

***:96 Overheads**

Part 3c: E-mail, SMTP, RFC822, MIME

More about this course about Internet application protocols can be found at URL:

<http://www.dsv.su.se/~jpalme/internet-course/Int-app-prot-kurs.html>

Last update: 23 Dec 2005

SMTP

- an interactive protocol

(Defined in RFC 821 and RFC2821)

HELO/EHLO	Opening session
MAIL FROM	Identifying sender
RCPT TO	Identifying recipient
DATA	Sending message body
VRFY	Check recipient name
EXPN	Expand alias/mailing list

SMTP delivery modes

MAIL FROM	To the recipient's mailbox
SEND FROM	Display on logged-in terminal
SOML FROM	Display on terminal if logged in, otherwise deliver to mailbox
SAML FROM	Deliver to mailbox and optionally display on terminal if logged in

Example of an SMTP dialogue

Sending agent command

Responding agent

HELO dsv.su.se

250 nexor.co.uk

MAIL FROM: jpalme@dsv.su.se

250 OK

RCPT TO: <j.onions@nexor.co.uk>

250 OK

RCPT TO: <seb@nexor.co.uk>

250 OK

DATA

354 Start mail
input; end with
<CRLF>.<CRLF>

... the lines of text ...

.

250 OK

QUIT

221 nexor.co.uk

SMTP syntax - 1

```

commands ::= "HELO " domain CRLF
          / "MAIL FROM: " route-addr CRLF
          / "MAIL FROM: " "<>" CRLF
          / "RCPT TO: " route-addr CRLF
          / "DATA" CRLF
          / "NOOP" CRLF
          / "RSET" CRLF
          / "QUIT" CRLF
          / optional

```

```

optional ::= "SEND FROM: " route-addr CRLF
          / "SOML FROM: " route-addr CRLF
          / "SAML FROM: " route-addr CRLF
          / "VRFY " string CRLF
          / "EXPN " string CRLF
          / "TURN" CRLF
          / "HELP" [ " " string] CRLF

```

SMTP syntax - 2

```
response ::=      *(code ["-"] [" " *text] CRLF)
                code      [" " *text] CRLF
```

```
code ::=      ("1" / "2" / "3" / "4" / "5")
              ("0" / "1" / "2" / / "5")
              1DIGIT
```

```
string ::= 1*(stext / quoted-pair)
```

```
stext ::= <any character, not including space or
specials>
```

```
text ::= <any character, including bare CR and
bare LF, but not including CRLF>
```

SMTP Reply codes (RFC 821)

First digit:

- 1 Positive preliminary (not used in SMTP)
- 2 Success
- 3 Ready but requires additional info
- 4 Transient failure
- 5 Permanent negative

Second digit:

- 0 Syntax (error)
- 1 Information requested in reply
- 2 Transport service issue
- 5 Application-specific issue**

Third Digit

To distinguish between reply codes with the same first two digits

Examples of reply codes to MAIL FROM:

250 Originator accepted

452 Out of local storage

500 Command syntax error

TRACE list for a spam message:

Return-Path: administrator@unixstory.org

X-Original-To: jpalme@dsv.su.se

Delivered-To: jpalme@dsv.su.se

Received: from av-in2.su.se (av-in2.su.se
[130.237.93.211])

by unni.dsv.su.se (Postfix) with ESMTTP id
246698B3B5

for <jpalme@dsv.su.se>; Tue, 22 Nov 2005 12:16:46
+0100 (CET)

Received: from localhost (av-in2.su.se [127.0.0.1])

by av-in2.su.se (Postfix) with ESMTTP id
167CA23EEBE

for <jpalme@dsv.su.se>; Tue, 22 Nov 2005 12:16:46
+0100 (CET)

Received: from av-in2.su.se ([127.0.0.1])
by localhost (av-in2.su.se [127.0.0.1]) (amavisd-
new, port 10024) with LMTP
id 16826-01-41 for <jpalme@dsv.su.se>; Tue, 22 Nov
2005 12:16:45 +0100 (CET)

Received: from mx1.su.se (mx1.su.se
[130.237.162.110])
by av-in2.su.se (Postfix) with ESMTP id
6B4F223EE97
for <jpalme@dsv.su.se>; Tue, 22 Nov 2005 12:16:45
+0100 (CET)

Received: from mta3.iomartmail.com
(mta3.iomartmail.com [62.128.193.153])
by mx1.su.se (Postfix) with ESMTP id 2EF382400A
for <jpalme@dsv.su.se>; Tue, 22 Nov 2005 12:16:44
+0100 (CET)

Received: from mta3.iomartmail.com (localhost
[127.0.0.1])

by mta3.iomartmail.com (8.12.8/8.12.8) with ESMTTP
id jAMBEkBw004968;

Tue, 22 Nov 2005 11:14:46 GMT

Received: from unkown ([196.202.65.92])
(authenticated bits=0)

by mta3.iomartmail.com (8.12.8/8.12.8) with ESMTTP
id jAMBDjIa003129;

Tue, 22 Nov 2005 11:14:41 GMT

Message-Id:

