



THE LAYOUT DATABASE SERVICE

Role, evolution, challenges and future plans

BE-CO Technical Committee, 26 February 2015 - Pascal Le Roux (BE-CO-DS) on behalf of the Layout Service



OUTLINE

What is a Layout ?

What is the Layout Database Service?

Role of the service

Collaborations with other CERN systems

Evolution over the last 15 years

Consequences of expansion

New approach and challenges: database consolidation, web user interfaces

Summary

WHAT IS A LAYOUT ?

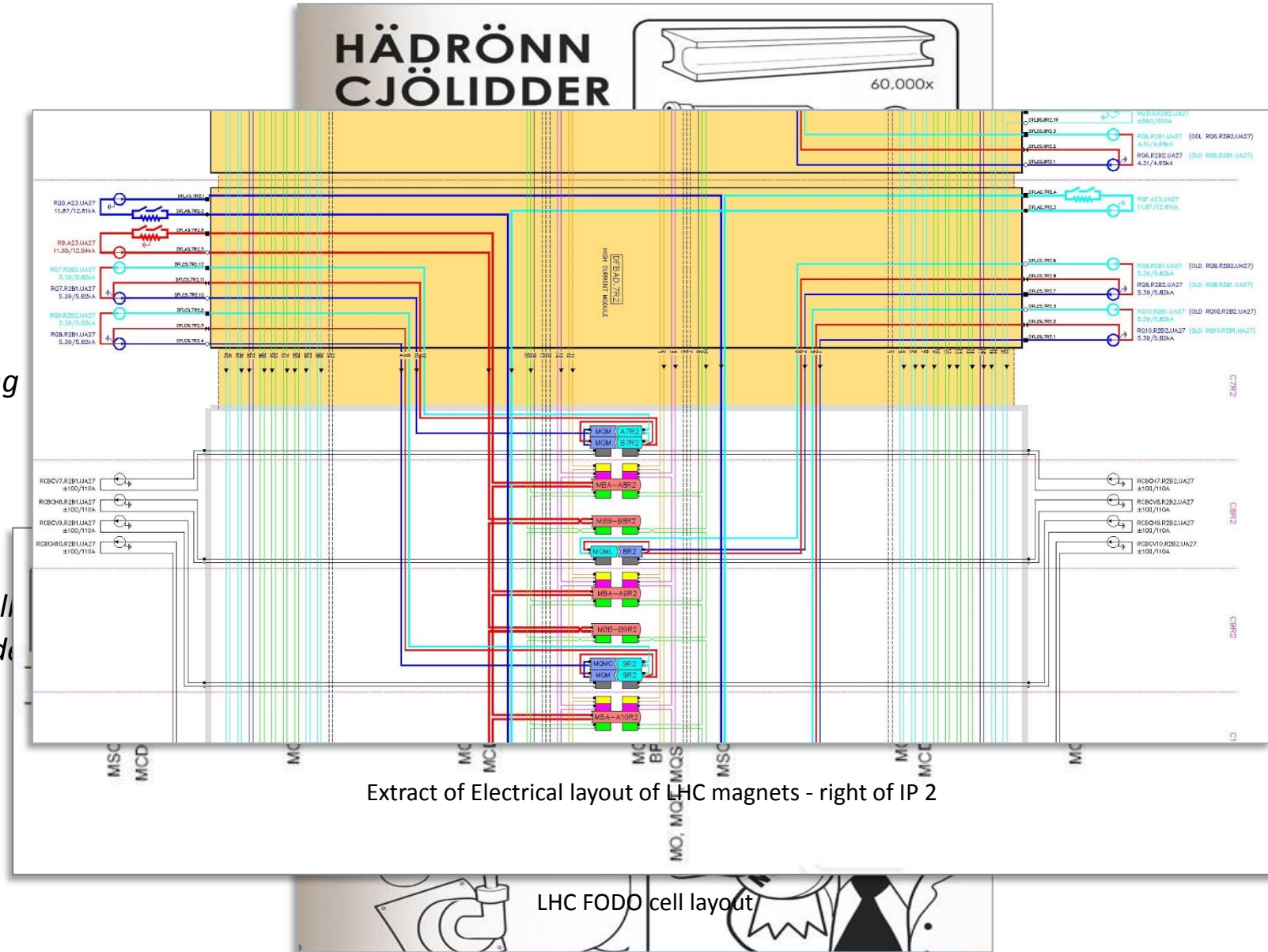
Dictionary definition:

"The way in which the parts of something are arranged or laid out"

Our definition:

"A set of functional positions mechanical, electrically or logically structured to model a system"

Some examples



Large Hadron Collider Layout "IKEA Style"

WHAT IS THE LAYOUT DATABASE SERVICE?

