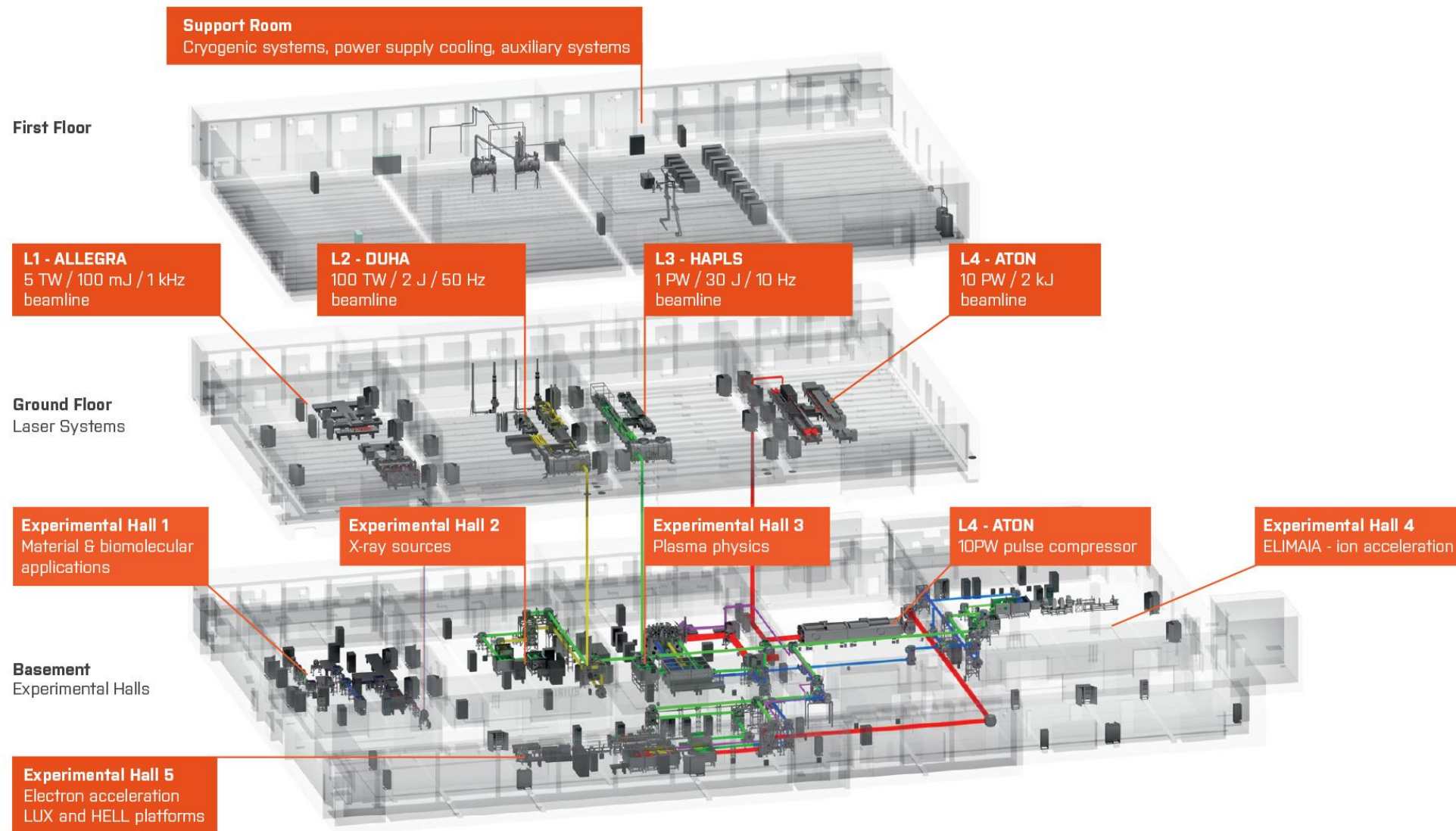


# ELI LCS Overview

Petr Mazůrek  
Birgit Plötzeneder



# ELI Beamlines in a nutshell



User operations since 2019  
Currently late-stage commissioning /ramp-up

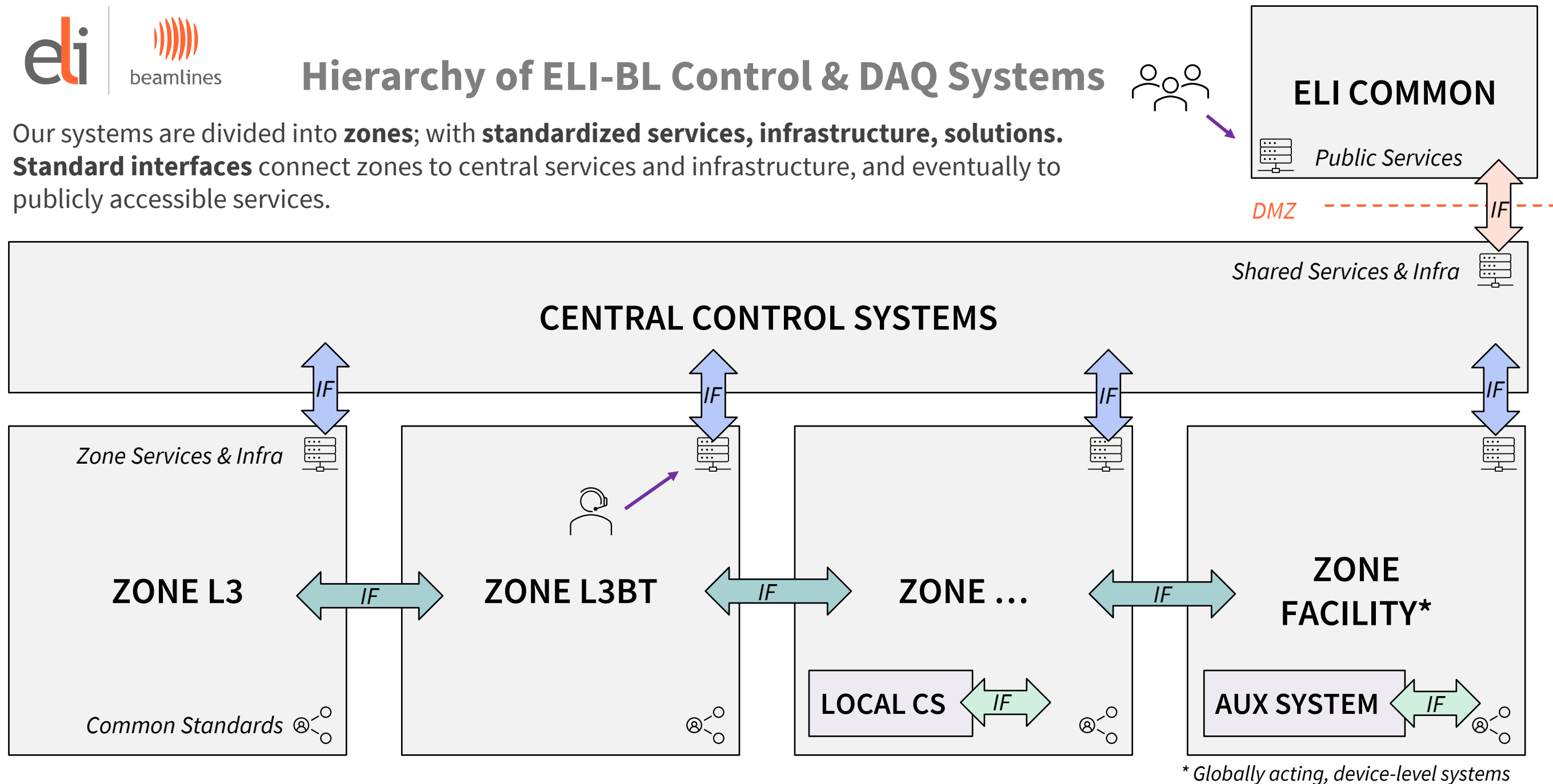


Located in Dolní Břežany, Czech Republic



# Hierarchy of ELI-BL Control & DAQ Systems

Our systems are divided into **zones**; with **standardized services, infrastructure, solutions**. **Standard interfaces** connect zones to central services and infrastructure, and eventually to publicly accessible services.

