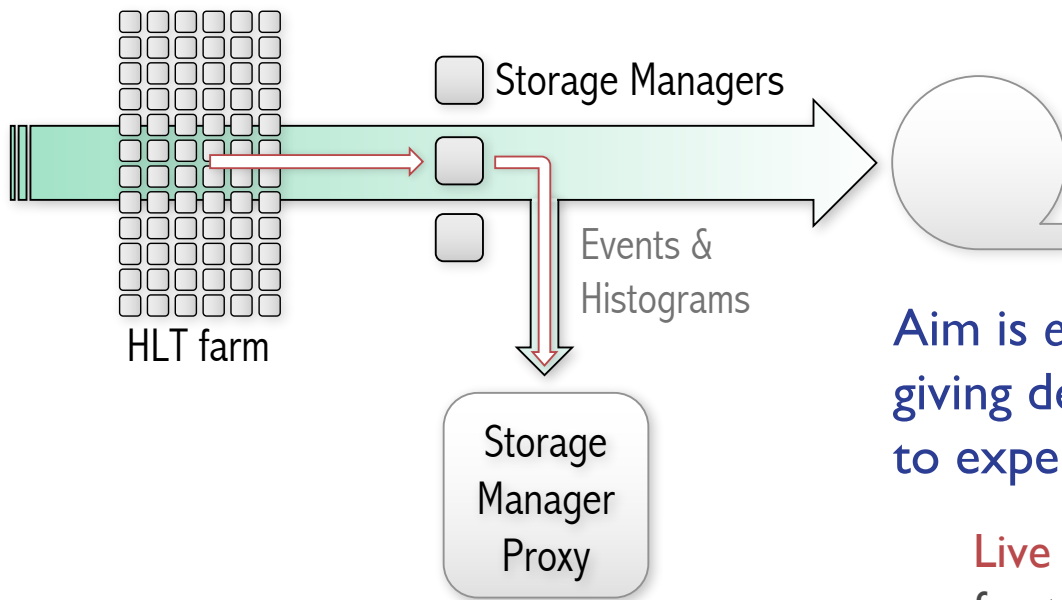# DQM

DESY group:
A.Meyer, J.Olzem, A.Raval, D.Krücker, N.Pietsch
(previously also M.Marienfeld, D.Volyanskyy)

Online DQM

Aim is *efficient detector and operation* by giving detector and trigger status feedback to experts and shifters.

Live display at Δt ~ seconds plus 1TB space for the archive of recent runs accessible to the entire CMS in real time.
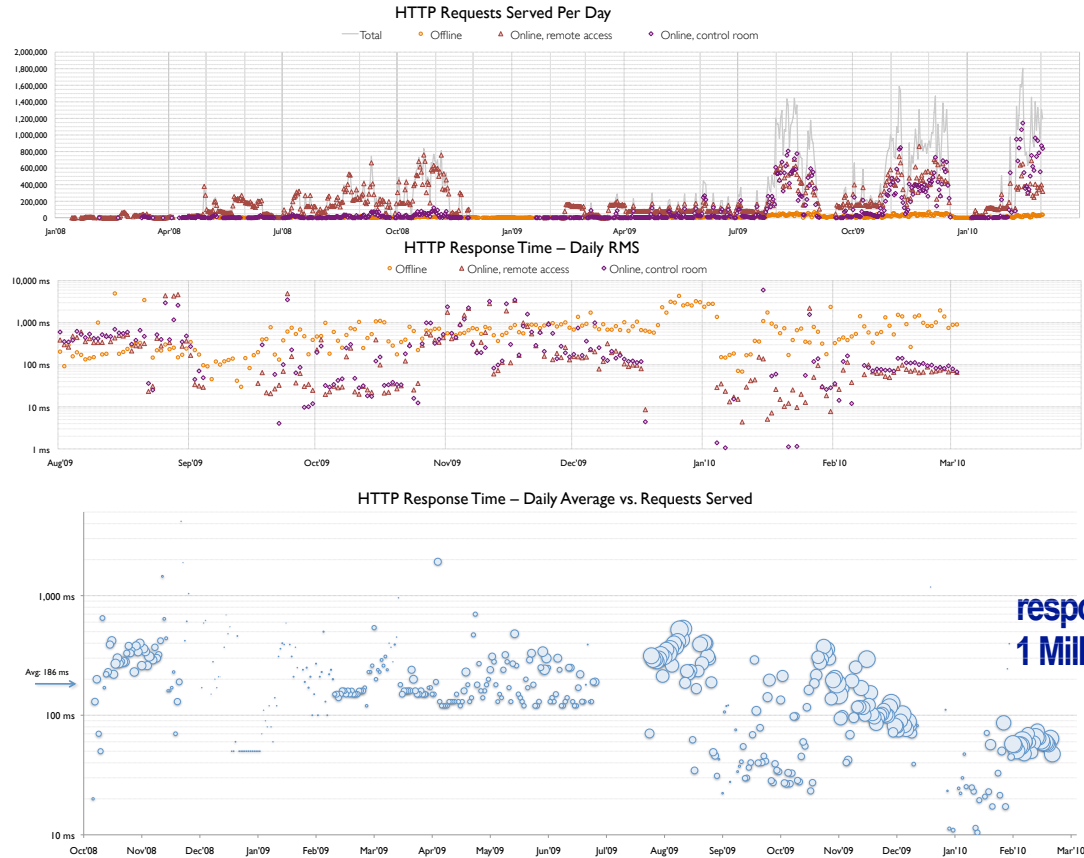
~300k histograms produced on DQM cluster, ~50k shown in GUI. HLT: 15 trigger monitoring, 3x8 FED subsystem histograms.

