Version : **2024.01**

Dernière mise-à-jour : 2024/03/08 08:30

LDF502 - Gestion des Paquets

Contenu du Module

- La Commande ldconfig

LAB #1 - Compiler à partir des sources

Historiquement il était nécessaire d'installer un logiciel à partir de ses fichiers sources.

Pour commencer, installez les outils dont vous aurez besoin :

```
root@debian11:~# apt-get -y install gcc
```

Pour comprendre ce qui est la compilation d'un logiciel, commencez par télécharger le logiciel hello :

```
root@debian11:~# wget --no-check-certificate https://ftp.gnu.org/gnu/hello/hello-2.1.1.tar.gz
--2022-04-25 13:38:57--  https://ftp.gnu.org/gnu/hello/hello-2.1.1.tar.gz
Resolving ftp.gnu.org (ftp.gnu.org)... 209.51.188.20, 2001:470:142:3::b
Connecting to ftp.gnu.org (ftp.gnu.org)|209.51.188.20|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 389363 (380K) [application/x-gzip]
Saving to: ‘hello-2.1.1.tar.gz’

hello-2.1.1.tar.gz
100%[=============================================================================================
========>] 380.24K   864KB/s    in 0.4s

2022-04-25 13:38:58 (864 KB/s) - ‘hello-2.1.1.tar.gz’ saved [389363/389363]
```

Ensuite désarchivez le logiciel :

```
root@debian11:~# tar xvf hello-2.1.1.tar.gz
```

Changez de répertoire :

```
root@debian11:~# cd hello-2.1.1/
root@debian11:~/hello-2.1.1# ls
ABOUT-NLS   AUTHORS  ChangeLog    config.guess  config.rpath  configure     contrib  depcomp  INSTALL     intl
Makefile.am  man      mkinstalldirs  po      src    THANKS
aclocal.m4  BUGS     ChangeLog.O  config.h.in   config.sub    configure.ac  COPYING  doc      install-sh  m4
Makefile.in  missing  NEWS           README  tests  TODO
```

A l'étude du fichier README, celui-ci nous renvoie vers le fichier **INSTALL** :

```
root@debian11:~/hello-2.1.1# cat README
We are pleased to announce the version 2.1 release of GNU Hello.
All reported bugs in previous test releases have been fixed.
Some bugs surely remain.

The GNU implementation of this classic program is brought to you by
the efforts of several people, including Mike Haertel, David MacKenzie,
Jan Brittenson, Roland McGrath, Charles Hannum, and The King.

The basic algorithm is described in: "The C Programming Language", by
B. W. Kernighan and D. M. Ritchie, Prentice-Hall, New Jersey, 1978;
the program is an enhancement of the one published in that book.

See the file INSTALL for building and installation instructions.

Please send all bug reports by electronic mail to:
    bug-gnu-hello@gnu.org

GNU Hello is free software.  See the file COPYING for copying conditions.
```

Visualisez donc ce dernier :

```
root@debian11:~/hello-2.1.1# more INSTALL
Copyright 1994, 1995, 1996, 1999, 2000, 2001 Free Software Foundation,
Inc.
```

```
   This file is free documentation; the Free Software Foundation gives
unlimited permission to copy, distribute and modify it.

Basic Installation
==================

   These are generic installation instructions.

   The `configure' shell script attempts to guess correct values for
various system-dependent variables used during compilation.  It uses
those values to create a `Makefile' in each directory of the package.
It may also create one or more `.h' files containing system-dependent
definitions.  Finally, it creates a shell script `config.status' that
you can run in the future to recreate the current configuration, and a
file `config.log' containing compiler output (useful mainly for
debugging `configure').

   It can also use an optional file (typically called `config.cache'
and enabled with `--cache-file=config.cache' or simply `-C') that saves
the results of its tests to speed up reconfiguring.  (Caching is
disabled by default to prevent problems with accidental use of stale
cache files.)

   If you need to do unusual things to compile the package, please try
to figure out how `configure' could check whether to do them, and mail
diffs or instructions to the address given in the `README' so they can
be considered for the next release.  If you are using the cache, and at
some point `config.cache' contains results you don't want to keep, you
may remove or edit it.

   The file `configure.ac' (or `configure.in') is used to create
`configure' by a program called `autoconf'.  You only need
`configure.ac' if you want to change it or regenerate `configure' using
a newer version of `autoconf'.
```

```
The simplest way to compile this package is:

  1. `cd' to the directory containing the package's source code and type
     `./configure' to configure the package for your system.  If you're
     using `csh' on an old version of System V, you might need to type
     `sh ./configure' instead to prevent `csh' from trying to execute
     `configure' itself.

     Running `configure' takes awhile.  While running, it prints some
     messages telling which features it is checking for.

  2. Type `make' to compile the package.

  3. Optionally, type `make check' to run any self-tests that come with
     the package.

  4. Type `make install' to install the programs and any data files and
     documentation.

  5. You can remove the program binaries and object files from the
--More--(26%)
[q] <<<<<<<<<<<< Appuyez sur la touche q
```

La procédure expliquée est celle utilisée pour la plupart des installations manuelles, à savoir la saisie des quatre commandes suivantes.

1.1 - ./configure

Important : **configure** est un script chargé de créer les ***makefiles*** pour une architecture donnée. Les ***makefiles*** sont lus par la commande **make**.

```
root@debian11:~/hello-2.1.1# ./configure
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... yes
checking for gawk... no
checking for mawk... mawk
checking whether make sets ${MAKE}... no
checking for gcc... gcc
checking for C compiler default output... a.out
checking whether the C compiler works... yes
checking whether we are cross compiling... no
checking for suffix of executables...
checking for suffix of object files... o
checking whether we are using the GNU C compiler... yes
checking whether gcc accepts -g... yes
checking for style of include used by make... none
checking dependency style of gcc... none
checking for strerror in -lcposix... no
checking how to run the C preprocessor... gcc -E
checking for ANSI C header files... yes
checking for sys/types.h... yes
checking for sys/stat.h... yes
checking for stdlib.h... yes
checking for string.h... yes
checking for memory.h... yes
checking for strings.h... yes
checking for inttypes.h... yes
checking for stdint.h... yes
checking for unistd.h... yes
checking for string.h... (cached) yes
checking fcntl.h usability... yes
checking fcntl.h presence... yes
checking for fcntl.h... yes
checking sys/file.h usability... yes
checking sys/file.h presence... yes
```

```
checking for sys/file.h... yes
checking sys/param.h usability... yes
checking sys/param.h presence... yes
checking for sys/param.h... yes
checking for working alloca.h... yes
checking for alloca... yes
checking for struct stat.st_blksize... yes
checking for msgfmt... no
checking for gmsgfmt... :
checking for xgettext... no
checking for msgmerge... no
checking build system type... x86_64-unknown-linux
checking host system type... x86_64-unknown-linux
checking for ranlib... ranlib
checking for gcc option to accept ANSI C... none needed
checking for an ANSI C-conforming const... yes
checking for inline... inline
checking for off_t... yes
checking for size_t... yes
checking for stdlib.h... (cached) yes
checking for unistd.h... (cached) yes
checking for getpagesize... yes
checking for working mmap... yes
checking whether we are using the GNU C Library 2.1 or newer... yes
checking for ld used by GCC... /usr/bin/ld
checking if the linker (/usr/bin/ld) is GNU ld... yes
checking for shared library run path origin... done
checking for iconv... yes
checking argz.h usability... yes
checking argz.h presence... yes
checking for argz.h... yes
checking limits.h usability... yes
checking limits.h presence... yes
checking for limits.h... yes
```

```
checking locale.h usability... yes
checking locale.h presence... yes
checking for locale.h... yes
checking nl_types.h usability... yes
checking nl_types.h presence... yes
checking for nl_types.h... yes
checking malloc.h usability... yes
checking malloc.h presence... yes
checking for malloc.h... yes
checking stddef.h usability... yes
checking stddef.h presence... yes
checking for stddef.h... yes
checking for stdlib.h... (cached) yes
checking for string.h... (cached) yes
checking for unistd.h... (cached) yes
checking for sys/param.h... (cached) yes
checking for feof_unlocked... yes
checking for fgets_unlocked... yes
checking for getc_unlocked... yes
checking for getcwd... yes
checking for getegid... yes
checking for geteuid... yes
checking for getgid... yes
checking for getuid... yes
checking for mempcpy... yes
checking for munmap... yes
checking for putenv... yes
checking for setenv... yes
checking for setlocale... yes
checking for stpcpy... yes
checking for strcasecmp... yes
checking for strdup... yes
checking for strtoul... yes
checking for tsearch... yes
```

```
checking for __argz_count... yes
checking for __argz_stringify... yes
checking for __argz_next... yes
checking for iconv declaration...
         extern size_t iconv (iconv_t cd, char * *inbuf, size_t *inbytesleft, char * *outbuf, size_t
*outbytesleft);
checking for nl_langinfo and CODESET... yes
checking for LC_MESSAGES... yes
checking for bison... no
checking whether NLS is requested... yes
checking whether included gettext is requested... no
checking for GNU gettext in libc... yes
checking for perl... perl
configure: creating ./config.status
config.status: creating Makefile
config.status: creating contrib/Makefile
config.status: creating doc/Makefile
config.status: creating intl/Makefile
config.status: creating man/Makefile
config.status: creating po/Makefile.in
config.status: creating m4/Makefile
config.status: creating src/Makefile
config.status: creating tests/Makefile
config.status: creating config.h
config.status: executing depfiles commands
config.status: executing default-1 commands
config.status: creating po/POTFILES
config.status: creating po/Makefile
config.status: executing default commands
```

1.2 - make

Important : **make** sert à appeler des commandes créant des fichiers nécessaires à l'installation du logiciel.

Notez que la commande **make** n'est pas installée. Installez la commande :

```
root@debian11:~/hello-2.1.1# make
-bash: make: command not found
root@debian11:~/hello-2.1.1# which make
root@debian11:~/hello-2.1.1# apt install y make
```

