Real Time Conference 2016
A Monitoring System for the LHCb Dataflow

João Barbosa[1], Clara Gaspar[1], Beat Jost[1], Markus Frank[1] and Luis G. Cardoso[1]
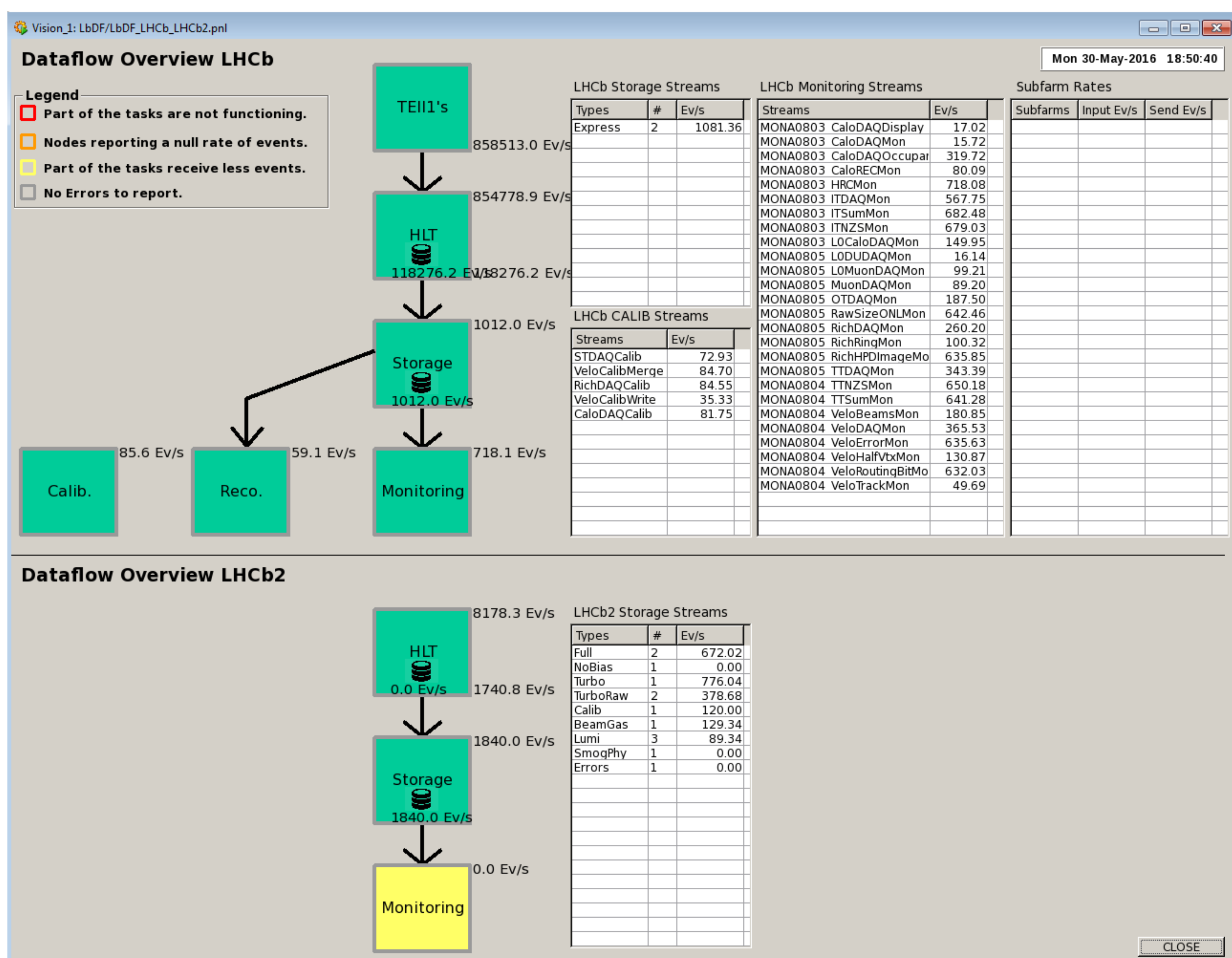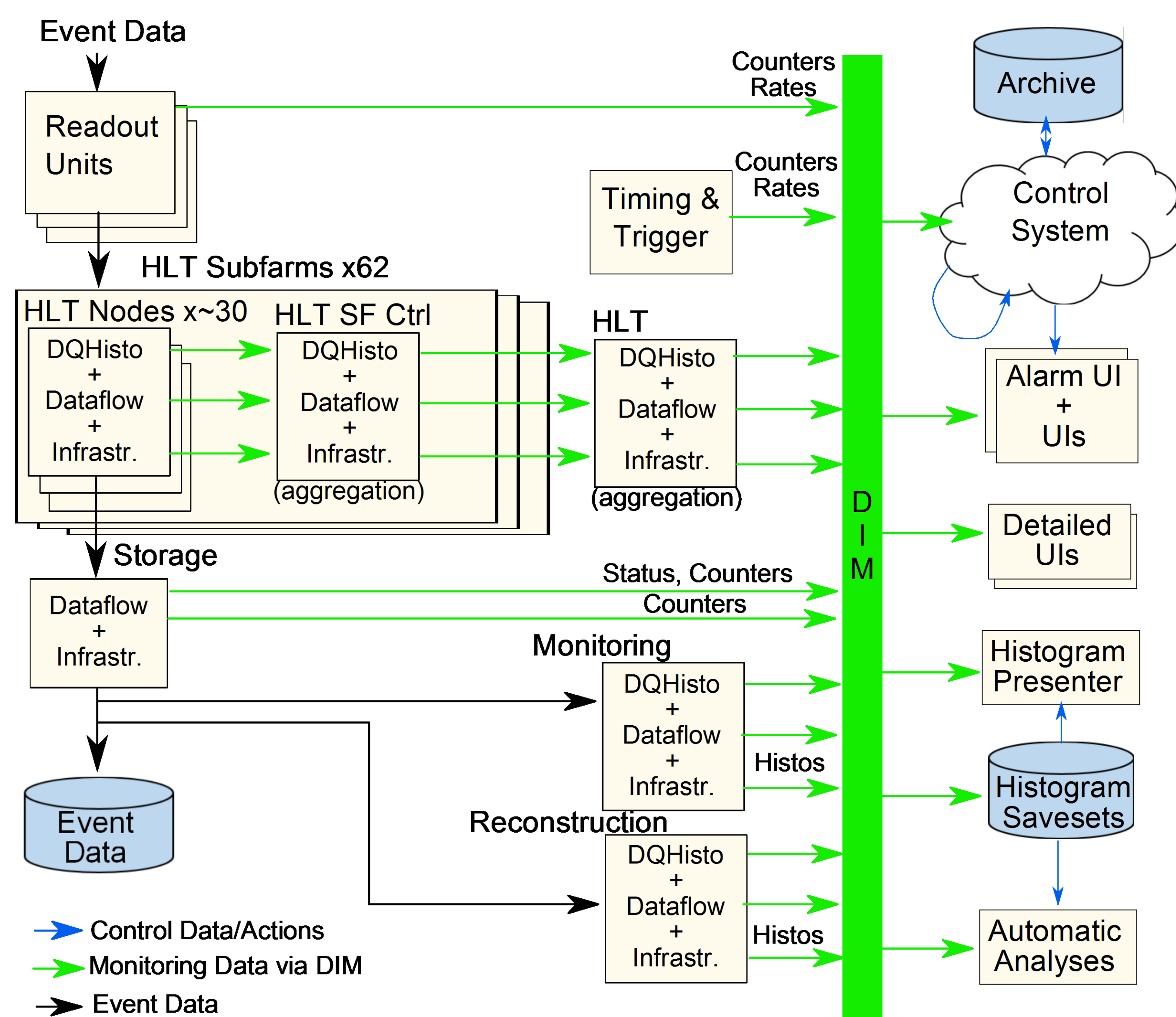
[1]CERN, Geneva, Switzerland

