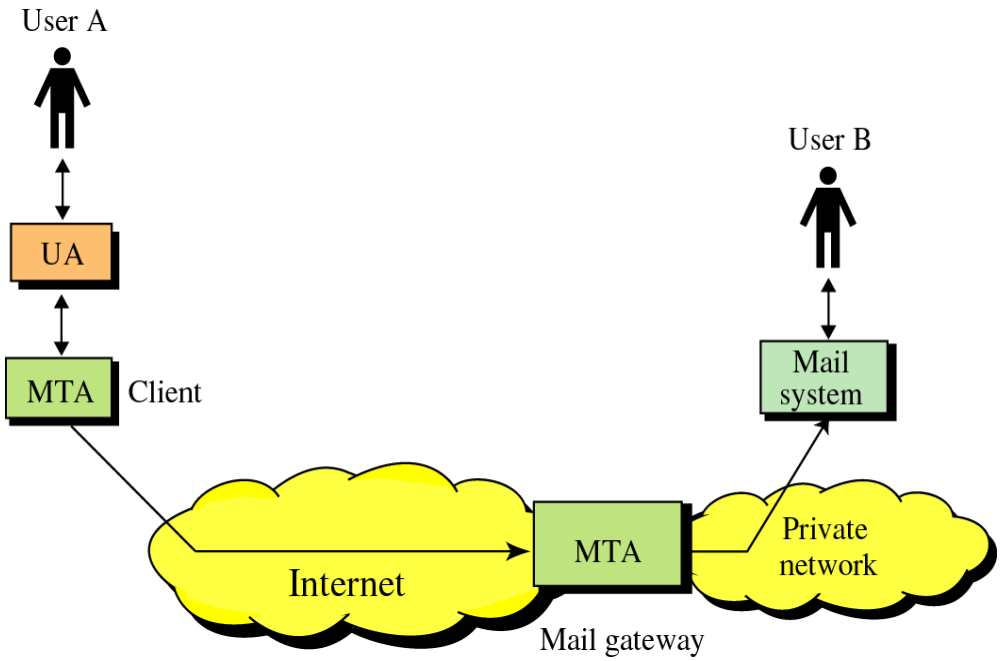
- The actual mail transfer is done through message transfer agents (MTAs).
- To send mail, a system must have the client MTA, and to receive mail, a system must have a server MTA.
- The formal protocol that defines the MTA client and server in the Internet is called Simple Mail Transfer Protocol (SMTP).
- Two pairs of MTA client-server programs are used in the most common situation.

SMTP

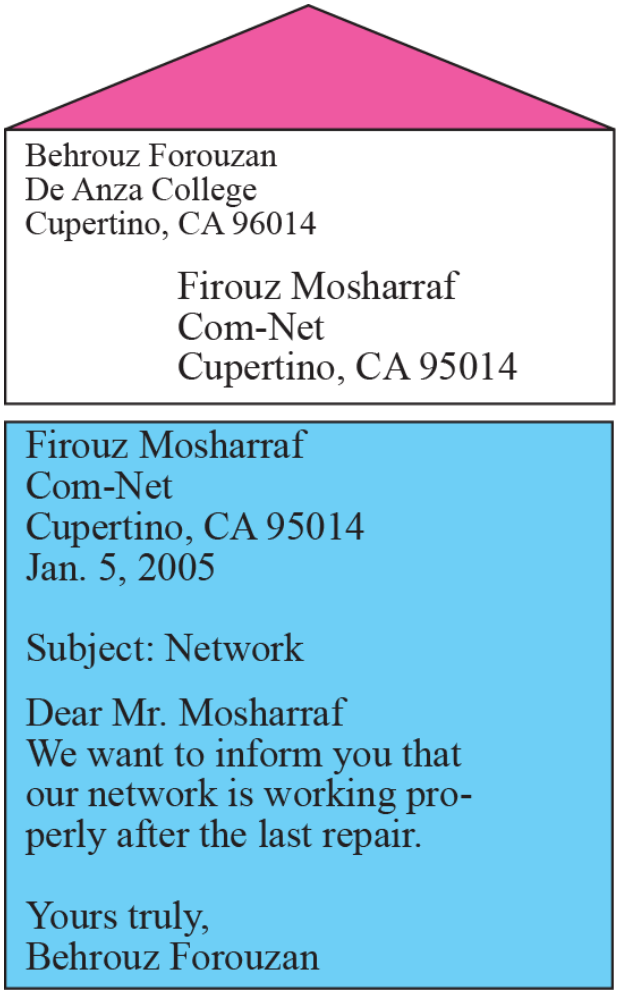
- SMTP also allows the use of Relays allowing other MTAs to relay the mail

