DQM

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TRG/DAQ workshop

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DQM viewer upgrade

JSROOT based DQM is now in operation!

- jsroot: https://root.cern.ch/js/

- Histograms in TMemFile are packed into TCanvas

- Shown in web browser of CSS (internal browser) by THTTP

DQM histogram sources

hltout

hrelay

exp. reco

hrelay

TMessage (TH1)

hserver

dqm machine

hserver

TMemFile

TMemFile

TH1

dqmana.py

TMessage (TCanvas)

canvasserver.C

Browser GUI

Browser GUI
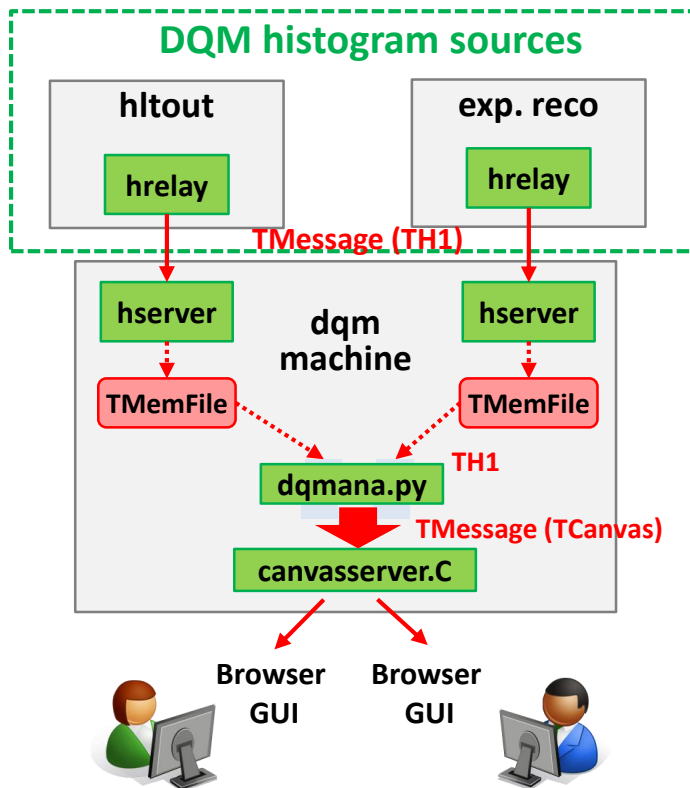
3 components working in the new scheme

- basf2 in HLT/expreco analyize online data togenerate histograms same as before

- dqmana.py (basf2 script) analyize histograms to pack into TCanvas

  - Adding new modules for dedicated analysis

  - Reference histogram can be added here

- canvasserver.C (root script) accepts TMessages with canvases and distributes them to browsers (THttpServer)

