

LHCb Online Data Quality Monitoring Project

The Presenter

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Péter Somogyi

CERN & Technical University of Budapest

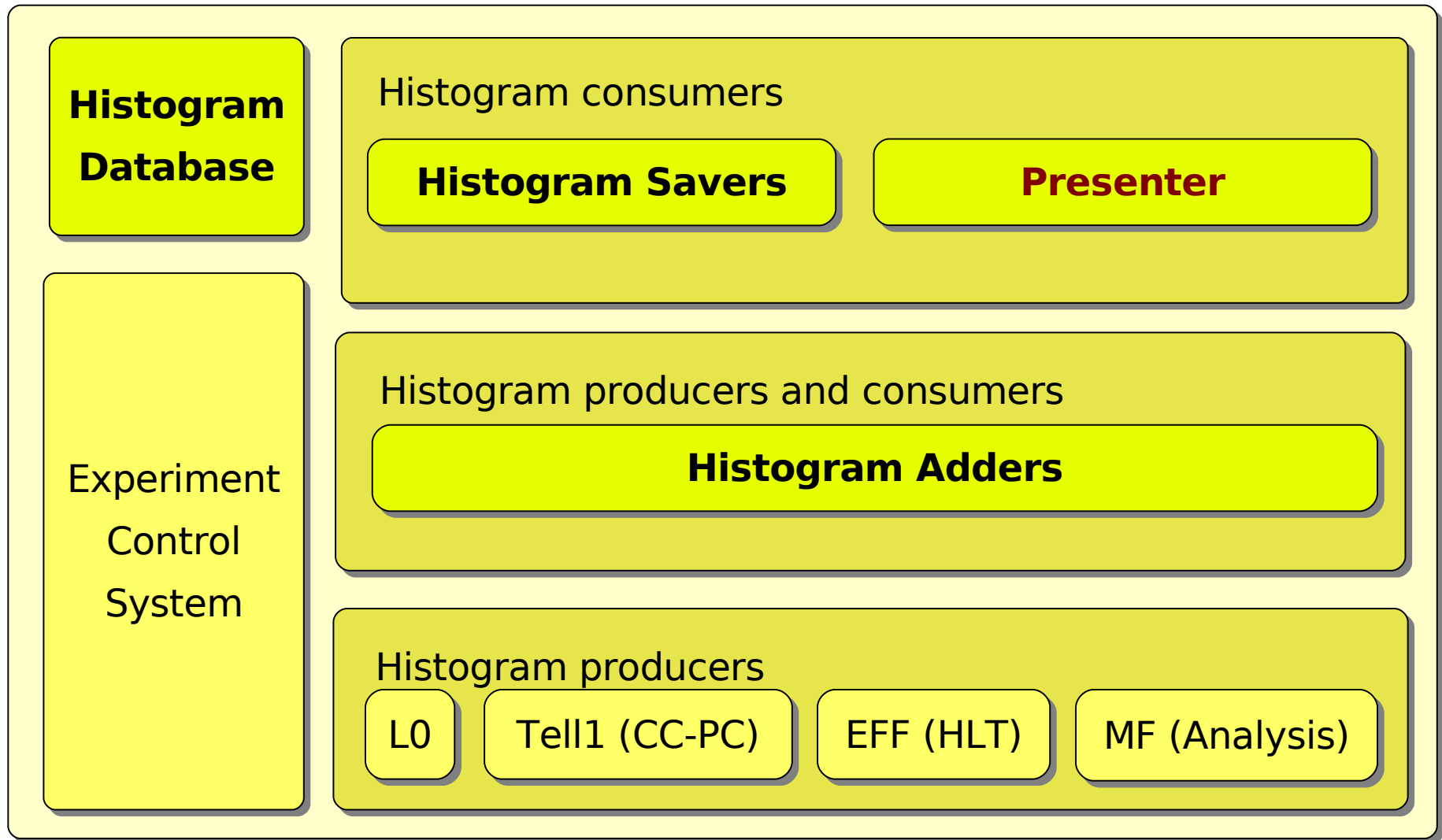
Outline

**Architectural overview of the LHCb Online Data
Quality Monitoring Framework**

Tools used by the presenter

Prototype

Overview



Requirements

Presenter will be “page” oriented

