

Development of the future Spiral2 control system

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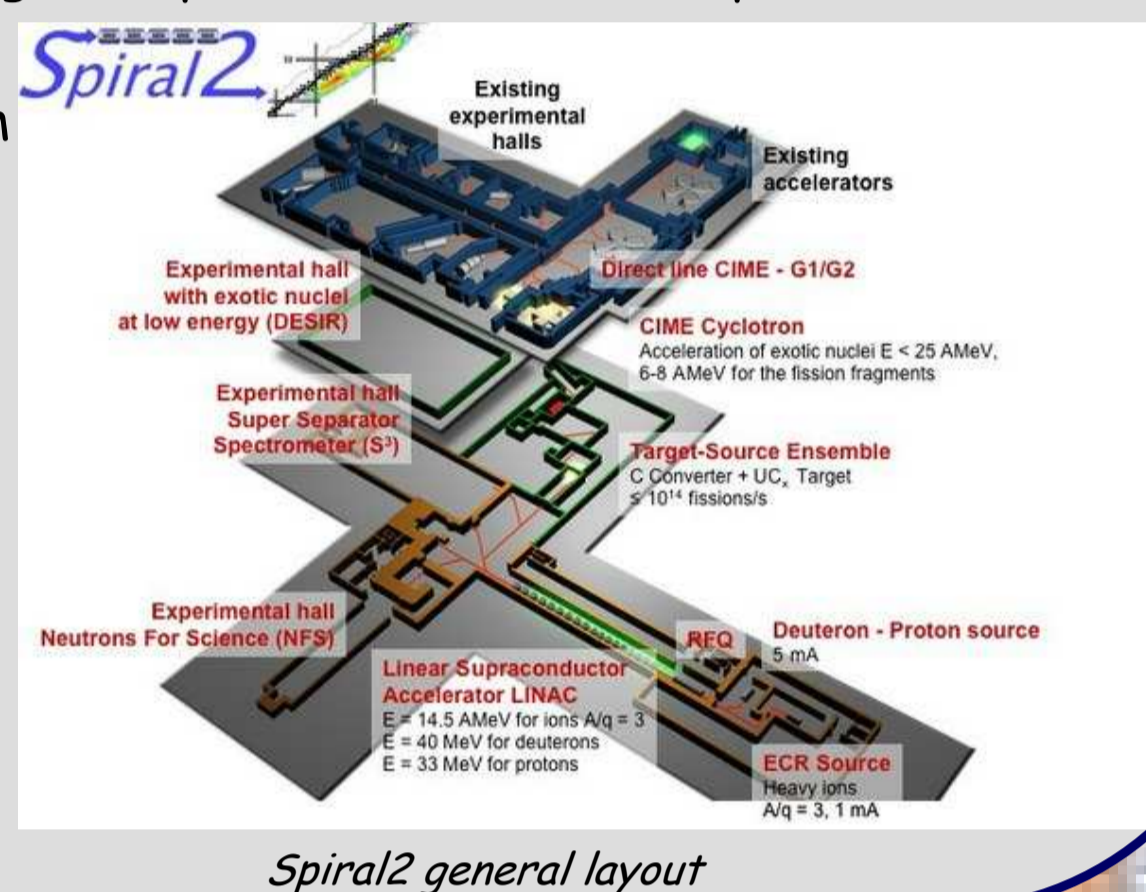
The Spiral2 project

The Spiral2 project aims at producing Rare Ion Beams (RIB) by ISOL and low-energy in-flight techniques and is coupled with the existing Ganil facility.

It is based on a multi-beam driver composed of two ECR sources (for $q/a=1/3$ heavy ions or deuterons), then a RFQ followed by a superconducting linac, the whole accelerator operating at 88.05 MHz. High energy beam transfer lines distribute the beam to a beam dump or to the experimental stable ion beam areas S3 and NFS or to the 200 kW target ion source system (10^{14} fission/s).

