

Ch 28. SMTP: **Simple Mail Transfer Protocol**

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Summary

Introduction

- MTA (Message Transfer Agent)
 - Exchange of mail using TCP

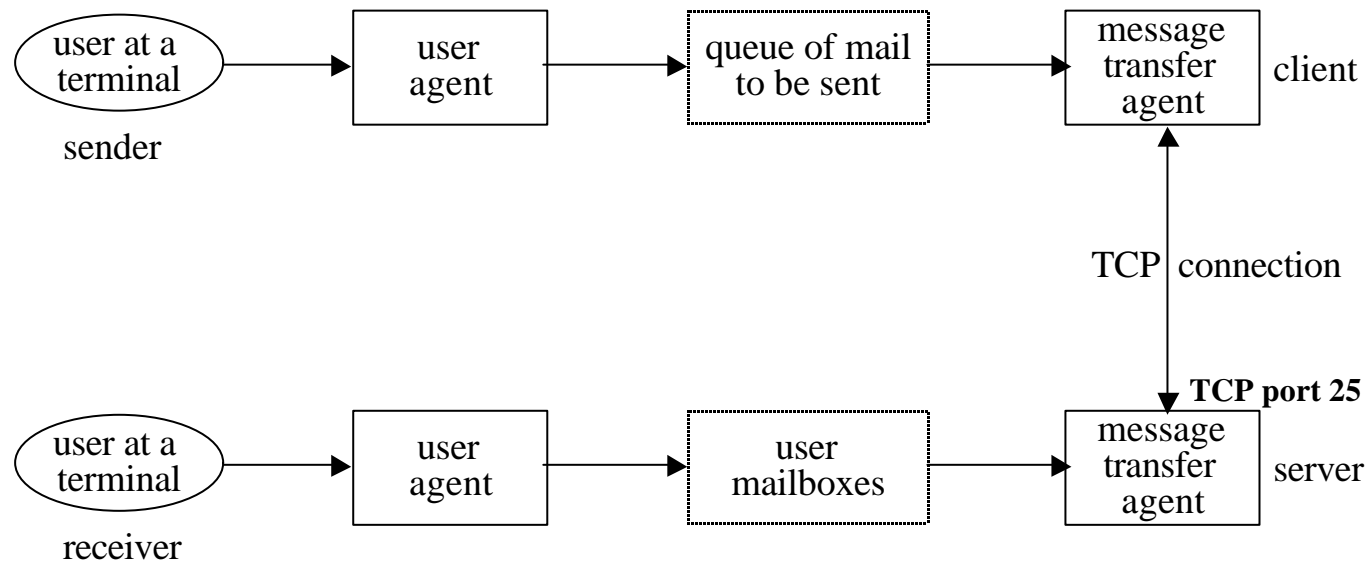


Figure 28.1 Outline of Internet electronic mail

SMTP Protocol

- Simple example

```
Sun % mail -v rstevens@noao.edu
To: rstevens@noao.edu
Subject: testing

1, 2, 3.
.
Sending letter ...rstevens@noao.edu ...

Connecting to mailhost via ether ...
Trying 140.252.1.54 ... Connected.
220 noao.edu Sendmail 4.1/SQG-Noao.G89 ready at Mon, 19 Jul 93 12:47:34 MST

>>> HELO sun.tuc.noao.edu.
250 noao.edu Hello sun.tuc.noao.edu., pleased to meet you

>>> MAIL From : <rstevens@sun.tuc.noao.edu>
250 <rstevens@sun.tuc.noao.edu>... Sender ok

>>> RCPT To : <rstevens@noao.edu>
250 <rstevens@noao.edu>... Recipient ok

>>> DATA
354 Enter mail, end with "." on a line by itself

>>> .
250 Mail accepted

>>> QUIT
221 noao.edu delivering mail

rstevens@noao.edu ... Sent
sent.
```

