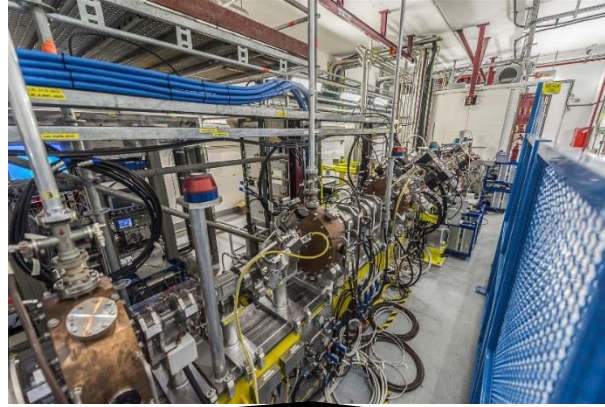


Breaking the wall between operational and expert tools

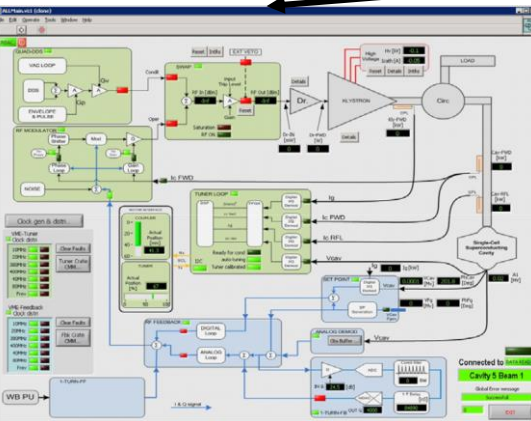


Delphine Jacquet

Many thanks to A.Butterworth, K.Furchsberger, J.C Garnier, S.Jackson, G.Kruk, N.Magnin and R.Thomas Garcia for their input.

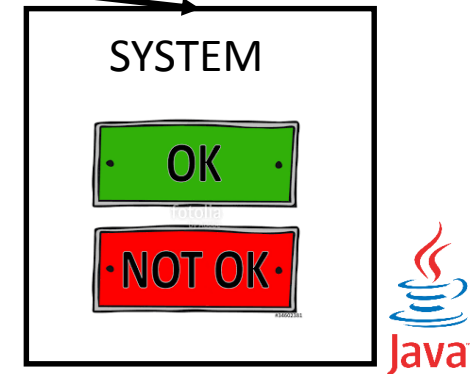


Expert application



- Developed by equipment group in any language
- provides all the details of the system

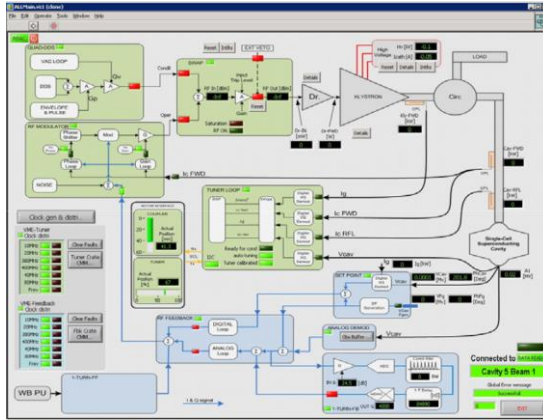
Operational application



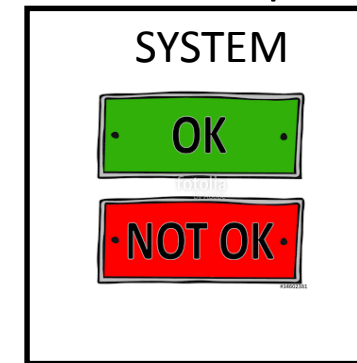
- Developed mainly by OP, in JAVA
- gives the state of the system at one glance