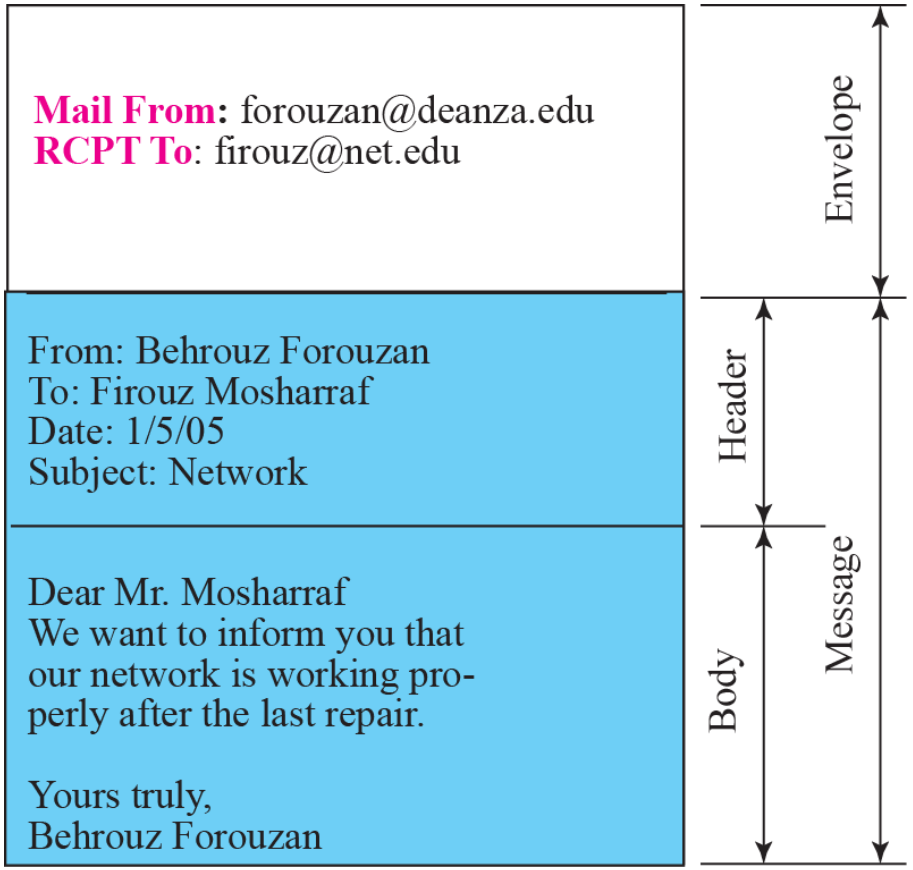
- Mail Gateways are used to relay mail prepared by a protocol other than SMTP and convert it to SMTP





