TUPV028

THE CONTROL AND ARCHIVING SYSTEM FOR THE GAMMA BEAM PROFILE STATION AT ELI-NP

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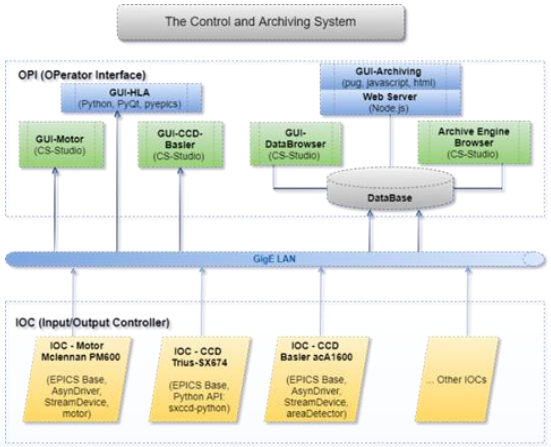
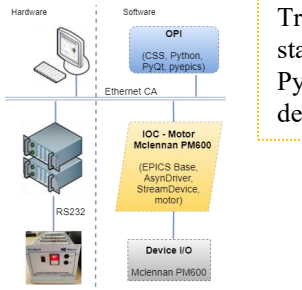
INTRODUCTION

The Variable Energy Gamma (VEGA) System of Extreme Light Infrastructure - Nuclear Physics (ELI-NP) will produce intense gamma-ray beams with a spectral density higher than 0.5 x 104 photons/eV/s, a relative energy bandwidth better than 0.5%, high degree of linear polarization at more than 95%, and energy continuously variable from 1 MeV up to 19.5 MeV based on the laser Compton backscattering of laser photons off a relativistic electron beam.

The EPICS based CAS for all the diagnostics stations will be designed and implemented by ELI-NP, to provide the machine information connection with the VEGA CS, to collect data from devices in the diagnostics stations, to monitor status of the devices, and to provide the High-Level Software (HLS) for the Gamma Beam Diagnostics.

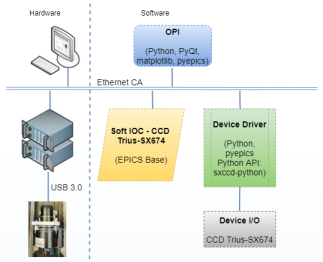


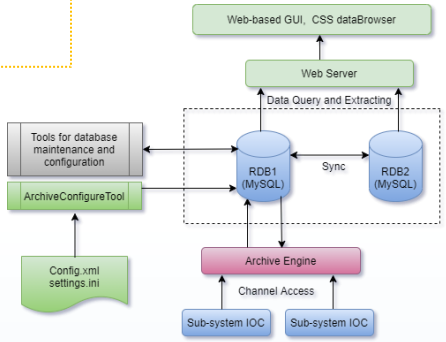
SYSTEM DESIGN AND CONFIGURATION



Trius-SX674 CCD camera is not a standard genicam camera
Python API sxccd-python as the device support module

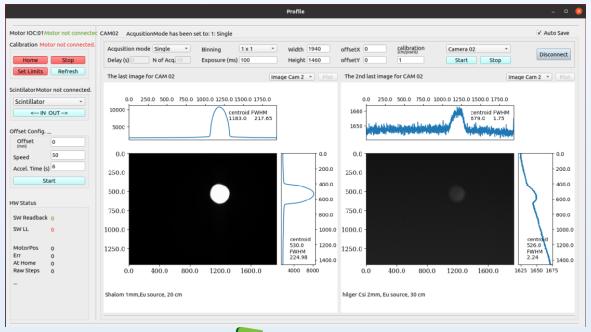
Mclennan PM600 is supported by the EPICS device support module motor record.

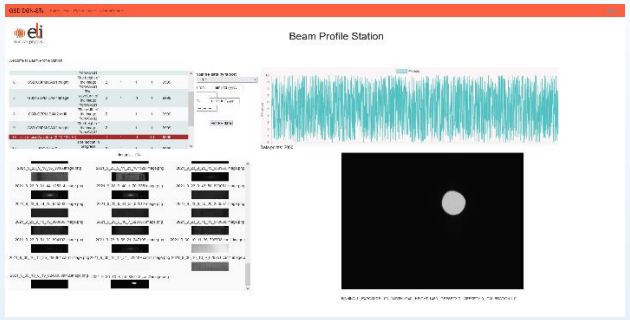




IMPLEMENTATION

The operator interface, the GUI is implemented using python3 and PyQt5.





The web server and the web-based GUI for the archiving system is implemented based on Node.js, Express, MySQL, Sequelize, Javascript, Pug, HTML, and VS code.

python · Qt · EPICS · control system studio · C/C++

CONCLUSION and ACKNOWLEDGEMENT

The work was supported by the Project Extreme Light Infrastructure - Nuclear Physics (ELI-NP). The author would like to thank Dr. Marian TOMA for his valuable comments and suggestions.

