Pocket DAQ manual (rev. 17080)

July 14, 2015

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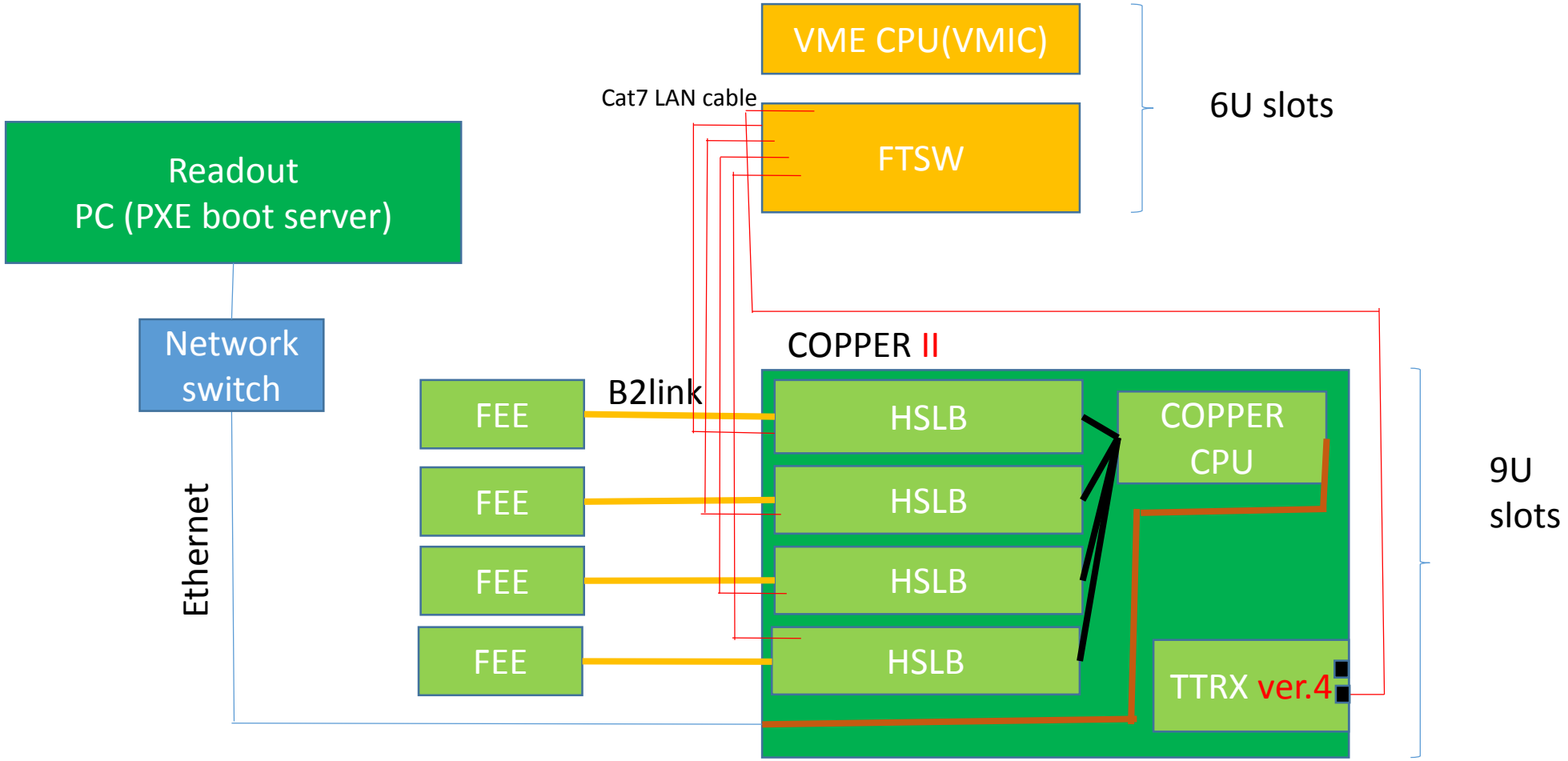
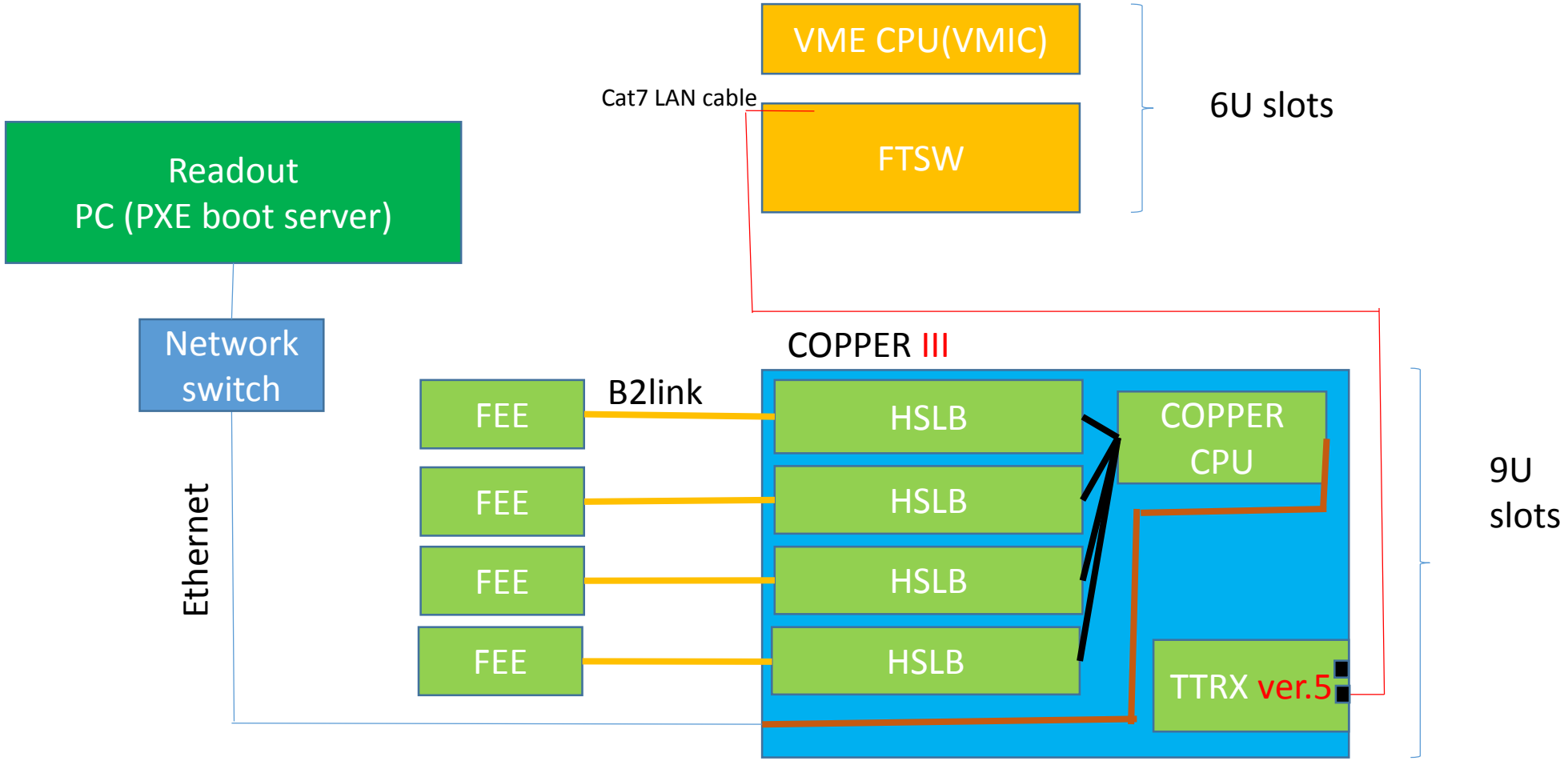
Connection between components (COPPER-II)