Format of an e-mail





Command and response

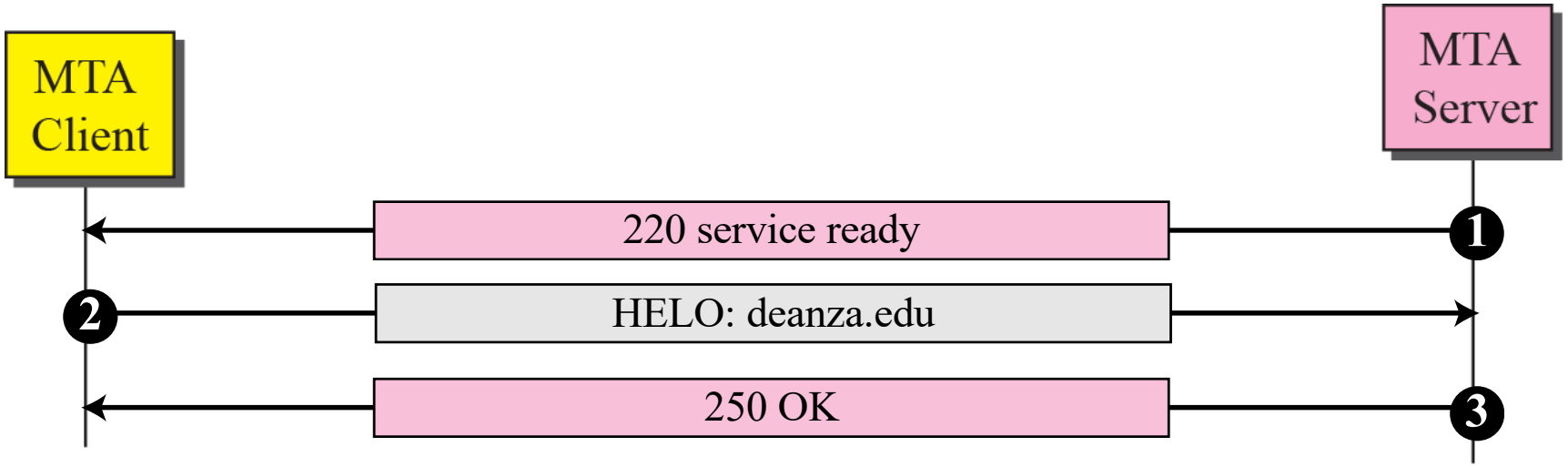
Table 23.1 *Commands*

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

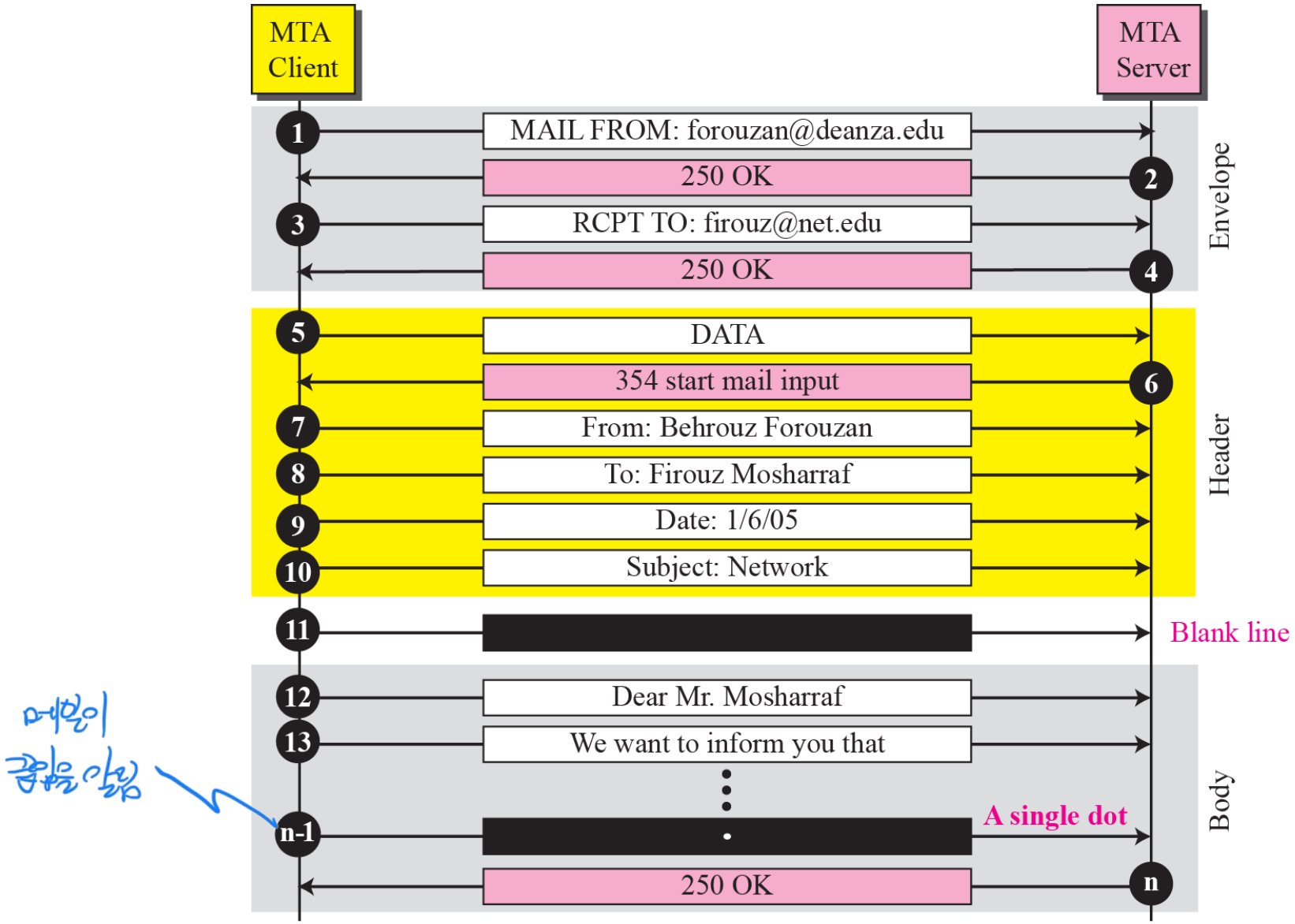
Table 23.2 *Responses*

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
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