Expert application



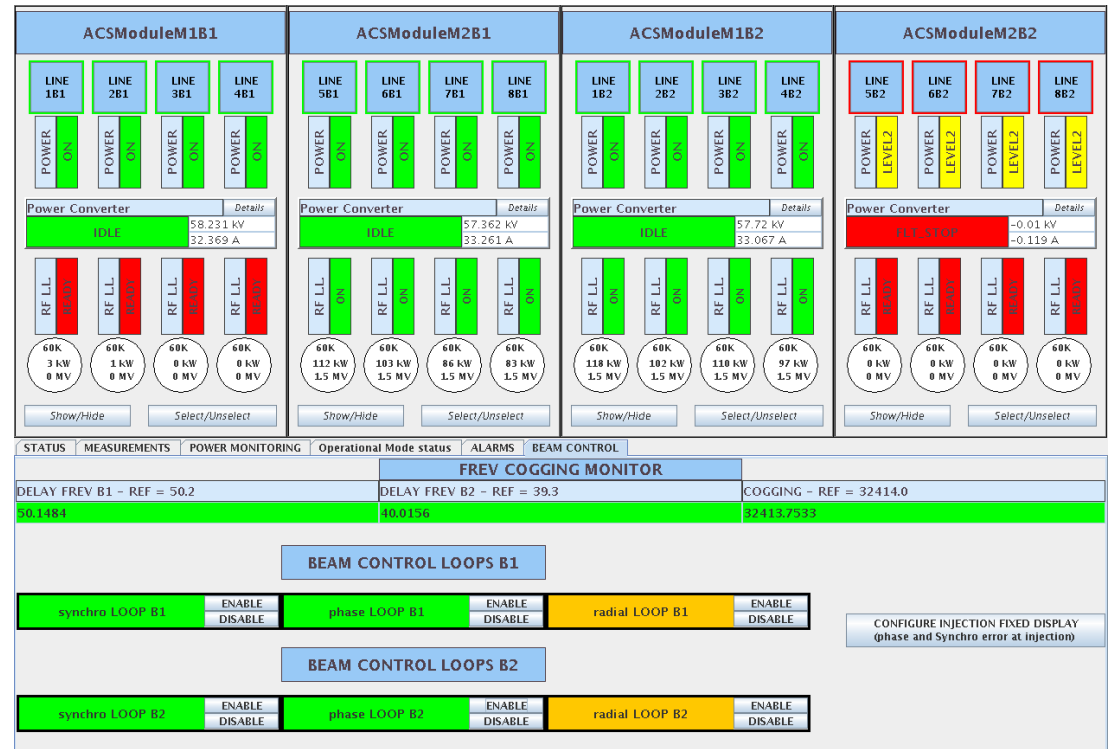
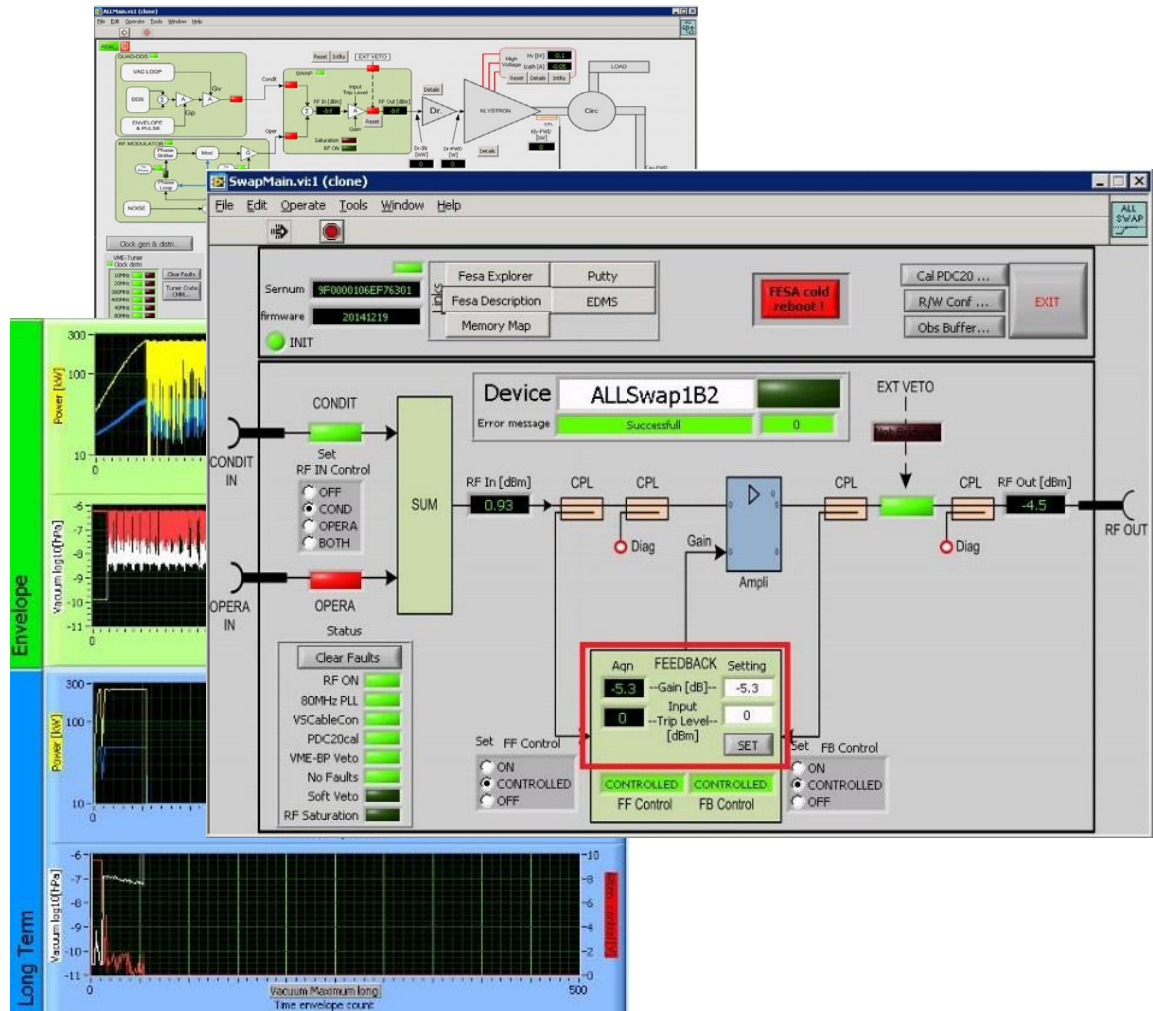
Operational application



- Application independent
- Each perfectly fit the requirements of experts and OP



- 2 applications to be developed and maintained
- Code duplication
- Operational application has to follow the equipment API modification (not always well communicated)