The Variable Energy Gamma (VEGA) System of Extreme Light Infrastructure - Nuclear Physics (ELI-NP) will produce intense gamma-ray beams with a spectral density higher than 0.5 x 104 photons/eV/s, a relative energy bandwidth better than 0.5%, high degree of linear polarization at more than 95%, and energy continuously variable from 1 MeV up to 19.5 MeV based on the laser Compton backscattering of laser photons off a relativistic electron beam.

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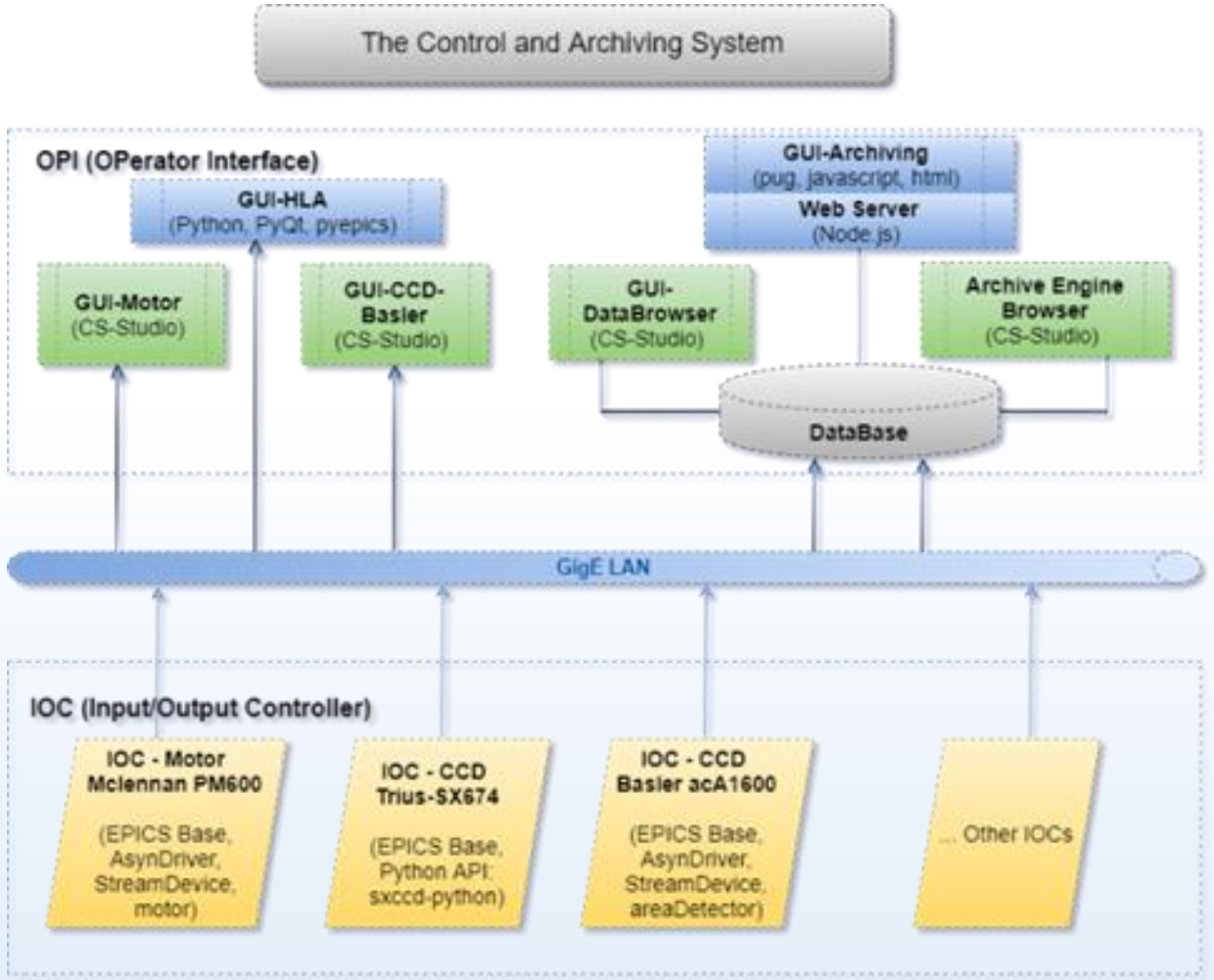
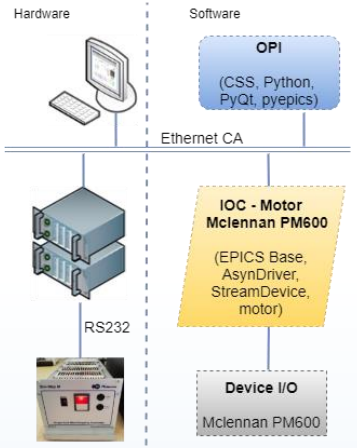