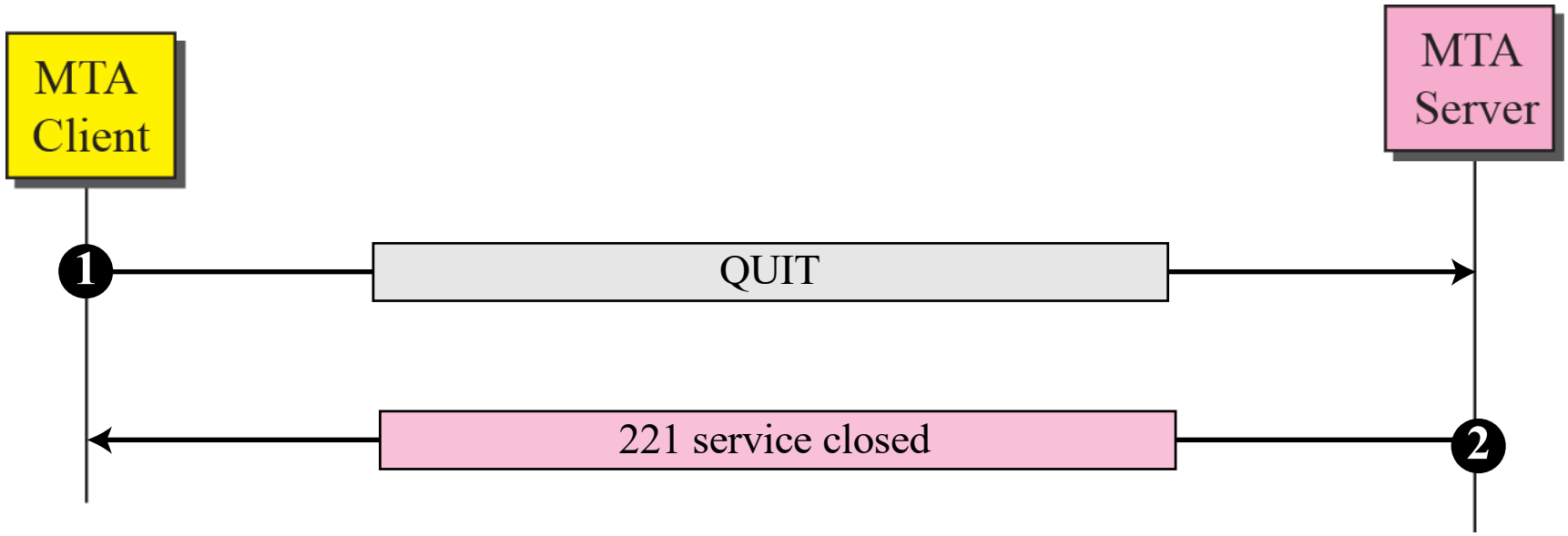
Connection establishment



Message transfer



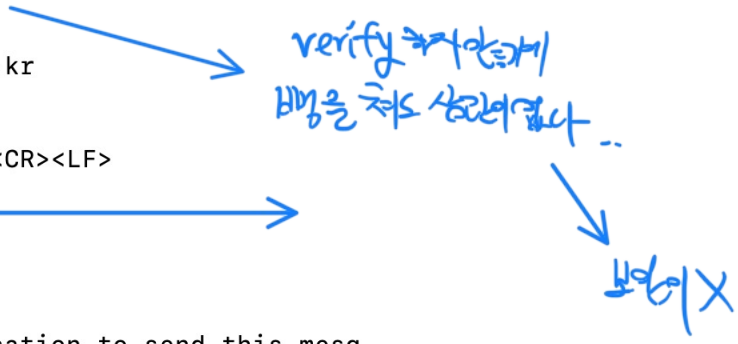
Connection termination



Example

```
jongwon:~$
jongwon:~$
jongwon:~$ telnet ims.hanyang.ac.kr 8825
Trying 166.104.231.44...
Connected to ims.hanyang.ac.kr.
Escape character is '^]'.
220 ims.hanyang.ac.kr ESMTP Postfix (Ubuntu)
EHLO google.com
250-ims.hanyang.ac.kr
250-PIPELINING
250-SIZE 10240000
250-VRFY
250-ETRN
250-ENHANCEDSTATUSCODES
250-8BITMIME
250-DSN
250 SMTPUTF8
MAIL FROM: abc@gmail.com
250 2.1.0 Ok
RCPT TO: jongwon@hanyang.ac.kr
250 2.1.5 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
Subject: TEST SMTP
From: Brady
To: Wiiliam

This is a test email.
