Procedure for Installing the Comedi Device Driver into Red Hat Linux 9 for use with the Measurement Computing PCI-DAS1200 Card

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Abstract. This report describes the step-by-step procedure for installing the Comedi device driver into Red Hat Linux 9, kernel version 2.4.20-8. This driver is used with the PCI-DAS1200 data acquisition card manufactured by Measurement Computing.

1. Introduction

The PCI-DAS1200 data acquisition card by Measurement Computing Inc. was chosen for use in the wide-band sweep-frequency spectrometer developed for the Green Bank Solar Radio Burst Spectrometer (GB/SRBS) project. The Comedi device driver is used to control that card within the Linux computing environment. Upon upgrading from Red Hat Linux 7.2 to 9 (kernel 2.4.20-8) for GB/SRBS we encountered some difficulties installing the driver software. The following procedure was found to properly install the driver into Red Hat 9.

2. Installation Procedure

2.1. Locate Comedi Driver Files

Locate the comedi-0.7.67.tar.gz and comedilib-0.7.21.tar.gz tarballs at the comedi website ¹ and copy these files to /usr/local/. Also, you will need to download a patch ² for comedilib to take care of some missing sgml tags in later releases. Copy the patch to /usr/local/ as well.

For the remainder of the steps to work, the linux kernel source files must be installed. Check whether they are present or not by typing cd /usr/src/. If there is a directory here with “linux” in the title, the source files are already installed and the following steps may be carried out. If not, go to System Settings under Start Here. Click on Add/Remove Applications. Under “Development”, choose the Kernel Development package click “update.” The needed directories will now appear under /usr/src/.

¹http://www/comedi.org/download.php
2.2. Configure the Linux Source Tree
The Linux source tree must be configured before comedì is integrated into it. Remember, all of the steps in this document must be executed as root. Below is the succession of commands to type at the shell:

- `cd /usr/src/`
  If there is not already a link `linux ⇒ linux-2.4` create one by typing `ln -s linux-2.4 linux`
- `cd /usr/src/linux/configs/`
- Select a config file closest to your architecture. If you are unsure which architecture you're using, type:
  
  ```
  rpm -q --qf "%{ARCH}\n" kernel
  ```
- If, for example, the return value is `i686` then the proper configuration file is `kernel-2.4.20-i686.config`. Copy this file to `.config` by typing: `cp -p kernel-2.4.20-i686.config /usr/src/linux/.config`
- `cd /usr/include/linux/`
- Type `uname -r` to check which kernel version is running (e.g. `2.4.20-8`)
- Edit the contents of `version.h`. Change `UTS_RELEASE` to match the results of `uname -r`, making sure to include the hyphenated portion (e.g. `UTS_RELEASE = "2.4.20-8"`).
- `cp version.h /usr/src/linux/include/linux/`
- `cd /usr/src/linux/`
- `make mproper`
- `make oldconfig`
- Edit the `Makefile`; near the top, change the line `EXTRAVERSION = -8`custom to read `EXTRAVERSION = -8` (remove the word custom). Save and exit.
- `make dep`

2.3. Compile the Driver
Next, untar the `comedi` tarball and compile the `comedi` driver. At the shell:

- `cd /usr/local/`
  ```
  tar -xzvf comedi-0.7.67.tar.gz (this will create the directory comedi-0.7.67 under /usr/local/)
  ```
The remap_page_range function contains a corruption in later releases of comedi. In the older releases, that function had four arguments but was supposed to have five in the newer releases. However, Redhat defaulted back to four arguments in the newer versions although the file mm.h does not reflect this. Therefore, make the following modification to mm.h to avoid errors during make.

- cd /usr/local/comedi-0.7.67/include/linux/
- emacs mm.h
- Replace the line 
  ```
  #if LINUX_VERSION_CODE < KERNEL_VERSION(2,5,0)
  with
  ```
  ```
  #if LINUX_VERSION_CODE < KERNEL_VERSION(2,4,20)
  ```
- cd /usr/local/comedi-0.7.67/
- ./configure
- make (if it works, there will be no errors)
- make install. This step installs comedi.o, kcomedilib.o, and <driverfiles>.o into /lib/modules/<<kernelversion>>/misc/.
- make dev. If this works, the output will look like the following:
  ```
  mknod -m 666 /dev/comedi0 c 98 0
  mknod -m 666 /dev/comedi1 c 98 1
  mknod -m 666 /dev/comedi2 c 98 2
  mknod -m 666 /dev/comedi3 c 98 3
  ```

2.4. Compile the Comedi User Libraries

Next, compile the comedi user libraries. From the shell:

- cd /usr/local/
  ```
  tar -xvzf comedilib-0.7.21.tar.gz (creates the directory comedilib-0.7.21)
  ```
- Apply the patch mentioned in the introduction to this document. Type: patch -p0 < comedilib-0.7.21_sgmlpatch. If it works, the system will output the message that comedilib.sgml, install.sgml, other.sgml, and tutorial.sgml were patched (in dir comedilib-0.7.21/doc/).
- cd comedilib-0.7.21
- Type:
  ```
  ./configure --disable-ext-bindings
  ```
  The appended option prevents swig and python errors from occurring. If successful, several config.status lines will appear at the end of the output.

- make
- make install
2.5. Install the Compiled Drivers and Core Comedi Modules

At the shell:

- cd /sbin
  ./modprobe comedii (using modprobe instead of insmod here and in the next step ensures the prevention of unresolved symbol errors during the comedii_config step)

- Note: if the system delivers an error that says “modprobe: can’t locate module comedii” try typing “depmod -a”. That command makes a makefile that establishes proper dependencies for kernel modules. Once the dependencies are correct, the modprobe command should work. To see if it did work, type lsmod; the (unused) comedii module should appear at the top of the list.

- ./modprobe cb_pcdias. Type lsmod and verify that the following appears:
  cb_pcdias (unused)
  comedii_fc [cb_pcdias]
  comedii [cb_pcdias comedii_fc]

- cd /usr/local/comedilib-0.7.21/

- Lastly, run the comedii_config command, which configures the driver module to use a particular device file (/dev/comedii*) and a particular device (in this case, cb_pcdias for the PCI-DAS1200 card). The command is:
  comedii_config /dev/comedii0 cb_pcdias

2.6. Final Detail

At this point, upon program execution the error “Error while loading shared libraries: libcomedii.so.0: cannot open shared object file: no such file or directory” may result. If that is the case, type:

"export LD_LIBRARY_PATH=3D$LD_LIBRARY_PATH:/usr/local/lib"

at the shell before running the program and the error should go away. Caution: this fix must be applied every time you reboot.