



Experience on SP-AGPS interface using non-standard EPICS setup

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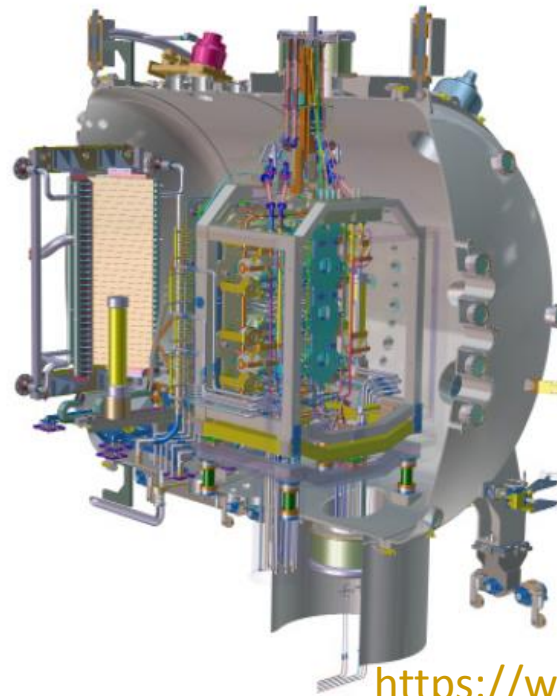
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NBTF, Italy

SPIDER

Source for Production of Ion of Deuterium Extracted from Rf plasma (SPIDER) has started operating in 2018 as the first ITER component prototype .

SPIDER is devoted to test and develop the most critical component of the heating beam: the negative ion source of deuterium (D-) and hydrogen (H-). To this aim SPIDER will be equipped with state-of-the-art diagnostics system that will allow a detailed study of the generated beam and its thorough optimization.



