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1 Introduction

GNU Mailutils is a set of libraries and utilities for handling electronic mail. It addresses a wide audience and can be of interest to application developers, casual users and system administrators alike.

It provides programmers with a consistent API allowing them to handle a variety of different mailbox formats transparently and without having to delve into complexities of their internal structure. While doing so, it also provides interfaces that simplify common programming tasks, such as handling lists, parsing configuration files, etc. The philosophy of Mailutils is to have a single and consistent programming interface for various objects designed to handle the same task. It tries to use their similarities to create an interface that hides their differences and complexities. This covers a wide variety of programming tasks: apart from mailbox handling, Mailutils also contains a unified interface for work with various DBM databases and much more.

The utilities built upon these libraries share that same distinctive feature: no matter what is the internal structure of an object, it is always handled the same way as other objects that do the same task. Again, the most common example of this approach are, of course, mailboxes. Whatever Mailutils program you use, you can be sure it is able to handle various mailbox formats. You even don’t have to inform it about what type a mailbox is: it will do its best to discover it automatically.

This approach sometimes covers entities which are seldom regarded as compatible. For example, using Mailutils it is possible to treat an SMTP connection as a mailbox opened only for appending new messages. This in turn, provides a way for extending the functionality of some utilities. As an example, using this concept of mailboxes, the usual mail delivery agent becomes able to do things usually reserved for mail transport agents only!

At the core of Mailutils is libmailutils, a library which provides an API for accessing a generalized mailbox. A set of complementary libraries provide methods for handling particular mailbox implementations: UNIX mailbox, Maildir, MH, POP3, IMAP4, even SMTP. Mailutils offers functions for almost any mail-related task, such as parsing of messages, email addresses and URLs, handling MIME messages, listing mail folders, mailcap facilities, extensible Sieve filtering, access control lists. It supports various modern data security and authentication techniques: TLS encryption, SASL and GSSAPI, to name a few. Mailutils is able to work with a wide variety of authorization databases, ranging from traditional system password database up to RADIUS, SQL and LDAP.

The utilities provided by Mailutils include imap4d and pop3d mail servers, mail reporting utility comsatd, general-purpose mail delivery agent maidag, mail filtering program sieve, an implementation of MH message handling system and much more.

All utilities share the same subset of command line options and use a unified configuration mechanism, which allows to easily configure the package as a whole.

This software is part of the GNU Project and is copyrighted by the Free Software Foundation. All libraries are distributed under the terms of the Lesser GNU Public License. The documentation is licensed under the GNU FDL, and everything else is licensed under the GNU GPL.
1.1 What this Book Contains

This book addresses a wide audience of both system administrators and users that aim to use Mailutils programs, and programmers who wish to use Mailutils libraries in their programs. Given this audience, the book is divided in three major parts.

The first part provides a detailed description of each Mailutils utility, and advices on how to use them in various situations. This part is intended for users and system administrators who are using Mailutils programs. If you are not interested in programming using Mailutils, this is the only part you need to read.

Subsequent parts address programmers.

The second part is a tutorial which provides an introduction to programming techniques for writing mail applications using GNU Mailutils.

Finally, the third part contains a complete Mailutils library reference.

This version of the book is not finished. The places that may contain inaccurate information carry prominent notices stating so. For updated versions of the documentation, visit http://mailutils.org/manual. All material that ends up in this document is first published in the Mailutils Wiki, available at http://mailutils.org/wiki. Be sure to visit it for latest updates.

If you have any questions that are not answered there, feel free to ask them at the mailing list bug-mailutils@gnu.org.

1.2 A bit of History, and why use this package?

Editor's note:
The information in this node may be obsolete or otherwise inaccurate. This message will disappear, once this node revised.

This package started off to try and handle large mailbox files more gracefully then available at that time POP3 servers did. While it handles this task, it also allows you to support a variety of different mailbox formats without any real effort on your part. Also, if a new format is added at a later date, your program will support that new format automatically as soon as it is compiled against the new library.
2 Mailbox

The principal object Mailutils operates on is mailbox – a collection of mail messages. The two main characteristics of a mailbox are its type and path. The type defines how the messages are stored within a mailbox. The path specifies the location of the mailbox. The two characteristics are usually combined within a Uniform Resource Locator (URL), which uniquely identifies the mailbox. The syntax for URL is:

```
type: //<user:password@host[:port]]path[?query][;params]
```

The square brackets do not appear in a URL, instead they are used to denote optional parts.

Not all parts are meaningful for all types. Their usage and purpose are described in the sections that follow.

2.1 Local Mailboxes

Local mailboxes store mail in files on the local file system. A local mailbox URL is:

```
type://path[;params]
```

The path defines its location in the file system. For example:

```
mbox://var/spool/mail/gray
```

Optional params is a semicolon-separated list of optional arguments that configures indexed directory structure. See [local URL parameters], page 19, for a detailed description.

The local mailbox types are:

- **mbox**: A traditional UNIX mailbox format. Messages are stored sequentially in a single file. Each message begins with a 'From' line, identifying its sender and date when it was received. A single empty line separates two adjacent messages. This is the default format.

- **maildir**: The Maildir mailbox format. Each message is kept in a separate file with a unique name. Each mailbox is therefore a directory. This mailbox format eliminates file locking and makes message access much faster. This format was originally described by D. J. Bernstein in [http://cr.yp.to/ proto/maildir.html](http://cr.yp.to/proto/maildir.html).

- **mh**: MH Message Handling System format. Each message is kept in a separate file named after its sequential numeric identifier within the mailbox. Deleted messages are not removed, but instead the corresponding file is renamed by prepending a comma to its original name. Each mailbox is a directory. Mailboxes can be nested. This format was originally developed by RAND Corporation. Mailutils implementation is compatible both with the original implementation and with its descendant nmh.

- **file**: This type can be used when accessing an existing mailbox of any of the formats defined above. The actual mailbox format is determined automatically. This type is assumed when a mailbox is referred to by its full pathname.
2.2 Remote Mailboxes

Remote mailboxes are accessed via one of the remote message protocols.

The basic remote mailbox types are:

- **pop**: Remote mailbox accessed using the *Post Office Protocol* (POP3). Default port number 110.
  
The URL is:
  
  \[
  \text{pop://[user[:pass][;auth=APOP]@} \text{host[:port][;notls]} \]
  
The *host* gives the name or IP address of the host running a POP3 server. Optional *port* can be used to connect to a port other than the default 110.

  The user and pass supply authentication credentials. If any of them is missing, Mailtils will first try to obtain it from the ticket file. If that fails, the behavior depends on the type of the controlling terminal. If the terminal is a tty device (i.e. the program accessing the mailbox was started from the command line), it will ask the user to supply the missing credentials. Otherwise it will issue an appropriate error message and refuse to access the mailbox.

  By default, the usual POP3 authentication is used. The ‘auth=APOP’ authentication parameter instructs Mailutils to use APOP authentication instead.

  If the server offers the STLS capability, Mailutils will attempt to establish encrypted TLS connection. The ‘notls’ parameter disables this behavior.

- **pops**: Remote mailbox accessed using the *Post Office Protocol* (POP3). The transmission channel is encrypted using the *transport layer security* (TLS). The default port is 995.
  
The URL is:
  
  \[
  \text{pops://[user[:pass][;auth=APOP]@} \text{host[:port]} \]
  
The meaning of its components is the same as for ‘pop’ type.

- **imap**: Remote mailbox accessed via the *Internet Message Access Protocol*. Default port number is 143.
  
The URL is:
  
  \[
  \text{imap://[user[:pass]@} \text{host[:port][;notls]} \]
  
The *host* gives the name or IP address of the host running an IMAP4 server. Optional *port* can be used to connect to a port other than the default 143.

  The user and pass supply authentication credentials. If any of them is missing, Mailtils will first try to obtain it from the ticket file. If that fails, the behavior depends on the type of the controlling terminal. If the terminal is a tty device (i.e. the program accessing the mailbox was started from the command line), it will ask the user to supply the missing credentials. Otherwise it will issue an appropriate error message and refuse to access the mailbox.

  If the server offers the STARTTLS capability, Mailutils will attempt to establish encrypted TLS connection. The ‘notls’ parameter disables this behavior.

- **imaps**: The ‘imaps’ type differs in that its transmission channel is encrypted using the *transport layer security* (TLS). The default port is 993.
The URL is:

```
imaps://[user[:pass]@host[:port]
```

The meaning of its components is the same as for ‘imap’ type.

### 2.3 SMTP Mailboxes

SMTP mailboxes types are special remote mailboxes that allow only append operation. Appending a message is equivalent to sending it to the given recipient or recipients.

**smtp**

A remote mailbox accessed using the Simple Message Transfer Protocol. 
The SMTP URL syntax is:

```
smtp://[user[:pass][;auth=mech,...]@host[:port][;params]
```

The `host` gives the name or IP address of the host running SMTP server. Optional `port` can be used to connect to a port other than the default 25.

The `user`, `pass`, and `auth=` elements supply credentials for ESMTP authentication, if the server supports it.

If the ESMTP authentication is used, Mailutils will select the best authentication mechanism from the list offered by the server. To force it to use a particular authentication mechanism, use the `auth` authentication parameter. Its value is a comma-separated list of authentication mechanisms, in the order from the most to the least preferred one, e.g.:

```
smtp://smith:guessme;auth=cram-md5,digest-md5@localhost
```

Optional params is a semicolon-separated list of additional parameters. Valid parameters are:

- `domain=string`
  
  Append ‘@string’ to those recipient addresses that lack the domain part.

- `from=addr`

  Use `addr` as sender address.

- `noauth`

  Disable ESMTP authentication.

- `notls`

  Disable TLS.

- `recipient-headers[=name[,name...]]`

  Use the supplied header names to determine recipient addresses. When no values are supplied, disables header scanning.

- `strip-domain`

  Strip domain part from all recipient addresses.

- `to=addr[,addr...]`

  Deliver messages to the supplied email addresses.

**smtps**

A remote mailbox accessed using the Simple Message Transfer Protocol, with the transmission channel encrypted using the transport layer security (TLS). The default port is 465.
The URL is

```
smtps://[user[:pass][;auth=mech,...]@]host[:port][;params]
```

See the ‘smtp’ type for a detailed description of its types. The only difference from ‘smtp’ is that the ‘notls’ parameter is not used.

### 2.4 Program Mailboxes

Program mailboxes support only append operation. Appending a message is performed by invoking the specified program and passing the message to its standard input stream.

A ‘sendmail’ mailbox is identified by the following URL:

```
sendmail[://path]
```

The messages are sent by invoking `sendmail` binary with the `-oi -t` options. If the message being appended has the ‘From’ header, its value is passed to `sendmail` using the `-f` option.

The default path to the sendmail binary is system-dependent. The `path` part can be used to specify it explicitly.

The ‘prog’ mailbox URL is:

```
prog://pathname[?query]
```

Messages are appended by invoking the program `pathname` with the arguments supplied by `query`. The latter is a list of words delimited by ‘&’ characters.

Arguments can contain the following variables (see Section 3.2.2 [Variables], page 15):

- `sender`: Expands to the sender email address.
- `rcpt`: Expands to comma-separated list of email addresses obtained from ‘To:’, ‘Cc:’ and ‘Bcc:’ headers of the message.
3 Mailutils Programs

GNU Mailutils provides a broad set of utilities for handling electronic mail. These utilities address the needs of both system administrators and users.

All utilities are built around a single core subsystem and share many common aspects. All of them are able to work with almost any existing mailbox formats. They use a common configuration file syntax, and their configuration files are located in a single subdirectory.

In this chapter we will discuss each utility, and give some advices on how to use them in various real life situations.

First of all we will describe command line and configuration file syntax.

3.1 Command Line

3.1.1 Basic Notions About Command Line Options

Many command line options have two forms, called short and long forms. Both forms are absolutely identical in function; they are interchangeable.

The short form is a traditional form for UNIX utilities. In this form, the option consists of a single dash, followed by a single letter, e.g. -c.

Short options which require arguments take their arguments immediately following the option letter, optionally separated by white space. For example, you might write -f name, or -fname. Here, -f is the option, and name is its argument.

Short options which allow optional arguments take their arguments immediately following the option letter, without any intervening white space characters. This is important, so that the command line parser might discern that the text following option is its argument, not the next command line parameter. For example, if option -d took an optional argument, then -dname would mean the option with its argument (name in this case), and -d name would mean the -d option without any argument, followed by command line argument name.

Short options’ letters may be clumped together, but you are not required to do this. When short options are clumped as a set, use one (single) dash for them all, e.g. -cvl is equivalent to -c -v -l. However, only options that do not take arguments may be clustered this way. If an option takes an argument, it can only be the last option in such a cluster, otherwise it would be impossible to specify the argument for it. Anyway, it is much more readable to specify such options separated.

The long option names are probably easier to memorize than their short counterparts. They consist of two dashes, followed by a multi-letter option name, which is usually selected to be a mnemonics for the operation it requests. For example, --verbose is a long option that increases the verbosity of a utility. In addition, long option names can abbreviated, provided that such an abbreviation is unique among the options understood by a given utility. For example, if a utility takes options --foreground and --forward, then the shortest possible abbreviations for these options are --fore and --forw, correspondingly. If you try to use --for, the utility will abort and inform you that the abbreviation you use is ambiguous, so it is not clear which of the options you intended to use.

Long options which require arguments take those arguments following the option name. There are two ways of specifying a mandatory argument. It can be separated from the
option name either by an equal sign, or by any amount of white space characters. For example, if the --file option requires an argument, and you wish to supply name as its argument, then you can do so using any of the following notations: --file=name or --file name.

In contrast, optional arguments must always be introduced using an equal sign.

3.1.2 Options That are Common for All Utilities.
All GNU Mailutils programs understand a common subset of options.

--help
-?
Display a short summary of the command line options understood by this utilities, along with a terse description of each.

The output of this option consists of three major parts. First, a usage synopsis is displayed. For example:

    Usage: sieve [OPTION...] SCRIPT
    GNU sieve -- a mail filtering tool

The first line tells that the sieve utility takes any number of options (brackets indicate optional part) and a single mandatory argument (‘SCRIPT’). The second lines summarizes the purpose of the utility.

Following this header is an option summary. It consists of two columns:

- -c, --compile-only  Compile script and exit
- -d, --debug[=FLAGS] Debug flags
- -e, --email=ADDRESS  Override user email address

The leftmost column contains a comma-separated list of option names. Short options are listed first. The options are ordered alphabetically. Arguments, if any, are specified after the last option name in the list, so that, e.g. the option ‘-e’ in the example above requires an argument: ‘-e ADDRESS’. Optional arguments are enclosed in square brackets, as in --debug option in the example above.

The rightmost column contains a short description of the option purpose.

The last part of --help output contains some additional notices and lists the email address for reporting bugs.

--usage
Display a short summary of options. In the contrast to the --help option, only option names and arguments are printed, without any textual description. For example:

    Usage: sieve [-cv?V] [--compile-only] [--debug[=FLAGS]]
            [--email=ADDRESS] SCRIPT

The exact formatting of the output produced by these two options is configurable. See Appendix D [Usage Vars], page 209, for a detailed descriptions of it.

--version
-V
Print program version and exit.

--show-config-options
Show configuration options used when compiling the package. You can use this option to verify if support for a particular mailbox format or other functionality
is compiled in the binary. The output of this option is intended to be both
documentation and understandability by humans.

The following command line options affect parsing of configuration files. Here we provide
a short summary, the next section will describe them in detail.

--config-file=file
   Load this configuration file, instead of the default.

--config-help
   Show configuration file summary.

--config-lint
   Check configuration file syntax and exit

--config-verbose
   Verbosely log parsing of the configuration files.

--no-site-config
   Do not load site-wide configuration file.

--no-user-config
   Do not load user configuration file.

--no-config
   Don’t load site-wide and user configuration files.

--set=path=value
   Set configuration variable. See [the –set option], page 14.

3.2 Mailutils Configuration File

Configuration files are the principal means of configuring any GNU Mailutils component.
When started, each utility tries to load its configuration from the following locations, in
that order:

1. Main site-wide configuration file.
   It is named sysconfdir/mailutils.conf, where sysconfdir stands for the system con-
   figuration directory set when compiling the package. You can obtain the value of
   sysconfdir by running
   
   $ mailutils info sysconfdir

   or

   $ prog --show-config-options | grep SYSCONFDIR
   
   where prog stands for any GNU Mailutils utility.

   The site-wide configuration file is not read if any of --no-site-config or --no-config
   command line options was given.

   Older versions of GNU Mailutils read configuration from file mailutils.rc. To facili-
tate transition, mailutils will look for that file as well. If both the default site-wide
   configuration file and legacy configuration file are present you will get the following
   warning:
   
   legacy configuration file /etc/mailutils.rc ignored
Otherwise, if `mailutils.conf` does not exist and `mailutils.rc` is present, it will be used instead and the following warning will be issued:

```
using legacy configuration file /etc/mailutils.rc:
please rename it to /etc/mailutils.conf
```

2. Per-user configuration file.

Client utilities, such as `frm` or `sieve`, look in the user home directory for a file named `.` + `prog`, where `prog` is the name of the utility. If present, this file will be loaded after loading the site-wide configuration file. For example, the per-user configuration file for `sieve` utility is named `.sieve`.

Loading of per-user configuration file is disabled by `--no-user-config` and `--no-config` options.

Server programs, such as `imap4d` don’t use per-user configuration files.

The `--no-config` option provides a shortcut for disabling loading of the default configuration files. For servers, its effect is the same as `--no-site-config`. For client utilities, it is equivalent to `--no-site-config --no-user-config` used together.

The `--config-file` command line option instructs the program to read configuration from the file supplied as its argument. In that case, default configuration files are not used at all.

Neither site-wide nor user configuration files are required to exist. If any or both of them are absent, GNU Mailutils won’t complain – the utility will silently fall back to its default settings.

To make configuration processing more verbose, use the `--config-verbose` command line option. Here is an example of what you might get using this option:

```
imap4d: parsing file '/etc/mailutils.conf'
imap4d: finished parsing file '/etc/mailutils.conf'
```

Specifying this option more than once adds more verbosity to this output. If this option is given two times, GNU Mailutils will print each configuration file statement it parsed, along with the exact location where it occurred (the exact meaning of each statement will be described later in this chapter):

```
imap4d: parsing file '/etc/mailutils.conf'
  # 1 "'/etc/mailutils.conf"
  mailbox {
  # 2 "'/etc/mailutils.conf"
    mailbox-pattern maildir:/var/spool/mail;type=index;param=2;user=${user};
  # 3 "'/etc/mailutils.conf"
    mailbox-type maildir;
  ;
  # 6 "'/etc/mailutils.conf"
    include /etc/mailutils.d;
    imap4d: parsing file '/etc/mailutils.d/imap4d'
```

To test configuration file without actually running the utility, use the `--config-lint` command line option. With this option, any Mailutils utility exits after finishing parsing of the configuration files. Any errors occurred during parsing are displayed on the standard
error output. This option can be combined with --config-verbose to obtain more detailed output.

The --config-help command line option produces on the standard output the summary of all configuration statements understood by the utility, with detailed comments and in the form suitable for configuration file. For example, the simplest way to write a configuration file for, say, imap4d is to run

$$\texttt{imap4d \--config-help > imap4d.conf}$$

and to edit the imap4d.conf file with your editor of choice.

The order in which configuration files are loaded defines the precedence of their settings. Thus, for client utilities, settings from the per-user configuration file override those from the site-wide configuration.

It is also possible to set or override arbitrary configuration variables in the command line. It can be done via the --set option. Its argument is a pathname of the variable to be set, followed by an equals sign and a value. For example, to define the variable 'syslog' in section 'logging' to 'no', do the following:

$$\texttt{imap4d \--set .logging.syslog=no}$$

Configuration pathnames are discussed in detail in Section 3.2.1.3 [Paths], page 14. For a detailed description of this option, [the --set option], page 14.

The --set options are processed after loading all configuration files.

3.2.1 Configuration File Syntax

The configuration file consists of statements and comments.

There are three classes of lexical tokens: keywords, values, and separators. Blanks, tabs, newlines and comments, collectively called white space are ignored except as they serve to separate tokens. Some white space is required to separate otherwise adjacent keywords and values.

3.2.1.1 Comments

Comments may appear anywhere where white space may appear in the configuration file. There are two kinds of comments: single-line and multi-line comments. Single-line comments start with ‘#’ or ‘//’ and continue to the end of the line:

```
# This is a comment
// This too is a comment
```

Multi-line or C-style comments start with the two characters ‘/*’ (slash, star) and continue until the first occurrence of ‘*/’ (star, slash).

Multi-line comments cannot be nested. However, single-line comments may well appear within multi-line ones.

3.2.1.2 Statements

A simple statement consists of a keyword and value separated by any amount of whitespace. Simple statement is terminated with a semicolon (‘;’).

The following is a simple statement:

```
standalone yes;
```
pidfile /var/run/pop3d.pid;

A keyword begins with a letter and may contain letters, decimal digits, underscores (\_\_) and dashes (\-\-). Examples of keywords are: \"expression\", \"output-file\".

A value can be one of the following:

number A number is a sequence of decimal digits.

boolean A boolean value is one of the following: \"yes\", \"true\", \t or \t\t, meaning true, and \"no\", \"false\", \nil\, \t\t, \t meaning false.

unquoted string
An unquoted string may contain letters, digits, and any of the following characters: \_, \-, \., \/, @, *, :.

quoted string
A quoted string is any sequence of characters enclosed in double-quotes (\"\"). A backslash appearing within a quoted string introduces an escape sequence, which is replaced with a single character according to the following rules:

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Replaced with</th>
</tr>
</thead>
<tbody>
<tr>
<td>\a</td>
<td>Audible bell character (ASCII 7)</td>
</tr>
<tr>
<td>\b</td>
<td>Backspace character (ASCII 8)</td>
</tr>
<tr>
<td>\f</td>
<td>Form-feed character (ASCII 12)</td>
</tr>
<tr>
<td>\n</td>
<td>Newline character (ASCII 10)</td>
</tr>
<tr>
<td>\r</td>
<td>Carriage return character (ASCII 13)</td>
</tr>
<tr>
<td>\t</td>
<td>Horizontal tabulation character (ASCII 9)</td>
</tr>
<tr>
<td>\v</td>
<td>Vertical tabulation character (ASCII 11)</td>
</tr>
<tr>
<td>\</td>
<td>A single backslash (\)</td>
</tr>
<tr>
<td>&quot;</td>
<td>A double-quote.</td>
</tr>
</tbody>
</table>

Table 3.1: Backslash escapes

In addition, the sequence \"newline\" is removed from the string. This allows to split long strings over several physical lines, e.g.:

\"a long string may be\n    split over several lines\"

If the character following a backslash is not one of those specified above, the backslash is ignored and a warning is issued.

Two or more adjacent quoted strings are concatenated, which gives another way to split long strings over several lines to improve readability. The following fragment produces the same result as the example above:

\"a long string may be\n    \" split over several lines\"

Here-document
A here-document is a special construct that allows to introduce strings of text containing embedded newlines.

The \<word\> construct instructs the parser to read all the following lines up to the line containing only word, with possible trailing blanks. Any lines thus read are concatenated together into a single string. For example:
A multiline string

The body of a here-document is interpreted the same way as a double-quoted string, unless word is preceded by a backslash (e.g. ‘<<\EOT’) or enclosed in double-quotes, in which case the text is read as is, without interpretation of escape sequences.

If word is prefixed with - (a dash), then all leading tab characters are stripped from input lines and the line containing word. Furthermore, if - is followed by a single space, all leading whitespace is stripped from them. This allows to indent here-documents in a natural fashion. For example:

```
<<< TEXT
   The leading whitespace will be ignored when reading these lines.
TEXT
```

It is important that the terminating delimiter be the only token on its line. The only exception to this rule is allowed if a here-document appears as the last element of a statement. In this case a semicolon can be placed on the same line with its terminating delimiter, as in:

```bash
help-text <<<EOT
   A sample help text.
EOT;
```

A list is a comma-separated list of values. Lists are enclosed in parentheses. The following example shows a statement whose value is a list of strings:

```
alias (test,null);
```

In any case where a list is appropriate, a single value is allowed without being a member of a list: it is equivalent to a list with a single member. This means that, e.g.

```
alias test;
```

is equivalent to

```
alias (test);
```

A block statement introduces a logical group of statements. It consists of a keyword, followed by an optional value, and a sequence of statements enclosed in curly braces, as shown in the example below:

```
server srv1 {
   host 10.0.0.1;
   community "foo";
}
```

The closing curly brace may be followed by a semicolon, although this is not required.
3.2.1.3 Statement Path

Mailutils configuration files have a distinct hierarchical structure. Each statement in such files can therefore be identified by its name and the names of block statements containing it. Such names form the pathname, similar to that used by UNIX file system.

For example, consider the following file:

```
foo {
  bar {
    baz 45;   # A.
  }
  baz 98;   # B.
}
```

The full pathname of the statement marked with ‘A’ can be written as:

```.foo.bar.baz```

Similarly, the statement marked with ‘B’ has the following pathname:

```.foo.baz```

The default path component separator is dot. A pathname beginning with a component separator is called absolute pathname. Absolute pathnames uniquely identify corresponding statements. If the leading dot is omitted, the resulting pathname is called relative. Relative pathnames identify statements in relation to the current point of reference in the configuration file.

Any other punctuation character can be used as a component separator, provided that it appears at the beginning of the pathname. In other words, only absolute pathnames allow for a change in component separators.

A block statement that has a tag is referred to by the statement’s name, followed by an equals sign, followed by the tag value. For example, the statement ‘A’ in the file below:

```
program x {
  bar {
    baz 45;    # A.
  }
}
```

is identified by the following pathname:

```.program=x.bar.baz```

The tag can optionally be enclosed in a pair of double quotes. Such a quoting becomes mandatory for tags that contain white space or path component separator, e.g.:

```.program="a.out".bar.baz```

The `--set` command line option allows you to set configuration variables from the command line. Its argument consists of the statement path and value, separated by a single equals sign (no whitespace is permitted at either side of it). For example, the following option:

```
--set .logging.facility=mail
```

has the same effect as the following statement in the configuration file:

```
logging {
```
Values set using this option override those set in the configuration files. This provides a convenient way for temporarily changing configuration without altering configuration files.

Notice, that when using `--set`, the '=' sign has two purposes: first it separates statement path from the value, thus forming an assignment, and secondly it can be used within the path itself to introduce a tag. To illustrate this, let’s assume you have the following statement in your configuration file:

```plaintext
program pop3d {
  logging {
    facility mail;
  }
  server 0.0.0.0 {
    transcript no;
  }
}
```

Now assume you wish to temporarily change logging facility to ‘local1’. The following option will do this:

```
--set .program=pop3d.logging.facility=local1
```

When splitting the argument to `--set`, the option parser always looks for the rightmost equals sign. Everything to the right of it is the value, and everything to the left of it - the path.

If the tag contains dots (as the `server` statement in the example above), you should either escape them with slashes or change the pathname separator to some other character, e.g.:

```
--set .program=pop3d.server='0\.0\.0\.0'.transcript=yes
or
--set /program=pop3d/server="0.0.0.0"/transcript=yes
```

### 3.2.2 Configuration Variables

Certain configuration statements allow for the use of variable references in their values. A variable reference has the form `$variable` or `${variable}`, where `variable` is the variable name. It is expanded to the actual value of `variable` when Mailutils consults the configuration statement in question.

The two forms are entirely equivalent. The form with curly braces is normally used if the variable name is immediately followed by an alphanumeric symbol, which will otherwise be considered part of it. This form also allows for specifying the action to take if the variable is undefined or expands to an empty value.

During variable expansion, the forms below cause Mailutils to test for a variable that is unset or null. Omitting the colon results in a test only for a variable that is unset.

```
${variable:-word}

Use Default Values. If `variable` is unset or null, the expansion of `word` is substituted. Otherwise, the value of `variable` is substituted.
```
$$\{\text{variable:=word}\}$$

Assign Default Values. If \text{variable} is unset or null, the expansion of \text{word} is assigned to \text{variable}. The value of \text{variable} is then substituted.

$$\{\text{variable:?word}\}$$

Display Error if Null or Unset. If \text{variable} is null or unset, the expansion of \text{word} (or a message to that effect if \text{word} is not present) is output to the current logging channel. Otherwise, the value of \text{variable} is substituted.

$$\{\text{variable:+word}\}$$

Use Alternate Value. If \text{variable} is null or unset, nothing is substituted, otherwise the expansion of \text{word} is substituted.

When a value is subject to variable expansion, it is also subject to command expansion. Commands are invoked in string values using the following format:

$$\{$cmd \ arg\}$$

where \text{cmd} is the command name, and \text{args} is a list of arguments separated by whitespace. Arguments can in turn contain variable and command references.

The following commands are defined:

\textbf{localpart \ string} \quad \text{[Command]}

Treats \text{string} as an email address and returns the part preceding the ‘@’ sign. If there is no ‘@’ sign, returns \text{string}.

\textbf{domainpart \ string} \quad \text{[Command]}

Treats \text{string} as an email address and returns the part following the ‘@’ sign. If there is no ‘@’ sign, returns empty string.

\textbf{shell \ cmd \ args} \quad \text{[Command]}

Runs the shell command \text{cmd} with the given arguments. Returns the standard output from the command. The command is invoked using /bin/sh -c and can contain any valid shell constructs.

The subsections below define variable names that are valid for use in each configuration statement.

\textbf{3.2.3 The \textit{include} Statement}

A special statement is provided that causes inclusion of the named file. It has the following syntax:

\begin{verbatim}
include file;
\end{verbatim}

When reading the configuration file, this statement is effectively replaced with the content of \text{file}. It is an error if \text{file} does not exist.

In site-wide configuration file, \text{file} can be a directory name. In this case, Mailutils will search this directory for a file with the same name as the utility being executed. If found, this file will be loaded.

It is a common to end the site-wide configuration file with an include statement, e.g.:

\begin{verbatim}
include /etc/mailutils.d;
\end{verbatim}

This allows each particular utility to have its own configuration file. Thus, \texttt{imap4d} will read /etc/mailutils.d/imap4d, etc.
3.2.4 The program statement

Another way to configure program-specific settings is by using the `program` statement. The syntax is as follows:

```
program progname {
  ...
}
```

The `program` statement is allowed only in the site-wide configuration file. When encountered, its tag (`progname`) is compared with the name of the program being run. If two strings are the same, the statements between curly braces are stored in a temporary memory, otherwise the statement is ignored. When entire configuration file is loaded, the statements accumulated in the temporary storage are processed.

Notice the difference between this statement and a per-program configuration file loaded via an `include` statement. No matter where in the file the `program` statement is, its content will be processed after the content of the enclosing file. In the contrast, the per-program configuration file loaded via `include` is processed right where it is encountered.

3.2.5 The logging Statement

Syntax

```
logging {
  # Send diagnostics to syslog.
  syslog boolean;

  # Print message severity levels.
  print-severity boolean;

  # Output only messages with a severity equal to or
  # greater than this one.
  severity string;

  # Set syslog facility.
  facility name;

  # Log session ID
  session-id boolean;

  # Tag syslog messages with this string.
  tag text;
}
```

Description

The `logging` block statement configures where the diagnostic output goes and how verbose it is.
syslog  bool  [Configuration]
        If ‘syslog’ is set to ‘yes’, the diagnostics will go to syslog. Otherwise, it goes to the standard error.

        The default syslog facility is determined at compile time, it can be inspected using the following command (see Section 3.20.3 [mailutils info], page 142):
        $ mailutils info log_facility

facility name  [Configuration]
        Use syslog facility name. Valid argument values are: ‘user’, ‘daemon’, ‘auth’, ‘authpriv’, ‘mail’, ‘cron’, ‘local0’ through ‘local7’ (all names case-insensitive), or a facility number.

tag  text  [Configuration]
        Tag syslog messages with text. By default, program name is used as syslog tag.

print-severity  bool  [Configuration]
        Print Mailutils severity name before each message.

severity name  [Configuration]

session-id  bool  [Configuration]
        Print session ID with each diagnostic message. This is useful for programs that handle multiple user sessions simultaneously, such as pop3d and imap4d.

3.2.6 The debug Statement

Syntax

dep bug {
    # Set Mailutils debugging level.
    level spec;
    # Prefix debug messages with Mailutils source locations.
    line-info bool;
}

Description

The ‘debug’ statement controls the amount of additional debugging information output by Mailutils programs. The ‘level’ statement enables additional debugging information. Its argument (spec) is a Mailutils debugging specification as described in Section 3.3 [debugging], page 42.

The ‘line-info’ statement, when set to ‘true’ causes debugging messages to be prefixed with locations in Mailutils source files where they appear. Normally, only Mailutils developers need this option.

3.2.7 The mailbox Statement
### Syntax

```plaintext
mailbox {
    # Use specified url as a mailspool.
    mail-spool url;

    # Create mailbox url using pattern.
    mailbox-pattern pattern;

    # Default mailbox type.
    mailbox-type type;

    # Default user mail folder.
    folder dir;
}
```

### Description

The `mailbox` statement configures the location, name and type of user mailboxes.

The mailbox location can be specified using `mail-spool` or `mail-pattern` statements.

**mail-spool path**

The `mail-spool` statement specifies directory that holds user mailboxes. Once this statement is given, the `libmailutils` library will assume that the mailbox of user `login` is kept in file `path/login`. Historically, `path` can contain mailbox type prefix, e.g.: `maildir:///var/spool/mail`, but such usage is discouraged in favor of `mailbox-pattern` statement.

**mailbox-pattern url**

The `mailbox-pattern` statement is a preferred way of configuring mailbox locations. It supersedes `mail-spool` statement.

The `url` must be a valid mailbox URL (see Chapter 2 [Mailbox], page 3), which may contain references to the ‘user’ variable (see Section 3.2.2 [Variables], page 15). This variable will be expanded to the actual user name.

Optional URL parameters can be used to configure indexed directory structure. Such structure is a special way of storing mailboxes, which allows for faster access in case of very large number of users.

By default, all user mailboxes are stored in a single directory and are named after user login names. To find the mailbox for a given user, the system scans the directory for the corresponding file. This usually implies linear search, so the time needed to locate a mailbox is directly proportional to the ordinal number of the mailbox in the directory.

GNU Mailutils supports three types of indexed directories: ‘direct’, ‘reverse’, and ‘hashed’.

In direct indexed directory structure, `path` contains 26 subdirectories named with lower-case letters of Latin alphabet. The location of the user mailbox is determined using the following algorithm:

1. Take the first letter of the user name.
2. Map it to a lower-case letter using index mapping table. The result gives the name of a sub-directory where the mailbox is located.
3. Descend into this directory.

For example, using this algorithm, the mailbox of the user ‘smith’ is stored in file path/s/smith.
If each of single-letter subdirectories contains the indexed directory structure, we have second level of indexing. In this case the file name of ‘smith’’s mailbox is path/s/m/smith.
The reverse indexed structure uses the same principles, but the indexing letters are taken from the end of the user name, instead of from the beginning. For example, in the 2nd level reverse indexed structure, the ‘smith’’s mailbox is located in path/h/t/smith.
Finally, the hashed structure consists of 256 subdirectories under path, named by 2-letter hex codes from ‘00’ to ‘FF’. Mailboxes are stored in these subdirectories. The name of the subdirectory is computed by hashing first level letters of the user name.
The hashing algorithm is:
1. Take next letter from the user name
2. Add its ASCII value to the hash sum.
3. Continue (1-2) until level letters are processed, or all letters from the file name are used, whichever occurs first.
4. Convert the computed sum modulo 256 to a hex code.

Indexed directory structures are configured using the following arguments:

- **type=value**
  Specifies the type of indexing. Valid values are ‘index’, for direct indexed structure, ‘rev-index’ for reverse indexing, and ‘hash’ for hashed structure.

- **param=number**
  Specifies indexing level.

- **user=string**
  Specifies indexing key. The only meaningful value, as of Mailutils version 3.10 is ‘user=${user}’.

Let’s assume the traditional mail layout, in which incoming mails are stored in a UNIX mailbox named after the recipient user name and located in /var/mail directory. The mailbox-pattern for this case is:

```
mailbox-pattern "/var/mail/${user}"
```
It is entirely equivalent to specifying ‘mail-spool "/var/mail"’.
Now, if the layout is the same, but mailboxes are kept in ‘maildir’ format, then the corresponding statement is:

```
mailbox-pattern "maildir:///var/mail/${user}";
```
Finally, if the mailboxes are stored in a directly-indexed directory with two levels of indexing, the URL is:

```
mailbox-pattern "maildir:///var/mail;type=index;param=2;user=${user}";
```
If neither `mailbox-pattern` nor `mail-spool` are given, the mailbox names are determined using the following algorithm:

1. If environment variable `FOLDER` is set, use its value.
2. Otherwise, if environment variable `MAIL` is set, use its value.
3. If neither of these is set, construct the mailbox name by concatenating the built-in mail spool directory name, a directory separator, and the user name.

The built-in mail spool directory name is determined at compile time, using the `_PATH_MAILDIR` define from the include file `paths.h`. If this value is not defined, `/var/mail` or `/usr/spool/mail` is used.

### [Configuration]

<table>
<thead>
<tr>
<th><code>mailbox-type type</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifies the type of mailboxes. By default, <code>mbox</code> (UNIX mailbox) is assumed. This can be changed while configuring the package by setting <code>MU_DEFAULT_SCHEME</code> configuration variable. The default value can be verified by running <code>mailutils info scheme</code>.</td>
</tr>
</tbody>
</table>

### [Configuration]

<table>
<thead>
<tr>
<th><code>folder dir</code></th>
</tr>
</thead>
</table>
| Sets user mail folder directory. Its value is used when expanding `plus-notation`, i.e. such mailbox names as `+inbox`. The `+` sign is replaced by `dir`, followed by a directory separator (`/`). The `dir` argument can contain mailbox type prefix, e.g `mh://Mail`.

The default folder name is `Mail/`.