Exécutez maintenant la commande **make** :

```
root@debian11:~/hello-2.1.1# make
make  all-recursive
make[1]: Entering directory '/root/hello-2.1.1'
Making all in contrib
make[2]: Entering directory '/root/hello-2.1.1/contrib'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/contrib'
Making all in doc
make[2]: Entering directory '/root/hello-2.1.1/doc'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/doc'
Making all in intl
make[2]: Entering directory '/root/hello-2.1.1/intl'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/intl'
Making all in po
make[2]: Entering directory '/root/hello-2.1.1/po'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/po'
Making all in src
make[2]: Entering directory '/root/hello-2.1.1/src'
source='hello.c' object='hello.o' libtool=no \
```

```
depfile='.deps/hello.Po' tmpdepfile='.deps/hello.TPo' \
depmode=none /bin/bash ../depcomp \
gcc -DLOCALEDIR=\"/usr/local/share/locale\" -DHAVE_CONFIG_H -I. -I. -I.. -I. -I. -I.. -I../intl -I../intl    -g -
O2 -c `test -f 'hello.c' || echo './'`hello.c
source='version.c' object='version.o' libtool=no \
depfile='.deps/version.Po' tmpdepfile='.deps/version.TPo' \
depmode=none /bin/bash ../depcomp \
gcc -DLOCALEDIR=\"/usr/local/share/locale\" -DHAVE_CONFIG_H -I. -I. -I.. -I. -I. -I.. -I../intl -I../intl    -g -
O2 -c `test -f 'version.c' || echo './'`version.c
source='getopt.c' object='getopt.o' libtool=no \
depfile='.deps/getopt.Po' tmpdepfile='.deps/getopt.TPo' \
depmode=none /bin/bash ../depcomp \
gcc -DLOCALEDIR=\"/usr/local/share/locale\" -DHAVE_CONFIG_H -I. -I. -I.. -I. -I. -I.. -I../intl -I../intl    -g -
O2 -c `test -f 'getopt.c' || echo './'`getopt.c
source='getopt1.c' object='getopt1.o' libtool=no \
depfile='.deps/getopt1.Po' tmpdepfile='.deps/getopt1.TPo' \
depmode=none /bin/bash ../depcomp \
gcc -DLOCALEDIR=\"/usr/local/share/locale\" -DHAVE_CONFIG_H -I. -I. -I.. -I. -I. -I.. -I../intl -I../intl    -g -
O2 -c `test -f 'getopt1.c' || echo './'`getopt1.c
gcc  -g -O2   -o hello  hello.o version.o getopt.o getopt1.o
make[2]: Leaving directory '/root/hello-2.1.1/src'
Making all in man
make[2]: Entering directory '/root/hello-2.1.1/man'
perl help2man --name="Friendly Greeting Program" ../src/hello >hello.1
make[2]: Leaving directory '/root/hello-2.1.1/man'
Making all in m4
make[2]: Entering directory '/root/hello-2.1.1/m4'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/m4'
Making all in tests
make[2]: Entering directory '/root/hello-2.1.1/tests'
make[2]: Nothing to be done for 'all'.
make[2]: Leaving directory '/root/hello-2.1.1/tests'
make[2]: Entering directory '/root/hello-2.1.1'
```

```
make[2]: Leaving directory '/root/hello-2.1.1'
make[1]: Leaving directory '/root/hello-2.1.1'
```

1.3 - make check

Important : **make check** permet de vérifier si la commande **make** a bien fonctionné.

```
root@debian11:~/hello-2.1.1# make check
Making check in contrib
make[1]: Entering directory '/root/hello-2.1.1/contrib'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/contrib'
Making check in doc
make[1]: Entering directory '/root/hello-2.1.1/doc'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/doc'
Making check in intl
make[1]: Entering directory '/root/hello-2.1.1/intl'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/intl'
Making check in po
make[1]: Entering directory '/root/hello-2.1.1/po'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/po'
Making check in src
make[1]: Entering directory '/root/hello-2.1.1/src'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/src'
Making check in man
make[1]: Entering directory '/root/hello-2.1.1/man'
```

```
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/man'
Making check in m4
make[1]: Entering directory '/root/hello-2.1.1/m4'
make[1]: Nothing to be done for 'check'.
make[1]: Leaving directory '/root/hello-2.1.1/m4'
Making check in tests
make[1]: Entering directory '/root/hello-2.1.1/tests'
make  check-TESTS
make[2]: Entering directory '/root/hello-2.1.1/tests'
PASS: hello-1
PASS: world-1
PASS: nothing-1
==================
All 3 tests passed
==================
make[2]: Leaving directory '/root/hello-2.1.1/tests'
make[1]: Leaving directory '/root/hello-2.1.1/tests'
make[1]: Entering directory '/root/hello-2.1.1'
make[1]: Leaving directory '/root/hello-2.1.1'
```

1.4 - make install

Important : **make install** sert à installer le logiciel.

```
root@debian11:~/hello-2.1.1# make install
Making install in contrib
make[1]: Entering directory '/root/hello-2.1.1/contrib'
make[2]: Entering directory '/root/hello-2.1.1/contrib'
make[2]: Nothing to be done for 'install-exec-am'.
```

```
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/root/hello-2.1.1/contrib'
make[1]: Leaving directory '/root/hello-2.1.1/contrib'
Making install in doc
make[1]: Entering directory '/root/hello-2.1.1/doc'
make[2]: Entering directory '/root/hello-2.1.1/doc'
make[2]: Nothing to be done for 'install-exec-am'.
/bin/bash ../mkinstalldirs /usr/local/info
mkdir -p -- /usr/local/info
 /usr/bin/install -c -m 644 ./hello.info /usr/local/info/hello.info
make[2]: Leaving directory '/root/hello-2.1.1/doc'
make[1]: Leaving directory '/root/hello-2.1.1/doc'
Making install in intl
make[1]: Entering directory '/root/hello-2.1.1/intl'
if test "hello" = "gettext" \
   && test '' = 'intl-compat.o'; then \
  /bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs" ;; esac`
/usr/local/lib /usr/local/include; \
  /usr/bin/install -c -m 644 libintl.h /usr/local/include/libintl.h; \
  @LIBTOOL@ --mode=install \
    /usr/bin/install -c -m 644 libintl.a /usr/local/lib/libintl.a; \
else \
  : ; \
fi
if test 'no' = yes; then \
  test yes != no || /bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs"
;; esac` /usr/local/lib; \
  temp=/usr/local/lib/t-charset.alias; \
  dest=/usr/local/lib/charset.alias; \
  if test -f /usr/local/lib/charset.alias; then \
    orig=/usr/local/lib/charset.alias; \
    sed -f ref-add.sed $orig > $temp; \
    /usr/bin/install -c -m 644 $temp $dest; \
    rm -f $temp; \
```

```
  else \
    if test yes = no; then \
      orig=charset.alias; \
      sed -f ref-add.sed $orig > $temp; \
      /usr/bin/install -c -m 644 $temp $dest; \
      rm -f $temp; \
    fi; \
  fi; \
  /bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs" ;; esac`
/usr/local/share/locale; \
  test -f /usr/local/share/locale/locale.alias \
    && orig=/usr/local/share/locale/locale.alias \
    || orig=./locale.alias; \
  temp=/usr/local/share/locale/t-locale.alias; \
  dest=/usr/local/share/locale/locale.alias; \
  sed -f ref-add.sed $orig > $temp; \
  /usr/bin/install -c -m 644 $temp $dest; \
  rm -f $temp; \
else \
  : ; \
fi
if test "hello" = "gettext"; then \
  /bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs" ;; esac`
/usr/local/share/gettext/intl; \
  /usr/bin/install -c -m 644 VERSION /usr/local/share/gettext/intl/VERSION; \
  /usr/bin/install -c -m 644 ChangeLog.inst /usr/local/share/gettext/intl/ChangeLog; \
  dists="COPYING.LIB-2.0 COPYING.LIB-2.1 Makefile.in config.charset locale.alias ref-add.sin ref-del.sin gmo.h
gettextP.h hash-string.h plural-exp.h eval-plural.h os2compat.h libgnuintl.h loadinfo.h bindtextdom.c dcgettext.c
dgettext.c gettext.c finddomain.c loadmsgcat.c localealias.c textdomain.c l10nflist.c explodename.c dcigettext.c
dcngettext.c dngettext.c ngettext.c plural.y plural-exp.c localcharset.c localename.c osdep.c os2compat.c intl-
compat.c"; \
  for file in $dists; do \
    /usr/bin/install -c -m 644 ./$file \
                    /usr/local/share/gettext/intl/$file; \
```

```
  done; \
  chmod a+x /usr/local/share/gettext/intl/config.charset; \
  dists="plural.c"; \
  for file in $dists; do \
    if test -f $file; then dir=.; else dir=.; fi; \
    /usr/bin/install -c -m 644 $dir/$file \
                    /usr/local/share/gettext/intl/$file; \
  done; \
  dists="xopen-msg.sed linux-msg.sed po2tbl.sed.in cat-compat.c COPYING.LIB-2 gettext.h libgettext.h plural-
eval.c"; \
  for file in $dists; do \
    rm -f /usr/local/share/gettext/intl/$file; \
  done; \
else \
  : ; \
fi
make[1]: Leaving directory '/root/hello-2.1.1/intl'
Making install in po
make[1]: Entering directory '/root/hello-2.1.1/po'
/bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs" ;; esac`
/usr/local/share
mkdir -p -- /usr/local/share/locale/ca/LC_MESSAGES
installing ca.gmo as /usr/local/share/locale/ca/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/da/LC_MESSAGES
installing da.gmo as /usr/local/share/locale/da/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/de/LC_MESSAGES
installing de.gmo as /usr/local/share/locale/de/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/de_DE/LC_MESSAGES
installing de_DE.gmo as /usr/local/share/locale/de_DE/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/el/LC_MESSAGES
installing el.gmo as /usr/local/share/locale/el/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/eo/LC_MESSAGES
installing eo.gmo as /usr/local/share/locale/eo/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/es/LC_MESSAGES
```

```
installing es.gmo as /usr/local/share/locale/es/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/et/LC_MESSAGES
installing et.gmo as /usr/local/share/locale/et/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/fi/LC_MESSAGES
installing fi.gmo as /usr/local/share/locale/fi/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/fr/LC_MESSAGES
installing fr.gmo as /usr/local/share/locale/fr/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/gl/LC_MESSAGES
installing gl.gmo as /usr/local/share/locale/gl/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/he/LC_MESSAGES
installing he.gmo as /usr/local/share/locale/he/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/hr/LC_MESSAGES
installing hr.gmo as /usr/local/share/locale/hr/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/hu/LC_MESSAGES
installing hu.gmo as /usr/local/share/locale/hu/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/id/LC_MESSAGES
installing id.gmo as /usr/local/share/locale/id/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/it/LC_MESSAGES
installing it.gmo as /usr/local/share/locale/it/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/ja/LC_MESSAGES
installing ja.gmo as /usr/local/share/locale/ja/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/ko/LC_MESSAGES
installing ko.gmo as /usr/local/share/locale/ko/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/lv/LC_MESSAGES
installing lv.gmo as /usr/local/share/locale/lv/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/nb/LC_MESSAGES
installing nb.gmo as /usr/local/share/locale/nb/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/nl/LC_MESSAGES
installing nl.gmo as /usr/local/share/locale/nl/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/nn/LC_MESSAGES
installing nn.gmo as /usr/local/share/locale/nn/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/pl/LC_MESSAGES
installing pl.gmo as /usr/local/share/locale/pl/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/pt/LC_MESSAGES
```

```
installing pt.gmo as /usr/local/share/locale/pt/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/pt_BR/LC_MESSAGES
installing pt_BR.gmo as /usr/local/share/locale/pt_BR/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/ru/LC_MESSAGES
installing ru.gmo as /usr/local/share/locale/ru/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/sk/LC_MESSAGES
installing sk.gmo as /usr/local/share/locale/sk/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/sl/LC_MESSAGES
installing sl.gmo as /usr/local/share/locale/sl/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/sv/LC_MESSAGES
installing sv.gmo as /usr/local/share/locale/sv/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/tr/LC_MESSAGES
installing tr.gmo as /usr/local/share/locale/tr/LC_MESSAGES/hello.mo
mkdir -p -- /usr/local/share/locale/uk/LC_MESSAGES
installing uk.gmo as /usr/local/share/locale/uk/LC_MESSAGES/hello.mo
if test "hello" = "gettext"; then \
  /bin/sh `case "./mkinstalldirs" in /*) echo "./mkinstalldirs" ;; *) echo ".././mkinstalldirs" ;; esac`
/usr/local/share/gettext/po; \
  for file in Makefile.in.in Makevars remove-potcdate.sin quot.sed boldquot.sed en@quot.header en@boldquot.header
insert-header.sin Rules-quot  ; do \
    /usr/bin/install -c -m 644 ./$file \
                     /usr/local/share/gettext/po/$file; \
  done; \
else \
  : ; \
fi
make[1]: Leaving directory '/root/hello-2.1.1/po'
Making install in src
make[1]: Entering directory '/root/hello-2.1.1/src'
make[2]: Entering directory '/root/hello-2.1.1/src'
/bin/bash ../mkinstalldirs /usr/local/bin
  /usr/bin/install -c hello /usr/local/bin/hello
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/root/hello-2.1.1/src'
```

```
make[1]: Leaving directory '/root/hello-2.1.1/src'
Making install in man
make[1]: Entering directory '/root/hello-2.1.1/man'
make[2]: Entering directory '/root/hello-2.1.1/man'
make[2]: Nothing to be done for 'install-exec-am'.
/bin/bash ../mkinstalldirs /usr/local/man/man1
mkdir -p -- /usr/local/man/man1
 /usr/bin/install -c -m 644 ./hello.1 /usr/local/man/man1/hello.1
make[2]: Leaving directory '/root/hello-2.1.1/man'
make[1]: Leaving directory '/root/hello-2.1.1/man'
Making install in m4
make[1]: Entering directory '/root/hello-2.1.1/m4'
make[2]: Entering directory '/root/hello-2.1.1/m4'
make[2]: Nothing to be done for 'install-exec-am'.
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/root/hello-2.1.1/m4'
make[1]: Leaving directory '/root/hello-2.1.1/m4'
Making install in tests
make[1]: Entering directory '/root/hello-2.1.1/tests'
make[2]: Entering directory '/root/hello-2.1.1/tests'
make[2]: Nothing to be done for 'install-exec-am'.
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/root/hello-2.1.1/tests'
make[1]: Leaving directory '/root/hello-2.1.1/tests'
make[1]: Entering directory '/root/hello-2.1.1'
make[2]: Entering directory '/root/hello-2.1.1'
make[2]: Nothing to be done for 'install-exec-am'.
make[2]: Nothing to be done for 'install-data-am'.
make[2]: Leaving directory '/root/hello-2.1.1'
make[1]: Leaving directory '/root/hello-2.1.1'
```

