Minutes of LHC-CP Link Meeting 4

Subject	:	LHC Controls Project

Date	:	16:00 26th September 2000

Place	:	112/R-018

Participants	:	Billen, R	SL-MR
		Bruning, O	SL-AP
		Carlier, E	SL-BT
		Ciapala, E	SL-HRF
		Di Maio, F	PS-CO
		Gavaggio, R	LHC-VAC
		Gayet, P	LHC-ACR
		Gras, JJ	SL-BI
		Jonker, M	SL-CO
		King, Q (Secretary)	SL-PO
		Lamont, M	SL-OP
		Lauckner, R (Chairman)	SL-DI
		Martel, P	EST-ISS
		Pezzetti, M	LHC-ECR
		Schmidt, R	AC-TCP
		Vanden Eynden, M	SL-CO
		Walckiers, L	LHC-MTA
		Wolf, R	LHC-MMS

Excused	:	

Absent	:	Brahy, J	LHC-IAS
		De Rijk, G	SL-MS
		Epting, U	ST-MO
		Rodriguez Mateos, F	LHC-ICP

Distribution	:	Via LHC-CP website: **http://lhc-cp.web.cern.ch/lhc-cp**
		Notification via: **lhc-cp-info@listbox.cern.ch**

Agenda	:	1. Minutes from previous meeting	
		2. News	R. Lauckner
		3. Mandate for LHC Analysis WG	M. Lamont
		4. Database activities	R. Lauckner
		5. Function Generators	Q. King
		6. AOB	

1. Minutes from Previous Meeting

It was noted in the minutes for meeting 3 that the INB approved safety alarm system to be deployed by ST is called CSAM and not CESAM. The minutes have already been corrected on the project web site.

J.J. Gras reiterated a comment he had made during the meeting, and which was not reported in the minutes:

> Due to the diversity (more than 30 different instruments) and the rapid and constant evolution of beam instrumentation, the BI Group is responsible for the development of its GUIs for operation. This does not mean that a GUI cannot be developed in another group but it's then a BI decision.
>
> BI rely (and want to be able to rely) on the SL/CO infrastructure, tools and recommendations. Our policy in this domain remains:
>
> 1. To use within our mandate the standard solutions provided by SL/CO whenever possible.
> 2. To check if a SL/CO standard solution can be provided on time when none is available.
> 3. If no standard solution can be provided within our timescale, we develop a BI solution.

2. News   R. Lauckner

The chairman reported to the group on some of the outcomes of the last Controls Board meeting held on August 17th. He explained that the new chairman Wolfgang Von Rueden was changing groups and so the question of chairman was again under review. A joint representative will replace the individual representatives from the LHC experiments. This will be JCOP chairman David Myers. Wolfgang Von Rueden reported on the Scada Working Group, which has succeeded in gaining Finance Committee approval for the use of PVSS for all LHC experiments. There was support for the use of PVSS CERN wide, but this was not unanimous.

Following the creation of the Alarms sub-project (meeting 3) and LHC analysis sub-project (this meeting), there is the plan to create a Post Mortem sub-project. R. Schmidt, K.H. Mess and R. Lauckner are preparing a first proposal of the post-mortem facilities.

3. Discussion: Mandate for LHC Analysis Working Group   M. Lamont

Mike Lamont presented the mandate for the proposed LHC Analysis Working Group (see attached slides). The mandate itself is available from http://cern.ch/lhc-cp/Sub-Projects/LAWG/LAWGmemo.PDF.

A key theme was the experience of designing LEP using SASD. There are many similarities between LEP and LHC, as well as many differences. In particular, LEP had been running for two years before the SASD analysis was undertaken, so the equipment access and related protocols were already defined. With LHC, equipment groups are in the middle of the design process and there is still the opportunity for the top-level analysis to generate requirements for the equipment groups.

Development methods have advanced since the early nineties and it is expected that the LHC analysis will be object oriented. The expected choice of CASE tool is Rational Rose.

