PCIe40 upgrade for SVD

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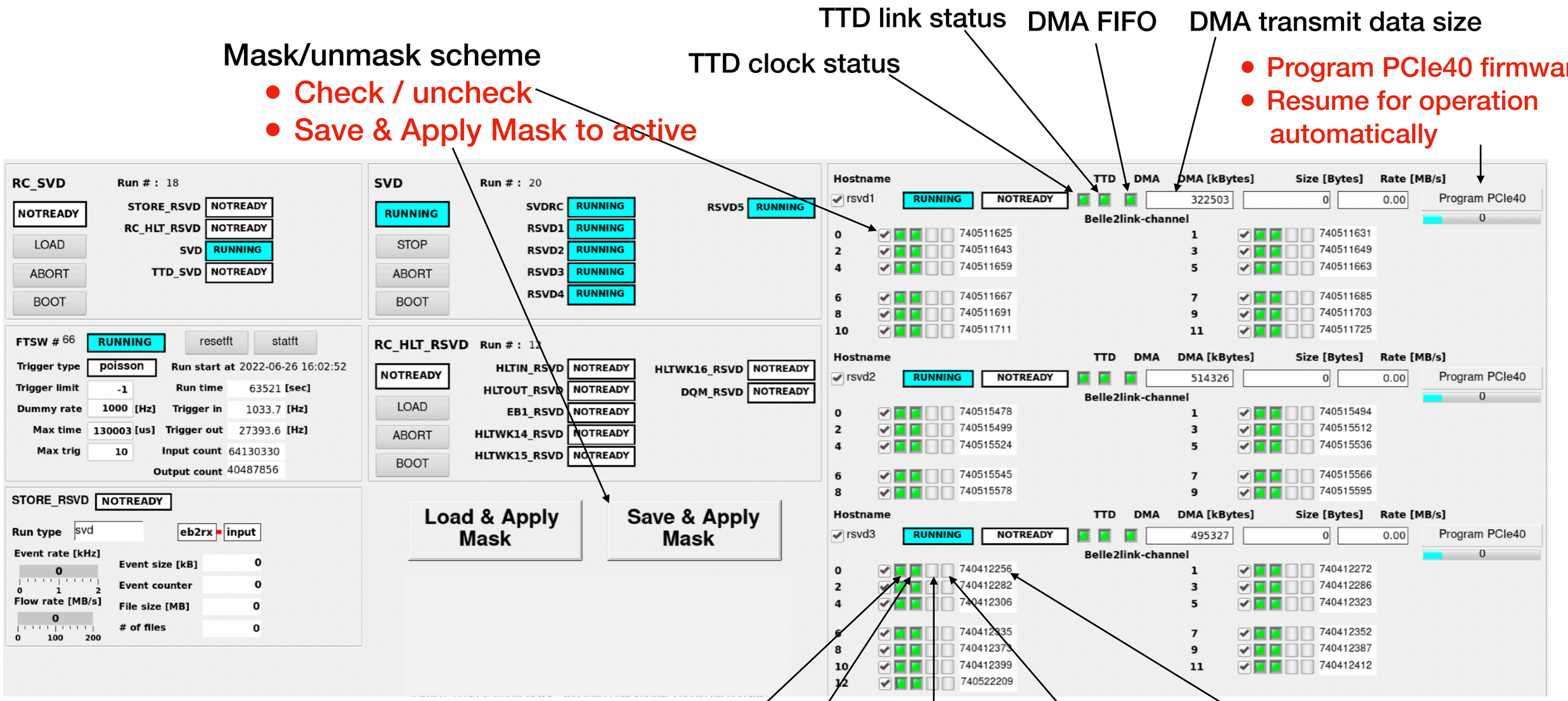
Commissioning of PCIe40 based SVD readout

- Slow control, TTD, dataflow for PCIe40 SVD was tested
- Local run could running with 30 kHz poisson trigger for several hours
  - SVD also joined global run with 30 kHz poisson trigger
  - Global run with COPPER system, local run with PCIe40 system to take data in parallel. the data was recorded for both global/local run
  - Masking and program PCIe40 firmware based on GUI has been tested
  - Issues still remained
    - Masking (SVDRC control by “SVD”) changing to CONFIGURING
      - Takes time and need a ABORT to fix the state
    - Update GUI for setup the run mode

