LHCb Online Data Quality Monitoring Project

The Presenter

ROOT Workshop
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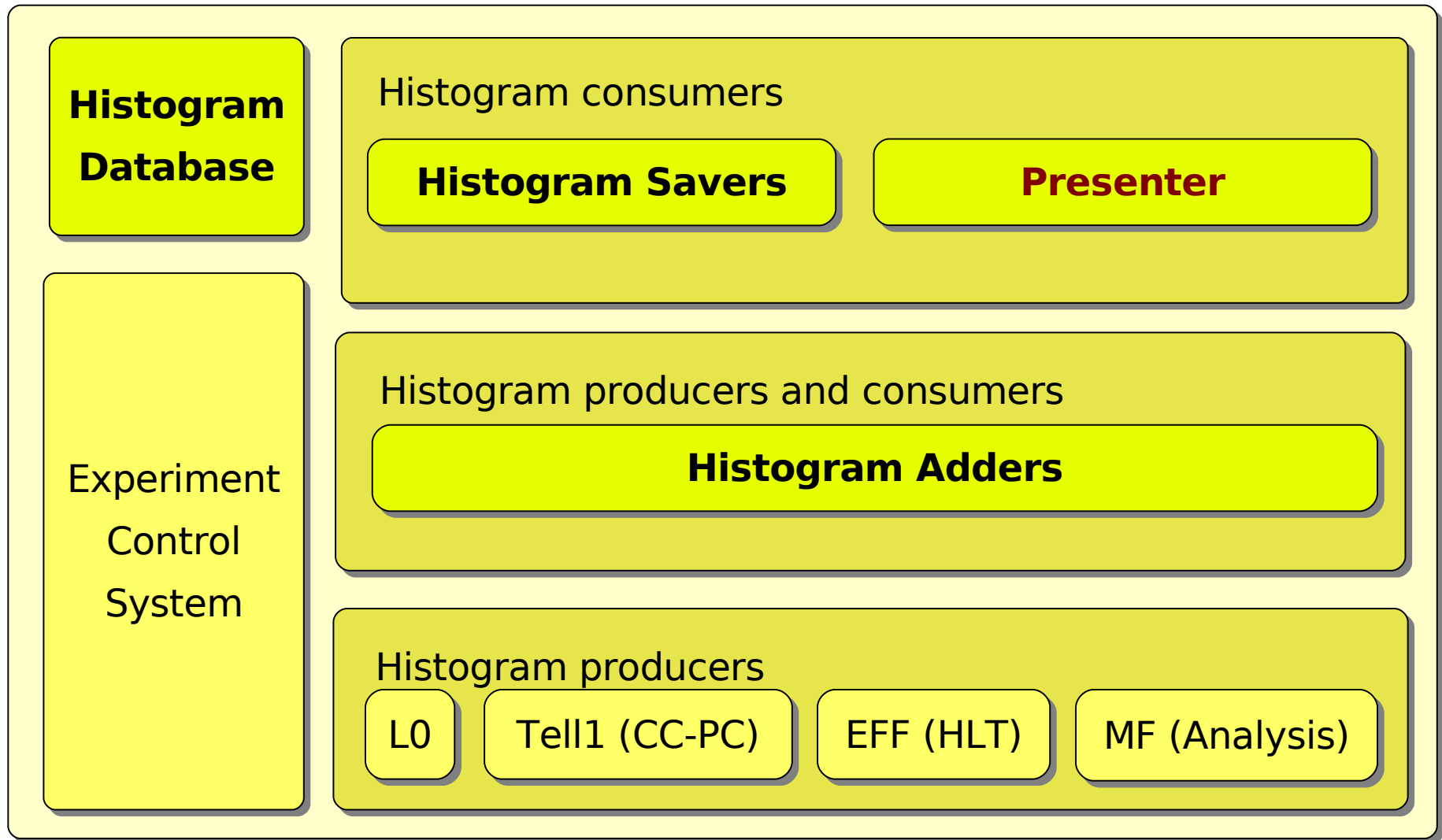
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Outline

Architectural overview of the LHCb Online Data Quality Monitoring Framework

Tools used by the presenter

Prototype

Overview

Histogram Database

Experiment Control System

Histogram consumers
- **Histogram Savers**
- **Presenter**

Histogram producers and consumers
- **Histogram Adders**

Histogram producers
- L0
- Tell1 (CC-PC)
- EFF (HLT)
- MF (Analysis)

