

MK-CONFIGURE – lightweight easy to use replacement for GNU Autotools

Aleksey Cheusov
vle@gmx.net

Minsk, Belarus, 2010

Concepts behind mk-configure

Design principles and goals

- ▶ The same way of building projects both for developers and users.
- ▶ The only file describing the project is(are) Makefile(s).
- ▶ The only command required for building is bmake (portable version of NetBSD make).
- ▶ Declarative approach of writing Makefile(s). Build and installation process is controlled with a help of special variables.
- ▶ No code generation. Library approach is used instead.
- ▶ No need to “reinvent” rules for compiling, linking, installing, uninstalling etc. again and again.
- ▶ KISS. Less than 4000 lines of code. No heavy dependencies.

Concepts behind mk-configure

Design principles and goals

- ▶ Cross-compilation.
- ▶ Portability to all UNIX-like systems.
- ▶ Modular approach. Extensions to mk-configure are implemented using bmake include files and standard POSIX tools, e.g. shell, awk, sed, grep and so on.

Concepts behind mk-configure

Negative side-effects

- ▶ End-users/packagegers have to install bmake and mk-configure to build applications based on mk-configure.

Example 1: Hello world application

Source code

Makefile

```
PROG=      hello

.include <mkc.prog.mk>
```

hello.c

```
#include <stdio.h>

int main (int, char **)
{
    puts ("Hello World!");
    return 0;
}
```

Example 1: Hello world application

How it works

```
$ export PREFIX=/usr SYSCONFDIR=/etc  
$ mkcmake  
checking for compiler type... gcc  
checking for program cc... /usr/bin/cc  
cc      -c hello.c  
cc      -o hello hello.o  
$ ./hello  
Hello World!  
$ DESTDIR=/tmp/fakeroot mkcmake install  
for d in _ /tmp/fakeroot/usr/bin; do  test "$d" = _ ||  
    install -d "$d";  done  
install  -c -s  -o cheusov -g users -m 755  
    hello /tmp/fakeroot/usr/bin/hello  
$
```

Supported targets: all, clean, cleandir (distclean), install, uninstall, installdirs, depend etc.

Example 2: Application using non-standard strcpy(3)

Source code

files in the directory

```
$ ls -l
total 12
-rw-r--r--  1 cheusov  users  158 May  2 15:04 Makefile
-rw-r--r--  1 cheusov  users  187 May  2 15:05 main.c
-rw-r--r--  1 cheusov  users  332 May  2 15:09 strcpy.c
$
```

Makefile

```
PROG=          strcpy_test
SRCS=          main.c

MKC_SOURCE_FUNCLIBS=  strcpy
MKC_CHECK_FUNCS3=    strcpy:string.h

.include <mkc.prog.mk>
```

Example 2: Application using non-standard strlcpy(3)

Source code

main.c

```
#include <string.h>

#ifdef HAVE_FUNC3_STRLCPY_STRING_H
size_t strlcpy(char *dst, const char *src, size_t siz);
#endif

int main (int argc, char** argv)
{
    /*    Use strlcpy(3) here    */
    return 0;
}
```


Example 2: Application using non-standard strlcpy(3)

How it works on Linux

```
$ CC='icc -no-gcc' mkcmake
checking for compiler type... icc
checking for function strlcpy... no
checking for func strlcpy ( string.h )... no
checking for program icc... /opt/intel/cc/10.1.008/bin/icc
icc -no-gcc -c main.c
icc -no-gcc -c strlcpy.c
icc -no-gcc -o strlcpy_test main.o strlcpy.o
$ echo _mkc_*
_mkc_compiler_type.err _mkc_compiler_type.res
_mkc_func3_strlcpy_string_h.c
_mkc_func3_strlcpy_string_h.err
_mkc_func3_strlcpy_string_h.res
_mkc_funclib_strlcpy.c _mkc_funclib_strlcpy.err
_mkc_funclib_strlcpy.res _mkc_prog_cc.err _mkc_prog_cc.res
$
```

Example 2: Application using non-standard strlcpy(3)