<https://www.igi.cnr.it/>

SP AGPS : NBTF, Italy



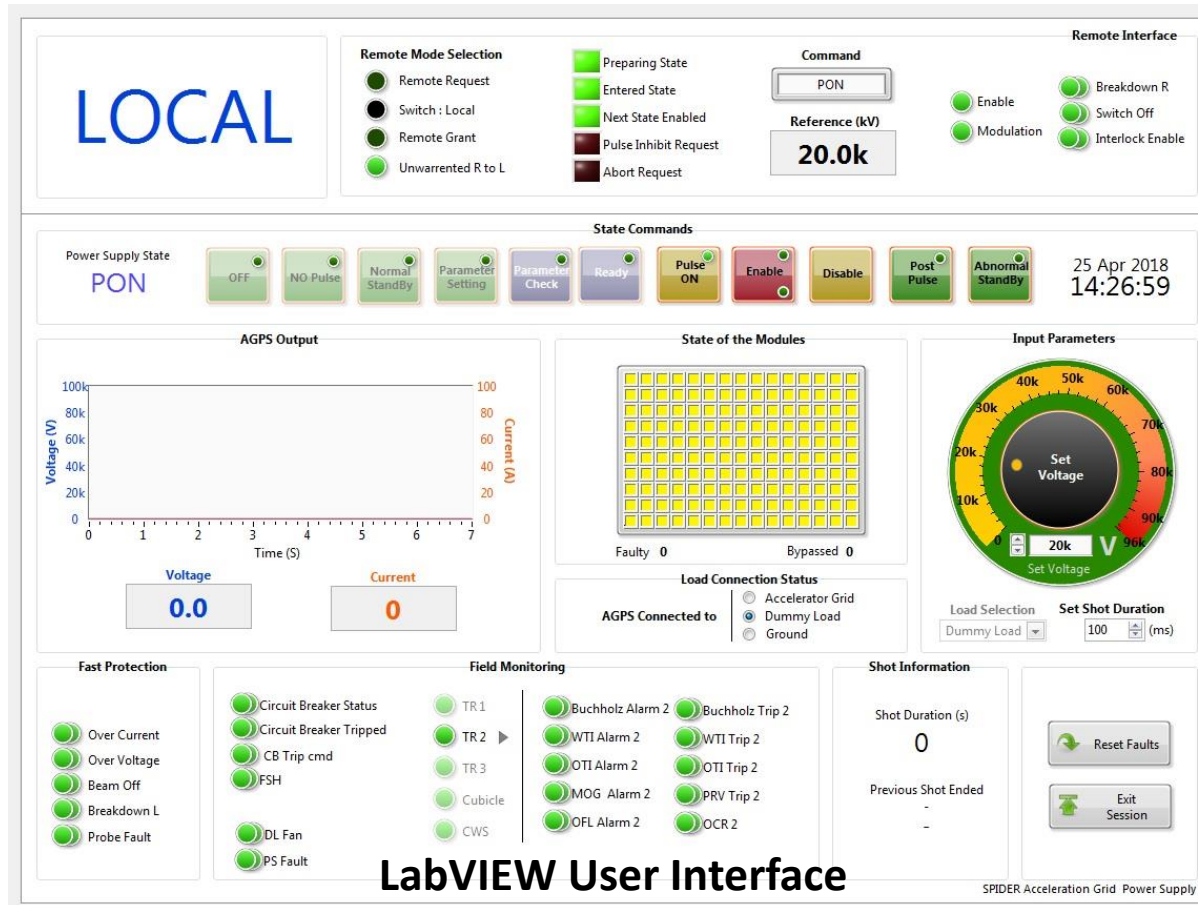
APGS SPS Module Installation



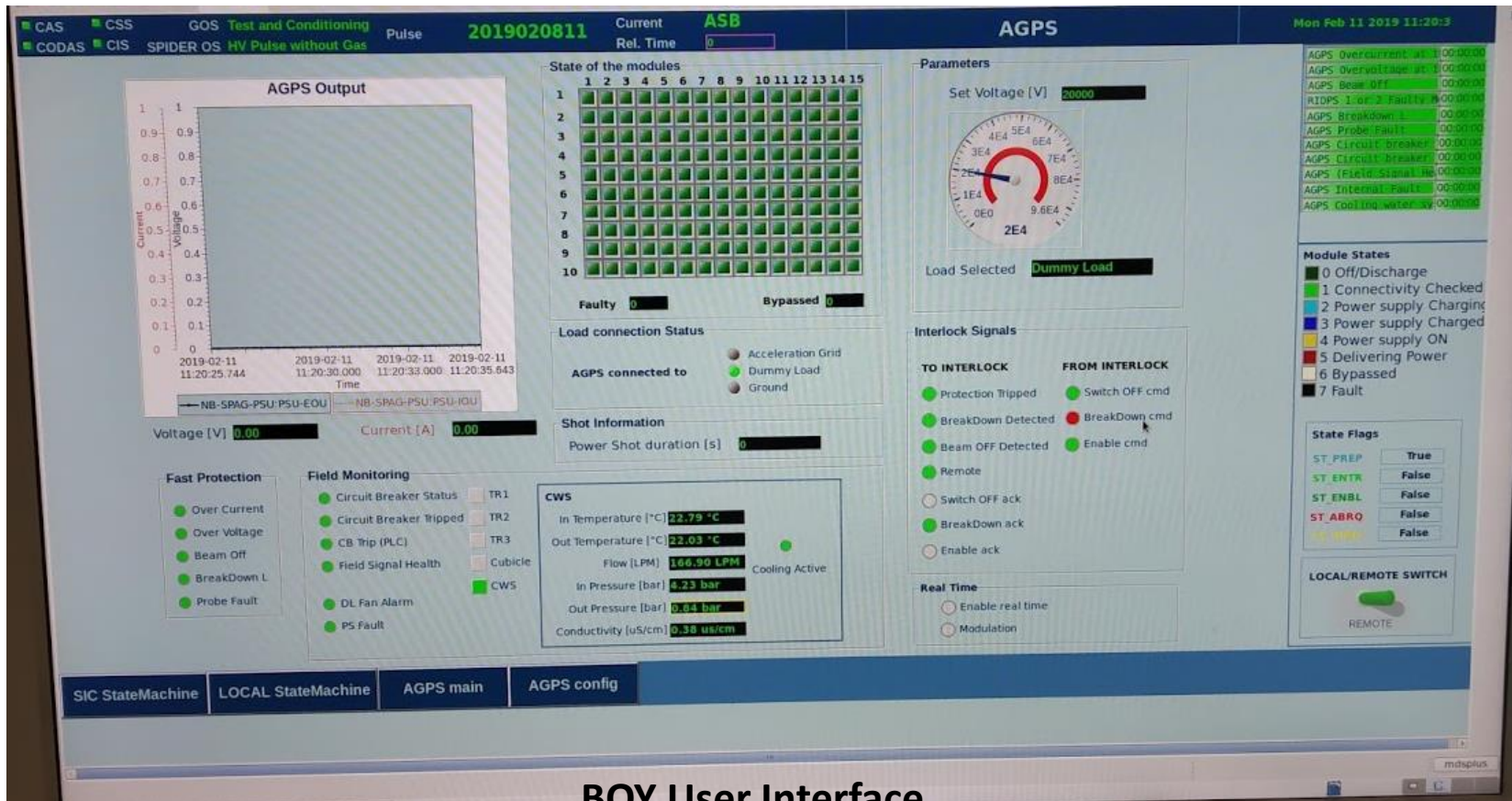
RT Controller

HMI Cubicle

SP AGPS : NBTF, Italy



SP AGPS : NBTF, Italy



BOY User Interface

Power Supplies with Similar Architecture

SPIDER Acceleration Grid Power Supply (96kV/75A – 7.2 MW)

- Currently in Operation at NBTF Facility
- Successfully, hydrogen Beam Extracted

DNB Acceleration Grid Power Supply (96kV/75A -7 MW)

- Currently in Operation at Indian Test Facility

Ion Cyclotron High Voltage Power Supply (14kV & 27kV)

- Currently in Operation at Indian Test Facility
- Thales/Europe RF Source Acceptance test
- CEC/USA RF source Acceptance Test

Why this Controller ?

