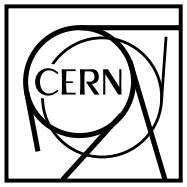
Available on CMS information server

CMS NOTE 1997/001

The Compact Muon Solenoid Experiment

CMS Note

Mailing address: CMS CERN, CH-1211 GENEVA 23, Switzerland



14 January 1997

CMS proposal for the Engineering Data Management System (EDMS) Pilot Project with Matrix & Report

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Abstract:

The CMS WOrking Group for Engineering and Integration (WOGEI) has been involved in the Engineering Data Management System (EDMS) Task Force. This Task Force has started in 1995 with a definition and selection procedure for an EDMS. The aim is to find out whether an EDMS is useful for CERN and the LHC experiments and which product is most suited.

The CMS-WOGEI has proposed and carried out a pilot project with Matrix, the EDMS selected by the EDMS task force. In this technical note the pilot project is described and the experience gained with this is summarised.

Proposal for an EDMS pilot project with Matrix.

The CMS WOrking Group for Engineering and Integration (WOGEI) is interested in carrying out one of the EDMS pilot projects.

The aim is to integrate the Integration data in such a system and make the information available to the people involved in the CMS sub detector projects both through workstation/Mac/PC interfaces and World-Wide Web. In a later phase, the data related to the Electromagnetic Calorimeter (ECAL) will be added

Several institutes in the collaboration have show interest in the use of such a system and in active participation.

The project will be started up by putting the existing Integration information, which is at present accessible only through WWW, into this system.

The intention is to copy the existing information into the EDM system and investigate in parallel the possibility to create procedures for automatic figure conversion to formats which will be needed for different purposes such as WWW display, printing etc.

Next step will be the setting-up of an approval procedure for some of the sub-detector information groups related to the Integration.

Finally the ECAL working group will be invited to integrate their information and approval procedures into the EDM System.

Experience gained with the Matrix - CMS-WOGEI pilot project.

Starting up the pilot

At the start of the pilot project a lot of time went by trying to define all kinds of common rules for the different ATLAS, CMS and LHC pilot projects. "Working the way you think" is difficult in an environment with different approaches. 3 months is also too short to take time to carefully design an organisation wide structure. In the different visits to companies where an EDMS is in use or in preparation, much more time was taken for preparation and definition. The decision to separate the pilots was therefore a relief which made it possible to start the CMS-WOGEI pilot in a simple way, mapping the existing information onto Matrix without having to re-work the structure, naming etc.

Setting up the pilot environment.

For the CMS-WOGEI pilot a stand-alone setup was considered but abandoned because the Macintosh version did not allow running the System, Business, Matrix and MQL modules in parallel without a lock server. And in the group there was no UNIX system available which was not used and which allowed enough system privileges to do a full stand-alone installation.

Test, development (dev) and production (pro) set-ups were created on the central EDMS server (asca02). Learning how to do this in an efficient manner took quite some time since no-one in the pilot projects committee had much experience with this and for 2/3 of the pilot period, no good documentation was available in sufficient quantities.

A mismatch between the Objectivity versions used in the Macintosh clients and in the UNIX clients caused data corruption on a few occasions. The corrupted set-ups had to be re-generated and it was decided to wait with the use of the Macintosh clients until this problem will be fixed by Objectivity and Matrix. For consultation of documents and manager-type of operations in Matrix and for Matrix-System and Matrix-Business tasks, working with Matrix using MacX is a well-working by-pass of this problem. The look and feel of Matrix under UNIX and on the Macintosh are practically identical. Only the menus are not at the top of the screen but at the top of the window. The only real but very important draw-back in this procedure is the unavailability of the direct checking in and out of documents residing on the Macintosh.

Other problems which were encountered with Matrix on system management level are to a large extend due to the lack of time for good preparation, the fact that was chosen for the new version 4 of Matrix which was not officially released at the start of the pilot project and that no experienced Matrix consultant was available on-site at regular intervals. The 3 visits of Matrix specialist during the pilot period helped solve the problems of those moments and made the pilot project move on with significant steps.

For the starting up of the Matrix clients on UNIX platforms some scripts were created on AFS which take care of the correct environment. They can be used[1] by everyone who needs to access the CMS-WOGEI pilot set-ups.

Creating the data structure and introducing the data.