Il convient maintenant de tester le nouveau logiciel :

```
root@debian11:~/hello-2.1.1# hello
```

```
Hello, world!
```

Le logiciel hello a été correctement installé.

LAB #2 - Utilisation de la Commande dpkg

Placez-vous dans le répertoire personnel de **root** grâce à la commande **cd ~** :

```
root@debian11:~/hello-2.1.1# cd ~
root@debian11:~# pwd
/root
```

Afin de faciliter l'installation, la désinstallation et la gestion des logiciels (appelés paquets) sous Linux, Debian et ses dérivés utilisent un format de fichier de logiciels installables spécifique. Celui-ci s'appelle DEB. La commande utilisée pour manipuler ses paquetages s'appelle **dpkg**.

Les options de la commande **dpkg** sont :

```
root@debian11:~# dpkg --help
Usage: dpkg [<option>...] <command>

Commands:
  -i|--install       <.deb file name>... | -R|--recursive <directory>...
  --unpack           <.deb file name>... | -R|--recursive <directory>...
  -A|--record-avail  <.deb file name>... | -R|--recursive <directory>...
  --configure        <package>... | -a|--pending
  --triggers-only    <package>... | -a|--pending
  -r|--remove        <package>... | -a|--pending
  -P|--purge         <package>... | -a|--pending
  -V|--verify [<package>...]       Verify the integrity of package(s).
  --get-selections [<pattern>...]  Get list of selections to stdout.
  --set-selections                 Set package selections from stdin.
  --clear-selections               Deselect every non-essential package.
```

```
  --update-avail [<Packages-file>] Replace available packages info.
  --merge-avail [<Packages-file>]  Merge with info from file.
  --clear-avail                    Erase existing available info.
  --forget-old-unavail             Forget uninstalled unavailable pkgs.
  -s|--status [<package>...]       Display package status details.
  -p|--print-avail [<package>...]  Display available version details.
  -L|--listfiles <package>...      List files 'owned' by package(s).
  -l|--list [<pattern>...]         List packages concisely.
  -S|--search <pattern>...         Find package(s) owning file(s).
  -C|--audit [<package>...]        Check for broken package(s).
  --yet-to-unpack                  Print packages selected for installation.
  --predep-package                 Print pre-dependencies to unpack.
  --add-architecture <arch>        Add <arch> to the list of architectures.
  --remove-architecture <arch>     Remove <arch> from the list of architectures.
  --print-architecture             Print dpkg architecture.
  --print-foreign-architectures    Print allowed foreign architectures.
  --assert-<feature>               Assert support for the specified feature.
  --validate-<thing> <string>      Validate a <thing>'s <string>.
  --compare-versions <a> <op> <b>  Compare version numbers - see below.
  --force-help                     Show help on forcing.
  -Dh|--debug=help                 Show help on debugging.

  -?, --help                       Show this help message.
      --version                    Show the version.

Assertable features: support-predepends, working-epoch, long-filenames,
  multi-conrep, multi-arch, versioned-provides, protected-field.

Validatable things: pkgname, archname, trigname, version.

Use dpkg with -b, --build, -c, --contents, -e, --control, -I, --info,
  -f, --field, -x, --extract, -X, --vextract, --ctrl-tarfile, --fsys-tarfile
on archives (type dpkg-deb --help).
```

```
Options:
  --admindir=<directory>     Use <directory> instead of /var/lib/dpkg.
  --root=<directory>         Install on a different root directory.
  --instdir=<directory>      Change installation dir without changing admin dir.
  --pre-invoke=<command>     Set a pre-invoke hook.
  --post-invoke=<command>    Set a post-invoke hook.
  --path-exclude=<pattern>   Do not install paths which match a shell pattern.
  --path-include=<pattern>   Re-include a pattern after a previous exclusion.
  -O|--selected-only         Skip packages not selected for install/upgrade.
  -E|--skip-same-version     Skip packages whose same version is installed.
  -G|--refuse-downgrade      Skip packages with earlier version than installed.
  -B|--auto-deconfigure      Install even if it would break some other package.
  --[no-]triggers            Skip or force consequential trigger processing.
  --verify-format=<format>   Verify output format (supported: 'rpm').
  --no-pager                 Disables the use of any pager.
  --no-debsig                Do not try to verify package signatures.
  --no-act|--dry-run|--simulate
                             Just say what we would do - don't do it.
  -D|--debug=<octal>         Enable debugging (see -Dhelp or --debug=help).
  --status-fd <n>            Send status change updates to file descriptor <n>.
  --status-logger=<command>  Send status change updates to <command>'s stdin.
  --log=<filename>           Log status changes and actions to <filename>.
  --ignore-depends=<package>[,...]
                             Ignore dependencies involving <package>.
  --force-<thing>[,...]      Override problems (see --force-help).
  --no-force-<thing>[,...]   Stop when problems encountered.
  --refuse-<thing>[,...]     Ditto.
  --abort-after <n>          Abort after encountering <n> errors.
  --robot                    Use machine-readable output on some commands.

Comparison operators for --compare-versions are:
  lt le eq ne ge gt       (treat empty version as earlier than any version);
  lt-nl le-nl ge-nl gt-nl (treat empty version as later than any version);
  < << <= = >= >> >       (only for compatibility with control file syntax).
```

```
Use 'apt' or 'aptitude' for user-friendly package management.
```

2.1 - Configuration

Le fichier de configuration proncipal de la commande **dpkg** est **/etc/dpkg/dpkg.cfg** :

```
root@debian11:~# cat /etc/dpkg/dpkg.cfg
# dpkg configuration file
#
# This file can contain default options for dpkg.  All command-line
# options are allowed.  Values can be specified by putting them after
# the option, separated by whitespace and/or an `=' sign.
#

# Do not enable debsig-verify by default; since the distribution is not using
# embedded signatures, debsig-verify would reject all packages.
no-debsig

# Log status changes and actions to a file.
log /var/log/dpkg.log
```

Les directives dans ce fichier sont les options de la commande dpkg sans les charactères **-**.

Il est important à noter que la base de données de la commande dpkg se trouve dans le répertoire **/var/lib/dpkg** :

```
root@debian11:~# ls -l /var/lib/dpkg
total 2836
drwxr-xr-x 2 root root    4096 Apr 25 13:38 alternatives
-rw-r--r-- 1 root root  121896 Apr 25 06:30 available
-rw-r--r-- 1 root root       8 Apr 25 06:29 cmethopt
-rw-r--r-- 1 root root     237 Apr 25 07:01 diversions
-rw-r--r-- 1 root root     292 Apr 25 07:01 diversions-old
drwxr-xr-x 2 root root  258048 Apr 25 13:45 info
```

```
-rw-r----- 1 root root       0 Apr 25 13:45 lock
-rw-r----- 1 root root       0 Apr 25 06:54 lock-frontend
drwxr-xr-x 2 root root    4096 Apr 14  2021 parts
-rw-r--r-- 1 root root     135 Apr 25 06:49 statoverride
-rw-r--r-- 1 root root     100 Apr 25 06:48 statoverride-old
-rw-r--r-- 1 root root 1239440 Apr 25 13:45 status
-rw-r--r-- 1 root root 1239479 Apr 25 13:45 status-old
drwxr-xr-x 2 root root    4096 Apr 25 06:52 triggers
drwxr-xr-x 2 root root    4096 Apr 25 13:45 updates
```

Important - Il est recommendé d'inclure ce répertoire et son contenu dans les sauvegardes régulières.

