



ELI Beamlines

Control System Overview

Author: Radek Horálek



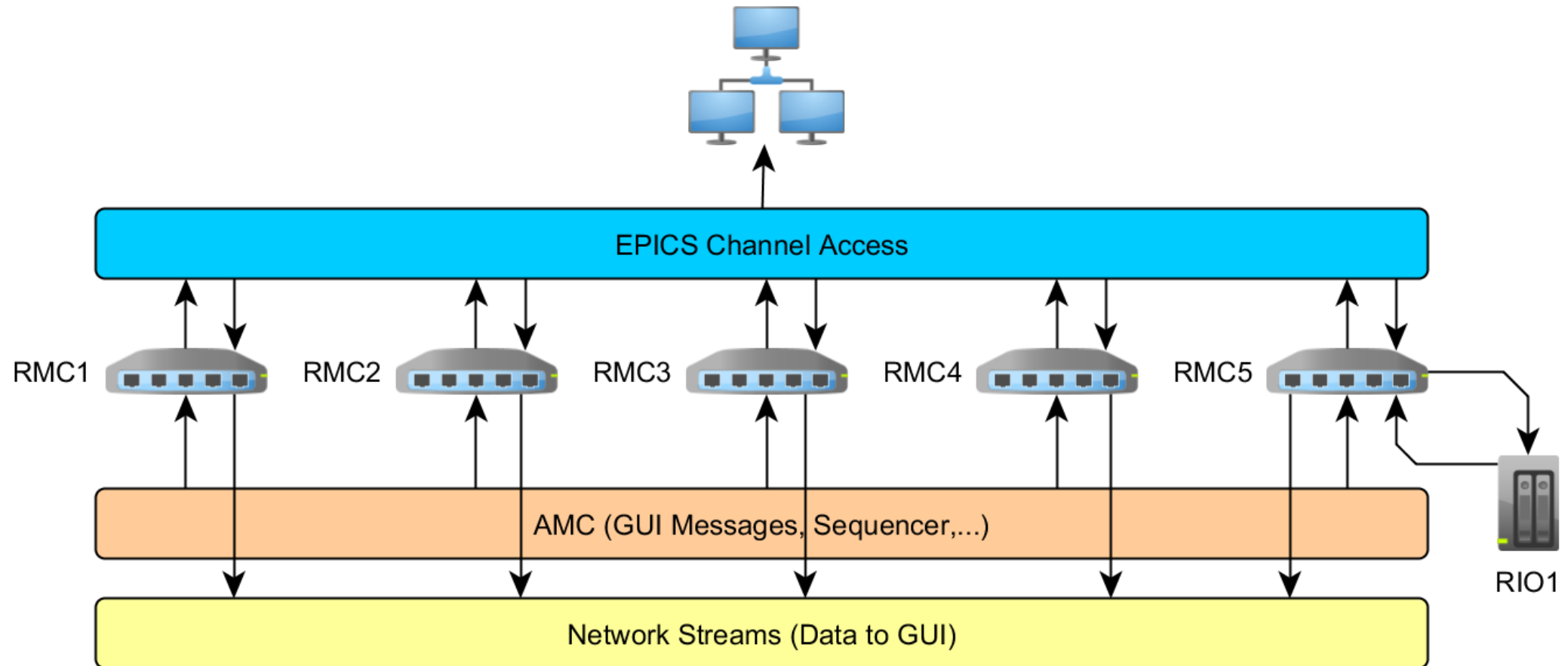


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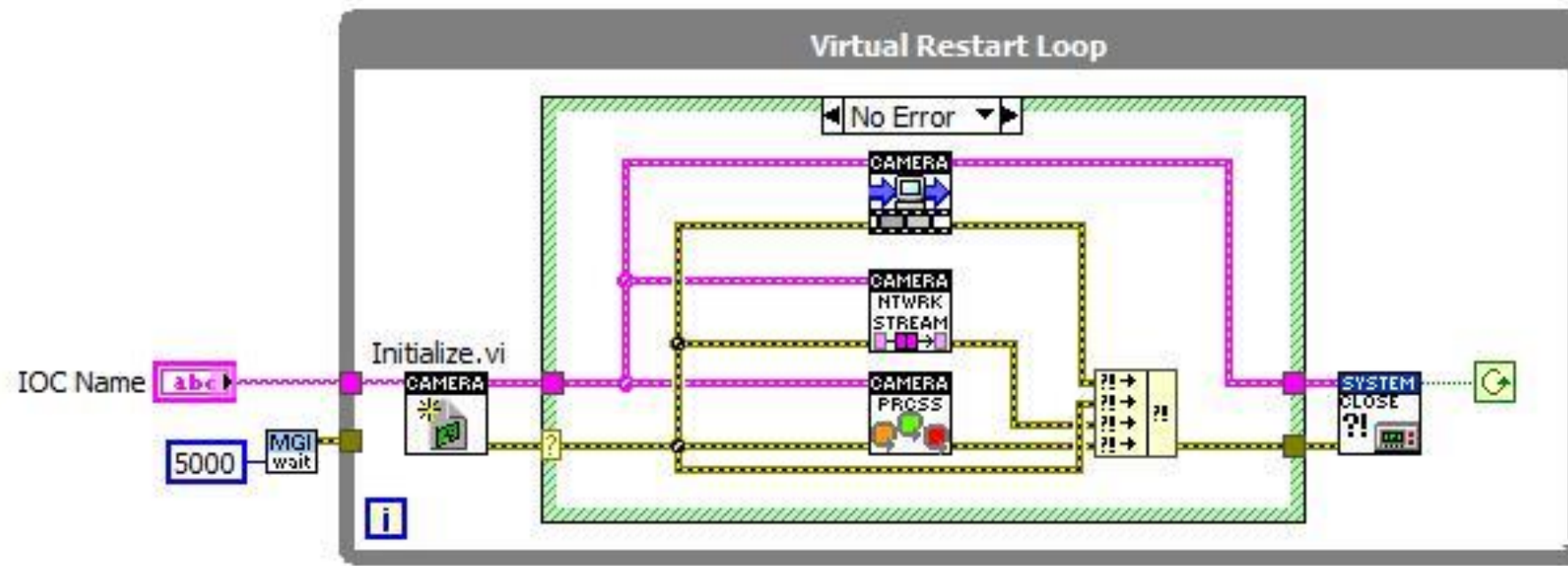
- Templates and source code versioning