



ALICE PC Rack Cooling System Sensor

Giulia Fanti

F.W. Olin College of Engineering

Marco Boccioli

André Augustinus

ALICE PC Cooling System

- Horizontal cooling
- Water to air heat exchanger
- System mounted on door
- 3 fans per door



Objective

- Sense whether cooling system is functional
 - Door closed
 - Fans operational
- Provide clear UI to allow user to monitor situation
- Secondary method to sense cooling
 - Temperature sensors already in place
 - Allow action before temperature rises too much

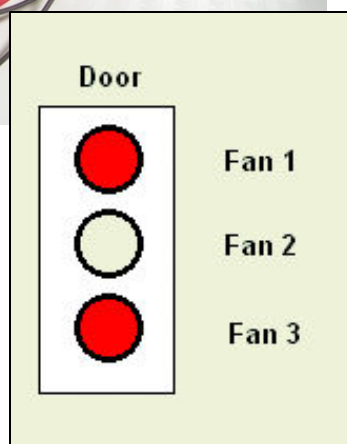
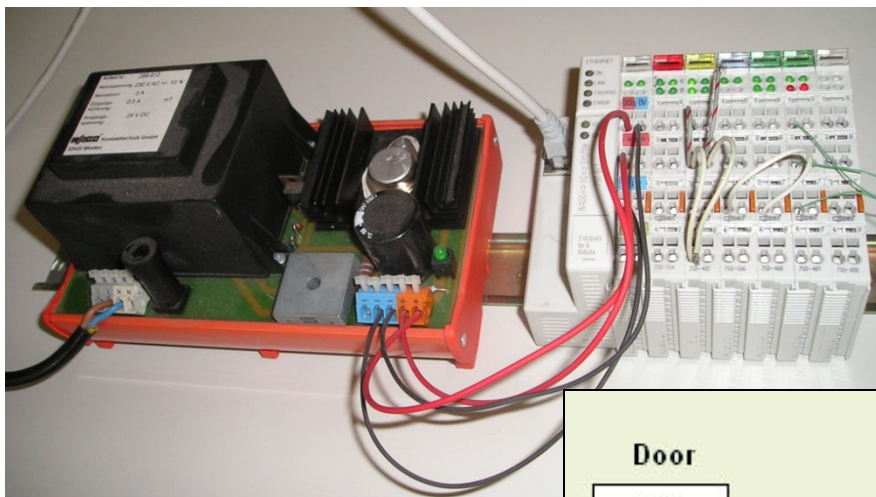
Hardware

- Switch wiring on racks
 - Fans connected in series
 - Door connectivity
- 3 options:
 - ELMB
 - WAGO PLC
 - Siemens PLC
- I/O System: WAGO
 - Siemens PLC more expensive
 - Non-critical system
 - Moderately large-scale execution



Initial Proof of Concept

- Small-scale proof of concept
- Use available PFC



Unit Monitor (System1 - Test; #1)

unit1

Element (4)	Value	Unit
.door_closed	TRUE	
.fan1_on	FALSE	
.fan2_on	TRUE	
.fan3_on	FALSE	

Highlight last value changes
 Change counter Coloring

Close



Larger scale extension

- Software-based
 - Materials lacking
- CTRL scripting
 - Specific to PVSS
 - mass parameterization
- JCOP Framework
 - Developed by CERN IT department
 - Naming conventions/guidelines
 - Software supporting common tasks
 - Standardizes controls development
 - WAGO not explicitly supported by fw

User Interface – Hardware View

Device Creation

PLC IP Address:	<input type="text"/>	* If the 'IP' field is left blank, units will be attributed to the last entered IP address
Counting Room Number:	<input type="text"/>	
Row Letter:	<input type="text"/>	
Number of Units:	From <input type="text"/> To: <input type="text"/>	
<input type="button" value="Create Devices"/>		

JCOP Device Editor/Navigator

Device Editor & Navigator

Running on:

Hardware | Logical | FSM

[-] dcs_rck:

- [-] AnalogDigital
- [-] WAGO
 - [-] WagoPlcCr1_1
 - [-] aliRckDoor_Cr1A01
 - [-] aliRckDoor_Cr1A02