2.2 - Utilisation

Afin de connaître la liste des paquets disponibles sur la machine, il convient de saisir la commande suivante dans une fenêtre de console en tant que **root** :

```
root@debian11:~# dpkg -l | more
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name                                  Version                          Architecture Description
+++-=====================================-================================-============-
================================================================================================
======
ii  acl                                   2.2.53-10                        amd64        access control list -
utilities
ii  adduser                               3.118                            all          add and remove users and
groups
```

```
ii  adwaita-icon-theme                  3.38.0-1                all          default icon theme of
GNOME
ii  alsa-topology-conf                  1.2.4-1                 all          ALSA topology
configuration files
ii  alsa-ucm-conf                       1.2.4-2                 all          ALSA Use Case Manager
configuration files
ii  alsa-utils                          1.2.4-1                 amd64        Utilities for configuring
and using ALSA
ii  anacron                             2.3-30                  amd64        cron-like program that
doesn't go by time
ii  apparmor                            2.13.6-10               amd64        user-space parser utility
for AppArmor
ii  apt                                 2.2.4                   amd64        commandline package
manager
ii  apt-listchanges                     3.24                    all          package change history
notification tool
ii  apt-utils                           2.2.4                   amd64        package management
related utility programs
ii  aspell                              0.60.8-3                amd64        GNU Aspell spell-checker
ii  aspell-en                           2018.04.16-0-1          all          English dictionary for
GNU Aspell
ii  at-spi2-core                        2.38.0-4                amd64        Assistive Technology
Service Provider Interface (dbus core)
ii  atril                               1.24.0-1                amd64        MATE document viewer
ii  atril-common                        1.24.0-1                all          MATE document viewer
(common files)
ii  avahi-daemon                        0.8-5                   amd64        Avahi mDNS/DNS-SD daemon
ii  base-files                          11.1+deb11u3            amd64        Debian base system
miscellaneous files
ii  base-passwd                         3.5.51                  amd64        Debian base system master
password and group files
ii  bash                                5.1-2+b3                amd64        GNU Bourne Again SHell
ii  bash-completion                     1:2.11-2                all          programmable completion
for the bash shell
```

```
ii  bc                                  1.07.1-2+b2                amd64        GNU bc arbitrary
precision calculator language
ii  bind9-dnsutils                      1:9.16.27-1~deb11u1        amd64        Clients provided with
BIND 9
ii  bind9-host                          1:9.16.27-1~deb11u1        amd64        DNS Lookup Utility
ii  bind9-libs:amd64                    1:9.16.27-1~deb11u1        amd64        Shared Libraries used by
BIND 9
ii  binutils                            2.35.2-2                   amd64        GNU assembler, linker and
binary utilities
ii  binutils-common:amd64               2.35.2-2                   amd64        Common files for the GNU
assembler, linker and binary utilities
ii  binutils-x86-64-linux-gnu           2.35.2-2                   amd64        GNU binary utilities, for
x86-64-linux-gnu target
ii  bsdextrautils                       2.36.1-8+deb11u1           amd64        extra utilities from
4.4BSD-Lite
ii  bsdutils                            1:2.36.1-8+deb11u1         amd64        basic utilities from
4.4BSD-Lite
ii  bubblewrap                          0.4.1-3                    amd64        utility for unprivileged
chroot and namespace manipulation
ii  busybox                             1:1.30.1-6+b3              amd64        Tiny utilities for small
and embedded systems
ii  bzip2                               1.0.8-4                    amd64        high-quality block-
sorting file compressor - utilities
ii  ca-certificates                     20210119                   all          Common CA certificates
ii  coinor-libcbc3:amd64                2.10.5+ds1-3               amd64        Coin-or branch-and-cut
mixed integer programming solver (shared libraries)
ii  coinor-libcgl1                      0.60.3+repack1-2           amd64        COIN-OR Cut Generation
Library
ii  coinor-libclp1                      1.17.5+repack1-1           amd64        Coin-or linear
programming solver (shared libraries)
ii  coinor-libcoinmp1v5:amd64           1.8.3-3                    amd64        Simple C API for COIN-OR
Solvers Clp and Cbc -- library
ii  coinor-libcoinutils3v5              2.11.4+repack1-1           amd64        Coin-or collection of
utility classes (binaries and libraries)
```

```
ii  coinor-libosi1v5:amd64                0.108.6+repack1-2                amd64        COIN-OR Open Solver
Interface
ii  colord                                1.4.5-3                          amd64        system service to manage
device colour profiles -- system daemon
ii  colord-data                           1.4.5-3                          all          system service to manage
device colour profiles -- data files
ii  console-setup                         1.205                            all          console font and keymap
setup program
ii  console-setup-linux                   1.205                            all          Linux specific part of
console-setup
ii  coreutils                             8.32-4+b1                        amd64        GNU core utilities
ii  cpio                                  2.13+dfsg-4                      amd64        GNU cpio -- a program to
manage archives of files
ii  cpp                                   4:10.2.1-1                       amd64        GNU C preprocessor (cpp)
ii  cpp-10                                10.2.1-6                         amd64        GNU C preprocessor
ii  cron                                  3.0pl1-137                       amd64        process scheduling daemon
ii  cups                                  2.3.3op2-3+deb11u1               amd64        Common UNIX Printing
System(tm) - PPD/driver support, web interface
ii  cups-browsed                          1.28.7-1+deb11u1                 amd64        OpenPrinting CUPS Filters
- cups-browsed
ii  cups-client                           2.3.3op2-3+deb11u1               amd64        Common UNIX Printing
System(tm) - client programs (SysV)
ii  cups-common                           2.3.3op2-3+deb11u1               all          Common UNIX Printing
System(tm) - common files
--More--
[q]
```

Important - L'option -l liste les paquets disponibles spécifiés par le fichier **/var/lib/dpkg/available**.

```
root@debian11:~# more /var/lib/dpkg/available
Package: gcc-10-base
```

```
Source: gcc-10
Version: 10.2.1-6
Installed-Size: 261
Maintainer: Debian GCC Maintainers <debian-gcc@lists.debian.org>
Architecture: amd64
Breaks: gnat (<< 7)
Description: GCC, the GNU Compiler Collection (base package)
Description-md5: b6e93638a6d08ea7a18929d7cf078e5d
Multi-Arch: same
Homepage: http://gcc.gnu.org/
Tag: role::shared-lib
Section: libs
Priority: required
Filename: pool/main/g/gcc-10/gcc-10-base_10.2.1-6_amd64.deb
Size: 201332
MD5sum: 8ad775342ca4fd0adca5a516849b6498
SHA256: be65535e94f95fbf04b104e8ab36790476f063374430f7dfc6c516cbe2d2cd1e

Package: libgcc-s1
Source: gcc-10
Version: 10.2.1-6
Installed-Size: 116
Maintainer: Debian GCC Maintainers <debian-gcc@lists.debian.org>
Architecture: amd64
Replaces: libgcc1 (<< 1:10)
Provides: libgcc1 (= 1:10.2.1-6)
Depends: gcc-10-base (= 10.2.1-6), libc6 (>= 2.14)
Breaks: cryptsetup-initramfs (<< 2:2.2.2-3~)
Description: GCC support library
Description-md5: bbd60d723e97d8e06c04228ee4c76f10
Multi-Arch: same
Homepage: http://gcc.gnu.org/
Important: yes
Protected: yes
```

```
Tag: role::shared-lib
Section: libs
Priority: optional
Filename: pool/main/g/gcc-10/libgcc-s1_10.2.1-6_amd64.deb
Size: 41400
MD5sum: 662ac9938f503745221bd777b5a94cab
SHA256: e478f2709d8474165bb664de42e16950c391f30eaa55bc9b3573281d83a29daf

Package: libcrypt1
Source: libxcrypt
Version: 1:4.4.18-4
Installed-Size: 226
Maintainer: Marco d'Itri <md@linux.it>
Architecture: amd64
Replaces: libc6 (<< 2.29-4)
Depends: libc6 (>= 2.25)
Description: libcrypt shared library
Description-md5: deac8c9adc422e925bdaf6bffdd3e875
Multi-Arch: same
Important: yes
Protected: yes
Tag: role::shared-lib
Section: libs
--More--(1%)
[q]
```

Le statut de chaque paquet est inclus dans le fichier **/var/lib/dpkg/status** :

```
root@debian11:~# more /var/lib/dpkg/status
Package: acl
Status: install ok installed
Priority: optional
Section: utils
Installed-Size: 208
```

```
Maintainer: Guillem Jover <guillem@debian.org>
Architecture: amd64
Multi-Arch: foreign
Version: 2.2.53-10
Depends: libacl1 (= 2.2.53-10), libc6 (>= 2.14)
Description: access control list - utilities
 This package contains the getfacl and setfacl utilities needed for
 manipulating access control lists. It also contains the chacl IRIX
 compatible utility.
Homepage: https://savannah.nongnu.org/projects/acl/

Package: adduser
Status: install ok installed
Priority: important
Section: admin
Installed-Size: 849
Maintainer: Debian Adduser Developers <adduser@packages.debian.org>
Architecture: all
Multi-Arch: foreign
Version: 3.118
Depends: passwd, debconf (>= 0.5) | debconf-2.0
Suggests: liblocale-gettext-perl, perl
Conffiles:
 /etc/deluser.conf 773fb95e98a27947de4a95abb3d3f2a2
Description: add and remove users and groups
 This package includes the 'adduser' and 'deluser' commands for creating
 and removing users.
 .
  - 'adduser' creates new users and groups and adds existing users to
    existing groups;
  - 'deluser' removes users and groups and removes users from a given
    group.
 .
 Adding users with 'adduser' is much easier than adding them manually.
```

```
 Adduser will choose appropriate UID and GID values, create a home
 directory, copy skeletal user configuration, and automate setting
 initial values for the user's password, real name and so on.
 .
 Deluser can back up and remove users' home directories
 and mail spool or all the files they own on the system.
 .
 A custom script can be executed after each of the commands.

Package: adwaita-icon-theme
Status: install ok installed
Priority: optional
Section: gnome
Installed-Size: 26370
Maintainer: Debian GNOME Maintainers <pkg-gnome-maintainers@lists.alioth.debian.org>
Architecture: all
Multi-Arch: foreign
Version: 3.38.0-1
Replaces: gnome-themes-standard-data (<< 3.18.0-2~)
--More--(0%)
[q]
```

Afin de connaître le nombre total de paquets installés, utilisez la commande suivante :

```
root@debian11:~# dpkg --get-selections | wc -l
1301
```

Imaginons maintenant que vous souhaitez vérifier si un paquet contenant la chaîne de caractères **zip** soit déjà installé sur la machine. Dans ce cas, il convient d'abord d'utiliser la commande suivante :

```
root@debian11:~# dpkg --get-selections | grep zip
bzip2                                           install
gzip                                            install
p7zip                                           install
```

```
p7zip-full                                      install
unzip                                           install
```

Afin de connaître le statut de du paquet **gzip**, il convient de saisir la commande suivante :

```
root@debian11:~# dpkg -s gzip
Package: gzip
Essential: yes
Status: install ok installed
Priority: required
Section: utils
Installed-Size: 242
Maintainer: Milan Kupcevic <milan@debian.org>
Architecture: amd64
Version: 1.10-4+deb11u1
Depends: dpkg (>= 1.15.4) | install-info
Pre-Depends: libc6 (>= 2.17)
Suggests: less
Description: GNU compression utilities
 This package provides the standard GNU file compression utilities, which
 are also the default compression tools for Debian.  They typically operate
 on files with names ending in '.gz', but can also decompress files ending
 in '.Z' created with 'compress'.
Homepage: https://www.gnu.org/software/gzip/
```

Afin de lister tous les fichiers installés par le paquet **gzip**, utilisez la commande suivante :

```
root@debian11:~# dpkg -L gzip
/.
/bin
/bin/gunzip
/bin/gzexe
/bin/gzip
/bin/uncompress
```

```
/bin/zcat
/bin/zcmp
/bin/zdiff
/bin/zegrep
/bin/zfgrep
/bin/zforce
/bin/zgrep
/bin/zless
/bin/zmore
/bin/znew
/usr
/usr/share
/usr/share/doc
/usr/share/doc/gzip
/usr/share/doc/gzip/NEWS.gz
/usr/share/doc/gzip/README.gz
/usr/share/doc/gzip/TODO
/usr/share/doc/gzip/changelog.Debian.gz
/usr/share/doc/gzip/changelog.gz
/usr/share/doc/gzip/copyright
/usr/share/info
/usr/share/info/gzip.info.gz
/usr/share/man
/usr/share/man/man1
/usr/share/man/man1/gzexe.1.gz
/usr/share/man/man1/gzip.1.gz
/usr/share/man/man1/zdiff.1.gz
/usr/share/man/man1/zforce.1.gz
/usr/share/man/man1/zgrep.1.gz
/usr/share/man/man1/zless.1.gz
/usr/share/man/man1/zmore.1.gz
/usr/share/man/man1/znew.1.gz
/usr/share/man/man1/gunzip.1.gz
/usr/share/man/man1/uncompress.1.gz
```

```
/usr/share/man/man1/zcat.1.gz
/usr/share/man/man1/zcmp.1.gz
/usr/share/man/man1/zegrep.1.gz
/usr/share/man/man1/zfgrep.1.gz
```

A l'inverse, si vous connaissez le nom d'un fichier et vous souhaitez savoir quel paquet l'a installé, utilisez la commande suivante :

```
root@debian11:~# dpkg -S /bin/zfgrep
gzip: /bin/zfgrep
```

LAB #3 - Utilisation de la Commande dselect

La commande **dselect** est un outil interactif utilisé pour gérer, installer et désinstaller des paquets. C'est un *Front End* à la commande **dpkg** et est lancé sans options.

