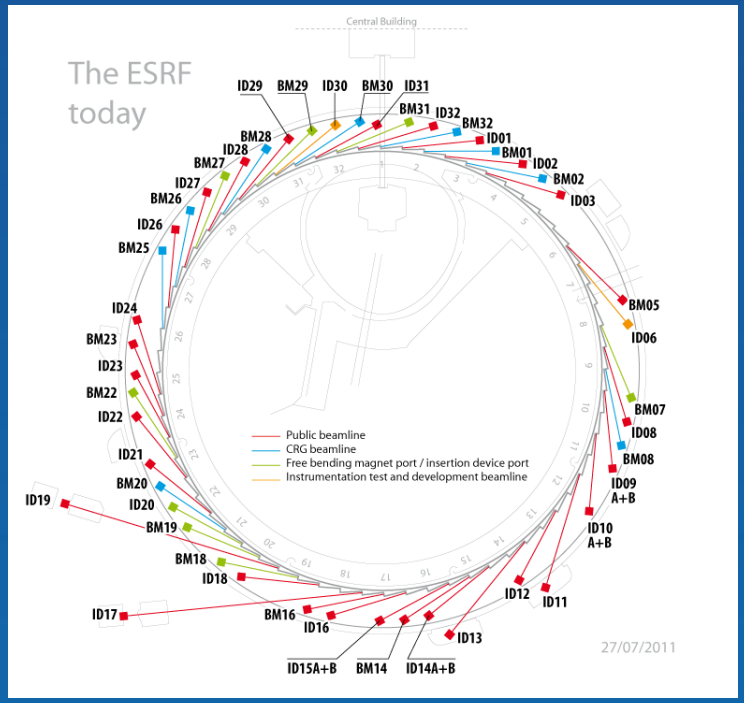
A Light for Science

European Synchrotron Radiation Facility

Tango for Experiment Control

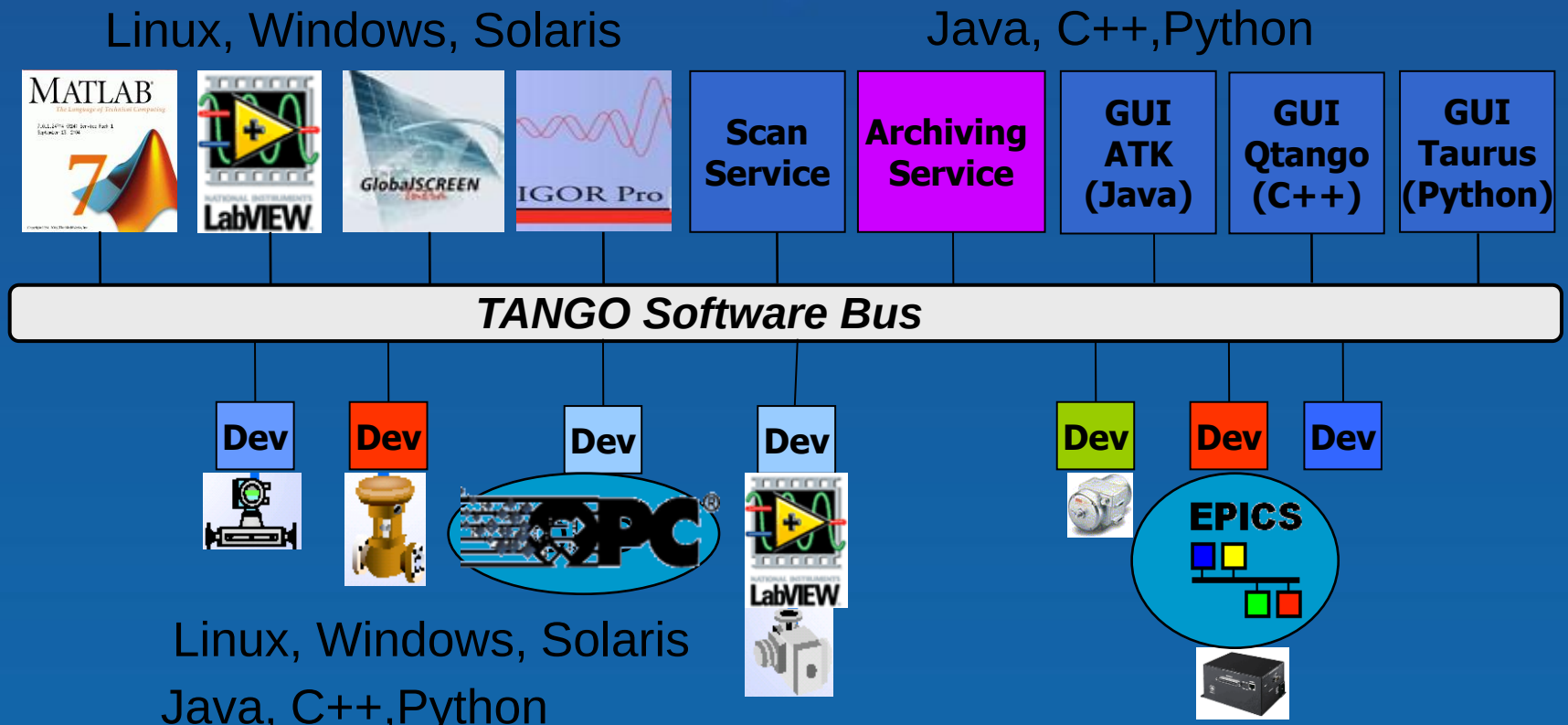
- What is Tango
- Scanning and Sequencing
- Diffractometers
- 2D Detectors
- Data Analysis Workbench



