

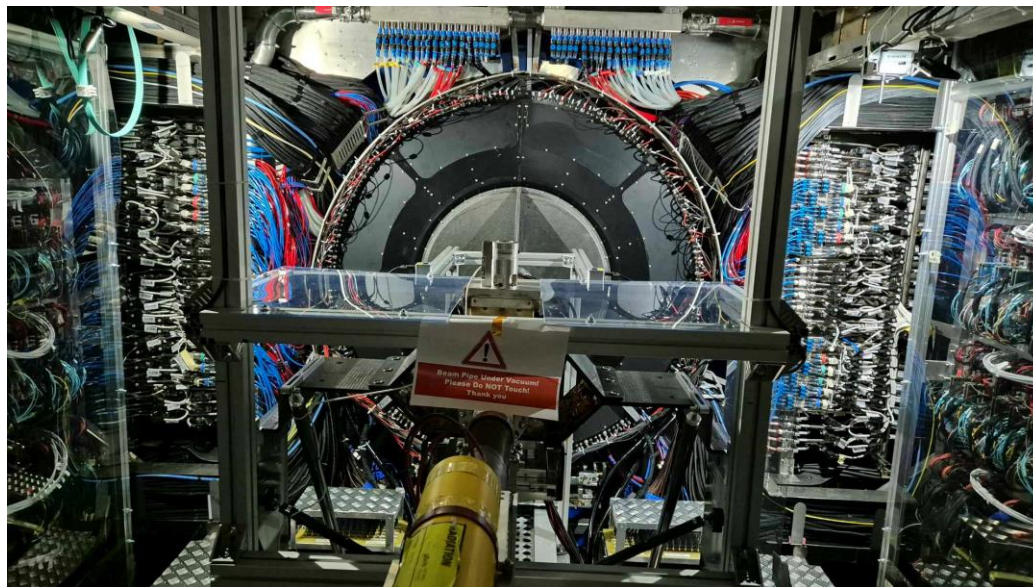


ALICE



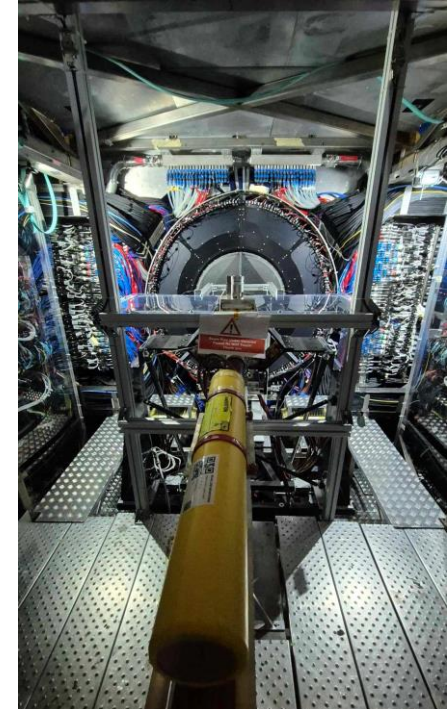
# WinCC SCADA system

Przemysław Kinasz



# Table of Contents

- 01. WinCC SCADA system**  
Transferring the Control Server from a dedicated application to WinCC OA 3.19.
- 02. System structure**  
Structure of the system after modernisation
- 03. DIM preprocessing**  
Method for processing and importing DIMs (Distributed Information Management System) of services and commands
- 04. Communication**  
Establishing a connection between SCADA and FRED (Flexible Framework for Frontend Electronics Control) server.
- 05. WinCC SCADA system**  
Setting up the SCADA (Supervisory Control And Data Acquisition) system.
- 06. On-call training station**  
Implementation in a laboratory setting for creating a training station for On-Call experts.
- 07. Future implementation**  
Future implementation in FIT setup.



# WinCC OA SCADA

and why we are copying a ready-made solution?

