CERN – European Organization for Nuclear Research

European Laboratory for Particle Physics

CTF3 Note 017 (Tech.)
(EDMS)

CTF3 PROJECT INFORMATION MANAGEMENT PROPOSAL

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Geneva, Switzerland
6th December 2000

1. Introduction

The PS Management Board of 7th August 2000 decided to introduce the EDMS (Electronic Data Management System) in the PS Division at the level of a Divisional project. It was agreed to apply this system to the CTF3 (CLIC Test Facility 3) project.

The objective of this proposal is to provide a system to manage *all* information; documents, drawings and raw or derived data, required for the realisation of the CTF3 project. A 'start small and evolve' approach would seem suitable for the project, which will continue over a period of five years. An attempt has been made to identify the major types of information used throughout the lifetime of the project. The start-up of any information project is facilitated by providing a solid infrastructure on which to build. Some of the issues to be resolved are raised, such as the classification of the items to be managed. The proposal suggests an approach to get the project off the ground. Existing information and information management tools are listed. These should be used whenever possible.

2. Information identification

The typical stages of a machine development project are described with an attempt to outline the information required and that generated at each stage. This breakdown is not intended to be a working specification, but is meant to illustrate the considerable re-use of information during the life-time of a machine and hence the importance of catching it at source and making it easily accessible. Since the CTF3 project is planned in three phases, the stages will overlap in time. The continual development of the machine provided a very good argument for carefully documenting what has been done and what is to be done. This list become more detailed as the project progresses. Existing information is mentioned when known.

2.1 Project organization

The project is initially specified giving requirements and the parameters needed to meet requirements. A project plan gives major tasks, phases and milestones. Decisions concerning the plans, the approval of specifications and modifications to earlier decisions are recorded in minutes. CFT3 meeting minutes and publications can be accessed via WEB pages. Technical Notes are also entered. A future development might be to link the all documents to the items under discussion. The different phases of the CTF3 project may need to be seen both separately and as part of the project as a whole.

2.2 Machine design

The parameters for the different phases of the CTF3 project set the basic requirements. A machine is designed using optics modelling software. The input includes the machine layout. Different configurations of the layout are explored with different optics parameters. The approved design forms the basis of the machine, the functional description of the components providing the principal requirements for the physical equipment specification. The machine layout is also represented on drawings.

The feasibility of using the current ABS (Automated Beam Steering) database currently used for the operation of the machines in the PS Complex is being tested. The ABS facility can handle simple change management. The date of installation (actual or planned) and of removal can be entered for each component. Currently no version handling has been implemented (although this was foreseen and has been designed). This feature would have to be added if the ABS database is to be used to manage optics modelling of CTF3.

2.3 Equipment design and specification

Equipment with the functional requirements of the optics model is designed. CAD tools are used for drawings. If the item is manufactured, a specification may be adequate. If it has to be built, detailed specifications, drawings and assembly instructions must be provided. Prototypes may be built and tested. Specification information for equipment to be re-used should be collected whenever possible.

2.4 Equipment acquisition

The design documents are required for market survey, tendering should be accessible to the designers and others. Template documents can help in the acquisition process. Once contracts have been approved and signed, contract follow-up is provided by the EDH system.

2.5 Equipment assembly and commissioning

Equipment must first be given a unique identifier. Equipment assembly requires the assembly drawings and instructions produced for the tendering, additional information may be acquired.

Once equipment has been assembled, it is tested. Test data may be also provided by the manufacturer. During the commissioning of the equipment calibration and other operational parameters will be derived.

2.6 Dismantling and installation

The CTF3 will gradually replace the existing machine LPI (LEP Pre-Injector). Old cables will be removed and new ones pulled. Many components will be either reused in the original configuration or moved to different locations with possibly different functionality. Components may be moved several times during the CFT3 project. Re-useable equipment will be temporarily stored. Radioactive equipment will be moved to special locations managed by TIS. Before ‘hot’ equipment can be removed from a machine, supplementary data is required by the radiation protection team. Facilities to manage radiation data are being built. Other equipment will be disposed of as waste. During the dismantling exercise, it will be important to identify and trace the movement of each piece of equipment to be reused.

The commissioned equipment is installed in the position specified in the machine layout. Layout drawings are required for installation planned. The equipment is aligned by the surveyors, who post the theoretical and measured position coordinates in the GEODE database, which has public access. Cables are installed and databases exist. The equipment is moved from storage or from the laboratory into a machine location.

2.7 Commissioning

Using the optics models and calibration data the machine will be commissioned and operation scenarios developed. The control system configuration will be described in the PS controls database. Measurements will be logged and analysed. If measured data is time-stamped and conserved, it can be use for correlation studies. Corrections to the layout, optics and equipment may be necessary with consequent changes to the operation and optics parameters.