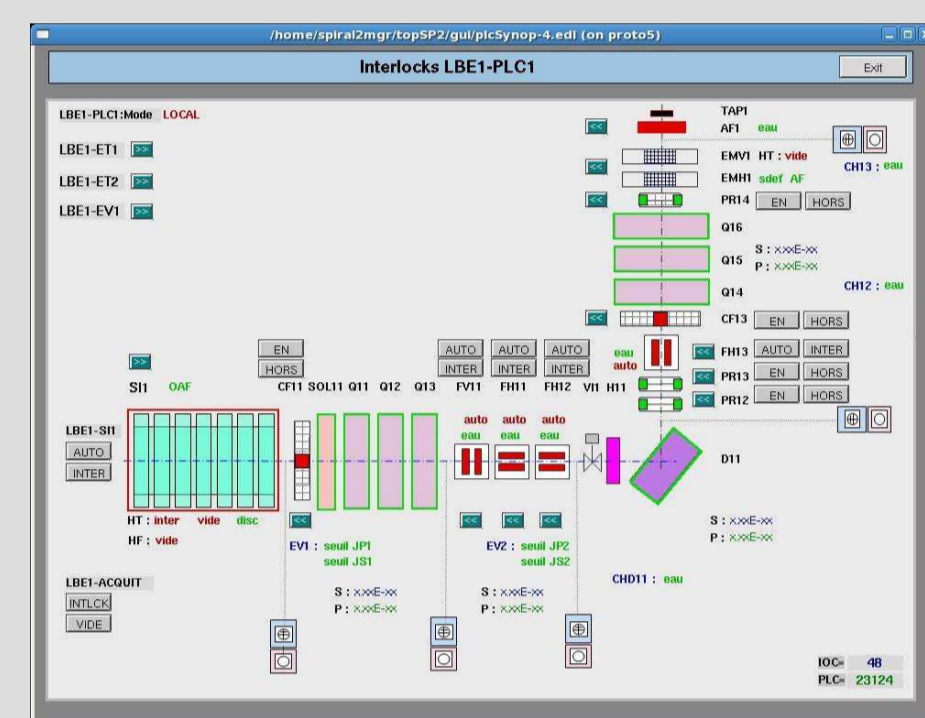
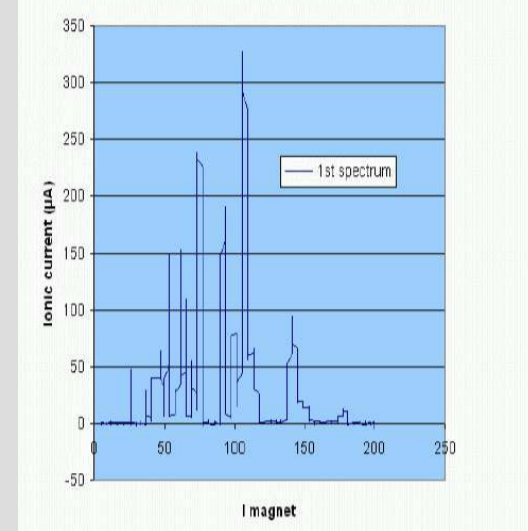
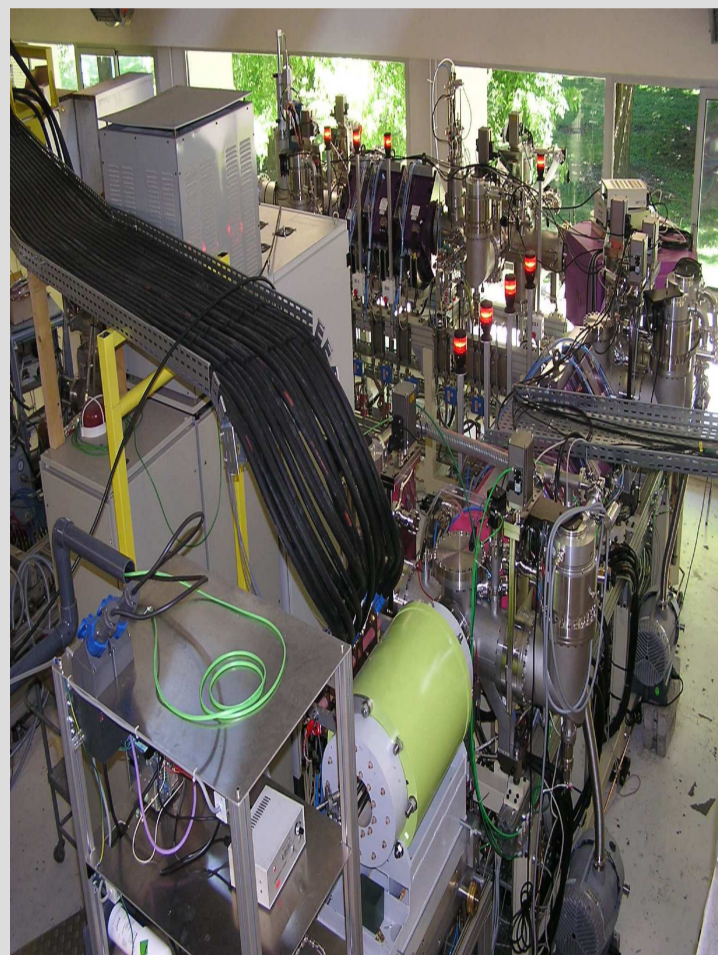
The RIB so produced is either sent to the new DESIR low energy experimental hall or post accelerated by the existing CIME cyclotron before being transported to the Ganil experimental switchyard.