<200511221114.jAMBDjIa003129@mta3.iomartmail.com>

From: "Paypal Billing Departmentemail"
<administrator@unixstory.org>

Subject: Your Account Will Be Suspended

To: p1@canada.com

Content-Type: text/html;iso-8859-1

Reply-To: administrator@unixstory.org

Date: Tue, 22 Nov 2005 13:14:37 +0200

X-Priority: 3

X-Library: Indy 8.0.25

X-Virus-Scanned: by amavisd-new at av-in.su.se

X-Spam-Status: No, score=4.6 tagged_above=-99
required=7

tests=[BAYES_50=0.001, HTML_MESSAGE=0.001,
MIME_HEADER_CTYPE_ONLY=0,
MIME_HTML_ONLY=0.001, RCVD_IN_BL_SPAMCOP_NET=1.558,
SARE_HEAD_XLIB_INDY2=0.639, X_LIBRARY=2.4]

X-Spam-Score: 4.6

X-Spam-Level: ****

X-Spamfire-UID:

<200511221114.jAMBDjIa003129@mta3.iomartmail.com>

ESMTP (RFC 1869 SMTP Service Extensions; Obsoletes RFC 1651)

EHLO command

A client supporting ESTMP should open SMTP communication with EHLO instead of HELO. The full syntax of the EHLO command is

```
ehlo-cmd ::= "EHLO" SP domain CR LF
```

Responses from the server to the EHLO command:

Successful	<pre>250 domain [SP greeting] CR LF 250- domain [SP greeting] CR LF *(250- ehlo-line CR LF) 250 SP ehlo-line CR LF ehlo-line ::= ehlo-keyword * (SP ehlo-param)</pre>
Failure, try HELO or QUIT	554 Cannot list service extensions
Command recognized but argument unacceptable	501
EHLO recognized but not implemented	502
SMTP service temporarily not available	421

SMTP service extensions

Service extension	Keyword	Parameters	Verb	Defined in RFC
Send	SEND	none	SEND	2821, 1869
Send or Mail	SOML	none	SOML	821, 1869
Send and Mail	SAML	none	SAML	821, 1869
Expand	EXPN	none	EXPN	2821, 1869
Help	HELP	none	HELP	2821, 1869
Turn	TURN	none	TURN	821, 1869
Pipelining	PIPELINING	none	none	1854
Message size declaration	SIZE	adds optional parameter size-value ::= 1*20DIGIT no of octets	none	1870

Checkpoint/ restart	CHECKPOINT	adds optional parameter TRANSID to MAIL FROM command	none	1845
Large and binary MIME messages	CHUNKING	BDAT is used instead of DATA, and takes as parameter packet length and last packet indication	BDAT	1830
8bit- MIMEtransport	8BITMIME	adds optional parameter BODY to MAIL FROM, values 7BIT and 8BITMIME	none	1652
Delivery Status Notification Extension	DSN	adds optional parameters NOTIFY and ORCPT to RCPT command and RET and ENVID to the MAIL command	none	1891, 1892, 1894

Examples of ESTMP establishment interactions

(1)
Only mandatory SMTP commands provided

```
S: <wait for connection on TCP port 25>
C: <open connection to server>
S: 220 dbc.mtview.ca.us SMTP service ready
C: EHLO ymir.claremont.edu
S: 250 dbc.mtview.ca.us says hello
```

(2)

```
S: <wait for connection on TCP port 25>
C: <open connection to server>
S: 220 dbc.mtview.ca.us SMTP service ready
C: EHLO ymir.claremont.edu
S: 250-dbc.mtview.ca.us says hello
```

Basic optional services: EXPN,
HELP;

```
S: 250-EXPN
S: 250-HELP
```

Standard service extension:
8BITMIME;

```
S: 250-8BITMIME
```

Unregistered services: XONE and
XVBR

```
S: 250-XONE
S: 250 XVBR
```

(3)
ESTMP not supported

```
S: wait for connection on TCP port 25>
C: <open connection to server>
S: 220 dbc.mtview.ca.us SMTP service ready
C: EHLO ymir.claremont.edu
S: 500 Command not recognized: EHLO
C: HELO ymir.claremont.edu
```

SMTP command pipelining (RFC 1854)

Without pipelining: 9 turnarounds:

```

S: <wait for open connection>
C: <open connection to server>
S: 220 innosoft.com SMTP ready
C: HELO dbc.mtview.ca.us
S: 250 innosoft.com
C: MAIL FROM:<mrose@dbc..ca.us>
S: 250 sender <mrose@dbc..ca.us> OK
C: RCPT TO:<ned@innosoft.com>
S: 250 recipient <ned@in.com> OK
C: RCPT TO:<dan@in.com>
S: 250 recipient <dan@in.com> OK
C: RCPT TO:<kvc@in.com>
S: 250 recipient <kvc@in.com> OK
C: DATA
S: 354 enter mail, end with line
containing only "."
...
C: .
S: 250 message sent
C: QUIT
S: 221 goodbye

```

With pipelining: 4 turnarounds:

```

S: <wait for open connection>
C: <open connection to server>
S: 220 innosoft.com SMTP ready
C: EHLO dbc.mtview.ca.us
S: 250-innosoft.com
S: 250 PIPELINING
C: MAIL FROM:<mrose@dbc..ca.us>
C: RCPT TO:<ned@innosoft.com>
C: RCPT TO:<dan@innosoft.com>
C: RCPT TO:<kvc@innosoft.com>
C: DATA
S: 250 sender <mrose@dbc..ca.us> OK
S: 250 recipient <ned@in.com> OK
S: 250 recipient <dan@in.com> OK
S: 250 recipient <kvc@in.com> OK
S: 354 enter mail, end with line
containing only "."
...
C: .
C: QUIT
S: 250 message sent
S: 221 goodbye