How it works on NetBSD

```
$ mkcmake
```

```
checking for compiler type... gcc
```

```
checking for function strlcpy... yes
```

```
checking for func strlcpy ( string.h )... yes
```

```
checking for program cc... /usr/bin/cc
```

```
cc -DHAVE_FUNC3_STRLCPY_STRING_H=1 -c main.c
```

```
cc -o strlcpy_test main.o
```

```
$
```

Example 3: Application using plugins

Source code

Makefile

```
MKC_CHECK_FUNCLIBS=      dlopen:dl

PROG=                     myapp

.include <mkc.configure.mk>

.if ${HAVE_FUNCLIB.dlopen} || ${HAVE_FUNCLIB.dlopen.dl}
CFLAGS+= -DPLUGINS_ENABLED=1
.endif

.include <mkc.prog.mk>
```

Example 3: Application using plugins

How it works on Linux

```
$ mkmake
```

```
checking for compiler type... gcc
```

```
checking for function dlopen ( -ldl )... yes
```

```
checking for function dlopen... no
```

```
checking for program gcc... /usr/bin/gcc
```

```
gcc -DPLUGINS_ENABLED=1      -c myapp.c
```

```
gcc      -o myapp myapp.o -ldl
```

```
$
```

Example 3: Application using plugins

How it works on OpenBSD

```
$ mkcmake
```

```
checking for compiler type... gcc
```

```
checking for function dlopen ( -ldl )... no
```

```
checking for function dlopen... yes
```

```
checking for program cc... /usr/bin/cc
```

```
cc -DPLUGINS_ENABLED=1 -c myapp.c
```

```
cc -o myapp myapp.o
```

```
$
```

Example 4: Support for shared libraries

Source code

Makefile

```
LIB=                                foobar
SRCS=                              foo.cc bar.cc baz.cc

MKPICLIB?=                         no
MKSTATICLIB?=                      no

SHLIB_MAJOR=                       1
SHLIB_MINOR=                       0

.include <mkc.lib.mk>
```

Example 4: Support for shared libraries

How it works on Solaris

\$ mkcmake

```
/opt/SUNWspro/bin/CC      -c -KPIC foo.cc -o foo.os
```

```
/opt/SUNWspro/bin/CC      -c -KPIC bar.cc -o bar.os
```

```
/opt/SUNWspro/bin/CC      -c -KPIC baz.cc -o baz.os
```

```
building shared foobar library (version 1.0)
```

```
/opt/SUNWspro/bin/CC -G -h libfoobar.so.1
```

```
    -o libfoobar.so.1.0  foo.os bar.os baz.os
```

```
ln -sf libfoobar.so.1.0 libfoobar.so
```

```
ln -sf libfoobar.so.1.0 libfoobar.so.1
```

\$

Example 4: Support for shared libraries

How it works on Darwin

```
$ mkcmake
```

```
checking for compiler type... gcc
```

```
checking for program c++... /usr/bin/c++
```

```
c++      -c -fPIC -DPIC foo.cc -o foo.os
```

```
c++      -c -fPIC -DPIC bar.cc -o bar.os
```

```
c++      -c -fPIC -DPIC baz.cc -o baz.os
```

```
building shared foobar library (version 1.0)
```

```
c++ -dynamiclib -install_name
```

```
    /usr/local/lib/libfoobar.1.0.dylib
```

```
    -current_version 2.0 -compatibility_version 2
```

```
    -o libfoobar.1.0.dylib  foo.os bar.os baz.os
```

```
ln -sf libfoobar.1.0.dylib libfoobar.dylib
```

```
ln -sf libfoobar.1.0.dylib libfoobar.1.dylib
```

```
$
```


Example 5: Big project consisting of several subprojects

Source code

Makefile

```
# This project consists of several subprojects:
# dict, dictd, dictfmt, dictzip, libdz, libmaa
# and libcommon. libcommon contains common code
# for executables and should not be installed.
# SUBPRJ specifies a dependency graph
# for all subprojects.

SUBPRJ=    libcommon:dict    # dict depends on libcommon
SUBPRJ+=   libcommon:dictd
SUBPRJ+=   libcommon:dictzip
SUBPRJ+=   libcommon:dictfmt
SUBPRJ+=   libdz:dictzip
SUBPRJ+=   libmaa:dict
...
.include <mkc.subprj.mk>
```

