Run control

Tomoyuki Konno

TRG/DAQ workshop

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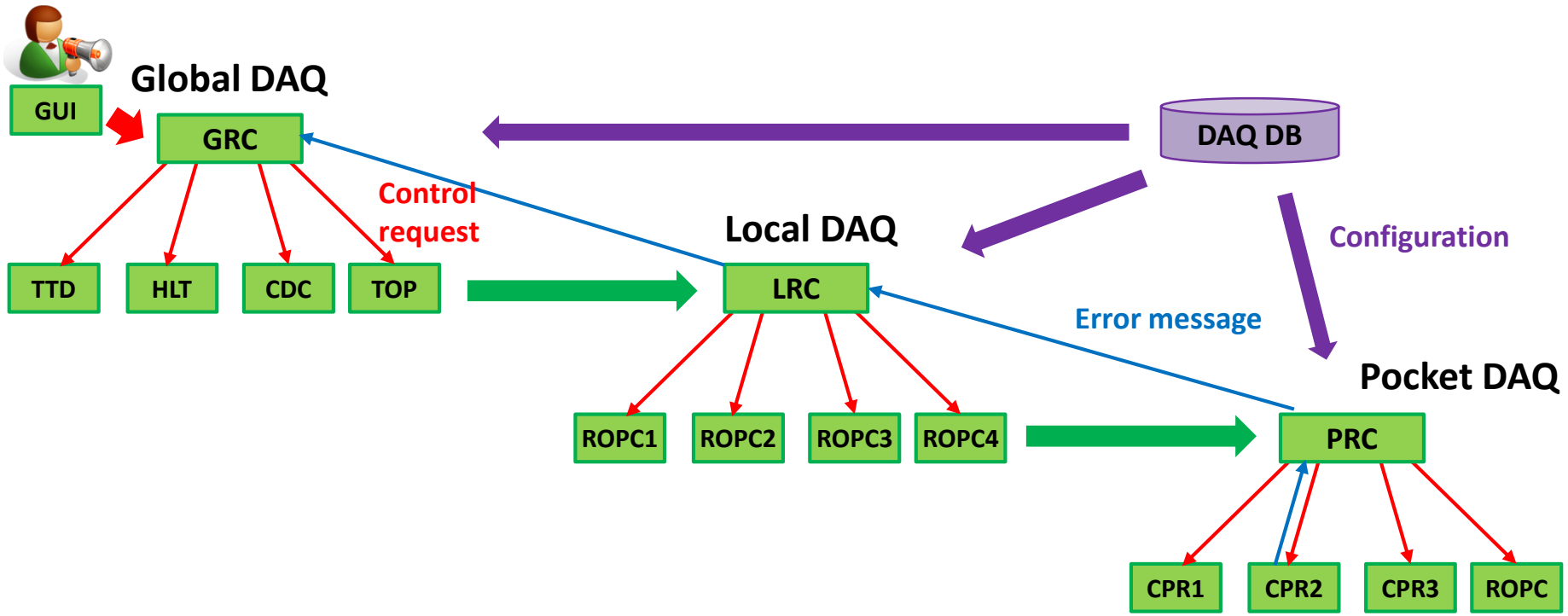
DAQ Run control



Three layers of nested run controls

- **Global DAQ** : Full system of the Belle II DAQ for physics run
- Local DAQ : Detector local DAQ setup for calibration or test
- Pocket DAQ : COPPER and RO PC for HSLB readout

=> Each layer of run control is controllable from GUI (by detector experts)