About port assignment of FTSW, see
svn+ssh://xxx@bdaq.local.kek.jp/bdaq/svn/firmware/ft2u/trunk/doc/ft2u.pdf



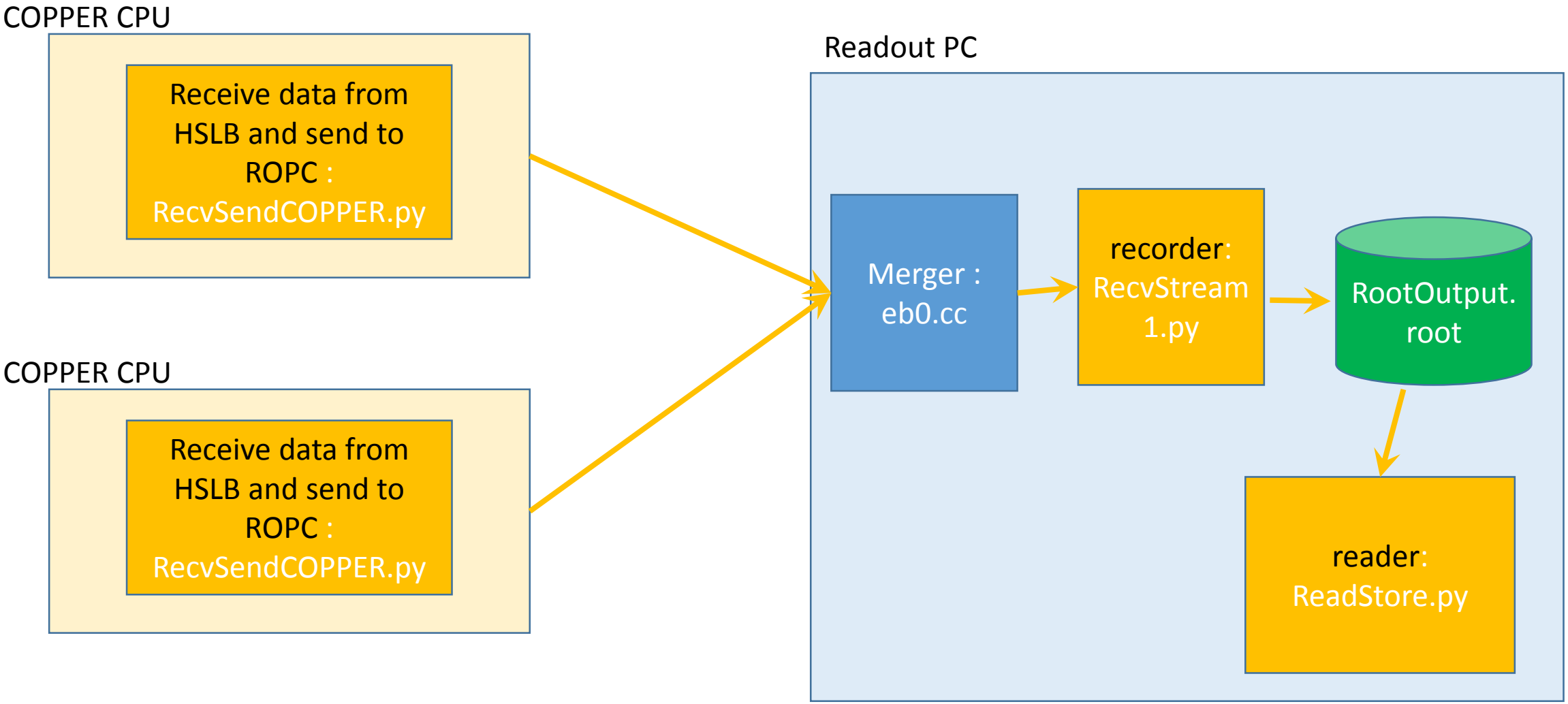
Connection between components (COPPER-III)

