Chapter 20

Electronic Mail: SMTP, POP, and IMAP

Objectives

Upon completion you will be able to:

- *Understand four configurations of email architecture*
- *Understand the functions and formats of a user agent*
- *Understand MIME and its capabilities and data types*
- *Understand the functions and commands of an MTA*
- *Understand the function of POP3 and IMAP4*

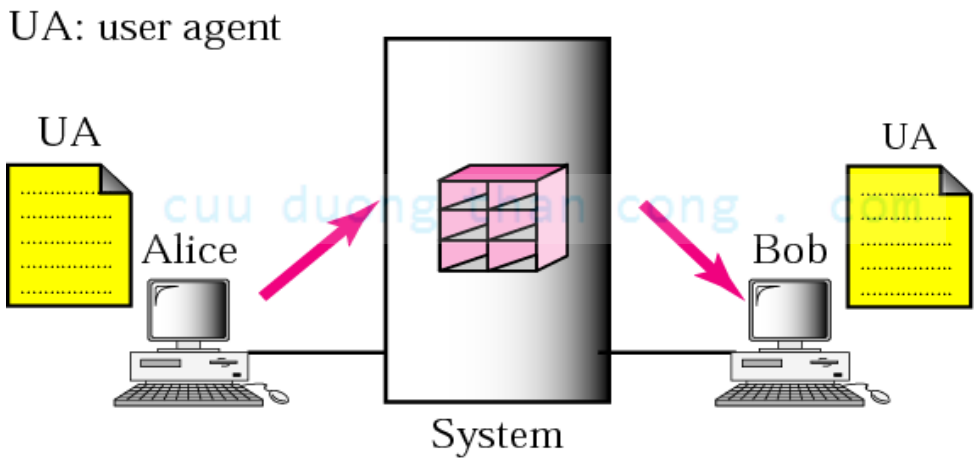
20.1 ARCHITECTURE

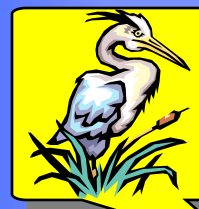
To explain the architecture of email, we give four scenarios. We begin with the simplest situation and add complexity as we proceed. The fourth scenario is the most common in the exchange of email.

The topics discussed in this section include:

First Scenario
Second Scenario
Third Scenario
Fourth Scenario

Figure 20.1 *First scenario*





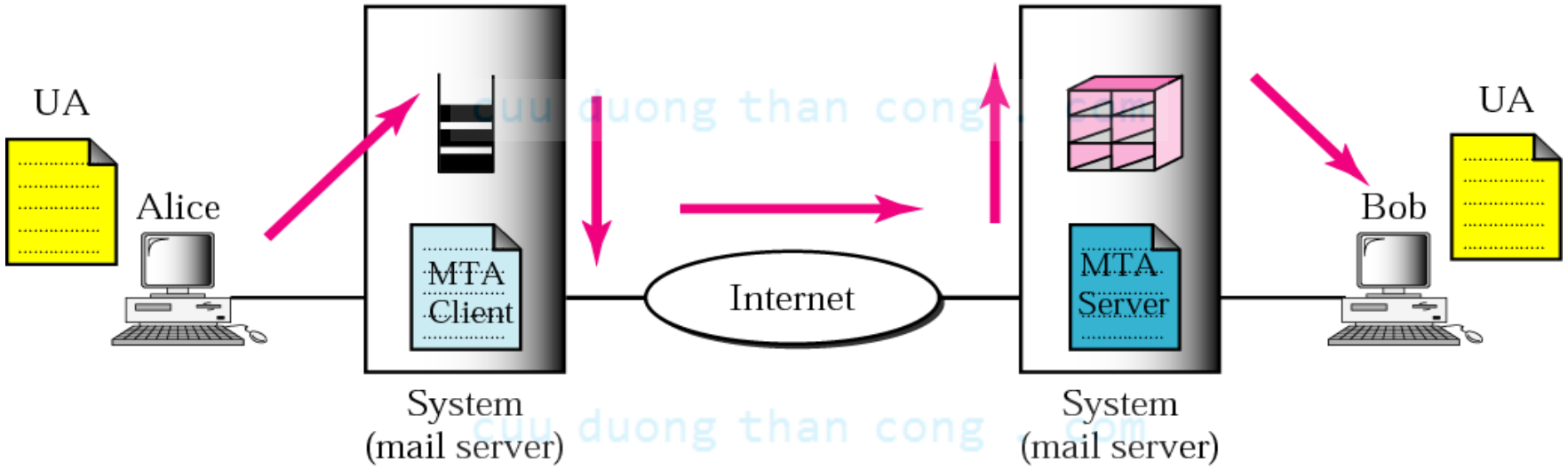
Note:

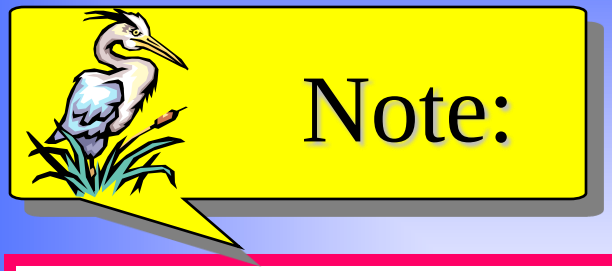
When the sender and the receiver of an email are on the same system, we need only two user agents.

