INTEGRATING CONTROLS FRAMEWORK: CONTROL SYSTEMS FOR NA62 LAV DETECTOR TESTBEAMS

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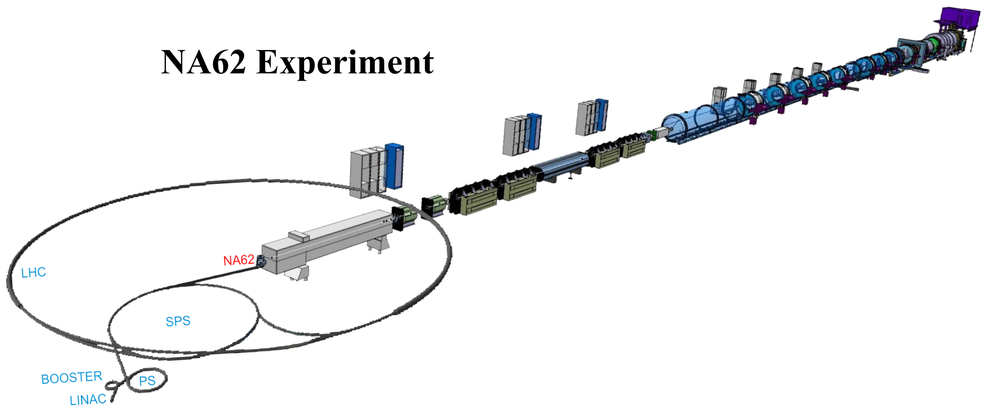
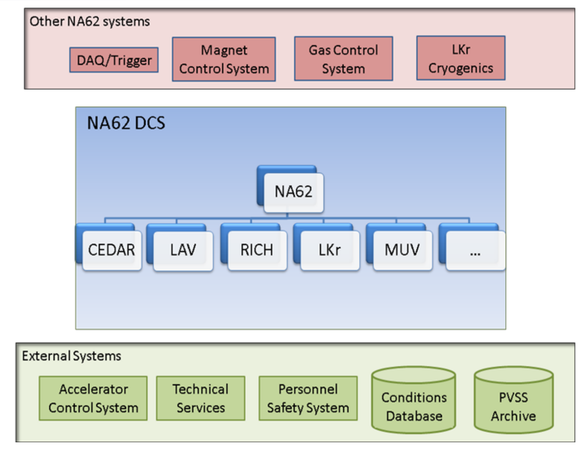
ABSTRACT

The detector control system for the NA62 experiment at CERN, to be ready for physics data-taking in 2014, is going to be built based on control technologies recommended by the CERN Engineering group. A rich portfolio of the technologies is planned to be showcased and deployed in the final application, and synergy between them is needed. In particular two approaches to building controls application need to play in harmony: the use of the high-level application framework called UNICOS, and a bottom-up approach of development based on the components of PVSS JCOP Framework. By combining the features provided by the two frameworks we want to avoid duplication of functionality and minimize the maintenance and development effort for future control applications. In the paper we present the result of the integration efforts obtained so far: the control applications developed for beam-testing of NA62 detector prototypes. Even though the delivered applications are simple, significant conceptual and development work was required to bring the smooth inter-play between the two frameworks, while assuring the possibility of unleashing their full power. We also discuss the current open issues, and namely the viability of the approach we have taken for larger-scale applications of high complexity, such as the complete detector control system for the NA62 detector.

NA62 Experiment



- A fixed-target experiment being constructed at CERN.
- Studying ultra-rare decays of K particles (kaons).
- Scheduled to start Physics Data-taking in 2014.
- Composed of 10 subdetectors in and around a 115m vacuum tank.
- In terms of controls, bigger than other fixed-target experiments at CERN.
- Fewer control parameters than the LHC experiments.
- Collaboration between NA62 and the CERN Industrial Controls & Engineering group (EN/ICE) to develop Detector Control System (DCS).
- NA62 experiment will have around 5000 high voltage channels and between 10000 and 20000 analog and digital channels.

