

LPI 108.3 - Mail Transfer Agent (MTA) basics

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ASIX M01-ISO 108 Essential System Services

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Mail Transfer Agent (MTA) basics

Description

Key concepts:

- ☐ Create e-mail aliases.
- ☐ Configure e-mail forwarding.
- ☐ Knowledge of commonly available MTA programs (postfix, sendmail, exim) (no configuration)

Commands and files:

- ☐ ~/.forward
- ☐ sendmail emulation layer commands
- ☐ newaliases
- ☐ mail
- ☐ mailq
- ☐ postfix
- ☐ sendmail
- ☐ exim

Mail Transfer Agent (MTA) basics

The program or email client used to retrieve, read, and compose email is known as a Mail User Agent (MUA). Linux comes with several MUAs, such as the mail program. The transfer of messages between machines and routing them to the correct destination is done by Mail Transfer Agents (MTA) such as sendmail, postfix, exim and qmail.

In Unix-like operating systems, such as Linux, every user has their own inbox: a special location on the filesystem that is inaccessible by other non-root users and stores the user's personal email messages. New incoming messages are added to the user's inbox by the Mail Transfer Agent (MTA). The MTA is a program running as a system service which collects messages sent by other local accounts as well as messages received from the network, sent from remote user accounts. The same MTA is also responsible for sending messages to the network, if the destination address refers to a remote account.

There are many distinct types of Mail User Agents. Desktop applications like Mozilla Thunderbird and Gnome's Evolution support both local and remote email accounts. Even Webmail interfaces can be seen as a type of MUA.

MUA: email clients (mail, thunderbird, evolution)

MTA: email transport (sendmail, postfix, exim))

Mail command

The mail command is a built-in text-based Mail User Agent (MUA) for Linux that does not support attachments.

mail basic commands:

- ? Show help
- n Read the next message (same as pressing Enter)
- h Display header information for all messages
- q Quit mail and preserve unread messages