La commande **dselect** n'est pas installé par défaut. Il convient donc d'utiliser la commande apt-get pour l'installer :

```
root@debian11:~# apt-get -y install dselect
```

Lancez maintenant dselect :

```
Debian 'dselect' package handling frontend version 1.20.9 (amd64).

 * 0. [A]ccess    Choose the access method to use.
   1. [U]pdate    Update list of available packages, if possible.
   2. [S]elect    Request which packages you want on your system.
   3. [I]nstall   Install and upgrade wanted packages.
   4. [C]onfig    Configure any packages that are unconfigured.
   5. [R]emove    Remove unwanted software.
   6. [Q]uit      Quit dselect.

Move around with ^P and ^N, cursor keys, initial letters, or digits;
```

```
Press <enter> to confirm selection.   ^L redraws screen.

Copyright (C) 1994-1996 Ian Jackson.
Copyright (C) 2000,2001 Wichert Akkerman.
This is free software; see the GNU General Public License version 2 or
later for copying conditions. There is NO warranty.
```

A faire - Notez les instructions en bas de l'écran et expérimentez avec l'interface. Quand vous avez terminé, quittez avec la commande [q].

LAB #4 - Utilisation de Commande apt-get

APT ou en anglais *Advanced Package Tool* est un gestionnaire de paquets de haut niveau capable de résoudre automatiquement les problèmes de dépendances entre les paquets.

La commande apt-get prend la forme suivante :

```
# apt-get <options> <commande> <paquet(s)> [Entrée]
```

Les options et commandes de la commande **apt-get** sont :

```
root@debian11:~# apt-get --help
apt 2.2.4 (amd64)
Usage: apt-get [options] command
       apt-get [options] install|remove pkg1 [pkg2 ...]
       apt-get [options] source pkg1 [pkg2 ...]

apt-get is a command line interface for retrieval of packages
and information about them from authenticated sources and
```

```
for installation, upgrade and removal of packages together
with their dependencies.

Most used commands:
  update - Retrieve new lists of packages
  upgrade - Perform an upgrade
  install - Install new packages (pkg is libc6 not libc6.deb)
  reinstall - Reinstall packages (pkg is libc6 not libc6.deb)
  remove - Remove packages
  purge - Remove packages and config files
  autoremove - Remove automatically all unused packages
  dist-upgrade - Distribution upgrade, see apt-get(8)
  dselect-upgrade - Follow dselect selections
  build-dep - Configure build-dependencies for source packages
  satisfy - Satisfy dependency strings
  clean - Erase downloaded archive files
  autoclean - Erase old downloaded archive files
  check - Verify that there are no broken dependencies
  source - Download source archives
  download - Download the binary package into the current directory
  changelog - Download and display the changelog for the given package

See apt-get(8) for more information about the available commands.
Configuration options and syntax is detailed in apt.conf(5).
Information about how to configure sources can be found in sources.list(5).
Package and version choices can be expressed via apt_preferences(5).
Security details are available in apt-secure(8).
                                        This APT has Super Cow Powers.
```

4.1 - Configuration

APT peut être configuré par un fichier centralisé **/etc/apt/apt.conf** :

```
root@debian11:~# cat /etc/apt/apt.conf
cat: /etc/apt/apt.conf: No such file or directory
```

Un exemple est fourni :

```
root@debian11:~# cat /usr/share/doc/apt/examples/apt.conf
/* This file is a sample configuration file with a few harmless sample
   options.
*/

APT
{
  // Options for apt-get
  Get
  {
     Download-Only "false";
  };
};

// Options for the downloading routines
Acquire
{
  Retries "0";
};

// Things that effect the APT dselect method
DSelect
{
  Clean "auto";   // always|auto|prompt|never
};

DPkg
{
  // Probably don't want to use force-downgrade..
```

```
  Options {"--force-overwrite";}
}
```

D'autres fichiers de configuration se trouvent dans le répertoire **/etc/apt/apt.conf.d/** :

```
root@debian11:~# ls /etc/apt/apt.conf.d/
00CDMountPoint  00trustcdrom  01autoremove  01autoremove-kernels  20listchanges  20packagekit  70debconf
```

Le contenu de ces fichiers sont :

```
root@debian11:~# cat /etc/apt/apt.conf.d/00CDMountPoint
Acquire::cdrom {
  mount "/media/cdrom";
};
Dir::Media::MountPath "/media/cdrom";
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/00trustcdrom
APT::Authentication::TrustCDROM "true";
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/01autoremove
APT
{
  NeverAutoRemove
  {
        "^firmware-linux.*";
        "^linux-firmware$";
        "^linux-image-[a-z0-9]*$";
        "^linux-image-[a-z0-9]*-[a-z0-9]*$";
  };

  VersionedKernelPackages
  {
        # kernels
        "linux-.*";
```

```
        "kfreebsd-.*";
        "gnumach-.*";
        # (out-of-tree) modules
        ".*-modules";
        ".*-kernel";
  };

  Never-MarkAuto-Sections
  {
        "metapackages";
        "contrib/metapackages";
        "non-free/metapackages";
        "restricted/metapackages";
        "universe/metapackages";
        "multiverse/metapackages";
  };

  Move-Autobit-Sections
  {
        "oldlibs";
        "contrib/oldlibs";
        "non-free/oldlibs";
        "restricted/oldlibs";
        "universe/oldlibs";
        "multiverse/oldlibs";
  };
};
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/01autoremove-kernels
// DO NOT EDIT! File autogenerated by /etc/kernel/postinst.d/apt-auto-removal
APT::LastInstalledKernel "5.10.0-13-amd64";
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/20listchanges
DPkg::Pre-Install-Pkgs { "/usr/bin/apt-listchanges --apt || test $? -lt 10"; };
```

```
DPkg::Tools::Options::/usr/bin/apt-listchanges::Version "2";
DPkg::Tools::Options::/usr/bin/apt-listchanges::InfoFD "20";
Dir::Etc::apt-listchanges-main "listchanges.conf";
Dir::Etc::apt-listchanges-parts "listchanges.conf.d";
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/20packagekit
// THIS FILE IS USED TO INFORM PACKAGEKIT
// THAT THE UPDATE-INFO MIGHT HAVE CHANGED

// Whenever dpkg is called we might have different updates
// i.e. if an user removes a package that had an update
DPkg::Post-Invoke {
"/usr/bin/test -e /usr/share/dbus-1/system-services/org.freedesktop.PackageKit.service && /usr/bin/test -S
/var/run/dbus/system_bus_socket && /usr/bin/gdbus call --system --dest org.freedesktop.PackageKit --object-path
/org/freedesktop/PackageKit --timeout 4 --method org.freedesktop.PackageKit.StateHasChanged cache-update >
/dev/null; /bin/echo > /dev/null";
};

// When Apt's cache is updated (i.e. apt-cache update)
APT::Update::Post-Invoke-Success {
"/usr/bin/test -e /usr/share/dbus-1/system-services/org.freedesktop.PackageKit.service && /usr/bin/test -S
/var/run/dbus/system_bus_socket && /usr/bin/gdbus call --system --dest org.freedesktop.PackageKit --object-path
/org/freedesktop/PackageKit --timeout 4 --method org.freedesktop.PackageKit.StateHasChanged cache-update >
/dev/null; /bin/echo > /dev/null";
};
root@debian11:~#
root@debian11:~# cat /etc/apt/apt.conf.d/70debconf
// Pre-configure all packages with debconf before they are installed.
// If you don't like it, comment it out.
DPkg::Pre-Install-Pkgs {"/usr/sbin/dpkg-preconfigure --apt || true";};
```

4.2 - Dépôts

Important - Un dépôt est un lieu de stockage de paquets binaires prêts à installer. Un dépôt peut être le DVD d'installation de la distribution, un dossier sur disque dur ou bien des serveurs distants accessibles par Internet.

Les dépôts de paquets sont spécifiés soit dans le fichier **/etc/apt/sources.list**, soit dans un fichier *par dépôt* stocké dans le répertoire **/etc/apt/sources.list.d** :

```
root@debian11:~# cat /etc/apt/sources.list
# deb cdrom:[Debian GNU/Linux 11.3.0 _Bullseye_ - Official amd64 NETINST 20220326-11:22]/ bullseye main

#deb cdrom:[Debian GNU/Linux 11.3.0 _Bullseye_ - Official amd64 NETINST 20220326-11:22]/ bullseye main

deb http://deb.debian.org/debian/ bullseye main
deb-src http://deb.debian.org/debian/ bullseye main

deb http://security.debian.org/debian-security bullseye-security main
deb-src http://security.debian.org/debian-security bullseye-security main

# bullseye-updates, to get updates before a point release is made;
# see https://www.debian.org/doc/manuals/debian-reference/ch02.en.html#_updates_and_backports
deb http://deb.debian.org/debian/ bullseye-updates main
deb-src http://deb.debian.org/debian/ bullseye-updates main

# This system was installed using small removable media
# (e.g. netinst, live or single CD). The matching "deb cdrom"
# entries were disabled at the end of the installation process.
# For information about how to configure apt package sources,
# see the sources.list(5) manual.
```

Chaque ligne de ce fichier comporte quatre champs :

- Le premier champ **deb** ou **deb-src**
  - indique si la source concerne des paquets binaires à installer ou les sources des paquets
- Le deuxième champ indique l'URL de la source
  - indique **file:// ou copy://** pour un répertoire local
  - indique **cdrom://** pour un CD ou DVD
  - indique **http://** pour un serveur web
  - indique **ftp://** pour un serveur ftp
- Le troisième champ indique la branche Debian
  - indique **stable**, **testing** ou **unstable** ou leur nom de correspondant tel **squeeze**
- Le quatrième champs indique une section de paquets
  - **main**
  - **contrib**
  - **non-free**
  - **non-US**

Important - Il est possible d'ajouter une source directement en éditant le fichier **/etc/apt/sources.list**, en créant un fichier spécifique dans le répertoire **/etc/apt/sources.list.d** ou en utilisant la commande **apt-setup**.

La mise à jour de la base de références de la description des paquets est effectuée un utilisant la commande suivante :

```
root@debian11:~# apt-get update
Hit:1 http://deb.debian.org/debian bullseye InRelease
Get:2 http://deb.debian.org/debian bullseye-updates InRelease [39.4 kB]
Hit:3 http://security.debian.org/debian-security bullseye-security InRelease
Fetched 39.4 kB in 1s (58.1 kB/s)
Reading package lists... Done
```

4.3 - Utilisation

Les **commandes** les plus utilisées d'apt-get sont :

Commande	Description
install	Installer un ou plusieurs paquets.
upgrade	Mettre à jour les paquets installés.
remove	Supprimer un paquet.
purge	Supprimer un paquet **et** ses fichiers de configuration.