ensure fast deployment of new solutions in the lab
 - MySQL, P4V Helix
 - ELI Controls and ELI.lib (developed in LabVIEW)
- EPICS commands and data are supported



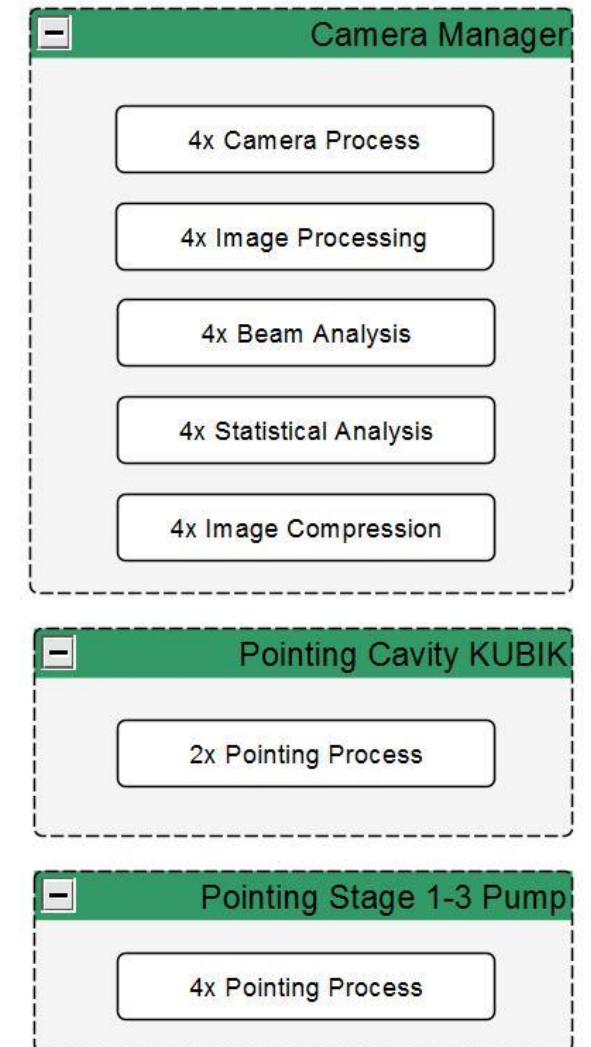


Scope of the Architecture (II)

