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 mode system"

Some examples



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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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

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

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



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Classifying the components of the infrastructure

Types:

Within a hierarchy of Classes and types

	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
lierarchy of	BI-BLM Class, ID : 1325563, Beam Loss Monitors
classes	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-UNNEL-MINI-CRATES Class, ID : 970343, Beam instrumentation Tunnel Mini Crates
	BI-VME Class, ID : 838012, Beam instrumentation VME
	^b 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
nembers of	Classes 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 Controler User Interfaces

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

Classifying the components of the infrastructure

- Within a hierarchy of Classes and types
- Types are identified by a 2-5 letters functional equipment code
- Adhering to CERN **naming conventions**

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Detailed rules for naming of equipment and signals	Gro	Ð	CFF	Controls Front End FMC Systems				
Detailed Cryogenics Facilities and Equipment Naming Conventions	 Lars 	(F)	CEG	Front-End Generator				
 Detailed Vacuum Interlocks and Controls Equipment Naming Conventions 	 Zorr 		CEL	aPCI				
 Detailed Vacuum Pumping Equipment Naming Conventions 	 Suitb 	II	CFI	CFCI				
Power Converters and El. Circuits Detailed Naming Conventions	 Sorei 	()	CFL	LXI Systems				
Practical Guidelines for Equipment Codes in the CO group	Eric \	<u>-</u>	CFO	Front-end industrial Oscilloscope				
 Naming of Hardware Equipment in the Controls Topology (draft version) 	Dam		CFP	PLC Systems				
PS	Chris	-9	CFS	Power Switch				
Equipment Naming Convention	Olive	Ð	CFU	uTCA Systems				
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 Conventions for naming of Layout components in the PS ring and related transfer line 	<u>s</u>	₽ <u>CI</u>	In	terlocks				
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Document the CERN infrastructures by **modelling** their **architecture** as **layouts**

Classifying the components of the infrastructure

- Within a hierarchy of Classes and types
- Types are identified by a 2-5 letters functional equipment code
- Adhering to CERN naming conventions

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



Example: ELENA naming convention



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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)



BLMEI.08R2.B1I21_MBA BLMEL.08R2.B1I21 MBA HOBC.A8R2.M MB.A8R2 BLMEI.08R2.B1I22_MBA BLMEL.08R2.B1I22_MBA GIWCT.A8R2 GIMBH.8R2 GIMSA C8R2

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Defining relationships between these components:

- Mechanical assemblies (Physical structures)
- Powering connections & circuits

GENERAL INFORMATION | POWER CONVERTERS | QPS | WARM CABLES | M LHC Electrical Circuits (STUDY) RB.A23 : Sector 2 to 3 Main bending. B1 & B2 in series Link to MTF Powering Subsector WLR1 ID: 254488. Circuit version: STUDY, Layout version: STUDY Powering Subsector XR1 Power Converters in the Circuit RPTE.UA27.RB.A23 (MTF, TE-EPC Database Powering Subsector LR1 UA27 Powering Subsector A12 ME Current Lea Powering Subsector ML2 DFLAS.7L3. Powering Subsector XL DFLAS.7L3.2 Power converter reference data used by LSA DFLAS.7R2.5 Powering Subsector WLR2 DFLAS.7R2.6 Magnets per Pow Powering Subsector XR2 Powering Subsector MR2 I Nominal 11850 A I Ultimate 12840 A A Bowering Subsector A23 ~1.1 * I ultimate A I Offset .0 A I Overload Min Op: 100.0 A Circuit RB.A23 15.708 H 001153 Ohm 001000 Ohm L tot : R tot Measured R tot . Ramp Time 1300.00 s max(di/dt) 10.000 A/s Time Constant 13623.327 s RPTE.UA27.RB.A23 U leads : 240 V U Extr : 1.534 V MB.A10L **U** Boost 157.080 V U Coll 14 989 V U Peak Circ 172.069 V MB.A10R2 Warm Cable Verification : ~ MB.A11L3 Circuit Paramete Associated documentation from EDMS: Non **Operational Temperature :** 1.9 K @ MB.A11R2 Beam Dump Request : YES conformities, Engineering specifications, ECR... MB.A12L3 Powering Subsector Abort : YES A23 MB.A12R2 Safev Subsector Download the XML circuit definition of the circuit RB.A2 MB.A13L3 Documents : Non Conformitie MB.A13R2 Electrical Object Concerned Document Description MB.A14L3 DQRB.7L3.EE.A23 EDMS Id Change of the Magnetic Energy Extraction Resistors for operation at 3.5TeV. Initial configuration of 3 || R (ie 3572 (ECR) 75mOhm per EE system) ha been temproarily changed to a 1R || (2 R serial) configuration with 150 mOhm MB.A14R2 per EE system DQRB.UA27.RB.A23 Change of the Magnetic Energy Extraction Resistors for operation at 3.5TeV. Initial configuration of 3 || R (ie MB.A15L3 1013572 (ECR) 75mOhm per EE system) ha been temproarily changed to a 1R || (2 R serial) configuration with 150 mOhm MB.A15R2 per EE system. MB.A16L3 MB.C25L3 During MIC-C campaign, on MB C25L3 (2205), the Vtap of diode EE015 was found open (see NC 633051 EDMS Id: 1003201 (NC) and 633052). Upon the request of QPS, the broken Vtap EE015 (D20-B2) has been now bridged with I-tag MB.A16R2 FE012 (D20-A1) inside the IFS box MB.A17L3 MB.A21L3 EDMS Id: 942550 (NC) MB.A17R2 MB.A18L3 MB.A18R2 MB.A19L3 MB.A19R2 Circuit hierarchy with Power converters and magnets