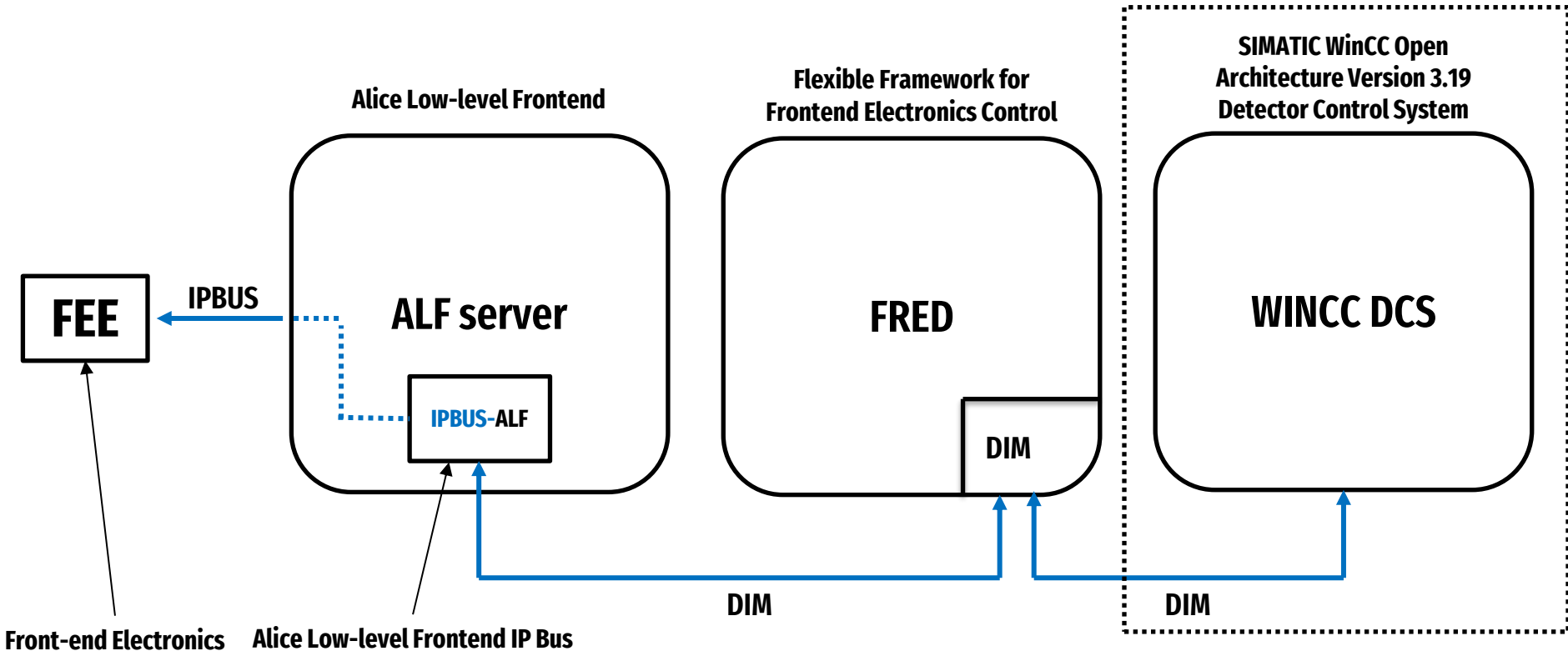
## Old *Control Server*

- **Not compatible with central DCS solutions**
- **Not reconfigurable**
- **Based with all software on localhost**
- **Without technical support from December 2024**

## New WinCC SCADA system

- **Supported by central DCS solutions**
- **Easily reconfigurable**
- **Based on an independent unit**
- **It can be used to create a training station for On-Call**

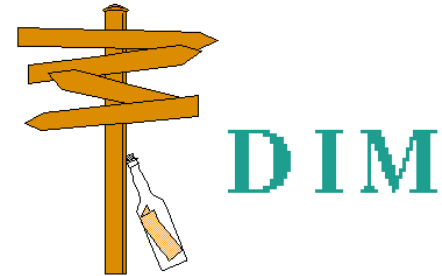
# After modernisation



What is DIM?

DIM-Distributed Information Management System

DIM, is a portable, light weight, package for information publishing, data transfer and inter-process communications. Like most communication systems, is based on the client/server paradigm.



