Version : **2024.01**

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LCF502 - Gestion des Paquets

Contenu du Module

LAB #1 - Compiler à partir des sources

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

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

```
[root@centos8 ~]# wget https://ftp.gnu.org/gnu/hello/hello-2.1.1.tar.gz
--2021-04-20 16:56:18--  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   941KB/s    in 0.4s

2021-04-20 16:56:19 (941 KB/s) - ‘hello-2.1.1.tar.gz’ saved [389363/389363]
```

Ensuite désarchivez le logiciel :

```
[root@centos8 ~]# tar xvf hello-2.1.1.tar.gz
hello-2.1.1/
hello-2.1.1/intl/
hello-2.1.1/intl/ChangeLog
hello-2.1.1/intl/Makefile.in
```

```
hello-2.1.1/intl/config.charset
hello-2.1.1/intl/locale.alias
hello-2.1.1/intl/ref-add.sin
hello-2.1.1/intl/ref-del.sin
hello-2.1.1/intl/gmo.h
hello-2.1.1/intl/gettextP.h
hello-2.1.1/intl/hash-string.h
hello-2.1.1/intl/plural-exp.h
hello-2.1.1/intl/eval-plural.h
hello-2.1.1/intl/os2compat.h
hello-2.1.1/intl/libgnuintl.h
hello-2.1.1/intl/loadinfo.h
hello-2.1.1/intl/bindtextdom.c
hello-2.1.1/intl/dcgettext.c
hello-2.1.1/intl/dgettext.c
hello-2.1.1/intl/gettext.c
hello-2.1.1/intl/finddomain.c
hello-2.1.1/intl/loadmsgcat.c
hello-2.1.1/intl/localealias.c
hello-2.1.1/intl/textdomain.c
hello-2.1.1/intl/l10nflist.c
hello-2.1.1/intl/explodename.c
hello-2.1.1/intl/dcigettext.c
hello-2.1.1/intl/dcngettext.c
hello-2.1.1/intl/dngettext.c
hello-2.1.1/intl/ngettext.c
hello-2.1.1/intl/plural.y
hello-2.1.1/intl/plural-exp.c
hello-2.1.1/intl/localcharset.c
hello-2.1.1/intl/localename.c
hello-2.1.1/intl/osdep.c
hello-2.1.1/intl/os2compat.c
hello-2.1.1/intl/intl-compat.c
hello-2.1.1/intl/plural.c
```

```
hello-2.1.1/intl/VERSION
hello-2.1.1/po/
hello-2.1.1/po/Makefile.in.in
hello-2.1.1/po/Makevars
hello-2.1.1/po/remove-potcdate.sin
hello-2.1.1/po/quot.sed
hello-2.1.1/po/boldquot.sed
hello-2.1.1/po/en@quot.header
hello-2.1.1/po/en@boldquot.header
hello-2.1.1/po/insert-header.sin
hello-2.1.1/po/Rules-quot
hello-2.1.1/po/POTFILES.in
hello-2.1.1/po/hello.pot
hello-2.1.1/po/ca.po
hello-2.1.1/po/da.po
hello-2.1.1/po/de.po
hello-2.1.1/po/de_DE.po
hello-2.1.1/po/el.po
hello-2.1.1/po/eo.po
hello-2.1.1/po/es.po
hello-2.1.1/po/et.po
hello-2.1.1/po/fi.po
hello-2.1.1/po/fr.po
hello-2.1.1/po/gl.po
hello-2.1.1/po/he.po
hello-2.1.1/po/hr.po
hello-2.1.1/po/hu.po
hello-2.1.1/po/id.po
hello-2.1.1/po/it.po
hello-2.1.1/po/ja.po
hello-2.1.1/po/ko.po
hello-2.1.1/po/lv.po
hello-2.1.1/po/nb.po
hello-2.1.1/po/nl.po
```

```
hello-2.1.1/po/nn.po
hello-2.1.1/po/pl.po
hello-2.1.1/po/pt.po
hello-2.1.1/po/pt_BR.po
hello-2.1.1/po/ru.po
hello-2.1.1/po/sk.po
hello-2.1.1/po/sl.po
hello-2.1.1/po/sv.po
hello-2.1.1/po/tr.po
hello-2.1.1/po/uk.po
hello-2.1.1/po/ca.gmo
hello-2.1.1/po/da.gmo
hello-2.1.1/po/de.gmo
hello-2.1.1/po/de_DE.gmo
hello-2.1.1/po/el.gmo
hello-2.1.1/po/eo.gmo
hello-2.1.1/po/es.gmo
hello-2.1.1/po/et.gmo
hello-2.1.1/po/fi.gmo
hello-2.1.1/po/fr.gmo
hello-2.1.1/po/gl.gmo
hello-2.1.1/po/he.gmo
hello-2.1.1/po/hr.gmo
hello-2.1.1/po/hu.gmo
hello-2.1.1/po/id.gmo
hello-2.1.1/po/it.gmo
hello-2.1.1/po/ja.gmo
hello-2.1.1/po/ko.gmo
hello-2.1.1/po/lv.gmo
hello-2.1.1/po/nb.gmo
hello-2.1.1/po/nl.gmo
hello-2.1.1/po/nn.gmo
hello-2.1.1/po/pl.gmo
hello-2.1.1/po/pt.gmo
```

```
hello-2.1.1/po/pt_BR.gmo
hello-2.1.1/po/ru.gmo
hello-2.1.1/po/sk.gmo
hello-2.1.1/po/sl.gmo
hello-2.1.1/po/sv.gmo
hello-2.1.1/po/tr.gmo
hello-2.1.1/po/uk.gmo
hello-2.1.1/po/ChangeLog
hello-2.1.1/po/LINGUAS
hello-2.1.1/README
hello-2.1.1/ABOUT-NLS
hello-2.1.1/AUTHORS
hello-2.1.1/COPYING
hello-2.1.1/ChangeLog
hello-2.1.1/INSTALL
hello-2.1.1/Makefile.am
hello-2.1.1/Makefile.in
hello-2.1.1/NEWS
hello-2.1.1/THANKS
hello-2.1.1/TODO
hello-2.1.1/aclocal.m4
hello-2.1.1/config.guess
hello-2.1.1/config.h.in
hello-2.1.1/config.rpath
hello-2.1.1/config.sub
hello-2.1.1/configure
hello-2.1.1/configure.ac
hello-2.1.1/depcomp
hello-2.1.1/install-sh
hello-2.1.1/missing
hello-2.1.1/mkinstalldirs
hello-2.1.1/BUGS
hello-2.1.1/ChangeLog.O
hello-2.1.1/contrib/
```

```
hello-2.1.1/contrib/ChangeLog
hello-2.1.1/contrib/Makefile.am
hello-2.1.1/contrib/Makefile.in
hello-2.1.1/contrib/de_franconian_po.txt
hello-2.1.1/contrib/evolution.txt
hello-2.1.1/contrib/hello.1
hello-2.1.1/doc/
hello-2.1.1/doc/gpl.texi
hello-2.1.1/doc/ChangeLog
hello-2.1.1/doc/Makefile.am
hello-2.1.1/doc/Makefile.in
hello-2.1.1/doc/mdate-sh
hello-2.1.1/doc/stamp-vti
hello-2.1.1/doc/texinfo.tex
hello-2.1.1/doc/version.texi
hello-2.1.1/doc/hello.texi
hello-2.1.1/doc/hello.info
hello-2.1.1/src/
hello-2.1.1/src/ChangeLog
hello-2.1.1/src/Makefile.am
hello-2.1.1/src/Makefile.in
hello-2.1.1/src/alloca.c
hello-2.1.1/src/hello.c
hello-2.1.1/src/version.c
hello-2.1.1/src/getopt.c
hello-2.1.1/src/getopt1.c
hello-2.1.1/src/getopt.h
hello-2.1.1/src/system.h
hello-2.1.1/man/
hello-2.1.1/man/ChangeLog
hello-2.1.1/man/Makefile.am
hello-2.1.1/man/Makefile.in
hello-2.1.1/man/hello.1
hello-2.1.1/man/help2man
```

```
hello-2.1.1/m4/
hello-2.1.1/m4/README
hello-2.1.1/m4/ChangeLog
hello-2.1.1/m4/Makefile.am
hello-2.1.1/m4/Makefile.in
hello-2.1.1/m4/codeset.m4
hello-2.1.1/m4/gettext.m4
hello-2.1.1/m4/glibc21.m4
hello-2.1.1/m4/iconv.m4
hello-2.1.1/m4/isc-posix.m4
hello-2.1.1/m4/lcmessage.m4
hello-2.1.1/m4/lib-ld.m4
hello-2.1.1/m4/lib-link.m4
hello-2.1.1/m4/lib-prefix.m4
hello-2.1.1/m4/progtest.m4
hello-2.1.1/tests/
hello-2.1.1/tests/ChangeLog
hello-2.1.1/tests/Makefile.am
hello-2.1.1/tests/Makefile.in
hello-2.1.1/tests/hello-1
hello-2.1.1/tests/world-1
hello-2.1.1/tests/nothing-1
```