Figure 20.2 *Second scenario*

UA: user agent

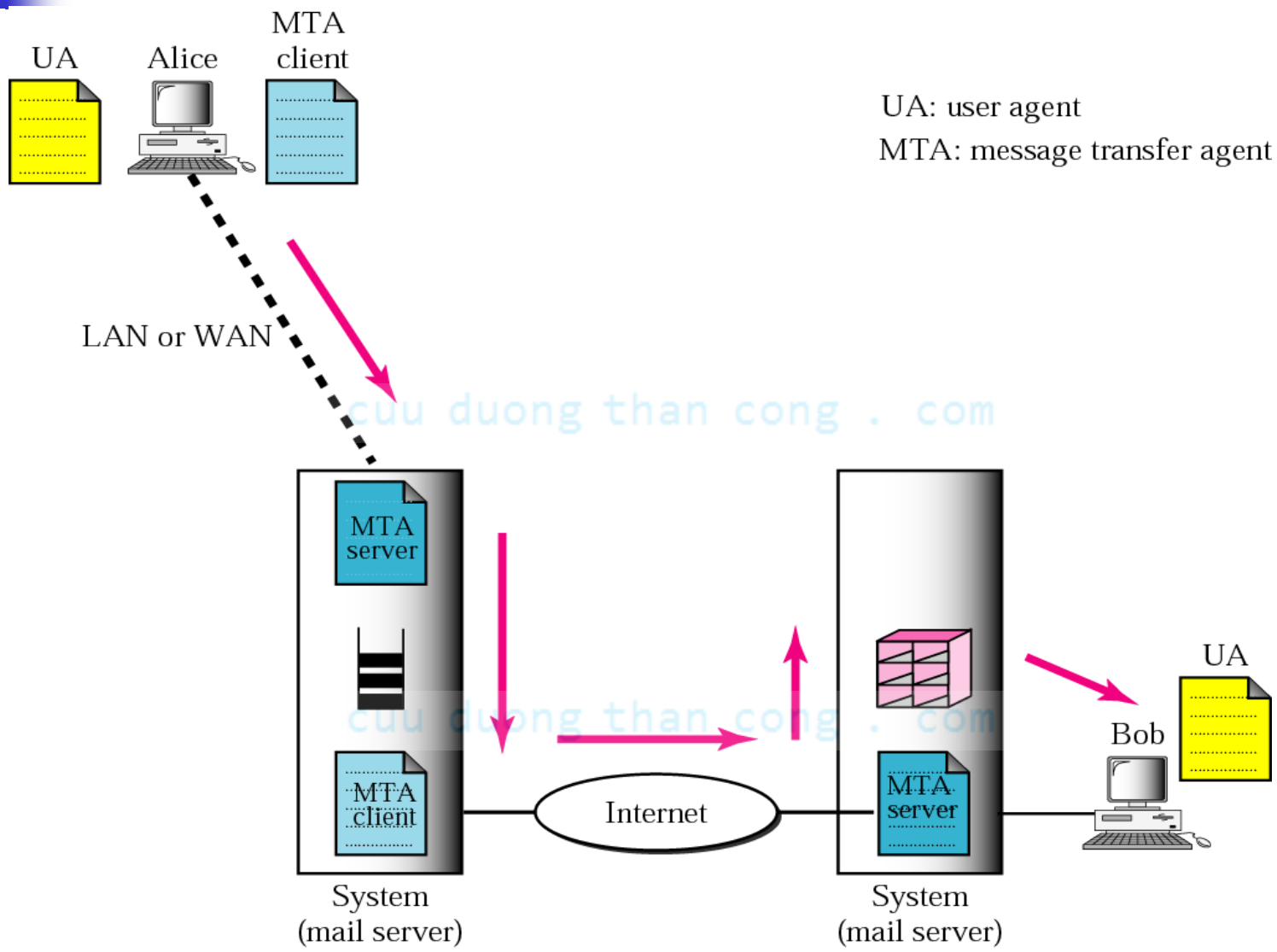
MTA: message transfer agent

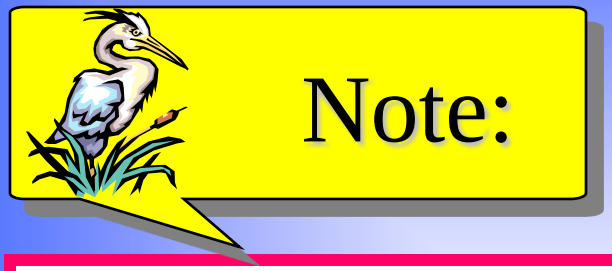




When the sender and the receiver of an email are on different systems, we need two UAs and a pair of MTAs (client and server).

Figure 20.3 *Third scenario*





When the sender is connected to the mail server via a LAN or a WAN, we need two UAs and two pairs of MTAs (client and server).

Figure 20.4 *Fourth scenario*

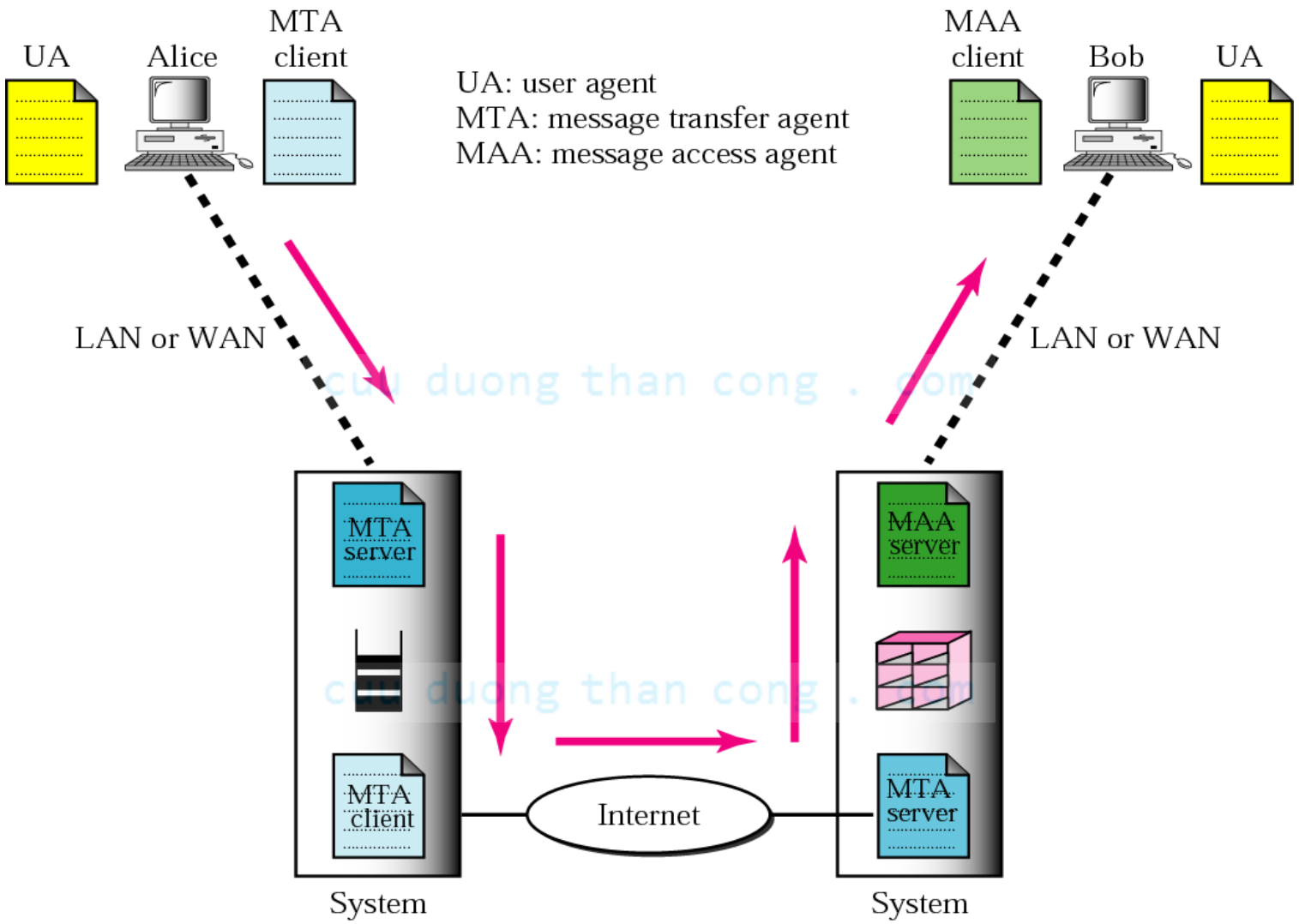
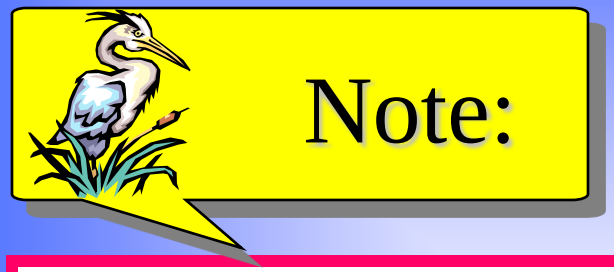


Figure 20.5 *Push vs. pull*



When both sender and receiver are connected to the mail server via a LAN or a WAN, we need two UAs, two pairs of MTAs (client and server), and a pair of MAAs (client and server). This is the most common situation today.