### 3.2.8 The mime Statement

#### Syntax

```
mime {
   # Define additional textual mime types.
   text-type PATTERN;
   # or
   text-type ( PATTERN-LIST );
}
```

#### Description

The `mime` compound statement is used by utilities that process MIME messages, in particular `mail`, `readmsg`, and `decodemail`. As of mailutils version 3.10 it contains only one statement:

```
text-type pattern |
|------------------|
| Defines additional patterns for recognition of textual message parts. The `pattern` is a shell globbing pattern that will be compared against the `Content-Type` header of a MIME message part in order to determine whether it can be treated as a text part. In second form, `pattern-list` is a comma-separated list of such patterns.

In both forms, the new patterns are appended to the built-in textual pattern list, which contains:

- `text/*`
3.2.9 The locking Statement

Syntax

locking {
  # Default locker flags.
  flags arg;

  # Set timeout for acquiring the lock.
  retry-timeout arg;

  # Set the maximum number of times to retry acquiring the lock.
  retry-count number;

  # Expire locks older than this amount of time.
  expire-timeout number;

  # Use prog as external locker program.
  external-locker prog;
}

Description

This block statement configures various parameters used when locking UNIX mailboxes in order to prevent simultaneous writes.

It is important to note, that locking applies only to traditional UNIX mailboxes (see [mbox], page 3). All other mailbox types don’t require locking.

flags string

Set locking flags. Argument is a string consisting of one or more of the following letters:

E Use an external program to manage locks. The program is given by the external-locker statement (see below).

R If the locking attempt failed, retry it. This is the default. The number of retries, and time interval between the two successive attempts is given by retry-count and retry-timeout statements, correspondingly.
Chapter 3: Mailutils Programs

T If a lock file exists, check its modification time and, if it is older than a predefined amount of time, remove the lock. The amount of time is specified by \texttt{expire-timeout} statement.

P Store the PID of the locking process in a lock file.

\textbf{retry-count} \texttt{number} \hspace{1cm} \text{[Configuration]}
Number of locking attempts. The ‘P’ flag must be set for this to take effect.

\textbf{retry-timeout} \texttt{seconds} \hspace{1cm} \text{[Configuration]}
Time interval, in seconds, between the two successive locking attempts. The ‘P’ flag must be set for this to take effect.

\textbf{expire-timeout} \texttt{seconds} \hspace{1cm} \text{[Configuration]}
Remove existing lock file, if it is created more than this number of seconds ago. The ‘T’ flag must be set for this to take effect.

\textbf{external-locker} \texttt{string} \hspace{1cm} \text{[Configuration]}
Determines the external locker program to use. The \texttt{string} argument is the valid command line, starting with the full program name. The ‘E’ flag must be set for this to take effect.

\section{3.2.10 The mailer Statement}

\textbf{Syntax}

\begin{verbatim}
mailer {
    url url;
}
\end{verbatim}

\textbf{Description}

A \textit{mailer} is a special logical entity GNU Mailutils uses for sending messages. Its internal representation is discussed in \textit{Mailer}. The \textit{mailer} statement configures it.

The mailer statement contains a single sub-statement:

\textbf{url} \texttt{str} \hspace{1cm} \text{[Configuration]}
Set the mailer URL.

GNU Mailutils supports three types of mailer URLs, described in the table below:

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>smtp://</td>
<td>smtp://[user[:pass][;auth=mech,...[@]host[:port]][;params]</td>
<td>Send messages using SMTP protocol. See Section 2.3 [SMTP Mailboxes], page 5, for a detailed description of the URL and its parts.</td>
</tr>
<tr>
<td>smtps://</td>
<td>smtps://[user[:pass][;auth=mech,...[@]host[:port]][;params]</td>
<td></td>
</tr>
<tr>
<td>sendmail://</td>
<td>sendmail://[progname]</td>
<td>Use sendmail-compatible program \textit{progname}. \textit{Sendmail-compatible} means that the program must support following command line options:</td>
</tr>
<tr>
<td></td>
<td>-oi Do not treat ‘.’ as message terminator.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-f \textit{addr} Use \textit{addr} as the sender address.</td>
<td></td>
</tr>
</tbody>
</table>
Get recipient addresses from the message.

See Section 2.4 [sendmail], page 6, for details.

prog://prognam?query
A prog mailer. This is a generalization of ‘sendmail’ mailer that allows to use arbitrary external programs as mailers.
It is described in detain in Section 2.4 [prog], page 6.

3.2.11 The acl Statement

Syntax

```plaintext
acl {
  # Allow connections from this IP address.
  allow [from] ip;

  # Deny connections from this IP address.
  deny [from] ip;

  # Log connections from this IP address.
  log [from] ip [string];

  /* Execute supplied program if a connection from this IP address is requested. */
  exec [from] ip program;

  /* Use program to decide whether to allow connection from ip. */
  ifexec [from] ip program;
}
```

Description

The ACL statement defines an Access Control List, a special structure that controls who can access the given Mailutils resource.

The acl block contains a list of access controls. Each control can be regarded as a function that returns a tree-state value: ‘True’, ‘False’ and ‘Don’t know’. When a remote party connects to the server, each of controls is tried in turn. If a control returns ‘False’, access is denied. If it returns ‘True’, access is allowed. If it returns ‘Don’t know’, then the next control is tried. It is unclear whether to allow access if the last control in list returned ‘Don’t know’. GNU Mailutils 3.10 issues a warning message and allows access. This default may change in future versions. Users are advised to write their ACLs so that the last control returns a definite answer (either True or False).

In the discussion below, wherever cidr appears as an argument, it can be replaced by any of:

- An IPv4 address in dotted-quad notation.
- An IPv6 address in numeric notation
• A CIDR in the form \texttt{ip/mask}, where \texttt{ip} is an IP address (either IPv4 or IPv6), and \texttt{mask} is the network mask.
• A symbolic host name.
• A word \texttt{any}, which matches any IP address.

The following controls are understood:

\textbf{allow [from] cidr} \hfill [Configuration]
Allow connections from IP addresses matching this \texttt{cidr} block.

\textbf{deny [from] cidr} \hfill [Configuration]
Deny connections from IP addresses matching this \texttt{cidr} block.

\textbf{ifexec [from] cidr program} \hfill [Configuration]
When a connection from the \texttt{cidr} block is requested, execute the program \texttt{program}. If its exit code is \texttt{0}, then allow connection. Otherwise, deny it.

The \texttt{program} argument undergoes variable expansion and word splitting. The following variables are defined:

\texttt{aclno} \quad Ordinal number of the control in the ACL. Numbers begin from ‘1’.
\texttt{family} \quad Connection family. Mailutils version 3.10 supports the following families: \texttt{‘AF_INET’}, \texttt{‘AF_INET6’} and \texttt{‘AF_UNIX’}.
\texttt{address} \quad Remote IP address (for \texttt{‘AF_INET’} and \texttt{‘AF_INET6’}) or socket name (for \texttt{‘AF_UNIX’}). Notice that most Unixes return empty string instead of the \texttt{‘AF_UNIX’} socket name, so do not rely on it.
\texttt{port} \quad Remote port number (for \texttt{‘AF_INET’} and \texttt{‘AF_INET6’}).

\textbf{exec [from] cidr program} \hfill [Configuration]
If a connection from the \texttt{cidr} block is requested, execute the given \texttt{program}. Do not wait for it to terminate, and ignore its exit code. The \texttt{program} is subject for variable expansion as in \texttt{ifexec}.

The following two controls are provided for logging purposes and as a means of extensions. They always return a \texttt{Don’t know} answer, and therefore should not be used at the end of an ACL:

\textbf{log [from] cidr [string]} \hfill [Configuration]
Log connections from addresses in this \texttt{cidr}. The \texttt{MU_DIAG_INFO} channel is used. If the logging goes to syslog, it is translated to the \texttt{LOG_INFO} priority.
If \texttt{string} is not given, the format of the log entry depends on the connection family, as described in the table below:

\{\texttt{AF_INET ip:port}\}
For inet IPv4 connections. The variables \texttt{ip} and \texttt{port} are replaced by the remote IP address and port number, correspondingly.

\{\texttt{AF_UNIX}\}
For connections over UNIX sockets. The socket name, if available, may be printed before the closing curly brace.
If string is supplied, it undergoes variable expansions as described for the ‘ifexec’.
For example, the following ACL makes a Mailutils server log every incoming connection:

```plaintext
acl {
    log from any "Connect from \${address}";
    ...
}
```

This was the default behavior for the versions of Mailutils up to ‘1.2’, so if you got
used to its logs you might wish to add the above in your configuration files.

```plaintext
exec [from] cidr program
```

If a connection from the cidr block is requested, execute the given program. Do not
wait for it to terminate, and ignore its exit code.

### 3.2.12 The tcp-wrappers Statement

#### Syntax

```plaintext
tcp-wrappers {
    # Enable TCP wrapper access control.
    enable bool;

    # Set daemon name for TCP wrapper lookups.
    daemon name;

    # Use file for positive client address access control.
    allow-table file;

    # Use file for negative client address access control.
    deny-table file;
}
```

#### Description

The tcp-wrappers statements provides an alternative way to control accesses to the re-
sources served by GNU Mailutils. This statement is enabled if Mailutils is compiled with
TCP wrappers library libwrap.

Access control using TCP wrappers is based on two files, called tables, containing access
rules. There are two tables: the allow table, usually stored in file /etc/hosts.allow, and the deny table, kept in file /etc/hosts.deny. The rules in each table begin with an
identifier called daemon name. A utility that wishes to verify a connection, selects the
entries having its daemon name from the allow table. A connection is allowed if it matches
any of these entries. Otherwise, the utility retrieves all entries with its daemon name from
the deny table. If any of these matches the connection, then it is refused. Otherwise, if
neither table contains matching entries, the connection is allowed.

The description of a TCP wrapper table format lies outside the scope of this document.
Please, see Section “ACCESS CONTROL FILES” in hosts_access(5) man page, for details.
enable bool
  Enable access control using TCP wrappers. It is on by default.

daemon name
  Set daemon name for TCP wrapper lookups. By default, the name of the utility is
  used. E.g. imap4d uses ‘imap4d’ as the daemon name.

allow-table file
  Use file as allow table. By default, /etc/hosts.allow is used.

deny-table file
  Use file as negative table. By default, /etc/hosts.deny is used.

3.2.13 Server Settings
GNU Mailutils offers several server applications: pop3d, imap4d, comsatd, to name a few.
Being quite different in their purpose, they are very similar in some aspects of their ar-
chitecture. First of all, they all support two operating modes: daemon, where a program
disconnects from the controlling terminal and works in background, and inetd, where it
remains in foreground and communicates with the remote party via standard input and
output streams. Secondly, when operating as daemons, they listen to a preconfigured set of
IP addresses and ports, reacting to requests that arrive.

To configure these aspects of functionality, GNU Mailutils provides Server Configuration
Settings, which is describes in this subsection.

3.2.13.1 General Server Configuration

Syntax:

```
# Set daemon mode.
mode ‘inetd|daemon’;

# Run in foreground.
foreground bool;

# Maximum number of children processes to run simultaneously.
max-children number;

# Store PID of the master process in file.
pidfile file;

# Default port number.
port portspec;

# Set idle timeout.
timeout time;
```

Description: These statements configure general server-related issues.
mode string;
  [Configuration]
  Set operation mode of the server. Two operation modes are supported:

  daemon  Run as a standalone daemon, disconnecting from the controlling terminal and continuing to run in the background. In this case, it is the server that controls what IP addresses and ports to listen on, who is allowed to connect and from where, how many clients are allowed to connect simultaneously, etc. Most remaining configuration statements are valid only in the daemon mode.

  This is the preferred mode of operation for GNU Mailutils servers.

  inetd  Operate as a subprocess of UNIX internet super-server program, inetd. See Section “Internet super-server” in inetd(8) man page, for a detailed description of the operation of inetd and its configuration. In this case it is inetd that controls all major connectivity aspects. The Mailutils server program communicates with it via standard input and output streams.

  For historical reasons, this mode is the default, if no mode statement is specified. This will change in the future.

foreground bool;
  [Configuration]
  [daemon mode only]
  Do not disconnect from the controlling terminal and remain in the foreground.

max-children number;
  [Configuration]
  [daemon mode only]
  Set maximum number of child processes allowed to run simultaneously. This equals the number of clients that can use the server simultaneously.

  The default is 20 clients.

pidfile file;
  [Configuration]
  After startup, store the PID of the main server process in file. When the process terminates, the file is removed. As of version 3.10, GNU Mailutils servers make no further use of this file. It is intended for use by automated startup scripts and controlling programs (e.g. see GNU Pies Manual).

port portspec;
  [Configuration]
  [daemon mode only]
  Set default port to listen to. The portspec argument is either a port number in decimal, or a symbolic service name, as listed in /etc/services (see Section “Internet network services list” in services(5) man page).

timeout time;
  [Configuration]
  Sets maximum idle time out in seconds. If a client does not send any requests during time seconds, the child process terminates.
3.2.13.2 The server Statement

Syntax:

```plaintext
server ipaddr[:port] {  
  # Run this server as a single process.
  single-process bool;

  # Log the session transcript.
  transcript bool;

  # Set idle timeout.
  timeout time;

  # Size of the queue of pending connections
  backlog <number: callback>;

  # Kind of TLS encryption to use for this server.
  tls-mode 'no'|'ondemand'|'required'|'connection';

  tls {
    # Specify SSL certificate file.
    ssl-certificate-file string;
    # Specify SSL certificate key file.
    ssl-key-file file;
    # Specify trusted CAs file.
    ssl-ca-file file;
    # Set the priorities to use on the ciphers, methods, etc.
    ssl-priorities string;
  }

  # Set server specific ACLs.
  acl { /* See [ACL Statement], page 24. */ };
}
```

Description:

The `server` block statement configures a single TCP or UDP server. It takes effect only in daemon mode (see [server mode], page 28). The argument to this statement specifies the IP address, and, optionally, the port, to listen on for requests. The `ipaddr` part is either an IPv4 address in dotted-quad form, or a IPv6 address enclosed in square brackets, or a symbolic host name which can be resolved to such an address. Specifying ‘0.0.0.0’ as the `ipaddr` means listen on all available network interfaces. The `port` argument is either a port number in decimal, or a symbolic service name, as listed in `/etc/services` (see Section “Internet network services list” in `services(5)` man page). If `port` is omitted, Mailutils uses the port set by `port` statement (see Section 3.2.13.1 [General Server Configuration], page 27), or, in its absence, the default port number, which depends on a server being used (e.g. 110, for `pop3d`, 143, for `imap4d`, etc.).
Any number of `server` statements may be specified in a single configuration file, allowing to set up the same service on several IP addresses and/or port numbers, and with different configurations.

Statements within the `server` block statement configure this particular server.

`single-process bool;`  
If set to true, this server will operate in single-process mode. This mode is intended for debugging only, do not use it on production servers.

`transcript bool;`  
Enable transcript of the client-server interaction. This may generate excessive amounts of logging, which in turn may slow down the operation considerably. Session transcripts are useful in fine-tuning your configurations and in debugging. They should be turned off on most production servers.

`timeout time;`  
Set idle timeout for this server. This overrides the global timeout settings (see Section 3.2.13.1 [General Server Configuration], page 27).

`backlog number;`  
Configures the size of the queue of pending connections

`tls-mode mode;`  
Configure the use of TLS encryption. The `mode` argument is one of the following:

- no: TLS is not used. The corresponding command (STLS, for POP3, STARTTLS, for IMAP4) won't be available even if the TLS configuration is otherwise complete.
- ondemand: TLS is initiated when the user issues the appropriate command. This is the default when TLS is configured.
- required: Same as above, but the use of TLS is mandatory. The authentication state is entered only after TLS negotiation has succeeded.
- connection: TLS is always forced when the connection is established. For `pop3d` this means using POP3S protocol (or IMAP4S, for `imap4d`).

`tls { ... }`  
The `tls` statement configures SSL certificate and key files, as well as other SSL settings for use in this server. It is used when `tls-mode` is set to any of the following values: `ondemand`, `required`, `connection`.

If `tls-mode` is set to any of the values above and `tls` section is absent, settings from the global `tls` section will be used. In this case, it is an error if the global `tls` section is not defined.

See Section 3.2.20 [tls statement], page 40, for a discussion of its syntax.

`acl`  
This statement defines a per-server Access Control List. Its syntax is as described in [ACL Statement], page 24. Per-server ACLs complement, but not override, global ACLs, i.e. if both global ACL and per-server ACL are used, the connection is allowed only if both of them allow it, and is denied if any one of them denies it.
3.2.14 The auth Statement

Syntax

```plaintext
auth {
  # Set a list of modules for authentication.
  authentication module-list;

  # Set a list of modules for authorization.
  authorization module-list;
}
```

Description

Some mail utilities provide access to their services only after verifying that the user is actually the person he is claiming to be. Such programs are, for example, `pop3d` and `imap4d`. The process of the verification is broken down into two stages: authorization and authentication. In authorization stage the program retrieves the information about a particular user. In authentication stage, this information is compared against the user-supplied credentials. Only if both stages succeed is the user allowed to use the service.

A set of modules is involved in performing each stage. For example, the authorization stage can retrieve the user description from various sources: system database, SQL database, virtual domain table, etc. Each module is responsible for retrieving the description from a particular source of information. The modules are arranged in a module list. The modules from the list are invoked in turn, until one of them succeeds or the list is exhausted. In the latter case the authorization fails. Otherwise, the data returned by the succeeded module are used in authentication.

Similarly, authentication may be performed in several ways. The authentication modules are also grouped in a list. Each module is tried in turn until either a module succeeds, in which case the authentication succeeds, or the end of the list is reached.

For example, the authorization list

```plaintext
(system, sql, virtdomains)
```

means that first the system user database (`/etc/password`) is searched for a description of a user in question. If the search fails, the SQL database is searched. Finally, if it also fails, the search is performed in the virtual domain database.

*Note,* that some authentication and/or authorization modules may be disabled when configuring the package before compilation. The names of the disabled modules are nevertheless available for use in runtime configuration options, but they represent a “fail-only” functionality, e.g. if the package was compiled without SQL support then the module ‘sql’ in the above example will always fail, thus passing the execution on to the next module.

The auth statement configures authentication and authorization.

```
authorization module-list
```

[Configuration]

Define a sequence of modules to use for authorization. Modules will be tried in the same order as listed in `module-list`.

The modules available for use in authorization list are:
system User credentials are retrieved from the system user database (/etc/password).

sql User credentials are retrieved from a SQL database. A separate configuration statement, sql, is used to configure it (see Section 3.2.18 [sql statement], page 36).

virtdomain User credentials are retrieved from a “virtual domain” user database. Virtual domains are configured using virtdomain statement (see Section 3.2.16 [virtdomain statement], page 33).

radius User credentials are retrieved using RADIUS. See Section 3.2.17 [radius statement], page 34, for a detailed description on how to configure it.

ldap User credentials are retrieved from an LDAP database. See Section 3.2.19 [ldap statement], page 38, for an information on how to configure it.

Unless overridden by authorization statement, the default list of authorization modules is:
1. generic
2. system
3. pam
4. sql
5. virtual
6. radius
7. ldap

authentication module-list [Configuration]
Define a sequence of modules to use for authentication. Modules will be tried in the same order as listed in module-list.

The following table lists modules available for use in module-list:

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>generic</td>
<td>The generic authentication type. User password is hashed and compared against the hash value returned in authorization stage.</td>
</tr>
<tr>
<td>system</td>
<td>The hashed value of the user password is retrieved from /etc/shadow file on systems that support it.</td>
</tr>
<tr>
<td>sql</td>
<td>The hashed value of the user password is retrieved from a SQL database using query supplied by getpass statement (see Section 3.2.18 [sql statement], page 36).</td>
</tr>
<tr>
<td>pam</td>
<td>The user is authenticated via pluggable authentication module (PAM). The PAM service name to be used is configured in pam statement (see Section 3.2.15 [pam statement], page 33).</td>
</tr>
<tr>
<td>radius</td>
<td>The user is authenticated on a remote RADIUS server. See Section 3.2.17 [radius statement], page 34.</td>
</tr>
<tr>
<td>ldap</td>
<td>The user is authenticated using LDAP. See Section 3.2.19 [ldap statement], page 38.</td>
</tr>
</tbody>
</table>
Unless overridden by authentication statement, the list of authentication modules is the same as for authorization, i.e.:

1. generic
2. system
3. pam
4. sql
5. virtual
6. radius
7. ldap

### 3.2.15 PAM Statement

**Syntax**

```plaintext
pam {
    # Set PAM service name.
    service text;
}
```

**Description**

The `pam` statement configures PAM authentication. It contains a single sub-statement:

`service text`  
Define service name to look for in PAM configuration. By default, the base name of the Mailutils binary is used.

This statement takes effect only if ‘pam’ is listed in authentication statement (see Section 3.2.14 [auth statement], page 31).

### 3.2.16 The virtdomain Statement

**Syntax**

```plaintext
virtdomain {
    # Name of the virtdomain password directory.
    passwd-dir dir;
}
```

**Description**

Virtual mail domains make it possible to handle several mail domains each having a separate set of users, on a single server. The domains are completely independent of each other, i.e. the same user name can be present in several domains and represent different users.

When authenticating to a server with virtual domain support enabled, users must supply their user names with domain parts. The server strips off the domain part and uses it as a name of UNIX-format password database file, located in the domain password directory. The latter is set using `passwd-dir` statement.

`passwd-dir dir`  
Set virtual domain password directory.
For example, when authenticating user ‘\texttt{smith@example.com}’, the server will use password file named \texttt{dir/example.com}. This file must be in UNIX passwd format (see Section “password file” in \texttt{passwd(5) man page}), with encrypted passwords stored in it (as of GNU Mailutils version 3.10, there is no support for shadow files in virtual password directories, although this is planned for future versions). Here is an example record from this file:

\begin{verbatim}
smith:Wbld/G2Q2Le2w:1000:1000:Email Account:/var/mail/domain/smith:/dev/null
\end{verbatim}

Notice, that it must contain user names without domain parts.

The \texttt{pw_dir} field (the 6th field) is used to determine the location of the maildrop for this user. It is defined as \texttt{pw_dir/INBOX}. In our example, the maildrop for user \texttt{smith} will be located in file \texttt{/var/mail/domain/smith}.

If user did not supply his domain name, or if no matching record was found in the password file, or if the file matching the domain name does not exist, then GNU Mailutils falls back to alternative method. First, it tries to determine the IP address of the remote party. Then the domain name corresponding to that address is looked up in the DNS system. Finally, this domain name is used as a name of the password file.

\subsection{The \texttt{radius} Statement}

\textbf{Syntax}

\begin{verbatim}
radius {
 # Set radius configuration directory.
 directory dir;
 # Radius request for authorization.
 auth request;
 # Radius request for getpwnam.
 getpwnam request;
 # Radius request for getpwuid.
 getpwuid request;
}
\end{verbatim}

\textbf{Description}

The \texttt{radius} block statement configures RADIUS authentication and authorization.

Mailutils uses GNU Radius library, which is configured via \texttt{raddb/client.conf} file (see Section “Client Configuration” in \texttt{GNU Radius Reference Manual}). Its exact location depends on configuration settings that were used while compiling GNU Radius. Usually it is \texttt{/usr/local/etc}, or \texttt{/etc}. This default can also be changed at run time using \texttt{directory} statement:

\begin{verbatim}
[Configuration]
directory dir
\end{verbatim}

Set full path name to the GNU Radius configuration directory.

It authorization is used, the Radius dictionary file must declare the the following attributes:

\begin{tabular}{|l|l|l|}
\hline
\textbf{Attribute} & \textbf{Type} & \textbf{Description} \\
\hline
GNU-MU-User-Name & string & User login name \\
\hline
\end{tabular}
GNU-MU-UID          integer   UID
GNU-MU-GID          integer   GID
GNU-MU-GECOS        string   GECOS
GNU-MU-Dir          string   Home directory
GNU-MU-Shell        string   User shell
GNU-MU-Mailbox      string   User mailbox
GNU-MU-Quota        integer   Mail quota (in bytes)

A dictionary file with appropriate definitions is included in the Mailutils distribution: examples/config/mailutils.dict. This file is not installed by default, you will have to manually copy it to the GNU Radius raddb/dict directory and include it in the main dictionary file raddb/dictionary by adding the following statement:

$INCLUDE dict/mailutils.dict

Requests to use for authentication and authorization are configured using three statements: auth, getpwnam and getpwuid. Each statement takes a single argument: a string, containing a comma-separated list of assignments. An assignment specifies a particular attribute-value pair (see Section “Overview” in GNU Radius Reference Manual) to send to the server. The left-hand side of the assignment is a symbolic attribute name, as defined in one of Radius dictionaries (see Section “dictionary file” in GNU Radius Reference Manual). The value is specified by the right-hand side of assignment. For example:

"Service-Type = Authenticate-Only, NAS-Identifier = \"mail\"

The assignment may contain references to the following variables (see Section 3.2.2 [Variables], page 15):

user       The actual user name (for auth and getpwnam), or user ID (for getpwuid). For example:
           User-Name = ${user}
passwd     User password. For examples:
           User-Password = ${passwd}

auth pairlist [Configuration]

Specifies the request to be sent to authenticate the user. For example:

    auth "User-Name = ${user}, User-Password = ${passwd}";

The user is authenticated only if this request returns Access-Accept (see Section “Authentication Requests” in GNU Radius Reference Manual). Any returned attribute-value pairs are ignored.

gotpwnam pairlist [Configuration]

Specifies the request that returns user information for the given user name. For example:

    getpwnam "User-Name = ${user}, State = getpwnam, 
            "Service-Type = Authenticate-Only";

If the requested user account exists, the Radius server must return Access-Accept packet with the following attributes: GNU-MU-User-Name, GNU-MU-UID, GNU-MU-GID, GNU-MU-GECOS, GNU-MU-Dir, GNU-MU-Shell.

The attributes GNU-MU-Mailbox and GNU-MU-Quota are optional.
If GNU-MU-Mailbox is present, it must contain a valid mailbox URL (see Chapter 2 [Mailbox], page 3). If GNU-MU-Mailbox is not present, Mailutils constructs the mailbox name using the settings from the mailbox configuration statement (see [Mailbox Statement], page 18), or built-in defaults, if it is not present.

If GNU-MU-Quota is present, it specifies the maximum mailbox size for this user, in bytes. In the absence of this attribute, mailbox size is unlimited.

getpwuid pairlist

Specifies the request that returns user information for the given user ID. In pairlist, the ‘user’ macro-variable is expanded to the numeric value of ID. For example:

```
getpwuid "User-Name = ${user}, State = getpwuid, "
    "Service-Type = Authenticate-Only";
```

The reply to getpwuid request is the same as to getpwnam request (see above).

### 3.2.18 The sql Statement

**Syntax**

```
sql {
    # Set SQL interface to use.
    interface 'mysql|odbc|postgres';
    # SQL server host name.
    host arg;
    # SQL user name.
    user arg;
    # Password for the SQL user.
    passwd arg;
    # SQL server port.
    port arg;
    # Database name.
    db arg;
    # Type of password returned by getpass query.
    password-type 'plain | hash | scrambled';
    # Set a field-map for parsing SQL replies.
    field-map list;
    # SQL query returning the user’s password.
    getpass query;
    # SQL query to use for getpwnam requests.
    getpwnam query;
    # SQL query to use for getpwuid requests.
    getpwuid query;
}
```

**Description**

The sql statement configures access credentials to SQL database and the queries for authentication and authorization.
GNU Mailutils supports three types of SQL interfaces: MySQL, PostgreSQL and ODBC. The latter is a standard API for using database management systems, which can be used to communicate with a wide variety of DBMS.

**interface type**

Configures type of DBMS interface. Allowed values for `type` are:

- **mysql**: Interface with a MySQL server ([http://www.mysql.org](http://www.mysql.org)).
- **postgres**: Interface with a PostgreSQL server ([http://www.postgres.org](http://www.postgres.org)).

The database and database access credentials are configured using the following statements:

**host arg**

The host running the SQL server. The value can be either a host name or an IP address in dotted-quad notation, in which case an INET connection is used, or a full pathname to a file, in which case a connection to UNIX socket is used.

**port arg**

TCP port the server is listening on (for INET connections). This parameter is optional. Its default value depends on the type of database being used.

**db arg**;

Name of the database.

**user arg**

SQL user name.

**passwd arg**;

Password to access the database.

**password-encryption arg**;

Defines type of encryption used by the password returned by `getpass` query (see below). Possible arguments are:

- **plain**: Password is in plain text.
- **crypt**
- **hash**: Password is encrypted by system `crypt` function (see Section “crypt” in `crypt(3)` man page).
- **scrambled**: Password is encrypted by MySQL `password` function.

**getpwnam query**

Defines SQL query that returns information about the given user. The `query` is subject to variable expansion (see Section 3.2.2 [Variables], page 15). The only variable defined is `$user`, which expands to the user name.

The query should return a single row with the following columns:

- **name**: User name.
passwd    User password.
uid       UID of the user.
gid       GID of the primary group.
gecos     Textual description of the user.
dir       User’s home directory
shell     User’s shell program.

The following columns are optional:

mailbox   Full pathname of the user’s mailbox. If not returned or NULL, the mail-
           box is determined using the default algorithm (see Chapter 2 [Mailbox],
           page 3).
quota     Upper limit on the size of the mailbox. The value is either an integer
           number optionally followed by one of the usual size suffixes: ‘K’, ‘M’, ‘G’,
           or ‘T’ (case-insensitive).

getpwuid query [Configuration]
Defines SQL query that returns information about the given UID. The query is subject
 to variable expansion (see Section 3.2.2 [Variables], page 15). The only variable
defined is ‘$user’, which expands to the UID.

The query should return a single row, as described for getpwnam.

gpasswd query [Configuration]
Defines SQL query that returns the password of the given user. The query is subject to
variable expansion (see Section 3.2.2 [Variables], page 15). The only variable defined
is ‘$user’, which expands to the user name.

The query should return a row with a single column, which gives the password. The
password can be encrypted as specified by the password-encryption statement.

field-map list [Configuration]
Defines a translation map for column names. The list is a list of mappings. Each
mapping is a string ‘name=column’, where name is one of the names described in
[getpw column names], page 37, and column is the name of the column in the returned
row that should be used instead. The effect of this statement is similar to that of
SQL AS keyword. E.g. the statement

    field-map (uid=user_id);

has the same effect as using ‘SELECT user_id AS uid’ in the SQL statement.

3.2.19 The ldap Statement

Syntax

    ldap {
        # Enable LDAP lookups.
        enable bool;
        # Set URL of the LDAP server.
url url;
# Base DN for LDAP lookups.
base string;
# DN for accessing LDAP database.
binddn string;
# Password for use with binddn.
passwd string;
# Use TLS encryption.
tls bool;
# Set LDAP debugging level.
debug number;
# Set a field-map for parsing LDAP replies.
field-map list;
# LDAP filter to use for getpwnam requests.
getpwnam string;
# LDAP filter to use for getpwuid requests.
getpwuid filter;
}

Description
The ldap statement configures the use of LDAP for authentication.

enable bool  [Configuration]
   Enables LDAP lookups. If absent, ‘enable 0n’ is assumed.

url url  [Configuration]
   Sets the URL of the LDAP server.

base string  [Configuration]
   Defines base DN for LDAP lookups.

binddn string  [Configuration]
   Defines the DN for accessing LDAP database.

passwd string  [Configuration]
   Password for use when binding to the database.

tls bool  [Configuration]
   Enable the use of TLS when connecting to the server.

debug number  [Configuration]
   Set LDAP debug level. Please refer to the OpenLDAP documentation, for allowed
   number values and their meaning.

field-map map  [Configuration]
   Defines a map for parsing LDAP replies. The map is a list of mappings\textsuperscript{1}. Each
   mapping is ‘field=attr’, where attr is the name of the LDAP attribute and field is

\textsuperscript{1} For backward compatibility, map can be a string containing colon-delimited list of mappings. Such usage
is, however, deprecated.
a field name that declares what information that attribute carries. Available values for field are:

- `name` User name.
- `passwd` User password.
- `uid` UID of the user.
- `gid` GID of the primary group.
- `gecos` Textual description of the user.
- `dir` User’s home directory
- `shell` User’s shell program.

The default mapping is

```plaintext
("name=uid",
 "passwd=userPassword",
 "uid=uidNumber",
 "gid=gidNumber",
 "gecos=gecos",
 "dir=homeDirectory",
 "shell=loginShell")
```

### getpwnam string

[Configuration]

Defines the LDAP filter to use for `getpwnam` requests. The default is:

```plaintext
(&(objectClass=posixAccount) (uid=$user))
```

### getpwuid string

[Configuration]

Defines the LDAP filter to use for `getpwuid` requests. The default filter is:

```plaintext
(&(objectClass=posixAccount) (uidNumber=$user))
```

### 3.2.20 The tls Statement

#### Syntax

```plaintext
tls {
    # Specify SSL certificate file.
    ssl-certificate-file string;
    # Specify SSL certificate key file.
    ssl-key-file file;
    # Specify trusted CAs file.
    ssl-ca-file file;
    # Set the priorities to use on the ciphers, methods, etc.
    ssl-priorities string;
}
```

#### Description

The `tls` statement configures TLS parameters to be used by servers. It can appear both in the global scope and in server scope. Global tls settings are applied for servers that are declared as supporting TLS encryption, but lack the `tls` substatement.
ssl-certificate-file string
    Specify SSL certificate file.

ssl-key-file file
    Specify SSL certificate key file.

ssl-ca-file file
    Specify the trusted certificate authorities file.

ssl-priorities string
    Set the priorities to use on the ciphers, key exchange methods, MACs and compression
    methods.

3.2.21 The tls-file-checks Statement

Syntax

tls-file-checks {
    # Configure safety checks for SSL key file.
    key-file list;
    # Configure safety checks for SSL certificate.
    cert-file list;
    # Configure safety checks for SSL CA file.
    ca-file list;
}

Description

This section configures security checks applied to the particular SSL configuration files in
order to decide whether it is safe to use them.

key-file list
    Configure safety checks for SSL key file. Elements of the list are names of individual
    checks, optionally prefixed with ‘+’ to enable or ‘-’ to disable the corresponding check.
    Valid check names are:

    none     Disable all checks.
    all      Enable all checks.
    gwrfil   Forbid group writable files.
    awrfil   Forbid world writable files.
    grdfil   Forbid group readable files.
    ardfil   Forbid world writable files.
    linkwrdir Forbid symbolic links in group or world writable directories.
    gwrdir   Forbid files in group writable directories.
    awrdir   Forbid files in world writable directories.

cert-file list
    Configure safety checks for SSL certificate. See key-file for a description of list.
ca-file list

[Configuration]
Configure safety checks for SSL CA file. See key-file for a description of list.

3.2.22 The gsasl Statement

---
Editor's note:
This node is to be written.
---

Syntax

```
gsasl {
    # Name of GSASL password file.
    cram-passwd file;
    # SASL service name.
    service string;
    # SASL realm name.
    realm string;
    # SASL host name.
    hostname string;
    # Anonymous user name.
    anonymous-user string;
}
```

3.3 Debugging

Mailutils debugging output is controlled by a set of levels, each of which can be set independently of others. Each debug level consists of a category name, which identifies the part of Mailutils for which additional debugging is desired, and a level number, which tells Mailutils how verbose should its output be.

Valid debug levels are:

- `error` Displays error conditions which are normally not reported, but passed to the caller layers for handling.
- `trace0` through `trace9` Ten levels of verbosity; ‘trace0’ producing less output, ‘trace9’ producing the maximum amount of output.
- `prot` Displays network protocol interaction, where applicable.

Implementation and applicability of each level differs between various categories. The full list of categories is available in file `libmailutils/diag/debcat` in the Mailutils source tree. Most useful categories and levels implemented for them are discussed later in this article.
3.3.1 Level Syntax

Debug levels can be set either from the command line, by using the `--debug-level` command line option, or from the configuration file, using the `.debug.level` statement. In both cases, the level is specified as a list of individual levels, delimited with semicolons. Each individual level can be specified as:

- `!category` Disables all levels for the specified category.
- `category` Enables all levels for the specified category.
- `category.level` For the given category, enables all levels from ‘error’ to level, inclusive.
- `category.=level` Enables only the given level for this category.
- `category=!level` Disables all levels from ‘error’ to level, inclusive, for this category.
- `category=!=level` Disables only the given level in this category.
- `category.levelA-levelB` Enables all levels in the range from levelA to levelB, inclusive.
- `category=!levelA-levelB` Disables all levels in the range from levelA to levelB, inclusive.

Additionally, a comma-separated list of level specifications is allowed after the dot. For example, the following specification:

```
acl.prot,!=trace9,!trace2
```

enables in category `acl` all levels, except ‘trace9’, ‘trace0’, ‘trace1’, and ‘trace2’.

3.3.2 BNF

The following specification in Backus-Naur form describes formally the Mailutils debug level:

```
<debug-spec> ::= <level-spec> | <debug-level-list>
<debug-level-list> ::= <debug-level> | <debug-level-list> ";" <debug-level>
<debug-level> ::= <category> | "!" <category> | <category> "." <level-list>
<level-list> ::= <level-spec> | <level-list> "," <level-spec>
<level-spec> ::= <level> | <negate-level>
<negate-level> ::= "!" <level>
<level> ::= <level-number> | ";" <level-number> | <level-number> ";" <level-number>
<level-number> ::= "error" | "trace0" | "trace1" | "trace2" | "trace3" | "trace4" | "trace5" | "trace6" | "trace7" | "trace8" | "trace9" | "prot"
```
3.3.3 Debugging Categories

acl
This category enables debugging of Access Control Lists. Available levels are:
- error
  As usual, displays errors, not directly reported otherwise.
- trace0
  Basic tracing of ACL processing.
- trace9
  Traces the process of matching the ACL conditions.

config
This category affects configuration parser and/or lexical analyzer. The following levels are supported:
- trace0
  Minimal information about configuration statements.
- trace2
  Trace lexical structure of the configuration files.
- trace7
  Trace execution of the configuration parser.

Due to its specific nature, this category cannot be enabled from the configuration file. A special hook is provided to facilitate debugging the configuration parser, namely, a pragmatic comment in form:

```
#debug=debug-level-list
```

causes debug-level-list to be parsed as described above. Thus, to force debugging of the configuration parser, one would add the following line at the very beginning of the configuration file:

```
#debug=config.trace7
```

mailbox
Operations over mailboxes. This module supports the following levels: ‘error’, ‘trace0’, ‘trace1’, and ‘prot’. The latter is used by remote mailbox support libraries.

auth
Enables debugging information about authentication and authorization. This category supports the following levels: ‘error’, ‘trace0’, ‘trace1’, and ‘trace2’.

In level ‘trace0’, user data are reported along with the data source they were obtained from. The output may look like this:

```
pop3d: source=system, name=gray, passwd=x, uid=120, gid=100, gecos=Sergey Poznyakoff, dir=/home/gray, shell=/bin/bash, mailbox=/var/mail/gray, quota=0, change_uid=1
```

In the ‘trace1’ level, additional flow traces are displayed.

In the level ‘trace2’, a detailed flow trace is displayed, which looks like the following:

```
pop3d: Trying generic...
pop3d: generic yields 38=Function not implemented
pop3d: Trying system...
pop3d: system yields 0=Success
pop3d: Trying generic...
pop3d: generic yields 4135=Authentication failed
pop3d: Trying system...
pop3d: system yields 0=Success
```
mailer  Debugs mailer operations. The following levels are supported:

error  Displays mild error conditions.

trace0  Traces mailer operations in general: displays what part of the message is being sent, etc.

trace6  When used together with ‘prot’, displays security-sensitive information (such as passwords, user keys, etc.) in plaintext. By default, such information is replaced with asterisks to reduce the possibility of security compromise.

trace7  When used together with ‘prot’, displays the payload information as it is being sent. The payload is the actual message contents, i.e. the part of SMTP transaction that goes after the ‘DATA’ command and which ends with a terminating dot line. Setting this level can generate huge amounts of information.

prot  For SMTP mailer: outputs transcripts of SMTP sessions.

server  This category provides debugging information for Mailutils IP server objects. It supports the ‘error’ and ‘trace0’ levels.

folder  This category controls debugging information shown for operations related to Mailutils folders.

remote  The remote category is used by imap4d and pop3d servers to request showing additional information in the session transcripts. This category takes effect only when the transcript configuration variable is set. Valid levels are:

trace6  Show security-sensitive information (user passwords, etc.)

trace7  Show payload information

3.4 frm and from — List Headers from a Mailbox

==================================================================
Editor’s note:
The information in this node may be obsolete or otherwise inaccurate. This message will disappear, once this node revised.

==================================================================

GNU mailutils provides two commands for listing messages in a mailbox. These are from and frm.

The behavior of both programs is affected by the following configuration file statements:
<table>
<thead>
<tr>
<th><strong>Statement</strong></th>
<th><strong>Reference</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
</tbody>
</table>

**frm**

The **frm** utility outputs a header information of the selected messages in a mailbox. By default, **frm** reads user’s system mailbox and outputs the contents of **From** and **Subject** headers for each message. If a folder is specified in the command line, the program reads that folder rather than the default mailbox.

The following command line options alter the behavior of the program:

- **-d**
  - **--debug** Enable debugging output.
- **-f string**
  - **--field string** Display the header named by **string** instead of **From Subject** pair.
- **-l**
  - **--to** Include the contents of **To** header to the output. The output field order is then: **To From Subject**.
- **-n**
  - **--number** Prefix each line with corresponding message number.
- **-Q**
  - **--Quiet** Be very quiet. Nothing is output except error messages. This is useful in shell scripts where only the return status of the program is important.
- **-q**
  - **--query** Print a message only if there are unread messages in the mailbox.
- **-S**
  - **--summary** Print a summary line.
- **-s attr**
  - **--status attr** Only display headers from messages with the given status. **Attr** may be one of the following: **new**, **read**, **unread**. It is sufficient to specify only first letter of an **attr**. Multiple **-s** options are allowed.
- **-t**
  - **--align** Tidy mode. In this mode **frm** tries to preserve the alignment of the output fields. It also enables the use of BIDI algorithm for displaying subject lines that contain text in right-to-left orientation (such as Arabic or Hebrew).

**from**

The **from** utility displays sender and subject of each message in a mailbox. By default, it reads the user’s system mailbox. If the program is given a single argument, it is interpreted
as a name of the user whose mailbox is to be read. Obviously, permissions are required to
access that user’s mailbox, so such invocations may be used only by superuser.

The option `-f` (`--file`) instructs `from` to read the given mailbox.

The full list of options, supported by `from` follows:

- `-c`  
  `--count`  
  Prints only a count of messages in the mailbox and exit.

- `-d`  
  `--debug`  
  Prints additional debugging output.

- `-s string`  
  `--sender=string`  
  Prints only mail with ‘From:’ header containing the supplied string.

- `-f url`  
  `--file=url`  
  Examine mailbox from the given `url`. 
3.5 mail — Send and Receive Mail

Mail is an enhanced version of POSIX mailx program. The program operates in two modes: read and send.

Mail enters send mode when at least one email address was specified in its command line. In this mode the program waits until user finishes composing the message, then attempts to send it to the specified addresses and exits. See Section 3.5.3 [Composing Mail], page 63, for a detailed description of this behavior.

If the command line contained no email addresses, mail switches to reading mode. In this mode it allows the user to read and manipulate the contents of the user system mailbox. Use the --file (-f) option to specify another mailbox name. For more detail, see Section 3.5.2 [Reading Mail], page 50.

In addition to the Mailutils configuration file, mail reads the traditional ‘mailrc’-style configuration files. See Section 3.5.7 [Mail Configuration Files], page 85, for a detailed description of their format.

3.5.1 Invoking mail

General usage of mail program is:

```
mail [option...] [address...]
```

If [address...] part is present, mail switches to mail sending mode, otherwise it operates in mail reading mode.

Mail understands the following command line options:

- `-A file`  
  --attach=file  
  Attach file to the composed message. The encoding, content type, and content description are controlled by the --encoding, --content-type, and --content-name options, correspondingly.
  
  The option --attach=- instructs mail to read the file to be attached from the standard input. Interactive shell is disabled in this case.

- `--attach-fd=fd`  
  Read attachment body from the file descriptor fd. The descriptor must be open for reading. This option is useful when calling mail from another program.
  
  See the options --encoding, --content-type, --content-name, and --content-filename.

- `-a header:value`  
  --append=header:value  
  Append the given header to the composed message.
--content-type=type
This option sets the content type to be used by all subsequent --attach options.

--content-filename=name
Set the 'filename' parameter in the 'Content-Disposition' header for the next --attach-fd option.

--content-name=text
Set the 'name' parameter (description) in the 'Content-Type' header for the next --attach or --attach-fd option.

-E command
--exec=command
Execute command before opening the mailbox. Any number of --exec options can be given. The commands will be executed after sourcing configuration files (see Section 3.5.7 [Mail Configuration Files], page 85), but before opening the mailbox.

-e
--exist
Return true if the mailbox contains some messages. Return false otherwise. This is useful for writing shell scripts.

--encoding=enc
Sets content transfer encoding for use by the subsequent --attach options.

-F
--byname
Record outgoing messages in a file named after the first recipient. The name is the login-name portion of the address found first on the 'To:' line in the mail header. This option sets the 'byname' variable, which see (see [byname], page 73).

-f
--file
Operate on the mailbox given by the first non-optional command line argument. If there is no such argument, read messages from the user's mbox file. See Section 3.5.2 [Reading Mail], page 50, for more details about using this option.

-H
--headers
Print header summary to stdout and exit.

-i
--ignore
Ignore interrupts when composing the message.

-M
--mime
--no-mime
The --mime option instructs mail to compose MIME messages. It is equivalent for -E 'set mime', except that it is processed after all other options. The --no-mime disables the MIME compose mode, and is a shortcut for -E 'set nomime'.

-N
--nosum
Do not display initial header summary.


- \n  --norc  Do not read the system-wide mailrc file. See Section 3.5.7 [Mail Configuration Files], page 85.

-p
  --print
  --read  Print all mail to standard output. It is equivalent to issuing following commands after starting `mail -N`
          
    print *
    quit
          except that mail --print does not change status of the messages.

-q
  --quit  Cause interrupts to terminate program.

-r address
  --return-address=address  Sets the return email address for outgoing mail. See [return-address], page 83.

--skip-empty-attachments
  --no-skip-empty-attachments  Don’t create attachments that would have zero-size body. This option affects all attachments created by --attach and --attach-fd options appearing after it in the command line, as well as the body of the original message.
To cancel its effect, use the --no-skip-empty-attachments option.

-s subj
  --subject=subj  Send a message with a Subject of subj. Valid only in sending mode.

-t
  --to  Read recipients from the message header. Ignore addresses listed in the command line.

-u user
  --user=user  Operate on user’s mailbox. This is equivalent to:

    mail -f/spool_path/user

    with spool_path being the full path to your mailspool directory
    (/var/spool/mail or /var/mail on most systems).

The program also understands the common mailutils options (see Section 3.1.2 [Common Options], page 8.

### 3.5.2 Reading Mail

The mail utility operates on three kinds of mailboxes. The user system mailbox is the mailbox where the incoming mail for the user is stored. Its location is system-dependent and is determined using the common mailutils rules (see Section 3.2.7 [mailbox statement], page 18). The personal mailbox (or mbox, for short) is the default location for saving messages that have been read. By default it is $HOME/mbox or whatever file specified by the MBOX environment variable. Any other mailboxes are called secondary mailboxes.
When called without arguments, `mail` opens the system mailbox for the invoking user. The `--file (-f)` used without arguments instructs `mail` to operate on the personal mailbox instead. When this option and a single command line argument are used together, `mail` treats the argument as the pathname of the secondary mailbox to operate upon.

Notice that this argument is not an argument to the `--file (-f)` option itself, but rather the first non-optional argument on the command line. This means that any number of additional options are allowed between the `--file` option and the mailbox file name. For example, the following three invocations are equivalent:

```
$ mail -fin mymbox
$ mail -f mymbox -in
$ mail --file -in mymbox
$ mail --file -i mymbox -n
```

Additionally, for conformance to the GNU standards, the following form is also accepted:

```
$ mail --file=mymbox -i -n
```

The `--user (-u)` option allows the system administrator to assume another user identity for operating on this user’s mailboxes. Obviously, it is available only to system administrators. For example:

```
mail --user=tom
```

reads mail from the system mailbox of the user ‘tom’, and

```
mail --user=tom --file
```
reads mail from the personal mailbox of this user.

Unless you have started mail with `--norc` command line option, it will read the contents of the system-wide configuration file. Then it will read the contents of user configuration file, if it exists. For detailed description of these files, see Section 3.5.7 [Mail Configuration Files], page 85. After this initial setup, `mail` displays the first page of header lines (unless the `-N` option has been given), followed by a prompt, indicating that it is waiting for regular commands. Upon receiving a command, `mail` parses and executes it, displays the result on the screen, prints the prompt and waits for the next command. This process is continued until `mail` receives any of the commands ‘quit’, ‘exit’ or the end-of-file character (ASCII 4, or C-D).

Each message in the mailbox has a state that affects how it is retained or deleted upon closing the mailbox when terminating the program (see [the quit command], page 54) or when switching to another mailbox (see [the file command], page 55). The state is reflected in the header listing and can be changed during the session. The states are:

**new** The message is present in the system mailbox and has not been read by the user or moved to any other state. When `mail` terminates, messages in this state are retained in the system mailbox. If the mailbox is closed, such messages are moved to the ‘unread’ state.

**unread** The message has been present in the system mailbox for more than one invocation of `mail` and has not been read by the user or moved to any other state. When `mail` terminates, messages in this state are retained in the system mailbox.
The message has been read by the user, i.e. processed by one of the following commands: `copy`, `mbox`, `next`, `pipe`, `prev`, `print`, `Print`, `struct`, `top`, `type`, `Type`, `undelete`, or any of the following escapes (in message compose mode): `~f`, `~m`, `~F`, `~M`.

When `mail` terminates, messages in this state are handled depending on the mailbox they are in.

If `mail` was operating on the user system mailbox, all messages in state `read` are preserved. The location where they are preserved is determined by the `hold` variable (see Section 3.5.6 [Mail Variables], page 72). If it is not set (the default), the messages are moved to the user’s `mbox`. If `hold` is set, the messages are held in the system mailbox instead.

The `read` messages in any other mailbox will be retained in their current location.

The message has been processed by one of the following commands: `delete`, `dp`, `dt`. Messages in this state are ignored by any command, excepting `undelete`, which changes their state back to `read`. When closing the mailbox, deleted messages are permanently removed from the mailbox.

The message has been processed by the `preserve (hold)` command. When closing the mailbox, such messages are retained in the mailbox.

The message has been processed by one of the following commands: `save`, `write`. When `mail` terminates, messages in this state are handled depending on the mailbox they are in.

If `mail` was operating on the user system mailbox, the default behavior for `saved` messages is to remove them from the system mailbox. If, however, the `keepsave` variable is set, they are preserved using the same rules as for `read` messages (see above).

Saved messages in non-system mailboxes are retained in their current location.

Unless the mailbox is empty, exactly one of its messages will be marked as current message. Upon startup, current message is set to the first new message, if there is any, or the first unread message if there is any, or to the first message in the mailbox. In the header listing, current message is marked with the ‘>’ sign at the beginning of the line. Current message is changed by any of the following commands: `dp`, `prev`, `next`.

### 3.5.2.1 Syntax of mail internal commands

Commands have the following syntax:

```
command [msglist] [argument ...]
```

A command is terminated by a newline character. Empty command (i.e. a newline character alone) is equivalent to `next` (see Section 3.5.2.4 [Moving Within a Mailbox], page 55).

In the syntax above, `command` is the command verb. Each command has long and short (abbreviated) form. Each of them can be used to invoke the command.

Many mail commands take a list of messages (msglist) to operate upon, which defaults to current message.
The list of messages in its simplest form is one of:

. Selects current message. It is equivalent to empty message list.
* Selects all messages in the mailbox.
^ Selects first non-deleted message.
$ Selects last non-deleted message.

In its complex form, the message list is a comma or whitespace-separated list of message specifiers. A message specifier is one of

n (integer number) This specifier addresses the message with the given ordinal number in the mailbox.

n-m All messages with ordinal numbers between n and m, inclusive.

t All messages of type t, where t can be any of:
‘d’ Deleted messages.
‘n’ New messages.
‘o’ Old messages (any message not in state ‘read’ or ‘new’).
‘r’ Messages in state ‘read’.
‘u’ Messages in state ‘unread’.
‘t’ Selects all tagged messages.
‘T’ Selects all untagged messages.
‘s’ Selects all messages in state ‘saved’.

[header:]/string[/] Header match. Selects all messages that contain header field header matching given string. If the variable regex is set, the string is assumed to be a POSIX regexp. (All comparison is case-insensitive in either case).

If header: part is omitted, it is assumed to be ‘Subject:’.

/:string[/] Message body match. Selects all messages with body matching the string. The matching rules are the same as described above.

A message specifier can be followed by message part specifier, enclosed in a pair of brackets. A message part specifier controls which part of a message should be operated upon. It is meaningful only for multipart messages. A message part specifier is a comma or whitespace-separated list of part numbers or ranges. Each part number can in turn be message part specifier, thus allowing for operating upon multiply-encoded messages.

The following are the examples of valid message lists:

3 Third message.
1-4 10 Messages from 1 through 4 and message 10.
4-* All messages starting from message 4.
/watch All messages with the word ‘watch’ in the subject.
/watch :/watch All messages with the word ‘watch’ in the subject or body.
/watch :/watch $ Same as above plus the last message in the mailbox.

3.5.2.2 Quitting the Program
Following commands quit the program:

quit [Mail command]
Terminates the session. The messages, marked with delete are removed. The messages in state ‘read’ and ‘saved’ are processed depending on the mailbox they are in.

If mail was operating on the user system mailbox, all messages in state ‘read’ are preserved. The location where they are preserved is determined by the hold variable. If it is not set (the default), the messages are moved to the user’s mbox. If hold is set, the messages are held in the system mailbox instead.
The default behavior for ‘saved’ messages is to remove them from the system mailbox. If, however, the keepsave variable is set, they are preserved using the same rules as for ‘read’ messages.

For non-system mailboxes, both ‘read’ and ‘saved’ messages are retained in their current location.
The same rules are followed when the mailbox is switched using the file command.
The program exits to the shell, unless saving the mailbox fails, in which case user can escape with the exit command.

exit [Mail command]
ex [Mail command]
xit [Mail command]
Program exits to the shell without modifying the mailbox it operates upon.

Typing EOF (‘C-D’) alone is equivalent to ‘quit’.

3.5.2.3 Obtaining Online Help
Following commands can be used during the session to request online help:

help [command] [Mail command]
help [command] [Mail command]
help [command] [Mail command]
Display detailed command synopsis. If no command is given, help for all available commands is displayed.

list [Mail command]
* [Mail command]
Print a list of available commands.
version
ve
Display program version.

warranty
wa
Display program warranty statement.

3.5.2.4 Moving Within a Mailbox

^ Move to the first undeleted message.

$ Move to the last undeleted message.

next
n Move to the next message.

previous
prev Move to the previous message.

3.5.2.5 Changing Mailbox/Directory

cd [dir] [Mail command]
chdir [dir] [Mail command]
ch [dir] [Mail command]
Change to the specified directory. If dir is omitted, $HOME is assumed.

file [mailbox] [Mail command]
fi [mailbox] [Mail command]
folder [mailbox] [Mail command]
fold [mailbox] [Mail command]
When used without argument, prints the information about the current mailbox: the mailbox file name (or URL), total number of messages and the number of unread messages, e.g.:

```
? fold
"/var/spool/mail/gray": 23 messages 22 unread
```

Otherwise, closes the current mailbox and opens the mailbox named by the mailbox argument. When closing the current mailbox, its messages are processed according to their state (see [mail message states], page 51).

The mailbox argument can be the name of the existing file, a mailbox URL (see Chapter 2 [Mailbox], page 3), or any of the following shortcuts:

% The system mailbox for the invoking user.
The system mailbox for user.
# The previous file.
& The user’s personal mailbox.
@ Secondary mailbox, given using the -f command line option.
+file The named file in the folder directory. See [folder variable], page 76.

### 3.5.2.6 Controlling Header Display

To control which headers in the message should be displayed, **mail** keeps two lists: a *retained* header list and an *ignored* header list. If *retained* header list is not empty, only the header fields listed in it are displayed when printing the message. Otherwise, if *ignored* header list is not empty, only the headers *not listed* in this list are displayed. The uppercase variants of message-displaying commands can be used to print all the headers.

The following commands modify and display the contents of both lists.

- **discard [header-field-list]**  [Mail command]
- **di [header-field-list]**  [Mail command]
- **ignore [header-field-list]**  [Mail command]
- **ig [header-field-list]**  [Mail command]
  Add header-field-list to the ignored list. When used without arguments, this command prints the contents of ignored list.
- **retain [header-field-list]**  [Mail command]
- **ret [header-field-list]**  [Mail command]
  Add header-field-list to the retained list. When used without arguments, this command prints the contents of retained list.

### 3.5.2.7 Displaying Information

- **=**  [Mail command]
  Displays the current message number.
- **headers [msglist]**  [Mail command]
- **h [msglist]**  [Mail command]
  Lists the current pageful of headers.
- **from [msglist]**  [Mail command]
- **f [msglist]**  [Mail command]
  Lists the contents of ‘From’ headers for a given set of messages.
- **z [arg]**  [Mail command]
  Presents message headers in pagefuls as described for **headers** command. When arg is ‘.’, it is generally equivalent to **headers**. When arg is omitted or is ‘+’, the next pageful of headers is displayed. If arg is ‘-‘, the previous pageful of headers is displayed. The latter two forms of **z** command may also take a numerical argument meaning the number of pages to skip before displaying the headers. For example:

```
? z +2
```

will skip two pages of messages before displaying the header summary.
size [msglist]                     [Mail command]
si [msglist]                      [Mail command]
    Lists the message number and message size in bytes for each message in msglist.

folders                        [Mail command]
    Displays the value of folder variable.

summary                      [Mail command]
su                             [Mail command]
    Displays current mailbox summary. E.g.:

```plaintext
? summary
"/var/spool/mail/gray": 23 messages 22 unread
```

### 3.5.2.8 Displaying Messages

print [msglist]                 [Mail command]
p [msglist]                     [Mail command]
type [msglist]                  [Mail command]
t [msglist]                     [Mail command]
    Prints out the messages from msglist. The variable crt determines the minimum number of lines the body of the message must contain in order to be piped through pager command specified by environment variable PAGER. If crt is set to a numeric value, this value is taken as the minimum number of lines. Otherwise, if crt is set without a value then the height of the terminal screen is used to compute the threshold. The number of lines on screen is controlled by screen variable.

Print [msglist]                 [Mail command]
P [msglist]                     [Mail command]
Type [msglist]                  [Mail command]
T [msglist]                     [Mail command]
    Like print but also prints out ignored header fields.

decode [msglist]                [Mail command]
dec [msglist]                   [Mail command]
    Print a multipart message. The decode command decodes and prints out specified message parts. E.g.

```
? decode 15[2]
+---------------------------------------
| Message=15[2]
| Type=message/delivery-status
| encoding=7bit
+---------------------------------------
Content-Type: message/delivery-status
...
```
top \[msglist\] \[Mail command\]
to \[msglist\] \[Mail command\]
Prints the top few lines of each message in \textit{msglist}. The number of lines printed is
controlled by the variable \textit{toplines} and defaults to five.

\textbf{pipe} [[msglist] shell-command] \[Mail command\]
| [[msglist] shell-command] \[Mail command\]
Pipe the contents of specified messages through \textit{shell-command}. Without arguments,
pipe the current message through the command given by the ‘\texttt{cmd}’ variable (which
must be set).

\textbf{struct} \[msglist\] \[Mail command\]
Prints the MIME structure of each message from \textit{msglist}. Empty \textit{msglist} means
current message.

Example:

\begin{verbatim}
? struct 2
 2 multipart/mixed 14k
 2[1] text/plain 296
 2[2] application/octet-stream 5k
 2[3] text/x-diff 31k
\end{verbatim}

\subsection{3.5.2.9 Marking Messages}

\textbf{tag} \[msglist\] \[Mail command\]
\textbf{ta} \[msglist\] \[Mail command\]
Tag messages. The tagged messages can be referred to in message list using ‘:\texttt{t}’ notation.

\textbf{untag} \[msglist\] \[Mail command\]
\textbf{unt} \[msglist\] \[Mail command\]
Clear tags from specified messages. To untag all messages tagged so far type

\> ? untag :t

\textbf{hold} \[msglist\] \[Mail command\]
\textbf{ho} \[msglist\] \[Mail command\]
\textbf{preserve} \[msglist\] \[Mail command\]
\textbf{pre} \[msglist\] \[Mail command\]
Marks each message to be held in user’s system mailbox. This command does not
override the effect of \texttt{delete} command.

\subsection{3.5.2.10 Disposing of Messages}

\textbf{delete} \[msglist\] \[Mail command\]
\textbf{d} \[msglist\] \[Mail command\]
Mark messages as deleted. Upon exiting with \texttt{quit} command these messages will be
deleted from the mailbox. Until the end of current session the deleted messages can
be referred to in message lists using \texttt{:d} notation.
undelete [msglist]

Clear delete mark from the specified messages.

dp [msglist]
dt [msglist]

Deletes the current message and prints the next message. If msglist is specified, deletes all messages from the list and prints the message immediately following last deleted one.

3.5.2.11 Saving Messages

save [[msglist] mailbox]
s [[msglist] mailbox]

Takes a message list and a file or mailbox name and appends each message in turn to that file or mailbox. The syntax for mailbox is the same as for the file command (see Mailbox shortcuts, page 55). The name of the mailbox and number of lines and characters appended to it is echoed on the terminal. When writing to file, the numbers represent exact number of lines and characters appended to the file. When file specifies a mailbox, these numbers may differ by the amount of lines/characters needed to represent message envelope for that specific mailbox type.

Each saved message is marked for deletion as if with delete command, unless the variable keepsave is set.

Save [msglist]
S [msglist]

Like save, but the file to append messages to is named after the sender of the first message in msglist. For example:

```
? from 14 15
 U 14 smith@noldor.org Fri Jun 30 18:11 14/358 The Save c
 U 15 gray@noldor.org Fri Jun 30 18:30 8/245 Re: The Sa
? Save 14 15
"smith" 22/603
```

i.e., 22 lines (603 characters) have been appended to the file “smith”. If the file does not exist, it is created.

write [[msglist] file]
w [[msglist] file]

Similar to save, except that only message body (without the header) is saved.

Write [msglist]
W [msglist]

Similar to Save, except that only message body (without the header) is saved.
Mark list of messages to be saved in the user's personal mailbox (see Section 3.5.2 [Reading Mail], page 50) upon exiting via quit command. This is the default action for all read messages, unless you have variable hold set.

Touch the specified messages. If any message in msglist is not specifically deleted nor saved in a file, upon normal termination it will be acted upon as if it had been read (see [mail message states], page 51).

Similar to save, except that saved messages are not marked for deletion.

Edited each message in msglist with the editor, specified in EDITOR environment variable.

Edits each message in msglist with the editor, specified in VISUAL environment variable.

With no arguments, prints out all currently-defined aliases. With one argument, prints out that alias. With more than one argument, creates a new alias or changes an old one.

 Takes a list of names defined by alias commands and discards the remembered groups of users. The alias names no longer have any significance.
The alternates command is useful if you have accounts on several machines. It can be used to inform mail that the listed addresses are really you. When you reply to messages, mail will not send a copy of the message to any of the addresses listed on the alternates list. If the alternates command is given with no argument, the current set of alternate names is displayed.

3.5.2.14 Replying

mail [address...] [Mail command]
m [address...] [Mail command]
  Switches to compose mode. After composing the message, sends messages to the specified addresses.

reply [msglist] [Mail command]
respond [msglist] [Mail command]
r [msglist] [Mail command]
  For each message in msglist, switches to compose mode and sends the composed message to the sender and all recipients of the message.

Reply [msglist] [Mail command]
Respond [msglist] [Mail command]
R [msglist] [Mail command]
  Like reply, except that the composed message is sent only to originators of the specified messages.

Notice, that setting mail variable flipr (see Section 3.5.6 [Mail Variables], page 72) swaps the meanings of the two above commands, so that reply sends the message to the sender and all recipients of the message, whereas Reply sends it to originators only.

followup [msglist] [Mail command]
fo [msglist] [Mail command]
  Switches to compose mode. After composing, sends the message to the originators and recipients of all messages in msglist.

Followup [msglist] [Mail command]
F [msglist] [Mail command]
  Similar to followup, but reply message is sent only to originators of messages in msglist.

To determine the sender of the message mail uses the list of sender fields (see Section 3.5.2.15 [Controlling Sender Fields], page 62). The first field from this list is looked up in message headers. If it is found and contains a valid email address, this address is used as the sender address. If not, the second field is searched and so on. This process continues until a field is found in the headers, or the sender field list is exhausted, whichever happens first.

If the previous step did not determine the sender address, the address from SMTP envelope is used.
Let’s illustrate this. Suppose your mailbox contains the following:

```
U 1 block@helsingor.org Fri Jun 30 18:30 8/245 Re: The Sa
? Print 1
From: Antonius Block <block@helsingor.org>
To: Smeden Plog <plog@helsingor.org>
Date: Tue, 27 Apr 2004 13:23:41 +0300
Reply-To: <root@helsingor.org>
Subject: News

Hi
```

Now, you issue the following commands:

```
? sender mail-followup-to reply-to from
? reply
To: <root@helsingor.org>
Subject: Re: News
```

As you see, the value of Reply-To field was taken as the sender address.

Now, let’s try the following command sequence:

```
# Clear the sender list
? nosender
# Set new sender list
? sender From
```

Now, the From address will be taken:

```
? reply
To: Antonius Block <block@helsingor.org>
Subject: Re: News
```

### 3.5.2.15 Controlling Sender Fields

Commands `sender` and `nosender` are used to manipulate the contents of the sender field list.

If the command `sender` is used without arguments, it displays the contents of the sender field list. If arguments are given, each argument is appended to the sender field list. For example:
Chapter 3: Mailutils Programs

3.5.2.16 Incorportating New Mail
The incorporate (inc) command incorporates newly arrived messages into the displayed list of messages. This is done automatically before returning to the mail command prompt if the variable autoinc is set.

3.5.2.17 Shell Escapes
To run arbitrary shell command from the mail command prompt, use the shell (sh) command. If no arguments are specified, the command starts the user login shell. Otherwise, it uses its first argument as a file name to execute and all subsequent arguments are passed as positional parameters to this command. The shell command can also be spelled as !.

3.5.3 Composing Mail
You can compose the message by simply typing the contents of it, line by line. But usually this is not enough, you would need to edit your text, to quote some messages, etc. Mail provides these capabilities through compose escapes. The compose escapes are single-character commands, preceded by special escape character, which defaults to ‘~’. The combination escape character + command is recognized as a compose escape only if it occurs at the beginning of a line. If the escape character must appear at the beginning of

? sender
Sender address is obtained from the envelope
? sender mail-followup-to reply-to
? sender
mail-followup-to
reply-to
? sender from
? sender
mail-followup-to
reply-to
from

Command nosender is used to remove items from the sender field list:

? sender
mail-followup-to
reply-to
from
? nosender reply-to
? sender
mail-followup-to
from

When used without arguments, this command clears the list:

? nosender
Sender address is obtained from the envelope
a line, enter it twice. The actual escape character may be changed by setting the value of escape mail variable (see Section 3.5.6 [Mail Variables], page 72).

3.5.3.1 Quitting Compose Mode

There are several commands allowing you to quit the compose mode.

Typing the end-of-file character (‘C-D’) on a line alone finishes compose mode and sends the message to its destination. The ‘C-D’ character looses its special meaning if ignoreeof mail variable is set.

If mail variable dot is set, typing dot (‘.’) on a line alone achieves the same effect as ‘C-D’ above.

Finally, using ‘~.’ escape always quits compose mode and sends out the composed message.

To abort composing of a message without sending it, type interrupt character (by default, ‘C-C’) twice. This behavior is disabled when mail variable ignore is set. In this case, you can use ‘~x’ escape to achieve the same effect.

3.5.3.2 Getting Help on Compose Escapes: ~?

The ‘~?’ escape prints on screen a brief summary of the available compose escapes. Please note, that ‘~h’ escape prompts for changing the header values, and does not give help.

3.5.3.3 Editing the Message: ~e and ~v

If you are not satisfied with the message as it is, you can edit it using a text editor specified either by EDITOR or by VISUAL environment variables. The ‘~e’ uses the former, and ‘~v’ uses the latter.

By default both escapes allow you to edit only the body of the message. However, if the editheaders variable is set, mail will load into the editor the complete text of the message with headers included, thus allowing you to change the headers as well.

3.5.3.4 Modifying the Headers: ~h, ~t, ~c, ~b, ~s

To add new addresses to the list of message recipients, use ‘~t’ command, e.g.:

~t name1@domain.net name2

To add addresses to Cc or Bcc, use ‘~c’ or ‘~b’ escapes respectively.

To change the Subject header, use ‘~s’ escape, e.g.:

~s "Re: your message"

Finally, to edit all headers, type ‘~h’ escape. This will present you with the values of To, Cc, Bcc, and Subject headers allowing to edit them with normal text editing commands.

3.5.3.5 Enclosing Another Message: ~m and ~M

If you are sending mail from within mail command mode, you can enclose the contents of any message sent to you by using ‘~m’ or ‘~M’ commands. Typing ‘~m’ alone will enclose the contents of the current message, typing ‘~m 12’ will enclose the contents of message #12 and so on.

The ‘~m’ uses retained and ignored lists when enclosing headers, the ‘~M’ encloses all header fields.
In both cases, the contents of `indentprefix` mail variable is prepended to each line enclosed.

### 3.5.3.6 Adding a File to the Message: `~r` and `~d`

To append the contents of file `filename` to the message, type

```
~r filename
```

or

```
~< filename
```

The `~d` escape is a shorthand for

```
~r dead.letter
```

### 3.5.3.7 Attaching a File to the Message

The `~+` escape attaches a file to the message. It takes one to three arguments. The first argument supplies the name of the file to attach:

```
~+ myfile.txt
```

The file will be attached with default content-type `application/octet-stream`, and encoding `base64` (these can be altered by the `--content-type` and `--encoding` command line options, correspondingly).

Optional second argument defines the content type to be used instead of the default one. Optional third argument defines the encoding, e.g.:

```
~+ myfile.html text/html base64
```

To list the files attached so far, use the `~l` escape:

```
~l
multipart/mixed
1 myfile.html text/html base64
```

The first line of the output shows the content type of the message. Each subsequent line contains the ordinal number of the attachment, the name of the file, content-type and transfer encoding used.

The `~/` escape toggles the content type between `multipart/mixed`, and `multipart/alternative`. The new value of the content type is displayed on the screen.

The `~^` escape removes attachments. Its argument is the number of the attachment to remove, e.g.:

```
~^ 1
```

### 3.5.3.8 Printing And Saving the Message

The `~p` escape types the contents of the message entered so far, including headers, on your terminal. You can save the message to an arbitrary file using `~w` escape. It takes the filename as its argument.

### 3.5.3.9 Signing the Message: `~a` and `~A`

To save you the effort of typing your signature at the end of each message, you can use `~a` or `~A` escapes. If your signature occupies one line only, save it to the variable `sign` and use `~a` escape to insert it. Otherwise, if it is longer than one line, save it to a file, store the name of this file in the variable `Sign`, and use `~A` escape to insert it into the message.
3.5.3.10 Printing Another Message: \texttt{~f} and \texttt{~F}

Sometimes it is necessary to view the contents of another message, while composing. These two escapes allow it. Both take the message list as their argument. If they are used without argument, the contents of the current message is printed. The difference between \texttt{~f} and \texttt{~F} is that the former uses ignored and retained lists to select headers to be displayed, whereas the latter prints all headers.

3.5.3.11 Inserting Value of a Mail Variable: \texttt{~i}

The \texttt{~i} escape enters the value of the named mail variable into the body of the message being composed.

3.5.3.12 Executing Other Mail Commands: \texttt{~:} and \texttt{~-}

You can execute a mail command from within compose mode using \texttt{~:} or \texttt{~-} escapes. For example, typing

\begin{verbatim}
~: from :t
\end{verbatim}

will display the from lines of all tagged messages. Note, that executing mail-sending commands from within the compose mode is not allowed. An attempt to execute such a command will result in diagnostic message “Command not allowed in an escape sequence” being displayed. Also, when starting compose mode immediately from the shell (e.g. running \texttt{mail address@domain}), most mail commands are meaningless, since there is no mailbox to operate upon. In this case, the only commands that can reasonably be used are: alias, unalias, alternate, set, and unset.

3.5.3.13 Executing Shell Commands: \texttt{~!} and \texttt{~|}

The \texttt{~!} escape executes specified command and returns you to mail compose mode without altering your message. When used without arguments, it starts your login shell. The \texttt{~!} escape pipes the message composed so far through the given shell command and replaces the message with the output the command produced. If the command produced no output, mail assumes that something went wrong and retains the old contents of your message.

3.5.4 Composing Multipart Messages

Multipart messages (or MIME, for short) can be used to send text in character sets other than ASCII, attach non-text files, send multiple parts in alternative formats, etc.

Technically speaking, the boolean variable \texttt{mime} controls this feature. If it is set (see \cite[Setting and Unsetting the Variables]{page 70}), MIME will create MIME messages by default. The variable can be set in the global or user configuration file (see Section 3.5.7 \cite[Mail Configuration Files]{page 85}), using the following command:

\begin{verbatim}
set mime
\end{verbatim}

It can also be set from the command line, using the \texttt{--mime} option.

GNU mail automatically turns on the MIME mode, when it is requested to send a non-plaintext message, or a message in character set other than ASCII, when the encoding is specified, or when attachments are given.

To send a message in another character set, specify it with the \texttt{--content-type} option:

\begin{verbatim}
mail --content-type 'text/plain; charset=utf-8'
\end{verbatim}
The **--encoding** specifies the encoding to use:

```bash
mail --content-type 'text/plain; charset=utf-8' --encoding=base64
```

Its argument is any encoding supported by GNU mailutils. The two most often used encodings are 'base64' and 'quoted-printable'.

To specify the charset from `mail` interactive section, enable the "edit headers" mode (`set editheaders`) and add the needed `Content-Type` header manually.

GNU mail also gives you a possibility to attach files to the message being sent.

The simplest way to attach a file from command line is by using the **--attach** (-A) option. Its argument specifies the file to attach. For example, the following will attach the content of the file `archive.tar`:

```bash
$ mail --attach=archive.tar
```

By default, the content type will be set to `application/octet-stream`, and the attachment will be encoded using the 'base64' encoding. To change the content type, use the **--content-type** option. For example, to send an HTML attachment:

```bash
$ mail --content-type=text/html --attach=in.html
```

The **--content-type** option affects all **--attach** options that follow it, and the message body (if any). To change the content type, simply add another **--content-type** option. For example, to send both the HTML file and the archive:

```bash
$ mail --content-type=text/html --attach=in.html

  --content-type=application/x-tar --attach=archive.tar
```

To change the content type of the message body when sending a message with attachments, use the trailing **--content-type** option, i.e. the option not followed by another **--attach** option:

```bash
$ mail --content-type=text/html --attach=in.html

  --content-type=application/x-tar --attach=archive.tar

  --content-type=text/plain
```

This example adds two attachments with different content types and switched back to the 'text/plain' content type for the message body.

The encoding to use is set up by the **--encoding** option. As well as **--content-type**, this option affects all attachments supplied after it in the command line as well as the message body read from the standard input, until changed by the eventual next instance of the same option. Extending the above example:

```bash
$ mail --content-type=text/html --encoding=quoted-printable

  --attach=in.html

  --content-type=application/x-tar --encoding=base64

  --attach=archive.tar
```

A trailing **--encoding** option sets the encoding of the message body.

Each attachment can also be assigned a *description* and a *file name*. Normally, these are the same as the file name supplied with the **--attach** option. However, you can change either or both of them using the **--content-name** and **--content-filename**, correspondingly. Both of these options affect only the next **--attach** (or **--attach-fd**, see below) option.
By default, the message will be assigned the content type ‘multipart/mixed’. To change it to ‘multipart/alternative’, use the --alternative command line option. Using this option also sets the ‘Content-Disposition’ header of each attached message to ‘inline’.

All the examples above will enter the usual interactive shell, allowing you to compose the body of the message. If that’s not needed, the non-interactive use can be forced by redirecting /dev/null to the standard input, e.g.:

```
$ mail --attach=archive.tar < /dev/null
```

This will normally produce a message saying:

```
mail: Null message body; hope that's ok
```

To suppress this message, unset the ‘nullbodymsg’ variable, as shown in the example below:

```
$ mail -E 'set nonullbodymsg' --attach=archive.tar < /dev/null
```

The option --attach=- forces mail to read the file to be attached from the standard input stream. This option disables the interactive mode and sets ‘nonullbodymsg’ implicitly, so that the above example can be rewritten as:

```
$ mail --attach=- < archive.tar
```

Special option is provided to facilitate the use of mail in scripts. The --attach-fd=N instructs the program to read the data to be attached from the file descriptor N. The above example is equivalent to:

```
$ mail --attach-fd=0 < archive.tar
```

Attachments created with this option have neither filename nor description set, so normally the use of --content-name and/or --content-filename is advised.

The option --skip-empty-attachments instructs mail to skip creating attachments that would have zero-size body. This option affects all attachments created by --attach and --attach-fd options appearing after it in the command line. It also affects the handling of the original message body. To cancel its effect, use the --no-skip-empty-attachments option.

Here are some examples illustrating how it works.

First, consider the following command line

```
$ mail --attach=archive.tar </dev/null
```

Assume that archive.tar is not empty.

This will create a MIME message of two parts: the first part having ‘text/html’ type and empty body, and the second part of type ‘application/octet-stream’, with the content copied from the file archive.tar.

Now, if you do:

```
$ mail --attach=archive.tar --skip-empty-attachments </dev/null
```

then the created MIME message will contain only one part: that containing archive.tar.

If the file archive.tar has zero length, the resulting archive will still contain the ‘application/octet-stream’ part of zero length. However, if you place the --skip-empty-attachments option before --attach, then the produced message will be empty.

The following Perl program serves as an example of using mail from a script to construct a MIME message on the fly. It scans all mounted file systems for executable files that have
setuid or setgid bits set and reports the names of those files in separate attachments. Each attachment is named after the mountpoint it describes.

The script begins with the usual prologue stating the modules that will be used:

```perl
#!/usr/bin/perl
use strict;
use autodie;
```

Then global variables are declared. The `@rcpt` array contains the email addresses of the recipients:

```perl
my @rcpt = 'root@example.com';
```

The `@cmd` variable holds the `mail` command line. It will be augmented for each file system. The initial value is set as follows:

```perl
my @cmd = ('mail', '-E set nonullbodymsg', '--content-type=text/plain');
```

The `find` utility will be used to locate the files. The script will start as many instances as there are mountpoints. Those instances will be run in parallel and their standard output streams will be connected to file descriptors passed to `mail` invocation in `--attach-fd` options.

The descriptors will be held in `@fds` array. This will prevent them from being wiped out by the garbage collector. Furthermore, care should be taken to ensure that the `O_CLOEXEC` flag be not set for these descriptors. This sample script takes a simplistic approach: it instructs Perl not to close first 255 descriptors when executing another programs:

```perl
my @fds;
$^F = 255;
```

The following code obtains the list of mount points:

```perl
open(my $in, '<|', 'mount -t nonfs,noproc,nosysfs,notmpfs');
while (<$in>) {
    chomp;
    if (/^\S+ on (?<mpoint>.+) type (?<fstype>.+) /) {
        For each mountpoint, the `find` command line is constructed and launched. The file descriptor is pushed to the `@fds` array to prevent it from being collected by the garbage collector:

```perl
open(my $fd, '<|', "find $+{mpoint} -xdev -type f"
     . " \( -perm -u+x -o -perm -g+x -o -perm -o+x \)"
     . " \( -perm -u+s -o -perm -g+s \) -print");
push @fds, $fd;
```

Now, the `mail` command is instructed to create next attachment from that file descriptor:

```perl
my $mpname = $+{mpoint};
$mpname =~ tr{/}{%};
push @cmd,
"--content-name=Set[ug]id files on $+{mpoint} (type $+{fstype})",
```
"--content-filename=$mpname.list",
'--attach-fd=' . fileno($fd);
}
}
close $in;

Finally, the emails of the recipients are added to the command line, the standard input is closed to make sure mail won’t enter the interactive mode and the constructed command is executed:

push @cmd, @rcpt;
close STDIN;
system(@cmd);

3.5.5 Scripting

Comments
The ‘#’ character introduces an end-of-line comment. All characters until and including the end of line are ignored.

Displaying Arbitrary Text
The ‘echo’ (‘ec’) command prints its arguments to stdout.

Sourcing External Command Files
The command ‘source filename’ reads commands from the named file. Its minimal abbreviation is ‘so’.

Setting and Unsetting the Variables
The mail variables are set using ‘set’ (‘se’) command. The command takes a list of assignments. The syntax of an assignment is

‘name=string’
Assign a string value to the variable. If string contains whitespace characters it must be enclosed in a pair of double-quote characters (""")

‘name=number’
Assign a numeric value to the variable.

‘name’ Assign boolean True value.

‘noname’ Assign boolean False value.

Example:

? set askcc nocrt indentprefix="> "

This statement sets askcc to True, crt to False, and indentprefix to “> ”.

To unset mail variables use ‘unset’ (‘uns’) command. The command takes a list of variable names to unset.

To undo the effect of the previous example, do:

? unset askcc crt indentprefix
When used without arguments, both `set` or `unset` list all currently defined variables. The form of this listing is controlled by `variable-pretty-print (varpp)` variable. If it is set, a description precedes each variable, e.g.:

```
# prompt user for subject before composing the message
ask

# prompt user for cc before composing the message
askcc

# output character set for decoded header fields
charset="auto"

# number of columns on terminal screen
columns=80
```

If `variable-pretty-print` is not set, only the settings are shown, e.g.:

```
ask
askcc
charset="auto"
columns=80
```

A special command is provided to list all internal `mail` variables:

```
variable [names...]
```

If used without arguments, it prints all known internal variables. If arguments are given, it displays only those internal variables that are listed in command line. For each variable, this command prints its name, data type, current value and a short description. For example:

```
? variable ask datefield
ask, asksub
Type: boolean
Current value: yes
prompt user for subject before composing the message

datefield
Type: boolean
Current value: [not set]
get date from the ‘Date:’ header, instead of the envelope
```

**Setting and Unsetting Shell Environment Variables**

Shell environment may be modified using `setenv` (‘sete’) command. The command takes a list of assignments. The syntax of an assignment is:

```
‘name=value’
```

If variable `name` does not already exist in the environment, then it is added to the environment with the value `value`. If `name` does exist, then its value in the environment is changed to `value`.

```
‘name’
```

Delete the variable `name` from the environment (‘unset’ it).

**Conditional Statements**

The conditional statement allows to execute a set of mail commands depending on the mode the `mail` program is in. The conditional statement is:
if \textit{cond} ... else ... endif

where ‘...’ represents the set of commands to be executed in each branch of the statement. \textit{cond} can be one of the following:

‘s’ True if \texttt{mail} is operating in mail sending mode.
‘r’ True if \texttt{mail} is operating in mail reading mode.
‘t’ True if stdout is a terminal device (as opposed to a regular file).

The conditional statements can be nested to arbitrary depth. The minimal abbreviations for ‘if’, ‘else’ and ‘endif’ commands are ‘i’, ‘el’ and ‘en’.

Example:

if t
  set crt prompt="& 
else
  unset prompt
endif
if s
  alt gray@example.com gray@example.org
  set

3.5.6 How to Alter the Behavior of mail

Following variables control the behavior of GNU mail:

\textbf{append}

Type: Boolean, Read-Only
Default: True
Messages saved in \texttt{mbox} are appended to the end rather than prepended. This is the default and cannot be changed. This variable exists only for compatibility with other mailx implementations.

\textbf{appenddeadletter}

Type: Boolean.
Default: False.
If this variable is \texttt{True}, the contents of canceled letter is appended to the user’s \texttt{dead.letter} file. Otherwise it overwrites its contents.

\textbf{askbcc}

Type: Boolean.
Default: False.
When set to \texttt{True} the user will be prompted to enter Bcc field before composing the message.
askcc
Type: Boolean.
Default: True.
When set to True the user will be prompted to enter Cc field before composing the message.

asksub
Type: Boolean.
Default: True in interactive mode, False otherwise.
When set to True the user will be prompted to enter Subject field before composing the message.

autoinc
Type: Boolean.
Default: True.
Automatically incorporate newly arrived messages.

autoprint
Type: Boolean.
Default: False.
Causes the delete command to behave like dp - thus, after deleting a message, the next one will be typed automatically.

bang
Type: Boolean.
Default: False.
When set, every occurrence of ! in arguments to ! command is replaced with the last executed command.

byname
Type: Boolean
Default: Unset
Record outgoing messages in a file named after the first recipient. The name is the login-name portion of the address found first on the ‘To:’ line in the mail header. This variable overrides the ‘record’ variable. It is set by the --byname (-F) command line option.

datefield
Type: Boolean.
Default: False.
By default the date in a header summary is taken from the SMTP envelope of the message. Setting this variable tells mail to use the date from Date: header field, converted to local time. Notice, that for messages lacking this field mail will fall back to using SMTP envelope.
See [fromfield], page 76.
charset
Type: string
Default: ‘auto’

The value of this variable is the character set used for input and output operations. If the value is ‘auto’, mail will try to deduce the name of the character set from the value of ‘LC_ALL’ environment variable. If the variable contains the character set part (e.g. ‘nb_NO.utf-8’), it will be used. Otherwise, mail will look up in its built-in database the value of the character for this language/territory combination. If ‘LC_ALL’ is not set, the ‘LANG’ environment variable is inspected.

