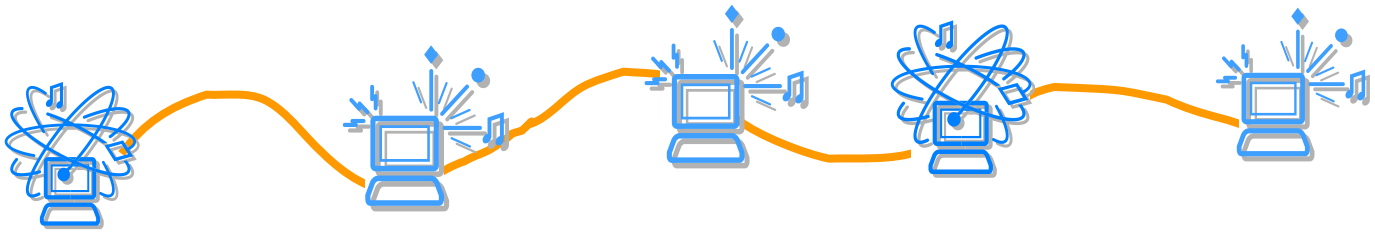
Correio Electrónico



Instituto Superior de Engenharia de Lisboa

Departamento de Engenharia de Electrónica e Telecomunicações e de Computadores

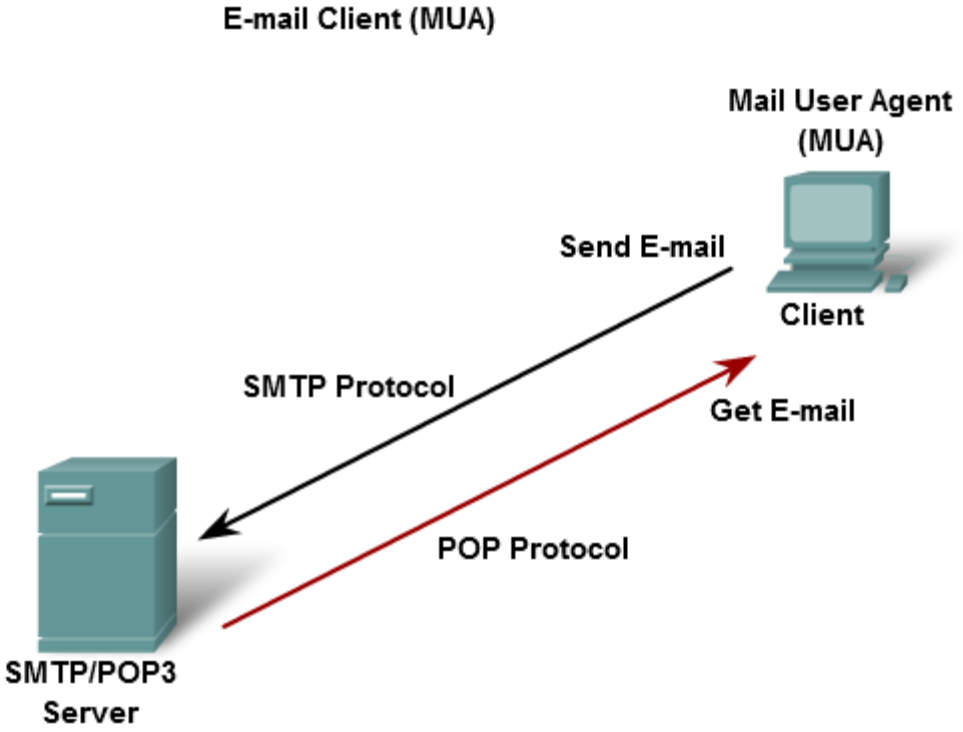
Redes de Computadores

Arquitectura

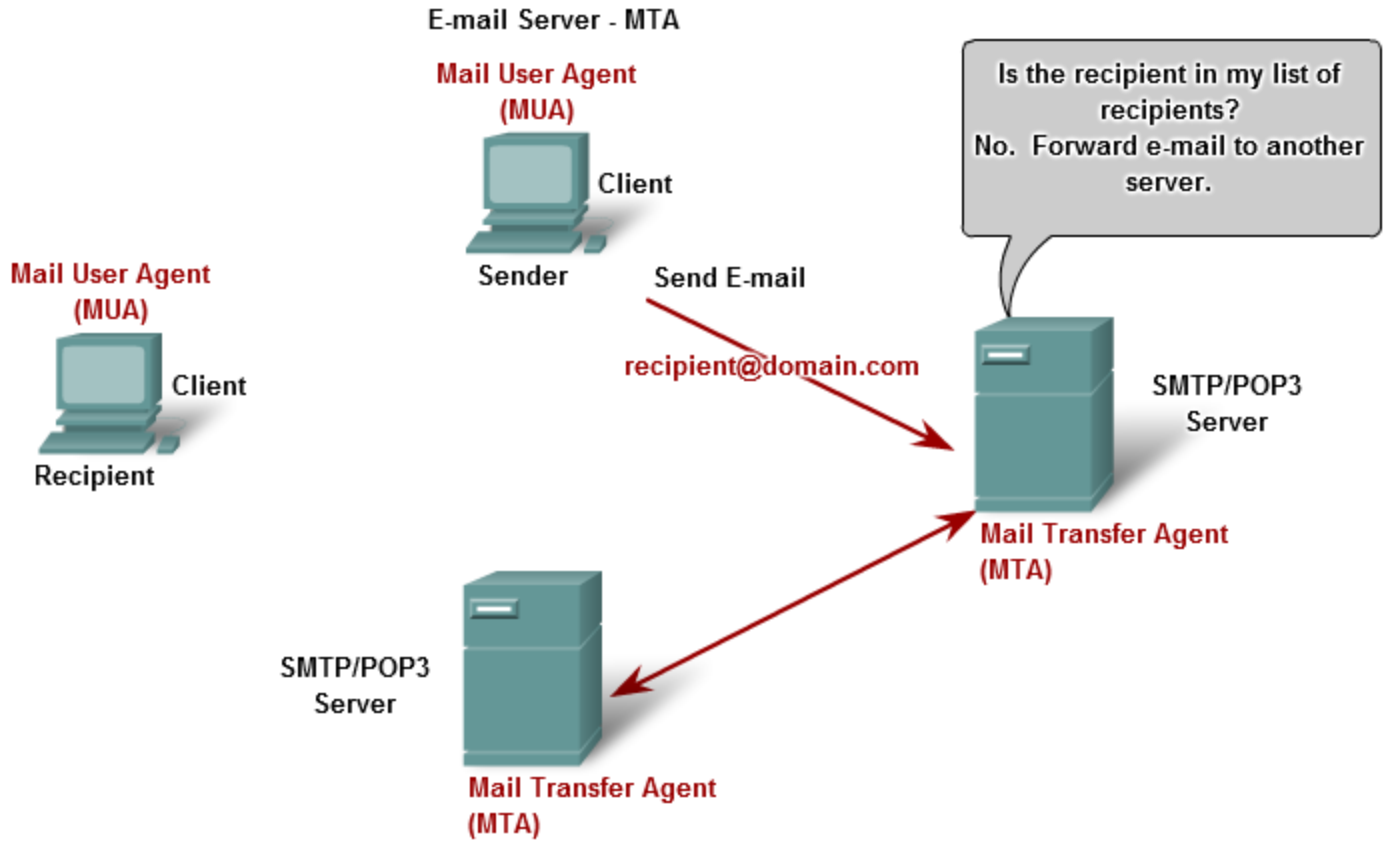
- Diferentes cenários possíveis

- Quatro componentes base:

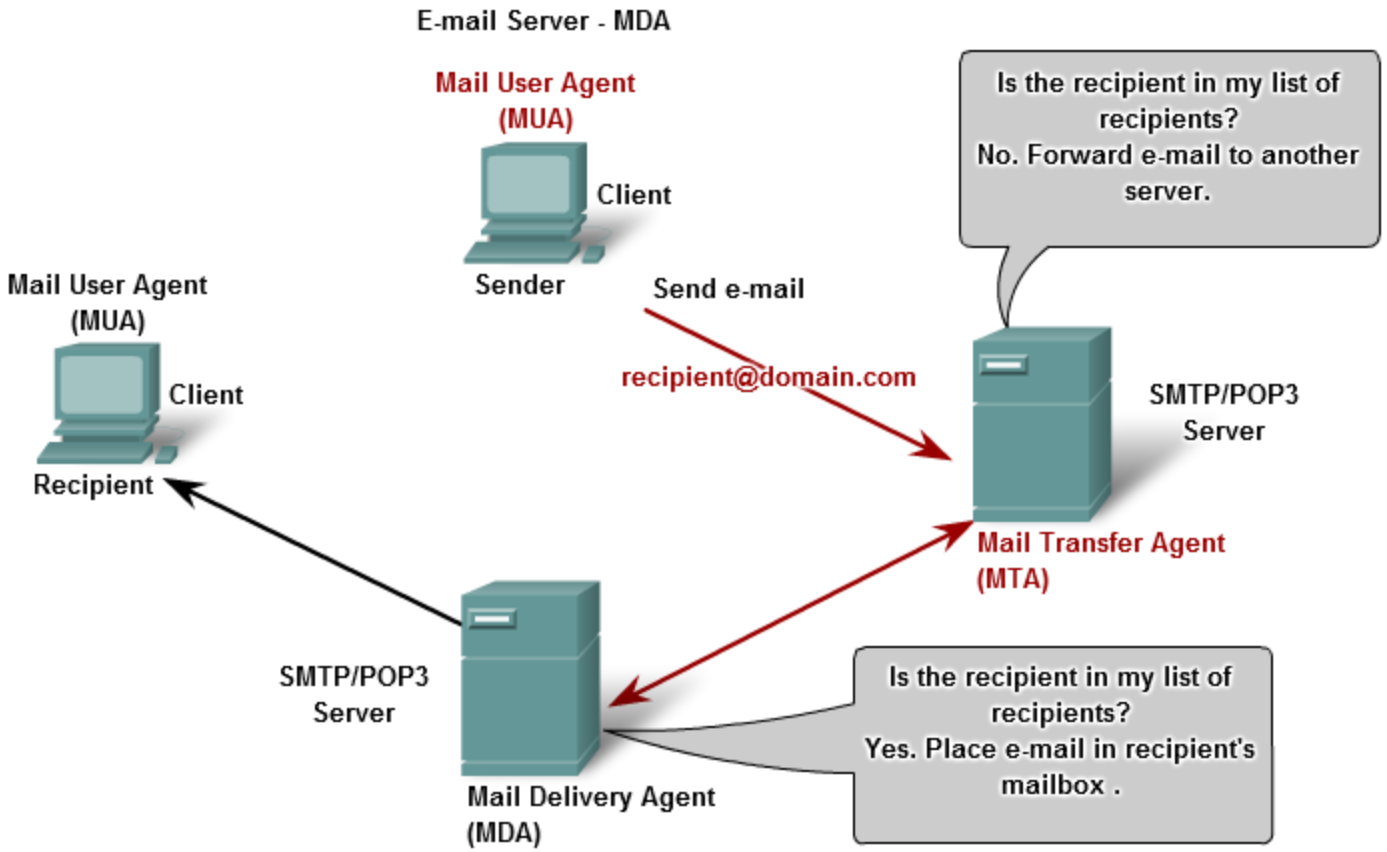
  - MTA (*Mail Transfer Agent*)
    - Software responsável pela transferência do correio electrónico entre computadores
      - Exemplo: Postfix, Exim, Sendmail, Exchange, Qmail
  - MUA (*Mail User Agent*)
    - Software cliente que corre do lado do utilizador e permite a gestão do correio electrónico
      - Exemplo: Microsoft Outlook, Mozilla Thunderbird, Gmail
  - MDA (*Mail Delivery Agent*)
    - Componente responsável pela entrega local do correio do utilizador depois de recebido pelo MTA.
  - MAA (*Message Access Agent*)
    - Permite a um cliente aceder à sua caixa de correio remotamente (servidor POP/IMAP)



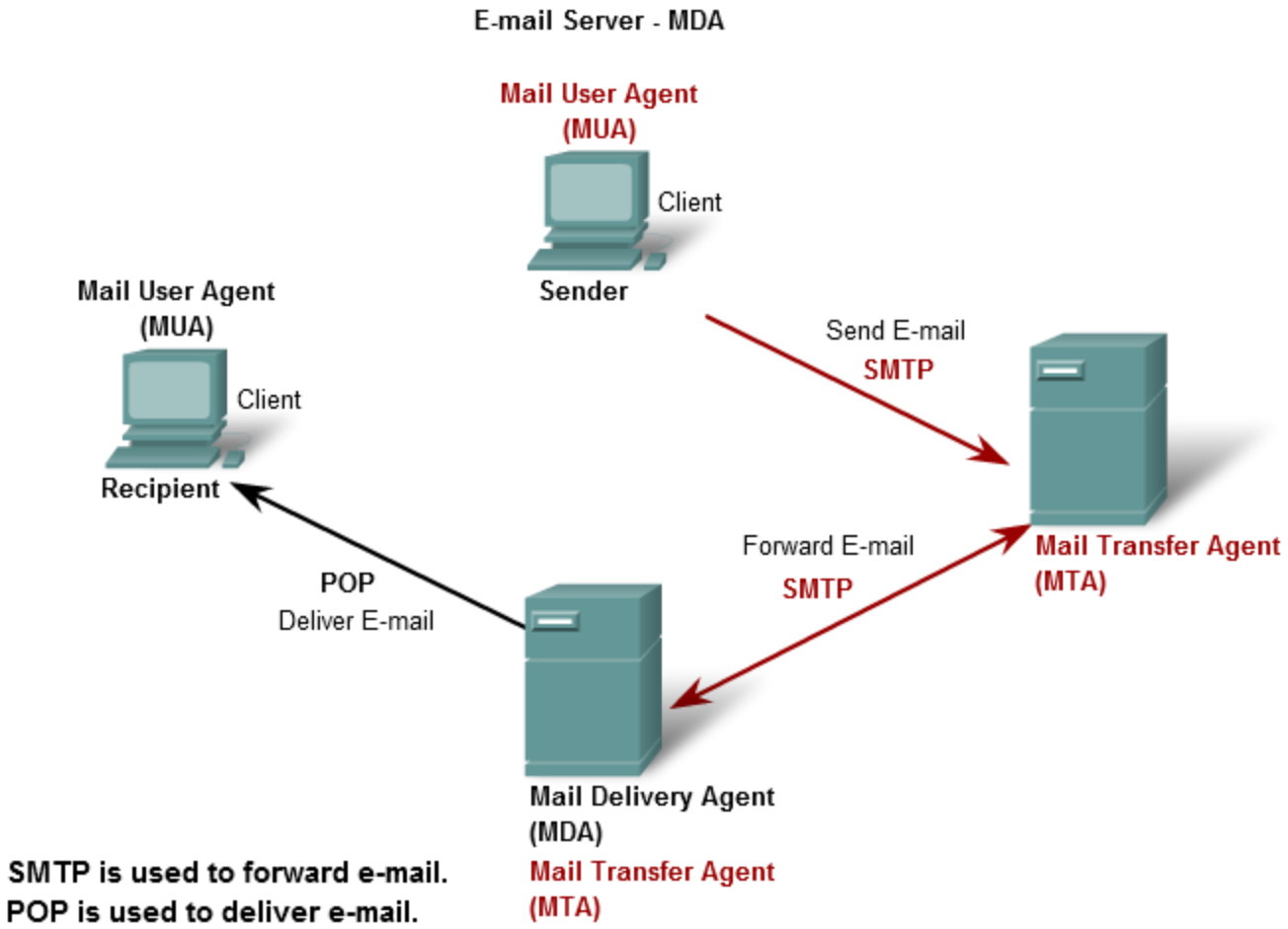
Clients send e-mails to a server using SMTP and receive e-mails using POP3.



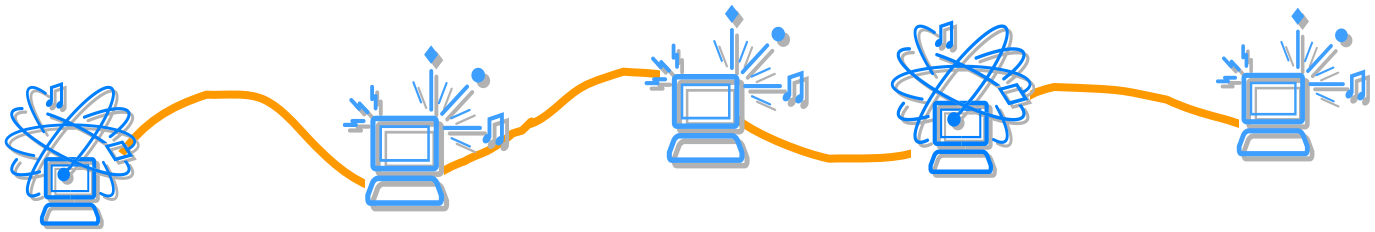
The Mail Transfer Agent process governs e-mail handling between servers and servers.



The Mail Delivery Agent process governs delivery of e-mail between servers and clients.