Requirements :

- Prime objective of HVPS Regulation
- Performance requirements
- COTS
- Reasonable length of Software Development Cycle
- Good Life Cycle for Hardware
- Technical Support Available



PXI Based Controller : Highly Modular

Controller Runs on Real time operating system: Performance

Developed in LabVIEW : Support and Development cycle

Adding Support for other Platform

Power supply with various specification for different application.

HVPS has users from various fields

- Windows
- Linux

Addressing User interface on Linux Platform

- Without changing current proven architecture
- Minimum changes

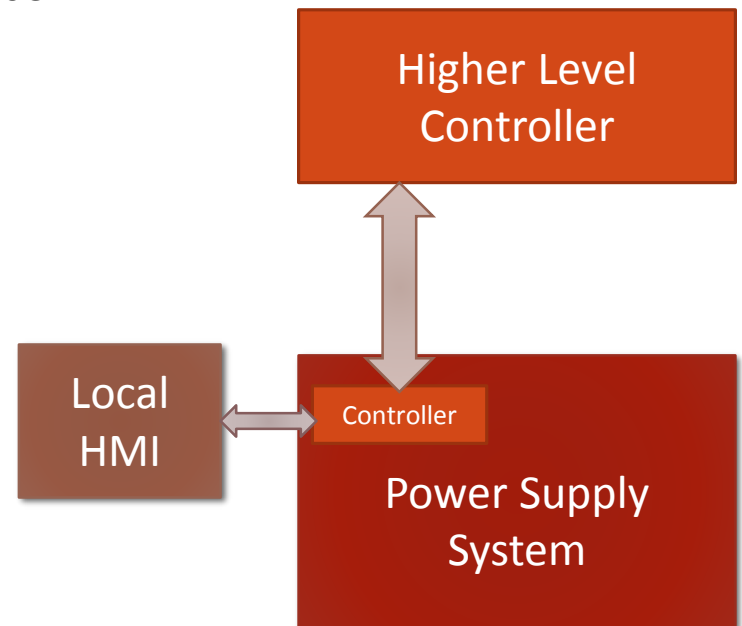
Interface Requirements

Local Operation

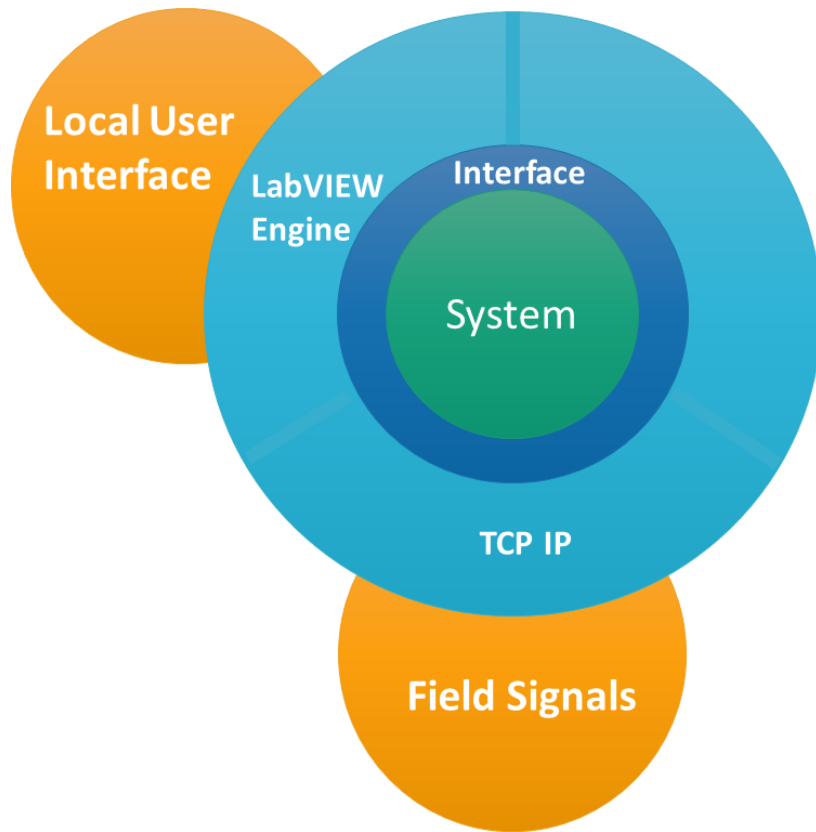
- User Interface based on LabVIEW

Remote operation

- EPICS based panel for operation commands
- LabVIEW based panel for maintenance
- Data transfer
- Synchronous Operation