The value of ‘charset’ controls both input and output operations. On input, it is used to set the value of the ‘charset’ parameter in the ‘Content-Type’ MIME header, if its value begins with ‘text/’ and ‘charset’ is not present.

On output, it is used to display values of the header fields encoded using RFC 2047. If the variable is unset, no decoding is performed and the fields are printed as they are. Otherwise, they are recoded to that character set.

cmd
Type: String.
Default: Unset.
Contains default shell command for pipe.

columns
Type: Numeric.
Default: Detected at startup by querying the terminal device. If this fails, the value of environment variable COLUMNS is used.

This variable contains the number of columns on terminal screen.

crt
Type: Boolean or Numeric
Default: True in interactive mode, False otherwise.

The variable crt determines the minimum number of lines the body of the message must contain in order to be piped through pager command specified by environment variable PAGER. If crt is set to a numeric value, this value is taken as the threshold. Otherwise, if crt is set without a value, then the height of the terminal screen is used to compute the threshold. The number of lines on screen is controlled by screen variable.

debug
Type: String to boolean
Default: Not set

Sets mailutils debug level. If set to string, the value must be a valid Mailutils debugging specification. See [Debug Statement], page 18, for a description.

If unset (i.e. set nodebug), clears and disables all debugging information. If set to ‘true’ (i.e. set debug), sets maximum debugging (‘<trace7’) on mailbox and its underlying objects.
decode-fallback

Type: String.
Default: ‘none’.

This variable controls the way to represent characters that cannot be rendered using current character set. It can have three values:

‘none’  Such characters are not printed at all. The conversion process stops at the first character that cannot be rendered.

‘copy-pass’  The characters are displayed ‘as is’. Notice, that depending on your setup, this may screw-up your terminal settings.

‘copy-octal’  Unprintable characters are represented by their octal codes. Printable ones are printed ‘as is’.

debug

Type: Boolean
Default: Unset

This variable is not used. It exists for compatibility with other mailx implementations and for future use.

dot

Type: Boolean.
Default: False.

If True, causes mail to interpret a period alone on a line as the terminator of a message you are sending.

emptystart

Type: Boolean.
Default: False.

If the mailbox is empty, mail normally prints ‘No mail for user’ and exits immediately. If this option is set, mail will start no matter is the mailbox empty or not.

editheaders

Type: Boolean.
Default: False.

When set, mail will include message headers in the text to be the ^e and ^v escapes, thus allowing you to customize the headers.

escape

Type: String.
Default: ^

If defined, the first character of this option gives the character to denoting escapes.
flipr
Type: Boolean
Default: Unset
If set, the variable flipr swaps the meanings of reply and Reply commands (see Section 3.5.2.14 [Replying], page 61).

folder
Type: String.
Default: Unset.
The name of the directory to use for storing folders of messages. If unset, $HOME is assumed.

fromfield
Type: Boolean.
Default: True.
By default the sender address is taken from the ‘From’ header. Unsetting this variable tells mail to obtain it from the SMTP envelope, instead.
See [datefield], page 73.

header
Type: Boolean.
Default: True, unless started with --nosum (-N) option.
Whether to run headers command automatically after entering interactive mode.

headline
Type: String
Default: ‘%>a%4m %18f %16d %3l/%-5o %s’
Format string to use for the header summary. The ‘%’ character introduces a format specifier. The format specifier consists of optional alignment specifier (+’ or –’ sign), optional output width and the specifier letter. Format specifiers are replaced on output with the corresponding piece of information from the message being described.
The ‘-’ character immediately following ‘%’ indicates that this field should be left aligned. The ‘+’ character indicates right alignment. Default alignment depends on the type of the specifier: the specifiers that produce numeric values (‘%l’, ‘%m’, and ‘%o’) are aligned to the right, whereas the ones producing string or date/time values are aligned to the left.
A number following ‘%’ or the alignment flag, indicates the field width.
Consider the ‘%m’ specifier as an example:

%4m         Print current message number. Use exactly 4 screen columns, truncating the output if it does not fit that width. Align the output to the right.
%-4m Same as above, but align to the left.

Valid format specifiers are:

%a Message attribute. One of the following letters, or a single horizontal space, if none of them applies:
   ‘M’ the message was copied to the mailbox (‘mbox’ command)
   ‘P’ the message was preserved (‘hold’ command)
   ‘*’ the message was saved (‘save’ or ‘Save’)
   ‘T’ the message was tagged (‘tag’)
   ‘R’ the message was read
   ‘N’ the message is new (was not seen)
   ‘U’ the message was seen, but wasn’t read

%d The date when the message was received. It is determined from the message header set by the ‘datefield’ variable (see [datefield], page 73). If that variable is not set, or the requested header is not present in the message, the date from the envelope is used.

The output is formatted according to the following format specification (see Appendix C [Date/time Format String], page 205):

    %a %b %e %H:%M

I.e.: abbreviated weekday name, abbreviated month name, day of the month as a decimal number, followed by hour and minutes. All names are displayed according to the current locale.

%D{fmt} Same as ‘%d’, but the date is formatted according to the date/time format fmt. It is essentially a C ‘strftime’ format string, described in detail in Appendix C [Date/time Format String], page 205.

For example:

   set headline="%4m %20D{%Y-%m-%dT%H:%M:%S}" 

Note, that the opening ‘{’ must follow the format letter without any intervening whitespace. If fmt contains ‘{’, ‘}’, or ‘\’, these characters must be escaped with backslash (e.g. ‘\{’).

%D{f} A simplified form of the ‘%D’ specifier. It is equivalent to

    %D{%f}

where f is a single ‘strftime’ specifier letter. It can be preceded by ‘E’ or ‘0’, if the Single UNIX Specification allows such usage (see [conversion specs], page 207), e.g. ‘%DOU’.

Notice, that ‘%D’ not followed by a valid time format in either of the above forms is treated as unknown specifier.

%f The email address of the message sender.

%1 The number of lines of the message.

%m Message number.

%o The number of octets (bytes) in the message.
%s Message subject (if any).
%S Message subject (if any) in double quotes.
%> A ‘>’ for the current message, otherwise a space.
%< A ‘<’ for the current message, otherwise a space.
%% A ‘%’ character.

hold
Type: Boolean.
Default: False.
Determines the location where to store the messages in state ‘read’ and (if the
keepsave is also set) ‘saved’. When set, these messages will be retained in the
system mailbox.
When not set (the default), such messages will be stored in the user’s personal
mailbox.
See [read messages], page 51, and See [saved messages], page 52, for a detailed
information on how such messages are processed when the mailbox is being
closed.
See [keepsave], page 79, for the discussion of the keepsave variable.

ignore
Type: Boolean.
Default: False.
When set to True, mail will ignore keyboard interrupts when composing mes-
sages. Otherwise an interrupt will be taken as a signal to abort composing.

ignoreeof
Type: Boolean.
Default: False.
Controls whether typing EOF character terminates the letter being composed.

indentprefix
Type: String.
Default: "\t" (a tab character).
String used by the ~m tilde escape for indenting quoted messages.

inplacealiases
Type: Boolean
Default: False
If set, mail will expand aliases in the address header field before entering send
mode (see Section 3.5.3 [Composing Mail], page 63). By default, the address
header fields are left intact while composing, the alias expansion takes place
immediately before sending message.
**keep**

Type: Boolean, Read-Only
Default: True

Truncate the user's system mailbox when it is empty, instead of removing it. This is the default and cannot be changed. This variable exists only for compatibility with other `mailx` implementations.

**keepsave**

Type: Boolean.
Default: False.
Controls whether saved messages should be retained. The location where they will be retained is controlled by the `hold` variable (see [the hold variable], page 78).

This variable is in effect only when operating upon the user's system mailbox. See [saved messages], page 52, for a detailed information on how the saved messages are processed when the mailbox is being closed.

**mailx**

Type: Boolean.
Default: False.

When set, enables `mailx compatibility mode`. This mode has the following effects:

- When composing a message `mail` will ask for Cc and Bcc addresses after composing the body. The default behavior is to ask for these values before composing the body.
- In send mode, if the composition was interrupted, `mail` will exit with zero status. By default it exits with zero status only if the message was sent successfully.

**metamail**

Type: Boolean or String.
Default: True.

This variable controls operation of `decode` command. If it is unset, `decode` will not attempt any interpretation of the content of message parts. Otherwise, if `metamail` is set to `true`, `decode` will use internal metamail support to interpret message parts. Finally, if `metamail` is assigned a string, this string is treated as command line of the external `metamail` command which will be used to display parts of a multipart message. For example:

```bash
# Disable MIME interpretation:
set nometamail
# Enable built-in MIME support:
set metamail
# Use external program to display MIME parts:
set metamail="metamail -m mail -p"
```

**mime**

Type: String
Default: Unset (false)
If set, this variable instructs mail to compose MIME messages. It can be set from the command line using `--mime` option.

**mimenoask**

Type: String  
Default: Empty  
By default mail asks for confirmation before running interpreter to view a part of the multi-part message. If this variable is set, its value is treated as a comma-separated list of MIME types for which no confirmation is needed. Elements of this list may include shell-style globbing patterns, e.g. setting

```
set mimenoask=text/*,image/jpeg
```

will disable prompting before displaying any textual files, no matter what their subtype is, and before displaying files with type `image/jpeg`.

**metoo**

Type: Boolean.  
Default: False.  
Usually, when an alias is expanded that contains the sender, the sender is removed from the expansion. Setting this option causes the sender to be included in the group.

**mode**

Type: String, Read-Only  
Default: The name of current operation mode.  
This variable keeps the name of the current operation mode. Its possible values are:

- **headers**: The program is started with the `--headers (-H)` command line option (see Section 3.5.1 [Invoking Mail], page 48).
- **exist**: The program is started with the `--exist (-e)` command line option (see Section 3.5.1 [Invoking Mail], page 48).
- **print**: The program is started with the `--print (-p)` command line option (see Section 3.5.1 [Invoking Mail], page 48).
- **read**: The program operates in read mode. This is the default.
- **send**: The program operates in send mode. This means it was given one or more recipient addresses in the command line.

**nullbody**

Type: Boolean  
Default: True  
Controls whether mail accepts messages with an empty body. The default value, `true`, means such messages are sent, and a warning (traditionally saying ‘Null message body; hope that’s ok’) is displayed. The text of the warning can be set using `nullbodymsg` variable (see below).

If `nullbody` is unset, mail will silently ignore such messages. This can be useful in crontab files, to avoid sending mails when nothing important happens. For
example, the crontab entry below will send mail only if the utility some-prog
outputs something on its standard output or error:

```
*/5 * * * * some-prog 2>&1 | \
    /bin/mail -E'set nonullbody' -s 'Periodic synchronization'
```

**showenvelope**

Type: Boolean  
Default: Unset  
If this variable is set, the print command will include the STMP envelope in its output.

**nullbodymsg**

Type: String  
Default: Null message body; hope that’s ok  
Keeps the text of the warning, displayed by mail before sending an empty message. When available, the translation of this text, in accordance with the current locale, is displayed.  
Unsetting this variable disables the warning.

**onehop**

Type: Boolean  
Default: Unset  
This variable is not used. It exists for compatibility with other mailx implementa-
tions and for future use.

**outfolder**

Type: String.  
Default: Unset.  
Contains the directory in which files created by save, write, etc. commands will be stored. When unset, current directory is assumed.

**PID**

Type: String, Read-Only  
Default: PID of the process.  
PID of the current mail process.

**page**

Type: Boolean.  
Default: False.  
If set to True, the pipe command will emit a linefeed character after printing each message.

**prompt**

Type: String.  
Default: "? "  
Contains the command prompt sequence.
quiet
Type: Boolean
Default: Unset
This variable is not used. It exists for compatibility with other mailx implementations and for future use.

quit
Type: Boolean.
Default: False, unless started with --quit (-q) option.
When set, causes keyboard interrupts to terminate the program.

rc
Type: Boolean.
Default: True, unless started with --norc (-N) option.
When this variable is set, mail will read the system-wide configuration file upon startup. See Section 3.5.7 [Mail Configuration Files], page 85.

readonly
Type: Boolean
Default: False
When set, mailboxes are opened in readonly mode. In this mode, any mail commands that alter the contents of the mailbox are disabled. These commands include, but are not limited to: delete, save and mbox.

record
Type: String.
Default: Unset.
When set, any outgoing message will be saved to the named file.

recursivealiases
Type: Boolean
Default: True
When set, mail will expand aliases recursively.

regex
Type: Boolean.
Default: True.
Setting this to True enables use of regular expressions in ‘/.../’ message specifications.

replyprefix
Type: String
Default: ‘Re: ’
Sets the prefix that will be used when constructing the subject line of a reply message.
replyregex

Type: String
Default: ‘^re: *’

Sets the regular expression used to recognize subjects of reply messages. If the Subject header of the message matches this expression, the value of replyprefix will not be prepended to it before replying. The expression should be a POSIX extended regular expression. The comparison is case-insensitive.

For example, to recognize usual English, Polish, Norwegian and German reply subject styles, use:

```bash
set replyregex="^\(re|odp|aw|ang\)\(\[[0-9]+\]\)?:[:blank:]"
```

(Notice the quoting of backslash characters).

return-address

Type: String
Default: unset

Sets the return email address to use when sending messages. If unset, the address is composed from the current user name and the host name.

save

Type: Boolean.
Default: True.

When set, the aborted messages will be stored in the user’s dead.file. See also appenddeadletter.

screen

Type: Numeric.
Default: Detected at startup by querying the terminal device. If this fails, the value of environment variable LINES is used.

This variable contains the number of lines on terminal screen.

sendmail

Type: String.
Default: sendmail:/usr/lib/sendmail

Contains URL of the mail transport agent.

sendwait

Type: Boolean
Default: Unset

This variable is not used. It exists for compatibility with other mailx implementations and for future use.

showto

Type: Boolean
Default: False

If the message was sent by the user, print its recipient address in the header summary.
Sign
Type: String.
Default: Unset.
Contains the filename holding users signature. The contents of this file is appended to the end of a message being composed by ^A escape.

sign
Type: String.
Default: Unset.
Contains the user’s signature. The contents of this variable is appended to the end of a message being composed by ^a escape. Use Sign variable, if your signature occupies more than one line.

showto
Type: Boolean
Default: unset
If this variable is set, mail will show To: addresses instead of From: for all messages that come from the user that invoked the program.

subject
Type: String.
Default: Unset.
Contains default subject line. This will be used when asksub is off.

toplines
Type: Numeric.
Default: 5
Number of lines to be displayed by top and Top commands.

variable-strict
varstrict
Type: Boolean.
Default: False.
Setting this variable enables strict control over variable settings. In this mode, mail refuses to set read-only variables. Also, if the user is trying to set an unknown variable, mail prints a warning.
See [Setting and Unsetting the Variables], page 70.

variable-pretty-print
varpp
Type: Boolean.
Default: False.
If this variable is set, the listing output by set contains short descriptions before each variable. See [Setting and Unsetting the Variables], page 70.

verbose
Type: Boolean.
Default: False.
When set, the actual delivery of messages is displayed on the user’s terminal.
xmailer
  Type: Boolean.
  Default: Set.
  Controls whether the header 'X-Mailer' should be added to outgoing messages.
  The default value of this header is
  
  X-Mailer: mail (GNU Mailutils 3.10)

3.5.7 Personal and System-wide Configuration Files

After processing the usual Mailutils configuration files (see Section 3.2 [configuration], page 9), mail reads the contents of the two command files: the system-wide command file, and the user’s command file. Each line read from these files is processed like a usual mail command.

When run with --norc (-N) option, mail does not read the contents of system-wide configuration file. The user’s file, if it exists, is always processed.

The user’s configuration file is located in the user’s home directory and is named .mailrc. The location and name of the system-wide configuration file is determined when configuring the package via --with-mail-rc option. It defaults to sysconfdir/mail.rc.
3.6 messages — Count the Number of Messages in a Mailbox

The `messages` command prints on standard output the number of messages contained in each folder specified in command line. If no folders are specified, it operates upon user’s system mailbox. For each folder, the following output line is produced:

```
Number of messages in folder: number
```

where `folder` represents the folder name, `number` represents the number of messages.

The following configuration file statements affect the behaviour of `messages`:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
</tbody>
</table>

In addition to the common mailutils options (see Section 3.1.2 [Common Options], page 8), the program accepts the following command line options:

- `-q`
- `--quiet`
- `-s`
- `--silent`  Be quiet. Display only number of messages per mailbox, without leading text.
Chapter 3: Mailutils Programs

3.7 movemail — Moves Mail from the User Maildrop to the Local File

The purpose of movemail, as its name implies, is to move mail from one location to another. For example, the following invocation:

    movemail /var/mail/smith INBOX

moves messages from file /var/mail/smith to file INBOX.

The program was initially intended as a replacement for movemail from GNU Emacs. The movemail program is run by Emacs Rmail module. See Section “Rmail” in Reading Mail with Rmail, for detailed description of Rmail interface.

Mailutils version of movemail is fully backward-compatible with its Emacs predecessor, so it should run flawlessly with older versions of Emacs. Emacs versions starting from 22.1 contain improved Rmail interface and are able to take advantage of all new features mailutils movemail provides.

Apart from that use, movemail proved to be a useful tool for incorporating mail from remote mailboxes into the local one. See Fetching Mail with Movemail (http://mailutils.org/wiki/Fetching_Mail_with_Movemail), for a detailed discussion with usage recipes.

3.7.1 Movemail Configuration

The following configuration file statements affect the behavior of movemail:

- **preserve bool** [Movemail Config]
  - If bool is ‘true’, do not remove messages from the source mailbox.

- **reverse bool** [Movemail Config]
  - If bool is ‘true’, reverse message sorting order.

- **emacs bool** [Movemail Config]
  - If bool is ‘true’, output information used by Emacs rmail interface.

- **ignore-errors bool** [Movemail Config]
  - Continue moving messages after errors. By default, mailfromd exits immediately if it cannot copy a message.

- **program-id fmt** [Movemail Config]
  - Set program identifier, i.e. a string which will prefix all diagnostic messages issued by the program. By default, program name is used.
  - The fmt is a format string that may contain references to the following variables (see Section 3.2.2 [Variables], page 15):
    - **progname** The program name.
    - **source** URL of the source mailbox.
    - **source_user** User part of the source mailbox URL.
    - **source_host** Host part of the source mailbox URL.
    - **source_path** Path part of the source mailbox URL.
dest URL of the destination mailbox

dest_user User part of the destination mailbox URL.

dest_host Host part of the destination mailbox URL.

dest_path Path part of the destination mailbox URL.

Setting program-id may be necessary if several movemail instances are run simultaneously (e.g. invoked from a script) to discern between the instances. For example:

```
program-id "${progname}: ${source} => ${dest}"
```

### uidl bool

Avoid copying the message if a message with the same UIDL already exists in the destination mailbox.

### verbose level

Set verbosity level.

### mailbox-ownership method-list

Define list of methods for setting ownership of the destination mailbox. The method-list argument can contain the following elements:

- **copy-id** Copy owner UID and GID from the source mailbox. This method works only with local mailboxes, i.e.: 'mbox' (UNIX mailbox), 'maildir' and 'mh'.

- **copy-name** Get owner name from the source mailbox URL and obtain UID and GID for this user using mailutils authorization methods.

- **set-id=uid[:gid]** Set supplied uid and gid. If gid is not supplied, it is read from the /etc/passwd record for this UID.

- **set-name=user** Make destination mailbox owned by user.

### max-messages count

Defines upper limit on the number of moved messages. Movemail will stop after transferring count messages.

By default, the number of messages is not limited.

### onerror actions

Defines what to do if an error occurs when transferring a message. actions is a list of one or more of the following keywords:

- **abort** Abort the transfer and terminate the program. This is the default action.

- **skip** Skip to the next message.
delete  Delete the affected message.
count  Count this message as processed.

Each keyword can be prefixed with 'no' to reverse its meaning.

The following standard Mailutils statements are supported:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
<tr>
<td>pam</td>
<td>See Section 3.2.15 [pam statement], page 33.</td>
</tr>
<tr>
<td>sql</td>
<td>See Section 3.2.18 [sql statement], page 36.</td>
</tr>
<tr>
<td>virtdomain</td>
<td>See Section 3.2.16 [virtdomain statement], page 33.</td>
</tr>
<tr>
<td>radius</td>
<td>See Section 3.2.17 [radius statement], page 34.</td>
</tr>
<tr>
<td>ldap</td>
<td>See Section 3.2.19 [ldap statement], page 38.</td>
</tr>
<tr>
<td>auth</td>
<td>See Section 3.2.14 [auth statement], page 31.</td>
</tr>
</tbody>
</table>

### 3.7.2 Setting Destination Mailbox Ownership

The information in this node may be obsolete or otherwise inaccurate. This message will disappear, once this node revised.

### 3.7.3 Movemail Usage Summary

**movemail [option...] inbox destfile [password]**

The first argument, *inbox*, is the url (see Chapter 2 [Mailbox], page 3) of the source mailbox. The second argument, *destfile*, traditionally means destination file, i.e. the UNIX mailbox to copy messages to. However, mailutils movemail extends the meaning of this parameter. You may actually specify any valid url as *destfile* parameter.

For compatibility with older implementations of movemail, the *source* argument can also have the form:

```
po:username[:pop-server]
```

where *pop-server* is the IP address or hostname of a POP3 server to connect to and *username* is the name of the user on that server. The password is then supplied by the third argument.

It is equivalent to the following URL:

```
pop://username[:password]@pop-server
```

In fact, whenever *source* refers to a remote mailbox, the *password* argument can be used to pass the password. However, the safer ticket method is of course preferred.

---

1 Rmail does not use this feature
Options are one or more of the following:

--emacs  Output information used by Emacs rmail interface.

--ignore-errors  Try to continue after errors.

--max-messages=count  Process at most count messages.

--notify  Enable biff notification.

--onerror=kw[,kw...]  What to do on errors. See [movemail-onerror], page 88, for a description of kw.

-P modelist  Control mailbox ownership. modelist is a comma-separated list of one or more ownership change methods. See [mailbox-ownership-methods], page 88, for a description of available methods.

This option is useful only when running movemail as root.

-p  --preserve  --keep-messages  Don’t remove transferred messages from the source mailbox.

--program-id=fmt  Set program identifier for diagnostics (default: the program name). See [movemail-program-id], page 87, for a description of its argument.

-r  --reverse  Reverse the order of retrieved messages.

-u  --uidl  Use UIDs to avoid downloading the same message twice.

-v  --verbose  Increase verbosity level.

The common options are also understood (see Section 3.1.2 [Common Options], page 8).
3.8 readmsg — Extract Messages from a Folder

The readmsg utility extracts messages from a mailbox according to the criteria specified in the command line. These criteria are:

1. A lone ‘*’ means “select all messages in the mailbox”.
2. A list of message numbers may be specified. Values of ‘0’ and ‘$’ in the list both mean the last message in the mailbox. For example:
   
   ```
   readmsg 1 3 0
   ```
   
   extracts three messages from the folder: the first, the third, and the last.
3. Finally, the selection may be some text to match. This will select a mail message which exactly matches the specified text. For example,

   ```
   readmsg staff meeting
   ```

   extracts the message which contains the words ‘staff meeting’. Note that it will not match a message containing ‘Staff Meeting’ – the matching is case sensitive by default. This can changed using the -i (--ignorecase) option. Two more options are provided to control the matching algorithm: the -g (--glob) option instructs readmsg to treat arguments as shell globbing patterns and the -r (--regex) option instructs it to treat them as POSIX extended regular expressions. Needless to say, when using any of the two latter options, you should pay attention to escape the matching pattern to prevent it from being interpreted by the shell. E.g.:

   ```
   readmsg --regex 'staff.*meeting'
   ```

   Unless requested otherwise, only the first message that matches the pattern is printed.

   At least one command line argument or one informational option must be present in readmsg invocation. Informational options are: --help (-?), --usage, and --version (-V).

3.8.1 Invocation of readmsg.

- a
  --show-all
  If a pattern is used for selection, show all messages that match pattern by default only the first one is presented.

- d
  --debug
  Display mailbox debugging information.

- e
  --exact
  Look for messages containing exactly the words given as arguments. This is the default. Other options changing this behavior are: --glob, --regex, and --ignorecase.

- f mailbox
  --folder=mailbox
  Specified the default mailbox.

- g
  --glob
  Treat non-option arguments as shell globbing patterns. For example, to select the first message with words ‘morning’ and ‘coffee’ with anything between them:
readmsg --glob 'morning*coffee'
(notice quoting, which prevents the shell from interpreting the ‘*’ prematurely).

-h
--header Show the entire header and ignore the weedlist.

-i
--ignorecase Ignore the case of letters when looking for matching messages. E.g.:
readmsg --glob --ignorecase 'morning*coffee'

-n
--no-header Do not print the message header.

-p
--form-feed Put form-feed (Control-L) between messages instead of newline.

-r
--regex Treat non-option arguments as POSIX extended regular expressions.

-w weedlist
--weedlist=weedlist
A whitespace or coma separated list of header names to show per message.
Default is --weedlist="From Subject Date To CC Apparently-".

See also Section 3.1.2 [Common Options], page 8.

3.8.2 Configuration of readmsg.
Following configuration statements affect the behavior of readmsg:

header bool [Readmsg Conf]
If bool is ‘true’, display entire headers.

weedlist str [Readmsg Conf]
Set the weedlist. The str argument is a string, containing a list of header names, separated by whitespace, commands or colons. This corresponds to the --weedlist command line option (see Section 3.8.1 [Opt-readmsg], page 91).

no-header bool [Readmsg Conf]
If bool is ‘true’, exclude all headers.

form-feeds bool [Readmsg Conf]
If bool is ‘true’, output formfeed character between messages.

folder url [Readmsg Conf]
Set the URL of the mailbox folder to read.

show-all-match bool [Readmsg Conf]
If bool is ‘true’, print all messages matching pattern, not only the first.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See [Debug Statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See [TLS Statement], page 40.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See [Mailbox Statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See [Locking Statement], page 22.</td>
</tr>
</tbody>
</table>
3.9 decodemail – Decode multipart messages

The `decodemail` utility is a filter program that reads messages from the input mailbox, decodes “textual” parts of each multipart message from a base64- or quoted-printable encoding to an 8-bit or 7-bit transfer encoding, and stores the processed messages in the output mailbox. All messages from the input mailbox are stored in the output, regardless of whether a change was made.

The message parts deemed to be textual are those whose `Content-Type` header matches a predefined, or user-defined, mime type pattern. In addition, encoded pieces of the `From:`, `To:`, `Subject:`, etc., headers are decoded.

For example, `decodemail` makes this transformation:

```
Subject: =?utf-8?Q?The=20Baroque=20Enquirer=20|=20July=202020?= 
⇒ Subject: The Baroque Enquirer | July 2020
```

The built-in list of textual content type patterns is:

- `text/*`
- `application/*shell`
- `application/shellscript`
- `*/x-csrc`
- `*/x-csource`
- `*/x-diff`
- `*/x-patch`
- `*/x-perl`
- `*/x-php`
- `*/x-python`
- `*/x-sh`

These strings are matched as shell globbing patterns (see Section “glob” in `glob(7)` manual page).

More patterns can be added to this list using the `mime.text-type` configuration statement. See Section 3.2.8 [mime statement], page 21, for a detailed discussion, and the configuration section below for a simple example.

When processing old messages you may encounter `Content-Type` headers whose value contains only type, but no subtype. To match such headers, use the pattern without `/whatever` part. E.g. `text/*` matches `text/plain` and `text/html`, but does not match `text`. On the other hand, `t*xt` does not match `text/plain`, but does match `text`.

Optionally, the decoded parts can be converted to another character set. By default, the character set is not changed.

3.9.1 Invocation of decodemail.

Usually, the utility is invoked as:

```
decodemail inbox outbox
```

where `inbox` and `outbox` are file names or URLs of the input and output mailboxes, correspondingly. The input mailbox is opened read-only and will not be modified in any way. In particular, the status of the processed messages will not change. If the output mailbox does not exist, it will be created. If it exists, the messages will be appended to it, preserving
any original messages that are already in it. This behavior can be changed using the -t
(--truncate) option, described below.

The two mailboxes can be of different types. For example you can read input from an
imap server and store it in local `maildir' box using the following command:

```
decodemail imap://user@example.com maildir:///var/mail/user
```

Both arguments can be omitted. If `outbox' is not supplied, the resulting mailbox will be
printed on the standard output in Unix `mbox' format. If `inbox' is not supplied, the utility
will open the system inbox for the current user and use it for input.

A consequence of these rules is that there is no simple way to read the input mailbox
from standard input (the input must be seekable). If you need to do this, the normal
procedure would be to save what would be standard input in a temporary file and then give
that file as `decodemail'’s input.

The following command line options modify the `decodemail' behavior:

```
-c, --charset=charset
 Convert all textual parts from their original character set to the specified
 charset.

-R, --recode
 Convert all textual parts from their original character set to the current char-
 acter set, as specified by the LC_ALL or LANG environment variable.

--no-recode
 Do not convert character sets. This is the default.

-t, --truncate
 If the output mailbox exists, truncate it before appending new messages.

--no-truncate
 Keep the existing messages in the output mailbox intact. This is the default.
```

Additionally, the Section 3.1.2 [Common Options], page 8, are also understood.

### 3.9.2 Configuration of `decodemail'.

The following common configuration statements affect the behavior of `decodemail':

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>mime</td>
<td>See Section 3.2.8 [mime statement], page 21.</td>
</tr>
<tr>
<td>debug</td>
<td>See [Debug Statement], page 18.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See [Mailbox Statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See [Locking Statement], page 22.</td>
</tr>
</tbody>
</table>

Notably, the `mime' statement can be used to extend the list of types which are decoded.
For example, in the file `~/.decodemail' (other locations are possible, see Section 3.2 [con-
figuration], page 9), you could have:

```
# base64/qp decode these mime types also:
mime {
  text-type "application/x-bibtex";
  text-type "application/x-tex";
```
Since the list of textual mime types is open-ended, with new types being used at any time, we do not attempt to make the built-in list comprehensive.

### 3.9.3 Purpose and caveats of `decodemail`.

The principal use envisioned for this program is to decode messages in batch, after they are received.

Unfortunately, some mailers prefer to encode messages in their entirety in base64 (or quoted-printable), even when the content is entirely human-readable text. This makes straightforward use of `grep` or other standard commands impossible. The idea is for `decodemail` to rectify that, by making the message text readable again.

Besides personal mail, mailing list archives are another place where such decoding can be useful, as they are often searched with standard tools.

It is generally not recommended to run `decodemail` within a mail reader (which should be able to do the decoding itself), or directly in a terminal (since quite possibly there will be 8-bit output not in the current character set).

Although the output message from `decodemail` should be entirely equivalent to the input message, apart from the decoding, it is generally not identical. Because `decodemail` parses the input message and reconstructs it for output, there are usually small differences:

- In the envelope ‘*From*’ line, multiple spaces are collapsed to one.
- A ‘*Content-Transfer-Encoding:*’ header may be added where not previously present, or its value changed from ‘*8bit*’ to ‘*7bit*’, or vice versa. This may happen both for the message as a whole, and for a given mime part. `decodemail` looks at the actual content of the text and outputs ‘*Content-Transfer-Encoding:*’ accordingly.
- A trailing space is inserted when a long header line is broken to occupy several lines (*header wrapping*).
- The non-tracing headers may be reordered, notably those that are mime-related.
- Any material before the first mime part of a mime multipart message is lost. By the standards, nothing should appear there. Typically if it does appear, it is a string such as ‘This is a multi-part message in MIME format.’.
- In mime parts, the charset specifications may no longer be quoted (if quoting is not necessary). For example, ‘*charset=*utf-8’ becomes ‘*charset=utf-8*’.
- The mime boundary strings will be changed.

If a discrepancy is created which actually affects message parsing or reading, that’s most likely a bug, and please report it. Naturally, please send an exact input message to reproduce the problem.

### 3.10 `sieve`

---

Editor’s note:
Sieve is a language for filtering e-mail messages at time of final delivery, described in RFC 3028. GNU Mailutils contains stand-alone sieve interpreter, which is described in detail below.

3.10.1 A Sieve Interpreter

The sieve interpreter sieve allows you to apply Sieve scripts to arbitrary number of mailboxes. GNU sieve implements a superset of the Sieve language as described in RFC 3028. See Chapter 5 [Sieve Language], page 163, for a description of the Sieve language. See Section 5.9 [GNU Extensions], page 187, for a discussion of differences between the GNU implementation of Sieve and its standard.

3.10.1.1 Invoking sieve

The sieve invocation syntax is:

```
sieve [options] script
```

Normally, script is the name of the disk file with the Sieve script. If script is a single dash, the script is read from the standard input. If the -E (--expression) option is given, script is taken to be the sieve script text.

where script denotes the filename of the sieve program to parse, and options is one or more of the following:

- `c`
  --compile-only
  Compile script and exit.

- --clear-library-path
  Clear Sieve library path. See also Section 3.10.1.2 [Sieve Configuration], page 99.

- --clear-include-path
  Clear Sieve include path. See also Section 3.10.1.2 [Sieve Configuration], page 99.

- `d[flags]`
  --debug[=flags]
  Specify debug flags. The flags argument is a sequence of one or more of the following letters:

  - 'g'
    Enable main parser traces
  - 'T'
    Enable mailutils traces
  - 'P'
    Trace network protocols
  - 't'
    Enable sieve trace
  - 'i'
    Trace the program instructions
-D
--dump Compile the script, dump disassembled code on standard output and exit.

--environment=name=value
Set sieve environment variable name to the value.

-e address
--email address
Override the user email address. This is useful for reject and redirect actions. By default, the user email address is deduced from the user name and the full name of the machine where sieve is executed. See also Section 3.10.1.2 [Sieve Configuration], page 99.

-E,
--expression
Treat the script argument as Sieve program text.

-I dir
--includedir=dir
Append directory dir to the list of directories searched for include files. See also Section 3.10.1.2 [Sieve Configuration], page 99.

-f
--mbox-url=mbox
Mailbox to sieve (defaults to user’s system mailbox). See also Section 3.10.1.2 [Sieve Configuration], page 99.

-k
--keep-going
Keep on going if execution fails on a message. See also Section 3.10.1.2 [Sieve Configuration], page 99.

-L dir
--libdir=dir
Append directory dir to the list of directories searched for library files. See also Section 3.10.1.2 [Sieve Configuration], page 99.

--libdir-prefix=dir
Add dir to the beginning of the list of directories searched for library files.

--line-info=bool
Print source location along with action logs (default).

-M url
--mailer=url
Define the URL of the default mailer.

-n
--no-actions
--dry-run
Dry run: do not execute any actions, just print what would be done.

--no-program-name
Do not prefix diagnostic messages with the program name.
-t ticket
--ticket=ticket
Ticket file for mailbox authentication. See also Section 3.10.1.2 [Sieve Configuration], page 99.

--variable=name=value
Set Sieve variable name. This option automatically inserts ‘require "variables"’ at the top of the script.

-v
--verbose
Log all actions executed. See also Section 3.10.1.2 [Sieve Configuration], page 99.

See also Section 3.1.2 [Common Options], page 8.

### 3.10.1.2 Sieve Configuration

The behavior of sieve is affected by the following configuration statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
<tr>
<td>logging</td>
<td>See Section 3.2.5 [logging statement], page 17.</td>
</tr>
<tr>
<td>mailer</td>
<td>See Section 3.2.10 [mailer statement], page 23.</td>
</tr>
</tbody>
</table>

The following statements configure sieve-specific features:

```plaintext
sieve { ... }
```

This block statement configures search paths sieve uses to locate its loadable modules. See Section 5.4 [Require Statement], page 167, for a detailed information about loadable modules.

This statement may contain the following sub-statements:

```plaintext
clear-library-path bool
```

If `bool` is ‘true’, clear library search path.

```plaintext
clear-include-path bool
```

If `bool` is ‘true’, clear include search path.

```plaintext
library-path path
```

Add directories to sieve library search path. Argument is a string containing a colon-separated list of directories.

```plaintext
library-path-prefix path
```

Add directories to the beginning if the library search path. Argument is a string containing a colon-separated list of directories.

```plaintext
include-path path
```

Add directories to the include search path. Argument is a string containing a colon-separated list of directories.
keep-going bool
  If bool is ‘true’, do not abort if execution of a Sieve script fails on a particular message.

mbox-url url
  Sets URL of the mailbox to be processed.

ticket file
  Sets the name of the ticket file for user authentication.

debug flags
  Sets Sieve debug flags. See Section 3.10.1.3 [Logging and Debugging], page 100, for a detailed description.

verbose bool
  If bool is ‘true’, log all executed actions.

line-info bool
  If bool is ‘true’, print source locations along with action logs. This statement takes effect only if verbose true is also set.

e-mail addr
  Set user e-mail address. This is useful for reject and redirect actions. By default, the user email address is deduced from the user name and the full name of the machine where sieve is executed.

3.10.1.3 Logging and debugging

The default behavior of sieve is to remain silent about anything except errors. However, it is sometimes necessary to see which actions are executed and on which messages. This is particularly useful when debugging the sieve scripts. The --verbose (-v) option outputs log of every action executed.

Option --debug allows to produce even more detailed debugging information. This option takes an argument specifying the debugging level to be enabled. The argument can consist of the following letters:

‘t’ This flag enables sieve tracing. It means that every test will be logged when executed.

‘T’ This flag enables debugging of underlying mailutils library.

‘P’ Trace network protocols: produces log of network transactions executed while running the script.

‘g’ Enable main parser traces. This is useful for debugging the sieve grammar.

‘i’ Trace the program instructions. It is the most extensive debugging level. It produces the full execution log of a sieve program, showing each instruction and states of the sieve machine. It is only useful for debugging the code generator.

Note, that there should be no whitespace between the short variant of the option (-d), and its argument. Similarly, when using long option (--debug), its argument must be preceded by equal sign.
If the argument to --debug is omitted, it defaults to ‘TPt’.

Option --dump produces the disassembled dump of the compiled sieve program.

By default sieve outputs all diagnostics on standard error and verbose logs on standard output. This behaviour is changed when --log-facility is given in the command line (see logging). This option causes sieve to output its diagnostics to the given syslog facility.

### 3.10.1.4 Extending sieve

The basic set of sieve actions, tests and comparators may be extended using loadable extensions. The usual require mechanism is used for that.

When processing arguments for require statement, sieve uses the following algorithm:

1. Look up the name in a symbol table. If the name begins with ‘comparator-’ it is looked up in the comparator table. If it begins with ‘test-’, the test table is searched instead. Otherwise the name is looked up in the action table.

2. If the name is found, the search is terminated.

3. Otherwise, transform the name. First, any ‘comparator-’ or ‘test-’ prefix is stripped. Then, any character other than alphanumeric characters, ‘.’ and ‘,’ is replaced with dash (‘-’). The name thus obtained is used as a file name of an external loadable module.

4. Try to load the module. The module is searched in the following search paths (in the order given):
   1. Mailutils module directory. By default it is $prefix/lib/mailutils.
   2. The value of the environment variable LTDL_LIBRARY_PATH.
   3. Additional search directories specified with the. --libdir-prefix command line option (see Section 3.10.1.1 [Invoking Sieve], page 97), or the library-path-prefix configuration statement (see Section 3.10.1.2 [Sieve Configuration], page 99).
   4. Additional search directories specified with the library-path statement (see Section 3.10.1.2 [Sieve Configuration], page 99) in Sieve configuration file.
   5. Additional search directories specified with the. --libdir command line option (see Section 3.10.1.1 [Invoking Sieve], page 97).
   6. Additional search directories specified with the #searchpath Sieve directive (see Section 5.3.2 [#searchpath], page 167).
   7. System library search path: The system dependent library search path (e.g. on Linux it is set by the contents of the file /etc/ld.so.conf and the value of the environment variable LD_LIBRARY_PATH).

The value of LTDL_LIBRARY_PATH and LD_LIBRARY_PATH must be a colon-separated list of absolute directories, for example, “/usr/lib/mypkg:/lib/foo”.

In any of these directories, sieve first attempts to find and load the given filename. If this fails, it tries to append the following suffixes to the file name:

1. the libtool archive extension ‘.la’
2. the extension used for native dynamic libraries on the host platform, e.g., ‘.so’, ‘.sl’, etc.
5. If the module is found, **sieve** executes its initialization function (see below) and again looks up the name in the symbol table. If found, search terminates successfully.

6. If either the module is not found, or the symbol wasn’t found after execution of the module initialization function, search is terminated with an error status. **sieve** then displays the following diagnostic message:

```
source for the required action NAME is not available
```
3.11 guimb — A Mailbox Scanning and Processing Language

Guimb is an experimental tool that iterates over messages in a mailbox (or several mailboxes), applying a Scheme function to each of them.

A user-defined *scheme module* that supplies the function to apply is specified using the `--source` or `--file` option. The module must define at least the following function:

\[
\text{guimb-message } \text{msg} \quad \text{[User function]}
\]

Processes message \text{msg}. This function can alter the message using Guile primitives supplied by mailutils.