SMTP Protocol

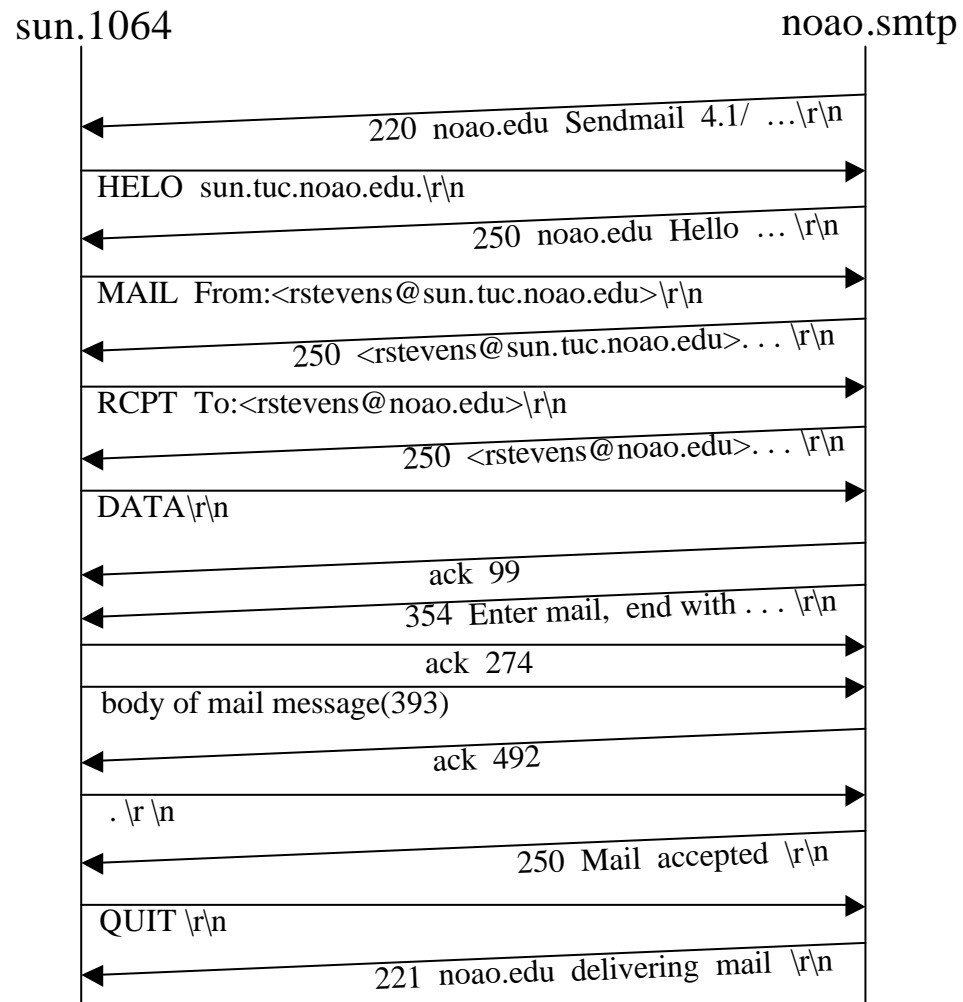


Figure 28.2 Basic SMTP mail delivery.

SMTP Protocol

- SMTP Commands
 - 8-commands : HELO, MAIL, RCPT, DATA, QUIT, RSET, VRFY, NOOP
 - RSET
 - abort the current mail transaction, reset both ends
 - VRFY
 - client ask the sender to verify a recipient address, without sending mail to the recipient
 - NOOP
 - force the server to respond with an OK reply code
 - Optional command
 - EXPN : expands a mailing list
 - TURN : the client and server switch roles
 - SEND, SOML, SAML : replace the MAIL command