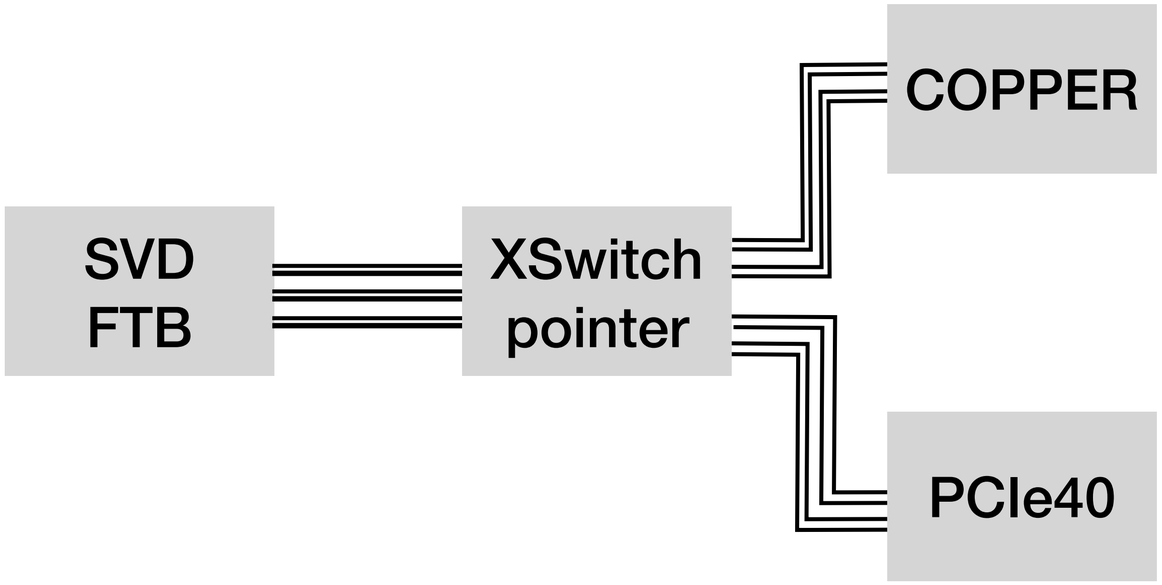
Items	status	comment
daq_slc	✅	
restart script	✅	
GUI	✅	
HLT/Storage	✅	
RC config db	✅	
ttd db	✅	
Unpacker	✅	
Data flow	✅	
Data quality	✅	Cosmic run

