Systems Built from Industrial Components

First LHC Controls Project (LHC-CP) Workshop

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Mandate

- What are the applications and their milestones?
- What is required to integrate these systems to the general control systems?
- Are the services set up by the Control Board sufficient - advice, purchasing, training?
- What are the common components? How should support be organised?

Purpose of the session

Discuss and clarify the scope and the objectives of the LHC-CP as far as “Industrial Components” are concerned.

Three steps:

- Inventory of the ongoing activities
- Identification of possible/potential requirements and open questions
- Highlight important milestones

Industrial Components (What's IN?)

- Fieldbuses *(Control Board recommendation)*
  - CAN, WorldFIP, PROFIBUS
- PLCs *(Control Board recommendation)*
  - SIEMENS, Schneider
- SCADAs *(Working group)*
- (Ethernet)

Industrial Components (What's OUT?)

Analogue and waveform acquisition systems based on industrial standard like VXI, PXI for the hardware and LabVIEW, HP-VEE for the software.

Nevertheless, a common approach for the use/integration of this kind of solution appears to be necessary within the LHC control architecture.

Fieldbuses (1/2)

Only two fieldbuses are actually used in the accelerator sector: **PROFIBUS** and **WorldFIP.**

Starting developments based on **CAN** have to be avoided for accelerator equipment control unless no solutions are available with PROFIBUS and WorldFIP.

The recommendation for the use of fieldbuses has to be reviewed in order to integrate the actuator and sensors bus.

Fieldbuses (2/2)

The distribution of machine timing events and absolute time is actually only available on WorldFIP.

The necessity to provide this kind of facilities on PROFIBUS has to be evaluated before starting development. Nevertheless the time stamping issue for data archiving from PLC through PROFIBUS has to be solved.

Integration (1/4)

- As many approaches as users present in the session (technical architecture/project management)
- A lot of basic technical choices have been already done and those choices are tightly link with the industry standards.
- Common points:
  - Multi-layers PLCs and fieldbuses architecture,
  - At one moment a connection to an Ethernet network exist,
  - Access to the equipment is done through a SCADA.

Integration (2/4)

Three different approaches:

- Turn-key DCS
- Partially subcontracted: sub-system and/or specific functionality subcontracted to industry, integration stays behind CERN responsibility
- Home made: development and integration completely behind CERN responsibility

How to integrate *homogeneously* those different approaches in the LHC control architecture?

Guidelines will be usefull...

Integration (3/4)

Communication requirements

- Horizontal: distributed around the machine at the field/automation level
- Vertical: high level machine operation to field / automation level
- Based on local and/or distributed SCADA system, and/or on front-end server

The middleware appears to be the key element for an homogeneous integration of the different solutions inside the LHC control architecture.

Integration (4/4)

Groups have to install, maintain and operate the same type of equipment in other accelerator than LHC.

The tendency for these groups to use the same approach in order to keep an homogeneity at the equipment level between the different accelerator exists and is extremely strong.

Technical choices made today for PS and SPS equipment control may have an impact on LHC control architecture.

Support & Maintenance (1/2)

- Support to the equipment groups appears to be necessary during the different phases of their project (development, integration and operation) on hardware (fieldbuses, PLC) and software (SCADA, OS). The level of the support expected from the equipment group vary significantly between users.
- A clear definition of responsibilities have to be established between the different “actors” of the control system.

Support & Maintenance (2/2)

- Return from industry seems to be very poor in this domain
- Simultaneously, it appears necessary to establish a common policy for PLC and SCADA software maintenance since the beginning of the project. (Software version consistency, upgrafe policy, industry market follow-up policy, software compatibility maintenance…)

Milestones

- A lot of equipment control based on industrial components will be installed in STRING2. At this occasion, it will be possible to test low level functionality up to the SCADA systems.
- Strong guidelines for the integration of the SCADA system in the LHC control architecture have to be issued during the next twelve months in order to avoid divergence.
- Similar control equipment as those used for the LHC will be installed during the next two years in the SPS (SPS2001) and in the PS (LEIR, ISOLDE, CTF3). The possibility of using those equipment as real test bench for integration of industrial components in the LHC control system has to be evaluated.

Conclusion

- Industrial components will be extensively used for the control of different type of LHC equipment. A lot of basic technical choices have been already made by the different equipment group and an homogenous integration of those different solutions in the LHC control architecture appears to be the challenge.
- Simultaneously, industrial component will also be used in other accelerators for the first time. Requirements for an homogeneous integration of industrial components in the different accelerator exist and their impact on the design of the LHC control system has to be evaluated.