

CMS DT Wheel + 2

CMS DT Wheel + 1

CMS DT Wheel 0

CMS DT Wheel - 2



The Compact Muon Solenoid Detector Control System



CMS DT Wheel - 1

CMS DT Wheel 2

ICALEPCS 2009 – Kobe, Japan
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CERN – PH/CMD



- Overview and requirements
- Deployment Strategy
- Status

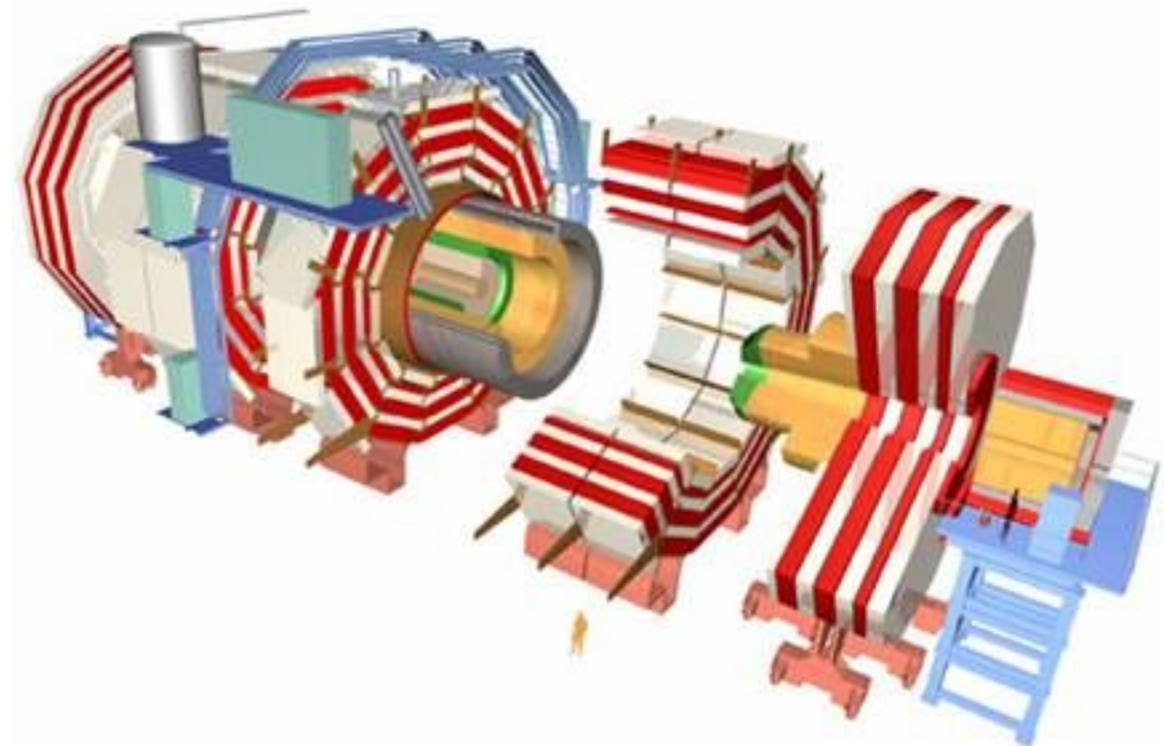


CMS Overview



- The Compact Muon Solenoid (CMS) is one of the Large Hadron Collider general purpose particle detectors