RF expert / Operational application

TSU Viewer
View Help
RBA: lhcop LIVE XPOC

LBDS - TSU - LIVE

BEAM 1

TSU A

FESA Status: OK FESA mode: ON

Errors details Card Info

Acquisition: 10.12.2016-16:46:45.595101750

State: NOT READY Control: LOCAL

BRF Detected: OK PLC Arming: OK

PLL Locked: OK Client Dump Reqst.: OK

Sync Dump Enabled: OK Sync Dump Reqst.: OK

Sync Dump Done: OK Async Dump Done: OK

PLL Frequency: 11.245487 kHz PLL Period: 88.925 us

DUMP Trig.Delay: 36.000 us BAGK Trig.Delay: 0.430 us

FPGA Status: OK Details

Client	CPLD1	CPLD2
All clients	REQ	REQ
BIS Freq.	9.375	9.375
BIS fast	REQ	REQ
BIS slow	REQ	REQ
BEC fast	REQ	REQ
BEC slow	REQ	REQ
BLMDD	OK	OK
Inject&Dump	OK	OK
SCSS	REQ	REQ
Internal	OK	OK

PLL Expert Details

TSU B

FESA Status: OK FESA mode: ON

Errors details Card Info

Acquisition: 10.12.2016-16:46:45.126625525

State: NOT READY Control: LOCAL

BRF Detected: OK PLC Arming: OK

PLL Locked: OK Client Dump Reqst.: OK

Sync Dump Enabled: OK Sync Dump Reqst.: OK

Sync Dump Done: OK Async Dump Done: OK

PLL Frequency: 11.245510 kHz PLL Period: 88.924 us

DUMP Trig.Delay: 36.000 us BAGK Trig.Delay: 0.430 us

FPGA Status: OK Details

Client	CPLD1	CPLD2
All clients	REQ	REQ
BIS Freq.	8.375	8.375
BIS fast	REQ	REQ
BIS slow	REQ	REQ
BEC fast	REQ	REQ
BEC slow	REQ	REQ
BLMDD	OK	OK
Inject&Dump	OK	OK
SCSS	REQ	REQ
Internal	OK	OK

PLL Expert Details

BEAM 2

TSU A

FESA Status: OK FESA mode: ON

Errors details Card Info

Acquisition: 10.12.2016-16:46:45.162482775

State: NOT READY Control: LOCAL

BRF Detected: OK PLC Arming: OK

PLL Locked: OK Client Dump Reqst.: OK

Sync Dump Enabled: OK Sync Dump Reqst.: OK

Sync Dump Done: OK Async Dump Done: OK

PLL Frequency: 11.245510 kHz PLL Period: 88.924 us

DUMP Trig.Delay: 70.280 us BAGK Trig.Delay: 0.200 us

FPGA Status: OK Details

Client	CPLD1	CPLD2
All clients	REQ	REQ
BIS Freq.	9.375	9.375
BIS fast	REQ	REQ
BIS slow	REQ	REQ
BEC fast	REQ	REQ
BEC slow	REQ	REQ
BLMDD	OK	OK
Inject&Dump	OK	OK
SCSS	REQ	REQ
Internal	OK	OK

PLL Expert Details

TSU B

FESA Status: OK FESA mode: ON

Errors details Card Info

Acquisition: 10.12.2016-16:46:45.568839625

State: NOT READY Control: LOCAL

BRF Detected: OK PLC Arming: OK

PLL Locked: OK Client Dump Reqst.: OK

Sync Dump Enabled: OK Sync Dump Reqst.: OK

Sync Dump Done: OK Async Dump Done: OK

PLL Frequency: 11.245487 kHz PLL Period: 88.925 us

DUMP Trig.Delay: 70.280 us BAGK Trig.Delay: 0.200 us

FPGA Status: OK Details

Client	CPLD1	CPLD2
All clients	REQ	REQ
BIS Freq.	8.375	8.375
BIS fast	REQ	REQ
BIS slow	REQ	REQ
BEC fast	REQ	REQ
BEC slow	REQ	REQ
BLMDD	OK	OK
Inject&Dump	OK	OK
SCSS	REQ	REQ
Internal	OK	OK

PLL Expert Details

LHC LBDS Monitoring v0.0.47 2014
RBA: lhcop

Kicker Status & Control MKB & MKD Status Inject & Dump

Status

	Beam 1	Beam 2
Status:	ok	ok
Mode:	on	on
Control:	remote	remote
Energy/GeV:	449.87	449.87

Ready Status

	Beam 1	Beam 2
BETS:	NO	YES
IPOC:	NO	YES
LASS:	YES	YES
Kicker:	NO	YES
Retrigger:	YES	YES
TSU:	NO	YES
LBDS:	NO	YES

Acquisition Control

Arm Control

Acknowledge Kicker B1 Set MKD B1

Acknowledge Kicker B2 Set MKD B2

Beam Dump Kicker - Status Control

ON Set MKD B1

ON Set MKD B2

BETS

	Beam 1	Beam 2
Mode:	DUMP INHIBITED	OPERATIONAL
Arm permitted:	YES	YES

Energy (HX.ENG) **449 GeV**

Console Running tasks

```

09:00:47 - Validating existing token...
09:00:47 - Token is still valid (lifetime > 1 hour)
09:05:47 - Validating existing token...
09:05:47 - Token is still valid (lifetime > 1 hour)
09:10:47 - Validating existing token...
09:10:47 - Token is still valid (lifetime > 1 hour)
09:15:47 - Validating existing token...
09:15:47 - Token is still valid (lifetime > 1 hour)
09:20:47 - Validating existing token...
09:20:47 - Token is still valid (lifetime > 1 hour)
  
```

06:54:58 - Ready.