A CERN-wide Oracle database



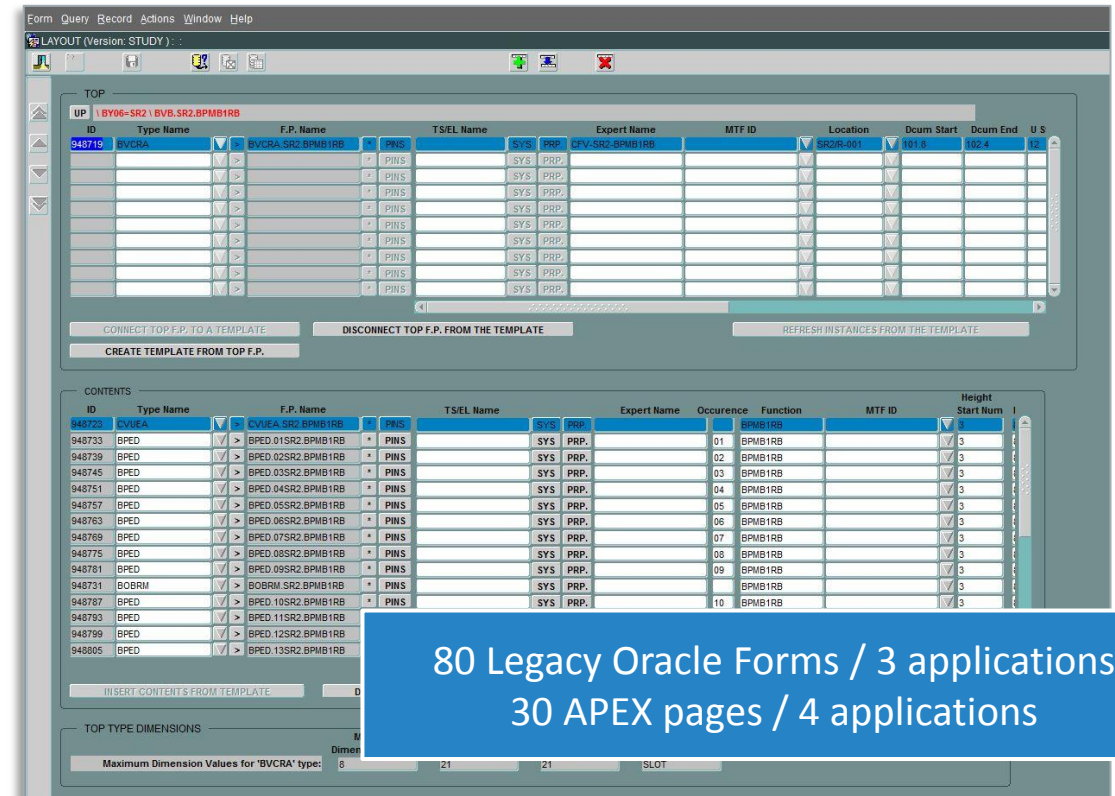
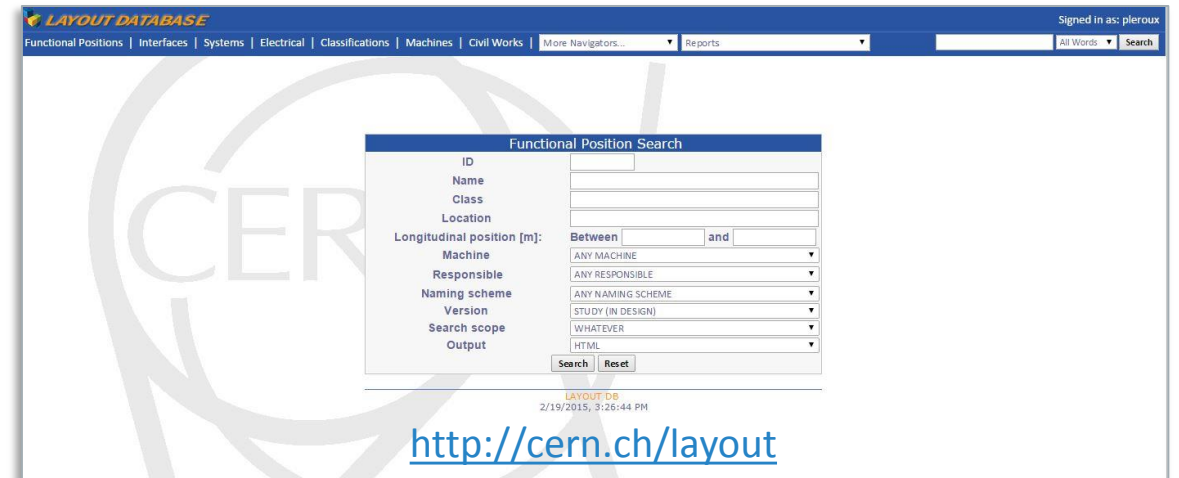
Public DB cluster in building 513 : `edmsdb/accdb/cerndb1` where the Layout DB is hosted

WHAT IS THE LAYOUT DATABASE SERVICE?

A CERN-wide Oracle database

A set of tools, including:

- A public web-interface with navigation and search capabilities
- Limited applications for data entry
- Views and APIs for external clients



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A CERN-wide Oracle database

A set of tools, including:

- A public web-interface with navigation and search capabilities
- Limited applications for data entry
- Views and APIs for external clients

Support from a dedicated team of people with **expertise** and **experience** since 2003

- Provide database support to EN-MEF-DC who manage the beam line layout data
- Assist equipment groups to structure coherently their layout data for electronic components, instrumentation and other non-beam line systems (Racks, WorldFIP, FECs...)

Centralises the management of **integrated, controlled functional position** and **layout** data across CERN