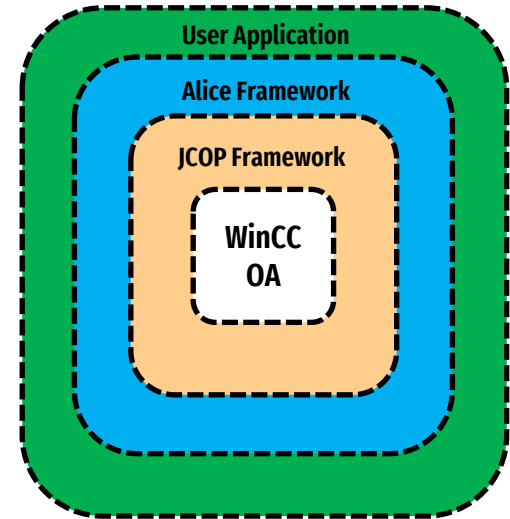
Distributed Information Management System

Source: <https://dim.web.cern.ch/>



## JCOP - Joint Controls Project

- JCOP provides, supports, and maintains a common framework of tools and components
- These tools and components allow for the configuration, monitoring, and operation of various sub-detectors
- The system includes communication mechanisms with Data Acquisition/Trigger systems
- It also interacts with external systems, such as CERN infrastructure services and the LHC
- In our system we use JCOP DIM and FSM (Finite State Machine) extensions.



```
113 // _____ MAIN _____
114 main()
115 {
116
117     fwDim_deleteConfig(CONFIG_NAME);
118     fwDim_createConfig(CONFIG_NAME);
119     string vartype;
120     filetosortarray();
121     int maxx=maxsize(dp);
122     file f;
123     string dummy;
124     int indexJ=1;
125     dyn_string vars;
126     int firstIteration = 1;
127     for(int g=1;g<flong;g++)
128     {
129         dyn_string parts = (devpart[g]);
130         dp = parts[1];
131         value = parts[2].trimmed();
132         string type = parts[3].trimmed();
133         dimtype=parts[4].trimmed();
134         if ((dimtype!="s") && (dimtype!="c")) {
135             errorflag=1;
136             DebugN("ERROR: DIM type error in line: "+g);
137         }
138         if (type=="int") vartype=DPEL_INT;
139         else
140         if (type=="string") vartype=DPEL_STRING;
141         else
142         if (type=="float") vartype=DPEL_DYN_FLOAT;
143         else
144         if (type=="b32") vartype=DPEL_BIT32;
145         else
146         if (type=="char") vartype=DPEL_CHAR;
147         else {
148             errorflag=1;
149             DebugN("ERROR: DIM type error in line: "+g);
150         }
151
152         parts[1]=parts[1].trimmed();
153         dyn_string dpparts = strsplit(parts[1], "/");
154
155         int tabsize=dynlen(dpparts);
156
157         string gen;
158         int cont=1;
159         int indexJp;
160         if(firstIteration==1){
```

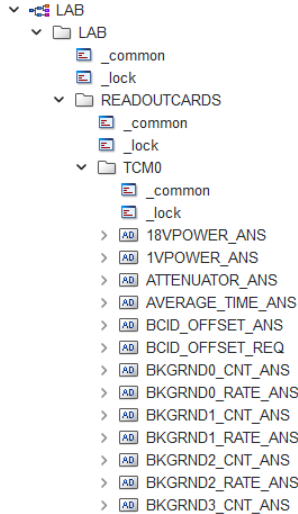
- Downloading DIM service and command data from a file or database
- Creation of DPs (Data Points)
- Creation of the configuration
- Linking DIM services and commands to DP
- Subscribing to a DNS server
- Error checking

# DIM preprocessing script

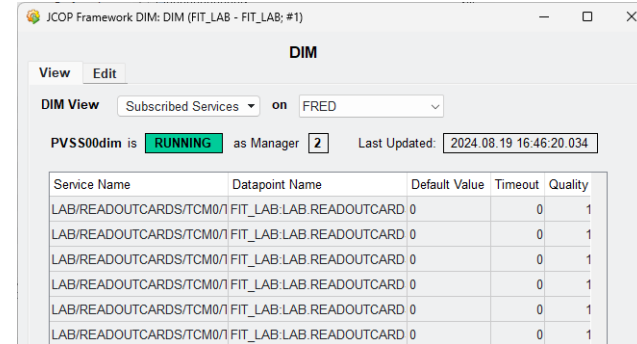
```
LAB/READOUTCARDS/TCM0/BCID_OFFSET_ANS;0;string;s
LAB/READOUTCARDS/TCM0/BCID_OFFSET_REQ;0;string;c
LAB/READOUTCARDS/TCM0/DATA_SEL_TRG_MASK_ANS;0;string;s
LAB/READOUTCARDS/TCM0/DATA_SEL_TRG_MASK_REQ;0;string;c
LAB/READOUTCARDS/TCM0/DG_TRG_RESPOND_MASK_ANS;0;string;s
LAB/READOUTCARDS/TCM0/DG_TRG_RESPOND_MASK_REQ;0;string;c
LAB/READOUTCARDS/TCM0/DG_BUNCH_PATTERN_ANS;0;string;s
LAB/READOUTCARDS/TCM0/DG_BUNCH_PATTERN_REQ;0;string;c
LAB/READOUTCARDS/TCM0/TG_PATTERN_1_ANS;0;string;s
LAB/READOUTCARDS/TCM0/TG_PATTERN_1_REQ;0;string;c
LAB/READOUTCARDS/TCM0/TG_PATTERN_0_ANS;0;string;s
```

