HPS DAQ Operations Manual v2.0

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1 System Description

The HPS experiment data acquisition (DAQ) handles the acquisition of data for the two sub-detectors: the SVT, and the ECal. HPS employs two DAQ architectures: the SVT is readout with Advanced Telecom Communications Architecture (ATCA) hardware while the ECal use VXS based hardware. The trigger system receives input from the ECal, and distributes a trigger signal to all detector subsystems to read out a selected event. Figure 1 gives a schematic block diagram of the DAQ system. For the ECal, every VXS crate contains a Readout Controller (ROC) that collects digitized information, processes it, and sends it on to the Event Builder (EB). The ROC is a single blade Intel-based CPU module running DAQ software under CentOS Linux OS. For the SVT ATCA system, a multi-ROC setup runs on embedded processors situated on the ATCA main board. The EB assembles information from the SVT and ECal ROCs into a single event which is passed to the Event Recorder (ER) that writes it to a RAID5-based data storage system. The DAQ network system is a Foundry router providing high-speed connections between the DAQ components and to the JLab computing facility.

2 DAQ Control

2.1 Starting the DAQ from scratch

1. Log into `clondaq5` as `clasrun`.

*Contact person for document.

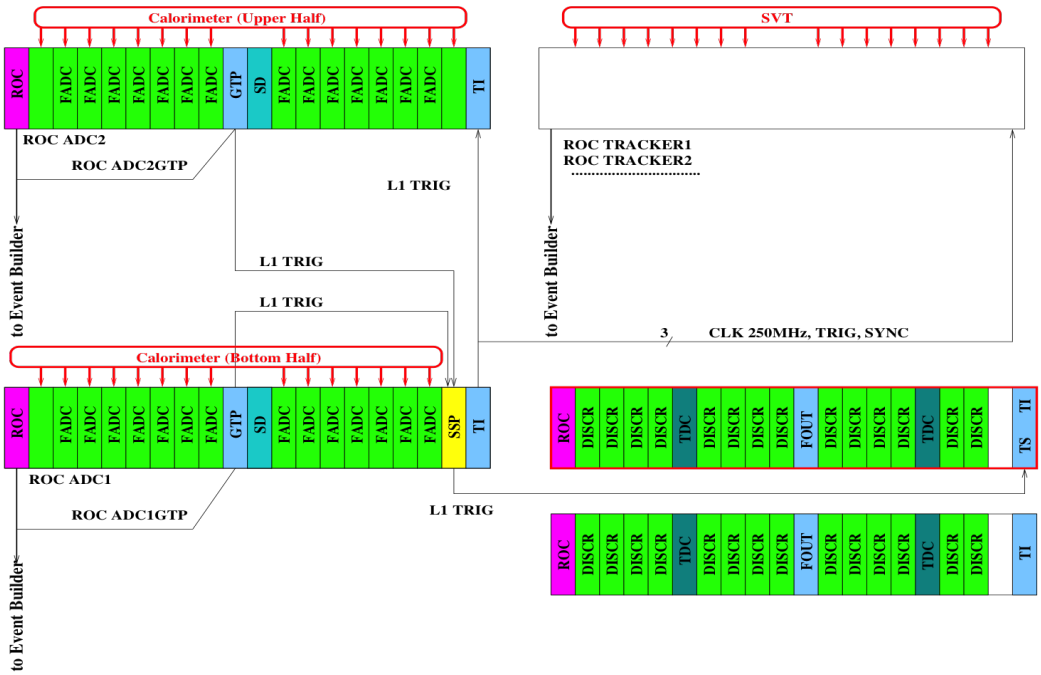

Figure 1: Schematic overview of the DAQ and trigger system.

2. To start all DAQ processes, open a terminal and run:
   ```
   > hps_start
   > roc_xterms_start
   ```
   This opens up all windows needed on the current workspace. The workspace should look like Fig. 2.