E-mail Server - MDA
Mail User Agent
(MUA)
Client
Sender
Mail User Agent
(MUA)
Client
Recipient
Send E-mail
SMTP
Mail Transfer Agent
(MTA)
Forward E-mail
SMTP
POP
Deliver E-mail
Mail Delivery Agent
(MDA)
Mail Transfer Agent
(MTA)
SMTP is used to forward e-mail.
POP is used to deliver e-mail.

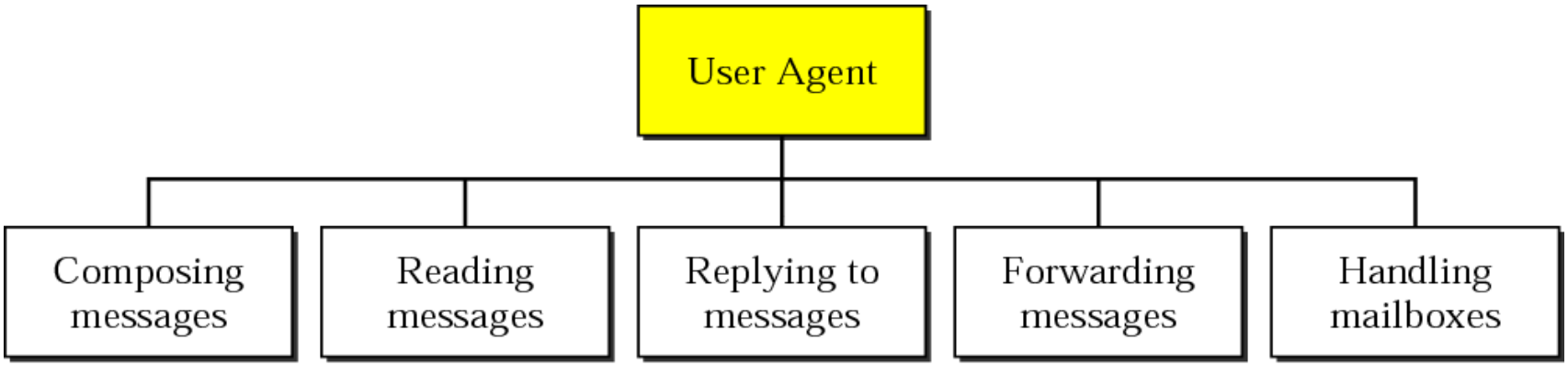
Correio Electrónico



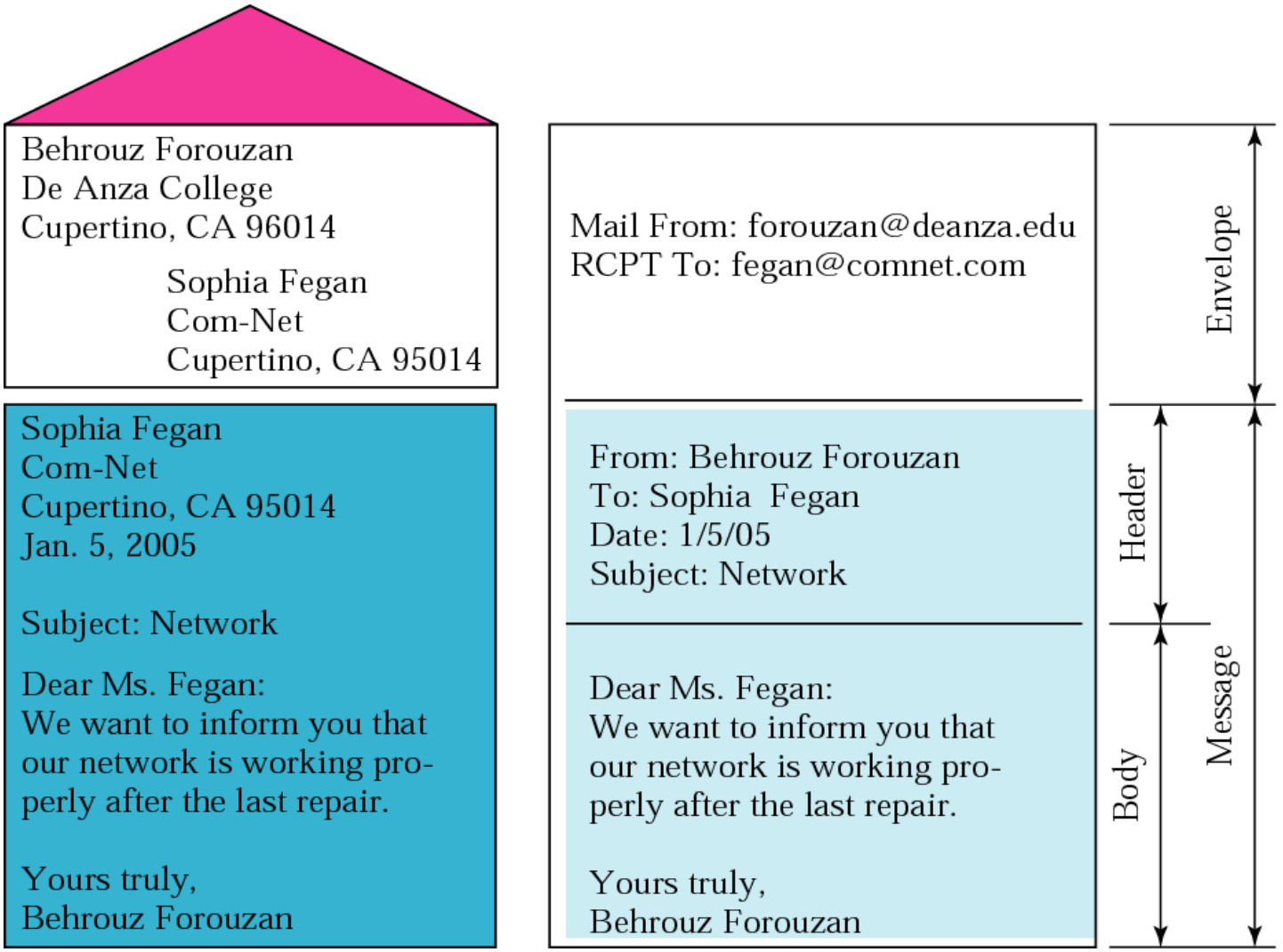
User Agent

User agent

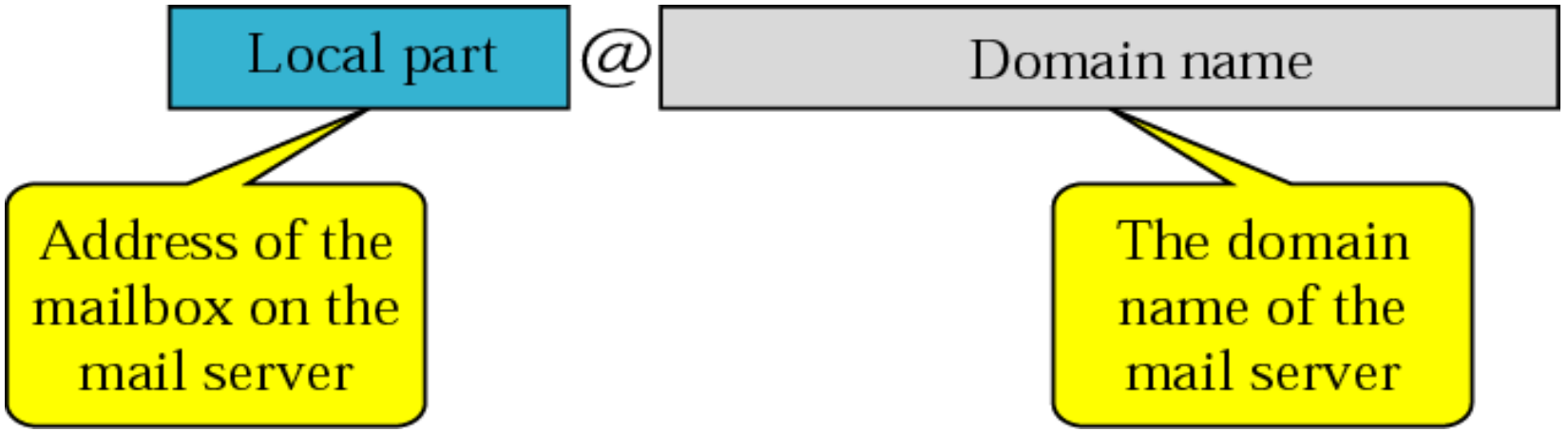
- Permite ao utilizador gerir o seu correio electrónico