Commencez par installer le paquet **mc** :

```
root@debian11:~# apt-get install mc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  mc-data
Suggested packages:
  arj catdvi | texlive-binaries dbview djvulibre-bin epub-utils genisoimage gv imagemagick libaspell-dev links |
w3m | lynx odt2txt python python-boto python-tz unar wimtools zip
The following NEW packages will be installed:
  mc mc-data
0 upgraded, 2 newly installed, 0 to remove and 0 not upgraded.
Need to get 1,880 kB of archives.
After this operation, 7,772 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

La ré-installation d'un paquet est effectuée un utilisant la commande suivante :

```
root@debian11:~# apt-get --reinstall install mc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
0 upgraded, 0 newly installed, 1 reinstalled, 0 to remove and 0 not upgraded.
Need to get 0 B/534 kB of archives.
After this operation, 0 B of additional disk space will be used.
```

```
(Reading database ... 102591 files and directories currently installed.)
Preparing to unpack .../mc_3%3a4.8.26-1.1_amd64.deb ...
Unpacking mc (3:4.8.26-1.1) over (3:4.8.26-1.1) ...
Setting up mc (3:4.8.26-1.1) ...
Processing triggers for desktop-file-utils (0.26-1) ...
Processing triggers for mailcap (3.69) ...
```

La suppression complète d'un paquet, y compris les fichiers de configuration éventuellement modifiés est effectuée un utilisant la commande suivante :

```
root@debian11:~# apt-get --purge remove mc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  mc-data
Use 'apt autoremove' to remove it.
The following packages will be REMOVED:
  mc*
0 upgraded, 0 newly installed, 1 to remove and 0 not upgraded.
After this operation, 1,528 kB disk space will be freed.
Do you want to continue? [Y/n] y
```

Les paquets téléchargés d'une source distante ou via une source **copy://** sont stockés dans le répertoire **/var/cache/apt/archives**. Les paquets partiellement téléchargés ou copiés sont stockés dans le répertoire **/var/cache/apt/archives/partial**.

```
root@debian11:~# ls /var/cache/apt/archives/
binutils_2.35.2-2_amd64.deb                   libasan6_10.2.1-6_amd64.deb              libcrypt-
dev_1%3a4.4.18-4_amd64.deb  libnsl-dev_1.3.0-2_amd64.deb         manpages-dev_5.10-1_all.deb
binutils-common_2.35.2-2_amd64.deb            libbinutils_2.35.2-2_amd64.deb           libctf0_2.35.2-2_amd64.deb
libtirpc-dev_1.3.1-1_amd64.deb       mc_3%3a4.8.26-1.1_amd64.deb
binutils-x86-64-linux-gnu_2.35.2-2_amd64.deb  libc6-dev_2.31-13+deb11u3_amd64.deb      libctf-
nobfd0_2.35.2-2_amd64.deb     libtsan0_10.2.1-6_amd64.deb          mc-data_3%3a4.8.26-1.1_all.deb
dselect_1.20.9_amd64.deb                      libcc1-0_10.2.1-6_amd64.deb              libgcc-10-
```

```
dev_10.2.1-6_amd64.deb     libubsan1_10.2.1-6_amd64.deb         partial
gcc-10_10.2.1-6_amd64.deb                      libc-dev-bin_2.31-13+deb11u3_amd64.deb   libitm1_10.2.1-6_amd64.deb
linux-libc-dev_5.10.106-1_amd64.deb
gcc_4%3a10.2.1-1_amd64.deb                     libc-devtools_2.31-13+deb11u3_amd64.deb
liblsan0_10.2.1-6_amd64.deb          lock
```

Pour nettoyer le cache il convient d'utiliser la commande suivante :

```
root@debian11:~# apt-get clean
root@debian11:~# ls /var/cache/apt/archives/
lock  partial
```

Pour mettre à jour les paquets déjà installés, il convient d'utiliser une de deux commandes apt-get :

- **upgrade** - permet de mettre à jour des paquets installés vers les versions les plus récentes. Cette action ne supprime aucun paquet installé.
- **dist-upgrade** - permet de mettre à jour des paquets installés vers les versions les plus récentes en mettant à jour aussi les dépendances modifiées. Cette action peut donc supprimer des paquets déjà installés. La commande est principalement utilisée pour mettre à jour une distribution complète, c'est-à-dire d'installer les mises à jour des paquets déjà installés **et** installer des nouveaux paquets ainsi que leur dépendances.

A faire - Utilisez la commande **man 8 apt-get** pour vous renseigner sur les autres commandes et options.

D'autres commandes apt sont présentes sur le système :

```
root@debian11:~# ls -l /usr/bin/apt*
-rwxr-xr-x 1 root root  18664 Jun 10  2021 /usr/bin/apt
-rwxr-xr-x 1 root root  88376 Jun 10  2021 /usr/bin/apt-cache
-rwxr-xr-x 1 root root  26936 Jun 10  2021 /usr/bin/apt-cdrom
-rwxr-xr-x 1 root root  26856 Jun 10  2021 /usr/bin/apt-config
-rwxr-xr-x 1 root root  22848 Jun 10  2021 /usr/bin/apt-extracttemplates
-rwxr-xr-x 1 root root 276800 Jun 10  2021 /usr/bin/apt-ftparchive
```

```
-rwxr-xr-x 1 root root  47416 Jun 10  2021 /usr/bin/apt-get
-rwxr-xr-x 1 root root  28191 Jun 10  2021 /usr/bin/apt-key
-rwxr-xr-x 1 root root  12242 Mar 28  2021 /usr/bin/apt-listchanges
-rwxr-xr-x 1 root root  51512 Jun 10  2021 /usr/bin/apt-mark
-rwxr-xr-x 1 root root  39152 Jun 10  2021 /usr/bin/apt-sortpkgs
```

Chaque commande a une fonction spécifique :

- **apt-cache** - utilisée pour se renseigner sur les paquets connus à APT,
- **apt-cdrom** - utilisée pour ajouter un CD-ROM aux sources des paquets disponibles,
- **apt-config** - utilisée pour obtenir les valeurs de la configuration de APT,
- **apt-extracttemplates** - utilisée pour extraire des fichiers templates pour la configuration d'un paquet lors de son installation. Le résultat est donc l'affichage de questions lors de l'installation d'un paquet dont les réponses sont nécessaires afin que l'installation s'effectue correctment,
- **apt-ftparchive** - utilisée pour créer les index dont APT se sert pour accéder aux sources des distributions,
- **apt-key** - utilisée pour gerer les clefs dont se sert APT pour authentifier les paquets. Les paquets authentifiés par ces clefs seront réputés fiables,
- **apt-listchanges** - utilisée pour afficher ce qui a changé dans la nouvelle version d'un paquet Debian par rapport à la version actuellement installée sur le système,
- **apt-mark** - utilisée pour diverses configurations d'un paquet, par exemple pour le marquer comme installé automatiquement ou manuellement, ou pour modifier les sélections de dpkg telles que hold install deinstall et purge,
- **apt-sortpkgs** - utilisée pour prendre un fichier index (source ou paquet) and trier les enregistrements de telle façon qu'ils soient ordonnés par nom.

LAB #5 - Utilisation de la Commande apt-cache

La commande apt-cache prend la forme suivante :

```
# apt-cache <options> <commande> <paquet(s)> [Entrée]
```

Les options et les commandes de la commande apt-cache sont :

```
root@debian11:~# apt-cache --help
apt 2.2.4 (amd64)
```

```
Usage: apt-cache [options] command
       apt-cache [options] show pkg1 [pkg2 ...]

apt-cache queries and displays available information about installed
and installable packages. It works exclusively on the data acquired
into the local cache via the 'update' command of e.g. apt-get. The
displayed information may therefore be outdated if the last update was
too long ago, but in exchange apt-cache works independently of the
availability of the configured sources (e.g. offline).

Most used commands:
  showsrc - Show source records
  search - Search the package list for a regex pattern
  depends - Show raw dependency information for a package
  rdepends - Show reverse dependency information for a package
  show - Show a readable record for the package
  pkgnames - List the names of all packages in the system
  policy - Show policy settings

See apt-cache(8) for more information about the available commands.
Configuration options and syntax is detailed in apt.conf(5).
Information about how to configure sources can be found in sources.list(5).
Package and version choices can be expressed via apt_preferences(5).
Security details are available in apt-secure(8).
```

Les **commandes** les plus utilisées d'apt-cache sont :

Commande	**Description**
stats	Affiche quelques statistiques de base.
search	Cherche une expression rationnelle dans la liste des paquets.
show	Affiche la description du paquet.
depends	Affiche toutes les dépendances d'un paquet.

Utilisez la commande **stats** de la commande apt-cache pour obtenir des statistiques sur les paquets :

```
root@debian11:~# apt-cache stats
Total package names: 98002 (2,744 k)
Total package structures: 87215 (3,837 k)
  Normal packages: 58293
  Pure virtual packages: 632
  Single virtual packages: 18895
  Mixed virtual packages: 347
  Missing: 9048
Total distinct versions: 58947 (5,187 k)
Total distinct descriptions: 117595 (2,822 k)
Total dependencies: 352751/101877 (8,685 k)
Total ver/file relations: 60904 (1,462 k)
Total Desc/File relations: 52059 (1,249 k)
Total Provides mappings: 22309 (535 k)
Total globbed strings: 186821 (4,214 k)
Total slack space: 100 k
Total space accounted for: 32.4 M
Total buckets in PkgHashTable: 196613
  Unused: 126297
  Used: 70316
  Utilization: 35.7637%
  Average entries: 1.24033
  Longest: 16
  Shortest: 1
Total buckets in GrpHashTable: 196613
  Unused: 119445
  Used: 77168
  Utilization: 39.2487%
  Average entries: 1.26998
  Longest: 6
  Shortest: 1
```

A faire - Utilisez le manuel d'apt-cache pour trouver les définitions des termes **Normal packages**, **Pure virtual packages**, **Single virtual packages** et **Mixed virtual packages**.

Recherchez maintenant la chaîne **mc** dans la liste des paquets :

```
root@debian11:~# apt-cache search mc | more
libace-rmcast-6.5.12 - ACE reliable multicast library
libace-rmcast-dev - ACE reliable multicast library - development files
libace-tmcast-6.5.12 - ACE transactional multicast library
libace-tmcast-dev - ACE transactional multicast library - development files
alsa-oss - ALSA wrapper for OSS applications
amule-emc - lists ed2k links inside emulecollection files
apel - portable library for emacsen
appstream - Software component metadata management
gir1.2-appstreamcompose-1.0 - Building blocks to compose AppStream metadata (introspection data)
ardour - the digital audio workstation
libarmci-mpi-dev - ARMCI-MPI (Development version)
auto-07p - software for continuation and bifurcation problems in ODE
auto-multiple-choice - Auto Multiple Choice - multiple choice papers management
auto-multiple-choice-common - Auto Multiple Choice - architecture independent files
auto-multiple-choice-doc - Auto Multiple Choice - HTML documentation
auto-multiple-choice-doc-pdf - Auto Multiple Choice - PDF documentation
bali-phy - Bayesian Inference of Alignment and Phylogeny
libbambamc-dev - Development files for reading and writing BAM (genome alignment) files
libbambamc0 - Runtime library for reading and writing BAM (genome alignment) files
python3-beaker - cache and session library for Python 3
beast-mcmc - Bayesian MCMC phylogenetic inference
beast-mcmc-examples - Bayesian MCMC phylogenetic inference - example data
libnucleotidelikelihoodcore0 - implementation of LikelihoodCore for nucleotides used by beast-mcmc
beast2-mcmc - Bayesian MCMC phylogenetic inference
beast2-mcmc-doc - Bayesian MCMC phylogenetic inference - documentation
beast2-mcmc-examples - Bayesian MCMC phylogenetic inference - example data
biobambam2 - tools for early stage alignment file processing
```

