Data Quality Monitoring

Online DQM - Global Runs - Plans

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CMS Hamburg Meeting
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DQM Mission

- Control, display and archive detector status and data quality
  - online and offline
  - event and non-event data, including history plots
  - local (P5), CERN and remote

- Provide fast feedback to shift crew and experts about data quality
  - Produce quality flags (alarms, warnings) for each luminosity section
  - Use standardized certification criteria (input to offline QA)
  - Graphical detector synoptic view (GUI):
    - List of histograms (and results of quality tests associated to histograms)
    - Navigation at different depth of detail

- Robust and easy to use
- Modular (specified by subsystems), operated centrally and automatically (run-control)

Coherent and standardized DQ monitoring and assessment for all CMS

Online DQM

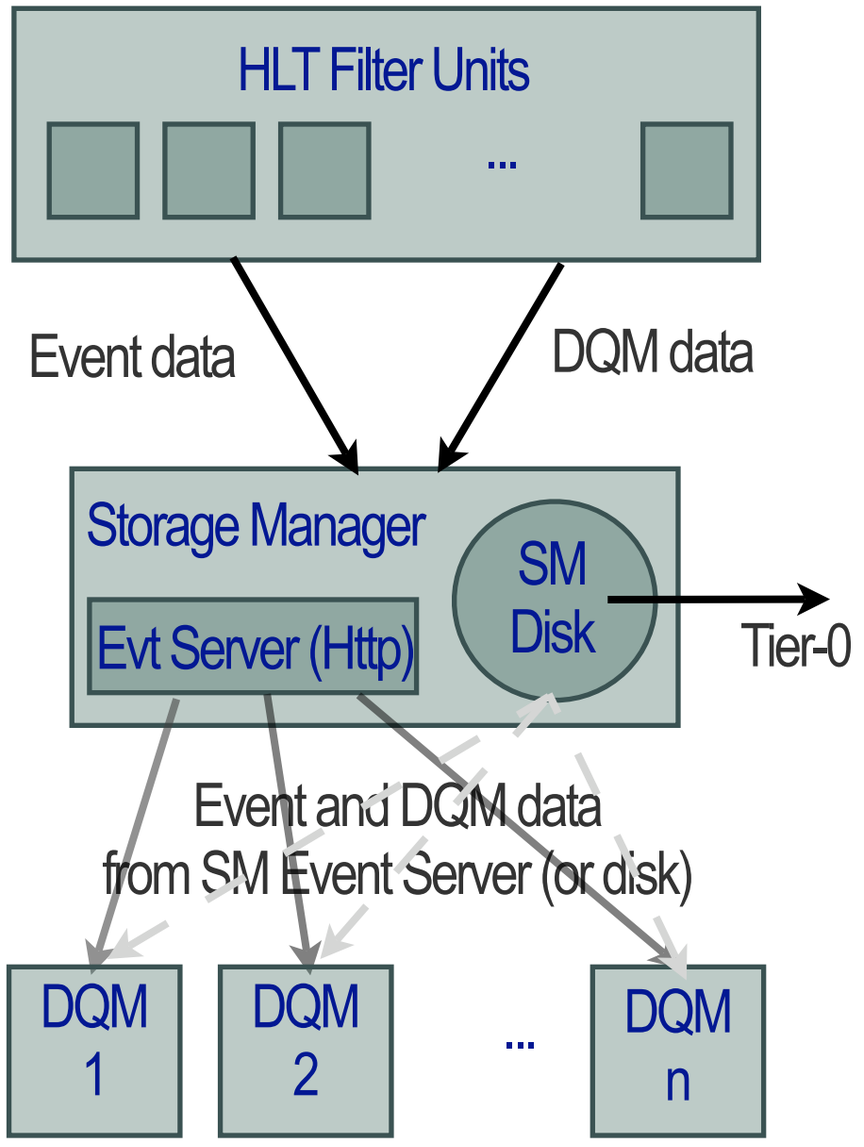
Two sources of Histograms:

- **Higher Level Trigger**
  - Input rate: 100 kHz
  - all L1 triggered events
  - small fraction of CPU for DQM
  - use ~% of bandwidth for DQM (1GB/s)
  - needs to be absolutely stable !

EXP. NETWORK
MUST USE CMSSW
MUST USE RC
LIMITED ACCESS TO DB
DCS: NO
DAQmon: NO

- **Storage Manager / Event Server**
  - provides event and DQM data (~5 Hz)
  - DQM histograms collated by SM
  - Individual subsystem consumers of event and DQM data
  - Delay: seconds