The following function definitions are optional:

\[
\text{guimb-getopt } \text{args} \quad \text{[User function]}
\]

If defined, this function is called after \text{guimb} has finished processing the command line. \text{args} is a list of unconsumed command line arguments.

The function is intended to provide a way of configuring the module from the command line.

\[
\text{guimb-end} \quad \text{[User function]}
\]

If defined, this function is called after all mailboxes have been processed.

In the following example we define a module that prints information about each message in the input mailbox, in a way similar to \text{frm} utility:

\[
\begin{align*}
\text{(define-module (frm)} \\
\quad :\text{export (guimb-message))}
\end{align*}
\]

\[
\begin{align*}
\text{(use-modules (mailutils mailutils))}
\end{align*}
\]

\[
\begin{align*}
\text{(define (guimb-message msg)} \\
\quad (\text{display (mu-message-get-sender msg)}) \\
\quad (\text{display " "}) \\
\quad (\text{display (mu-message-get-header msg "subject")}) \\
\quad (\text{newline})
\end{align*}
\]

The modules are looked up in directories listed in the global variable \%load-path. New directories can be added to that variable on the fly using the \-L (\--load-path) option. For example, if the sample module above was saved in a file \text{frm.scm} somewhere in the load path, it can be applied to the current user inbox by running the following command:

\[
\text{guimb --file frm}
\]

**Specifying Scheme Program to Execute**

The Scheme module that defines message processing functions is given via the following options:

\-s \text{module}

\--source \text{module}

Load Scheme code from \text{module}. 
This option stops further argument processing, and passes all remaining arguments as the value of args argument to the `guimb-getopt` function, if it is defined.

\[-f\] \[module\]
\[--file\] \[module\]

Load Scheme source code from \[module\]. The remaining arguments are processed in the usual way. When using this option, you can pass additional options and or arguments to the module by enclosing them in \[-\{\] and \[-\}\] options (see [Passing Options to Scheme], page 104).

An experimental option is provided, that evaluates a supplied Scheme expression right after loading the module:

\[-e\] \[expr\]
\[--expression\] \[expr\]

Evaluate scheme expression.

Specifying Mailboxes to Operate Upon

There are four basic ways of passing mailboxes to `guimb`.

`guimb` \[options\] \[mailbox...\]

The resulting mailbox is not saved, unless the user-supplied scheme program saves it.

`guimb` \[options\] \[--mailbox\] \[defmbox\]

The contents of \[defmbox\] is processed and is replaced with the resulting mailbox contents. Useful for applying filters to user’s mailbox.

`guimb` \[options\] \[--mailbox\] \[defmbox\] \[mailbox\] \[mailbox...\]

The contents of specified mailboxes is processed, and the resulting mailbox contents is appended to \[defmbox\].

`guimb` \[options\] \[--user\] \[username\] \[mailbox...\]

The contents of specified mailboxes is processed, and the resulting mailbox contents is appended to the user’s system mailbox. This makes it possible to use `guimb` as a mail delivery agent.

If no mailboxes are specified in the command line, `guimb` reads and processes the system mailbox of the current user.

Passing Options to Scheme

Sometimes it is necessary to pass some command line options to the scheme procedure. There are three ways of doing so.

When using \[--source\] (\[-s\]) option, the rest of the command line following the option’s argument is passed as the args argument to the `guimb-getopt` function, if such function is defined. This allows for making guimb scripts executable by the shell. If your system supports ‘‘#!’’ magic at the start of scripts, add the following two lines to the beginning of your script to allow for its immediate execution:

```
#! /usr/local/bin/guimb -s
!#
```
(replace ‘/usr/local/bin/’ with the actual path to the guimb).

Otherwise, if you use the --file option, the additional arguments can be passed to the Scheme program -g (--guile-arg) command line option. For example:

```
guimb --guile-arg -opt --guile-arg 24 --file progfile
```

In this example, the guimb-getopt function will get the following argument:

```
('opt' 24)
```

Finally, if there are many arguments to be passed to Scheme, it is more convenient to enclose them in -{ and } escapes:

```
guimb -{ -opt 24 } --file progfile
```

**Command Line Option Summary**

This is a short summary of the command line options available to guimb.

- **-d**
  --debug  Start with debugging evaluator and backtraces.

- **-e expr**
  --expression expr  Execute given Scheme expression.

- **-L dir**
  --load-path dir  Insert dir at the beginning of the %load-path list. The argument is either a single directory name, or a list of such names, delimited by ‘:’ characters.

- **-m path**
  --mail-spool=path  Set path to the mailspool directory

- **-f progfile**
  --file progfile  Read Scheme program from progfile.

- **-g arg**
  --guile-command arg  Append arg to the command line passed to Scheme program.

- **-{ ... }**  Pass all command line options enclosed between -{ and } to Scheme program.

- **-m**
  --mailbox mbox  Set default mailbox name.

- **-u**
  --user name  Act as local MDA for user name.

- **-h**
  --help  Display help message.

- **-v**
  --version  Display program version.
3.12 mda

GNU local mail delivery agent reads a message from its standard input and delivers it to one or more local recipients listed in the command line. When we speak about local recipients, we mean that these are system users that are known to the system that runs mda. However, the mailboxes of these users can be local as well as remote ones. mda is able to deliver mail to any mailbox format, supported by GNU Mailutils. These formats, among others, include ‘smtp://’, ‘prog://’ and ‘sendmail://’ which are equivalent to forwarding a message over SMTP to a remote node.

Mda is also able to process incoming messages using Sieve, Scheme or Python scripts and, based on results of this processing, to take a decision on whether to actually deliver and where to deliver them. Due to its extensive scripting facilities, mda offers much more flexibility than other popular MDAs.

3.12.1 Using mda with Sendmail.

When used with Sendmail, mda must be invoked from the local mailer definition in the sendmail.cf file. The flags ‘lswS’ must be set for the mailer. These mean: the mailer is local, quote characters should be stripped off the address before invoking the mailer, the user must have a valid account on this machine and the userid should not be reset before calling the mailer. Additionally, the ‘fn’ flags may be specified to allow mda to generate the usual ‘From’ envelope instead of the one supplied by sendmail.

If you wish to use mda with non-local authentication, such as SQL or LDAP, you also need to remove the ‘w’ flag, since in that case the user is not required to have a valid account on the machine that runs sendmail.

Here is an example of mailer definition in sendmail.cf:

```plaintext
Mlocal, P=/usr/local/sbin/mda,
 F=lsDFMAw5:/|@qSPfhn9,
 S=EnvFromL/HdrFromL, R=EnvToL/HdrToL,
 T=DNS/RFC822/X-Unix,
 A=mail $u
```

To define local mailer in ‘mc’ source file, it will suffice to set:

```plaintext
define('LOCAL_MAILER_PATH', '/usr/local/sbin/mda')
define('LOCAL_MAILER_ARGS', 'mail $u')
```

3.12.2 Using mda with Exim.

Using mda with Exim is quite straightforward. The following example illustrates the definition of the appropriate transport and director in exim.conf:

```plaintext
# transport
mda_pipe:
  driver = pipe
  command = /usr/local/sbin/mda $local_part
  return_path_add
  delivery_date_add
  envelope_to_add

# director
```
mda:
    driver = localuser
    transport = mda_pipe

3.12.3 Using mda with MeTA1.

MeTA1 (http://meta1.org) communicates with the delivery agent using LMTP. Instead of using mda you will have to start the LMTP daemon lmtpd and configure MeTA1 to communicate with it. See Section 3.13.1 [MeTA1-lmtpd], page 116, for details.

3.12.4 Mailbox Quotas

Mailbox quota is a limit on the size of the mailbox. When a mailbox size reaches this limit, mda stops accepting messages for this recipient and returns an error condition to the sender. The error code is accompanied by the following error message:

    user: mailbox quota exceeded for this recipient

Furthermore, if accepting the incoming message would make the mailbox size exceed the quota, such a message will be rejected as well. In this case, the error message is:

    user: message would exceed maximum mailbox size for this recipient

In both cases, the default return code will be ‘service unavailable’ (corresponding to the SMTP return code ‘550’), unless the following statement is present in the maidag configuration file:

    quota {
        exit-tempfail yes;
    }

in which case a temporary error will be returned.

The mailbox quota can be retrieved from the following sources:
1. Authentication method.
2. DBM file.
3. SQL database.

3.12.4.1 Keeping Quotas in DBM File

To use DBM quota database, GNU Mailutils must be compiled with one of the following command line options: --with-gdbm, --with-berkeley-db, --with-ndbm, --with-tokycabinet, or --with-kyotocabinet. Examine the output of mda --show-config-options, if not sure.

The quota database should have the following structure:

<table>
<thead>
<tr>
<th>Key</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key represents the user name. Special key ‘DEFAULT’ means default quota value, i.e. the one to be used if the user is not explicitly listed in the database.</td>
<td>Mailbox quota for this user. If it is a number, it represents the maximum mailbox size in bytes. A number may optionally be followed by ‘kb’ or ‘mb’, meaning kilobytes and megabytes, respectively. A special value ‘NONE’ means no mailbox size limit for this user.</td>
</tr>
</tbody>
</table>
Here is an example of a quota database in text form:

```plaintext
# Default quota value:
DEFAULT 5mb

# Following users have unlimited mailbox size
root NONE
smith NONE

# Rest of users
plog 26214400
karin 10MB
```

To use the DBM quota database, specify its absolute name using the `database` configuration statement in the `quota` section, e.g.:

```plaintext
quota {
  database /etc/mail/quota.db;
}
```

### 3.12.4.2 Keeping Quotas in SQL Database

User quotas can be kept in an SQL table as well. Currently (as of mailutils version 3.10) it is assumed that this table can be accessed using the credentials set in ‘sql’ configuration statement (see [SQL Statement], page 36).

For example, suppose you have the following quota table:

```sql
CREATE TABLE mailbox_quota(
  user_name VARCHAR(32) NOT NULL,
  quota INT,
  UNIQUE (user_name)
);
```

To retrieve user quota the following query can be used:

```sql
SELECT quota FROM mailbox_quota WHERE user_name='${user}'
```

To define this query use the `sql-query` statement:

```plaintext
quota {
  sql-query "SELECT quota "
    "FROM mailbox_quota "
    "WHERE user_name='${user}'";
}
```

There are no special provisions for specifying group quotas, similar to ‘DEFAULT’ in DBM databases. This is because group quotas can easily be implemented using SQL language. Mda always uses the first tuple from the set returned by mailbox quota query. So, you can add a special entry to the `mailbox_quota` table that would keep the group quota. In the discussion below we assume that the `user_name` column for this entry is lexicographically less than any other user name in the table. Let’s suppose the group quota name is ‘00DEFAULT’. Then the following query:

```sql
SELECT quota
FROM mailbox_quota
```
WHERE user_name IN ('${user}','OODEFAULT')
ORDER BY user_name DESC

will return two tuples if the user is found in mailbox_quota. Due to ORDER statement, the first tuple will contain quota for the user, which will be used by mda. On the other hand, if the requested user name is not present in the table, the above query will return a single tuple containing the group quota.

The following configuration statement instructs maidag to use this query for retrieving the user quota:

```
quota {
    sql-query "SELECT quota "
    "FROM mailbox_quota "
    "WHERE user_name IN ('${user}','OODEFAULT') "
    "ORDER BY user_name DESC";
}
```

### 3.12.5 Scripting in mda

Mda can use global or per-user mail filters to decide whether to deliver the message, and where to deliver it. As of Mailutils version 3.10, such mail filters may be written in the following languages:

- **Sieve** See Chapter 5 [Sieve Language], page 163.
- **Scheme**
- **Python**

Mail filters to use are specified using 'script' configuration statement. The following meta-symbols can be used in its argument:

- %h Expands to the recipient home directory.
- %u Expands to the recipient user name.

By default, the filename extension decides which scripting language will be used. User can alter the choice using 'language' configuration statement. For example:

```
script {
    language python;
    pattern "~/maidag-py-filter";
}
```

### 3.12.5.1 Sieve MDA Filters

The file name of the Sieve filter to use is specified using 'script' configuration statement. For example, the following configuration statement:

```
script {
    pattern "~/maidag.sv";
}
```

instructs maidag to use file .maidag.sv in the recipient home directory as a Sieve filter.

Normal message delivery is attempted if execution of the Sieve code ended with keep action (either implicit or explicit).
Other Sieve actions are executed as described in Section 5.7 [Actions], page 176. For example, to deliver message to another mailbox, use the fileinto action.

Any modifications to headers or body of the message performed by the Sieve code will be visible in the delivered message.

### 3.12.5.2 Scheme MDA Filters

The file name of the Scheme mail filter is specified using ‘script’ configuration statement. For example, the following configuration statement:

```plaintext
script {
    pattern "~/.maidag.scm"
}
```

instructs mda to use file .maidag.scm in the recipient home directory as a Scheme filter.

### 3.12.5.3 Python MDA Filters

The file name of the Python mail filter is specified using ‘script’ configuration statement. For example, the following configuration statement:

```plaintext
script {
    pattern "~/.maidag.py"
}
```

instructs mda to use the file .maidag.py in the recipient home directory as a Python filter.

A simple example of a mail filter written in Python:

```python
from mailutils import *
import maidag
import re

msg = message.Message (maidag.message)
hdr = msg.header

try:
    if 'List-Post' in hdr and 'Received' in hdr \
        and hdr['Received'].find ('fencepost.gnu.org') != -1:
        # check envelope's sender address
        m = re.search (r'([\w\-]+)-bounces\+([\w]+)=.*',
                       msg.envelope.get_sender ()
        if m:
            lbox = m.group (1)
            user = m.group (2)
            # open destination mailbox and append message
            dst = mailbox.MailboxDefault ('~/Mail/%s' % lbox)
            dst.open ('ac')
            dst.append_message (msg)
            dst.close ()
            # set deleted flag so maidag will not deliver msg elsewhere
            msg.attribute.set_deleted ()
```
except Exception:
    pass

3.12.6 Forwarding

A forward file is a special file in the user’s home directory that contains the email address of the mailbox where the user wants to forward his mail. Normally, forward files are processed by MTA. However, there are some MTA that lack this feature. One of them is MeTA1.

Mda provides a forwarding feature that is useful to compensate the lack of it. This feature is controlled by the forward section in the configuration file:

```plaintext
forward {
    # Process forward file.
    file name;
    # Configure safety checks for the forward file.
    file-checks (list);
}
```

The name of the forward file is given by the file statement in the forward section. A common usage is:

```plaintext
forward {
    file .forward;
}
```

The forward file is always searched in the recipient home directory.

Before actually using the forward file, a number of safety checks are performed on it. If the file fails to pass one of these checks, no forwarding is performed and the message is delivered as usual. These checks are configured using the forward.file-checks statement:

```plaintext
forward {
    file .forward;
    file-checks (list);
}
```

Its argument is a list of the following keywords:

groupwritablefile
file_iwgrp The file must not be group writable.

worldwritablefile
file_iwoth The file must not be world writable.

linkedfileinwritabledir
link The file cannot be a symlink in a writable directory.

fileingroupwritabledir
file_iwgrp The file cannot reside in a group writable directory.

fileinworldwritabledir
file_iwoth The file cannot reside in a world writable directory.

all All of the above checks.

The default is ‘file-checks all’.
Each of these keywords may be prefixed by ‘no’ to disable this particular check. For example:

```plaintext
forward {
    file-checks (nodir_iwoth, nodir_iwgrp);
    file .forward;
}
```

### 3.12.7 MDA Configuration File Summary

The behavior of `mda` is affected by the following configuration statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
<tr>
<td>pam</td>
<td>See Section 3.2.15 [pam statement], page 33.</td>
</tr>
<tr>
<td>sql</td>
<td>See Section 3.2.18 [sql statement], page 36.</td>
</tr>
<tr>
<td>virtdomain</td>
<td>See Section 3.2.16 [virtdomain statement], page 33.</td>
</tr>
<tr>
<td>radius</td>
<td>See Section 3.2.17 [radius statement], page 34.</td>
</tr>
<tr>
<td>ldap</td>
<td>See Section 3.2.19 [ldap statement], page 38.</td>
</tr>
<tr>
<td>auth</td>
<td>See Section 3.2.14 [auth statement], page 31.</td>
</tr>
<tr>
<td>mailer</td>
<td>See Section 3.2.10 [mailer statement], page 23.</td>
</tr>
</tbody>
</table>

**stderr** bool

If `bool` is true, log to standard error instead of syslog.

**deliver** { ... }

This section contains general delivery settings:

```plaintext
deliver {
    domain string;
    exit-multiple-delivery-success arg;
};
```

**domain** name

Default email domain.

**exit-multiple-delivery-success** arg;

In case of multiple delivery, exit with code 0 if at least one delivery succeeded.

**forward** { ... }

Controls the forwarding support:

```plaintext
forward {
    file name;
    file-checks (list);
}
```

**file** name

Defines the name of the forward file. E.g.:

```plaintext
forward {
```
file .forward;
}

See Section 3.12.6 [Forwarding], page 111, for a detailed description.

file-checks (list) [forward]
Configures safety checks to be performed on the forward file prior to using it. See Section 3.12.6 [Forwarding], page 111, for a detailed description.

quota { ... } [MDA Config]
This section configures mail quota support. See Section 3.12.4 [Mailbox Quotas], page 107, for a detailed description.

    quota {
        database name;
        sql-query query;
        exit-tempfail bool;
    }

database name [quota]
Sets the name of the quota database in DBM format. See Section 3.12.4.1 [DBM Quotas], page 107.

sql-query query [quota]
If the quotas are kept in a SQL table, this statement defines the SQL query to retrieve the quota for a given user name. See Section 3.12.4.2 [SQL Quotas], page 108.

exit-tempfail bool [quota]
By default, if a message cannot be delivered because the user has exceeded its mail quota, or its delivery would cause it to be exceeded, MDA exits with the 'service unavailable' status, which causes MTA to return the 550 code. If exit-tempfail is set to true, it will return a temporary error instead.

script { ... } [MDA Config]
Controls scripting. See Section 3.12.5 [MDA Scripting], page 109.

    script {
        language lang;
        pattern glob;
    }

language lang [script]
Defines the language that is used for scripting. Allowed values for lang are: 'sieve', 'scheme', or 'python'. See [scripting language], page 109.

pattern pat [script]
Defines the pattern for the script file name. The '~' at the beginning of the pattern will be replaced with the name of the home directory of the recipient user. The '%u' in pattern will be replaced with the recipient user name, and '%h' with the home directory for that user.
3.12.8 Mailing list implementation

This subsection explains how to implement mailing lists in mda using the ‘prog’ mailbox scheme.

Delivery to the ‘prog’ mailbox results in invoking the specified command with the given arguments and passing the message to its standard input. There are two ways to specify a ‘prog’ mailbox:

prog://program?args

Here, program is the absolute pathname of the program binary, and args are its arguments, separated by ‘&’ signs.

|program args

In this notation, args are command line arguments separated by white space.

In both cases, args do not include argv[0].

The ‘prog’ mailbox can be used to implement mailing lists.

For example, suppose that the mda configuration contains:

```
auth {
  authorization (sql, system);
  authentication (generic, system);
}

sql {
  interface mysql;
  db mail;
  getpwnam "SELECT user as name, mailbox, "
    "'x' as passwd, 500 as uid, 2 as gid, "
    "'/nonexistent' as dir, '/sbin/nologin' as shell "
  "FROM userdb "
  "WHERE user='${user}'";
}
```

Then, the following entries in the ‘userdb’ table implement the mailman@yourdomain mailing list:

```
mysql> select * from userdb;
+---------------------+---------------------------------------+
| user | mailbox |
+---------------------+---------------------------------------+
| mailman | |/usr/bin/mailman post mailman |
| mailman-admin | |/usr/bin/mailman admin mailman |
| mailman-bounces | |/usr/bin/mailman bounces mailman |
| mailman-confirm | |/usr/bin/mailman confirm mailman |
| mailman-join | |/usr/bin/mailman join mailman |
| mailman-leave | |/usr/bin/mailman leave mailman |
| mailman-owner | |/usr/bin/mailman owner mailman |
| mailman-request | |/usr/bin/mailman request mailman |
| mailman-subscribe | |/usr/bin/mailman subscribe mailman |
| mailman-unsubscribe | |/usr/bin/mailman unsubscribe mailman |
```
3.13 lmtpd

The LMTP is a local mail transport protocol defined in RFC 2033. GNU Mailutils is shipped with lmtpd - a daemon for delivering messages using this protocol.

The daemon shares most of its codebase and configuration with mda and consequently provides the same features. See Section 3.12 [mda], page 106, for a detailed description of these.

The behavior of lmtpd is affected by the following configuration statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>server</td>
<td>See Section 3.2.13 [Server Settings], page 27,</td>
</tr>
<tr>
<td>acl</td>
<td>See Section 3.2.11 [acl statement], page 24.</td>
</tr>
<tr>
<td>tcp-wrappers</td>
<td>See Section 3.2.12 [tcp-wrappers statement], page 26.</td>
</tr>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
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<td>virtdomain</td>
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</tr>
<tr>
<td>mailer</td>
<td>See Section 3.2.10 [mailer statement], page 23.</td>
</tr>
</tbody>
</table>

3.13.1 Using lmtpd with MeTA1.

MeTA1 (http://meta1.org) communicates with the delivery agent using LMTP.

The socket to listen for LMTP requests must be specified using the server statement (see Section 3.2.13 [Server Settings], page 27). For the purposes of this section, let’s suppose lmtpd will listen on a UNIX socket /var/spool/meta1/lmtpsock. Then, the following (minimal) lmtpd configuration will do the job:

```
# Run as daemon.
mode daemon;
# Switch to this group after startup.
group meta1c;
# Configure server:
server unix:///var/spool/meta1/lmtpsock {
   transcript no;
};
```

To configure MeTA1 to use this socket, add the following statement to the `smtpc` section in /etc/meta1/meta1.conf:

```
LMTP_socket="lmtpsock";
```
3.14 putmail

The **putmail** utility reads a message from its standard input and delivers it to the specified mailbox URL. The usage is:

```
putmail URL
```

For example, to deliver mail to a local mailbox `/var/spool/mail/test`:
```
putmail /var/spool/mail/test
```

Of course, this would work only if the `test` mailbox is writable for the user invoking `putmail`.

The **smtp** mailbox scheme can be used for remote delivery. For example:
```
putmail 'smtp://mail.example.org;to=ovr'
```

The program will initiate SMTP dialog with the server `mail.example.org` and will send the message from its standard input to the user `ovr` on that server.

### 3.14.1 putmail options

- **-f email**
- **-r email**
- **--from=email**

Specify the sender address. If not used, the current user name will be used.

- **-l name**
- **--language=name**

Define scripting language for the next --script option. Valid arguments are ‘sieve’, ‘scheme’ and ‘python’.

- **--message-id-header=header**

Use this header to identify messages when logging Sieve actions

- **-s name**
- **--script=name**

Set the name of the user-defined mail filter. See Section 3.12.5 [MDA Scripting], page 109, for a detailed discussion of the scripting feature.

### 3.14.2 putmail configuration

The behavior of **putmail** is affected by the following configuration statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
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</tr>
<tr>
<td>auth</td>
<td>See Section 3.2.14 [auth statement], page 31.</td>
</tr>
<tr>
<td>mailer</td>
<td>See Section 3.2.10 [mailer statement], page 23.</td>
</tr>
</tbody>
</table>
The utility also accepts all MDA configuration statements: See Section 3.12.7 [Conf- mda], page 112.
3.15 mimeview

For each file given in its command line, mimeview attempts to autodetect its type and invoke an appropriate file viewer.

To detect the file type, mimeview uses mime.types file. This file is a part of Common UNIX Printing System, Section “mime.types” in mime.types man page. By default mimeview searches for mime.types in $prefix/etc/cups/¹, however its exact location can be specified at runtime as well (see --mimetypes below).

Once file MIME type is successfully determined, mimeview consults mailcap files in order to determine how to display the file. It does so essentially in the same manner as metamail utility, i.e., it scans all files specified in METAMAIL environment variable until it finds an entry describing the desired file format or until the list of files is exhausted. If METAMAIL variable is not set, mimeview uses the following default path instead:

```
$HOME/.mailcap:/usr/local/etc/mailcap:
/usr/etc/mailcap:/etc/mailcap:
/etc/mail/mailcap:/usr/public/lib/mailcap
```

3.15.1 Mimeview Invocation

The following table summarizes options specific for mimeview:

- `a[type-list]`
- `--no-ask=[type-list]`
  - By default mimeview asks for confirmation before running interpreter to view a message. If this option is used without argument, it disables the default behavior for all message types. Otherwise, if argument type-list is given, it specifies a comma-separated list of MIME types for which no questions should be asked. Elements of this list may include shell-style globbing patterns, e.g. setting
    ```
    --no-ask='text/*,image/jpeg'
    ```
  - will disable prompting before displaying any textual files, no matter what their subtype is, and before displaying files with type ‘image/jpeg’. Notice, that when the long form is used, its argument must be separated from the option by a single equal sign, as shown in the example above. When the short form (-a) is used, its argument must follow the option immediately, without any intervening whitespace, e.g. `-a’text/*’).

- `d[flags]`
- `--debug=[flags]`
  - Enables debugging output. Flags is a sequence of characters specifying the desired debugging level. Following characters are meaningful in flags:
    ```
g
    Enables debugging of mime.types parser
    ```

¹ The exact location is determined at configuration time by setting environment variable DEFAULT_CUPS_CONFDIR. On most sites running
   
   ```
   ./configure DEFAULT_CUPS_CONFDIR=/etc/cups
   ```
   should be recommended.
1 Enables debugging of `mime.types` lexical analyzer (warning: produces very copious output)
0 Prints basic information about actions to be executed and reports about exit status of executed commands.
1 Additionally displays each file name along with its MIME type
2 Additionally traces the process of looking up the matching entry in mailcap files.
3 Additionally, enables debugging of `mime.types` parser (`g`).
4 Additionally, enables debugging of `mime.types` lexer (`l`).

digits from 5 to 9
The same as 4, currently.

If flags are not given, the default ‘2’ is assumed.

`--metamail[=file]`
Run metamail to display files, instead of using the internal mechanisms. If file is specified, it is taken as metamail command line.

`-h`
`--no-interactive`
`--print`
This options tells mimeview that it should run in non-interactive mode. In this mode prompting is disabled, and the normal mailcap command field is not executed. Instead mimeview will execute the command specified in the print field. If there is nothing in the print field, the mailcap entry is ignored and the search continues for a matching mailcap entry that does have a print field.

Notice, that unlike in metamail `-h`, this option does not force mimeview to send the output to the printer daemon.

When used with `--metamail` option, this option passes `-h` flag to the invocation of metamail.

By default mimeview behaves as if given `--no-interactive` option whenever its standard input is not a tty device.

`-i`
`--identify`
Identifies and prints the MIME type for each input file.

`-n`
`--dry-run`
Do not do anything, just print what would be done. Implies `--debug=1`, unless the debugging level is set up explicitly.

`-f file`
`--mimetypes file`
Use file as mime.types file. If file is a directory, use `file/mime.types`

`-t`
`--lint`
Check syntax of the `mime.types` file and exit. Command line arguments are ignored.
### 3.15.2 Mimeview Config

The following configuration statements affect the behavior of `mimeview`:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>debug</code></td>
<td>See [Debug Statement], page 18.</td>
</tr>
<tr>
<td><code>mimetypes file</code></td>
<td>[Mimeview Config]</td>
</tr>
<tr>
<td></td>
<td>Read <code>file</code> instead of the default <code>mime.types</code>.</td>
</tr>
<tr>
<td><code>metamail program</code></td>
<td>[Mimeview Config]</td>
</tr>
<tr>
<td></td>
<td>Use <code>program</code> to display files.</td>
</tr>
</tbody>
</table>
3.16 POP3 Daemon

The pop3d daemon implements the Post Office Protocol Version 3 server.

pop3d has two operation modes:

Inetd

The server is started from /etc/inetd.conf file:

```
pop3 stream tcp nowait root /usr/local/sbin/pop3d pop3d
```

This is the default operation mode.

Standalone

The server runs as daemon, forking a child for each new connection.

The server operation mode is configured using `mode` statement (see Section 3.2.13 [Server Settings], page 27).

3.16.1 Login delay

POP3 clients often login frequently to check for new mail. Each new connection implies authenticating the user and opening his maildrop and can be very resource consuming. To reduce server load, it is possible to impose a minimum delay between any two consecutive logins. This is called ‘LOGIN-DELAY’ capability and is described in RFC 2449.

As of version 3.10, GNU Mailutils pop3d allows to set global login delay, i.e. such enforcement will affect all POP3 users. If a user attempts to log in before the specified login delay expires, he will get the following error message:

```
-ERR [LOGIN-DELAY] Attempt to log in within the minimum login delay interval
```

The message will be issued after a valid password is entered. This prevents this feature from being used by malicious clients for account harvesting.

To enable the login delay capability, specify the minimum delay using `login-delay` configuration statement, e.g.:

```
login-delay 60;
```

The pop3d utility keeps each user’s last login time in a special DBM file, called login statistics database, so to be able to use this feature, Mailutils must be compiled with DBM support. By default, the login statistics database is called /var/run/pop3-login.db. You can change its name using `stat-file` configuration statement:

```
login-delay 60;
stat-file /tmp/pop.login.db;
```

The login delay facility will be enabled only if pop3d is able to access the statistics database for both reading and writing. If it is not, it will report this using syslog and start up without login delay restrictions. A common error message looks like:

```
Unable to open statistics db: Operation not permitted
```

You can check whether your pop3d uses login delays by connecting to it and issuing the ‘CAPA’ command. If login delays are in use, there response will contain the string ‘LOGIN-DELAY n’, where n is the actual login delay value.
3.16.2 Auto-expire

Automatic expiration of messages allows you to limit the period of time users are permitted to keep their messages on the server. It is enabled by \texttt{expire} configuration statement:

\texttt{expire n; Enable automatic expiration of messages after }n\texttt{ days.}

The current implementation works as follows. When a message is downloaded by \texttt{RETR} or \texttt{TOP} command, it is marked with `X-Expire-Timestamp: n' header, where \( n \) is current value of UNIX timestamp. The exact expiration mechanism depends on you. Mailutils allows you two options:

1. Expired messages are deleted by \texttt{pop3d} upon closing the mailbox. You specify this mechanism using \texttt{delete-expired} configuration statement:

\texttt{delete-expired bool; If }bool\texttt{ is true', delete expired messages after receiving the QUIT command.}

2. Expired messages remain in the mailbox after closing it. The system administrator is supposed to run a cron job that purges the mailboxes. Such a cron job can be easily implemented using \texttt{sieve} from GNU Mailutils and the following script:

\begin{verbatim}
require "timestamp";
# Replace "5" with the desired expiration period
if timestamp :before "X-Expire-Timestamp" "now - 5 days"
{
    discard;
}
\end{verbatim}

This script will remove expired messages 5 days after the retrieval. Replace ‘5’ with the desired expiration period and make sure it equals the argument to \texttt{expire} configuration keyword.

The statement \texttt{expire 0} means the client is not permitted to leave mail on the server. It always implies \texttt{delete-expired true}.

3.16.3 Bulletins

The bulletin feature allows you to send important announcements to all POP3 users without mailing them. It works by creating a \texttt{bulletin source mailbox} and sending the announcements to it.

After a user successfully authenticates, \texttt{pop3d} checks the last \texttt{bulletin number} the user receives. The bulletin number refers to the number of the bulletin message in the bulletin source mailbox. If the latter contains more messages, these are appended to the user mailbox.

The user last bulletin number can be kept in two places. First, it can be stored in file \texttt{.popbull} in his home directory. Secondly, if Mailutils is compiled with DBM support, the numbers can be kept in a DBM file, supplied via \texttt{bulletin-db} configuration statement. If both the database and the \texttt{.popbull} file are present, the data from the database take precedence.

To enable this feature, use the following configuration statements:

\texttt{bulletin-source mbox}

Set the URL of the bulletin source mailbox.
### bulletin-db file

Set the name of the database file to keep last bulletin numbers in.

The following example instructs `pop3d` to look for the bulletin messages in MH folder `/var/spool/bull/mbox` and to keep the database of last delivered bulletin numbers in `/var/spool/bull/numbers.db`:

```
bulletin-source mh:/var/spool/bull/mbox;
bulletin-db /var/spool/bull/numbers.db;
```

### 3.16.4 Pop3d Configuration

The following configuration file statements affect the behavior of `pop3d`.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>tls-file-checks</td>
<td>See Section 3.2.21 [tls-file-checks statement], page 41.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
<tr>
<td>logging</td>
<td>See Section 3.2.5 [logging statement], page 17.</td>
</tr>
<tr>
<td>pam</td>
<td>See Section 3.2.15 [pam statement], page 33.</td>
</tr>
<tr>
<td>sql</td>
<td>See Section 3.2.18 [sql statement], page 36.</td>
</tr>
<tr>
<td>virtdomain</td>
<td>See Section 3.2.16 [virtdomain statement], page 33.</td>
</tr>
<tr>
<td>radius</td>
<td>See Section 3.2.17 [radius statement], page 34.</td>
</tr>
<tr>
<td>ldap</td>
<td>See Section 3.2.19 [ldap statement], page 38.</td>
</tr>
<tr>
<td>auth</td>
<td>See Section 3.2.14 [auth statement], page 31.</td>
</tr>
<tr>
<td>server</td>
<td>See Section 3.2.13 [Server Settings], page 27.</td>
</tr>
<tr>
<td>acl</td>
<td>See Section 3.2.11 [acl statement], page 24.</td>
</tr>
<tr>
<td>tcp-wrappers</td>
<td>See Section 3.2.12 [tcp-wrappers statement], page 26.</td>
</tr>
</tbody>
</table>

### tls-mode mode

Configure the use of TLS encryption for inetd mode.

In daemon mode, this statement sets the type of TLS encryption to use in all server blocks that lack the `tls-mode` statement (see Section 3.2.13.2 [Server Statement], page 29).

Allowed values for `mode` are:

- **no**    
  TLS is not used. The STLS command won’t be available even if the TLS configuration is otherwise complete.

- **ondemand**    
  TLS is initiated when the user issues the appropriate command. This is the default when TLS is configured.

- **required**    
  Same as above, but the use of TLS is mandatory. The authentication state is entered only after TLS negotiation has succeeded.

- **connection**    
  TLS is always forced when the connection is established (POP3S protocol).
undelete bool
   On startup, clear deletion marks from all the messages.

expire n
   Automatically expire read messages after n days. See Section 3.16.2 [Auto-expire], page 123, for a detailed description.

delete-expired bool
   Delete expired messages upon closing the mailbox. See Section 3.16.2 [Auto-expire], page 123, for a detailed description.

login-delay duration
   Set the minimal allowed delay between two successive logins. See Section 3.16.1 [Login delay], page 122, for more information.

stat-file file
   Set the name of login statistics file for the login-delay facility. See Section 3.16.1 [Login delay], page 122, for more information.

bulletin-source file
   Get bulletins from the specified mailbox. See Section 3.16.3 [Bulletins], page 123, for a detailed description.

bulletin-db file
   Set bulletin database file name. See Section 3.16.3 [Bulletins], page 123, for a detailed description.

3.16.5 Command line options
The following table summarizes all pop3d command line options.

-d[number]
   --daemon[=number]
   Run in standalone mode. An optional number specifies the maximum number of child processes allowed to run simultaneously. When it is omitted, it defaults to 10 processes. Please note, that there should be no whitespace between the -d and its parameter.

-i
   --inetd
   Run in inetd mode.

--foreground
   Remain in foreground.

The Mailutils common options are also understood. See Section 3.1.2 [Common Options], page 8.
3.17 IMAP4 Daemon

GNU imap4d is a daemon implementing IMAP4 rev1 protocol for accessing and handling electronic mail messages on a server. It can be run either as a standalone program or from \texttt{inetd.conf} file.

3.17.1 Namespace

GNU imap4d supports a notion of namespaces defined in RFC 2342. A namespace can be regarded as a list of entities, defining locations to which the user has certain access rights. Each entity includes the prefix, under which the mailboxes can be found, hierarchy delimiter, a character used to delimit parts of a path to a mailbox, and a directory on the file system on the server, which actually holds the mailboxes. Among these three values, only first two are visible to the client using the IMAP \texttt{NAMESPACE} command.

There are three namespaces:

Personal Namespace

A namespace that is within the personal scope of the authenticated user on a particular connection. The user has all permissions on this namespace.

By default, this namespace contains a single prefix:

- \texttt{prefix}: 
- \texttt{delimiter}: /
- \texttt{directory}: home directory of the user

Other Users’ Namespace

A namespace that consists of mailboxes from the “Personal Namespaces” of other users. The user can read and list mailboxes from this namespace. However, he is not allowed to use \texttt{%} and \texttt{*} wildcards with \texttt{LIST} command, that is he can access a mailbox only if he knows exactly its location.

By default, this namespace is empty.

Shared Namespace

A namespace that consists of mailboxes that are intended to be shared amongst users and do not exist within a user’s Personal Namespace. The user has all permissions on this namespace.

By default, this namespace is empty.

The default values ensure that each user is able to see or otherwise access mailboxes residing in the directories other than his own home.

These defaults can be changed using the \texttt{namespace} block statement:

\begin{verbatim}
namespace name {
  mailbox-mode mode;
  prefix pfx {
    directory path;
    delimiter chr;
    mailbox-type type;
  }
}
\end{verbatim}
The *name* argument to the *namespace* statement declares which namespace is being configured. Allowed values are: 'personal', 'other', and 'shared'.

The *mailbox-mode* statement configures the file mode for the mailboxes created within that namespace (provided that the directory permissions allow the user to create mailboxes). The *mode* argument is a comma-delimited list of symbolic mode settings, similar to that used by *chmod*. Each setting begins with a letter 'g', which means set mode bits for file group, or 'o', which means set mode bits for other users (note, that there is no 'u' specifier, since user ownership of his mailbox cannot be changed). This letter is followed by an '=' (or '+'), and a list of modes to be set. This list can contain only two letters: 'r' to set read permission, and 'w' to set write permission.

For example, the following statement sets read and write permissions for the group:

```
mailbox-mode g=rw;
```

The *prefix* statement configures available prefixes and determines their mappings to the server's file system. The *pfx* argument defines the prefix which will be visible to the IMAP client.

The *directory* statement defines the directory in the file system to which *pfx* is mapped. Exactly one *directory* statement must be present in each *prefix* block. The interpretation of its argument depends on the namespace in which it occurs.

When used in the 'namespace shared' block, the argument to this statement is interpreted verbatim, as an absolute pathname.

When used in 'namespace personal' the argument to *directory* statement can contain references to the following variables (see Section 3.2.2 [Variables], page 15):

user Login name of the user.
home Home directory of the user.

For example, the following statement maps the default personal namespace to the directory 'imap' in the user’s home directory:

```
namespace personal {
    prefix "";
    directory "$home/imap";
}
```

If the 'directory' statement is used within the 'namespace other' block, its value can contain the '$user' and '$home' variables as well, but their meaning is different. For the 'other' namespace, the '$user' variable is expanded to the part of the actual reference contained between the prefix and first hierarchy delimiter (or the end of the reference, if no delimiter occurs to the right of the prefix). Correspondingly, '$home' expands to the home directory of that user. Consider, for example, the following statement:

```
namespace other {
    prefix "~";
    directory "~/var/imap/$user";
}
```

If the client issues the following statement:

```
1 LIST "~smith" "%"
```
then `$user` will expand to the string `smith` and the server will look for all mailboxes in the directory `/var/imap/smith`.

The **delimiter** statement defines the folder hierarchy delimiter for that prefix. It is optional, the default value being "/".

The **mailbox-type** statement declares the type of the mailboxes within that prefix. If present, its argument must be a valid mailbox type (e.g. `mailbox`, `maildir`, or `mh`). The IMAP LIST command will display only mailboxes of that type. The CREATE command will create mailboxes of that type.

In the absence of the **mailbox-type** statement, the IMAP LIST command will display mailboxes of any type supported by Mailutils. The type of newly-created mailboxes is then determined by the **mailbox-type** statement (see [mailbox-type], page 21).

Any number of prefix blocks can be present.

Consider, for example, the following configuration:

```plaintext
namespace personal {
    prefix "" {
        directory "$home/mailfolder";
    }
    prefix "#MH:" {
        directory "$home/Mail";
        delimiter "/";
        mailbox-type "mh";
    }
}
```

It defines the personal namespace containing two prefixes. The empty prefix is mapped to the directory `mailfolder` in the home directory of the currently authenticated user. Any type of mailboxes is supported within that prefix.

The prefix ‘#MH:’ is mapped to the directory `Mail` in the home directory of the user, and is limited to contain only mailboxes in MH format.