```
libblosc-dev - high performance meta-compressor optimized for binary data (development files)
libblosc1 - high performance meta-compressor optimized for binary data
python3-cachy - Provide a simple yet effective caching library (Python 3)
libcbf-dev - development files for CBFlib
cbmc - bounded model checker for C and C++ programs
cccc - C and C++ Code Counter, a software metrics tool
libccid - PC/SC driver for USB CCID smart card readers
libcglm-dev - Development files for the cglm library
cif-tools - Suite of tools to manipulate, validate and query mmCIF files
cl-babel - charset encoding/decoding library for Common Lisp
cl-trivial-backtrace - generate a Common Lisp backtrace portably
cl-uffi - Universal Foreign Function Library for Common Lisp
claws-mail-spam-report - Spam reporting plugin for Claws Mail
clonalframeml - Efficient Inference of Recombination in Whole Bacterial Genomes
libclutter-imcontext-0.1-0 - Open GL based interactive canvas library IMContext framework
libclutter-imcontext-0.1-0-dbg - Open GL based interactive canvas library IMContext framework (debug files)
libclutter-imcontext-0.1-bin - Open GL based interactive canvas library IMContext framework
libclutter-imcontext-0.1-dev - Open GL based interactive canvas library IMContext framework (dev. files)
libclutter-imcontext-0.1-doc - Open GL based interactive canvas library IMContext framework (document)
cmucl-source - CMUCL lisp sources
cohomcalg - sheaf cohomology of line bundles on toric varieties
cohomcalg-common - sheaf cohomology of line bundles on toric varieties (common files)
collectd-core - statistics collection and monitoring daemon (core system)
colortest - utilities to test color capabilities of terminal
libcombblas-dev - an extensible parallel graph library for graph analytics
libcombblas-docs - an extensible parallel graph library for graph analytics (docs)
libcombblas1.16.0 - an extensible parallel graph library for graph analytics
comgt - Option GlobeTrotter and Vodafone datacard control tool
complexity - tool for analyzing the complexity of C program functions
complexity-doc - tool for analyzing the complexity of C program (documentation)
cp2k - Ab Initio Molecular Dynamics
--More--
[q]
```

Pour être plus précis dans la recherche, il est nécessaire de rechercher une phrase clef :

```
root@debian11:~# apt-cache search "midnight commander"
pilot - Simple file browser from Alpine, a text-based email client
avfs - virtual filesystem to access archives, disk images, remote locations
junior-system - Debian Jr. System tools
krusader - twin-panel (commander-style) file manager
mc - Midnight Commander - a powerful file manager
mc-data - Midnight Commander - a powerful file manager -- data files
moc - ncurses based console audio player
```

Afficher maintenant les informations concernant le paquet **mc** :

```
root@debian11:~# apt-cache show mc
Package: mc
Version: 3:4.8.26-1.1
Installed-Size: 1492
Maintainer: Dmitry Smirnov <onlyjob@debian.org>
Architecture: amd64
Provides: mcedit
Depends: libc6 (>= 2.15), libext2fs2 (>= 1.37), libglib2.0-0 (>= 2.59.2), libgpm2 (>= 1.20.7), libslang2 (>=
2.2.4), libssh2-1 (>= 1.2.8), mc-data (= 3:4.8.26-1.1)
Recommends: mime-support, perl, unzip, sensible-utils
Suggests: arj, bzip2, catdvi | texlive-binaries, dbview, djvulibre-bin, epub-utils, file, genisoimage, gv,
imagemagick, libaspell-dev, links | w3m | lynx, odt2txt, poppler-utils, python, python-boto, python-tz, unar,
wimtools, xpdf | pdf-viewer, zip
Description-en: Midnight Commander - a powerful file manager
 GNU Midnight Commander is a text-mode full-screen file manager. It
 uses a two panel interface and a subshell for command execution. It
 includes an internal editor with syntax highlighting and an internal
 viewer with support for binary files. Also included is Virtual
 Filesystem (VFS), that allows files on remote systems (e.g. FTP, SSH
 servers) and files inside archives to be manipulated like real files.
Description-md5: 252a5c5aeeb7425db45357d4ab8aa55f
```

```
Homepage: https://www.midnight-commander.org
Tag: admin::filesystem, devel::lang:perl, devel::library, implemented-in::c,
 implemented-in::perl, interface::commandline, interface::text-mode,
 role::devel-lib, role::program, scope::application, suite::gnu,
 uitoolkit::ncurses, use::browsing, use::editing, use::organizing,
 works-with::archive, works-with::file
Section: utils
Priority: optional
Filename: pool/main/m/mc/mc_4.8.26-1.1_amd64.deb
Size: 534020
MD5sum: 0f8a73d3655353c27a214a483a7bc8ce
SHA256: 517dbba5018b82bee2d6f2b940100360f54bc7cd83d0d791a372a1d279ceebad
```

Dernièrement, visualisez les dépendances du paquet **mc** :

```
root@debian11:~# apt-cache depends mc
mc
  Depends: libc6
  Depends: libext2fs2
  Depends: libglib2.0-0
  Depends: libgpm2
  Depends: libslang2
  Depends: libssh2-1
  Depends: mc-data
  Recommends: mime-support
  Recommends: perl
  Recommends: unzip
  Recommends: sensible-utils
  Suggests: arj
  Suggests: bzip2
 |Suggests: catdvi
  Suggests: texlive-binaries
  Suggests: dbview
  Suggests: djvulibre-bin
```

```
 Suggests: epub-utils
 Suggests: file
 Suggests: genisoimage
 Suggests: gv
 Suggests: imagemagick
   graphicsmagick-imagemagick-compat
   imagemagick-6.q16
 Suggests: libaspell-dev
|Suggests: links
|Suggests: w3m
 Suggests: lynx
 Suggests: odt2txt
 Suggests: poppler-utils
 Suggests: <python>
   python-is-python2
 Suggests: <python-boto>
 Suggests: <python-tz>
 Suggests: unar
 Suggests: wimtools
|Suggests: xpdf
 Suggests: <pdf-viewer>
   atril
   evince
   gv
   mupdf
   okular
   qpdfview
   viewpdf.app
   xpdf
   zathura-pdf-poppler
 Suggests: zip
```

Les deux lignes suivantes :

```
|Suggests: xpdf
 Suggests: <pdf-viewer>
```

indiquent soit **xpdf** soit **<pdf-viewer>**

Important - Il est aussi possible d'utiliser la commande **aptitude** pour effectuer le gestion des paquets. Aptitude est un *Front End* à la commande **apt-get**.

Les Bibliothèques Partagées

Présentation

Introduction

Les bibliothèques partagées sont des fonctions communes à plusieurs programmes différents d'un même **domaine** (son, base de données, vidéo etc.). Les fonctions proposées par une ou plusieurs bibliothèques forment un **API** (*Application Programming Interface*). Sous Linux les bibliothèques se nomment ***Shared Objects*** et portent le suffixe **.so**.

Stockage

Les bibliothèques partagées sont stockées par convention dans des répertoires **lib**, par exemple :

Répertoire	**Contenu**
/lib	Bibliothèques du système de base
/usr/lib	Bibliothèques utilisateurs
/usr/local/lib	Bibliothèques locales

Répertoire	Contenu
/usr/X11R6/lib	Bibliothèques de l'environnement X
/opt/kde4/lib	Bibliothèques de KDE

Important : La bibliothèque la plus importante est **libc**. Sans elle, le système Linux ne peut pas fonctionner.

ld-linux.so.2

La bibliothèque **ld-linux.so.2** est utilisée par le système pour créer un lien avec une bibliothèque partagée au moment de l'exécution d'un programme et s'appelle le **chargeur de liens**. Ce dernier recherche des bibliothèques partagées dans un ordre précis :

- dans les chemins précisés par la variable système **LD_LIBRARY_PATH**,
- dans les chemins précisés dans le contenu compilé du fichier **/etc/ld.so.cache**,
- dans **/lib** et **/usr/lib**.

Il est à noter que le contenu du cache **ld.so.cache** est construit à partir des informations contenus dans le fichier de configuration **/etc/ld.so.conf**.

Afin d'étudier les bibliothèques liées à une application, nous allons d'abord installer l'application **mc**, un explorateur de fichiers en mode console :

```
root@debian11:~# apt-get install mc
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  arj catdvi | texlive-binaries dbview djvulibre-bin epub-utils genisoimage gv imagemagick libaspell-dev links |
w3m | lynx odt2txt python python-boto python-tz unar wimtools zip
The following NEW packages will be installed:
  mc
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 534 kB of archives.
After this operation, 1,528 kB of additional disk space will be used.
```

```
Get:1 http://deb.debian.org/debian bullseye/main amd64 mc amd64 3:4.8.26-1.1 [534 kB]
Fetched 534 kB in 0s (20.7 MB/s)
Selecting previously unselected package mc.
(Reading database ... 102490 files and directories currently installed.)
Preparing to unpack .../mc_3%3a4.8.26-1.1_amd64.deb ...
Unpacking mc (3:4.8.26-1.1) ...
Setting up mc (3:4.8.26-1.1) ...
update-alternatives: using /usr/bin/mcview to provide /usr/bin/view (view) in auto mode
Processing triggers for desktop-file-utils (0.26-1) ...
Processing triggers for mailcap (3.69) ...
```

La Commande ldd

Pour déterminer quelles sont les bibliothèques liées à une application, il convient d'utiliser la commande **ldd** :

```
root@debian11:~# ldd /usr/bin/mc
        linux-vdso.so.1 (0x00007ffc4b5cf000)
        libslang.so.2 => /lib/x86_64-linux-gnu/libslang.so.2 (0x00007ff729cb2000)
        libgpm.so.2 => /lib/x86_64-linux-gnu/libgpm.so.2 (0x00007ff729caa000)
        libe2p.so.2 => /lib/x86_64-linux-gnu/libe2p.so.2 (0x00007ff729c9e000)
        libssh2.so.1 => /lib/x86_64-linux-gnu/libssh2.so.1 (0x00007ff729c69000)
        libext2fs.so.2 => /lib/x86_64-linux-gnu/libext2fs.so.2 (0x00007ff729bfd000)
        libgmodule-2.0.so.0 => /lib/x86_64-linux-gnu/libgmodule-2.0.so.0 (0x00007ff729bf7000)
        libglib-2.0.so.0 => /lib/x86_64-linux-gnu/libglib-2.0.so.0 (0x00007ff729ac6000)
        libutil.so.1 => /lib/x86_64-linux-gnu/libutil.so.1 (0x00007ff729ac1000)
        libpthread.so.0 => /lib/x86_64-linux-gnu/libpthread.so.0 (0x00007ff729a9f000)
        libc.so.6 => /lib/x86_64-linux-gnu/libc.so.6 (0x00007ff7298da000)
        libdl.so.2 => /lib/x86_64-linux-gnu/libdl.so.2 (0x00007ff7298d4000)
        libm.so.6 => /lib/x86_64-linux-gnu/libm.so.6 (0x00007ff729790000)
        libgcrypt.so.20 => /lib/x86_64-linux-gnu/libgcrypt.so.20 (0x00007ff72966e000)
        libz.so.1 => /lib/x86_64-linux-gnu/libz.so.1 (0x00007ff729651000)
        libcom_err.so.2 => /lib/x86_64-linux-gnu/libcom_err.so.2 (0x00007ff72964b000)
        libpcre.so.3 => /lib/x86_64-linux-gnu/libpcre.so.3 (0x00007ff7295d8000)
```