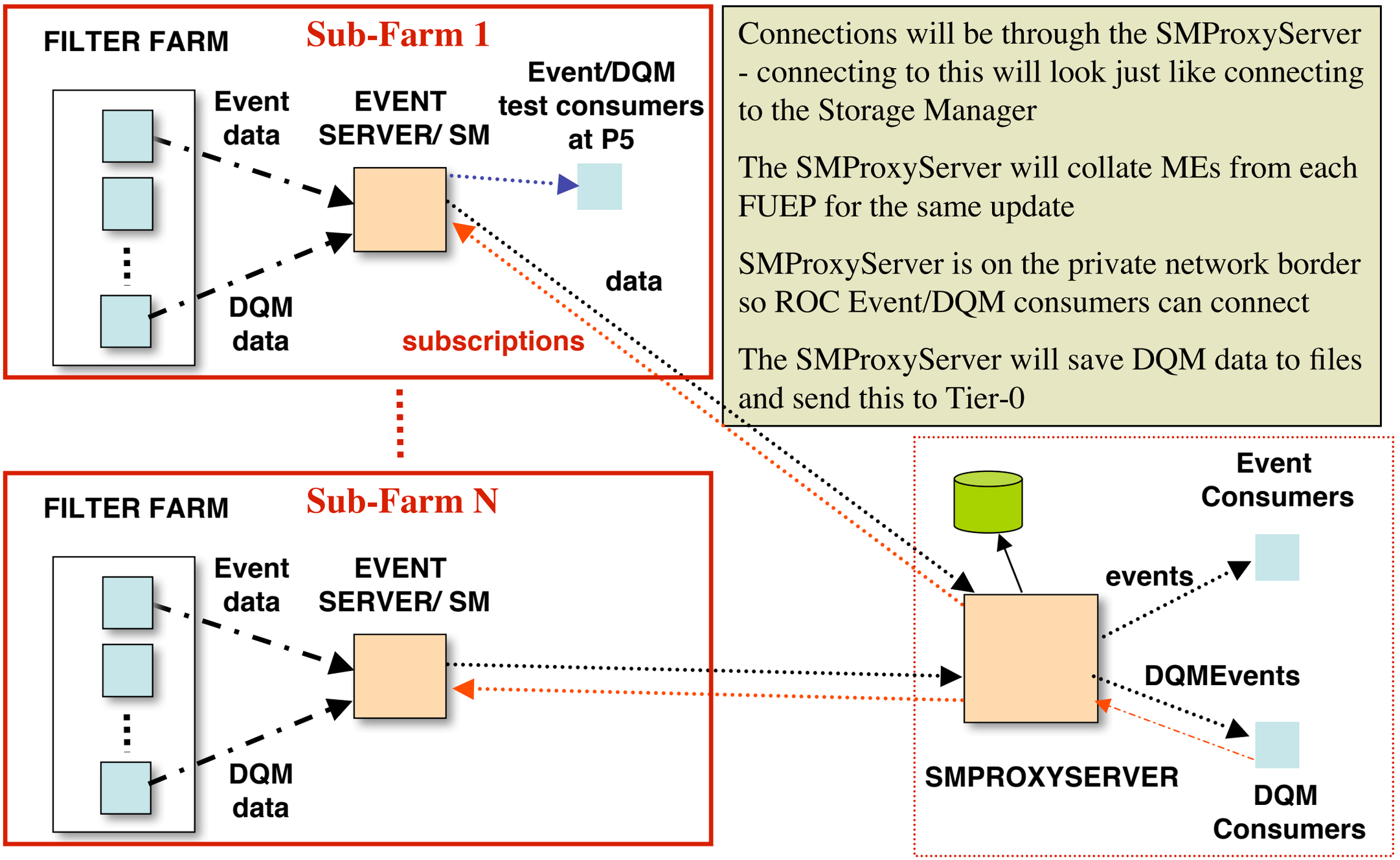
EXP. OR CAMPUS NETWORK
MUST USE CMSSW
CAN USE RC
FREE ACCESS TO DB (EXP)
DCS: via PSX or DB
DAQmon: via DB



Individual subsystem consumers create DQM histograms and qtest results

General strategy (changed w.r.t. MTCC): SM event server as default source of DQM input
Parallel DQM processing of individual subsystem, avoiding involvement of HLT

Storage Manager Event and DQM Server



Connections will be through the SMProxyServer - connecting to this will look just like connecting to the Storage Manager

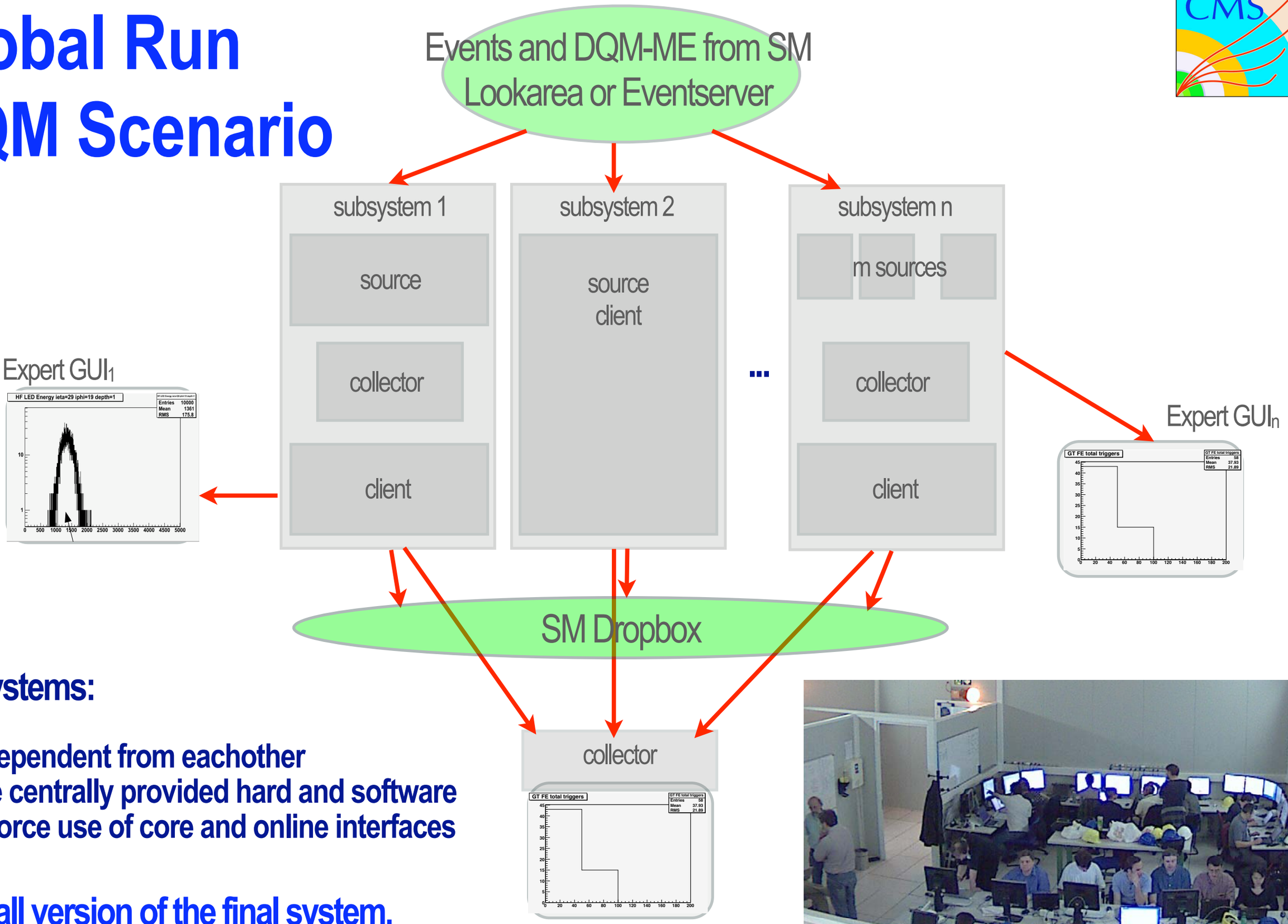
The SMProxyServer will collate MEs from each FUEP for the same update