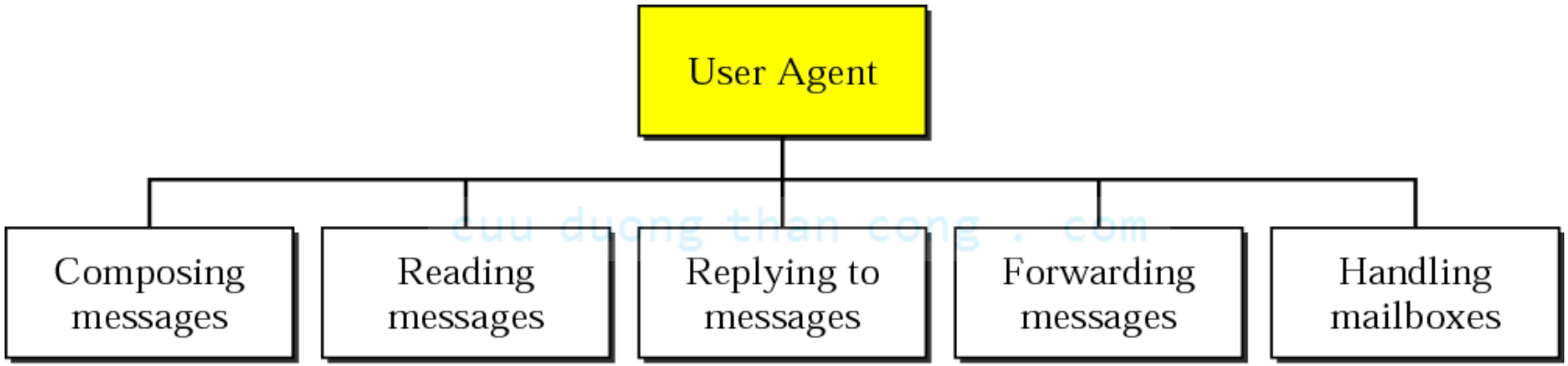
20.2 USER AGENT

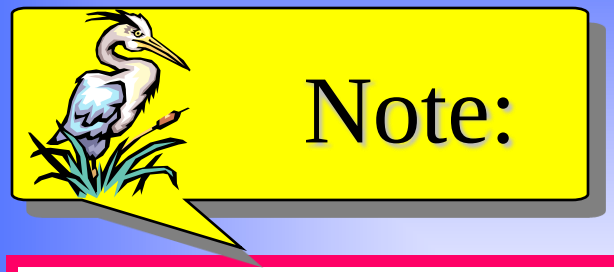
The user agent (UA) provides service to the user to make the process of sending and receiving a message easier.

The topics discussed in this section include:

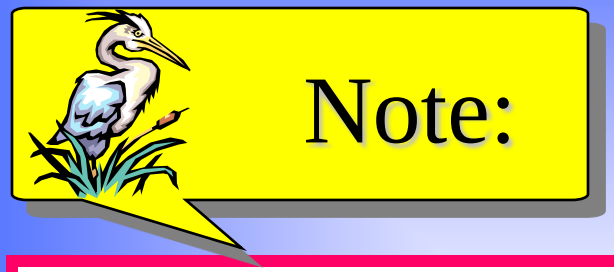
Services Provided by a User Agent
User Agent Types
Sending Mail
Receiving Mail
Addresses
Mailing List
MIME

Figure 20.6 *User agent*





Some examples of command-driven user agents are mail, pine, and elm



Some examples of GUI-based user agents are Eudora, Outlook, and Netscape.

