XENOMAI INSTALLATION GUIDE

Ref.: IG001

- **VERSIONS**

VERSION	DATE	AUTHOR	EVOLUTION
V1	01/12/2020	MOHAMED ABDULLA Mohamed Irfanulla	Initial Version
V2			

Contacts:

Name : Mohamed Irfanulla MOHAMED ABDULLA
Function : CIFRE PhD
Mail : m.mohamedabdulla@e-cobot.com

Note, In this document the red coloured text are the terminal commands.

Prerequisite :

$ sudo apt-get update

Git: $ sudo apt install git

Others : $ sudo apt-get install dh-autoreconf libncurses5 libncurses5-dev flex bison

STEP 1: Create a new directory to maintain the source file

```
mkdir -p ~/xeno_rtos
cd xeno_rtos
```

From now, the working directory is ~/xeno_rtos

STEP 2: Download Linux kernel

Linux kernel link : https://mirrors.edge.kernel.org/pub/linux/kernel/

```
wget https://mirrors.edge.kernel.org/pub/linux/kernel/v5.x/linux-5.4.77.tar.xz
```

Extract the tar file

```
tar xvJf linux-5.4.77.tar.xz
```

STEP 3: Download ipipe-core

ipipe-core link : https://xenomai.org/downloads/ipipe/

```
wget https://xenomai.org/downloads/ipipe/v5.x/x86/ipipe-core-5.4.77-x86-2.patch
```

STEP 4: Download Xenomai

Xenomai link : https://gitlab.denx.de/Xenomai/xenomai

Stable versions link : https://xenomai.org/downloads/xenomai/stable/

Git clone the xenomai repository.

```
git clone git://git.xenomai.org/xenomai-3.git
```

If you are using linux kernel > 5.2 switch the branch to « next ».

```
cd xenomai-3
git checkout next
```

Note : for kernel version < 5.2 use the default « master » branch (the maste branch contains stable xenomai-3.1 version)

STEP 5: Bootstrap

Remain in the xenomai-3 directory.

./scripts/bootstrap

```
root@dell:/xeno_rtos/xenomai-3# ./scripts/bootstrap
libtoolize: putting auxiliary files in AC_CONFIG_AUX_DIR, 'config'.
libtoolize: copying file 'config/ltmain.sh'
libtoolize: putting macros in AC_CONFIG_MACRO_DIRS, 'config'.
libtoolize: copying file 'config/libtool.m4'
libtoolize: copying file 'config/ltoptions.m4'
libtoolize: copying file 'config/ltsugar.m4'
libtoolize: copying file 'config/ltversion.m4'
libtoolize: copying file 'config/lt~obsolete.m4'
configure.ac:80: installing 'config/compile'
configure.ac:66: installing 'config/config.guess'
configure.ac:66: installing 'config/config.sub'
configure.ac:68: installing 'config/install-sh'
configure.ac:105: installing 'config/missing'
demo/alchemy/Makefile.am: installing 'config/depcomp'
root@dell:/xeno_rtos/xenomai-3#
```

STEP 6: Build Xenomai Cobalt kernel

scripts/prepare-kernel.sh --linux=../linux-5.4.77 --ipipe=../ipipe-core-5.4.77-x86-2.patch --arch=x86_64

```
checking file kernel/trace/trace_clock.c
checking file kernel/trace/trace_functions.c
checking file kernel/trace/trace_functions_graph.c
checking file kernel/trace/trace_preemptirq.c
checking file lib/Kconfig.debug
checking file lib/atomic64.c
checking file lib/bust_spinlocks.c
checking file lib/dump_stack.c
checking file lib/ioremap.c
checking file lib/smp_processor_id.c
checking file mm/memory.c
checking file mm/mlock.c
checking file mm/mmu_context.c
checking file mm/mprotect.c
checking file mm/vmalloc.c
root@dell:/xeno_rtos/xenomai-3#
```