SMProxyServer is on the private network border so ROC Event/DQM consumers can connect

The SMProxyServer will save DQM data to files and send this to Tier-0

Retrieve events (and collated DQM) by Http-Request to SMProxyServer

Global Run DQM Scenario



Subsystems:

- independent from eachother
- use centrally provided hard and software
- enforce use of core and online interfaces

A small version of the final system, growing each month

GREJ (Global Run End of June) Summary

Subsystems: HCAL, ECAL, DT, Trigger (DT-TF)

RCMS integration

- ✔ Deploy first version of Levelone DQM FM
- ✔ Automated production of client output files for all subsystems
- ✔ Deliver live monitorables to DQM GUI
- ✘ Use application with full XDAQ state (FUEventProcessor)

DQM Operation

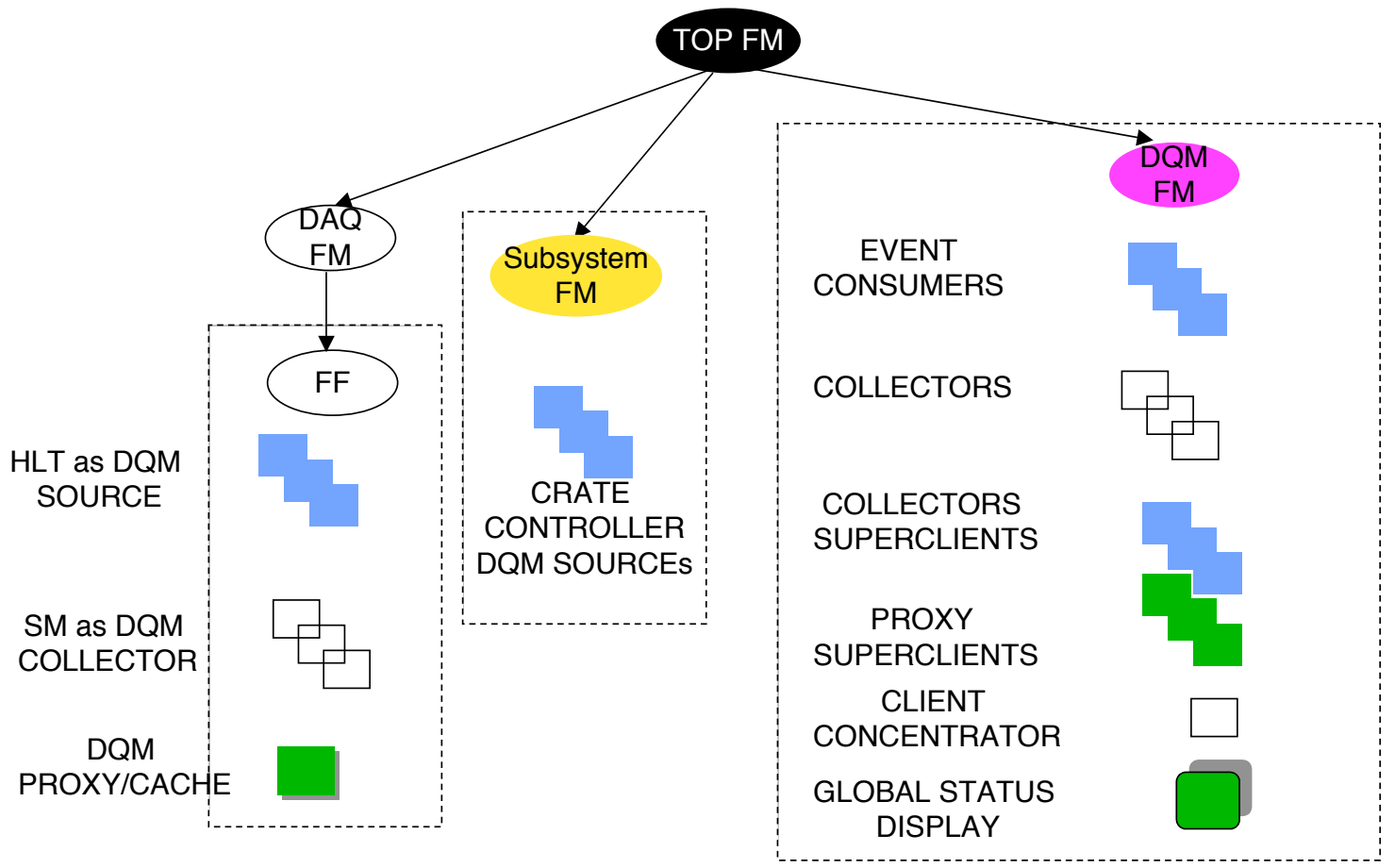
- ✔ Unpack events in DQM source (First DTTF unpacking of real data, debugged)
- ✔ Produce integrated source-client application
- ✔ Store DQM client output files in dropbox and archive on cmsmon
- ✔ ECAL: store client output also in ECAL Cond DB
- ✘ Test collection and saving of DQM-ME from FU to dropbox