I use SMTP without authentication to send this mesg.
Have fun.
.
250 2.0.0 Ok: queued as 5522622A0931
quit
221 2.0.0 Bye
Connection closed by foreign host.
jongwon:~$
```



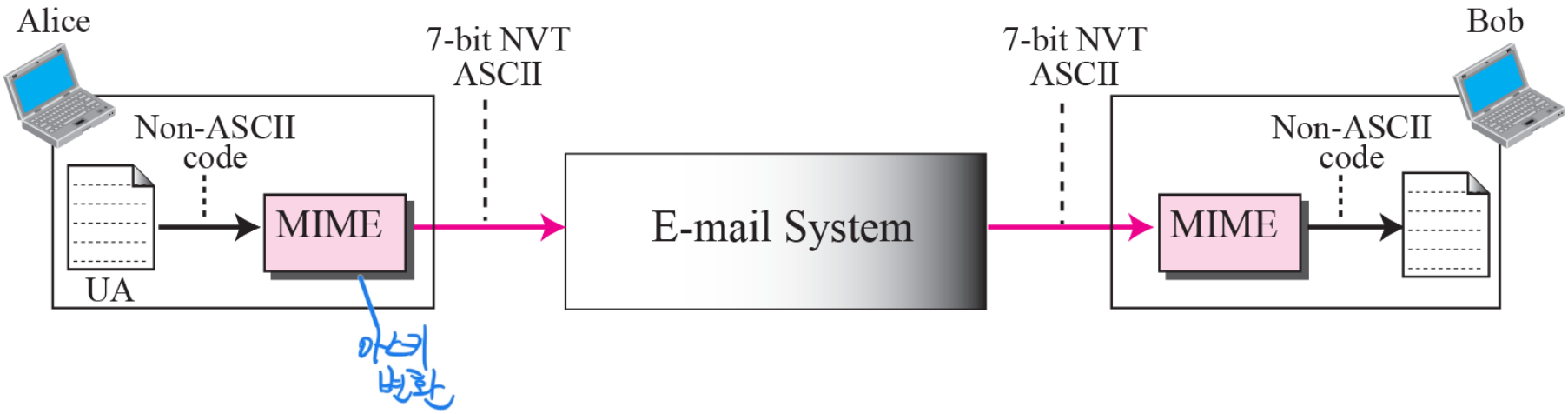
Limitations in SMTP

- Only uses NVT (Network Virtual Terminal) 7 bit ASCII format (has limitations)
- No authentication mechanisms
- Messages are sent un-encrypted
- Susceptible to misuse (Spamming, faking sender address)

언어든지 위조가 가능

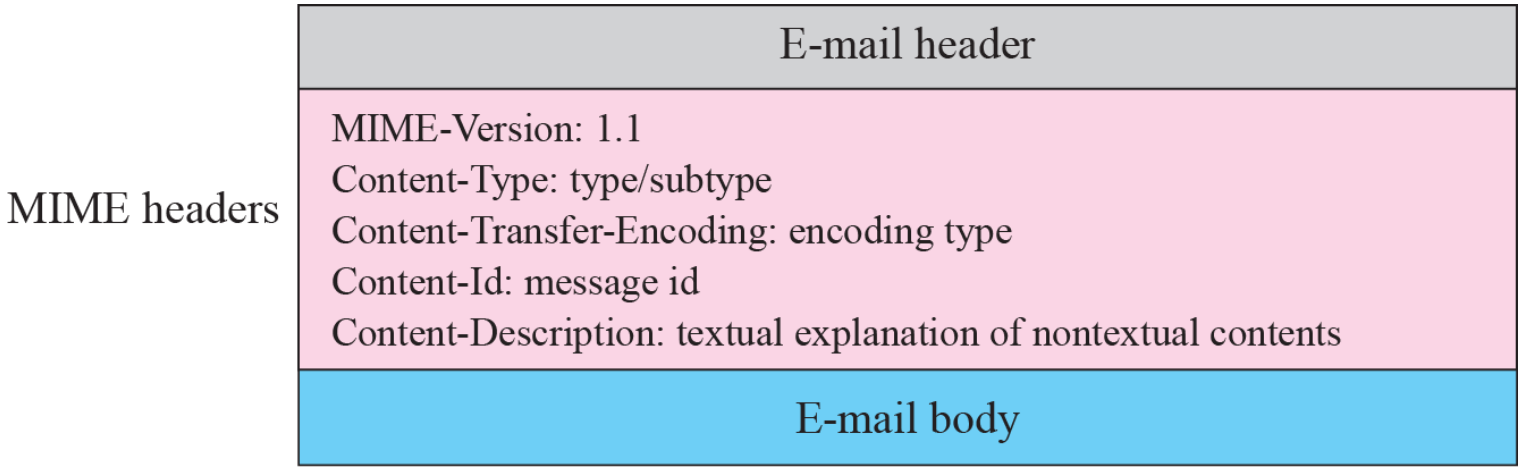
Solution: MIME (SMTP extensions)

- MIME – Multipurpose Internet Mail Extensions
  - MIME transforms non-ASCII data to NVT ASCII data and delivers it to the client MTA .
  - The message at the receiving site is transformed back to the original data.