Requirements

Presenter will be "page" oriented

Allows the visualization of histograms, counters and timecharts

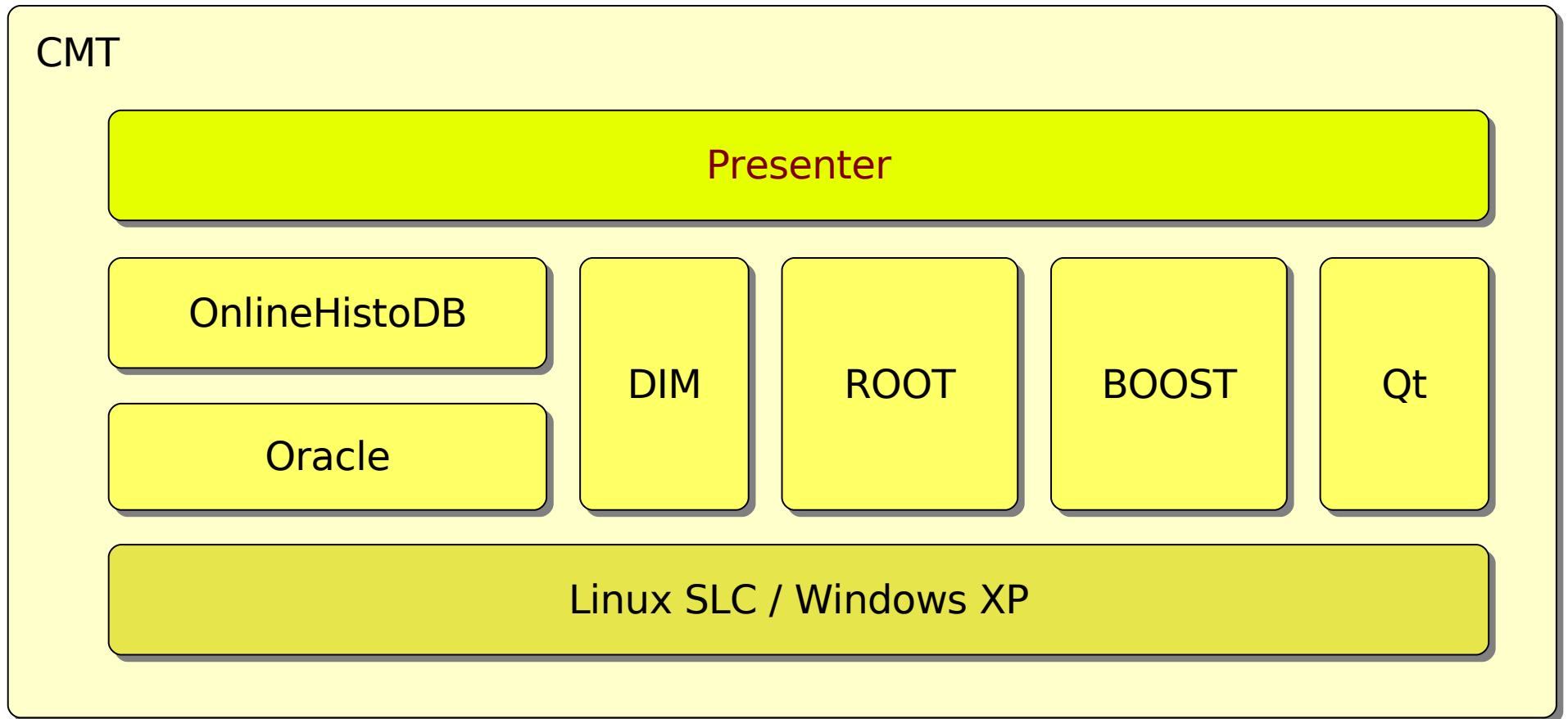**Comparison with reference histograms and values**

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

Diagram: CMT container enclosing the following stack:
- Presenter (top layer, spanning full width)
- OnlineHistoDB
- Oracle
- DIM
- ROOT
- BOOST
- Qt
- Linux SLC / Windows XP (bottom layer, spanning full width)