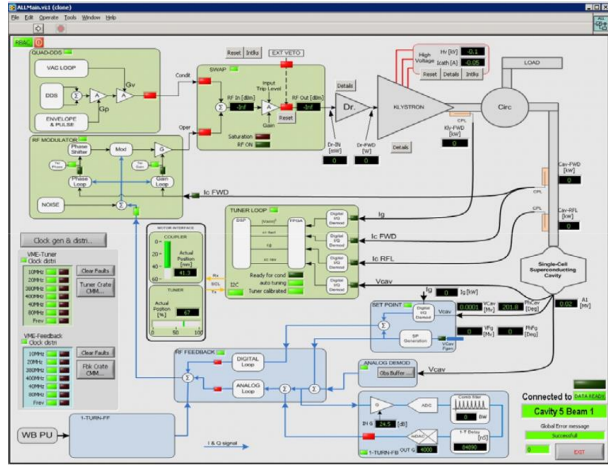
TSU viewer for expert/ LBDS monitoring

7th Evian workshop 13-15 December 2016 - Controls and tools

5

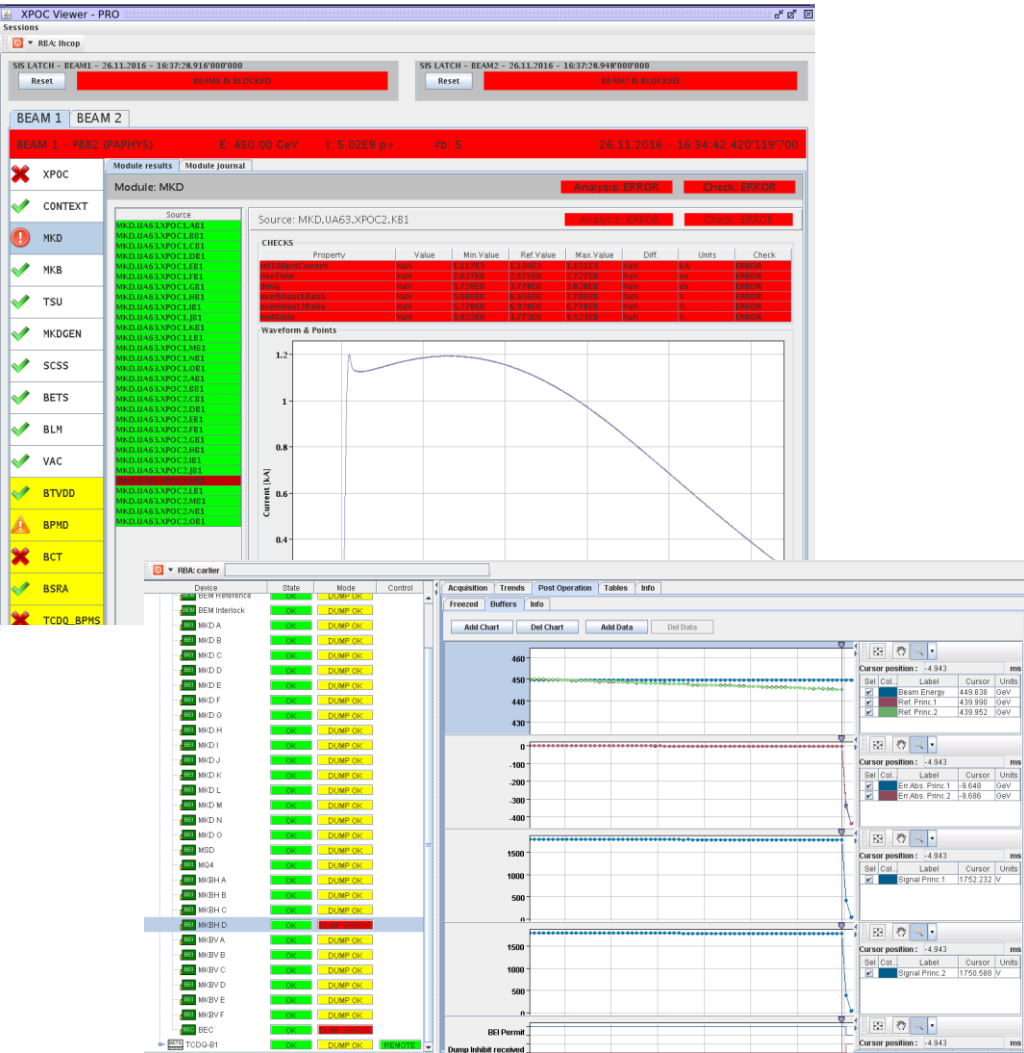


Expert application used in operation as well



- No **manpower** to develop a separated operational application
- Some expert tools prove to be **useful for OP**, i.e. for diagnostic
- Expert actions or measurements are **delegated to OP**

XPOC viewer application



BETS explorer



- Only one application to maintain
- Control of authorized actions thanks to RBAC



Designed for experts

- Difficult to understand for non expert (i.e. find the right devices) : leads to mistakes
- No training provided to use the application, OP get easily lost
- Tendency to try every buttons...

QPS expert tools

BPM Phase-In

File Testing RBA: Incop

Quick Check All Automatic Phase-In All Restore ALL FEC settings ...

Start Checking Reachability Point 1 Start Quick Check Procedure Point 1 **DOING Automatic Phase-In Point 1** Restore FEC settings Point 1...