At present the CMS-WOGEI data is stored on the CMSdoc web server and is managed with a

[1] on the central UNIX services try out the instruction "/afs/cern.ch/user/k/kuipers/matrix/matrix-test matrix", user guest, no password. do a find (the binoculars): name cms, type project, in the other boxes a *

FileMaker Pro 3.0 relational database. The programming capabilities of FileMaker Pro 3.0 are such that it is easy to systematically generate the HTML scripts for the Web pages. The experience gained with this programming was easy to apply for the systematic generation of MQL[2] scripts for the introduction of the data into Matrix FileMaker Pro 3.0 was also used to generate the MQL scripts for the structural elements for the Matrix pilot.

It took several iterations before a workable data model was generated and introduced into Matrix. This was done on occasions on CERNSP, HPPLUS, the CMS work group server and a Digital AlphaStation engineering workstation.

Entering the data into Matrix was done directly on CMSdoc using the there residing Web data.

What needs to be done.

In the present situation, document numbering for the documents managed with FileMaker Pro 3.0 is done manually. This is still possible because it is in the hands of only one person and the number of documents is still relatively small. But this needs to be automated in order to make it possible for all the people who create documents to obtain a number without errors. There are two approaches possible. One is to use the CDD[3], which does this for CAD drawings and which has simple approval procedure incorporated. The alternative is to implement scripts in Matrix which will take care of this in a structured way. The seond option has the advantage that all documents can use one unique numbering scheme where-as the first option will deal only with drawings and something different has to be done for the other engineering documents like technical specifications, market surveys, tenders, production and calibration data.

Procedures will have to be added to the life cycle of the documents, triggering programs which will start actions under certain conditions.

- special mailing list will have to be created in order to inform specific groups of people who are not actively introducing data into Matrix but who need to be informed about the arrival of a document in a specific state.

- for specific categories of documents, when a revision of a document reaches the "approved" state, the original or previous revision needs to be automatically moved on to the state "archived" and relationships disconnected in order to avoid the continuing of the usage of these documents.

The Atlas and LHC pilot projects have been testing the TUOVI[4] WWW ÷ Matrix interface. This has not been done in the CMS-WOGEI pilot because a well functioning Web based Engineering Data Management System and repository is already in place. When CMS-WOGEI will switch over from it's Web based EDMS to the Matrix EDMS, the announced Matrix Web interface is hopefully in place with an important amount of Matrix functionality. When that is not the case, the TUOVI approach will also be implemented for the world-access to the CMS-WOGEI engineering data in Matrix.

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2 Matrix Query Language

3 CERN Drawing Directory

4 TUOVI is a HTI & CERN joint venture to investigate the possibilities of using technology that is based on visual communication in projects where research & development and manufacturing are geographically distributed. More information can be obtained at URL: http://tuovi.cern.ch/

Matrix system improvements.

Kerberos[5] authentication should become available A.S.A.P. This will avoid that people who have been authenticated by the system have to login again in order to use Matrix.

The possibility to create relations between different Matrix database federations without having to merge the federations.

Conclusions

A 3-month period is too short to setup a complete EDMS when there is no 100 % dedicated team available. Not all the ideas could be realised or tried out.

The simple installation which has been realised has shown that Matrix is able to do what is looked for by the CMS-WOGEI team, an Engineering Data Management System which has the potential of efficiently help managing engineering documents go through more or less complex life cycles where the different state changes in the life cycles can trigger actions varying from notifying people by e-mail to running complex programs affecting the engineering data in the EDMS or processes external to the EDMS.

The use of Matrix in connection with in- and external processes has been part of a separate evaluation done in the context of the CMS CRISTAL project: "A data capture and production management tool for the assembly and construction of the CMS ECAL detector". A schema of the project flow can be found in appendix C and a detailed description of this project can be found in CMS NOTE 1996/003[6]. Also this pilot exercise confirmed that Matrix is usable in this project's context.

The technical problems encountered in the operation of Matrix can to a large extend be explained by the short learning period and the fact that the EDMS task force has chosen to do the pilot projects with a pre-release of Matrix. On the other hand, there is quite some room for improvement in the support by Adra-Matrix.

Trying to manage all of CERN (3 pilot projects in this case) has shown to be too ambitious. Trying to manage all the CMS engineering projects from within one setup is probably also too ambitious. Giving all the teams who want to do a well-defined project in their own environment a separate set-up is probably the most efficient approach. Matrix probably has the potential to - in the future - federate the individual set-ups with relations without having to fuse them.