Changez de répertoire :

```
[root@centos8 ~]# cd hello-2.1.1/
```

A l'étude du fichier README, celui-ci nous renvoie vers le fichier **INSTALL**. Visualisez donc ce dernier :

```
[root@centos8 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.)
--Plus--(11%)
```

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@centos8 hello-2.1.1]# ./configure
checking for a BSD-compatible install... /bin/install -c
checking whether build environment is sane... yes
checking for gawk... gawk
checking whether make sets ${MAKE}... yes
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... GNU
checking dependency style of gcc... gcc3
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... /bin/msgfmt
checking for gmsgfmt... /bin/msgfmt
checking for xgettext... /bin/xgettext
checking for msgmerge... /bin/msgmerge
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... /bin/ld
checking if the linker (/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.

```
[root@centos8 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=gcc3 /bin/sh ../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=gcc3 /bin/sh ../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=gcc3 /bin/sh ../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=gcc3 /bin/sh ../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@centos8 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@centos8 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/sh ../mkinstalldirs /usr/local/info
mkdir -p -- /usr/local/info
 /bin/install -c -m 644 ./hello.info /usr/local/info/hello.info
 install-info --info-dir=/usr/local/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; \
  /bin/install -c -m 644 libintl.h /usr/local/include/libintl.h; \
  @LIBTOOL@ --mode=install \
    /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; \
    /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; \
      /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; \
  /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; \
  /bin/install -c -m 644 VERSION /usr/local/share/gettext/intl/VERSION; \
  /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 $dists; do \
    /bin/install -c -m 644 ./$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; \
    /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 \
    /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/sh ../mkinstalldirs /usr/local/bin
  /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/sh ../mkinstalldirs /usr/local/man/man1
mkdir -p -- /usr/local/man/man1
 /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@centos8 hello-2.1.1]# hello
Hello, world!
```

Le logiciel hello a été correctement installé.

LAB #2 - La commande rpm

Afin de faciliter l'installation, la désinstallation et la gestion des logiciels (appelés paquets), CentOS et Red Hat utilisent un format de fichier de logiciels installables spécifique. Celui-ci s'appelle **RPM** pour Red Hat Package Manager. La commande utilisée pour manipuler ses paquets s'appelle aussi **rpm**.

Les options de la commande rpm sont :

```
[root@centos8 hello-2.1.1]# cd ~
[root@centos8 ~]# rpm --help
Usage: rpm [OPTION...]

Query/Verify package selection options:
  -a, --all                          query/verify all packages
  -f, --file                         query/verify package(s) owning file
  -g, --group                        query/verify package(s) in group
  -p, --package                      query/verify a package file
      --pkgid                        query/verify package(s) with package identifier
      --hdrid                        query/verify package(s) with header identifier
      --triggeredby                  query the package(s) triggered by the package
      --whatconflicts                query/verify the package(s) which require a dependency
      --whatrequires                 query/verify the package(s) which require a dependency
      --whatobsoletes                query/verify the package(s) which obsolete a dependency
      --whatprovides                 query/verify the package(s) which provide a dependency
      --whatrecommends               query/verify the package(s) which recommends a dependency
      --whatsuggests                 query/verify the package(s) which suggests a dependency
      --whatsupplements              query/verify the package(s) which supplements a dependency
      --whatenhances                 query/verify the package(s) which enhances a dependency
      --nomanifest                   do not process non-package files as manifests

Query options (with -q or --query):
  -c, --configfiles                  list all configuration files
  -d, --docfiles                     list all documentation files
  -L, --licensefiles                 list all license files
  -A, --artifactfiles                list all artifact files
      --dump                         dump basic file information
  -l, --list                         list files in package
      --queryformat=QUERYFORMAT      use the following query format
  -s, --state                        display the states of the listed files
```

```
Verify options (with -V or --verify):
      --nofiledigest                 don't verify digest of files
      --nofiles                      don't verify files in package
      --nodeps                       don't verify package dependencies
      --noscript                     don't execute verify script(s)

Install/Upgrade/Erase options:
      --allfiles                     install all files, even configurations which might otherwise be skipped
      --allmatches                   remove all packages which match <package> (normally an error is generated if
<package> specified multiple packages)
      --badreloc                     relocate files in non-relocatable package
  -e, --erase=<package>+             erase (uninstall) package
      --excludedocs                  do not install documentation
      --excludepath=<path>           skip files with leading component <path>
      --force                        short hand for --replacepkgs --replacefiles
  -F, --freshen=<packagefile>+       upgrade package(s) if already installed
  -h, --hash                         print hash marks as package installs (good with -v)
      --ignorearch                   don't verify package architecture
      --ignoreos                     don't verify package operating system
      --ignoresize                   don't check disk space before installing
      --noverify                     short hand for --ignorepayload --ignoresignature
  -i, --install                      install package(s)
      --justdb                       update the database, but do not modify the filesystem
      --nodeps                       do not verify package dependencies
      --nofiledigest                 don't verify digest of files
      --nocontexts                   don't install file security contexts
      --nocaps                       don't install file capabilities
      --noorder                      do not reorder package installation to satisfy dependencies
      --noscripts                    do not execute package scriptlet(s)
      --notriggers                   do not execute any scriptlet(s) triggered by this package
      --oldpackage                   upgrade to an old version of the package (--force on upgrades does this
automatically)
      --percent                      print percentages as package installs
      --prefix=<dir>                 relocate the package to <dir>, if relocatable
```

```
      --relocate=<old>=<new>         relocate files from path <old> to <new>
      --replacefiles                 ignore file conflicts between packages
      --replacepkgs                  reinstall if the package is already present
      --test                         don't install, but tell if it would work or not
  -U, --upgrade=<packagefile>+       upgrade package(s)
      --reinstall=<packagefile>+     reinstall package(s)

Common options for all rpm modes and executables:
  -D, --define='MACRO EXPR'          define MACRO with value EXPR
      --undefine=MACRO               undefine MACRO
  -E, --eval='EXPR'                  print macro expansion of EXPR
      --target=CPU-VENDOR-OS         Specify target platform
      --macros=<FILE:...>            read <FILE:...> instead of default file(s)
      --noplugins                    don't enable any plugins
      --nodigest                     don't verify package digest(s)
      --nosignature                  don't verify package signature(s)
      --rcfile=<FILE:...>            read <FILE:...> instead of default file(s)
  -r, --root=ROOT                    use ROOT as top level directory (default: "/")
      --dbpath=DIRECTORY             use database in DIRECTORY
      --querytags                    display known query tags
      --showrc                       display final rpmrc and macro configuration
      --quiet                        provide less detailed output
  -v, --verbose                      provide more detailed output
      --version                      print the version of rpm being used

Options implemented via popt alias/exec:
      --scripts                      list install/erase scriptlets from package(s)
      --setperms                     set permissions of files in a package
      --setugids                     set user/group ownership of files in a package
      --setcaps                      set capabilities of files in a package
      --restore                      restore file/directory permissions
      --conflicts                    list capabilities this package conflicts with
      --obsoletes                    list other packages removed by installing this package
      --provides                     list capabilities that this package provides
```

```
      --requires                    list capabilities required by package(s)
      --recommends                  list capabilities recommended by package(s)
      --suggests                    list capabilities suggested by package(s)
      --supplements                 list capabilities supplemented by package(s)
      --enhances                    list capabilities enhanced by package(s)
      --info                        list descriptive information from package(s)
      --changelog                   list change logs for this package
      --changes                     list changes for this package with full time stamps
      --xml                         list metadata in xml
      --triggers                    list trigger scriptlets from package(s)
      --filetriggers                list filetrigger scriptlets from package(s)
      --last                        list package(s) by install time, most recent first
      --dupes                       list duplicated packages
      --filesbypkg                  list all files from each package
      --fileclass                   list file names with their classes
      --filecolor                   list file names with their colors
      --fileprovide                 list file names with their provides
      --filerequire                 list file names with requires
      --filecaps                    list file names with their POSIX1.e capabilities

Help options:
  -?, --help                        Show this help message
      --usage                       Display brief usage message
```

