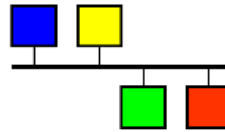


DE LA RECHERCHE À L'INDUSTRIE



# EPICS TOOLS FOR SMALL



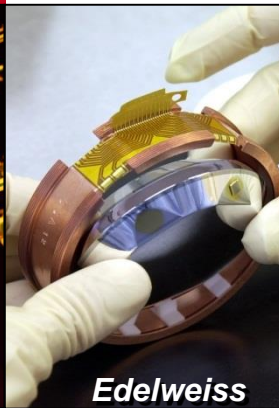
# EXPERIMENT BASED ON PLC



Double Chooz



ALICE



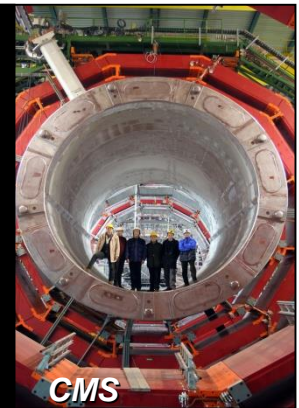
Edelweiss



HESS



Herschel

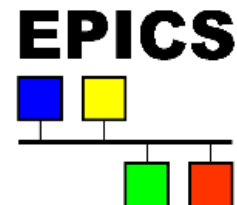
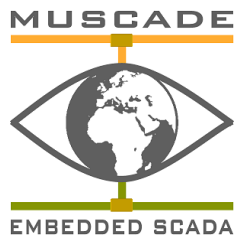


CMS



Katy SAINTIN & Paul LOTRUS

June 2019



## Small Experiments

- In-house projects
- **2 developers**

## Functions :


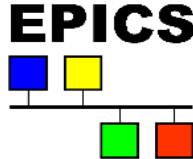






- Windows OS
- SIEMENS PLC Protocol
- Optimized archiving
- Tool to build server
- Tool to build GUI
- Web remote access

## Big facilities :

- International projects
- **EPICS community**

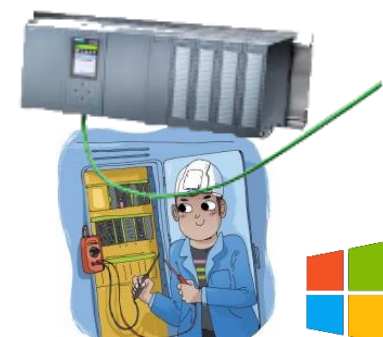
## Functions :

- Linux OS
- Numerous Drivers
- Archiving Appliance
- CSS BOY to build a GUI

- **Plcparsertool**  → 
- **CAFE Java** (Channel Access For EPICS) 
- **DXF2OPI**  → 
- **MOONARCH** (Memory Optimizer On ARCHiver Appliance)
- **EPICS WEB**  
- **DATABROWSER** 

Generate all EPICS files for build an EPICS IOC

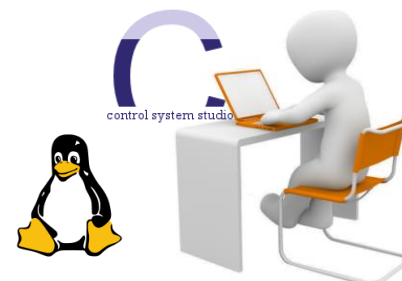
- db file
- include.dbd file
- cmd file for protocol configuration



PLC Programmer

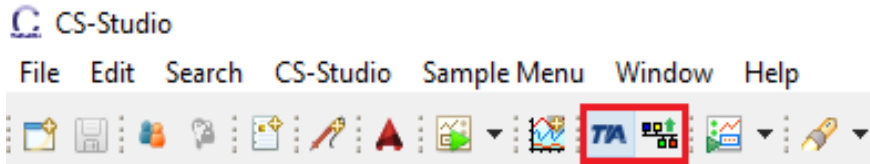


SIEMENS S7

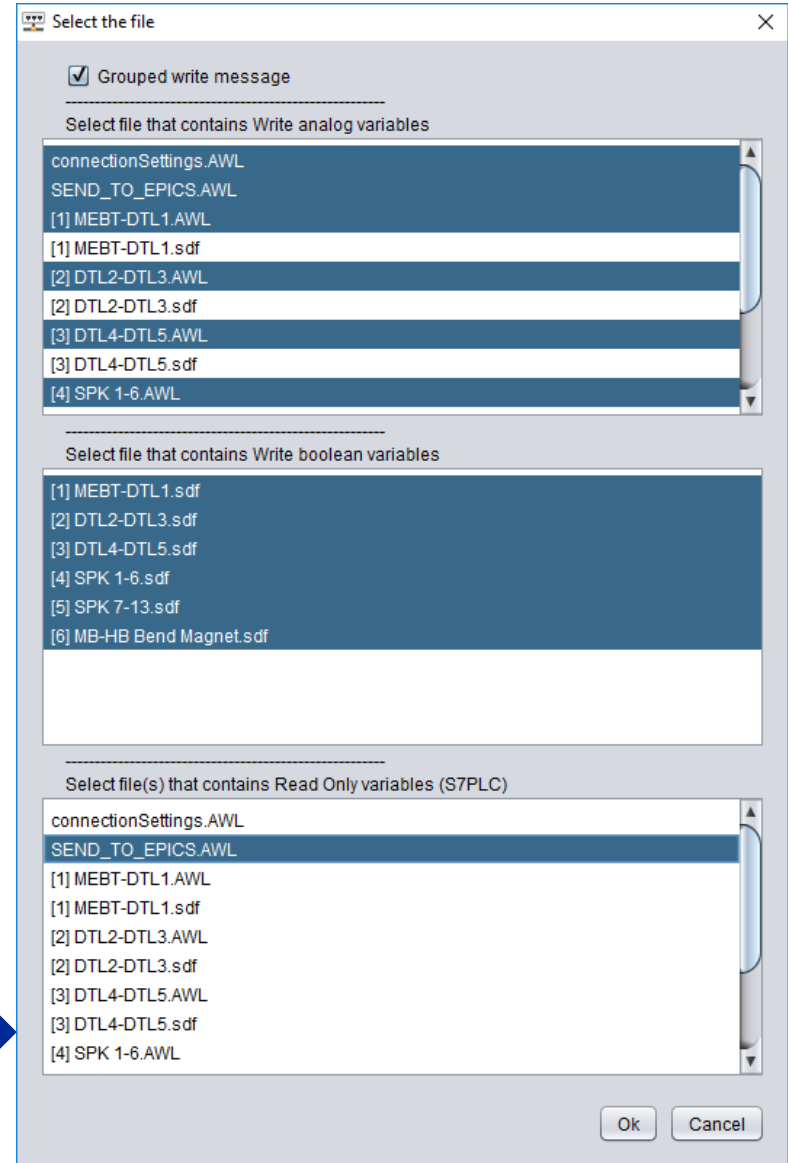
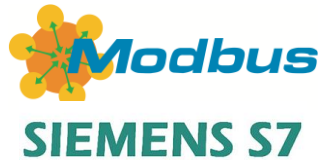
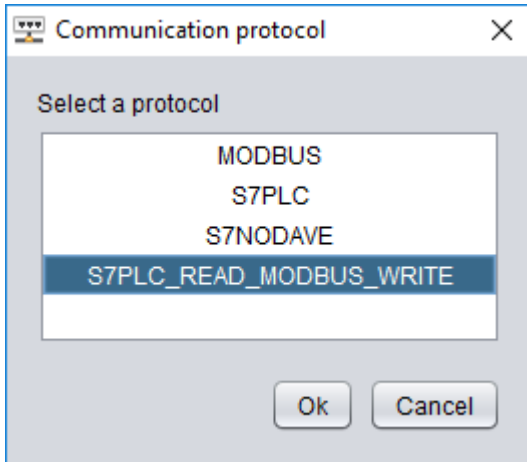
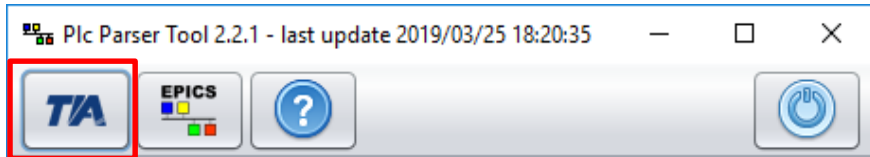