Powering sub-sectors

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

Classifying the components of the infrastructure

- Within a hierarchy of Classes and types
- Types are identified by a 2-5 letters functional equipment code

CLHC Point 1 CLHC Point 2

CBW.IE CBW.IP

Adhering to CERN naming conventions

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)
- Powering connections & circuits
- Control connections & circuits

<i>[</i>		WorldFIPCompletesegmentsadressdownl							ete se resse wnlo	segment report with FIP es, cable numbers oadable as Excel file						
LHC Point 1																
LHC Point 2	W	ORLDF	IP SEGME	INT						_					_	
SE CBW.IP2.BT2A		NA CRW/I	ME	GAT	EWAY M	ANAGER		DESCRIPTI	N			CLIENT	RESPON	SIBLE	MAIN LC	DCATION
CBW.IP2.BT2B		Expert Na	me: CFQ-D	CFC-SH	2-QL3CD CBW	MB.SHB2.QL3D CI	RYO WORLDFIP segment	ment / IP 2 Left / Segment number : D				CRYO	PAULO GOMES L		.2	
CBW.JP2.BTI20	0.0	10.10	11000													
CBW IP2 BTI2D	Do	wnload	the Excel	file forma	t for this segmen	t (Printable ver	sion)									
				CIVII					TRUNK	TRUNK	SUBTRUNK			DROP	FIP	FIP
CONTRACTOR	#	TYPE	LOCATION	WORK	SLOT NAME	TSEL NAME	RESPONSIBLE	RACK REF	IN	OUT	IN	OUT	DROP IN	OUT	ADDRESS 1	ADDRES
CBWMB.SHB2.QL3C	1	CBWMB	SHB2/R-401	SHB2/R-	CBWMB.SHB2.QL3D		MAGNUS BJORK	QYCOM.01SHB2		1210996						
CBWJA.SHB2.QL3C	2	CBWJA	SHB2/R-401	SHB2/R-	CBWJA.SHB2.QL3D	QJCFD00=SH2	JULIEN PALLUEL	QYCOM.01SHB2	1210996	1210980				VIRTUAL		
QYMMW.01QVIRT-S23.A	2	OVMM	01/IPT \$23	401 OVERT \$23	QYMMW.01QVIRT-		CZESLAV KRZYSZTOF	OVC OVERT S22					VIRTUAL	CABLE	03	04
2 QYMMW.02QVIRT-S23.A		Ce HVIIWIYY	QVIRT-525	Q VIR 1-323	S23.B		FLUDER CZESLAW KRZYSZTOF	:					CABLE		33	04
2 QYMMW.03 QVIRT-S23.A	4	QYMMW	QVIRT-S23	QVIRT-S23	S23.B		FLUDER	QYC.QVIRT-S23					CABLE		95	96
2 QYMMW.05 QVIRT-S23.A	5	QYMMW	QVIRT-S23	QVIRT-S23	S23.B		FLUDER	QYC.QVIRT-S23					CABLE		97	98
SBWRE.SHB2.QL3C	6	QYMMW	QVIRT-S23	QVIRT-S23	QYMMW.04QVIRT- S23.B		CZESLAW KRZYSZTOF	QYC.QVIRT-S23					CABLE		91	92
Se CBWRE.RE32.0 3C	7	CBWRE	SHB2/R-401	SHB2/R- 401	CBWRE.SHB2.QL3D		ULIEN PALLUEL	QYCOM.01SHB2	1210980	FIBER						
	8	CBWRE	RE32	RE32	CBWRE.RE32.QL3D		JULIEN PALLUEL	CYFRE01=UJ32	FIBER	X1						
	9	CBWRB CBWJA	RE32 RE32	RE32 RE32	CBWRB.RE32.QL3DB CBWJA RE32 OL3DB	OJCEB01=RE32	JULIEN PALLUEL	CYFRE01=UJ32 CYFRE01=UJ32	X1		1305260	1305260 1302934A	PONT	PONT		