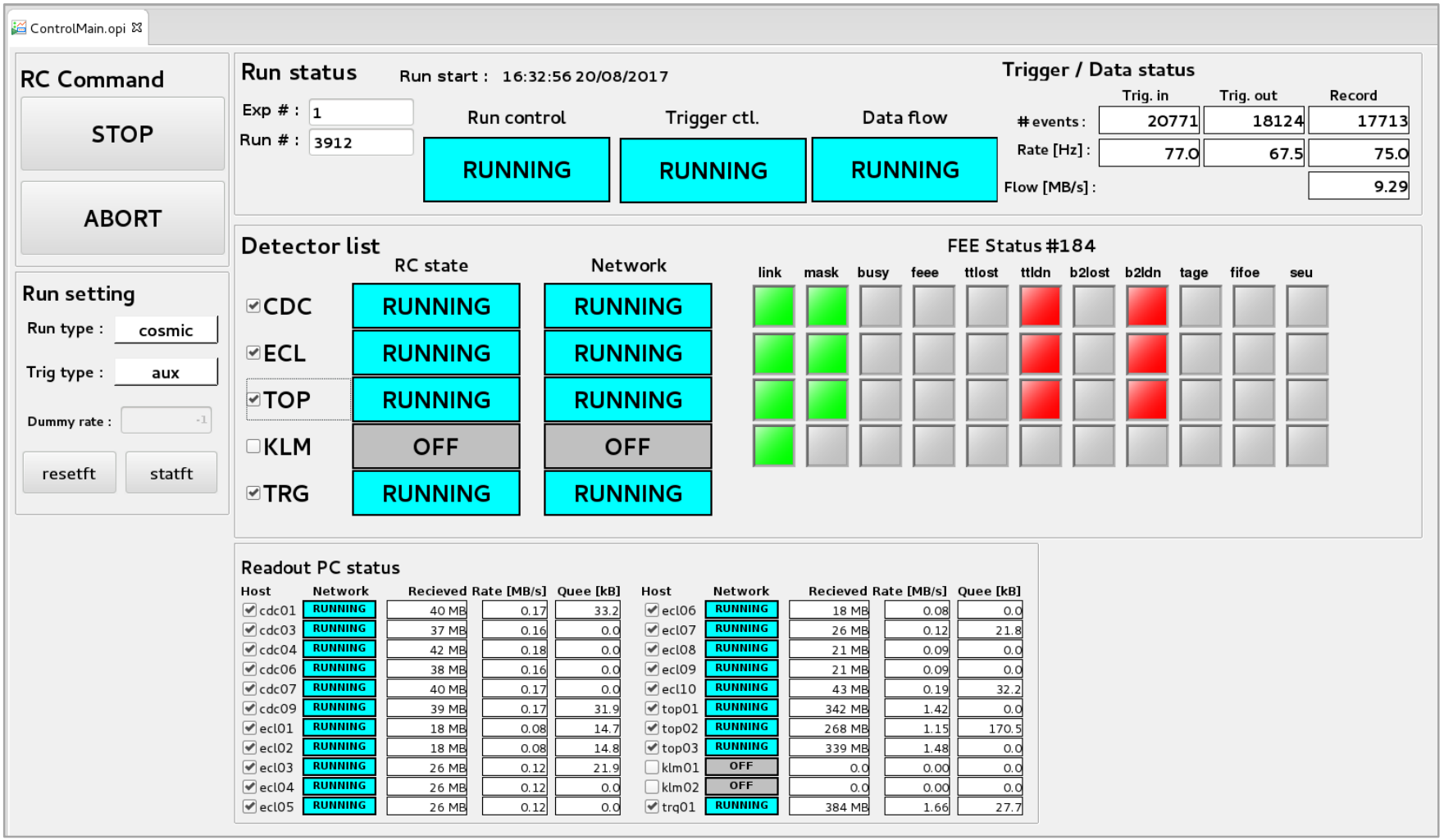
Running Run controls

Three run control systems

- **Global run control with Belle II detector**
  - Data taking shift for global cosmic ray test (GCRT)
  - Running with CDC, TOP, ECL, KLM and TRG
  - Detector local run controls for CDC, TOP, ECL