EPICS Programmer

## CSS plugin



## Standalone



Ess\_nblm

Search

Index	Name	Record type	Address	Data type	D_TYP
358	FEB-050Row:PBI-PLC-Line6:HardErrP	hi	@PLC01/29 T=BYTE B-4	BYTE	S7nic
359	Ess_nblm				
360					
361	Search				
362					
Index	Name	Record type	Address	Data type	
363					
364	126 FEB-050Row:PBI-PLC-Line4:ShuntErrTim	ao	@asyn(PLC01505_AS_WRITE_0,44,1)INT16	INT16	
365	34 FEB-050Row:PBI-PLC-Line1:PrsLoErrTrsh	ao	@asyn(PLC01502_AS_WRITE_0,45,1)FLOAT32_BE	FLOAT32_BE	
366	65 FEB-050Row:PBI-PLC-Line2:PrsLoErrTrsh	ao	@asyn(PLC01503_AS_WRITE_0,45,1)FLOAT32_BE	FLOAT32_BE	
367	96 FEB-050Row:PBI-PLC-Line3:PrsLoErrTrsh	ao	@asyn(PLC01504_AS_WRITE_0,45,1)FLOAT32_BE	FLOAT32_BE	
368	127 FEB-050Row:PBI-PLC-Line4:PrsLoErrTrsh	ao	@asyn(PLC01505_AS_WRITE_0,45,1)FLOAT32_BE	FLOAT32_BE	
369	35 FEB-050Row:PBI-PLC-Line1:PrsLoErrTim	ao	@asyn(PLC01502_AS_WRITE_0,47,1)INT16	INT16	
130	66 FEB-050Row:PBI-PLC-Line2:PrsLoErrTim	ao	@asyn(PLC01503_AS_WRITE_0,47,1)INT16	INT16	
131	97 FEB-050Row:PBI-PLC-Line3:PrsLoErrTim	ao	@asyn(PLC01504_AS_WRITE_0,47,1)INT16	INT16	
132	128 FEB-050Row:PBI-PLC-Line4:PrsLoErrTim	ao	@asyn(PLC01505_AS_WRITE_0,47,1)INT16	INT16	
133	36 FEB-050Row:PBI-PLC-Line1:GapFlw	ao	@asyn(PLC01502_AS_WRITE_0,48,1)FLOAT32_BE	FLOAT32_BE	
134	67 FEB-050Row:PBI-PLC-Line2:GapFlw	ao	@asyn(PLC01503_AS_WRITE_0,48,1)FLOAT32_BE	FLOAT32_BE	
135	98 FEB-050Row:PBI-PLC-Line3:GapFlw	ao	@asyn(PLC01504_AS_WRITE_0,48,1)FLOAT32_BE	FLOAT32_BE	
136	129 FEB-050Row:PBI-PLC-Line4:GapFlw	ao	@asyn(PLC01505_AS_WRITE_0,48,1)FLOAT32_BE	FLOAT32_BE	
137	6 FEB-050Row:PBI-FT-A10:FlwR	ai	@PLC01/30 T=FLOAT	FLOAT	
138	7 FEB-050Row:PBI-FT-A19:FlwR	ai	@PLC01/34 T=FLOAT	FLOAT	
139	8 FEB-050Row:PBI-FCV-A10:PosSPR	ai	@PLC01/38 T=FLOAT	FLOAT	
140	9 FEB-050Row:PBI-FT-A10:LoErrTrshR	ai	@PLC01/42 T=FLOAT	FLOAT	
141	10 FEB-050Row:PBI-FT-A10:HiErrTrshR	ai	@PLC01/46 T=FLOAT	FLOAT	
142	11 FEB-050Row:PBI-FT-A10:HiHiErrTrshR	ai	@PLC01/50 T=FLOAT	FLOAT	
143	12 FEB-050Row:PBI-PLC-Line1:GapFlwHiErrTrshR	ai	@PLC01/54 T=FLOAT	FLOAT	
144	13 FEB-050Row:PBI-PLC-Line1:GapFlwHiHiErrTrshR	ai	@PLC01/58 T=FLOAT	FLOAT	
145	14 FEB-050Row:PBI-MV-A10:MismatchErrTimR	ai	@PLC01/62 T=SHORT	SHORT	
	15 FEB-050Row:PBI-FT-A10:LoErrTimR	ai	@PLC01/64 T=SHORT	SHORT	
	16 FEB-050Row:PBI-FT-A10:HiErrTimR	ai	@PLC01/66 T=SHORT	SHORT	
	17 FEB-050Row:PBI-FT-A10:HiHiErrTimR	ai	@PLC01/68 T=SHORT	SHORT	
	18 FEB-050Row:PBI-PLC-Line1:GapFlwHiErrTimR	ai	@PLC01/70 T=SHORT	SHORT	
	19 FEB-050Row:PBI-PLC-Line1:GapFlwHiHiErrTimR	ai	@PLC01/72 T=SHORT	SHORT	
	20 FEB-050Row:PBI-FCV-A10:KpR	ai	@PLC01/74 T=FLOAT	FLOAT	
	21 FEB-050Row:PBI-FCV-A10:TiR	ai	@PLC01/78 T=FLOAT	FLOAT	

BINARY ANALOG Configuration

Ess\_nblm

TA EPICS ?

Ess\_nblm

Click here to Generate IOC Files EPICS

AppName : Ess\_nblm

Ioc directory path : D:\EPICS\S7PLCMODBUS\NBLM\UPDATE\AWL

PLC name : PLC01

PV Prefix :

Ip : 127.0.0.1

Top type : SARAF

Reading protocol S7 Writing protocol \*

Protocol : SIEMENS

Port : 2 000

InByte : 642

OutByte : 0

Endian type : BigEndian

Receive Timeout : 500

Send Interval : 100

BINARY ANALOG Configuration

**EPICS**



> Data (D:) > EPICS > S7PLCMODBUS > NBLM > iocFiles

Nom	Modifié le
deploy_ioc.sh	10/04/2019 14:57
IOC_MODBUS_CONFIGURATION.cmd	10/04/2019 14:57
IOC_S7PLC_CONFIGURATION.cmd	10/04/2019 14:57
iocEss_nblm.db	10/04/2019 14:57
iocEss_nblmInclude.dbd	10/04/2019 14:57
Makefile	10/04/2019 14:57

## API dedicated EPICS :

- Based on CAJ (Channel Access for Java)
  - Pure Java implementation of Channel Access
  - <http://epics-jca.sourceforge.net/caj/>
- Read Process Variable
- Write Process Variable
- Run a Channel Access Server (Java IOC)



## Applications :

- Simulated java IOC EPICS
- EPICS Generic Control Panel
- Muscade IOC EPICS
- ...