CBWJA.RE32.QE3CG	11	CBWJA	UJ32	UJ32	CBWJA.UJ32.QL3DB	QJCFB01=RE32	JULIEN PALLUEL	01111201-0032			1302934A	1302853A	PONT	PONT		
CBWJA.UJ32.0L3CG	12	2 CBWJA	15L3	R33	CBWJA.15L3.QL3DB	QJCFB.A15L3=R33	JULIEN PALLUEL				1302853A	1302854A		1302935A		
EBWJA.A29L3.QL3CG	14	CBWJA	14L3	R33	CBWJA.14L3.QL3DB	QJCFB.A14L3=R33	JULIEN PALLUEL				1302854A	1302855A		1302936A		
EBWJA.B29L3.QL3CG	15	5	101.0								10000551			10000071		
D 😤 CBWJA.30L3.QL3CG	10	CBWJA	13L3	R33	CBWJA.B13L3.QL3DB	QJCFB.B13L3=R33	CZESLAW KRZYSZTOF	OVCEC 1212			1302855A	1302656A	12020274	1302937A	24	22
🖻 😪 CBWJA.A31L3.QL3CG	18	CBWJA	131.3	R33	CBWJA A13L3 OL3DB	OJCEB A13I 3=R33	FLUDER	GTOLO.ISES			1302856A	1302857A	13020318	1302938A	21	
P 😤 CBW1A B311 3 01 3CG	19)	IOLO	1100	001101.0100.02000	0001 0.41020-1000	VOLENT ALCOLL				10020004	100200114		100200011		
	20	CBWJA	12L3	R33	CBWJA.B12L3.QL3DB	QJCFB.B12L3=R33	JULIEN PALLUEL				1302857A	1302858A		1302939A		
CBWJA.32L3.QL3CG	22	CBWJA	12L3	R33	CBWJA.A12L3.QL3DB	QJCFB.A12L3=R33	JULIEN PALLUEL				1302858A	1302859A		1302940A		
CBWJA.A33L3.Q.3CG	23		111.2	D22	CRW1A 1112 OL 2DR	O ICER 4111 2-822					12028504	12029604		12020414		
EBWJA.B33L3.QL3CG	25	5	TILD	RUU	CONTRA THES. GESEDE	GOOLD ATTES-ROS	JULIEN PALEOLL				1302033A	13020004		1302341A		
EBWJA.A34L3.QL3CG	26	6 CBWJA	10L3	R33	CBWJA.10L3.QL3DB	QJCFB.A10L3=R33	JULIEN PALLUEL				1302860A	1302861A		1302942A		
EBWJA.B34L3.QLBCG	27	QYMMW	10L3	R33	QYMMW.10L3.B	QYMMW.B10L3=R33	FLUDER	QYCDB.10L3					1302942A		9	10
CBWDB.34L3.QL3CG	28	CBWJA	9L3	R33	CBWJA.9L3.QL3DB	QJCFB.A9L3=R33	CZESLAW KRZYSZTOF				1302861A	1302862A	10000.05	1302943A	-	
EBWRB.RE32.QL3CE	29		9L3	R33	CRIMIN 812 OLDER	QYMMW.A9L3=R33	FLUDER	QYCEB.9L3			13030001	1205247	1302943A	12020444	(8
CBWRB.RE32.01 3CC	30		0L3 81.3	R33	OYMMW 813 B	OVIMMW BRI 3-D22	CZESLAW KRZYSZTOF	OVCOR 812			1302002A	1303217	13029444	1302944A	1	2
	30	CBWDT	81.3	R33	CBWDT 8I 3 QI 3DB	CBWDT A8I 3=R33	FLUDER	G1000.0L3			1305217		1302344A			2
CONVIDENCESZIQUESCA	33	CBWRB	RE32	RE32	CBWRB.RE32.QL3DD		JULIEN PALLUEL	CYFRE01=UJ32				1305259				
THE REPORT OF A DECK		0.014111	0.000	0000	CONTRACTOR DECOR OF ADD	O LOEDAL DEAD	IL IL ICAL PARTICIPAT	LOWEREAA LUIDA			1005050	40000504	DONT	DOUT		