- Layout data from different domains are fully **inter-related**



Pascal



Eve



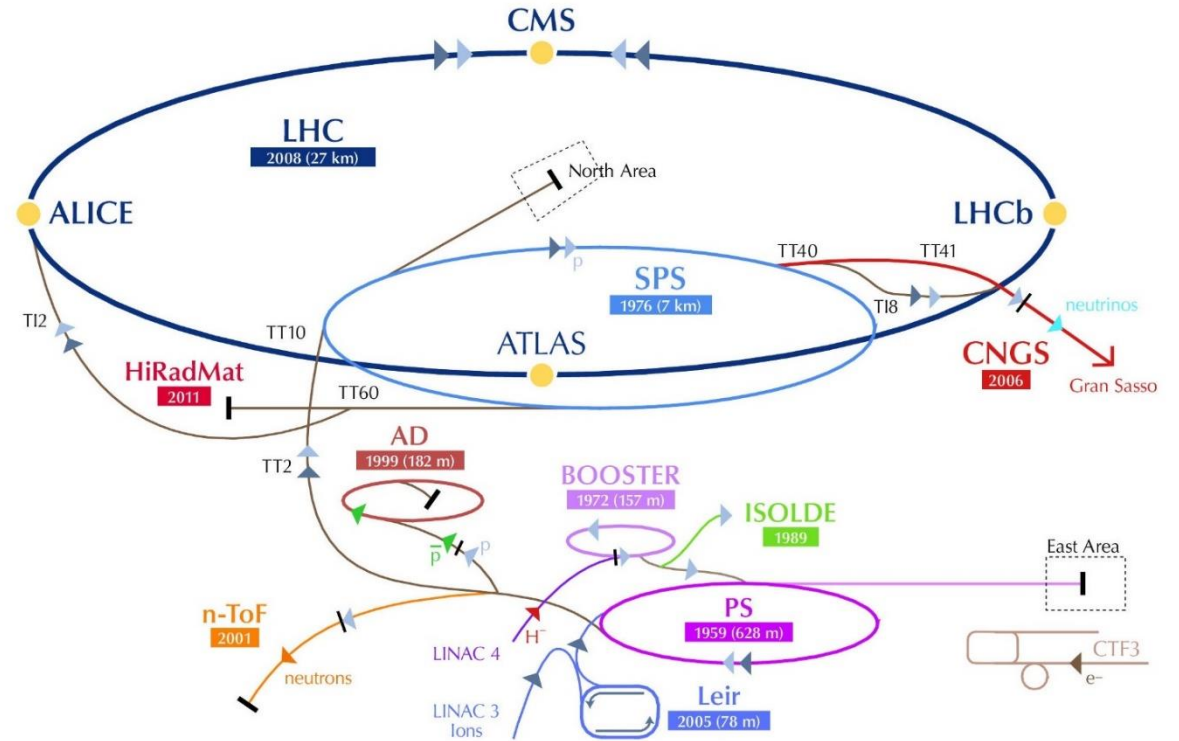
Vasileios



Chris

ROLE OF THE SERVICE

Document the CERN infrastructures by **modelling** their **architecture as layouts**



ROLE OF THE SERVICE

Document the CERN infrastructures by **modelling** their **architecture** as **layouts**

Classifying the components of the infrastructure

- Within a hierarchy of Classes and types

Hierarchy of classes

Types: members of classes

- ▷ **COLLIMATION-DOMAIN** Class, ID : 2582431, Collimation domain
- ▲ **CONTROL-ELECTRONIC-DOMAIN** Class, ID : 118820, Control Electronic domain
 - ▲ **BI-CONTROL-COMPONENTS** Class, ID : 838011, Beam instrumentation Control Components
 - ▷ **BI-BLM** Class, ID : 1325563, Beam Loss Monitors
 - ▷ **BI-CRATES-OPTIC-FIBER-BLM-BPM** Class, ID : 900762, BI mini crates optic fiber BLM / BPM
 - ▷ **BI-CRATES-OPTIC-FIBER-CONNECT** Class, ID : 900764, BI mini crates optic fiber connector
 - ▷ **BI-CRATES-OPTIC-FIBER-MODULE** Class, ID : 900763, BI mini crates optic fiber modules
 - ▷ **BI-JUNCTION-BOXES** Class, ID : 970342, Beam instrumentation Junction Boxes
 - ▷ **BI-TUNNEL-MINI-CRATES** Class, ID : 970343, Beam instrumentation Tunnel Mini Crates
 - ▲ **BI-VME** Class, ID : 838012, Beam instrumentation VME
 - ▷ **BI-VME-ACCESSORY** Class, ID : 838013, Beam instrumentation VME Accessories
 - ▲ **BI-VME-BACKPLANE** Class, ID : 838014, Beam instrumentation VME Backplanes
 - BVBP** Type, LHC QAP, ID : 1961027, BI VME backplane, BE-BI
 - BVBPA** Type, LHC QAP, ID : 838022, BI VME backplane of type A, BE-BI
 - BVBPB** Type, LHC QAP, ID : 838023, BI VME backplane of type B, BE-BI
 - ▷ **BI-VME-BLOCK** Class, ID : 838015, Beam instrumentation VME Blocks
 - ▲ **BI-VME-CPU-MODULE** Class, ID : 838016, Beam instrumentation VME CPU Modules
 - BVUH** Type, LHC QAP, ID : 838031, BI VME High Perf CPU, BE-BI
 - ▷ **BI-VME-CRATE** Class, ID : 838017, Beam instrumentation VME Crates
 - ▷ **BI-VME-FAN-UNIT** Class, ID : 838018, Beam instrumentation VME Fan Units
 - ▷ **BI-VME-MODULE** Class, ID : 838019, Beam instrumentation VME Modules
 - ▷ **BI-VME-POWER-SUPPLY** Class, ID : 838020, Beam instrumentation VME Power Supplies
- ▷ **BIC-USER-INTERFACES** Class, ID : 580695, Beam Interlock Controller User Interfaces

ROLE OF THE SERVICE

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- Adhering to CERN **naming conventions**

Accelerators Entities and Signals
NAMING PORTAL

Home Signal Simple Extraction Signal Experts Interface LHC Equipment Codes SPS Equipment Codes PS Equipment Codes Print Help

EQUIPMENT CODES CATALOGUES

- LHC Equipment Codes catalogue
- SPS Equipment Codes catalogue
- PS-Complex Equipment Codes catalogue

ENTITIES & SIGNALS

- Machine Systems Report
- Signals (Parameters) - Simple Data Extraction Interface
- Entities and Signals (Parameters) - Experts Interface

