MEDICIS high level control application

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ABSTRACT

CERN MEDICIS is a research facility that will produce radioisotopes for medical research using the primary proton beam at ISOLDE and ISOLDE-like targets. It will start operating later in 2017. In this framework, the high-level application for the new MEDICIS beam line is responsible for the control of various equipment, such as power supplies, faraday cups and scanners, as well as the monitoring of environmental parameters such as the vacuum level. It is characterised by a single user-friendly interface to facilitate the operators' tasks. In this paper, we provide arguments for the chosen solution and give the latest update on the status of the project.

HARDWARE SETUP

As any other beam line at CERN, MEDICIS is equipped with several beam instruments. Each instrument is provided by a CERN equipment group with an expert user interface. A unified graphical user interface, to control or monitor heterogeneous hardware is required to speed up the learning curve of newcomers. The communication layers can vary from a CERN protocol CMW, to Fetch/Write depending on the equipments.

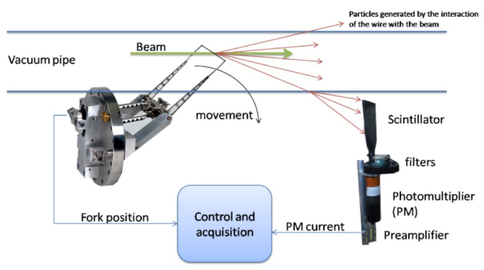
Power supplies

The CERN power converter team is dealing with the hardware installation, the low-level control including safety. The power team is providing communication layers linked to the equipment.

Faraday cup and wire scanner

A Faraday cup is a conductive cup designed to intercept charged particles in vacuum. The resulting current can be measured and used to determine the number of ions or electrons hitting the cup.

A wire scanner is a device measuring the transverse beam density profile in a particle accelerator by means of a thin moving wire.



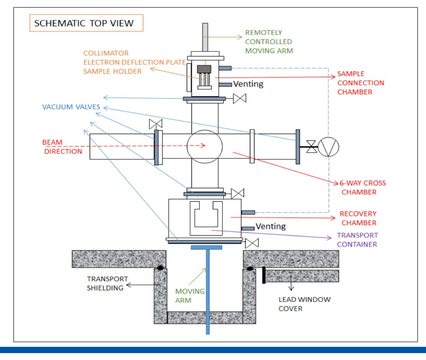
Vacuum

The vacuum team provides the expert interface to be able to control their installation on MEDICIS. They are publishing useful information for the unified graphical user interface through CMW.

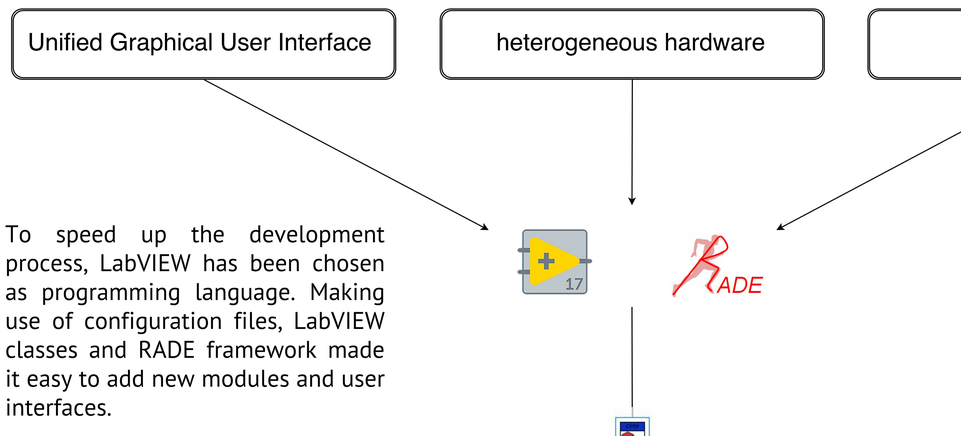
Collection Chamber

The ion beam will go to a collection chamber. The beam will be focused on samples where ions will implant.

EN-STI team is in charge of developing the mechanical parts as well as the PLC programming to ensure the basic movements and safety levels. Data will be exchanged with the high-level control interface using the Fetch/Write protocol from Siemens.

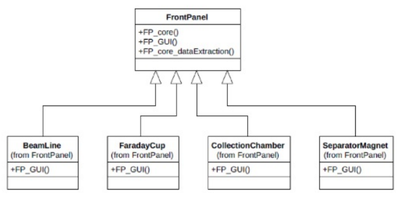


SOFTWARE ARCHITECTURE



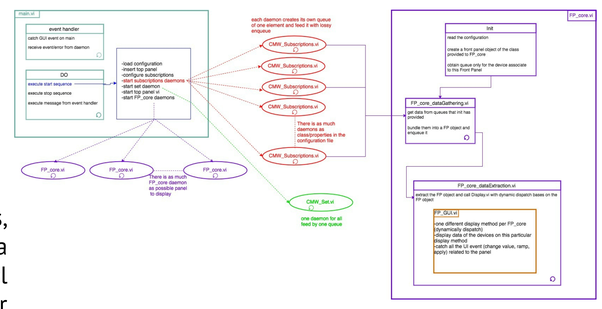
To speed up the development process, LabVIEW has been chosen as programming language. Making use of configuration files, LabVIEW classes and RADE framework made it easy to add new modules and user interfaces.