```

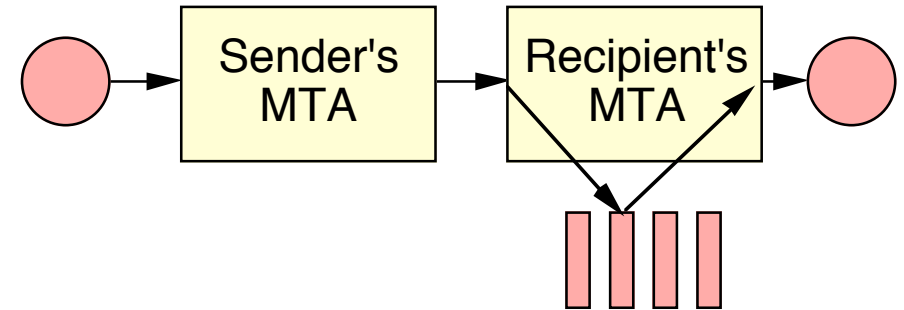

Delivery status notifications

RFC 1891: SMTP service extension

RFC 1892: Multipart/report content-type

RFC 1893: Enhanced status codes

RFC 1894: Delivery Status Notification format



SMTP command	Optional parameter	Description
RCPT TO	NOTIFY	Values: NEVER SUCCESS FAILURE DELAY (= willingness to accept notifications if delivery is delayed)
RCPT TO	ORCPT	Original sender-specified recipient address (needed to allow recipient of notifications to correlate notifications with original recipients)
MAIL FROM	RET	Values: FULL HDRS
MAIL FROM	ENVID	Transaction ID to be returned with notification

The Multipart/report MIME Content Type (RFC 1892)

Part 1 (mandatory):	Human readable message	Any content type. Multipart/alternative can be used, for example to give message in more than one language.
Part 2 (mandatory):	Machine parsable account of reported event	Message/delivery-status (defined in RFC 1894)
Part 3 (optional):	Returned message or portion thereof	Text/rfc822-headers

Example of Delivery Status Report 1

Date: Thu, 7 Jul 1994 17:16:05 -0400

From: Mail Delivery Subsystem <MAILER-DAEMON@CS.UTK.EDU>

Message-Id: <199407072116.RAA14128@CS.UTK.EDU>

Subject: Returned mail: Cannot send message for 5 days

To: <owner-info-mime@cs.utk.edu>

MIME-Version: 1.0

Content-Type: multipart/report; report-type=delivery-status;

boundary="RAA14128.773615765/CS.UTK.EDU"

--RAA14128.773615765/CS.UTK.EDU

The original message was received at Sat, 2 Jul 1994
17:10:28 -0400

from root@localhost

----- The following addresses had delivery
problems -----

<louis1@larry.slip.umd.edu> (unrecoverable error)

----- Transcript of session follows -----
<louis1@larry.slip.umd.edu>... Deferred: Connection
timed out

with larry.slip.umd.edu.

Message could not be delivered for 5 days

Message will be deleted from queue

--RAA14128.773615765/CS.UTK.EDU

content-type: message/delivery-status

Reporting-MTA: dns; cs.utk.edu

Original-Recipient: rfc822;louis1@larry.slip.umd.edu
Final-Recipient: rfc822;louis1@larry.slip.umd.edu
Action: failed
Status: 4.0.0
Diagnostic-Code: smtp; 426 connection timed out
Last-Attempt-Date: Thu, 7 Jul 1994 17:15:49 -0400

--RAA14128.773615765/CS.UTK.EDU
content-type: message/rfc822

[original message goes here]

--RAA14128.773615765/CS.UTK.EDU--

Delivery Status Report fields - 1

per-message-fields =

[original-envelope-id-field CRLF]	Envelope identifier from request.
reporting-mta-field CRLF	MTA which attempted to perform the delivery or relay.
[dsn-gateway-field CRLF]	Name of gateway which transformed foreign delivery report.
[received-from-mta-field CRLF]	MTA from which the message was received.
[arrival-date-field CRLF]	Arrival date to reporting MTA.
*(extension-field CRLF)	

Delivery Status Report fields - 2

per-recipient-fields =

[original-recipient-field CRLF]	Original recipient when sent.
final-recipient-field CRLF	Final recipient to whom delivery status is reported.
action-field CRLF	failed, delyaed, delivered, relayed (to non-DSA environment), expanded.
status-field CRLF	Status code (RFC 1893) (DIGIT "." 1*DIGIT "." 1*3DIGIT
[remote-mta-field CRLF]	Name of MTA which reported to reporting MTA.
[diagnostic-code-field CRLF]	Sometimes less preciste diagnostic code from remote MTA.
[last-attempt-date-field CRLF]	Time of last delivery attempt.
[final-log-id-field CRLF]	Log entry in final MTA logs.
[will-retry-until-field CRLF]	Time when delivery attempts will stop.
*(extension-field CRLF)	

Example of a Message heading

From comp.protocols.iso.x400-outbound-request@ics.
uci.edu Wed Nov 4 04:16 MET 1992