- x Exit mail and preserve all messages (even if deleted)
- p Print the message again (re-read)
- r [message #] Reply to current (indicated by >) or specified message #
- d [message list] Delete current (indicated by >) or specified message(s)

```
[pue@localhost ~]$ mail
No mail for pue

[pue@localhost ~]$ mail pue
Subject: hello pue
hello pue
this is a message from user pue to user pue
just ti prove mail
bye
EOT
/usr/sbin/sendmail: No existe el fichero o el directorio
"/home/pue/dead.letter" 12/275
. . . message not sent.
```

```
[pue@localhost ~]$ sudo dnf -y install sendmail
## apt-get install sendmail mailutils

Última comprobación de caducidad de metadatos hecha hace 0:02:30, el mar 09 nov 2021
17:11:10 CET.
Dependencias resueltas.
=====
Paquete                Arquitectura          Versión
Repositorio            Tam.
=====
Instalando:
 sendmail                x86_64
8.15.2-34.el8           appstream
768 k
Instalando dependencias:
 procmail                x86_64
3.22-47.el8             appstream
180 k

Resumen de la transacción
=====
Instalar 2 Paquetes
```

```
[pue@localhost ~]$ sudo systemctl start sendmail

[pue@localhost ~]$ sudo systemctl status sendmail
• sendmail.service - Sendmail Mail Transport Agent
   Loaded: loaded (/usr/lib/systemd/system/sendmail.service; disabled; vendor preset: disabled)
   Active: active (running) since Tue 2021-11-09 17:15:31 CET; 6s ago
     Process: 6321 ExecStart=/usr/sbin/sendmail -bd $SENDMAIL_OPTS $SENDMAIL_OPTARG (code=exited, status=0/SUCCESS)
     Process: 6316 ExecStartPre=/etc/mail/make aliases (code=exited, status=0/SUCCESS)
     Process: 6314 ExecStartPre=/etc/mail/make (code=exited, status=0/SUCCESS)
    Main PID: 6322 (sendmail)
      Tasks: 1 (limit: 23548)
     Memory: 4.9M
    CGroup: /system.slice/sendmail.service
            └─6322 sendmail: accepting connections
```

```
## apt-cache search /bin/mail
axmail - Mail user agent for ax.25 users, accessed via a node frontend
bsd-mailx - simple mail user agent
mailutils - GNU mailutils utilities for handling mail

## apt-get install mailutils
```

```
[pue@localhost ~]$ mail pue
Subject: hello pue
hello pue
this is a message from user pue to user pue
just ti prove mail
bye
EOT
EOT

[pue@localhost ~]$ mail
Heirloom Mail version 12.5 7/5/10. Type ? for help.
"/var/spool/mail/pue": 2 messages 2 new
>N 1 pue Tue Nov 9 17:15 25/915 "hello pue"
& q
Held 1 message in /var/spool/mail/pue
```

```
[pere@localhost ~]$ mail pue
Subject: message from pere to pue
hi pue,
ho do you do?
bye!
EOT
[pere@localhost ~]$ mail
No mail for pere

[pere@localhost ~]$ mail pue
Subject: second message
hi, this is my second message to pue
i am pere
bye
EOT
```

```
[pue@localhost ~]$ mail
Heirloom Mail version 12.5 7/5/10. Type ? for help.
"/var/spool/mail/pue": 2 messages 1 new 2 unread
  U 1 pere@localhost.local Tue Nov 9 17:21 24/877 "message from pere to pue"
>N 2 pere@localhost.local Tue Nov 9 17:22 23/881 "second message"
& h
  U 1 pere@localhost.local Tue Nov 9 17:21 24/877 "message from pere to pue"
>N 2 pere@localhost.local Tue Nov 9 17:22 23/881 "second message"
& r2
To: pere@localhost.localdomain pue@localhost.localdomain
Subject: Re: second message
```

```
pere@localhost.localdomain wrote:
> hi, this is my second message to pue
> i am pere
> bye
hi pere, thanks for your two messages
ciao
EOT
& 1
Message 1:
From pere@localhost.localdomain Tue Nov 9 17:21:36 2021
Return-Path: <pere@localhost.localdomain>
From: pere@localhost.localdomain
Date: Tue, 09 Nov 2021 17:21:36 +0100
To: pue@localhost.localdomain
Subject: message from pere to pue
User-Agent: Heirloom mailx 12.5 7/5/10
Content-Type: text/plain; charset=us-ascii
Status: RO

hi pue,
ho do you do?
bye!
& d 1
& h
>A 2 pere@localhost.local Tue Nov 9 17:22 23/881 "second message"
& q
Held 1 messages in /var/spool/mail/pue
```

```
[pere@localhost ~]$ mail
Heirloom Mail version 12.5 7/5/10. Type ? for help.
"/var/spool/mail/pere": 1 message 1 unread
>U 1 pue Tue Nov 9 17:24 30/1098 "Re: second message"
& 1
Message 1:
From pue@localhost.localdomain Tue Nov 9 17:24:19 2021
Return-Path: <pue@localhost.localdomain>
From: pue <pue@localhost.localdomain>
Date: Tue, 09 Nov 2021 17:24:19 +0100
To: pue@localhost.localdomain, pere@localhost.localdomain
Subject: Re: second message
User-Agent: Heirloom mailx 12.5 7/5/10
Content-Type: text/plain; charset=us-ascii
Status: RO

pere@localhost.localdomain wrote:

> hi, this is my second message to pue
> i am pere
> bye
hi pere, thanks for your two messages
ciao
```

```
[pere@localhost ~]$ cat /var/spool/mail/pere
From pue@localhost.localdomain Tue Nov 9 17:24:19 2021
Return-Path: <pue@localhost.localdomain>
Received: from localhost.localdomain (localhost [127.0.0.1])
        by localhost.localdomain (8.15.2/8.15.2) with ESMTPS id 1A9GOJim006598
        (version=TLSv1.3 cipher=TLS_AES_256_GCM_SHA384 bits=256 verify=NOT);
```

```
$ mail -s "Maintenance fail" henry@lab3.campus <<<"The maintenance script failed at
`date`"
```

Example with image in base64:

```
# sender
$ base64 /tmp/foto.jpeg > /tmp/foto.txt
$ mail -s "foto email" test2 < /tmp/foto.txt
```

```

$ receiver
$ mail
"/var/mail/test2": 4 messages 4 unread
>U 1 test1@d01.informat Tue Mar 8 13:00 21/811 primer email
U 2 test1@d01.informat Tue Mar 8 13:01 17/822 tercer email
U 3 test1@d01.informat Tue Mar 8 13:05 925/62591 tercer email
U 4 test1@d01.informat Tue Mar 8 13:14 449/34606 photo email
? s 4 foto.txt
"/home/test2/foto.txt" 44952/3460736
? q
Held 3 messages in /var/mail/test2

$ base64 -d foto.txt > /tmp/new.jpeg
$ eog /tmp/new.jpeg

```

mailq command

Messages to send are stored in a mail queue (“post office”) where they are held for a short period of time until emails that arrive first are sent (FIFO). Once the message has been sent to a remote mail server, it is removed from the mail queue. The command `mailq` can list the queue.

The behavior of the `mailq` command is identical to the `sendmail -bp` command for systems that are using the `sendmail` service. To have messages in the mail queue re-sent, use the `-q` option to the `mailq` command.