About port assignment of FTSW, see
svn+ssh://xxx@bdaq.local.kek.jp/bdaq/svn/firmware/ft2u/trunk/doc/ft2u.pdf



Old Software components

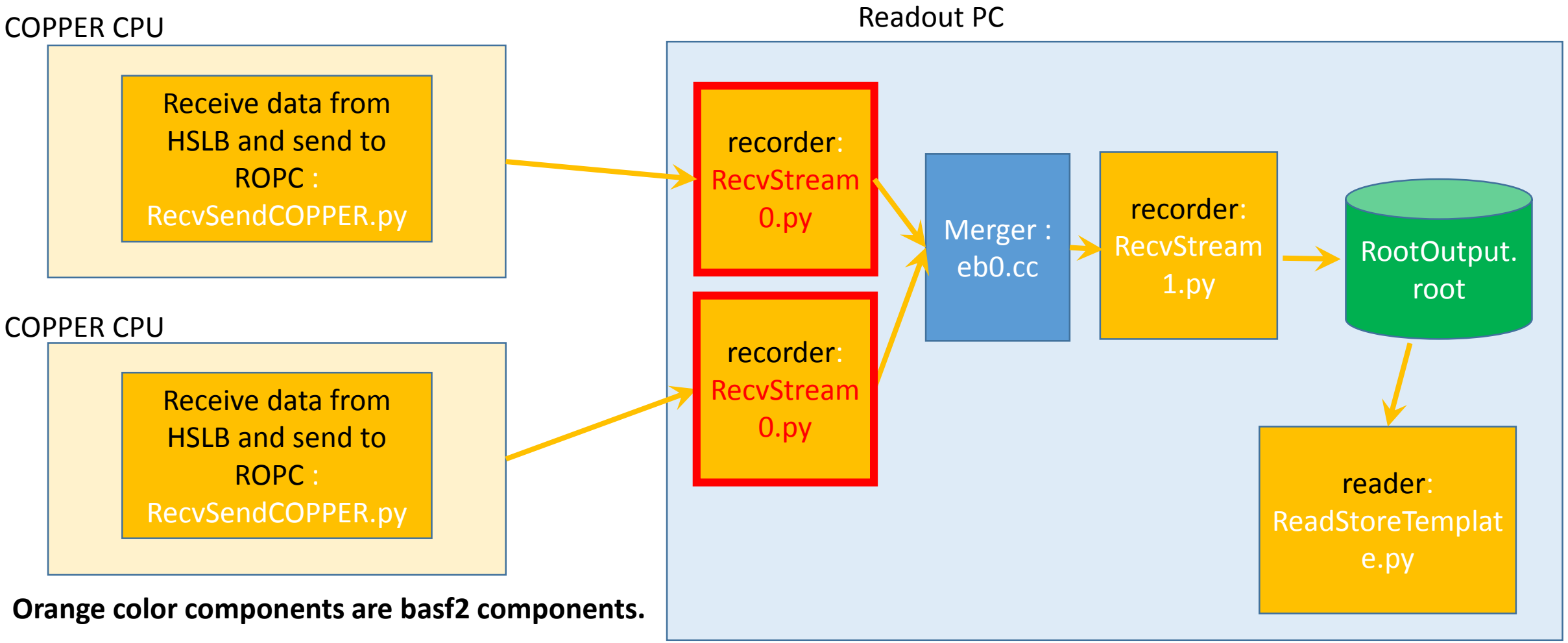
These are stored under https://belle2.cc.kek.jp/svn/trunk/software/daq



Orange color components are basf2 components.