DOCUMENTATION

Process for code creation for GCOs

CERN Equipment Identification

LHC

- LHC Quality Assurance Plan
- Equipment Naming Convention
 - LHC Part and Assets Identification
 - General rules for naming of equipment and signals
 - Detailed rules for naming of equipment and signals
 - Detailed Cryogenics Facilities and Equipment Naming Conventions
 - Detailed Vacuum Interlocks and Controls Equipment Naming Conventions
 - Detailed Vacuum Pumping Equipment Naming Conventions
 - Power Converters and El. Circuits Detailed Naming Conventions
 - Practical Guidelines for Equipment Codes in the CO group
 - Naming of Hardware Equipment in the Controls Topology (draft version)

SPS

- Equipment Naming Convention
- Naming of Electrical Circuits and Power Converters for: LHC Injection Lines, CNGS

PS-Complex

- Equipment Naming Convention
- Conventions for naming of Layout components in the PS ring and related transfer lines
- ELENA - Naming Conventions for the Layout of ELENA
- ISOLDE - Detailed Naming Conventions
- Linac4 - Naming conventions for the Layout of Linac4

Location Naming

- GEOSIP
- Locations Project

PROCEDURE FOR NEW EQUIPMENT CODE REQUEST

- Send an e-mail to Accelerators-Naming.Service@cern.ch in order to request a new code. You can use the template for [Equipment Codes request](#).

For additional details see the BPMN process: [Create Equipment Code](#)

Codes Search

Naming Codes Advanced Search

Search

LHC Equipment Codes - System: C Collapse Tree Expand Tree

- ⊖ C Controls and Communication (up)
 - ⊖ CA Controls Equipment Accessories
 - ⊖ CB Fieldbus
 - ⊖ CC Telecommunications
 - ⊖ CF Front End
 - CFB Front-End single-Board computer
 - CFE PC Front End Computer
 - CFE Controls Front End PCI Express Systems
 - CFE Controls Front End FMC Systems
 - CFG Front-End Generator
 - CFI cPCI
 - CFI LXI Systems
 - CFO Front-end industrial Oscilloscope
 - CFP PLC Systems
 - CES Power Switch
 - CFU uTCA Systems
 - CFV VME Systems
 - CFX VXI Systems
 - CH High Power Controls Modules
 - CI Interlocks
 - CJ Junction Boxes for Controls
 - CK Kicker magnet control
 - CL Logging System
 - CP PLC Components
 - CQ Sequencer
 - CS Server Computer
 - CT Controls and Timing
 - CV VME
 - CW Workstations and Desktop Computers
 - CY Racks for Controls

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Defining, identifying the components as **Functional Positions**

- Nature/function of the components
- Localisation/position of the components
- Official name defined by the QA plan of each machine

Defining **relationships** between these components:

- **Mechanical** assemblies (Physical structures)



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- **Powering** connections & circuits

Powering sub-sectors

Power converter reference data used by LSA

Associated documentation from EDMS: Non conformities, Engineering specifications, ECR...

Circuit hierarchy with Power converters and magnets

RB.A23 : Sector 2 to 3 Main bending. B1 & B2 in series [Link to MTF](#)

ID : 254488, Circuit version : STUDY, Layout version : STUDY

Power Converters in the Circuit	PC Location	Rack Name/Slot
RPTC_UA27_RB_A23 (MTF, TE-EPC Database)	UA27	-

Magnets in the Circuit	Number
MB	154

Current Leads in the Circuit
DFLAS.7L3.1
DFLAS.7L3.2
DFLAS.7R2.5
DFLAS.7R2.6

Magnets per Power Converter	
RPTC_UA27_RB_A23	154

Operational Parameters	
Operational Temperature :	1.9 K
Beam Dump Request :	YES
Powering Subsector Abort :	YES
Safety Subsector :	A23

Electrical Object Concerned	Document	Description
DORB.7L3.EE.A23	EDMS Id: 1013572 (ECR)	Change of the Magnetic Energy Extraction Resistors for operation at 3.5TeV. Initial configuration of 3 R (ie 75mOhm per EE system) has been temporarily changed to a 1R (2 R serial) configuration with 150 mOhm per EE system.
DORB_UA27_RB_A23	EDMS Id: 1013572 (ECR)	Change of the Magnetic Energy Extraction Resistors for operation at 3.5TeV. Initial configuration of 3 R (ie 75mOhm per EE system) has been temporarily changed to a 1R (2 R serial) configuration with 150 mOhm per EE system.
MB_C25L3	EDMS Id: 1003201 (NC)	During MIC-C campaign, on MB_C25L3 (2205), the Vtap of diode EE015 was found open (see NC 633051 and 633052). Upon the request of QPS, the broken Vtap EE015 (D20-B2) has been now bridged with I-tap EE012 (D20-A1) inside the IFS box.
MB_A21L3	EDMS Id: 942550 (NC)	

Operational Parameters

Operational Temperature : 1.9 K
Beam Dump Request : YES
Powering Subsector Abort : YES
Safety Subsector : A23

Download the XML circuit definition of the circuit RB.A23

Documents : Non Conformities, ECR...

Electrical Object Concerned Document Description

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MB_A21L3 EDMS Id: 942550 (NC)

Current Leads in the Circuit		
I Nominal : 11850 A	I Ultimate : 12840 A	I Min Op : 100.0 A
I Offset : 0 A	I Overload : ~1.1 * I ultimate A	R tot Measured : 0.01000 Ohm
L tot : 15.708 H	R tot : 0.01153 Ohm	Time Constant : 13623.327 s
Ramp Time : 1300.00 s	max(dI/dt) : 10.000 A/s	
U leads : 240 V	U Extr : 1.534 V	
U Boost : 157.080 V	U Coll : 14.989 V	U Peak Circ : 172.069 V

Warm Cable Verification :

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- **Powering** connections & circuits
- **Control** connections & circuits

WorldFIP segments

Complete segment report with FIP addresses, cable numbers... downloadable as Excel file