Received: from sunic.sunet.se by heron.dafa.se
(16.6/SiteCap-3.0)

id AA09605; Wed, 4 Nov 92 04:16:24 +0100

Received: from USENET by q2.ics.uci.edu id aa14789; 3 Nov
92

13:46 PST

From: "Paul.Rarey" <prarey@ssf-sys.dhl.com>

Subject: Re: X400 address

Message-ID: <921103134349.16483@maverick.ssf-
sys.DHL.COM>

Encoding: 35 TEXT, 12 TEXT SIGNATURE

X-Mailer: Poste 2.0

Date: 3 Nov 92 21:46:13 +00:00

To: mhsnews@ics.uci.edu,

Piet Beertema <mcvax!cwi.nl!piet@uunet.uu.net>

cc: ifip65@ics.uci.edu

Some Internet message heading fields

Received

From

To

CC

Bcc

Message-ID

Reply-To

In-Reply-To

References

Date

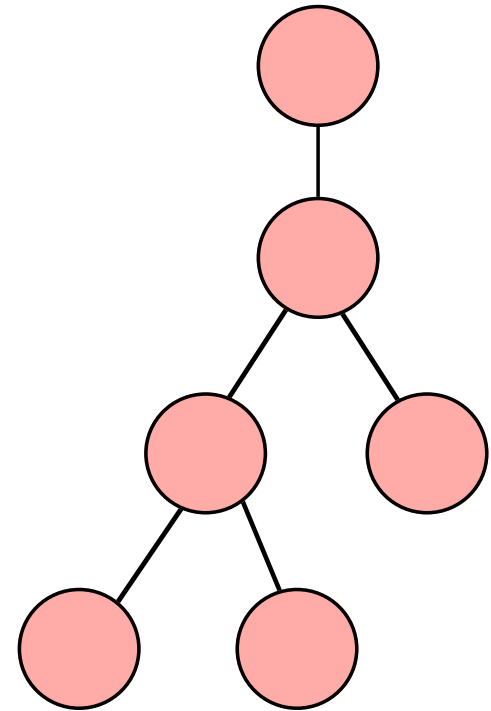
Subject

Usenet News

Newsgroups

Followup-To

Control



Group sending:

```

From: Nils Nielsson <nilsn@foo.bar>
To: Flower-lovers:
    Mary Smith <marys@foo.bar>,
    Eliza Brown <elizab@foo.bar>;
Subject: Growing roses indoors
  
```

Outbox/Inbox/Folder listing:

John Svensson	22 Dec 2005	This is a subject of a message
Mary Smith <m	23 Dec 2005	Growing roses indoors
Flower-lovers:	23 Dec 2005	Growing roses indoors

Sending mail without disclosing recipients to each other:

```
From: Nils Nielsson <nilsn@foo.bar>  
To: My love;;  
Bcc: Mary Smith <marys@foo.bar>,  
      Eliza Brown <elizab@foo.bar>  
Subject: You are the only one I love
```

Usage: To hide a very long list

Alternative: Put your own e-mail address into the To: header.

RFC 2822 syntax definitions 1

```
message          =      (fields / obs-fields)
                   [CRLF body]
body             =     >(*998text CRLF) *998text
```

RFC 2822 syntax definitions 2

```
fields          =      *(trace
                        *(resent-date /
                          resent-from /
                          resent-sender /
                          resent-to /
                          resent-cc /
                          resent-bcc /
                          resent-msg-id))
                        *(orig-date /
                          from /
                          sender /
                          reply-to /
                          to /
                          cc /
                          bcc /
                          message-id /
                          in-reply-to /
                          references /
                          subject /
                          comments /
                          keywords /
                          optional-field)
```

RFC 2822 syntax definitions 3

```
from           =      "From:" mailbox-list CRLF

sender         =      "Sender:" mailbox CRLF

reply-to      =      "Reply-To:" address-list CRLF

to            =      "To:" address-list CRLF

cc           =      "Cc:" address-list CRLF

bcc          =      "Bcc:" (address-list / [CFWS]) CRLF
message-id   =      "Message-ID:" msg-id CRLF

in-reply-to   =      "In-Reply-To:" 1*msg-id CRLF

references    =      "References:" 1*msg-id CRLF
```

RFC 2822 syntax definitions 4

msg-id = [CFWS] "<" id-left "@" id-right ">" [CFWS]

id-left = dot-atom-text / no-fold-quote /
obs-id-left

id-right = dot-atom-text / no-fold-literal /
obs-id-right

no-fold-quote = DQUOTE *(qtext / quoted-pair) DQUOTE

no-fold-literal = "[" *(dtext / quoted-pair) "]"

subject = "Subject:" unstructured CRLF

comments = "Comments:" unstructured CRLF

keywords = "Keywords:" phrase *(", " phrase) CRLF

RFC 2822 syntax definitions 5

```
resent-date      = "Resent-Date:" date-time CRLF
resent-from      = "Resent-From:" mailbox-list CRLF
resent-sender    = "Resent-Sender:" mailbox CRLF
resent-to        = "Resent-To:" address-list CRLF
resent-cc        = "Resent-Cc:" address-list CRLF
resent-bcc       = "Resent-Bcc:" (address-list / [CFWS])
CRLF
resent-msg-id    = "Resent-Message-ID:" msg-id CRLF
```