Host	cfv-sr1	bpmb11a	cfv-sr1	bpmb11b	cfv-sr1	bpmb21a	cfv-sr1	bpmb21b	cfv-sr1	bpmb11a	cfv-sr1	bpmb11b	cfv-sr1	bpmb21a	cfv-sr1	bpmb21b
FESA Serv...	LHC BPM	SRI E11A	LHC BPM	SRI E11B	LHC BPM	SRI E21A	LHC BPM	SRI E21B	LHC BPM	SRI E11A	LHC BPM	SRI E11B	LHC BPM	SRI E21A	LHC BPM	SRI E21B
Bobr	ROBR_cfv	bpmb11a	ROBR_cfv	bpmb11b	ROBR_cfv	bpmb21a	ROBR_cfv	bpmb21b	ROBR_cfv	bpmb11a	ROBR_cfv	bpmb11b	ROBR_cfv	bpmb21a	ROBR_cfv	bpmb21b
Channel	Hor	Ver	Hor	Ver	Hor	Ver	Hor	Ver	Hor	Ver	Hor	Ver	Hor	Ver	Hor	Ver
#1	1832	1832	1829	1830	2602	2603	2603	2603	1836	1838	1838	1836	2597	2597	2593	2593
#2	1825	1825	1867	1867	2606	2605	2672	2672	1840	1840	1907	1907	2589	2589	2631	2631
#3	1861	1861	1855	1854	2671	2671	2671	2671	1906	1906	1906	1906	2624	2624	2617	2617
#4	1845	1845	1840	1840	2671	2670	2677	2676	1905	1905	1909	1909	2608	2608	2604	2604
#5	1837	1837	1848	1848	2684	2684	2706	2706	1917	1917	1942	1942	2601	2601	2616	2616
#6	1842	1842	1855	1855	2710	2710	2738	2737	1944	1944	1972	1972	2606	2606	2621	2621
#7	1850	1850	1853	1853	2746	2746	2764	2764	1979	1979	1998	1998	2614	2613	2617	2617
#8	1856	1856	1860	1860	2781	2781	2799	2799	2015	2015	2033	2033	2621	2621	2624	2624
#9	1863	1863	1866	1866	2817	2817	2835	2835	2050	2050	2068	2068	2627	2627	2631	2630
#10	1870	1870	1873	1873	2852	2852	2870	2870	2086	2086	2104	2104	2634	2634	2638	2638
#11	1877	1877	1880	1880	2888	2887	2905	2905	2121	2121	2139	2139	2641	2641	2644	2644
#12	1884	1884	1887	1887	2923	2923	2941	2941	2157	2156	2174	2174	2648	2648	2651	2651
#13	1890	1890	1894	1894	2956	2958	2976	2976	2192	2192	2210	2209	2655	2655	2658	2658
#14	1897	1897	1900	1900	2994	2994	3011	3011	2227	2227	2245	2245	2661	2661	2665	2665
#15	1904	1904	1907	1907	3029	3029	3047	3047	2262	2262	2280	2280	2668	2667	2672	2672
#16	1910	1911	1914	1914	3064	3064	3082	3082	2298	2298	2316	2315	2675	2675	2678	2678
#17	1918	1917	1920	1920	3100	3099	3117	3116	2333	2333	2351	2351	2681	2681	2685	2685
#18					2670	2670	2367	2368	1905	1905	2687	2687				

Save to LSA database... Results from: 2016/04/28 - 19:44:40

Point 1 Point 2 Point 3 Point 4 Point 5 Point 6 Point 7 Point 8

B1: 513 - B2: 513 - errors: 48 / 2168 Save ALL to LSA databas...

FESA SERVER STATUS: ■ Server OK ■ Server Error ■ Access not granted ■ Restore OK ■ Restore Error

PHASE-IN RESULTS: ■ Success ■ Bunch delay error ■ Problem found ■ No bunch found ■ No result

Version: 201604151742

BPM phase-In application



To much details:

- confusing and can lead to a wrong diagnostic.
- Information useful for OP is lost



Direct access to the devices :

- Multiplication of clients not always managed properly
- Parameters not in LSA, no settings managements tools like trim history

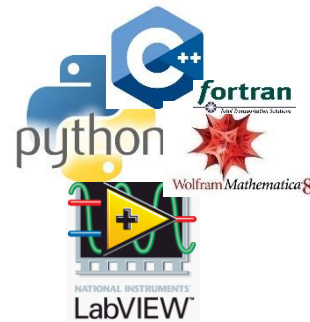
Can we do better?

We all have the same problems!!

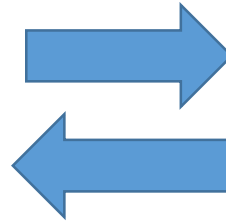


Stay flexible, independent and use the a language best adapted to the need

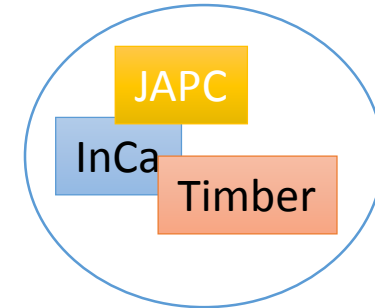
But not isolated from the control system