Note that if the prefixes ‘"' is not defined in the personal namespace, the following default will be automatically created:

```plaintext
prefix "" {
    directory "$home";
}
```

### 3.17.2 Configuration of imap4d.

The behavior of **imap4d** is altered by the following configuration statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>tls</td>
<td>See Section 3.2.20 [tls statement], page 40.</td>
</tr>
<tr>
<td>tls-file-checks</td>
<td>See Section 3.2.21 [tls-file-checks statement], page 41.</td>
</tr>
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<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
</tbody>
</table>
logging See Section 3.2.5 [logging statement], page 17.
pam See Section 3.2.15 [pam statement], page 33.
sql See Section 3.2.18 [sql statement], page 36.
virtdomain See Section 3.2.16 [virtdomain statement], page 33.
radius See Section 3.2.17 [radius statement], page 34.
ldap See Section 3.2.19 [ldap statement], page 38.
auth See Section 3.2.14 [auth statement], page 31.
server See Section 3.2.13 [Server Settings], page 27.
ace See Section 3.2.11 [acl statement], page 24.
tcp-wrappers See Section 3.2.12 [tcp-wrappers statement], page 26.

namespace name { ... }  [Imap4d Conf]
Configures namespace. The argument is one of: ‘personal’, ‘other’, ‘shared’.
The following statements (described below) are allowed within curly braces:
mailbox-mode and prefix.
See Section 3.17.1 [Namespace], page 126.

mailbox-mode mode  [Imap4d namespace]
Configures the file mode for the mailboxes created within that namespace. The syntax
for mode is:
\texttt{g(\pm)=}[wr]+,\texttt{o(\pm)=}[wr]+
See Section 3.17.1 [Namespace], page 126.

prefix pfx { ... }  [Imap4d namespace]
Configures a prefix and determines its mapping to the server’s file system. The pfx
argument is the prefix which will be visible to the IMAP client. Available sub-
statements are: directory, delimiter, and mailbox-type.
See Section 3.17.1 [Namespace], page 126.

directory path  [Imap4d namespace.prefix]
Defines the directory in the file system to which the prefix is mapped.
See Section 3.17.1 [Namespace], page 126.

delimiter chr  [Imap4d namespace.prefix]
Defines the folder hierarchy delimiter for the prefix. Argument must be a single
character.
See Section 3.17.1 [Namespace], page 126.

mailbox-type type  [Imap4d namespace.prefix]
Defines the type of the mailboxes inside that prefix.
See Section 3.17.1 [Namespace], page 126.

login-disabled bool  [Imap4d Conf]
Disable LOGIN command, if bool is ‘true’.

create-home-dir bool  [Imap4d Conf]
Create nonexistent user home directories. See also home-dir-mode, below.
home-dir-mode mode

Set file mode for created user home directories. Mode is specified in octal.

The default value for mode is ‘700’ (‘drwx------’ in ls terms).

preauth mode

Configure PREAUTH mode. Valid arguments are:

prog://program-name

Imap4d invokes an external program to authenticate the connection. The
command line is obtained from the supplied string, by expanding the
following meta-variables:

${client_address}
Remote IP address in dotted-quad notation;

${client_port}
Remote port number;

${server_address}
Local IP address;

${server_port}
Local port number.

If the connection is authenticated, the program should print the user
name, followed by a newline character, on its standard output and exit
with code ‘0’.

Otherwise, it should exit with a non-zero exit code.

ident://:port

The remote machine is asked about the requester identity using the ident-
ification protocol (RFC 1413). Both plaintext and DES encrypted replies
are understood. Optional port specifies the port to use, if it differs from
the default ‘113’. It can be either a decimal port number or a symbolic
name of a service, listed in /etc/services.

stdio

PREAUTH mode is enabled automatically if imap4d is started from com-
mmand line in interactive mode (-i command line option). The current
login name is used as the user name.

preauth-only bool

If bool is ‘true’, use only preauth mode. If unable to setup it, disconnect immediately.

ident-keyfile file

Set DES keyfile for decoding encrypted ident responses. Used with ‘ident://’ preauth
mode.

ident-encrypt-only bool

Use only encrypted IDENT responses.

id-fields list

Set list of fields to return in response to ID command.
Valid field names are:

name  Package name (‘GNU Mailutils’).
version  Package version (‘3.10’).
vendor  Vendor name (‘GNU’).
support-url  The string ‘http://www.gnu.org/software/mailutils’
address  The string ‘51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA’.
os  OS name.
os-version  OS version number.
command  Name of the imap4d binary.
arguments  Invocation command line.
environment  List of environment variables with their values.

3.17.3 Starting imap4d

imap4d may run either in standalone or in inetd operation modes. When run in “standalone” mode, the server disconnects from the terminal and runs as a daemon, forking a child for each new connection.

The “inetd” mode allows to start the server from /etc/inetd.conf file. This is the default operation mode.

imap4 stream tcp nowait root /usr/local/sbin/imap4d imap4d

Command Line Options

-d[number]
--daemon[number]
  Run in standalone mode. An optional number specifies the maximum number of child processes the daemon is allowed to fork. When it is omitted, it defaults to 20 processes. Please note, that there should be no whitespace between the -d and its parameter.

-i
--inetd  Run in inetd mode.
--foreground
  Run in foreground.
--preauth
  Start in preauth mode
--test  Run in test mode.

See also Section 3.1.2 [Common Options], page 8.
3.18 Comsat Daemon

Comsatd is the server which receives reports of incoming mail and notifies users about it. By default, it prints subject, sender name and email, followed by first five lines of each newly arrived message to the tty of the recipient user. Users can customize this behavior.

3.18.1 Starting comsatd

-d
--daemon  Run as a standalone daemon.

-i
--inetd  The server is started from /etc/inetd.conf file:

    comsat dgram udp wait root /usr/sbin/comsatd \
    comsatd -c /etc/comsat.conf

This is the default operation mode.

-t[file]
--test=[file]

Test mode. In this mode, comsatd takes two arguments: URL of a mailbox and QID of the message from that mailbox and prints the notification to the current user tty (/dev/tty), or file, if it is supplied. If the ~/.biffrc file exists, it will be used. For example:

    $ comsatd --test /var/mail/root 34589

Notice, that file is an optional argument. When supplied, it should follow the short option form immediately, or the long option form after the equals sign, e.g.:

    $ comsatd --test=logfile /var/mail/root 34589

or

    $ comsatd -tlogfile /var/mail/root 34589

--foreground

Don’t detach from the controlling terminal, remain in foreground.

See also Section 3.1.2 [Common Options], page 8.

3.18.2 Configuring comsatd

Following configuration statements affect the behavior of comsatd:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>debug</td>
<td>See Section 3.2.6 [debug statement], page 18.</td>
</tr>
<tr>
<td>logging</td>
<td>See Section 3.2.5 [logging statement], page 17.</td>
</tr>
<tr>
<td>mailbox</td>
<td>See Section 3.2.7 [mailbox statement], page 18.</td>
</tr>
<tr>
<td>locking</td>
<td>See Section 3.2.9 [locking statement], page 22.</td>
</tr>
<tr>
<td>acl</td>
<td>See Section 3.2.11 [acl statement], page 24.</td>
</tr>
</tbody>
</table>

3.18.2.1 General Settings

These statements control the general behavior of the comsat daemon:
max-lines number  [Comsatd Conf]
    Set maximum number of message body lines to be output.

allow-biffrc bool  [Comsatd Conf]
    Enable or disable processing of user’s .biffrc file. By default, it is enabled.

3.18.2.2 Security Settings
These statements control the way comsatd fights possible flooding attacks.

max-requests number  [Comsatd Conf]
    Set maximum number of incoming requests per ‘request-control-interval’.

request-control-interval duration  [Comsatd Conf]
    Set the request control interval.

overflow-delay-time duration  [Comsatd Conf]
    Set initial amount of time to sleep, after the first overflow occurs.

overflow-control-interval duration  [Comsatd Conf]
    Set overflow control interval. If two consecutive overflows happen within that interval, the overflow-delay-time is doubled.

3.18.3 A per-user Configuration File
By default, when a notification arrives, comsatd prints subject, from headers and the first five lines from the new message to the user’s tty. The user is allowed to change this behavior by using his own configuration file. This file should be located in the user’s home directory and should be named .biffrc. It must be owned by the user and have its permissions bits set to 0600. (Please note, that the use of per-user configuration files may be disabled, by specifying ‘allow-biffrc no’ in the main configuration file, see see Section 3.18.2 [Configuring comsatd], page 132).

The .biffrc file consists of a series of statements. Each statement occupies one line and defines an action to be taken upon arrival of a new mail. Very long lines may be split using ‘\’ as the last character on the line. As usual, comments may be introduced with ‘#’ character.

The actions specified in .biffrc file are executed in turn. The following actions are defined:

beep  Produce an audible signal.

echo [-n] string [string...]
    Output the arguments to the user’s terminal device. If several arguments are given they will be output separated by single spaces. The newline character will be printed at the end of the output, unless the -n option is used.

exec prog arglist
    Execute program prog with arguments from arglist. prog must be specified with absolute pathname. It may not be a setuid or setgid program.
In the description above, *string* denotes any sequence of characters. This sequence must be enclosed in a pair of double-quotes, if it contains whitespace characters. The ‘\’ character inside a string starts a C escape sequence. Following meta-characters may be used in strings:

- $u$ Expands to username
- $h$ Expands to hostname
- $H\{name\}$ Expands to value of message header ‘name’.
- $B(c,l)$ Expands to message body. $c$ and $l$ give maximum number of characters and lines in the expansion. When omitted, they default to 400, 5.

**Example I**

Dump to the user’s terminal the contents of ‘From’ and ‘Subject’ headers followed by at most 5 lines of message body.

```
  echo "Mail to \a$u@$h\a\n---\n
  From: $H\{from\}\n  Subject: $H\{Subject\}\n  ---\n  $B(,5)\n  ---\n"
```

The above example can also be written as:

```
  echo Mail to \a$u@$h\a
  echo ---
  echo From: $H\{From\}
  echo Subject: $H\{Subject\}
  echo ---
  echo $B\{5\}
  echo ---
```

**Example II**

Produce a bell, then pop up the xmessage window on display :0.0 with the text formatted in the same manner as in the previous example.

```
  beep
  exec /usr/X11R6/bin/xmessage \n  -display :0.0 -timeout 10 "Mail to $u@$h \n---\n
  From: $H\{from\}\n  Subject: $H\{Subject\}\n  ---\n  $B(,5)\n  ---\n"
```
Chapter 3: Mailutils Programs

3.19 MH — The MH Message Handling System

The primary aim of this implementation is to provide an interface between Mailutils and Emacs using mh-e module.

To use Mailutils MH with Emacs, add the following line to your site-start.el or .emacs file:

(load "mailutils-mh")

For the information about the current state of Mailutils MH implementation please refer to file mh/TODO in the Mailutils distribution directory.

3.19.1 Major differences between Mailutils MH and other MH implementations

1. UUCP addresses are not supported;
2. Mailutils supports a set of new format specifications (see Section 3.19.1.1 [Format String Diffs], page 135);
3. Mailutils provides a set of new profile variables (see Section 3.19.1.2 [Profile Variable Diffs], page 137);
4. All programs recognize --help and --version options
   These options are recognized only if no other arguments are present in the command line. Abbreviations are not recognized. This makes Mailutils MH implementation compatible with the standard usage for GNU tools.
5. Several programs behave differently (see Section 3.19.1.3 [Program Diffs], page 137);

3.19.1.1 New and Differing MH Format Specifications

string decode (string str)  
Decodes the input string str as per RFC 2047. Useful in printing ‘From:’, ‘To:’ and ‘Subject:’ headers.

Notice that, unlike the similar NMH function, decode checks the value of the global profile variable Charset (see [Charset variable], page 137) to determine the charset to output the result in. If this variable is not set, decode returns its argument without any change. If this variable is set to auto, decode tries to determine the charset name from the setting of LC_ALL environment variable. Otherwise, the value of Charset is taken to be the name of the character set.

string package ()  
Returns package name (string ‘mailutils’).

string package_string ()  
Returns full package string (e.g. ‘GNU Mailutils 2.1’)

string version ()  
Returns mailutils version.

string unre (string str)  
The function removes any leading whitespace and eventual ‘Re:’ prefix from its argument. Useful for creating subjects in reply messages:

%<{subject}Subject: Re: %(unre{subject})\n%>
void reply_regex (string r) [MH Format]
Sets the regular expression used to recognize reply messages. The argument r should
be a POSIX extended regular expression. Matching is case insensitive.
For example, the following invocation
\%\{reply_regex \"\(re|aw|ang|odp\)\(\([\=\[\=\[0-9]+]\)|\]\):?[:blank:]\}\}
corresponds to English ‘Re’, Polish ‘Odp’, Norwegian ‘Aw’ or German ‘Ang’, optionally
followed by a number in brackets, followed by colon and any amount of whitespace.
Notice proper quoting of the regex metacharacters.
See also Reply-Regex (see [Reply-Regex variable], page 137) and isreply (see [isreply
MH function], page 136) below.

boolean isreply ([string str]) [MH Format]
If str is not given, the value of ‘Subject:’ header is taken.
The function returns true if its argument matches the “reply subject” regular expression. This expression is set via
the global profile variable Reply-Regex (see [Reply-Regex variable], page 137) or via the format function reply_regex.
This function is useful for creating ‘Subject:’ headers in reply messages. For example, consider the following construction:
\%<\{subject\}\%\{lit\}\%<\{isreply\}\%?
\(\text{profile reply-prefix}\\%\{concat\}\%\{concat \text{Re:}\}\%\\%
\%\{concat\{subject\}\%\{printhdr Subject: \}\%>
If the ‘Subject:’ header already contained reply prefix, this construct leaves it unchanged. Otherwise it prepends to it the value of Reply-Prefix profile variable, or, if it is unset, the string ‘Re:’.
This expression is used in default replcomps and replgroupcomps files.

boolean rcpt (‘to’ | ‘cc’ | ‘me’ | ‘all’) [MH Format]
This function returns true if the given element is present in the recipient mask (as modified by
\text{--cc} or \text{--nocc} options) and false otherwise. It is used in default formats for repl and comp, e.g.:
\%\{\text{lit}\}\%<\{rcpt\ \text{to}\}\%<\{formataddr\{to\}\}\%>
Notice that this means that usual replcomps file will be ignoring \text{--cc} and \text{--nocc} options, unless it has been modified as shown above.

string concat () [MH Format]
Appends whitespace + arg to string register.

string printhdr (string str) [MH Format]
Prints the value of string register, prefixed by str. The output is formatted as a RFC 822 header, i.e. it is split at whitespace characters nearest to the width boundary
and each subsequent segment is prefixed with horizontal tabulation.

string in_reply_to () [MH Format]
Generates the value for ‘In-reply-to:’ header according to RFC 2822.

string references () [MH Format]
Generates the value for ‘References:’ header according to RFC 2822.
3.19.1.2 New MH Profile Variables

MH Variable string *Charset*  
Controls the character set in which the components decoded via the `decode` (see [decode function], page 135) format function should be output.

MH Variable string *Reply-Regex*  
Keeps the regular expression used to recognize reply messages. The argument should be a POSIX extended regular expression. Matching is case insensitive.  
For more information, please see See [reply_regex function], page 136.

3.19.1.3 Differences in MH Program Behavior

**anno**  
The prompt in interactive mode is ‘*Component name:*’, instead of ‘Enter *component name:*’ displayed by the RAND anno.  
If a `-component field` is not specified and standard input is not connected to a terminal, anno does not display the prompt before reading the component from the standard input. RAND anno displays the prompt anyway.

**burst**  
The utility is able to burst both RFC 934 digest messages and MIME multipart messages. It provides two additional command line options: `-recurse` and `-length`.  
The `-recurse` option instructs the utility to recursively expand the digest.  
The `-length` option can be used to set the minimal encapsulation boundary length for RFC 934 digests. Default length is 1, i.e. encountering one dash immediately following a newline triggers digest decoding. It is OK for messages that follow RFC 934 specification. However, many user agents do not precisely follow it, in particular, they often do not escape lines starting with a dash by ‘-’ sequence. Mailman is one of such agents. To cope with such digests you can set encapsulation boundary length to a higher value. For example, bounce `-length 8` has been found to be sufficient for most Mailman-generated digests.

**comp**  
Understands `-build` option.

**fmtdump**  
This command is not provided. Use fmtcheck instead.

**inc**  
- The `-moveto` option. The `-moveto` option instructs inc to move messages into another folder after incorporating them. This option has effect only if the `-truncate` option has also been specified and the underlying mailbox supports the ‘move’ operation. Currently only ‘imap’ and ‘imaps’ mailboxes support it. For example, the following command moves incorporated messages into the ‘archive’ folder:  
  
  inc -file imaps://imap.gmail.com -moveto=archive
The ‘moveto’ URL parameter can be used instead of this option, e.g.:

```
inc -file 'imaps://imap.gmail.com;moveto=archive'
```

- **Multiple sources** Mailutils **inc** is able to incorporate messages from several source mailboxes. These are specified via multiple **-file** options, e.g.:

```
inc -truncate \
    -file 'imaps://imap.gmail.com;moveto=archived' \
    -file pops://mail.gnu.org \
    -file /var/mail/root
```

- **URL parameters** The following additional parameters can be used in the mailbox URLs supplied with the **-file** option:

```
moveto=folder
```

Moves incorporated messages into another folder. This was discussed above.

```
nomoveto
```

Disables the previous **-moveto** option.

```
truncate[=bool]
```

Controls source mailbox truncation. If **bool** is not given or it is ‘yes’, the mailbox will be truncated after successful processing. If **bool** is ‘no’, the source mailbox will not be truncated.

### mhl

The ‘ignores’ keyword can be used in variable list. In that case, if its value contains more than one component name it must be enclosed in double-quotes, e.g.:

```
leftadjust,compwidth=9,"ignores=msgid,message-id,received"
```

The above is equivalent to the following traditional notation:

```
leftadjust,compwidth=9
ignores=msgid,message-id,received
```

The ‘MessageName’ component is not yet implemented.

Interactive prompting is not yet implemented.

The following format variables are silently ignored: ‘center’, ‘split’, ‘datefield’.

### mhn

- **New option** New option **-compose** forces **mhn** editing mode. This is also the default mode. This differs from the standard **mhn**, which switches to the editing mode only if no other options were given and the input file name coincides with the value of **mhdraft** environment variable.

- **Show mode** **(-show)** If an appropriate **mhn-show-type[/subtype]** was not found, GNU **mhn** prints the decoded message content using **moreproc** variable. Standard **mhn** in this case used to print ‘don’t know how to display content’ diagnostic.

The default behaviour is to pipe the content to the standard input of the **mhn-show-type[/subtype]** command. This is altered to using a temporary file if the command contains %f or %F escapes.
• Store mode (-store) If the Content-Disposition header contains ‘filename=’, and mhn is invoked with -auto switch, it transforms the file name into the absolute notation and uses it only if it lies below the current mhn-storage directory. Standard mhn only requires that the file name do not begin with ‘/’.

Before saving a message part, GNU mhn checks if the file already exists. If so, it asks whether the user wishes to rewrite it. This behaviour is disabled when -quiet option was given.

mhparam

The -all mode does not display commented out entries.

pick

New command line option -cflags allows to control the type of regular expressions used. The option must occur right before --component pattern or equivalent construct (like -cc, -from, etc.)

The argument to this option is a string of type specifications:

B Use basic regular expressions
E Use extended regular expressions
I Ignore case
C Case sensitive

Default is ‘EI’.

The flags remain in effect until the next occurrence of -cflags option.

Sample usage:

    pick -cflag BC -subject '*a string'

The date comparison options (-before and -after accept date specifications in a wide variety of formats, e.g.:

    pick -after 20030301
    pick -after 2003-03-01
    pick -after 01-mar-2003
    pick -after 2003-mar-01
    pick -before '1 year ago'
    etc...

prompter

1. Prompter attempts to use GNU Readline library, if it is installed. Consequently, arguments to -erase and -kill option must follow GNU style key sequence notation (see Section “Readline Init File Syntax” in GNU Readline Library).

If prompter is built without readline, it accepts the following character notations:

    \nnnn Here, n stands for a single octal digit.
    ^chr This notation is translated to the ASCII code ‘chr + 0100’.

2. Component continuation lines are not required to begin with a whitespace. If leading whitespace is not present, prompter will add it automatically.
refile

1. Linking messages between folders goes against the logic of Mailutils, so refile never makes links even if called with -link option. The latter is actually a synonym for -copy, which preserves the original message.

2. The -preserve option is not implemented. It is retained for backward compatibility only.

3. Message specs and folder names may be interspersed.

repl

Understands -use option. Disposition shell provides use command.

rmm

1. Different behaviour if one of the messages in the list does not exist:
   Mailutils rmm does not delete any messages. Standard rmm in this case deletes all messages preceding the non-existent one.

2. The rmm utility will unlink messages, if the rmmproc profile component has empty value, e.g.:
   rmmproc:

sortm

New option -numfield specifies numeric comparison for the given field.
Any number of -datefield, -textfield and -numfield options may be given, thus allowing to build sort criteria of arbitrary complexity.
The order of -.*field options sets the ordering priority. This differs from the behaviour of the standard sortm, which always orders datefield-major, textfield-minor.

Apart from sorting the mailfolder the following actions may be specified:

- list List the ordered messages using a format string given by -form or -format option.
- dry-run Do not actually sort messages, rather print what would have been done. This is useful for debugging purposes.
3.20 mailutils

The mailutils utility is a multi-purpose tool shipped with Mailutils. It can be used for various mail and database-related tasks, as well as an auxiliary tool for compiling and linking programs with Mailutils.

3.20.1 Invocation Syntax

Mailutils is a command line tool. Its invocation syntax is:

```
mailutils [options] command [args]
```

where options are options that affect the behavior of mailutils as a whole, command instructs it what it is to do and args are any arguments the command needs in order to be executed.

The commands are:

- **2047**: Decodes or encodes email message headers.
- **acl**: Tests Mailutils access control lists.
- **cflags**: Shows compiler options needed to compile with Mailutils.
- **dbm**: Invokes a DBM management tool.
- **;filter**: Applies a chain of filters to the input.
- **help**: Displays a terse help summary.
- **imap**: Invokes an IMAP4 client shell (in development).
- **info**: Displays information about Mailutils compile-time configuration.
- **ldflags**: Constructs a `ld(1)` command line for linking a program with Mailutils.
- **logger**: Logs information using Mailutils log facility.
- **pop**: Invokes a POP3 client shell.
- **query**: Queries configuration values.
- **wicket**: Scans wicket for matching URLs

3.20.2 mailutils help

The mailutils help command lists all available options and command names along with short descriptions of what each of them does. It is similar to the mailutils --help option.

A command name can be supplied as an argument to help, in which case it will display a help page for that particular command, e.g.:

```
mailutils help ldflags
```

will output help for the ldflags command. It is synonymous to the --help option used with that particular command, e.g.: mailutils ldflags --help.
3.20.3 mailutils info

The `mailutils info` command displays information about Mailutils compile-time configuration. In normal form its output lists a single configuration flag per line, e.g.:

```sh
$ mailutils info
VERSION=2.99.93
SYSCONFDIR=/etc
MAILSPOOLDIR=/var/mail/
SCHEME=mbox
LOG_FACILITY=mail
IPV6
USE_LIBPAM
HAVE_LIBLTL
WITH_GDBM
WITH_GNUTLS
WITH_GSASL
```

A configuration flag can consist either of a single word, indicating that a particular capability has been enabled at compile time, or of a keyword/value pair delimited by an equal sign, which indicates a particular value used by default for that feature. For example, `IPV6` means that Mailutils was compiled with support for IPv6, whereas `SYSCONFDIR=/etc` means that the default place for configuration files is in `/etc` directory.

Such short output is convenient for using `mailutils info` in scripts to decide whether it is possible to use a given feature. To assist human users, the `--verbose` (`-v`) option is provided. It prints a short description next to each flag:

```sh
$ mailutils info --verbose
VERSION=2.99.93 - Version of this package
SYSCONFDIR=/etc - System configuration directory
MAILSPOOLDIR=/var/mail/ - Default mail spool directory
SCHEME=mbox - Default mailbox type
LOG_FACILITY=mail - Default syslog facility
IPV6 - IPv6 support
USE_LIBPAM - PAM support
HAVE_LIBLTL - a portable ‘dlopen’ wrapper library
WITH_GDBM - GNU DBM
WITH_GNUTLS - TLS support using GNU TLS
WITH_GSASL - SASL support using GNU SASL
```

3.20.4 mailutils cflags

The `mailutils cflags` command shows compiler options needed to compile a C source with Mailutils. It is intended for use in configuration scripts and Makefiles, e.g.:

```sh
CFLAGS=-g -O2 'mailutils cflags'
```

3.20.5 mailutils ldflags

The `mailutils ldflags` command is a counterpart of `cflags` which is used for linking. It constructs a `ld` command line for linking a program with Mailutils.
When used without arguments, it outputs `ld` arguments which would link only with the core Mailutils library `libmailutils`, e.g.:

```
$ mailutils ldflags
-L/usr/local/lib -lmailutils
```

This command accepts a number of keywords which allow to select a particular subset of Mailutils libraries to link with. In particular, the argument ‘all’ instructs it to link in all available libraries:

```
$ mailutils ldflags all
-L/usr/local/lib -lmu_mbox -lmu_mh -lmu_maildir -lmu_imap -lmu_pop \\
-lmu_mailer -lmu_compat -lmailutils -lmu_auth -lgsasl -lgnutls -lgcrypt \\
-lldap -lgnuradius -lpm -ldl
```

Other available keywords are:

- **mbox**: Link in the UNIX mbox format support.
- **mh**: Link in the MH format support.
- **maildir**: Link in the Maildir format support.
- **imap**: Link in the IMAP protocol support.
- **pop**: Link in the POP protocol support.
- **mailer**: Enable support for mailers.
- **sieve**: Link in the support for Sieve mail filtering language.
- **dbm**: Link in the support for DBM databases (libmu_dbm library).
- **auth**: Link in the Mailutils authentication library.
- **guile**: Provide Guile language bindings.
- **python**: Provide Python language bindings.

### 3.20.6 mailutils stat

The command `mailutils stat` shows status of a mailbox. The name or URL of the mailbox to operate upon is supplied in the first argument. If not given, the command will display status of the invoking user system mailbox.

```
$ mailutils stat
  type: maildir
  path: /var/mail/smith
  URL: /var/mail/smith
  size: 3498
  messages: 24
  recent messages: 3
  first unseen: 20
  uidvalidity: 1338543026
  next uid: 87
  access: 2016-12-15 09:15:08 +0200
```
The output format is controlled by the --format (-c) option. Its argument is the desired format string, composed of ordinary characters, which are reproduced on standard output verbatim, backslash sequences, and format specifiers, beginning with '%'.

Backslash sequences are interpreted as in C.

A format specifier consists of a leading '%' followed by a letter. Optional ':' may occur between '%' and the letter. Its presence instructs the program to print the description of the corresponding value before the value itself.

The following format sequences are understood:

- %f Name of the mailbox as supplied in the command line. If mailutils stat was used without explicit mailbox argument, '%f' is equivalent to '%U'.
- %t Type of the mailbox ('mbox', 'maildir', etc.). The description string is 'type'.
- %p Path to the mailbox. In case of remote mailboxes, it is the path part of the mailbox URL. Description string: 'path'.
- %U URL of the mailbox. Description string: 'URL'.
- %s Size of the mailbox in octets. Description string: 'size'.
- %c Number of messages in the mailbox. Description string: 'messages'.
- %r Number of recent (unread) messages in the mailbox. Description string: 'recent messages'.
- %u Index of the first unseen message. Description string: 'first unseen'.
- %v The UIDVALIDITY value. Description string: 'uidvalidity'.
- %n The UID value which will be assigned to the new message to be incorporated into the mailbox. Description string: 'next uid'.
- %a Access time of the mailbox, as a number of seconds since the epoch.
- %A Access time of the mailbox in human-readable format.

### 3.20.7 mailutils query

The mailutils query command queries values from Mailutils configuration files. It takes one or more configuration paths (see Section 3.2.1.3 [Paths], page 14) as its arguments. On output, it displays the values it found, each value on a separate line. If the requested value is a block statement it is displayed in full. For example, if main configuration file contained:

```plaintext
logging {
    syslog yes;
    facility mail;
}
```

Then:

```bash
$ mailutils query .logging.syslog
syslog yes;
$ mailutils query .logging.syslog .logging.facility
syslog yes;
facility mail;
```
Several command line options allow to modify output format. The --value option instructs the command to output only values:

$ mailutils query --value .logging.syslog

yes

The --path option instructs it to print full pathnames for each value:

$ mailutils query --path .logging.syslog

logging.syslog: yes

The --program option instructs mailutils to behave as if it was called under another program name. For example, the following command:

$ mailutils query --program=pop3d .server.transcript

will return the value of the '.server.transcript' statement which the pop3d utility would see.

By default, mailutils query operates on the main configuration file. Another configuration file can be supplied using the --file (-f) option:

$ mailutils query --file /usr/local/etc/file.conf .pidfile

### 3.20.8 mailutils 2047

The mailutils 2047 command is a filter for decoding or encoding email message headers formatted in accordance with RFC 2047 (see http://www.faqs.org/rfcs/rfc2047.html). By default, it operates in encode mode and assumes the 'iso-8859-1' encoding. If arguments are supplied in the command line, they are treated as the text to operate upon. Otherwise the command acts as a UNIX filter, reading lines from the standard input and printing results on the standard output.

For example:

$ mailutils 2047 'Keld Jørn Simonsen <keld@dkuug.dk>'

=?ISO-8859-1?Q?Keld_J=F8rn_Simonsen?= <keld@dkuug.dk>

The decode mode can be requested via the --decode (-d) option:

$ mailutils 2047 --decode '=?ISO-8859-1?Q?Keld_J=F8rn_Simonsen?= \ <keld@dkuug.dk>'

Keld Jørn Simonsen <keld@dkuug.dk>

The --charset (-c) option changes the default character set. It is meaningful both in decode and in encode modes. In decode mode it instructs the utility to convert the output to the given character set. In encode mode it indicates the encoding of the input data, which will be reflected in the resulting string:

$ mailutils 2047 --charset=utf-8 'Keld Jørn Simonsen <keld@dkuug.dk>'

=?utf-8?Q?Keld J=C3=B8rn Simonsen <keld@dkuug.dk>?

The --encoding (-E) option can be used in encode mode to change the output encoding. Valid arguments for this option are: 'quoted-printable' (the default) or 'base64'.

```
```
The **--newline** (-n) option prints an additional newline character after each line of output.

### 3.20.9 mailutils filter

The *mailutils filter* command applies a chain of filters to the input. The filters to apply and their arguments are given in the command line. The full invocation syntax is:

```
mailutils filter [option] filter-chain
```

The syntax for *filter-chain* in Backus-Naur form follows:

```
<filter-chain> ::= <filter> | <filter-chain> "+" <filter>
<filter> ::= <filter-spec> <ARG>*
<filter-spec> ::= <WORD> | "~" <WORD>
```

where `<WORD>` stands for the filter name and `<ARG>` represents filter arguments. To obtain a list of known filter names, run:

```
mailutils filter --list
```

Filters are applied in the order of their appearance, from left to right and operate in encode mode. The plus sign has the same meaning as pipe in shell. The default mode can be changed using the **--decode** (-d) and **--encode** (-e) options. Whatever the default mode is, a `'~'` character before filter name reverts the mode for that filter alone.

For example, to encode the contents of file `file.txt` in Base64 run:

```
mailutils filter base64 < file.txt
```

To convert it to base64 and use CRLF as line delimiters, run:

```
mailutils filter base64 + crlf < file.txt
```

The following command will decode the produced output:

```
mailutils filter --decode crlf + base64
```

It can also be written as

```
mailutils filter ~crlf + ~base64
```

The following example converts the input from ISO-8859-2 to UTF-8, quotes eventual ‘From’ occurring at the beginning of a line, encodes the result in Base64 and changes line delimiters to CRLF:

```
mailutils filter iconv iso-8859-2 utf-8 + from + base64 + crlf
```

This final example removes UNIX-style comments from the input and joins continuation lines:

```
mailutils filter --decode inline-comment -S ' ' + linecon
```

Such invocation can be useful in shell scripts to facilitate configuration file processing.

### 3.20.10 mailutils acl

The *mailutils acl* command tests Mailutils Access Control Lists. By default it reads ACL from the Mailutils configuration file section ‘acl’. The command takes a list of IP addresses as its arguments, applies the ACL to each of them in turn and prints the result.

To select the ACL to test, two options are provided. The **--file** (-f) option supplies the name of configuration file to read instead of the default one. The **--path** (-p option supplies the pathname (see Section 3.2.1.3 [Paths], page 14) of the ACL section to use
instead of the default ‘.acl’. For example, to test ACL in section ‘server 213.130.1.232’ of file /etc/pop3d.conf use:

```bash
mailutils acl --file=/etc/pop3d.conf --path=/server="213.130.1.232"/acl address
```

As an example of its use, consider file test.conf with the following contents:

```plaintext
acl {
  deny from 10.10.10.1;
  deny from 10.10.1.0/24;
  log from any "Connect from ${address}";
  allow from 10.0.0.0/8;
  allow from 192.168.1.0/24;
  deny from any;
}
```

Then, running `mailutils acl --file=test.conf 127.0.0.1` you will get:

```
Testing 127.0.0.1:
mailutils: Connect from 127.0.0.1
127.0.0.1: deny
```

More examples:

```
$ mailutils acl --file=test.conf 127.0.0.1 10.10.10.1 10.10.1.3 10.5.3.1 192.168.1.0 192.168.2.0
Testing 127.0.0.1:
mailutils: Connect from 127.0.0.1
127.0.0.1: deny
Testing 10.10.10.1:
10.10.10.1: deny
Testing 10.10.1.3:
10.10.1.3: deny
Testing 10.5.3.1:
mailutils: Connect from 10.5.3.1
10.5.3.1: accept
Testing 192.168.1.0:
mailutils: Connect from 192.168.1.0
192.168.1.0: accept
Testing 192.168.2.0:
mailutils: Connect from 192.168.2.0
192.168.2.0: accept
```

The `mailutils` option --debug-level will give you a deeper insight into the address matching algorithm:

```
$ mailutils --debug-level=acl.trace9 acl --file test.conf 127.0.0.1
Testing 127.0.0.1:
mailutils: Checking sockaddr 127.0.0.1
mailutils: 1:deny: Does 10.10.10.1/255.255.255.255 match 127.0.0.1? no;
mailutils: 2:deny: Does 10.10.1.0/255.255.255.0 match 127.0.0.1? no;
mailutils: 3:log: Does any match 127.0.0.1? yes;
mailutils: Expanding "Connect from ${address}";
```
mailutils: Expansion: "Connect from 127.0.0.1";
mailutils: Connect from 127.0.0.1
mailutils: 4:accept: Does 10.0.0.0/255.0.0.0 match 127.0.0.1? no;
mailutils: 5:accept: Does 192.168.0.0/255.255.0.0 match 127.0.0.1? no;
mailutils: 6:deny: Does any match 127.0.0.1? yes;
127.0.0.1: deny
See Section 3.3.3 [Debugging Categories], page 44.

3.20.11 mailutils wicket

The mailutils wicket command looks up matching URLs in the Mailutils ticket file (by default, ~/.mu-tickets) and prints them. The URLs to look for are supplied in the command line.

Consider the following ticket file as an example:

smtp://foo:bar@*
smtp://bar:baz@gnu.org
*://baz:qux*@*
*://quux:bar@gnu.org

Now, running mailutils wicket smtp://bar@gnu.org will show:

smtp://bar@gnu.org: /home/user/.mailutils-tickets:2
(where user is your login name). This means that this URL matches the line 2 in your .mailutils-tickets file. The wicket command does not show the actual matching line to avoid revealing eventual security-sensitive information. You can instruct it to do so using the --verbose (-v) option:

$ mailutils wicket -v smtp://bar@gnu.org
smtp://bar@gnu.org: /home/user/.mailutils-tickets:2: smtp://bar:***@gnu.org

As you see, even in that case the tool hides the actual password part by replacing it with three asterisks. If you are working in a secure environment, you can tell mu wicket to show passwords as well, by supplying the -v option twice.

A counterpart of --verbose is the --quite (-q) option, which instructs wicket to suppress any output, excepting error messages. This can be used in scripts, which analyze the mailutils wicket exit code to alter the control flow.

The mailutils wicket tool exits with code 0 if all URLs were matched and with code 1 if some of them were not matched in the ticket file. If an error occurred, the code 2 is returned.

3.20.12 mailutils dbm

The mailutils dbm tool manages DBM files using libmu_dbm. The invocation syntax is:

mailutils dbm subcommand [options] file [keys]

or

mailutils dbm [options] subcommand file [keys]

where subcommand selects the operation mode, options modify the tool behavior and file specifies the DBM file to operate upon. Some commands allow for optional keys to be specified.

The file argument can be either a DBM file name or a Database URL.
3.20.12.1 Create a Database

The `create` subcommand and its synonym `load` instruct the tool to create a new database:

```
mailutils dbm create file.db
```

If the argument file already exists, it will be truncated prior to adding new records to it.

The data to populate the database with are read from the standard input. The `mailutils dbm` command supports several formats for these data, which are discussed later. In the simplest case (a so-called `format 0.0`) each input line must consist of two fields separated by any amount of whitespace. The first field is treated as a key and the second one as the corresponding value.

The usual way to read data from a file is, of course, by redirecting the file to the standard input as in:

```
mailutils dbm create file.db < input.txt
```

There is also a special option for that purpose: `--file (-f)`. Thus, the following command is equivalent to the one above:

```
mailutils dbm create --file input.txt file.db
```

The `--file` option has the advantage that it allows, in conjunction with another options, for copying input file metadata (owner UID, GID and file mode) to the created database. For example, the following command ensures that the created database file will have the same metadata as the input file:

```
mailutils dbm create --file input.txt --copy-permissions file.db
```

The `--copy-permissions (-P)` option is the one that does the job.

There are also other ways to control mode and ownership of the created database, which are described below.

More advanced dump formats (e.g. `'version 1.0' format`) carry additional information about the file, including its original name, ownership and mode. If input is in one of these formats, the file name argument becomes optional. If it is not supplied, the name stored in the input stream will be used. For example, supposing that the file `users.dump` is in format 1.0, the following command suffices to restore the original filename, ownership, mode and, of course, data:

```
mailutils dbm create --file users.dump
```

3.20.12.2 Add Records to a Database

The `add` subcommand adds records to a database. Records are read from the standard input and must be formatted as for `create`:

```
mailutils dbm add file.db
```

If the argument file does not exist, it will be created.

Adding a record with a key which is already present in the database produces an error. To replace existing records, use the `replace` subcommand instead.

The same options that affect the behavior of `create` apply to `add` and `replace` as well, e.g.:

```
mailutils dbm replace --file input.txt --copy-permissions file.db
```
3.20.12.3 Delete Records

To delete records, use the delete subcommand. It reads a list of keys to delete to be specified as arguments in the command line:

```
mailutils dbm delete file.db foo bar
```

The command above will delete from file.db records with keys ‘foo’ and ‘bar’.

It is not an error to attempt to delete a key that does not exist in the database, although such use will produce a warning message.

By default, keys are matched literally. It is also possible to use various pattern matching techniques, depending on the option specified.

The --glob (-G) option instructs the tool to use UNIX globbing pattern matching. For example, the command below will delete all keys starting with ‘foo’ and ending with a decimal digit:

```
mailutils dbm delete file.db 'foo*[0-9]'
```

(note the quoting necessary to prevent shell from interpreting the metacharacters itself).

Another option, --regex (-R) instructs mailutils to treat supplied keys as extended regular expressions:

```
mailutils dbm delete --regex file.db 'foo.*[0-9]{1,3}'
```

Both options are affected by the --ignore-case (-i) option, which turns on case-insensitive matching.

Using pattern matching to delete records can be a risky operation as selecting a wrong pattern will lead to removing wrong records. It is recommended to first use the list mode described below to verify that the patterns match the right keys.

3.20.12.4 List the Database

The list command lists the content of the database:

```
mailutils dbm list file.db
```

By default, entire content is listed on the standard output.

If supplied more than one command line argument, this mode treats the rest of arguments after the database file name as the keys to look for and lists only records with these keys:

```
$ mailutils dbm list file.db foo bar
foo 1
bar 56
```

The --glob and --regex options instruct the tool to use UNIX globbing or extended regular expression matching, correspondingly. These were described in detail above.

3.20.12.5 Dump the Database

The dump subcommand dumps the database to the standard output in a format suitable for backup or sending over the network (a version 1.0 format).

```
mailutils dbm dump file.db < file.dump
```

The produced file is suitable for input to the create (load) command. Among other uses, it provides an easy way to convert databases between various formats supported by
Mailutils. For example this is how to convert the database file `file.db` to the GDBM database `new.db`:

```bash
mailutils dbm dump file.db | mailutils dbm create gdbm://new.db
```

Both `list` and `dump` subcommands share the same set of options. In fact, they are pretty similar, except that use different defaults. The `list` subcommand is designed to produce a human-readable output, whereas the `dump` subcommand is oriented towards backup purposes.

### 3.20.12.6 Dump Formats

As of version 3.10, `mailutils dbm` supports two formats for dumping DBM databases. Both formats are line-oriented. Comments are introduced with a sharp (‘#’) sign in the column 0 of a line, followed by at least one white space character (space or tab). Sharp sign followed by a colon (‘#:’) introduces a pragmatic comment, which carries some additional information to the loader.

The version 0.0 format is suitable for databases whose records contain only ASCII data. In this format, each record occupies a separate line, which consists of the key and value separated by a single tab character. Empty lines are ignored. For example:

```bash
$ mailutils list /etc/mail/users.db
root    guessme
smith   pAssword
qed     fooBar
```

The output in version 0.0 format is human readable and can be used as input to the `popauth` utility (see `popauth`). However, version 0.0 has serious drawbacks. First of all, it is not suitable for databases that contain binary data. Secondly, it cannot properly handle keys beginning with a sharp sign or containing tab. The version 1.0 format is free from these drawbacks.