The first stable beam is expected in 2012.



First beam tests

First beam tests started this year at LPSC (Grenoble) implying the ECR ion source ($q/a=1/3$) and the coupled low energy beam transfer line. It also constitutes the opportunity of integrating the first components of the future control system.



Control system overview

EPICS

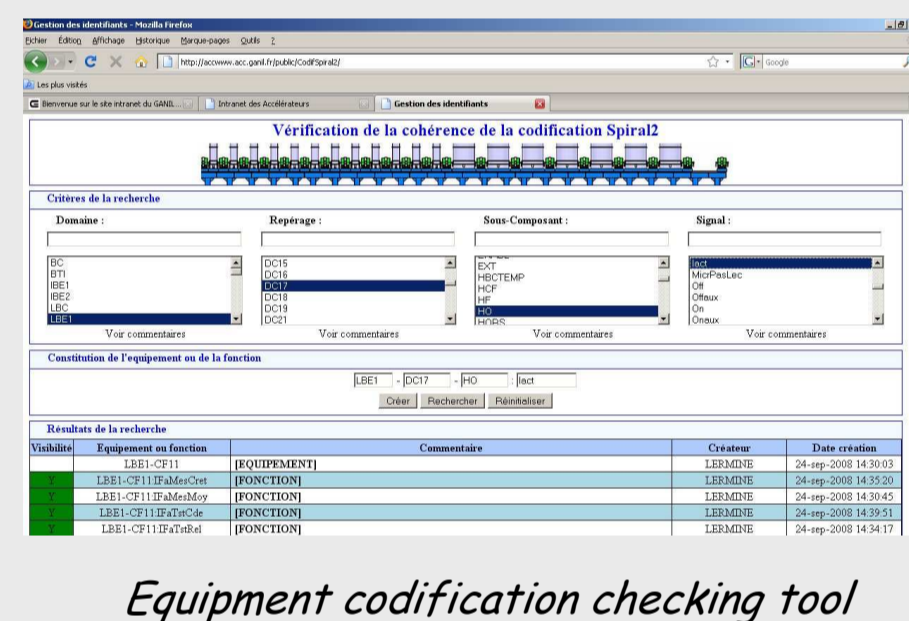
3.14.9 version

- ↳ Servers (IOCs):
 - ✓ Linux (Red hat Enterprise 5) PCs
 - ✓ VxWorks (6.5) VME chassis with MVME 5500 CPU
- ↳ Clients on Linux PCs:
 - ✓ Standard Epics tools (EDM, StripTool, ArchiveViewer, CSS ?)
 - ✓ Java applications (+ Xal ?)
- ↳ Equipment interfaces:
 - ✓ VME I/O boards
 - ✓ Modbus/TCP protocol
- ↳ PLCs:
 - ✓ Siemens s7
 - ✓ Modbus/TCP protocol
- ↳ Software management:
 - ✓ Eclipse
 - ✓ SVN

