THE CERN BEAM INSTRUMENTATION GROUP
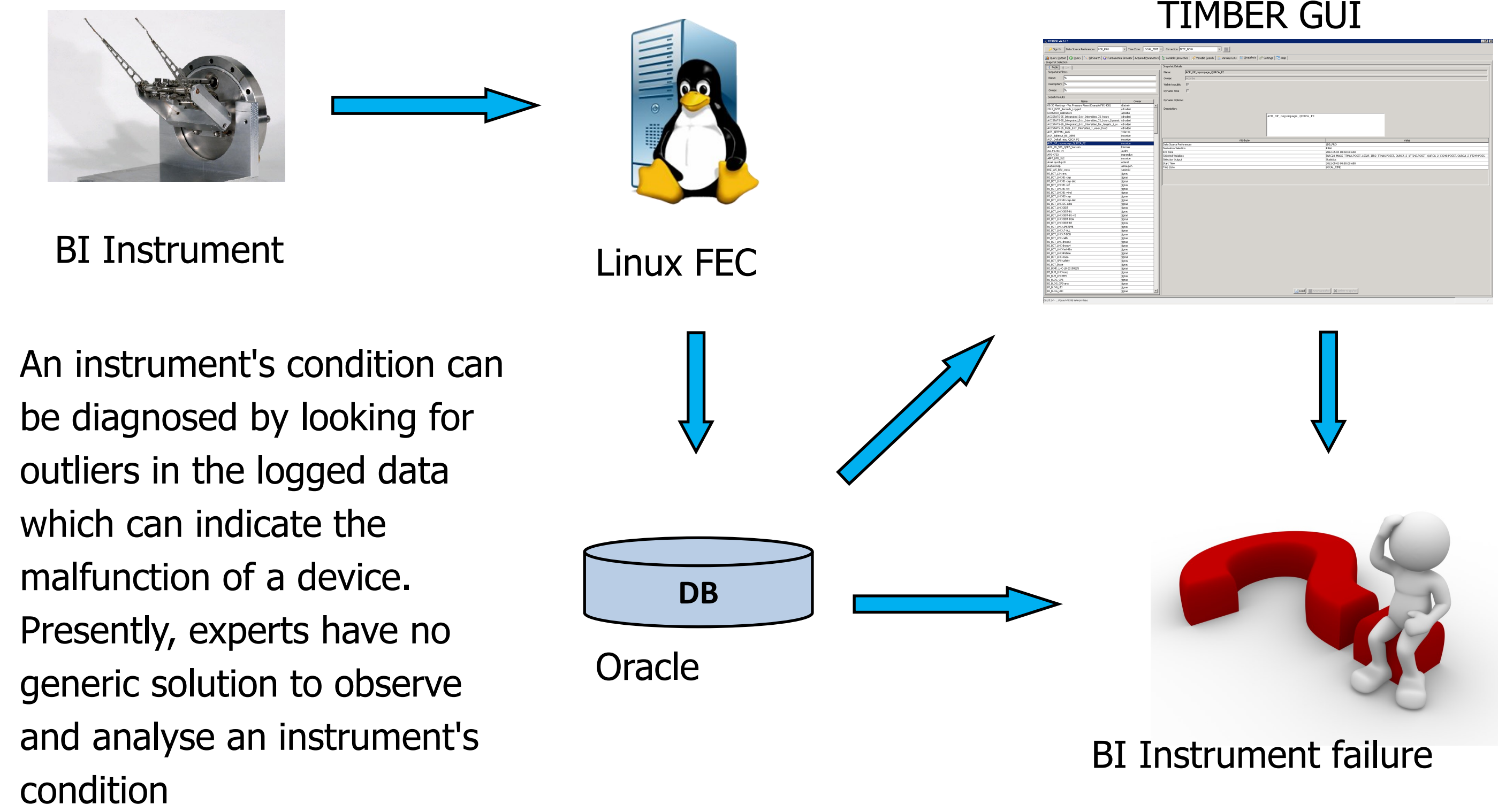
OFFLINE ANALYSIS FRAMEWORK