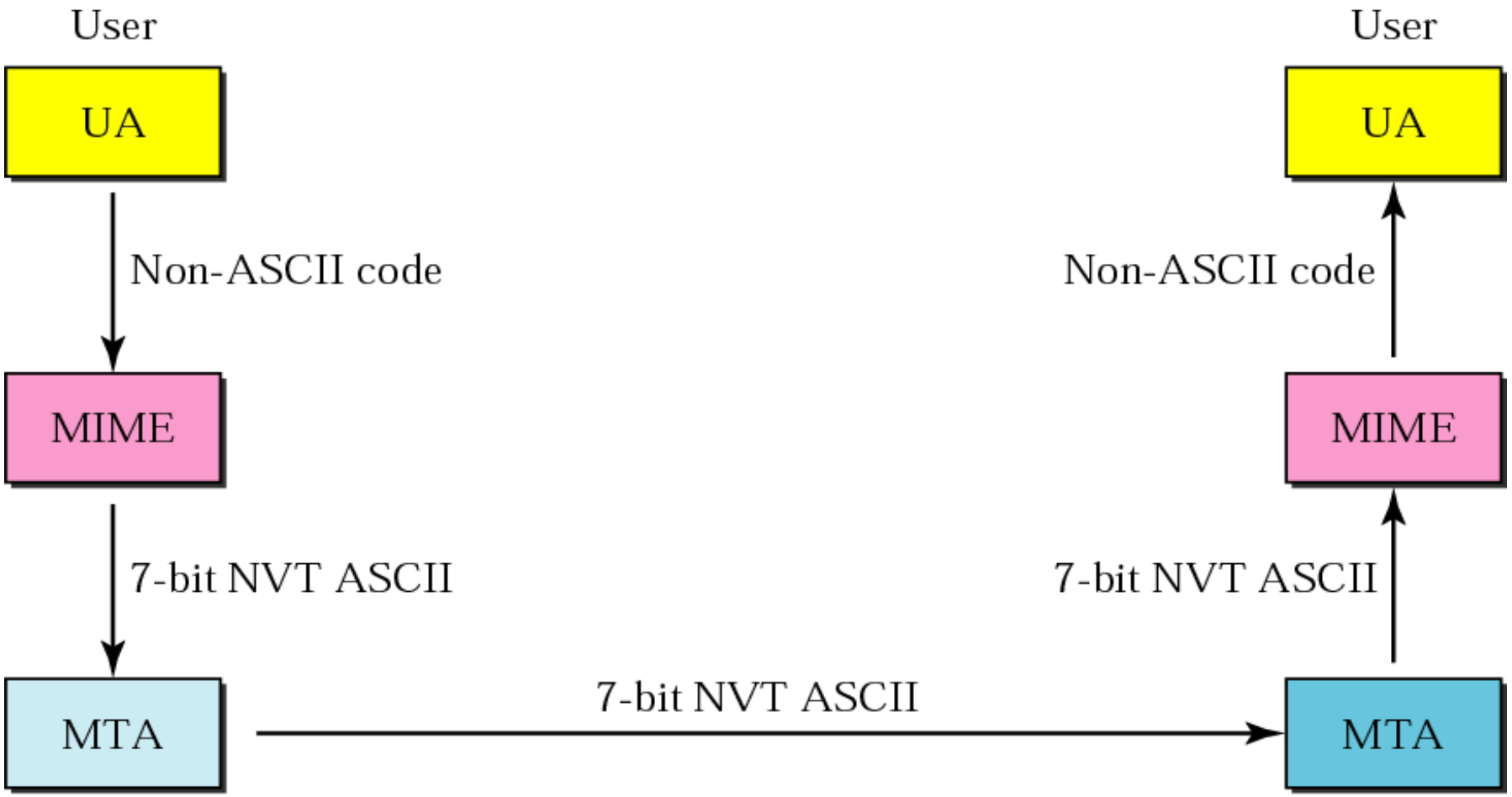
Formato do correio electrónico



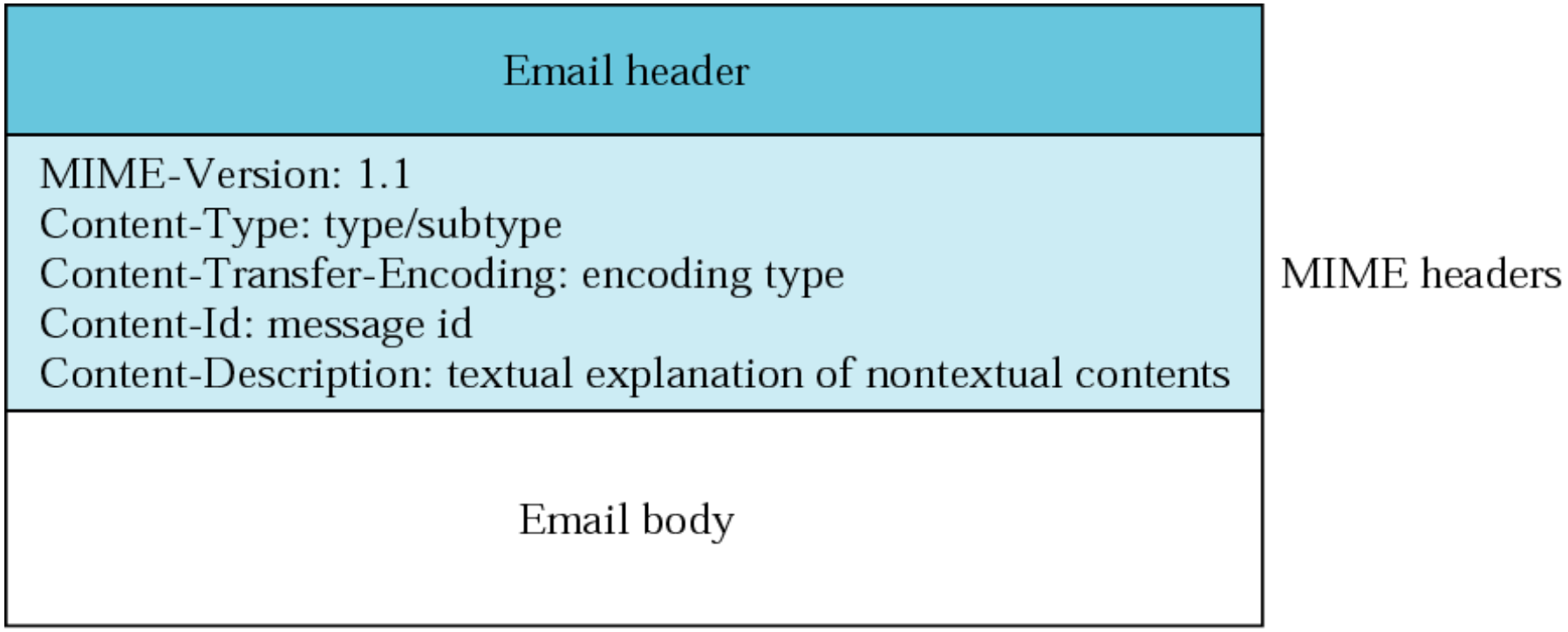
Endereços de Email



MIME (*Multipurpose Internet Mail Extensions*)



Cabeçalhos MIME



Tipos e subtipos MIME (1)

