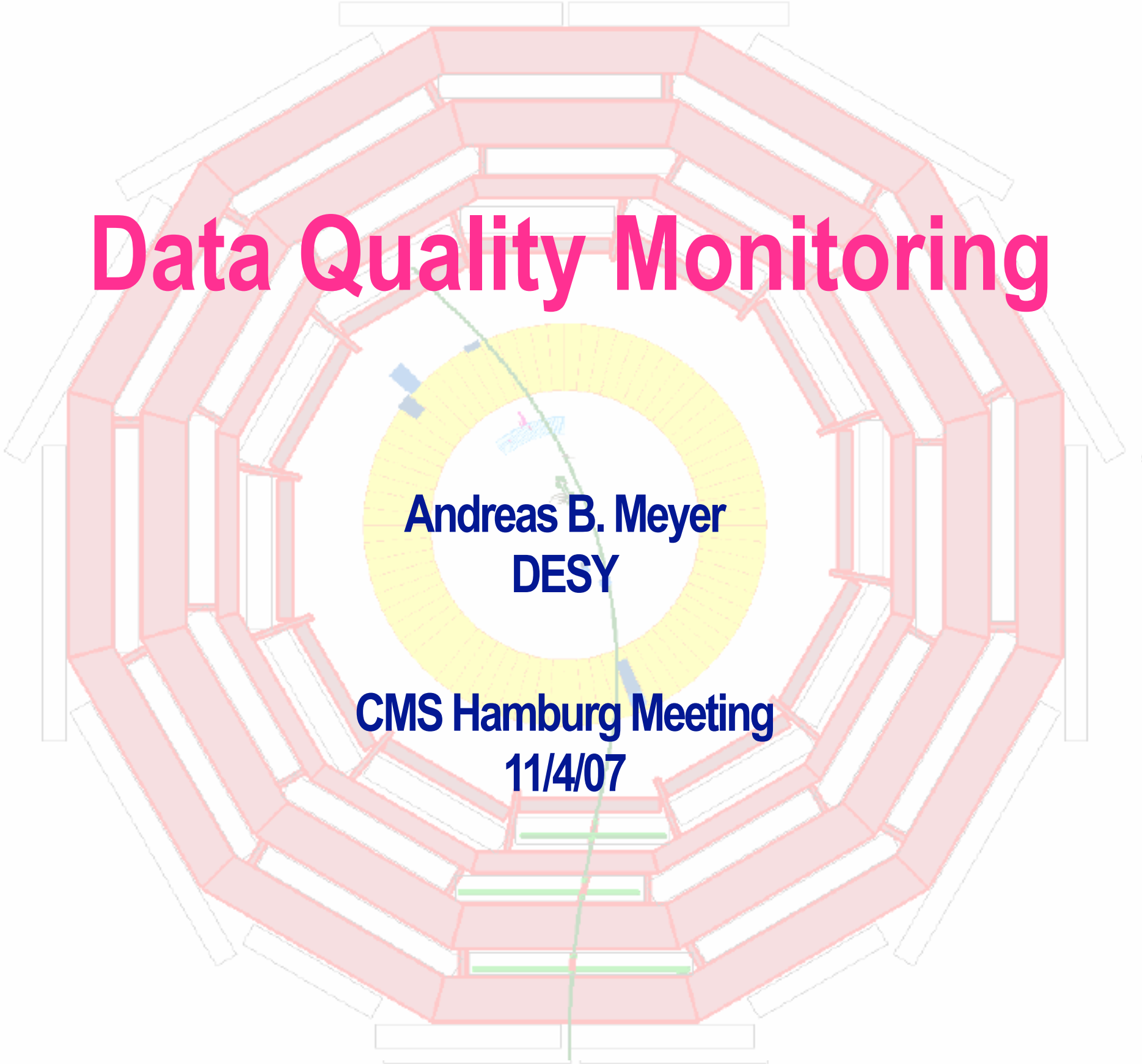
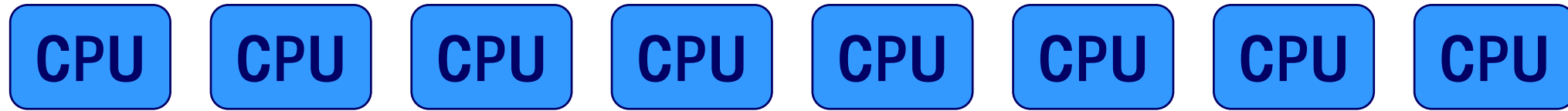


Data Quality Monitoring

A schematic diagram of the CMS detector, showing its complex, multi-layered structure. The detector is represented by concentric rings of red and white segments, with a central yellow ring. A green line runs vertically through the center, and a blue line runs horizontally. A small blue square is located near the center of the yellow ring.