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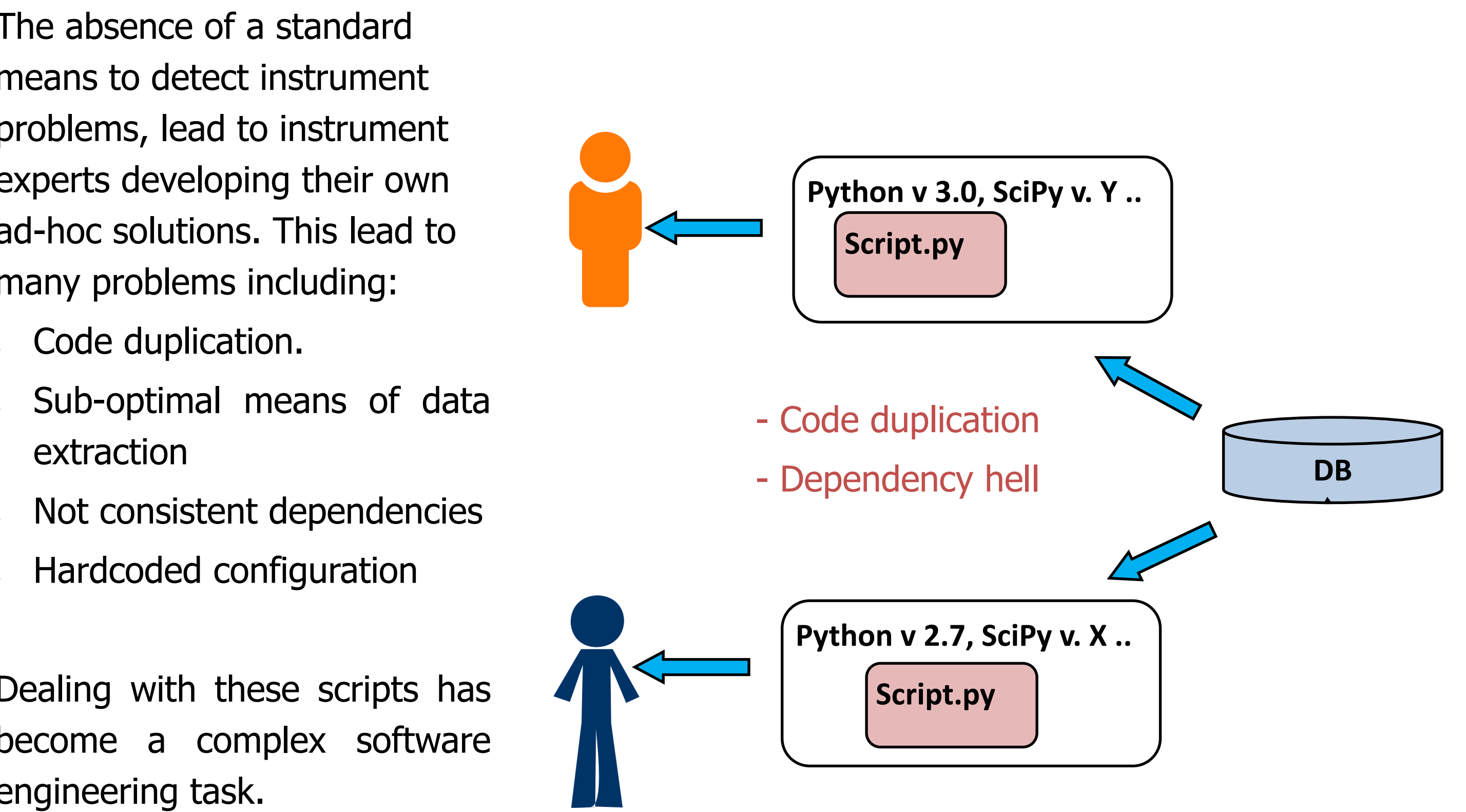CERN, Geneva, Switzerland