Figure 20.7 *Format of an email*

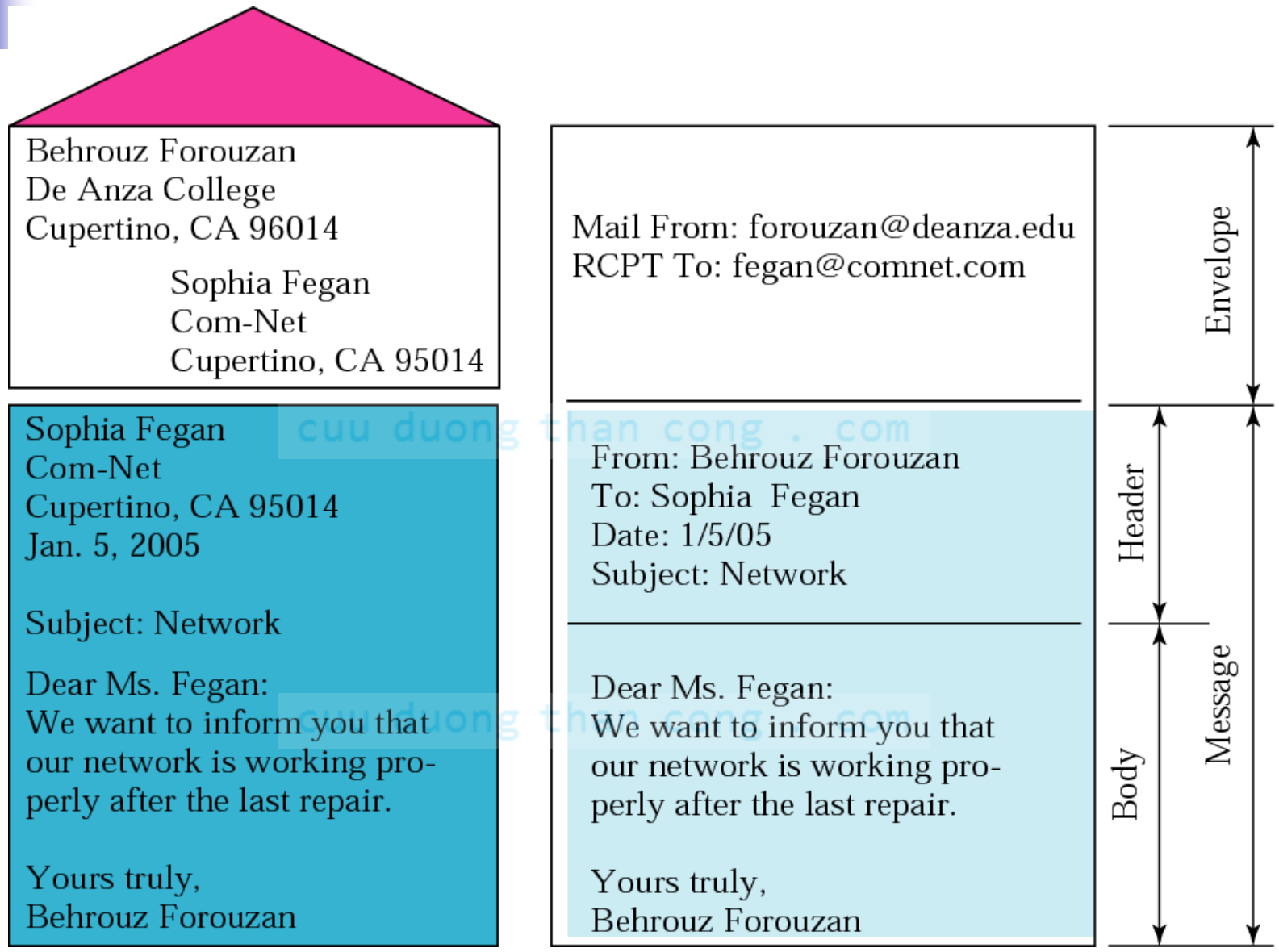


Figure 20.8 *Email address*

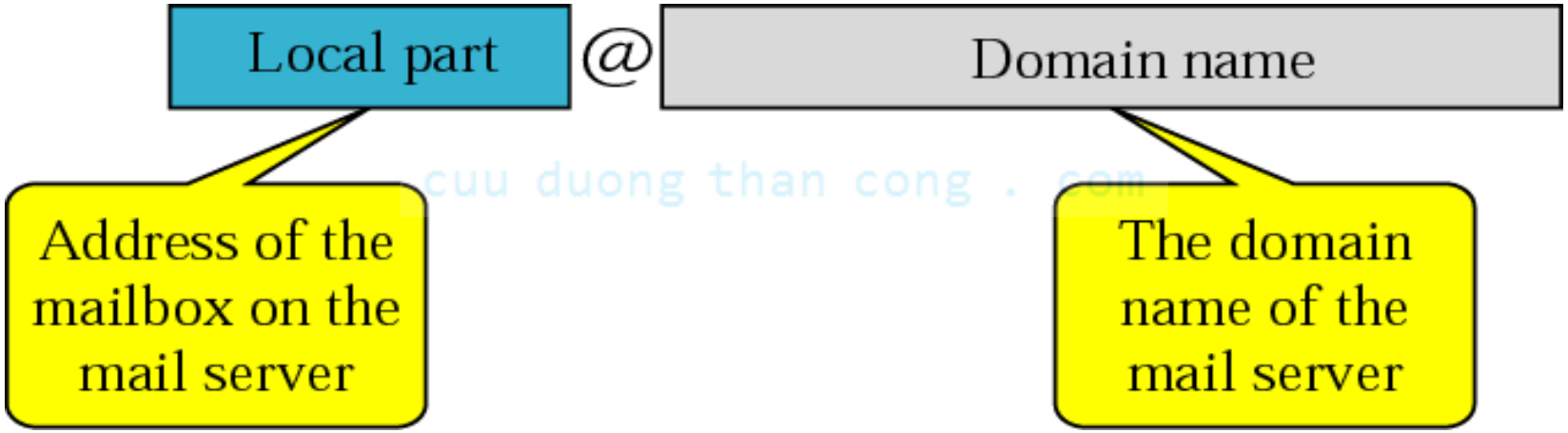


Figure 20.9 *MIME*

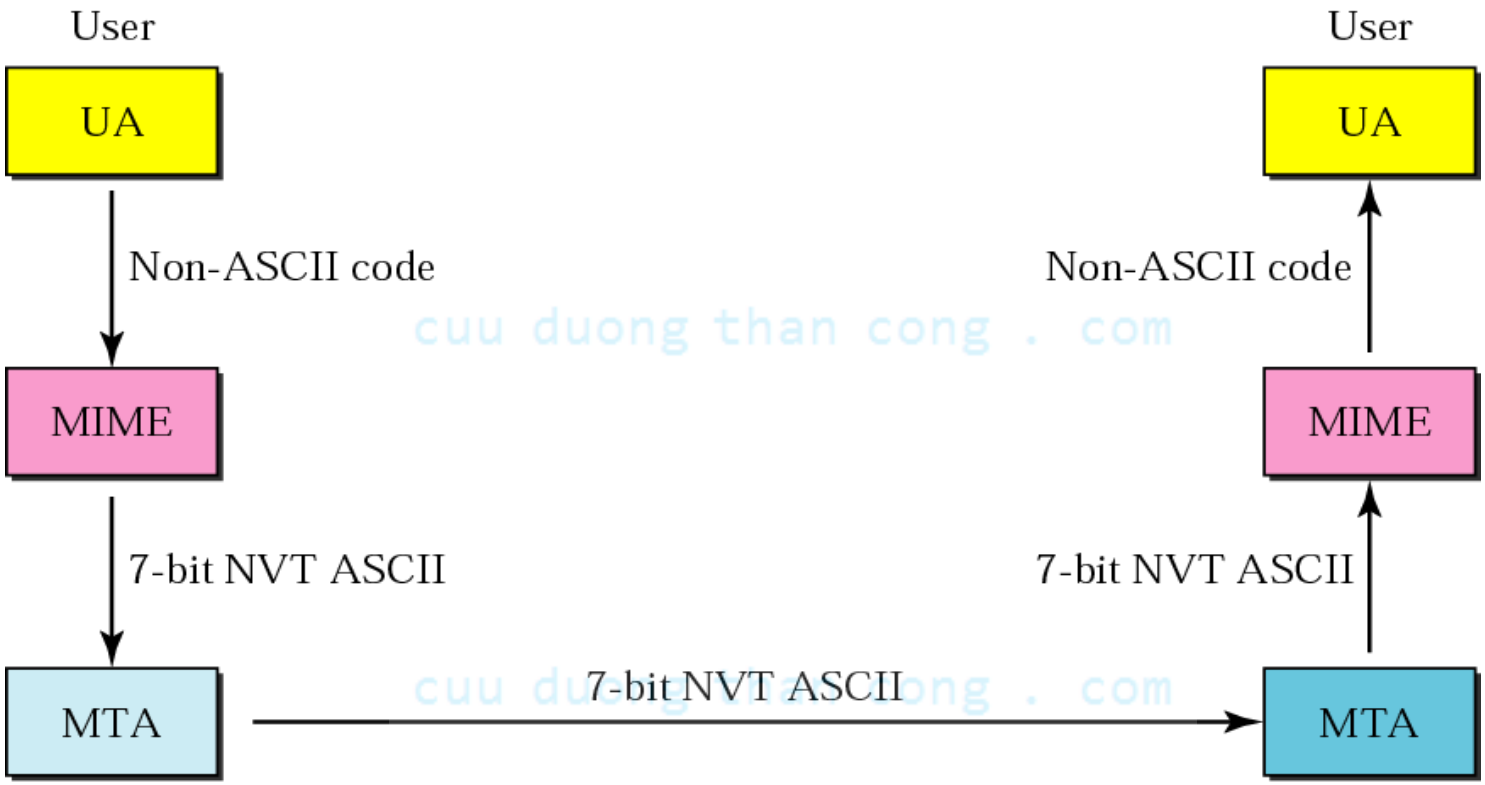


Figure 20.10 *MIME header*

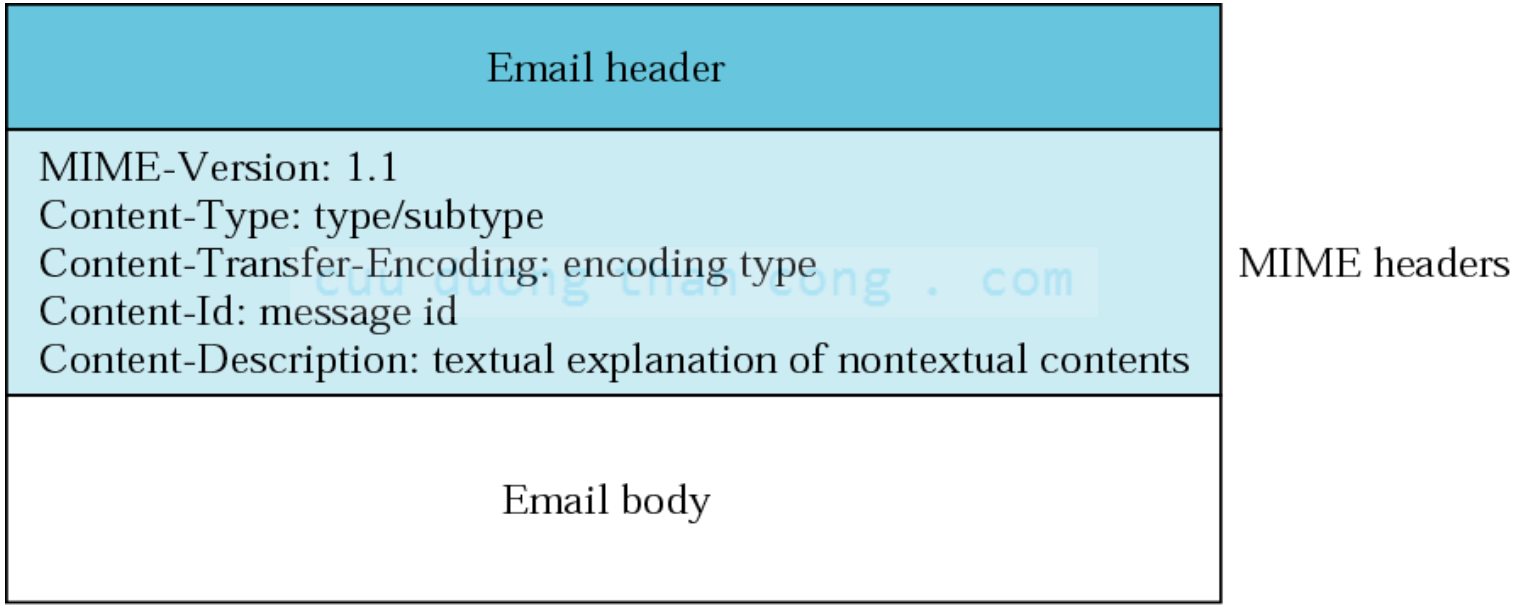


Table 20.1 Data types and subtypes in MIME

Type	*Subtype*	*Description*
Text	Plain	Unformatted
	HTML	HTML format (see Chapter 22)
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