Andreas B. Meyer
DESY

CMS Hamburg Meeting
11/4/07



Monitoring producers

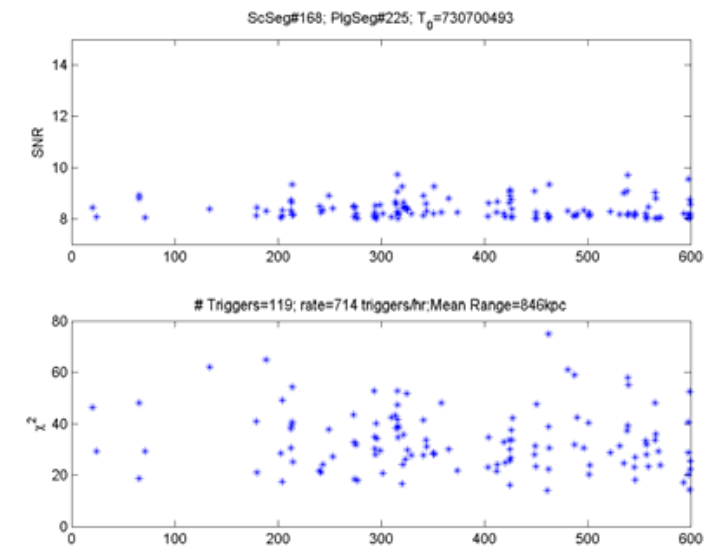
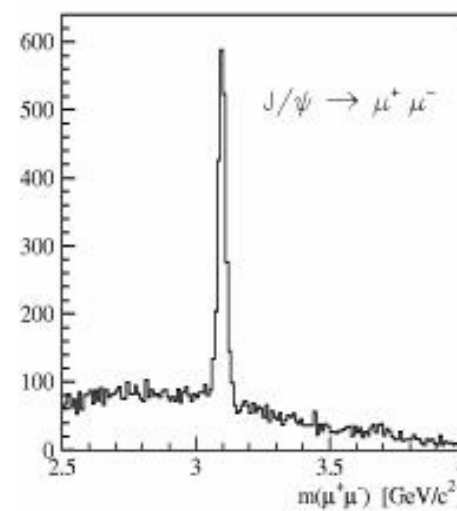
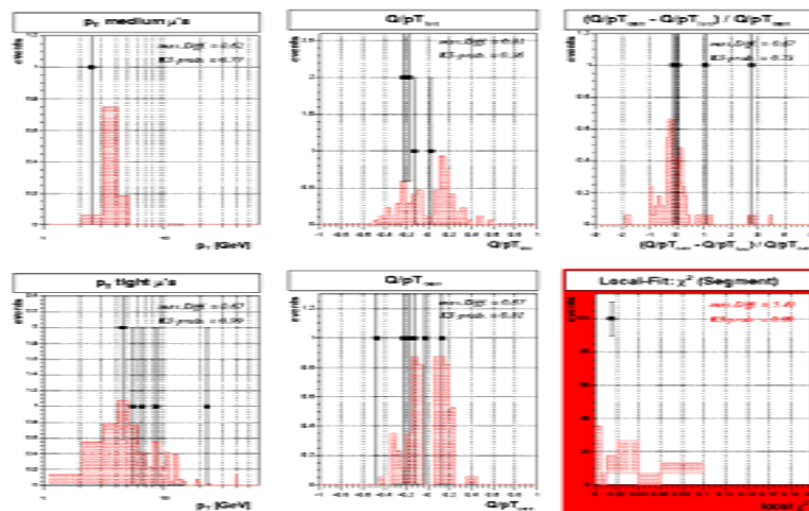
DQM infrastructure:
Collectors/Servers

**DQM principle: use
same code to serve
different customers
(DQM, analysis)**

Inputs

Physics objects

Triggers etc...

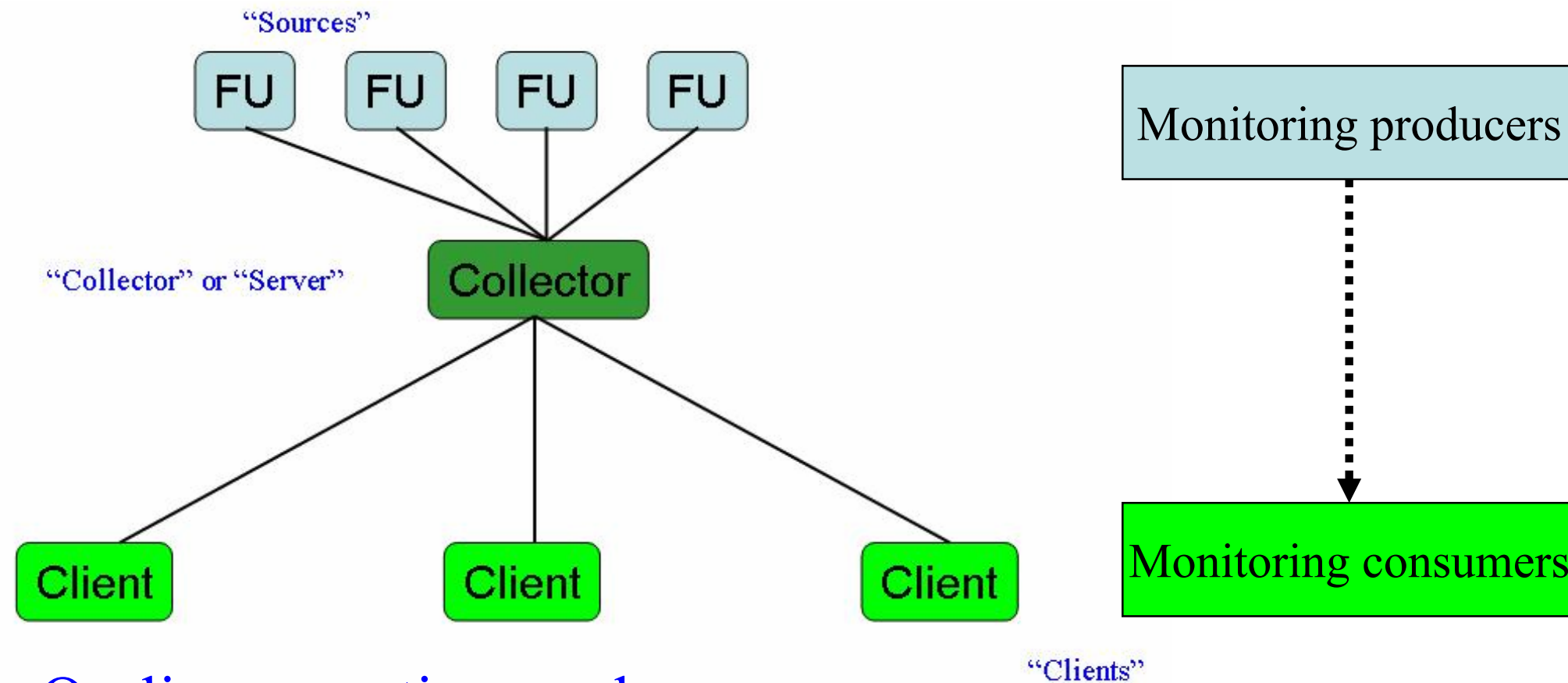
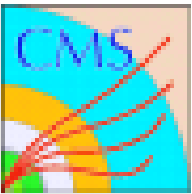