```
        /lib64/ld-linux-x86-64.so.2 (0x00007ff72a0e1000)
        libgpg-error.so.0 => /lib/x86_64-linux-gnu/libgpg-error.so.0 (0x00007ff7295b2000)
```

Afin de comprendre ce qui se passe dans le cas où une bibliothèque est manquante, renommez la bibliothèque **/usr/lib/libgpm.so.2** en **/usr/lib/libgpm.so.2.old** :

```
root@debian11:~# mv /usr/lib/x86_64-linux-gnu/libgpm.so.2  /usr/lib/x86_64-linux-gnu/libgpm.so.2.old
```

Exécutez de nouveau la commande ldd. Vous obtiendrez un résultat similaire à celui-ci :

```
root@debian11:~# ldd /usr/bin/mc
        linux-vdso.so.1 (0x00007fff2999d000)
        libslang.so.2 => /lib/x86_64-linux-gnu/libslang.so.2 (0x00007faa2f6d3000)
        libgpm.so.2 => not found
        libe2p.so.2 => /lib/x86_64-linux-gnu/libe2p.so.2 (0x00007faa2f6c7000)
        libssh2.so.1 => /lib/x86_64-linux-gnu/libssh2.so.1 (0x00007faa2f692000)
        libext2fs.so.2 => /lib/x86_64-linux-gnu/libext2fs.so.2 (0x00007faa2f626000)
        libgmodule-2.0.so.0 => /lib/x86_64-linux-gnu/libgmodule-2.0.so.0 (0x00007faa2f620000)
        libglib-2.0.so.0 => /lib/x86_64-linux-gnu/libglib-2.0.so.0 (0x00007faa2f4ef000)
        libutil.so.1 => /lib/x86_64-linux-gnu/libutil.so.1 (0x00007faa2f4ea000)
        libpthread.so.0 => /lib/x86_64-linux-gnu/libpthread.so.0 (0x00007faa2f4c8000)
        libc.so.6 => /lib/x86_64-linux-gnu/libc.so.6 (0x00007faa2f303000)
        libdl.so.2 => /lib/x86_64-linux-gnu/libdl.so.2 (0x00007faa2f2fd000)
        libm.so.6 => /lib/x86_64-linux-gnu/libm.so.6 (0x00007faa2f1b9000)
        libgcrypt.so.20 => /lib/x86_64-linux-gnu/libgcrypt.so.20 (0x00007faa2f097000)
        libz.so.1 => /lib/x86_64-linux-gnu/libz.so.1 (0x00007faa2f07a000)
        libcom_err.so.2 => /lib/x86_64-linux-gnu/libcom_err.so.2 (0x00007faa2f074000)
        libpcre.so.3 => /lib/x86_64-linux-gnu/libpcre.so.3 (0x00007faa2f001000)
        /lib64/ld-linux-x86-64.so.2 (0x00007faa2fb02000)
        libgpg-error.so.0 => /lib/x86_64-linux-gnu/libgpg-error.so.0 (0x00007faa2efdb000)
```

Notez la présence de la ligne **libgpm.so.2 ⇒ not found**. Compte tenu de la bibliothèque partagée manquante, le programme **mc** ne peut plus être lancé :

```
root@debian11:~# mc
mc: error while loading shared libraries: libgpm.so.2: cannot open shared object file: No such file or directory
```

Renommez la bibliothèque correctement et vérifiez la résolution de l'erreur précédente avec la commande ldd :

```
root@debian11:~# mv /usr/lib/x86_64-linux-gnu/libgpm.so.2.old  /usr/lib/x86_64-linux-gnu/libgpm.so.2
root@debian11:~# ldd /usr/bin/mc
        linux-vdso.so.1 (0x00007ffc23da7000)
        libslang.so.2 => /lib/x86_64-linux-gnu/libslang.so.2 (0x00007fe759056000)
        libgpm.so.2 => /lib/x86_64-linux-gnu/libgpm.so.2 (0x00007fe75904e000)
        libe2p.so.2 => /lib/x86_64-linux-gnu/libe2p.so.2 (0x00007fe759042000)
        libssh2.so.1 => /lib/x86_64-linux-gnu/libssh2.so.1 (0x00007fe75900d000)
        libext2fs.so.2 => /lib/x86_64-linux-gnu/libext2fs.so.2 (0x00007fe758fa1000)
        libgmodule-2.0.so.0 => /lib/x86_64-linux-gnu/libgmodule-2.0.so.0 (0x00007fe758f9b000)
        libglib-2.0.so.0 => /lib/x86_64-linux-gnu/libglib-2.0.so.0 (0x00007fe758e6a000)
        libutil.so.1 => /lib/x86_64-linux-gnu/libutil.so.1 (0x00007fe758e65000)
        libpthread.so.0 => /lib/x86_64-linux-gnu/libpthread.so.0 (0x00007fe758e43000)
        libc.so.6 => /lib/x86_64-linux-gnu/libc.so.6 (0x00007fe758c7e000)
        libdl.so.2 => /lib/x86_64-linux-gnu/libdl.so.2 (0x00007fe758c78000)
        libm.so.6 => /lib/x86_64-linux-gnu/libm.so.6 (0x00007fe758b34000)
        libgcrypt.so.20 => /lib/x86_64-linux-gnu/libgcrypt.so.20 (0x00007fe758a12000)
        libz.so.1 => /lib/x86_64-linux-gnu/libz.so.1 (0x00007fe7589f5000)
        libcom_err.so.2 => /lib/x86_64-linux-gnu/libcom_err.so.2 (0x00007fe7589ef000)
        libpcre.so.3 => /lib/x86_64-linux-gnu/libpcre.so.3 (0x00007fe75897c000)
        /lib64/ld-linux-x86-64.so.2 (0x00007fe759485000)
        libgpg-error.so.0 => /lib/x86_64-linux-gnu/libgpg-error.so.0 (0x00007fe758956000)
```

Le fichier /etc/ld.so.conf

Le fichier **/etc/ld.so.conf** est utilisé pour configurer le cache **/etc/ld.so.cache** :

```
root@debian11:~# cat /etc/ld.so.conf
```

```
include /etc/ld.so.conf.d/*.conf
```

Dans ce cas, le fichier ne contient qu'une directive **include** qui renvoie vers le contenu du répertoire **/etc/ld.so.conf.d/** :

```
root@debian11:~# ls -l /etc/ld.so.conf.d/
total 8
-rw-r--r-- 1 root root  44 Jul 29  2019 libc.conf
-rw-r--r-- 1 root root 100 Mar 17 22:37 x86_64-linux-gnu.conf
```

Le contenu de ces deux fichiers est le suivant :

```
root@debian11:~# cat /etc/ld.so.conf.d/libc.conf
# libc default configuration
/usr/local/lib
```

```
root@debian11:~# cat /etc/ld.so.conf.d/x86_64-linux-gnu.conf
# Multiarch support
/usr/local/lib/x86_64-linux-gnu
/lib/x86_64-linux-gnu
/usr/lib/x86_64-linux-gnu
```

La Commande ldconfig

La commande **ldconfig** est utilisée pour :

- mettre à jour le cache pour les chemins inclus dans le fichier **/etc/ld.so.conf** ainsi que pour les répertoires **/lib** et **/usr/lib**. L'option **-N** de la commande ldconfig empêche la mise à jour des chemins dans le fichier,
- mettre à jour les liens symboliques sur les bibliothèques. L'option **-X** de la commande ldconfig empêche la mise à jour des liens symboliques.

Les liens symboliques sont utilisés pour gérer les versions de bibliothèques.

La commande ldconfig peut être utilisée avec l'option **-p** pour visualiser le contenu du cache :

```
root@debian11:~# ldconfig -p | more
851 libs found in cache `/etc/ld.so.cache'
        libz3.so.4 (libc6,x86-64) => /lib/x86_64-linux-gnu/libz3.so.4
        libzvbi.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzvbi.so.0
        libzvbi-chains.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzvbi-chains.so.0
        libzstd.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzstd.so.1
        libzmq.so.5 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzmq.so.5
        libzmf-0.0.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzmf-0.0.so.0
        libzbar.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libzbar.so.0
        libz.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libz.so.1
        libyaml-0.so.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libyaml-0.so.2
        libyajl.so.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libyajl.so.2
        libx265.so.192 (libc6,x86-64) => /lib/x86_64-linux-gnu/libx265.so.192
        libx264.so.160 (libc6,x86-64) => /lib/x86_64-linux-gnu/libx264.so.160
        libxxhash.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxxhash.so.0
        libxvidcore.so.4 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxvidcore.so.4
        libxtables.so.12 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxtables.so.12
        libxslt.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxslt.so.1
        libxshmfence.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxshmfence.so.1
        libxml2.so.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxml2.so.2
        libxmlsec1.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxmlsec1.so.1
        libxmlsec1-nss.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxmlsec1-nss.so.1
        libxklavier.so.16 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxklavier.so.16
        libxkbregistry.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxkbregistry.so.0
        libxkbfile.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxkbfile.so.1
        libxkbcommon.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxkbcommon.so.0
        libxfconf-0.so.3 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxfconf-0.so.3
        libxfce4util.so.7 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxfce4util.so.7
        libxfce4ui-2.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxfce4ui-2.so.0
        libxfce4panel-2.0.so.4 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxfce4panel-2.0.so.4
        libxfce4kbd-private-3.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxfce4kbd-private-3.so.0
        libxcb.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb.so.1
        libxcb-xfixes.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-xfixes.so.0
        libxcb-util.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-util.so.1
```

```
        libxcb-sync.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-sync.so.1
        libxcb-shm.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-shm.so.0
        libxcb-shape.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-shape.so.0
        libxcb-render.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-render.so.0
        libxcb-randr.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-randr.so.0
        libxcb-present.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-present.so.0
        libxcb-glx.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-glx.so.0
        libxcb-dri3.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-dri3.so.0
        libxcb-dri2.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxcb-dri2.so.0
        libxatracker.so.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxatracker.so.2
        libxapian.so.30 (libc6,x86-64) => /lib/x86_64-linux-gnu/libxapian.so.30
        libwrap.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwrap.so.0
        libwps-0.4.so.4 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwps-0.4.so.4
        libwpg-0.3.so.3 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwpg-0.3.so.3
        libwpe-1.0.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwpe-1.0.so.1
        libwpd-0.10.so.10 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwpd-0.10.so.10
        libwoff2enc.so.1.0.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwoff2enc.so.1.0.2
        libwoff2dec.so.1.0.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwoff2dec.so.1.0.2
        libwoff2common.so.1.0.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwoff2common.so.1.0.2
        libwnck-3.so.0 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwnck-3.so.0
        libwebrtc_audio_processing.so.1 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwebrtc_audio_processing.so.1
        libwebpmux.so.3 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwebpmux.so.3
        libwebpdemux.so.2 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwebpdemux.so.2
        libwebp.so.6 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwebp.so.6
        libwebkit2gtk-4.0.so.37 (libc6,x86-64) => /lib/x86_64-linux-gnu/libwebkit2gtk-4.0.so.37
--More--
[q]
```

Pour ajouter des bibliothèques partagées, il convient de :

- créer un fichier dans le répertoire **/etc/ld.so.conf.d/** et d'y inscrire le ou les chemins vers le lieu de stockage des bibliothèques partagées à ajouter,
- exécuter la commande **ldconfig -v**, où v implique verbose, afin de reconstruire le cache.