DRAFT PROPOSAL

ALICE DETECTOR CONTROL SYSTEM (DCS) PROJECT

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1. Introduction

The initial steps in developing an ALICE DCS were taken several years ago and much work has already been invested and results have been achieved which will be used as basis for the future DCS developments. Due to changes in the organizational structure of ALICE and in view of re-launching the DCS developments it was felt necessary to redefine the DCS project and to establish a clear Controls Co-ordination mandate. This paper describes the new DCS project.

2. Goal

2.1 Ultimate goal

The ultimate goal is a working Detector Control System (DCS) ready for exploitation end 2005 allowing to control and operate the experiment during all modes of operation and according to defined requirements.

2.2 Final assembly and commissioning

The Control Systems for each individual detector should be ready to be used during the final assembly and commissioning end 2004.

2.3 Intermediate goals

A set of milestones for the project will have to be defined, discussed and agreed in the ALICE Controls Board (ACB).

3. Organizational layout

ALICE Control Coordination (ACC) is the functional unit mandated to co-ordinate the execution of the DCS project (see 'ALICE Controls Co-ordination Mandate'). It reports to ALICE Technical Coordinator (TC) and the Technical Board (TB).

The main parties involved in the DCS project are the various detector groups and the groups providing the external services. In addition the DAQ, Trigger and Offline systems as well as the LHC Machine need to be linked-up with DCS.

ALICE Controls Board (ACB) is the principal steering group for the execution of the DCS project and it reports back to ALICE Technical Board (TB).

Furthermore, ACC participates in the Joint Controls Project (JCOP) which is co-ordinated by the IT/CO group. (See Fig. 1).

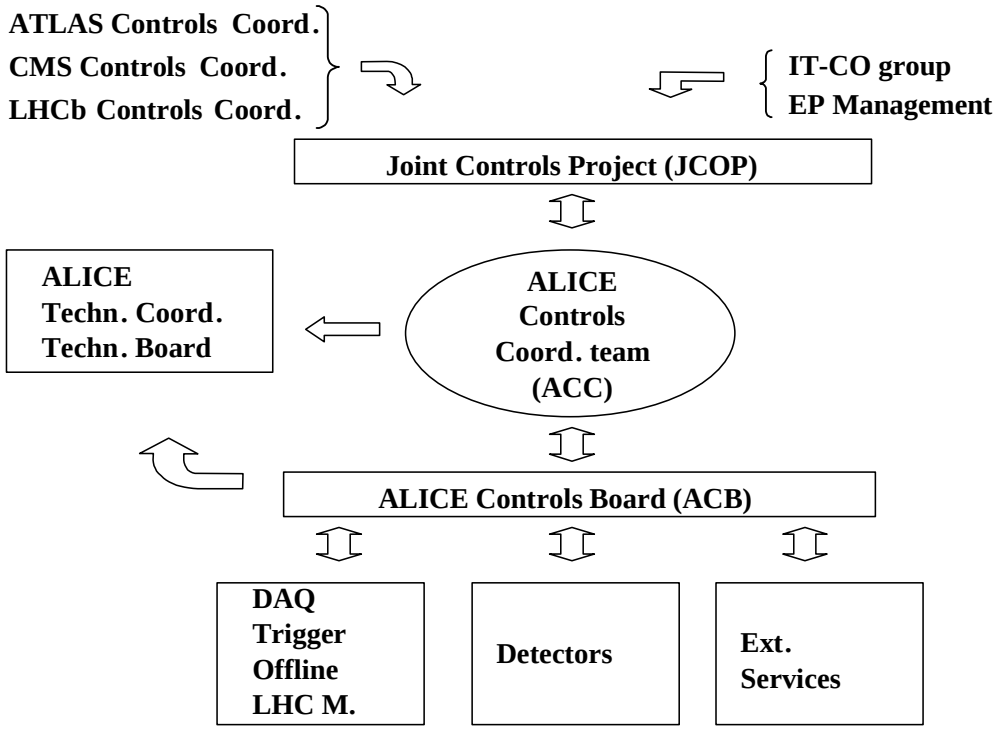

Fig. 1 Organizational layout

4. Technical layout

4.1 Experimental Control System (ECS)

The control and operation of the experiment takes place on the ECS layer. Through this layer DCS is linked up with the Data Acquisition (DAQ), Trigger (TRG) and Offline systems and with the LHC Machine.