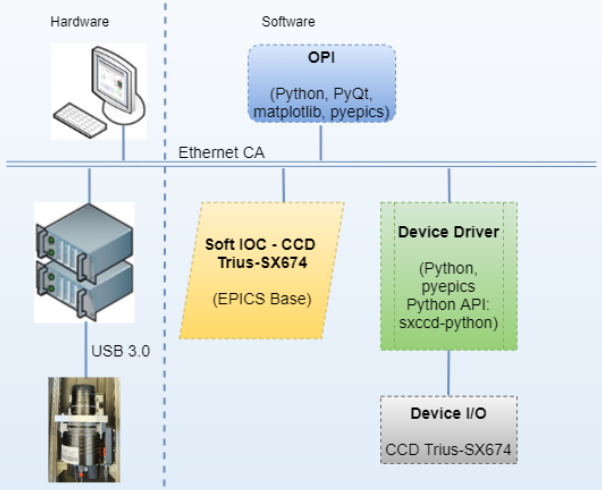
The control of the Beam Profile Station for Gamma Beam diagnostics includes one Mclennan PM600 motor controller and two Trius-SX674 CCD cameras.



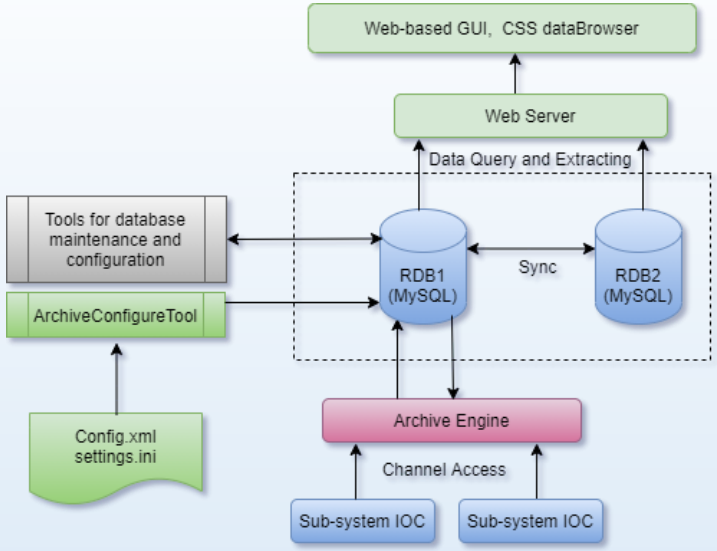
Mclennan PM600 is supported by the EPICS device support module motor record. The IOC can:

- read motor position from the controller's readback register
- get readback information while the motor is moving
- trigger a forward link when a complete motion is finished.

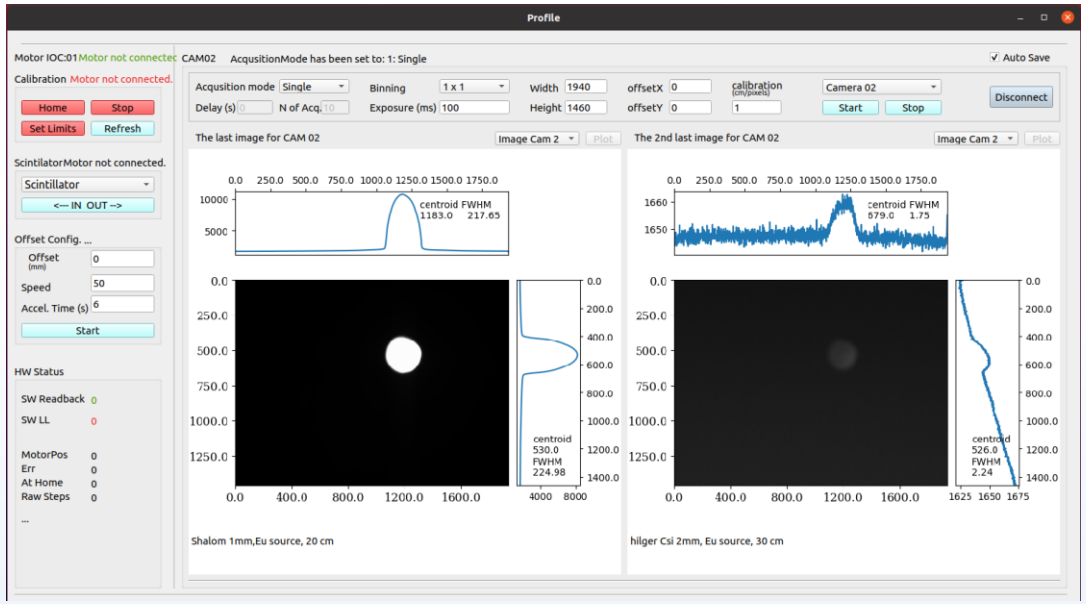
- Trius-SX674 CCD camera is not a standard genicam camera
- The driver aravisGigE and areaDetector cannot be used
- Python API sxccd-python as the device support module
- A driver wrapper need to be implemented
- A soft IOC will deal with the EPICS databases for the CCD camera control.