Webserver DQM GUI

- ✔ Deploy first version with HCAL client
- ✔ Remote access through proxy server

Online DQM and Run-Control

- Sources and clients are XDAQ applications with standard message and error report lines
- DAQ will of course NOT stop if a DQM component is unavailable



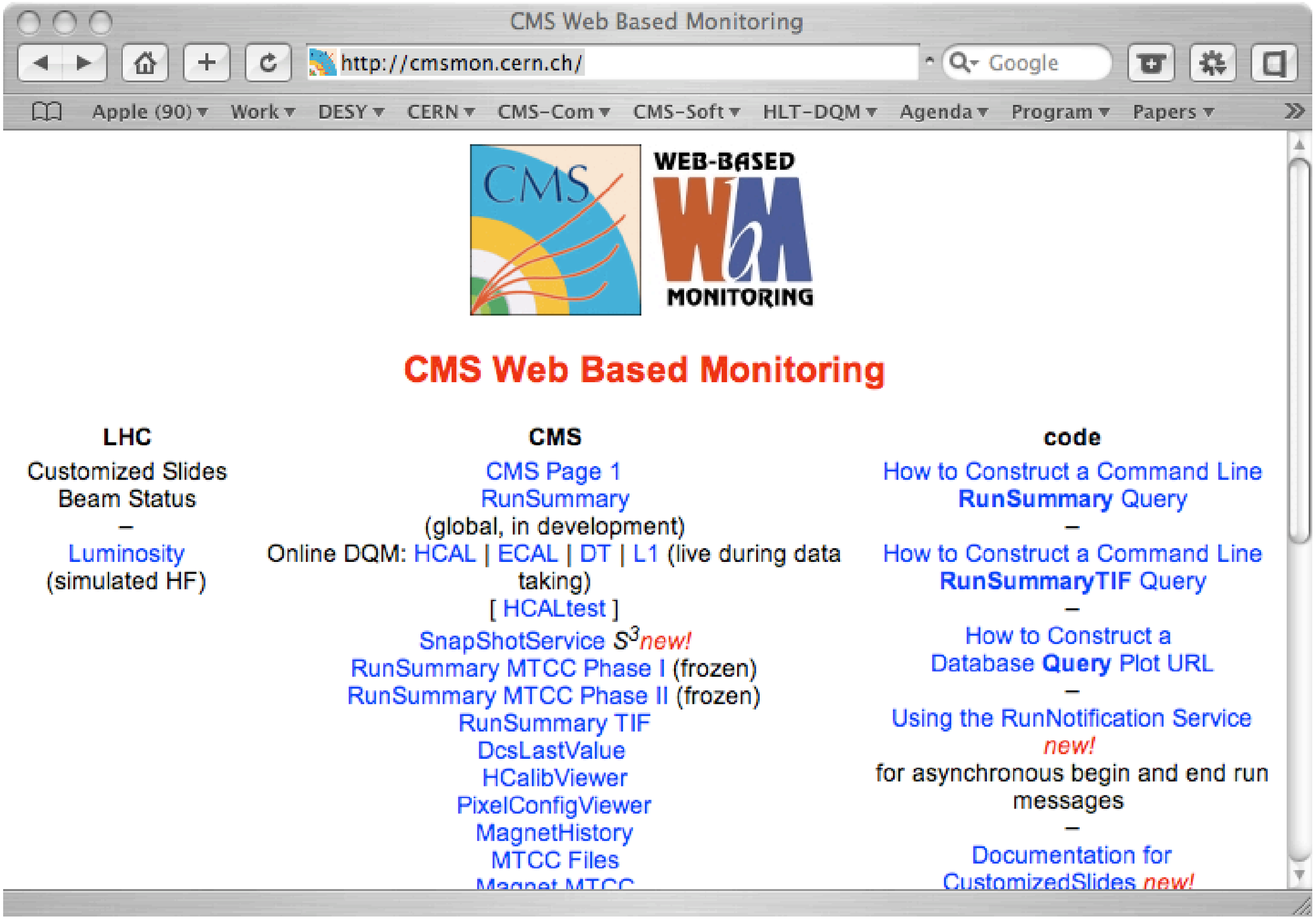
- First version of DQM Level-One Function Manager exists (deployed for June GR)

Plan for step-by-step integration with run-control until October

Web Based Monitoring

http://cmsmon.cern.ch/

Bill Badgett



Useful links to run information (including PVSS etc)

