Online Software Status

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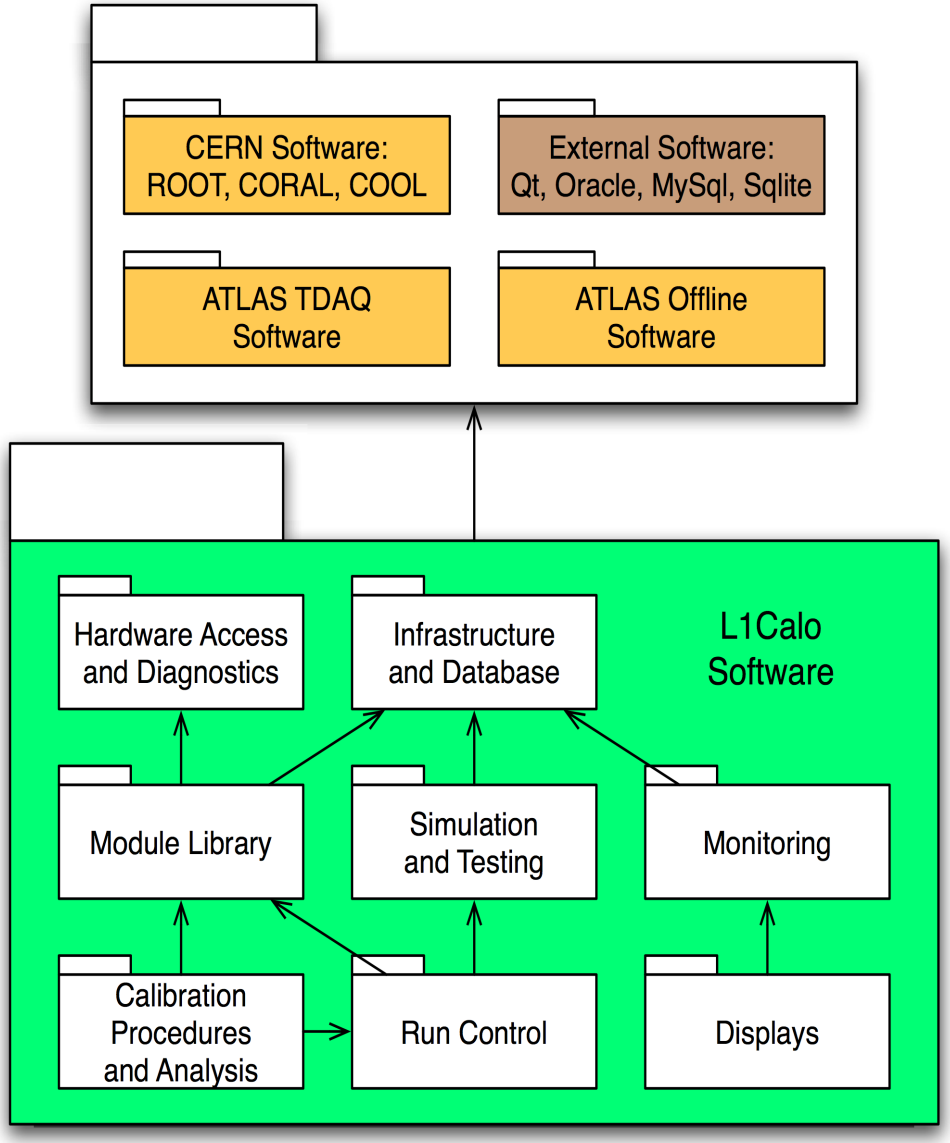
- Overview
  - Databases, hardware diagnostics, module services, simulations, run control, calibration, monitoring, displays, tools, etc
- Summary

Overview of L1Calo Online Software

- Configures, controls, tests, monitors & displays L1Calo
  - based on TDAQ software
    - also offline (DetCommon), LCG and other external libraries
  - 78 packages in C++/Java
    - grouped in several categories
  - developed over 10 years...
    - could do with some pruning?
    - but some further development is also needed
  - recent TWEPP proceedings:
    - http://cdsweb.cern.ch/record/1138902



Databases (1)

- TDAQ (OKS) Database
  - L1Calo schema adds classes for our modules, cables, options
  - Describes the hardware and (fairly) static configuration
    - Most downloadable parameters now moved to COOL
    - Large parts of the point 1 database generated by a script
      - And some aspects of test rig databases too
  - Some OKS derived state (automatically disabled items) will soon also be copied to COOL conditions DB

Databases (2)

- COOL Database
  - Generally used as a "preconditions" database for settings to be used in the next run
  - Downloadable configuration parameters (calibrations) specific for each module
  - Run parameters and other global settings
  - Unvalidated results from all calibrations
- Open points:
  - Long time to load
    - Relational table style: channel per module, many attributes
    - May need to change strategy?
  - Currently using SQLite, need to move to Oracle
    - Event longer time to load?
  - Starting to add normal "conditions" for the current run