Example 5: Big project consisting of several subprojects

Source code

libcommon/Makefile

```
# Internal static library that implements functions
# common for dict, dictd, dictfmt
# and dictzip applications

LIB=                common
SRCS=               str.c iswalnum.c # and others

MKINSTALL=         no # Do not install it!

.include <mkc.lib.mk>
```

libcommon/linkme.mk

```
PATH.common:=      ${.PARSEDIR}

CPPFLAGS+=         -I${PATH.common}
DPLIBDIRS+=        ${PATH.common}
```

Example 5: Big project consisting of several subprojects

Source code

libmaa/Makefile

```
LIB=          maa
SRCS=         set.c prime.c log.c # etc.

SHLIB_MAJOR=  1
SHLIB_MINOR=  2
SHLIB_TEENY=  0

# list of exported symbols
EXPORT_SYMBOLS= libmaa.sym

.include <mkc.lib.mk>
```

libmaa/linkme.mk

```
PATH.maa:=    ${.PARSEDIR}

CPPFLAGS+=    -I${PATH.maa}
DPLIBDIRS+=   ${PATH.maa}
```

Example 5: Big project consisting of several subprojects

Source code

libdz/Makefile

```
LIB=          dz
SRCS=         dz.c

MKC_REQUIRE_HEADERS=  zlib.h
MKC_REQUIRE_FUNCLIBS= deflate:z

EXPORT_SYMBOLS=      libdz.sym
SHLIB_MAJOR=         1
SHLIB_MINOR=         0

.include <mkc.lib.mk>
```

libdz/linkme.mk

```
PATH.dz:=      ${.PARSEDIR}

CPPFLAGS+=     -I${PATH.dz}
DPLIBDIRS+=    ${PATH.dz}
```

Example 5: Big project consisting of several subprojects

Source code

dictzip/Makefile

```
PROG=    dictzip
MAN=     dictzip.1

.include "../libcommon/linkme.mk"
.include "../libdz/linkme.mk"
.include "../libmaa/linkme.mk"

DPLIBS+=      -lcommon -ldz -lmaa

.include <mkc.prog.mk>
```

Example 5: Big project consisting of several subprojects

How it works

```
$ mkcmake dictzip
```

```
=====
```

```
all ==> libcommon
```

```
...
```

```
=====
```

```
all ==> libdz
```

```
...
```

```
=====
```

```
all ==> dictzip
```

```
...
```

```
checking for program cc... /usr/bin/cc
```

```
cc -I../libcommon -I../libdz -I../libmaa -c dictzip.c
```

```
cc -L/tmp/hello_dictd/libcommon -L/tmp/hello_dictd/libdz
```

```
    -L/tmp/hello_dictd/libmaa -o dictzip
```

```
    dictzip.o -lcommon -lmaa -ldz
```

```
$
```

Example 6: Support for Lua programming language

Source code

Makefile

```
SCRIPTS=      foobar  # scripts written in Lua
LUA_LMODULES= foo bar # modules written in Lua
LUA_CMODULE=  baz     # Lua module written in C

.include <mkc.lib.mk>
```

Example 6: Support for Lua programming language

How it works

```
$ mkmake errorcheck
```

```
checking for program pkg-config...
```

```
    /usr/pkg/bin/pkg-config
```

```
checking for [pkg-config] lua... 1 (yes)
```

```
checking for [pkg-config] lua --cflags...
```

```
    -I/usr/pkg/include
```

```
checking for [pkg-config] lua --libs...
```

```
    -Wl,-R/usr/pkg/lib -L/usr/pkg/lib -llua -lm
```

```
checking for [pkg-config] lua --variable=INSTALL_LMOD...
```

```
    /usr/pkg/share/lua/5.1
```

```
checking for [pkg-config] lua --variable=INSTALL_CMOD...
```

```
    /usr/pkg/lib/lua/5.1
```

```
checking for compiler type... gcc
```

```
checking for header lua.h... yes
```

```
checking for program cc... /usr/bin/cc
```

```
$
```