Skeleton of Front Panel hierarchy



As the final application has a lot of different graphical user interfaces, and they all have a lot of functionalities to share: run in parallel, get data from subscription, set a value, open additional function, the Front Panel class has been created to share all this functionality and specific User Interface can be developed with dynamic dispatch in FP_GUI.

The most important daemons are all the instances of CMWSubscription.vi. There is one instance per property per device. They collect all the data coming from all the devices. The second most important daemons are the FP_core.vi. They extract data from a list of devices coming from the configuration file, displaying them in the FP_GUI.vi attached.

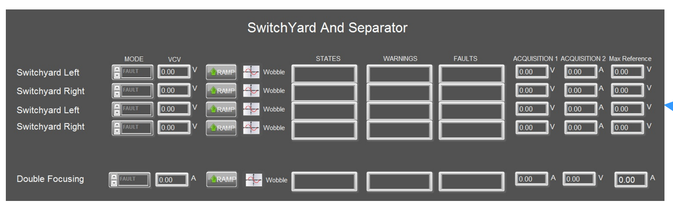


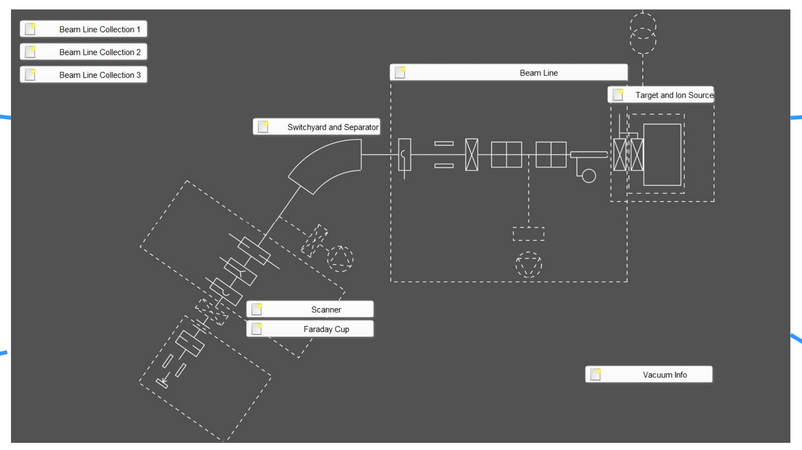
Software architecture

USER INTERFACE

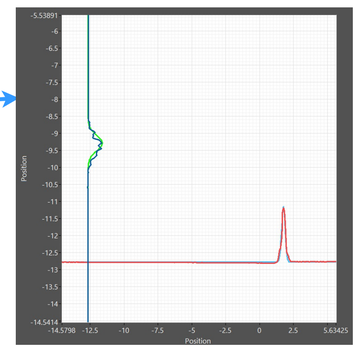
With the synoptic view of the facility the user can select different panels to open.

Power supply

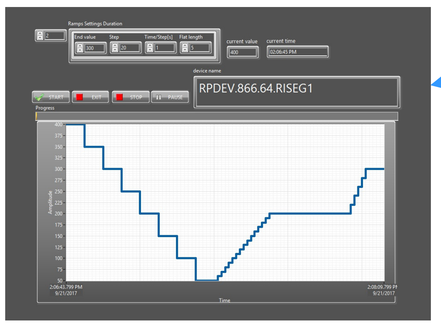




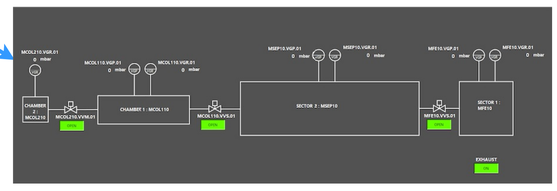
Scanner



Ramp control



Vacuum



Adding new hardware to display and control

Using the LabVIEW™ class architecture combined with the configuration file makes it easy to quickly react to new requests. It takes a few minutes to fill in the file with the data source information. This information is used to get or set data to the newly declared device. The fast development environment, ie LabVIEW™, allows the programmer to provide a new Graphical User Interface within a day. The acquisition data source is linked to a display in the configuration file.

CONCLUSIONS

The MEDICIS high level application has been developed in a very generic way, always considering the possibility of hardware modification during the construction of the facility. The use of LabVIEW, CERN common middleware and the RADE framework have speed up the development process. It is foreseen that the available user interfaces can be enhanced and/or replaced during the MEDICIS exploitation. Thanks to the availability of equipment in the CERN accelerator complex, it has been possible to validate drivers as well as communication layers before the operation of the machine.

A new system has been requested to appear in the high-level control application and we are gathering the communication information in order to quickly provide a new interface with summary information.