Hardware Access and Diagnostics

- HDMC package used for a long time (last millenium!)
  - Object oriented description of module programming models
    - Register bit fields, groupings of registers in submodules etc
  - Descriptions used by Qt based GUI
    - Graphical view of all registers in all modules
    - Some custom GUIs for modules
    - Recently ported to Qt4
  - HDMC configuration files compiled to C++ register classes
    - Generated register classes used in higher level C++ code
- Open points:
  - Move private HDMCExceptions to use ERS?
  - Finally enable bus errors!!
    - All problems now fixed and tested, but not yet the default
  - Long standing intention to improve "parts" & config files

Module Libraries

- Module Services package for each module type
  - Higher level code using generated HDMC classes
  - Implements actions for required run control transitions
  - Also custom methods for calibrations and any other module specific actions
- Open points:
  - Move private ModServExceptions to ERS
  - Further optimisation of run state transitions?
  - Pruning of obsolete code
    - Maintenance headache, especially in cases of multiple developers or where strategies have changed over time

Simulation and Testing

- Simulation package for each trigger module type
  - Detailed simulation of the hardware
  - Produces exact bit by bit results seen by hardware readout
  - Configured by same databases as the real hardware
  - Suites of test vectors generated for each module
    - Some customised for calibrations
  - Typical test sequence:
    - Select type of test vectors and where to load them
    - Start a run, compare collected events with simulate ones
      - In case of errors, call simulation expert to interpret logfiles and firmware expert to fix them
- Open points:
  - Try running simulated physics events through the system
    - Infrastructure for this is complete(?)

Run Control

- Run controllers implement TDAQ superclass
  - Respond to state transitions and call module services to configure the system (or simulation to model it)
  - L1Calo also implements "substates"
    - Two stages in the standard "Configure" transition
  - Run controllers also publish status and rates to IS
- Open points:
  - TDAQ model for substates will change in tdaq-02-00-01
    - Code implemented but not rigourously tested at point 1
  - L1Calo (and LAr) not using the standard "ROD Crate DAQ"
    - Problem with our CPUs overheating!
    - Move to the standard one day if this is fixed
  - Reorganise module services to avoid need for substates?
  - Add "on the fly" commands, eg for hot channel killing

Calibrations (1)

- Many different calibration procedures and analysis
  - Preprocessor
    - DAC and pedestal runs
    - Coarse and fine (PHOS4) timing scans with pulsers
    - Pulse shape measurement (saturated and non-saturated)
    - Energy calibration
  - CP and JEP:
    - Input and backplane timing of CPMs, JEMs (and CMMs)
    - All currently run and analysed in the online environment
- Analysis and database:
  - All PP calibrations currently analysed offline
    - Expect at least DAC and pedestal runs to move online
  - Other scans will be analysed offline (Athena/CAF)
    - Will need DB updates passed back to point 1

Calibrations (2)

- Validation
  - All calibration scans always store results of each run to DB
  - Physicist can choose to "validate" calibration
    - Simple minded procedure to copy/merge new results to separate COOL folders for validated calibrations
- Open points:
  - Still plenty of work on analysis of calibrations
  - Need a more sophisticated framework for validation
  - Calibration runs require some TDAQ setup
    - Need better documentation, all in one place
  - Could do with more shifter friendly tool
    - Especially when running combined calibrations with LAr/Tile

Monitoring and Data Quality

- Two monitoring frameworks: GNAM and AthenaPT
  - Quite a bit of duplication at the moment
    - GNAM is "faster and lighter" and could process events read from RODs (which we could but currently do not sample)
    - AthenaPT allows comparision of L1Calo with Lar/Tile readout
      - Usually the last to appear after a new TDAQ release
    - Data quality only updated from AthenaPT histograms(?)
  - Both frameworks produce many, many, many plots
  - OHP configuration files exist to help the shifter
    - But still show lots of plots, often separated by PP/CP/JEP system
- Open points:
  - Data quality also from GNAM
    - Actually not yet reactivated for AthenaPT since tdaq-02-00-00
  - Select a few key plots for "front page" shifter status?
  - Develop web monitoring (for office and home institutes)

Displays and Tools (1)

- Various displays and tools exist, at least for experts
  - HDMC, OHP already mentioned
  - ACE: editor/browser for L1Calo COOL database
  - Mapping Tool: rates, status, DB values and other quantities
    - Displayed with a variety of hardware mappings
  - l1rates: (for when trigger rate presenter doesnt work)
  - l1chuck: hot/unwanted channel killer (in development)
    - Could do with hot/unwanted Tile drawer killer too?
- Open points:
  - Handling of hot cells needs more work
    - More automated procedure using on board PPM rates and histos?

Miscellaneous Open Points

- Generally improve error reporting
- Improve monitoring of RODs and readout
- Store calibration histograms to MDA or POOL files
- Track calibrations with time
- Overhaul build/installation scripts
  - Move to Subversion (SVN)
  - Patching policy for point 1
- Restrict changes as beam gets closer?
  - Though will need to be able to adapt monitoring and higher level tools

Summary

- Most important items on the "to do" list
  - Move to production COOL database
  - Calibration procedures and validation
  - Dynamic hot channel killing (GUI and Run Control)
  - Resuscitate data quality reporting
- And better documentation
  - Backup paper...