Specific topics

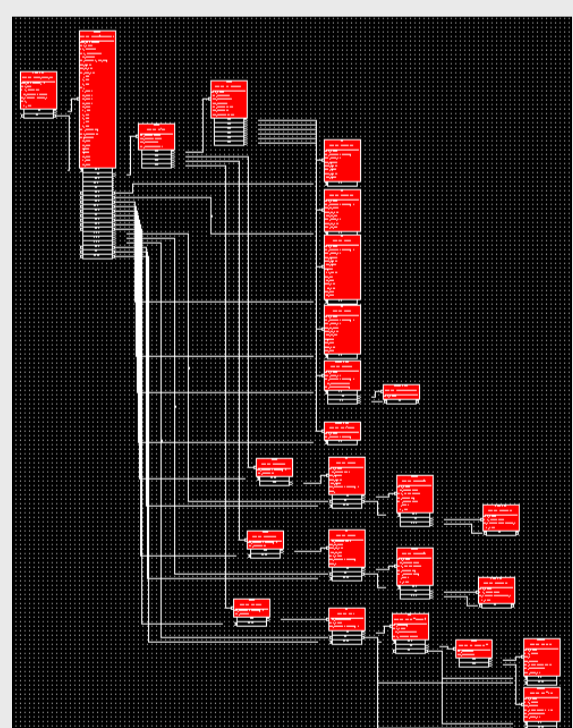
Equipment naming

Codification rules were established and a Web based tool (PHP technology) is in use to check coherency and integrity.



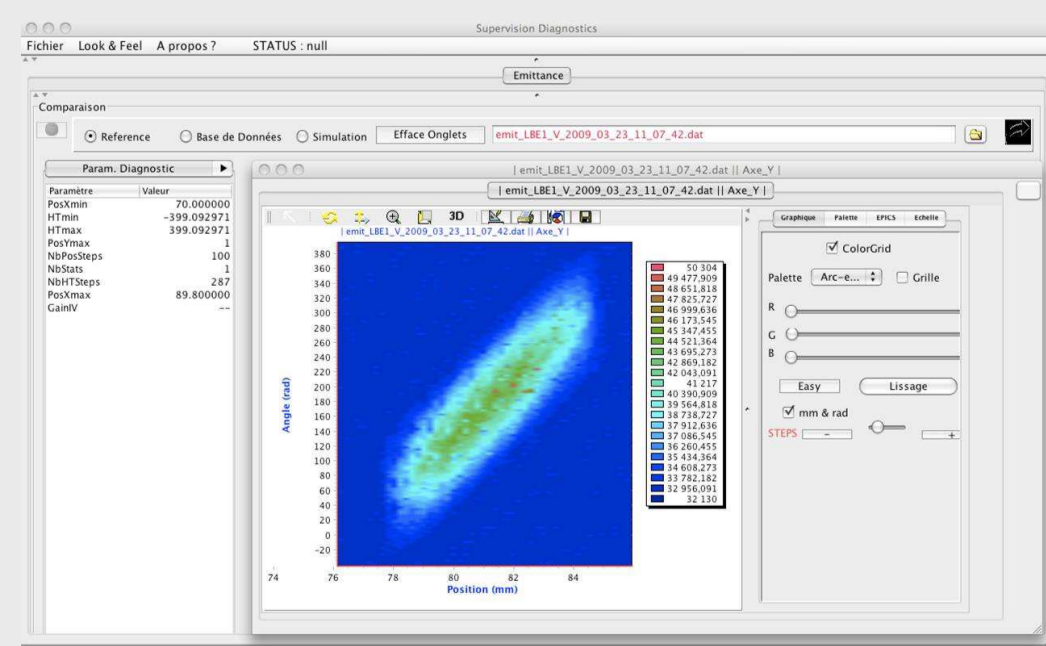
Power supplies interface

Power supplies are interfaced using the Modbus/TCP protocol over Ethernet from a soft IOC running on a Linux PC or within the VME/VxWorks environment. The development allows to interface either power supplies implementing a Ganil integrated Modbus/TCP interface (voltage regulated converters) or the first current regulated power supplies of the low energy beam transfer line. The Epics record database design makes use of Gensub records to implement data conversion as well as the local / distance commutation modes.