Easy access to the control system



Use expert libraries in operational code



Lots of turn-over
code developed by persons leaving
the group



needs to be taken over

Maintenance and evolution of the applications



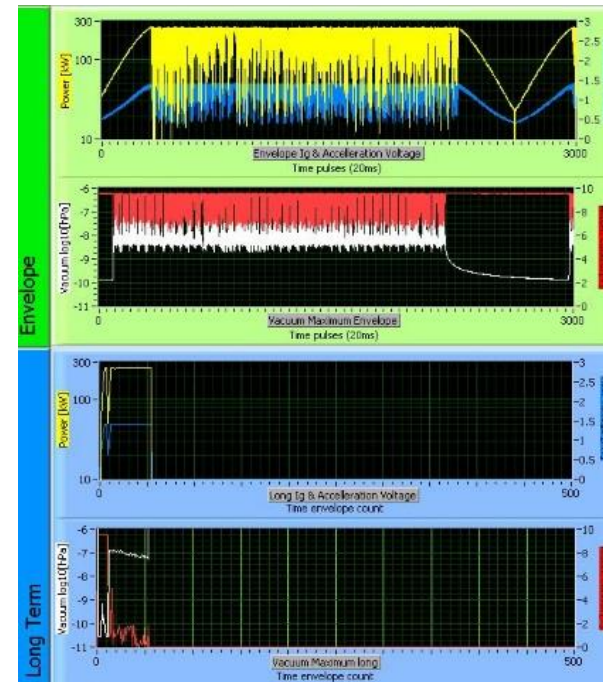
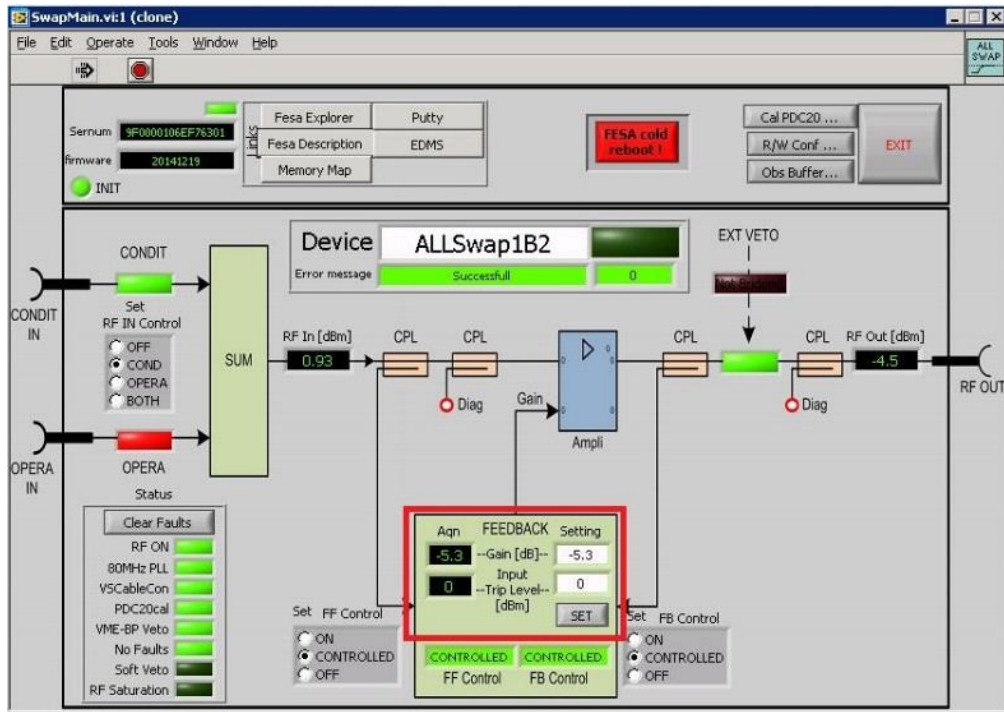
- adaptation to new hardware
- adaptation to a fast evolving control system



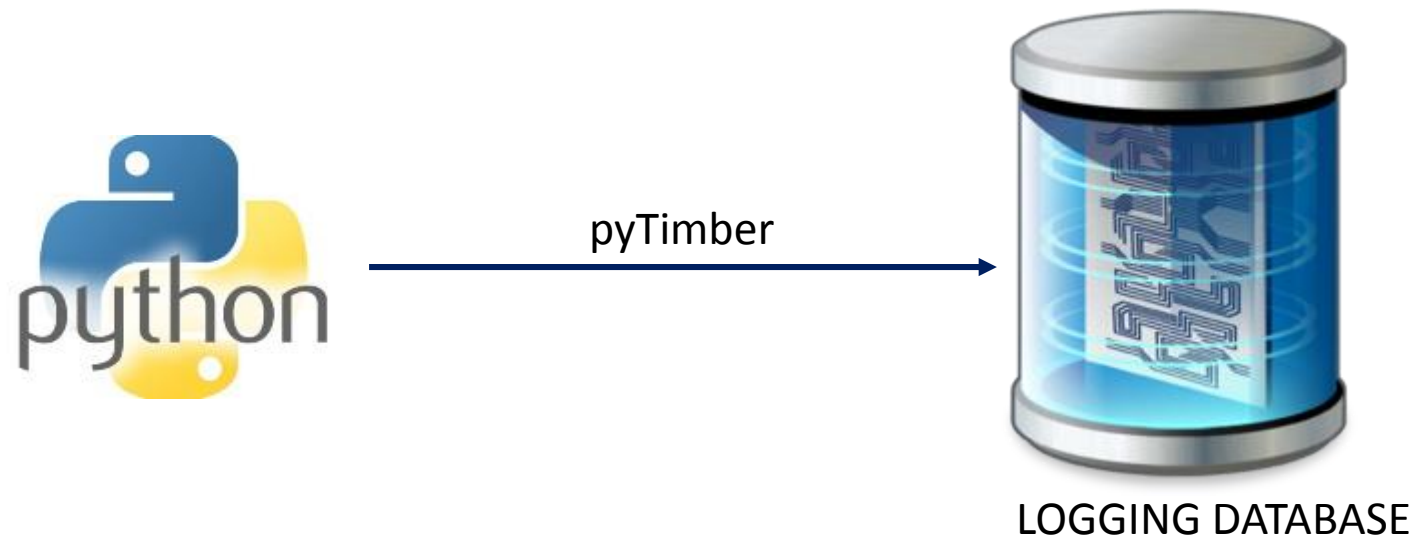
But not all the same solutions...