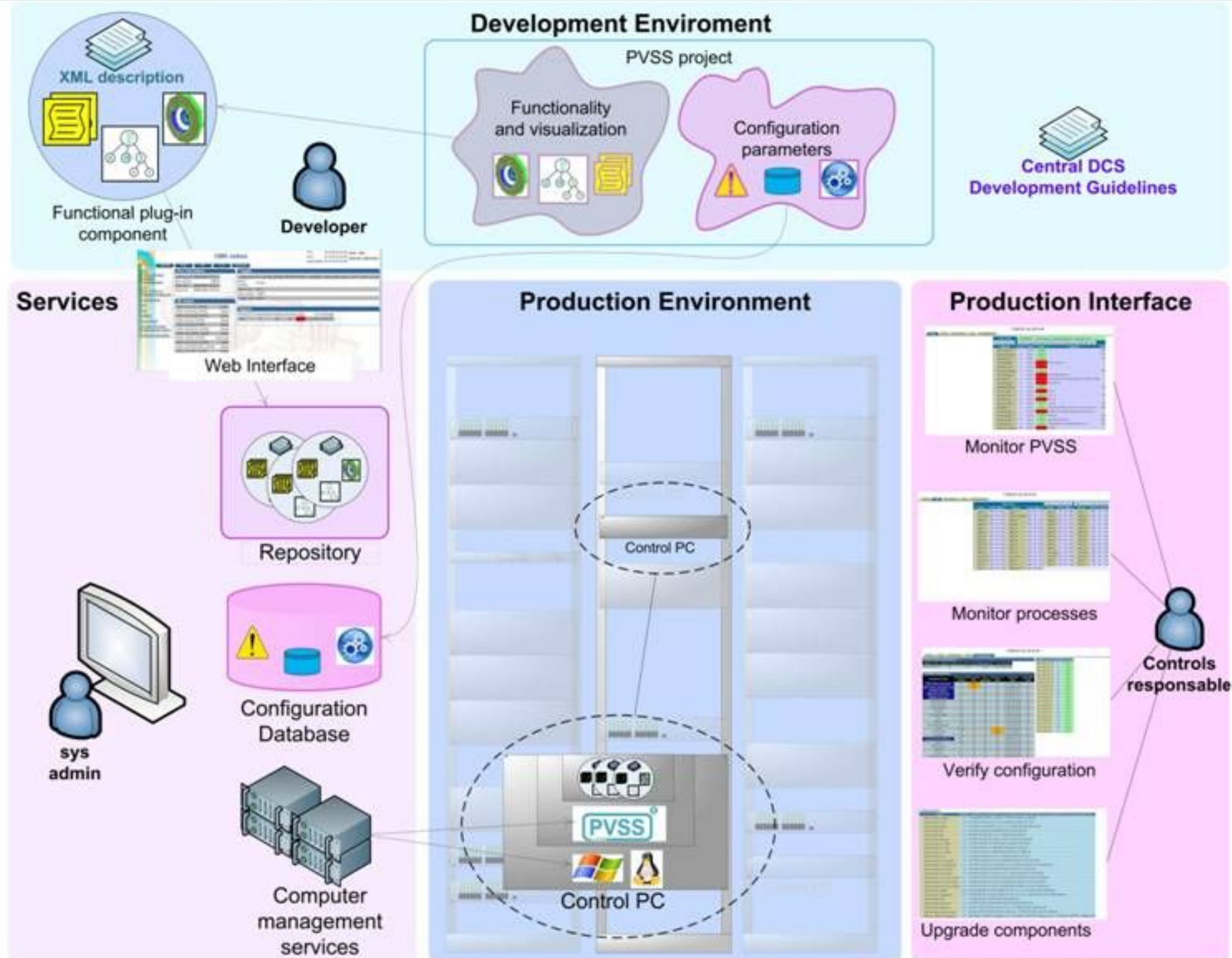
System Name	Number of PCs	Monitored Parameters
Tracker	14	350k
Calorimeter	14	115k
Muon	30	435k
Trigger DCS	2	1k
Alignment	3	3k
Services	35	20k
Total	98	934k



~ 10^6 control system parameters



Deployment Strategy





- Running 24h/d
- Deployment strategy easing maintenance
 - Recovering nodes
 - Updating packages
- A hierarchy of Finite State Machines based nodes summarize states and propagates commands. The most top layer:
 - Provides control over CMS DCS trigger partitions
 - Communicates with experiment Run Control
 - Handle the handshake with the LHC



Main DCS Operator Screen



USER: root
ROLE: SystemOperator

Place your CERN card on the card reader and select your operator role
If you don't have DCS operator role go have fun with Run Control :)