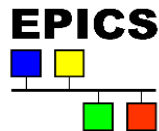




# CAFE JAVA – RUN SIMULATED IOC

The screenshot displays the TIA EPICS interface for the 'Ess\_nblm' application. A blue button labeled 'Run a simulated Ioc' is highlighted with a red box, and a blue arrow points from it to the process diagram below. The interface includes a menu bar (File, Edit, Search, CS-Studio, Sample Menu, Window, Help), a toolbar, and a Navigator pane showing 'MEBT-DTL1Gas.opi'. The main area features a process diagram for the 'MEBT & DTL1 line' with various components and a legend. A legend on the left indicates 'Flow' (green) and 'No flow' (red). A legend on the right identifies 'PBI-FT-A10:Flw' (blue) and 'PBI-FT-A19:Flw' (green). A graph on the right shows a plot of flow rate (L/h) over time (2019-05-16 17:47:36). The process diagram includes components like PT\_A10 (12.34 mBar), MV\_A10 (OPENED), FV\_A10 (CLOSED), FCV\_A10 (0 %), Gap (0 L/h), FV\_A19 (OPENED), and FT\_A19 (0 L/h). The diagram shows a flow path from left to right, with a distance of 8m indicated between two sections. The bottom of the interface shows the 'Auto/Manu' control and logos for cea, c2a, and ESS.

- PV list built from EPICS db file
- Test the IOC without a synoptic
- Works in CSS or in stand alone mode

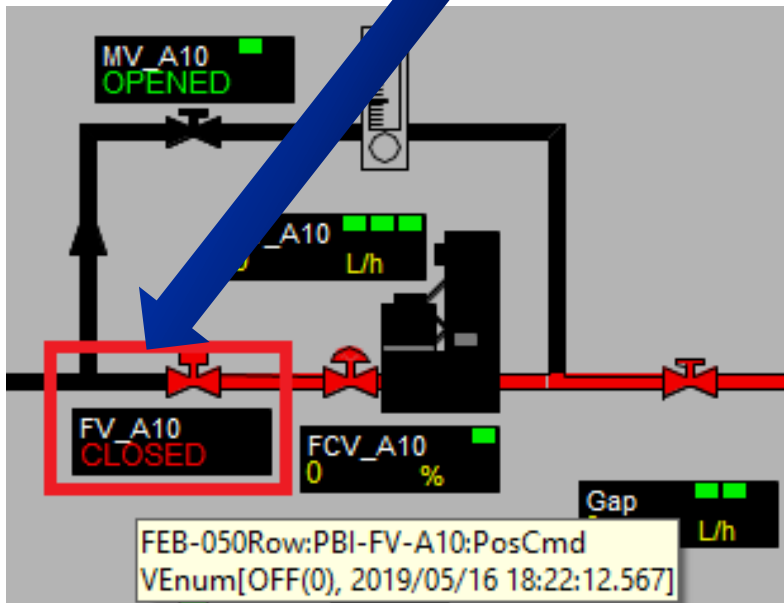


Data (D:) > EPICS > S7PLCMODBUS > NBLM > iocFiles	
Nom	Modifié le
deploy_ioc.sh	10/04/2019 14:57
IOC_MODBUS_CONFIGURATION.cmd	10/04/2019 14:57
IOC_S7PLC_CONFIGURATION.cmd	10/04/2019 14:57
iocEss_nblm.db	
iocEss_nblmInclude.dbd	10/04/2019 14:57
Makefile	10/04/2019 14:57

Ess_nblm	
Search	
Connection_status	
FEB-050Row:PBI-FCV-A10:AutoManu	
FEB-050Row:PBI-FCV-A10:AutoManuR	
FEB-050Row:PBI-FCV-A10:HardErr	
FEB-050Row:PBI-FCV-A10:HardErrR	
FEB-050Row:PBI-FCV-A10:Kp	
FEB-050Row:PBI-FCV-A10:KpR	
FEB-050Row:PBI-FCV-A10:LimB	
FEB-050Row:PBI-FCV-A10:LimBR	
FEB-050Row:PBI-FCV-A10:LimH	
FEB-050Row:PBI-FCV-A10:LimHR	
FEB-050Row:PBI-FCV-A10:PosSP	
FEB-050Row:PBI-FCV-A10:PosSPR	
FEB-050Row:PBI-FCV-A10:Td	
FEB-050Row:PBI-FCV-A10:TdR	
FEB-050Row:PBI-FCV-A10:Ti	
FEB-050Row:PBI-FCV-A10:TiR	
FEB-050Row:PBI-FCV-A20:AutoManu	
FEB-050Row:PBI-FCV-A20:AutoManuR	
FEB-050Row:PBI-FCV-A20:HardErr	
FEB-050Row:PBI-FCV-A20:HardErrR	
FEB-050Row:PBI-FCV-A20:Kp	
FEB-050Row:PBI-FCV-A20:KpR	
FEB-050Row:PBI-FCV-A20:LimB	
FEB-050Row:PBI-FCV-A20:LimBR	
FEB-050Row:PBI-FCV-A20:LimH	
FEB-050Row:PBI-FCV-A20:LimHR	
FEB-050Row:PBI-FCV-A20:PosSP	
FEB-050Row:PBI-FCV-A20:PosSPR	
FEB-050Row:PBI-FCV-A20:Td	
FEB-050Row:PBI-FCV-A20:TdR	

Search

PV Name	Read	Write
FEB-050Row:PBI-FV-A10:PosCmdR	<input type="checkbox"/>	<input type="checkbox"/>



MV\_A10 OPENED

FT\_A10 0 L/h

FV\_A10 CLOSED

FCV\_A10 0 %

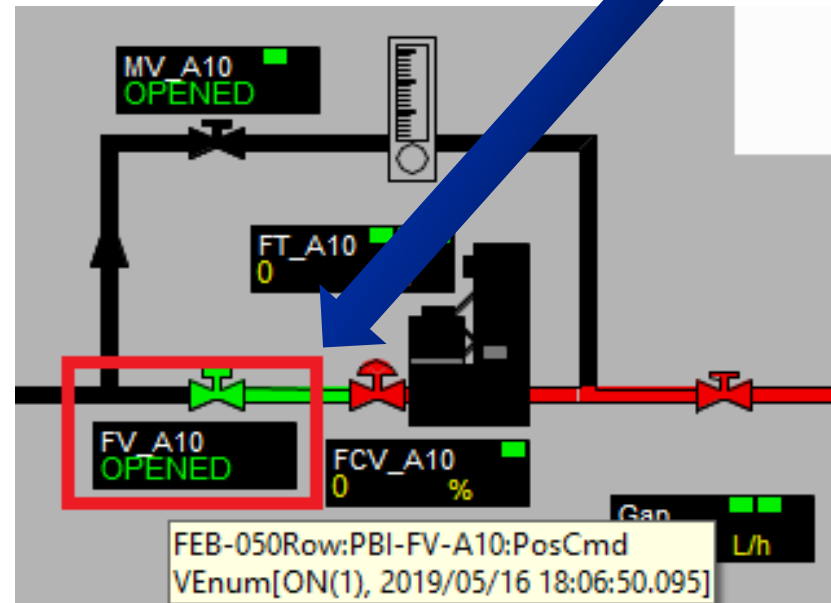
Gap L/h

FEB-050Row:PBI-FV-A10:PosCmd  
VEnum[OFF(0), 2019/05/16 18:22:12.567]

A blue arrow points from the 'Read' checkbox in the table above to the 'FV\_A10 CLOSED' status box in the diagram.