Operation panel for SVD



Preparation for PCIe40 based SVD readout

- Manual to switch readout system for SVD

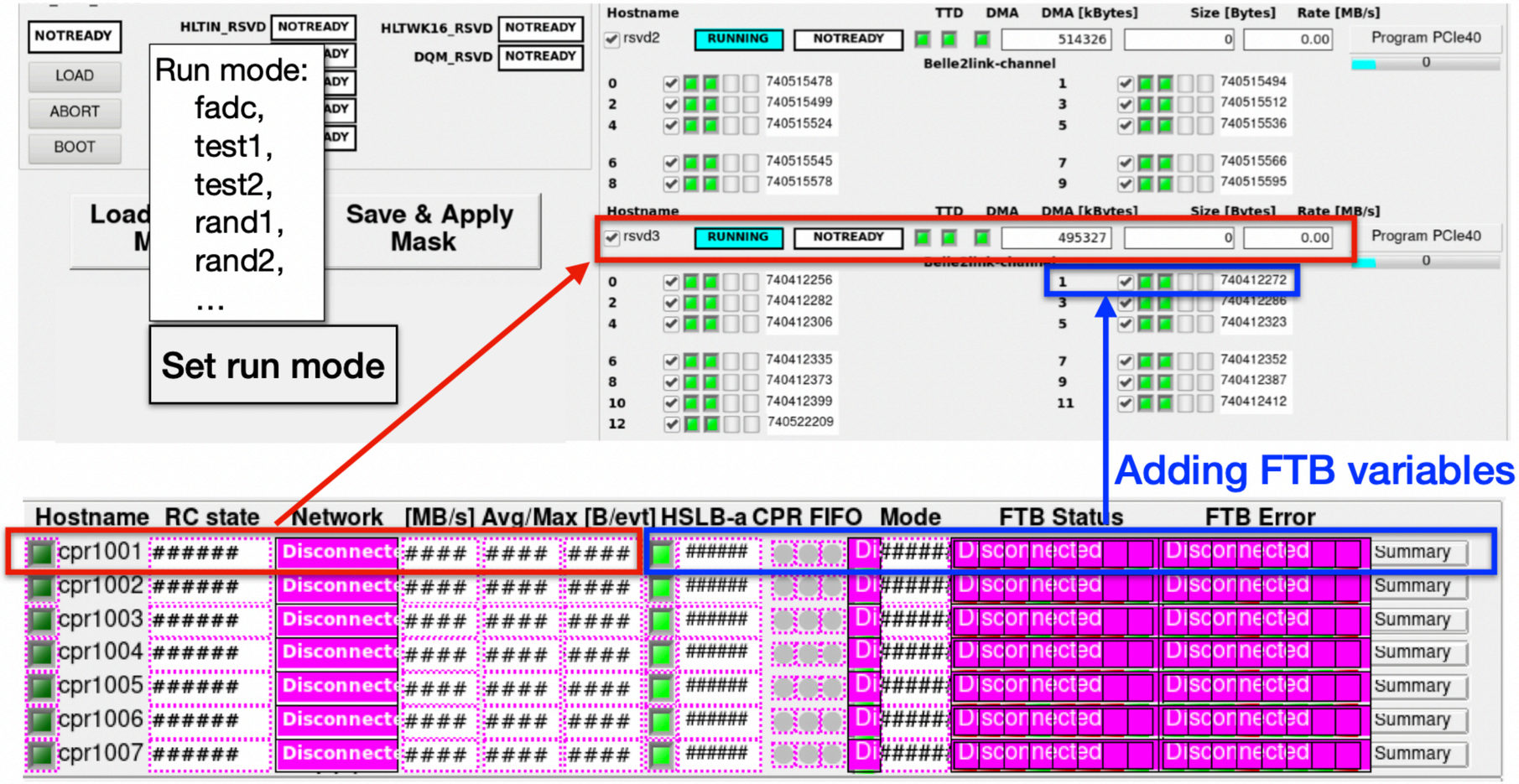


- SVD FTB used for PCIe40 readout test
  - FTB connected to a XSwitch pointer, the spitter of fibers connect to COPPER and PCIe40 system
  - The use of the system could be switched by the software
- The database for TTD system (maskdb, namedb, ttdb) were created for both system
  - Need to change the database entry to switching the system
  - Use one of the slow control system to avoid conflict (runcontrold of “SVD”)

Global run and local SVD run in parallel

- Wait for a break of global run
- Download the firmware of PCIe40
  - A special firmware for PCIe40 for the b2l establishment
- Start slc on rsvd1, but kill “runcontrold svd -d” to avoid the conflict with global run (COPPER system)
- Exclude “SVD” and “TTD_SVD” from local “RC_SVD”
- Control the local HLT and storage to be RUNNING
- Use “rcrequest” to manually start “RSVD1” on rsvd1 ROPC
- Wait for global run start, then the data will flowing both on global and local run system

Update of local run GUI



- A dedicated meeting with SVD expert was hold
  - K. Hara -san will adding the FTB variables
  - Katsuro-san will update the script to change the run mode, then implement it to the GUI b2svd@rsvd1: ~/svd_daq_pcie40/ftb_mode_nsm.py

```
$ nsmvlistget -c pcie40link PCIE40LINK00

svd[0].busy                : int get set
svd[0].busy[0]             : int get
svd[0].busy[1]             : int get
svd[0].busy[2]             : int get
svd[0].busy[3]             : int get
svd[0].busy[4]             : int get
svd[0].busy[5]             : int get
svd[0].busy[6]             : int get
svd[0].busy[7]             : int get
svd[0].cfr                 : int get set
svd[0].error               : int get set
svd[0].error[0]            : int get
svd[0].error[1]            : int get
svd[0].error[2]            : int get
svd[0].error[3]            : int get
svd[0].error[4]            : int get
svd[0].error[5]            : int get
svd[0].error[6]            : int get
svd[0].error[7]            : int get
svd[0].fadc.id             : int get set
svd[0].mask.datconerr      : int get set
svd[0].mask.fadcerr        : int get set
svd[0].mbmr                : int get set
svd[0].mt32.nword          : int get set
svd[0].runmode             : int get set
svd[0].runmode_s           : text get set
svd[0].status              : int get set
svd[0].status[0]           : int get
svd[0].status[1]           : int get
svd[0].status[2]           : int get
svd[0].status[3]           : int get
svd[0].status[4]           : int get
svd[0].status[5]           : int get
svd[0].status[6]           : int get
svd[0].status[7]           : int get
svd[0].testreg             : int get set
svd[0].trgcnt              : int get
version                    : text get
```