MIME Headers

- Located between the Email Header and Body
  - MIME-Version: 1.1
  - Content-Type: type/subtype
  - Content-Transfer-Encoding: encoding type
  - Content-Id: message id
  - Content-Description: textual explanation of non-textual contents



MIME Headers

- Content-Type – Type of data used in the Body
  - Text: plain, unformatted text; HTML
  - Multipart: Body contains different data types
  - Message: Body contains a whole, part, or pointer to a message
  - Image: Message contains a static image (JPEG, GIF)
  - Video: Message contains an animated image (MPEG)
  - Audio: Message contains a basic sound sample (8kHz)
  - Application: Message is of data type not previously defined

- Content-Transfer-Encoding – How to encode the message
  - 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

Table 23.3 *Data Types and Subtypes in MIME*

Type	*Subtype*	*Description*
Text	Plain	Unformatted
	HTML	HTML format (see Appendix E)
Multipart	Mixed	Body contains ordered parts of different data types
	Parallel	Same as above, but no order
	Digest	Similar to Mixed, but the default is message/RFC822
	Alternative	Parts are different versions of the same message
Message	RFC822	Body is an encapsulated message
	Partial	Body is a fragment of a bigger message
	External-Body	Body is a reference to another message
Image	JPEG	Image is in JPEG format
	GIF	Image is in GIF format
Video	MPEG	Video is in MPEG format
Audio	Basic	Single channel encoding of voice at 8 KHz
Application	PostScript	Adobe PostScript
	Octet-stream	General binary data (eight-bit bytes)

Table 23.4 *Content-Transfer-Encoding*

Type	*Description*
7bit	NVT ASCII characters and short lines
8bit	Non-ASCII characters and short lines
Binary	Non-ASCII characters with unlimited-length lines
Base64	6-bit blocks of data are encoded into 8-bit ASCII characters
Quoted-printable	Non-ASCII characters are encoded as an equal sign plus an ASCII code

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, 25% overhead

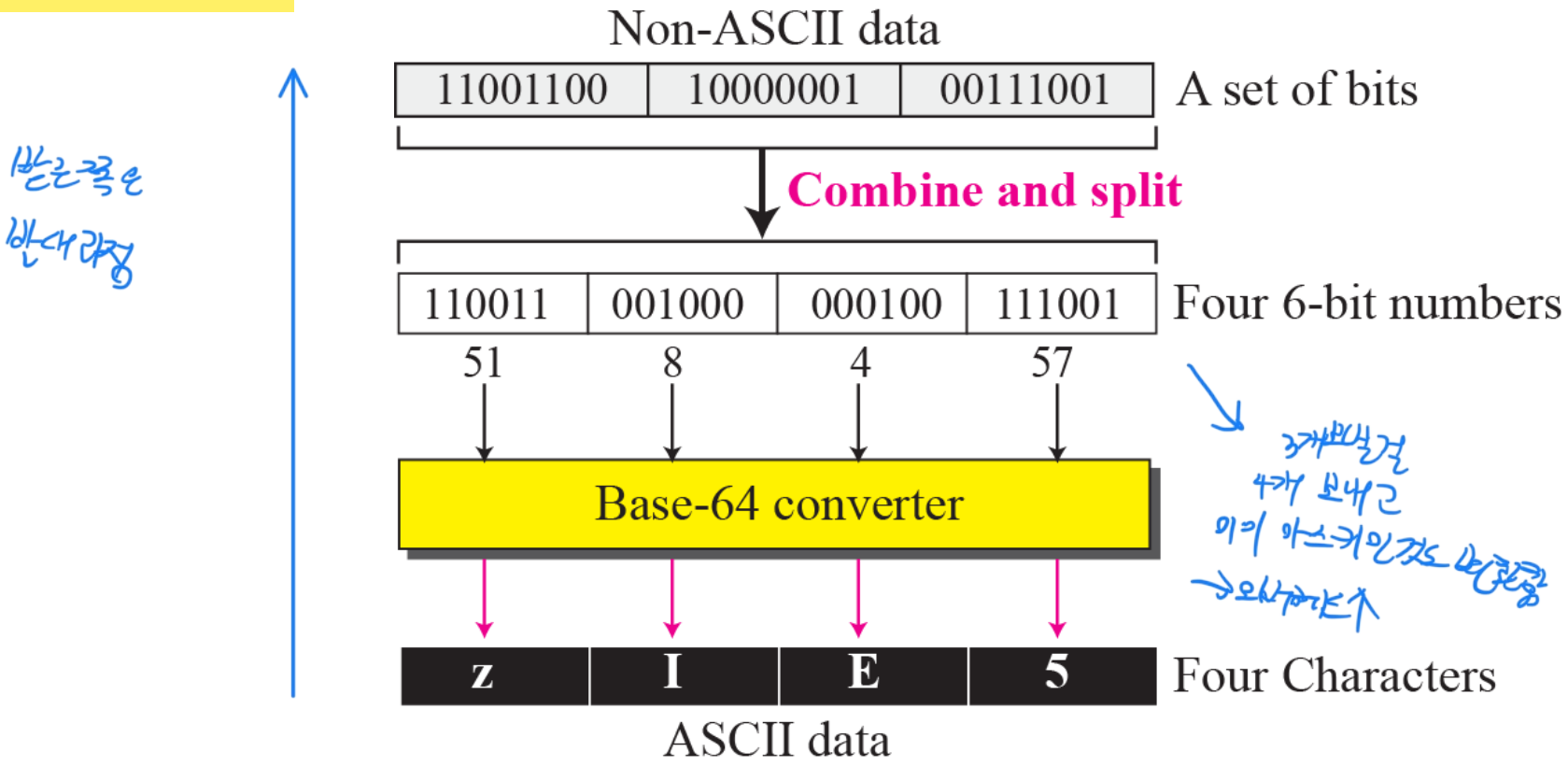
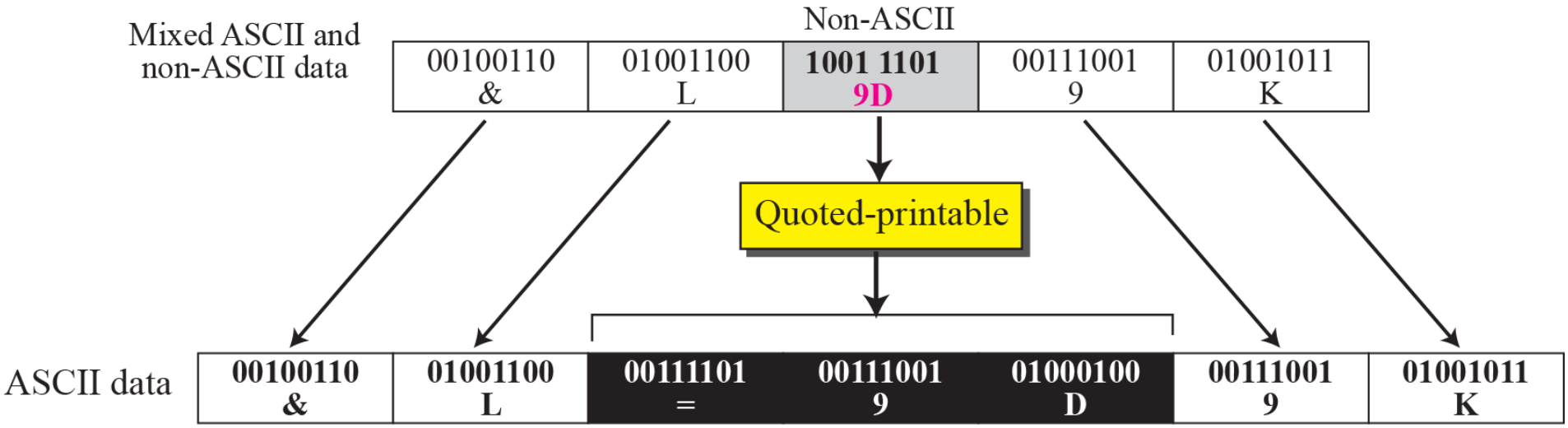