- Each RMC contains several Input-Output Controllers (IOC)
- Each IOC contains processes



L1-FE-RMC-1 (10.42.1.89)



AMC (Asynchronous Message Communication)

- UDP based
- Sending commands from Developer GUIs to IOCs

Network Streams

- Handle reliable transfers on top of modified TCP/IP
- Used for developer GUIs
- Streams are wrapped into the architecture

CA (Channel Access)

- Used by EPICS 3.14
- Enables transfer of data using TCP/IP with additional features



HW Needs

- Supported OS: ETS PharLap, NI RT Linux, Win10
- RMC 8354 (matured)
- KISS 1U Short V3 CFL
 - Intel i7-9700E (8Core/2,6GHz)
 - 8GB DIMM DDR4 2666
- NI cRIO (different types)
- Real-time controllers can be virtualized

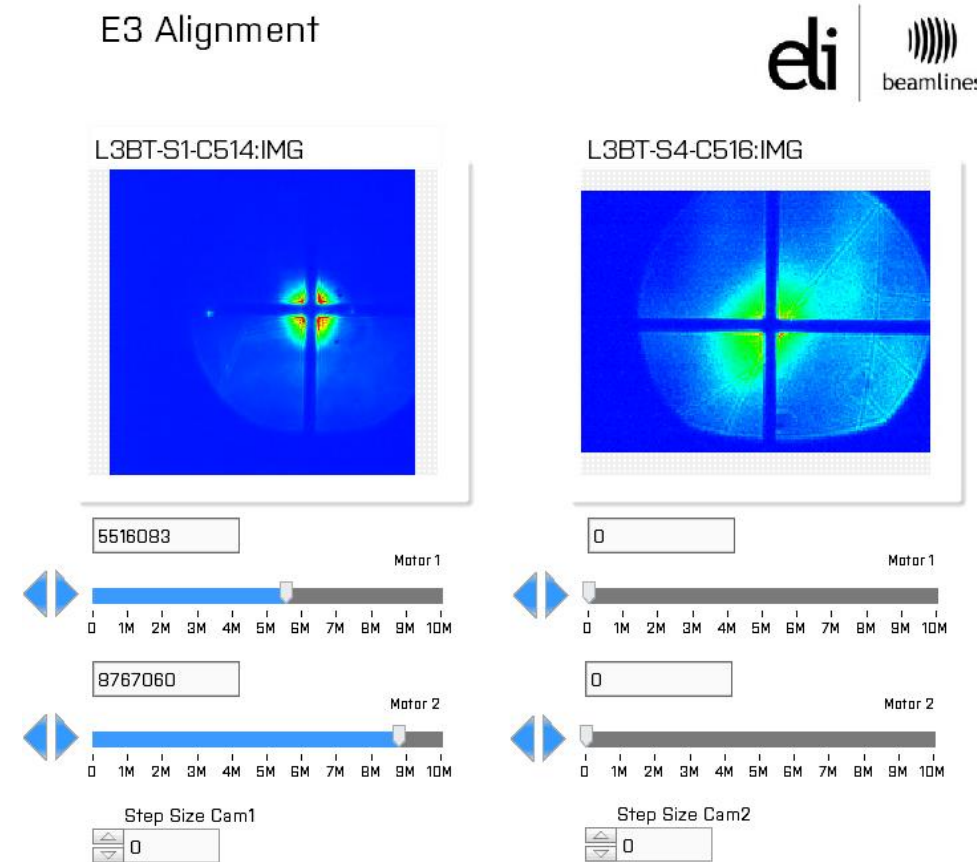




RIO Utilization

- NI 9149 is the most common type (Ethernet RIO)
- Programmatic interaction with FPGA front panel for slow data
- FIFOs for fast data
- Both DAQ and state machine control are applicable on FPGA

- Process data -> IOC -> EPICS
- EPICS GUIs allow access to multiple IOCs through EPICS layer