Allows the visualization of histograms, counters and timecharts

Comparison with reference histograms and values

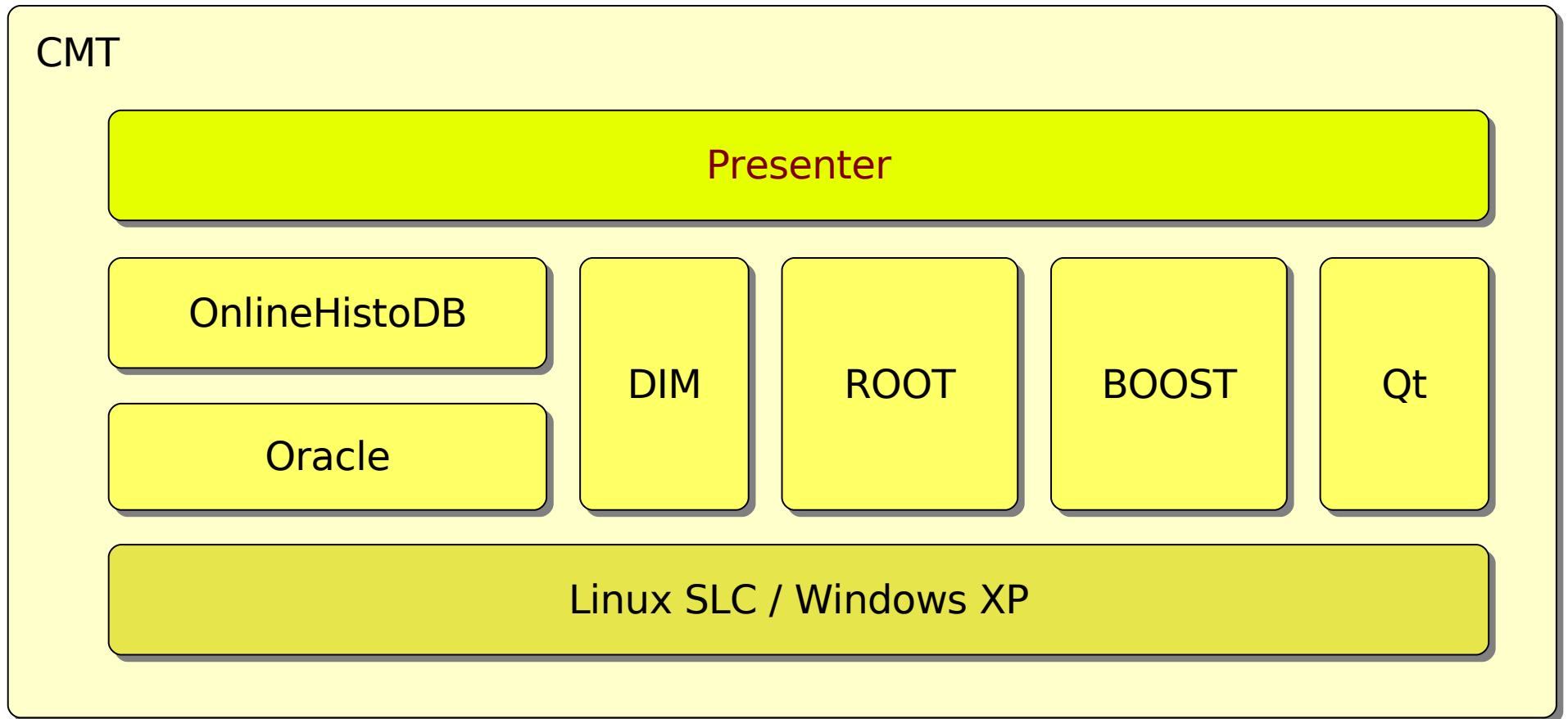
Easy way to reset to “factory settings” for shifters, pages with more detailed information for experts

Online and History modes with essentially identical GUI

Presenter will run with (in pit) or without database (standalone)