Datapoint Monitoring

dcs_rck:WAGO/WagoPlcCr1_1	
Model	Heartbeat TRUE
Version	Connected TRUE
	PLC Status 0

PLC Unit

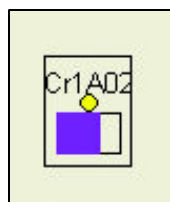
dcs_rck:WAGO/WagoPlcCr1_1/aliRckDoor_Cr1A01	
Fans On	Door Closed
TRUE	TRUE

Door Unit

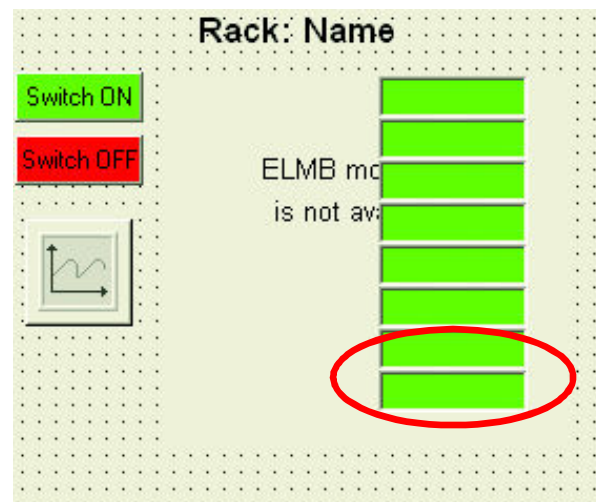
UI – Other Modifications

Revise existing monitoring panels

Zone CR3											
X01	X02	X03	X04	X05	X06	X07	X08	X09	X10	X11	X12
Y12	Y13	Z01	Z02	Z03	Z04	Z05	Z06	Z07	Z08	Z09	Z10

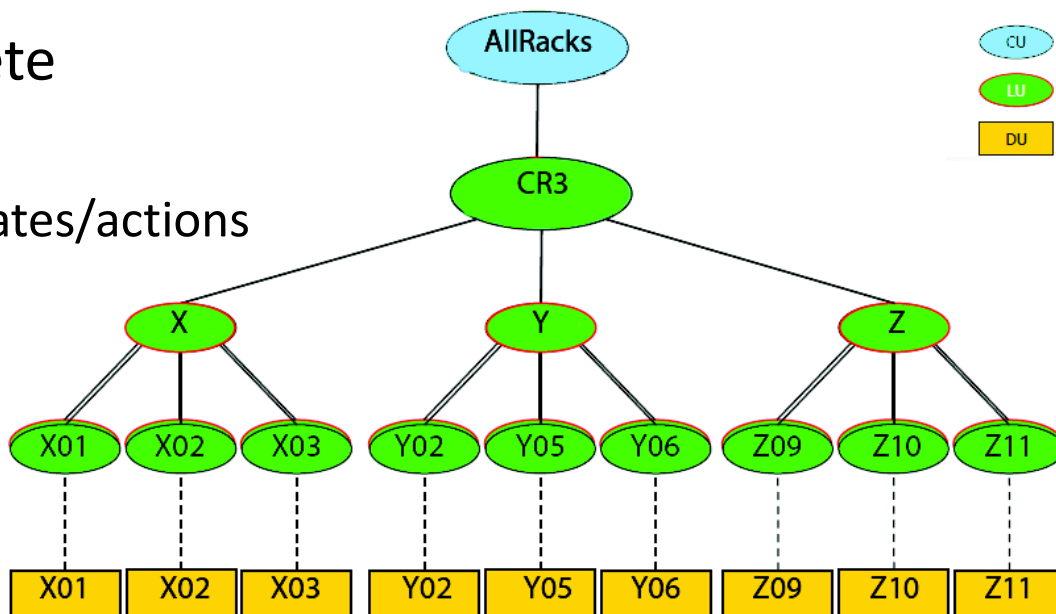


ELMB Monitoring



Device Abstraction

- Logical View
- FSM
 - More intuitive for operators
 - Control/Logical Units, Device Units
 - Hides hardware details
 - Currently incomplete
 - sets up devices
 - Does not define states/actions





Acknowledgements

- André Augustinus
- Marco Boccioli
- UM-REU Program
- ALICE DCS Group
- CERN