2.1 - Configuration

Le fichier de configuration principal de la commande rpm est **/usr/lib/rpm/rpmrc** :

```
[root@centos8 ~]# more /usr/lib/rpm/rpmrc
#/*! \page config_rpmrc Default configuration: /usr/lib/rpm/rpmrc
# \verbatim
#
# This is a global RPM configuration file. All changes made here will
```

```
# be lost when the rpm package is upgraded. Any per-system configuration
# should be added to /etc/rpmrc, while per-user configuration should
# be added to ~/.rpmrc.
#
############################################################
# Values for RPM_OPT_FLAGS for various platforms

# "fat" binary with both archs, for Darwin
optflags: fat -O2 -g -arch i386 -arch ppc

optflags: i386 -O2 -g -march=i386 -mtune=i686
optflags: i486 -O2 -g -march=i486
optflags: i586 -O2 -g -march=i586
optflags: i686 -O2 -g -march=i686
optflags: pentium3 -O2 -g -march=pentium3
optflags: pentium4 -O2 -g -march=pentium4
optflags: athlon -O2 -g -march=athlon
optflags: geode -Os -g -m32 -march=geode
optflags: ia64 -O2 -g
optflags: x86_64 -O2 -g
optflags: amd64 -O2 -g
optflags: ia32e -O2 -g

optflags: alpha -O2 -g -mieee
optflags: alphaev5 -O2 -g -mieee -mtune=ev5
optflags: alphaev56 -O2 -g -mieee -mtune=ev56
optflags: alphapca56 -O2 -g -mieee -mtune=pca56
optflags: alphaev6 -O2 -g -mieee -mtune=ev6
optflags: alphaev67 -O2 -g -mieee -mtune=ev67

optflags: sparc -O2 -g -m32 -mtune=ultrasparc
optflags: sparcv8 -O2 -g -m32 -mtune=ultrasparc -mv8
optflags: sparcv9 -O2 -g -m32 -mtune=ultrasparc
optflags: sparcv9v -O2 -g -m32 -mtune=niagara
```

```
optflags: sparc64 -O2 -g -m64 -mtune=ultrasparc
optflags: sparc64v -O2 -g -m64 -mtune=niagara

optflags: m68k -O2 -g -fomit-frame-pointer

optflags: ppc -O2 -g
optflags: ppc8260 -O2 -g
optflags: ppc8560 -O2 -g
optflags: ppc32dy4 -O2 -g
optflags: ppciseries -O2 -g
optflags: ppcpseries -O2 -g
optflags: ppc64 -O2 -g
optflags: ppc64le -O2 -g
optflags: ppc64p7 -O3 -mtune=power7 -mcpu=power7 -g

optflags: parisc -O2 -g -mpa-risc-1-0
optflags: hppa1.0 -O2 -g -mpa-risc-1-0
optflags: hppa1.1 -O2 -g -mpa-risc-1-0
optflags: hppa1.2 -O2 -g -mpa-risc-1-0
--More--(11%)
```

Ces directives indiquent comment optimiser la construction d'un rpm en fonction du type de processeur retourné par la commande **uname -p**. Par exemple, la directive **buildarchtranslate: athlon: i386** indique que le processus doit utiliser les optimisations **i386** lors de la construction d'un src.rpm sur une architecture **athlon**. Si au contraire il est souhaité que les optimisations **athlon** soient utilisées, il convient d'inclure la ligne **buildarchtranslate: athlon: athlon** dans le fichier **/etc/rpmrc**. En effet lors de la mise à jour du paquet rpm, le fichier /usr/lib/rpm/rpmrc est écrasé. Toute modification des directives de ce fichier doivent être inscrites dans **/etc/rpmrc** ou dans un fichier **~/.rpmrc** spécifique à un utilisateur.

2.2 - Utilisation

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

```
[root@centos8 ~]# rpm -qa | more
dracut-squash-049-95.git20200804.el8_3.4.x86_64
```

```
gnutls-dane-3.6.14-8.el8_3.x86_64
mtr-0.92-3.el8.x86_64
fontpackages-filesystem-1.44-22.el8.noarch
dhcp-libs-4.3.6-41.el8.x86_64
alsa-lib-1.2.3.2-1.el8.x86_64
geolite2-city-20180605-1.el8.noarch
cockpit-ws-224.2-1.el8.x86_64
python3-dbus-1.2.4-15.el8.x86_64
libvirt-daemon-config-network-6.0.0-28.1.module_el8.3.0+755+88436ea4.x86_64
samba-client-libs-4.12.3-12.el8.3.x86_64
libICE-1.0.9-15.el8.x86_64
bind-license-9.11.20-5.el8_3.1.noarch
dnf-4.2.23-4.el8.noarch
at-spi2-core-2.28.0-1.el8.x86_64
libssh-config-0.9.4-2.el8.noarch
bzip2-libs-1.0.6-26.el8.x86_64
python3-syspurpose-1.27.16-1.el8.x86_64
perl-Unicode-Normalize-1.25-396.el8.x86_64
centos-linux-release-8.3-1.2011.el8.noarch
sssd-krb5-2.3.0-9.el8.x86_64
perl-MIME-Base64-3.15-396.el8.x86_64
glibc-langpack-en-2.28-127.el8.x86_64
libcollection-0.7.0-39.el8.x86_64
vim-filesystem-8.0.1763-15.el8.noarch
perl-Sys-Virt-6.0.0-1.module_el8.3.0+555+a55c8938.x86_64
elfutils-libelf-0.180-1.el8.x86_64
vim-enhanced-8.0.1763-15.el8.x86_64
kernel-modules-4.18.0-147.8.1.el8_1.x86_64
perl-Encode-2.97-3.el8.x86_64
audit-libs-3.0-0.17.20191104git1c2f876.el8.x86_64
grub2-pc-2.02-90.el8_3.1.x86_64
perl-libnet-3.11-3.el8.noarch
--More--
```

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

```
[root@centos8 ~]# rpm -qa | wc -l
802
```

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

```
[root@centos8 ~]# rpm -qa | grep setup
platform-python-setuptools-39.2.0-6.el8.noarch
python3-setuptools-wheel-39.2.0-6.el8.noarch
setup-2.12.2-6.el8.noarch
cryptsetup-libs-2.3.3-2.el8.x86_64
cryptsetup-2.3.3-2.el8.x86_64
```

Afin de connaître les détails du paquet **setup-2.8.71-4.el7.noarch**, il convient de saisir la commande suivante :

```
[root@centos8 ~]# rpm -qi setup
Name        : setup
Version     : 2.12.2
Release     : 6.el8
Architecture: noarch
Install Date: Mon 19 Apr 2021 11:50:02 AM EDT
Group       : System Environment/Base
Size        : 724837
License     : Public Domain
Signature   : RSA/SHA256, Fri 15 May 2020 01:23:16 AM EDT, Key ID 05b555b38483c65d
Source RPM  : setup-2.12.2-6.el8.src.rpm
Build Date  : Fri 15 May 2020 01:20:15 AM EDT
Build Host  : aarch64-02.mbox.centos.org
Relocations : (not relocatable)
Packager    : CentOS Buildsys <bugs@centos.org>
Vendor      : CentOS
URL         : https://pagure.io/setup/
```

```
Summary     : A set of system configuration and setup files
Description :
The setup package contains a set of important system configuration and
setup files, such as passwd, group, and profile.
```

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

```
[root@centos8 ~]# rpm -ql setup
/etc/aliases
/etc/bashrc
/etc/csh.cshrc
/etc/csh.login
/etc/dnf/protected.d/setup.conf
/etc/environment
/etc/ethertypes
/etc/exports
/etc/filesystems
/etc/fstab
/etc/group
/etc/gshadow
/etc/host.conf
/etc/hosts
/etc/inputrc
/etc/motd
/etc/networks
/etc/passwd
/etc/printcap
/etc/profile
/etc/profile.d
/etc/profile.d/csh.local
/etc/profile.d/lang.csh
/etc/profile.d/lang.sh
/etc/profile.d/sh.local
/etc/protocols
```

```
/etc/services
/etc/shadow
/etc/shells
/etc/subgid
/etc/subuid
/usr/share/doc/setup
/usr/share/doc/setup/uidgid
/usr/share/licenses/setup
/usr/share/licenses/setup/COPYING
/var/log/lastlog
```

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@centos8 ~]# rpm -qf /etc/exports
setup-2.12.2-6.el8.noarch
```

Pour connaître les fichiers modifiés depuis l'installation d'un paquet, utilisez la commande suivante :

```
[root@centos8 ~]# rpm -qV setup
.M....G..  g /var/log/lastlog
```

Dans le cas où aucun fichier n'a été modifié, la console n'affiche rien. Dans le cas où les fichiers ont été modifiés, le système vous indique, fichier par fichier, les modifications apportées selon le tableau ci-dessous. Pour plus d'informations utilisez les commandes man et info :

Lettre ou mot Clé	**Description**
5	Contrôle MD5
S	Taille du fichier
L	Lien symbolique
T	Date de modification
D	Périphérique
U	Utilisateur propriétaire
G	Groupe propriétaire
M	Droits d'accès

Lettre ou mot Clé	Description
?	Fichier illisible
Manquant	Fichier manquant

Important : Un paquet rpm est un fichier cpio modifié. Pour pouvoir extraire le contenu d'un src.rpm et explorer l'arborescence utilisé pour construire le paquet, utilisez la commande **rpm2cpio paquet.src.rpm | cpio -i –make-directories**

LAB #3 - La commande dnf

3.1 - Présentation

dnf est une abréviation de **Dandified YUM**. Historiquement, RHEL et CentOS ont utilisé **Y**ellow dog **U**pdater, **M**odified (Yum) en tant qu'utilitaire de gestion de paquets. Sous RHEL/CentOS 8, la commande yum a été remplacée par la commande **dnf-3** :

```
[root@centos8 ~]# ls -l /usr/bin/dnf-3
-rwxr-xr-x. 1 root root 1954 Aug  4  2020 /usr/bin/dnf-3
[root@centos8 ~]# ls -l /usr/bin/yum
lrwxrwxrwx. 1 root root 5 Aug  4  2020 /usr/bin/yum -> dnf-3
[root@centos8 ~]# ls -l /usr/bin/dnf
lrwxrwxrwx. 1 root root 5 Aug  4  2020 /usr/bin/dnf -> dnf-3
```

La commande dnf apporte des améliorations suivantes par rapport à la commande **yum** :

- une résolution des dépendances plus rapide en utilisant moins de mémoire,
- le fonctionnement dans les environnements Python 2 et Python 3.

Il est à noter que :

- l'utilisation de la commande dnf est similaire à l'utilisation de la commande **yum**,

- les commandes dnf et yum peuvent coexister sur le même système.

L'utilisation de l'alias **dnf** de la commande dnf-3 prend la forme suivante :