What is Tango

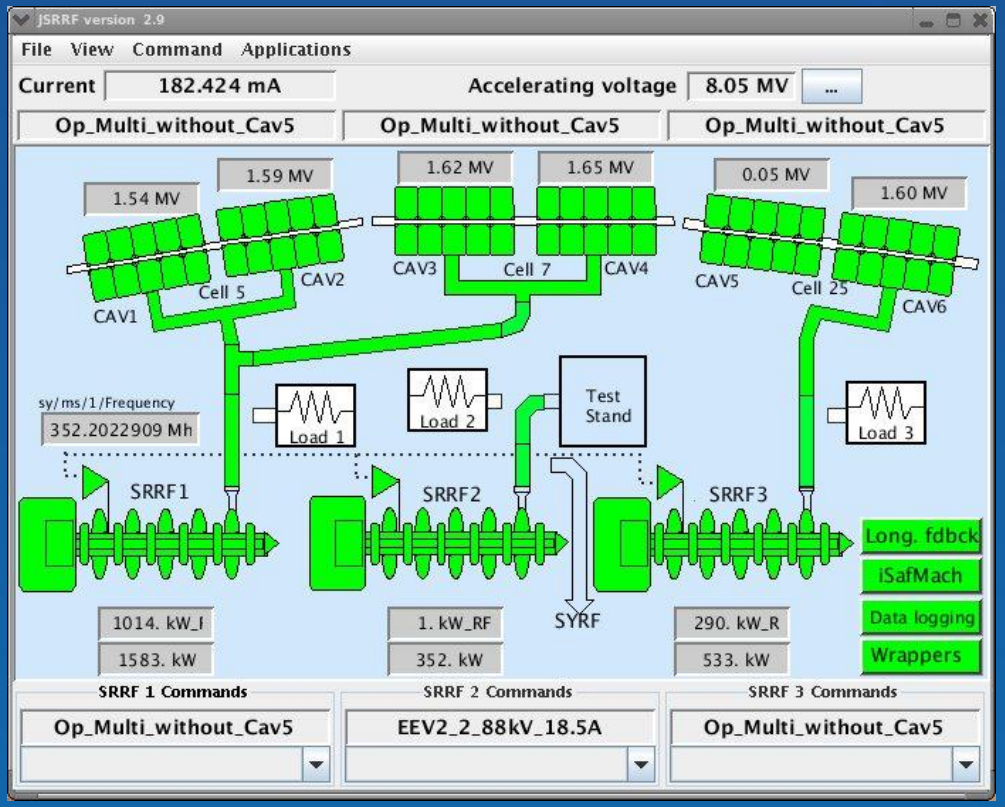
What is Tango

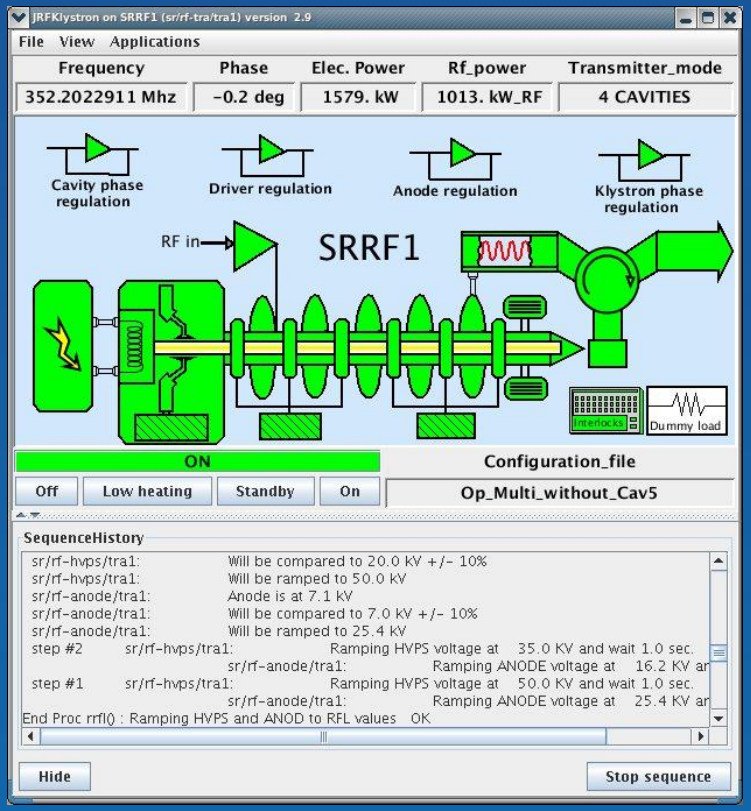
- A software bus for distributed objects