Search

PV Name	Read	Write
FEB-050Row:PBI-FV-A10:PosCmdR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



MV\_A10 OPENED

FT\_A10 0

FV\_A10 OPENED

FCV\_A10 0 %

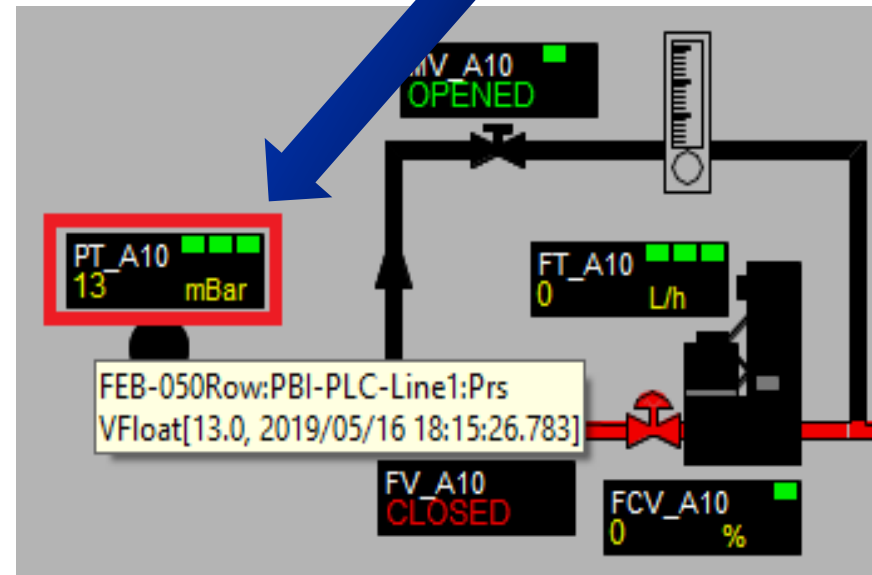
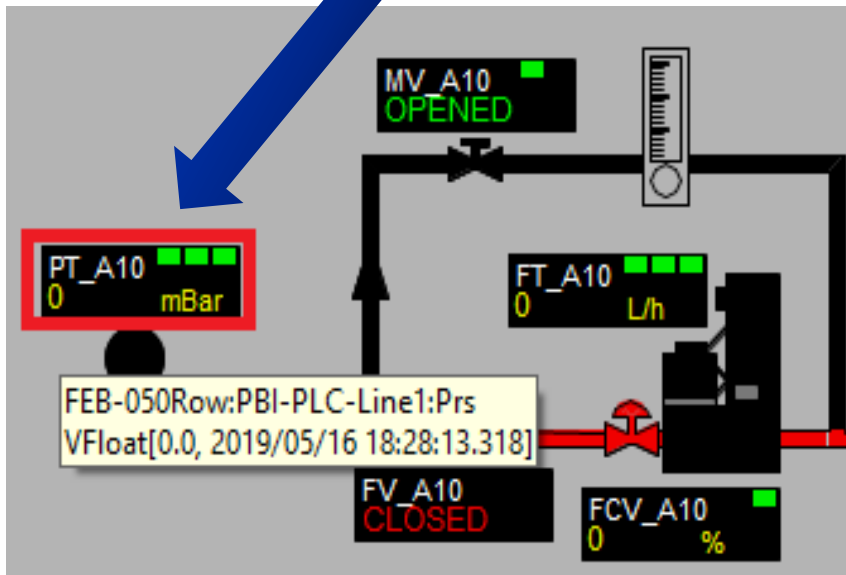
Gap L/h

FEB-050Row:PBI-FV-A10:PosCmd  
VEnum[ON(1), 2019/05/16 18:06:50.095]

A blue arrow points from the 'Read' checkbox in the table above to the 'FV\_A10 OPENED' status box in the diagram.

PV Name	Read	Write
FEB-050Row:PBI-PLC-Line1:PrsR	0.0	0.0

PV Name	Read	Write
FEB-050Row:PBI-PLC-Line1:PrsR	13.0	13.0





ARRAY 0: CR\_VALREMP

TREND ARRAY HISTORICS REC

Previous Next Main

2019/05/17 14:23:06,044 +0200 C

CR_VALREMP	h1.CH1.TOTAL
0	0.00
DEPRESS	h1.CH2.FAILURE
0	0
E542A	h1.CH2.INSTANT
0.00	0.00
E542B	h1.CH2.TOTAL
0.00	0.00
E542C	h1.CH3.FAILURE
0.00	0
E542D	h1.CH3.INSTANT
0.00	0.00
ETAT_REMP	h1.CH3.TOTAL
0	0.00
S542A	
0.00	
S542B	
0.00	
S542C	
0.00	
S542D	
0.00	
h1.CH0.FAILURE	
0	
h1.CH0.INSTANT	
0.00	

muscade

Search

S542A  
h1.CH0.FAILURE

PV Name	Read	Write	LOLO
h1.CH0.FAILURE	<input type="checkbox"/>	<input type="checkbox"/>	

Search

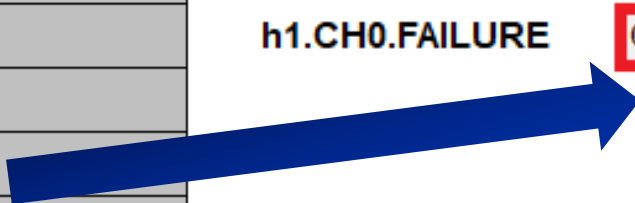
PV Name	Read	Write	LOLO	LOW	HIGH	HIHI	DESC
S542A	0.0	0.0	-10.0	0	5.0	10.0	Muscade pv S542A

CS-Studio

File Edit Search CS-Studio Sample Menu Window Help

Display CENTER 100%

MUSCADE SERVER



0 Hauteur

S542A  
VDouble[0.0, 2019/05/17 14:31:35.304]

h1.CH0.FAILURE

OFF

h1.CH0.FAILURE  
VEnum[OFF(0), 2019/05/17 14:31:35.304]





ARRAY 0: CR\_VALREMP

TREND ARRAY HISTORICS RE

Previous Next Main

2019/05/17 14:51:09,553 +0200

CR_VALREMP 0	h1.CH1.TOTAL 0.00
DEPRESS 0	h1.CH2.FAILURE 0
E542A 0.00	h1.CH2.INSTANT 0.00
E542B 0.00	h1.CH2.TOTAL 0.00
E542C 0.00	h1.CH3.FAILURE 0
E542D 0.00	h1.CH3.INSTANT 0.00
ETAT_REMP 0	h1.CH3.TOTAL 0.00
S542A 12.00	
S542B 0.00	
S542C 0.00	
S542D 0.00	
h1.CH0.FAILURE 0	

muscade

PV Name	Read	Write	LOLO	LOW	HIGH	HIHI	DESC
S542A	12.0	12.0	-10.0	-5.0	5.0	10.0	Muscade pv S542A

