INTEGRATING A WORKFLOW ENGINE WITHIN A COMMERCIAL SCADA TO BUILD END USERS APPLICATIONS IN A SCIENTIFIC ENVIRONMENT

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Abstract

To build integrated high-level applications, SOLEIL is using an original component-oriented approach based on GlobalSCREEN, an industrial Java SCADA [1]. The aim of this integrated development environment is to give SOLEIL's scientific and technical staff a way to develop GUI applications for external users of beamlines. These GUI applications must address the two following needs: monitoring and supervision of a control system and development and execution of automated processes (as beamline alignment, data collection and on-line data analysis).

The first need is now completely answered through a rich set of Java graphical components based on the COMETE [2] library and providing a high level of service for data logging, scanning and so on. To reach the same quality of service for process automation, a big effort has been made for more seamless integration of PASSERELLE [3], a workflow engine with dedicated user-friendly interfaces for end users, packaged as JavaBeans in GlobalSCREEN components library.

Starting with brief descriptions of software architecture of the PASSERELLE and GlobalSCREEN environments, we will then present the overall system integration design as well as the current status of deployment on SOLEIL beamlines.

INTRODUCTION

GlobalSCREEN is a SCADA supporting the JavaBeans technology. Java beans are reusable graphical unitary components often used in Java GUI software projects (Swing components). GlobalSCREEN provides a user-friendly GUI to implement Java applications by drag-dropping. It also proposes to integrate all developed reusable components in a shared library.

Passerelle is a toolkit provided by Isencia [4] for designing sequences (and more generally data workflows) in a "drag and drop" graphical environment. Its core functionalities are based on the Java technology standards.

To design/develop/program sequences, called models, ISencia provides a graphical IDE (Integrated Development Environment). The IDE offers an execution engine as well as a number of essential framework services.

To use Passerelle models in a non-development environment, another Passerelle execution environment is provided by a GUI (Graphical User Interface) called PasserelleHMI. This GUI is able to display a panel on top

of any model, giving access to all its configurable parameters.

This GUI component was the principal tool for the scientific acquisition workflow integration within GlobalSCREEN. That solution was not enough flexible to provide GlobalCREEN application developers with the ability to devise synthetic views where component addressing control/supervision/monitoring can be inter-mixed with elementary Passerelle sequence parameter configurations. There was also the need, behind the scenes, for different sequences to be triggered depending on the different user interaction scenarios with the GlobalSCREEN application.

All these consideration motivated the modification of the overall system integration design.

THE INTEGRATION DESIGN

The basic idea of the system integration design is to use, for the Passerelle environment, the same philosophy used for Tango integration in GlobalSCREEN through the COMETE library and its use of the Tango client API.

Hence the library of graphical components named Passerelle Widgets have been extended to give access to all the Workflow engine features through the use of PasserelleAPI module.

In this new integration design we also took care of the possibility to launch the final end user applications locally or remotely taking benefit from the compatibility of GLOBALSCREEN is compatible with the Java Web Start technology. Java Web Start is a framework developed by Sun Microsystems that allows users to start application software for the Java Platform directly from the Internet using a web browser. This enables SOLEIL users to remotely access the same rich client platform applications they use locally, in daily operation.

To achieve this, all the API Interface libraries needed for client access to each of the services are available with two different implementations, one local and one remote.

For the remote implementation:

- COMETE was adapted to access the control system via an intermediate layer. This layer translates Tango requests to the TangORB API in the local case or to HTTP requests reaching a WebTangORB server for remote access. The WebTangORB server then translates these requests to TangORB API calls to the underlying control system.

- The PasserelleAPI Interface is implemented as HTTP requests addressing a remote server complying with the W3C Webservice standard for

software systems designed to support interoperable machine-to-machine interaction over a network.

APPLICATION EXAMPLE

We will here describe how the use of this new design of Passerelle Workflow engine integration within GlobalSCREEN helped the ANTARES beamline at SOLEIL to provide their users with an integrated graphical user interface with all the needed features to handle their acquisition process.

This beamline (see Fig. 1) was designated for the complete determination of the electronic structure of condensed matter, using the angle resolved photoemission spectroscopy and the photoelectron diffraction (PED), which allows a local characterization of the geometric structure.
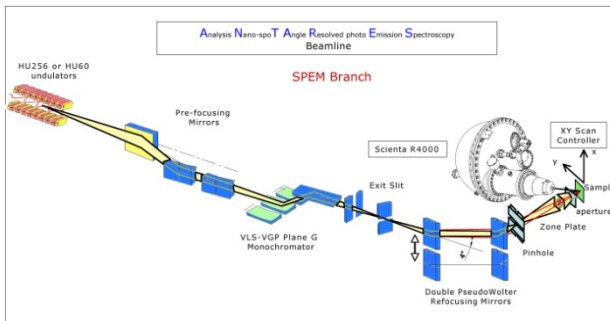

Figure 1: Beamline design.

As shown in the GlobalSCREEN Welcome page (see Fig. 2), the user can access to all the steps needed to drive his experiment: beamline control and supervision, alignment, homing of optical devices, running experiments.