```
# dnf <options> <commande> <paquet(s)> [Entrée]
```

Les options et commandes de dnf sont :

```
[root@centos8 ~]# dnf --help
usage: dnf [options] COMMAND

List of Main Commands:

alias                     List or create command aliases
autoremove                remove all unneeded packages that were originally installed as dependencies
check                     check for problems in the packagedb
check-update              check for available package upgrades
clean                     remove cached data
deplist                   List package's dependencies and what packages provide them
distro-sync               synchronize installed packages to the latest available versions
downgrade                 Downgrade a package
group                     display, or use, the groups information
help                      display a helpful usage message
history                   display, or use, the transaction history
info                      display details about a package or group of packages
install                   install a package or packages on your system
list                      list a package or groups of packages
makecache                 generate the metadata cache
mark                      mark or unmark installed packages as installed by user.
module                    Interact with Modules.
provides                  find what package provides the given value
reinstall                 reinstall a package
remove                    remove a package or packages from your system
repolist                  display the configured software repositories
```

```
repoquery                   search for packages matching keyword
repository-packages         run commands on top of all packages in given repository
search                      search package details for the given string
shell                       run an interactive DNF shell
swap                        run an interactive DNF mod for remove and install one spec
updateinfo                  display advisories about packages
upgrade                     upgrade a package or packages on your system
upgrade-minimal             upgrade, but only 'newest' package match which fixes a problem that affects your system

List of Plugin Commands:

builddep                    Install build dependencies for package or spec file
changelog                   Show changelog data of packages
config-manager              manage dnf configuration options and repositories
copr                        Interact with Copr repositories.
debug-dump                  dump information about installed rpm packages to file
debug-restore               restore packages recorded in debug-dump file
debuginfo-install           install debuginfo packages
download                    Download package to current directory
needs-restarting            determine updated binaries that need restarting
playground                  Interact with Playground repository.
repoclosure                 Display a list of unresolved dependencies for repositories
repodiff                    List differences between two sets of repositories
repograph                   Output a full package dependency graph in dot format
repomanage                  Manage a directory of rpm packages
reposync                    download all packages from remote repo

General DNF options:
  -c [config file], --config [config file]
                          config file location
  -q, --quiet             quiet operation
  -v, --verbose           verbose operation
  --version               show DNF version and exit
  --installroot [path]    set install root
```

```
--nodocs              do not install documentations
--noplugins           disable all plugins
--enableplugin [plugin]
                      enable plugins by name
--disableplugin [plugin]
                      disable plugins by name
--releasever RELEASEVER
                      override the value of $releasever in config and repo
                      files
--setopt SETOPTS      set arbitrary config and repo options
--skip-broken         resolve depsolve problems by skipping packages
-h, --help, --help-cmd
                      show command help
--allowerasing        allow erasing of installed packages to resolve
                      dependencies
-b, --best            try the best available package versions in
                      transactions.
--nobest              do not limit the transaction to the best candidate
-C, --cacheonly       run entirely from system cache, don't update cache
-R [minutes], --randomwait [minutes]
                      maximum command wait time
-d [debug level], --debuglevel [debug level]
                      debugging output level
--debugsolver         dumps detailed solving results into files
--showduplicates      show duplicates, in repos, in list/search commands
-e ERRORLEVEL, --errorlevel ERRORLEVEL
                      error output level
--obsoletes           enables dnf's obsoletes processing logic for upgrade
                      or display capabilities that the package obsoletes for
                      info, list and repoquery
--rpmverbosity [debug level name]
                      debugging output level for rpm
-y, --assumeyes       automatically answer yes for all questions
--assumeno            automatically answer no for all questions
```

```
  --enablerepo [repo]   Enable additional repositories. List option. Supports
                        globs, can be specified multiple times.
  --disablerepo [repo]  Disable repositories. List option. Supports globs, can
                        be specified multiple times.
  --repo [repo], --repoid [repo]
                        enable just specific repositories by an id or a glob,
                        can be specified multiple times
  --enable              enable repos with config-manager command
                        (automatically saves)
  --disable             disable repos with config-manager command
                        (automatically saves)
  -x [package], --exclude [package], --excludepkgs [package]
                        exclude packages by name or glob
  --disableexcludes [repo], --disableexcludepkgs [repo]
                        disable excludepkgs
  --repofrompath [repo,path]
                        label and path to an additional repository to use
                        (same path as in a baseurl), can be specified multiple
                        times.
  --noautoremove        disable removal of dependencies that are no longer
                        used
  --nogpgcheck          disable gpg signature checking (if RPM policy allows)
  --color COLOR         control whether color is used
  --refresh             set metadata as expired before running the command
  -4                    resolve to IPv4 addresses only
  -6                    resolve to IPv6 addresses only
  --destdir DESTDIR, --downloaddir DESTDIR
                        set directory to copy packages to
  --downloadonly        only download packages
  --comment COMMENT     add a comment to transaction
  --bugfix              Include bugfix relevant packages, in updates
  --enhancement         Include enhancement relevant packages, in updates
  --newpackage          Include newpackage relevant packages, in updates
  --security            Include security relevant packages, in updates
```

```
  --advisory ADVISORY, --advisories ADVISORY
                        Include packages needed to fix the given advisory, in
                        updates
  --bz BUGZILLA, --bzs BUGZILLA
                        Include packages needed to fix the given BZ, in
                        updates
  --cve CVES, --cves CVES
                        Include packages needed to fix the given CVE, in
                        updates
  --sec-severity {Critical,Important,Moderate,Low}, --secseverity {Critical,Important,Moderate,Low}
                        Include security relevant packages matching the
                        severity, in updates
  --forcearch ARCH      Force the use of an architecture
```

Avant de poursuivre, exécutez les deux commandes suivantes pour réparer les dépôts cassés :

```
[root@centos8 ~]# sed -i 's/^mirrorlist/#mirrorlist/g' /etc/yum.repos.d/CentOS-*
[root@centos8 ~]# sed -i 's|#baseurl=http://mirror.centos.org|baseurl=http://vault.centos.org|g'
/etc/yum.repos.d/CentOS-*
```

3.2 - Configuration

La configuration principale de dnf est effectuée en éditant le fichier **/etc/dnf/dnf.conf** :

```
[root@centos8 ~]# cat /etc/dnf/dnf.conf
[main]
gpgcheck=1
installonly_limit=3
clean_requirements_on_remove=True
best=True
skip_if_unavailable=False
```

Le répertoire **/etc/dnf** contient lui-même des répertoires :

```
[root@centos8 ~]# ls -l  /etc/dnf
total 4
drwxr-xr-x. 2 root root   6 Aug  4  2020 aliases.d
-rw-r--r--. 1 root root 108 Jun  2  2020 dnf.conf
drwxr-xr-x. 2 root root 168 Apr 19 12:13 modules.d
drwxr-xr-x. 2 root root   6 Aug  4  2020 modules.defaults.d
drwxr-xr-x. 3 root root  89 Aug  4  2020 plugins
drwxr-xr-x. 2 root root  93 Apr 19 11:52 protected.d
drwxr-xr-x. 2 root root  37 Aug  4  2020 vars
```

3.3 - 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 dans un fichier *par dépôt* stocké dans le répertoire **/etc/yum.repos.d** :

```
[root@centos8 ~]# ls /etc/yum.repos.d/
CentOS-Linux-AppStream.repo          CentOS-Linux-Plus.repo
CentOS-Linux-BaseOS.repo             CentOS-Linux-PowerTools.repo
CentOS-Linux-ContinuousRelease.repo  CentOS-Linux-Sources.repo
CentOS-Linux-Debuginfo.repo          epel-modular.repo
CentOS-Linux-Devel.repo              epel-playground.repo
CentOS-Linux-Extras.repo             epel.repo
CentOS-Linux-FastTrack.repo          epel-testing-modular.repo
CentOS-Linux-HighAvailability.repo   epel-testing.repo
CentOS-Linux-Media.repo
```

Par exemple :

```
[root@centos8 ~]# cat /etc/yum.repos.d/CentOS-Linux-BaseOS.repo
# CentOS-Linux-BaseOS.repo
#
# The mirrorlist system uses the connecting IP address of the client and the
# update status of each mirror to pick current mirrors that are geographically
# close to the client.  You should use this for CentOS updates unless you are
# manually picking other mirrors.
#
# If the mirrorlist does not work for you, you can try the commented out
# baseurl line instead.