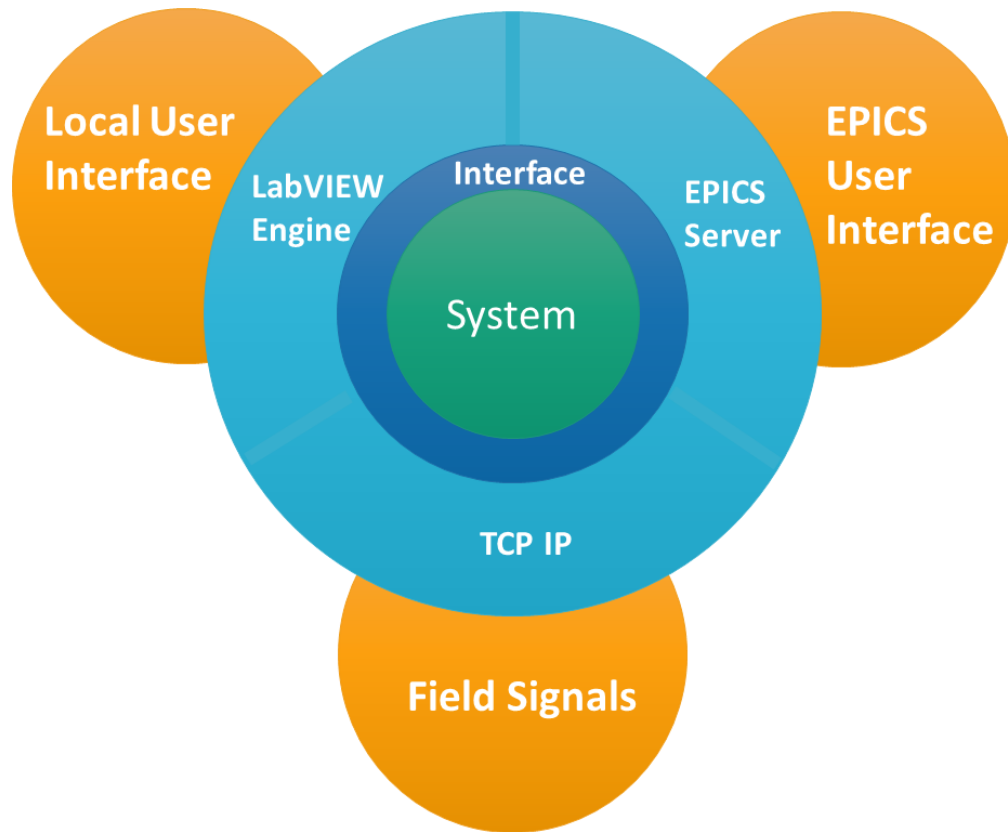
Exposing System to public functionalities



LabVIEW Shared Variable Engine deployed on the both side of the system

Simple TCP IP Protocol to monitor slow data

Exposing System to public functionalities



LabVIEW Shared Variable Engine deployed on the both side of the system

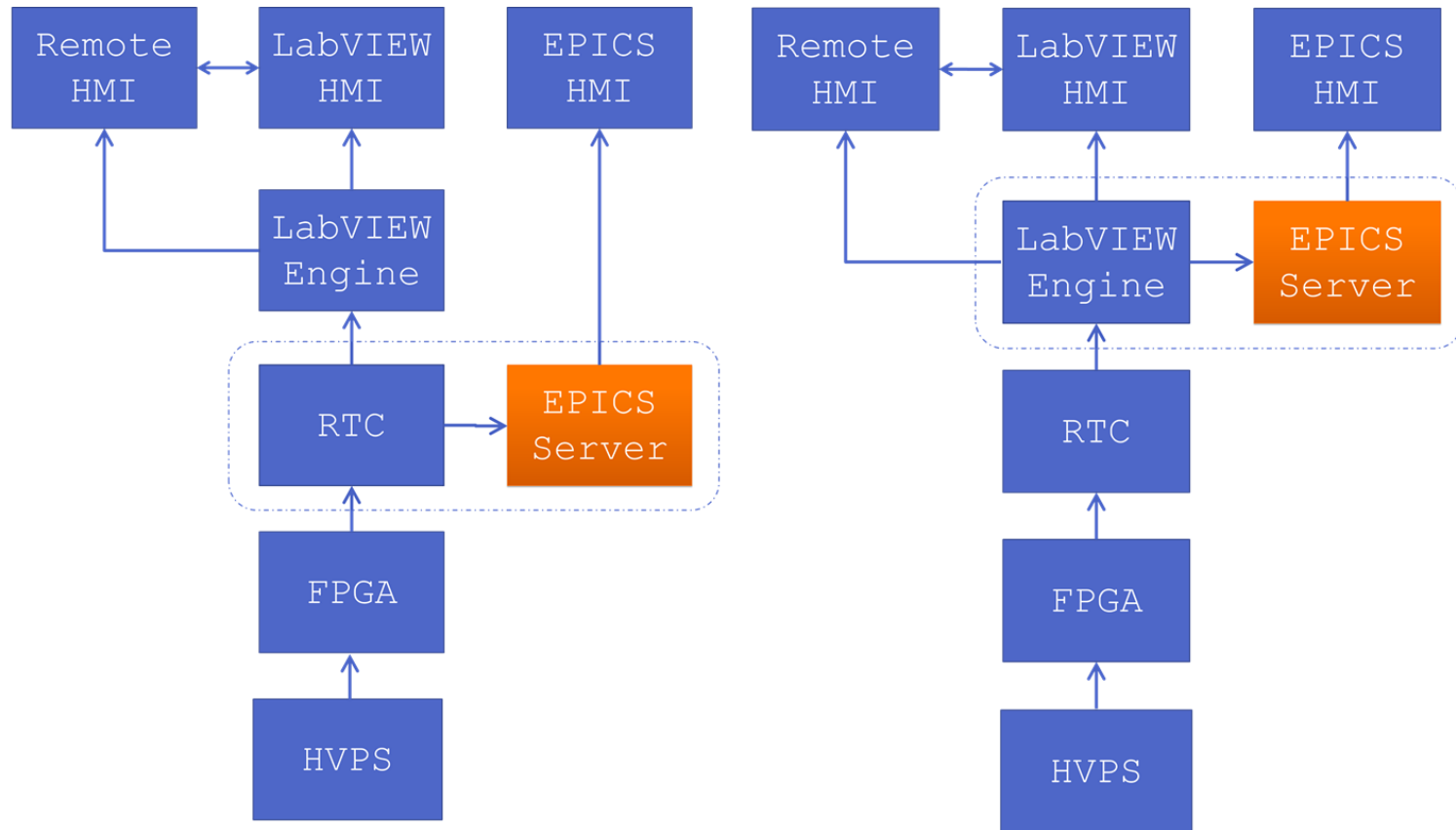
Simple TCP IP Protocol to monitor slow data