RFC 2822 syntax definitions 6

```
trace           = [return]
                 1*received

return          = "Return-Path:" path CRLF

path            = ([CFWS] "<" ([CFWS] / addr-spec) ">" [CFWS]) /
                 obs-path

received        = "Received:" name-val-list ";" date-time CRLF

name-val-list   = [CFWS] [name-val-pair *(CFWS name-val-pair)]

name-val-pair   = item-name CFWS item-value

item-name       = ALPHA *([ "-" ] (ALPHA / DIGIT))

item-value      = 1*angle-addr / addr-spec /
                 atom / domain / msg-id
```

RFC 2822 “obs-” features

Proper format:

From: "John F. Kennedy" <johnf@white-house.gov>

“obs” format:

From: John F. Kennedy <johnf@white-house.gov>

Syntax definition:

```

mailbox-list  = (mailbox *(", " mailbox)) / obs-mbox-list
mailbox       = name-addr / addr-spec
name-addr    = [display-name] angle-addr
display-name = phrase
phrase       = 1*word / obs-phrase
word         = atom / quoted-string
obs-phrase   = word *(word / "." / CFWS)
obs-mbox-list = 1*([mailbox] [CFWS] ", " [CFWS]) [mailbox]

```

Multipurpose Internet Mail Extensions (MIME)

- Multiple objects in one message.
- Unlimited line length and message length.
- Character sets other than IA5 (7-bit ASCII).
- Binary and application-specific files.
- Diagrams, pictures, voice, video, and multimedia.
- References to files, which can be retrieved.
- RFC 1522: Non-ascii characters in message headings

MIME Encoding of Data

Encoding type

Example

7Bit

Shrimps sandwich

Note that `R}ksm|rg{s` is not 7BIT encoding, it is faulty usage of MIME

Quoted-Printable

`R=E4ksm=F6rg=E5s`

Base64

`UuRrc232cmf1cw0KDQo=`

8Bit

Räksmörgås

Binary

`010100101000101001101011, etc.`

Example of a MIME-Encoded Message-1a

Test message containing 8-bit characters.
AE=Ä, OE=Ö.

**H
E
A
D
I
N
G**

```
Return-Path: <jpalme@ester.dsv.su.se>
Date: Sun, 26 Sep 1993 18:49:01 +0100 (MET)
From: Jacob Palme DSV <jpalme@dsv.su.se>
Subject: A pine message
To: Lars Enderin <larse@dialog.se>
Message-Id: <3.85.93.A27024-0200000@ester>
Mime-Version: 1.0
Content-Type: MULTIPART/MIXED; BOUNDARY="1430317162"
```

**P
A
R
T
1**

--1430317162

Content-Type: TEXT/PLAIN; CHARSET=ISO 8859-1

Content-Transfer-Encoding: QUOTED-PRINTABLE

Test message containing 8-bit characters.

AE=3D=80, OE=3D=85.

Test message containing 8-bit characters.

AE=3D=80, OE=3D=85.