[baseos]
name=CentOS Linux $releasever - BaseOS
mirrorlist=http://mirrorlist.centos.org/?release=$releasever&arch=$basearch&repo=BaseOS&infra=$infra
#baseurl=http://mirror.centos.org/$contentdir/$releasever/BaseOS/$basearch/os/
gpgcheck=1
enabled=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-centosofficial
```

Pour consulter tous les dépôts, activés ou non, en utilisant dnf, il convient d'utiliser la commande **repolist all** :

```
[root@centos8 ~]# dnf repolist all
repo id                         repo name                                                       status
appstream                       CentOS Linux 8 - AppStream                                      enabled
appstream-source                CentOS Linux 8 - AppStream - Source                             disabled
baseos                          CentOS Linux 8 - BaseOS                                         enabled
baseos-source                   CentOS Linux 8 - BaseOS - Source                                disabled
cr                              CentOS Linux 8 - ContinuousRelease                              disabled
debuginfo                       CentOS Linux 8 - Debuginfo                                      disabled
devel                           CentOS Linux 8 - Devel WARNING! FOR BUILDROOT USE ONLY!         disabled
epel                            Extra Packages for Enterprise Linux 8 - x86_64                  enabled
epel-debuginfo                  Extra Packages for Enterprise Linux 8 - x86_64 - Debug          disabled
```

```
epel-modular                    Extra Packages for Enterprise Linux Modular 8 - x86_64                enabled
epel-modular-debuginfo          Extra Packages for Enterprise Linux Modular 8 - x86_64 - Debug        disabled
epel-modular-source             Extra Packages for Enterprise Linux Modular 8 - x86_64 - Source       disabled
epel-playground                 Extra Packages for Enterprise Linux 8 - Playground - x86_64           disabled
epel-playground-debuginfo       Extra Packages for Enterprise Linux 8 - Playground - x86_64 - Debug   disabled
epel-playground-source          Extra Packages for Enterprise Linux 8 - Playground - x86_64 - Source  disabled
epel-source                     Extra Packages for Enterprise Linux 8 - x86_64 - Source               disabled
epel-testing                    Extra Packages for Enterprise Linux 8 - Testing - x86_64              disabled
epel-testing-debuginfo          Extra Packages for Enterprise Linux 8 - Testing - x86_64 - Debug      disabled
epel-testing-modular            Extra Packages for Enterprise Linux Modular 8 - Testing - x86_64      disabled
epel-testing-modular-debuginfo Extra Packages for Enterprise Linux Modular 8 - Testing - x86_64 - De disabled
epel-testing-modular-source    Extra Packages for Enterprise Linux Modular 8 - Testing - x86_64 - So disabled
epel-testing-source             Extra Packages for Enterprise Linux 8 - Testing - x86_64 - Source     disabled
extras                          CentOS Linux 8 - Extras                                               enabled
extras-source                   CentOS Linux 8 - Extras - Source                                      disabled
fasttrack                       CentOS Linux 8 - FastTrack                                            disabled
ha                              CentOS Linux 8 - HighAvailability                                     disabled
media-appstream                 CentOS Linux 8 - Media - AppStream                                    disabled
media-baseos                    CentOS Linux 8 - Media - BaseOS                                       disabled
plus                            CentOS Linux 8 - Plus                                                 disabled
plus-source                     CentOS Linux 8 - Plus - Source                                        disabled
powertools                      CentOS Linux 8 - PowerTools
```

Pour ne consulter que la liste des dépôts actifs, utilisez la commande **repolist** seule :

```
[root@centos8 ~]# dnf repolist
repo id                           repo name
appstream                         CentOS Linux 8 - AppStream
baseos                            CentOS Linux 8 - BaseOS
epel                              Extra Packages for Enterprise Linux 8 - x86_64
epel-modular                      Extra Packages for Enterprise Linux Modular 8 - x86_64
extras                            CentOS Linux 8 - Extras
```

3.4 - Rechercher des Paquets

Pour lister tous les paquets installés **et** disponibles il convient d'utiliser la commande **list** :

```
[root@centos8 ~]# dnf list | more
Last metadata expiration check: 2:31:07 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
Installed Packages
NetworkManager.x86_64                                   1:1.26.0-12.el8_3
             @BaseOS
NetworkManager-libnm.x86_64                             1:1.26.0-12.el8_3
             @BaseOS
NetworkManager-team.x86_64                              1:1.26.0-12.el8_3
             @BaseOS
NetworkManager-tui.x86_64                               1:1.26.0-12.el8_3
             @BaseOS
PackageKit.x86_64                                       1.1.12-6.el8
             @AppStream
PackageKit-glib.x86_64                                  1.1.12-6.el8
             @AppStream
abattis-cantarell-fonts.noarch                          0.0.25-4.el8
             @AppStream
acl.x86_64                                              2.2.53-1.el8
             @BaseOS
adcli.x86_64                                            0.8.2-7.el8
             @BaseOS
adwaita-cursor-theme.noarch                             3.28.0-2.el8
             @appstream
adwaita-icon-theme.noarch                               3.28.0-2.el8
             @appstream
alsa-lib.x86_64                                         1.2.3.2-1.el8
             @appstream
at.x86_64                                               3.1.20-11.el8
             @BaseOS
```

```
at-spi2-atk.x86_64                                      2.26.2-1.el8
             @appstream
at-spi2-core.x86_64                                     2.28.0-1.el8
             @appstream
atk.x86_64                                              2.28.1-1.el8
--More--
```

Pour ne lister que les paquets installés, la commande list prend l'option **installed** :

```
[root@centos8 ~]# dnf list installed | more
Installed Packages
NetworkManager.x86_64                              1:1.26.0-12.el8_3
 @BaseOS
NetworkManager-libnm.x86_64                        1:1.26.0-12.el8_3
 @BaseOS
NetworkManager-team.x86_64                         1:1.26.0-12.el8_3
 @BaseOS
NetworkManager-tui.x86_64                          1:1.26.0-12.el8_3
 @BaseOS
PackageKit.x86_64                                  1.1.12-6.el8
 @AppStream
PackageKit-glib.x86_64                             1.1.12-6.el8
 @AppStream
abattis-cantarell-fonts.noarch                     0.0.25-4.el8
 @AppStream
acl.x86_64                                         2.2.53-1.el8
 @BaseOS
adcli.x86_64                                       0.8.2-7.el8
 @BaseOS
adwaita-cursor-theme.noarch                        3.28.0-2.el8
 @appstream
adwaita-icon-theme.noarch                          3.28.0-2.el8
 @appstream
alsa-lib.x86_64                                    1.2.3.2-1.el8
```

```
 @appstream
at.x86_64                                       3.1.20-11.el8
 @BaseOS
at-spi2-atk.x86_64                              2.26.2-1.el8
 @appstream
at-spi2-core.x86_64                             2.28.0-1.el8
 @appstream
atk.x86_64                                      2.28.1-1.el8
 @appstream
--More--
```

Pour ne lister que les paquets disponibles, la commande list prend l'option **available** :

```
[root@centos8 ~]# dnf list available | more
Last metadata expiration check: 2:40:08 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
Available Packages
3proxy.x86_64                                           0.8.13-1.el8
             epel
AusweisApp2.x86_64                                      1.20.2-10.el8
             epel
AusweisApp2-data.noarch                                 1.20.2-10.el8
             epel
AusweisApp2-doc.noarch                                  1.20.2-10.el8
             epel
BackupPC.x86_64                                         4.4.0-1.el8
             epel
BackupPC-XS.x86_64                                      0.62-1.el8
             epel
BibTool.x86_64                                          2.68-1.el8
             epel
CCfits.x86_64                                           2.5-14.el8
             epel
CCfits-devel.x86_64                                     2.5-14.el8
             epel
```

```
CCfits-doc.noarch                                       2.5-14.el8
             epel
CGSI-gSOAP.x86_64                                       1.3.11-7.el8
             epel
CGSI-gSOAP-devel.x86_64                                 1.3.11-7.el8
             epel
CUnit.i686                                              2.1.3-17.el8
             appstream
CUnit.x86_64                                            2.1.3-17.el8
             appstream
CharLS.x86_64                                           2.0.0-6.el8
             epel
CharLS-devel.x86_64                                     2.0.0-6.el8
--More--
```

Pour rechercher une chaîne dans le nom ou dans la description courte du paquet, il convient d'utiliser la commande **search** :

```
[root@centos8 ~]# dnf search httpd
Last metadata expiration check: 2:41:18 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
================================ Name Exactly Matched: httpd ================================
httpd.x86_64 : Apache HTTP Server
============================== Name & Summary Matched: httpd ===============================
centos-logos-httpd.noarch : CentOS-related icons and pictures used by httpd
keycloak-httpd-client-install.noarch : Tools to configure Apache HTTPD as Keycloak client
lighttpd-fastcgi.x86_64 : FastCGI module and spawning helper for lighttpd and PHP configuration
lighttpd-filesystem.noarch : The basic directory layout for lighttpd
lighttpd-mod_authn_gssapi.x86_64 : Authentication module for lighttpd that uses GSSAPI
lighttpd-mod_authn_mysql.x86_64 : Authentication module for lighttpd that uses a MySQL database
lighttpd-mod_authn_pam.x86_64 : Authentication module for lighttpd that uses PAM
lighttpd-mod_mysql_vhost.x86_64 : Virtual host module for lighttpd that uses a MySQL database
pagure-web-apache-httpd.noarch : Apache HTTPD configuration for Pagure
python3-keycloak-httpd-client-install.noarch : Tools to configure Apache HTTPD as Keycloak
                                             : client
radicale3-httpd.noarch : httpd config for Radicale
```