Continuous, dead-line free integration of the full DQM chain in a replica playback system.

Online results, initial run summary made available to offline analysis and processing.

Includes online detector quality summary and other key values in conditions database.

Storage Managers

Events & Histograms

HLT farm

Storage Manager Proxy

Run Control

CSC | DAQ | DT | EB | EE | HLT | HCAL | L1T | L1TEMU | Pixel | RPC | Strip | HLX

Histograms and quality tests, shared memory while live, ROOT files for archival.

Run Registry

CMS data quality GUI test: 30129 - 3 - 1361: Everything, 1 / 15

DQM GUI

Online Infrastructure: DQM GUI

response time ~60 ms,
1 Million requests / day

- **GUI next steps: Further improvements of navigation and histogram viewing**
  - **better navigation, inspection (e.g. top level frame, customization menus stick to glass, focus on single histogram)** https://twiki.cern.ch/twiki/bin/view/CMS/DQMGUIMenuUpdate
- **Handling/upload to files from other central workflows (CAF, manual harvesting)**
- **starting to**

Online Infrastructure: DQM Apps

strength: code and configs updates flexibly

- **Parallel processing inside online DQM (consumers)**
    - **i.e. online summation of histograms from different CPU**
        - **reusing infrastructure as implemented in DAQ/HLT**
    - **"COW-like" online DQM**
        - **hardware being put in place (parallel processing up to 8 core will be simple within foreseen system)**
    - **Dedicated developer (S.Morovic) working full time on this now (status next slide)**
        - **starting tests with production system at P5 next week**
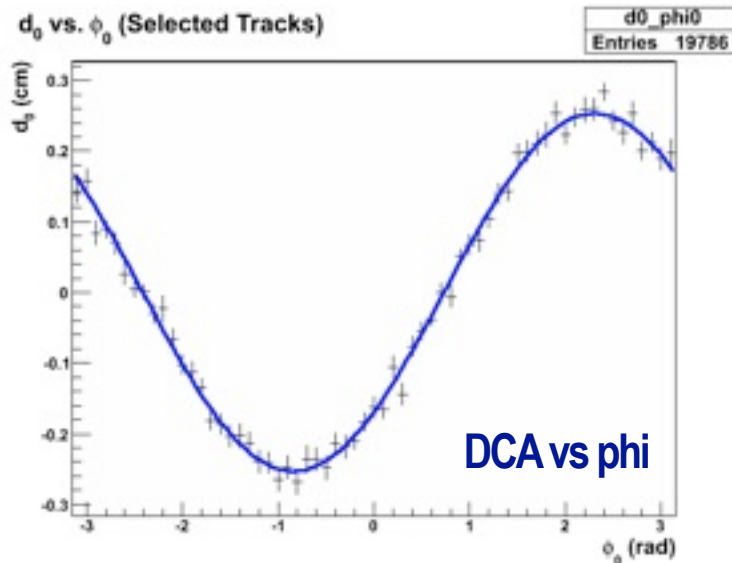
- **DQM inside HLT (during filtering)**   strength: huge number of cores (thousands)
    - **histogram collection had problems in the limit of low L1A rates (<< 100 kHz)**
        - **being debugged (almost working now)**
    - **used for L1/HLT monitoring**
    - **FED data integrity checking (1st version being deployed)**

Online BS Monitoring, e.g. run 124020

d₀ vs. φ₀ (Selected Tracks)

d0_phi0 — Entries 19786

DCA vs phi

Results of previous good fit

Error	0.000104232	0.00010473	0.174899	0.151422
Mean	0.194206	0.175682	-0.238969	4.33194
	x	y	z	sigma_z
	x_0	y_0	z_0	σ_{zs}