Table 20.1 Data types and subtypes in MIME (Continued)

Type	*Subtype*	*Description*
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 20.2 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 followed by an ASCII code

Figure 20.11 *Base64*

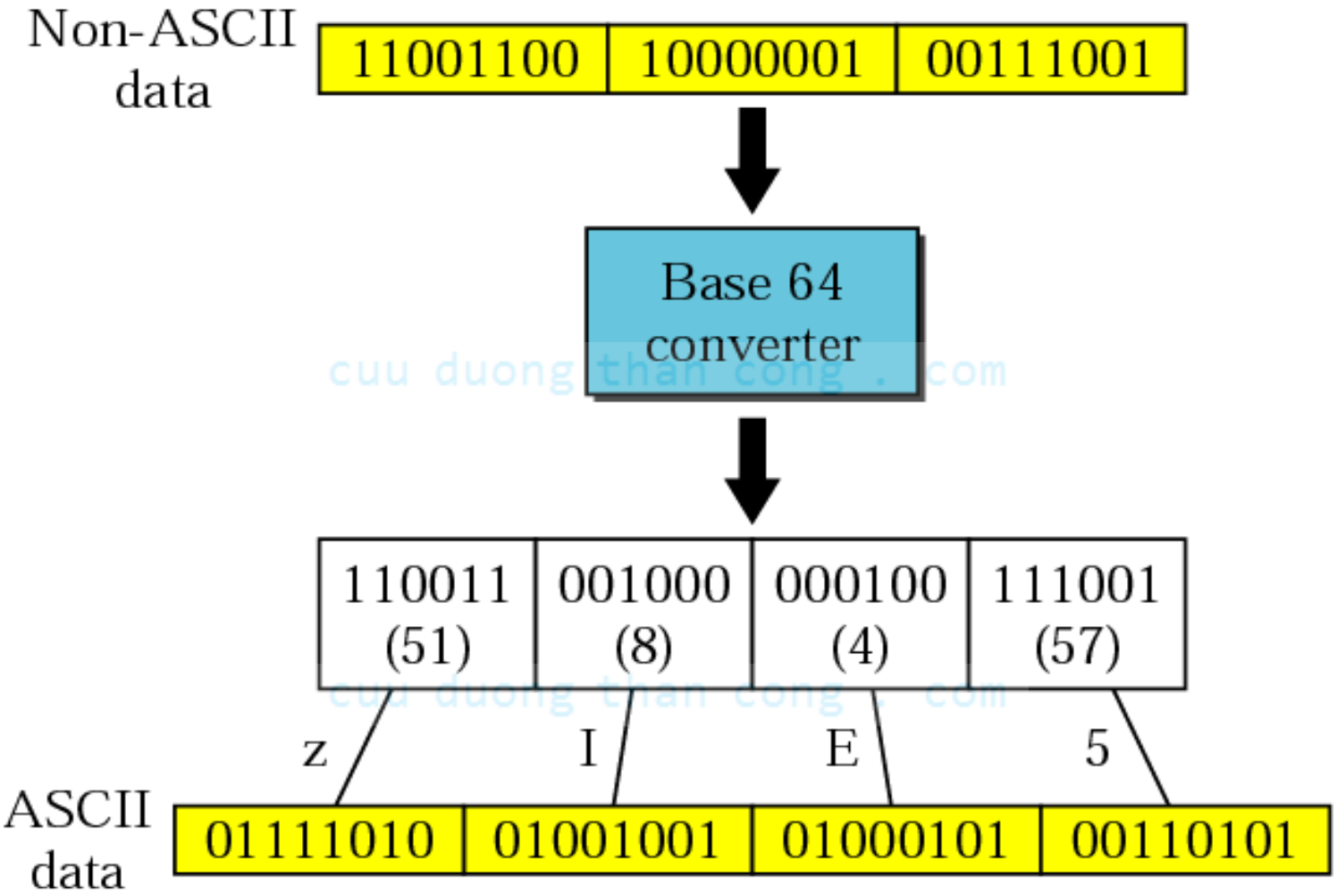
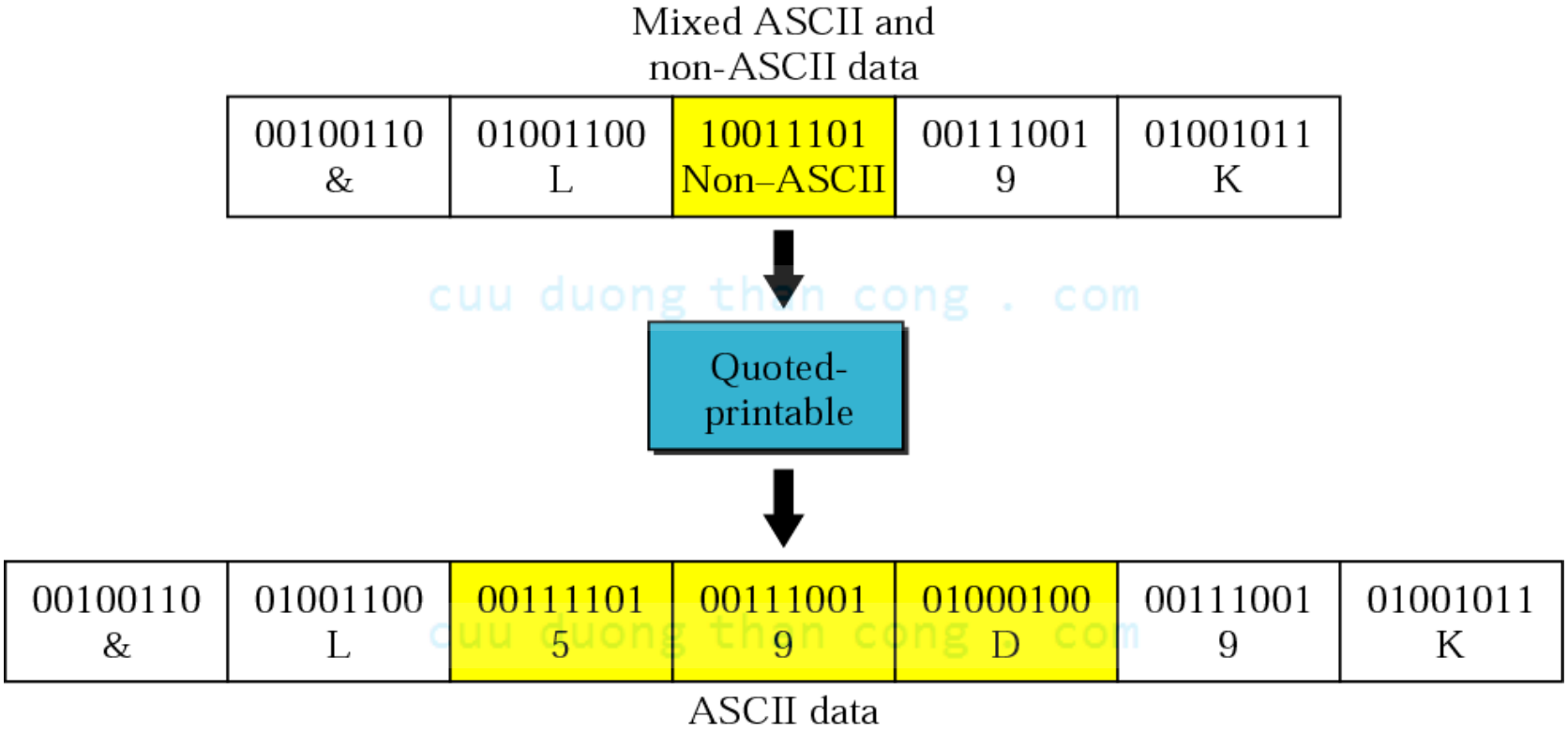