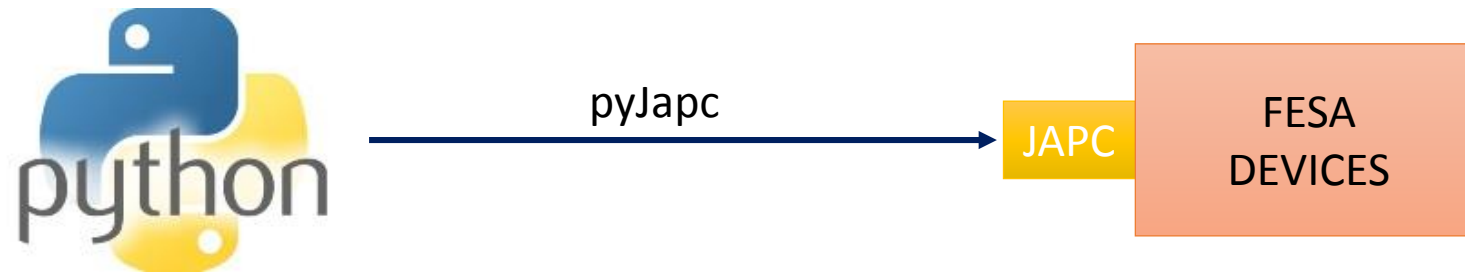
LabVIEW for RF expert -> easier for graphical interface



ABP people have developed the pyTimber library to access the logging database from python



BI people have developed the pyJapc library to access FESA devices via JAPC from python





Limitations of these individual initiatives

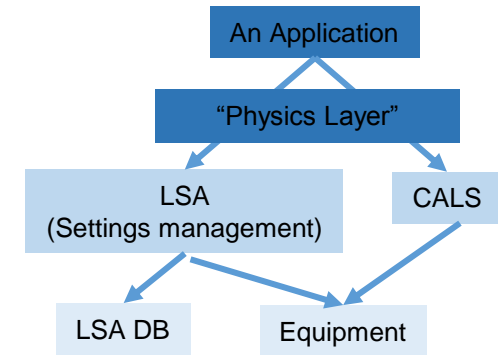
- Solutions not scaled or adapted to be **use intensively**
- Developers did not foresee to **maintain and evolve** their libraries for everybody's needs
- How to make sure these products are **sustainable?**
- Eventually somebody has to take it over for **long term support...**(CO??)

What is needed are common solutions for

➤ **GUI framework** that would facilitate the creation of user interfaces

➤ **High level software layers**

i.e. library for automatic scans from CO !