Sub-detector

Trigger Partition

Hardware Status

Ready for physics
Preparing for physics
Standby
Going to Standby
Off
Switching off
Error

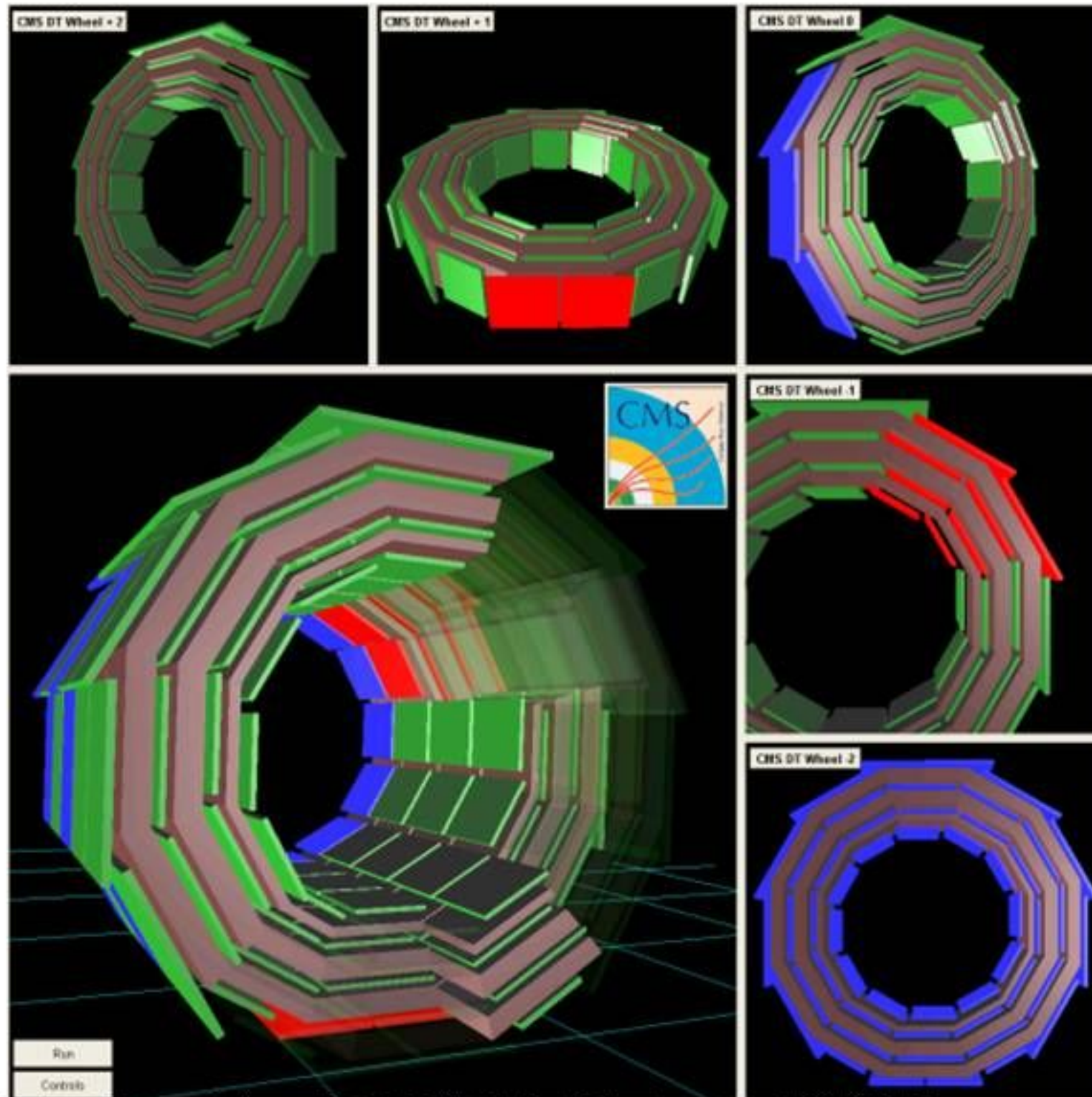
B PIX	IN LOCAL	PixelBarrel	OFF	No Owner
	NOT READY			
F PIX	IN LOCAL	PixelEndCap	OFF	No Owner
	NOT READY			
TIB/TID	IN LOCAL	TIB	OFF	
	NOT READY			
TOB	IN LOCAL	TIB	OFF	
	NOT READY			
TEC+	IN LOCAL	TEC plus	OFF	
	NOT READY			
TEC-	IN LOCAL	TEC minus	OFF	
	NOT READY			
EE-	IN LOCAL	Endcap Higgs	ERROR	No Owner
	NOT READY			
EB-	IN LOCAL	Barrel Higgs	ERROR	No Owner
	NOT READY			
EB+	IN LOCAL	Barrel Higgs	ERROR	No Owner
	NOT READY			
EE+	IN LOCAL	Endcap Higgs	ERROR	No Owner
	NOT READY			
ES-	IN LOCAL	ES Higgs	OFF	No Owner
	NOT READY			
ES+	IN LOCAL	ES Higgs	OFF	No Owner
	NOT READY			
H*	IN LOCAL	H*	ERROR	German Ruben Martinez
	NOT READY			
H0	IN LOCAL	H0	ERROR	German Ruben Martinez
	NOT READY			
HEHba	IN LOCAL	HEHba	ERROR	German Ruben Martinez
	NOT READY			
HEHbb	IN LOCAL	HEHbb	ERROR	German Ruben Martinez
	NOT READY			
HEHbc	IN LOCAL	HEHbc	ERROR	German Ruben Martinez
	NOT READY			
DT+	IN LOCAL	Wheel YB1	OFF	Marina Ciuchea
	NOT READY	Wheel YB2	OFF	Marina Ciuchea
DT0	IN LOCAL	Wheel YB3	OFF	Marina Ciuchea
	NOT READY			
DT-	IN LOCAL	Wheel YB-1	OFF	Marina Ciuchea
	NOT READY	Wheel YB-2	OFF	Marina Ciuchea
RPC	IN LOCAL	CMS RPC	ERROR	cms_rpc_soc_04:Manager1
	NOT READY			
CSC-	IN LOCAL			
	NOT READY			
CSC+	IN LOCAL			
	NOT READY			