Table 20.3 Base64 encoding table

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**		

Figure 20.12 *Quoted-printable*



20.3 MESSAGE TRANSFER AGENT: SMTP

The actual mail transfer requires message transfer agents (MTAs). The protocol that defines the MTA client and server in the Internet is called Simple Mail Transfer Protocol (SMTP).

The topics discussed in this section include:

Commands and Responses
Mail Transfer Phases

Figure 20.13 *SMTP range*

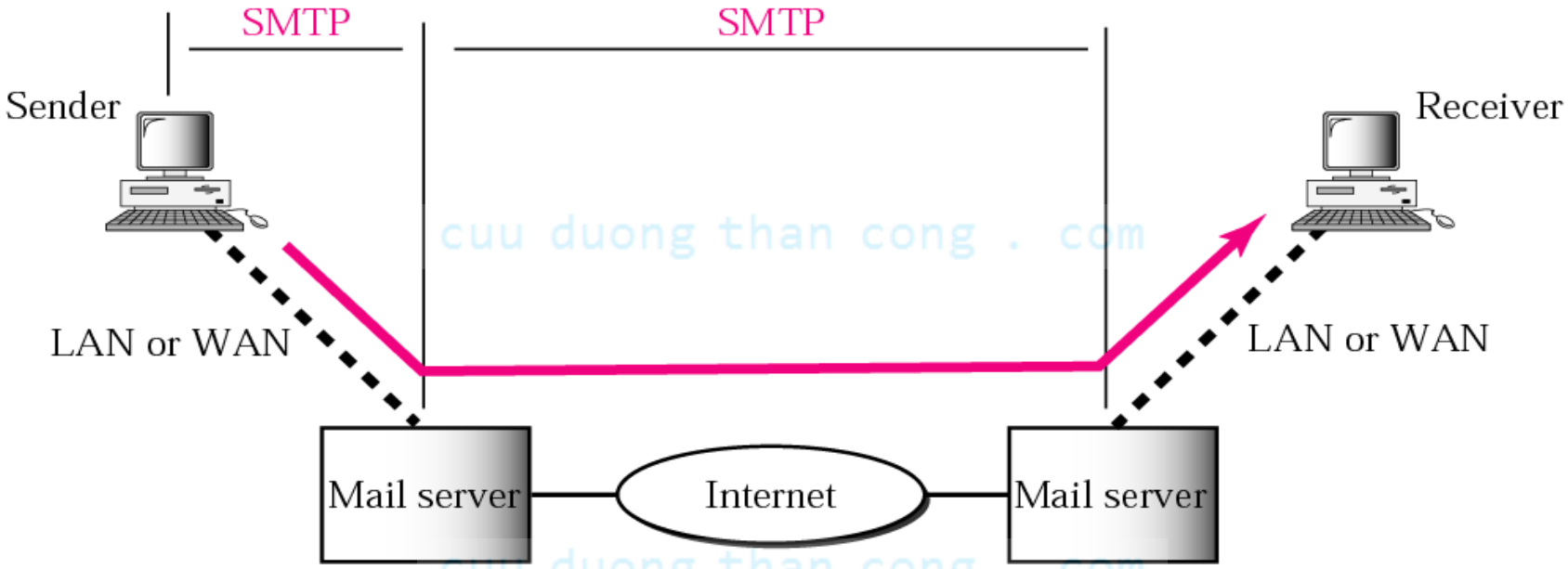


Figure 20.14 *Commands and responses*

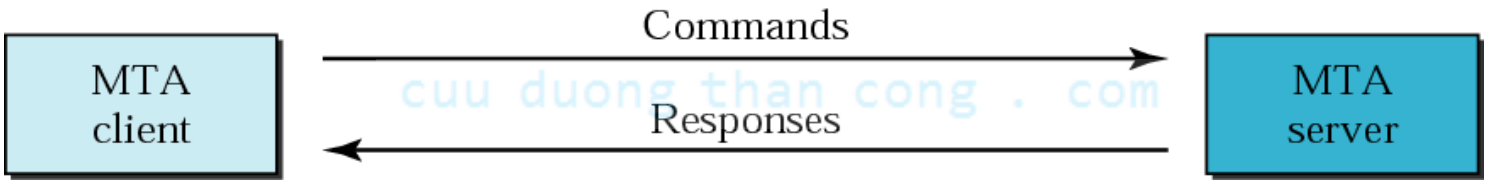


Figure 20.15 *Command format*

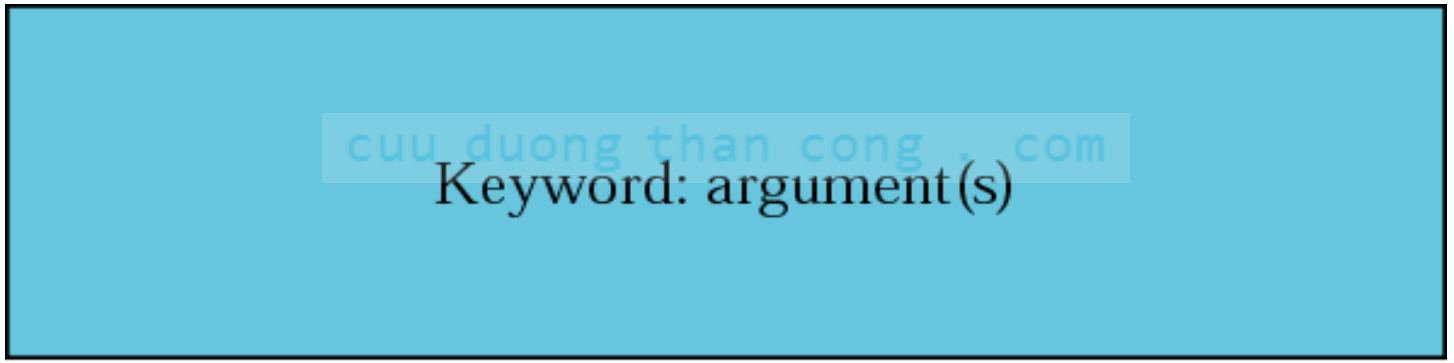


Table 20.4 Commands

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

Table 20.5 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

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

Figure 20.16 *Connection establishment*

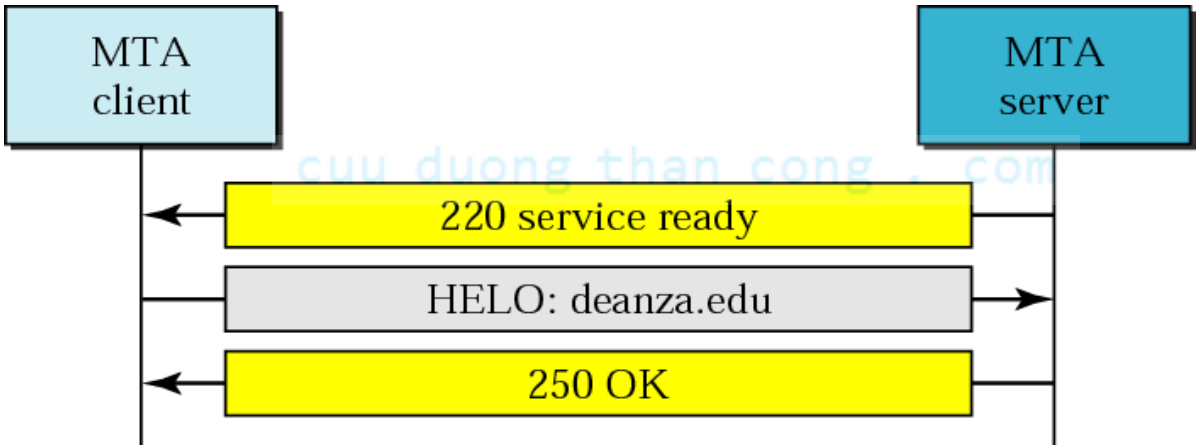


Figure 20.17 *Message transfer*

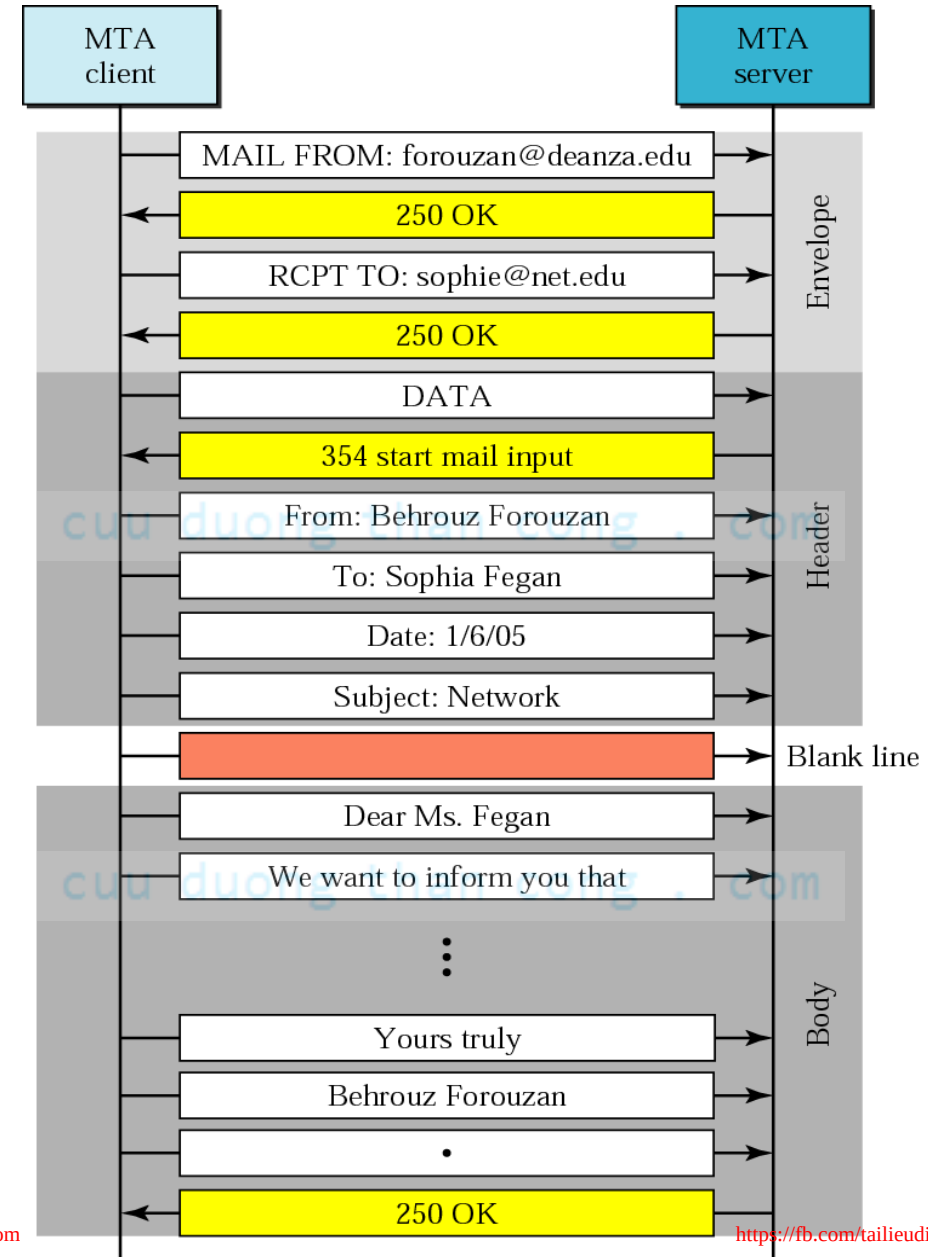
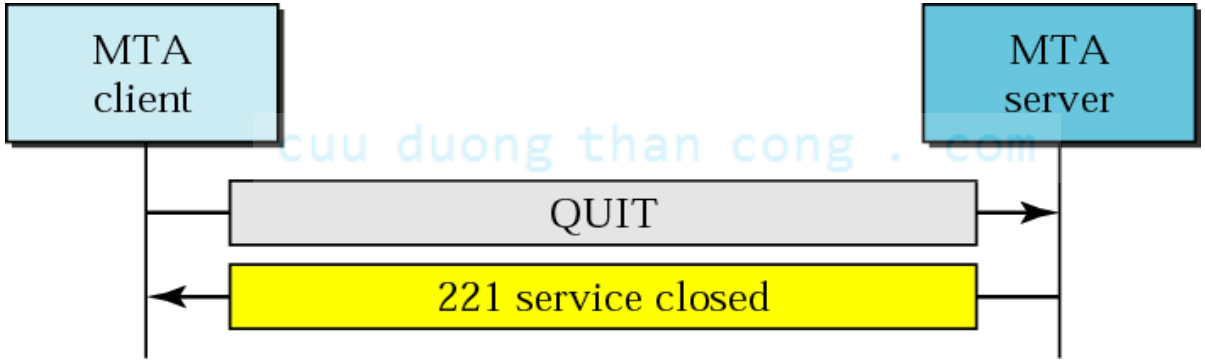


Figure 20.18 *Connection termination*



EXAMPLE 1