DIM name; default value; DIM type; Service/Command

**Input text file/database**



**Generated WinCC  
Para DP structure**

JCOF Framework DIM: DIM (FIT\_LAB - FIT\_LAB; #1)

View Edit

DIM View Subscribed Services on FRED

PVSS00dim is **RUNNING** as Manager 2 Last Updated: 2024.08.19 16:46:20.034

Service Name	Datapoint Name	Default Value	Timeout	Quality
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1
LAB/READOUTCARDS/TCM0/1/FIT_LAB.LAB.READOUTCARD	0	0	1	1

**Automatic subscription to  
DIM services and commands**





# New WinCC SCADA system



The screenshot displays the WinCC SCADA system interface with several key sections:

- Board selection:** A grid of boards labeled A0 through C9. Board A0 is highlighted with a green border and labeled "FRED DIM STATUS" and "CONNECTED".
- System status:** A panel showing system health, including "Is restarting", "Restart" button, "system" status, "Errors presented", and "clear" button.
- Board status (TCM):** A panel showing TCM (Temperature Control Module) status for the selected board, including "Board temp.", "FPGA temp.", "Board type", "Serial number", "MCU FW vers.", and "FPGA FW vers.".
- GBT readout:** A panel showing GBT (Global Back Trigger) readout status, including "Reset", "FSM reset", "unlock", "HB respons", "GBT", "bypass", "normal", and "HBR reject".
- BCID shift & RDH:** A panel showing BCID shift and RDH (Readout Data Header) status, including "1 OK", "RDH", "System ID", "FEE ID", "Data select trig mask", and "Reset" button.
- Triggers:** A table showing trigger settings for Central, Semi, Vertex, ORC, and ORA, including On/Off, Mode, Signature, Random rate, A-side level, C-side level, and Rate.
- Background counters:** A table showing background counter rates for Noise A, True ORA, Beam-gas A, Beam-gas C, True ORC, and True Vertex.
- Laser system:** A panel showing laser system status, including "Laser enabled", "on Cal trigger", "Pattern", "BCs in", "BCs at frequency", "Suppress trig. for", and "ERROR" and "BUSY" indicators.
- Trigger panel:** A row of 12 buttons labeled 0 through 11, representing different trigger phases.
- Statistics:** A panel showing statistics for the selected board, including "FIFO max", "Drop count", "BC indicators", "Converter", "Detector", "GBT words", and "Events".
- Data generator:** A panel showing data generator status, including "Data generator", "Trig respond mask", "Reset start", "Pattern", "Start BC", "Rate", "Mode", "idle", "HBR rate", "FIFO max", "Drop count", "BC indicators", "Converter", "Detector", "GBT words", and "Events".
- Board status (TCM) (right):** A panel showing board status (TCM) status, including "Phase aligner CPLL lock", "Rx wordclk ready", "Rx frameclk ready", "MGT link ready", "Tx reset done", "Tx FSM reset done", "GBT Rx ready", "GBT Rx error", "RX phase", "Board readout mode", "CRU readout mode", "BCID sync state", "CRU orbit", "FIFOs empty", "not empty on run start", "TCM data FIFO full", "trig FIFO was full", "slit ready on read", "BC sync lock", "FSM error code".