Old Software components (from rev. 13542 to rev. 15005)

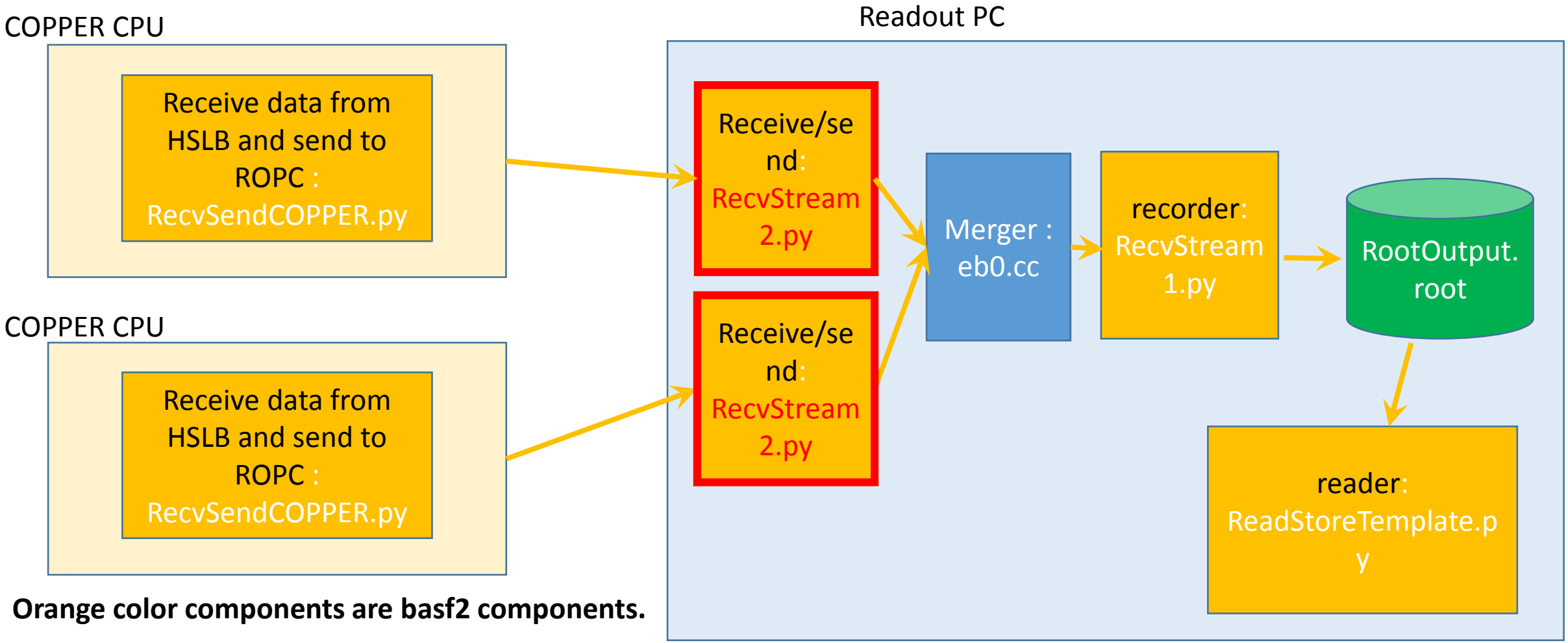
These are stored under https://belle2.cc.kek.jp/svn/trunk/software/daq



Orange color components are basf2 components.

New Software components (from rev. 15006)