Emittance measurement

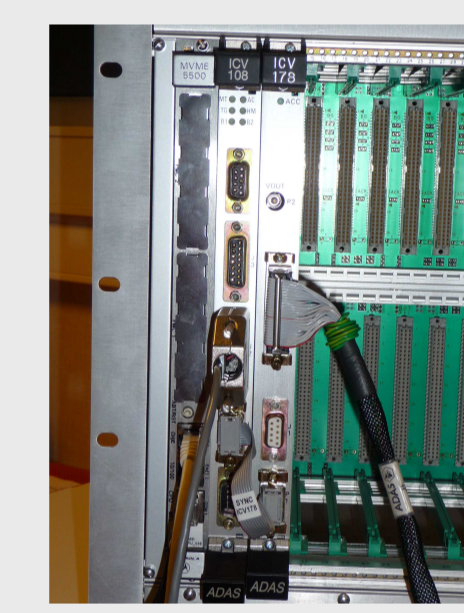
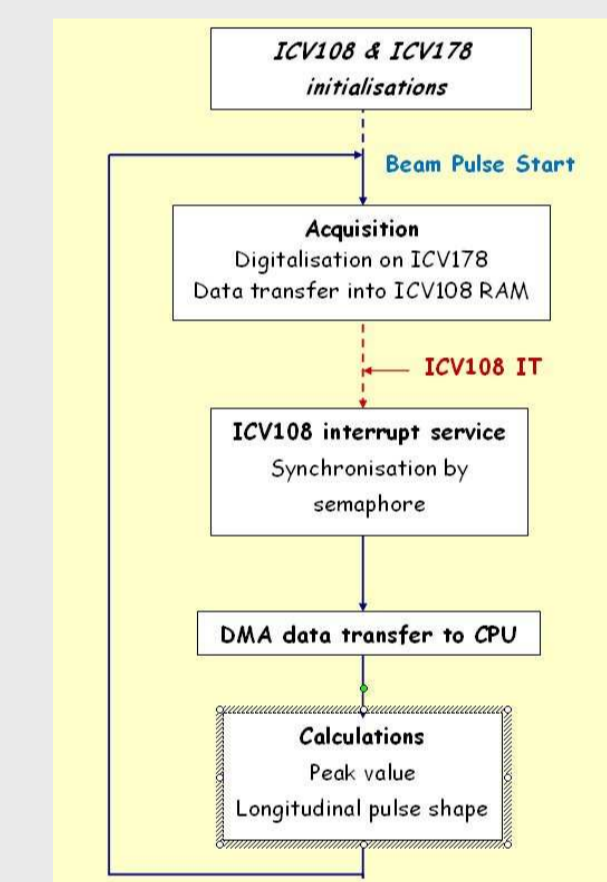
An emittance measurement system (Allison scanners) has been designed and tested with a real beam. The VME IOC configuration is achieved by an EDM screen while the emittance is displayed using a Java application addressing the IOC through the CAJ package. Interlocks and vacuum are controlled by a Siemens PLC.



Development of a triggered acquisition system

To measure the beam intensity (peak value) through Faraday Cups on the beam pulse width (ranging from 100 μ s at 1Hz for tuning to CW in delivery mode), two coupled VME boards were selected:

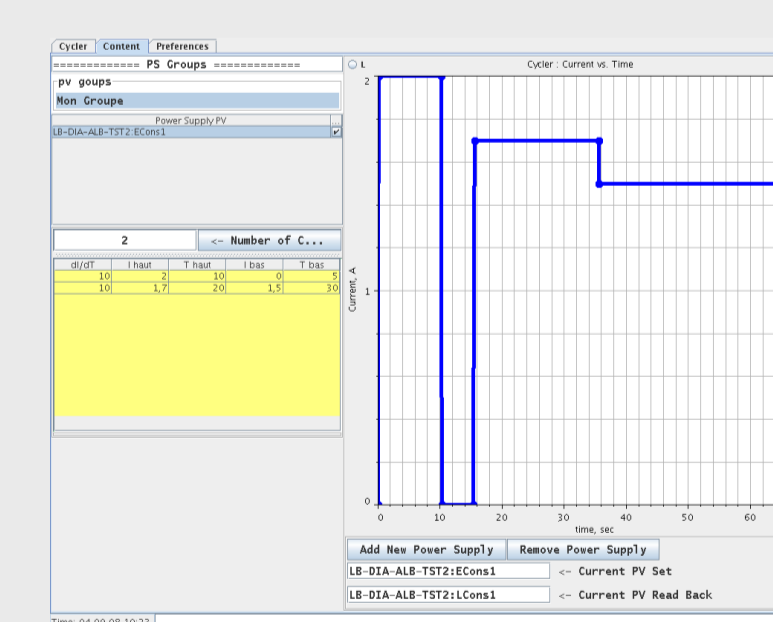
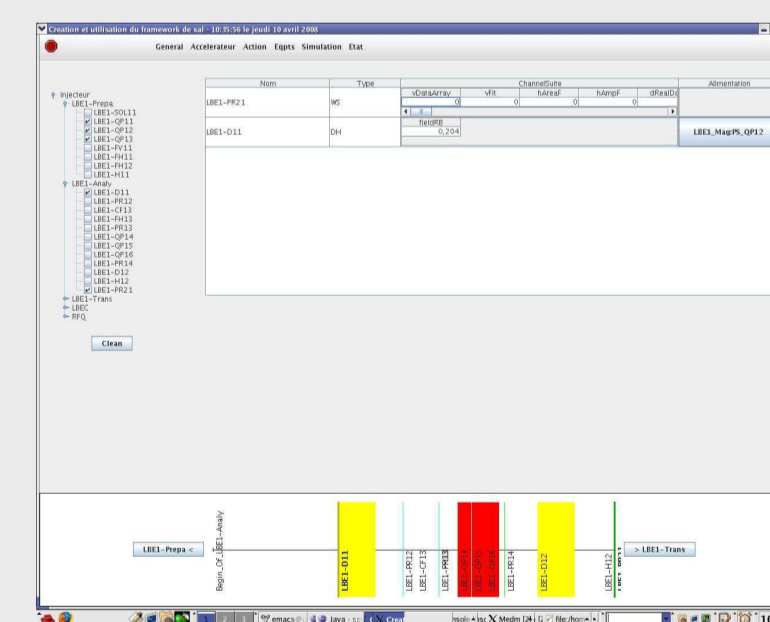
- ✓ An analog ADAS ICV 178 board with 16 bits resolution, 8 inputs and up to 1,2 MSamples/s
- ✓ A controller ADAS ICV 108 with external trigger, one RAM buffer of 4 Mbytes and running in "single event" or "flip flop" modes. Data transfer to the CPU is performed in DMA mode.



Software development is currently in progress.

