# MutekH as Unix process quick start guide

This guide explain how to run MutekH embedded in a Unix process in a way similar to <u>?user mode linux</u>. This is the simplest way to run MutekH as it doesn't require any hardware platform. It will work if you running a Linux or Darwin host kernel on x86 or x86\_64 processor(s).

### Overview

The MutekH operation system is built on top of the Hexo hardware abstraction layer. It's composed of several modules and libraries.



When compiled to run embedded in a Unix process, minimal hardware ressource are needed: The host processor and unix process memory are used as execution platform and a simple TTY driver redirect output to the Unix terminal.

It enables running MutekH natively on the host processor. This configuration suffer from several limitations regarding available peripherals, but it is usefull to test and debug algorithms.



### Getting the sources

The example below show how to run MutekH using this configuration, it only requires to get the MutekH source code.

The MutekH source code is fully configurable and can be tweaked to adapt hardware platform and application needs. Configuration is handled by a dedicated tool which check dependencies and other relationships between the large set of available configuration tokens.

```
svn co https://www.mutekh.org/svn/trunk/mutekh/
```

Source tree is organized this way:

mutekh		
	arch	contains hardware platforms modules for hexo
	сри	contains processors modules for hexo
	doc	documentation
	drivers	device and filesystem drivers
	examples	Test and example programs
	gpct	container library, available as a separate project
	hexo	Hexo hardware abstraction layer
	mutek	hardware independant kernel code
	libc	standard C library
	libm	standard math library
	libnetwork	netwotk stack
	libpthread	posix thread library
	libvfs	virtual File System
	scripts	build system scripts
`	tools	some usefull tools

More directories are actually available with other libraries and features.

#### Writing the example source code

Note: This example is available directly from examples/hello directory in source tree: trunk/mutekh/examples/hello

```
• Creating a new modules directory
         mkdir hello
         cd hello
• Writing the source code in hello.c
         #include <pthread.h>
         pthread_mutex_t m;
         pthread_t a, b;
         void *f(void *param)
         {
           while (1)
             {
                pthread_mutex_lock(&m);
                printf("(%i) %s", cpu_id(), param);
                pthread_mutex_unlock(&m);
                pthread_yield();
              }
         }
         int main()
         {
           pthread_mutex_init(&m, NULL);
           pthread_create(&a, NULL, f, "Hello ");
pthread_create(&b, NULL, f, "World\n");
         }
```

• Writing the Makefile

objs = hello.o

# Writing the MutekH configuration

#### Standalone configuration file

Our configuration file is named hello/config\_emu. Details about configuration file is explained later. This configuration file describe the following things:

- The application license, used to check license consistency for modules in use,
- The target hardware platform and processor
- Use of the POSIX threads library
- Use of terminal output
- Declaration of a new "hello" modules

The MutekH source code is split in modules. We now have to declare our new module to have it compiled along with the kernel by the build system. As modules may be located out of the source tree, we have to specify the module directory.

```
# New source code module to be compiled
CONFIG_MODULES examples/hello:%CONFIGPATH
# Application license
CONFIG_LICENSE_APP_LGPL
# Platform types
CONFIG_ARCH_EMU
CONFIG_ARCH_EMU_LINUX
# Processor types
CONFIG_CPU_X86_EMU
....
```

The complete configuration file is available here: trunk/mutekh/examples/hello/config\_emu.

Have a look to the <u>BuildSystem</u> page for more information about configuration system and configuration file format. The <u>MutekH API reference manual</u> describes all available configuration tokens.

#### Generic configuration file

The flat and standalone configuration file described above is specific to the target emu architecture, GNU/Linux host operating system and x86 32bits processor.

It's possible to write a more generic configuration file which relies on common files to target more platforms.

The complete generic configuration file is available here: trunk/mutekh/examples/hello/config.

### Compiling the application along with MutekH

#### Getting the cross-compilers

You may have some success in compiling MutekH/emu using your readily available host GNU compiler. If it doesn't work because, please use a MutekH toolchain. You can rely on the tools/crossgen.mk script which

comes along with MutekH to build some GNU toolchains or download a precompiled toolchain. See <u>BuildingExamples</u> page.

#### Compiling

Simply type something like:

make CONF=examples/hello/config\_emu

or to use the generic configuration file:

make CONF=examples/hello/config BUILD=emu-linux-x86

The later allows targeting other emu platforms like MacOs X (darwin) and x86\_64 processors and other hardware platforms. See <u>BuildingExamples</u> for details.

Once the compilation process has finished, the executable binary is available.

## Execution

Simply execute the program as a normal unix executable:

```
$ ./kernel-emu-x86-emu.out
(0) Hello (0) World
(0) Hello (0) World
(0) Hello (0) World
(0) Hello (0) World
...
```

Other more advanced topics and guides are available from the Main page.