Physics Data and Monitoring Data in LHCb [1]

The current Data Acquisition infrastructure[2],[3] in LHCb implements a three stage trigger and is composed of:

- ~350 Readout boards (TELL1) associated with each part of the detector
- A Timing and Fast Control System
- The High Level Trigger implemented in a ~1800 server farm
- A storage system

In each stage of DAQ, hardware and software devices publish monitoring data such as: event counters, status reports and histograms. The monitoring data reaches the control system[4] via DIM[5].

Dataflow Overview LHCb — Mon 30-May-2016 18:50:40

Legend
- Part of the tasks are not functioning.
- Nodes reporting a null rate of events.
- Part of the tasks receive less events.
- No Errors to report.

Dataflow Monitoring Tool

The Dataflow Monitoring System, based on WinCC-OA [6] software, provides a broad view of what is happening with the event data in the DAQ system to the operators. Summarily its real-time features are:

- Gathering and aggregation of monitoring data from several formats and sources.
- Differentiation between different DAQ partitions, toggled on demand.
- Discovery of allocated resources in each partition.
- Display of detailed monitoring information per device.
- Display of alarm situations (per group and per device)
- Relay of selected alarms to the central Alarm Screen in the Control Room.

History Mode & Trending

For debug purposes, the monitoring data is smoothed and archived. All of the tool's interfaces can be used in history mode allowing for a replay of past events in the DAQ System. Also, all of the metrics shown can be plotted with a trending tool. Both these features together allow for a strong method of identifying issues and correlations between different problems.
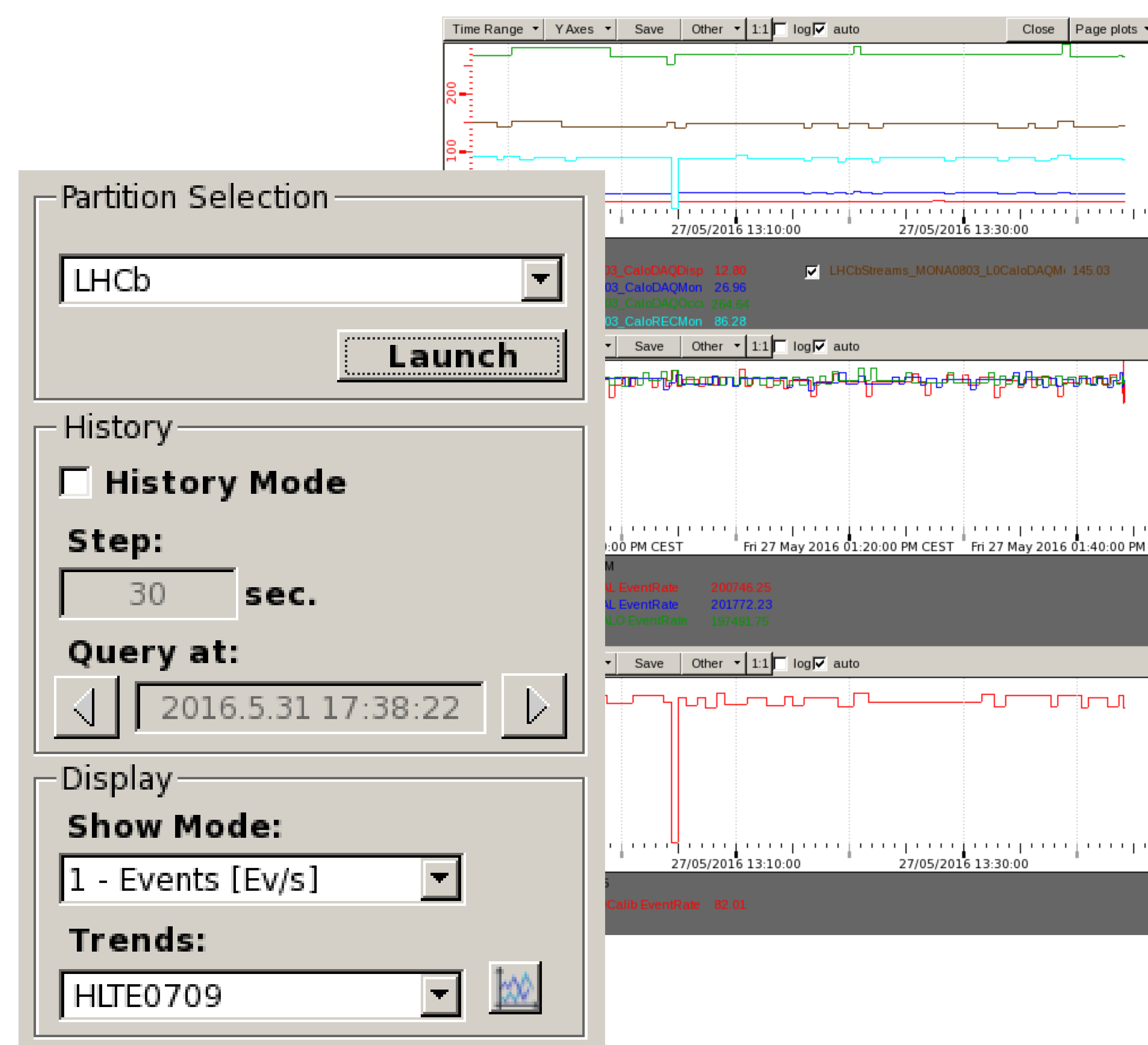
References:

[1] LHCb Collaboration, "LHCb - the Large Hadron Collider beauty experiment, reoptimised detector design and performance", CERN/LHCC 2003-030

[2] B. Jost, "The LHCb DAQ system," Nuclear Science Symposium Conference Record, 2000 IEEE, Lyon, 2000, pp. 26/1-26/6 vol.3

[3] D. Campora, N. Neufeld and R. Schwemmer, "Improvements in the LHCb DAQ," Real Time Conference (RT), 2014 19th IEEE-NPSS, Nara, 2014, pp. 1-2.

[4] F. Alessio et al., "The LHCb Run Control System," Real Time Conference (RT), 2010 17th IEEE-NPSS, Lisbon, 2010, pp. 1-6.

[5] C. Gaspar, M. Dönszelmann and Ph. Charpentier, "DIM, a portable, light weight package for information publishing, data transfer and interprocess communication", Computer Physics Communications 140 1+2 102-9, 2001.

[6] WinCC-OA http://w3.siemens.com/mcms/human-machine-interface/en/visualization-software/simatic-wincc-open-architecture/Pages/Default.aspx