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

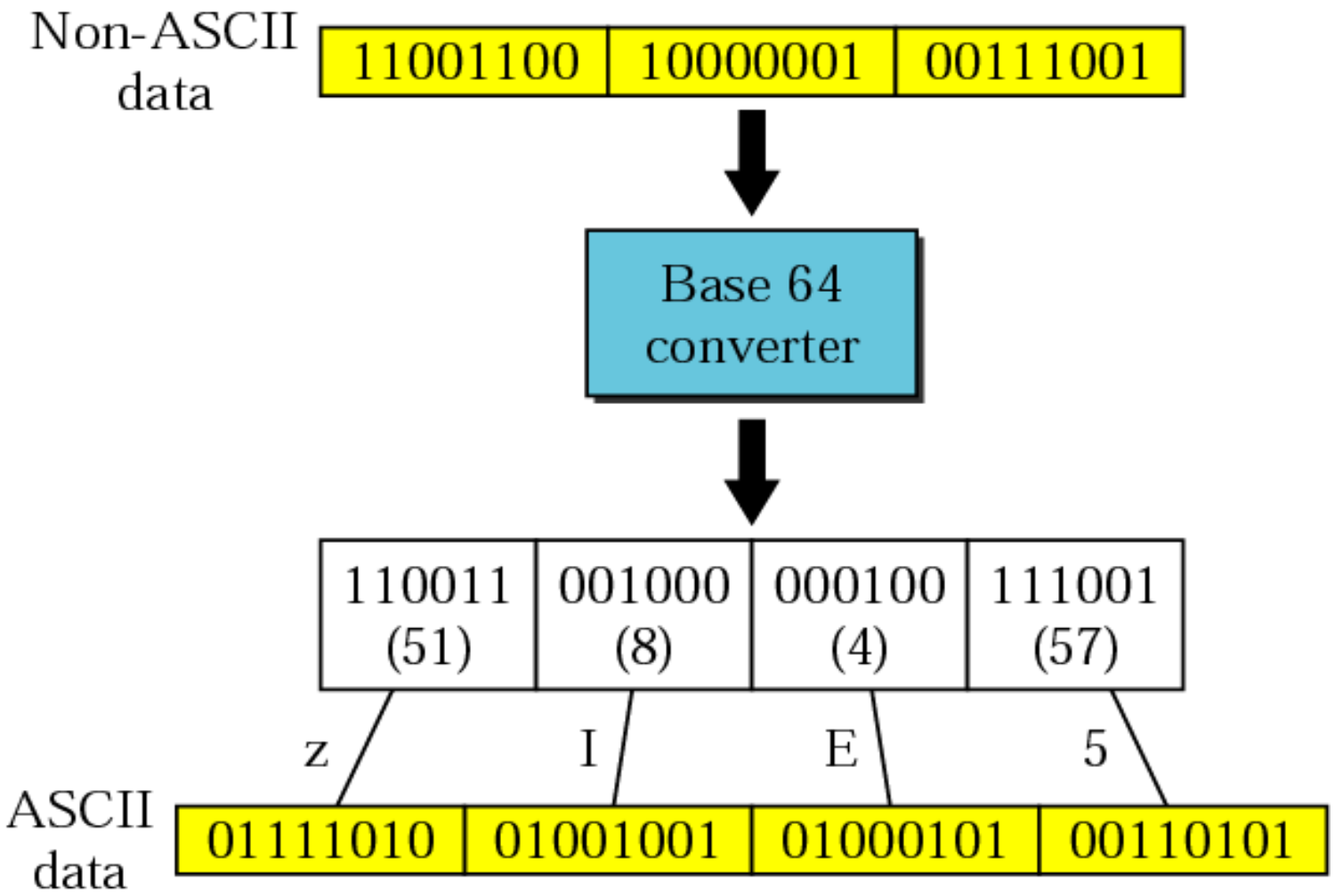
Tipos e subtipos MIME (2)

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)

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

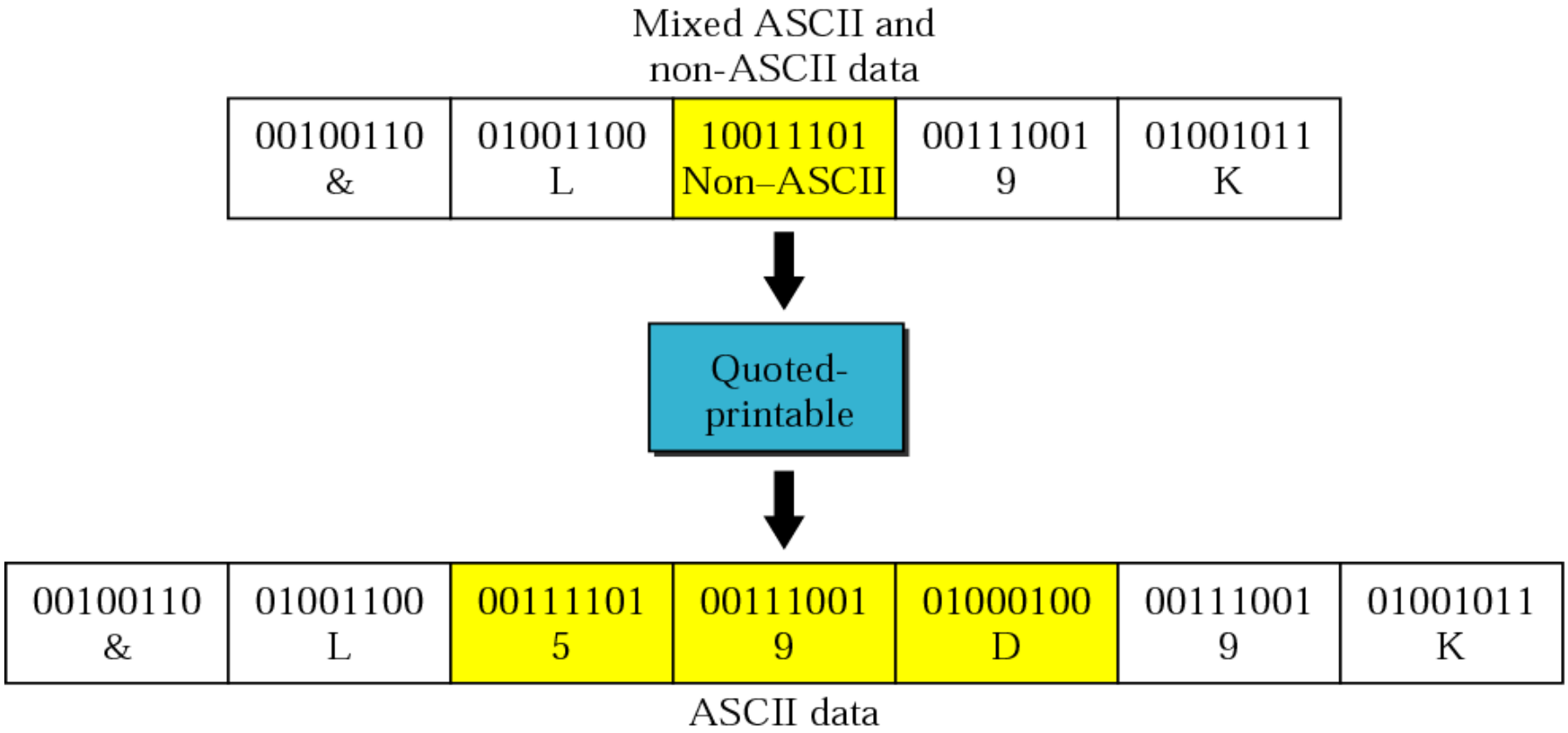
Base64


Non-ASCII data
11001100
10000001
00111001
Base 64 converter
110011 (51)
001000 (8)
000100 (4)
111001 (57)
z
I
E
5
ASCII data
01111010
01001001
01000101
00110101