WBM DQM Browser

Archive – Download – Browse

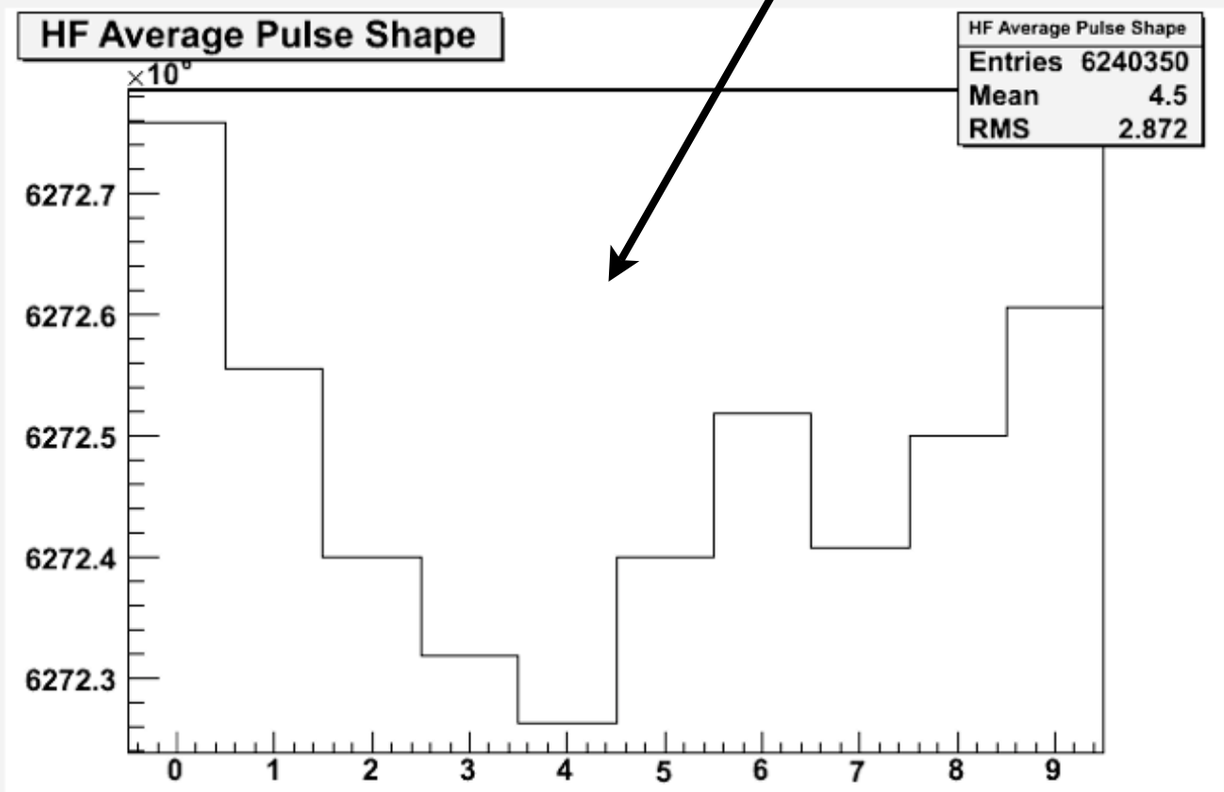
DQMBrowser

http://cmsmon.cern.ch/cmsdb/servlet/DQMBrowser?RUN=12436

Apple (90) ▾ Work ▾ DESY ▾ CERN ▾ CMS-Com ▾ CMS-Soft ▾ HLT-DQM ▾ Agenda ▾ Program ▾ Papers ▾ Misc ▾ Travel ▾ Mobile ▾ Computing ▾ News ▾

Run 12436
- RootFileTree
  - DQM_Hcal_Dt_Dttf000012436.root
    - DQMData
      - DT
      - HcalMonitor
        - TNamed: BEAM ENERGY [i=-1]
        - TNamed: EVT MASK [i=94]
        - TNamed: EVT NUMBER [i=432]
        - TNamed: RUN NUMBER [i=12436]
        - TNamed: RUN TYPE [i=-1]
        - TNamed: STATUS [i=2]
        - TH1F: TB Trigger Type
        - DataFormatMonitor
        - LEDMonitor
          - TH2F: DCC 0 Mean Energy Map
          - TH2F: DCC 0 Mean Shape Map
          - TH2F: DCC 0 Mean Time Map
          - TH2F: DCC 0 RMS Energy Map
          - TH2F: DCC 0 RMS Shape Map
          - TH2F: DCC 0 RMS Time Map
          - TH2F: DCC 1 Mean Energy Map
          - TH2F: DCC 1 Mean Shape Map
          - TH2F: DCC 1 Mean Time Map
          - TH2F: DCC 1 RMS Energy Map
          - TH2F: DCC 1 RMS Shape Map
          - TH2F: DCC 1 RMS Time Map
          - TH2F: DCC 10 Mean Energy Map
          - TH2F: DCC 10 Mean Shape Map
          - TH2F: DCC 10 Mean Time Map

RootDisplay
TH1F: HF Average Pulse Shape;1
Title: HF Average Pulse Shape
Path: /DQMData/HcalMonitor/LEDMonitor/HF
File: /cms/mon/data/dqm/online/000/012/436/DQM_Hcal_Dt_Dttf000012436.root