  - CSS and browser are available as viewer

Canvases in jsroot

- running in http://rc01.b2nsm.kek.jp:8082
  -> available using ssh tunneling: ssh -L 8082:rc01:8082 -f -N bdaq.local.kek.jp
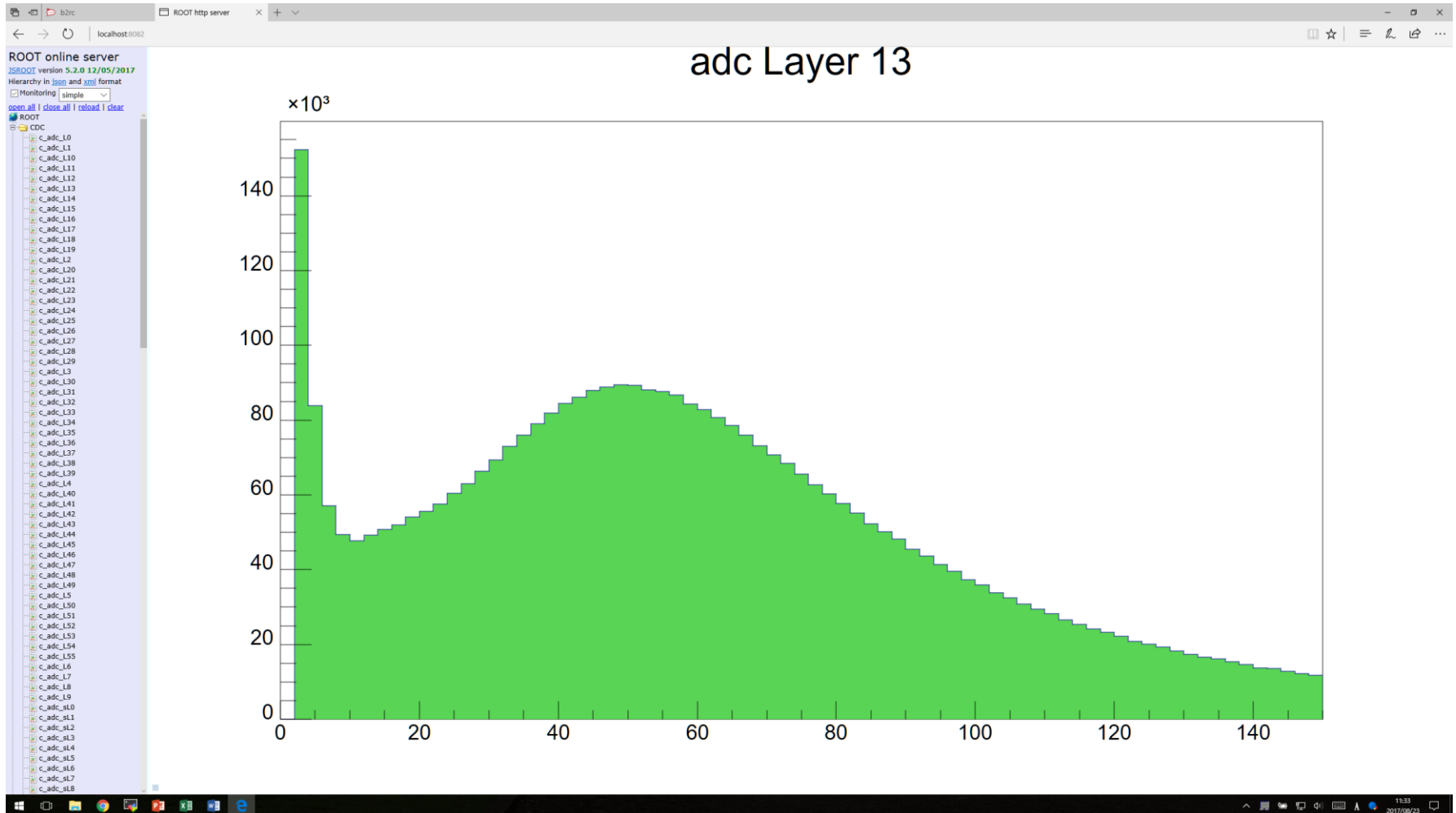
Adding histogram analysis module

DQM histogram analysis is now in a basf2 module

- DQMHistAnalysisInput extracts histograms from TMemFile
  - Provides canvas per histogram by default (shown in the GCRT)
- **Detector experts are expected to add their own modules**
  - An example code of analysis module is in Belle II git: daq/dqm/analysis/modules/DQMHistAnalysisExample.h

```
void DQMHistAnalysisExampleModule::event()
{
  TH1* h = findHist(m_dirname, m_histoname);
  if (h != NULL) {
    m_c->cd();
    h->Draw();
    TString a = m_dirname + "_" + m_histoname;
    h->Fit("f_"+a);
    m_c->Update();
  } else {
    B2WARN("Histo " << m_histoname << " not found");
  }
}
```

DQMHistAnalysisExample is extended from DQMHistAnalysis (extended from HistoModule)