**P
A
R
T
2**

--1430317162

Content-Type: TEXT/PLAIN; CHARSET=ISO 8859-1

Content-Transfer-Encoding: BASE64

VGVzdCBtZXNzYWdlIGNvbnRhaW5pbmcgOC1iaXQgY2hhcmFjdGVyc

gCwgT0U9hS4K

--1430317162--

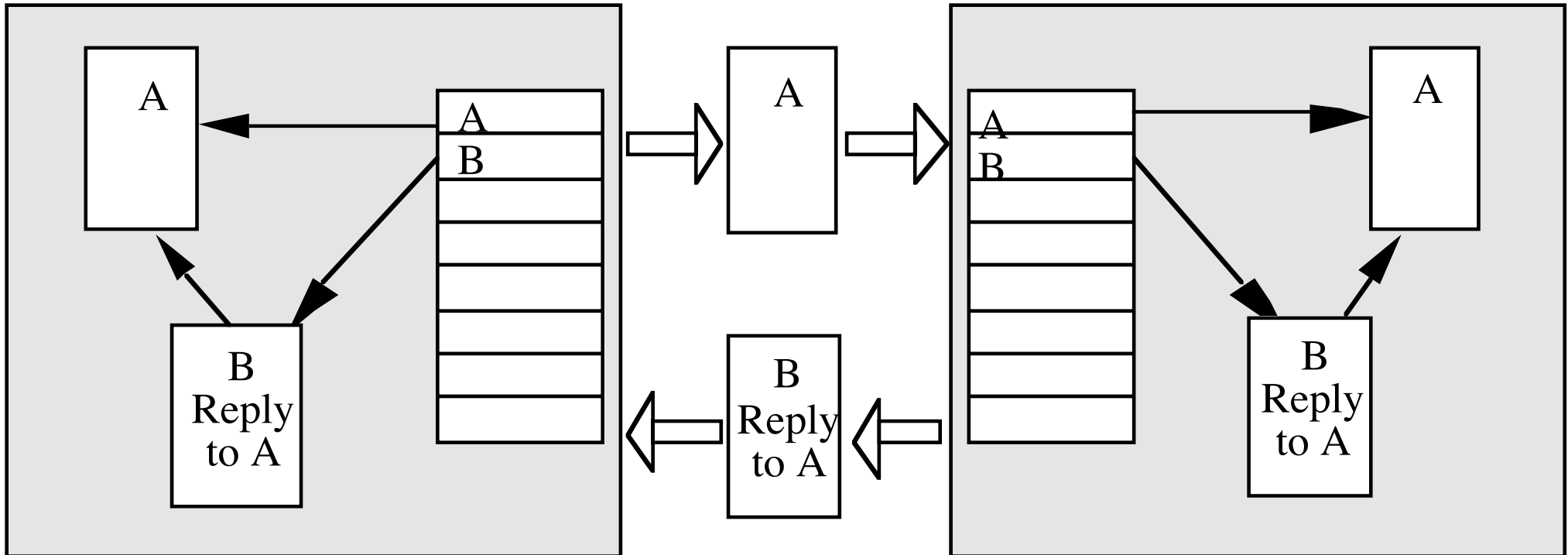
Use of Message-Ids to identify replies

Message
data base

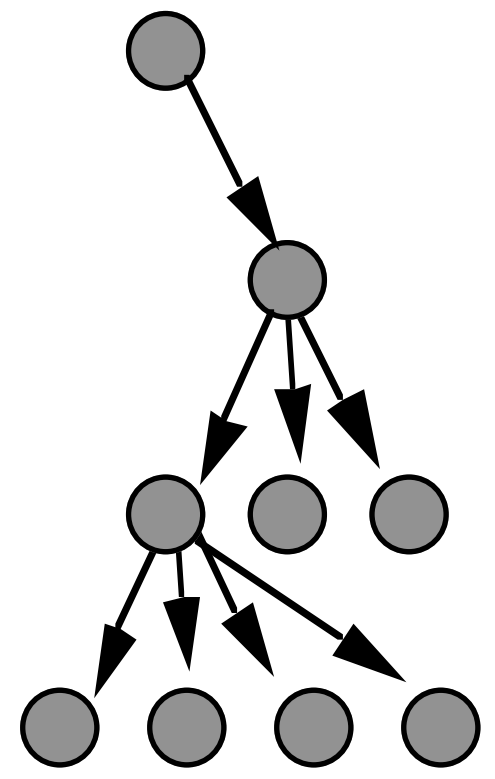
ID
file

ID
file

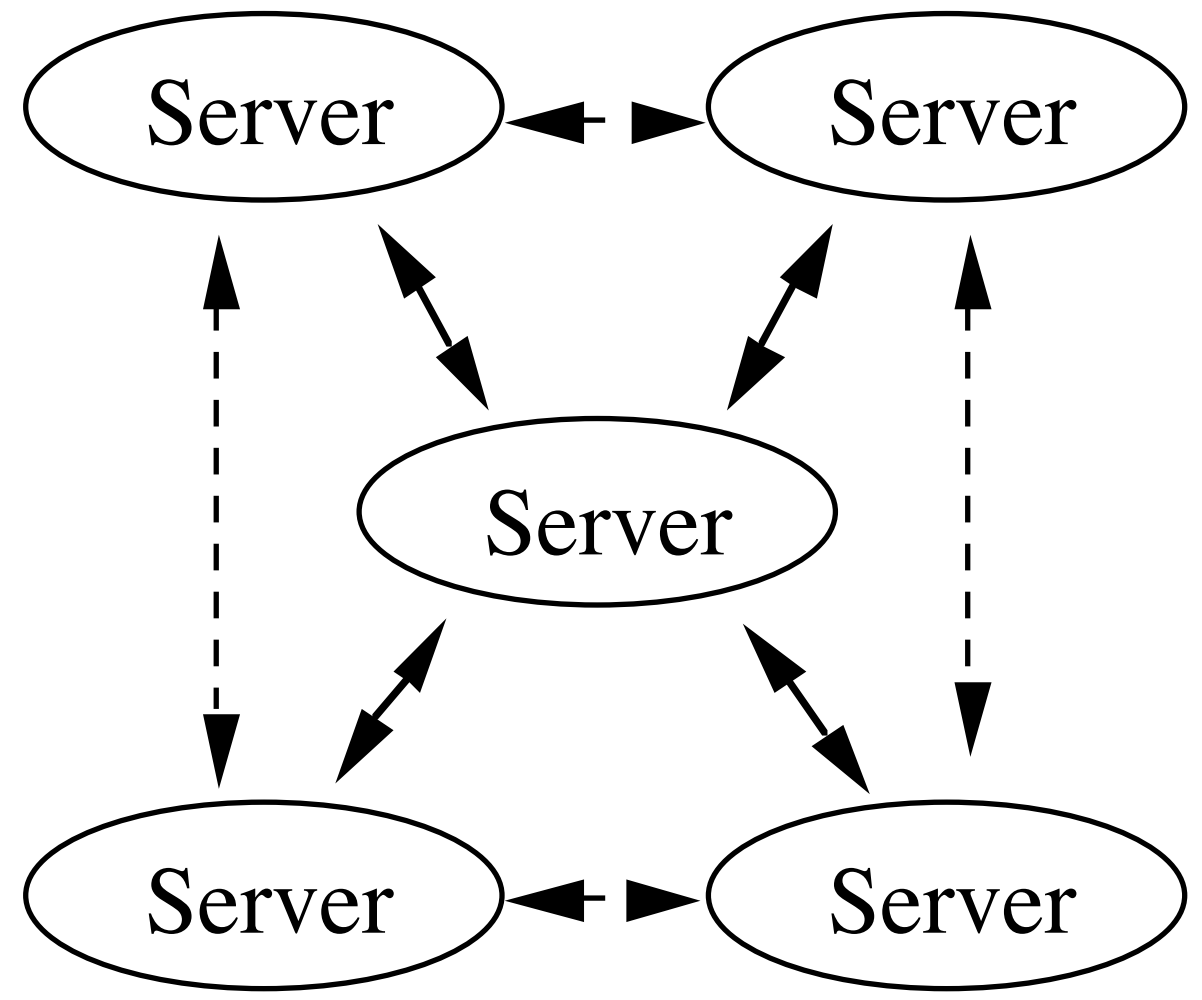
Message
data base

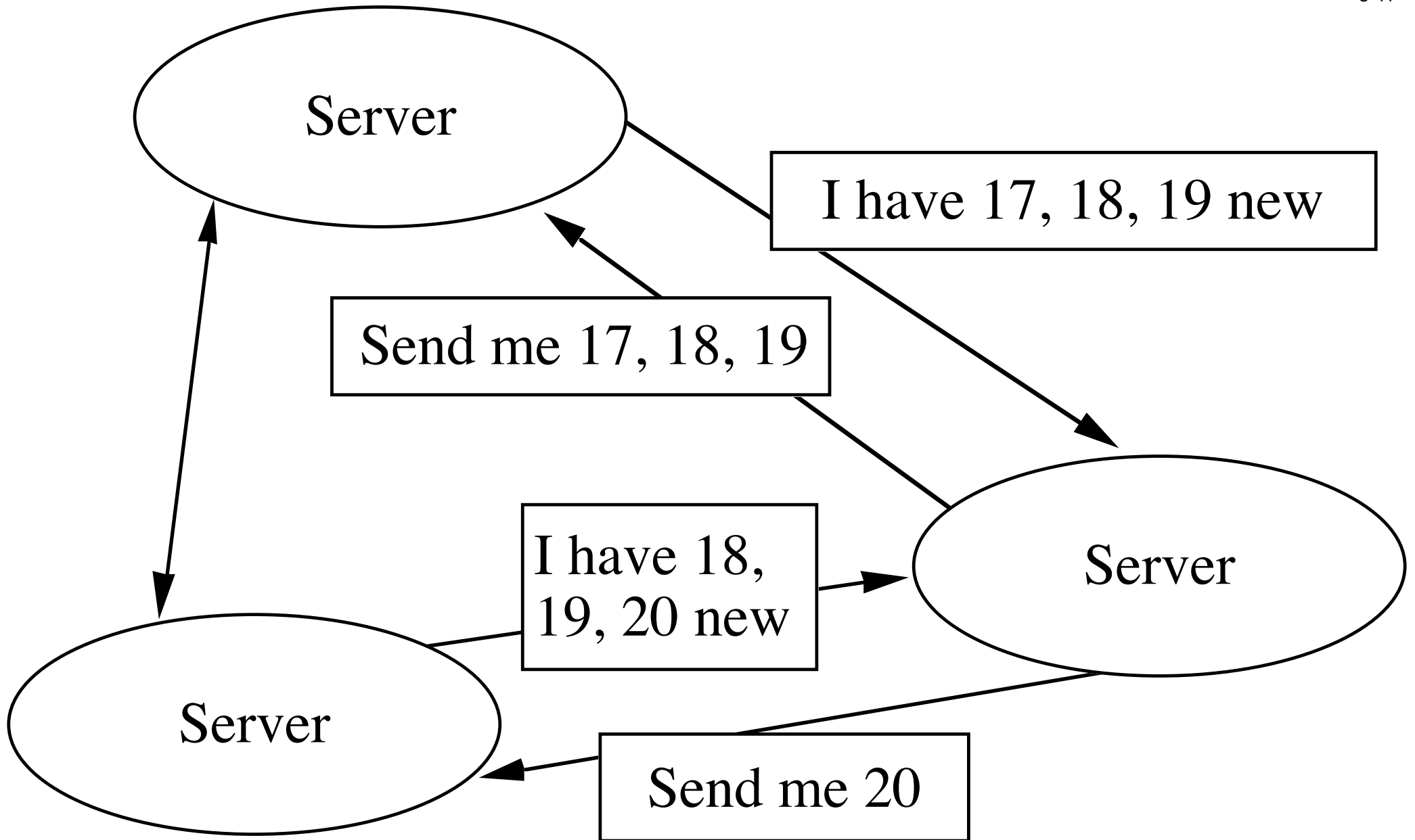


Distribution lists

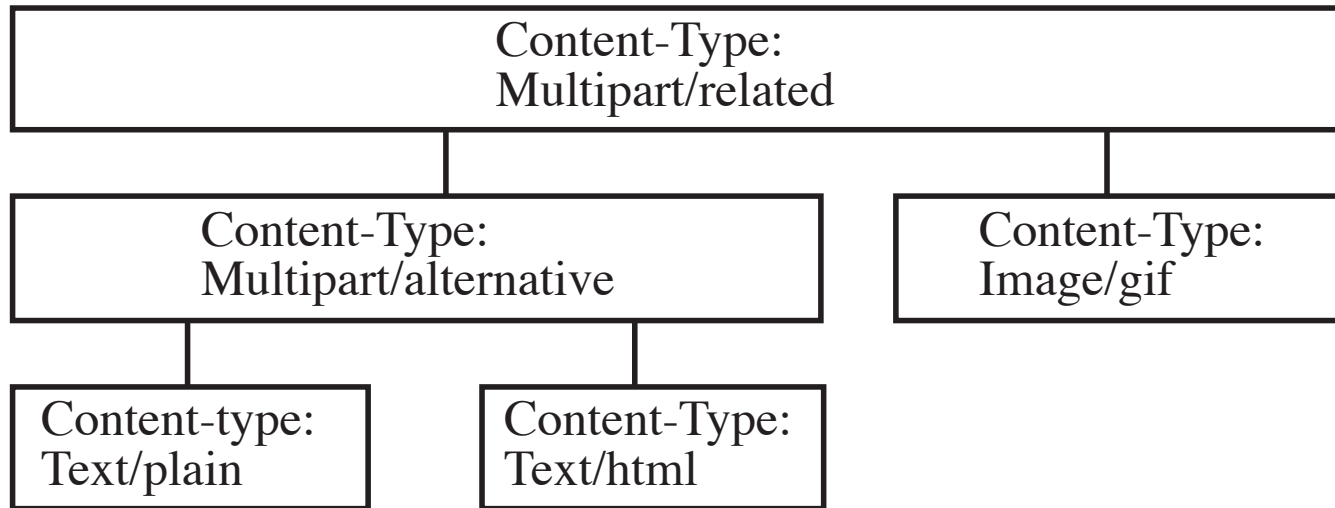


Usenet News distribution method

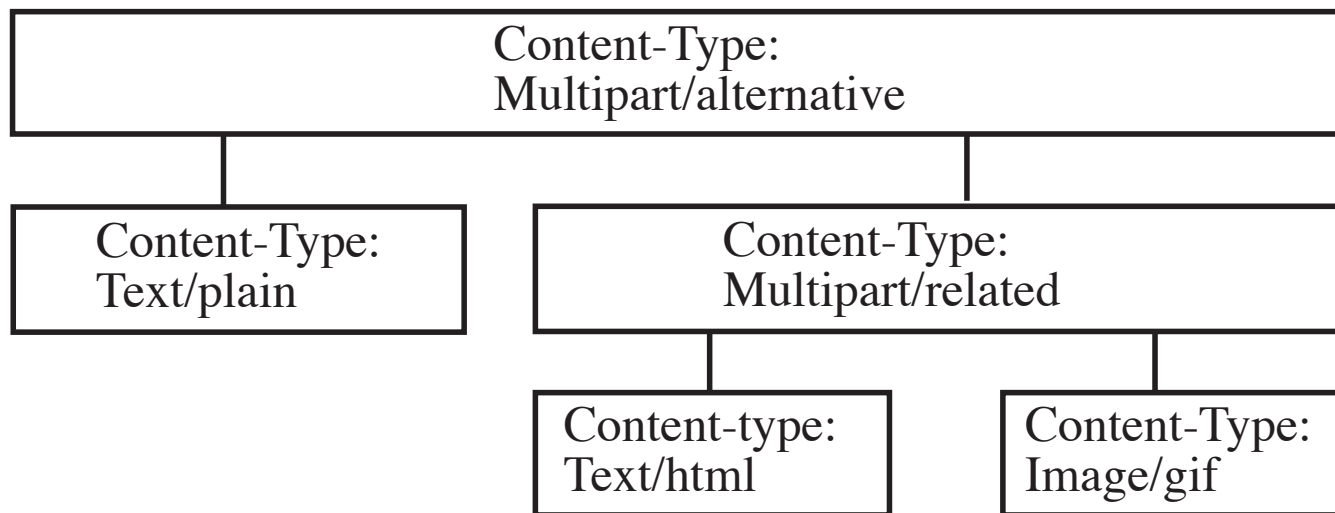