WORLDVIP SEGMENT

NAME	GATEWAY	MANAGER	DESCRIPTION	CLIENT	RESPONSIBLE	MAIN LOCATION
CBW.IP2.QL3D Expert Name: CFQ-D ID: 1011590	CFC-SH2-QL3CD	CBWMB.SHB2.QL3D	CRYO WORLDVIP segment / IP 2 Left / Segment number : D	CRYO	PAULO GOMES	L2

Download the Excel file format for this segment (Printable version)

#	TYPE	LOCATION	CIVIL WORK	SLOT NAME	TSEL NAME	RESPONSIBLE	RACK REF	TRUNK IN	TRUNK OUT	SUBTRUNK IN	SUBTRUNK OUT	DROP IN	DROP OUT	FIP ADDRESS 1	FIP ADDRESS 2
1	CBWMB	SHB2/R-401	SHB2/R-401	CBWMB.SHB2.QL3D		MAGNUS BJORK	QYCOM.01SHB2		1210996						
2	CBWJA	SHB2/R-401	SHB2/R-401	CBWJA.SHB2.QL3D	QJCFD00=SH2	JULIEN PALLUEL	QYCOM.01SHB2	1210996	1210980				VIRTUAL CABLE		
3	QYMMW	QVIRT-S23	QVIRT-S23	QYMMW.01QVIRT-S23.B			CZESLAW KRZYSZTOF FLUDER							93	94
4	QYMMW	QVIRT-S23	QVIRT-S23	QYMMW.02QVIRT-S23.B			CZESLAW KRZYSZTOF FLUDER							95	96
5	QYMMW	QVIRT-S23	QVIRT-S23	QYMMW.03QVIRT-S23.B			CZESLAW KRZYSZTOF FLUDER							97	98
6	QYMMW	QVIRT-S23	QVIRT-S23	QYMMW.04QVIRT-S23.B			CZESLAW KRZYSZTOF FLUDER							91	92
7	CBWRE	SHB2/R-401	SHB2/R-401	CBWRE.SHB2.QL3D		JULIEN PALLUEL	QYCOM.01SHB2	1210980	FIBER						
8	CBWRE	RE32	RE32	CBWRE.RE32.QL3D		JULIEN PALLUEL	CYFRE01=UJ32	FIBER	X1						
9	CBWRB	RE32	RE32	CBWRB.RE32.QL3DB		JULIEN PALLUEL	CYFRE01=UJ32			1305260					
10	CBWJA	RE32	RE32	CBWJA.RE32.QL3DB	QJCFB01=RE32	JULIEN PALLUEL	CYFRE01=UJ32			1305260	1302934A	PONT	PONT		
11	CBWJA	UJ32	UJ32	CBWJA.UJ32.QL3DB	QJCFB01=RE32	JULIEN PALLUEL				1302934A	1302853A	PONT	PONT		
12	CBWJA	15L3	R33	CBWJA.15L3.QL3DB	QJCFB.A15L3=R33	JULIEN PALLUEL				1302853A	1302854A			1302935A	
13															
14	CBWJA	14L3	R33	CBWJA.14L3.QL3DB	QJCFB.A14L3=R33	JULIEN PALLUEL				1302854A	1302855A			1302936A	
15															
16	CBWJA	13L3	R33	CBWJA.B13L3.QL3DB	QJCFB.B13L3=R33	JULIEN PALLUEL				1302855A	1302856A			1302937A	
17	QYMMW	13L3	R33	QYMMW.13L3.B	QYMMW.C13L3=R33		CZESLAW KRZYSZTOF FLUDER			QYCFB.13L3		1302937A		21	22
18	CBWJA	13L3	R33	CBWJA.A13L3.QL3DB	QJCFB.A13L3=R33	JULIEN PALLUEL				1302856A	1302857A			1302938A	
19															
20	CBWJA	12L3	R33	CBWJA.B12L3.QL3DB	QJCFB.B12L3=R33	JULIEN PALLUEL				1302857A	1302858A			1302939A	
21															
22	CBWJA	12L3	R33	CBWJA.A12L3.QL3DB	QJCFB.A12L3=R33	JULIEN PALLUEL				1302858A	1302859A			1302940A	
23															
24	CBWJA	11L3	R33	CBWJA.11L3.QL3DB	QJCFB.A11L3=R33	JULIEN PALLUEL				1302859A	1302860A			1302941A	
25															
26	CBWJA	10L3	R33	CBWJA.10L3.QL3DB	QJCFB.A10L3=R33	JULIEN PALLUEL				1302860A	1302861A			1302942A	
27	QYMMW	10L3	R33	QYMMW.10L3.B	QYMMW.B10L3=R33		CZESLAW KRZYSZTOF FLUDER			QYCFB.10L3		1302942A		9	10
28	CBWJA	9L3	R33	CBWJA.9L3.QL3DB	QJCFB.A9L3=R33	JULIEN PALLUEL				1302861A	1302862A			1302943A	
29	QYMMW	9L3	R33	QYMMW.9L3.B	QYMMW.A9L3=R33		CZESLAW KRZYSZTOF FLUDER			QYCFB.9L3		1302943A		7	8
30	CBWJA	8L3	R33	CBWJA.8L3.QL3DB	QJCFB.A8L3=R33	JULIEN PALLUEL				1302862A	1305217			1302944A	
31	QYMMW	8L3	R33	QYMMW.8L3.B	QYMMW.B8L3=R33		CZESLAW KRZYSZTOF FLUDER			QYCFB.8L3		1302944A		1	2
32	CBWDT	8L3	R33	CBWDT.8L3.QL3DB	CBWDT.A8L3=R33	JULIEN PALLUEL				1305217					
33	CBWRB	RE32	RE32	CBWRB.RE32.QL3DB		JULIEN PALLUEL	CYFRE01=UJ32							1305259	