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
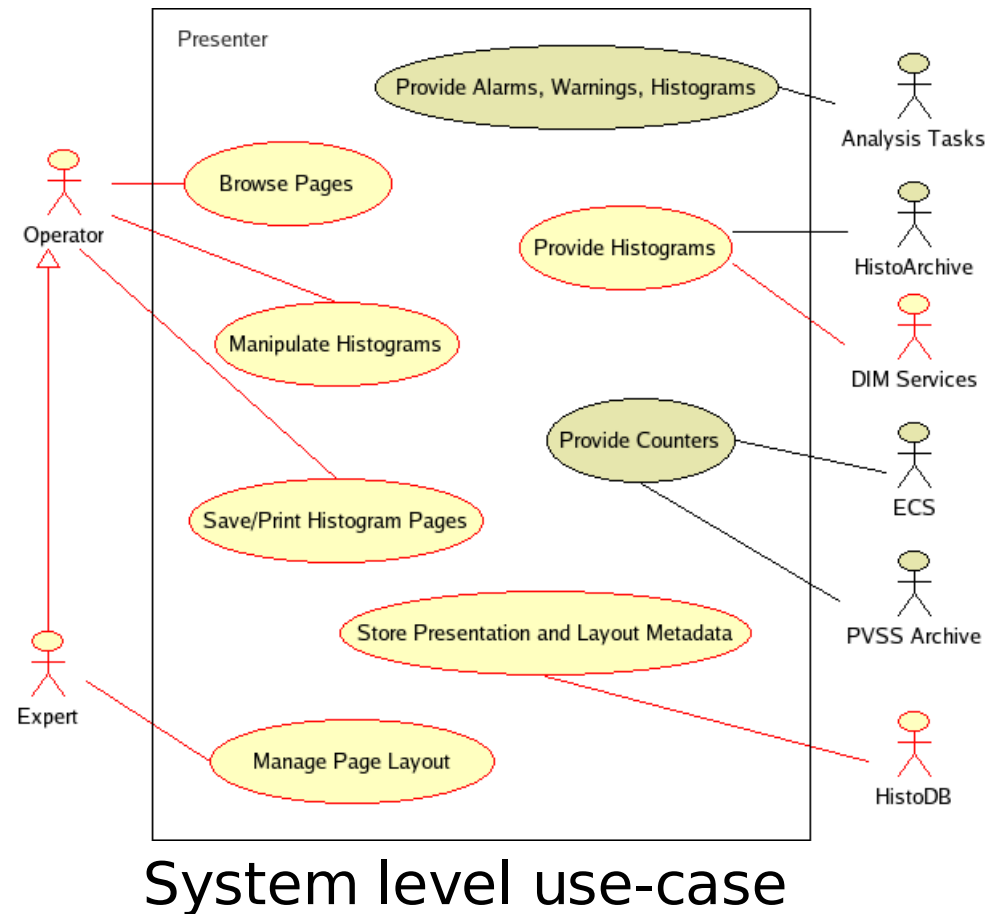
Presenter system level use-case

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

System level use-case

Histogram Database

Histogram entry

Page entry

Page Editor GUI

Presenter GUI Prototype

Proof of concept

Tools working together

Database browser

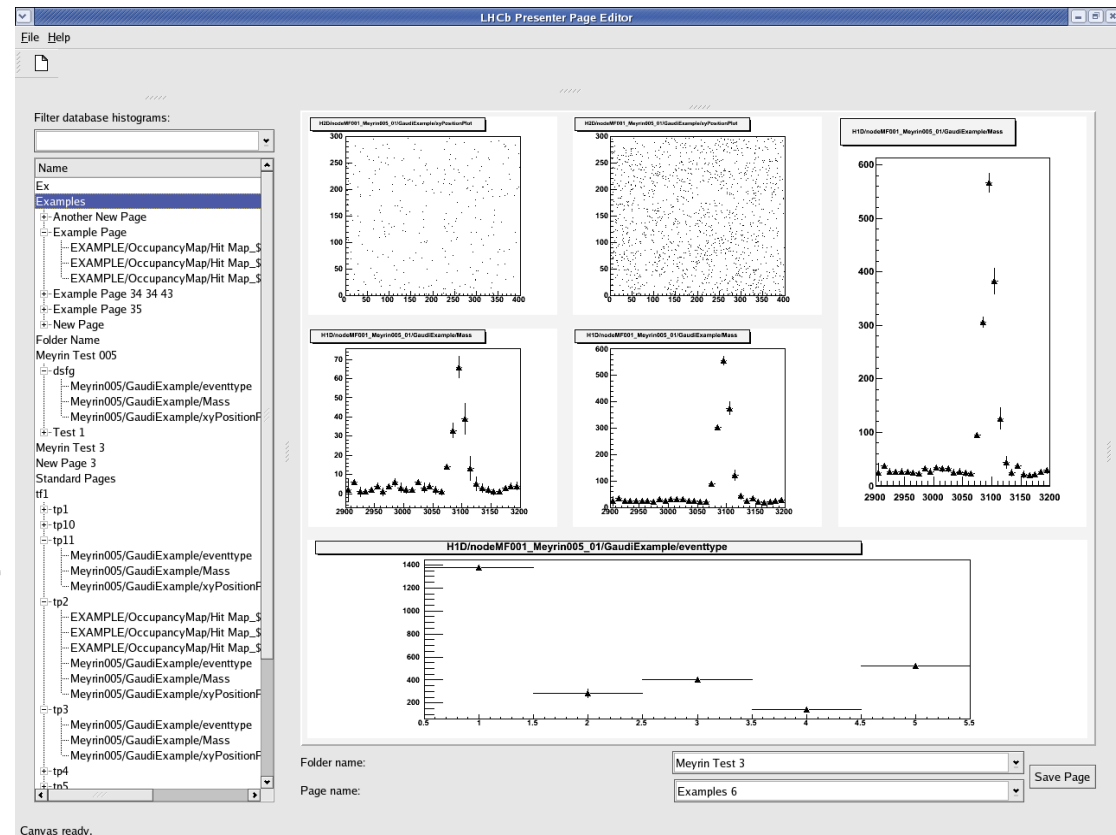**Available histograms for creating pages**

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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