EPICS IOC Server utilises Channel Access protocol to transfer data

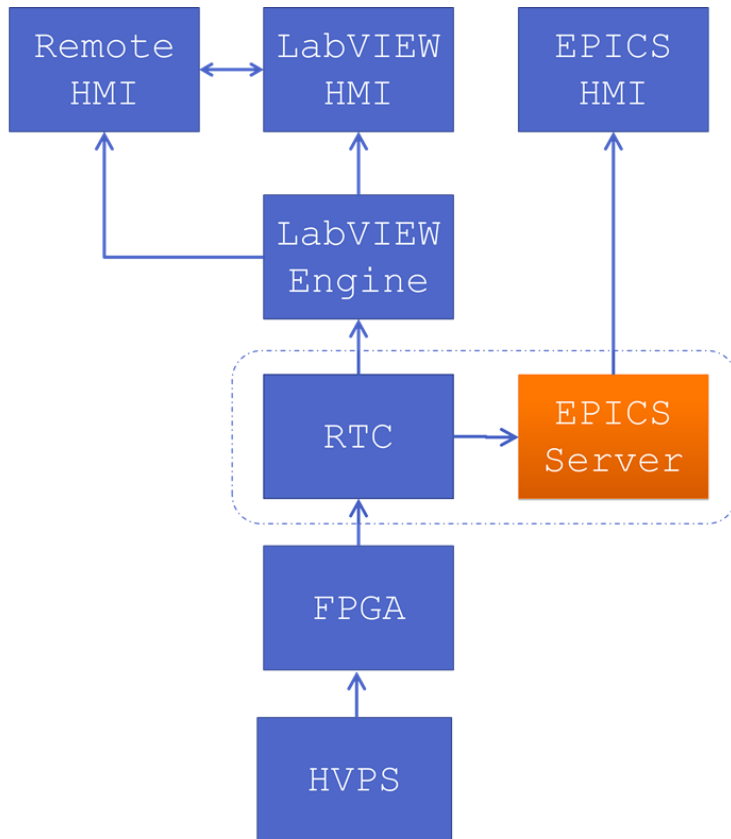
Tested data format

1. Unsigned integer 8, 16, 32bit
2. Signed integer 8, 16,32 bit
3. Floating point 32bit
4. Array of all these format
5. string

Location of EPICS server



Location of EPICS server

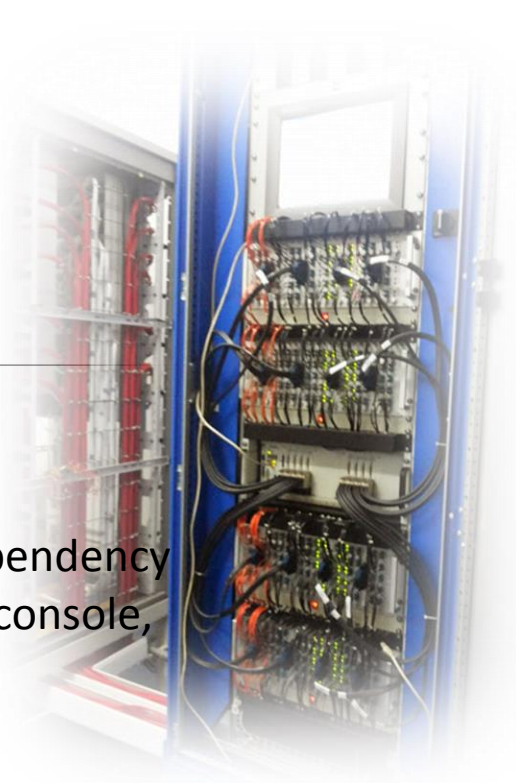


Pros

- Totally Head Less, No dependency
- No need to provide user console, Saves costs.

