EVOLUTION OF THE CERN BEAM INSTRUMENTATION OFFLINE ANALYSIS FRAMEWORK (OAF)

A. Samantas, M. Gonzalez-Berges, J-J Gras, S. Zanzottera | CERN, Geneva, Switzerland

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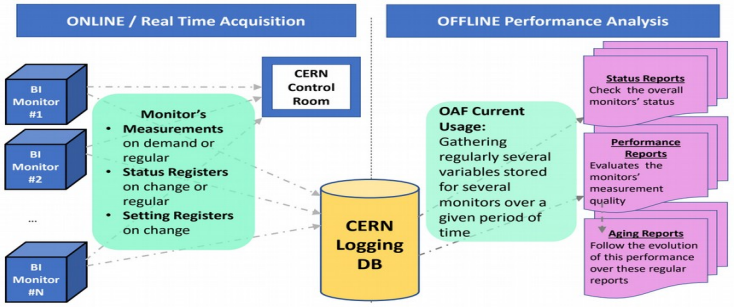
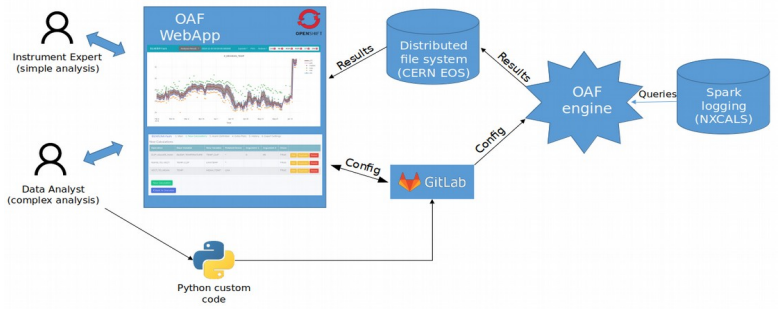
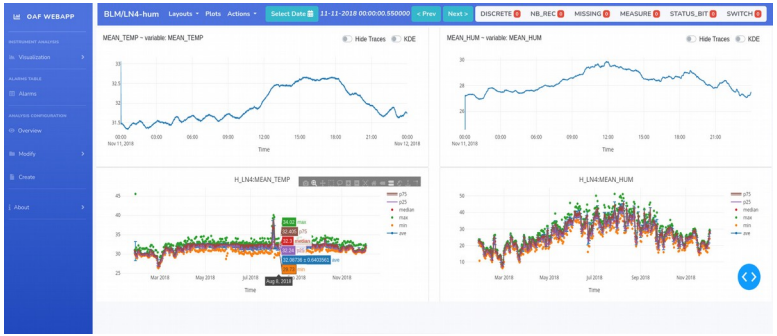
Introduction & Current Usage