What is Tango

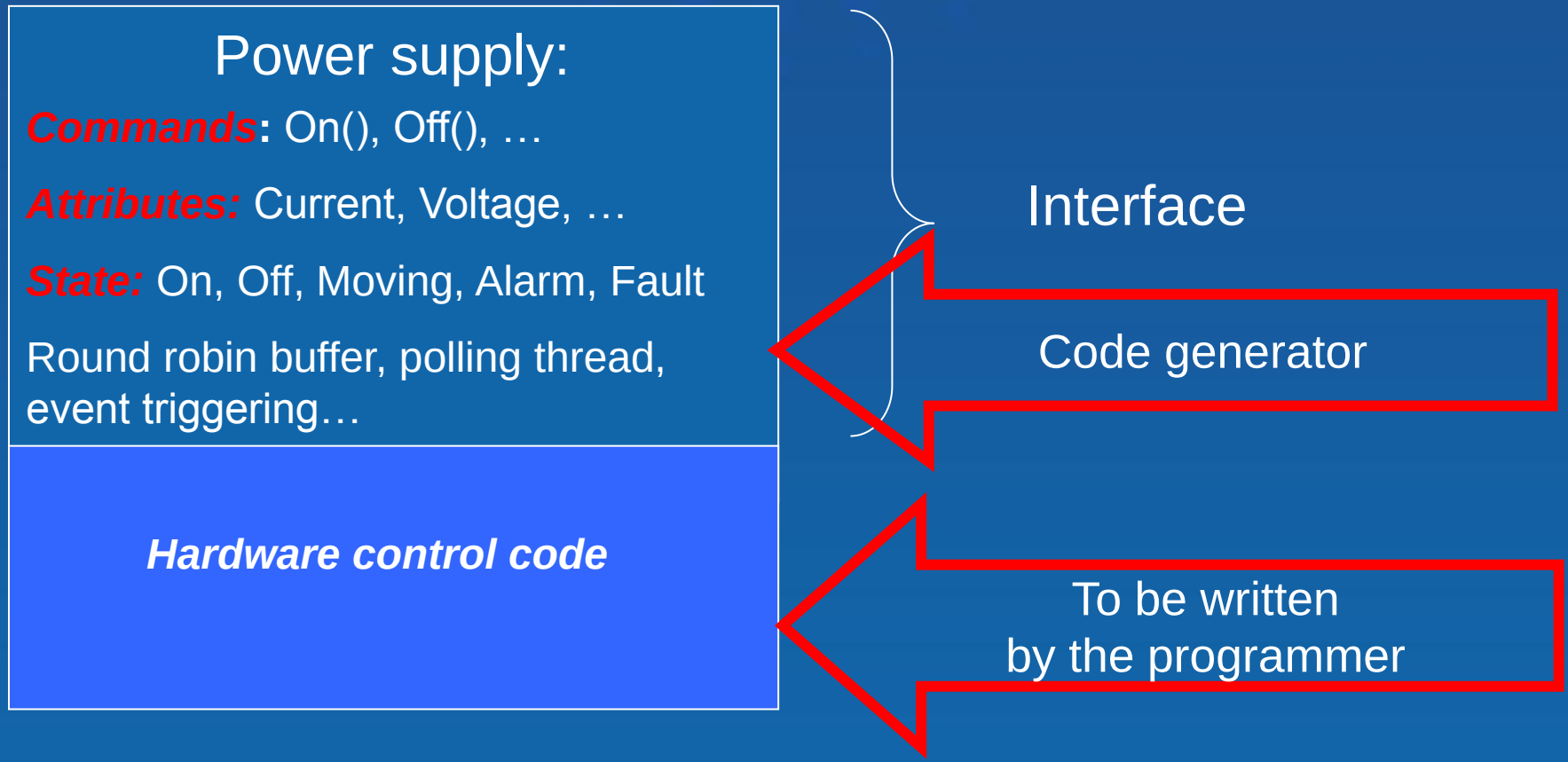
- GUI frameworks for C++, Python and Java
- Synoptic editor