**Monitoring
consumers (clients)**

G.Della-Ricca

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

DQM Components



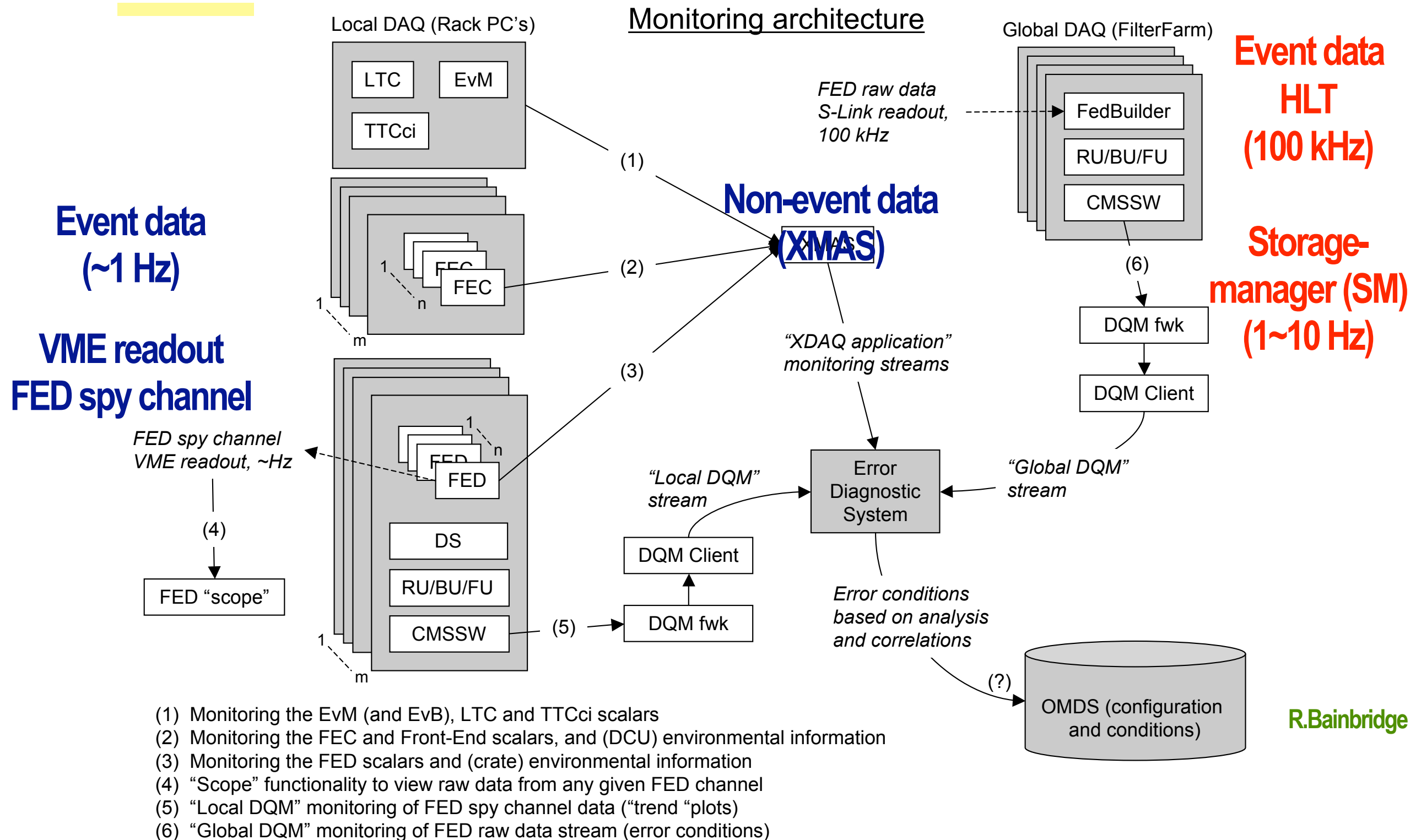
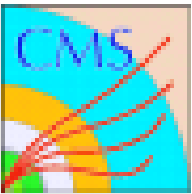
On-line operating mode:

Monitoring producers → server → 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)