Cons

- Supporting code at RTC, thus difficult to update without compromising performance
- On site Changes difficult so user inputs cannot be integrated at last stage



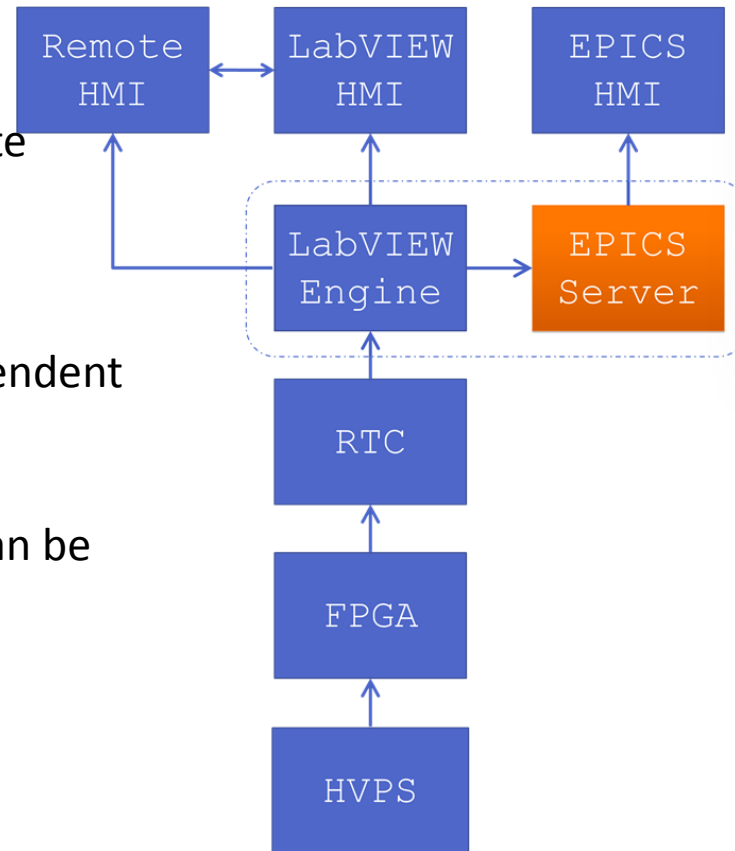
Location of EPICS server

Pros :

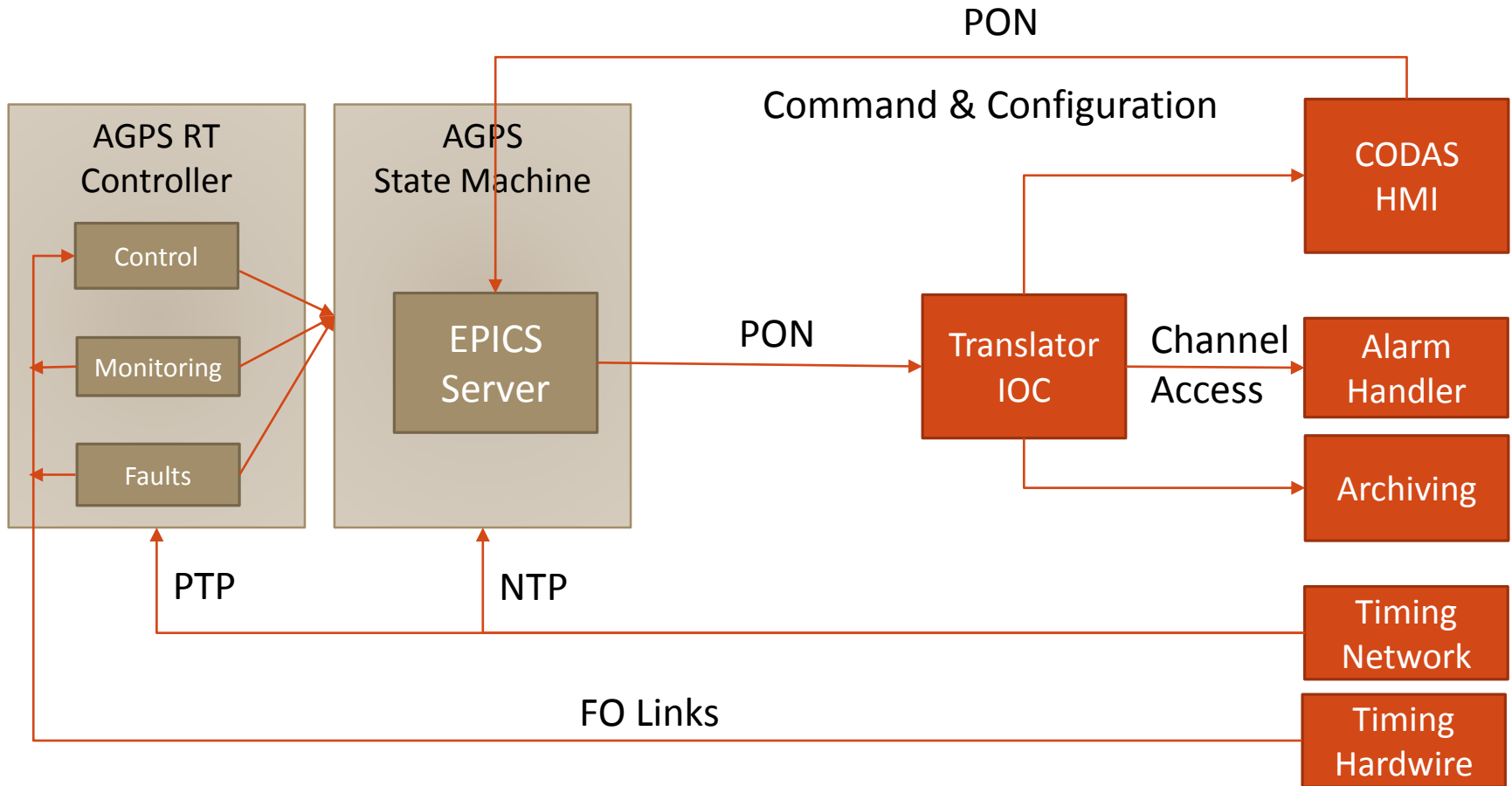
- Easy to modify and Update
- RTC code is undisturbed
- Late user inputs can be integrated
- Can be distributed independent Real time control
- Different functionality at different user interface can be supported