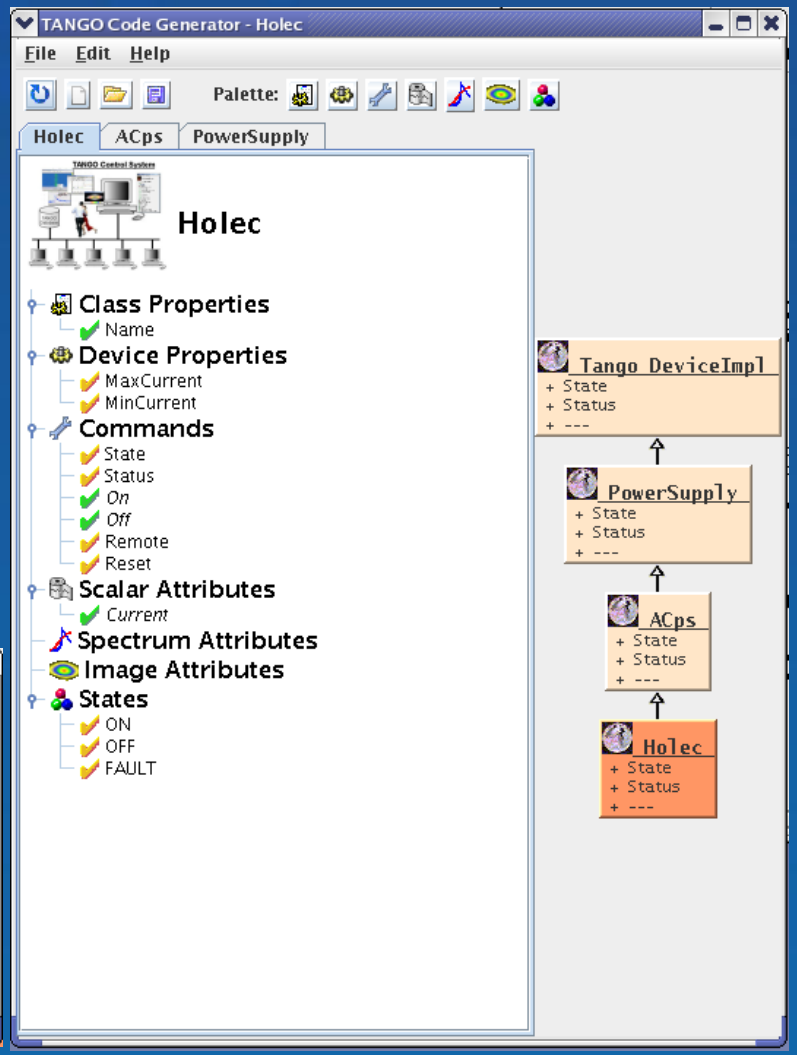
What is Tango

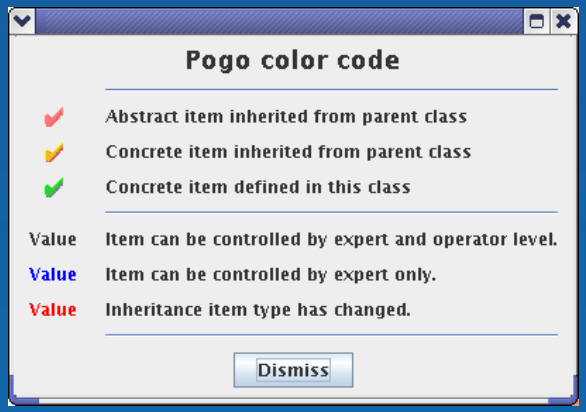
A simple Tango device



What is Tango

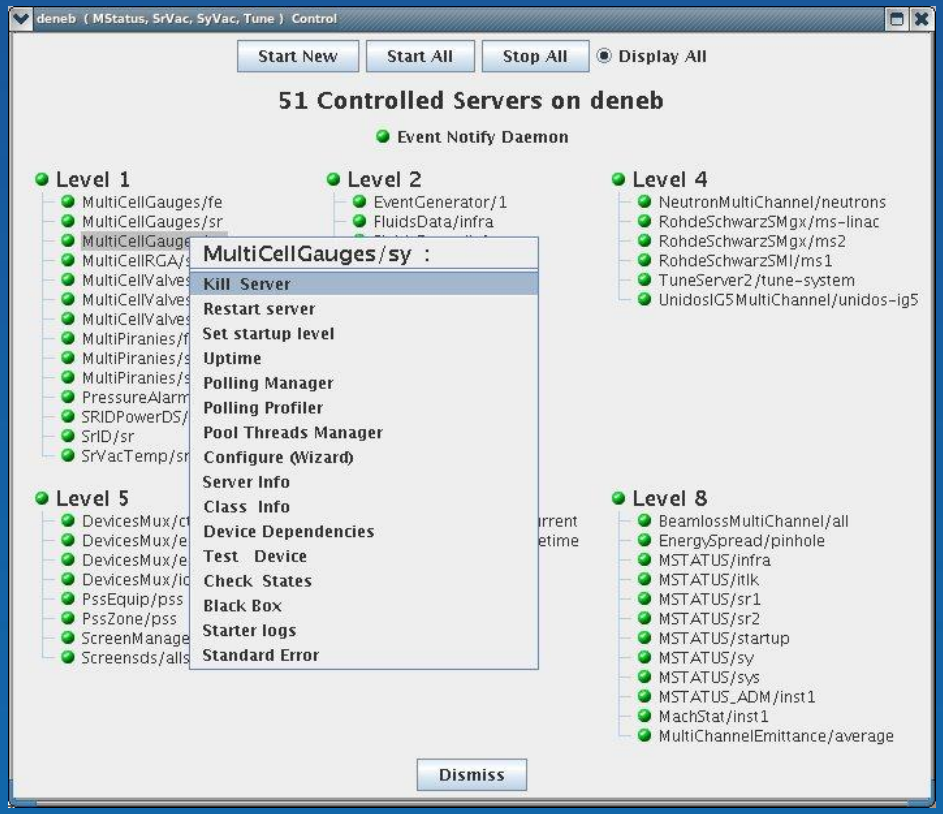
- Graphical interface and state machine design
- Code generation: C++, Java and Python
- Editing and code re-generation
- Fast development cycle





What is Tango

- Administration and survey system
- Graphical system configuration



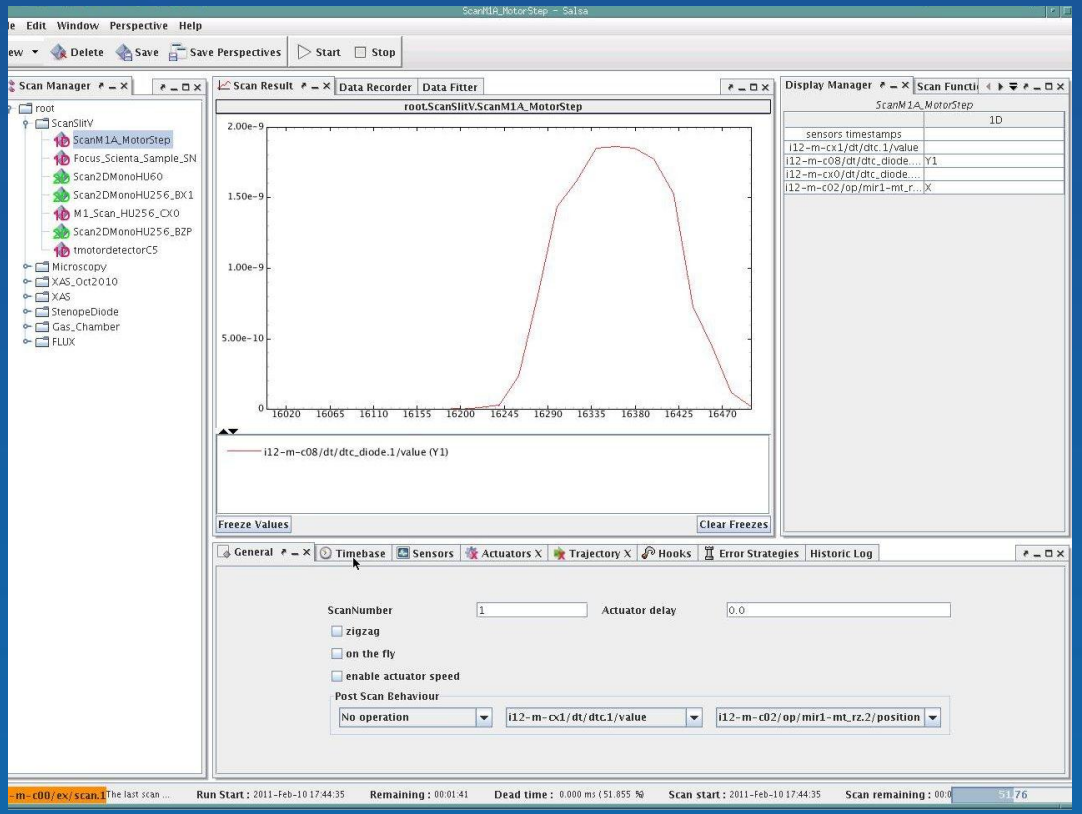
What is Tango?

