Instructions after succeeding in booting Linux on COPPER CPU

Aug. 28, 2015 S. Yamada

1, How to install COPPER driver on COPPER CPU

1-1, Get driver's source code

~~svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/driver/cprdist-0.1.0~~

~~svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/driver/cprdist-0.1.5~~

~~svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/driver/cprdist-0.1.6~~

~~or~~

Download the latest version from

https://belle2.cc.kek.jp/~twiki/bin/view/Detector/DAQ/COPPER

1-2, How to compile and install COPPER drivers

Log in COPPER CPU first. (You can compile on a boot server but in that case you need to be careful of specifying proper **gcc and kernel version in Makefile**.)

% make clean

% make

% cd cprfin_fngeneric/

% make

% cd ..

% /bin/su

You can obtain the following installation scripts from svn repository : daq/copper/driver/copper

(https://belle2.cc.kek.jp/browse/viewvc.cgi/svn/trunk/software/daq/copper/driver/copper/)

./initd_copper start

./initd_cprfin_fngeneric start

check if drivers are successfully installed.

% /sbin/lsmod

Module	Size	Used by
cprfin_fngeneric	9808	0
copper	30208	0

==========

To avoid an error message below during installation of modules, please check notices,

"insmod: error inserting 'cprdist-***/drv/copper.ko': -1 Invalid module format"

NOTICE : the version of compiler(/usr/bin/gcc) should be
same as the one used for kernel compilation or PXE server's gcc version.
You can check the version by % /usr/bin/gcc --dumpversion

NOTICE : If you try to compile drivers on a PXE server and COPPER_CPU's linux kernel is different from
the one used on PXE server, please modify KERNEL_VERSION in drv/Makefile and cprfin_fngeneric/Makefile.

The "invalid module format" occurs when the vermagic of copper.ko is different from that of the running kernel on cpr***. You can check the vermagic of copper.ko as follows;
[user @cpr***: daq/copper/driver/cprdist-*.*.*/drv]$ modinfo copper.ko
filename: *copper.ko*
license: *GPL*
srcversion: *C4ED63ABE5BABCCCFF7C688*
depends:
vermagic: *2.6.18 SMP mod_unload 686 REGPARM 4KSTACKS gcc-4.1*

1-3, How to install COPPER drivers modules automatically
1) correct path of module and script
e.g.)
insmod ./drv/copper.ko -> Need to modify
action $"Making nodes: " ./src/mkdevs.sh -> Need to modify

2) copy initd_copper and initd_cprfin_fngeneri files
[on COPPER CPU] # cp initd_copper /etc/init.d/copper
[on COPPER CPU] # cp initd_cprfin_fngeneric /etc/init.d/cprfin_fngeneric

If you boot many COPPER CPUs w/ one boot server, note that those files may be common to all COPPER boards,
unless you specify them in /tftpboot/copper/snapshot/files.

3) use chkconfig to register

[on COPPER CPU] # chkconfig --add copper
[on COPPER CPU] # chkconfig --add cprfin_fngeneric

4)
Maybe it will work.
It is better to place drivers under /lib/modules.

2, Configure CPLD before using an unused HSLB

2-1, download a CPLD configuration directory

% svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/HSLB HSLB

The CPLD configuration file is HSLB/**130621_HSLB_cpld_readback.jed** .

2-2, Configure CPLD

1) Attach a HSLB on a COPPER, set the COPPER in a KEK-VME crate, and turn on the power of the crate.

2) Download the CPLD configuration file to the CPLD on the HSLB

A) Prepare a USB-JTAG adapter cable

B) Connect between your PC and the HSLB by the cable

C) Use iMPACT software to download the CPLD configuration file to the CPLD

3, How to get and download a FTSW firmware

3-1, Get the latest FTSW firmware and utitlities

svn co svn+ssh://xxx@bdaq.local.kek.jp/bdaq/svn/firmware/ft2u/trunk ft2u

Copy the latest ft2u/bit-files/ft2u****.bit file to VMIC PC.

Compile ft2u/ftprogs/*.c and copy binaries to VMIC PC.

3-2, login to VMIC PC in the same crate where FTSW is installed.

3-3, download fitmware by bootft

For FTSW#48(There should be a label on FTSW.),

VMICPC $ ./bootft -48 ~nakao/daq/ftsw/ft2u***.bit

4, How to get and download a TTRX firmware

4-0, download and install TTRX driver software

Download the latest ttprogs tar ball at

https://belle2.cc.kek.jp/~twiki/bin/view/Detector/DAQ/COPPER

Please follow the README file in driver/ directory.

You can also see Nakao-san's e-mail, "[b2link_ml:0169] ttrxprogs".

4-1, download a bit file from the svn repository on bdaq

~~svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/driver/ttrx/ttrxprogs-20060413-for-SL5~~

(See Nakao-san's e-mail :

[daq2ml:0162] FTSW firmware / tools update (ft2u) on bdaq SVN)

[on bdaq]

svn co file:///bdaq/svn/firmware/ft2u/trunk ft2u

[on elsewhere in KEK]

svn co svn+ssh://xxx@bdaq.local.kek.jp/bdaq/svn/firmware/ft2u/trunk ft2u

(please replace xxx with your bdaq account name)

[from outside of KEK]

add two lines in ~/.subversion/config

[tunnels]

ssh_bpost = ssh -A xxx@bpost.kek.jp ssh

(again, replace xxx with your bpost account name)

Then

svn co svn+ssh_bpost://xxx@bdaq/bdaq/svn/firmware/ft2u/trunk ft2u
(again, replace xxx with your bdaq account name.
bpost knows bdaq is bdaq.local.kek.jp.)
If you are using Windows, similar instruction can be found by googling with "subversion windows ssh tunnels".