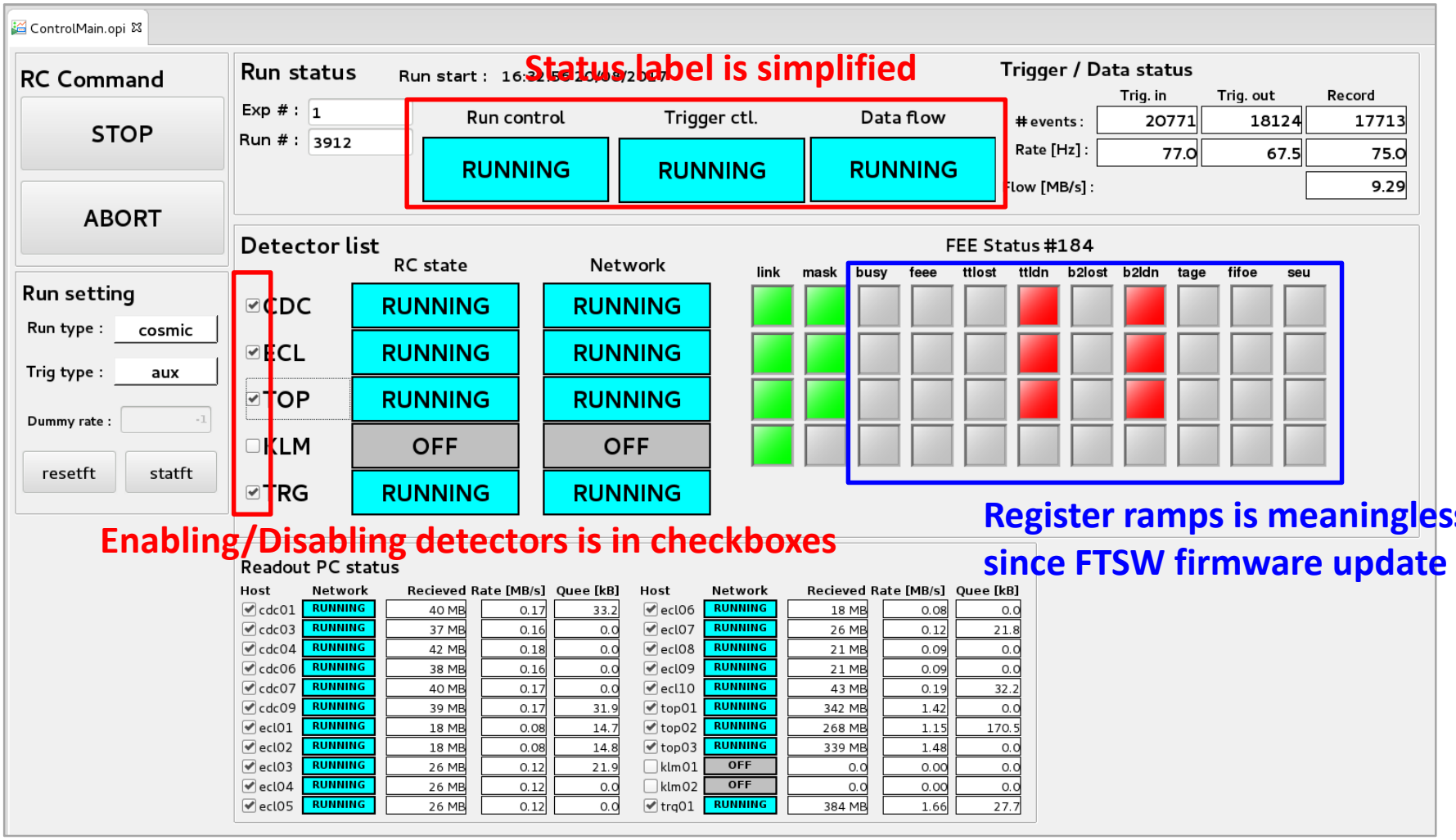
  => Basically running stably during the GCRT
- ARICH run control at B4 => covered yesterday
  - Pocket DAQ and now extending to global DAQ
  - Good experience and debug info. to run control too
- VXD-DAQ combined run control at DESY (so-called PERSY)
  - Set up with a copy of the Belle II DAQ system for VXD