- DIM status →
- TCM status →
- Switches →
- Trigger settings →
- Background counters →
- Laser system →
- Trigger panel →
- Laser phase →

- Board status (TCM) ←
- Status bits ←
- RX phase ←
- Board status (TCM) ←

Statistics  
Trigger generator

# New WinCC SCADA system

PM options

PM TRG control

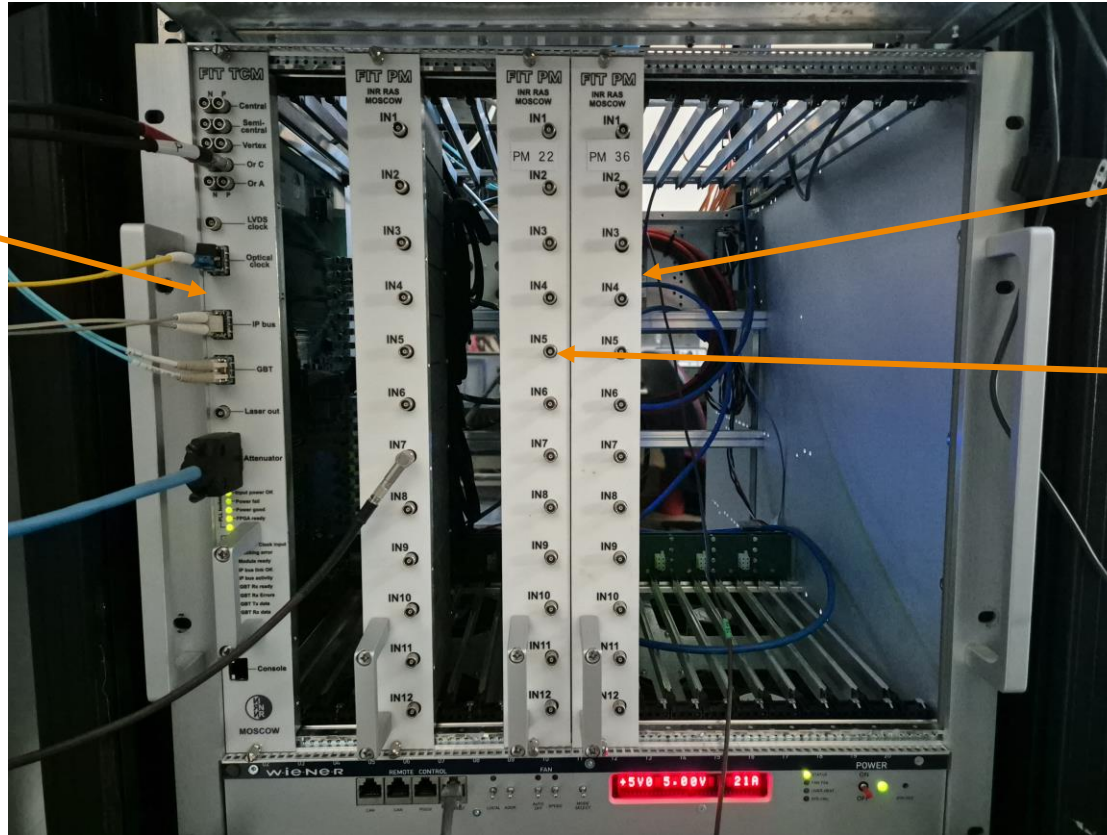
Clock sync

Trigger generator

TRG sync

# Progress of work

## FIT electronics



TCM module  
↓  
Trigger and  
Clock Module

PM module

PM channel

↓  
Processing  
Module

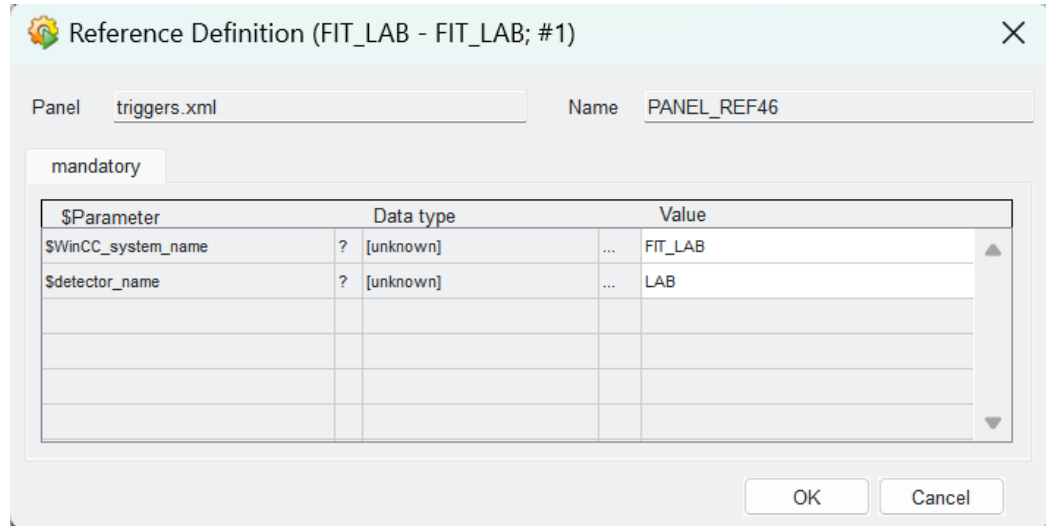
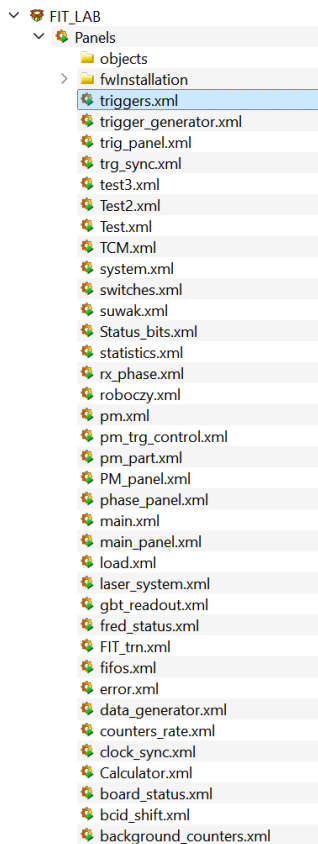
# Progress of work

## Laboratory station



← **Laboratory simulator  
of the FIT detectors**

# New WinCC SCADA system



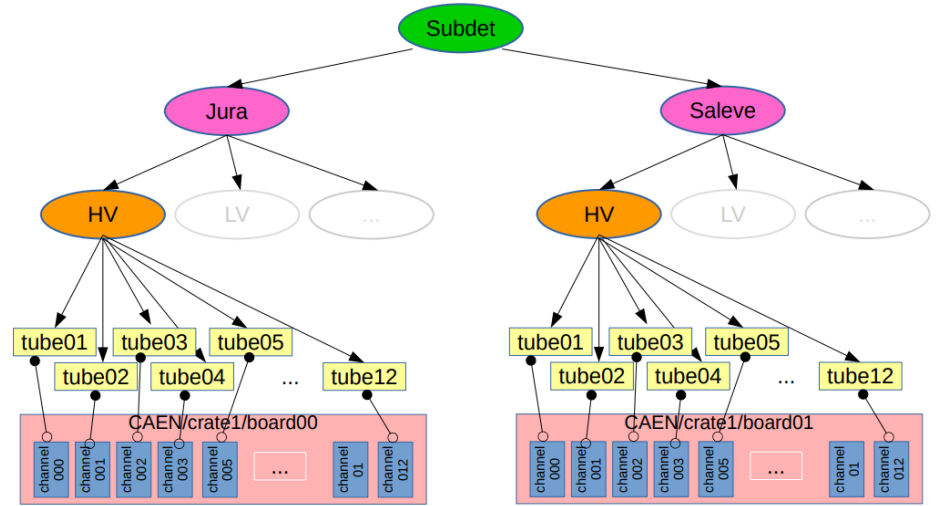
Parameterisation of panels

arguments:



We are currently working on:

- completing the PM part
- implementing the FSM (Finite State Machine)



© CERN

WinCC-OA & JCOP-Framework Course

2024

49

Source: <https://edms.cern.ch/ui/file/1029856/latest/part4Slides.pdf>

- Launch of the training station for On-Call Experts
- Future implementation to the new FIT detector control solution



Source: <https://home.cern/news/news/experiments/alice-opens-its-new-nerve-centre>





ALICE



# Thank you!



**Przemysław Kinasz**



[przemyslaw.kinasz@cern.ch](mailto:przemyslaw.kinasz@cern.ch)



Faculty of Electrical Engineering,  
Warsaw University of Technology



**Krystian Roslon, M.Sc.**



[krystian.roslon@cern.ch](mailto:krystian.roslon@cern.ch)



Faculty of Physics,  
Warsaw University of Technology