Hierarchy of a segment with managers, repeaters, tap box, agents, fip diags

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Data provided to LSA since 2006

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Defining **relationships** between these components:

- **Mechanical** assemblies (Physical structures)
- **Powering** connections & circuits
- **Control** connections & circuits
- **MAD optic** sequences
- **Logical** connections between otherwise unrelated components : EIS Safety Chains

```
/*
*****
***** LHC SEQUENCE
*****
LHC B1 : SEQUENCE, refer = CENTRE, L = LHCLLENGTH;
IP1:OMK,
MBAS2.1R1:MBAS2,
TAS.1R1:TAS,
BPMSW.1R1.B1:BPMSW002,
BPMSW.1R1.B1_DOROS:BPMSW002,
BPMWK.1R1:BPMWK,
BPMWF.A1R1.B1:BPMWF,
MQXA.1R1:MQXA,
MCBXH.1R1:MCBXH,
MCBXV.1R1:MCBXV,
BPMS.2R1.B1:BPMS,
MQXB.A2R1:MQXB,
MCBXH.2R1:MCBXH,
MCBXV.2R1:MCBXV,
MQXB.B2R1:MQXB,
TASB.3R1:TASB,
MQSX.3R1:MQSX,
MQXA.3R1:MQXA,
MCBXH.3R1:MCBXH,
MCBXV.3R1:MCBXV,
MCSX.3R1:MCSX,
MCTX.3R1:MCTX,
MCOSX.3R1:MCOSX,
MCOX.3R1:MCOX,
MCSSX.3R1:MCSSX,
DFBxB.3R1:DFBxB,
BPMSY.4R1.B1:BPMSY,
MBXW.A4R1:MBXW,
MBXW.B4R1:MBXW,
MBXW.C4R1:MBXW,
MBXW.D4R1:MBXW,
MBXW.E4R1:MBXW,
MBXW.F4R1:MBXW,
X1FCR.4R1:X1FCR,
BRANA.4R1:BRANA,
X1ZDC.A4R1:X1ZDC001,
TANAR.4R1:TANAR,
TCL.4R1.B1:TCL,
BPMWB.4R1.B1:BPMWB,
MBRC.4R1.B1:MBRC,
MCBYV.A4R1.B1:MCBYV,
MCBYH.4R1.B1:MCBYH,
MCBYV.B4R1.B1:MCBYV,
MQY.4R1.B1:MQY,
BPMS.4R1.B1:BPMS,
at= pIP1+IP1OFS.B1*DS;
at= 1.5+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 2209454, from= IP1;
at= 20.015+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 102103, from= IP1;
at= 21.564+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 6080259, assembly_id= 6080224, from= IP1;
at= 21.564+(-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 10429420, assembly_id= 6080224, from= IP1;
at= 21.62+(0-IP1OFS.B1)*DS, slot_id= 6080224, from= IP1;
at= 21.724+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 6080267, assembly_id= 6080224, from= IP1;
at= 26.15+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282126, assembly_id= 102104, from= IP1;
at= 29.842+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282213, assembly_id= 102104, from= IP1;
at= 29.842+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282212, assembly_id= 102104, from= IP1;
at= 31.529+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 241889, assembly_id= 102105, from= IP1;
at= 34.8+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 241890, assembly_id= 102105, from= IP1;
at= 38.019+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249450, assembly_id= 102105, from= IP1;
at= 38.019+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249451, assembly_id= 102105, from= IP1;
at= 41.3+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 241892, assembly_id= 102105, from= IP1;
at= 45.342+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 241893, assembly_id= 102106, from= IP1;
at= 46.608+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282127, assembly_id= 102106, from= IP1;
at= 50.15+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 241895, assembly_id= 102106, from= IP1;
at= 53.814+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249456, assembly_id= 102106, from= IP1;
at= 53.814+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249457, assembly_id= 102106, from= IP1;
at= 53.814+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249458, assembly_id= 102106, from= IP1;
at= 53.814+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 249459, assembly_id= 102106, from= IP1;
at= 54.297+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282237, assembly_id= 102106, from= IP1;
at= 54.297+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282236, assembly_id= 102106, from= IP1;
at= 54.297+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 282235, assembly_id= 102106, from= IP1;
at= 56.427+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 104672, from= IP1;
at= 58.3145+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 104595, from= IP1;
at= 61.322+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134500, from= IP1;
at= 65.588+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134501, from= IP1;
at= 69.854+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134502, from= IP1;
at= 74.12+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134503, from= IP1;
at= 78.386+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134504, from= IP1;
at= 82.652+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 134505, from= IP1;
at= 141.16+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 378054, assembly_id= 102108, from= IP1;
at= 141.376+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 883446, assembly_id= 102108, from= IP1;
at= 141.71+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 2019586, assembly_id= 102108, from= IP1;
at= 142.75+(0-IP1OFS.B1)*DS, mech_sep= 0, slot_id= 102108, from= IP1;
at= 149.73+(0-IP1OFS.B1)*DS, mech_sep= 0.1755, slot_id= 6755437, from= IP1;
at= 151.0945+(0-IP1OFS.B1)*DS, mech_sep= 0.1780, slot_id= 181634, from= IP1;
at= 157.9+(0-IP1OFS.B1)*DS, mech_sep= 0.1880, slot_id= 241903, assembly_id= 102110, from= IP1;
at= 164.439+(0-IP1OFS.B1)*DS, mech_sep= 0.1940, slot_id= 249460, assembly_id= 102111, from= IP1;
at= 165.735+(0-IP1OFS.B1)*DS, mech_sep= 0.1940, slot_id= 249462, assembly_id= 102111, from= IP1;
at= 167.031+(0-IP1OFS.B1)*DS, mech_sep= 0.1940, slot_id= 249464, assembly_id= 102111, from= IP1;
at= 169.553+(0-IP1OFS.B1)*DS, mech_sep= 0.1940, slot_id= 241907, assembly_id= 102111, from= IP1;
at= 172.227+(0-IP1OFS.B1)*DS, mech_sep= 0.1940, slot_id= 241908, assembly_id= 102111, from= IP1;
```

LHC sequence file generated from the database. Used by BE-ABP as one input file for MAD program (Methodical Accelerator Design simulation program)

COLLABORATIONS WITH OTHER CERN SYSTEMS

Layout database shares data with ~40 CERN database accounts (LSA, CCDB, SURVEY...)

