

Linux RTAI - Installation

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Objectives

- Be able to perform all the steps needed to install a Linux RTAI PC
 - Patching the kernel
 - Install Mesa+EFLTK
 - Install COMEDILIB and COMEDI
 - Install RTAI
 - Install RTAI-Lab and some variants



Outline

- 1 Requirements
- 2 Kernel
- 3 Mesa and EFLTK
- 4 RTAI + COMEDI
- 5 Scicoslab and addons



Requirements

- The Mesa 3D graphical library. <http://www.mesa3d.org>
- The EFLTK graphic widgets library. equinox-project.org
- A new Linux “vanilla” kernel. <http://www.kernel.org>
- The RTAI real-time modules. <http://www.rtai.org>
- The Comedilib data acquisition device interface library. <http://www.comedi.org>
- The Comedi data acquisition device modules. <http://www.comedi.org>
- Scicoslab <http://www.scicoslab.org>
- The Scilab/Scicos Computer Aided Control System Design (CACSD) software



Kernel

- Download the last Linux RTAI distribution
- Check kernel version numbers of available RTAI patches:
`ls <RTAI>/base/arch/x86/patches/`
and look for kernel version numbers in:
`hal-linux-<kernel-version>.patch`
- Download the corresponding kernel.



New kernel

Driver modules

```

emacs@pcm2033
File Edit Options Buffers Tools Help
[Icons]
bucher@pcm2033:~$ lspci -v
...
00:19.0 Ethernet controller: Intel Corporation 82567LM Gigabit Network Connection (rev 03)
Subsystem: Hewlett-Packard Company Device 30e7
...
Kernel driver in use: e1000e
Kernel modules: e1000e

00:1a.0 USB Controller: Intel Corporation 82801I (ICH9 Family) USB UHCI Controller #4 (rev 03)
...
Kernel driver in use: uhci_hcd

0:1f.2 IDE interface: Intel Corporation ICH9M/M-E 2 port SATA IDE Controller (rev 03) (prog-if 8a)
[Master SecP PriP]
Subsystem: Hewlett-Packard Company Device 30e7
...
Kernel driver in use: ata_piix

03:00.0 Network controller: Intel Corporation Wireless WiFi Link 5300
...
Kernel driver in use: iwlnag
Kernel modules: iwlnag

...
x.x All L2 (LD-Script)

```



SUPSI

Kernel - Patch, configure and compile

- Patch the kernel:

```
cd /usr/src/linux-xxxxx  
patch -p1 <patch>
```
- make xconfig
- make
- make modules_install install
- Configure “/boot/grub/menu.lst”
- reboot the PC and check the new kernel



Mesa libraries

- Visit <http://www.mesa3d.org> or <http://sourceforge.net/projects/mesa3d> and download MesaLib-7.x.x.tar.bz2
- `tar jxvf MesaLib-7.x.x.tar.bz2`
- `cd Mesa-7.x.x`
- `make realclean`
- `make linux-x86-static`
- `make install`



EFLTK libraries

- `svn co https://ede.svn.sourceforge.net/svnroot/ede/trunk/efltk`
- `autoconf`
- `./configure --disable-mysql --disable-unixODBC`
- `./emake`
- `./emake install`
- Edit `/etc/ld.so.conf` and add a line with the path `/usr/local/lib` on a line.
- Execute `/sbin/ldconfig` to update the library database



Sequence

- Conflict: COMEDI needs RTAI installed, RTAI needs COMEDI installed!
- Solution: The first time install RTAI in two steps



Make and install RTAI 1

I'm used to work in a separate folder by installing RTAI. In this example I'm working in the folder “/home/rtai_distro/rtai”. The RTAI files are for example installed under “/usr/src/rtai”.