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5 KERBEROS is an authentication system for open network computing environments. It is based on the model of trusted third-party authentication presented by Needham and Schroeder [NS78]. It is trusted in the sense that each of its clients believes KERBEROS' judgement as to the identity of each of its other clients to be accurate.

6 http://cmsdoc.cern.ch/tn/all96.html#NOTE1996003

Apendix A - Organisation of the Matrix pilot project

Current EDMS organisation with the Web

The current EDMS is based on a document vault on the Web and meta data managed with FileMaker Pro 3.0

Schema of the EDMS tree

```
project CMS
   |_ collaboration: CMS
   |_ costbook: CMS
   |_ equipment: CMS
   |     |- equipment: ecal
   |     |   |_ equipment: ....
   |     |_ equipment: ....
   |_ experimental data: CMS
   |_ simulation: CMS
   |_ software: CMS
   |_ work breakdown structure: CMS
         |_ work breakdown structure: detector integration
         |     |_ work breakdown structure: alignment & survey
         |     |     |_ document: cmsdiala0001
         |     |     |_ document: ....
         |     |     |_ document: ....
         |     |     |_ document: ....
         |     |     |_ document: ....
         |     |_ work breakdown structure: assembly
         |     |     |_ document: ....
         |     |     |_ document: ....
         |     |     |_ document: ....
         |     |_ work breakdown structure: coil integration
         |     |_ work breakdown structure: cooling & ventilation
         |     |_ work breakdown structure: detector-machine interface
         |     |_ work breakdown structure: ecal integration
         |     |_ work breakdown structure: experimental area
         |     |_ work breakdown structure: fixed cranes
         |     |_ work breakdown structure: general parameters
         |     |_ work breakdown structure: hcal integration
         |     |_ work breakdown structure: infrastructure
         |     |_ work breakdown structure: luminosity detector integration
         |     |_ work breakdown structure: muon detector integration
         |     |_ work breakdown structure: preshower
         |     |_ work breakdown structure: rpc integration
         |     |_ work breakdown structure: safety
         |     |_ work breakdown structure: shielding integration
         |     |_ work breakdown structure: tracker integration
         |     |_ work breakdown structure: return yoke integration
         |_ work breakdown structure: ecal
         |     |_ work breakdown structure: ....
         |_ work breakdown structure: .....
         |     |_ work breakdown structure: ....
```

Document hierarchy

Lattice	Groups	Documents
Detector integration	People General Safety Alignment & Survey Assembly scenario and planning Detector/Machine interface Luminosity Tracker ECAL Preshower HCAL Muon RPC Magnet Coil Magnet Return Yoke Cooling & Ventilation Shielding Experimental area & general services Infrastructure Fixed Cranes	(Graphical) overview info visualisation

Checking in integration documents with the Web

In the present situation, integration documents are available on the web in ps and gif format. Most of the people who are generating this information will be able to use Matrix from their workstation. In those cases where people from outside CERN will need to check in documents they will have to use WWW.

Each document consists of 2 - 4 files:

ps
gif (+ minigif)
(original)

These should be dealt with in one go and not as individual documents. For each document (at present) the following information needs to be put into the EDMS via the Web:

1) Title or short description
2) Category (list, see "Subdetector-Interface codes")
3) Engineering domain (list, see "Engineering Domain codes")
4) original (file/docmrp/....) name
5) status (future: list)
6) validity period
7) created at institute
8) creator/author/updater
9) creator/author/updater-ccid
10) reason for correction/revision

11) verified by (when part of the life cycle falls outside control of EDMS)
12) verified by-ccid
13) contact person
14) contact person - ccid
15) approved by (when part of the life cycle falls outside control of EDMS)
16) approver-ccid
17) keywords
18) abstract/long description

EDMS setup for Matrix

Users

All the users are required to have accepted the CERN computer centre User Rules and signed the CERN COMPUTER CENTRE USER REGISTRATION form.

The users will be registered with their user name on the central computer facilities.