- **event**() is called at every refresh of histograms in memory : ~ 5sec
- **findHist**() finds histogram in the memory
- TCanvas::**Update**() is called in the end
  - Canvases are transferred by DQMHistoAnalysisOutputReplyMsg
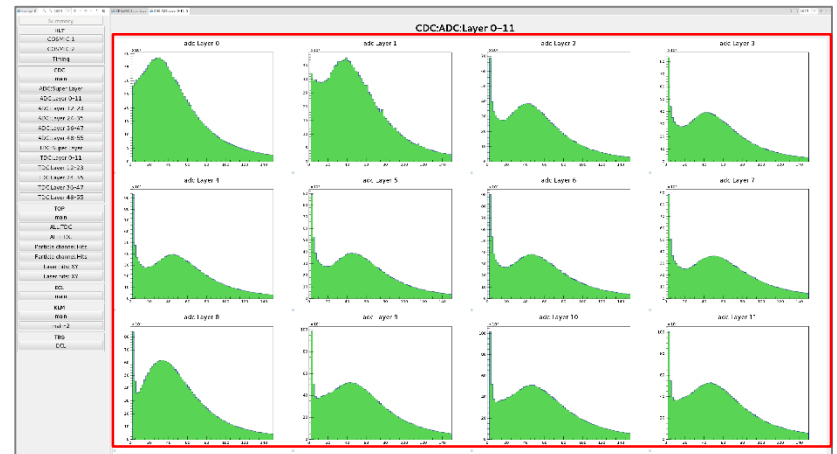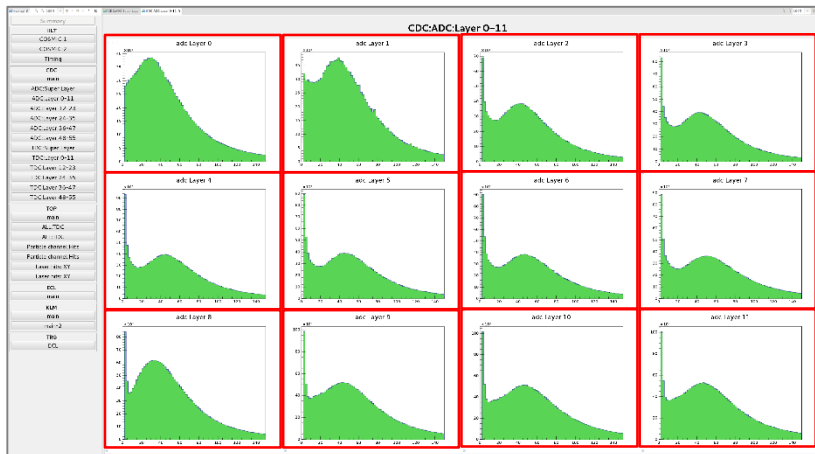- daq/dqm/analysis/example/dqmana.py is the script used in the GCRT

DQM plots for CDC
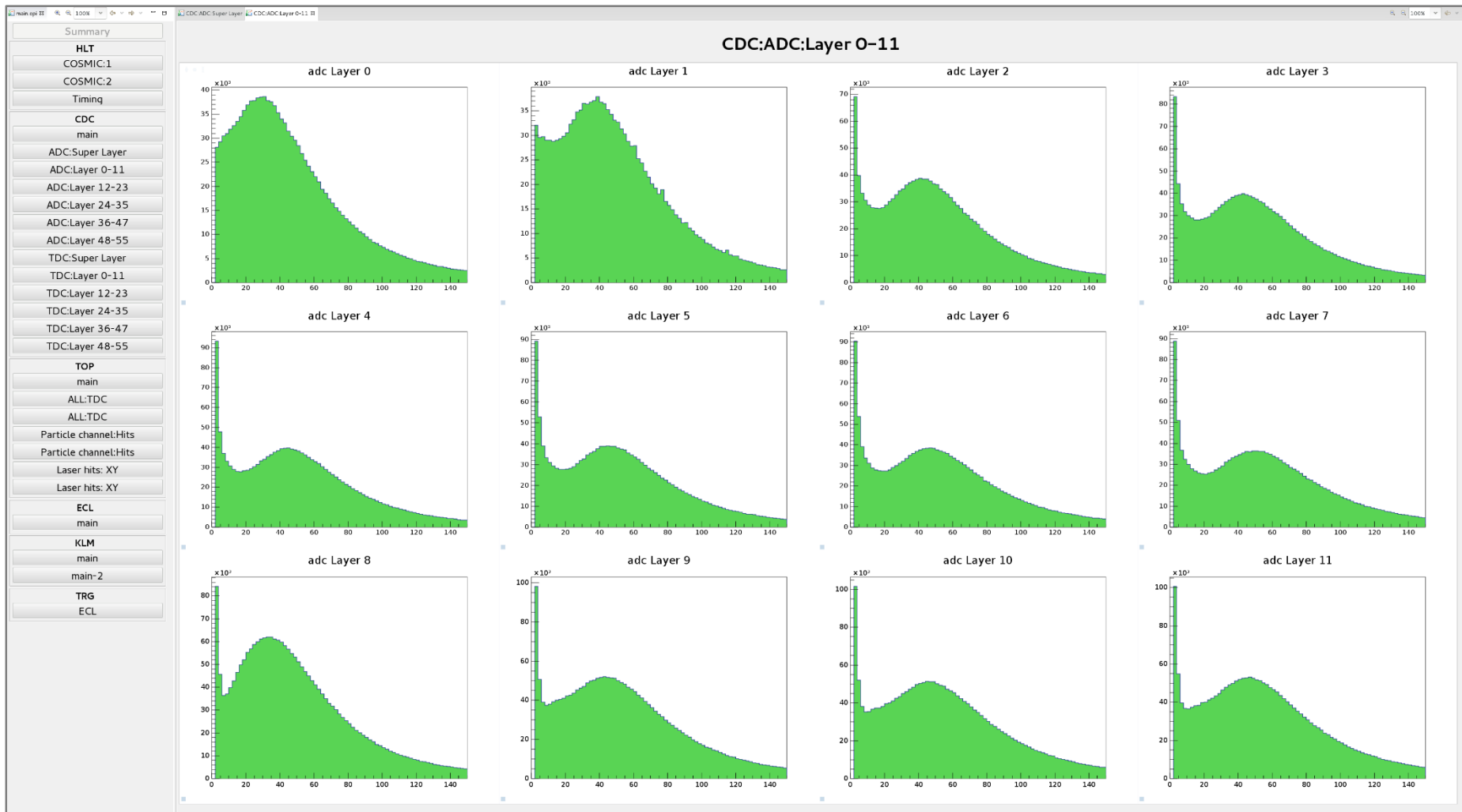
- Canvases are shown in CSS internal web browser (webcat)