Table 23.5 *Base-64 Converting Table*

Value	*Code*	*Value*	*Code*	*Value*	*Code*	*Value*	*Code*	*Value*	*Code*	*Value*	*Code*
0	**A**	11	**L**	22	**W**	33	**h**	44	**s**	55	**3**
1	**B**	12	**M**	23	**X**	34	**i**	45	**t**	56	**4**
2	**C**	13	**N**	24	**Y**	35	**j**	46	**u**	57	**5**
3	**D**	14	**O**	25	**Z**	36	**k**	47	**v**	58	**6**
4	**E**	15	**P**	26	**a**	37	**l**	48	**w**	59	**7**
5	**F**	16	**Q**	27	**b**	38	**m**	49	**x**	60	**8**
6	**G**	17	**R**	28	**c**	39	**n**	50	**y**	61	**9**
7	**H**	18	**S**	29	**d**	40	**o**	51	**z**	62	+
8	**I**	19	**T**	30	**e**	41	**p**	52	**0**	63	/
9	**J**	20	**U**	31	**f**	42	**q**	53	**1**		
10	**K**	21	**V**	32	**g**	43	**r**	54	**2**		

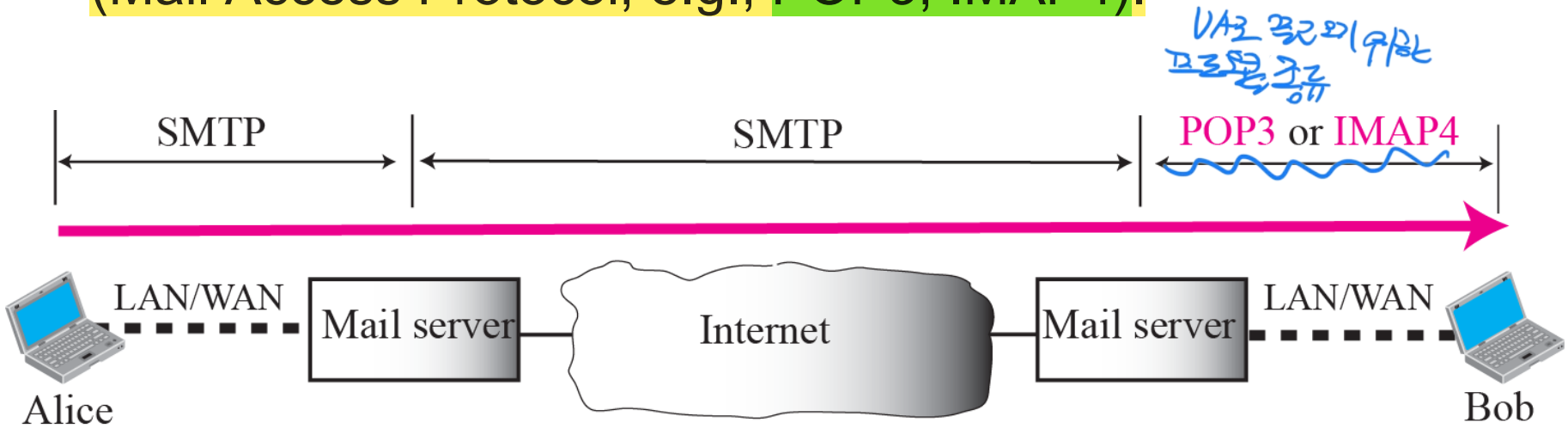
Quoted-Printable Encoding

- 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



Message Access Agent

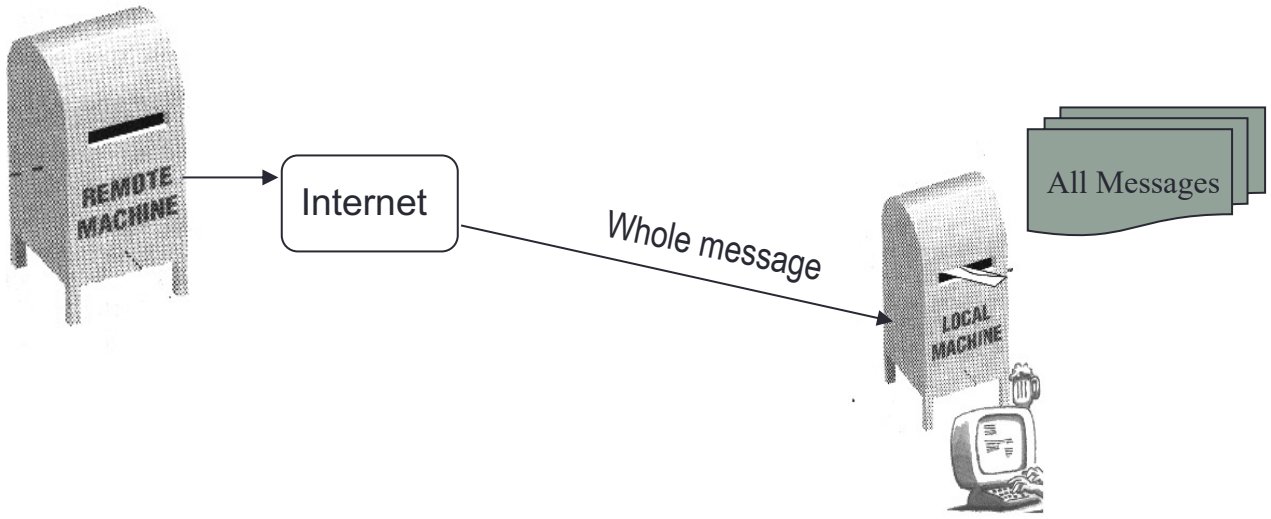
- The first and the second stages of mail delivery use SMTP.
- SMTP is not involved in the third stage because SMTP is a push protocol.
- The third stage needs a pull protocol; the client must pull messages from the server using a Message Access Agent (Mail Access Protocol, e.g., POP3, IMAP4).