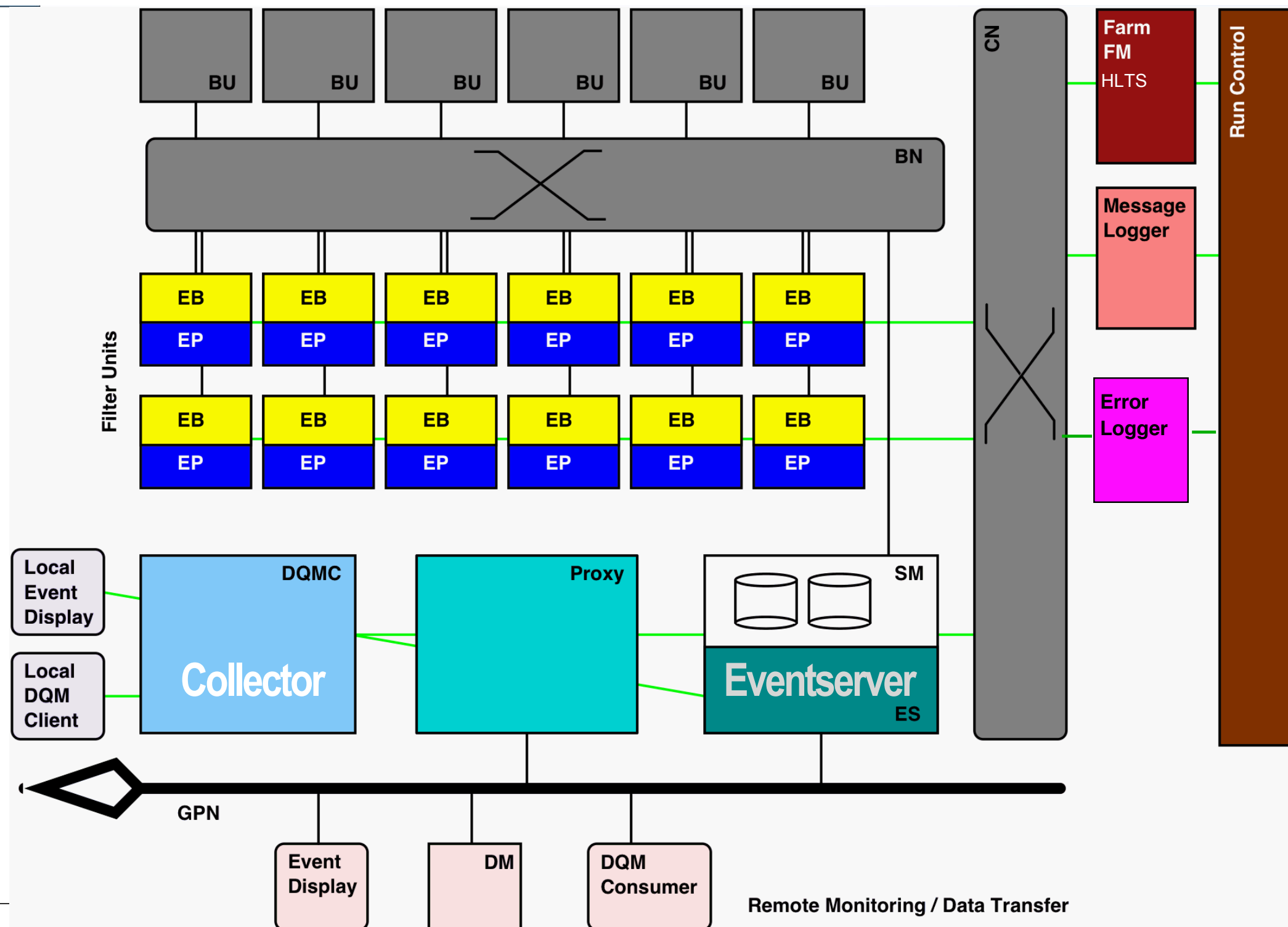
C.Leonidopoulos

CMS-online DQM Streams

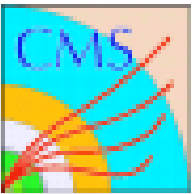


R.Bainbridge

Online Event DQM through HLT / SM



Online Event DQM through HLT / SM



■ HLT

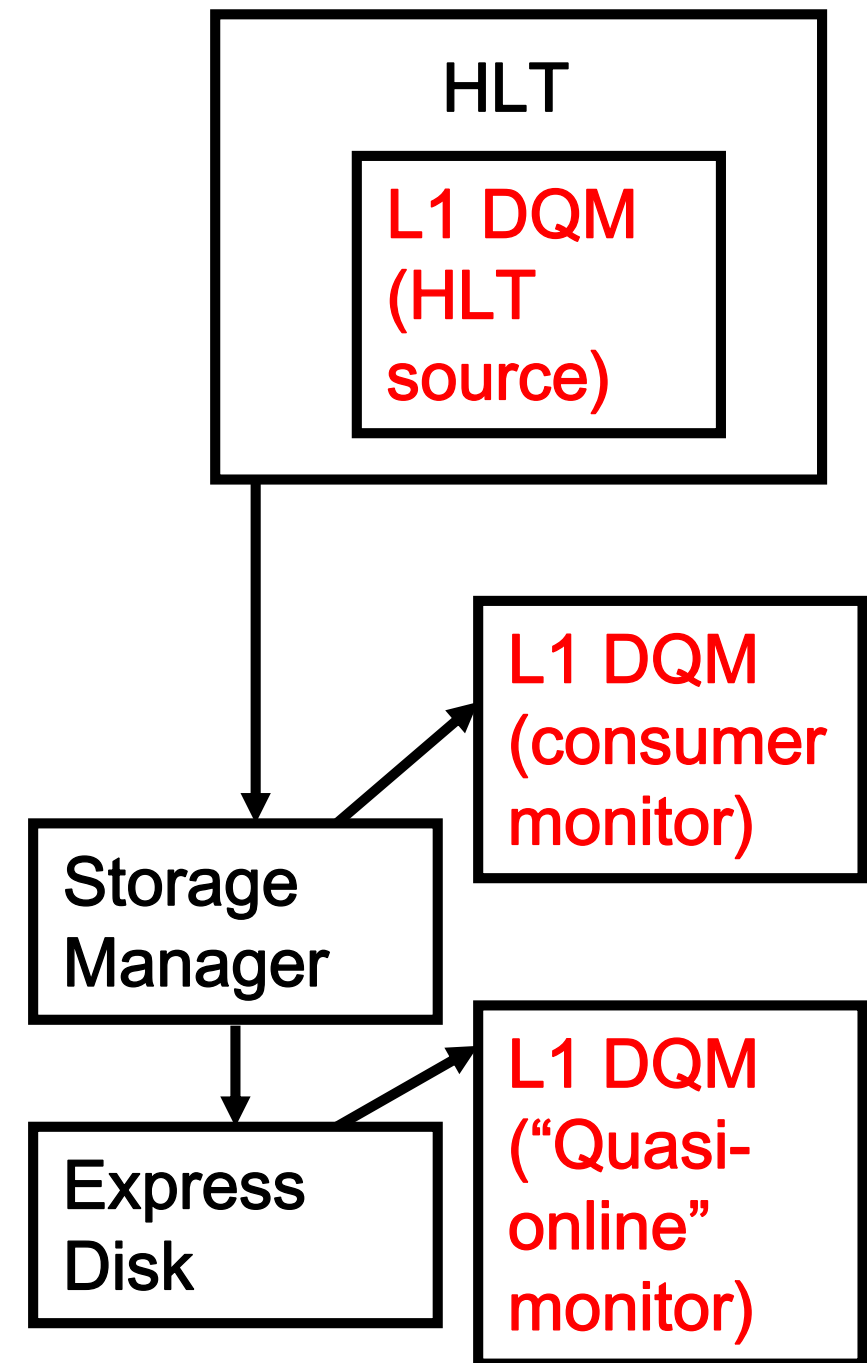
- Input rate: 100 kHz
- all L1 triggered events
- max. 10% of CPU for DQM
- max. 5% of bandwidth for DQM (1GB/s)