CS-Studio

File Edit Search CS-Studio Sample Menu Window Help



Display CENTER 100%

MUSCADE SERVER

S542A  
h1.CH0.FAILURE

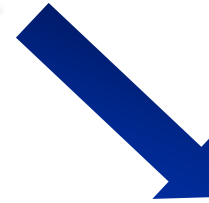
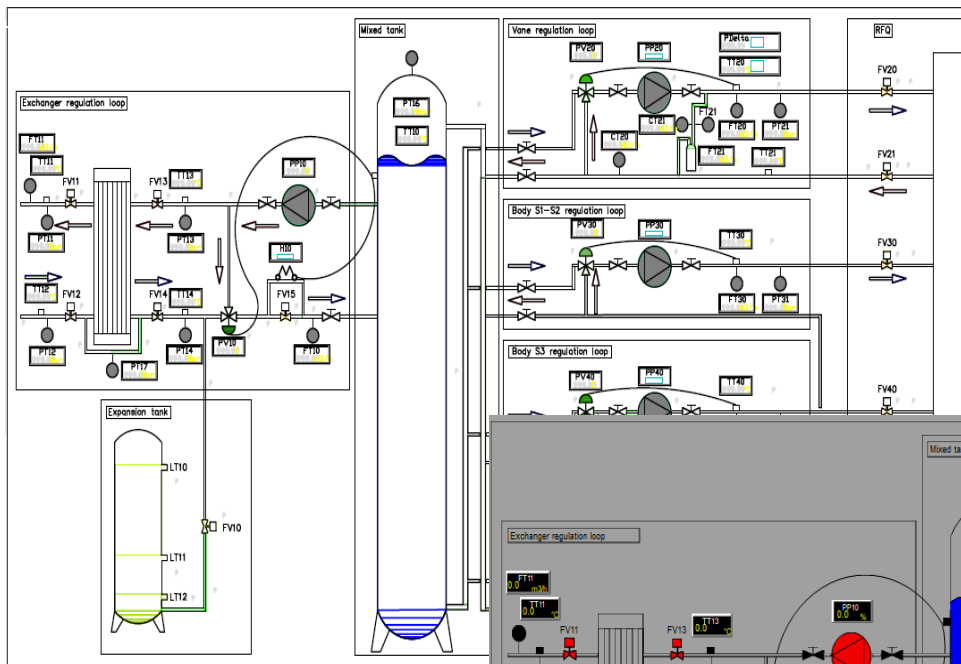
12 Hauteur

12

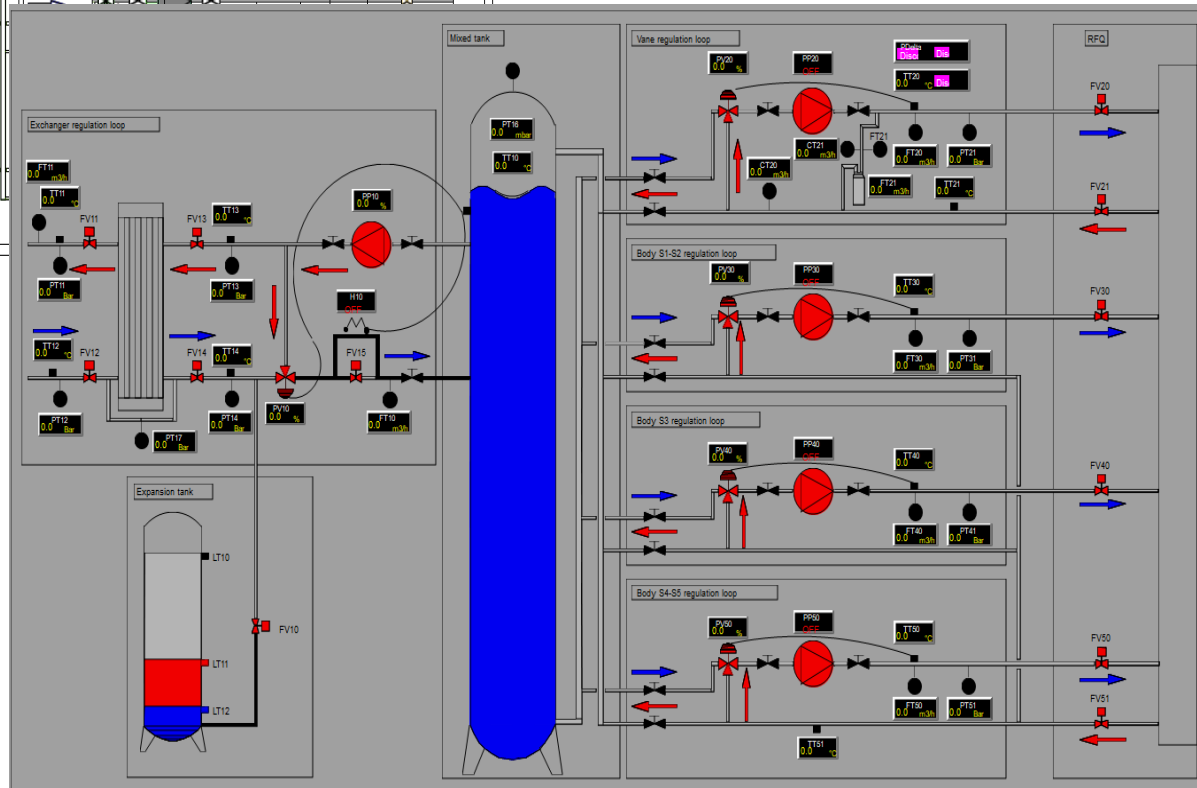
OFF S542A  
VDouble[12.0, MAJOR(HIHI\_ALARM), 2019/05/17 14:49:14.460]