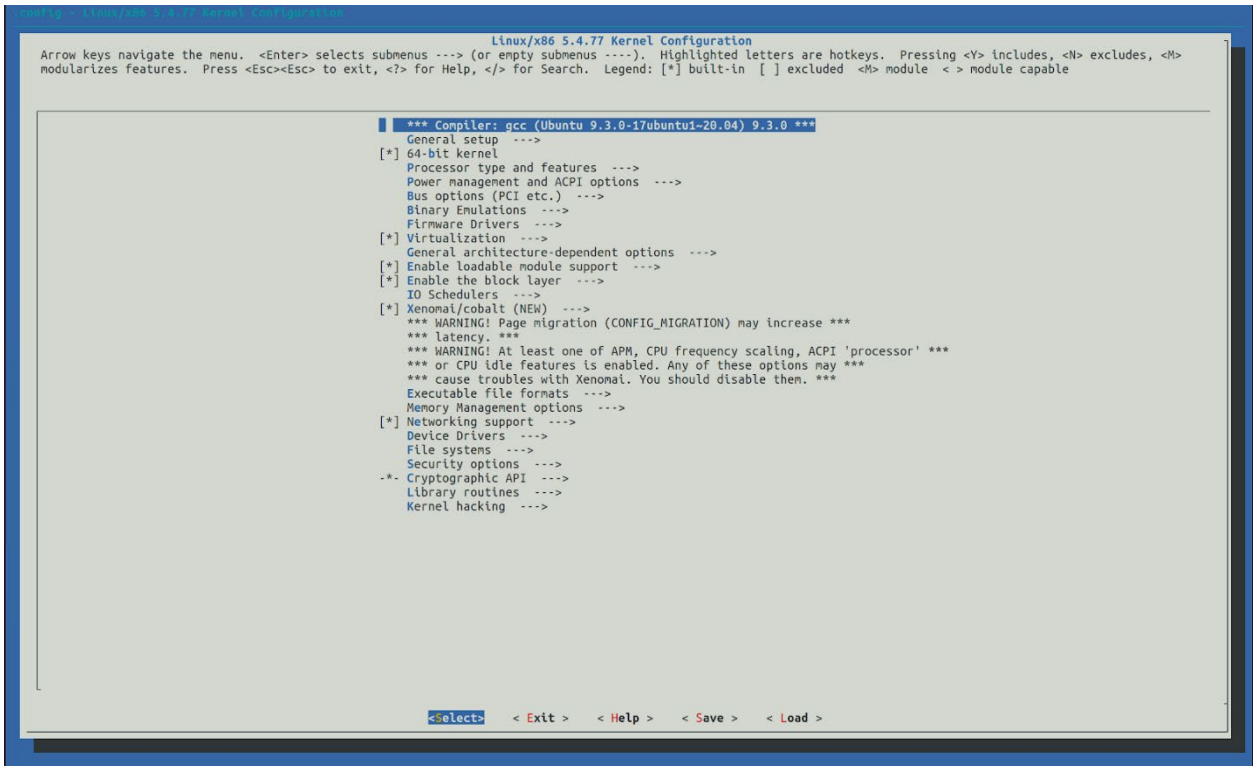
Go back to xeno_rtos directory

cd ..

STEP 7: Kernel Configuration

cd linux-5.4.77

make menuconfig



Xenomai Configuration for x86 based kernel link : https://gitlab.denx.de/Xenomai/xenomai/-/wikis/Configuring_For_X86_Based_Dual_Kernels#pcspkr

Configuration options to include and exclude:

Note:

```
Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M>
modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable
```

* General setup
  --> Local version - append to kernel release: -xenomai-3.1

* Processor type and features
  --> Linux guest support (**exclude**)
  --> CPU core priorities scheduler support (**exclude**)

Warning: Do not disable power management globally

* Power management and ACPI options
 --> CPU Frequency scaling
  --> CPU Frequency scaling (**exclude**)
 --> ACPI (Advanced Configuration and Power Interface) Support
  --> Processor (**exclude**)
 --> CPU Idle
  --> CPU idle PM support (**exclude**)

* Memory management options
 --> Transparent Hugepage Support (**exclude**)
 --> Contiguous Memory Allocation (**exclude**)
 --> Allow for memory compaction (**exclude**)
 --> Page Migration (**exclude**)

* Device Drivers
--> Input device support
  --> Miscellaneous devices
    --> PC Speaker support (**exclude**)
 --> Staging drivers
  --> Unisys SPAR driver support
   --> Unisys visorbus driver (**exclude**)

Save and exit.

STEP 8: Build and Install kernel

In linux-5.4.77 directory

sudo make -j8

(Takes long time to build)

sudo make -j8 modules_install install

(installs the modules and updates the grub with the new kernel image)

STEP 9: Install xenomai libraries

In xenomai-3 directory

./configure && make && make install

STEP 10: Reboot the system.

The configuration, build and install of Xenomai on the kernel is complete.

When booting enter the correct kernel to work with Xenomai.

In startup grub menu.

1. Select Advance option for ubuntu
2. Select the linux kernel with xenomai kernel

Incase of boot hang:

In startup grub menu

1. Select Advance ubuntu
2. Press '**e**' on the xenomai kernel
3. Add "**nomodeset**" before "quite splash" in the line starting with **linux**
4. Press ctrl + x to boot
5. After booting successful install the required nvidia drivers
6. Reboot the system and you can login without boot hang

Reference:

http://blog.reds.ch/?p=1308

This link can be used to build xenomai-3.1 stable release instead of using git repository. Follow the steps till "*Prepare kernel source*" and for building and installing the kernel follow this guide from STEP 7.