■ Storage Manager

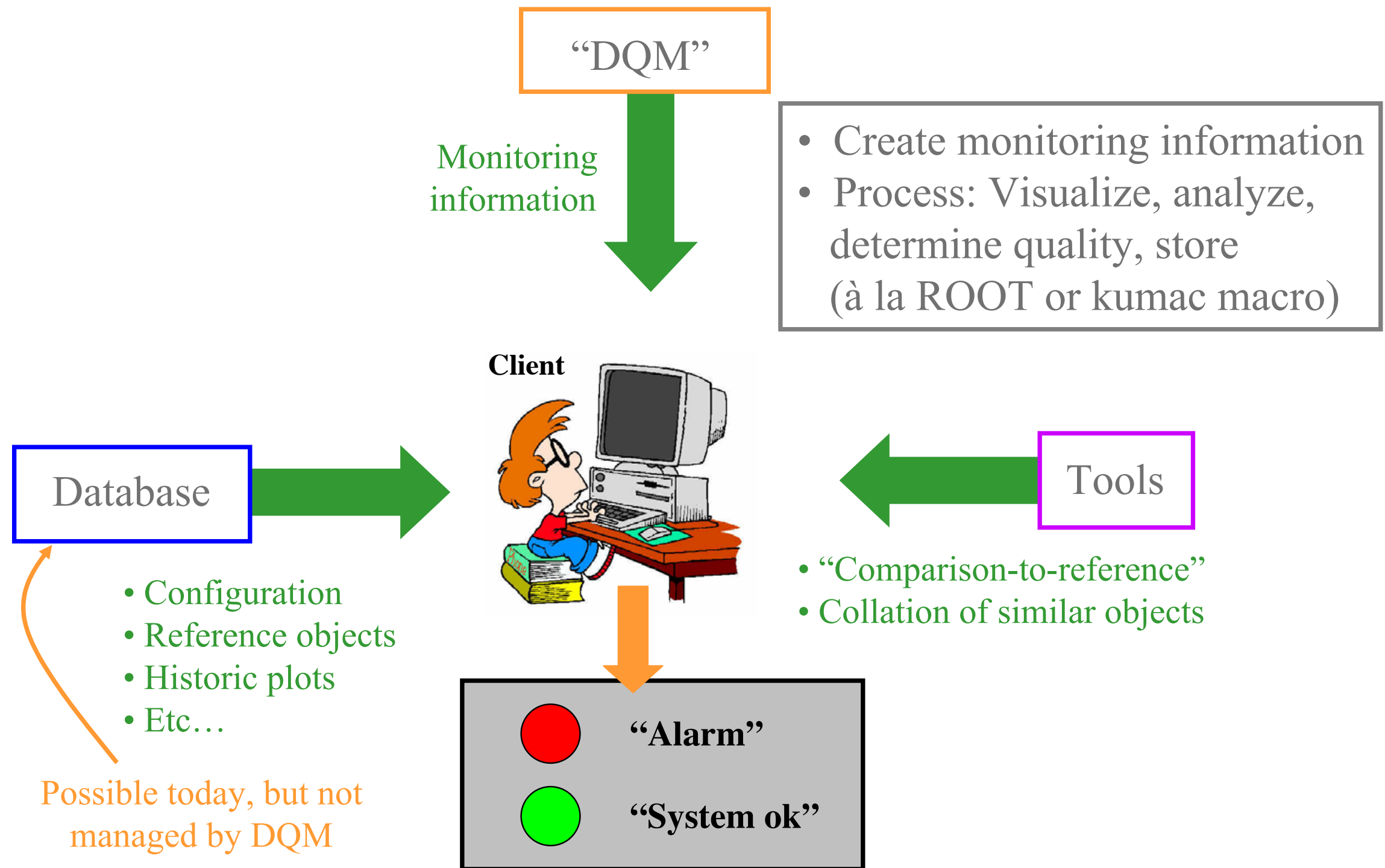
- receives Event and DQM data (1-10 Hz)
- run source on event consumer
- subsystem CPU
- Delay: seconds