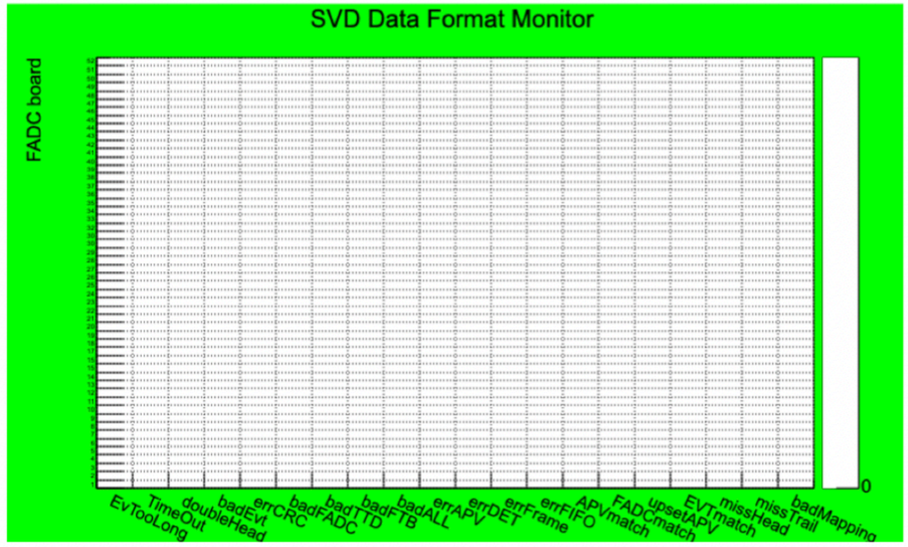
Data quality check for PCIe40 based SVD readout

- Cosmic run with PCIe40 based SVD readout
  - Date: Jun 29 (solenoid OFF)
  - Exp No.: 27, Run No.: 74
  - Sub-systems: SVD, CDC, ECL, TRG
  - Duration: 5 hours 47 mins. (~3.8 M events)

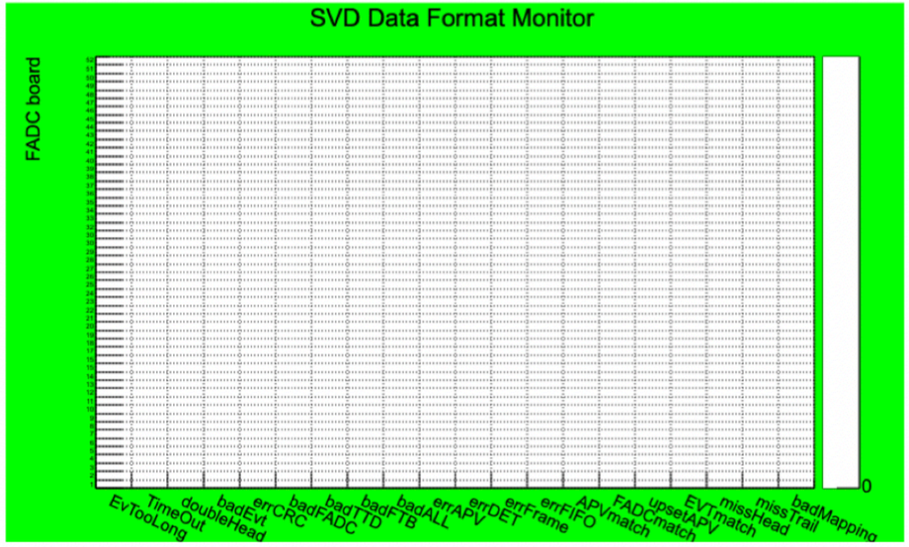
- Cosmic run with COPPER based SVD readout (reference)
  - Date: Jun 23 (end of 2022b, solenoid OFF)
  - Exp No.: 26, Run No.: 2091
  - Sub-systems: all included
  - Duration: 7 hours 47 mins. (~15 M events)