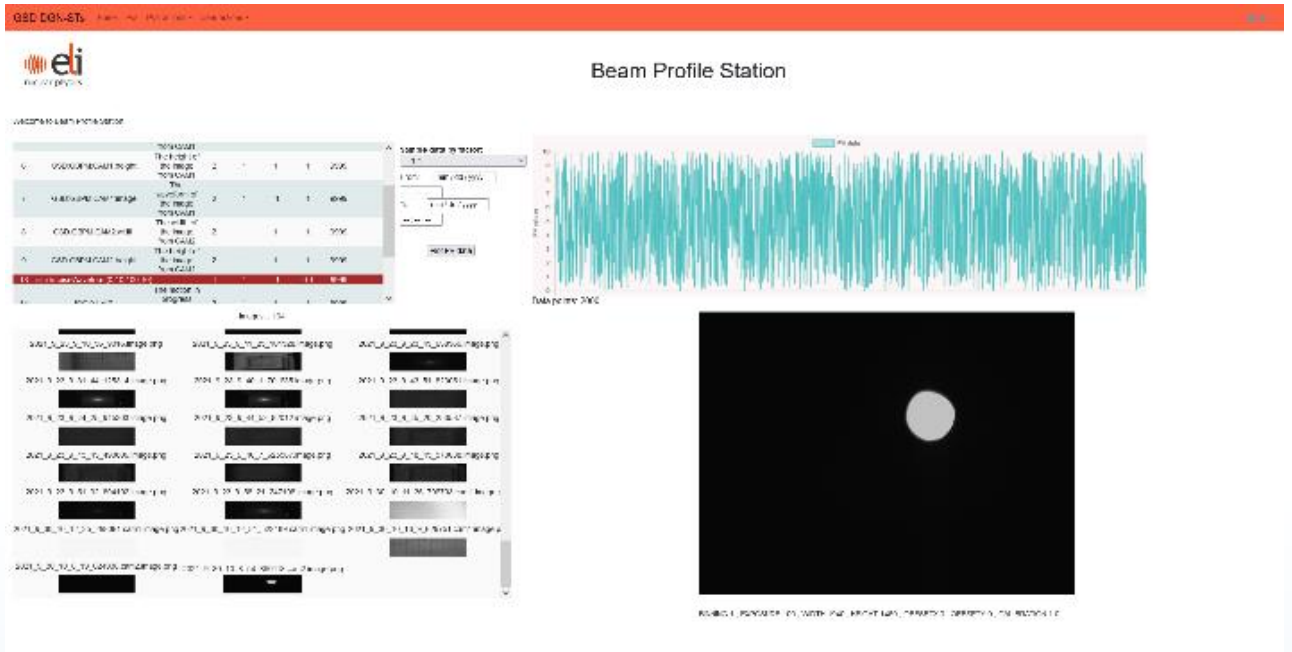


- The Archive Engine samples Process Variable (PV) data, time stamp etc., from EPICS IOCs via Channel Access and places them in a Relational Database.
- Users can access the historic data from the database as well as the live data from the PV channels using the CSS Data Browser.
- Config.xml and settings.ini are the two basic configuration files needed to configure the database by using the provided ArchiveConfigureTool.
- PhpMyAdmin is used as the tool for database maintenance and configuration.



The operator interface, the GUI is implemented using python3 and PyQt5. Some other python modules, such as numpy, pyepics, threading, and matplotlib etc., are also imported for the development.





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python

Qt

EPICS

control system studio

C/C++

CONCLUSION and ACKNOWLEDGEMENT

- We have implemented an EPICS based control and archiving system for the Beam Profile Station at ELI-NP. The devices Trius-SX674 CCD cameras and Mclennan PM600 controller has been integrated into the control system.
- The IOC for the CCD camera has been configured based on the Python API sxccd-python.
- The IOC for Mclennan PM600 controller has been configured using the version of the motor record motorR7-1, as well as other related modules in EPICS SynApps5-8.
- The GUI for the control has been implemented using python3 and PyQt5.
- The archive engine has been configured for the Profile Station.
- The web server and the web-based GUI have been implemented using the MVC pattern.

- This implementation has been proved as a professional programming structure that helps in maintenance and readability of the whole system.
- It is reliable enough for scaling up in the future implementation for other stations such as Beam Energy Station and Beam Polarization Station at ELI-NP.

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