Cons

- Extra cost, More space



EPICS Interface implementation



Issues

Issue : Importing Variables

Is there any method to convert existing LabVIEW Variables in library to directly EPICS library variables ?

No Export and Import, Manual Entry is the only Option

Issue : Crash

Stops responding randomly

All PVs disconnects

OPI Restart or Refresh needed

Sometimes required system Restart

Causing Events:

- Mostly happens, When any new variable is added. Need to restart CSS.
- Network Connectivity has to be stable. LAN and Wifi should not be ON together
- All PVs should be linked properly, failure to set one PV properly may disconnect whole OPI.
- Multiple libraries Running on LabVIEW

Issue : PV not updating



PV Assigned to CSS Mimic

Set automatically 0 , no matter what PV value is.

Caput will change value on command line

Caget will display actual Value

CSS displays 0 always

Solution

- Auto Range has to be removed

```
[codac-dev@localhost ~]$ caput  
Hitesh:Ser_Lib:Amplitude 6  
Old : Hitesh:Ser_Lib:Amplitude 5  
New : Hitesh:Ser_Lib:Amplitude 6
```

Incompatibility

Issues : Alarms

Alarm severity

Case 1 (Required case) : Variable 2 (Configuration :Alarm On = "Low")

- Set "VAL" to "false"
- Alarm severity "SEVR" = **NO_ALARM**

So, **No alarm is detected** at archiving even if "STAT" says "STATE_ALARM"

Case 2 (Normal case): Variable 3 (Configuration :Alarm On = "High")

- Set "VAL" to "true"
- Alarm severity "SEVR" = **MAJOR_ALARM**

So, **Alarm is detected** perfectly at EPICS Archiving and Client side.

Issues : Alarms

OSV and ZSV

Path	Value	Access
test2		
EPICS Server2		
Variable2		
+ abc OSV	MAJOR_ALARM	Read
+ abc SEVR	NO_ALARM	Read
+ abc STAT	STATE	Read
+ TF VAL	false (In Alarm)	Read
+ abc ZSV	NO_ALARM	Read
Variable3		
+ abc OSV	MAJOR_ALARM	Read
+ abc SEVR	MAJOR_ALARM	Read
+ abc STAT	STATE	Read
+ TF VAL	true (In Alarm)	Read
+ abc ZSV	NO_ALARM	Read
+ TF Variable2	false (In Alarm)	Read/Write
+ TF Variable3	true (In Alarm)	Read/Write

Issues : Alarms

Now Registered as Know Issue

	Reported Version: 2016	Resolved Version: N/A	Added: 05/21/2018
701706 Return	<i>The alarm in EPICs Client for boolean when set to low doesn't work</i> When you set an alarm for a boolean in EPICs Client when the value becomes low, it doesn't work Workaround: N/A		
	Reported Version: 2018	Resolved Version: N/A	Added: 06/21/2018

Known Issues by Category

The following items are known issues in DSC2018 sorted by Category.