- ◉ Aimed for an intuitive HMI for operators
 - No need for courses
 - No need for extensive documentation
 - Software helpers guiding operator
- ◉ Touch screen operation panels in underground cavern
 - Card reader authentication
 - Functionality enabled depending on user privileges
- ◉ 3D technology for geometrical error correlation



3D DCS View





Rack Control Touch Screens



DEVICE_MODULE: fwRack/fwRackOperation.prl cms_conf_dcs_01/RCA/Zones/S1 in MODE_NAVIGATOR (cms_conf_dcs_01 - ServiceProject; #6)

Rack zone: S1 [9.7m x 10m]

S1A02	S1B02	S1C00	S1D00	S1E00	S1F00	S1G00	
OFF	ON	ON	ON	ON	ON	ON	
S1A03	S1B03	S1C01	S1D01	S1E01	S1F01	S1G01	S1H01
ON	ON	ON	ON	ON	ON	ON	ON
S1A04	S1B04	S1C02	S1D02	S1E02	S1F02	S1G02	S1H02
ON	ON	ON	ON	ON	ON	ON	ON
S1A05	S1B05	S1C03	S1D03	S1E03	S1F03	S1G03	S1H03
ON	ON	ON	ON	ON	ON	ON	ON
S1A06	S1B06	S1C04	S1D04	S1E04	S1F04	S1G04	S1H04
ON	ON	ON	ON	ON	ON	ON	ON
S1A07	S1B07	S1C05	S1D05	S1E05	S1F05	S1G05	S1H05
ON	ON	ON	OFF	ON	ON	ON	ON
S1A08	S1B08	S1C06	S1D06	S1E06	S1F06	S1G06	S1H06
ON	ON	ON	ON	ON	ON	ON	ON
S1A09	S1B09	S1C07	S1D07	S1E07	S1F07	S1G07	S1H07
ON	ON	ON	ON	ON	ON	ON	ON
S1A10	S1B10	S1C08	S1D08	S1E08	S1F08	S1G08	S1H08
ON	ON	ON	ON	ON	ON	ON	ON
S1A11	S1B11	S1C09	S1D09	S1E09	S1F09	S1G09	S1H09
ON	ON	ON	ON	ON	ON	ON	ON
S1A12	S1B12	S1C10	S1D10	S1E10	S1F10	S1G10	S1H10
ON	ON	ON	ON	ON	n/a	ON	ON
S1A13	S1B13	S1C11	S1D11	S1E11	S1F11	S1G11	S1H11
ON	ON	ON	ON	n/a	n/a	ON	ON
S1A14	S1B14	S1C12	S1D12				
ON	ON	ON	ON				
S1A15	S1B15						
ON	ON						