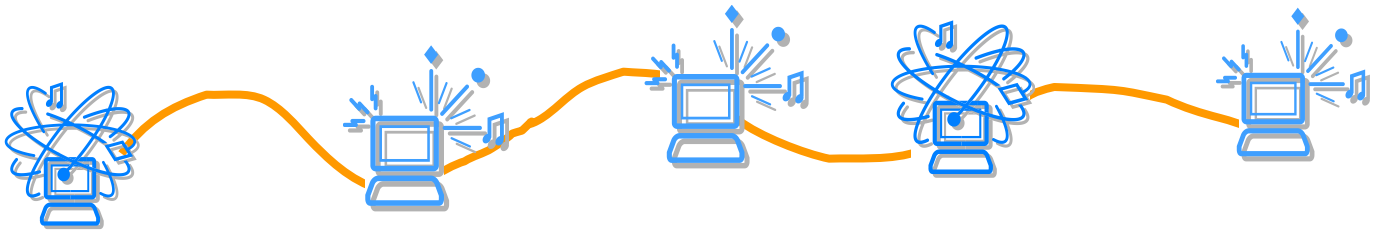
Codificação em Base64

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

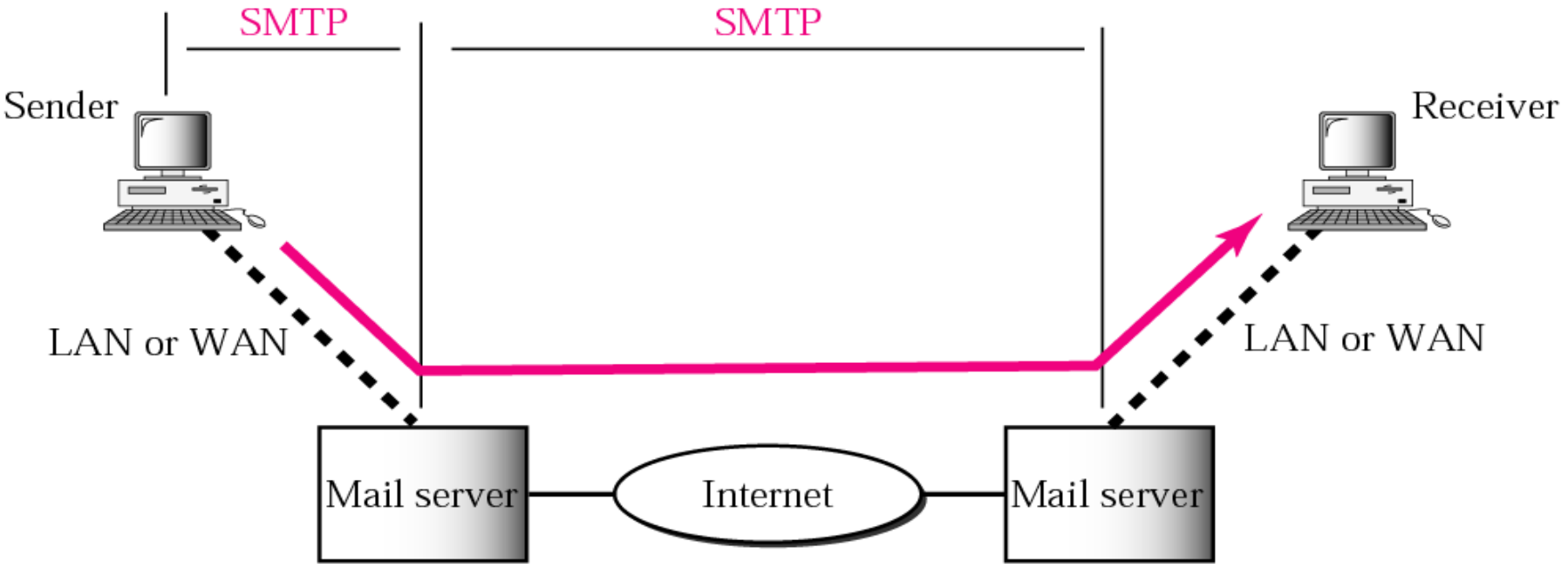


Correio Electrónico



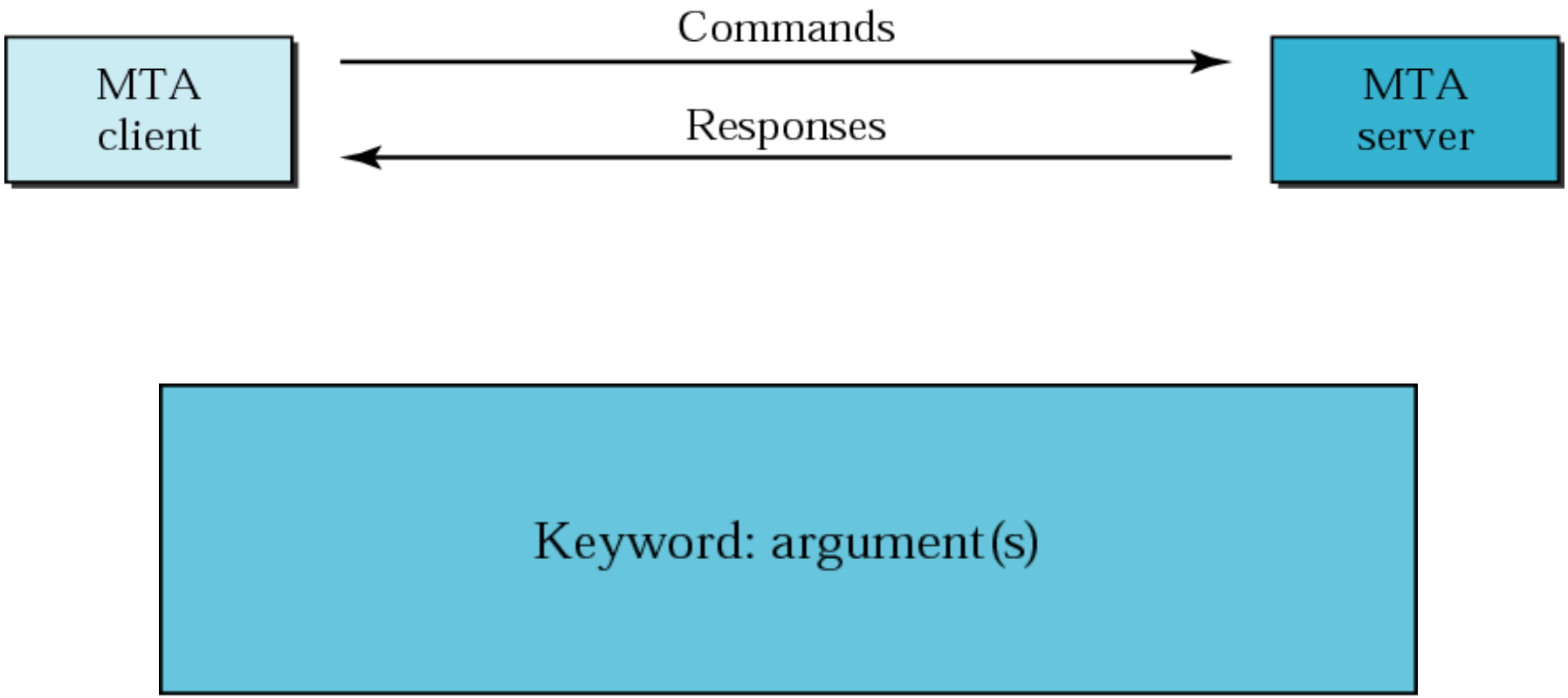
Mail Transfer Agent

SMTP (*Simple Mail Transfer Protocol*)



Tipicamente o MTA está à escuta no porto 25

Comandos e Respostas



Comandos

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

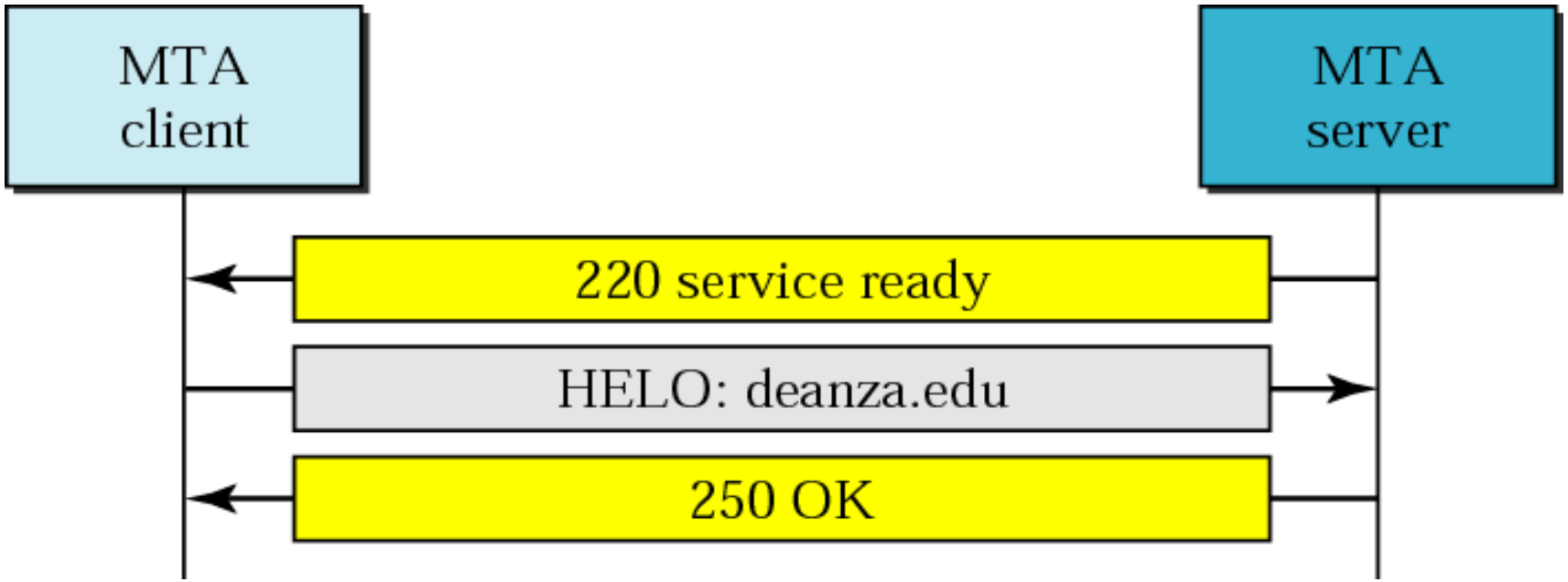
Respostas (1)