Global run control GUI



Operational with CDC, TOP, ECL, KLM and TRG

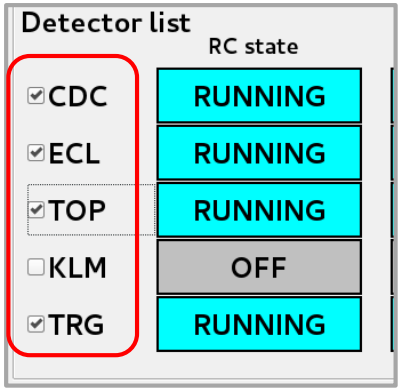
Global run control GUI

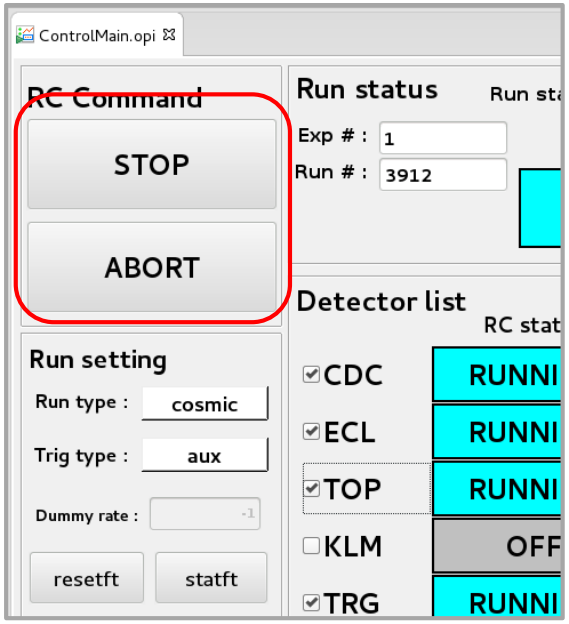


How to operate global DAQ

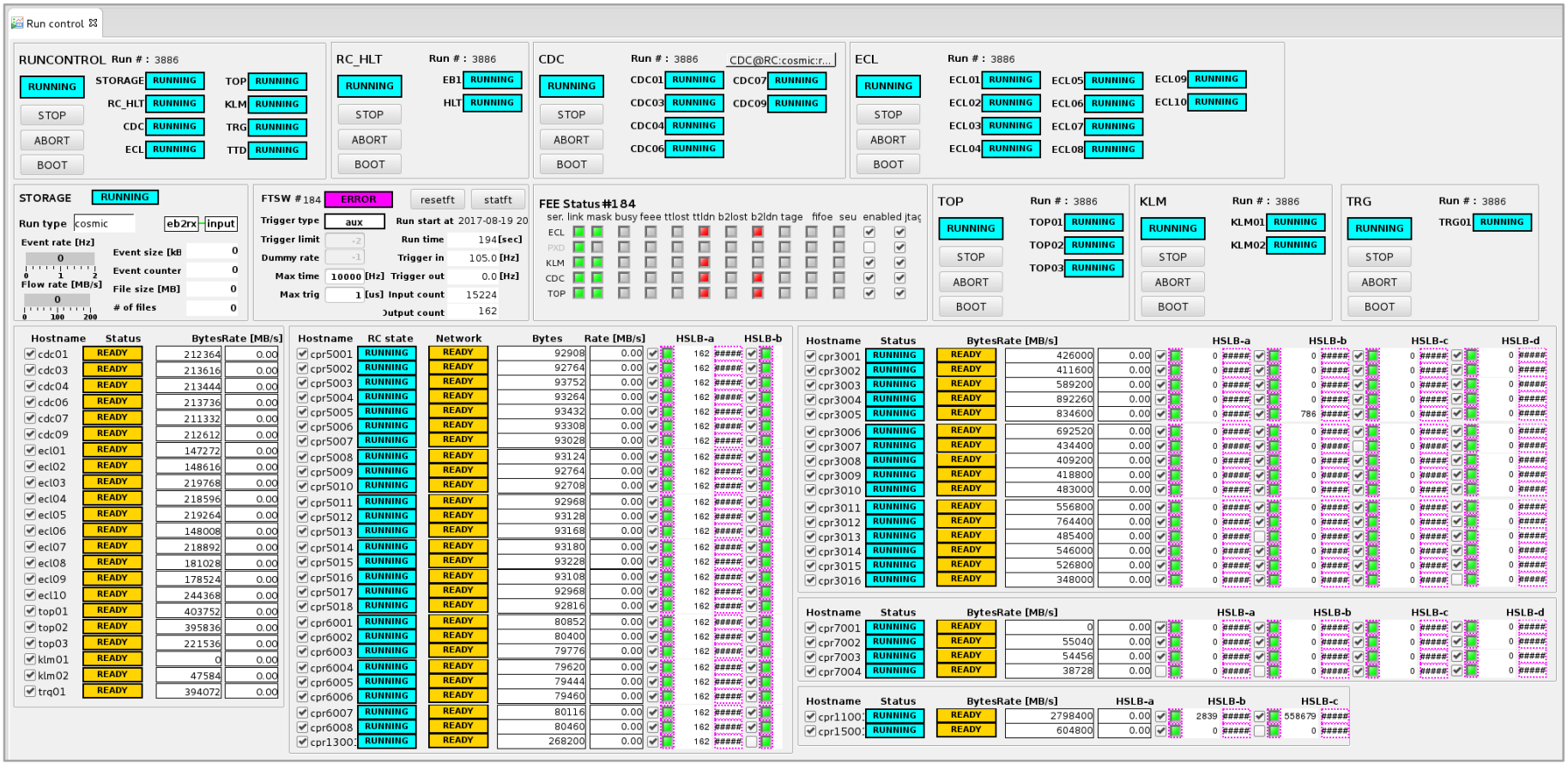
- Open GUI on shift PC (or VNC screen)