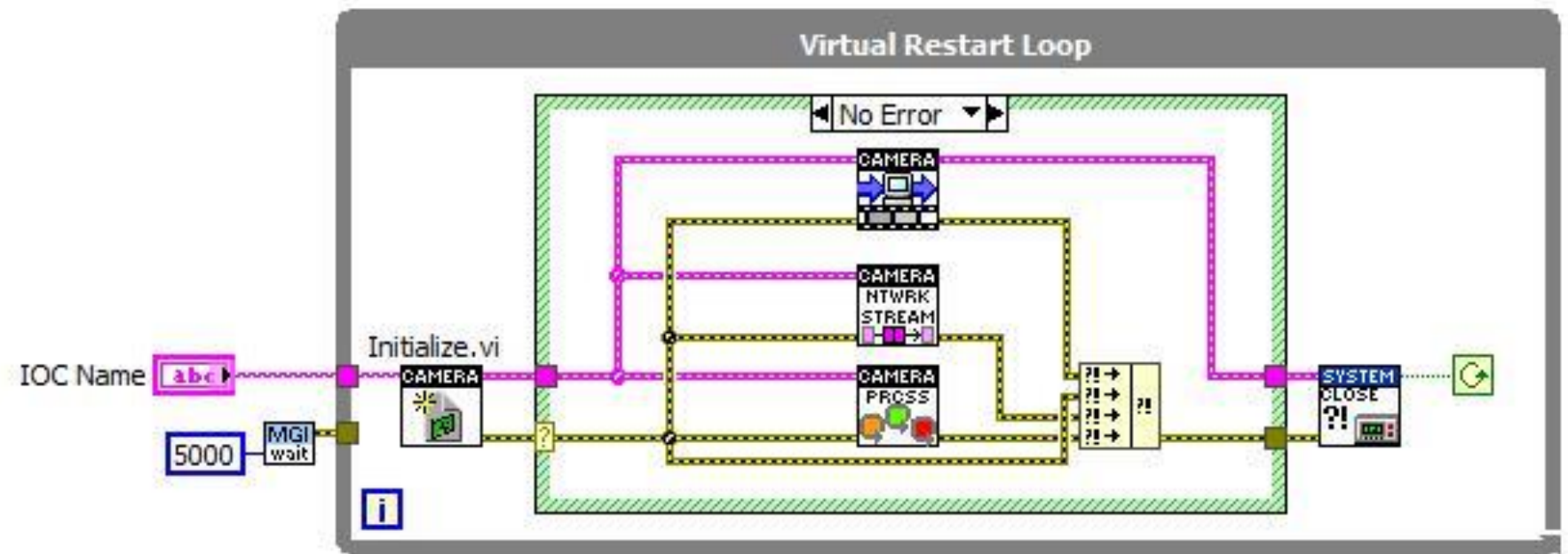
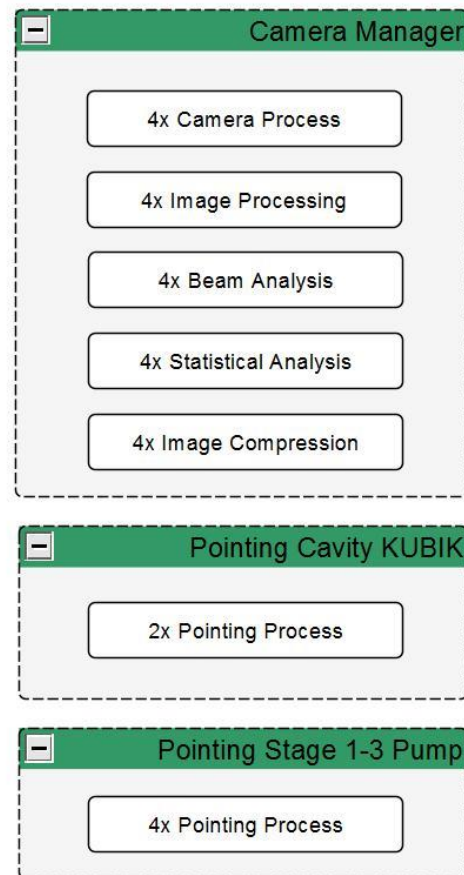