- `mailq <==> sendmail -bp`
- `/var/spool/mqueue`

```

[pue@localhost ~]$ sudo mailq
[sudo] password for pue:
/var/spool/mqueue is empty
Total requests: 0

[pue@localhost ~]$ sudo ls -l /var/spool/mqueue/
total 0

```

```

[pue@localhost ~]$ ls -l /var/spool/mail/
total 12
-rw-rw---- 1 pere mail 1099 nov 9 17:32 pere
-rw-rw---- 1 pue mail 2002 nov 9 17:27 pue
-rw-rw---- 1 root root 888 nov 9 17:33 root
-rw-rw---- 1 rpc mail 0 sep 29 2020 rpc

```

Aliasing email address

Mail aliasing is a feature that allows alternative names (aliases) to be set up to emails or groups of emails. The `/etc/mail/aliases` file defines the aliases. An alias can be created to an email address, a user name, a file, a command, or another alias.

```
alias_name:  name_1, name_2, name_3
```

Example /etc/mail/aliases

```
support:  ted, jaime, olivia, ian, rita
user1:    user1@ind.netdevgroup.com;user1@aus.netdevgroup.com
apblog:   |/usr/local/bin/trackissues
bin:      /dev/null
boss:     /dev/null
```

The sendmail program does not understand the format of the /etc/mail/aliases, it reads a binary format of the file: /etc/mail/aliases.db. The command [newaliases](#) generates that file. The behavior of the newaliases command is identical to the [sendmail -bi](#) command for systems that are using the sendmail program.

```
[root@localhost pue]# tail -1 /etc/aliases
totis: pue, pere

[root@localhost pue]# newaliases
/etc/aliases: 78 aliases, longest 10 bytes, 792 bytes total
```

```
[pue@localhost ~]$ mail totis
Subject: hello totis
this is a super fashion email
to totis, that is, to lgtbih
bye
EOT
```

```
[pue@localhost ~]$ mail
Heirloom Mail version 12.5 7/5/10.  Type ? for help.
"/var/spool/mail/pue": 3 messages 1 new 2 unread
  A  1 pere@localhost.local  Tue Nov  9 17:22  25/904  "second message"
  U  2 pue                  Tue Nov  9 17:24  30/1098  "Re: second message"
>N  3 pue                  Tue Nov  9 17:52  23/898  "hello totis"
& 3
Message 3:
From pue@localhost.localdomain  Tue Nov  9 17:52:03 2021
Return-Path: <pue@localhost.localdomain>
From: pue <pue@localhost.localdomain>
Date: Tue, 09 Nov 2021 17:52:03 +0100
To: totis@localhost.localdomain
Subject: hello totis
User-Agent: Heirloom mailx 12.5 7/5/10
Content-Type: text/plain; charset=us-ascii
Status: R

this is a super fashion email
to totis, that is, to lgtbih
bye
```

```
[pere@localhost ~]$ mail
Heirloom Mail version 12.5 7/5/10.  Type ? for help.
"/var/spool/mail/pere": 2 messages 1 new
  1 pue                  Tue Nov  9 17:24  30/1099  "Re: second message"
>N  2 pue                  Tue Nov  9 17:52  23/898  "hello totis"
& 2
Message 2:
From pue@localhost.localdomain  Tue Nov  9 17:52:03 2021
Return-Path: <pue@localhost.localdomain>
From: pue <pue@localhost.localdomain>
Date: Tue, 09 Nov 2021 17:52:03 +0100
To: totis@localhost.localdomain
Subject: hello totis
```

```
User-Agent: Heirloom mailx 12.5 7/5/10
Content-Type: text/plain; charset=us-ascii
Status: R

this is a super fashion email
to totis, that is, to lgtbih
bye
```

Mail forwarding

The `~/forward` file, when placed in a user's home directory, is used for automatically forwarding mail as it is received to the address(es) or alias(es) specified in this file. Once the message is forwarded, a copy will **not** be retained in the user's mailbox.

```
totis, support, psgsupport, "|/usr/bin/vacation"
```

```
[pue@localhost ~]$ vim .forward
[pue@localhost ~]$ cat .forward
pue, root, profe@gmail.com
[pue@localhost ~]$ rm .forward
```

MTA Mail Transfer Agents

Simple Mail Transfer Protocol (SMTP) is the standard protocol for communication between email servers. Most email systems that send mail over the internet use SMTP to send messages from one server to another; the messages are then retrieved with an email client using either POP3 (Post Office Protocol) or IMAP (Internet Message Access Protocol). It uses TCP/UDP port number 25 for communication.

Four of the most popular MTAs found on Linux systems are: sendmail, postfix, qmail (old/deprecated), and exim.

Sendmail

At one point, sendmail was the standard MTA (was released in 1979). However, with the need for increased security and less complex configurations, other MTA programs were developed and have become popular alternatives.

Sendmail uses DNS (Domain Name System) for translating hostnames into their network addresses. Sendmail has two major components: the sendmail program (referred to as the sendmail binary) and the sendmail configuration file (</etc/mail/sendmail.cf>) to allow for

complex customization. The sendmail daemon manages the mail service. The `/etc/mail/sendmail.cf` file is used to configure the sendmail daemon.