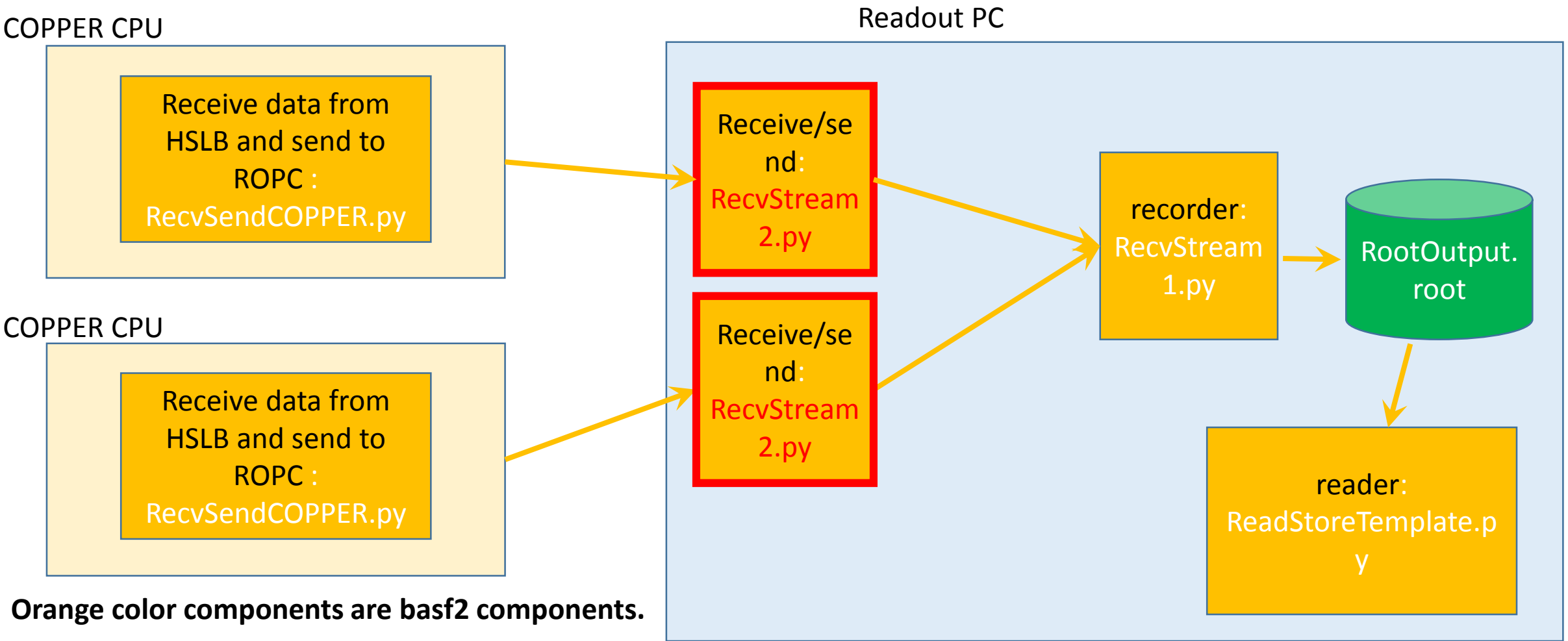
These are stored under https://belle2.cc.kek.jp/svn/trunk/software/daq



Orange color components are basf2 components.

Alternative scheme not w/o eb0(1)

- If you run pocket-DAQ on readout PCs in E-hut (e.g. klm case), basically eb0 cannot be used without Konno-san's nshm-based run-control system.
- In that case, you need to bypass eb0 to use Pocket DAQ as shown in the following figure.
  - You need to change some parameters in RecvStream1.py for this bypass. (next page)



Orange color components are basf2 components.

Alternative scheme w/o eb0(2)

How to change daq/rawdata/examples/RecvStream1.py

With eb0 : (default)

```
# Receiver
…
receiver.param('NumConn', 1)
receiver.param('HostNameFrom', ['localhost'])
receiver.param('PortFrom', [int(argvs[2]) ])
```

Usually, 5101 is used as argvs[2].
It is a port # of eb0.

Without eb0 w/ one COPPER (192.168.10.102)

```
# Receiver
…
receiver.param('NumConn', 1)
receiver.param('HostNameFrom', ['localhost‘ ])
receiver.param('PortFrom', [34002] )
```

3400* is a port # of RecvStream2.py
You need to connect it directly from RecvStream1.py

Without eb0 w/ 3 COPPERs (192.168.10.102, 192.168.10.105, 192.168.10.110)

```
# Receiver
…
receiver.param('NumConn', 3)
receiver.param('HostNameFrom', ['localhost‘, 'localhost‘, 'localhost‘ ])
receiver.param('PortFrom', [34002, 34005, 34010 ] )
```

Pocket DAQ w/o slow controller and GUI

0. Before using pocket DAQ

- Setup a PXE boot server for COPPER CPU and install driver for COPPER etc
  - See https://belle2.cc.kek.jp/~twiki/bin/view/Detector/DAQ/PocketDAQ
- Install basf2 on both COPPER CPU and Readout PC
  - See https://belle2.cc.kek.jp/~twiki/bin/view/Software/SoftwareInstallation .
    "addall" does no install the daq package. You need to do "addpkg daq".
  - Check daq/Sconscripts and comment out "if env['CONTINUE'] = False" line.
  - Compile with scons.
- Compile eventbuilder
  - cd ${BELLE2_LOCAL_DIR}/daq/eventbuilder/evb0/ ; gmake eb0

Notice from Konno-san about compiling daq package

IMPORTANT!