Data quality check for PCIe40 based SVD readout

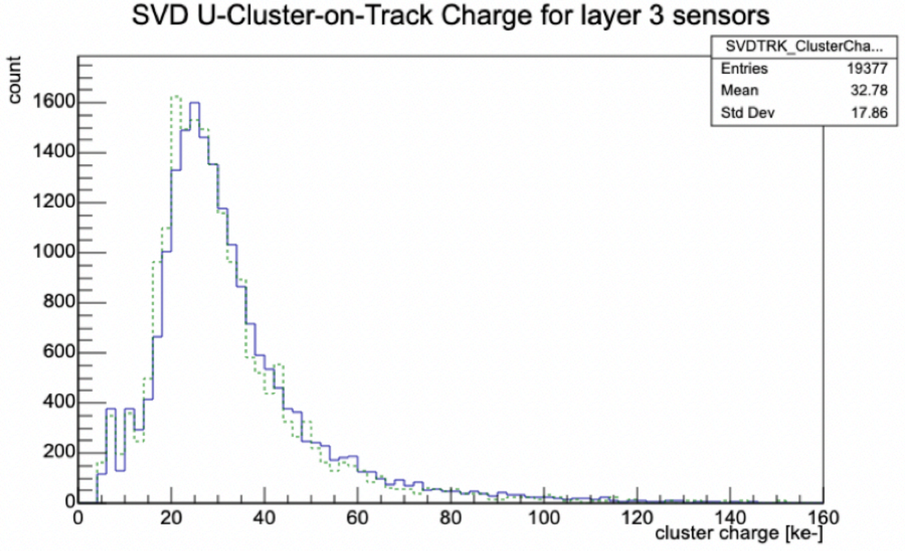
Unpacker error: PCIe40 readout



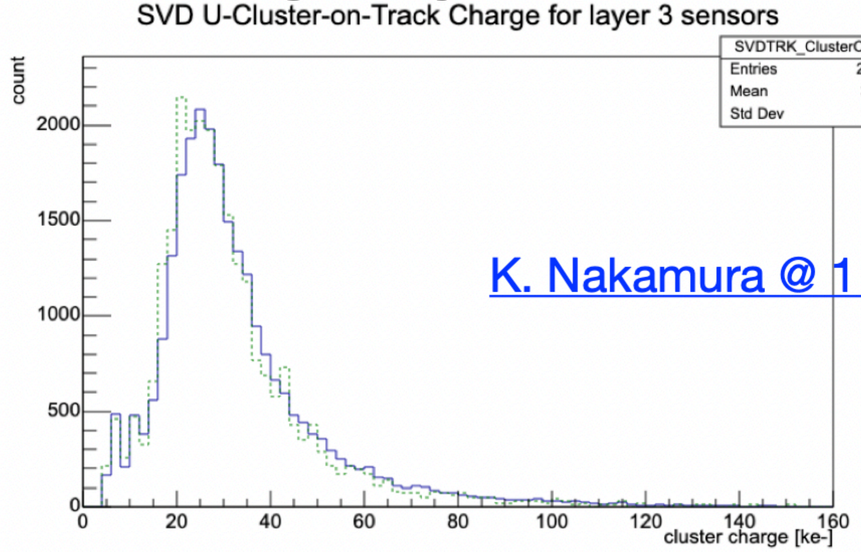
Unpacker error: COPPER readout



Cluster charge (layer 3): PCIe40 readout



Cluster charge (layer 3): COPPER readout



K. Nakamura @ 1 Jul. 2022

Prepare high rate test for SVD

- nsmd2 9210 was not running on b2db2
  - restart it by restart script
- nsmd2 9210 running on rc01 (not necessary)
  - stopped by killing it
- pocket ttd_svd and ttctrld for svd was not running on ttd11
- local HLT for SVD on HLT06 was not running, started by restart script
- store_svd was not running, started by nsmd2 9210, then storeaged
- nsmd2 on rsvd4 could not be started, lan cable connection issue (reconnected the lan cable by Yamada-san, fixed it)
- SVDRC need to be excluded, when SVD electrics was turned off due to no cooling system
- In order to join global run, SVD need to change their runmode to “rand2”
  - pcie40_regconfig or

```
[b2svd@rsvd1 daq_slc]$ nsmvset -c pcie40link PCIE40LINK00 svd[0].runmode_s text rand2
```