# cea DXF20PI CSS PLUGIN

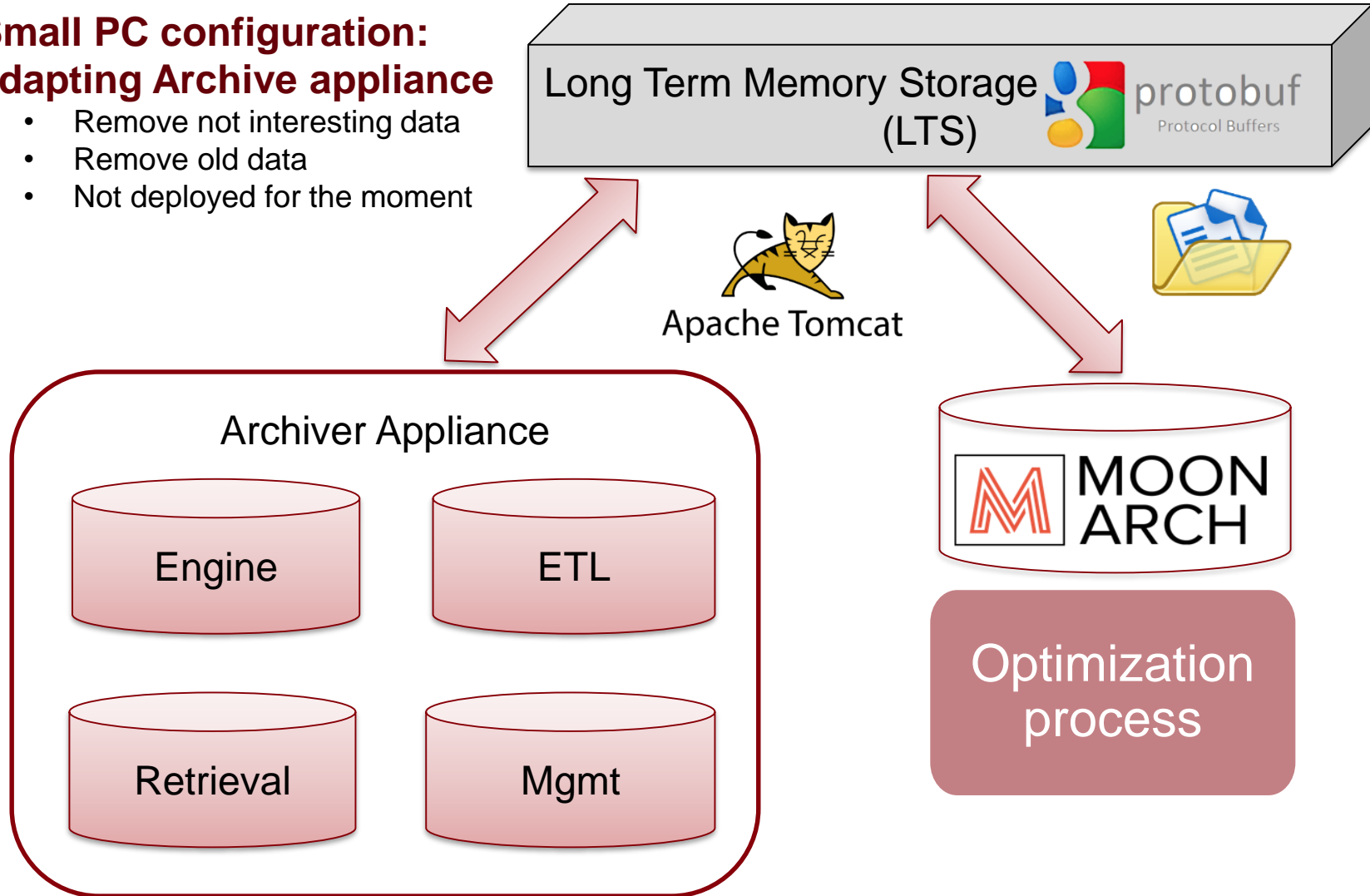


control system studio



## Small PC configuration: adapting Archive appliance

- Remove not interesting data
- Remove old data
- Not deployed for the moment





Memory Optimizer ON Archiver Appliance (MOONARCH) - Mozilla Firefox@ifufxsis229

Memory Optimizer O... x

localhost:17669/moonarch/

MOON Archiver Appliance : Configuration page

User Configuration

Data depth: 1 [S]

Max Storage Duration: 5 year(s)

Optimization Mode: by File

PVs To Exclude: iphi:lebt:Thall  
\*BOB1\_3\_ON  
ex : project.group.pvname ; can use wildcards (\*)

Set Expert's Configuration

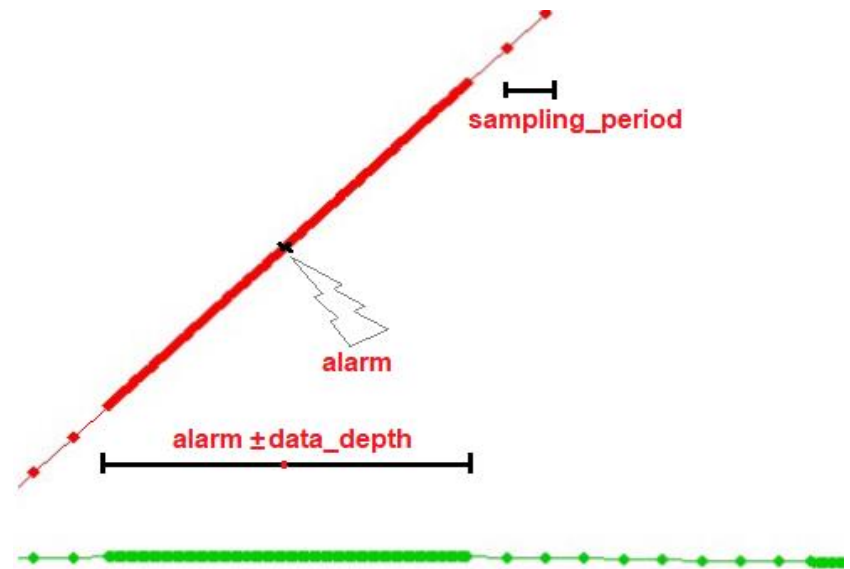
Load Default Configuration Leave Changes Change Configuration

Start Optimization

Stop Optimization

## Parameters :

- Data depth
- Max storage duration
- Process variables to exclude
- Process period
- Optimization mode
- Process variables per task ...



Propriétés de : GBAR

Général | Partage | Sécurité | Versions précédentes | Personnaliser

GBAR

Type : Dossier de fichiers

Emplacement : D:\EPICS\ArchivingData

Taille : 1,32 Go (1 420 253 245 octets)

Taille sur le disque : 1,32 Go (1 420 967 936 octets)

Contenu : 394 Fichiers, 6 Dossiers



Memory size - 40 %

Propriétés de : GBAR

Général | Partage | Sécurité | Versions précédentes | Personnaliser

GBAR

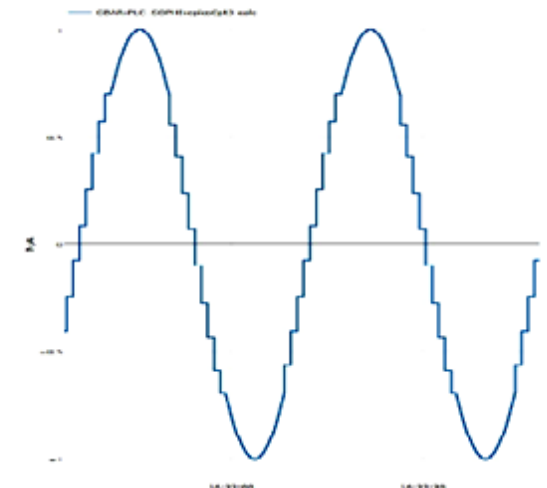
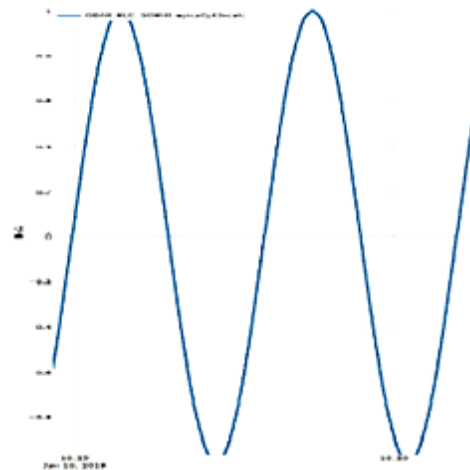
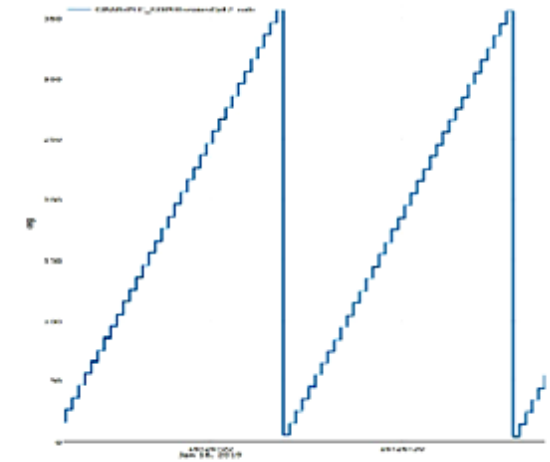
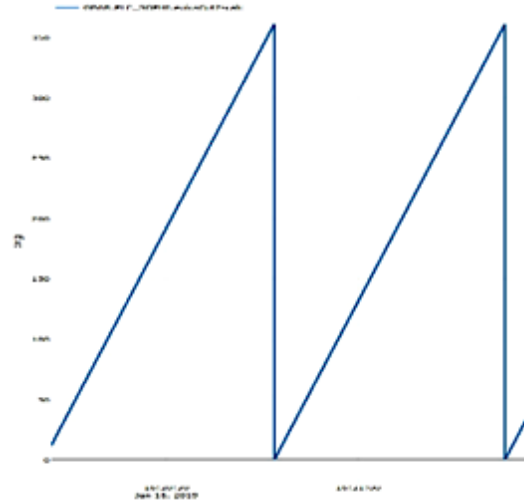
Type : Dossier de fichiers