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

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

Classifying the components of the infrastructure

- Within a hierarchy of Classes and types
- Types are identified by a 2-5 letters functional equipment code
- Adhering to CERN naming conventions

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

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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

Data provided to LSA since 2006 LHC SEQUENCE

LHCB1 : IP1:OMK MBAS2

HCB1 : SEQUENCE, refer = CENTRE	, L = LHCLENGTH;	
P1:OMK,	at= pIP1+IP10FS.B1*DS;	
MBAS2.1R1:MBAS2,	at= 1.5+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 2209454,	from= IP1
TAS.1R1:TAS,	at= 20.015+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 102103,	from= IP1
BPMSW.1R1.B1:BPMSW002,	at= 21.564+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 6080259, assembly_id= 6080224,	from= IP1
BPMSW.1R1.B1_DOROS:BPMSW002,	at= 21.564+(-IP10FS.B1)*DS, mech_sep= 0, slot_id= 10429420, assembly_id= 6080224,	from= IP1
BPMWK.1R1:BPMWK,	at= 21.62+(0-IP10F5.B1)*DS, slot_id= 6080224,	from= IP1
BPMWF.A1R1.B1:BPMWF,	at= 21.724+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 6080267, assembly_id= 6080224,	from= IP1
MQXA.1R1:MQXA,	at= 26.15+(0-IP10F5.B1)*DS, mech_sep= 0, slot_id= 282126, assembly_id= 102104,	from= IP1
MCBXH.1R1:MCBXH,	at= 29.842+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 282213, assembly_id= 102104,	from= IP1
MCBXV.1R1:MCBXV,	at= 29.842+(0-IP10FS.B1)*DS, mech_sep= 0, slot_id= 282212, assembly_id= 102104,	from= IP1
BPMS.2R1.B1:BPMS,	at= 31.529+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 241889, assembly id= 102105,	from= IP1
MQXB.A2R1:MQXB,	at= 34.8+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 241890, assembly id= 102105,	from= IP1
MCBXH.2R1:MCBXH,	at= 38.019+(0-IP10FS.B1)*DS, mech sep= 0, slot_id= 249450, assembly_id= 102105,	from= IP1
MCBXV.2R1:MCBXV,	at= 38.019+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 249451, assembly id= 102105,	from= IP1
MQXB.B2R1:MQXB,	at= 41.3+(0-IP10F5.B1)*DS, mech_sep= 0, slot id= 241892, assembly id= 102105,	from= IP1
TASB.3R1:TASB,	at= 45.342+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 241893, assembly id= 102106,	from= IP1
MQSX.3R1:MQSX,	at= 46.608+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 282127, assembly id= 102106,	from= IP1
MQXA.3R1:MQXA,	at= 50.15+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 241895, assembly id= 102106,	from= IP1
MCBXH. 3R1: MCBXH,	at= 53.814+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 249456, assembly id= 102106,	from= IP1
MCBXV. 3R1: MCBXV,	at= 53.814+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 249457, assembly id= 102106,	from= IP1
MCSX.3R1:MCSX,	at= 53.814+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 249458, assembly id= 102106,	from= IP1