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



DQM Clients / Automatic DQ Assessment



DQM: Validation Tools – Nov 8th, 2006

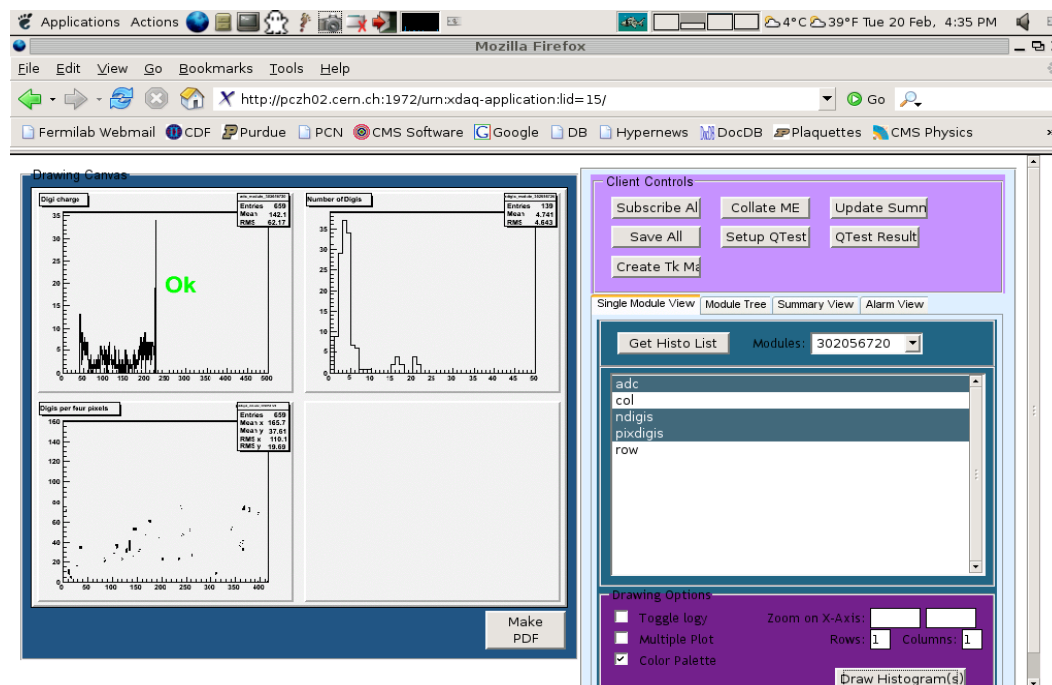
Christos Leonidopoulos 7

DQM GUI



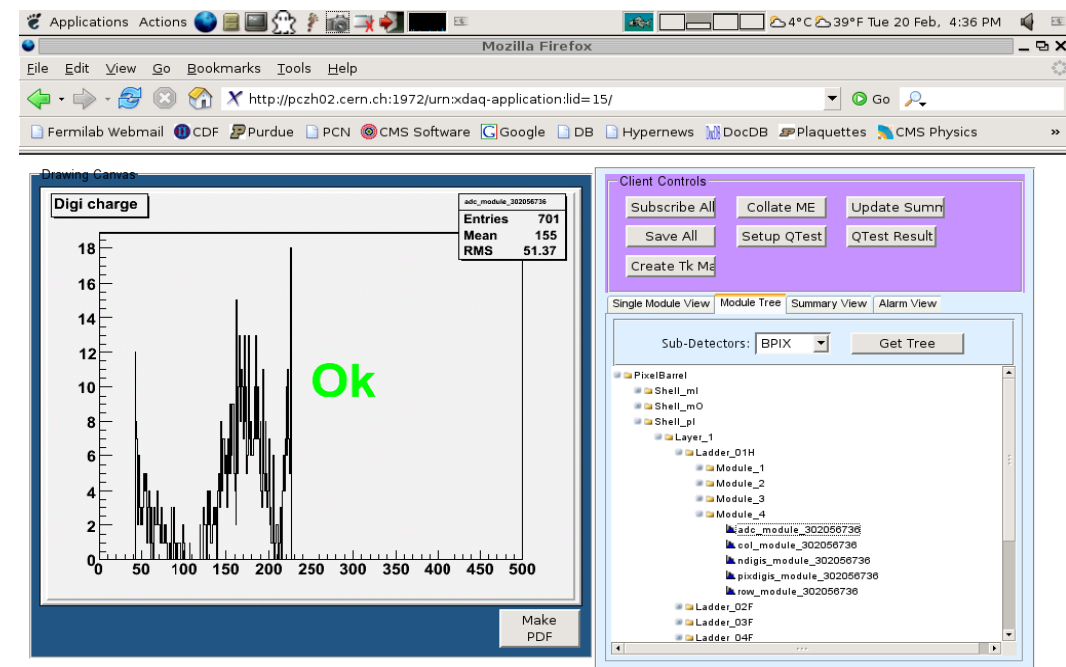
- **Display, Control of**
 - **DQM Monitoring Elements**
 - **Reference Histograms**
 - **Detector Status after processing**
 - **Expert Level**
 - largely under control of subsystems
 - **Shift Level**
 - needs to be homogeneous, provide access to expert level
- **Navigation !!**
 - **Different views (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



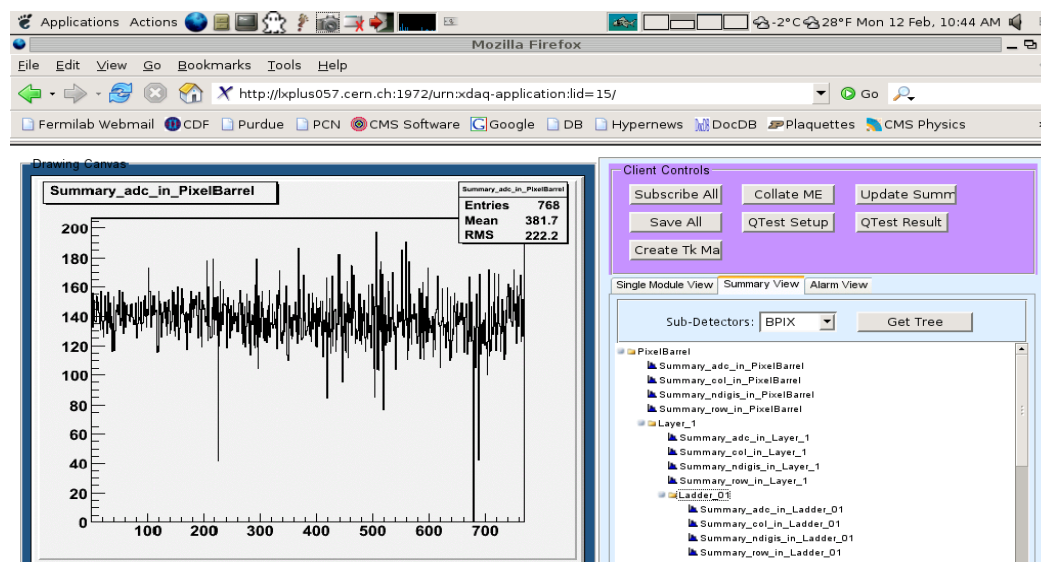
Transferring data from pczh02.cern.ch...