The version 1.0 dump format begins with a header containing important information about the file, such as its file name, ownership and file mode. This information is stored in pragmatic comments and allows `mailutils dbm load` to easily recreate an exact copy of the file. The following comments are defined:

```
#:version=1.0
Indicates that the data that follow are in version 1.0 format.

#:filename=s
Original database file name, without directory parts.

#:uid=n
Owner UID.

#:user=s
Owner name.

#:gid=n
Owner GID

#:group=s
Owner group name.

#:mode=o
File mode in octal
```
Following this header are actual data. Each record is output in two parts: key and value. Each part begins with a `#:len=n` construct on a line by itself, where n is the length of the data in decimal. This line is followed by one or more lines of the actual data, encoded in base64. The data are formatted so that each line does not exceed 76 bytes in length (not counting the terminating newline). An example of this format follows:

```
# Database dump file created by GNU Mailutils 2.99.93 on
# Tue Nov  1 13:28:03 2011
#:version=1.0
#:file=users.db
#:uid=0,user=root,gid=25,group=mail,mode=640
#:len=6
c21pdGgA
#:len=9
cEFzc3dvcmQA
#:len=5
cm9vdAA=
#:len=8
Z3Vlc3NtZQA=
#:len=4
cWVkAA==
#:len=7
Zm9vQmFyAA==
```

### 3.20.12.7 Dbm Exit Codes

The table below summarizes exit codes used by `mailutils dbm`:

<table>
<thead>
<tr>
<th>Code</th>
<th>Symbolic name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>EX_OK</td>
<td>Successful termination</td>
</tr>
<tr>
<td>64</td>
<td>EX_USAGE</td>
<td>Command line usage error</td>
</tr>
<tr>
<td>65</td>
<td>EX_DATAERR</td>
<td>Error in user-supplied data: the input file is badly formatted, or some of the data supplied in the command line are invalid (e.g. user name, uid or the like), etc.</td>
</tr>
<tr>
<td>66</td>
<td>EX_NOINPUT</td>
<td>Cannot open input file</td>
</tr>
<tr>
<td>67</td>
<td>EX_NOUSER</td>
<td>No such user or UID when trying to set output file ownership</td>
</tr>
<tr>
<td>69</td>
<td>EX_UNAVAILABLE</td>
<td>Operation cannot be performed due to some kind of problem (e.g. access to the file denied, etc.)</td>
</tr>
<tr>
<td>70</td>
<td>EX_SOFTWARE</td>
<td>Internal software error</td>
</tr>
<tr>
<td>74</td>
<td>EX_IOERR</td>
<td>Input/output error</td>
</tr>
</tbody>
</table>

### 3.20.13 mailutils logger

The `mailutils logger` tool logs information using Mailutils log facility.

**Syntax:**

```
m Mailutils Logger 
```
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The message argument, if supplied, gives the text to log. If not supplied, the utility reads lines of text from standard input or a file (if the --file option is given) and sends them to log:

# Send text to log
$ mailutils logger I am here
# Log each line from file.txt
$ mailutils logger --file file.txt
# Read stdin and log it:
$ mailutils logger

The default logging channel is bound to standard error. To bind it to syslog, use the --syslog command line option. In that case mailutils uses facility ‘user’ and priority ‘err’. You can change this by using the --priority (-p) option. Its argument is either a syslog facility name or facility and severity names separated by a dot. For example, the following invocation will use facility ‘auth’, severity ‘info’:

mailutils logger --priority auth.info

The syslog tag can be set using the --tag (-t) option:

mailutils logger --tag myprog

The default tag is ‘mu-logger’.


Finally, the --locus (-l) option binds log messages to a location in a file. Its argument has the following syntax:

file:line[:col]

where file is the file name, line is the line number and optional col is the column number in that file.

For example, the following invocation:

mailutils logger --locus mailutils.conf:34 Suspicious statement

will send the following to the log:

mu-logger: mailutils.conf:34: Suspicious statement

### 3.20.14 mailutils pop

The mailutils pop command invokes an interactive POP3 client shell. It reads commands from the standard input, executes them and displays the results on the standard output. If the standard input is connected to a terminal, the readline and history facilities are enabled (provided that Mailutils is configured with GNU Readline).

The mailutils pop commands form two major groups. POP3 protocol commands interact with the remote POP3 server and display responses obtained from it. These commands are named after their POP3 equivalents. Another group, internal commands, are used to configure the shell itself.

#### POP protocol commands

connect [-tls] hostname [port]

Open connection to hostname. If the -tls option is given, TLS encryption (also known as POPS protocol) will be used. If port argument is not given, the
command uses port 110 for a plain POP connection or 995 for POPS (if -tls is given).

stls Start TLS negotiation. This command is valid only after successful unencrypted connection has been initiated (using connect without -tls argument).

user name Send user name to the server. The pass command must follow.

pass [password]
Send password. This command is valid only after user. If the password argument is omitted, the shell will ask you to enter it. While entering, both echoing and history recording will be disabled. Use this to avoid compromising your password.

apop user [password]
Authenticate with APOP. If the password argument is omitted, you will be asked to supply it. While entering, both echoing and history recording will be disabled.

capa [-reread] [name...] List server capabilities. Any number of arguments is accepted. If given, the shell will display only the named capabilities, otherwise it displays entire list. By default capa reuses the response of its previous invocation (if there was any), instead of resending the ‘CAPA’ command to the server. To force it do so, use the -reread option.

noop Send a ‘NOOP’ (no operation) command to the server.

stat Get the mailbox size and number of messages in it.

uidl [number]
Shows unique message identifiers. Without arguments, shows identifiers for each message in the mailbox. If number is given, the command returns the UIDL of that particular message only.

list [number]
Lists messages. See above for the meaning of number. Each line of the produced listing contains describes a single message and contains at least the message number and size in bytes. Depending on the POP3 server implementation, additional fields may be present. For example, Mailutils pop3d can also output number of lines in the message in the additional third field.

retr number
Retrieve a message.

top msgno [number]
Display message headers and first number (default 5) of lines of its body.

dele number
Mark message for deletion.

rset Remove deletion marks.

quit Quit pop3 session.

disconnect Close existing connection.
Internal commands

verbose [on|off|mask|unmask] [secure [payload]]
Control output verbosity. Without arguments the verbose command shows current settings.

The argument ‘off’ (the default) turns off all additional output. The ‘verbose on’ command enables POP3 protocol tracing output. Additional arguments can be used to provide more verbosity. The ‘secure’ argument enables display of user passwords in the trace output and the ‘payload’ argument enables showing payload data (e.g. response body sent in the reply to ‘RETR’ command, etc.)
Thus, the full diagnostics output is obtained by

```
verbose on secure payload
```

The ‘mask’ and ‘unmask’ arguments allow to disable and enable such additional verbosity. For example, supposing the command above is in action, the following command will suppress the display of user passwords in the traces:

```
verbose mask secure
```

Similarly, `verbose unmask secure` will turn it back again.

prompt string

Set command prompt. The argument can contain variable references in any of the following forms:

```
$\text{name}
\$\{\text{name}\}
```

where \text{name} is the variable name. Such references are expanded to the actual value of the variable at the time of expansion. The following variables are defined:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>user</td>
<td>Login name of the authenticated POP3 user. If the session is not authenticated yet, expands to ‘[nouser]’.</td>
</tr>
<tr>
<td>host</td>
<td>Name of the remote host, or ‘[nohost]’ if no connection is established.</td>
</tr>
<tr>
<td>program-name</td>
<td>Name of the program, as typed on the command line to invoke it.</td>
</tr>
<tr>
<td>canonical-program-name</td>
<td>‘mailutils’</td>
</tr>
<tr>
<td>package</td>
<td>‘Mailutils’</td>
</tr>
<tr>
<td>version</td>
<td>Mailutils version number (3.10)</td>
</tr>
<tr>
<td>status</td>
<td>Session status. One of: ‘disconnected’, ‘connected’ or ‘logged in’.</td>
</tr>
</tbody>
</table>

For example:

```
prompt "[\$\{user\}@\$\{host\}"
```

Notice the use of quotes to include the space character in the prompt.

exit Exit the program.
help [command]
? [command]
Without arguments displays a list of commands with possible arguments and short descriptions.
With one argument, displays a terse description for the given command.

text

history
Shows command history.

3.20.15 mailutils imap
The mailutils imap command invokes an interactive IMAP4 client shell. It reads commands from the standard input, executes them and displays the results on the standard output. The shell is similar to the mailutils pop (see Section 3.20.14 [mailutils pop], page 153) shell.

IMAP protocol commands
Most commands in this group correspond (with minor differences) to IMAP commands described in RFC 3501.

connect [-tls] host [port]
Opens connection to the server host. If the -tls option is given, TLS encryption (also known as IMAPS protocol) will be used. If port argument is not supplied, the command uses port 143 for a plain IMAP connection or 993 for IMAPS (if -tls is given).

capability [-reread] [name...]
Lists server capabilities. Any number of names is accepted. If at least one is given, the shell will display only the named capabilities, otherwise it displays the entire list. By default, capability reuses the response of its previous invocation (if there was any), instead of resending the CAPABILITY command to the server. To force it to do so, use the -reread option.

starttls
Starts TLS negotiation. This command is valid only after unencrypted connection has been successfully initiated using connect without the -tls option.

login user [password]
Logs in to the server as user with optional password. If the pass argument is omitted, the shell will ask you to enter it. While entering, both echoing and history recording will be disabled. Use this to avoid compromising your password.

logout

quit
Quits the imap session.

id [-test kw] [arg...]
Sends IMAP ID command. See RFC 2971, for a discussion of arguments. By default, this command outputs entire ID list. If, however, the -test option is given, it will check whether the keyword kw is defined and display its value if so.

---

1 See http://www.faqs.org/rfcs/rfc3501.html.
2 http://www.faqs.org/rfcs/rfc2971.html
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check
   Requests a server checkpoint.

select [mbox]
   Selects the named mailbox. Without argument, selects ‘INBOX’.

examine [mbox]
   Examines the named mailbox, i.e. selects it in read-only mode. If mbox is not given, ‘INBOX’ is assumed.

status mbox kw [kw...]
   Gets mailbox status. Valid keywords (kw arguments) are: ‘MESSAGES’, ‘RECENT’, ‘UIDNEXT’, ‘UIDVALIDITY’, and ‘UNSEEN’. Keywords are case-insensitive.

fetch msgset items
   Fetches message data. See RFC 3501, section 6.4.53, for a discussion of its arguments.

store msgset items
   Alters mailbox data. See RFC 3501, section 6.4.64, for a discussion of its arguments.

close
   Closes the currently selected mailbox (with expunge).

unselect
   Closes the currently selected mailbox (without expunge).

delete mbox
   Deletes the mailbox mbox.

rename old-name new-name
   Renames existing mailbox old-name to new-name.

expunge
   Permanently removes messages marked for deletion.

create name
   Creates new mailbox with the given name.

append [-time datetime] [-flag flag] mailbox file
   Reads an RFC-822 message from file and appends it to the mailbox. Use the -time option to supply envelope date for the message. Use the -flag option to supply message flags. For example:

   append -time "25-Aug-2002 18:00:00 +0200" -flag \Seen INBOX input.msg

list ref mbox
   Lists matching mailboxes. See RFC 3501, section 6.3.85, for a discussion of its arguments.

lsub ref mbox
   Lists subscribed mailboxes (RFC 3501, section 6.3.96).
subscribe mbox
  Subscribes to a mailbox.

unsubscribe mbox
  Removes mailbox mbox from the subscription list.

noop
  Sends a no operation command.

disconnect
  Closes existing connection.

Internal commands
The imap shell implements the same set of internal commands as pop shell: See Section 3.20.14 [mailutils pop], page 153. There is only one imap-specific internal command:

uid [on|off]
  Controls the UID mode. When the UID mode is on, the commands fetch and store operate on and return message UIDs instead of their sequence numbers.
  To examine the current state of the UID mode, issue the uid command without arguments.

3.20.16 mailutils send
Reads an RFC-822 message from a file and sends it over to a specified SMTP server. The syntax is:

mailutils send [options] host file

where host defines the SMTP server through which to send the message, and file is the name of the input file containing the message. For example, to send a message from file input.msg using SMTP service at localhost, one would write:

$ mailutils send localhost input.msg

The host argument can be an IP address, hostname, or a valid SMTP URL.

The following command line options are understood:

-F address
  --from=address
    Supplies envelope sender address.

-T address
  --rcpt=address
    Supplies envelope recipient address. It can be specified multiple times.

-t
  --read-recipients
    Instructs the program to read recipient email addresses from the message ‘To:’, ‘Cc:’, and ‘Bcc:’ headers.
3.20.17 mailutils smtp

The mailutils smtp command invokes an interactive SMTP client shell. It reads commands from the standard input, executes them and displays the results on the standard output. If the standard input is connected to a terminal, the readline and history facilities are enabled (provided that Mailutils is configured with GNU Readline).

Initializing connection

connect [-tls] host [port]  [smtp command]
   Connects to SMTP server at host (IP address or host name). If the -tls option is given, TLS encryption (also known as SMTPS protocol) will be used. The default port number is 25 for plain SMTP and 465 for SMTPS. Explicit port argument overrides the default value.

Connection parameters

A number of parameters is associated with an open connection:

domain   Domain name used in EHLO statement. Defaults to the current host name.

The following parameters are used for ESMTP authentication:

username   User name.

password   User password.

service    GSASL service name.

realm      Realm name.

host       Host name.

url        SMTP URL. It can contain all of the above. Default is smtp://

These parameters are manipulated using the following statements:

set param value [param value...]  [smtp command]
   Sets parameter param to value. Several parameters can be set with one set statement.

clear [param...]  [smtp command]
   Unset the supplied connection parameters. If used without arguments, unsets all parameters.

list [param...]  [smtp command]
   Lists the values of the connection parameters. If used without arguments, lists all parameters.

SMTP commands

ehlo [domain]  [smtp command]
   Sends the ESMTP greeting. Unless domain is supplied, the connection parameter ‘domain’ is used.

capa [name...]  [smtp command]
   Lists the server capabilities.
**starttls**

Initiates encrypted connection. This command is disabled if the connection is opened with the `-tls` option.

**auth mech [mech...]**

Authenticate using the supplied mechanisms.

**rset**

Reset the session state.

**from [email]**

Sets sender email address. If used without arguments, prints the sender email address.

**to [email]**

Sets recipient email address. If used without arguments, prints all recipient names collected so far.

**smtp command [args...]**

Sends the command with its arguments verbatim.

**quit**

Quits the SMTP session.

**send [file]**

Reads the message from file and sends it. If file is not supplied, the action depends on whether a send command was used previously within the same session. If so, mailutils will first ask whether to reuse the already supplied message. If not, it will start an editor, allowing you to enter the new message. When you exit from the editor, you will be prompted what to do with the message: send, edit, or quit (discard) it.

**Internal commands**

Internal commands are the same as in pop shell: See Section 3.20.14 [mailutils pop], page 153.
4 Mailutils Libraries

Editor’s note:
This node is to be written.
5 Sieve Language

The input language understood by the GNU Sieve Library is a superset of the Sieve language as described in RFC 3028.

5.1 Lexical Structure

Whitespace and Comments

Comments are semantically equivalent to whitespace and can be used anyplace that whitespace is (with one exception in multi-line strings, as described below).

There are two kinds of comments: hash comments, that begin with a ‘#’ character that is not contained within a string and continue until the next newline, and C-style or bracketed comments, that are delimited by ‘/\*’ and ‘*/’ tokens. The bracketed comments may span multiple lines. E.g.:

```c
if size :over 100K
    { # this is a comment
discard;
    }

if size :over 100K
    { /* this is a comment
    this is still a comment */ discard /* this is a comment again */
    */
    ;
}
```

Like in C, bracketed comments do not nest.

Lexical Tokens

The basic lexical entities are identifiers and literals.

An identifier is a sequence of letters, digits and underscores, that begins with a letter or underscore. For example, header and check_822_again are valid identifiers, whereas 1st is not. A special form of identifier is tag: it is an identifier prefixed with a colon (‘:’), e.g.: :comparator.

A literal is a data that is not executed, merely evaluated “as is”, to be used as arguments to commands. There are four kinds of literals:

- **Number**

  Numbers are given as ordinary unsigned decimal numbers. An optional suffix may be used to indicate a multiple of a power of two. The suffixes are: ‘K’ specifying “kibi-”, or 1,024 (2^10) times the value of the number; ‘M’ specifying “mebi-”, or 1,048,576 (2^20) times the value of the number; and ‘G’ specifying “tebi-”, or 1,073,741,824 (2^30) times the value of the number.

  The numbers have 32 bits of magnitude.

- **String** A string is any sequence of characters enclosed in double quotes (‘”’). A string cannot contain newlines and double quote characters. This limitation will disappear in future releases.

- **Multiline Strings** A multiline string is used to represent large blocks of text with embedded newlines and special characters. It starts with the keyword text: followed by
a newline and ends with a dot (‘.’) on a newline by itself. Any characters between these two markers are taken verbatim. For example:

```
text:
  ** This is an automatic response from my message **
  ** filtering program. **
  I can not attend your message right now. However it will be saved, and I will read it as soon as I am back.

  Regards,
  Fred
```

Notice that a hashed comment or whitespace may occur between `text:` and the newline. However, when used inside the multiline string a hash sign looses its special meaning (except in one case, see below) and is taken as is, as well as bracketed comment delimiters. In other words, no comments are allowed within a multiline string. E.g.:

```
text: # This is a comment

Sample text
  # This line is taken verbatim
  /* And this line too */
```

The only exception to this rule is that preprocessor `include` statement is expanded as usual when found within a multiline string (see Section 5.3 [Preprocessor], page 167), e.g.:

```
text: #include <myresponse.txt>
```

This results in the contents of file `myresponse.txt` being read and interpreted as the contents of the multiline string.

GNU `libmu_sieve` extends the described syntax as follows. If the keyword `text:` is immediately followed by a dash (‘-’), then all leading tab characters are stripped from input lines and the line containing delimiter (‘.’). This allows multiline strings within scripts to be indented in a natural fashion.

Furthermore, if the `text:` (optionally followed by ‘-’) is immediately followed by a word, this word will be used as ending delimiter of multiline string instead of the default dot. For example:

```
if header "from" "me@example.com"
{
  reject text:-EOT
    I do not accept messages from this address.
    .
    .
    EOT
    # Notice that this the multiline string ends here.
    # The single dots above will be part of it.
  ;
}
```
• String Lists
A string list is a comma-delimited list of quoted strings, enclosed in a pair of square brackets, e.g.:

\["me@example.com", "me00@landru.example.edu"]

For convenience, in any context where a list of strings is appropriate, a single string is allowed without being a member of a list: it is equivalent to a list with a single member. For example, the following two statements are equivalent:

\[exists "To"; exists ["To"];

5.2 Syntax
Being designed for the sole purpose of filtering mail, Sieve has a very simple syntax.

5.2.1 Commands
The basic syntax element is a command. It is defined as follows:

\[command-name [tags] args\]

where command-name is an identifier representing the name of the command, tags is an optional list of optional or tagged arguments and args is a list of required or positional arguments.

Positional arguments are literals delimited with whitespace. They provide the command with the information necessary to its proper functioning. Each command has a fixed number of positional arguments. It is an error to supply more arguments to the command or to give it fewer arguments than it accepts.

Optional arguments allow to modify the behaviour of the command, like command line options in UNIX do. They are a list of tags (see Section 5.1 [Lexical Structure], page 163) separated by whitespace. An optional argument may have at most one parameter.

Each command understands a set of optional arguments. Supplying it tags that it does not understand results in an error.

For example, consider the following command

\[header :mime :comparator "i;octet" ["to", "from"] "bug-mailutils@gnu.org"\]

Here, given that header takes two positional arguments: header is command name, the list ["to", "from"] is first positional argument and the string "bug-mailutils@gnu.org" is second positional argument. There are two optional arguments: :mime and :comparator. The latter has a string "i;octet" as its parameter.

5.2.2 Actions Described
An action is a Sieve command that performs some operation over a message. Actions do the main job in any Sieve program. Syntactically, an action is a command terminated with semicolon, e.g.:

\[keep;\]

\[fileinto "mbox";\]

GNU Sieve provides the full set of actions described in RFC 3028. It also allows to extend this set using loadable actions. See Section 5.7 [Actions], page 176, for detailed discussion of actions.
5.2.3 Control Flow

The only control flow statement Sieve has is if statement. In its simplest form it is:

```plaintext
if condition { ... }
```

The effect of this statement is that the sequence of actions between the curly braces is executed only if the condition evaluates to true.

A more elaborate form of this statement allows to execute two different sets of actions depending on whether the condition is true or not:

```plaintext
if condition { ... } else { ... }
```

The most advanced form of the “if” statement allows to select an action depending on what condition from the set of conditions is met.

```plaintext
if cond1 { ... } elsif cond2 { ... } else { ... }
```

There may be any number of “elsif” branches in an “if” statement. However it may have at most one “else” branch. Notes for C programmers:
1. The braces surrounding each branch of an “if” statement are required.
2. The “else if” construct is disallowed. Use “elsif” keyword instead.

Here’s an example of “if” statement:

```plaintext
if header :contains "from" "coyote"
{
    discard;
}
elsif header :contains ["subject"] ["$$$"]
{
    discard;
}
else
{
    fileinto "INBOX";
}
```

The following section describes in detail conditions used in “if” statements.

5.2.4 Tests and Conditions

Tests are Sieve commands that return boolean value. E.g. the test

```plaintext
header :contains "from" "coyote"
```

returns true only if the header “From” of the current message contains substring “coyote”.

The tests shipped with the GNU Sieve are described in Section 5.6 [Tests], page 169.

Condition is a Sieve expression that evaluates to true or false. In its simplest form, condition is just a Sieve test.

To reverse the sense of a condition use keyword not, e.g.:

```plaintext
not header :contains "from" "coyote"
```

The results of several conditions may be joined together by logical and and or operations. The special form all of takes several tests as its arguments and computes the logical and of their results. Similarly, the form any of performs logical or over the results of its arguments. E.g.:

```plaintext
if anyof (not exists ["From", "Date"],
          header :contains "from" "fool@example.edu")
{
```
Chapter 5: Sieve Language

5.3 Preprocessor

Preprocessor statements are a GNU extension to the Sieve language. The syntax for a preprocessor statement is similar to that used in C programming language, i.e. a pound character (‘#’) followed by a preprocessor directive and its arguments. Any amount of white-space can be inserted between the ‘#’ and the directive. Currently implemented directives are include and searchpath.

5.3.1 Sieve #include directive

The #include directive reads in the contents of the given file. The contents is “inserted” into the text being parsed starting at the line where the directive appears. The directive takes two forms:

```
#include "filename"
```

The filename is taken relative to the current directory.

```
#include <filename>"
```

The filename is searched in the list of include directories as specified by the -I command line options.

If filename starts with a directory separator character (‘/’) both forms have the same effect.

5.3.2 Sieve #searchpath directive

The #searchpath directive adds its argument to the list of directories searched for load-able modules. It has the same effect as library-path Sieve configuration statement (see Section 3.10.1.2 [Sieve Configuration], page 99).

5.4 Require Statement

Syntax: require string;
        require string-list;

The require statement informs the parser that a script makes use of a certain extension. Multiple capabilities can be declared using the second form of the statement. The actual handling of a capability name depends on its suffix.

If the name starts with ‘comparator-‘, it is understood as a request to use the specified comparator. The comparator name consists of the characters following the suffix.

If the name starts with ‘test-‘, it means a request to use the given test. The test name consists of the characters following the suffix.

Otherwise, the capability is understood as a name of an action to be used.

The require statement, if present, must be used before any other statement that is using the required capability. As an extension, the GNU sieve allows the require and any other statements to be interspersed.

By default the following actions and comparators need not be explicitly required:

• stop
• keep
• discard
• i;octet
• i;ascii-casemap

Example:

require ["fileinto", "reject"];
require "fileinto";
require "comparator-i;ascii-numeric";

When processing arguments for require statement, GNU libmu_sieve uses the following algorithm:

1. Look up the name in a symbol table. If the name begins with ‘comparator-’ it is looked up in the comparator table. If it begins with ‘test-’, the test table is used instead. Otherwise the name is looked up in the action table.
2. If the name is found, the search is terminated.
3. Otherwise, transform the name. First, any ‘comparator-’ or ‘test-’ prefix is stripped. Then, any character other than alphanumeric characters, ‘.’ and ‘,’ is replaced with dash (‘-’). The name thus obtained is used as a file name of an external loadable module.
4. Try to load the module. The module is searched in the following search paths (in the order given):
   1. Mailutils module directory. By default it is $prefix/lib/mailutils.
   2. Sieve library path as given with the -L options in the command line
   3. Additional search directories specified with the #searchpath directive.
   4. The value of the environment variable LTL_LIBRARY_PATH.
   5. System library search path: The system dependent library search path (e.g. on Linux it is set by the contents of the file /etc/ld.so.conf and the value of the environment variable LD_LIBRARY_PATH).

The value of LTL_LIBRARY_PATH and LD_LIBRARY_PATH must be a colon-separated list of absolute directories, for example, ‘"/usr/lib/mypkg:/lib/foo"’. In any of these directories, libmu_sieve first attempts to find and load the given filename. If this fails, it tries to append the following suffixes to the file name:
   1. the libtool archive extension ‘.la’
   2. the extension used for native dynamic libraries on the host platform, e.g., ‘.so’, ‘.sl’, etc.

5. If the module is found, libmu_sieve executes its initialization function (see below) and again looks up the name in the symbol table. If found, search terminates successfully.
6. If either the module is not found, or the symbol wasn’t found after execution of the module initialization function, search is terminated with an error status. libmu_sieve then issues the following diagnostic message:

source for the required action NAME is not available
5.5 Comparators

GNU libmu_sieve supports the following built-in comparators:

i;octet  This comparator simply compares the two arguments octet by octet

i;ascii-casemap
  It treats uppercase and lowercase characters in the ASCII subset of UTF-8 as the same. This is the default comparator.

i;ascii-numeric
  Treats the two arguments as ASCII representation of decimal numbers and compares their numeric values. This comparator must be explicitly required prior to use.

5.6 Tests

This section describes the built-in tests supported by GNU libmu_sieve. In the discussion below the following macro-notations are used:

match-type
  This tag specifies the matching type to be used with the test. It can be one of the following:

:is
  The :is match type describes an absolute match; if the contents of the first string are absolutely the same as the contents of the second string, they match. Only the string “frobnitzm” is the string “frobnitzm”. The null key “:is” and only “:is” the null value. This is the default match-type.

:contains
  The :contains match type describes a substring match. If the value argument contains the key argument as a substring, the match is true. For instance, the string “frobnitzm” contains “frob” and “nit”, but not “fbm”. The null key “” is contained in all values.

:matches
  The :matches version specifies a wildcard match using the characters ‘*’ and ‘?’. ‘*’ matches zero or more characters, and ‘?’ matches a single character. ‘?’ and ‘*’ may be escaped as ‘\?’ and ‘\*’ in strings to match against themselves. The first backslash escapes the second backslash; together, they escape the ‘*’.

:regex
  The :regex version specifies a match using POSIX Extended Regular Expressions.

:value relation
  The :value match type does a relational comparison between strings. Valid values for relation are:

  "eq"  Equal
  "ne"  Not Equal
  "gt"  Greater Than
"ge"       Greater than or Equal
"lt"       Less Than
"le"       Less than or Equal

:count relation
This match type first determines the number of the specified entities
(headers, addresses, etc.) in the message and does a relational
comparison of the number of entities to the values specified in the
test expression. The test expression must be a list of one element.

comparator
A comparator syntax item is defined as follows:
:comparator "comparator-name"

It instructs sieve to use the given comparator with the test. If comparator-name
is not one of ‘i;octet’, ‘i;ascii-casemap’ it must be required prior to using
it. For example:
require "comparator-i;ascii-numeric";

if header :comparator "i;ascii-numeric" :is "X-Num" "10"
{
...

address-part
This syntax item is used when testing structured Internet addresses. It specifies
which part of an address must be used in comparisons. Exactly one of the
following tags may be used:
:all          Use the whole address. This is the default.
:localpart    Use local part of the address.
:domain       Use domain part of the address.

Notice, that match-type modifiers interact with comparators. Some comparators are
not suitable for matching with :contains or :matches. If this occurs, sieve issues an
appropriate error message. For example, the statement:
if header :matches :comparator "i;ascii-numeric"

would result in the following error message:
comparator ‘i;ascii-numeric’ is incompatible with match type ‘:matches’
in call to ‘header’

GNU Sieve supports two kinds of tests. Built-in tests are defined within the library and
do not require any external files. External tests are loadable modules that can be linked in
at run time using the require statement (see Section 5.4 [Require Statement], page 167).

5.6.1 Built-in Tests

false       [Test]
This test always evaluates to “false”.

ture        [Test]
This test always evaluates to “true”.

address [address-part] [comparator] [match-type] header-names key-list

Tagged arguments:

address-part
Selects the address part to compare. Default is the whole email address (:all).

comparator
Specifies the comparator to be used instead of the default i;ascii-casemap.

match-type
Specifies the match type to be used instead of the default :is.

Required arguments:

header-names
A list of header names.

key-list
A list of address values.

The address test matches Internet addresses in structured headers that contain addresses. It returns true if any header contains any key in the specified part of the address, as modified by comparator and match-type optional arguments.

This test returns true if any combination of the header-names and key-list arguments match.

The address primitive never acts on the phrase part of an email address, nor on comments within that address. Use the header test instead. It also never acts on group names, although it does act on the addresses within the group construct.

Example:

if address :is :all "from" "tim@example.com"
{
    discard;
}

size [:over | :under] limit(number)

The size test deals with the size of a message. The required argument limit represents the size of the message in bytes. It may be suffixed with the following quantifiers:

‘k’
‘K’
The number is expressed in kilobytes.

‘m’
‘M’
The number is expressed in megabytes.

‘g’
‘G’
The number is expressed in gigabytes.

If the tagged argument is ‘:over’, and the size of the message is greater than number, the test is true; otherwise, it is false.

If the argument is ‘:under’, and the size of the message is less than the number, the test is true; otherwise, it is false.
Otherwise, the test is true only if the size of the message equals exactly \textit{number}. This is a GNU extension.

The size of a message is defined to be the number of octets from the initial header until the last character in the message body.

\textbf{envelope} \{\textit{address-part}\} \{\textit{comparator}\} \{\textit{match-type}\} \hspace{1cm} [\textbf{Test}]
\begin{verbatim}
envelope-part(string-list) key-list(string-list)
\end{verbatim}

Tagged arguments:

\textit{address-part}
Selects the address part to compare. Default is the whole email address (\texttt{:all}).

\textit{comparator}
Specifies the comparator to be used instead of the default \texttt{i;ascii-casemap}.

\textit{match-type}
Specifies the match type to be used instead of the default \texttt{:is}.

Required arguments:

\textit{envelope-parts}
A list of envelope parts to operate upon.

\textit{key-list}
A list of address values.

The \textit{envelope} test is true if the specified part of the SMTP envelope matches the specified key.

If the envelope-part strings is (case insensitive) \texttt{`from'}, then matching occurs against the FROM address used in the SMTP MAIL command.

\textit{Notice}, that due to the limitations imposed by SMTP envelope structure the use of any other values in \textit{envelope-parts} header is meaningless.

\textbf{exists} \textit{header-names}(string-list) \hspace{1cm} [\textbf{Test}]

Required arguments:

\textit{header-names}
List of message header names.

The \textit{exists} test is \textbf{true} if the headers listed in \textit{header-names} argument exist within the message. All of the headers must exist or the test is false.

The following example throws out mail that doesn’t have a From header and a Date header:

\[
\text{if not exists ["From","Date"]}
\{
  \text{discard;}
\}
\]
header [comparator] [match-type] [:mime] header-names(string-list) [Test]
key-list(string-list)

Tagged arguments:

comparator
Specifies the comparator to be used instead of the default i;ascii-casemap.

match-type
Specifies the match type to be used instead of the default :is.

:mime
This tag instructs header to search through the mime headers in multipart messages as well.

Required arguments:

header-names
A list of header names.

key-list
A list of header values.

The header test evaluates to true if any header name matches any key. The type of match is specified by the optional match argument, which defaults to ".:is" if not explicitly given.

The test returns true if any combination of the header-names and key-list arguments match.

If a header listed in header-names exists, it contains the null key (""). However, if the named header is not present, it does not contain the null key. So if a message contained the header

X-Caffeine: C8H10N4O2

these tests on that header evaluate as follows:

header :is ["X-Caffeine"] ["] ⇒ false
header :contains ["X-Caffeine"] ["] ⇒ true

5.6.2 External Tests

numaddr [:over | :under] header-names(string-list) count(number) [Test]

Synopsis:

require "test-numaddr";
...
if numaddr args
{
   ...
}

Description: This test is provided as an example of loadable extension tests. You must use 'require "test-numaddr"' statement before actually using it.
The `numaddr` test counts Internet addresses in structured headers that contain addresses. It returns true if the total number of addresses satisfies the requested relation.

If the tagged argument is `':over'` and the number of addresses is greater than `count`, the test is true; otherwise, it is false.

If the tagged argument is `':under'` and the number of addresses is less than `count`, the test is true; otherwise, it is false.

If the tagged argument is not given, `':over'` is assumed.

**Synopsis:**

```plaintext
require "test-pipe";
if pipe command {
   ...
}
```

**Description:** The `pipe` test executes a shell command specified by its argument and pipes the entire message (including envelope) to its standard input. When given, tags `:envelope`, `:header`, and `:body` control what parts of the message to pipe to the command.

In the absence of the `:exit` tag, the test returns true if the command exits with code 0. If `:exit` is given, the test returns true if the command exits with code equal to its argument.

The `:signal` tag determines the result of the test in case if the program exits on signal. By default, the test returns false. If `:signal` is given and the number of signal which caused the program to terminate matches its argument, the test returns true.

**Synopsis:**

```plaintext
spamd [:host tcp-host(string)] [:port tcp-port(number)] [:socket unix-socket(string)] [:user name(string)] [:over | :under limit(string)]
```

**Description:** This test is an interface to SpamAssassin filter. It connects to the `spamd` daemon using connection parameters specified by tagged arguments `:host` and `:port` (if the daemon is listening on an INET socket), or `:socket` (if the daemon is listening on a UNIX socket) and returns true, if SpamAssassin qualifies the message as spam. Tagged argument `limit` alters the default behavior. Its value is a string representation.
of a floating point number. If the tag :over is used, then the test returns true if the
spam score returned from SpamAssassin is greater than limit. Otherwise, if :under is
used, the test returns true if the spam score is less than limit. The comparison takes
into account three decimal digits.

Tagged argument :user allows to select a specific user profile. If it is not given, the
user name is determined using the effective UID.

Before returning, the spamd test adds the following headers to the message:

X-Spamd-Status
   ‘YES’ or ‘NO’, depending on whether the message is qualified as spam or
   ham.

X-Spamd-Score
   Actual spam score value.

X-Spamd-Threshold
   Spam score threshold, as configured in SpamAssassin settings.

X-Spamd-Keywords
   Comma-separated list of keywords, describing the spam checks that suc-
   ceeded for this message.

Example:

request "test-spamd";

if spamd :host 127.0.0.1 :port 3333
{
   discard;
}

list [comparator] [match-type] [:delim delimiters(string)]
headers(string-list) keys(string-list)

Synopsis:

require "test-list";
if list args
{
   ...
}

Description: The list test evaluates to true if any of headers matches any key from
keys. Each header is regarded as containing a list of keywords. By default, comma
is assumed as list separator. This can be overridden by specifying the :delim tag,
whose value is a string consisting of valid list delimiter characters.

Example:

This test can be used in conjunction with the spamd test described above:

require ["fileinto", "test-spamd", "test-list"];

if spamd :host 127.0.0.1 :port 3333
{
   if list :matches :delim " ,"
      "X-Spamd-Keywords" [ "HTML_*", "FORGED_*" ]
}
timestamp [:before | :after] header(string) date(string) [Test]

Synopsis:

require "test-timestamp";

if timestamp arg
{
  ...
}

Description: The timestamp test compares the value of a structured date header field (header) with the given date (date).

If the tagged argument is :after and the date from the header is after the specified date the result is true, otherwise, if the header date is before the given date, the result is false.

If the tagged argument is :before and the date from the header is before the specified date the result is true, otherwise, if the header date is after the given date, the result is false.

If no tagged argument is supplied, :after is assumed.

Almost any date format is understood. See Appendix B [Date Input Formats], page 197, for a detailed information on date formats.

Example:
The test below succeeds if the date in ‘X-Expire-Timestamp’ header is more than 5 days older than the current date:

require "test-timestamp";

if timestamp :before "X-Expire-Timestamp" "now - 5 days"
{
  discard;
}

5.7 Actions

There are two groups of GNU Sieve actions: built-in actions, which are defined within the library, and external actions, i.e. loadable modules that can be linked in at run time using the require statement (see Section 5.4 [Require Statement], page 167).

5.7.1 Built-in Actions

The GNU libmu_sieve supports the following built-in actions:

- stop
• keep
• discard
• fileinto
• reject
• redirect

Among them the first three actions do not need to be explicitly required by a `require` statement, while the others do.

These actions are described in detail below.

`stop` [Action]
The `stop` action ends all processing. If no actions have been executed, then the `keep` action is taken.

`keep` [Action]
The effect of this action is to preserve the current message in the mailbox. This action is executed if no other action has been executed.

`discard` [Action]
`discard` silently throws away the current message. No notification is returned to the sender, the message is deleted from the mailbox.

Example:
```
if header :contains ["from"] ["idiot@example.edu"]
{
    discard;
}
```

`fileinto [:permissions mode] folder` [Action]
Required arguments:

`folder` A string representing the folder name

Tagged arguments:

`:permissions mode` Specifies the permissions to use, if the mailbox is created.

The `fileinto` action delivers the message into the specified folder. If the folder is local, it is created using permissions ‘0600’, for regular files, and ‘0700’ for directories. This default can be changed by using the `:permissions` tag. Its argument is a mode specification, similar to that used by `chmod` shell utility. It is a list of permissions settings separated by commas. Each setting begins with one of the following letters:

- `g` Set permissions for the users in the file group.
- `o` Set permissions for users not in the file’s group.

This letter must be followed by either ‘+’ or ‘=’ and the list of permissions to be set. This latter list is a string containing any one or both of the following characters:

- `r` Grant permission to read.
- `w` Grant permission to write.
For example, the following instruction creates the mailbox `/shared` which will be world readable and writable for the group:

```
fileinto :permissions "g=rw,o=r" "~/shared"
```

Notice that:
1. The :permissions setting are affected by the current umask value.
2. Only `r` and `w` permissions can be set, since other permissions do not seem to be useful for mailboxes. However, for mailboxes that have a directory structure (such as maildir and MH), any settings in `g` and `o` sets imply setting the executable bit.
3. Owner’s permissions cannot be set. The owner always has all permissions on the mailbox he created.
4. The :permissions settings apply only to local mailboxes. They are ignored for remote mailboxes.

### `reject reason`

The optional `reject` action refuses delivery of a message by sending back a message delivery notification to the sender. It resends the message to the sender, wrapping it in a “reject” form, noting that it was rejected by the recipient. The required argument `reason` is a string specifying the reason for rejecting the message.

