Data Quality Monitoring

Andreas B. Meyer DESY

CMS Hamburg Meeting 11/4/07



Idea: Use same software (framework) for data inspection / analysis at all levels of data processing

DQM Components





- Monitoring producers \rightarrow server \rightarrow monitoring consumers
- DQM software provides a set of monitoring tools (based on root)
 - creation of Monitoring Elements (ME, i.e. histograms etc.)
 - transfer mechanisms for subscribed ME (source -> collector -> client)
 - quality assessment tools (reference histograms, alarm conditions)
 - visualization tools (GUI)

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C.Leonidopoulos

CMS-online DQM Streams





(5) "Local DQM" monitoring of FED spy channel data ("trend "plots)(6) "Global DQM" monitoring of FED raw data stream (error conditions)

Online Event DQM through HLT / SM





Online Event DQM through HLT / SM



DAQmon: NO

EXP. OR CAMPUS NETWORK MUST USE CMSSW CAN USE RC FREE ACCESS TO DB (EXP) DCS: via PSX or DB DAQmon: via DB

- HLT
 - Input rate: 100 kHz
 - all L1 triggered events
 - max. 10% of CPU for DQM
 - max. 5% of bandwidth for DQM (1GB/s)
- Storage Manager
 - receives Event and DQM data (1-10 Hz)
 - run source on event consumer
 - subsystem CPU
 - Delay: seconds





DQM Clients / Automatic DQ Assessment





DQM GUI



- Display, Control of
 - DQM Monitoring Elements
 - Reference Histograms
 - Detector Status after processing
 - Expert Level
 - Iargely under control of subsystems
 - Shift Level
 - needs to be homogeneous, provide access to expert level
- Navigation !!
 - Different views (navigate from shift to expert level)
 - hardware cabling view
 - geometrical view (esp. useful for shift, based on event display)
 - detector-specific hierarchies
 - Two different GUI technologies are under development and in use for commissioning
 - Web-based Monitoring
 - IGUANA

Interactive Web-Client GUI





Transferring data from pczh02.cern.ch.

Single module view



Summary view





Transferring data from pczh02.cern.ch

Detector hierarchical view



Alarm view

Commands to Client via Ajax (Javascript)

IGUANA GUI





G.Della-Ricca

10

Display of Root Histograms with full Root Functionality

Integration with Event Display





G.Zito

Graphics Interface: display status of modules, click for occupancy plots etc.

Subsystem DQM



Several different (and partially divergent) implementations of DQM exist in the subsystems

List of contact persons and twiki pages per sub-detector:

- Tracker:
- Contact persons: Vincenzo Chiochia (pixel), Suchandra Dutta (strip), Giacomo Bruno (overall). At FNAL: Elizaveta Shabalina
 - Tracker DQM Twiki page
- RPC:
 - Contact persons: Marcello Maggi, Ilaria Segoni
 - <u>RPC DQM Twiki page</u>
- CSC:
 - Contact persons: Andrey Korytov, Parolo Bartalini, Victor Barashko
 - Main EMU-DQM Web and CSC DQM tutorial Twiki page
- DT:
 - Contact person: Marco Zanetti
 - DT DQM Twiki page
- HCAL:
 - Contact persons: Wade Fisher, Pawel de Barbaro
 - HCAL DQM Web Page
- ECAL:
 - Contact persons: Giuseppe Della Ricca, Giovanni Franzoni, Alessio Ghezzi, Benigno Gobbo
 - ECAL DQM Twiki page
- Trigger:
 - Contact persons: Jeffrey Berryhill
 - Trigger Monitoring Twiki page

So far tailored for subsystem commissioning and MTCC

DQM Status



- A lot of software infrastructure exists and is rather well tested
- Standardization / Coherence between subsystems must happen now:
 - DQM Framework (bug fixes and missing features, volunteers needed)
 - Clients (DQM Processing)
 - DQ Assessment Standards (Detector Status Bits)
 - Controls (DQM System Operation via RunControl)
 - GUI Navigation (needs framework development, volunteers needed)
 - GUI Look and Feel
 - Data Operations (ROC, volunteers needed)
- Tests / Test set-ups (planned)
 - SM-based teststand for full integrated CMS-wide DQM
 - Global Running (end of May)





- What/where is the hardware to run the DQM source and clients on?
 - HLT vs. SM
- What to do with accumulated info and how to analyse it?
 - 'superclients'
- Where do I send my output ?
 - archiving and reference histogram scheme
- What do I use for display (GUI)?
 - IGUANA vs. Ajax/XDAQ
- How do I correlate event and non-event data
 - Database access through EventSetup ?
- How do I assess the data quality?
 - detector status bits must be standardized and reasonable
- How do I package the software
 - online release vs offline and visualization
- What is the available bandwidth compared to my requirements (CPU, network, file+data store)

DQM Plans for Summer 07



- Establish coherence (kick-off meeting during offline week 18/4/07)
- Finalize architecture and operational conditions
 - So far: DQM used for subsystem testing (some divergence since MTCC)
 - goal for Oct 15: compatible and standardized DQM tools and data quality rules
- Set up bi-weekly meetings with topical agendae
 - bring subsystem experts together
 - create agreement on details
- Put people on central DQM framework tasks (presently ~3 FTE missing):
 - GUI development (IGUANA and/or Interactive Web-client)
 - DQM framework development (implement incoming feature requests)
 - DQM data operations (archival, export, teststand operation)
- Milestones:
 - Global running (end of May)
 - Storage manager teststand

Remote Operations Control



- Mainly for remote DQM shifts (first tests in October 07)
- Minimally: use SSS (Snap Shot Service) semi-offline viewing of DQM screens
- Maximally: run full-blown clients on DQM elements (could be a bandwidth issue)
- DESY should operate a ROC

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DQM in Hamburg



DQM is

- in the center of the experiment
- going to provide fast lane access to the real data
- crucial for good data
- ROC at DESY: qualification and visibility
- Join the effort !
 - CMS is desperately looking for several volunteers in this area
 - DESY and Hamburg can make an impact