SVDRC change to CONFIGURING during masking

svdrc_callback.cpp

```
73  void eventCallback(struct event_handler_args eha)
74  {
75    chid  chid = eha.chid;
76    if(eha.status != ECA_NORMAL) {
77      printChidInfo(chid, "eventCallback");
78    } else {
79      const std::string pvdata  = StringUtil::toupper((const char *)eha.dbr);
80      const char* pvname_c = ca_name(eha.chid);
81      if (pvname_c != NULL) {
82        std::string pvname = StringUtil::replace(pvname_c, ":", ".");
83        //int ival = atoi(pvdata.c_str());
84        LogFile::info("Event Callback: %s = %s", pvname.c_str(), pvdata.c_str());
85        if (pvname == "SVD.CTRL.State") {
86      if (pvdata == "IDLE") {
87        g_callback->setState(RCState::NOTREADY_S);
88        g_callback->set(pvname, "IDLE");
89      } else if (pvdata == "DOWN") {
90        g_callback->setState(RCState::NOTREADY_S);
91        g_callback->set(pvname, "DOWN");
92      } else if (pvdata == "CONFIGURING") {
93        g_callback->setState(RCState::LOADING_TS);
94        g_callback->set(pvname, "CONFIGURING");
```

RCCommand.cc

```
104  108  RCState RCCommand::nextTState() const
105  109  {
106  110    const RCCommand& cmd(*this);
107       -  if (cmd == CONFIGURE) return RCState::CONFIGURING_TS;
     111  +  if (cmd == CONFIGURE || cmd == SETMASK) return RCState::CONFIGURING_TS;
108  112    else if (cmd == LOAD) return RCState::LOADING_TS;
109  113    else if (cmd == START) return RCState::STARTING_TS;
110  114    else if (cmd == STOP) return RCState::STOPPING_TS;
111  115    else if (cmd == RESUME) return RCState::RUNNING_S;
112  116    else if (cmd == PAUSE) return RCState::PAUSED_S;
113  117    else if (cmd == RECOVER) return RCState::RECOVERING_RS;
114  118    else if (cmd == ABORT) return RCState::ABORTING_RS;
115  119    else if (cmd == BOOT) return RCState::BOOTING_RS;
116  120    else return Enum::UNKNOWN;
117  121  }
```

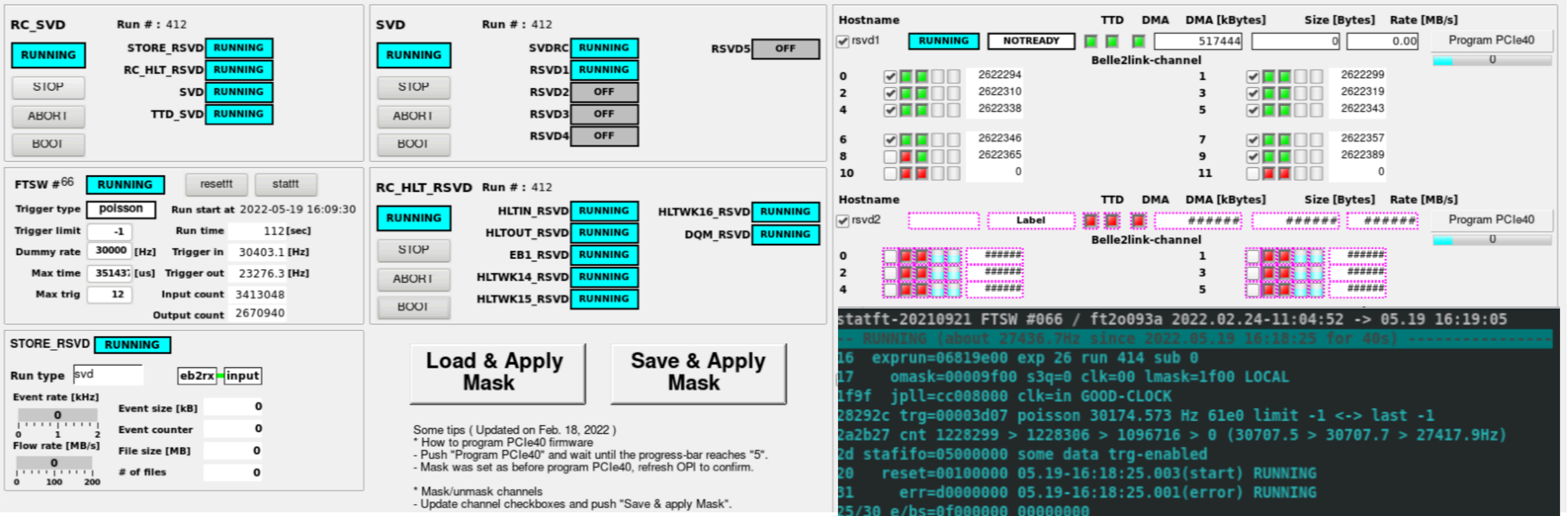
Need a change of “SETMASK” to not used “CONFIGURING_TS”