# Laser Control Systems



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



## **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, client compatible with EPICS 7 (ca only)
- Enables transfer of data using TCP/IP with additional features

## FPGA

- 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



## RT

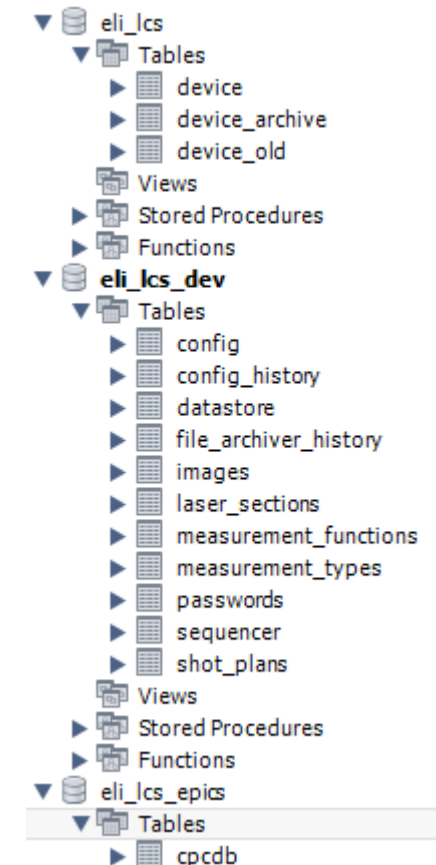
- Supported OS: ETS PharLap, NI RT Linux, Win10
- RMC 8354 (matured)
- KISS 1U Short V3 CFL
  - Intel i7-9700E (8Core/2,6GHz)
  - 8GB DIMM DDR4 2666
- Real-time controllers can be virtualized



- Database contains information about all the PVs and IOCs

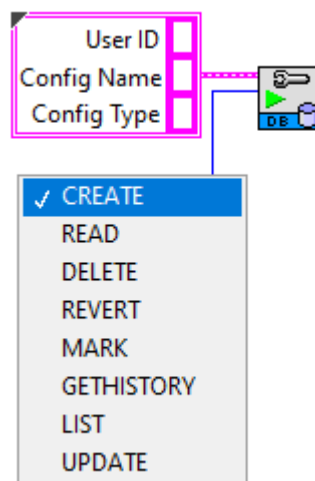
id	pv_name	cp_ta	gr	device_id	ioc_id	datastore_id	pv_t	ds_type	nelm	pv_class
802	L1-FE-PM01:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone 0:CH1 Data	AI	DBL	NULL	LABIOC_AI
803	L1-FE-PM24:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone 0:CH2 Data	AI	DBL	NULL	LABIOC_AI
804	L1-FE-PM04:VAL_CAL	NULL	NULL	RMC123	EDS	EDS-Zone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




## User Interfaces



L1 | Version: 2.1.0.34 | User: ALLEGRA-Deploy-petr.mazurek

## L1



Search:

ALLEGRA-SEQ	TestStand IOC		
RMC101	 Camera Manager	Pointing Cavity KUBIK	Pointing R:
RMC102	 Camera Manager	ScAC	Motion
RMC103	Camera Manager	TEC Temp Control	Pointing S
RMC104	Camera Manager	Pointing Stage 1-3 Pump	ScAC KUB
RMC105	 Camera Manager	Pointing Stage 4 Pump	Jitter IOC
RMC106	Camera Manager	Pointing DIRA 1	Pointing D
RMC107	Camera Manager	Motion RIO15 M0toM7	Motion RIO
RMC108	Camera Manager	ENV1	Pointing M
RMC109	Camera Manager	AO	