- `make -f /usr/src/rtai/makefile xconfig`
- save and exit
- `make`
- `make install`



Check RTAI

Check RTAI performances

- `cd /usr/realtime/testsuite/user/latency`
- `./run`



Check RTAI

Code generation

```

local : bash
File Edit View Scrollback Bookmarks Settings Help
RTAI Testsuite - USER latency (all data in nanoseconds)
2009/06/15 08:41:08
RTH|   lat min|   ovl min|   lat avg|   lat max|   ovl max|   overruns
RTD|   -957|   -957|   -625|   5965|   5965|   0
RTD|   -838|   -957|   -698|   5356|   5965|   0
RTD|   -800|   -957|   -712|   722|   5965|   0
RTD|   -827|   -957|   -715|   859|   5965|   0
RTD|   -827|   -957|   -712|   4957|   5965|   0
RTD|   -838|   -957|   -714|   4746|   5965|   0
RTD|   -827|   -957|   -713|   4099|   5965|   0
RTD|   -800|   -957|   -713|   5220|   5965|   0
RTD|   -825|   -957|   -712|   4155|   5965|   0
RTD|   -831|   -957|   -713|   5020|   5965|   0
RTD|   -800|   -957|   -711|   4929|   5965|   0
RTD|   -815|   -957|   -715|   4424|   5965|   0
RTD|   -834|   -957|   -713|   4972|   5965|   0
RTD|   -827|   -957|   -714|   4681|   5965|   0
RTD|   -838|   -957|   -715|   1088|   5965|   0
^CRTD|   -838|   -957|   -715|   1088|   5965|   0

>>> S = 98.696, EXECTIME = 0.0439081
root@rego2:/usr/realtime/testsuite/user/latency#

```



ComediLib

- `sh autogen.sh`

Note: you may ignore warnings and reminders

- `./configure`
- `make`
- `make install`



Comedi

- `sh autogen.sh`
Note: you may ignore warnings and reminders
- `./configure`
- `make`
- `make install`
- `make dev`
- `mkdir /usr/local/include/linux`
- `cd include/linux`
- `cp comedi.h comedilib.h /usr/local/include/linux`



Make and install RTAI 2

- `cd /home/rtai_distro/rtai`
- `make xconfig`
- check boxes of the following addons:
 - RTDM
 - COMEDI
 - RTAI-Lab
- save and exit
- `make`
- `make install`



Usefull tips

Sometimes it can be possible that you receive such errors by linking `xrtailab`

```
undefined reference to 'Fl_Gl_Window::layout()'
...
```

In this case you have some problems with the mesa libs on your machine.



Usefull tips

Simply do the following:

- Edit the “configure” file“ under ”efltk“
- Switch the two lines ”/usr/include“ and ”/usr/local/include“
- Regenerate the efltk libraries and reinstall them
- make ”RTAI“ again



Install Scicoslab

- Get scicoslab from www.scicoslab.org
- Install it following the instructions fro your distribution.



Install the basic scicos blocks

- Move under `/usr/src/rtai/rtai-lab/scicoslab/macros`
- Run `make install` as superuser
- Run `scicoslab` as normal user and exit
- Run `make user` as normal user

This command fills the user specific “.scilab” file with the commands needed to start scicoslab with the RTAI addons.



Scicos blocks for CANopen

These addons are not distributed within Linux RTAI. They must be installed separately.



Install files

- Unpack the scicoslab.tgz file (in this example it has been unpacked under `/home/stud/sviluppo`).
- Move under “devices” and run `make install`
→ install the implementation library.
- Move under “SUPSIdev” and run `make install`
→ install the interface library.
- Move under “SUPSIfun” and run `make install`
→ install the SUPSI additional functions.
- Copy the “scilab” file into the
“`/home/stud/.Scilab/4.2/.scilab`” file



Addons for startup

The “scilab” file contains the following lines:

```
load('/home/stud/sviluppo/scicoslab/SUPSIfun/lib')
load('/home/stud/sviluppo/scicoslab/SUPSIdev/lib')
scicos_pal($+1,:)=['SUPSI-Lib', '/home/stud/sviluppo/scicoslab/SUPSIdev/SUPSIlib
%scicos_gif($+1)=['/home/stud/sviluppo/scicoslab/SUPSIdev/gif_icons/' ];
```