Layout Service website integrates navigation to other external web interfaces at CERN:

- MTF (Assets Maintenance Management)
- EDMS (Documentation Management)
- Power converters Database (Alim DB)
- GIS Portals (CERN Geographical Information Systems)
- Normal Conducting magnets database (Norma DB)
- Control Configuration Service (CCDB)
- IT Network Service, etc...

RPMB.C.UL16.RTQX1.R1 : PC:[600A 10V 4Q] Use:Inner Triplet Model:B without DC contactor
 ID : 2348088, Layout version : STUDY

IDENTIFICATION	
ID	2348088
Type	RPMB.C
Description	PC:[600A 10V 4Q] Use:Inner Triplet Model:B without DC contactor
Layout Name (Electrical)	RPMB.C.UL16.RTQX1.R1
Location	UL16 (Galerie de liaison)
Powering sector	XR1
Circuits	RQX.R1
Links to other databases	RPMB.C.UL16.RTQX1.R1 in MTF T MTF HCRPMB.C...-C1000167 equipment in MTF T RPMB.C.UL16.RTQX1.R1 in TE-EPC DB T TE/EPC ALIM DB More P.C. Data in Layout DB...

Log

DOCUMENTS : NON CONFORMITIES, ECR...		
Electrical Object Concerned	Document	Description
RPMB.C.UL16.RTQX1.R1	EDMS Id: 1227985 (ECR)	Change of software over current protection thresholds for the Inner Triplet power converters
RPMB.C.UL16.RTQX1.R1	EDMS Id: 977059 (ECR)	Change of Power Converter Type to include DC contactor.

EDMS Documents

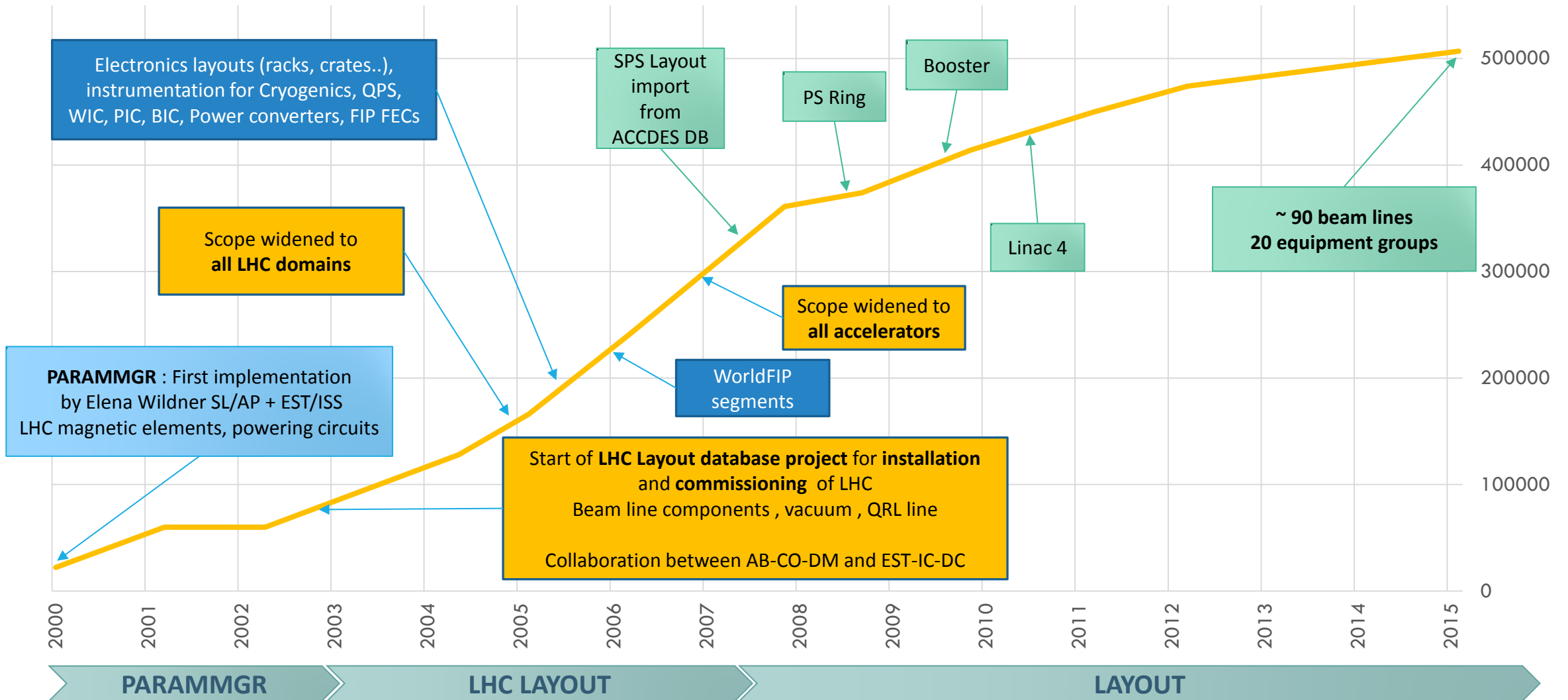
IT Network Service

FUNCTIONAL POSITIONS SYSTEM

SYSTEM ID	SYSTEM TYPE	SYSTEM NAME	SYSTEM EXPERT NAME	HOSTNAME	MAIN LOCATION	FUNCTION	DESCRIPTION	STATUS	RESPONSIBLE	USER	ELEC.	Links	VERSION
444611	CFC	CFC-SR1-DT1FA	CFC-SR1-DT1FA	cfc-sr1-dt1fa	SR1/R-E28	DT1FA	LHC Quench Protection	INSTALLED	HERVE MILCENT , EN-ICE	HERVE MILCENT EN-ICE	Elec. Object Elec. Circuit	Network DB CCDB MTF	STUDY CCDB