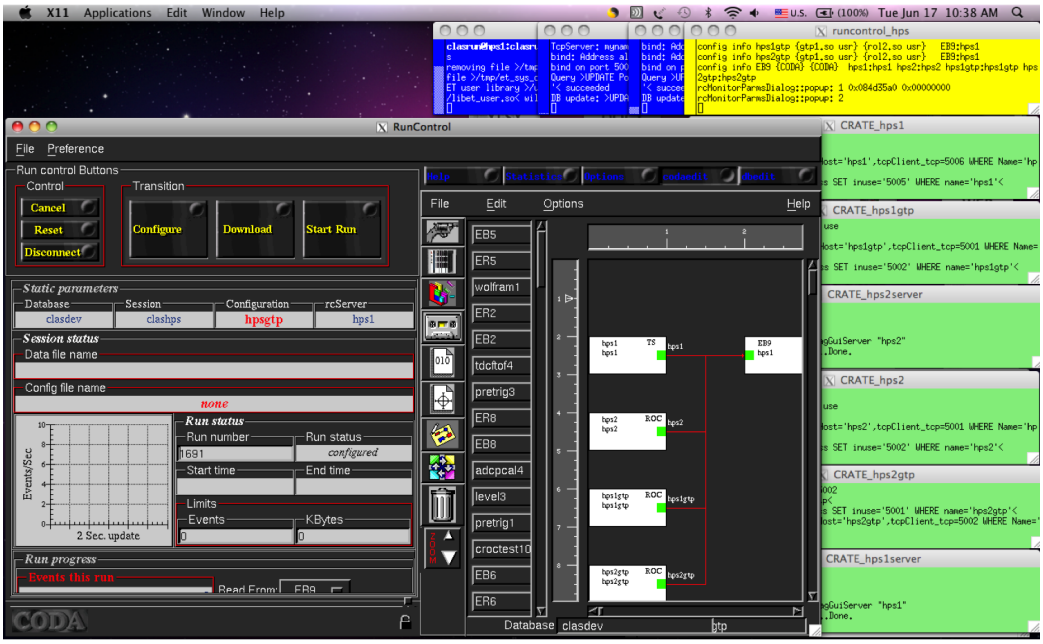

Figure 2: CODA workspace.

2.2 Start and stop a run

1. Beamline checklist

   (a) Beam conditions are ready for running (see beam line manual for more details).

2. ECal Checklist

   (a) Items to be added.

3. SVT Checklist

   (a) SVT position is appropriate for the run. **Check with shift leader if not sure.**

   (b) SVT Flange boards and SVT Front end boards (FEBs) are powered with currents as specified.
   IF ON: check that currents are updating: if not, try to reboot the "iochvCaen" IOC.
   IF OFF: restart the FEBs turning on in the order: **DIG, ANAP and then ANAN**. Then power all the flange channels. Go to the "svtDpmLinkStatus" GUI and check that the FEB link errors are not incrementing. If they do, try to cycle the flange board power (wait 10-20s between cycles). You may need up to 4 cycles.

   (c) SVT Hybrids are powered (all indicators green) and currents updating regularly.

   (d) Bias high voltage is ON and at 180V (unless SVT expert has told you something different). **Important: Check that beam conditions for turning on bias voltage is OK before swiching on (see above)!**

   (e) SVT DAQ is in a state ready to run:

      i. Check that all the DPM and DTMs in `svtDaqIOCStatus` GUI are OK.

      ii. Check that error counts in the "svtDpmLinkStatus" GUI are zero and not updating.

      iii. In `svtDpmStatus` GUI: check that all DPMs are in "Ready" or "Unconfigured" state.

      iv. In `svtDpmStatus` GUI": check that all DPMs are in the appropriate CODA Runstate. This may be different if the DAQ was stopped from a previous run (e.g. in "End") or this is starting from scratch.

4. **If continuing with same the same run configuration from a stopped run continue to 9.**

5. Go to the `RunControl` GUI: click `connect`, a new GUI window opens.

6. Click on `DAQ Configuration` and choose the configuration that has been explained to you: either on the run plan wiki or on the whiteboard. Click OK.

7. Check that run number, data filename and run configuration filename shown on `RunControl` GUI are correct. The "download" button should appear.

8. Press `Download`.

   (a) Wait until the "Prestart" button appears and `RunControl` GUI reports that Download was completed. This might takes up to 30s to complete.

   (b) Go to the `svtDpmRunState` GUI and check that all DPM's are in "Download" state.