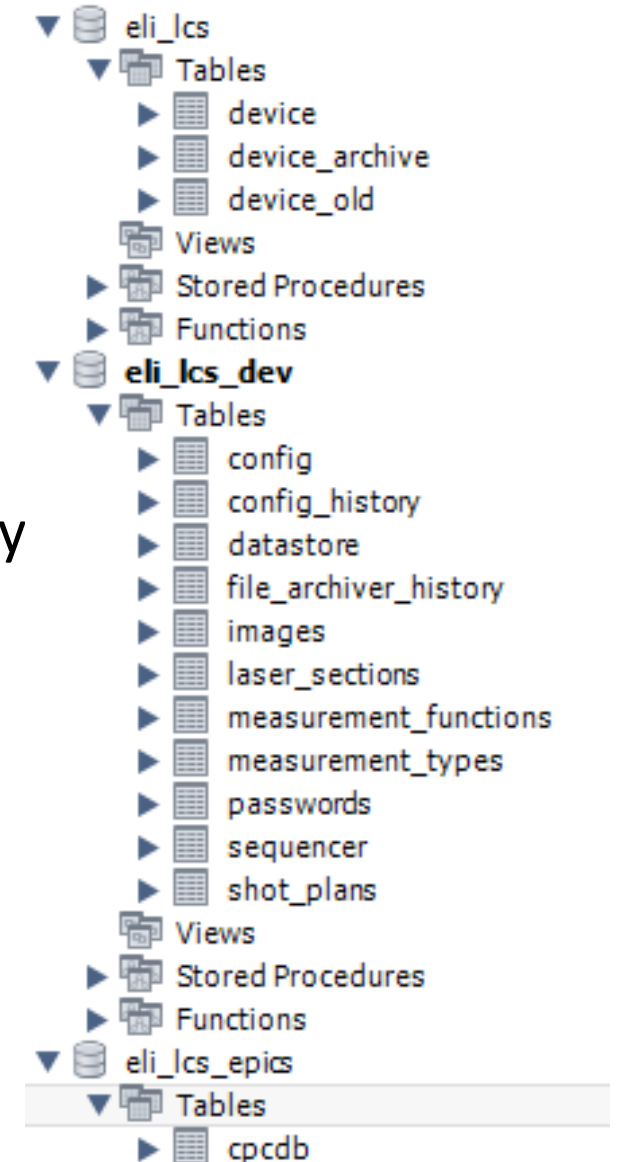


Integration (II)

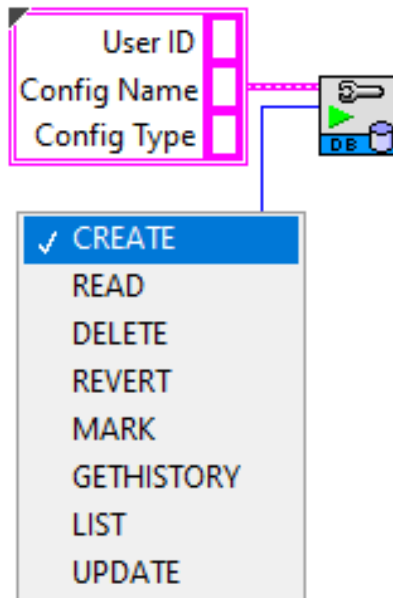
- Database contains information about all the PVs and IOCs

id	pv_name	cp_tag	group	device_id	ioc_id	datastore_id	pv_t	ds_type	nelm	pv_class
802	L1-FE-PM01:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone 0:CH1 Data	AI	DBL	NULL	LABIOC_AI
803	L1-FE-PM24:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone 0:CH2 Data	AI	DBL	NULL	LABIOC_AI
804	L1-FE-PM04:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone 0:CH3 Data	AI	DBL	NULL	LABIOC_AI

- PVs require server information
- IOCs require INI and CFG configurations that define their functionality



- Database access is provided using DB Config Access.vi



- Configuration history can then be used to backtrack in time what changes might have had an effect on the system

- Data is published using a LabIOC server which is present on all machines



Record list	Client list
L1-BB-C01:CentroidX	10.64.1.1:50041
L1-BB-C01:CentroidY	10.64.1.31:54857
L1-BB-C01:TotalPower	10.64.1.205:49244
L1-BB-C02:CentroidX	10.64.1.205:58840
L1-BB-C02:CentroidY	10.64.1.211:53078
L1-BB-C02:TotalPower	
L1-DEV-RMC101:CPU	
L1-DEV-RMC101:DSD-PERIOD	
L1-DEV-RMC101:Disk	
L1-DEV-RMC101:RAM	
L1-FE-C01:IMG	
L1-FE-C02:IMG	
L1-FE-C03:IMG	
L1-FE-C14:CentroidX	
L1-FE-C14:CentroidY	
L1-FE-C14:IMG	
L1-FE-C14:TotalPower	
L1-FE-RMC-1-IOC:RAM	
L1-FE-RMC-1-PointingCavityKUBIK:LOAD_CO	
L1-MSS-RMC101:MSS_DISABLE	