```
================================== Name Matched: httpd ==================================
httpd-devel.x86_64 : Development interfaces for the Apache HTTP server
httpd-filesystem.noarch : The basic directory layout for the Apache HTTP server
httpd-manual.noarch : Documentation for the Apache HTTP server
httpd-tools.x86_64 : Tools for use with the Apache HTTP Server
libmicrohttpd.i686 : Lightweight library for embedding a webserver in applications
libmicrohttpd.x86_64 : Lightweight library for embedding a webserver in applications
lighttpd.x86_64 : Lightning fast webserver with light system requirements
perl-Test-Fake-HTTPD.noarch : Fake HTTP server module for testing
sysusage-httpd.noarch : Apache configuration for sysusage
================================ Summary Matched: httpd ================================
mod_auth_mellon.x86_64 : A SAML 2.0 authentication module for the Apache Httpd Server
mod_dav_svn.x86_64 : Apache httpd module for Subversion server
```

Pour ne rechercher que la chaîne dans le nom du paquet, utilisez la commande **list** :

```
root@centos8 ~]# dnf list httpd
Last metadata expiration check: 0:08:16 ago on Wed 21 Apr 2021 12:54:45 AM EDT.
Available Packages
httpd.x86_64                          2.4.37-30.module_el8.3.0+561+97fdbbcc                          appstream
```

Pour rechercher le paquet qui contient l'exécutable httpd, il convient d'utiliser la commande **provides** :

```
[root@centos8 ~]# dnf provides httpd
Last metadata expiration check: 0:03:35 ago on Wed 21 Apr 2021 12:54:45 AM EDT.
httpd-2.4.37-30.module_el8.3.0+561+97fdbbcc.x86_64 : Apache HTTP Server
Repo        : appstream
Matched from:
Provide    : httpd = 2.4.37-30.module_el8.3.0+561+97fdbbcc
```

Pour rechercher tout paquet commençant par **kerne**, utilisez la commande suivante :

```
[root@centos8 ~]# dnf list kerne\*
Last metadata expiration check: 0:00:24 ago on Wed 21 Apr 2021 12:54:45 AM EDT.
```

```
Installed Packages
kernel.x86_64                                4.18.0-147.8.1.el8_1                @BaseOS
kernel.x86_64                                4.18.0-240.22.1.el8_3               @BaseOS
kernel-core.x86_64                           4.18.0-147.8.1.el8_1                @BaseOS
kernel-core.x86_64                           4.18.0-240.22.1.el8_3               @BaseOS
kernel-modules.x86_64                        4.18.0-147.8.1.el8_1                @BaseOS
kernel-modules.x86_64                        4.18.0-240.22.1.el8_3               @BaseOS
kernel-tools.x86_64                          4.18.0-240.22.1.el8_3               @BaseOS
kernel-tools-libs.x86_64                     4.18.0-240.22.1.el8_3               @BaseOS
Available Packages
kernel-abi-whitelists.noarch                 4.18.0-240.22.1.el8_3               baseos
kernel-cross-headers.x86_64                  4.18.0-240.22.1.el8_3               baseos
kernel-debug.x86_64                          4.18.0-240.22.1.el8_3               baseos
kernel-debug-core.x86_64                     4.18.0-240.22.1.el8_3               baseos
kernel-debug-devel.x86_64                    4.18.0-240.22.1.el8_3               baseos
kernel-debug-modules.x86_64                  4.18.0-240.22.1.el8_3               baseos
kernel-debug-modules-extra.x86_64            4.18.0-240.22.1.el8_3               baseos
kernel-devel.x86_64                          4.18.0-240.22.1.el8_3               baseos
kernel-doc.noarch                            4.18.0-240.22.1.el8_3               baseos
kernel-headers.x86_64                        4.18.0-240.22.1.el8_3               baseos
kernel-modules-extra.x86_64                  4.18.0-240.22.1.el8_3               baseos
kernel-rpm-macros.noarch                     123-1.el8                           appstream
kernelshark.x86_64                           2.7-8.el8                           appstream
```

Pour lister les groupes de paquets, il convient d'utiliser la commande **grouplist** :

```
[root@centos8 ~]# dnf grouplist
Last metadata expiration check: 1:49:11 ago on Tue 20 Apr 2021 09:37:31 PM EDT.
Available Environment Groups:
   Server with GUI
   Server
   Workstation
   KDE Plasma Workspaces
   Virtualization Host
```

```
   Custom Operating System
Installed Environment Groups:
   Minimal Install
Available Groups:
   Container Management
   .NET Core Development
   RPM Development Tools
   Development Tools
   Graphical Administration Tools
   Headless Management
   Legacy UNIX Compatibility
   Network Servers
   Scientific Support
   Security Tools
   Smart Card Support
   System Tools
   Fedora Packager
   Xfce
```

3.5 - Obtenir de l'Information sur un Paquet et le Télécharger

Pour obtenir de l'information sur un paquet, il convient d'utiliser la commmande **info** :

```
[root@centos8 ~]# dnf info httpd
Last metadata expiration check: 2:43:14 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
Available Packages
Name         : httpd
Version      : 2.4.37
Release      : 30.module_el8.3.0+561+97fdbbcc
Architecture : x86_64
Size         : 1.7 M
Source       : httpd-2.4.37-30.module_el8.3.0+561+97fdbbcc.src.rpm
Repository   : appstream
```

```
Summary      : Apache HTTP Server
URL          : https://httpd.apache.org/
License      : ASL 2.0
Description  : The Apache HTTP Server is a powerful, efficient, and extensible
             : web server.
```

Pour télécharger sans installer un paquet, l'ancienne commande **yumdownloader** a été remplacée par la commande **download** de dnf :

```
[root@centos8 ~]# dnf download httpd
Last metadata expiration check: 2:46:56 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
httpd-2.4.37-30.module_el8.3.0+561+97fdbbcc.x86_64.rpm         4.0 MB/s | 1.7 MB     00:00
```

Ce paquet est téléchargé vers le répertoire courant :

```
[root@centos8 ~]# updatedb
[root@centos8 ~]# locate httpd-2.4.37-30.
/root/httpd-2.4.37-30.module_el8.3.0+561+97fdbbcc.x86_64.rpm
```

3.6 - Installer un Paquet

Pour installer un paquet, dnf possède la commande **install** :

```
[root@centos8 ~]# dnf install httpd
Last metadata expiration check: 2:58:37 ago on Tue 20 Apr 2021 03:34:31 PM EDT.
Dependencies resolved.
================================================================================
 Package               Arch      Version                                 Repository    Size
================================================================================
Installing:
 httpd                 x86_64    2.4.37-30.module_el8.3.0+561+97fdbbcc   appstream    1.7 M
Installing dependencies:
 apr                   x86_64    1.6.3-11.el8                            appstream    125 k
```

```
 apr-util              x86_64    1.6.1-6.el8                                appstream    105 k
 centos-logos-httpd    noarch    80.5-2.el8                                 baseos        24 k
 httpd-filesystem      noarch    2.4.37-30.module_el8.3.0+561+97fdbbcc      appstream     37 k
 httpd-tools           x86_64    2.4.37-30.module_el8.3.0+561+97fdbbcc      appstream    104 k
 mod_http2             x86_64    1.15.7-2.module_el8.3.0+477+498bb568       appstream    154 k
Installing weak dependencies:
 apr-util-bdb          x86_64    1.6.1-6.el8                                appstream     25 k
 apr-util-openssl      x86_64    1.6.1-6.el8                                appstream     27 k
Enabling module streams:
 httpd                           2.4

Transaction Summary
================================================================================
Install  9 Packages

Total download size: 2.3 M
Installed size: 6.0 M
Is this ok [y/N]: n
Operation aborted.
```

Pour répondre automatiquement oui à chaque question posée par dnf, utilisez l'option **-y** :

```
[root@centos8 ~]# dnf install httpd -y
...
Installed:
  apr-1.6.3-11.el8.x86_64
  apr-util-1.6.1-6.el8.x86_64
  apr-util-bdb-1.6.1-6.el8.x86_64
  apr-util-openssl-1.6.1-6.el8.x86_64
  centos-logos-httpd-80.5-2.el8.noarch
  httpd-2.4.37-30.module_el8.3.0+561+97fdbbcc.x86_64
  httpd-filesystem-2.4.37-30.module_el8.3.0+561+97fdbbcc.noarch
  httpd-tools-2.4.37-30.module_el8.3.0+561+97fdbbcc.x86_64
  mod_http2-1.15.7-2.module_el8.3.0+477+498bb568.x86_64
```

```
Complete!
```

Il est possible de ré-installer un paquet avec la commande **reinstall** :

```
[root@centos8 ~]# dnf reinstall httpd
Last metadata expiration check: 0:02:31 ago on Tue 20 Apr 2021 06:35:25 PM EDT.
Dependencies resolved.
================================================================================
 Package     Architecture Version                                Repository       Size
================================================================================
Reinstalling:
 httpd       x86_64       2.4.37-30.module_el8.3.0+561+97fdbbcc  appstream       1.7 M

Transaction Summary
================================================================================

Total download size: 1.7 M
Installed size: 4.9 M
Is this ok [y/N]: y
```

Pour installer un groupe de paquets, dnf possède la commande **groupinstall** :