Example 6: Support for Lua programming language

How it works

```
$ export PREFIX=/usr/pkg
$ mkcmake all
cc -DHAVE_HEADER_LUA_H=1 -I/usr/pkg/include
  -c -fPIC -DPIC baz.c -o baz.os
building shared baz library (version 1.0)
cc -shared -Wl,-soname -Wl,libbaz.so.1 -o baz.so  baz.os
  -Wl,-R/usr/pkg/lib -L/usr/pkg/lib -llua -lm
$
```

Example 6: Support for Lua programming language

How it works

```
$ mkmake install DESTDIR=/tmp/fakeroot
```

```
...
```

```
$ find /tmp/fakeroot -type f
```

```
/tmp/fakeroot/usr/pkg/bin/foobar
```

```
/tmp/fakeroot/usr/pkg/lib/lua/5.1/baz.so
```

```
/tmp/fakeroot/usr/pkg/share/lua/5.1/foo.lua
```

```
/tmp/fakeroot/usr/pkg/share/lua/5.1/bar.lua
```

```
$
```

Example 7: Portable version of AWK from NetBSD

<http://mova.org/~cheusov/pub/mk-configure/nbawk/>

```
PROG= awk
SRCS= awkgram.y b.c lex.c lib.c main.c parse.c
      proctab.c run.c tran.c
YHEADER= yes
MKC_COMMON_DEFINES.Linux= -D_GNU_SOURCE
MKC_COMMON_HEADERS= ctype.h stdio.h string.h
MKC_CHECK_FUNCS1= __fpurge:stdio_ext.h fpurge isblank
MKC_CHECK_FUNCS3= strlcat
MKC_SOURCE_FUNCLIBS= fpurge strlcat
.include <mkc.configure.mk>
.if ${HAVE_FUNC1.isblank:U0}
CPPFLAGS+= -DHAS_ISBLANK
.endif
.if !${HAVE_FUNC1.fpurge:U1} && !${HAVE_FUNC1.__fpurge.stdio_ext.h:U1}
MKC_ERR_MSG+= "fpurge(3) cannot be found"
.endif
CPPFLAGS+= -I.
LDADD+= -lm
.include <mkc.prog.mk>
```

Example 7: Portable version of AWK from NetBSD

run.c

```
--- nbawk-20100903/run.c.orig
+++ nbawk-20100903/run.c
@@ -40,6 +40,14 @@
#include "awk.h"
#include "awkgram.h"

+#ifndef HAVE_FUNC1_FPURGE
+int fpurge (FILE *stream);
+#endif
+
+#ifndef HAVE_FUNC3_STRLCAT
+size_t strlcat(char *dst, const char *src, size_t size);
+#endif
+
#define tempfree(x)    if (istemp(x)) tfree(x); else

void stdinit(void);
```

Example 7: Portable version of AWK from NetBSD

fpurge.c

```
#include <stdio.h>

#if HAVE_FUNC1__FPURGE_STDIO_EXT_H
#include <stdio_ext.h>
#endif

int fpurge(FILE *stream);

int fpurge(FILE *stream)
{
    #if HAVE_FUNC1__FPURGE_STDIO_EXT_H
        __fpurge (stream);
        return 0;
    #else
        #error "cannot find fpurge(3), sorry"
    #endif
}
```

Example 7: Portable version of AWK from NetBSD

strcpy.c

If you want this code, you know where to get it! ;-)

Features

1. Automatic detection of system configuration (**mkc.configure.mk**)

- ▶ header presence (MKC_{CHECK,REQUIRE}_HEADERS)
- ▶ function declaration (MKC_{CHECK,REQUIRE}_FUNCS[n])
- ▶ type declaration (MKC_{CHECK,REQUIRE}_TYPES)
- ▶ structure member (MKC_{CHECK,REQUIRE}_MEMBERS)
- ▶ variable declaration (MKC_{CHECK,REQUIRE}_VARS)
- ▶ define declaration (MKC_{CHECK,REQUIRE}_DEFINES)
- ▶ type size (MKC_CHECK_SIZEOF)
- ▶ function implementation in the library
(MKC_{CHECK,REQUIRE}_FUNCLIBS and
MKC_SOURCE_FUNCLIBS)
- ▶ checks for programs (MKC_{CHECK,REQUIRE}_PROGS)
- ▶ user's custom checks (MKC_{CHECK,REQUIRE}_CUSTOM)
- ▶ built-in checks (MKC_CHECK_BUILTINS), e.g. endianness,
prog_flex, prog_bison, prog_gawk or prog_gm4)