Example:

If the message contained

```
Date: Tue, 1 Apr 1997 09:06:31 -0800 (PST)
From: coyote@desert.example.org
To: roadrunner@acme.example.com
Subject: I have a present for you

I’ve got some great birdseed over here at my place.
Want to buy it?
```

and the user’s script contained:

```
if header :contains "from" "coyote@desert.example.org"
{
    reject "I am not taking mail from you, and I don’t want your birdseed, either!";
}
```

then the original sender `<coyote@desert.example.org>` would receive the following notification:

```
To: <coyote@desert.example.org>
X-Authentication-Warning: roadrunner set sender using -f flag
Content-Type: multipart/mixed; boundary=----- =_aaaaaaaaaa0
MIME-Version: 1.0
----- =_aaaaaaaaaa0
The original message was received at
Tue, 1 Apr 1997 09:07:15 -0800 from coyote@desert.example.org.
Message was refused by recipient’s mail filtering program.
Reason given was as follows:

I am not taking mail from you, and I don’t want your
birdseed, either!

----- _aaaaaaaaaaaa0
Content-Type: message/delivery-status

Reporting-UA: sieve; GNU Mailutils 0.1.3
Arrival-Date: Tue, 1 Apr 1997 09:07:15 -0800
Final-Recipient: RFC822; roadrunner@acme.example.com
Action: deleted
Disposition: automatic-action/MDN-sent-automatically;deleted
Last-Attempt-Date: Tue, 1 Apr 1997 09:07:15 -0800

----- _aaaaaaaaaaaa0
Content-Type: message/rfc822

From: coyote@desert.example.org
To: roadrunner@acme.example.com
Subject: I have a present for you

I’ve got some great birdseed over here at my place.
Want to buy it?

If the reason argument is rather long, the common approach is to use the combination of the text: and #include keywords, e.g.:

```plaintext
if header :mime :matches "Content-Type"
    [ "*application/msword;*", ",audio/x-midi*"
]
{
    reject text:
    #include "nomsword.txt"
    ;
}
```

**redirect address**

The redirect action is used to send the message to another user at a supplied address, as a mail forwarding feature does. This action makes no changes to the message body or existing headers, but it may add new headers. It also modifies the envelope recipient.

The redirect command performs an MTA-style “forward” — that is, what you get from a .forward file using sendmail under UNIX. The address on the SMTP envelope is replaced with the one on the redirect command and the message is sent back out. *Notice*, that it differs from the MUA-style forward, which creates a new message with a different sender and message ID, wrapping the old message in a new one.

### 5.7.2 External Actions

GNU Mailutils is shipped with a set of external Sieve actions. These actions are compiled as loadable modules and must be required prior to use (see Section 5.4 [Require Statement], page 167).

**moderator** [:keep] [:address address(string)] [:source sieve-file(string)] [:program sieve-text(string)]

Synopsis:
require "moderator"
moderator args;

Description: This action is a moderator robot for Mailman-driven mail archives. A Mailman moderation request is a MIME message consisting of the following three parts:

<table>
<thead>
<tr>
<th>N</th>
<th>Content-Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>text/plain</td>
<td>Introduction for the human reader.</td>
</tr>
<tr>
<td>2</td>
<td>message/rfc822</td>
<td>Original submission.</td>
</tr>
<tr>
<td>3</td>
<td>message/rfc822</td>
<td>Mailman control message.</td>
</tr>
</tbody>
</table>

Replying to part 3 (keeping the subject intact) instructs Mailman to discard the original submission.

Replying to part 3 while adding an ‘Approved:’ header with the list password in it approves the submission.

The moderator action spawns an inferior Sieve machine and filters the original submission (part 2) through it. If the inferior machine marks the message as deleted, the action replies to the control message, thereby causing the submission to be discarded. The ‘From:’ address of the reply can be modified using :address tag. After discarding the message, moderator marks it as deleted, unless it is given :keep tag.

If the :source tag is given, its argument specifies a Sieve source file to be used on the message. Otherwise, if :program is given, its argument supplies a Sieve program to be used on this message. At most one of these tags may be specified. Supplying them both, or supplying several instances of the same tag, is an error. The behavior of the action in this case is undefined.

If neither :program nor :source is given, moderator will create a copy of the existing Sieve machine and use it on the message.

The action checks the message structure: it will bail out if the message does not have exactly 3 MIME parts, or if parts 2 and 3 are not of ‘message/rfc822’ type. It is the responsibility of the caller to make sure the message is actually a valid Mailman moderation request (see the example below).

Example:

```plaintext
if allof(header :is "Sender" "mailman-bounces@gnu.org",
          header :is "X-List-Administrivia" "yes")
{
    moderator :source "~/.sieve/mailman.sv";
}
```

pipe [:envelope] [:header] [:body] command(string)  [Action]

Synopsis:

```plaintext
require "pipe";

pipe command
```
Description: The pipe action executes a shell command specified by its argument and pipes the entire message (including envelope) to its standard input. When given, tags :envelope, :header, and :body control what parts of the message to pipe to the command.

Example: The example below uses the putmail utility (see Section 3.14 [putmail], page 117) to forward the message to user 'gray' on the machine 'mail.gnu.org'.

```
require "pipe";
pipe "/usr/bin/putmail smtp://gray@mail.gnu.org"
```

```
vacation [:days ndays(number)] [:subject subject(string)] [:aliases addrlist(string-list)] [:noreply noreply-address(string-list)] [:reply_regex expr(string)] [:reply_prefix prefix(string)] [:sender email(string)] [:database path(string)] [:return_address email(string)] [:header headers(string-list)] [:mime] [:always_reply] [:rfc2822] [:file] text(string)
```

Syntax:

```
require "vacation";
vacation args;
```

Description: The vacation action returns a message with text to the sender. It is intended to inform the sender that the recipient is not currently reading his mail.

If the :file tag is present, text is treated as the name of the file to read the body of the reply message from. When used together with tag :rfc2822, the file should be formatted as a valid RFC 2822 message, i.e. headers followed by empty line and body. Headers may not contain 'To', 'From', and 'Subject', as these will be generated automatically.

If the :subject tag is given, its argument sets the subject of the message. Otherwise, the subject is formed by prefixing original subject with 'Re:', or the prefix given with the :reply_prefix tag. Before prefixing, any original prefixes matching extended regular expression expr (:reply_regex tag) are stripped from the subject line. If :reply_regex is not specified, the default regexp is `^re: *`.

Another headers can be added using the :header tag. Its argument is a list of header strings, each one having the form "name:value". Additional whitespace is allowed on both sides of the colon.

The :aliases tag instructs vacation to handle messages for any address in addrlist in the same manner as those received for the user’s principal email.

Before processing, vacation compares the sender address with its address exclusion list. Elements of this list are extended case-insensitive regular expressions. If the sender address matches any of these expressions, the message will not be replied. The default exclusion list is:

```
.*-REQUEST@.*
.*-RELAY@.*
```
New entries can be added to this list using :noreply tag.
The :days tag sets the reply interval. A reply is sent to each sender once in ndays days. GNU Sieve keeps track of sender addresses and dates in file .vacation stored in the user's home directory. The file name can be changed using the :database tag.
The tag :always_reply instructs vacation to respond to the message regardless of whether the user email is listed as a recipient for the message.

5.8 Extensions
The following extensions are implemented

5.8.1 The encoded-character extension
The ‘encoded-character’ extension complies with RFC 5228, part 2.4.2.4. It provides a way of incorporating multibyte sequences in a Sieve script using only ASCII characters. This is a built-in extension. It is enabled using the following statement:

```
require "encoded-character";
```

When this extension is enabled, the sequences ‘${hex: ...}’, and ‘${unicode: ...}’ can appear inside of quoted strings.

The sequence

```
${hex: XX}
```

where XX is a sequence of one or two-digit hex numbers separated by any amount of whitespace, is replaced with the octets with the hexadecimal values given by each hex number. For example,

```
"${hex: 24 24}" ⇒ "$$"
```

Thus, the following script will discard any message containing three contiguous dollar signs in its 'Subject' header:

```
require "encoded-character";

if header :contains "Subject" "${hex:24 24}" {
  discard;
}
```

The ‘hex:’ keyword is case-insensitive. If XX contains invalid hex numbers, the entire sequence is left verbatim. This is illustrated by the following example:

```
"${hex:40}" ⇒ "${hex:40}"
"${hex: 40 }" ⇒ "@"
"${HEX: 40}" ⇒ "@"
"${hex:40}" ⇒ "${hex:40}"
"${hex:400}" ⇒ "${hex:400}"
"${hex:4${hex:30}}" ⇒ "${hex:40}"
```
The sequence

```
${unicode: HEXNUM}
```

where \textit{HEXNUM} is a list of hexadecimal numbers separated with whitespace, will be replaced by the UTF-8 encoding of the specified Unicode characters, which are identified by the hexadecimal value of \textit{HEXNUM}. For example, the following string represents a single ‘@’ sign:

```
"${UNICODE:40}"
```

Similarly to ‘\textit{hex}’, the ‘\textit{unicode}’ indicator is case insensitive. The following examples demonstrate the handling of several valid and invalid encodings:

```
"${unicode:40}"  \Rightarrow "@"
"${ unicode:40}"  \Rightarrow "${ unicode:40}"
"${UNICODE:40}"  \Rightarrow "@"
"${UnICoDE:0000040}"  \Rightarrow "@"
"${Unicode:40}"  \Rightarrow "@"
"${Unicode:Cool}"  \Rightarrow "${Unicode:Cool}"
"${unicode:200000}"  \Rightarrow error
"${Unicode:DF01}"  \Rightarrow error
```

### 5.8.2 The relational extension

The ‘\textit{relational}’ extension complies with \textit{RFC 3431}. It is a built-in extension. When enabled, the two new match types become available: \textit{:count} and \textit{:value}. Both keywords take a single argument defining the relational operator to use:

- “\texttt{gt}”: greater than (‘\texttt{>}’)
- “\texttt{ge}”: greater than or equal (‘\texttt{>=}’)
- “\texttt{lt}”: less than (‘\texttt{<}’)
- “\texttt{le}”: less than or equal (‘\texttt{<=}’)
- “\texttt{eq}”: equal to (‘\texttt{==}’)
- “\texttt{ne}”: not equal to (‘\texttt{!=}’)

The \textit{:value} keyword requires a relational comparison between strings. The left side of the relation is formed by the value from the message. The right side of the relation is the value from the test expression. If there are multiple values on either side or both sides, the test is considered true if any pair is true. For example,

```
require ["relational", "fileinto"];

if header :value "gt" :comparator "i;ascii-numeric"
  ["x-spam-level"] ["5"]
  
  fileinto "spam";

```

The \textit{:count} keyword counts the specified entities in the message and compares their number with the value given in the test expression. The latter must be a list of one element. This match type can only be used with numeric comparators. For example, the following script will discard any message with 10 or more recipient addresses in the ‘\texttt{To}’ and ‘\texttt{Cc}’ headers:

```
require "relational";
```
if address :count "ge" :comparator "i;ascii-numeric"
    ["to", "cc"] ["10"]
{
    discard;
    }

5.8.3 The variables extension

The ‘variables’ extension is defined in RFC 5229. It is a built-in extension. It introduces support for variables in Sieve scripts.

There are two kind of variables: user-defined and match variables.

A user-defined variable is initialized using the set action:

\texttt{set [modifiers] name(string) value(string)} \hspace{1cm} \text{[Action]}

Stores the specified value in the variable identified by \texttt{name}. Optional \texttt{modifiers} are applied on \texttt{value} before it is stored in the variable.

The following modifiers are available:

- \texttt{:lower} \hspace{1cm} Convert value to lower case letters.
- \texttt{:upper} \hspace{1cm} Convert value to upper case letters.
- \texttt{:lowerfirst} \hspace{1cm} Convert the first character in value to lower case.
- \texttt{:upperfirst} \hspace{1cm} Convert the first character in value to upper case.
- \texttt{:quotewildcard} \hspace{1cm} Quote wildcard characters (‘*’, ‘?’, ‘\’) by prefixing each occurrence with a backslash (‘\’). This can be used to ensure that the variable will only match a literal occurrence if used as a parameter to \texttt{:matches}.
- \texttt{:length} \hspace{1cm} The value is the decimal number of characters in the expansion, converted to a string.

When several modifiers are present, they are applied in the following order of precedence (largest value first):

\begin{center}
\begin{tabular}{|c|c|}
\hline
\textbf{preference} & \textbf{modifiers} \\
\hline
40 & :lower or :upper \\
30 & :lowerfirst or :upperfirst \\
20 & :quotewildcard \\
10 & :length \\
\hline
\end{tabular}
\end{center}

Modifiers having the same precedence (i.e. listed on the same row in the above table) cannot be used together.

Variables are referenced within text strings using the construct ‘\texttt{$\{name\}$}’, where \texttt{name} is the name of the variable as it appeared in the first parameter to the \texttt{set} statement. For example:

```
require "variables";
```
set "sender" "root"

if envelope :matches "${sender}"
{
  ...
}

Match variables refer to parts of the most recently evaluated successful match of type :matches or :regex. They have names consisting entirely of decimal digits. The variable ‘${0}’ refers to the entire matched expression. The variable ‘${1}’ refers to the substring matching the first occurrence of the wildcard (‘?’ and ‘*’), ‘${2}’ refers to the second occurrence and so on. The wildcards match as little as possible (non-greedy matching). For example:

require ["variables", "fileinto"];

if header :matches "List-ID" "*<*
" {
    fileinto "INBOX.lists.${2}";
    stop;
}

If :regex match is used, the match variables starting from ‘${1}’ refer to the substrings of the argument value matching subsequent parenthesized groups of the regular expression.

string [comparator] [match-type] source(string-list) keys(string-list) [Test]
The string test compares two strings according to the selected comparator and match type. The test evaluates to ‘true’ if any two strings from source and keys match.

The ‘:count’ match used in ‘string’ counts each empty string as 0, and each non-empty one as 1. The count of a string list is the sum of the counts of the member strings.

5.8.4 environment
The ‘environment’ extension complies with RFC 5183. It is a built-in extension. It introduces the following test:

environment [comparator] [match-type] name(string) keys(string-list) [Test]
The environment test evaluates to ‘true’ if the value of the environment items name matches any string from keys.

The following environment items are defined:

domain The primary DNS domain of the machine where the Sieve script is executing.
host The fully-qualified domain name of the host where the Sieve script is executing.
location Type of service that is evaluating the script. Depending on the utility that is evaluating the script it is:
Utility Location
sieve "MUA", or set with the --environment option.

maidad "MDA"
inc "MUA"

name The string ‘GNU Mailutils’
phase The point relative to final delivery where the Sieve script is being evaluated. Depending on the utility that is evaluating the script it is:

Utility Location
sieve 'post' unless set with the --environment option.

maidad "during"
inc "post"

version Mailutils version string (e.g. ‘3.10’).

5.8.5 The numaddr extension
This is an example loadable extension. Section 5.6.2 [External Tests], page 173.

5.8.6 The editheader extension
The editheader extension complies with RFC 5293. It provides the following actions:

addheader [:last] field-name(string) value(string)  [Action]
Adds a header field to the existing message header. By default the header is inserted at the beginning of the header list. If the tag :last is specified, it is appended at the end.

deleteheader [:index fieldno(number) :last] [comparator] [match-type] field-name(string) [value-patterns(string-list)]  [Action]
Deletes occurrences of the header field matching the criteria.
The value-patterns, if specified, determines which occurrences of the header field to delete. If not supplied, comparator and match-type are silently ignored.
If ‘:index fieldno’ is specified, only the numbered occurrence of the named header field will be matched (header numbering begins at 1). If :last is specified, the count is backwards; 1 denotes the last named header field, 2 the second to last, and so on. The counting happens before the value-patterns match, if any. Thus, e.g. the action
deleteheader :index 1 :contains "Delivered-To" "bob@example.com";
would delete the first ‘Delivered-To’ header field if it contains the string ‘bob@example.com’.

5.8.7 The list extension
Section 5.6.2 [External Tests], page 173.

5.8.8 The moderator extension
A loadable extension implementing a moderator robot for Mailman-driven mail archives. Section 5.7.2 [External Actions], page 179.
5.8.9 The pipe extension

A loadable extension for external command execution. It provides the pipe action (see Section 5.7.2 [External Actions], page 179) and test (see Section 5.6.2 [External Tests], page 173).

5.8.10 The spamd extension

Implements a test which interfaces to SpamAssassin filter. This is a loadable extension. see Section 5.6.2 [External Tests], page 173.

5.8.11 The timestamp extension

The loadable extension timestamp implements a test for comparing the value of a structured date header field with the given date.

Note: this extension will probably phase away in favor of the date Sieve extension (RFC 5260).

5.8.12 The vacation extension

The loadable extension vacation provides the action intended to inform the sender that the recipient is not currently reading his mail.

See Section 5.7.2 [External Actions], page 179.

5.9 GNU Extensions

This section summarizes the GNU extensions to the sieve language

1. Multiline strings syntax

   GNU libmu_sieve understands the following multiline string syntax:
   
   text:[-][delimiter]
   ....
   delimiter

   The meaning of optional flags is the same as in shell “here document” construct: the dash strips all leading tab characters from the string body, thus allowing it to be indented in a natural fashion; delimiter introduces the new end-of-text delimiter instead of the default dot. If delimiter starts with a backslash, no preprocessing will be performed within a string.

2. Handling of the require statement.

   • According to the RFC an error must occur if a require appears after a command other than require. The GNU sieve library allows interspersing the require and other statements. The only requirement is that require must occur before a statement that is using the required capability (see Section 5.4 [Require Statement], page 167).

   • Prefixing the required capability with “test” requires the use of an extension test.

3. header test

   The header takes an optional argument :mime, meaning to scan the headers from each part of a multipart message.
4. **size** test
   The **size** test allows to omit the optional argument (:over|:under). In this case exact equality is assumed.

5. **envelope** test
   The only value that can be meaningfully used as the first required argument of an **envelope** test is `from`. This limitation may disappear from the subsequent releases.

6. **fileinto** action
   The **fileinto** action allows to specify permissions on the mailbox, in case it will be created (see [fileinto], page 177).

7. Match type optional argument.
   Along with the usual :is, :matches and :contains matching type, GNU sieve library understands :regex type. This matching type toggles POSIX Extended Regular Expression matching.
6 Reporting Bugs

Email bug reports to bug-mailutils@gnu.org.

As the purpose of bug reporting is to improve software, please be sure to include maximum information when reporting a bug. The information needed is:

- Version of the package you are using.
- Compilation options used when configuring the package.
- Conditions under which the bug appears.

The archives of bug-mailutils mailing list are available from http://mail.gnu.org/mailman/listinfo/bug-mailutils.
7 Getting News About GNU Mailutils


The updated versions of this manual are available online from http://mailutils.org/manual. See also Mailutils Wiki (http://mailutils.org/wiki) for the latest updates.
8 Acknowledgement

In no particular order,

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- Jordi Mallach jordi@sindominio.net
- Wojciech Polak polak@gnu.org
Appendix A References

Editor’s note:
This node is to be written.
Appendix B Date Input Formats

First, a quote:

Our units of temporal measurement, from seconds on up to months, are so complicated, asymmetrical and disjunctive so as to make coherent mental reckoning in time all but impossible. Indeed, had some tyrannical god contrived to enslave our minds to time, to make it all but impossible for us to escape subjection to sodden routines and unpleasant surprises, he could hardly have done better than handing down our present system. It is like a set of trapezoidal building blocks, with no vertical or horizontal surfaces, like a language in which the simplest thought demands ornate constructions, useless particles and lengthy circumlocutions. Unlike the more successful patterns of language and science, which enable us to face experience boldly or at least level-headedly, our system of temporal calculation silently and persistently encourages our terror of time.

... It is as though architects had to measure length in feet, width in meters and height in ells; as though basic instruction manuals demanded a knowledge of five different languages. It is no wonder then that we often look into our own immediate past or future, last Tuesday or a week from Sunday, with feelings of helpless confusion. . . .

— Robert Grudin, *Time and the Art of Living*.

This section describes the textual date representations that GNU programs accept. These are the strings you, as a user, can supply as arguments to the various programs. The C interface (via the `get_date` function) is not described here.

B.1 General date syntax

A *date* is a string, possibly empty, containing many items separated by whitespace. The whitespace may be omitted when no ambiguity arises. The empty string means the beginning of today (i.e., midnight). Order of the items is immaterial. A date string may contain many flavors of items:

- calendar date items
- time of day items
- time zone items
- day of the week items
- relative items
- pure numbers.

We describe each of these item types in turn, below.

A few ordinal numbers may be written out in words in some contexts. This is most useful for specifying day of the week items or relative items (see below). Among the most commonly used ordinal numbers, the word ‘last’ stands for −1, ‘this’ stands for 0, and ‘first’ and ‘next’ both stand for 1. Because the word ‘second’ stands for the unit of time there is no way to write the ordinal number 2, but for convenience ‘third’ stands for 3, ‘fourth’ for 4, ‘fifth’ for 5, ‘sixth’ for 6, ‘seventh’ for 7, ‘eighth’ for 8, ‘ninth’ for 9, ‘tenth’ for 10, ‘eleventh’ for 11 and ‘twelfth’ for 12.
When a month is written this way, it is still considered to be written numerically, instead of being “spelled in full”; this changes the allowed strings.


The output of the date command is not always acceptable as a date string, not only because of the language problem, but also because there is no standard meaning for time zone items like ‘IST’. When using date to generate a date string intended to be parsed later, specify a date format that is independent of language and that does not use time zone items other than ‘UTC’ and ‘Z’. Here are some ways to do this:

```
$ LC_ALL=C TZ=UTC0 date
Mon Mar  1 00:21:42 UTC 2004
$ TZ=UTC0 date +'%Y-%m-%d %H:%M:%SZ'
2004-03-01 00:21:42Z

$ date --iso-8601=ns | tr T ' ' # --iso-8601 is a GNU extension.
2004-02-29 16:21:42,692722128-0800
$ date --rfc-2822 # a GNU extension
Sun, 29 Feb 2004 16:21:42 -0800
$ date +'%Y-%m-%d %H:%M:%S %z' # %z is a GNU extension.
2004-02-29 16:21:42 -0800
$ date +'@%s.%N' # %s and %N are GNU extensions.
@1078100502.692722128
```

Alphabetic case is completely ignored in dates. Comments may be introduced between round parentheses, as long as included parentheses are properly nested. Hyphens not followed by a digit are currently ignored. Leading zeros on numbers are ignored.

Invalid dates like ‘2005-02-29’ or times like ‘24:00’ are rejected. In the typical case of a host that does not support leap seconds, a time like ‘23:59:60’ is rejected even if it corresponds to a valid leap second.

### B.2 Calendar date items

A calendar date item specifies a day of the year. It is specified differently, depending on whether the month is specified numerically or literally. All these strings specify the same calendar date:

```
1972-09-24 # ISO 8601.
72-9-24 # Assume 19xx for 69 through 99,
    # 20xx for 00 through 68.
72-09-24 # Leading zeros are ignored.
9/24/72 # Common U.S. writing.
24 September 1972
24 Sept 72 # September has a special abbreviation.
24 Sep 72 # Three-letter abbreviations always allowed.
Sep 24, 1972
24-sep-72
24sep72
```

The year can also be omitted. In this case, the last specified year is used, or the current year if none. For example:
Here are the rules.

For numeric months, the ISO 8601 format ‘year-month-day’ is allowed, where year is any positive number, month is a number between 01 and 12, and day is a number between 01 and 31. A leading zero must be present if a number is less than ten. If year is 68 or smaller, then 2000 is added to it; otherwise, if year is less than 100, then 1900 is added to it. The construct ‘month/day/year’, popular in the United States, is accepted. Also ‘month/day’, omitting the year.


When months are written literally, the calendar date may be given as any of the following:

```
day month year
day month
month day year
day-month-year
```

Or, omitting the year:

```
month day
```

### B.3 Time of day items

A *time of day item* in date strings specifies the time on a given day. Here are some examples, all of which represent the same time:

```
20:02:00.000000
20:02
8:02pm
20:02-0500  # In EST (U.S. Eastern Standard Time).
```

More generally, the time of day may be given as ‘hour:minute:second’, where hour is a number between 0 and 23, minute is a number between 0 and 59, and second is a number between 0 and 59 possibly followed by ‘.’ or ‘,’ and a fraction containing one or more digits. Alternatively, ‘:second’ can be omitted, in which case it is taken to be zero. On the rare hosts that support leap seconds, second may be 60.

If the time is followed by ‘am’ or ‘pm’ (or ‘a.m.’ or ‘p.m.’), hour is restricted to run from 1 to 12, and ‘:minute’ may be omitted (taken to be zero). ‘am’ indicates the first half of the day, ‘pm’ indicates the second half of the day. In this notation, 12 is the predecessor of 1: midnight is ‘12am’ while noon is ‘12pm’. (This is the zero-oriented interpretation of ‘12am’ and ‘12pm’, as opposed to the old tradition derived from Latin which uses ‘12m’ for noon and ‘12pm’ for midnight.)

The time may alternatively be followed by a time zone correction, expressed as ‘shhmm’, where s is ‘+’ or ‘-’, hh is a number of zone hours and mm is a number of zone minutes. The zone minutes term, mm, may be omitted, in which case the one- or two-digit correction is interpreted as a number of hours. You can also separate hh from mm with a colon. When a time zone correction is given this way, it forces interpretation of the time relative to
Coordinated Universal Time (UTC), overriding any previous specification for the time zone or the local time zone. For example, ‘+0530’ and ‘+05:30’ both stand for the time zone 5.5 hours ahead of UTC (e.g., India). This is the best way to specify a time zone correction by fractional parts of an hour. The maximum zone correction is 24 hours.

Either ‘am’/‘pm’ or a time zone correction may be specified, but not both.

B.4 Time zone items

A time zone item specifies an international time zone, indicated by a small set of letters, e.g., ‘UTC’ or ‘Z’ for Coordinated Universal Time. Any included periods are ignored. By following a non-daylight-saving time zone by the string ‘DST’ in a separate word (that is, separated by some white space), the corresponding daylight saving time zone may be specified. Alternatively, a non-daylight-saving time zone can be followed by a time zone correction, to add the two values. This is normally done only for ‘UTC’; for example, ‘UTC+05:30’ is equivalent to ‘+05:30’.

Time zone items other than ‘UTC’ and ‘Z’ are obsolescent and are not recommended, because they are ambiguous; for example, ‘EST’ has a different meaning in Australia than in the United States. Instead, it’s better to use unambiguous numeric time zone corrections like ‘-0500’, as described in the previous section.

If neither a time zone item nor a time zone correction is supplied, time stamps are interpreted using the rules of the default time zone (see Section B.9 [Specifying time zone rules], page 202).

B.5 Day of week items

The explicit mention of a day of the week will forward the date (only if necessary) to reach that day of the week in the future.

Days of the week may be spelled out in full: ‘Sunday’, ‘Monday’, ‘Tuesday’, ‘Wednesday’, ‘Thursday’, ‘Friday’ or ‘Saturday’. Days may be abbreviated to their first three letters, optionally followed by a period. The special abbreviations ‘Tues’ for ‘Tuesday’, ‘Wednes’ for ‘Wednesday’ and ‘Thur’ or ‘Thurs’ for ‘Thursday’ are also allowed.

A number may precede a day of the week item to move forward supplementary weeks. It is best used in expression like ‘third monday’. In this context, ‘last day’ or ‘next day’ is also acceptable; they move one week before or after the day that day by itself would represent.

A comma following a day of the week item is ignored.

B.6 Relative items in date strings

Relative items adjust a date (or the current date if none) forward or backward. The effects of relative items accumulate. Here are some examples:

1 year
1 year ago
3 years
2 days

The unit of time displacement may be selected by the string ‘year’ or ‘month’ for moving by whole years or months. These are fuzzy units, as years and months are not all of equal
duration. More precise units are ‘fortnight’ which is worth 14 days, ‘week’ worth 7 days, ‘day’ worth 24 hours, ‘hour’ worth 60 minutes, ‘minute’ or ‘min’ worth 60 seconds, and ‘second’ or ‘sec’ worth one second. An ‘s’ suffix on these units is accepted and ignored.

The unit of time may be preceded by a multiplier, given as an optionally signed number. Unsigned numbers are taken as positively signed. No number at all implies 1 for a multiplier. Following a relative item by the string ‘ago’ is equivalent to preceding the unit by a multiplier with value −1.

The string ‘tomorrow’ is worth one day in the future (equivalent to ‘day’), the string ‘yesterday’ is worth one day in the past (equivalent to ‘day ago’).

The strings ‘now’ or ‘today’ are relative items corresponding to zero-valued time displacement, these strings come from the fact a zero-valued time displacement represents the current time when not otherwise changed by previous items. They may be used to stress other items, like in ‘12:00 today’. The string ‘this’ also has the meaning of a zero-valued time displacement, but is preferred in date strings like ‘this thursday’.

When a relative item causes the resulting date to cross a boundary where the clocks were adjusted, typically for daylight saving time, the resulting date and time are adjusted accordingly.

The fuzz in units can cause problems with relative items. For example, ‘2003-07-31 -1 month’ might evaluate to 2003-07-01, because 2003-06-31 is an invalid date. To determine the previous month more reliably, you can ask for the month before the 15th of the current month. For example:

```
$ date -R
Thu, 31 Jul 2003 13:02:39 -0700
$ date --date='-1 month' +'Last month was %B?'
Last month was July?
$ date --date="$(date +%Y-%m-15) -1 month" +'Last month was %B!'
Last month was June!
```

Also, take care when manipulating dates around clock changes such as daylight saving leaps. In a few cases these have added or subtracted as much as 24 hours from the clock, so it is often wise to adopt universal time by setting the TZ environment variable to ‘UTC0’ before embarking on calendrical calculations.

### B.7 Pure numbers in date strings

The precise interpretation of a pure decimal number depends on the context in the date string.

If the decimal number is of the form `yyyy/mm/dd` and no other calendar date item (see Section B.2 [Calendar date items], page 198) appears before it in the date string, then `yyyy` is read as the year, `mm` as the month number and `dd` as the day of the month, for the specified calendar date.

If the decimal number is of the form `hh:mm` and no other time of day item appears before it in the date string, then `hh` is read as the hour of the day and `mm` as the minute of the hour, for the specified time of day. `mm` can also be omitted.

If both a calendar date and a time of day appear to the left of a number in the date string, but no relative item, then the number overrides the year.
B.8 Seconds since the Epoch

If you precede a number with ‘@’, it represents an internal time stamp as a count of seconds. The number can contain an internal decimal point (either ‘.’ or ‘,’); any excess precision not supported by the internal representation is truncated toward minus infinity. Such a number cannot be combined with any other date item, as it specifies a complete time stamp.

Internally, computer times are represented as a count of seconds since an epoch—a well-defined point of time. On GNU and POSIX systems, the epoch is 1970-01-01 00:00:00 UTC, so ‘@0’ represents this time, ‘@1’ represents 1970-01-01 00:00:01 UTC, and so forth. GNU and most other POSIX-compliant systems support such times as an extension to POSIX, using negative counts, so that ‘@-1’ represents 1969-12-31 23:59:59 UTC.

Traditional Unix systems count seconds with 32-bit two’s-complement integers and can represent times from 1901-12-13 20:45:52 through 2038-01-19 03:14:07 UTC. More modern systems use 64-bit counts of seconds with nanosecond subcounts, and can represent all the times in the known lifetime of the universe to a resolution of 1 nanosecond.

On most hosts, these counts ignore the presence of leap seconds. For example, on most hosts ‘@915148799’ represents 1998-12-31 23:59:59 UTC, ‘@915148800’ represents 1999-01-01 00:00:00 UTC, and there is no way to represent the intervening leap second 1998-12-31 23:59:60 UTC.

B.9 Specifying time zone rules

Normally, dates are interpreted using the rules of the current time zone, which in turn are specified by the TZ environment variable, or by a system default if TZ is not set. To specify a different set of default time zone rules that apply just to one date, start the date with a string of the form ‘TZ="rule"’. The two quote characters (‘”’) must be present in the date, and any quotes or backslashes within rule must be escaped by a backslash.

For example, with the GNU date command you can answer the question “What time is it in New York when a Paris clock shows 6:30am on October 31, 2004?” by using a date beginning with ‘TZ="Europe/Paris"’ as shown in the following shell transcript:

```
$ export TZ="America/New_York"
$ date --date='TZ="Europe/Paris" 2004-10-31 06:30'
Sun Oct 31 01:30:00 EDT 2004
```

In this example, the --date operand begins with its own TZ setting, so the rest of that operand is processed according to ‘Europe/Paris’ rules, treating the string ‘2004-10-31 06:30’ as if it were in Paris. However, since the output of the date command is processed according to the overall time zone rules, it uses New York time. (Paris was normally six hours ahead of New York in 2004, but this example refers to a brief Halloween period when the gap was five hours.)

A TZ value is a rule that typically names a location in the ‘tz’ database (http://www.twinsun.com/tz/tz-link.htm). A recent catalog of location names appears in the TWiki Date and Time Gateway (http://twiki.org/cgi-bin/xtra/tzdate). A few non-GNU hosts require a colon before a location name in a TZ setting, e.g., ‘TZ=":America/New_York"’.

The ‘tz’ database includes a wide variety of locations ranging from ‘Arctic/Longyearbyen’ to ‘Antarctica/South_Pole’, but if you are at sea and
have your own private time zone, or if you are using a non-GNU host that does not support
the ‘tz’ database, you may need to use a POSIX rule instead. Simple POSIX rules like
‘UTC0’ specify a time zone without daylight saving time; other rules can specify simple
daylight saving regimes. See Section “Specifying the Time Zone with TZ” in The GNU C
Library.

B.10 Authors of get_date

get_date was originally implemented by Steven M. Bellovin (smb@research.att.com)
while at the University of North Carolina at Chapel Hill. The code was later tweaked
by a couple of people on Usenet, then completely overhauled by Rich $alz (rsalz@bbn.com)
and Jim Berets (jberets@bbn.com) in August, 1990. Various revisions for the GNU system
were made by David MacKenzie, Jim Meyering, Paul Eggert and others.

This chapter was originally produced by François Pinard (pinard@iro.umontreal.ca)
from the getdate.y source code, and then edited by K. Berry (kb@cs.umb.edu).
Appendix C Date/time Format String

This appendix documents the format specifications for outputting date/time values. It is used, in particular, by the `mail` utility (see [headline], page 76).

Essentially, it is a reproduction of the man page for GNU `strftime` function. Some of the conversion specifiers might not be available on all systems, due to differences in `strftime` between systems. If unsure, please consult Section “strftime” in the `strftime(3)` man page.

Ordinary characters placed in the format string are reproduced without conversion. Conversion specifiers are introduced by a ‘%’ character, and are replaced as follows:

- `%a` The abbreviated weekday name according to the current locale.
- `%A` The full weekday name according to the current locale.
- `%b` The abbreviated month name according to the current locale.
- `%B` The full month name according to the current locale.
- `%c` The preferred date and time representation for the current locale.
- `%C` The century number (year/100) as a 2-digit integer.
- `%d` The day of the month as a decimal number (range 01 to 31).
- `%D` Equivalent to ‘%m/%d/%y’.
- `%e` Like ‘%d’, the day of the month as a decimal number, but a leading zero is replaced by a space.
- `%E` Modifier: use alternative format, see below (see [conversion specs], page 207).
- `%F` Equivalent to ‘%Y-%m-%d’ (the ISO 8601 date format).
- `%G` The ISO 8601 year with century as a decimal number. The 4-digit year corresponding to the ISO week number (see ‘%V’). This has the same format and value as ‘%y’, except that if the ISO week number belongs to the previous or next year, that year is used instead.
- `%g` Like ‘%G’, but without century, i.e., with a 2-digit year (00-99).
- `%h` Equivalent to ‘%b’.
%H  The hour as a decimal number using a 24-hour clock (range 00 to 23).

%I  The hour as a decimal number using a 12-hour clock (range 01 to 12).

%j  The day of the year as a decimal number (range 001 to 366).

%k  The hour (24-hour clock) as a decimal number (range 0 to 23); single digits are preceded by a blank. (See also ‘%H’.)

%l  The hour (12-hour clock) as a decimal number (range 1 to 12); single digits are preceded by a blank. (See also ‘%I’.)

%m  The month as a decimal number (range 01 to 12).

%M  The minute as a decimal number (range 00 to 59).

%n  A newline character.

%O  Modifier: use alternative format, see below (see [conversion specs], page 207).

%p  Either ‘AM’ or ‘PM’ according to the given time value, or the corresponding strings for the current locale. Noon is treated as ‘pm’ and midnight as ‘am’.

%P  Like ‘%p’ but in lowercase: ‘am’ or ‘pm’ or a corresponding string for the current locale.

%r  The time in ‘a.m.’ or ‘p.m.’ notation. In the POSIX locale this is equivalent to ‘%I:%M:%S %p’.

%R  The time in 24-hour notation (‘%H:%M’). For a version including the seconds, see ‘%T’ below.

%s  The number of seconds since the Epoch, i.e., since 1970-01-01 00:00:00 UTC.

%S  The second as a decimal number (range 00 to 61).

%t  A tab character.

%T  The time in 24-hour notation (‘%H:%M:%S’).
%u The day of the week as a decimal, range 1 to 7, Monday being 1. See also ‘%w’.

%U The week number of the current year as a decimal number, range 00 to 53, starting with the first Sunday as the first day of week 01. See also ‘%V’ and ‘%W’.

%V The ISO 8601:1988 week number of the current year as a decimal number, range 01 to 53, where week 1 is the first week that has at least 4 days in the current year, and with Monday as the first day of the week. See also ‘%U’ and ‘%W’.

%w The day of the week as a decimal, range 0 to 6, Sunday being 0. See also ‘%u’.

%W The week number of the current year as a decimal number, range 00 to 53, starting with the first Monday as the first day of week 01.

%x The preferred date representation for the current locale without the time.

%x The preferred time representation for the current locale without the date.

%y The year as a decimal number without a century (range 00 to 99).

%Y The year as a decimal number including the century.

%z The time-zone as hour offset from GMT. Required to emit RFC822-conformant dates (using ‘%a, %d %b %Y %H:%M:%S %z’)

%Z The time zone or name or abbreviation.

%+ The date and time in date(1) format.

%% A literal ‘%’ character.

Some conversion specifiers can be modified by preceding them by the ‘E’ or ‘O’ modifier to indicate that an alternative format should be used. If the alternative format or specification does not exist for the current locale, the behaviour will be as if the unmodified conversion specification were used. The Single Unix Specification mentions ‘%Ec’, ‘%EC’, ‘%Ex’, ‘%EX’, ‘%Ry’, ‘%Ey’, ‘%Od’, ‘%Od’, ‘%Oh’, ‘%OI’, ‘%Om’, ‘%OS’, ‘%Ou’, ‘%OU’, ‘%OV’, ‘%Ow’, ‘%OW’, ‘%Oy’, where the effect of the ‘O’ modifier is to use alternative numeric symbols (say, roman numerals), and that of the ‘E’ modifier is to use a locale-dependent alternative representation.
Appendix D Configuring Help Summary

Running `prog --help` displays the short usage summary for `prog` utility (see Section 3.1.2 [Common Options], page 8). This summary is organized by groups of semantically close options. The options within each group are printed in the following order: a short option, eventually followed by a list of corresponding long option names, followed by a short description of the option. For example, here is an excerpt from the actual `sieve --help` output:

- `-c, --compile-only` Compile script and exit
- `-d, --debug=[FLAGS]` Debug flags
- `-e, --email=ADDRESS` Override user email address

The exact visual representation of the help output is configurable via `ARGP_HELP_FMT` environment variable. The value of this variable is a comma-separated list of format variable assignments. There are two kinds of format variables. An offset variable keeps the offset of some part of help output text from the leftmost column on the screen. A boolean variable is a flag that toggles some output feature on or off. Depending on the type of the corresponding variable, there are two kinds of assignments:

Offset assignment

The assignment to an offset variable has the following syntax:

```
variable=value
```

where variable is the variable name, and value is a numeric value to be assigned to the variable.

Boolean assignment

To assign `true` value to a variable, simply put this variable name. To assign `false` value, prefix the variable name with `no-`. For example:

```
# Assign true value:
dup-args
# Assign false value:
no-dup-args
```

Following variables are declared:

**boolean dup-args**

If true, arguments for an option are shown with both short and long options, even when a given option has both forms, for example:

```
-e ADDRESS, --email=ADDRESS Override user email address
```

If false, then if an option has both short and long forms, the argument is only shown with the long one, for example:

```
-e, --email=ADDRESS Override user email address
```

and a message indicating that the argument is applicable to both forms is printed below the options. This message can be disabled using `dup-args-note` (see below).

The default is false.

**boolean dup-args-note**

If this variable is true, which is the default, the following notice is displayed at the end of the help output:
Mandatory or optional arguments to long options are also mandatory or optional for any corresponding short options.

Setting `no-dup-args-note` inhibits this message. Normally, only one of variables `dup-args` or `dup-args-note` should be set.

**offset short-opt-col**

Column in which short options start. Default is 2.

```bash
$ sieve --help|grep ADDRESS
-e, --email=ADDRESS Override user email address
$ ARGP_HELP_FMT=short-opt-col=6 sieve --help|grep ARCHIVE
-e, --email=ADDRESS Override user email address
```

**offset long-opt-col**

Column in which long options start. Default is 6. For example:

```bash
$ sieve --help|grep ADDRESS
-e, --email=ADDRESS Override user email address
$ ARGP_HELP_FMT=long-opt-col=16 sieve --help|grep ADDRESS
-e, --email=ADDRESS Override user email address
```

**offset doc-opt-col**

Column in which `doc options` start. A doc option isn’t actually an option, but rather an arbitrary piece of documentation that is displayed in much the same manner as the options. For example, in the output of `folder --help`:

```
Usage: folder [OPTION...] [action] [msg]
GNU MH folder
Actions are:
  --list List the contents of the folder stack
...
```

the string ‘Actions are:’ is a doc option. Thus, if you set `ARGP_HELP_FMT=doc-opt-col=6` the above part of the help output will look as follows:

```
Usage: folder [OPTION...] [action] [msg]
GNU MH folder
Actions are:
  --list List the contents of the folder stack
...
```

**offset opt-doc-col**

Column in which option description starts. Default is 29.

```bash
$ sieve --help|grep ADDRESS
-e, --email=ADDRESS Override user email address
$ ARGP_HELP_FMT=opt-doc-col=19 sieve --help|grep ADDRESS
-e, --email=ADDRESS Override user email address
$ ARGP_HELP_FMT=opt-doc-col=9 sieve --help|grep -i ADDRESS
-e, --email=ADDRESS Override user email address
```

Notice, that the description starts on a separate line if `opt-doc-col` value is too small.
offset header-col

Column in which group headers are printed. A group header is a descriptive text preceding an option group. For example, in the following text:

Sieve options
-I, --includedir=DIR Append directory DIR to the
list of include directories

the text ‘Sieve options’ is a group header.

The default value is 1.

offset usage-indent

Indentation of wrapped usage lines. Affects --usage output. Default is 12.

offset rmargin

Right margin of the text output. Used for wrapping.
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This is an alphabetical list of all Mailutils functions.

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