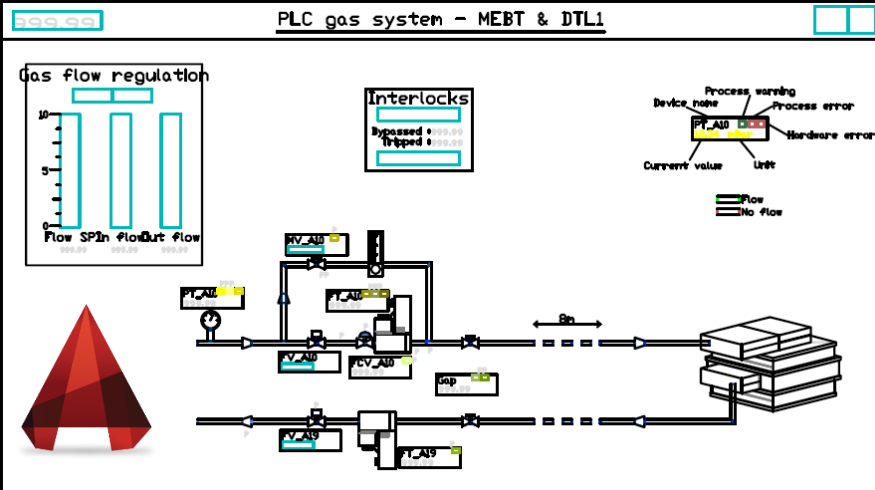
Emplacement : D:\EPICS\optimizedLts

Taille : 799 Mo (837 895 889 octets)

Taille sur le disque : 799 Mo (838 598 656 octets)

Contenu : 386 Fichiers, 6 Dossiers





Web EPICS

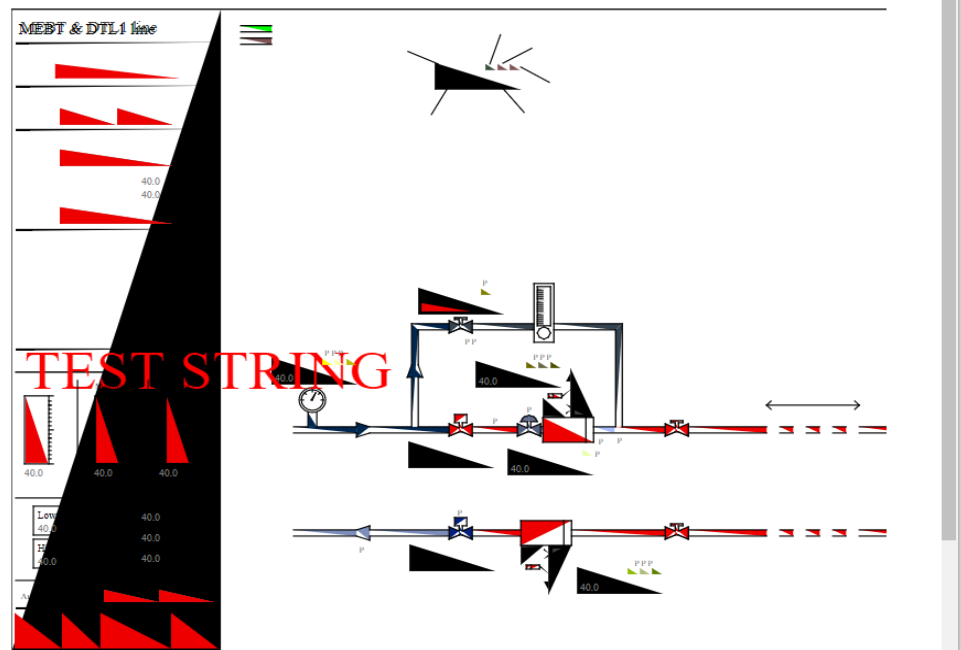
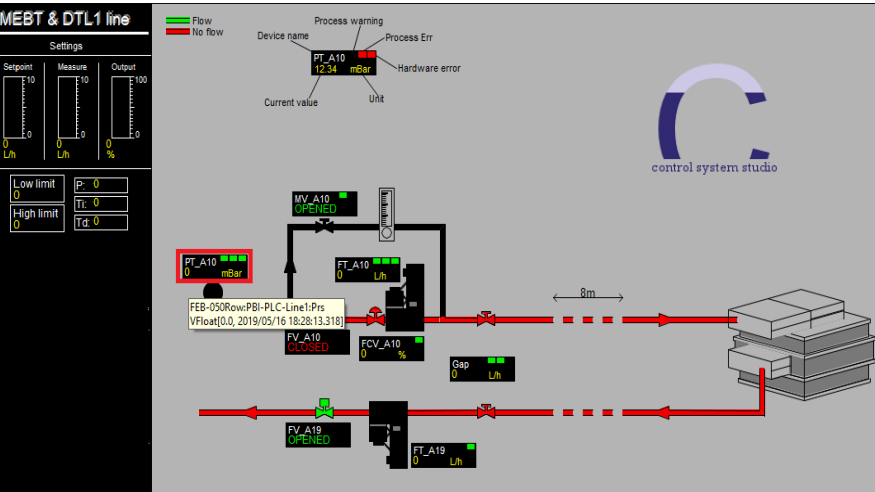
Apache Tomcat

WEB EPICS

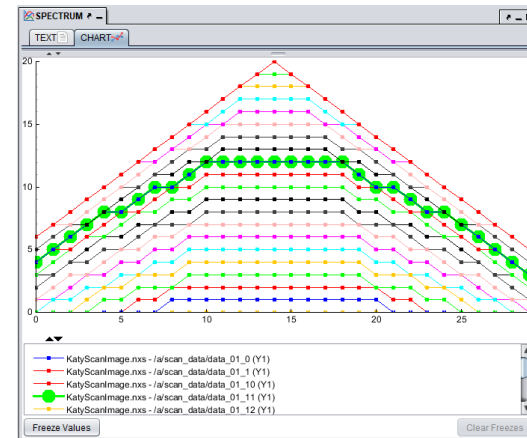
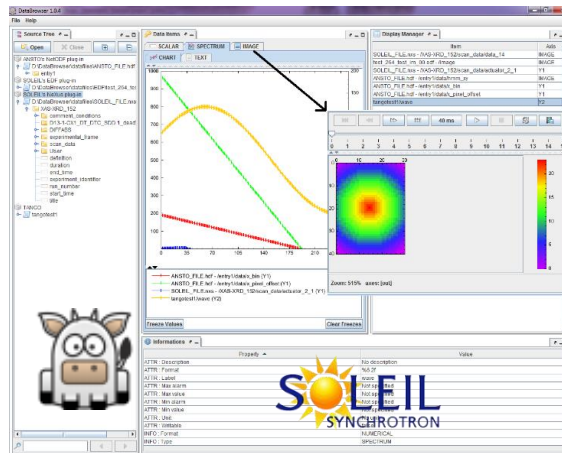
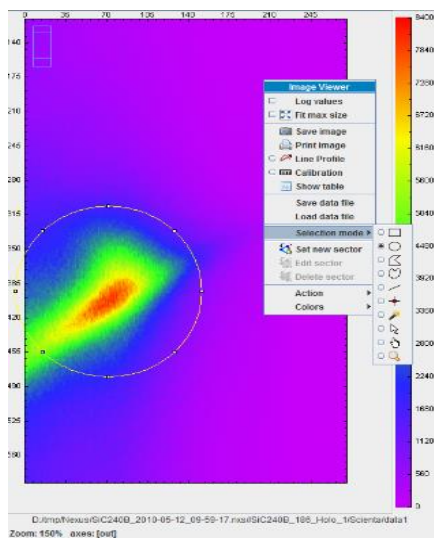
localhost:8080/IOCViewer/webepics