Callouts:

- Choose property to display
- Card reader authentication
- Group Commands
- Rack Overall Status

Right Panel:

- USER: NO USER
- ROLE: []
- CHOOSE USER AND ROLE
- Label: []
- CHOOSE RACK TITLE
- Status: []
- CHOOSE DISPLAYED P...
- CLEAR GROUP SELECTION
- SEND GROUP COMMANDS
- EXPERT ACTIONS
- HOW TO USE THIS PANEL



- PVSS users and privileges are synchronized with CMS LDAP server
- Web base applications allow control group responsible to provide privileges to users
- Synchronized with CMS Shift List tool



- ◉ Alarm screen summarizes all CMS DCS alerts
- ◉ Alert help engine
 - Web forms for DCS experts to add help content
 - Dynamic Web pages for Operators with incremental alert help



Alarm Screen



Alarm Screen

Print alarms:

Acknowledgement: Unacknowledged Individual/Group acknowledged

Mode: Current Alarms Historical Alarms

Alarm Filters:

Systems: Logical Name: Alarm Text:

Device Description: Quick Filters:

Sh	Device DP element	Log	Alarm text	Dir.	Value	Ack	Time	Co
F	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Bad ESS connection!	WENT	FALSE	<input type="checkbox"/>	2009/10/07 15:48:58.650	
F	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Overheating!	CAME	255	<input type="checkbox"/>	2009/10/09 19:50:47.457	
F	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		FSM Summary	CAME	TRUE	<input type="checkbox"/>	2009/08/24 14:16:57.933	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Cooling problem!	CAME	TRUE	<input type="checkbox"/>	2009/10/10 09:38:46.415	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		LV Cool Alarm!	WENT	FALSE	<input type="checkbox"/>	2009/09/17 16:35:27.862	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Bad ESS connection!	WENT	FALSE	<input type="checkbox"/>	2009/10/07 15:48:57.999	
F	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Overheating!	CAME	255	<input type="checkbox"/>	2009/10/09 19:50:47.457	
F	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		FSM Summary	CAME	TRUE	<input type="checkbox"/>	2009/08/24 14:16:57.960	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Cooling problem!	CAME	TRUE	<input type="checkbox"/>	2009/10/10 09:38:46.415	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		LV Cool Alarm!	WENT	FALSE	<input type="checkbox"/>	2009/09/17 16:35:28.894	
W	cms_ecal_dcs_02:CMS_ECAL_DCS/ESS_SM_pos		Bad ESS connection!	WENT	FALSE	<input type="checkbox"/>	2009/10/07 15:48:58.952	
F	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		Overheating!	CAME	255	<input type="checkbox"/>	2009/10/09 19:50:47.457	
F	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		TRUE	CAME	TRUE	<input type="checkbox"/>	2009/09/04 16:18:41.106	
W	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		TRUE	CAME	TRUE	<input type="checkbox"/>	2009/09/04 16:06:55.053	
W	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		TRUE	WENT	TRUE	<input type="checkbox"/>	2009/08/27 09:25:27.950	
W	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		TRUE	WENT	TRUE	<input type="checkbox"/>	2009/09/09 12:50:33.921	
F	cms_ecal_dcs_02:CMSAlertSystem/SumAlerts/Sat		TRUE	CAME	TRUE	<input type="checkbox"/>	2009/08/24 14:25:14.214	
F	cms_ecal_dcs_02:ECAL_ESS ECAL_ESS		FSM Summary	CAME	TRUE	<input type="checkbox"/>	2009/10/06 19:44:12.554	
E	cms_ecal_dcs_06:Cooling_DU/EBM_01_Cooling		FSM Summary	CAME	TRUE	<input type="checkbox"/>	2009/08/25 14:55:08.212	
W	cms_ecal_dcs_06:Cooling_DU/EBM_01_Cooling.FI		Low	CAME	0.6104795932	<input type="checkbox"/>	2009/10/10 09:39:21.950	
E	cms_ecal_dcs_06:Cooling_DU/EBM_01_Cooling.FI		Very Low	CAME	0.6104795932	<input type="checkbox"/>	2009/10/10 09:39:21.950	