In the discussion that followed, concerns were expressed about the difficulty of using a CASE tool. It was explained that only a core team would be expected to become experts with the tool, and that most equipment groups would be able to express there functionality and requirements in plain text. It was also noted that one element of the analysis process, Use Cases, is very simple and intuitive.

4. Database Activities R. Lauckner

Robin Lauckner briefly presented a vision for the development of LHC databases. He pointed out that there are is a concentration of database specialists within the SL/MR group, in the DBS section under Ronny Billen. Although the group will be heavily occupied with LEP dismantling for many months, it is foreseen that once this task is complete, their database expertise will be drawn upon for various database problems related to LHC controls.

A related subject is the management of LHC construction documentation. The CERN database for this is EDMS, and Pedro Martel will present an overview of EDMS to the LHC-CP linkmen at the next meeting.

In the brief discussion that followed, it was noted that for some applications, a relational database is more complex than required, and can provide poor performance compared to a flat file structure. It was also pointed out that the experimental areas upgrade, which is a middleware prototyping project, there will be the need for databases sooner rather than later. In particular, sooner than SL/MR effort will be released from the task of LEP dismantling.

5. Function generators Q. King

Quentin King presented a very brief overview of the SL/PO LHC magnet current control system project (http://cern.ch/mccs/). He then explained that time constraints in the hardware development process mean that the hardware design will need to be finalised next year. At the heart of the system is an embedded controller which performs function generation duties. It also provides control and monitoring of power converter hardware and closed loop current control. It is clear that there will be other requirements for function generation across the LHC, and in some cases, the same SL/PO controller could be considered a candidate implementation.

The purpose of the announcement was to make it clear that any requests to use the SL/PO controller would have to be received before the end of this year, if they are to be considered. It was also explained that SL/PO are short staffed and they could not promise solutions for other groups, however, they are open to debate the issue.

In the following discussion, it was noted that the reuse of a single function generator design would make the top-level control software simpler. Both RF and BT expressed an interest in the solution and agreed to follow up the issue directly with SL/PO.

Edmond Ciapala provided the following comment:

> The function generator is a good example of a piece of equipment developed in one group, which other groups could make use of. This is in line with traditional arguments such as cutting down unnecessary work and reducing the diversity of interfaces to the control system. The idea also keeps discussion alive on important issues such as the ramp requirements and strategy, timing system requirements and the physical distribution of timing. It would therefore seem sensible to look for other possible common developments – *preferably at an early stage.*

> A good example from LEP has been the collaboration between RF and CO groups to use GPS timing for post-mortem analysis. Large numbers of remote signals related to beam loss and RF unit trips are time stamped. This will certainly find applications in LHC RF and could clearly be used for other LHC systems.

> In general, if equipment groups have ideas for developments which may be of interest to others, they could present them in LHC-CP and co-operating groups could be formed.

In line with this suggestion, Quentin King agreed to present the SL/PO controller design in more depth at a future meeting.

6. AOB

The chairman asked if the LHC-CP meetings should be open to anyone. It was decided that the linkmen should be free to invite people from their group as appropriate, but that the agenda would continue to be sent only to the lhc-cp@cern.ch mailing list.

Actions	People
Review RT requirements for end of 2000.	M. Lamont, R Lauckner
Prepare presentation about EDMS for LHC-CP meeting 5 (10th October)	Pedro Martel
Prepare presentation about the SL/PO controller for a future LHC-CP meeting.	Quentin King

Analysis

- **At the high level want to have an integrated system to operate the machine for physics and MD and support needs of equipment and instrumentation.**
- **Process:**
  - **choose and commit to a method (try impose some discipline)**
    - early stage: analysis, requirements capture, Use Case
  - **choose a CASE tool and learn how to use it**
- **Why?**
  - **Clear definition of requirements**
    - clearly so final system has required functionality
    - to make sure control system infrastructure is capable of meeting them, otherwise we're second guessing
    - clearly defined interfaces to equipment and provision of low level functionality
    - proper integration of components & other systems
  - **Some chance that it might work reasonably well**