Features

2. Building, installing, uninstalling, cleaning etc. Supported targets: all, installdirs, install, uninstall, clean, cleandir (distclean) and others.
3. Building standalone programs (**mkc.prog.mk**), static and shared libraries (**mkc.lib.mk**) using C, C++, Objective C, Pascal and Fortran compilers. Shared libraries support is provided for numerous OSes: NetBSD, FreeBSD, OpenBSD, DragonFlyBSD, MirOS BSD, Linux, Solaris, Darwin (MacOS-X), Tru64, QNX, HP-UX, Cygwin (no support for shared object files yet) and compilers: GCC, Intel C/C++ compilers, Portable C compiler aka pcc, DEC C/C++ compiler, HP C/C++ compiler, Oracle SunPro and others.
4. Handling of man pages.

Features

5. Building info pages from texinfo sources.
6. Handling of scripts as well as plain text files, i.e. installing or uninstalling.
7. Cross-building. mk-configure itself doesn't run produced executables, so you can freely use cross-tools (compiler, linker etc.). Also you can override any variable initialized by mk-configure.
8. Support for pkg-config (**mkc_imp.pkg-config.mk**).
9. Support for Lua programming language (**mkc_imp.lua.mk**).
10. Support for yacc and lex.
11. Support for projects with multiple subprojects (**mkc.subprj.mk** and **mkc.subdir.mk**).

Features

12. Special targets `bin_tar`, `bin_targz`, `bin_tarbz2`, `bin_zip`, `bin_deb` creates `.tar`, `.tar.gz`, `.tar.bz2`, `.zip` archives and `.deb` package (on Debian Linux).
13. Parts of `mk-configure` functionality is accesible via individual programs, e.g. **`mkc_install`**, **`mkc_check_compiler`**, **`mkc_check_header`**, **`mkc_check_funclib`**, **`mkc_check_decl`**, **`mkc_check_prog`**, **`mkc_check_sizeof`** and **`mkc_check_custom`**.

MK-CONFIGURE in real world

Packages in UNIX-like system and distributions

NetBSD make (bmake) is packaged in the following OSes:

- ▶ FreeBSD, NetBSD
- ▶ Gentoo Linux, Fedora Linux, AltLinux
- ▶ Debian/Ubuntu
deb <http://movs.org/~cheusov/pub/debian lenny main>
deb-src <http://movs.org/~cheusov/pub/debian lenny main>

mk-configure is packaged in the following OSes

- ▶ FreeBSD, NetBSD
- ▶ AltLinux
- ▶ Debian/Ubuntu
deb <http://movs.org/~cheusov/pub/debian lenny main>
deb-src <http://movs.org/~cheusov/pub/debian lenny main>

MK-CONFIGURE in real world

Real life samples of use

- ▶ Lightweight modular malloc Debugger.
<http://sf.net/projects/lmdbg/>
- ▶ NetBSD version of AWK programming language.
<http://mova.org/~cheusov/pub/mk-configure/nbawk/>
- ▶ Any project based on traditional **bsd.{prog,lib,subdir}.mk** can easily be converted to use mk-configure.
 - ▶ **<http://sourceforge.net/projects/runawk/>**
Modules Framework for AWK programming language
 - ▶ **<http://sourceforge.net/projects/paexec/>**
Parallel Executer
 - ▶ **<http://mova.org/~cheusov/pub/distbb/>**
Distributed fault tolerant bulk build tool for pkgsrc
 - ▶ **http://mova.org/~cheusov/pub/pkg_online/**
Client/server package search system for pkgsrc
 - ▶ ...

MK-CONFIGURE in real world

My own opensource software projects using mk-configure (romb), Mk files (box) and others (oval)