There are bit files for TTRX in the svn repository:
ft2u/bit-files/tt4r***.bit (For ver.4 TTRX used for COPPER-II)
ft2u/bit-files/tt5r***.bit (For ver.5 TTRX used for COPPER-III)

4-2, Download the TTRX firmware

bootrx should be used.
You can obtain it from the latest ttprogs tar ball at
https://belle2.cc.kek.jp/~twiki/bin/view/Detector/DAQ/COPPER

```
$ ./bootrx tt*r**.bit
```

5, How to download FPGA firmware and check data from HSLB

5-1, Download a utility folder

- svn co https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/test_program

5-2, Download a HSLB firmware

svn co svn+ssh://xxx@bdaq.local.kek.jp/bdaq/svn/firmware/hslb/trunk hslb

5-3, Download firmware to FPGA on HSLB

% gunzip ./hslb/bitfiles/***_xtal.bit.gz (the file from the bdaq repository)
Then use an executable file in the utility folder to download the bit file.

Prepare utitilies to download firmware to HSLB
% cd ./hslb/hsprogs
% make all
% ./booths -abcd ./***_xtal***.bit
"-abcd" specifies slots for the HSLB cards

If you fail to download firmware, please try following

- Check if CPLD on HSLB is already programmed.
- Check if copper and cprfin_fngeneric have already been installed
  % /sbin/lsmod
- Install drivers again
  # driver/cprdist-0.1.0/initd_copper stop
  # driver/cprdist-0.1.0/initd_copper start
  # driver/cprdist-0.1.0/initd_cprfin_fngeneric stop （do not use “restart”）
  # driver/cprdist-0.1.0/initd_ cprfin_fngeneric start
- Download firmware to CPLD on HSLB again.（basically not necessary）.

5-4, Read data in COPPER FIFO

% ./copper/record-nakao -abcd
"-abcd" specify slots for HSLB cards

5-5, Use HSLB as a dummy data producer for test

1, Get a test firmware which make a HSLB produces dummy data with size of about 256byte and 1Hz rate
COPPER II : https://belle2.cc.kek.jp/~twiki/pub/Detector/DAQ/PocketDAQ/HSLB_1Hz256B_COPPER2.bit
COPPER III : https://belle2.cc.kek.jp/~twiki/pub/Detector/DAQ/PocketDAQ/HSLB_1Hz256B_COPPER3.bit

2, Download the firmware to FPGA
% ./booths -abcd ./HSLB_1Hz256B_COPPER?.bit
"-abcd" specify slots for HSLB cards

3, Read data
% ...daq/copper/test_program/copper/record-nakao -abcd

APPENDIX A. setup for handling COPPER and TTRX drivers

Sep. 2, 2014 S. Yamada

The following is a procedure to set up COPPER and TTRX drivers in ecl02

1, copy *.ko and script files from ecl01

2, make a direcotry for module files

```
[b2daq@ecl02:yamadas]$ sudo mkdir /tftpboot/copper/root/lib/modules/2.6.18/misc
```

3, copy module files in the misc directory

```
[b2daq@ecl02:yamadas]$ ls *.ko
copper.0.1.5.ko                 copper.131010.ko              cprfin_fngeneric.131008.ko
vme_universe.ko
copper.0.1.6.chksumcheck.ko  copper.ko                     cprfin_fngeneric.ko
copper.0.1.6.ko                 cprfin_fngeneric.0.1.5.ko  ttrx_fifo.ko
copper.0.1.6.timeout1s.ko    cprfin_fngeneric.0.1.6.ko  ttrx.ko
[b2daq@ecl02:yamadas]$ sudo cp *.ko /tftpboot/copper/root/lib/modules/2.6.18/misc
```

4, copy scripts

```
[b2daq@ecl02:yamadas]$ sudo cp copper /tftpboot/copper/root/etc/rc.d/init.d/
[b2daq@ecl02:yamadas]$ sudo cp ttrx /tftpboot/copper/root/etc/rc.d/init.d/
```

5, Add copper and ttrx in the startup list in COPPER

```
[root@cpr5014:b2daq]#  sudo /sbin/chkconfig --add copper
[root@cpr5014:b2daq]#  sudo /sbin/chkconfig --add ttrx
```

6, reboot COPPERs or install the drivers by hand

```
[root@cpr5014:b2daq]# /sbin/service copper start
Loading COPPER driver:                                     [  OK  ]
Loading FINESSE driver:                                    [  OK  ]
[root@cpr5014:b2daq]# /sbin/service ttrx start
Loading TT-RX device driver:                               [  OK  ]
Loading TT-RX FIFO driver:
```

Update history :

Aug. 28, 2015 : Rename boothslb to booths
Jul. 23, 2015 : Change the location to obtain bit files and utilities.
Nov. 5, 2014 : Change the location of initd_copper and initd_cprfin_fngeneric
Nov.10, 2014: The locations of tt*r***.bit, ft2u***.bit, bootrx and bootft are updated.
Feb. 5, 2015 : Add dummy-data firmware for HSLB on COPPER III
Apr. 11, 2015 : TTRX related softwares should be downloaded from https://belle2.cc.kek.jp/~twiki/bin/view/Detector/DAQ/COPPER, not from svn repository.