Platform independent

Tool stack



Foundations I

Extensive use of DIM

Communication system for distributed environments, providing a network transparent inter-process communication layer

DIM services: Histograms and Counters

Gaudi algorithms publish histograms and counters using MonitorSvc (Gaucho)

Clients: presenter, adders/savers

Foundations II

A hierarchy of adders sums identical histograms from jobs on the Event Filter Farm

Presenter looks at histograms published by the highest level adder by default, but can be pointed to any level just like a browser

Foundations III

Database to keep track of histogram display properties in a consistent way

Histograms identified by task, algorithm and “histogram name”

Display properties are those variables needed for displaying, analysing, etc. (ex: axis labels, scale properties, description)

No duplication of information: binning information not stored in Database

Page layout and content description stored in Database

DIM & ROOT

Subscription model

Services are requested by the histogram consumers only once, and they are updated by the producers either using timers or callbacks when new data is available.

Online updating of the client is done via the DimProxy class, creating root TH-s from DIM services.

Archived data will be handled by a similar class in offline mode, using .root files instead.

```
DimProxy
- m_serviceType : ServiceType
- m_serviceOK : bool
- m_histoDimension : int
- m_serviceSize : int
- m_serviceName : std::string
- m_serviceUpdated : bool
- m_verbosity : int
- m_bookedHistogram : bool
- m_CI4 : int
- m_CF4 : float
- m_CD8 : double
- m_histoData : float*
- m_H1D : TH1*
- m_H2D : TH2*
- m_HPD : TH1*
+ DimProxy(serviceName : std::string, refreshTime : int, verbosity : int)
+ ~ DimProxy()
+ serviceOK() : bool
+ serviceUpdated() : bool
+ resetServiceUpdated()
+ rootH1D() : TH1*
+ rootOffsetH1D() : TH1*
+ rootH2D() : TH2*
+ rootOffsetH2D() : TH2*
+ rootHPD() : TH1*
+ rootOffsetHPD() : TH1*
+ floatCF4() : float
+ doubleCD8() : double
+ intCI4() : int
+ getType() : ServiceType
- fillHistogramH2D()
- fillHistogramH1D()
- fillHistogramHPD()
- infoHandler()
```

Histogram clear/reset

Histogram data only sent when a histogram is looked at

Update rate configurable per histogram in DB

The Presenter clears displayed histograms locally (by cloning and subtracting two root histograms)

Histograms from jobs on the Event Filter Farm can be reset via a command sent by the Experiment Control System