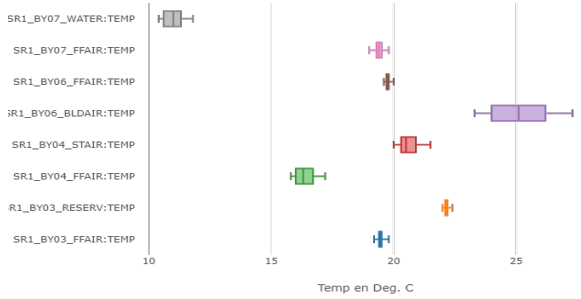
Architecture Redesign



OAF Web Application



Use Case & Conclusion

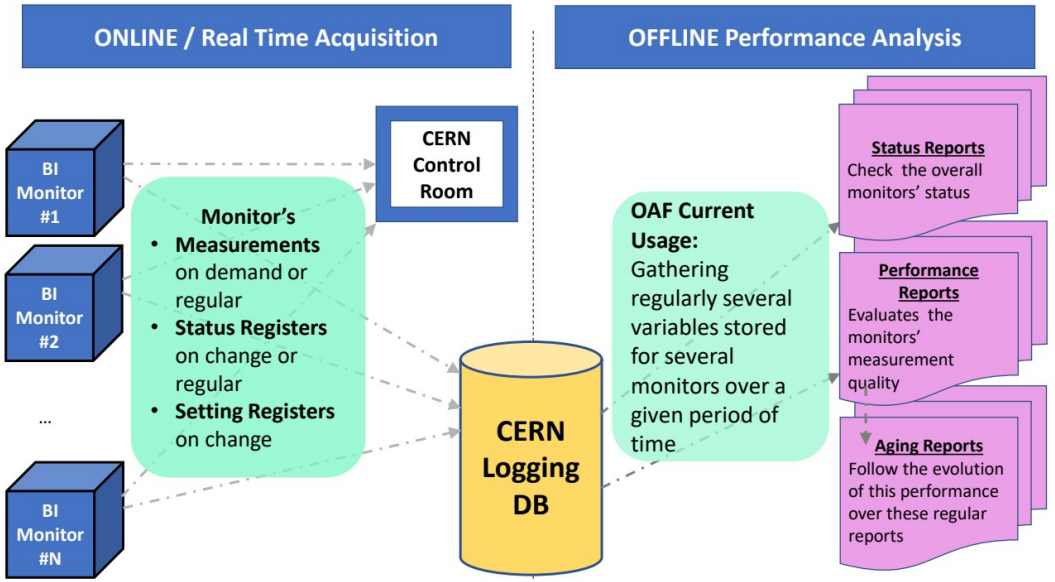


Introduction

The CERN accelerators require a large number of instruments, measuring different beam parameters. The Beam Instrumentation group developed the Offline Analysis Framework some years ago to regularly and systematically analyze these data. This poster presents the current usage, the architecture redesign and the new web based application. In addition, it provides a use case making more clear the functionality and the usability of the framework.

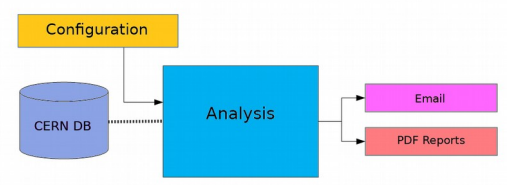
Current Usage

- Instruments produce beam physics data as well as status information.
- Measure: beam intensity, position, losses, current etc.
- Send these values for:
  - Real time operation
  - Future analysis storing then into the CERN logging database.
- The OAF regularly monitors the records stored and automatically produces 3 kinds of reports:
  - Status Reports
  - Performance Reports
  - Aging Reports



Standard usage workflow.

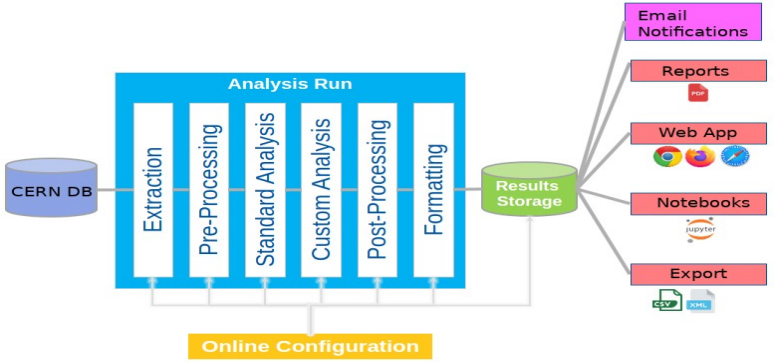
Architecture Redesign



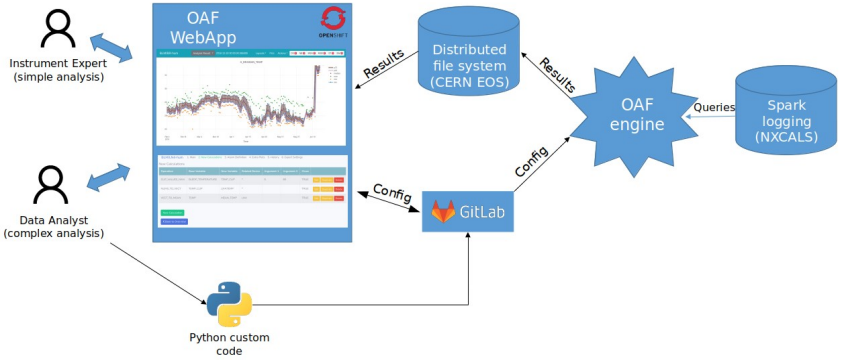
Original architecture of OAF.

Why Redesign OAF?

- Modular and maintainable.
- User friendly.
- Need of Spark base DB (NXCALS).
- Split the code-base into meaningful modules.
- Improve the performance on some analysis.
- New analysis types.



OAF architecture after the redesign.



OAF Runtime Architecture.

Redesign Outcome:

- OAF Webapp as a single entry point application.
- Additional output mediums (raw data file, python notebooks).
- Use of Python 3 exclusively.
- Result storage for processed data (HDF5 files).
- OAF-Commons library.