MCTX.3R1:MCTX,	at= 53.814+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 249459, assembly id= 102106,	from= IP1
MCOSX. 3R1: MCOSX,	at= 54.297+(0-IP10F5.B1)*D5, mech sep= 0, slot id= 282237, assembly id= 102106,	from= IP1
MCOX.3R1:MCOX,	at= 54.297+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 282236, assembly id= 102106,	from= IP1
MCSSX.3R1:MCSSX,	at= 54.297+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 282235, assembly id= 102106,	from= IP1
DFBXB.3R1:DFBXB,	at= 56.427+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 104672,	from= IP1
BPMSY.4R1.B1:BPMSY,	at= 58.3145+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 104595,	from= IP1
MBXW.A4R1:MBXW,	at= 61.322+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 134500,	from= IP1
MBXW.B4R1:MBXW,	at= 65.588+(0-IP10F5.B1)*D5, mech sep= 0, slot id= 134501,	from= IP1
MBXW.C4R1:MBXW,	at= 69.854+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 134502,	from= IP1
MBXW.D4R1:MBXW,	at= 74.12+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 134503,	from= IP1
MBXW.E4R1:MBXW,	at= 78.386+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 134504,	from= IP1
MBXW.F4R1:MBXW,	at= 82.652+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 134505,	from= IP1
X1FCR, 4R1: X1FCR,	at= 141.16+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 378054, assembly id= 102108,	from= IP1
BRANA, 4R1: BRANA,	at= 141.376+(0-IP10F5.B1)*DS, mech sep= 0, slot id= 883446, assembly id= 102108.	from= IP1
X1ZDC.A4R1:X1ZDC001,	at= 141.71+(0-IP10FS.B1)*DS, mech sep= 0, slot id= 2019586, assembly id= 102108,	from= IP1
TANAR, 4R1: TANAR,	at= 142.75+(0-IP10F5.B1)*D5, mech sep= 0, slot id= 102108.	from= IP1
TCL, 4R1, B1; TCL,	at= 149.73+(0-IP10F5.B1)*D5, mech sep= 0.1755, slot id= 6755437.	from= IP1
BPMWB, 4R1, B1; BPMWB,	at= 151.0945+(0-IP10F5.81)*DS, mech sep= 0.1780, slot id= 181634.	from= IP1
MBRC.4R1.B1:MBRC.	at= 157.9+(0-IP10F5.B1)*DS, mech sep= 0.1880, slot id= 241903, assembly id= 102110.	from= IP1
MCBYV, A4R1, B1:MCBYV,	at= 164.439+(0-IP10F5.B1)*DS, mech sep= 0.1940, slot id= 249460, assembly id= 102111.	from= IP1
MCBYH.4R1.B1:MCBYH,	at= 165.735+(0-IP10FS.B1)*DS, mech sep= 0.1940, slot id= 249462, assembly id= 102111.	from= IP1
MCBYV, B4R1, B1:MCBYV,	at= 167.031+(0-IP10FS.B1)*DS, mech sep= 0.1940, slot id= 249464, assembly id= 102111.	from= IP1
MOY, 4R1, B1; MOY,	at= 169.553+(0-IP10FS.B1)*DS, mech sep= 0.1940, slot id= 241907, assembly id= 102111.	from= TP1
DDUNA 401 01.0040/0	-+ 172 227/0 T01055 01/*D5 meth 0 1040 -1-+ ++ 241000	£ TD1

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)

SYSTEM EXPERT NAM

CFC-SR1-DT1FA

HOSTNAME

cfc-sr1-dt1fa

MAIN LOCATION

SR1/R-E28

- Normal Conducting magnets database (Norma DB)
- Control Configuration Service (CCDB)

SYSTEM NAME

CFC-SR1-DT1FA

IT Network Service, etc...

FUNCTIONAL POSITIONS SYSTEM

SYSTEM TYPE

CFC

SYSTEM ID

444611



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