click for help



- Central DCS services integrated
 - Rack and crate control
 - Gas
 - Cooling
 - Ventilation
 - Magnet



Rack and Crate Control



USER: webermat
ROLE: CMS OPERATOR

Access control

Clickable racks

Rack area summary

Off	On	Unkn	Error	DSS
0	53	0	0	0



Rack details



Rack Operation

Rack Information

DB Label: **S2D02**
 Detector: ECAL
 Usage: ULR
 Responsible: ECAL_OD

Electrical Equipment Information

Power PLC name: **PLC_S2**
 Equipment name: **S2D02**
 Equipment type: **Type_19**

Breaker Command information

Send command:

Last sent command:
 ACKA 2009.08.21 20:08

Last received response:
 2009.08.21 20:13

Electrical Equipment status

Property	Value
Output_5_Breaker_Open	FALSE
Output_5_Breaker_Closed	TRUE
Output_5_CircuitBreaker_Fault	FALSE
Output_5_Discordance_Fault	FALSE
Temperature_Interlock_Active	TRUE
Fire_Interlock_Active	FALSE
EmergencyInterlock_Active	FALSE
DSS_Interlock_Active	FALSE
User_Interlock_2_Active	FALSE
User_Interlock_3_Active	FALSE
Temperature_Alert_Active	TRUE
Fire_Alert_Active	FALSE
EmergencyStop_Alert_Active	FALSE
DSS_Alert_Active	FALSE
UserAlert_2_Active	FALSE

Show Mask

Front

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1

TURBINE UNIT

Temperature1: 22.1C CurrentA: 0.9A
 Temperature2: 22.8C CurrentB: 0.9A
 Humidity: 53.7% Card:

Heat exchanger 1U
 Blank panel 2U

EE- Readout Crate A

Fan tray 2U

Heat exchanger 1U
 Blank panel 3U

WIENER CRATE

CHANNEL	VOLT[V]	CURR.[A]
ON/OFF		
AVG FAN SPEED		
3180		
ERRORS		
AC POWER		
Channel0	4.330	2.540
Channel1	11.370	0.000
Channel2	0.000	0.000
Channel3	3.330	59.560
Channel4	0.000	0.000
Channel5	12.000	0.200
Channel6	0.000	0.000
Channel7	3.230	68.320

Fan tray 2U

Heat exchanger 1U
 Blank panel 2U

WIENER CRATE

CHANNEL	VOLT[V]	CURR.[A]
ON/OFF		
AVG FAN SPEED		
3180		
ERRORS		
AC POWER		
Channel0	5.000	2.420
Channel1	11.370	0.000
Channel2	0.000	0.000
Channel3	3.200	57.260
Channel4	0.000	0.000
Channel5	11.300	0.140
Channel6	0.000	0.000
Channel7	3.230	11.360