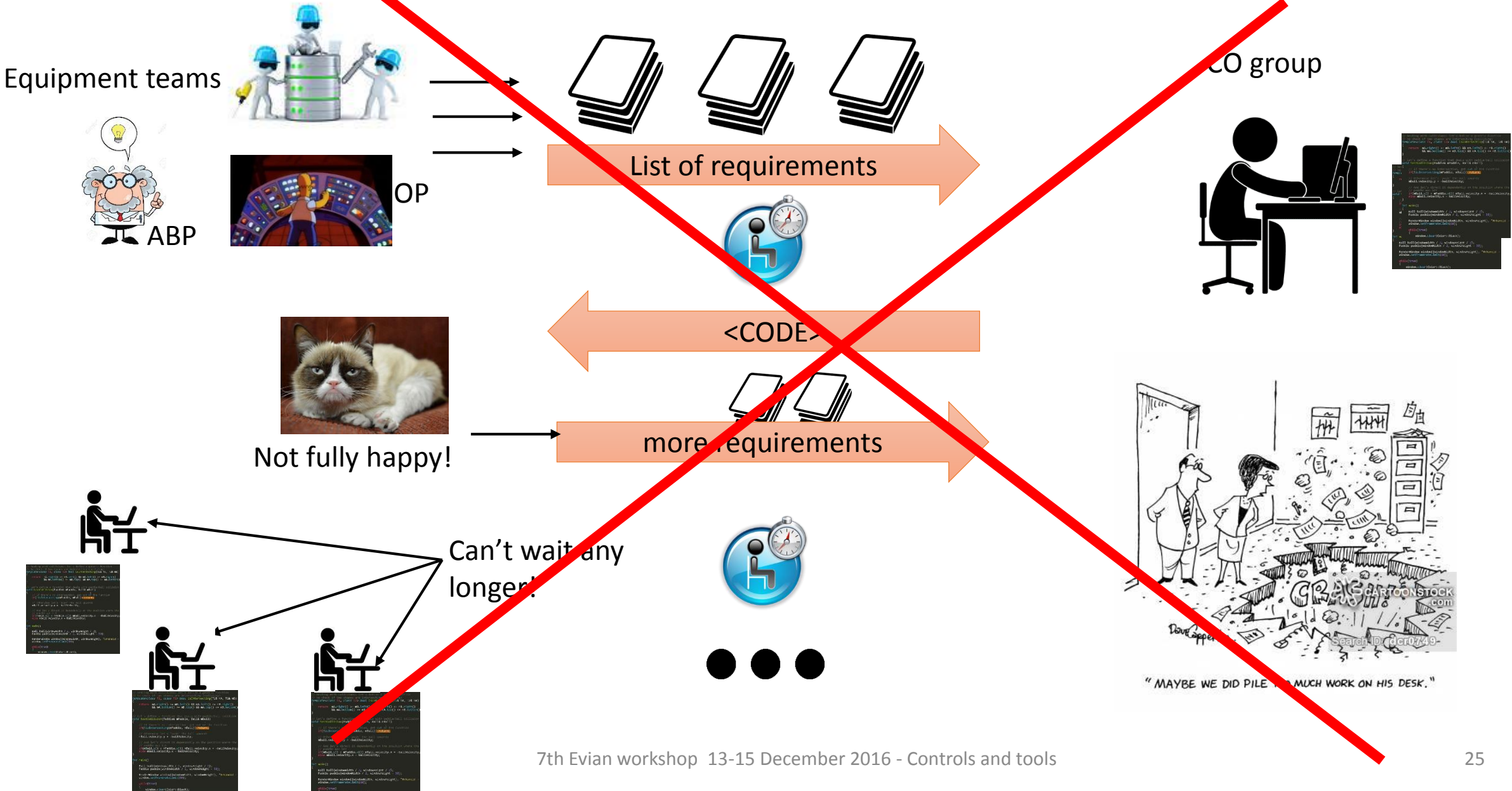


Kajetan Fuchsberger- Evian 2015

➤ Consolidate the **interfaces** between the control system and other languages

HOW?

Simple : ask CO!



Better: collaborate!



- Work together to develop **tools and frameworks** needed by everyone
- Identify **common requirements** and create project's teams
- **Free contribution** to improve and evolve the software (including frameworks) anytime
- Create a forum, a **place of exchange** for all the developers

For team work to be possible, we need to agree on **common principles and practices**, i.e.

- software structure
- software tools
- testing, reviews

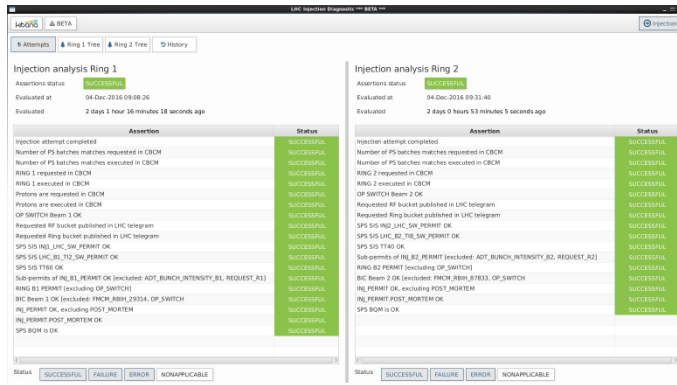




The benefits

- Products should fit better the **need of every groups**
- **Re-usable** code instead of code duplication
- **Dynamic** evolution of the software
- A central place to get **help, advice and information** for new development
- **Sharing** of experience and expertise

Example of successful collaboration



Filling diagnostic



	INPUT	DISABLED	SAFE BEAM ...	MATRIX	PERMIT A	PERMIT B
Software Permit	TRUE			TRUE	TRUE	TRUE
1/A Vacuum L551 + TT10	TRUE	NO		TRUE		
2/A MKD	TRUE	NO		TRUE		
2/B Q KICKER	TRUE	NO		TRUE		
3/A	TRUE	NO		TRUE		
3/B	TRUE	NO		TRUE		
4/A WIC	TRUE	NO		TRUE		
4/B	TRUE	NO		TRUE		
5/A	FALSE	YES		TRUE		
5/B	FALSE	YES		TRUE		
6/A	FALSE	YES		TRUE		
6/B	FALSE	YES		TRUE		
7/A	FALSE	YES		TRUE		
7/B	FALSE	YES		TRUE		
8/A	TRUE	NO	NO	TRUE	TRUE	TRUE
8/B	TRUE	NO	NO	TRUE	TRUE	TRUE
9/A Beam Position	TRUE	NO	NO	TRUE	TRUE	TRUE
9/B	TRUE	NO	NO	TRUE	TRUE	TRUE
10/A	TRUE	NO	NO	TRUE	TRUE	TRUE
10/B	TRUE	NO	NO	TRUE	TRUE	TRUE
11/A	FALSE	YES	NO	TRUE	TRUE	TRUE
11/B	FALSE	YES	NO	TRUE	TRUE	TRUE
12/A	FALSE	YES	NO	TRUE	TRUE	TRUE
12/B	FALSE	YES	NO	TRUE	TRUE	TRUE
13/A	FALSE	YES	NO	TRUE	TRUE	TRUE
13/B	FALSE	YES	NO	TRUE	TRUE	TRUE
14/A	FALSE	YES	NO	TRUE	TRUE	TRUE
14/B	FALSE	YES	NO	TRUE	TRUE	TRUE

New BIS supervision GUI (Kamil Krol)

New analysis framework

Generate streams from any source
(japc, timing telegram, SIS, BIC...)

Define analysis modules using the streams

Conclusions

- **Commons problems** and needs can be identified for OP, CO, ABP and equipment groups
- **Working together** to address them obviously presents big advantages
- If it pays at longer term, collaboration is **difficult and request efforts and commitment**
- So it is important that collaboration is **valued and encouraged by the management**

Henry Ford



Coming together is a
BEGINNING

Keeping together is
PROGRESS

Working together is
SUCCESS