Axis Resize and Scale

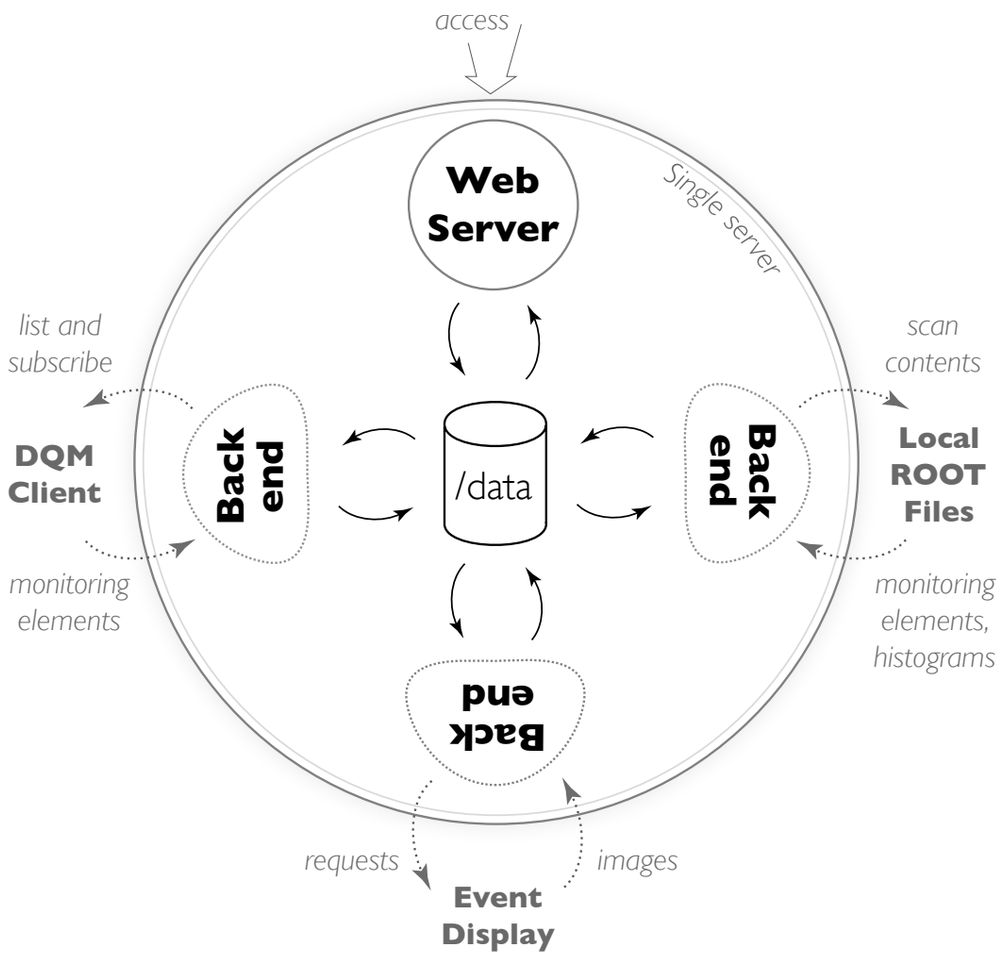
xMin xLog
xMax
yMin yLog
yMax

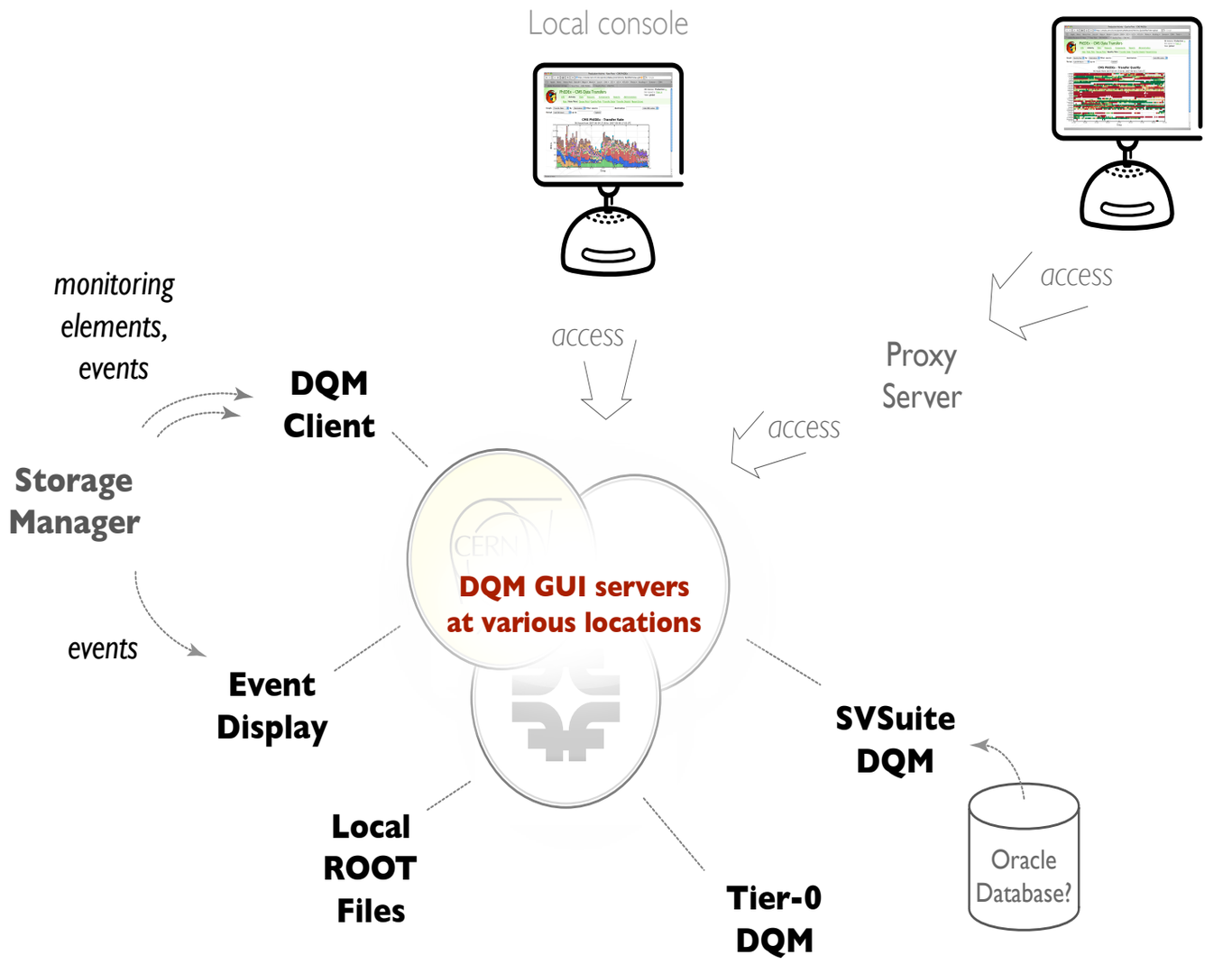
[eps | root]
min and max axis settings apply only to histograms
Submit