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

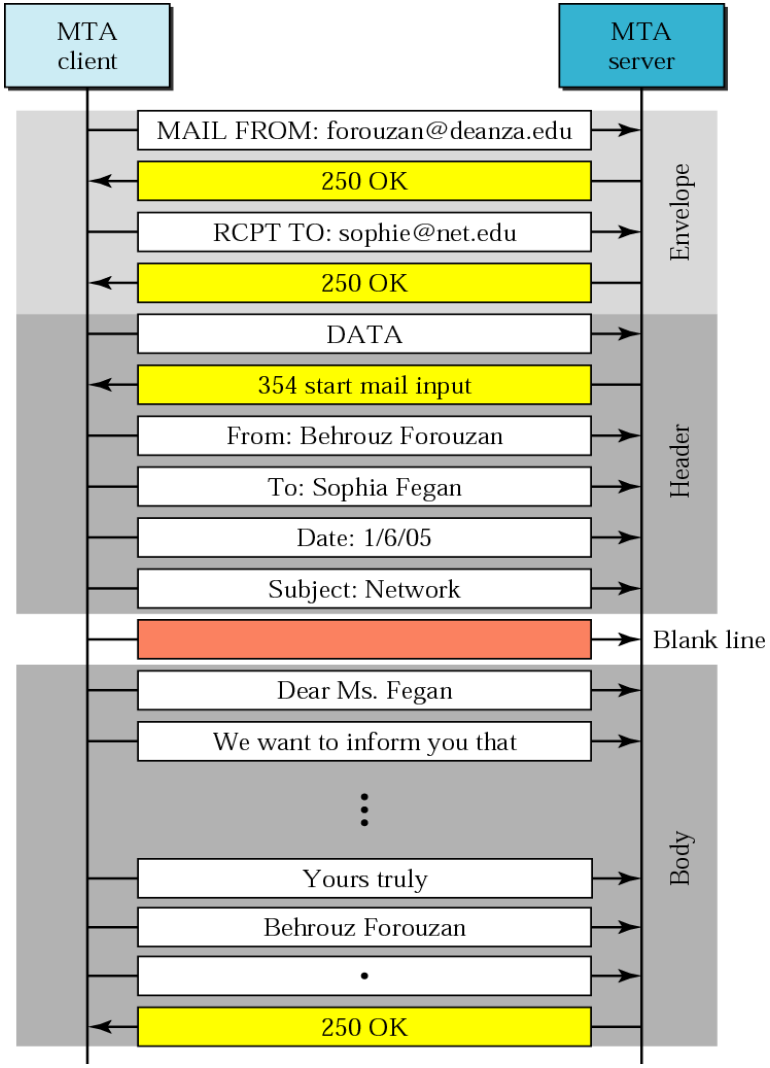
Respostas (2)