1. Include/exclude detectors
   - Checkbox in the detector list
2. Select run type:
   - cosmic : normal data taking
   - test : test data taking
3. Push buttons to start/stop DAQ
   - LOAD : configure to be READY
   - START : start triggers to be RUNNING
   - STOP : stop trigger to be READY
   - ABORT : discards to be NOTREADY
4. Check data flow status and logs
   - Sound or alarm is not prepared yet

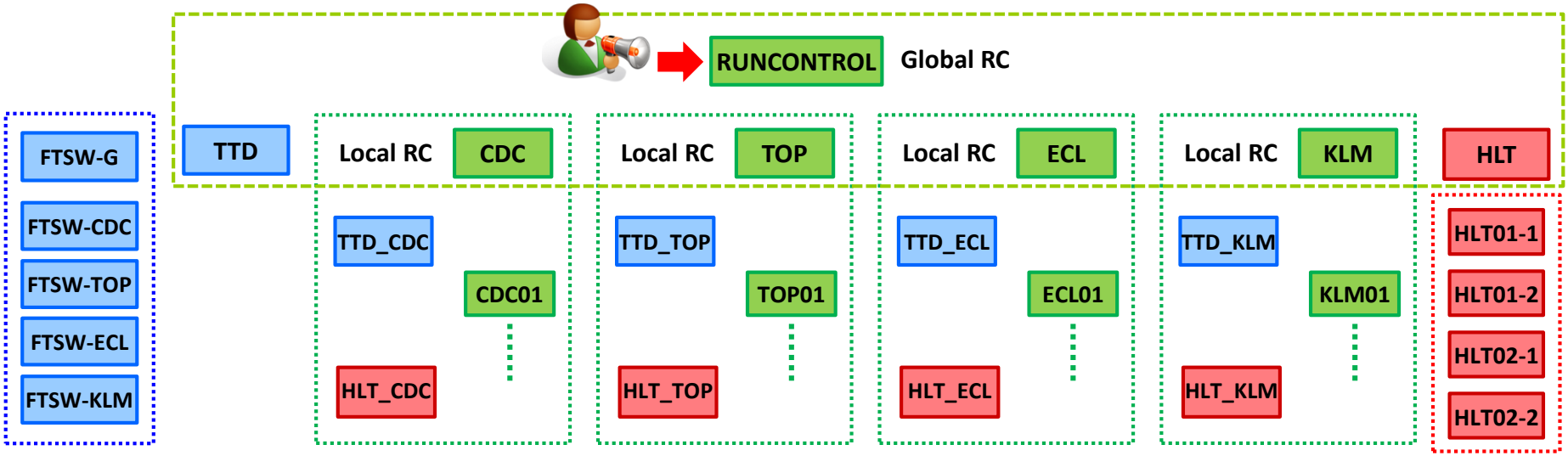




Global GUI (details)