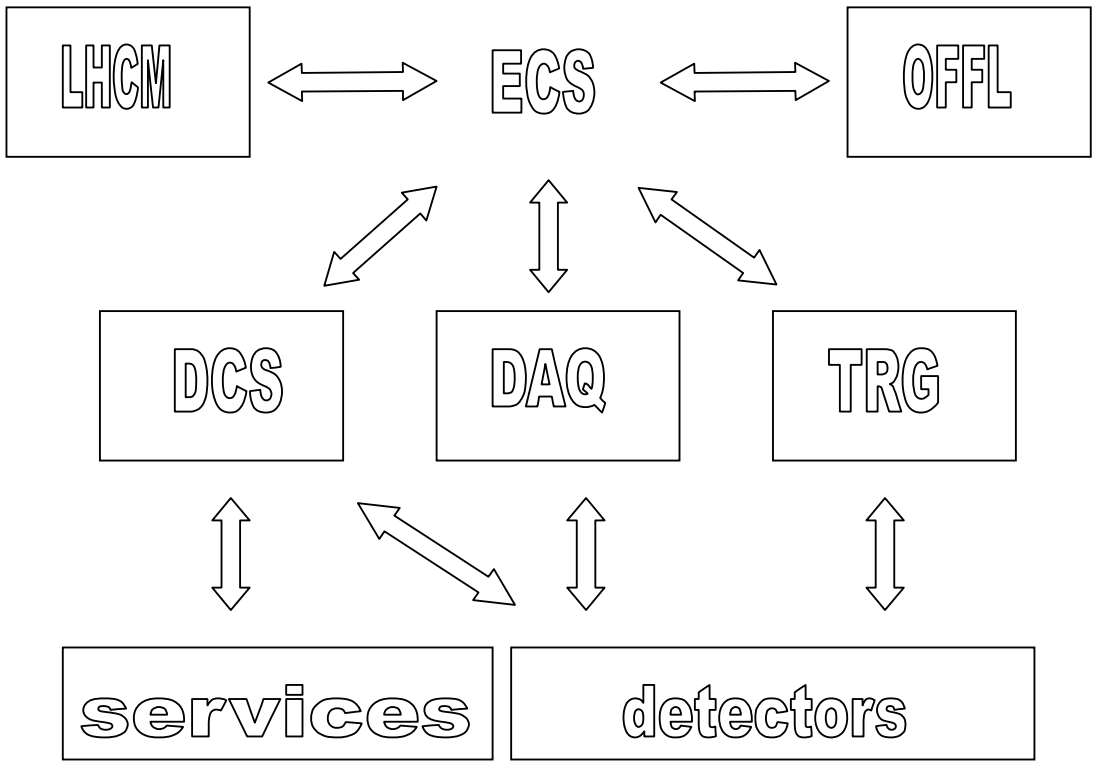

Fig. 2 Experimental Control System

4.2 DCS layout

The 'standard' DCS model consists of a number of hardware and software components on three hierarchical layers: the supervision layer, the controls layer and the field layer (see Fig 3.).

4.2.1 Supervision layer

The supervision and operation of the detectors take place on this layer and some of the tools and facilities needed are:

- SCADA framework tools
  - Man-Machine-Interface and graphics
  - Logging and archiving facilities
  - Alarms
  - Configuration databases
- Application programs and data
  - Object library for supervision
  - Supervision and operation programs (finite state machines)

4.2.2 Control layer

On the control layer the collection and processing of data takes place and the following components can typically be found here:

- Process Control Units
- Local Operator Workplace
- Local Engineering Workplace
- Data server
- Application programs and data
    - Object library for process control
    - Local operation programs
    - Sub-detector configuration data

4.2.3 Field layer

The connection of the detector equipment to DCS takes place on the field layer via sensors, I/O-interfaces and fieldbuses.