- Please run the following command to update nsm2 programs in your external directory

$ source ${BELLE2_LOCAL_DIR}/ daq/slc/extra/nsm2/export.sh

Otherwise you may get error messages about compilation of slow control programs ;

daq/slc/nsm/src/NSMData.cc: In member function 'void Belle2::NSMData::parse(const char*, bool)':*

daq/slc/nsm/src/NSMData.cc:299:68: error: too many arguments to function 'NSMparse nsmlib_parsefile(const char*, int, const char*, char*)'*

In file included from include/daq/slc/nsm/NSMData.h:20:0,

from daq/slc/nsm/src/NSMData.cc:1:

Install GLEW for running basf2 program

After external ver.0.5.0?, basf2 requires GLEW(The OpenGL Extension Wrangler Library).
The following procedure worked fine.
1, install the yum epel repository.
ropc01$ wget http://ftp-srv2.kddilabs.jp/Linux/distributions/fedora/epel/5/i386/epel-release-5-4.noarch.rpm
ropc01$ ssh cpr** -lroot
cpr**# rpm -ivh epel-release-5-4.noarch.rpm
cpr**# ls -lrt /etc/yum.repos.d/
cpr**# exit
2, install glew on COPPER
ropc01$ sudo yum install glew --installroot=/tftpboot/copper/root

0.5, Set active HSLB slots in TTRX register

From Nakao-san's mail : [b2link_ml:0159] Re: ft2u-0.65, b2tt-0.31, hslb-0.36

To partially mask HSLB, one can modify register 130 of tt4r:
- setting each of bit 0..3 to 0 corresponds to masking HSLB A..D
- default value of register 130 is 0010000f (all HSLB are enabled)
- bit 20..23 are read only and should be 1 as above
- for example, one can mask HSLB-A by

copper_CPU $ regrx 130 0000000e

Example :
When you use;
Slot A : **copper_CPU $ regrx 130 00000001**
Slot B : **copper_CPU $ regrx 130 00000002**
Slot A and B : **copper_CPU $ regrx 130 00000003**

1, Set parameters in run_start.sh (1)

[ROPC] % cd ${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts

[ROPC] % emacs run_start.sh

Set arguments of start_copper.sh

Usage : start_copper.sh **<HOSTNAME> <COPPER node> <FINNESSE bit flag: A=1, B=2, C=4, D=8> <Use network shared memory : Yes=1, No=0> <node name(used for Network Shared Memory)>**

e.g.)

/usr/bin/xterm -e ${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/start_copper.sh cpr006 1 1 0 0&

/usr/bin/xterm -e ${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/start_copper.sh cpr007 2 3 0 0&

<COPPER node ID> will be attached to RawCOPPER header.

1, Set parameters in run_start.sh (2)

NOTICE : Environment variables for basf2

In ${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/copper.sh, a line, “source ~/.bash_profile”, is for setting up basf2 environment. You need to add basf2 setting commands in your .bash_profile (or other script file).

Please see "Setup of Software Tools" at https://belle2.cc.kek.jp/~twiki/bin/view/Software/SoftwareInstallation **for details.**

[${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/copper.sh]
#
setup basf2 environment (See "Setup of Software Tools" at
https://belle2.cc.kek.jp/~twiki/bin/view/Computing/SoftwareInstallation
#
source ~/.bash_profile

1, Set parameters in run_start.sh (3)

Set arguments of RecvStream2.sh

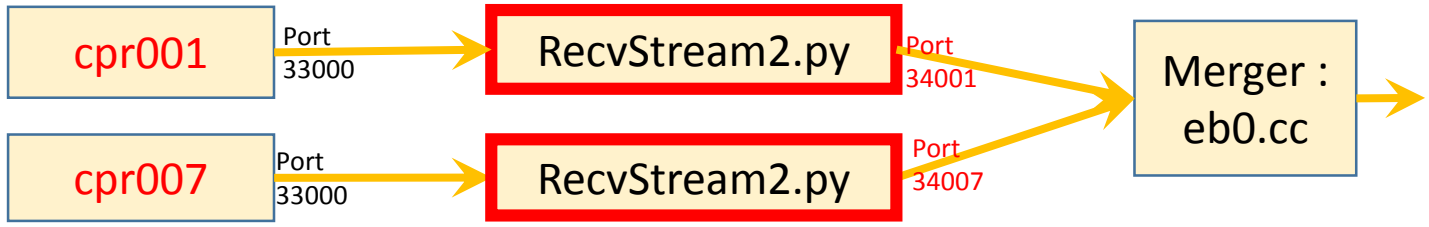
Usage : RecvStream2.py <COPPER hostname> <Use NSM(Network Shared Memory)? yes=1/no=0> <port # to accept connection from eb0 > <NSM nodename>

Readout PC

Example :

/usr/bin/xterm -e "${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/RecvStream2.sh cpr001 0 34001 hogehoge1000;" &

/usr/bin/xterm -e "${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/RecvStream2.sh cpr007 0 34007 hogehoge1000;" &



1, Set parameters in run_start.sh (4)

Specify whether communication with GUI via shared memory will be used or not :

1, Edit ${BELLE2_LOCAL_DIR}/daq/rawdata/examples/RecvStream1.py

If you use GUI, set ‘UseShmFlag’ = 1
receiver.param('UseShmFlag', 1)
If you don’t use GUI set ‘UseShmFlag’ = 0
receiver.param('UseShmFlag', 0)

2, Edit ${BELLE2_LOCAL_DIR}/daq/rawdata/examples/RecvStream2.py

If you use GUI, set ‘UseShmFlag’ = 1
receiver.param('UseShmFlag', 1)
If you don’t use GUI set ‘UseShmFlag’ = 0
receiver.param('UseShmFlag', 0)