Abstract

Beam instrumentation systems at CERN require periodic verifications of both their state and condition. Presently, experts have no generic solution to observe and analyse an instrument's condition and as a result, many ad-hoc Python scripts have been developed to extract historical data from CERN's logging service. Clearly, ad-hoc developments are not desirable for medium/long term maintenance reasons and therefore a generic solution has been developed. In this poster we present the Offline Analysis Framework (OAF), used for automatic report generation based on data from the central logging service. OAF is a Java / Python based tool which allows generic analysis of any in-
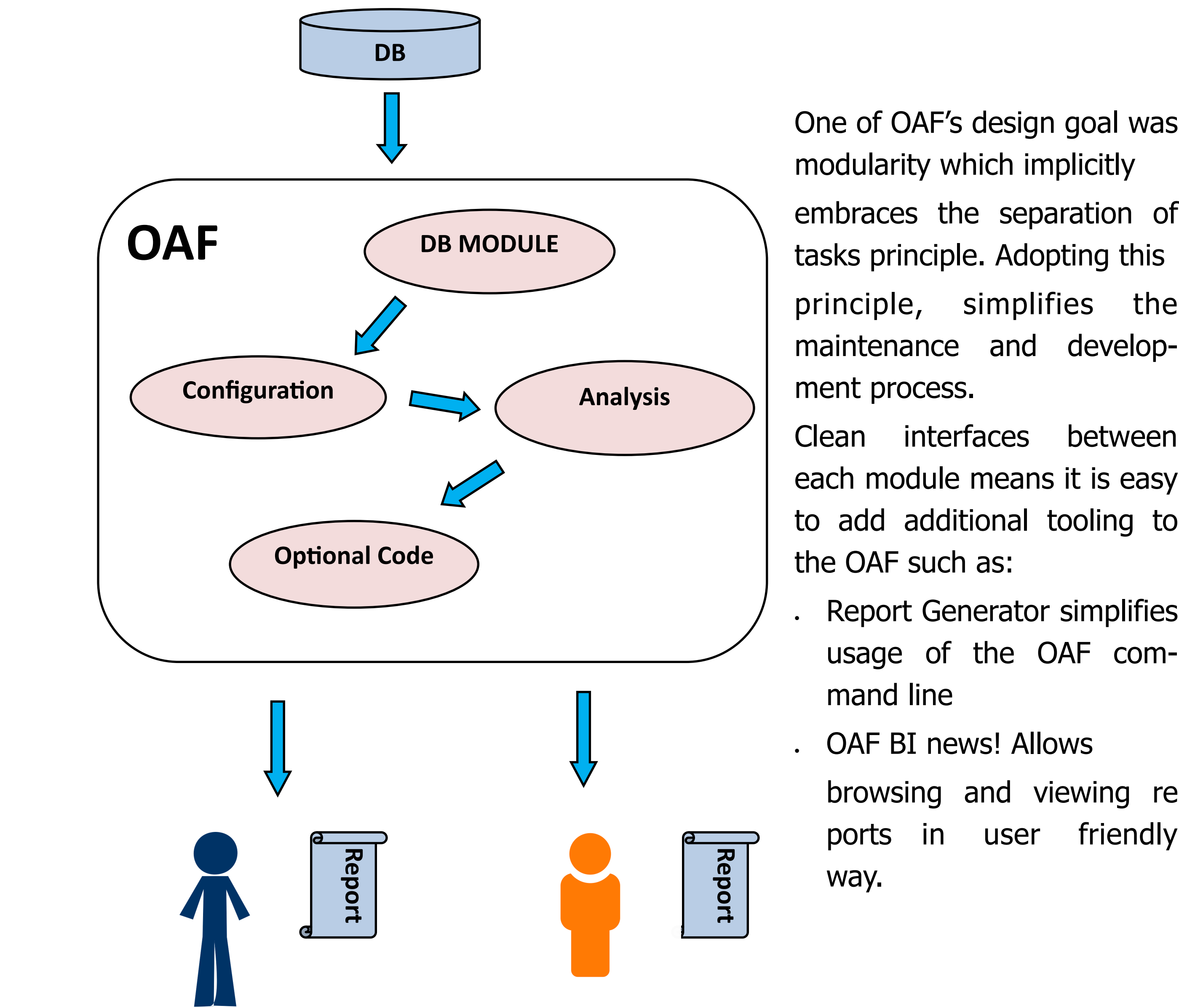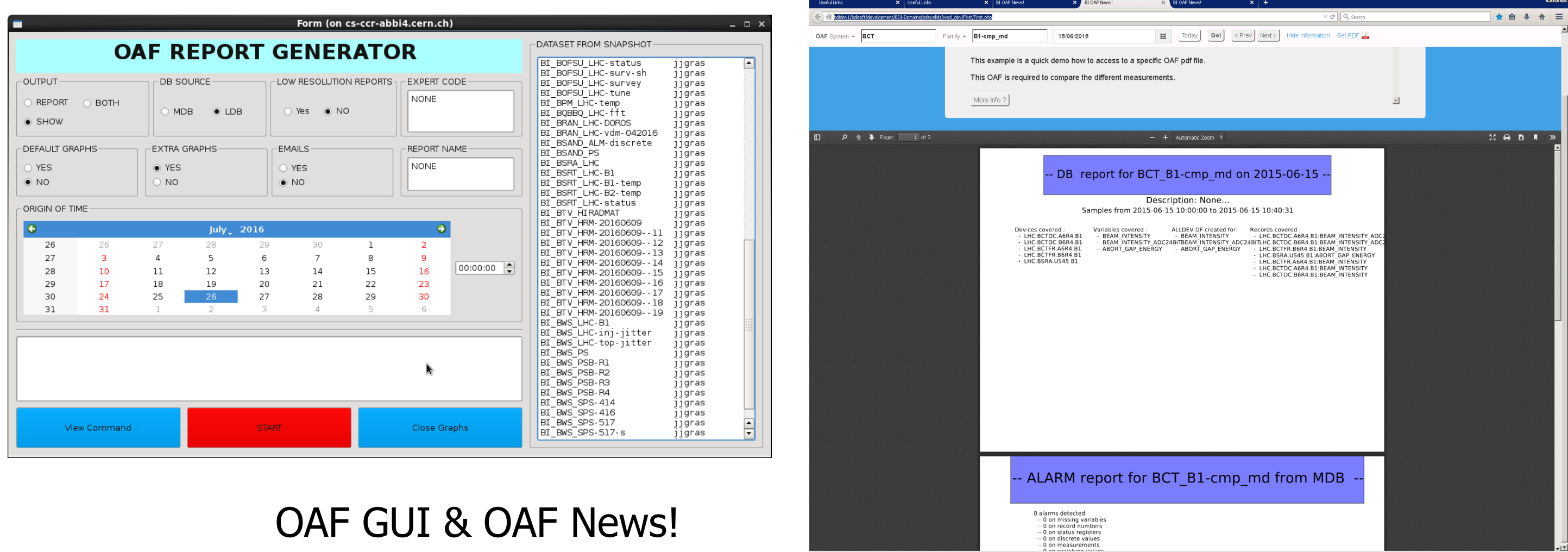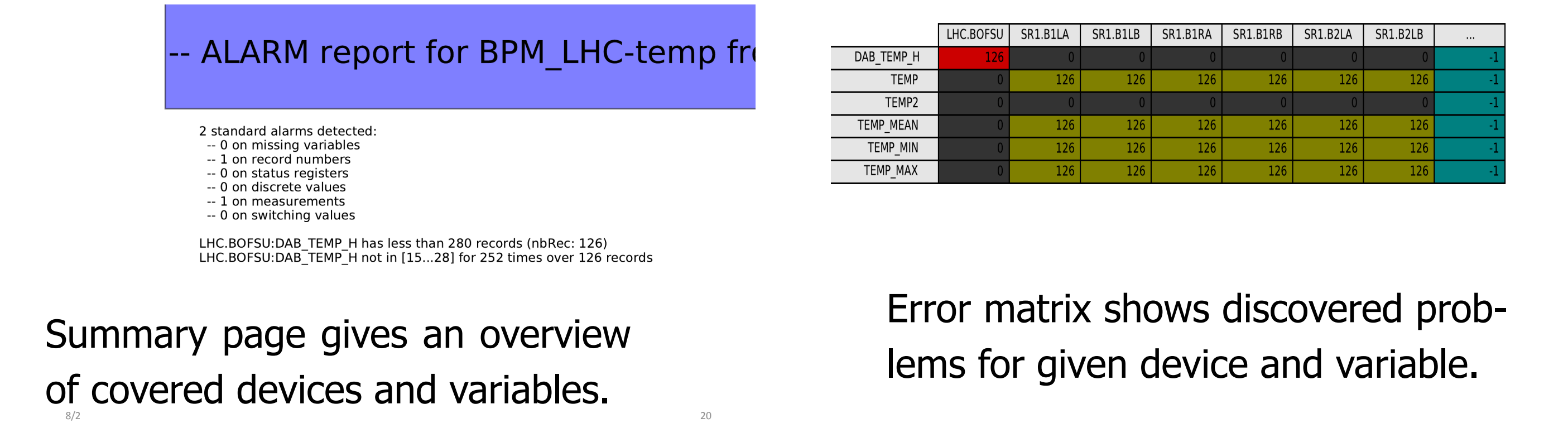
THE PROBLEM