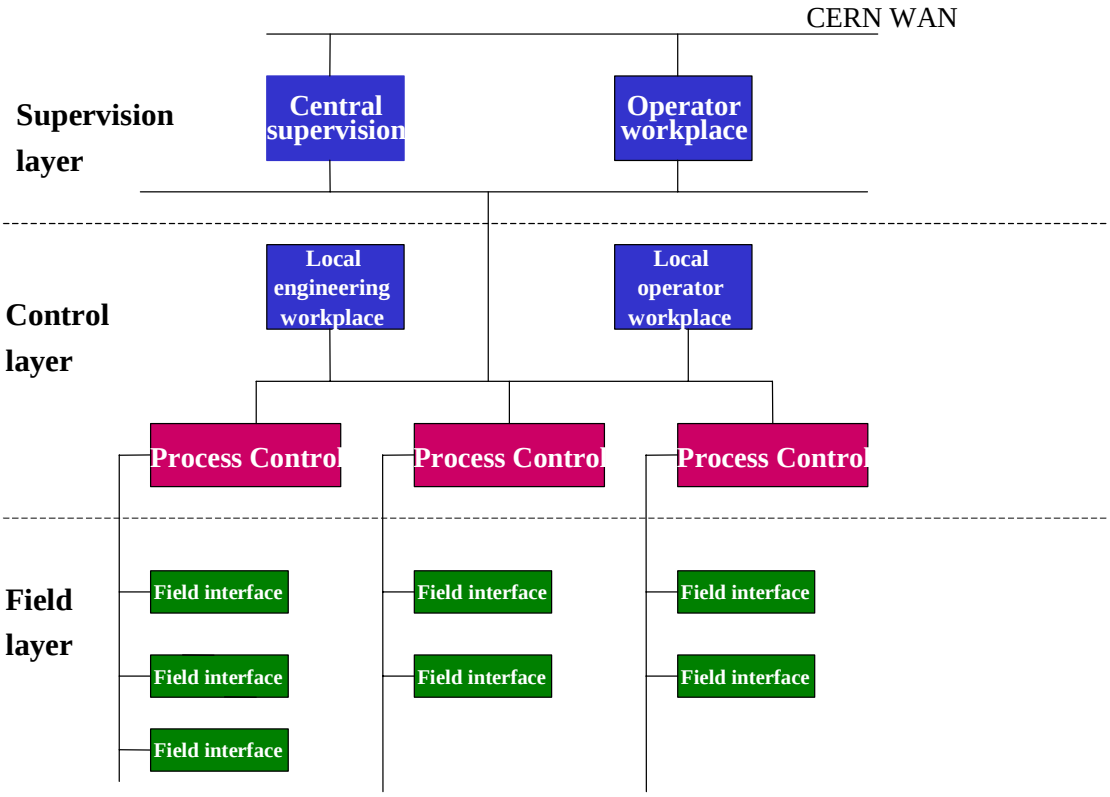

Fig. 3 Standard DCS model

5. Possible deliverables

While working towards the final delivery of an operational DCS a number of intermediate deliverables should be achieved. These deliverables will be discussed and approved by the Controls Board. Some possible deliverables are listed below:

- Basic DCS architecture layout definition
- URD of systems, devices and parameters to be controlled and operated by DCS.
- Definition of 'standard' ALICE controls components and connection mechanisms.
- Prototype implementation of 'standard solutions'.
- Prototype implementation of an end-to-end detector controls slice.
- Object library definition for supervision and process control
- Global project budget estimation
- Planning and milestones
- etc

6. Prototype development

In order to study and evaluate possible options of 'standard solutions' to be used by the detector groups it is absolutely necessary to gain "hands-on" experience and develop prototype solutions.

Such prototype developments, which could be tried out in detector lab-tests or in testbeams, will be identified after discussions in ALICE Controls Board and initiated by the ACC team in close collaboration with a few detector groups, which will be used as test cases. A few examples of such prototypes are listed below:

- Standard ways of measuring temperatures
- Control of HV systems
- Monitoring of LV power supplies
- Etc.

Furthermore, it is also necessary to prototype complete end-to-end detector control slices including the necessary functions at each DCS layer. This will make use of the SCADA framework tools, which presently are being developed within the JCOP project.

7. Responsibilities

The responsibilities are shared between the different projects involved (see fig. 1) and an overview of "who is responsible for what" is sketched below:

ALICE Controls Co-ordination (ACC):

ACC is responsible for the co-ordination of the execution of the DCS project. This involves monitoring of progress of the design, construction and installation and follow-up of time-scales and

budget of the different parts forming the DCS.

ACC is also responsible for giving guidelines and assistance in the execution of the projects in view of obtaining a homogeneous Controls System. The level of assistance is limited to the available manpower.