- An object oriented software bus
  - Communication types: Synchronous, asynchronous, grouped asynchronous and event driven
  - Servers and clients can be written in C++, Python and Java
- The Tango tool chain: Software from the hardware interface to the GUI

Module	Description
Core Libraries	Client/Server communication libraries for C++, Python and Java
Device Classes	About 300 hardware interface classes are available to download
GUI Frameworks	Available for C++ and Python using QT, for Java using Swing and a web interface written in PHP
Client Bindings	LabView, Matlab and IgorPro
Tools	Pogo – Code generator for device classes in C++, Python and Java Jive – Configuration and testing tool Astor – Administration and survey of the Control system
Archiving	Archiving and snapshot system with GUIs and web interface. Usable with Oracle and MySQL
Sardana	Framework for experiment control : Interface standardization, configuration, sequencing, command line interface

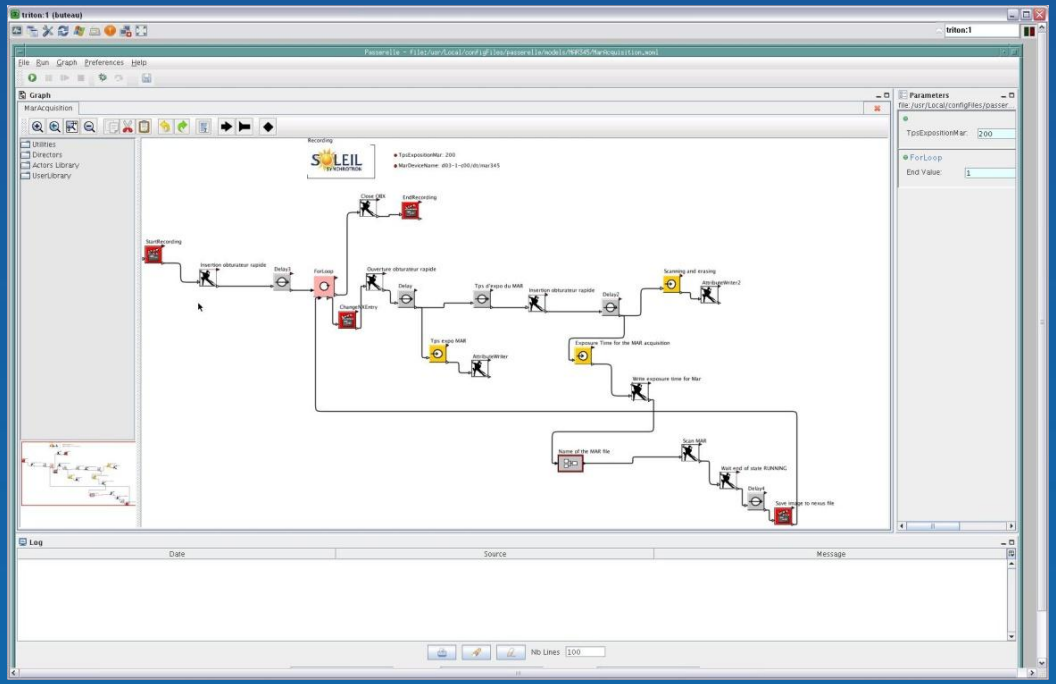
Sequencing and Scanning

- Tango Scan Server + GUI
  - Different types of scans available
  - Plug-in architecture for hardware integration
  - Developed at SOLEIL