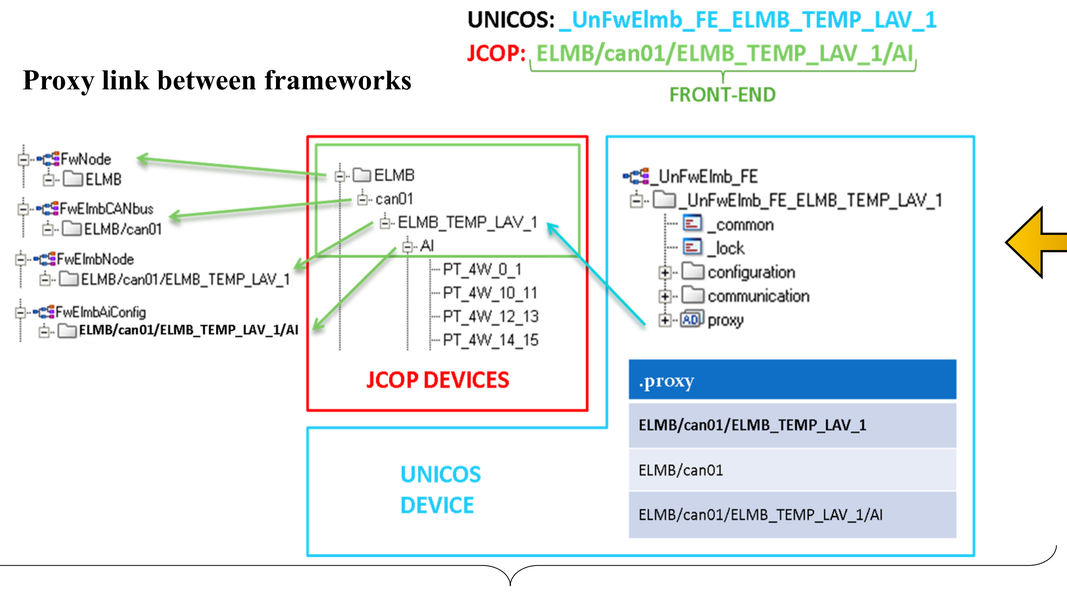


CERN Industrial Control Frameworks

JCOP framework:

- Provides a set of tools and a defined architecture which the developers can use as a basis for building the complete application.
- Simple creation, great degree of flexibility, configuration and multiple hierarchical (multiple layers) tree organisation of instances of device classes.
- Extensive library of functionality and a predefined set of devices is provided.
- Control devices with integrated Finite State Machine logic.

Proxy link between frameworks



UNICOS framework:

- Provides developers a methodology to create ready-to-use controls application with full control.
- Provides a framework that encompasses the hardware interfaces up to the final operator's view of the system.
- Offers tools to diagnose problems in the process and the control system itself.
- Homogenous customizable user interface.
- Two level hierarchy: Front-End and Device.

As a result, two applications were created: **LAV Prototype** and **LAV Environment Monitor**

Control System for LAV Prototype testbeams:

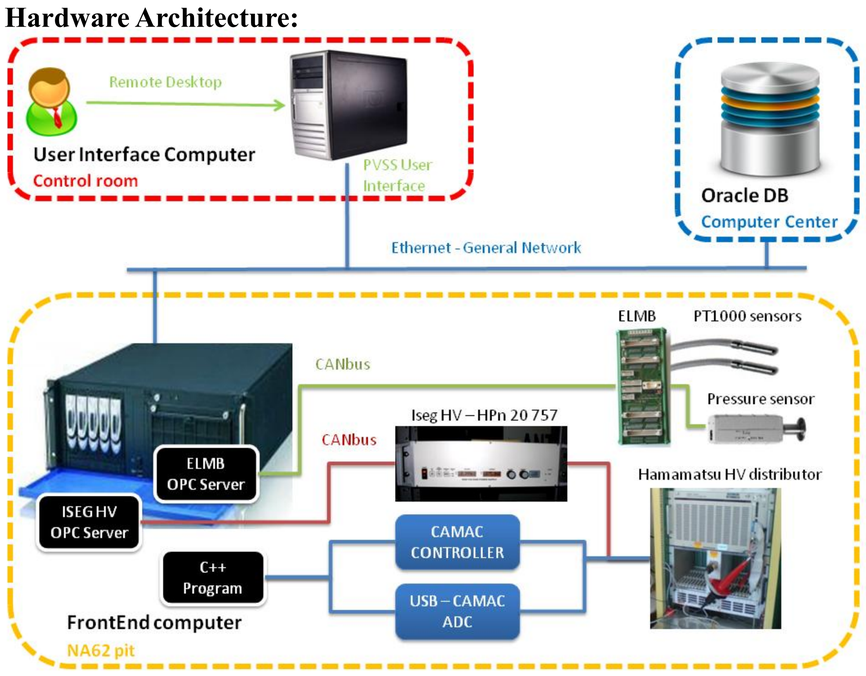
Objectives:

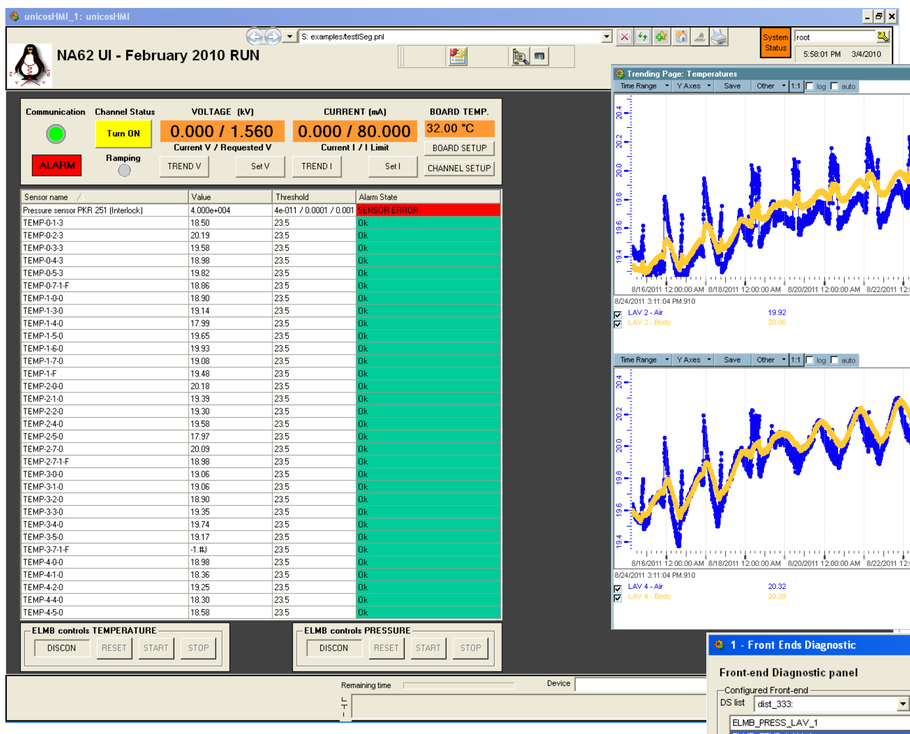
- Test possible frameworks integration.
- Implement control and monitoring for LAV detector.

Features:

- Oracle DB archive.
- Access control.
- Trending.
- High voltage interlock monitoring.
- System Integrity (SMS and night report).
- Alarm screen.
- ...

Hardware Architecture:





Screenshots:

- Top left: LAV prototype main screen in UNICOS environment with **Iseg** high voltage monitoring and control, and **ELMB** (Embedded Local Monitor Board) readout for **pressure** measurements and **temperatures**.
- Top right: Temperature trending divided by LAV station.
- Bottom right: Front End Diagnostic panel, where **system integrity** was integrated for **ELMB** and **Iseg** high voltage power supply.

CONCLUSIONS

The NA62 LAV and LKr applications have validated the approach to gain the benefits of both the UNICOS and JCOP frameworks. The device proxy concept enables the high level UNICOS tools to access JCOP data required at operations time. This provides a seamless interface to the control application operator.
Additional synergy can be obtained by integrating the frameworks together more closely. There are tools that are still limited to functioning in one of the two framework domains. As these issues are tackled, the full benefits of this combined framework approach will become available.

The further work required on the NA62 DCS will provide a suitable test bed and showcase for future integration work. There are still significant conceptual and design efforts ahead, but experience to date shows that the results of such work should be reusable in many future applications, providing a sustained improvement in efficiency of application building and maintenance.

Industrial Controls
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