The presenter does not send commands to the producers

Presenter system level use-case

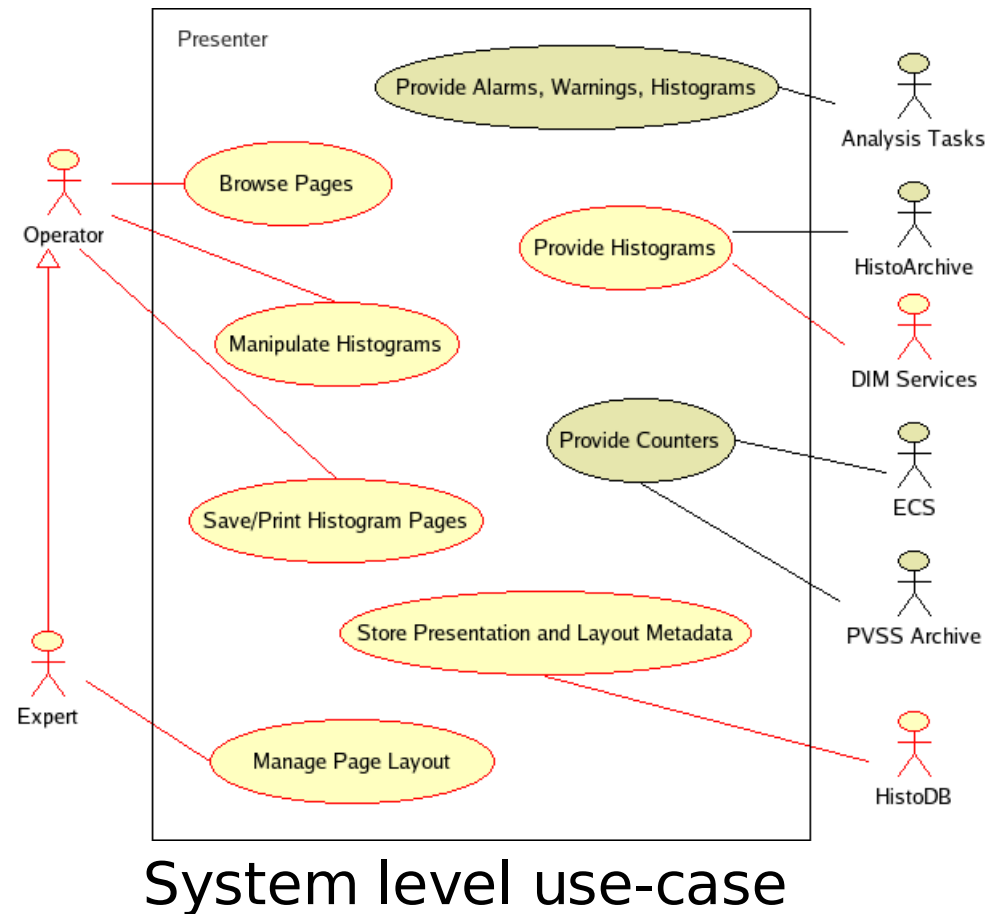
System level use-case of the presenter application

Actors on each side

Dark functions not evaluated yet

Widgets are Qt

Histogram handling (incl. display) done using ROOT



Histogram Database

The screenshot shows the 'Histogram Record 18/1' page. The interface includes a sidebar with navigation options like 'Search Histogram', 'Browse Histograms', and 'Page Configuration'. The main content area displays the record details: ID 18/1, Task EXAMPLE, Algorithm OccupancyMap, Type H2D, Name Hit_Map Region_MIR1, and Identifier EXAMPLE/OccupancyMap/Hit_Map_\$Region_MIR1. It also shows related detectors (MUON GAS), a description field, and a 'Display Options' section with various input fields for X Label, Y Label, Z Label, Y minimum, Y maximum, Stats option, Fill Style, Fill Color, Line Width, Line Style, Line Color, and ROOT Draw options. The status bar at the bottom indicates 'Kész' and the URL 'webafs3.cern.ch'.

Histogram entry

The screenshot shows the 'Page entry' page. The interface includes a sidebar with navigation options like 'Search Histogram', 'Browse Histograms', and 'Page Configuration'. The main content area displays the page details: Name 'My Example Page', Folder 'Examples/My examples', and a description field. It also shows a list of histograms displayed on the page, including Histogram ID 18/1, 18/2, and 18/3, with their respective X and Y positions and sizes. The status bar at the bottom indicates 'Kész' and the URL 'webafs3.cern.ch'.

Page entry

Page Editor GUI

LHCb Presenter Page Editor

File Help

Filter database histograms:

Name

- lhcbweek
- Standard Pages
- unsorted
 - xyPage
 - z1/GaudiExample/eventtype
 - z1/GaudiExample/Mass
 - z1/GaudiExample/xyPosit
 - z/GaudiExample/eventtyp
 - z/GaudiExample/Mass
 - z/GaudiExample/xyPositi
 - unsorted2
 - unsorted3
 - unsorted4
 - test1
 - unsorted5
 - test2
 - z1/GaudiExample/eventtyp
 - z1/GaudiExample/Mass
 - z1/GaudiExample/xyPosit
 - z/GaudiExample/eventtyp
 - z/GaudiExample/Mass
 - z/GaudiExample/xyPositi
 - test3
 - test4
 - z1/GaudiExample/eventtyp
 - z1/GaudiExample/Mass
 - z1/GaudiExample/xyPosit
 - z/GaudiExample/eventtyp
 - z/GaudiExample/Mass
 - z/GaudiExample/xyPositi
 - test5
 - test6

Canvas ready.