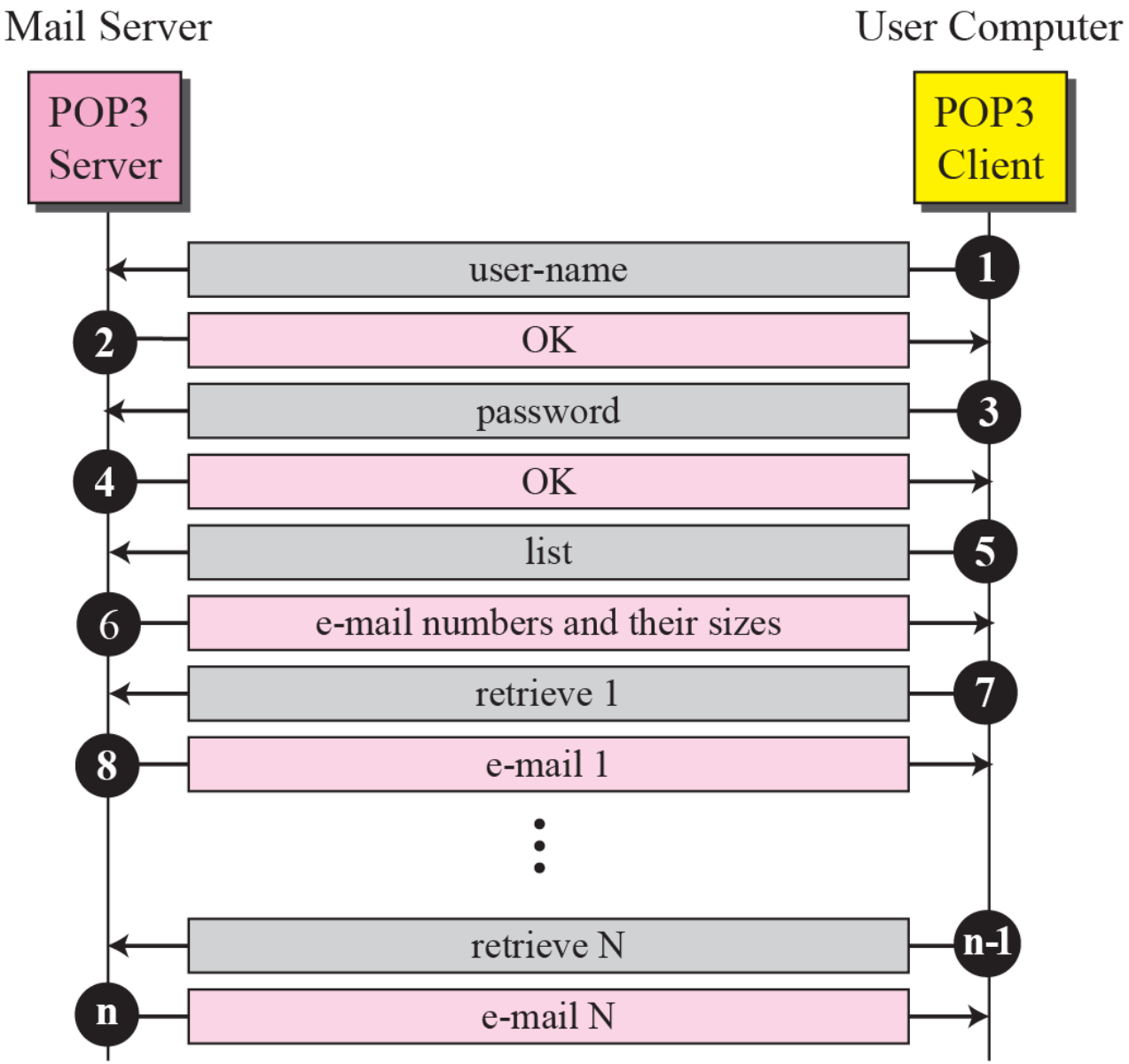
Post Office Protocol v3

- 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

POP3:



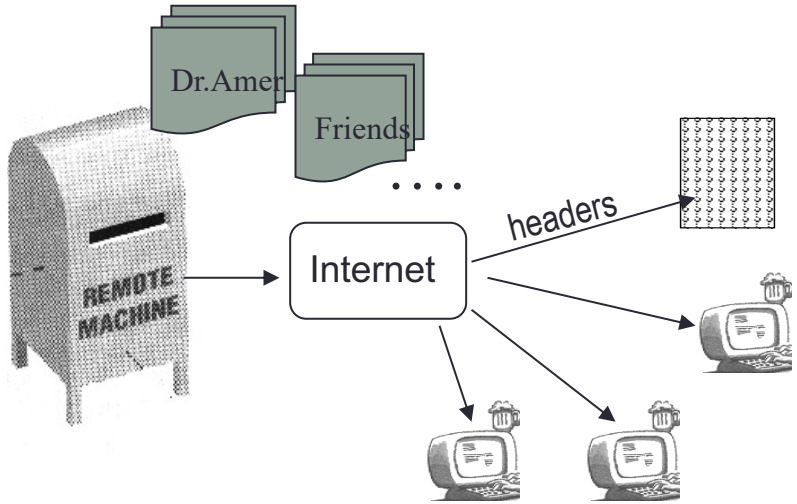
POP3


Mail Server
User Computer
POP3 Server
POP3 Client
user-name
1
2
OK
password
3
4
OK
list
5
6
e-mail numbers and their sizes
retrieve 1
7
8
e-mail 1
retrieve N
n-1
n
e-mail N

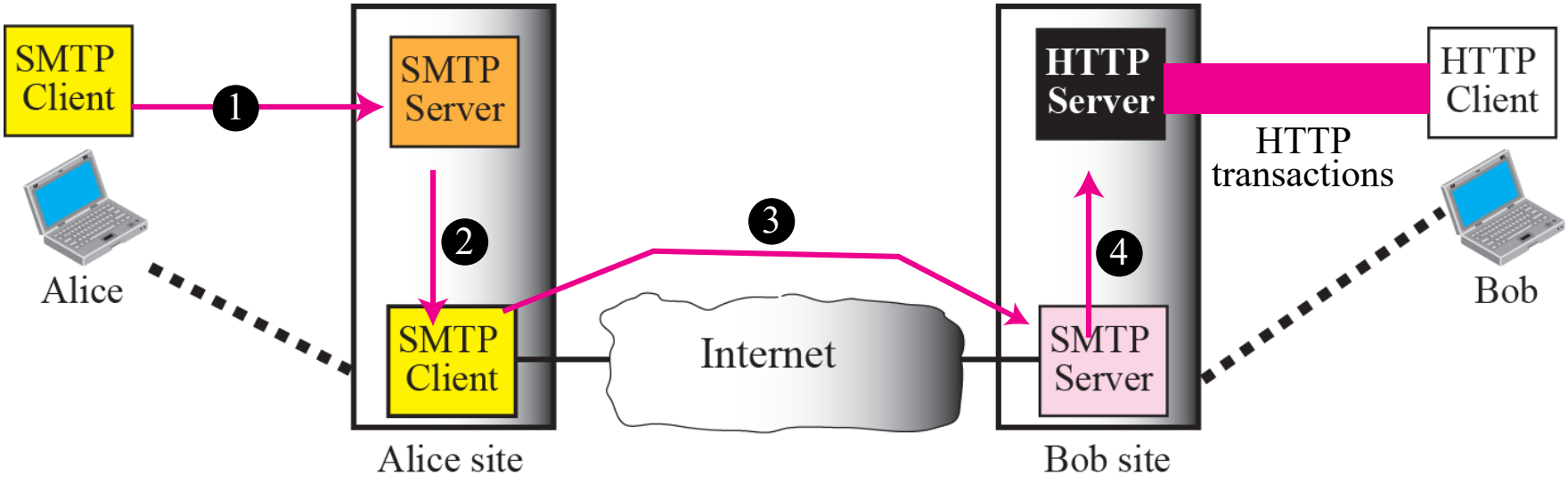
Internet Mail Access Protocol v4

- 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

IMAP:



Web-based E-mail



Web-based E-mail