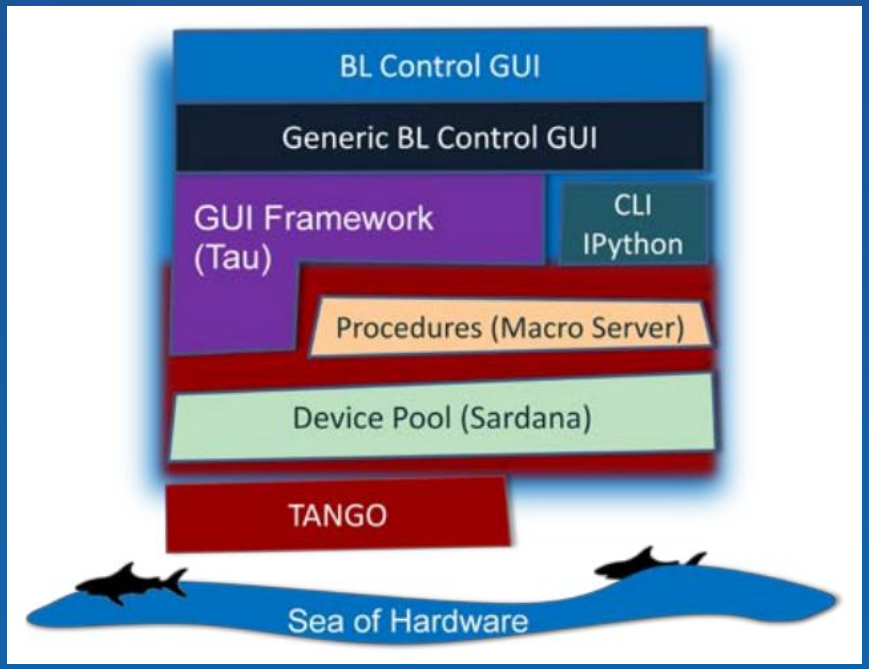
Sequencing and Scanning

- Workflow editor Passerelle:
  - http://code.google.com/a/eclipselabs.org/p/passerelle
  - Customized for experiment sequencing at SOLEIL
  - Library of standard actuators
  - Allows non programmers to write experimental sequences



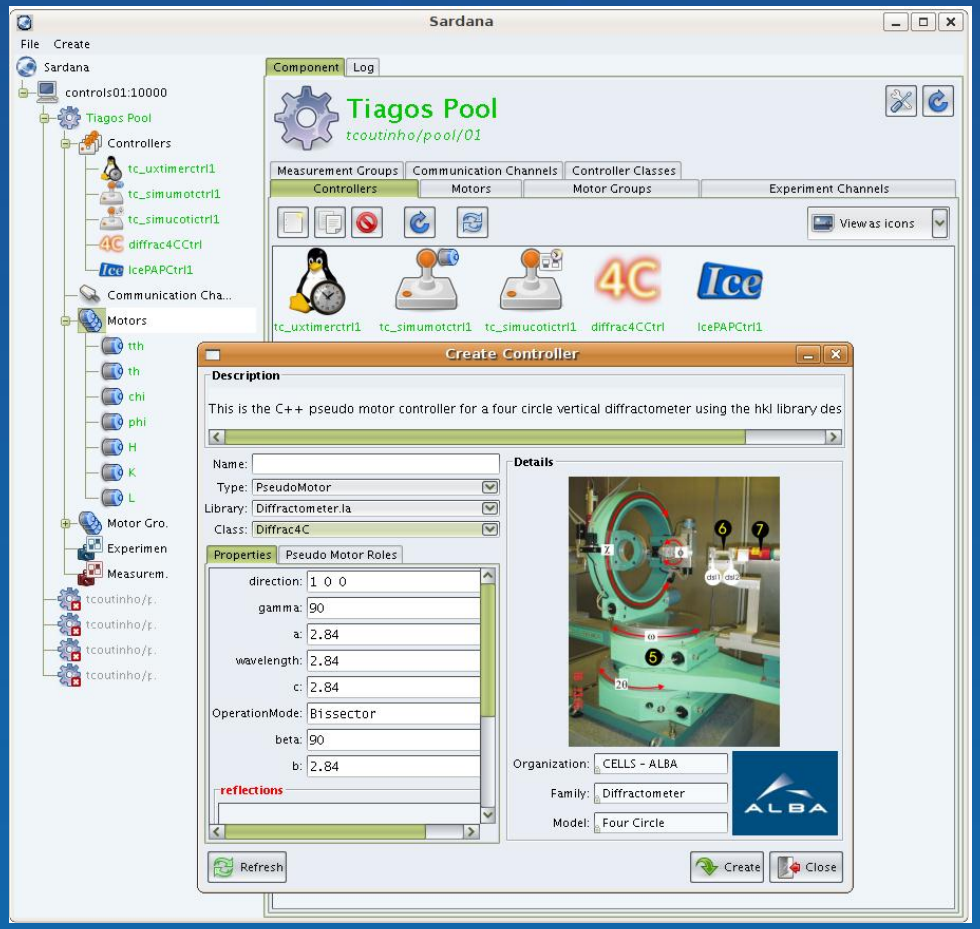
Sequencing and Scanning

- Sardana
  - Integrated user environment developed at ALBA
  - Interface standardization
  - Scanning framework
  - Python procedures + IDE
  - Command line interface
    - SPEC like syntax
  - Configuration GUI
  - GUI builder
    - based on PyQt widgets
  - http://www.tango-controls.org/static/sardana/latest/doc/html/index.html