BI Instrument

Linux FEC

TIMBER GUI

DB

Oracle

BI Instrument failure

An instrument's condition can be diagnosed by looking for outliers in the logged data which can indicate the malfunction of a device. Presently, experts have no generic solution to observe and analyse an instrument's condition

OLD SOLUTION

The absence of a standard means to detect instrument problems, lead to instrument experts developing their own ad-hoc solutions. This lead to many problems including:

. Code duplication.

. Sub-optimal means of data extraction

. Not consistent dependencies

. Hardcoded configuration

Dealing with these scripts has become a complex software engineering task.

Python v 3.0, SciPy v. Y ..
Script.py

- Code duplication
- Dependency hell

DB

Python v 2.7, SciPy v. X ..
Script.py

OAF FRAMEWORK

DB

OAF

DB MODULE

Configuration

Analysis

Optional Code

Report

Report

One of OAF's design goal was modularity which implicitly embraces the separation of tasks principle. Adopting this principle, simplifies the maintenance and development process.

Clean interfaces between each module means it is easy to add additional tooling to the OAF such as:

. Report Generator simplifies usage of the OAF command line

. OAF BI news! Allows browsing and viewing reports in user friendly way.

Other OAF tools:

OAF GUI & OAF News!

REPORTS

Report Generic Part

Summary page gives an overview of covered devices and variables.

Error matrix shows discovered problems for given device and variable.

Report Plots

Generic plot: Shows appropriate values together with corresponding alarms.

Results of the custom analysis
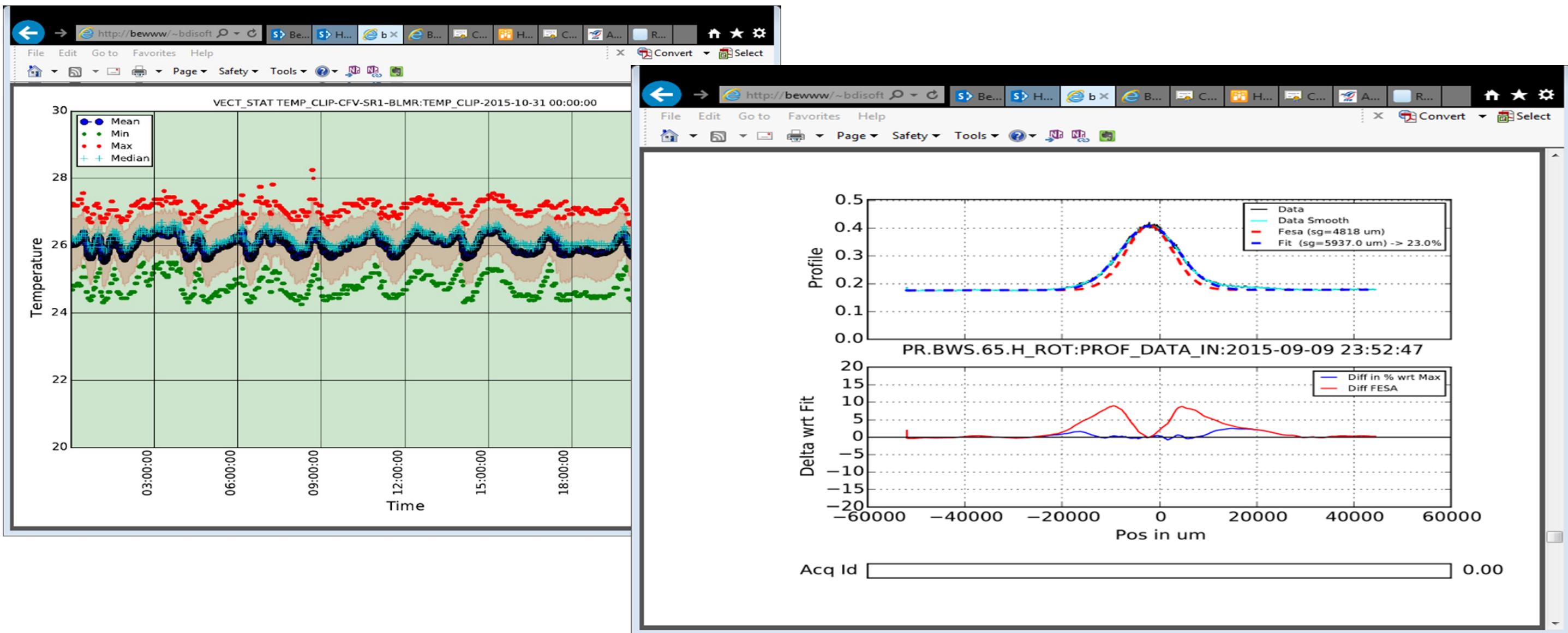
Conclusion

Presently, forty reports are produced every day, covering beam position, losses, current and profile measurements in all of the CERN complex (LHC, SPS, PS, BOOSTER...). Two thirds of these reports only rely on OAF's core features. Some reports use expert code included into the framework to add some specific analysis and plots. Finally, a recurrent "OAF outcomes" topic has been added to our regular internal technical board meetings where we present to all BI experts interesting observations as well as new features of the framework.