High level applications

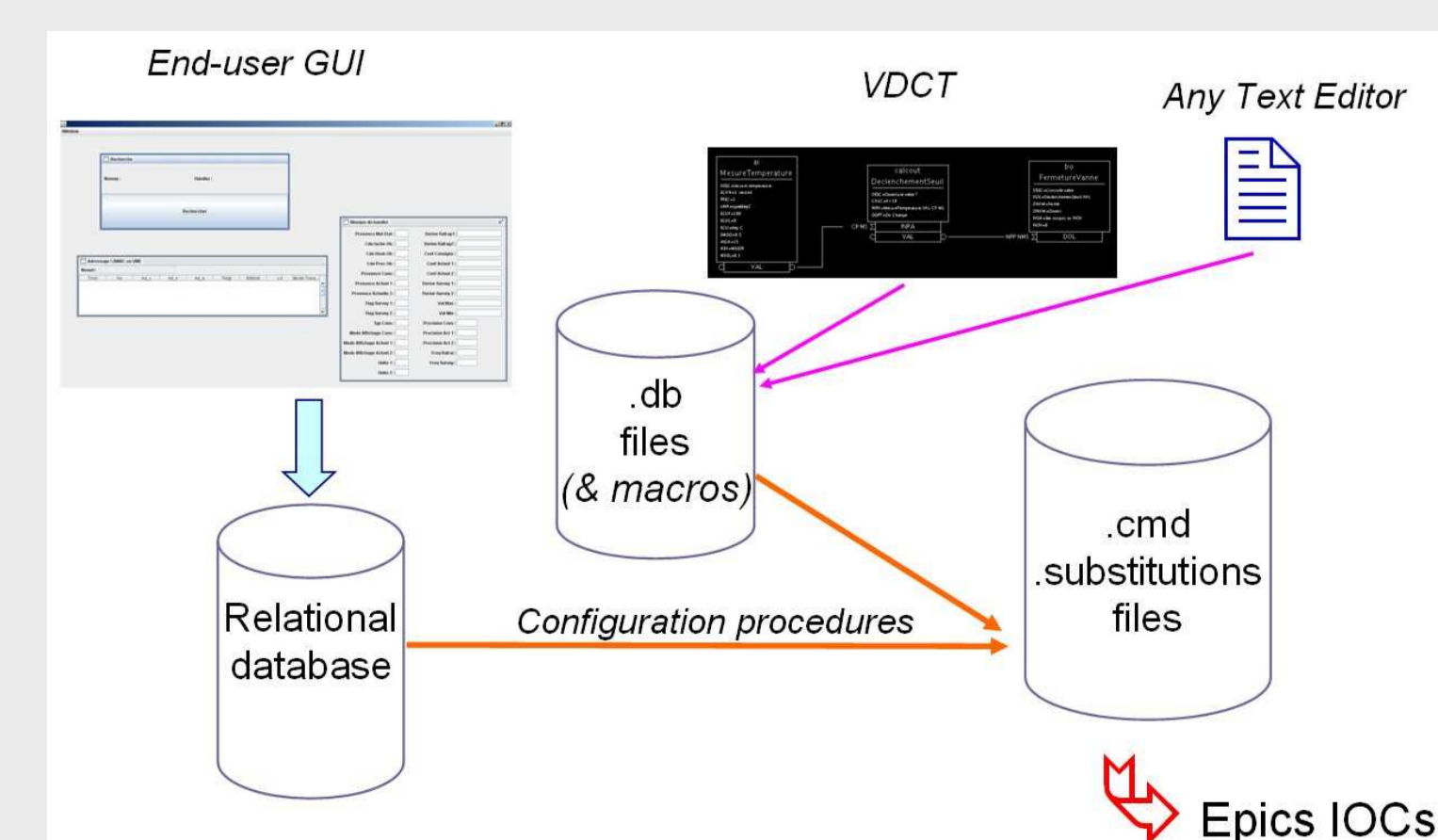
High level applications written in Java will have to be developed to fulfill the tuning requirements and to follow the commissioning procedures. So a technical work is in progress to study how to implement and to design the architecture and basic framework for the high level applications. Within this context, an investigation of the XAL environment is currently been carried out and, as a test bench, some existing applications were slightly modified or adapted to some of our specifications in order to know in which extend it could be transposed to the Spiral2 specificities (needs and requirements, multi beams machine, connection with the CEA TraceWin simulation code ...).



Epics equipment database management

To answer to a first need, Irmis V2 is used to provide a general view of the Epics databases configuration.

Beside of that, an investigation is under way to provide end-users even not Epics aware the ability to manage their own equipment. Template files (.db, .seq) would be generated by developers using standard tools (VDCT, text editor ...). Then, users would interface a relational database and then would generate the appropriate macros substitutions files for the Epics databases as well as the .cmd starting file to integrate the adequate devices initialization routine calls.



A prototype has just been defined for power supplies and is now going to be extended to other classes of equipment (Faraday cups, beam slits ...) to check the principles.