OAF Web Application

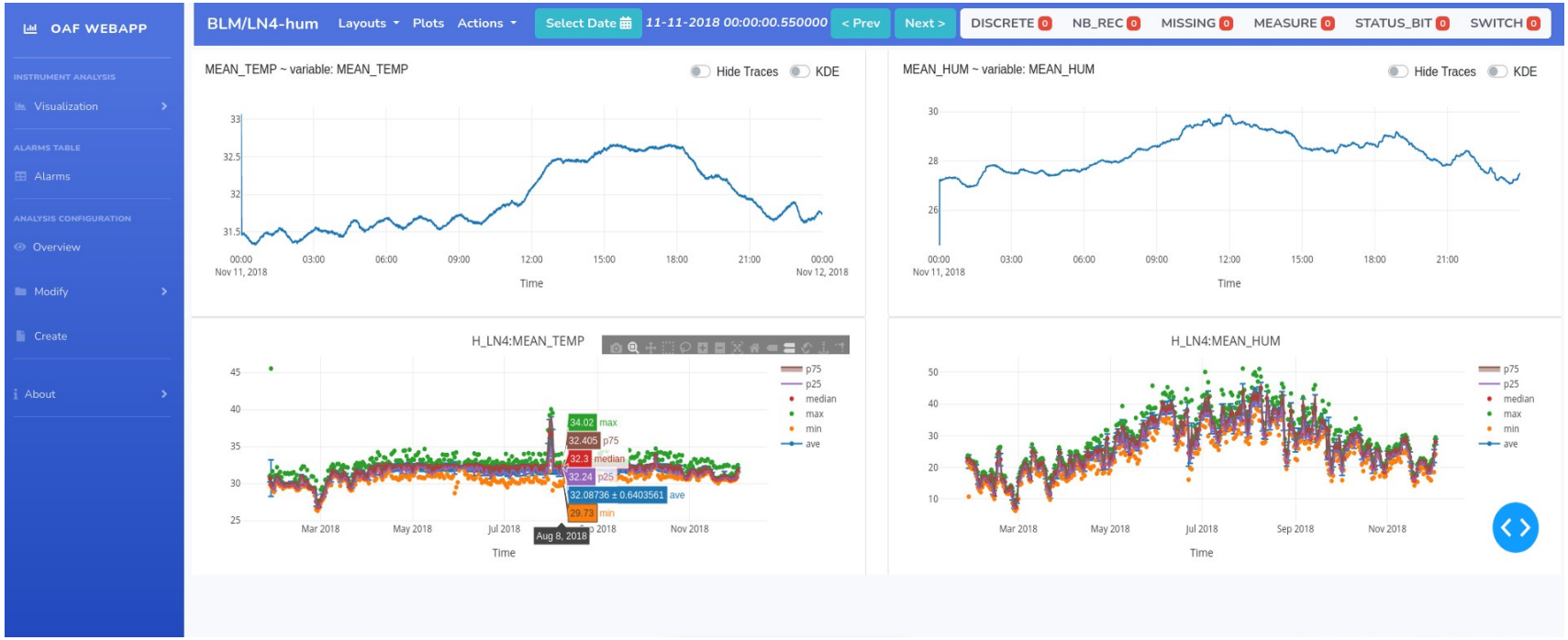
4. Visualization of data results.

5. Overview of the alarms from all the reports.

3. Overview of the available analysis.

2. Configuration of the available analysis.

1. Create or import an analysis



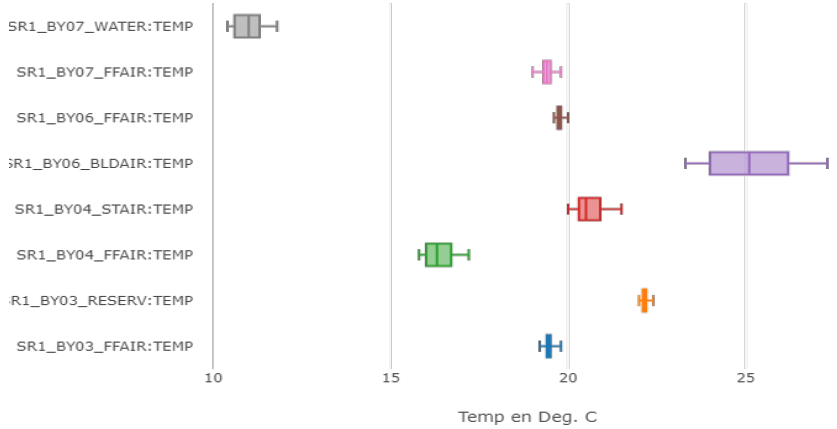
Webapp Interface.

Use Cases

Where the OAF is been used today?

At the end of the LHC run 2 (end of 2018) there were nearly 100 use cases running daily. Two of them are the following:

1. Luminosity measurements for CERN's LHC physics experiments.
2. Surveillance of the control of the water cooled racks temperatures hosting our Beam Position measurement electronics to prevent calibration changes caused by the building temperature variations as shown in figure below.



Temperature evolution envelop (min, max, median and a box from 1st quartile to 3rd) of the different sensors located in LHC building SR1.

Conclusion

The Offline Analysis Framework was developed some years ago to systematically analyze beam instrumentation data. The tool has helped diagnose and solve numerous issues so far. In the meantime, the technologies it is based on have evolved and opened new possibilities. This paper presents a first step towards this direction by introducing a web-based self-service tool for the users to configure their analysis and visualize the results. A second future step will be focus on the improvements of the algorithms that can be used within the tool.