Fixing issues

- DQM CSS was crashed very often (once per day or more)
  - Due to huge memory usage reaching limit of process memory
  - An internal browser was assigned to each canvas => much memories!
    - http://rc01.b2nsm.kek.jp:8082/?nobrowser&item=CDC/c_adc_L0
  - THttpServer has an option to show multiple canvases in grid layout
    - http://rc01.daqnet.kek.jp:8082/?nobrowser&items=[CDC/c_adc_L0,CDC/c_adc_L1,..
  - More flexible if dedicated html file is prepared
- Now memory usages are significantly saved
- => CSS has no crash after the modification

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OPI files for viewer

The left side panel shows a file viewer interface labeled "main.opi" at 100% zoom with the following sections:

Summary

HLT
- COSMIC:1
- COSMIC:2
- Timing

CDC
- main
- ADC:Super Layer
- ADC:Layer 0-11
- ADC:Layer 12-23
- ADC:Layer 24-35
- ADC:Layer 36-47
- ADC:Layer 48-55
- TDC:Super Layer
- TDC:Layer 0-11
- TDC:Layer 12-23
- TDC:Layer 24-35
- TDC:Layer 36-47
- TDC:Layer 48-55

TOP
- main
- ALL:TDC
- ALL:TDC
- Particle channel:Hits
- Particle channel:Hits
- Laser hits: XY
- Laser hits: XY

ECL
- main

KLM
- main
- main-2

TRG
- ECL

- OPI files are now available in DESY stash (Belle II Group)
  - git clone ssh://git@stash.desy.de/daq_dqm_gui/
  - Usage: import daq_dqm_gui/DQM into your CSS
- DQM/template/4K_4x3.opi is used as default
  - Macros for histogram names

  => Buttons in the side panel allocate histogram names
- Current issue: Buttons are created by T.K.
  - Important histograms might be missed!

  => **Detector experts are expected to make your OPI files**
- Another option is to create html files dedicated for each subdetectors from detector experts
 - Need more dedicated techniques of HTML5 and jsroot

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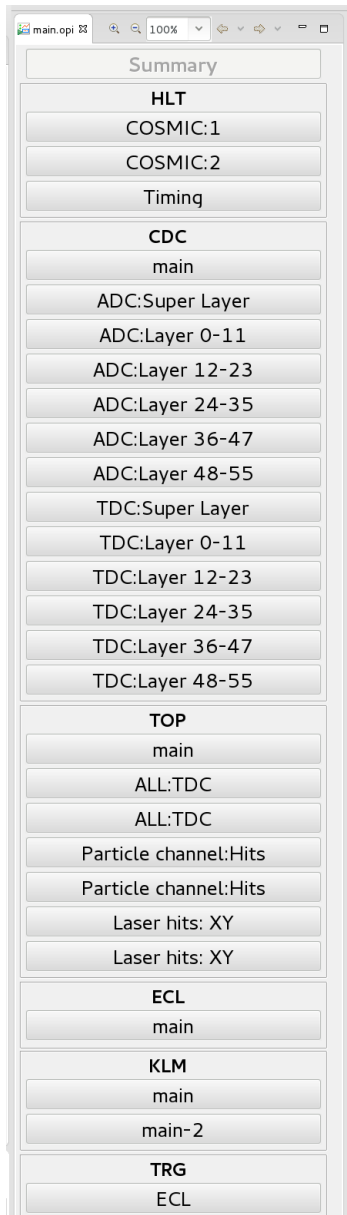
Summary