Fan tray 2U

Heat exchanger 1U
 Air deflector 2U

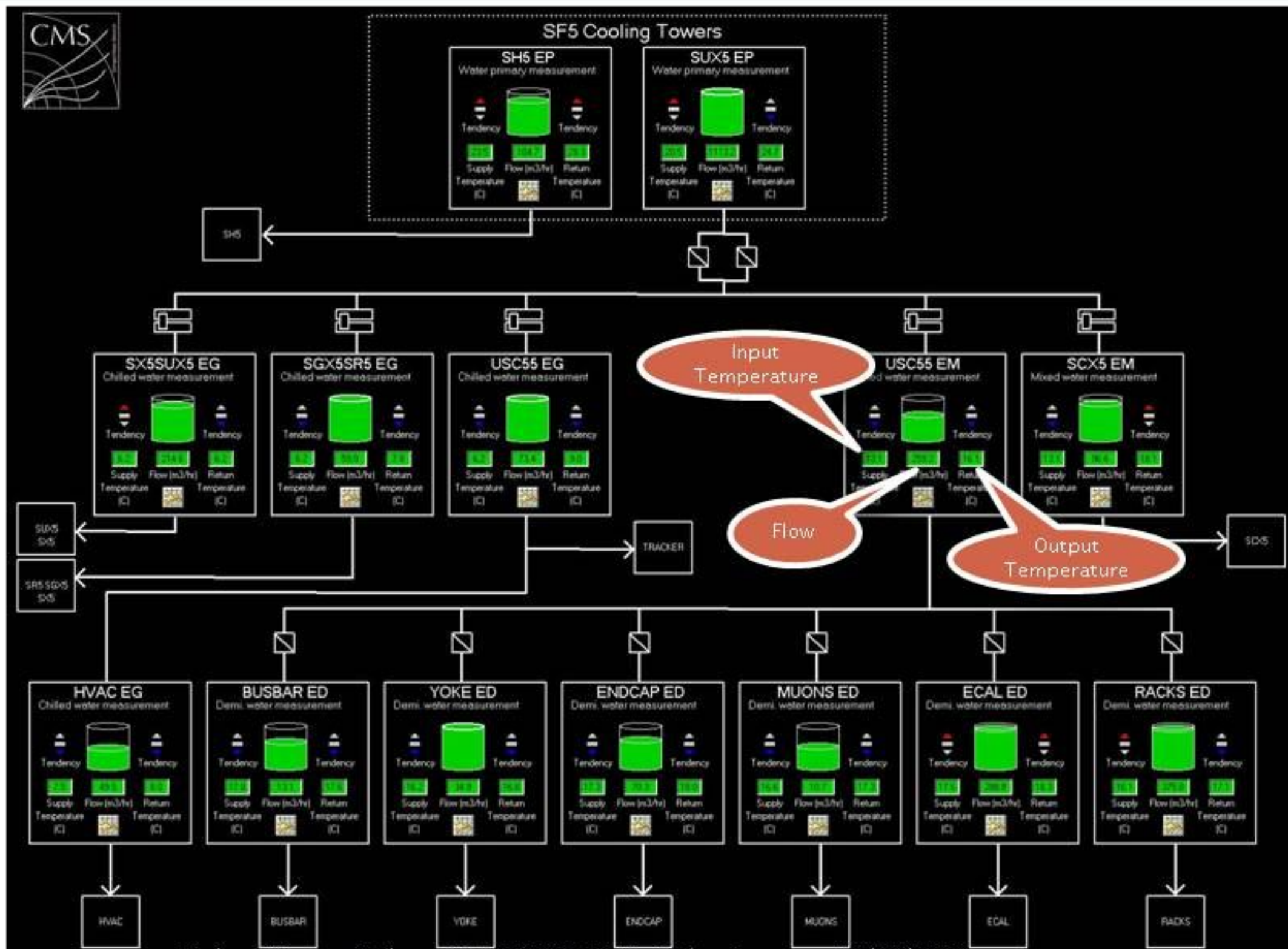
Electrical information

Environment monitoring

Crate Control



Cooling Monitoring





どうもありがとう
Thank you !