People who will be involved in the Matrix pilot:

Task:	Persons:
Set-up of Matrix	Jos Kuipers
Matrix management	Jean Bos Gerard Faber Patrick Ingenito Jos Kuipers Françoise Rondeau (2nd phase)
Users introducing new material	Jean Bos Marc-Henri Bovard Dominique Carrocci Guy Duthion Jean-Pierre Girod Patrick Ingenito Pascal Petiot Françoise Rondeau (2nd phase)
Users evaluating documents	Domenico Campi Gerard Faber Alain Hervé Ron Pintus Françoise Rondeau (2nd phase)
Users consulting EDMS	Engineers collaborating in CMS

Training requirements:

Matrix role:	Persons:	Prel. date:	Lang.
System	Jos Kuipers	13 - 14/08	e
Business	Jean Bos	06 - 08/08	e
	Gerard Faber	06 - 08/08	e
	Patrick Ingenito	06 - 08/08	e
	Jos Kuipers	29 - 31/07	e
	Françoise Rondeau	06 - 08/08	e
User	Jean Bos		
	Marc-Henri Bovard		f
	Domenico Campi		
	Dominique Carrocci	29/08	f
	Guy Duthion	29/08	f
	Gerard Faber		
	Jean-Pierre Girod	29/08	f
	Alain Hervé		
	Patrick Ingenito		
	Jos Kuipers		
	Jean-Francois Michaud		
	Pascal Petiot	29/08	f
	Ron Pintus		
	Françoise Rondeau		

Data organisation structure:

Types:	Names:	Details:
Lattice:	cms cms-di	
Stores:	cms-di	
Roles:	cms-di-%%[7]	designers verifiers approvers
	cmsdi edms managers	faber ingenito kuipers rondeaux
Groups:		

[7] %% is one of the subdetector codes, see appendix B for an overview

People:	Jean Bos Marc-Henri Bovard Domenico Campi Doninique Carrocci Gerard Faber Guy Duthion Jean-Pierre Girod Alain Herve Patrick Ingenito Jos Kuipers Jean-Francois Michaud Pascal Petiot Ron Pintus Francoise Rondeaux	jbos[8] bovard cpd carrocci gduthion faber jgirod herve ingenito kuipers michaud ppetiot pintus rondeaux
Attributes:	title/short description category engineering domain original name status validity period created at institute creator/author/updater creator/author/updater ccid reason for corr./rev. verified by verified by - ccid contact person contact person - ccid approved by approved by - ccid keywords long description/abstract	
Business Object types:	project collaboration costbook equipment experimental data simulation software work-breakdown structure cms-di-%% document	Drawings Documents Minutes
Relationships:	project organisation work breakdown work related document part breakdown …	
Programs:	CERN gif view CERN ps view CERN text edit Newtscape …	

8 user name in Matrix will be the username on the computer platform on which the user is normally working

Document format:	Program
	Claris CAD
	Euclid
	AutoCAD
	
	AutoCAD
	MS Word
	gif
	jpeg
	PostScript
	Encapsulated PostScript
	…
		`type,crea,ext`
		`CAD2,CCAD`
		`    ,    ,.dxf`
		`DWG ,ACAD,.dwg`
		`TEXT,ACAD,.lsp`
		`    ,    ,.dxf`
		`WDBN,MSWD,.doc`
		`GIFf,GCon,.gif`
		`JPEG,JVWR,.jpg`
		`TEXT,vgrd,.ps`
		`EPSF,ART5,.eps`

Policies:	project cms-di-%%[1] document life cycle	states: defined states: start draft verified approved archived
Reports:	to be defined	
Forms:	to be defined	

Requests for programming in Matrix

When a new document is going to be introduced, Matrix should come up with a panel for the document name/number generation in which the user can give the following information:

experiment	3-character code	
detector	2-character code	list of choices depending on experiment
sub-detector/interface	2-character code	list of choices depending on detector
engineering domain	2-character code	list of choices depending on experimen

The document number then should be generated automatically:

document number	4-character code	automatic generation following the information entered by the user
revision number	2-character code	Automatic in Matrix

When a document is moved to the state approved, an e-mail has to be sent to a mailing list of people of which many will not be known to Matrix.

Apendix B - subdetector codes.

al	-	alignment & survey
as	-	assembly
co	-	coil
cv	-	cooling & ventilation
dm	-	detector-machine interface
ec	-	ecal
ex	-	experimental area
fc	-	fixed cranes
ge	-	general parameters
hc	-	hcal
in	-	infrastructure
lu	-	luminosity
mu	-	muon
ps	-	preshower
rp	-	rpc
sa	-	safety
sh	-	shielding
tk	-	tracker
yo	-	return yoke

Apendix C - CRISTAL EDMS schema