Fitted Beam Spot

sigma _x
sigma_y
dx/dz
dy/dz

Vertex (PCA) position of selected tracks

trk_vx_vy — Entries 20363

trk_y vs trk_x

x coordinate of beam spot vs lumi (Fit)

x0_lumi — Entries 134

x vs. LS
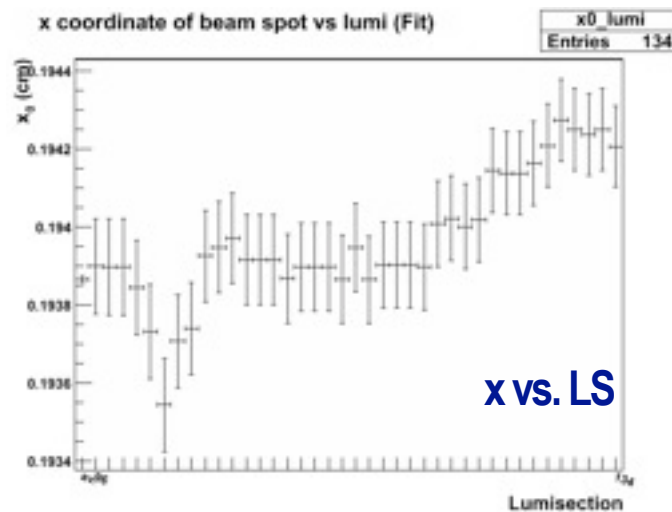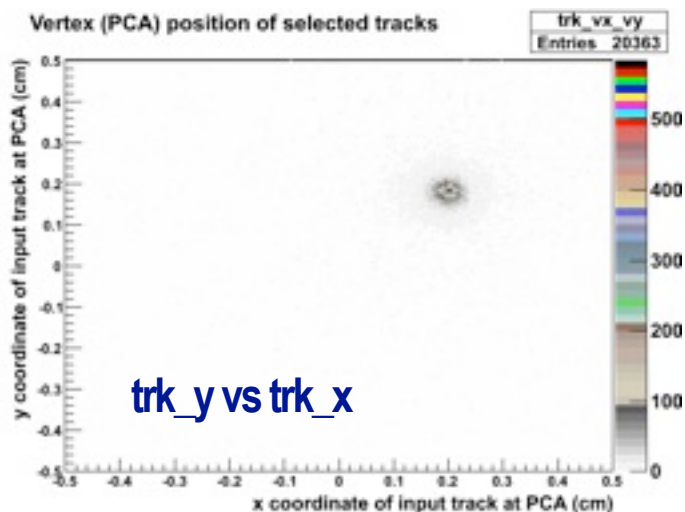
- **Upgrade for DIP: Pixel tracks/vertexing and full tracks/vertexing (2*8 values)**

Data Certification By-Lumi

- **Run Registry**
    - **Added by-Lumi information:**
        - **detector HV status, physics-declared bit**
        - **beams setup (intensity, energy, luminosity)**
    - **More plots producable in automated way (e.g. DCS status vs. LS)**
    - **Migrate server to WBM**
    - **Output good run list (JSON format) / input to CRAB**

DCS vs Lumi

Shifts

- **3 shift categories:**
  - **online, offline/remote, system operations/on-call**
- **Need to sustain 24/7 operation over coming 18 months**
- **Trying to build up DQM operations team**
- **Shift infrastructure documentation campaign**
  - **Improve shift instructions / shifts workspace (histogram descriptions, tutorial, tests, trainee shifts)**

Proposal for shift blocks (for P5 shifts)

The **shift selection** TAB looks as shown here: once one selects any shift In a block he/she get assigned the block
Blocks forbidden by CERN rules will not be selectable(or give rise to errors)
Once a shift block is assigned it cannot be selected by another user.
You have the possibility to assign one of your shifts to another shifter of equal competence in case of need.
Selection will be on a first come-first serve basis
Please take note that there are some 'single-shift-block' these are necessary for allowing people to max the # of shifts in given period without breaking CERN rules. They could be used at times to allow on-call experts to take some field shift to keep in touch with 'reality'

Summary

Gearing up for real and sustained operations

- **DQM GUI: improved navigation and histogram viewing | workflows | maintainance tools**
- **Data Certification: Run Registry:**
  - **Relevant by-Lumi information added**
  - **Move to Web-based monitoring server (requires SL5 in online)**
  - **Good run list output file RR -> direct input to CRAB**
- **Online DQM**
  - **Infrastructure: parallel processing | improve trigger selection (SMPS) | graceful stopping of runs (FU)**
  - **Injection of online DQM results in online DB and DIP (requested by lumi and beamspot monitoring)**
  - **FED integrity checking in HLT**
- **Offline DQM (not addressed in detail)**
  - **By-Lumi certification: implemented for 3_5_0**
  - **harvesting: Manual harvesting still required for Tier-1, Tier-2**
  - **Reference histograms from DB: all components existing | automation still needs work**