Single module view

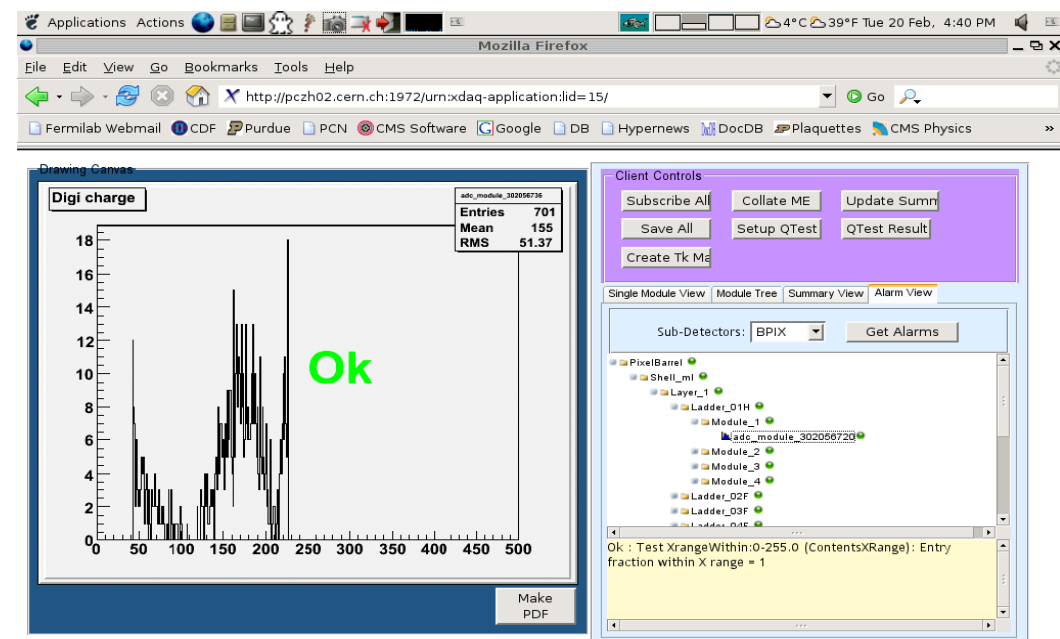


Transferring data from pczh02.cern.ch...

Detector hierarchical view



Summary view

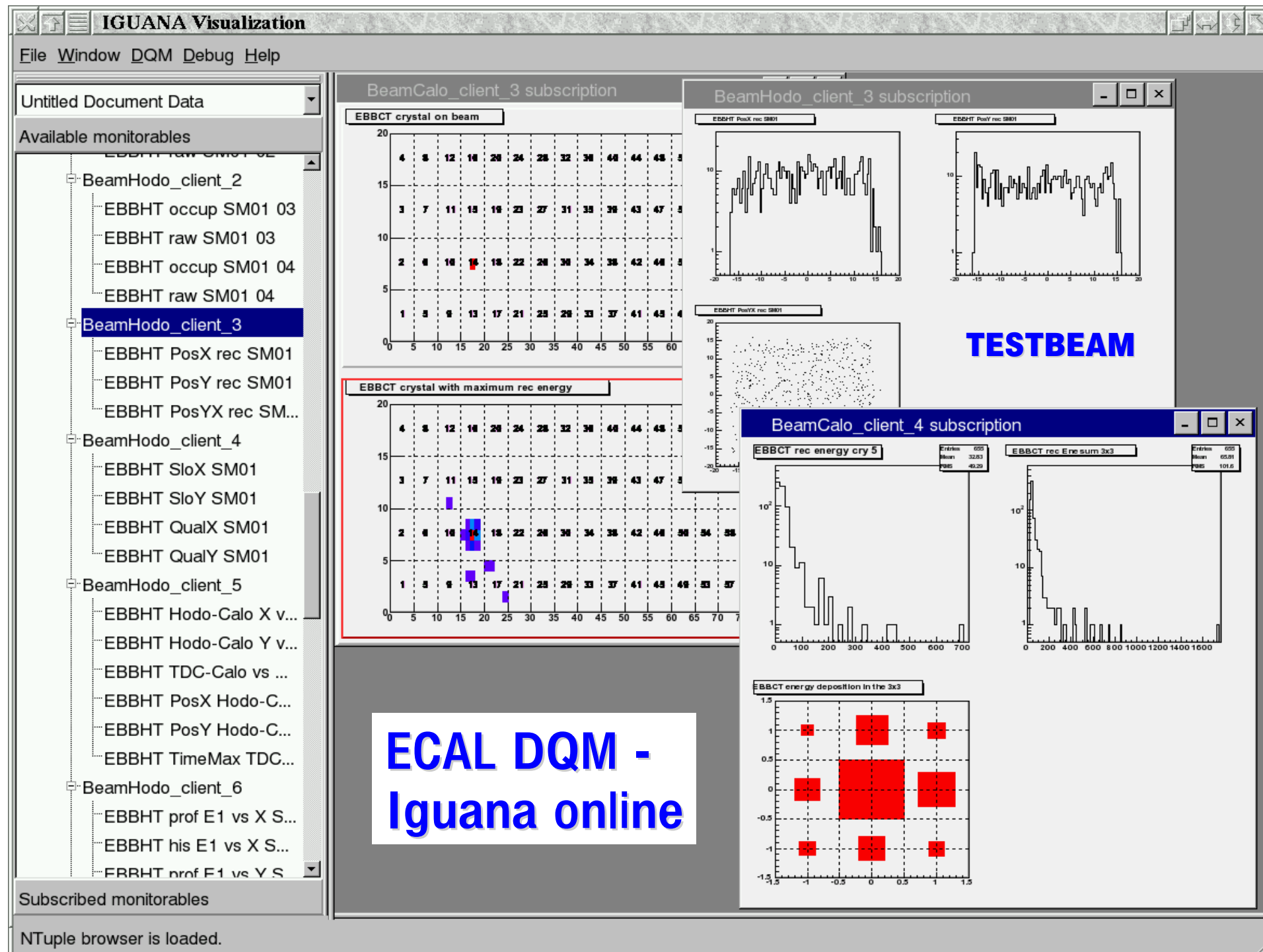
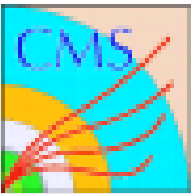


Alarm view

V.Chiochia

Commands to Client via Ajax (Javascript)