### EPICS GUIs

DIRA 1  
DIRA 2  
DIRA 3  
EDS BL Overview  
KUBIK  
KUBA  
L1 MSS FRONT END  
L1 MSS BEAMLINE  
L1 FRONTEND PSS  
L1 BEAMLINE PSS

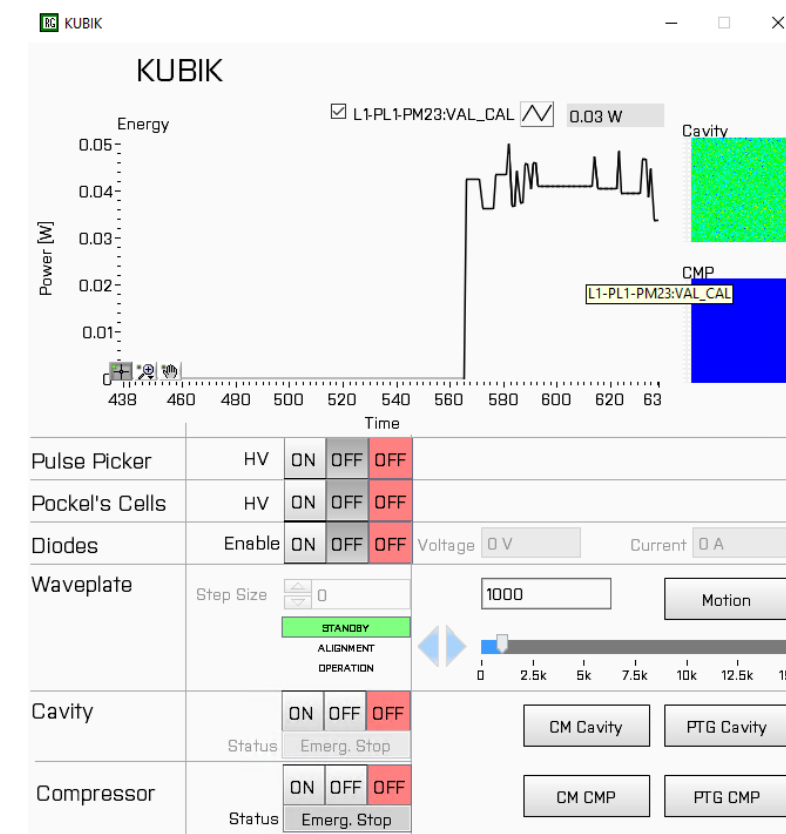
 PV LIST
  ALLEGRA\_Shared
  CFG PROBE
  ELI B&D
 MANUAL
 NOTE

 - PTP offset  
 - 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

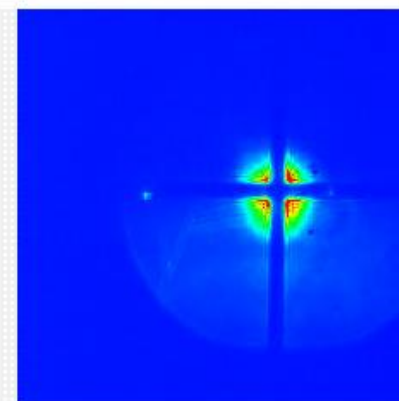
Control Name	PV linked
Fundamental Spectrum	L1-PL1-PM23:VAL_CAL
GUI Name	
PC Status	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on_RBV
PC Off	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on
PC On	L1-FE-L1_1-BB-PL1-RA-PC-HV:HV-on
Diodes	L1-FE-L1_1-BB-PL1-RA-LH-PL-PS:Out_Enable_RBV
Diodes OFF	L1-FE-L1_1-BB-PL1-RA-LH-PL-PS:Out_Enable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