SMTP Protocol

- Envelopes, Headers, and Body
 - envelope
 - used by the MTAs for delivery
 - Specified by the two SMTP commands (MAIL, RCPT)
 - header
 - Used by the user agent
 - body
 - the content of the message from sending user to receiving user
 - specify the body as lines of NVT ASCII text
- User agent : add headers to body, passes it to the MTA (DATA command)
- MTA : add headers, envelope, send to another MTA

SMTP Protocol

- Relay Agents

- has a hostname of *mailhost* in the local domain
- all the individual systems are configured to send their mail to this host
- simplify the configuration of all MTAs other than the relay system's MTA
 - If the host used as the relay changes, only its DNS name need change

sun %	host	mailhost		
mailhost.tuc.noao.edu	CNAME	noao.edu		canonical name
noao.edu	A	140.252.1.54		its real IP address

- one system act as the mail hub, hiding all the individual systems

SMTP Protocol

- NVT ASCII
 - SMTP uses NVT ASCII for envelope, header, body
 - 7-bit character code, transmitted as 8-bit bytes, with the high-order bit set to 0
 - extended SMTP, multimedia mail (MIME)
- Retry Intervals
 - If the delivery fails
 - the MTA queue the message, try again later
 - initial timeout of at least 30 minutes
 - for at least 4-5 days
 - try two connection attempts during the first hour that the message is in the queue

SMTP Examples

- MX Records: Host Not Directly Connected to the Internet
 - MX : mail exchange record

<pre>Sun % mail -v ron@mlfarm.com To: ron@mlfarm.com Subject: MX test message Sending letter . . . ron@mlfarm.com ... Connecting to mlfarm.com via tcp ... Mail exchanger is mercury.hsi.com Trying 143.122.1.91 ...connected. 220 mercury.hsi.com</pre>	<pre>Sun % host -a -v -t mx mlfarm.com The following answer is not authoritative: mlfarm.com 86388 IN MX 10 mercury.hsi.com mlfarm.com 86388 IN MX 15 hsi86.hsi.com Additional information : mercury.hsi.com 86388 IN A 143.122.1.91 hsi86.hsi.com 172762 IN A 143.122.1.6</pre>
---	---

<pre>1 0.0 sun.1624 > noao.edu.53: 2+ MX? mlfarm.com. (28) 2 0.445572 (0.4456) noao.eddo.53 > sun.1624: 2* 2/0/2 MX mercury.his.com.10 (113) 3 0.505739 (0.0602) sun.1143 > mercury.hsi.com.25: S 1617536000 : 1617536000 (0) win 4096 4 0.985428 (0.4797) mercury.hsi.com.25 > sun.1143: S 1832064000 : 1832064000 (0) ack 1617536001 sin 16384 5 0.986003 (0.0006) sun.1143 > mercury.hsi.com.25: . ack 1 win 4096 6 1.735360 (0.7494) mercury.hsi.com.25 > sun.1143: P 1:90 (89) ack 1 win 16384</pre>
--

SMTP Examples

- The steps are executed by the MTA (Sendmail)
 - send mail to rstevens@mailhost.tuc.noao.edu from sun
 - Sendmail asks the DNS for **CNAME records** for mailhost.tuc.noao.edu

```
sun % host -t cname mailhost.tuc.noao.edu
mailhost.tuc.noao.edu CNAME noao.edu
```

- DNS query is issued for CNAME records for noao.edu
- Sendmail asks the DNS for **MX records** for noao.edu

```
sun % host -t mx noao.edu
noao.edu MX noao.edu
```

- Sendmail queries the DNS for an **A record** for noao.edu (returned as additional RR with MX reply)
- SMTP connection is initiated, mail is sent