- Guideline for DQM panels are being prepared
  - But still in my mind. Please give me feedback
  - 4 x 3 plots in a page looks best for 4K display in the control room
    - A template can be used with macros
  - B. Wang prepared nice panels available templates
- Implementation of DQM (+browsing) are still ongoing
  - DQM for Tracking is only available live DQM
  - CDC, ECL, TOP and KLM prepared DQM modules but not included yet
  - TRG provides ECL TRG DQM only others are not ready yet
  - PXD, SVD and tracking DQM are tested in the beam test at DESY
- A plan for upgrade with JSROOT
  - Replaced after stable cosmic run get started
  - Template will reduce the effort of replacement

Live DQM display in control room

- DQM browser is implemented in control system studio
  - Introduction page is available for Belle II members:
    https://confluence.desy.de/display/BI/DQM+viewer+panel
- There is one 4K display : resolution: 3840x2160
  - One display is fully available for DQM browsing
- Discussion for guideline of viewer panels
  - B. Wang prepared nice examples for templates
  - Size and layout of the plots in 4K display
    - **4 x 3 plots (800x640)** : maximum # of plots in a panel
  - Layers of view panels
    - Main summary page over detectors: 1-2 plots/detector
    - Detector summary page : 1 page / detector
    - Detector details pages : 3-4 pages

Discussion about layout of DQM viewer is just started at this B2GM

Overview of DQM browsing
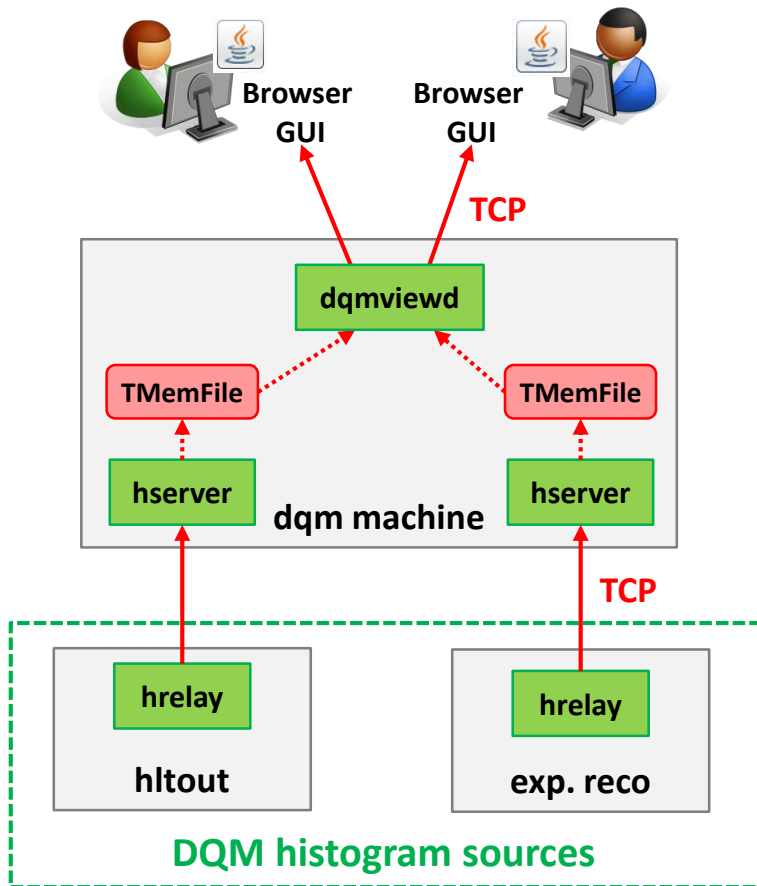
- DQM Histograms are collected and merged in hrelay - hserver chains
  - HLT
  - Express reco.
- dqmviewd : interface to user
  - Distributes histograms to GUIs
  - Extracts histograms in TMemFiles
- DQM browser
  - works on Control System Studio
    - A eclipse plugin
  - 1-D and 2-D histograms converted from TH1 and TH2
  - Histograms are identified by names