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

## E3 Alignment

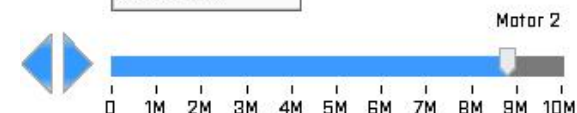
L3BT-S1-C514:IMG



5516083



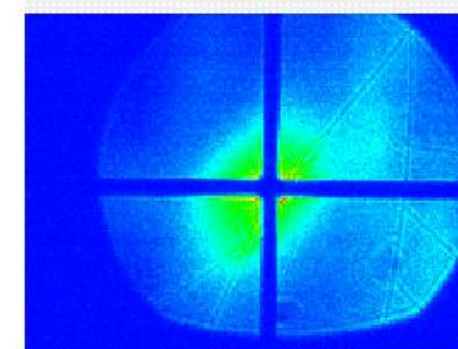
8767060



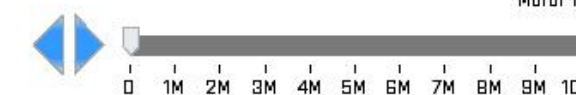
Step Size Cam1

0

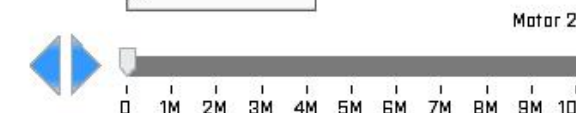
L3BT-S4-C516:IMG



0

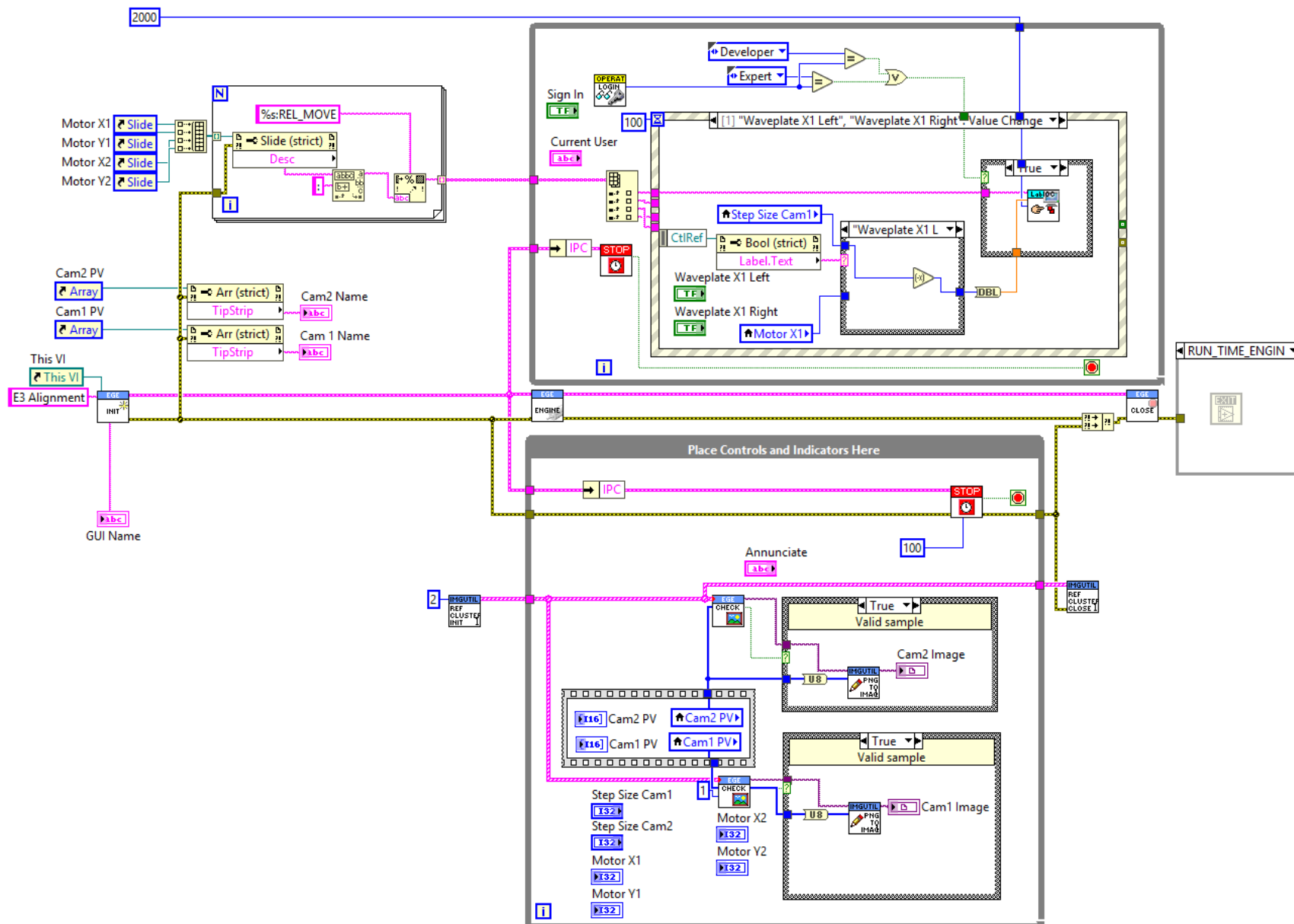



0




Step Size Cam2

0




 **FZU** Institute of Physics  
of the Czech  
Academy of Sciences


 **The Czech Academy  
of Sciences**





# Deployment

eli ELI Build & Deploy (ver: 2.1.0.10)


Remote Desktop 


Build 

Deploy 

Backup 

PV List 

ELI PV Editor 

DS Viewer 



ELI TestStand Manager  
Configurator GUI  
EPICS Fake Server  
Configuration Probe  
GUI PV Host  
LaserLauncher\_MCL  
VIS  
PV Editor  
MTR Configuration Mana

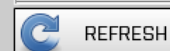
eli ELI Build Utility

ELI Build Utility



Configurations

Name	Date Modified
All Tools	2022-07-21 08:55:04
All EPICS GUIs	2022-07-21 12:14:03
All GUIs	2023-03-15 21:58:09
All RMCs	2021-09-21 16:03:24