   (c) When `Prestart` button shows up the DAQ is ready to take data.

9. Press `Prestart` and wait between 5 and 10s and no errors are reported.

   (a) Go to the `svtDpmRunState` GUI and check that all DPM's are in "Prestart" state.

   (b) Go to the `svtHybSync` GUI and check that all hybrids are in "sync" i.e. the `SyncDetected` variable should be `0x1f` and indicator should be green for all hybrids.

10. Press `Go` to start the run.

    (a) Check that the run status is 'running' and that triggers are issued.

    (b) Verify that the SVT DAQ started run properly:

        i. Go to the `svtDpmRunState` GUI and

           A. Check that all DPM's are in "Go" state

           B. Check that the `TrigCount` is incrementing for both DPM and DTMs and are similar.

           C. Check that the `EventCount` is incrementing.

2.3 Stopping a run

1. Go to the `RunControl` GUI and press `End Run` to stop data taking.
2. End of run SVT DAQ checklist:
   (a) Go to the `svtDpmRunState` GUI and:
      i. Check that the CODA run state is `Stopped` for all DPMs and DTMs.
      ii. Check that the `TrigCount` and `EventCount` variables for DPMs and DTMs are identical and the indicators are .

2.4 Beam trips: actions and recovery for DAQ

Beam trips are frequent and in the most normal case the SVT high voltage bias will trip and will need to be restored before continuing. If a beam trips happen:

1. Stop the run
2. If the SVT is operating in a safe or fully retracted position follow these instructions.

   If not, consult run coordinator for instructions on if the SVT position in these cases.
3. When beam is back and we are ready go to the `softInterLocks` GUI under `Devices` on the HPS GUI. Reset the interlock for the SVT high voltage bias in the bottom right corner.
4. Go to the SVT high voltage GUI and ramp up voltages.

   Make sure beam conditions and SVT positions are OK (see above) before ramping up high voltage.
5. Go back to CODA `run_control` and continue the run (see above).

2.5 Stopping and restarting the DAQ

2.5.1 `FIX DAQ`: stopping and restarting CODA

If DAQ problems occur and restarting the run do not work all DAQ processes can be restarted by typing:

1. `hps_exit` in a terminal on `clondaq5`
   `roc_xterms_exit` in a terminal on `clondaq5`
   Wait for script to finish and check that no coda processes are running in the machine.

2. `hps_start` in a terminal on `clondaq5` `roc_xterms_start` in a terminal on `clondaq5`

This will cleanup all processes and you can restart by following the procedures above.

2.5.2 Reboot ECal or master TI crates

Sometimes hardware reset needed to bring the ECal DAQ system back to normal. For HPS there are four VME/VXS crates: `hps11`, `hps12`, `hps1` and `hps2`. These can be power cycled to try and get back into the normal state. Crate `hps11` is a master, so it have to be rebooted first, followed by others. To reboot, do the following in a terminal on `clondaq3`:

1. Type command `roc_reboot hps11` in a terminal.

2. Type command `roc_reboot crate_id` in the same terminal where `crate_id` is `hps12`, `hps1` or `hps2`.

2.5.3 SVT DAQ

In case you suspect that the SVT DAQ has crashed and it cannot be recovered in the `FIX DAQ` section above you can restart the SVT DAQ following these instructions.

These are expert tasks. Don't do this unless you know what you are doing or the SVT expert helps you.

"Rebooting the COBs"
Open a terminal on `clondaq5`.

```
> cd $CLAS/slac_svt/svtdaq/daq/rceScripts
>./reboot_cobs
```

Issue a ping to one of the DAQ hosts in a terminal (e.g. `ping dtm0`) and wait until it responds

Check if the reboot was successful by going to the `svtDaqIOCStatus` GUI and see that all nodes are coming back with OK status. This may take up to 30s.

"Restart the DAQ software"

Open a terminal on `clondaq5`.

```
> cd $CLAS/slac_svt/svtdaq/daq/rceScripts
> ./rem_restart
```

You will see the script connecting to each host. Wait until finished, can be up to 20s.

Check if the reboot was successful by going to the `svtDaqIOCStatus` GUI and see that all nodes are coming back with OK status. This may take up to 30s.