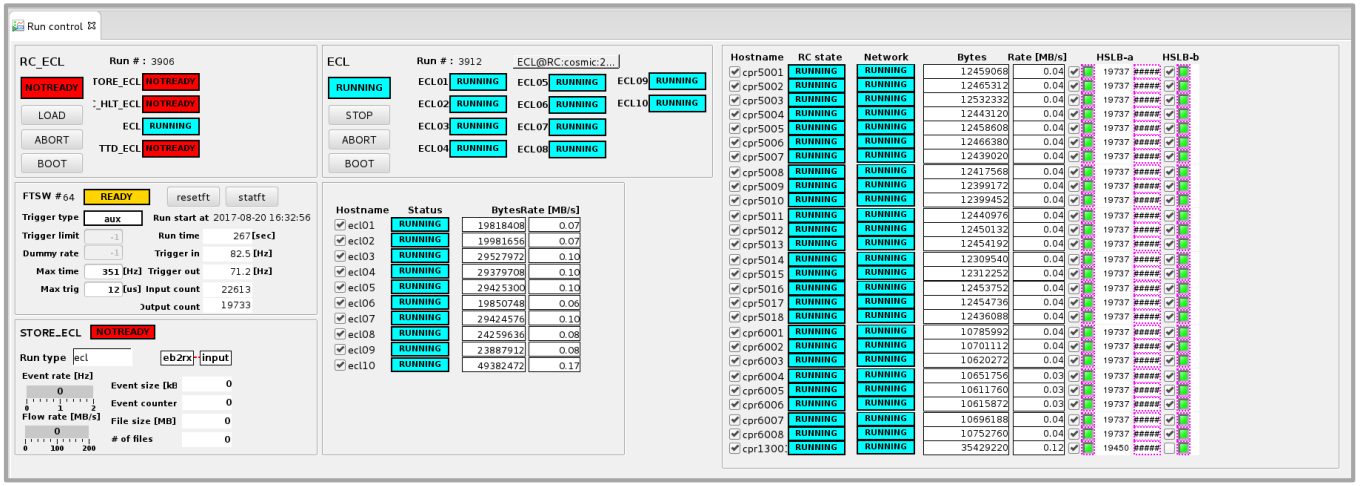
Local run controls



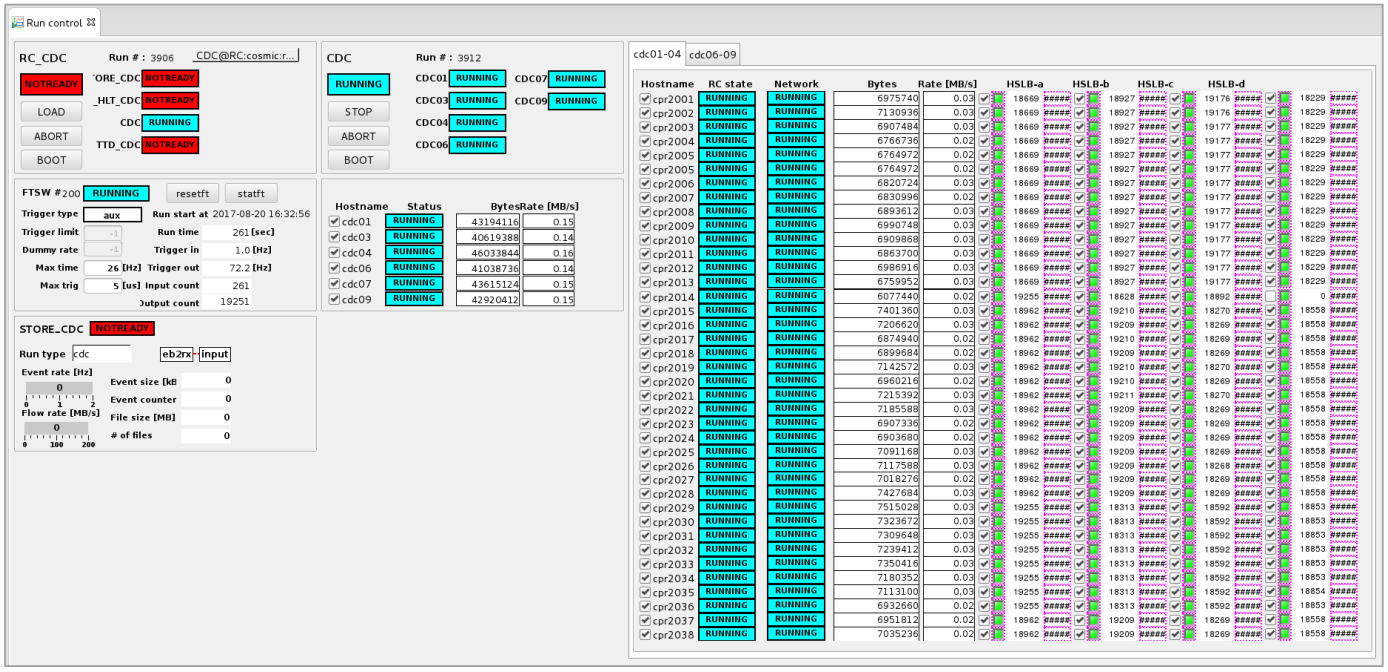
- Local run control contains three major parts
  - Detector R/O control common with Global Run control
    - COPPERs and readout PCs are under control of local masters
  - TTD control manages the master FTSW(#184)
    - Detector FTSWs are under control of the master FTSW
    - FTSW for TRG is not