L1

Configuration Name

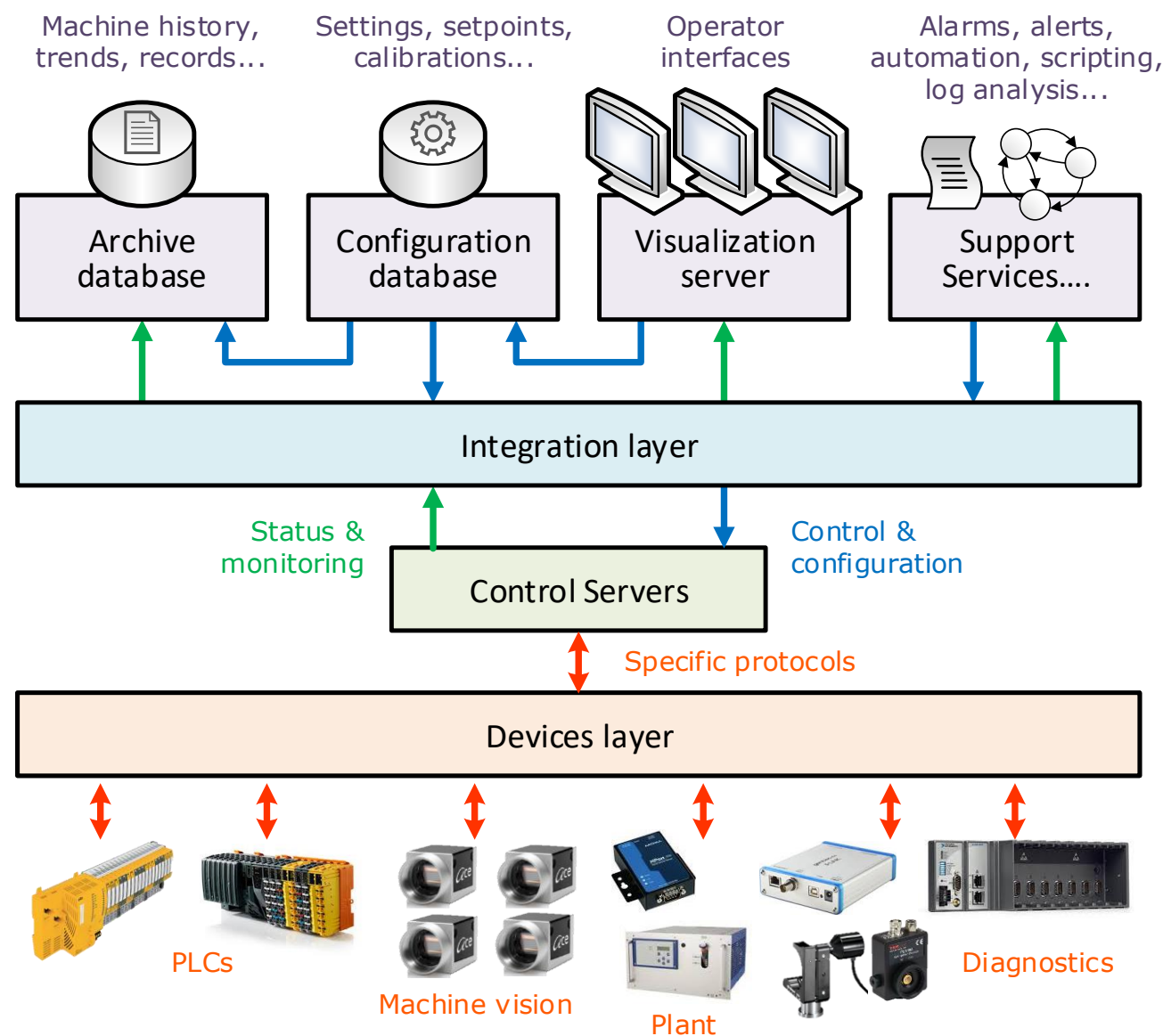
All RMCs

Status

Timestamp	Target Name

Machines to Build

Machine Name	Project Path	BuildSpec Name
RMC101	\\L1\\Deployment\\RMC101.lvproj	RMC101
RMC102	\\L1\\Deployment\\RMC102.lvproj	RMC102
RMC103	\\L1\\Deployment\\RMC103.lvproj	RMC103
RMC104	\\L1\\Deployment\\RMC104.lvproj	RMC104
RMC105	\\L1\\Deployment\\RMC105.lvproj	RMC105
RMC106	\\L1\\Deployment\\RMC106.lvproj	RMC106
RMC107	\\L1\\Deployment\\RMC107.lvproj	RMC107
RMC108	\\L1\\Deployment\\RMC108.lvproj	RMC108
RMC109	\\L1\\Deployment\\RMC109.lvproj	RMC109
RMC110	\\L1\\Deployment\\RMC110.lvproj	RMC110
RMC111	\\L1\\Deployment\\RMC111.lvproj	RMC111
RMC112	\\L1\\Deployment\\RMC112.lvproj	RMC112
RMC113	\\L1\\Deployment\\RMC113.lvproj	RMC113
RMC114	\\L1\\Deployment\\RMC114.lvproj	RMC114
RMC115	\\L1\\Deployment\\RMC115.lvproj	RMC115





# See you around!

[petr.mazurek@eli-beams.eu](mailto:petr.mazurek@eli-beams.eu)

[birgit.ploetzeneder@eli-beams.eu](mailto:birgit.ploetzeneder@eli-beams.eu)

[www.eli-beams.eu](http://www.eli-beams.eu)