- A central launcher is used to access developer GUIs

L3 | Version: 2.1.0.38 | User: HAPLS-deploy-hapls_admin

L3

Search:

RMC303	SPIDER	Spectrometer	Dazzler	
RMC305	Holzworth	Energy Meters		
RMC307	<div>N/C</div> L3 VCS			
RMC308	PV Publisher			
RMC309	PV Publisher 2			
RMC310	PV Publisher 3			
RMC311	Camera Manager	Pointing		
RMC312	Camera Manager	Pointing		
RMC313	Camera Manager			
RMC314	PAD Motion	Trigger Fanout		
RMC315	Motion			
RMC316	L3 PSS	L3 PNEU LT4-5	L3 PNEU LT1-2	L3 PNEU Compre
RMC317	L3 VCS CMP	L3 VCS BIS	L3 VCS ENV	
RMC318	CompMCS			
RMC319	Camera Manager			
RMC320	Camera Manager	Motion		
CRIO310	Utilities			
RMC03-021	Camera Manager			
RMC03-022	Camera Manager			
RMC03-023	Camera Manager			
RMC03-024	Camera Manager			
RMC03-025	Camera Manager			
RMC03-026	Camera Manager			

EPICS GUIs

L3 PSS

E3 Alignment

E4 Alignment

E5 Alignment

L3 Compressor VCS

L3 PNEU

Martin2.0

UPM156

Dazzler phase control

SPIDER

E2 Alignment

L3BT MSS

Listbox

PV LIST

HAPLS_Shared

CFG PROBE

ELI B&D

MANUAL


NOTE

PTP

 - PTP offset

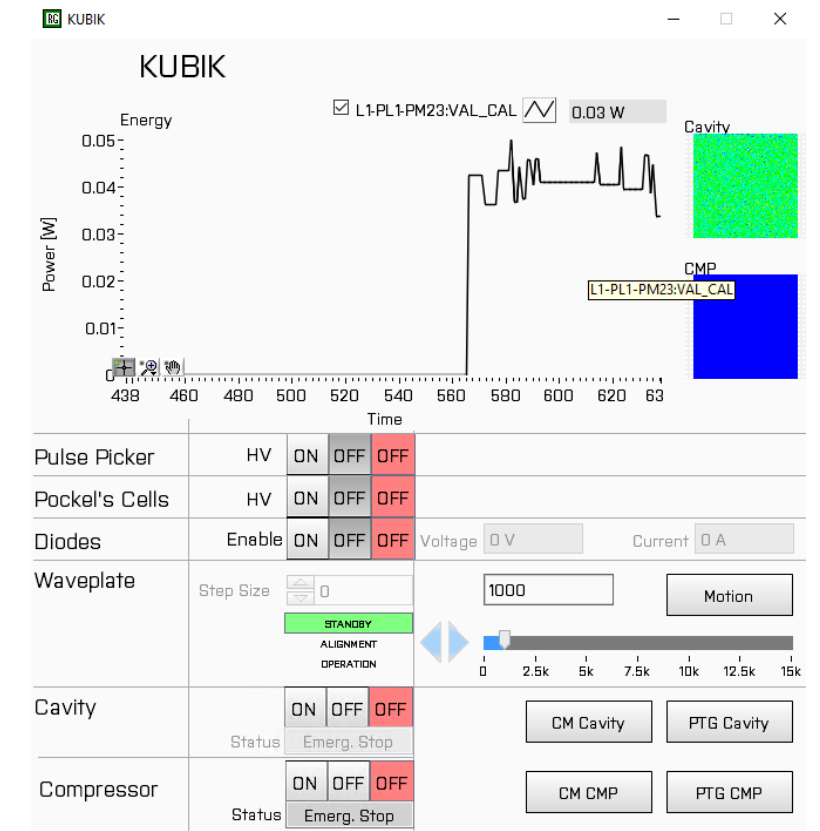
N/C

 - PV disconnect



- EPICS GUIs use a special template that defines their appearance but allows various PVs to be added as data sources
- This is stored in the database and it is modifiable using an editor