Compatibility

636042 — [Library deploy fails in localization environment](#)

Distributed System Manager

676093 — [NI Distributed System Manager constrains the "Remove Process" confirmation dialog](#)

Translator IOC

- Incompatible Data types like MBBI, MBBO
- Inverted Alarms
- Other PV Fields

```
record (bi,"NB-SPAG-CWS:GH-BY-CODAS")
{
    field(DESC, "AGPS Cooling water system Bypass valve")
    field(INP, "NB-SPAG-CWS:GH-BY-INVERTED")
    field(ONAM, "OK")
    field(OSV, "NO_ALARM")
    field(ZNAM, "IN_ALARM")
    field(ZSV, "MAJOR")
}

record (calc,"NB-SPAG-CWS:GH-BY-INVERTED")
{
    field(CALC, "! A")
    field(DESC, "Invert NB-SPAG-CWS:GH-BY")
    field(FLNK, "NB-SPAG-CWS:GH-BY-CODAS")
    field(INPA, "NB-SPAG-CWS:GH-BY CP")
    field(PINI, "YES")
    field(VAL, "1")
}

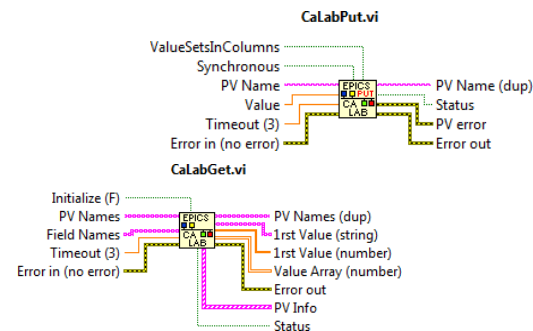
record (ai,"NB-SPAG-CWS:GH-CYTY-CODAS")
{
    field(DESC, "AGPS CWS conductivity value")
    field(INP, "NB-SPAG-CWS:GH-CYTY CP")
    field(EGU, "us/cm")
    field(HHSV, "MAJOR")
    field(HIHI, "1.0")
    field(HSV, "MINOR")
    field(LLSV, "MAJOR")
    field(LOLO, "0.05")
    field(LSV, "MINOR")
}

record (ai,"NB-SPAG-CWS:GH-FTY-CODAS")
{
    field(DESC, "AGPS CWS flow rate value")
    field(INP, "NB-SPAG-CWS:GH-FTY CP")
}
```

CA Lab ?

Support

- Issues are very application specific
- Issues are environment specific
- As we are buying customer for National Instrument,
 - Remote Support with Mail
 - In-person Meetings
 - Video Conference Meetings (Team from Paris & China)
 - Live debugging
 - On Site Help



http://www-csr.bessy.de/control/SoftDist/CA_Lab/

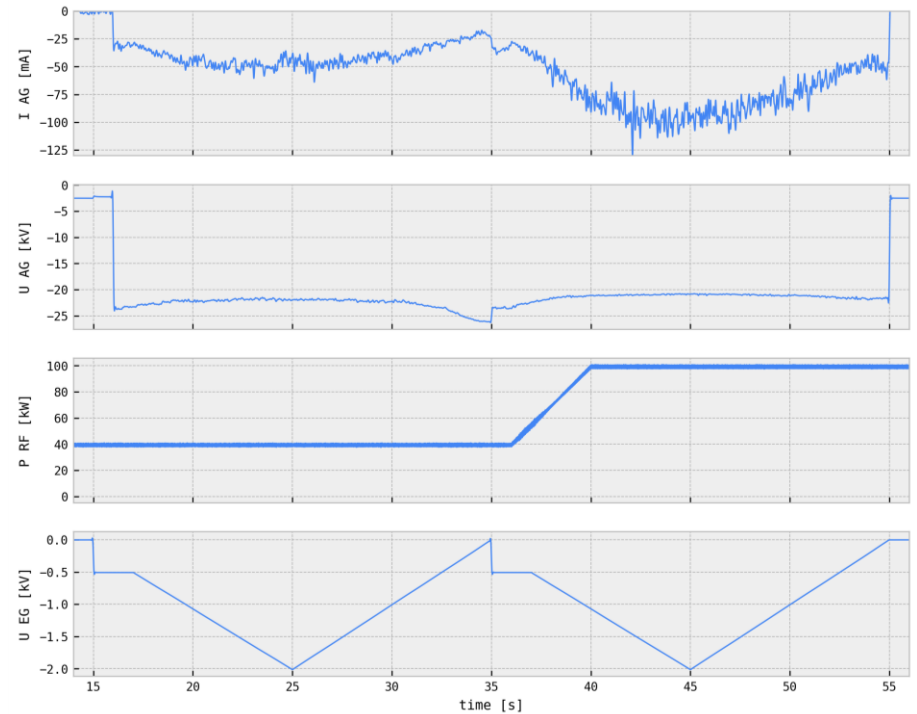
Thanks

RFX CODAS Team

NI EPICS Team

CODAC Support

With your support,
EPICS interface was
successfully Implemented



References

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Thank you