ACC is responsible for the provision of a common control structure including common facilities and interfaces to external systems. (Subject to clarification of JCOP responsibilities).

ACC provides access to common tools and components.

(See also 'ALICE Controls Co-ordination Mandate').

Detector Groups: Each detector group is responsible for the design and implementation of the Control System of their detector respecting the technical specification, the agreed planning and the financial resources. Each group participates in the ALICE Controls Board (ACB), shares its decisions and follows the guidelines as far as applicable.

ALICE Controls Board (ACB):

ACB is the principal steering group in all matters of Controls Co-ordination. It is chaired by the Controls Co-ordinator (CC) or in his absence by the Deputy CC. ACB is composed of Controls representatives of each detector project and service activity. The project leaders nominate the representatives.

ACB is authorized to take technical decisions, which ACB deems not to have a significant impact on performance or cost of the ALICE Detector. More important technical decisions are prepared in form of a proposal by ACB for discussion and action by the TB.

Services Groups: External services group can in general be seen as detector groups each being responsible for the design and implementation of the Controls System of their service, however, the details for each service needs still to be defined. An ALICE controls linkman is nominated for each service to co-ordinate and follow the activity of the service and represent the service in the ACB. The services are:

Magnets
Electricity/racks
Gas
Cooling & ventilation
Access

Alarms & Safety

Associated Project Groups (DAQ, Trigger, Offline):
The design and implementation of the interfaces between DCS and the associated projects DAQ, Trigger and Offline will be subject to future common projects where the roles and responsibilities will be defined.

IT Controls Group: The Controls Group is responsible for the co-ordination and execution of the Joint Controls Project (JCOP) in close collaboration with the Controls Co-ordination of each LHC experiment and the EP management. The group is also responsible for the provision and support of the common components and tools which have been defined by JCOP. (To be confirmed).

Joint Controls Project (JCOP):
The scope of JCOP is to provide a common framework of tools and components to allow the LHC experiments to build their own DCS application. (See also JCOP mandate).

LHC Machine: The design and implementation of the interfaces between DCS and the LHC machine will be subject to a future JCOP project where the roles and responsibilities will be defined. (To be confirmed).

8. Resources

8.1 Budget
To be defined

8.2 Manpower
Only the manpower required for the Controls Co-ordination has been estimated here. The required level is strongly dependent on much on how the work is shared between all parties involved and how much assistance the detector groups require.

The tasks are project oriented, will evolve with time and need to be redefined as the project advances.

Controls Coordinator
The Controls Co-ordinator (CC) is leader of the Controls Co-ordination team and is in charge of the DCS project. He takes care of the general organization, such as resources, work organization and links with the management and he is responsible for the co-ordination with the various parties involved. He chairs the ALICE Controls Board, represents DCS in the Technical Board and represents ALICE in JCOP.

Common software facilities
Two software engineers or physicists are required to take care of and be responsible for the overall software aspects of DCS, in particular the common facilities on the supervisory layer.

- To participate in the elaboration and design of the DCS architecture and control strategy.
- To participate in the definition and implementation of standard connection mechanisms between supervisory and process layers in DCS.
- To participate in the design and implementation of interfaces between DCS and the external services and to carry out the integration of the services in DCS.
- To participate in common projects to define and implement the required interfaces and command structures between DCS and the DAQ, TRG and Offline systems.
- To participate in the development of the connection mechanism with the LHC Machine.

Process control and field layer activities
One hardware/software engineer or physicist and two technicians are required to take care of and be responsible for all questions concerning the process control and field layers and to act as co-ordinator for the detector controls:

- To participate in the elaboration and design of the DCS architecture and control strategy.
- To participate in the definition and implementation of standard connection mechanisms between the process layer and the detector devices.
- To set-up a test lab and to prototype standard solutions to be used as model for the detector groups.
- To advice and assist the detector groups in solving their control requirements.

9. The initial steps

The initial steps in developing an ALICE DCS were taken several years ago and much work has already been invested and results have been achieved which will be used as basis for the future DCS work. Some initial steps to re-launch the project are listed below:

- Agree on a project definition including responsibilities and resources (this document)
- Establish the necessary resources and create the ACC team
- Establish the ALICE Controls Board (ACB)
- Define organization of work
- Identify initial applications for prototyping
- Agree on milestones and establish detailed planning
- Set up and start regular meetings to monitor progress