Remote access – Example HCAL distribution from GREJ run taken last week

DQM-Webserver

Lassi Tuura





Building a purely web-based DQM service for live and offline access (local and remote)

DQM-Webserver Development Plan

- Drawing on experience/code of Tracker DQM GUI, FNAL DQM Browser, Webtools and IGUANA
- Features:
  - histogram viewing and manipulation (e.g. zooming)
  - (geometrical) navigation
  - support of sub-detector plug-ins
  - ...
- Different backends for online and offline DQM at P5, ROCs, SVSuite, Tier-0/1
- Remote access through proxy-servers
- Timeline:
  - June GR: first simple version in P5 (successful)
  - August: support for display plug-ins and offline
  - September: navigation facilities
  - October: start help subsystems port their GUIs

Goal: Deprecate existing DQM-GUIs (IGUANA and XDAQ-based) by end of the year

DQM-Webserver

Remote access: see links from http://cmsmon.cern.ch

Lassi Tuura

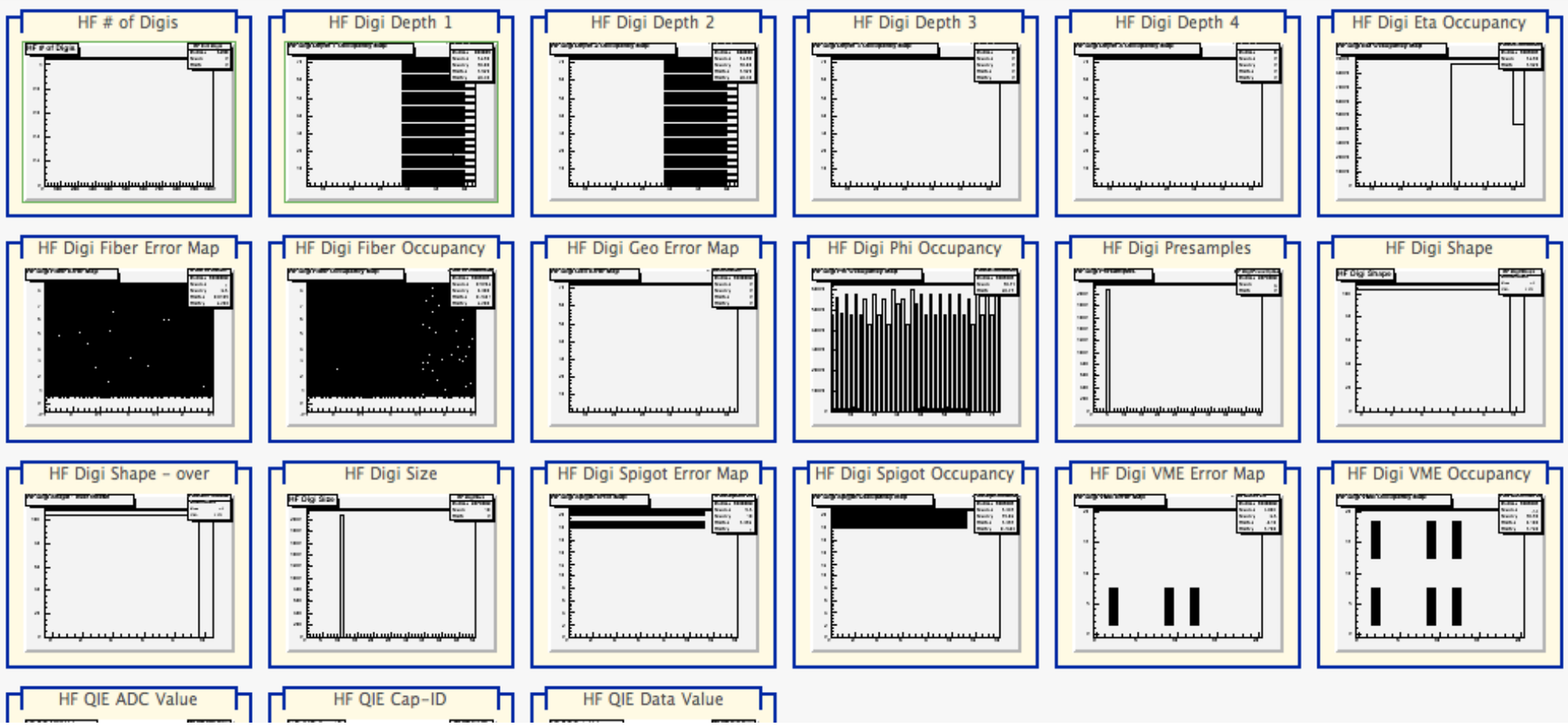
HCAL – Online data quality

This is pre-release version. Please file any feature requests and any bugs you find in Savannah.