```
[root@centos8 ~]# dnf groupinstall 'System Tools'
Last metadata expiration check: 1:51:28 ago on Tue 20 Apr 2021 09:37:31 PM EDT.
Dependencies resolved.
================================================================================
 Package                       Architecture      Version                 Repository            Size
================================================================================
Installing group/module packages:
 NetworkManager-libreswan      x86_64            1.2.10-4.el8            appstream            120 k
 cifs-utils                    x86_64            6.8-3.el8               baseos                96 k
 libreswan                     x86_64            3.32-7.el8_3            appstream            1.4 M
 nmap                          x86_64            2:7.70-5.el8            appstream            5.8 M
 openldap-clients              x86_64            2.4.46-15.el8           baseos               202 k
```

```
 samba-client                          x86_64          4.12.3-12.el8.3          baseos              692 k
 setserial                             x86_64          2.17-45.el8              baseos               32 k
 tigervnc                              x86_64          1.10.1-9.el8_3           appstream           290 k
 tmux                                  x86_64          2.7-1.el8                baseos              317 k
 xdelta                                x86_64          3.1.0-4.el8              baseos               96 k
 zsh                                   x86_64          5.5.1-6.el8_1.2          baseos              2.9 M
Installing dependencies:
 fltk                                  x86_64          1.3.4-5.el8              appstream           590 k
 ldns                                  x86_64          1.7.0-21.el8             appstream           166 k
 mesa-libGLU                           x86_64          9.0.0-15.el8             appstream           185 k
 nss-tools                             x86_64          3.53.1-17.el8_3          appstream           560 k
 tigervnc-icons                        noarch          1.10.1-9.el8_3           appstream            47 k
 tigervnc-license                      noarch          1.10.1-9.el8_3           appstream            38 k
Installing Groups:
 System Tools

Transaction Summary
================================================================================================================
Install  17 Packages

Total download size: 13 M
Installed size: 47 M
Is this ok [y/N]: y
```

3.7 - Mettre à jour des Paquets

Pour vérifier la disponibilité des mises-à-jour, dnf possède la commande **check-update** :

```
[root@centos8 ~]# dnf check-update
Last metadata expiration check: 1:38:50 ago on Tue 20 Apr 2021 09:37:31 PM EDT.

epel-release.noarch                          8-10.el8                        epel
procps-ng.x86_64                             3.3.15-3.el8_3.1                baseos
```

```
selinux-policy.noarch                       3.14.3-54.el8_3.4              baseos
selinux-policy-targeted.noarch              3.14.3-54.el8_3.4              baseos
```

Pour procéder à la mise à jour de tous les paquets, dnf possède les commandes **update** et **upgrade**. Il est aussi possible de spécifier un paquet spécifique :

```
[root@centos8 ~]# dnf update epel-release.noarch
Last metadata expiration check: 1:43:33 ago on Tue 20 Apr 2021 09:37:31 PM EDT.
Dependencies resolved.
================================================================================
 Package                    Architecture          Version                 Repository             Size
================================================================================
Upgrading:
 epel-release               noarch                8-10.el8                epel                   22 k

Transaction Summary
================================================================================
Upgrade  1 Package

Total download size: 22 k
Is this ok [y/N]: y
```

La gestion des mises à jour des groupes de paquets se fait en utilisant la commande **groupupdate** :

```
[root@centos8 ~]# dnf groupupdate 'System Tools'
Last metadata expiration check: 1:55:43 ago on Tue 20 Apr 2021 09:37:31 PM EDT.
Dependencies resolved.
================================================================================
 Package                Architecture          Version                 Repository             Size
================================================================================
Installing Groups:
 System Tools

Transaction Summary
```

```
================================================================================================================

Is this ok [y/N]: y
Complete!
```

3.8 - Supprimer des Paquets

Pour supprimer un paquet, il convient d'utiliser la commande **remove** :

```
[root@centos8 ~]# dnf remove httpd
Dependencies resolved.
================================================================================================================
 Package                  Architecture Version                                  Repository        Size
================================================================================================================
Removing:
 httpd                    x86_64       2.4.37-30.module_el8.3.0+561+97fdbbcc    @appstream       4.9 M
Removing unused dependencies:
 apr                      x86_64       1.6.3-11.el8                             @appstream       260 k
 apr-util                 x86_64       1.6.1-6.el8                              @appstream       231 k
 apr-util-bdb             x86_64       1.6.1-6.el8                              @appstream        12 k
 apr-util-openssl         x86_64       1.6.1-6.el8                              @appstream        20 k
 centos-logos-httpd       noarch       80.5-2.el8                               @baseos          1.9 k
 httpd-filesystem         noarch       2.4.37-30.module_el8.3.0+561+97fdbbcc    @appstream       400
 httpd-tools              x86_64       2.4.37-30.module_el8.3.0+561+97fdbbcc    @appstream       195 k
 mod_http2                x86_64       1.15.7-2.module_el8.3.0+477+498bb568     @appstream       393 k

Transaction Summary
================================================================================================================
Remove  9 Packages

Freed space: 6.0 M
Is this ok [y/N]: y
```

Pour supprimer un groupe de paquets, il convient d'utiliser la commande **groupremove** :

```
[root@centos8 ~]# dnf groupremove 'System Tools'
Dependencies resolved.
================================================================================
 Package                         Architecture     Version                  Repository            Size
================================================================================
Removing:
 NetworkManager-libreswan        x86_64           1.2.10-4.el8             @appstream           420 k
 cifs-utils                      x86_64           6.8-3.el8                @baseos              192 k
 libreswan                       x86_64           3.32-7.el8_3             @appstream           4.7 M
 nmap                            x86_64           2:7.70-5.el8             @appstream            24 M
 openldap-clients                x86_64           2.4.46-15.el8            @baseos              612 k
 samba-client                    x86_64           4.12.3-12.el8.3          @baseos              2.3 M
 setserial                       x86_64           2.17-45.el8              @baseos               37 k
 tigervnc                        x86_64           1.10.1-9.el8_3           @appstream           849 k
 tmux                            x86_64           2.7-1.el8                @baseos              781 k
 xdelta                          x86_64           3.1.0-4.el8              @baseos              184 k
 zsh                             x86_64           5.5.1-6.el8_1.2          @baseos              7.2 M
Removing unused dependencies:
 fltk                            x86_64           1.3.4-5.el8              @appstream           2.8 M
 ldns                            x86_64           1.7.0-21.el8             @appstream           536 k
 mesa-libGLU                     x86_64           9.0.0-15.el8             @appstream           490 k
 nss-tools                       x86_64           3.53.1-17.el8_3          @appstream           2.2 M
 tigervnc-icons                  noarch           1.10.1-9.el8_3           @appstream            33 k
 tigervnc-license                noarch           1.10.1-9.el8_3           @appstream            18 k
Removing Groups:
 System Tools

Transaction Summary
================================================================================
Remove  17 Packages

Freed space: 47 M
```

```
Is this ok [y/N]: y
```

Pour surppimer les dépendances inutilisées, utilisez la commande **autoremove** :

```
[root@centos8 ~]# dnf autoremove
Last metadata expiration check: 0:08:52 ago on Wed 21 Apr 2021 12:39:54 AM EDT.
Dependencies resolved.
================================================================================
 Package                 Architecture        Version                   Repository            Size
================================================================================
Removing:
 fipscheck               x86_64              1.5.0-4.el8               @BaseOS               47 k
 fipscheck-lib           x86_64              1.5.0-4.el8               @BaseOS               12 k
 grub2-tools-efi         x86_64              1:2.02-90.el8_3.1         @BaseOS              2.0 M

Transaction Summary
================================================================================
Remove  3 Packages

Freed space: 2.1 M
Is this ok [y/N]: y
```

Pour nettoyer le cache des paquets téléchargés, utilisez la commande **clean all** :

```
[root@centos8 ~]# dnf clean all
58 files removed
```

LAB #4 - Les Bibliothèques Partagées

4.1 - 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
/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** :

```
[root@centos8 ~]# dnf install mc
Last metadata expiration check: 0:20:35 ago on Wed 21 Apr 2021 12:54:45 AM EDT.
Dependencies resolved.
================================================================================
 Package            Architecture           Version                    Repository                 Size
================================================================================
Installing:
 mc                 x86_64                 1:4.8.19-9.el8             appstream                 1.9 M

Transaction Summary
================================================================================
Install  1 Package

Total download size: 1.9 M
Installed size: 6.8 M
Is this ok [y/N]: y
```

4.2 - La Commande ldd

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

```
[root@centos8 ~]# ldd /usr/bin/mc
    linux-vdso.so.1 (0x00007fff39386000)
    libslang.so.2 => /lib64/libslang.so.2 (0x00007f0a74152000)
    libgpm.so.2 => /lib64/libgpm.so.2 (0x00007f0a73f4b000)
    libgmodule-2.0.so.0 => /lib64/libgmodule-2.0.so.0 (0x00007f0a73d47000)
    libglib-2.0.so.0 => /lib64/libglib-2.0.so.0 (0x00007f0a73a2e000)
    libpthread.so.0 => /lib64/libpthread.so.0 (0x00007f0a7380e000)
    libc.so.6 => /lib64/libc.so.6 (0x00007f0a7344b000)
```