Multipart Messages in MHTML



With the
multipart/alternative
inside the
multipart/related



With the
multipart/alternative
outside the
multipart/related

Multipart/related (HTML with inline objects)

RFC 2110-
2112

Method 1

```
Content-Type:
Multipart/related
```

```
Content-Type: Text/html
```

Here is a picture

```

```

```
Content-Type: Image/gif
Content-ID: :12345@jp@host.nu
```

```
VGvzdCBtZXNzYWdlIGNvbnRhaW5pbm
```

Method 2

```
Content-Type: Multipart/related
```

```
Content-Type: Text/html
```

Here is a picture

```

```

```
Content-Type: Image/gif
Content-location: my-
picture.gif
```

```
VGvzdCBtZXNzYWdlIGNvbnRhaW5pbm
```

Combining multipart/alternative with multipart/related

Alternative outside

Content-Type: Multipart/alternative
Content-Type: Text/plain Plain text version ...
Content-Type: Multipart/related
Content-Type: Text/html HTML text version ...
Content-Type: Image/gif

Related outside

Content-Type: Multipart/related
Content-Type: multipart/alternative
Content-Type: Text/plain Plain text version...
Content-Type: Text/html HTML text version ...
Content-Type: Image/gif

Tentamen

Glöm inte bort att du måste anmäla dig om du vill delta i tentamen på denna kurs!