EVOLUTION

Functional Position increase over 15 years



UNDERESTIMATED IMPACT OF EXPANSION

As you have seen, over the last 10 years, the Layout service has expanded enormously

- Increase in **geographical scope**: From LHC main tunnel to any accelerator related locations
- Increase in **domain scope**: From LHC beam-line components to potentially any domain covered at CERN (Magnets, QPS, Shielding's...)
- Consequently, increase in **responsibility and technical expertise** provided

Scope extension not initially foreseen in 2003

Evolution not well controlled:

- Fulfilling missing functionality **extending far beyond the Layout primary scope** in response to critical user requests
- Prioritising short-term satisfaction of user, **neglecting maintainability**, underestimating long-term support
- **Over-compensating for equipment group's** lack of time, resources, commitment and understanding of their own data/business

Resulting in :

- Sub-optimal evolution of the database (wrong choices, duplicate implementations ...)
- Technical debts
- Increased supports

"PHILOSOPHY" DID NOT CHANGE

Layout service's philosophy of providing support for **centralised, integrated** functional position data has not changed over the last decade

Equipment groups are responsible for the accuracy of their data, but not necessarily its maintenance

In order to maintain a **global coherency, data management, integration** and **control** of layout data is currently performed by "layout data managers"

- ~4 FTEs across BE-CO-DS and EN-MEF-DC

EXPANSION WILL NOT STOP

The expansion will definitely continue, demands are there:

- Support for HL-LHC
- Maintenance Management Project expressed the need to extend the scope to any surface buildings
- Requests for experiment layouts
- Not even talking about FCC layout studies...

NOT SCALABLE, NOR SUSTAINABLE...

The service is becoming increasingly unsustainable with the current limited resources, due to:

- The number of **domains** covered
- The range of **functionalities** provided
- The complex, **labour-intensive nature** of the highly-relational data
- Reliance on **domain expertise** within the Layout team
- **LHC centric** data model not originally designed to support all infrastructures
- A growing user community implies a **proliferation of user-support** and **data maintenance**

The current philosophy, procedures and tools are no longer appropriate, as they cannot be scaled to meet the ever-increasing demand for the service

NEW APPROACH

Review the responsibility model, **redistribute the roles** and **delegate responsibility** for data management

As far as possible, equipment groups should be able to maintain their data

- Requires new accredited functions in the groups
- Knowledgeable person with appropriate competences to manage and be responsible for the data

Representatives from EN-MEF-DC to become responsible for **validating changes** made by users to **ensure the continuity of the global coherency**

Transform Layout Database Service in BE-CO-DS

- From data support oriented team to **Agile development team**
- Focus on **providing database and tools, minimise direct data management**
- **Additional resources** allocated for development phase



Hernan Diaz Rodriguez



Margarita Chrysogelou

CHALLENGES: DATABASE CONSOLIDATION

A complete new database is required

- To eliminate **technical debt** incurred by incremental evolution
- To **rationalise**, consolidate similar core concepts
- To model **more accurately** the business logic of the specific domains
- To **reinforce integrity constraints** of the specialised domain data
- To implement a **fine-grained access scheme** to protect data
- Improve **interoperability** and **automated synchronisation** with other systems (CCDB, LSA, MTF/InforEAM, GIS, Survey DB, Norma DB)
- To develop a detailed **time-oriented database mechanism** in order to manage past, current and **future** layouts
- Use standardised BE-CO-DS **Oracle Commons** database modules (for auditing, history, notification, error management...)

Without this new model, it is **not possible to delegate responsibility** for the data management back to the equipment groups

Re-establish clear boundaries for the scope of the Layout Database

- e.g. Separate pure Layout Data (Hardware topologies) from UNICOS configuration data (software objects and parameters) (concerned cryogenics, vacuum, QPS)

CHALLENGES: WEB USER INTERFACES

A new database implies complete new Graphical User Interfaces

- Combine read/write capabilities into **one modern, web-based tool**
- **Modular** GUI for power users such as EN-MEF-DC
- **Tailored tools**; customised to the different data sets, procedures and workflows of each domain

Excellent **opportunity to streamline** the approach between Layout and other BE-CO systems in terms of implementation technology and architecture

- No more .NET or APEX but latest BE-CO technology stack : Java spring MVC + REST + ExtJS or JSF

SUMMARY

The Layout Service is a 12 years old **critical information system** (used by many people to do lots of different things)

It's scope has **evolved significantly**, but the database and tools have not

Layout service **must evolve** in order to preserve both the quality of data and the overall level of service

- Current situation/ philosophy is not scalable
- Need to give responsibility for data management back to the equipment groups
- Break vicious cycle : too much data support meaning less development

2015 will be a crucial year for the service; the **resources are now available** to do the work and it is essential to **make significant progress** in the coming months

We need to have at least the **main core features** of the new system in place **before LS2**

- For **key Layout users** i.e. MEF + CRG
- This is already a **very ambitious goal**, but it would significantly reduce the amount of data support for LS2
- **Less critical domains can follow incrementally** in function of necessity, time and resources available