The sendmail configuration file is the core of its functionality. When a message arrives for delivery, it is processed as follows:

- If both the recipient and the sender are on the same machine, then sendmail delivers the message directly.
- If the sender's and recipient's machines share a UUCP (Unix to Unix Copy) connection, then sendmail uses the uux program to deliver the message.
- If the recipient's address is an internet address, then sendmail uses SMTP to deliver the message.

A message will be queued under the following conditions:

- Sendmail can be configured to queue all messages by default to protect against message loss in case the system crashes.
- If a message is intended for multiple recipients and delivery to some of the recipients fails, then the failed messages will be queued and retried again at a later time.
- If the destination machine is unreachable for any reason, then the message will be queued and scheduled for delivery only when the machine becomes available again.

Some of the key options of the sendmail command are:

- B type
Set the message's body type to type, allowed values are 7BIT or 8BITMIME
- bd
Run in the background as a daemon
- bD
Run as a foreground process
- bi
Initialize the alias database
- bp
List the mail queue
- bv
Verify the address without sending an actual message
- C file
Use the specified file as the configuration file
- R return
Used when a message bounces. If set to full, then the entire message will be returned. If set to hdrs, then only the header will be returned.
- t
Read message for recipients. The To:, Cc:, and Bcc: lines will be searched for valid recipient addresses.

Postfix

A limitation of the sendmail email program is its monolithic design. Many functions, are handled by a single executable, which causes potential security issues since the executable

is owned by the root user. In the 1990s, the postfix program was developed at IBM as an alternative to sendmail.

The postfix program runs in a router-like mode where it accepts messages from different sources (such as local users and SMTP), supports lookups in its maps to decide where to send messages, and applies any rules if specified on the messages.

The configuration file of the postfix program can be updated easily using the Postfix Admin web-based program. The postfix program provides a faster, secure, and easy to use alternative to sendmail.

Exim

In 1995, another alternative to the sendmail program, known as the exim program, was developed at the University of Cambridge. The main focus of the exim program was better security.

it provides many features such as access control lists, for better policy control, integration with spam and virus scanners and managing delivery issues with retry rules.

Example Exercises

1. Install and start the sendmail service
2. Send two messages to another user (not to root, user1 to user2).
3. As the other user check the messages, delete the first one and answer the second.
4. Create an alias grouping the two users.
5. Which file contains the emails of the second user (user2)?
6. Which command can the root user execute to list the undelivered messages that originated on the local system? (there are two commands that do the same).
7. Where are held the messages waiting for delivery?
8. How can a user automate sending the incoming messages to another addresses?
9. Realitza els exercicis indicats a: [108.3 Mail Transfer Agent \(MTA\) basics](#)
10. Realitza els exercicis del Question-Topics 108.3

1. Install and start the sendmail service
`sudo apt-get install sendmail`
2. Send two messages to another user (not to root, user1 to user2).
`mail`
`mail -s "subject message" user-destination`
3. As the other user check the messages, delete the first one and answer the second.
`mail`
4. Create an alias grouping the two users.
`vim /etc/alias`
`/etc/mail/aliases`
`newaliases`
5. Which file contains the emails of the second user (user2)?
`# ls /var/spool/mail`
`ecanet root test1 test2`

`# ls -l /var/spool/mail/test2`
`-rw-rw---- 1 test2 mail 627775 Mar 8 13:16 /var/spool/mail/test2`

`# head /var/spool/mail/test2`
`From test1@d01.informatica.escoladeltreball.org Tue Mar 8 13:00:08 2022`
`Return-Path: <test1@d01.informatica.escoladeltreball.org>`
`Received: from d01.informatica.escoladeltreball.org (localhost [127.0.0.1])`
`by d01.informatica.escoladeltreball.org (8.15.2/8.15.2/Debian-22) with ESMTP id`
`228C08LD006986;`
`Tue, 8 Mar 2022 13:00:08 +0100`
`Received: (from test1@localhost)`
`by d01.informatica.escoladeltreball.org (8.15.2/8.15.2/Submit) id`
`228C08fN006985;`
`Tue, 8 Mar 2022 13:00:08 +0100`
`Date: Tue, 8 Mar 2022 13:00:08 +0100`
`From: test1@d01.informatica.escoladeltreball.org`
6. Which command can the root user execute to list the undelivered messages that originated on the local system? (there are two commands that do the same).
`mailq`
7. Where are held the messages waiting for delivery?
`/var/spool/mqueue`
8. How can a user automate sending the incoming messages to another addresses?
`.forward` in the user's home directory
`owns-user, other, users`

9. Realitza els exercicis indicats a: [108.3 Mail Transfer Agent \(MTA\) basics](#)
10. Realitza els exercicis del Question-Topics 108.3