Action: Subscribe, Unsubscribe, Reload

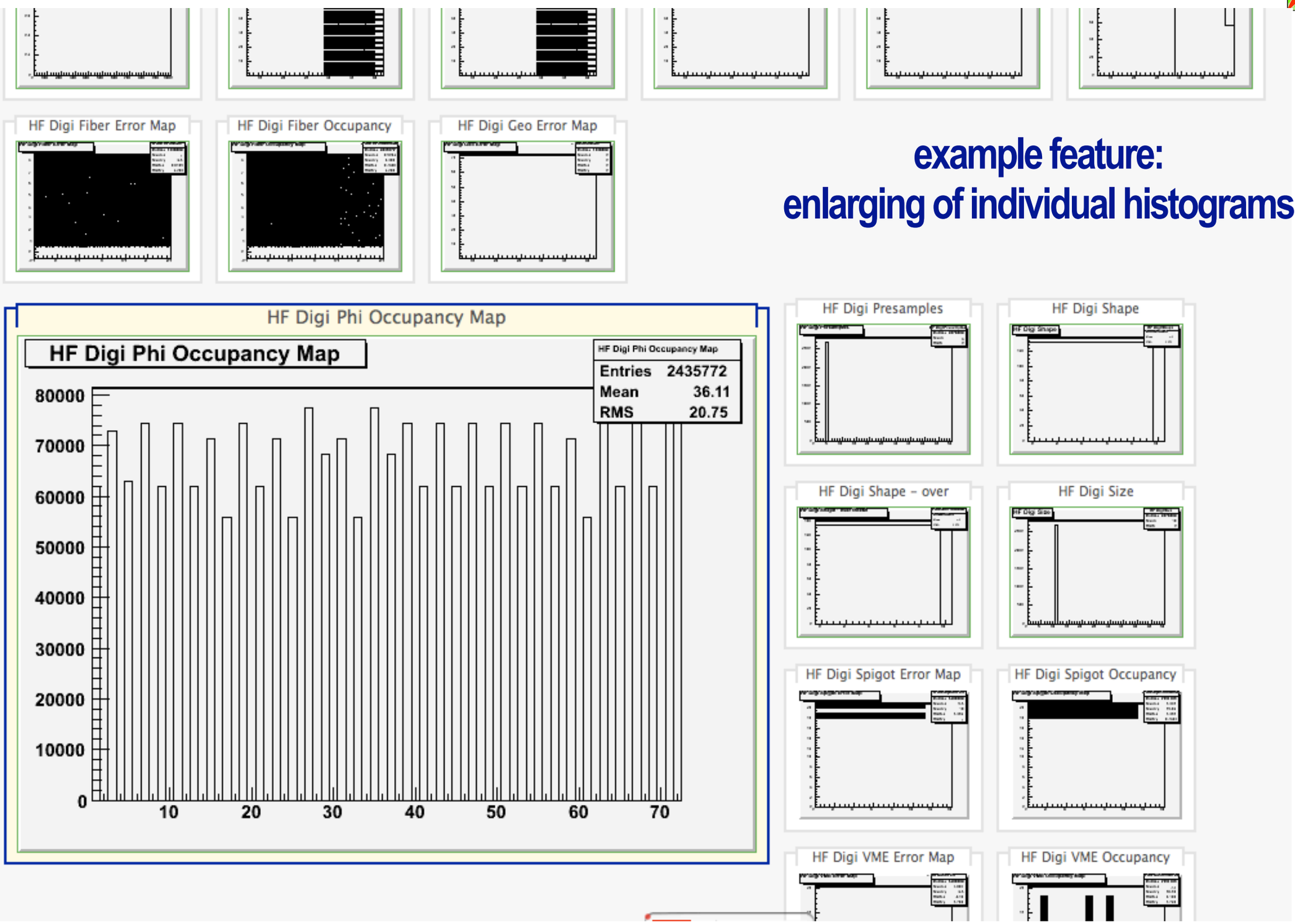
+ Layouts	+ ~~DQM~~	+ DT	+ DataFormatMonito	+ HB	* HF # of
+ 21 Collector	+ 21 LiveDQM	+ 21 HcalMonitor	+ 21 DigiMonitor	+ HE	* HF Digi
	+ ~~Playback~~	+ L1TMonitor	+ LEDMonitor	+ 21 HF	* HF Digi
	+ ~~Playback2~~		BEAM ENERGY	+ HO	* HF Digi
			EVT MASK	Digi Depth 1 Occu	* HF Digi

Select: All, None, Alarms, Non-alarms | Size: XS – S – M – L – XL



Pre-release version deployed very successfully tested/used by all subsystems HCAL, DT, Trigger

DQM-Webserver



Lassi Tuura

example feature:
enlarging of individual histograms

Very well received by subsystem DQM GUI experts

DQM Information / Communication

- **Project Documentation wiki-page on architecture, project document and near-future action items**
  https://twiki.cern.ch/twiki/bin/view/CMS/DQMInfrastructure

- **Contacts with subsystem responsibles largely established**
  https://twiki.cern.ch/twiki/bin/view/CMS/DQMSubDetectors

- **Hypernews forum on DQM development in active use**
  https://hypernews.cern.ch/HyperNews/CMS/get/dqmDevel.html

- **Weekly EvF/DQM Meeting (Thursdays 16-18)**
  http://cmsevf.web.cern.ch/cmsevf/DQMMeetings.html

DQM Plans

- DQM Framework software
  - Storage Manager / Event Server
  - Development (feature requests, e.g. reference histos, decorations and handling)
  - DQM GUI
- Online integration and operation
  - Integration with Run-Control
  - Output file archival retrieval
  - Database read- and write access, interface with XMAS
  - Support of subsystem integration
- Offline integration and operation
  - Integration with SVSuite, AliCal, Tier-0
- Subsystem Standardization / Coherence
  - Communication
  - DQ certification criteria (standardized detector status bits)

Will not be able to achieve all these goals w/o additional help — from Hamburg !?

Conclusions

- DQM development and integration activities ramping up
  - Global runs are very useful (and exciting)
  - Gather experience in integration procedures, commissioning, operation
  - Establish close communication, cooperation with and among subsystem experts

- DQM developments started:
  - Improvement/tuning of DQM framework software and applications
  - DQM integration with run-control started
  - Universal web-based DQM GUI project just started
  - Setting up an independent Storage Manager (DAQ) test stand for DQM development

- Topics yet uncovered (several rather well-defined tasks):
  - Offline DQM (e.g. DQM of alignment processing)
  - Non-event data monitoring, e.g. trigger scalers etc.
  - Framework development