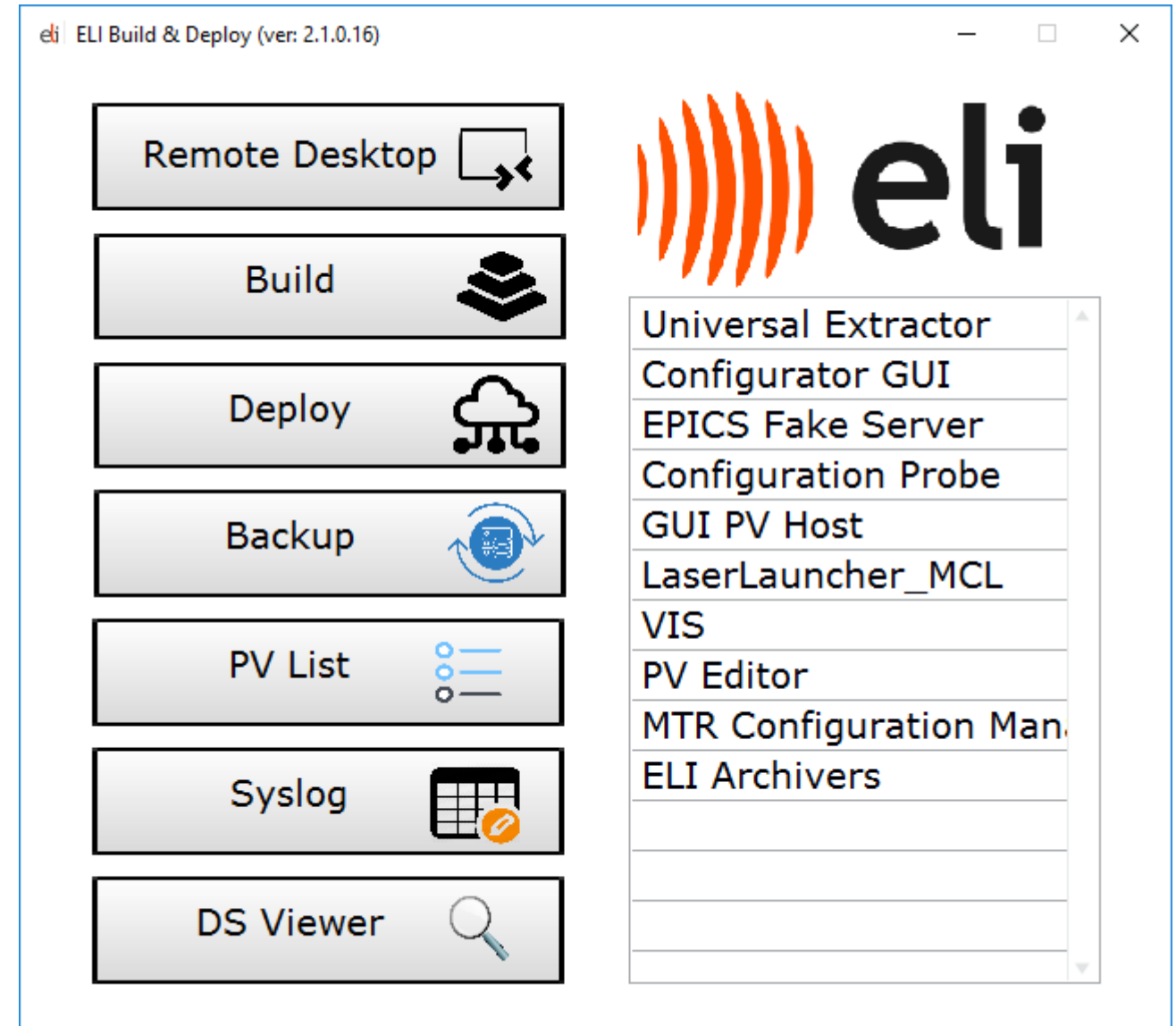
Control Name	PV linked
Fundamental Spectrum	L1-PL1-PM23:VAL_CAL
GUI Name	
PC Status	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on_RBV
PC Off	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on
PC On	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on
Diodes	L1-FE-L1_1-BB-PL1-RA-LH-PL-PS:Out_Enable_RBV
Diodes OFF	L1-FE-L1_1-BB-PL1-RA-LH-PL-PS:Out_Enable
Diodes ON	L1-FE-L1_1-BB-PL1-RA-LH-PL-PS:Out_Enable