2.8 Operation

Since CTF3 is an experimental facility the logging of all changes and measurements will be important for both on-line and post mortem analysis. New operations will be developed possibly requiring in-depth knowledge of the equipment installed.

2.9 Maintenance

When a machine fails, it is important to get it running again in the shortest possible time. Exploitation teams need to know the details about the specification and functioning of the components of the machine, tolerances, etc., as well as the cabling plan and possible previous performance. If equipment has to be replaced, the move of the broken equipment out of the machine and the installation of the replacement equipment should be recorded.

3. Document management

Information management tools provide central repositories for storing and managing information, whether this is in the form of documents or data. The CERN Engineering Data Management System (EDMS) is composed of a commercial product CADIM and a browsing interface, TUOVI, developed by the Helsinki Institute of Technology. Technical drawings are produced using AutoCAD or EUCLID, and are stored in the CERN Drawings Dictionary (CDD). The information in the EDMS system is safe-guarded against lost and corruption and, when recommended document formats are used, they are protected against ageing. Few software systems guarantee backwards compatibility therefore documents produced with earlier versions may not be readable. Information is centrally stored, accessed and maintained using a single interface, removing the need to provide and maintain special access software such as Web pages with URLs pointing to files on independently maintained servers. Centralised support removes the need to maintain such servers for managing project or activity documentation. Access can be restricted for sensitive information, once responsibilities for the protection of sensitive data have been defined. The quality of information can to be assured by using existing or new acceptance procedures. Documents may need to be assigned a status; for example, a specification may be ‘in work’, ‘draft’, ’released’, or ‘obsolete’.

The key success factor of an information system is usefulness and the presentation of projects, activities and documents must help users to find what they need. User participation in the data access structure is essential. Documents must be easily entered and retrieved, and each project or activity should have appropriate links to other relevant information. For example, the minutes of meetings should be linked to the items discussed. Data should be maintained directly by the person responsible for the information.

4. Data management

Data such as dimensions, calibration measurements, etc. should also be stored in a data repository. The CERN database management system is ORACLE. ORCALE is also used by the EDMS system, which provides facilities for data management. ORACLE was introduced to CERN in 1983, since which time many application software systems have been developed. Examples are

1. ST cables database manages all cables except those used for control.
2. ST drawings database manages drawings and mock-up of CERN buildings
3. Survey database (GEODE) holds the equipment alignment data.
4. PS Controls database.
5. TIS radiation-protection database (being developed).
6. ACCIS, used for the PS ABS system, manages machine layout description and optics modelling data. The PS control system uses a purpose built database for controlling the PS machines.

A commercial product MP5 (previously called RAPIER) was introduced to handle the maintenance of cryogenic systems and lifting equipment, among others. The EDMS system can be used access this data as well as to provide hooks to move into other software environments. The CTF3 information system should provide seamless integration of the data and software tools used.

In order to treat equipment data the management requirements must first be determined and then the items to be treated such as machine components, equipment and locations, must be classified and their properties defined. Methods of identification include barcodes, serial numbers and coded names. Coded names of physical equipment should not be given the same as functional components in the machine, since equipment can be replaced, moved, or be assigned a different function. Ideally each component of a machine should be documented throughout its entire lifetime, starting with the functional requirements, through to its disposal.

5. Conclusion

The CERN EDMS system should be used for the CTF3 project. The first stage will be a pilot project to demonstrate the possibilities of the system and to provide a top-level menu structure for the project consisting of general project information and a hook for the principal projects. A first proposal is shown in Appendix 1. Once this has been achieved, the internal structure of each sub-project will be determined with the people responsible.

Appendix 1: CTF3 in EDMS (Proposal)

1. General
   1.1. Parameter list
   1.2. People/ responsibilities
   1.3. Publications
   1.4. Minute
   1.5. Template documents
2. LPI dismantling
3. CTF3 Preliminary phase
4. Drive beam Injector (DBI)
   4.1. Thermionic gun
   4.2. Bunching system
   4.3. Accelerating structures
   4.4. Solenoids
   4.5. Beam optics
5. Drive Beam Accelerator (DBA)
   5.1. Accelerating structures
   5.2. Magnets
   5.3. Beam optics
6. Klystrons 3 GHz and modulators
7. Pulse compressors (LIPS, BOC)
8. Injection transfer line DBA --> CR (CRI)
9. Delay Loop (DL)
10. Combiner Ring (CR)
11. Ejection transfer line CR --> CEA (CRE)

12. CTF3 Experimental Area (CEA)
13. Main Beam Injector (MBI)
14. Main Beam Accelerator (MBA)
15. CLIC Accelerator Structures (CAS)
16. High Power Test Stand (HPT)
17. Drive Beam Decelerator (DBD)
18. Power Extraction Transfer Structures (PETS)
19. Safety issues
20. Power supplies
21. Beam Diagnostics
22. Vacuum
23. Controls
24. Alignment
25. Laser systems
26. RF photo-injector option