```
    libdl.so.2 => /lib64/libdl.so.2 (0x00007f0a73247000)
    libm.so.6 => /lib64/libm.so.6 (0x00007f0a72ec5000)
    libncurses.so.6 => /lib64/libncurses.so.6 (0x00007f0a72c9a000)
    libtinfo.so.6 => /lib64/libtinfo.so.6 (0x00007f0a72a6d000)
    libgnutls.so.30 => /lib64/libgnutls.so.30 (0x00007f0a7267c000)
    libpcre.so.1 => /lib64/libpcre.so.1 (0x00007f0a7240b000)
    /lib64/ld-linux-x86-64.so.2 (0x00007f0a74994000)
    libp11-kit.so.0 => /lib64/libp11-kit.so.0 (0x00007f0a720d8000)
    libidn2.so.0 => /lib64/libidn2.so.0 (0x00007f0a71eba000)
    libunistring.so.2 => /lib64/libunistring.so.2 (0x00007f0a71b39000)
    libtasn1.so.6 => /lib64/libtasn1.so.6 (0x00007f0a71926000)
    libnettle.so.6 => /lib64/libnettle.so.6 (0x00007f0a716ec000)
    libhogweed.so.4 => /lib64/libhogweed.so.4 (0x00007f0a714bb000)
    libgmp.so.10 => /lib64/libgmp.so.10 (0x00007f0a71223000)
    libffi.so.6 => /lib64/libffi.so.6 (0x00007f0a7101a000)
```

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

```
[root@centos8 ~]# mv /lib64/libslang.so.2 /lib64/libslang.so.2.old
```

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

```
[root@centos8 ~]# ldd /usr/bin/mc
    linux-vdso.so.1 (0x00007fff669a6000)
    libslang.so.2 => not found
    libgpm.so.2 => /lib64/libgpm.so.2 (0x00007fc6ccba0000)
    libgmodule-2.0.so.0 => /lib64/libgmodule-2.0.so.0 (0x00007fc6cc99c000)
    libglib-2.0.so.0 => /lib64/libglib-2.0.so.0 (0x00007fc6cc683000)
    libpthread.so.0 => /lib64/libpthread.so.0 (0x00007fc6cc463000)
    libc.so.6 => /lib64/libc.so.6 (0x00007fc6cc0a0000)
    libncurses.so.6 => /lib64/libncurses.so.6 (0x00007fc6cbe75000)
    libtinfo.so.6 => /lib64/libtinfo.so.6 (0x00007fc6cbc48000)
    libdl.so.2 => /lib64/libdl.so.2 (0x00007fc6cba44000)
```

```
    libgnutls.so.30 => /lib64/libgnutls.so.30 (0x00007fc6cb653000)
    libpcre.so.1 => /lib64/libpcre.so.1 (0x00007fc6cb3e2000)
    /lib64/ld-linux-x86-64.so.2 (0x00007fc6cd112000)
    libp11-kit.so.0 => /lib64/libp11-kit.so.0 (0x00007fc6cb0af000)
    libidn2.so.0 => /lib64/libidn2.so.0 (0x00007fc6cae91000)
    libunistring.so.2 => /lib64/libunistring.so.2 (0x00007fc6cab10000)
    libtasn1.so.6 => /lib64/libtasn1.so.6 (0x00007fc6ca8fd000)
    libnettle.so.6 => /lib64/libnettle.so.6 (0x00007fc6ca6c3000)
    libhogweed.so.4 => /lib64/libhogweed.so.4 (0x00007fc6ca492000)
    libgmp.so.10 => /lib64/libgmp.so.10 (0x00007fc6ca1fa000)
    libffi.so.6 => /lib64/libffi.so.6 (0x00007fc6c9ff1000)
```

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

```
[root@centos8 ~]# mc
mc: error while loading shared libraries: libslang.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@centos8 ~]# mv /lib64/libslang.so.2.old /lib64/libslang.so.2
[root@centos8 ~]# ldd /usr/bin/mc
    linux-vdso.so.1 (0x00007fff4b8de000)
    libslang.so.2 => /lib64/libslang.so.2 (0x00007f670a991000)
    libgpm.so.2 => /lib64/libgpm.so.2 (0x00007f670a78a000)
    libgmodule-2.0.so.0 => /lib64/libgmodule-2.0.so.0 (0x00007f670a586000)
    libglib-2.0.so.0 => /lib64/libglib-2.0.so.0 (0x00007f670a26d000)
    libpthread.so.0 => /lib64/libpthread.so.0 (0x00007f670a04d000)
    libc.so.6 => /lib64/libc.so.6 (0x00007f6709c8a000)
    libdl.so.2 => /lib64/libdl.so.2 (0x00007f6709a86000)
    libm.so.6 => /lib64/libm.so.6 (0x00007f6709704000)
    libncurses.so.6 => /lib64/libncurses.so.6 (0x00007f67094d9000)
    libtinfo.so.6 => /lib64/libtinfo.so.6 (0x00007f67092ac000)
```

```
    libgnutls.so.30 => /lib64/libgnutls.so.30 (0x00007f6708ebb000)
    libpcre.so.1 => /lib64/libpcre.so.1 (0x00007f6708c4a000)
    /lib64/ld-linux-x86-64.so.2 (0x00007f670b1d3000)
    libp11-kit.so.0 => /lib64/libp11-kit.so.0 (0x00007f6708917000)
    libidn2.so.0 => /lib64/libidn2.so.0 (0x00007f67086f9000)
    libunistring.so.2 => /lib64/libunistring.so.2 (0x00007f6708378000)
    libtasn1.so.6 => /lib64/libtasn1.so.6 (0x00007f6708165000)
    libnettle.so.6 => /lib64/libnettle.so.6 (0x00007f6707f2b000)
    libhogweed.so.4 => /lib64/libhogweed.so.4 (0x00007f6707cfa000)
    libgmp.so.10 => /lib64/libgmp.so.10 (0x00007f6707a62000)
    libffi.so.6 => /lib64/libffi.so.6 (0x00007f6707859000)
```

4.3 - Le fichier /etc/ld.so.conf

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

```
[root@centos8 ~]# cat /etc/ld.so.conf
include 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@centos8 ~]# ls -l /etc/ld.so.conf.d/
total 16
-rw-r--r--. 1 root root 26 Mar  1 10:21 bind-export-x86_64.conf
-r--r--r--. 1 root root 67 Apr  9  2020 kernel-4.18.0-147.8.1.el8_1.x86_64.conf
-r--r--r--. 1 root root 67 Apr  8 15:09 kernel-4.18.0-240.22.1.el8_3.x86_64.conf
-rw-r--r--. 1 root root 17 Nov  3 19:38 libiscsi-x86_64.conf
```

Par exemple, le contenu du fichier **bind-export-x86_64.conf** est :

```
[root@centos8 ~]# cat /etc/ld.so.conf.d/bind-export-x86_64.conf
/usr/lib64//bind9-export/
```

4.4 - 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@centos8 ~]# ldconfig -p | more
546 libs found in cache `/etc/ld.so.cache'
    p11-kit-trust.so (libc6,x86-64) => /lib64/p11-kit-trust.so
    libzstd.so.1 (libc6,x86-64) => /lib64/libzstd.so.1
    libz.so.1 (libc6,x86-64) => /lib64/libz.so.1
    libyaml-0.so.2 (libc6,x86-64) => /lib64/libyaml-0.so.2
    libyajl.so.2 (libc6,x86-64) => /lib64/libyajl.so.2
    libxtables.so.12 (libc6,x86-64) => /lib64/libxtables.so.12
    libxslt.so.1 (libc6,x86-64) => /lib64/libxslt.so.1
    libxshmfence.so.1 (libc6,x86-64) => /lib64/libxshmfence.so.1
    libxml2.so.2 (libc6,x86-64) => /lib64/libxml2.so.2
    libxkbcommon.so.0 (libc6,x86-64) => /lib64/libxkbcommon.so.0
    libxcb.so.1 (libc6,x86-64) => /lib64/libxcb.so.1
    libxcb-xvmc.so.0 (libc6,x86-64) => /lib64/libxcb-xvmc.so.0
    libxcb-xv.so.0 (libc6,x86-64) => /lib64/libxcb-xv.so.0
    libxcb-xtest.so.0 (libc6,x86-64) => /lib64/libxcb-xtest.so.0
    libxcb-xselinux.so.0 (libc6,x86-64) => /lib64/libxcb-xselinux.so.0
    libxcb-xkb.so.1 (libc6,x86-64) => /lib64/libxcb-xkb.so.1
    libxcb-xinput.so.0 (libc6,x86-64) => /lib64/libxcb-xinput.so.0
    libxcb-xinerama.so.0 (libc6,x86-64) => /lib64/libxcb-xinerama.so.0
    libxcb-xf86dri.so.0 (libc6,x86-64) => /lib64/libxcb-xf86dri.so.0
    libxcb-xfixes.so.0 (libc6,x86-64) => /lib64/libxcb-xfixes.so.0
```

```
    libxcb-sync.so.1 (libc6,x86-64) => /lib64/libxcb-sync.so.1
    libxcb-shm.so.0 (libc6,x86-64) => /lib64/libxcb-shm.so.0
--More--
```

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.