Let us see how we can directly use SMTP to send an email and simulate the commands and responses we described in this section. We use TELNET to log into port 25 (the well-known port for SMTP). We then use the commands directly to send an email. In this example, forouzanb@adelphia.net is sending an email to himself. The first few lines show TELNET trying to connect to the adelphia mail server.

```
$ telnet mail.adelphia.net 25
Trying 68.168.78.100...
Connected to mail.adelphia.net (68.168.78.100).
```

After connection, we can type the SMTP commands and then receive the responses as shown below. We have shown the commands in black and the responses in color. Note that we have added for clarification some comment lines, designated by the "=" sign. These lines are not part of the email procedure.

EXAMPLE 1 (CONTINUED)

========== Connection Establishment ==========

220 mta13.adelphia.net SMTP server ready Fri, 6 Aug 2004 . . .

HELO mail.adelphia.net

250 mta13.adelphia.net

========== Envelope ==========

MAIL FROM: forouzanb@adelphia.net

250 Sender <forouzanb@adelphia.net> Ok

RCPT TO: forouzanb@adelphia.net

250 Recipient <forouzanb@adelphia.net> Ok

========== Header and Body ==========

DATA

354 Ok Send data ending with <CRLF>.<CRLF>

From: Forouzan

TO: Forouzan

This is a test message

to show SMTP in action.