Summary and plan

- SVD could running with 30 kHz with PCIe40 based readout in global and local run
  - A stability test with on-side detector
- A cross-point switch gained the flexibility for the commissioning during operation
  - Global run and local run (including data-recording) realized
- Data quality was checked with cosmic run, compared with COPPER readout system
  - No significant difference was found
- To-do:
  - Test the updated RC state slow software to avoid “CONFIGURING” when do masking
  - Implement a functionality botton to change the run-mode for FTB

Backup

A local run with GUI



- Current limitation 10 trigger pre 130 us from SVD FEE fifo
- 30 kHz input -> 27 kHz output same performance with COPPER system

File name contains same runno for global and local run

- Data was recorded for both global run (physics…) and local run (svd…) on storage 06
  - Both global run and local run created with the runno 661, cased the issue for offline transfer
  - We are using the same SVD FTB data, the expno, runno, from database distributed by TTD system
  - TTD system is basically controlled by global run (COPPER)
  - Even the local run (660) is assigned to “RC_SVD” and “RSVD1”, the file name is defined by expno, runno.
  - Yamagata-san has made a filedb need to be tested for this issue

```
-rw-r--r-- 1 stordaq daq 7.9G May 25 15:43 svd.0026.00661.HLT6.f00000.sroot
-rw-r--r-- 1 stordaq daq 7.9G May 25 15:48 svd.0026.00661.HLT6.f00001.sroot
-rw-r--r-- 1 stordaq daq 7.9G May 25 15:52 physics.0026.00661.HLT6.f00000.sroot
-rw-r--r-- 1 stordaq daq 7.9G May 25 15:53 svd.0026.00661.HLT6.f00002.sroot
```

fadc ctrl rerr issue

- “ttaddr -66 -p” shows rerr from fctrl, which is a module of SVD for distributing the clock and trigger

```
6=14700 reg=18100001 18100001 anyerr rerr=0
 0=14701 38100000  rerr=none [fctrl]
```

- Comment from Nakao-san

START request should be sent to TTD_SVD only after the START request to SVD is completed, but in the current setting, START request is sent to SVD and TTD_SVD with no delay. This is the incorrect configuration of "sequentail" flag in rc_svd.conf.

```
node[2].name       : SVD
node[2].used       : bool(true)
node[2].sequential : bool(false)
node[2].rcconfig   : RC:test:cosmic
node[3].name       : TTD_SVD
node[3].used       : bool(true)
node[3].sequential : bool(false)
node[3].rcconfig   : RC:test:cosmic
```

```
node[2].name       : SVD
node[2].used       : bool(true)
node[2].sequential : bool(false)
node[2].rcconfig   : RC:test:cosmic
node[3].name       : TTD_SVD
node[3].used       : bool(true)
node[3].sequential : bool(true)
node[3].rcconfig   : RC:test:cosmic
```

- After fixing this configuration for “RC_SVD”, to start TTD_SVD sequentially, rerr issue of fctrl has be fixed

Unpacker error for FADC51

- SVDUnpacker for FADC=51 has been found during the global run test
  - This issue need to be fixed by SVD expert
  - The data recorded by global run and local run may also be used for data quality check, need SVD expert to analysis the data

```
Event number = 401333
FADC = 51  { module: SVDUnpacker }
[2022-05-20 12:29:52] [ERROR] basf2 : (7076) Missing FTB Header is detected. SVD data might be
corrupted!
Event number = 401445
FADC = 51  { module: SVDUnpacker }
[2022-05-20 12:29:52] [ERROR] basf2 : (7076) Missing FTB Trailer is detected. SVD data might be
corrupted!
Event number = 401445
FADC = 51  { module: SVDUnpacker }
[2022-05-20 12:29:52] [ERROR] basf2 : (7040) Missing FTB Header is detected. SVD data might be
corrupted!
Event number = 401417
FADC = 51  { module: SVDUnpacker }
[2022-05-20 12:29:52] [ERROR] basf2 : (7040) Missing FTB Trailer is detected. SVD data might be
corrupted!
Event number = 401417
FADC = 51  { module: SVDUnpacker }
```