  - Local (virtual) units of HLT /storage

Local run control GUI (in global run)

TOP-RC

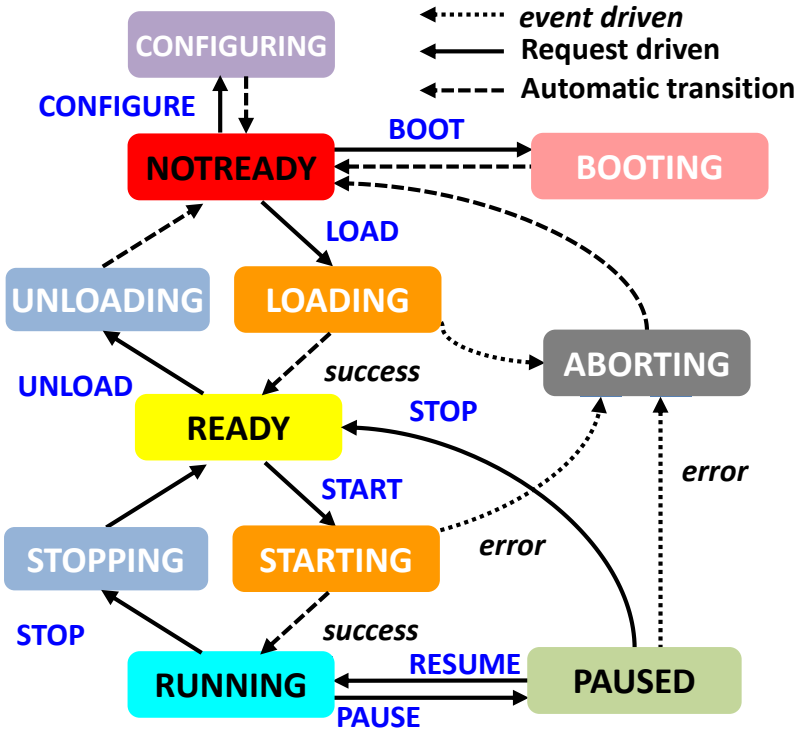


CDC-RC



Run control state diagram

Run control state diagram



List of run control requests

CONFIGUTRE : Load new config. from DB
BOOT : (Re)initialize the system
LOAD : Loads parameters
UNLOAD : Unload parameters
START : Start triggers
STOP : Stop triggers
ABORT : Discards configuration