Analysis II

- **Capture operational model**
  - **work out how we're going to run this thing with due regard to**
    - past experience
    - other accelerators
    - novel aspects of LHC
  - **Use Case and capture in one repository**
- **Definition of responsibilities: establish use of control system from PCR:**
  - **monitoring of equipment during shutdown and repair**
  - **making LHC safe for operation**
  - **preparing equipment for operation**
  - **operation without beam**
  - **operation with beam**
  - **recovery and diagnostics**

Analysis III

- **At this (early) stage:**
  - **can start to flesh out high level requirements that users will have of the system but must anticipate…**
  - **demands on:**
    - control system architecture and components
      - middleware, timing, real-time, distributed data
    - equipment
      - real-time demands, post-mortem, low level functionality, communication
    - instrumentation
      - feedback, acquisition rates, communication
    - other systems
      - cryogenics
    - subsystems
      - experimental communications
      - logging
      - post-mortem

LEP

- **SloppySoft performed top-down analysis using SASD...**
- **Middleware already in place**
  - **extended to allow asynchronous sends**
- **Equipment interfaces already in place, low level functionality as given**
  - **Power converters got it right**
  - **Separators was and still is horrible**
  - **RF - totally out there on it's own**
- **Beam instrumentation**
  - **stand alone**
  - **slow acquisition and little integration**
- **Experimental communications**
  - **was home made & inflexible**
  - **replaced by an existing database**
- **Timing as given and OK**

A note on databases

SL-MR Support

1. LHC-CP should continue the high level breakdown of the control and operation of the LHC until database requirements start to emerge. SL-MR will become involved with analysis and design at this point.

2. In parallel specific projects will start in areas such as alarms and post-mortem. Where such projects have an important database component SL-MR will be ready to provide support for database analysis and design.

3. Equipment groups will use databases as an engineering tool during the development and construction of their systems. At some point they will have to provide data to the control system. In order to anticipate this the 2nd LHC-CP workshop in April 2001 will include a session on database activities which will review the applications and methods being used by the groups and ask if data integration problems are expected.

SL-MR Support

4. Good design and consistency of approach are important for control system performance and to ease maintenance. This is to be achieved by advice from SL-MR on all important database projects.

5. This autumn SL-MR and the LHC-CP will review the EDMS activity to ascertain the scope of what they are doing and to explore the future integration of EDMS data into the control system and possibly EDMS tools and techniques.

6. LHC-CP software systems will take advantage of modern object technology. However the relational database remains the best tool for the solution of a wide class of data management problems and is the strategic technology for the LHC Control System.

Robin Lauckner

Analysis Working Group - mandate

- **LHC application software**
  - High level stuff used in PCR essentially for beam handling
- **Capture requirements**
  - functional
  - interfaces with other systems
  - for control system components
    - performance, data rates, timing
    - implications for architecture
  - interfaces with equipment
- **Formal specification**
  - I.e. drive through analysis & design & production
  - capture with CASE
- **Identify responsibilities**
  - roles
  - who's going to do the work

First phase - objectives

- **Scoping study: scope of PCR controls activities and definition of responsibilities. Identify users of system.**
- **Formal capture of high level user requirements (not forgetting the equipment and instrumentation groups)**
- **Requirements that high-level control system will place on key control system components**
  - in particulars timing and middleware
- **Baseline architecture**
- **Identification of novel control requirements**
  - e.g. real-time
- **Read "The Unified Software Development Process"**
- **Learn how to use Rational Rose**

Management

- **Deliverables:**
  - For April 2001 (as long as they don't run LEP next year)
    - the phase 1 objectives as listed above
- **Who:**
  - Mike Lamont, Oliver Bruning, M. Vanden Eynden
- **Answerable to:**
  - no-one
- **Progress reports:**
  - LHC-CP meetings
  - SL technical committee