1-1, Edit RecvStream1.py

- $ emacs release/daq/rawdata/examples/RecvStream1.py
- There are basf2 modules to be used in the scripts
    - main.add_module(receiver) : receive data from eb0
    - main.add_module(converter) : Convert RawDataBlock to RawDetector object (optional)
    - main.add_module(dump) : Record received data on disk
    - main.add_module(sender) : Send data downstream

- For PocketDAQ purpose, receiver, converter and dump modules are basically used. So please modify the script like the following.

```
main.add_module(receiver)
main.add_module(converter)
main.add_module(dump)
# main.add_module(sender)
```

2, Setting of merger (eb0) (1)

1, compile

$ cd ${BELLE2_LOCAL_DIR}/daq/eventbuilder/evb0

$ make

2, edit eb0.sh

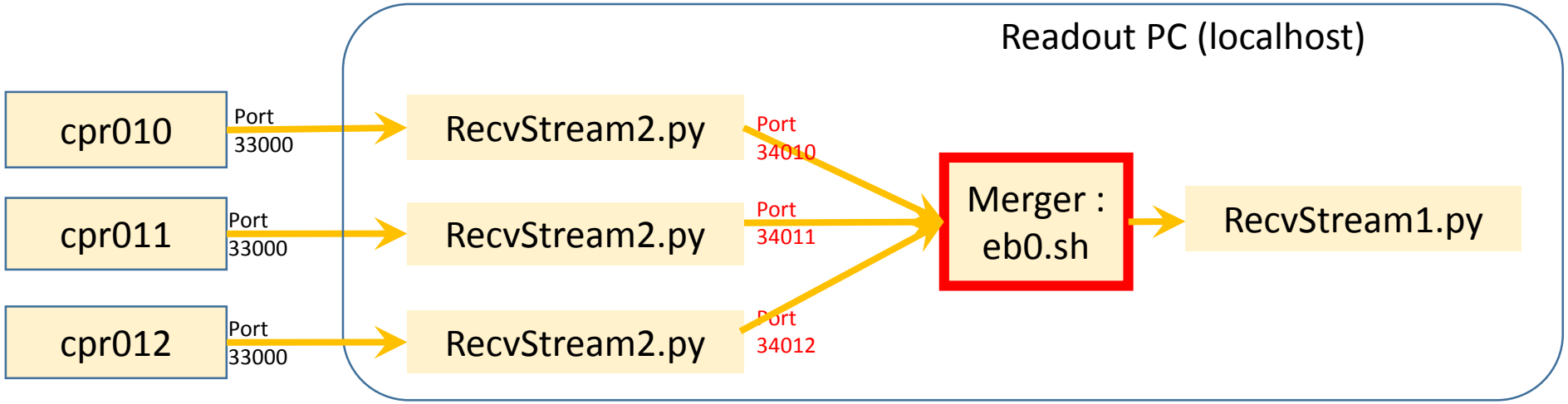
cd /home/usr/b2daq/eb # change to cd “your local BelleII directroy”/daq/eventbuilder/evb0/eb-xinetd

(e.g. cd /home/usr/yamada/basf2/release/daq/eventbuilder/evb0/eb-xinetd)

If you want to read data from COPPERs with hostnames of cpr010, cpr011 and cpr012 and corresponding port # of RecvStream2.py are 34010, 34011 and 34012, respectively, use the following ;

~~./eb0 cpr010:33000 cpr011:33000 cpr012:33000~~

./eb0 localhost:34010 localhost:34011 localhost:34012



2, Setting of merger (eb0) (2)

3, edit eb0's part in ${BELLE2_LOCAL_DIR}/daq/eventbuilder/evb0/eb-xinted

Modify user and server.

```
service eb0
{           bind = 127.0.0.1
            socket_type = stream
            type = UNLISTED
            port = 5101
            wait = no
            user = g0cdc  # Change to your user name (e.g. yamagata)
            server = /home/usr/b2daq/eb/eb0.sh
            #  change to "your Belle2 local directory"/daq/eventbuilder/evb0/eb0.sh
            #                                  (e.g. /home/usr/yamagata/basf2/release/daq/eventbuilder/evb0/eb0.sh)
}
```

You need to change the other services in eb-xinetd (eb1tx, eb1rx, eb2tx, eb2rx ….) in the same way.

2, Setting of merger (eb0) (3)

4, Set link to eb-xinetd

```
# cd /etc/xinetd.d/
# ln –s ${BELLE2_LOCAL_DIR}/daq/eventbuilder/evb0/eb-xinetd eb-xinetd
# /sbin/service xinetd restart
```

The eb0 daemon will be automatically invoked when a basf2 program on a readout PC connects to a port specified in eb-xinted.