COUNTER PV	10
DOUBLE PV	40.0
ENUM PV	three
BOOLEAN PV	ON
STRING PV	TEST STRING

Scalable Vector Graphics



<http://wiki.synchrotron-soleil.fr/tikiwiki/tiki-index.php?page=How-browse-downloaded-Nexus-files>



## COMETE GUI



## CDMA



### Plugin



### Plugin



### Plugin



### Plugin EPICS



### Plugin



**CAJ** : Channel Access for Java to read & write PV

**VisualDCT** : EPICS Visual Database Configuration Tool for parsing a EPICS db file

The screenshot displays the CS-Studio interface. On the left, the 'Source Tree' shows the project structure with 'IRFU's EPICS plugin' selected. The main area contains a 'SCALAR' control panel with a value of 20.0 and a 'SPECTRUM' plot showing two data series: '127.0.0.1:FEB-050Row:PBI-FCV-A10:AutoManuR History (Y1)' and '127.0.0.1:FEB-050Row:PBI-FCV-A10:KpR History (Y2)'. A 'control system studio' logo is visible in the center. On the right, a 'Display' window shows a graph with two axes: 'Primary Y Axis (1)' and 'Secondary Axis (2)'. The graph plots two series: 'FEB-050Row:PBI-FCV-A10:KpR' (blue line) and 'FEB-050Row:PBI-FCV-A10:AutoManuR' (red line).

The dialog box 'IRFU's EPICS plugin seeker' is shown. It contains a text field for 'Define a host name or an IP address' with the value '132.166.36.231'. Below this, it says 'Type a list of process variable' and lists 'GBAR.PLC\_SOPHI:epicsCpt1-calc' and 'GBAR.PLC\_SOPHI:epicsCpt2-calc'. On the right, there are search icons and a 'Rechercher dans' field containing 'iocEss\_nblm.db'. Below that, 'Nom du fichier' is 'iocEss\_nblm.db' and 'Type de fichier' is '\*DB, \*.db'. 'Ok' and 'Cancel' buttons are at the bottom.

## EPICS Archiver Appliance : Read Google Protobuf files



The screenshot displays the EPICS Archiver Appliance Viewer interface. At the top, there are navigation controls for time ranges (30s, 1m, 5m, 15m, 30m, 1h, 4h, 8h, 1d, 2d, 1w, 2w, 1M, 6M, YTD, 1Y, Live). The main plot area shows two data series: GBAR:PLC\_SOPHI:epicsCpt1-calc (blue line) and GBAR:PLC\_SOPHI:epicsCpt2-calc (orange line). The y-axis is labeled 'SEC' and ranges from -20 to 80. The x-axis represents time.

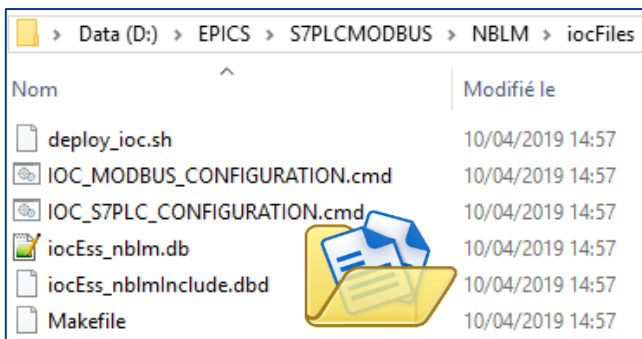
Overlaid on the main view are several windows:

- DataBrowser 1.3.0**: A source tree window showing the file structure of the archive, including folders for IRFU's Muscade Plugin, IRFU's EPICS plugin, and IRFU's EPICS Appliance plugin. It lists specific data items like 'D:\EPICS\optimize-dlts\GBAR\PLC\_SOPHI\epicsCpt1calc\2018.pb'.
- IRFU's EPICS Appliance plugin seeker**: A configuration dialog box for searching files. It includes a search path, a file list (currently showing 'calc\2018.pb'), and options for sampling parameters. The 'Options' section has checkboxes for 'Override Default settings' and 'Define a time range', and a 'Dynamic date range' dropdown set to 'Last hour'. Date pickers show a start date of '2018-12-10 11:34:53' and an end date of '2018-12-11 11:14:57'. Other options include 'Sampling period' (None), 'Sampling factor' (0), and 'Number max of events' (0).
- SCALAR** and **SPECTRUM** windows: These windows show zoomed-in views of the data. The SPECTRUM window displays two series: '2018\_GBARIPLC\_SOPHI:epicsCpt1-calc (Y1)' (blue line) and '2018\_GBARIPLC\_SOPHI:epicsCpt2-calc (Y2)' (red line). The x-axis shows time intervals, and the y-axis ranges from 0 to 60.
- Informations** window: A table showing properties of the selected data item.
 

Property	Value
INFO : Format	NUMERICAL
INFO : Type	SPECTRUM
PV_INFO : Approximated events count	19351589
PV_INFO : Archiving data type	DOUBLE
PV_INFO : FilePath	D:\EPICS\optimize-dlts\GBAR\PLC_SOPHI\epicsCpt2calc\2018.pb
PV_INFO : First event date	Wed Oct 24 15:52:31 CEST 2018
PV_INFO : Last event date	Tue Dec 11 11:14:57 CET 2018
PV_INFO : numberMaxEvents	0
PV_INFO : samplingFactor	0




## PLC Parser Tool :

- Generate script `deploy_ioc.sh` for IOC Files deployment in an EPICS's top folder



```
ksaintin@SISPCY144: ~/topIFMIF
File Edit View Search Terminal Help
ksaintin@SISPCY144:~/topIFMIF$ makeBaseApp.pl -t ifmif ess nblm
ksaintin@SISPCY144:~/topIFMIF$ ll
total 60
drwxr-xr-x 1 ksaintin ksaintin 4096 mai 23 17:05 ./
drwxr-xr-x 1 ksaintin ksaintin 4096 mai 23 16:58 ../
drwxrwxr-x 1 ksaintin ksaintin 4096 mars 26 16:22 bin/
-rw-r--r-- 1 ksaintin ksaintin 1650 avril 19 2016 ChangeLog
drwxr-xr-x 1 ksaintin ksaintin 4096 avril 2 16:53 configure/
drwxrwxr-x 1 ksaintin ksaintin 4096 mars 26 16:50 css/
drwxrwxr-x 1 ksaintin ksaintin 4096 avril 2 16:53 db/
drwxrwxr-x 1 ksaintin ksaintin 4096 mars 27 12:23 dbd/
drwxrwxr-x 1 ksaintin ksaintin 4096 mai 23 17:05 ess_nblmApp/
drwxr-xr-x 1 ksaintin ksaintin 4096 avril 19 2016 exampleApp/
drwxrwxr-x 1 ksaintin ksaintin 4096 mars 26 17:15 include/
drwxr-xr-x 1 ksaintin ksaintin 4096 mars 26 17:33 iocBoot/
drwxrwxr-x 1 ksaintin ksaintin 4096 mars 26 16:22 lib/
-rw-r--r-- 1 ksaintin ksaintin 837 avril 15 2016 Makefile
-rw-r--r-- 1 ksaintin ksaintin 8232 avril 15 2016 README
drwxrwxr-x 1 ksaintin ksaintin 4096 avril 2 16:53 s7plctestApp/
```

## Synoptic visualization :

-  AutoCAD convert to BOB for PHEOBUS
-  AutoCAD convert to SVG for EPICS Web
-  mode, to replay a synoptic at a request time range



## Deployment automation :

-  playbook for a full EPICS framework deployment on a small experiment

**THANK YOU FOR YOUR  
ATTENTION!**



**ANY QUESTIONS?**

[meme-generator.net](http://meme-generator.net)