Figure 3 displays the view giving access to all the entry points to all the optics alignments needed before starting the acquisition.
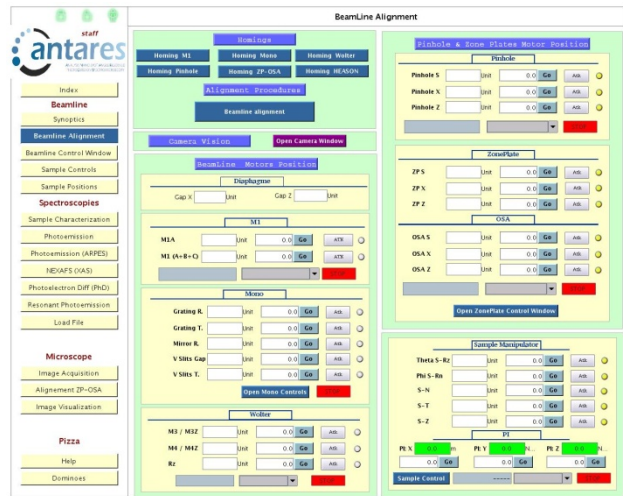

Figure 2: Application welcome page.

Figure 3: Alignment workflows.

In the Figure 4 below we can see the panel that pops up when we launch the monochromator homing button.

All the buttons entitled "Grating and Mirror", "Vertical Slits", "Horizontal Slits" are in fact unitary elementary Passerelle Widgets connected to predefined workflows that can fire Passerelle sequences to be started, resumed or stopped.
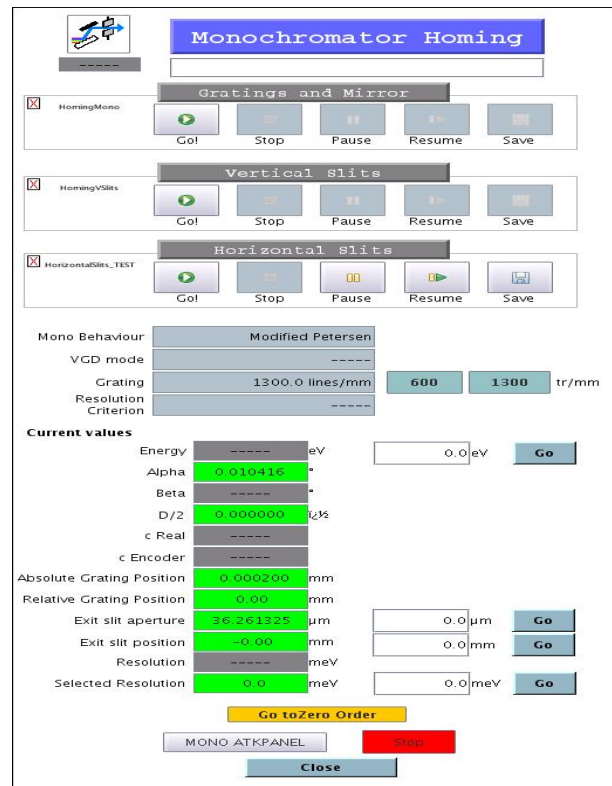

Figure 4: Monochromator alignment.

Figure 5 shows the GUI for performing a photoemission experiment using a Scienta detector. Here again, Passerelle Widgets for the acquisition workflow parameterization, sequence launching are seamlessly intermixed with Comete Widgets for equipments control and data acquisition monitoring (Scienta spectrum and image) giving the user total control of their experimental operation in the same application and hiding all the software layers operating behind the scenes.
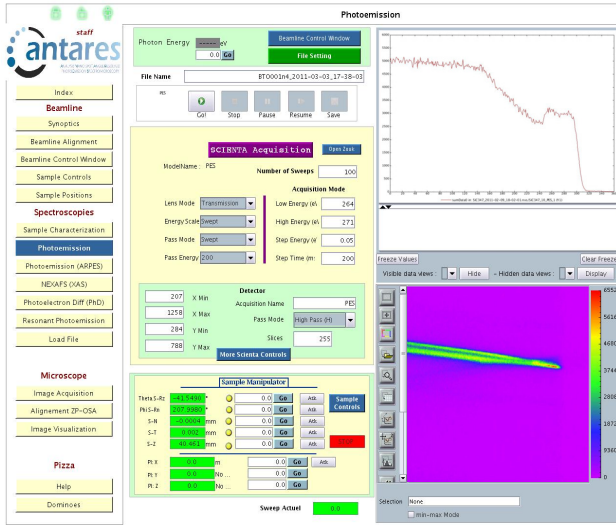

Figure 5: Scienta experiment view.

STATUS OF DEPLOYMENT

The figure below shows that using the Passerelle Workflow engine as a strategic tool for performing experimental acquisition processes in an integrated manner when combined with GlobalScreen is now becoming a reality at SOLEIL. Even if some beamlines are yet to be convinced of the benefit they can obtain from this way of operating beamline, the success obtained on doing it on many beamlines will facilitate this in a near future.

Beamline	Used by beamline staff	Used in daily operation	Convinced by The product	To be convinced
ALES				
SMS				
CASSIOPEE			0	1
CRISTAL	1	1	0,5	0,5
DIFFABS	1	1	1	
DESIRS				
ODE	1	1	1	
PROXIMA1	1	1	1	
SAMBA				
SWING	1	1	1	
TEMPO	1	1	1	
METROLOGIE			0	1
ANTARES	1	1	1	0
PLEIADES	0,5		0	1
LUCIA			0	1
MARS	1	1	1	0
SIXS	1	1	0,5	1
DISCO			0	1
DEIMOS			0	1
MICROFOCUS			0	1

Figure 6: Passerelle Deployment status.

REFERENCES

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[4] Isencia http://www.isencia.be/