3, How to start DAQ

[ROPC] % cd ${BELLE2_LOCAL_DIR}/release/daq/copper/daq_scripts

[ROPC] % ./run_start.sh

It is convenient to login COPPER w/o typing password.
For example;
ropc $ cd ~/.ssh
ropc S ssh-keygen rsa
ropc $ cat ./id_dsa.pub >> authorized_keys
ropc $ chmod 600 authorized_keys

4, How to stop DAQ

- No stop button for now (If you use GUI, you have.)
- You need to specify max # of events or time to stop the run on a basf2 python file.

ROPC % cd ${BELLE2_LOCAL_DIR}/daq/rawdata/examples
Edit RecvStream1.py

You can set following paramters to stop a run.
receiver.param('MaxTime', 300.)
receiver.param('MaxEventNum', 30.)

-1 means inifinite.

5. Read an output file and extract FEE buffer

- Output file name
  - ${BELLE2_LOCAL_DIR}/daq/copper/daq_scripts/root_output.root
  - You can change the filename by editing ${BELLE2_LOCAL_DIR}/daq/rawdata/examples/RecvStream1.py
- Read the root file
  - Please see dataformat and unpacker manuals.
  - Data format
    - https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/doc/SetupPocketDAQ_4p1_RawCOPPERDataHandling.pdf
  - Unpacker
    - https://belle2.cc.kek.jp/svn/trunk/software/daq/copper/doc/SetupPocketDAQ_4p5_RawDataUnpackerPacker.pdf

Revision history(1)

- 2013/10/16
  - Change explanation about option of run_start.sh script
- 2014/7/15 (rev. 11619)
  - To specify FINESSE bit field, you need to use decimal value (not hexadecimal).
  - Add an argument of RecvSenDCOPPER.py
  - Update eb0 related issues.
    - About eb0.sh
    - About eb0-xinted
- 2014/7/16(rev. 11654)
  - eb0.sh and eb-xinetd need more modification
- 2014/7/19
  - Add a comment about “addpkg daq”
- 2014/8/8
  - Modify usage of start_run.sh. (nodename is only used for NSM)
- 2014/10/29
  - Change a DAQ scheme so that RecvStream0.py is used on a readout PC
- 2014/11/10
  - Add figures to indicate connection between COPPER and FTSW
  - Add procedure to ssh-login w/o typing password
- 2014/11/14
  - Add “Notice from Konno-san about compiling daq” page
- 2015/1/22
  - Use RecvStream2.py(=DesSerPrePC.cc) instead of RecvStream0.py(=DeSerializerPrePC.cc+Serializer.cc)

Revision history(2)

- 2015 4/13
  - Add “0.5, Set active HSLB slots in TTRX register”
- 2015 5/08
  - Add an “Edit RecvStream1.py” page
- 2015/7/14
  - Add an instruction to use PoecketDAQ w/o eb0.

Appendix

A-1, yum setting for COPPER

Sometime yum fails when you try to install software to COPPER directory;

readoutPC # yum install **** --installroot=/tftpboot/copper/root

In that case, you need to change yum setting for COPPER host:

1, Copy yum repository files.
readoutPC # cp */etc/yum.repo.d/** */tftpboot/copper/root/etc/yum.repo.d/**

2, Set a proxy server in /tftpboot/copper/root/etc/yum.conf **same as** readoutPC:/etc/yum.conf

A-2, Socket parameters on COPPER, readout PC and etc..

1, Enable “Jumbo Frame” in network switch’s setting, if necessary (e.g. HP1810-24G)
If the switch does not support Jumbo frame, setting MTU a large value may cause a problem.

2, Change socket parameters

/sbin/ifconfig eth? mtu 9000

/sbin/sysctl -w net.ipv4.tcp_rmem="8388608 8388608 8388608"
/sbin/sysctl -w net.ipv4.tcp_wmem="8388608 8388608 8388608"
/sbin/sysctl -w net.ipv4.tcp_mem="9000000 9000000 9000000"
/sbin/sysctl -w net.core.rmem_default=8388608
/sbin/sysctl -w net.core.wmem_default=8388608
/sbin/sysctl -w net.core.rmem_max=8388608
/sbin/sysctl -w net.core.wmem_max=8388608

3, edit /etc/rc.local(or /tftpboot/copper/root/etc/rc.local) if you want the parameters automatically set at boot time

A-3, Use ntpd to adjust time on COPPER

1, Edit /tftpboot/copper/root/etc/rc.d/init.d/ntpd

```
# Source networking configuration.
. /etc/sysconfig/network

ntpdate 192.168.10.1

if [ -f /etc/sysconfig/ntpd ];then
        . /etc/sysconfig/ntpd
fi
```

2, check ntpd is started at boot time

cpr**** $ chkconfig –list | grep ntp

A-4, syslogd

Install syslogd :

readoutPC # yum install syslogd --installroot=/tftpboot/copper/root

Add entry to /tftpboot/copper/root/etc/syslogd.conf if needed:

Log anything (except mail) of level info or higher.

Don't log private authentication messages!

*.info;mail.none;news.none;authpriv.none;cron.none /var/log/messages

B-1, Test bench at Tsukuba B3