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

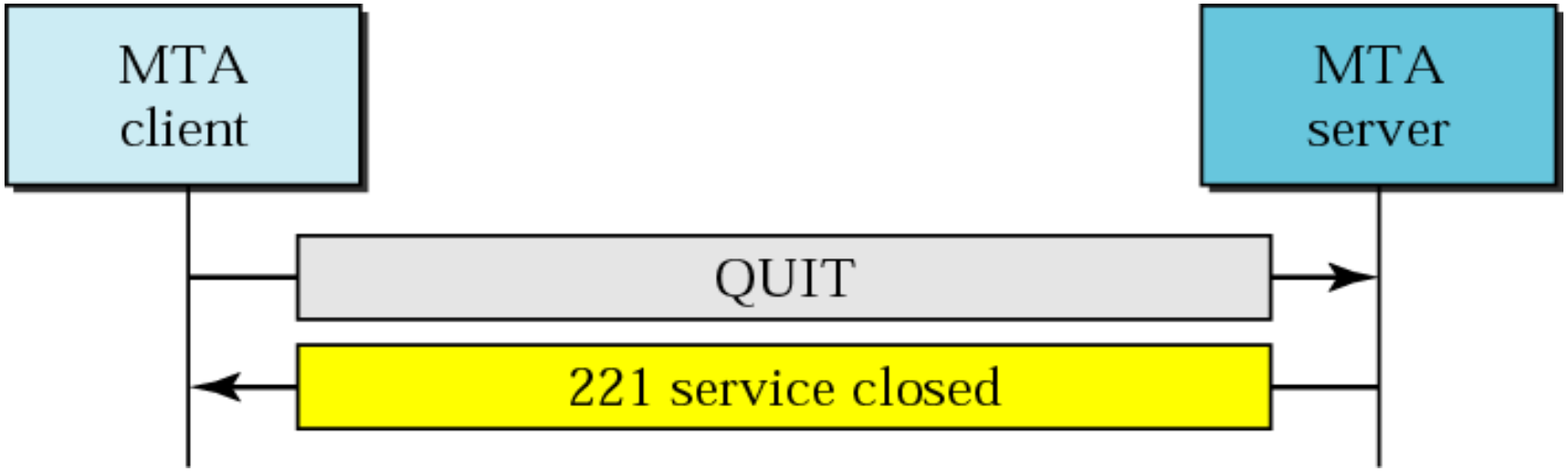
Estabelecimento da ligação



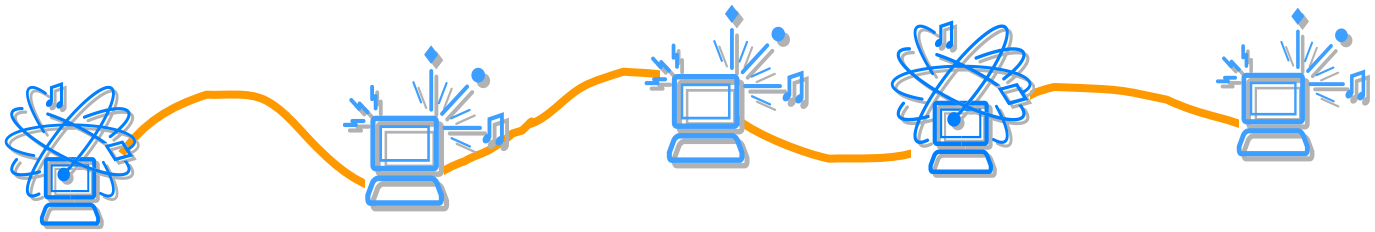
Transferência das mensagens



Fecho da ligação



Correio Electrónico

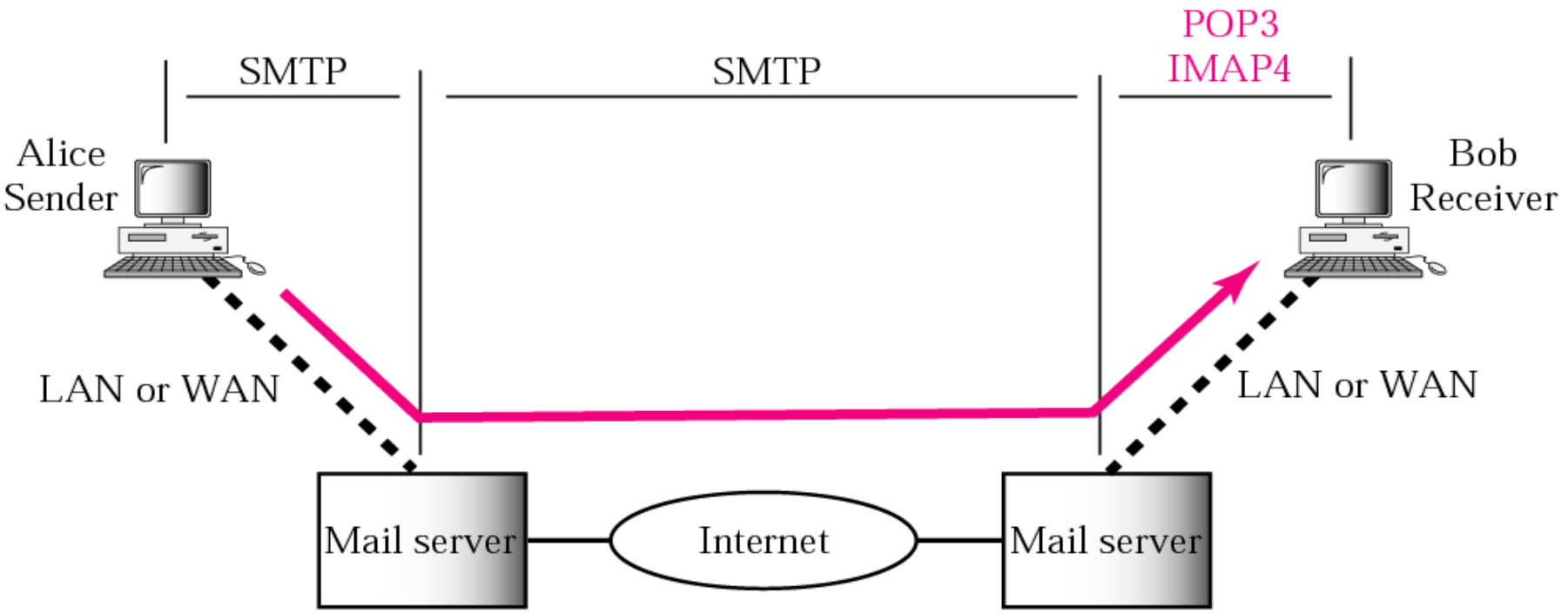


Message Access Agent

Modelos de funcionamento

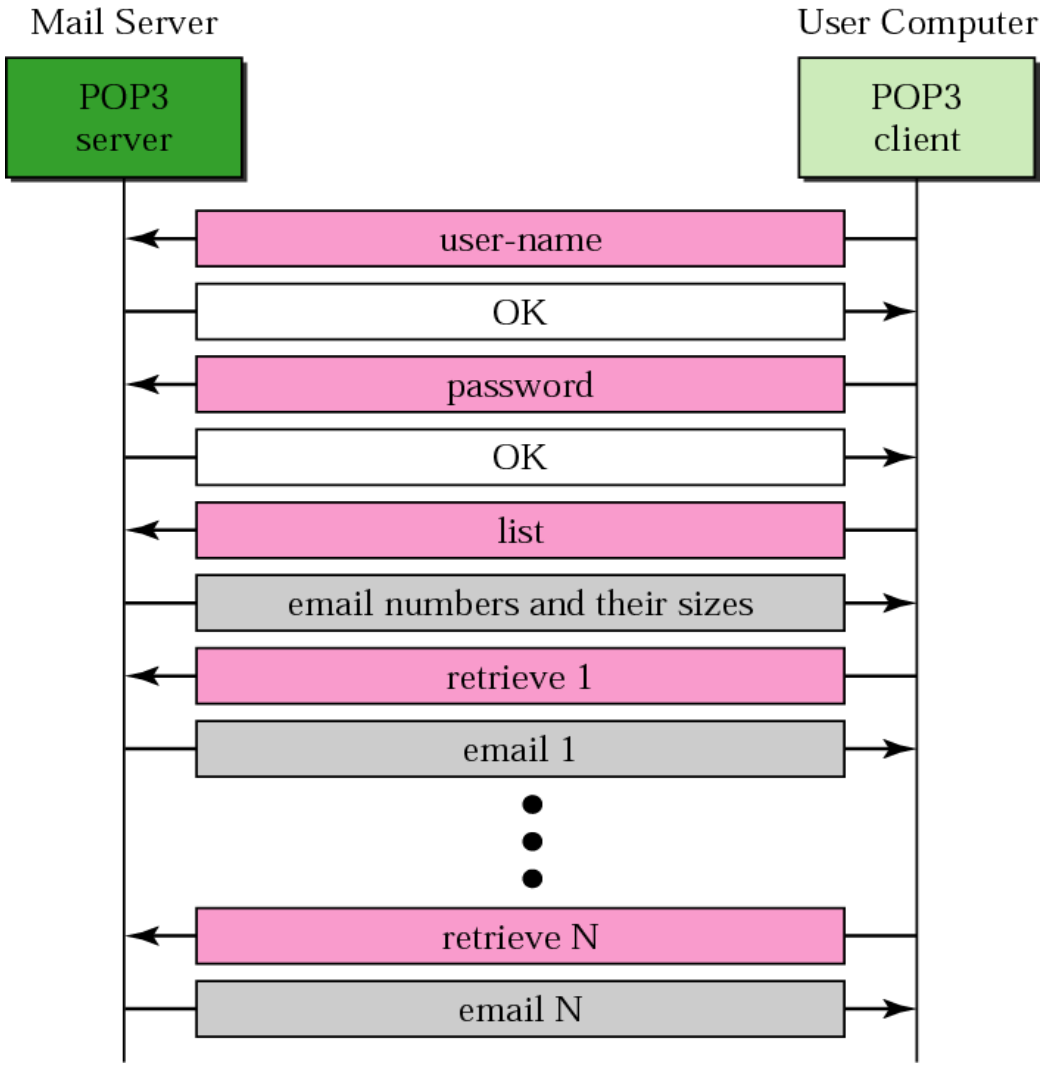
- Offline (POP3)
  - O cliente liga-se ao servidor e obtém todo o correio electrónico existente neste
  - Tudo é guardado no servidor
- Online (IMAP4)
  - Cliente liga-se ao servidor
  - Todos os e-mails são mantidos no servidor
- Disconnected (IMAP4)
  - O cliente está síncrono com o servidor
  - O servidor é tem a autoridade sobre os e-mails

PO3P (*Post Office Protocol*) e IMAP4 (*Internet Message Access Protocol*)



Tipicamente o MAA está à escuta no porto 110 (POP3) ou 143 (IMAP4)

POP3


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

Comandos

- USER name
- PASS password
- APOP name digest - (opcional)
- STAT - saber quantas mensagens que existem e tamanho total
- LIST - saber o tamanho de cada mensagem existentes
- RETR msg - Ler uma mensagem
- DELE msg - Apagar uma mensagem

- RSET <CRLF>
- NOOP <CRLF>
- QUIT <CRLF>

- TOP msg lines <CRLF>
- UIDL

Troca de mensagens POP

+OK <3262.1098353259@pop.net.ipl.pt>
USER pribeiro@net.ipl.pt
+OK
PASS MuitoSecreta
+OK
STAT
+OK 3 1500
LIST 2
+OK 2 500
QUIT
+OK

O comando STAT obtém o numero de mensagens e o tamanho destas em bytes

O comando LIST obtém o tamanho em bytes de uma mensagem individual, se não indicarmos a mensagem obtém de todas.

Legenda

- Respostas do servidor
- Comandos do cliente

IMAP

- Permite dividir o email por pastas
- Diferentes modos de operação
- Próximo do POP em termos de funcionamento
- Lista muito extensa de comandos

Exemplo (1)

```
S:  * OK IMAP4rev1 Service Ready
C:  a001 login ncruz@net.ipl.pt PassSegura
S:  a001 OK LOGIN completed
C:  a002 select inbox
S:  * 18 EXISTS
S:  * FLAGS (\Answered \Flagged \Deleted \Seen \Draft)
S:  * 2 RECENT
S:  * OK [UNSEEN 17] Message 17 is the first unseen message
S:  * OK [UIDVALIDITY 3857529045] UIDs valid
S:  a002 OK [READ-WRITE] SELECT completed
C:  a003 fetch 12 full
S:  * 12 FETCH (FLAGS (\Seen) INTERNALDATE "17-Jul-1996 02:44:25 -0700"
    RFC822.SIZE 4286 ENVELOPE ("Wed, 17 Jul 1996 02:23:25 -0700 (PDT)"
    "IMAP4rev1 WG mtg summary and minutes"
    (("Terry Gray" NIL "gray" "cac.washington.edu"))
    (("Terry Gray" NIL "gray" "cac.washington.edu"))
    (("Terry Gray" NIL "gray" "cac.washington.edu"))
    ((NIL NIL "imap" "cac.washington.edu"))
    ((NIL NIL "minutes" "CNRI.Reston.VA.US")
    ("John Klensin" NIL "KLENSIN" "MIT.EDU")) NIL NIL
    "<B27397-0100000@cac.washington.edu>")
```

LOGIN – Efectua o login

SELECT – Selecciona uma pasta

FETCH – Obter a mensagem 12 mas apenas as *flags*, data, tamanho e o envelope

Exemplo (2)

```
    BODY ("TEXT" "PLAIN" ("CHARSET" "US-ASCII") NIL NIL "7BIT" 3028
    92))
S:  a003 OK FETCH completed
C:  a004 fetch 12 body[header]
S:  * 12 FETCH (BODY[HEADER] {342}
S:  Date: Wed, 17 Jul 1996 02:23:25 -0700 (PDT)
S:  From: Terry Gray <gray@cac.washington.edu>
S:  Subject: IMAP4rev1 WG mtg summary and minutes
S:  To: imap@cac.washington.edu
S:  cc: minutes@CNRI.Reston.VA.US, John Klensin <KLENSIN@MIT.EDU>
S:  Message-Id: <B27397-0100000@cac.washington.edu>
S:  MIME-Version: 1.0
S:  Content-Type: TEXT/PLAIN; CHARSET=US-ASCII
S:
S:  )
S:  a004 OK FETCH completed
C:  a005 store 12 +flags \deleted
S:  * 12 FETCH (FLAGS (\Seen \Deleted))
S:  a005 OK +FLAGS completed
C:  a006 logout
S:  * BYE IMAP4rev1 server terminating connection
S:  a006 OK LOGOUT completed
```

FETCH – Obter a mensagem 12 mas apenas o cabeçalho

STORE – Alterar as flags da mensagem 12 para passar esta ao estado de apagada

Referências

- “Computer Networking, a top down approach featuring the Internet (4th edition)”, James F. Kurose (Author), Keith W. Ross, Addison-Wesley Longman.

- “TCP/IP Protocol Suite”, Behrouz A. Forouzan, Sophia C. Fegan, McGraw-Hill Professional.