z/GaudiExample/xyPositionPlot

histo_4

Entries	19
Mean x	200.6
Mean y	149.3
RMS x	114
RMS y	86.3

z/GaudiExample/xyPositionPlot

histo_2

Entries	19
Mean x	200.6
Mean y	149.3
RMS x	114
RMS y	86.3

z/GaudiExample/eventtype

histo_2

Entries	19
Mean	2.326
RMS	1.584

z/GaudiExample/Mass

histo_3

Entries	19
Mean	3078
RMS	58.47

Folder name:

Page name:

Save Page Stop Integrate Investigate

Name	Algorithm	Task	Type
DIM Services			
nodeMF001_z_01			
eventtype	GaudiExample z		H1D
Mass	GaudiExample z		H1D
xyPositionPlot	GaudiExample z		H2D

Presenter GUI Prototype

Proof of concept

Tools working together

Database browser

Available histograms for creating pages

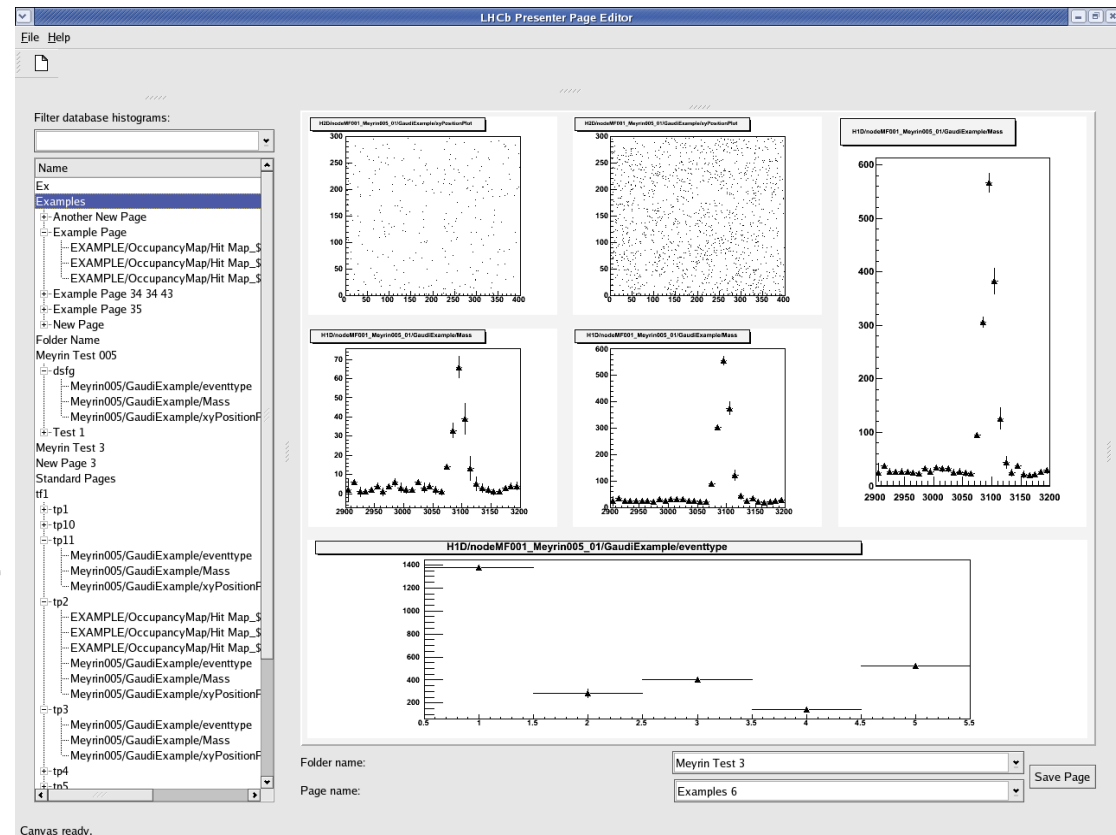
Saved pages

DIM browser available

For use without DB and development (not shown)

Page display

Histograms filled via an example histogram producing job



Presenter

Acknowledgements

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