SMTP Examples

- **MX Records: Hosts That Are Down**
 - provide an alternative mail receiver when the destination host is down

```
sun % host -a -v -t mx sun.tuc.noao.edu
sun.tuc.noao.edu      86400    IN      MX      0      sun.tuc.noao.edu
sun.tuc.noao.edu      86400    IN      MX      10     noao.edu
Additional information :
sun.tuc.noao.edu      86400    IN      A       140.252.1.29
sun.tuc.noao.edu      86400    IN      A       140.252.13.33
noao.edu              86400    IN      A       140.252.1.54
```

```
vangogh % mail -v rstevens@sun.tuc.noao.edu
A test to a host that's down.
.
EOT

rstevens@sun.tuc.noao.edu. . . Connecting to sun.tuc.noao.edu. (smtp) . . .
rstevens@sun.tuc.noao.edu. . . Connecting to noao.edu. (smtp) . . .

220 noao.edu . . .
```

SMTP Examples

- VRFY and EXPN Commands
 - VRFY : verify that a recipient address is OK, without actually sending mail
 - for a valid name, server responds with the username on the local host
 - EXPN : expand a mailing list, without sending mail to the list
 - determine that the mail for this user is being forwarded, and print the forwarding address
 - many sites disable the VRFY and EXPN commands for privacy

SMTP Examples

- Example of VRFY and EXPN

```
sun % telnet vangogh.cs.berkeley.edu 25
220 - vangogh.CS.Berkeley.EDU Sendmail 8.1C/6.32 ready at Tue, 3 Aug 1993 14:59:12 -0700
220  ESMTP spoken here
helo  bsdi.tuc.noao.edu
250  vangogh.CS.Berkeley.EDU Hello sun.tuc.noao.edu [140.252.1.29], pleased to meet you
vrfy  nosuchname
550  nosuchname . . . User unknown
vrfy  rstevens
250  Richard Stevens rstevens@vangogh.CS.Berkeley.EDU
expn  rstevens
250  Richard Stevens <rstevens@noao.edu>
```

```
sun % telnet whitehouse.gov 25
220  whitehouse.gov SMTP/smmap Ready
helo  sun.tuc.noao.edu
250  (sun.tuc.noao.edu) pleased to meet you.
vrfy  clinton
500  Command unrecognized
```

SMTP Futures (cont.)

- Envelope Changes: Extended SMTP (ESMTP)
 - EHLO command : initiates the session with the server
 - responds with a 250 reply code
 - reply : multiline, containing a keyword and optional argument

```
ehlo sun.tuc.noao.edu
```

```
250 – vangogh.CS.Berkeley.EDU Hello sun.tuc.noao.edu [140.252.1.29], pleased to meet you
```

```
250 – EXPN
```

```
250 – 8BITMIME
```

```
250 – XADR
```

```
250 – HELP
```

```
250 SIZE 461544960
```

SMTP Futures

- extended command
 - SIZE : client specify the size of the message in bytes
 - server verify that it will accept a message of that size, before client starts to send it
 - 8BITMIME : client specify whether the body contains NVT ASCII characters or 8-bit data
 - default : NVT ASCII character
 - XADR : refer to local SMTP extension
- when server doesn't support ESMTP
 - client receives a 500 reply
 - client issue the RSET command

SMTP Futures

- Header Changes: Non-ASCII Characters
 - header field : =? *charset* ? *encoding* ? *encoded-text* ?=
 - charset : character set specification
 - us-ascii, iso-8859-X
 - encoding : single character to specify the encoding method
 - Q : quoted-printable
 - most characters are sent as NVT ASCII
 - eighth bit is setting character : =two hexadecimal
 - B : base-64 encoding
 - three consecutive bytes of text (24 bits) are encoded as four 6-bit values

SMTP Futures (cont.)

- Body Changes: Multipurpose Internet Mail Extensions (MIME)
 - allow structure in the body
 - does not require any of the extension
 - adds some new headers that tell the recipient the structure of the body
 - along with MIME
 - SMTP SIZE : MIME messages can become large
 - non ASCII header : not required by MIME

SMTP Futures (cont.)

- five new header field
 - Mime-Version :
 - Content-Type :
 - TEXT/PLAIN
 - content-Transfer-Encoding :
 - 7bit, quoted-printable, base64, 8bit, binary encoding
 - Content-ID :
 - Content-Description :