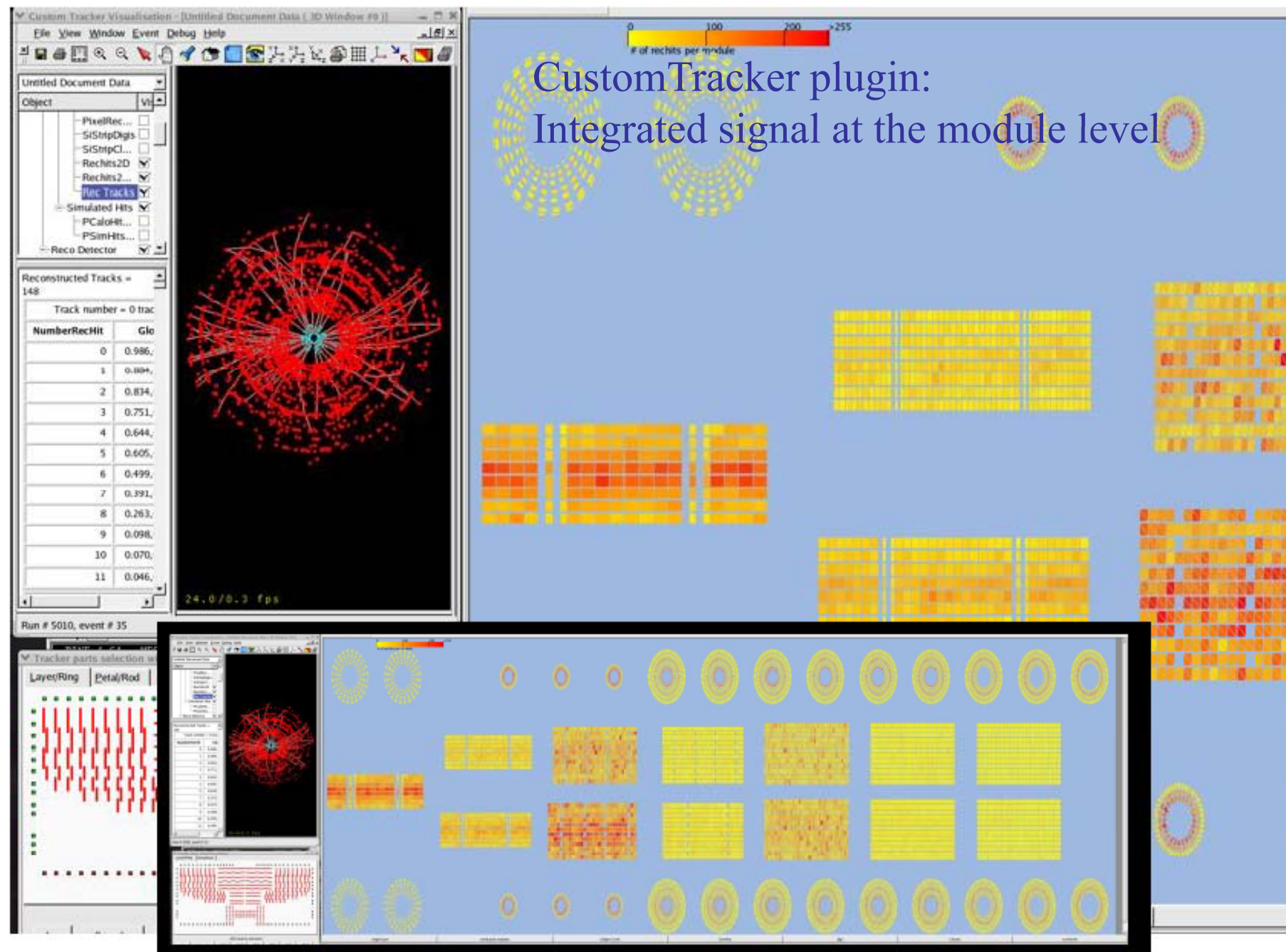
IGUANA GUI



G.Della-Ricca

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
 - [RPC DQM Twiki page](#)
- **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)

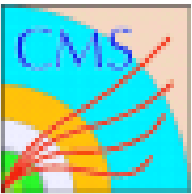
- What/where is the hardware to run the DQM source and clients on?
 - HLT vs. SM
- What to do with accumulated info and how to analyse it?
 - 'superclients'
- Where do I send my output ?
 - archiving and reference histogram scheme
- What do I use for display (GUI) ?
 - IGUANA vs. Ajax/XDAQ
- How do I 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

File Edit View Go Bookmarks Tools Help

http://cmsdaq.cern.ch/cmsmon/cmsdb/servlet/RunSummary

News Maps CDF cms running util

Rows: 1 Data: [root](#) | [text](#) | [xml](#) | [query](#)

RUNNUMBER	USERNAME	SEQUENCE	BOOKINGTIME	RUN_MODE	START_TIME	STOP_TIME	TRIGGERS	EVENTS	MAG_CUR_AVG	BFIELD
2600	toppro	CESSY_DAQ	2006.08.27 13:40:22	null	2006.08.27 15:40:22	2006.08.27 16:59:42	776957	776956	18159	3.7995

Components: [CSC](#) [DAQ](#) [DT](#) [ECAL](#) [HCAL](#) [TRACKER](#) [TRG](#) Links: [eLog](#) [DQMBrowser](#) [CERN](#) | [FNAL](#)

Rows: 3 Data: [root](#) | [text](#) | [xml](#) | [query](#)

COMPONENT	AVERAGE_RATE_HZ	AVERAGE_SIZE	AVERAGE_SIZE_RMS	N
BU_PERFORMANCE	32.132	184517.114	4422.438	403
EVM_PERFORMANCE	175.121	72.000	0E0	73
RU_PERFORMANCE	169.391	37247.714	947.717	361

LTC_CONTROL Conditions				LTC_CONTROL Rates, n=80		MagnetStatus	
Trigger	Name	Enable	Count				
0	DT	1	n/a	AVERAGEDEFFICIENCY	0.863	Temperature, °K	4.900 n=429 2006.08.27 14:59:32
1	CSC	1	n/a	AVERAGEDL1ARATE	163.516	Temperature, Min, °K	18156.000 n=52 2006.08.27 14:53:40
2	RBC1	1	n/a	AVERAGEDRAWL1ARATE	184.538	MAGNET_CURRENT, A (average)	18159.000 n=4 2006.08.27 14:14:10
3	RBC2	0	n/a	BLOCKEDTRIGGERS	35172.412	BField, Tesla	3.800 n=4 2006.08.27 14:14:10
4	RPCTB	1	n/a	EFFICIENCY	0.855	VACCUUM, bar	806.9693E-9 n=0 * 2006.08.27 11:38:30
5	na	0	n/a	L1ARATE	162.495	* no values during run; last value before run is shown	
6	RAM		n/a	RAWL1ARATE	182.939		
7	VME		n/a				

Done

Link to DQM results

click to plot magnet current history

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