Difference between BOOT and LOAD
- BOOT : called manually when needed
- LOAD : called every time run start

Three functions : CONFIGURE/BOOT/LOAD should be implemented
- CONFIGURE : switch config to load from DB (otherwise no change from default)
- BOOT : initialization taking long time but no need before every run start
- LOAD : parameter loading called at ever run start

R/O control integration to detectors

- CDC (Nanae): Running for long term as local/global run control
  - CONFIGURE : 2 data modes for suppressed (cosmic) / raw (pedestal)
  - LOADING : loading parameters e.g. pedestals
  - Monitor : FEE temperatures
- ECL (Pavel): Collector is configured but Shaper not yet
  - CONFIGURE : different timings for global and local run
  - BOOT : first initialization of Shaper DSP => Moving into Belle2Link but not yet
  - LOAD : loading parameters such as trigger timings into Collector
- TOP (Tobias->Maeda) : nicely worked but unusable due to too long initialization time
  - BOOT : full FEE initialization, taking long time since it takes pedestals
  - FEE status including LV, current, temperatures
- KLM (Isar): Configuration scripts converted into C++ codes by T.K.
  - LOAD : loading parameters, as a copy from configuration scripts
- ARICH (Konno): Running in the test setup (outside of Belle II)
  - BOOT : programing Frontend FPGA via Merger
  - LOAD : loading parameters Frontend FPGA and ASICs such as threshold values
- TRG (Nakazawa): Interface for trigger condition control is under preparation

Issues in run control

- FTSW register readout does not work correctly
  - Status registers (b2lost,b2ldown,ttlost etc)
  - Operation mode : Local/Global
  - Masks status of FEE ports

  => I'm now hacking Nakao-san' code and rewriting into slow control
- Synchronization of run control status takes sometime time
  - Time consumption in LOAD/ABORT is still acceptable
    => Thanks to small number of nodes

  => Optimization of state synchronization is ongoing...
- Disabling local run during global run and the opposite are not implemented
  - Local run control can start during global run, causing DAQ crash
- System goes down with NSM2 crashes

NSM2 troubles

NSM2 network is now unstable and nsmd2 easily goes died

- nsmd2 kills all connected process when it goes die
- Once NSM2 gets problematic, all nsmd2 must be killed

=> nsmd2 in some hosts goes died in 1-2 days
=> Full restart of slow control takes about 1 hour

Possible reasons of the instabilities

- nsmd2 master was launched at ttd1 (VME CPU) which has small memory

=> Easily move the master to other machine (rc01 for example)

- **Too many NSM2 requests are sent**
  - One Set/get request can handle with only one variables

    => O(100) requests might be transferred

    => **Reduction of # requests looks essential**

Summary

- Global cosmic run is in operation with run control GUI
  - Status from FTSW is difficult to monitor on the panel yet
  - Local run control is also running for each subdetector
- Run control integration into outer detectors are still on going
  - CDC is running with two data modes for cosmic and pedestal
  - ECL collector is configured via Belle2Link but shaper is still not yet
  - TOP FEE control is implemented and taken over to Maeda-san
  - KLM is also configured via Belle2Link by slow control
  - ARICH Merger and Frontend are configure by slow control

  => Several functions to monitor FEE status are also implemented
- Missing items for run configuration
  - Trigger condition and status are unreachable
  - FTSW control on GUI is not enough and CLTs are needed
- Serious issues in NSM2 (maybe) due to too much NSM2 requests