Build & Deploy

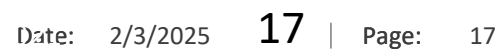
- Central app allows access to various tasks





Build & Deploy (Build)

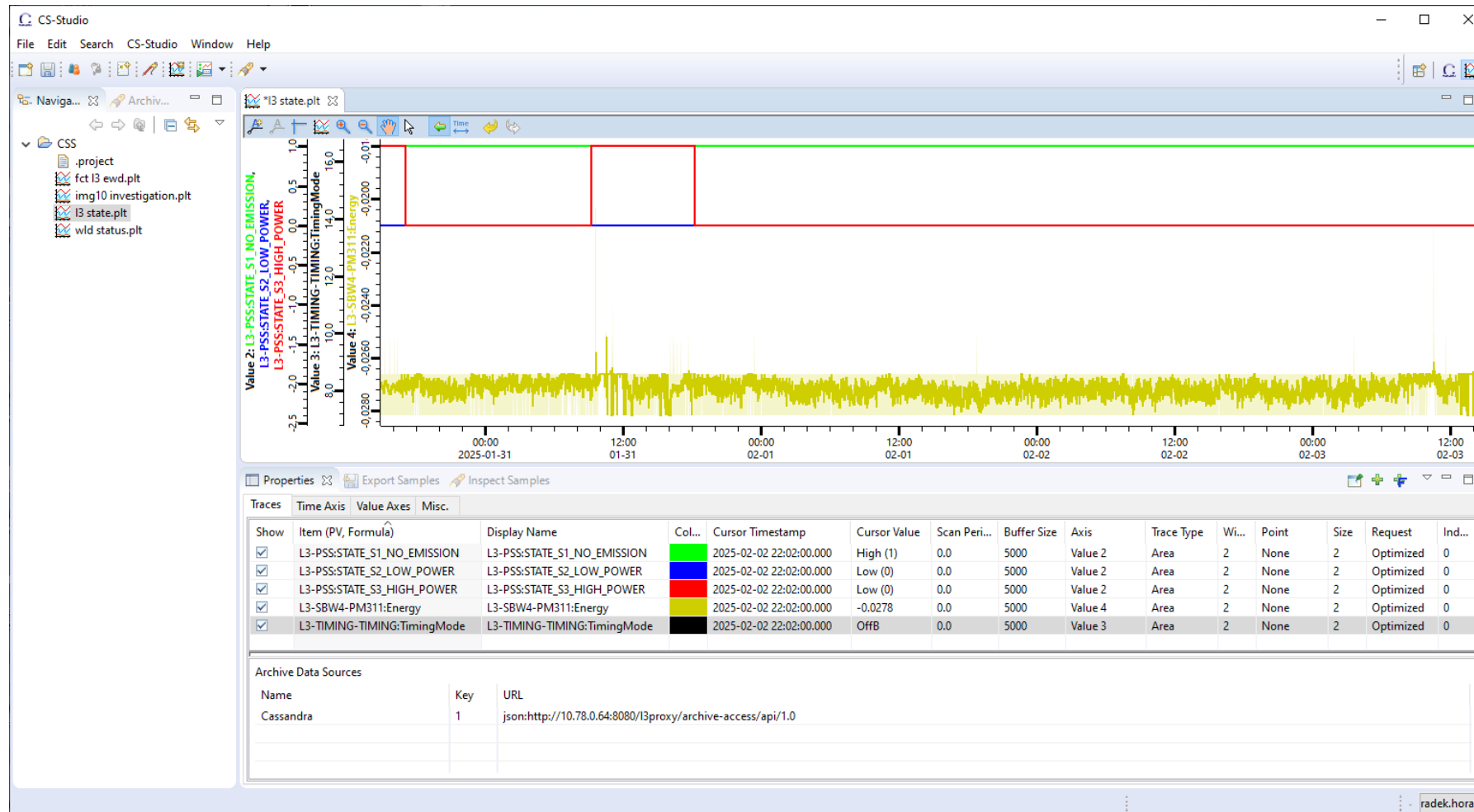
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Archiving

- Raw archived data are stored centrally for all lasers





Thank you
for your attention!

Author: Radek Horalek
(radek.horalek@eli-beams.eu)