.

EXAMPLE 1 (CONTINUED)

========== Connection Termination==========

250 Message received: adelphia.net@mail.adelphia.net

QUIT

221 mta13.adelphia.net SMTP server closing connection

Connection closed by foreign host.

20.4 MESSAGE ACCESS AGENT: POP AND IMAP

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.

The topics discussed in this section include:

POP3
IMAP4

Figure 20.19 *POP3 and IMAP4*

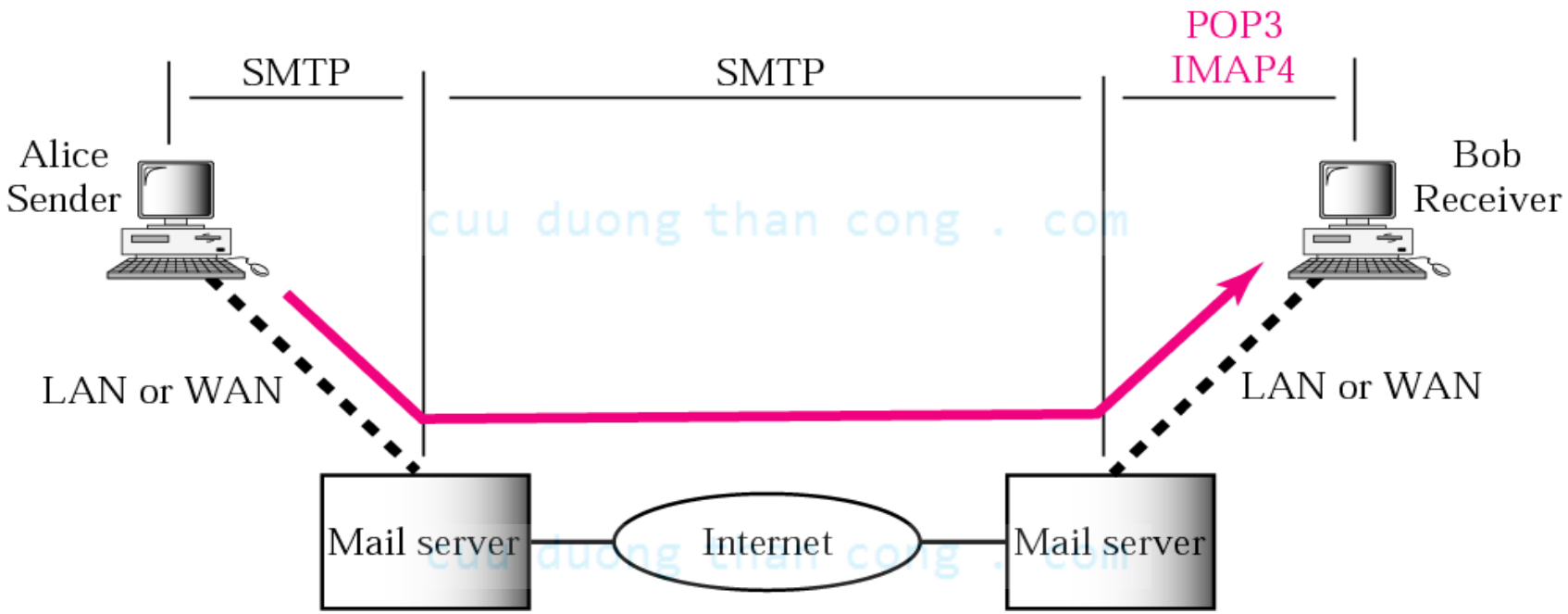
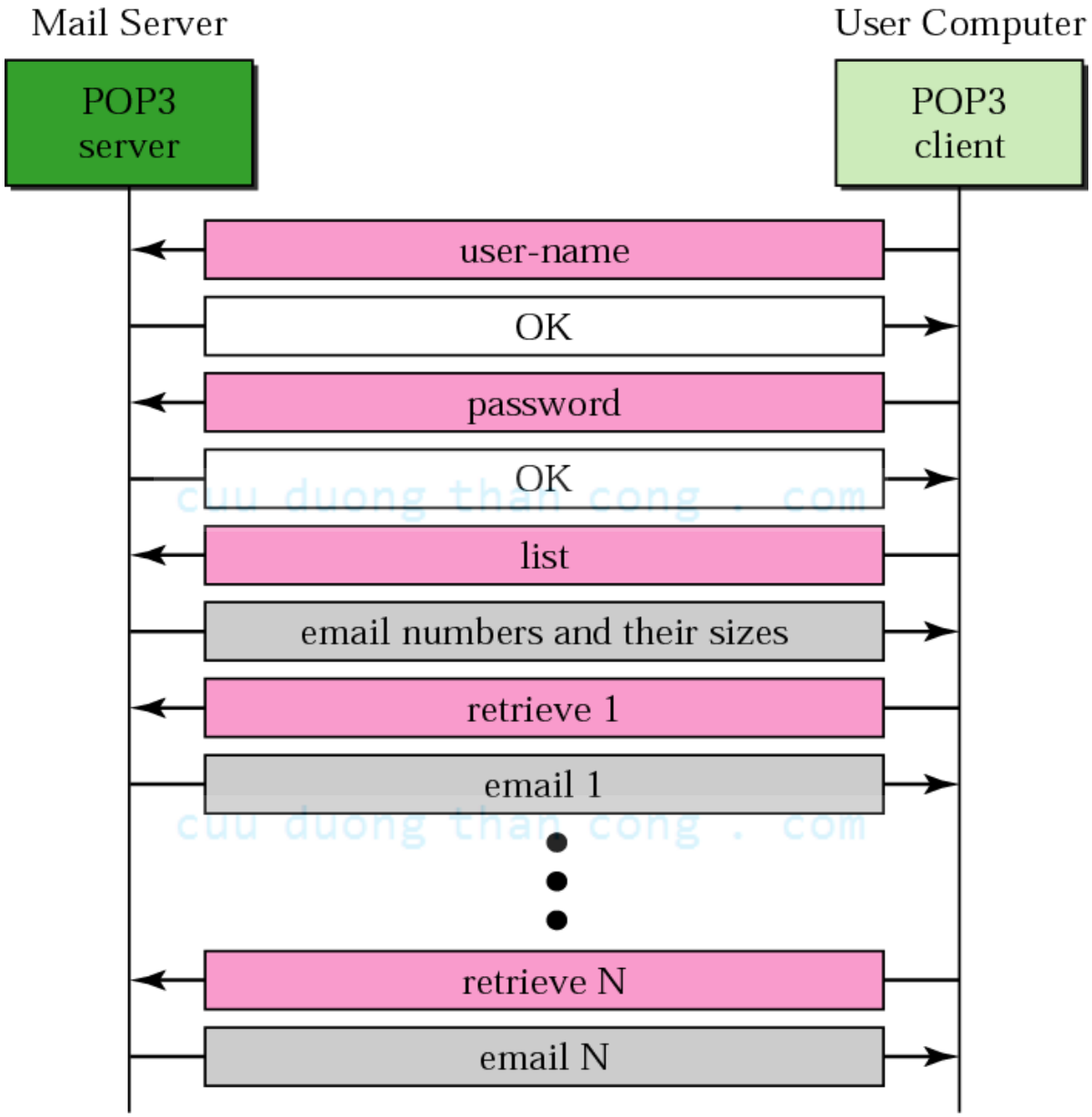


Figure 20.20 *POP3*



20.5 WEB-BASED MAIL

Some websites such as Hotmail and Yahoo provide email service to anyone who accesses the site. Mail transfer and retrieval requires the use of HTTP.

cuu duong than cong . com