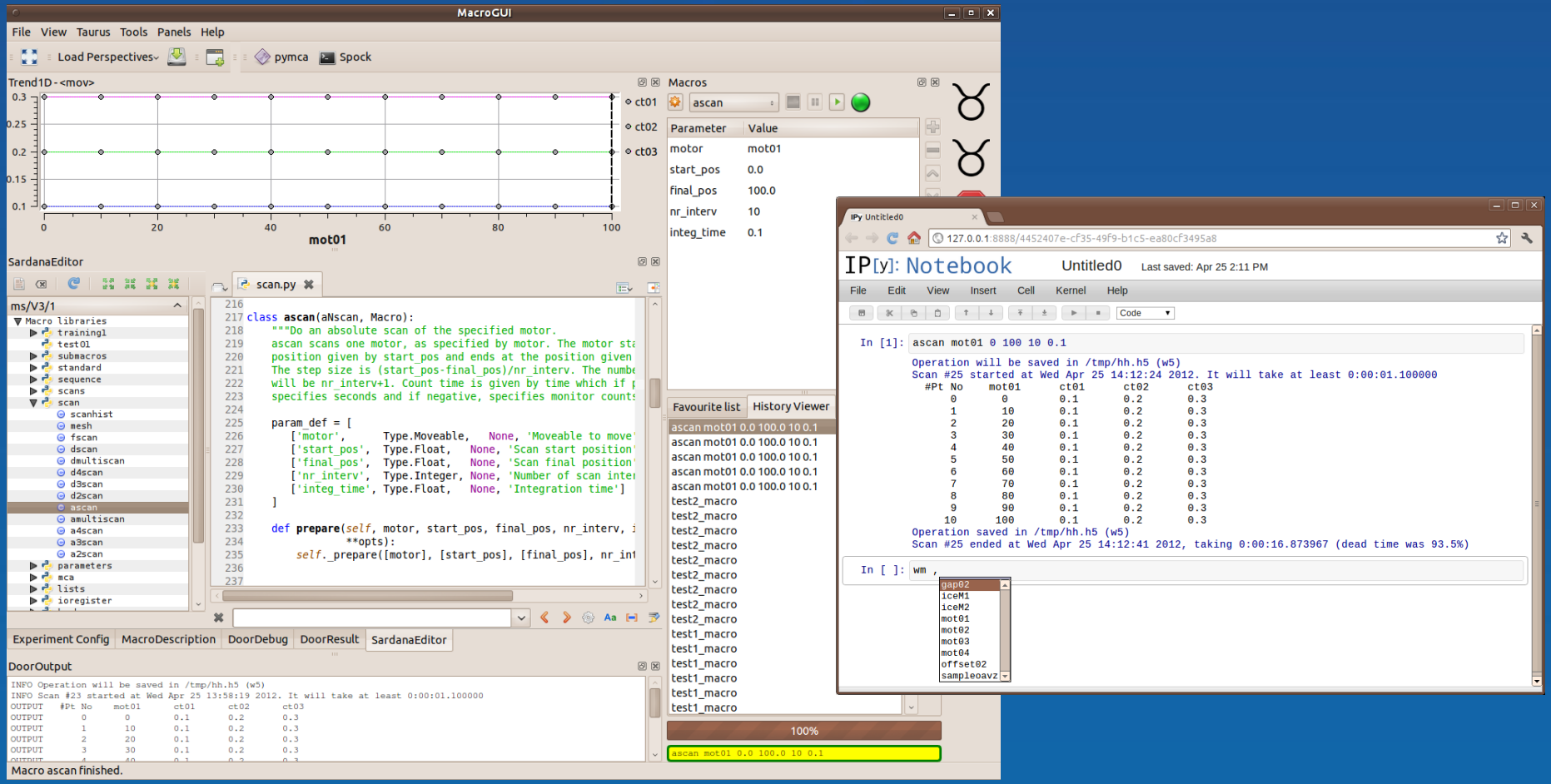
Sequencing and Scanning

- Sardana configuration GUI



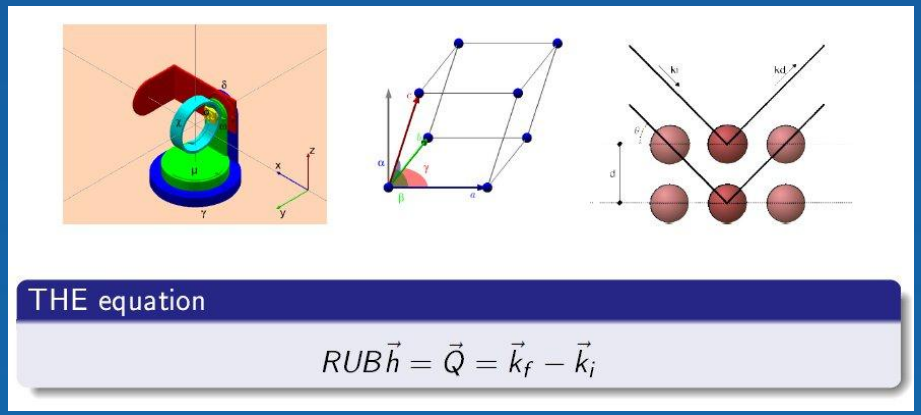
Sequencing and Scanning

- Sardana procedure IDE and the command line interface



Diffractometers

- SOLEIL developed a C-library for reciprocal space transformations.
- The purpose of the library is to factorise single crystal diffraction angles computation for different kinds of diffractometer geometries.
- http://people.debian.org/picca/hkl

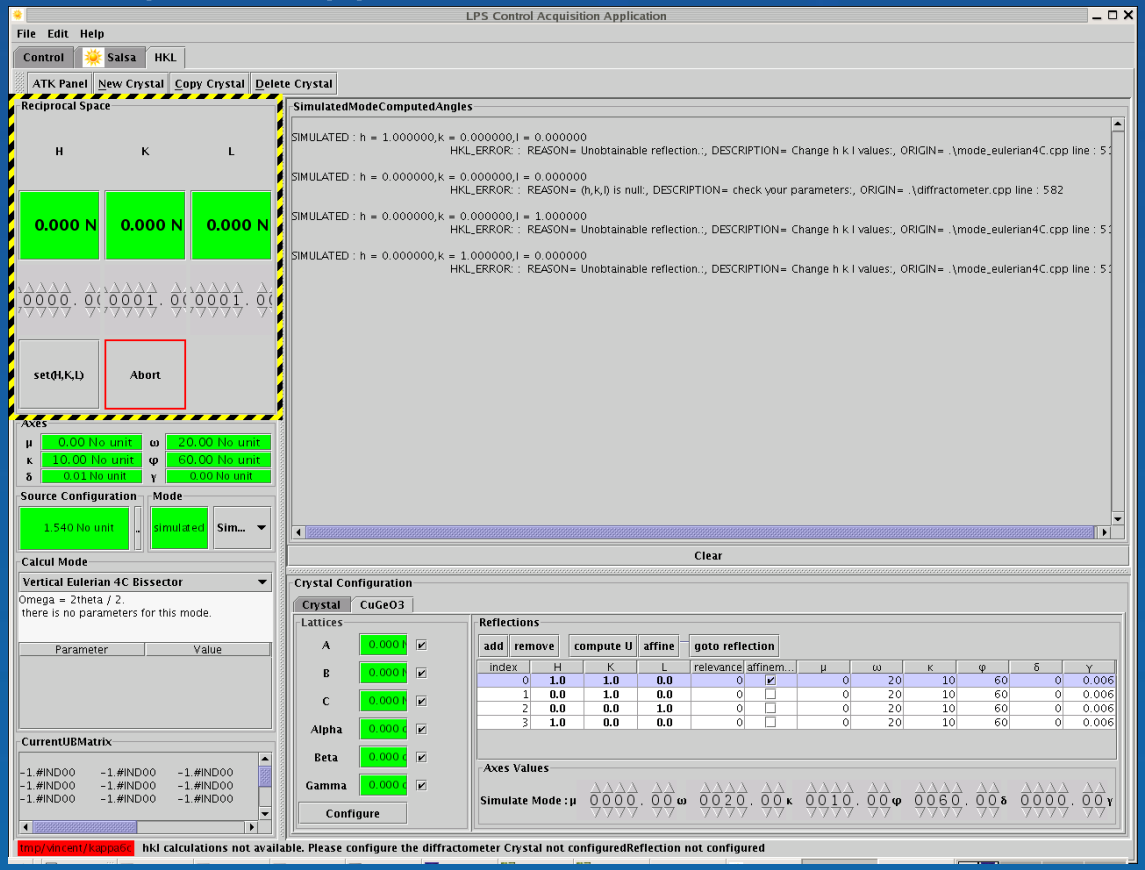


Diffractometers

- The main features are:
  - Mode computation
  - UB matrix computation
  - Crystal lattice refinement
  - Pseudo axes (psi, eulerians, q, ...)
- Today the HKL library can handle 5 different geometries:
  - 2 circles
  - Eulerian 4 circles
  - Eulerian 6 circles
  - Kappa 4 circles
  - Kappa 6 circles
- Modes hkl
  - bissecteur
  - constant omega, chi, phi

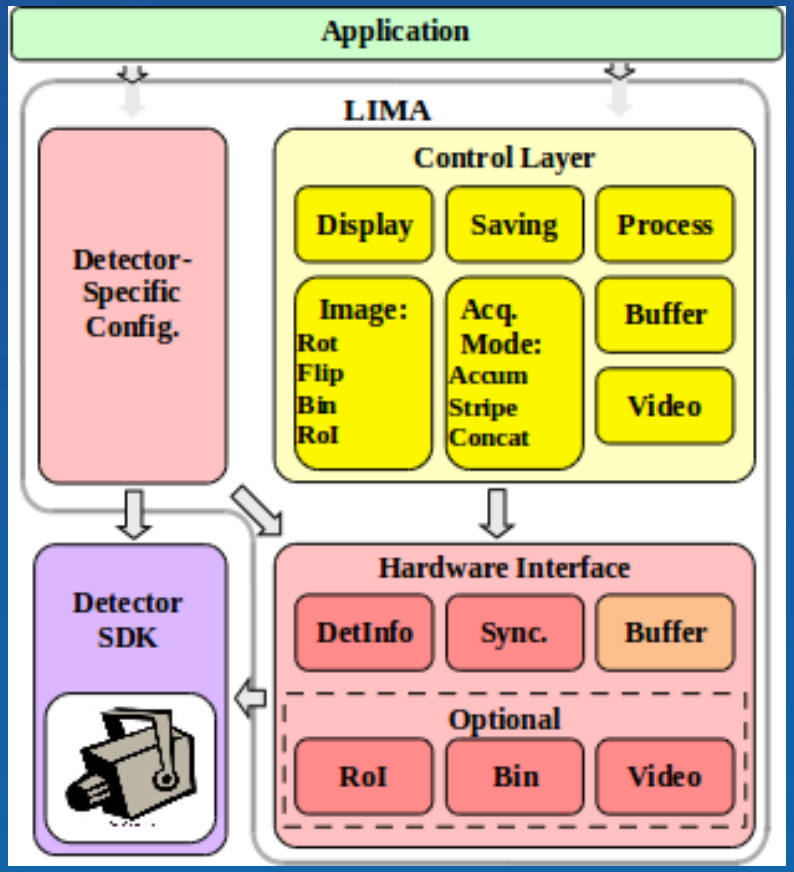
Diffractometers

- Generic diffractometer device server + GUI
  - Example : Kappa 6 Circles diffractometer GUI



2D Detectors

- LIMA : Library for Image Acquisition
  - Lima is a C++ library for integrating 2D detectors developed at ESRF
  - Oriented to high-speed detectors
  - Separate hardware specific code from common software
  - Provide software alternatives to “missing” hardware capabilities
  - Plug-in architecture for detector integration
  - Web site : http://www.lima.blissgarden.org
  - Contributors: SOLEIL, PETRA-III, FRM-II, ALBA, RAYONIX, ADSC



2D Detectors

- **Geometric image transformations:**
  - **Reconstruction of discontinuous readout**
  - **Bin, RoI, Flip & Rotation**
  - **Stripe concatenation**
- **Basic image processing:**
  - **Multi-RoI Statistics**
  - **Centroid (Beam Position Monitoring)**
  - **RoI Spectrum**
  - **Background subtraction, Flat-field normalisation**
  - **Spatial distortion correction**
  - **Frame accumulation**
  - **Image Mask**

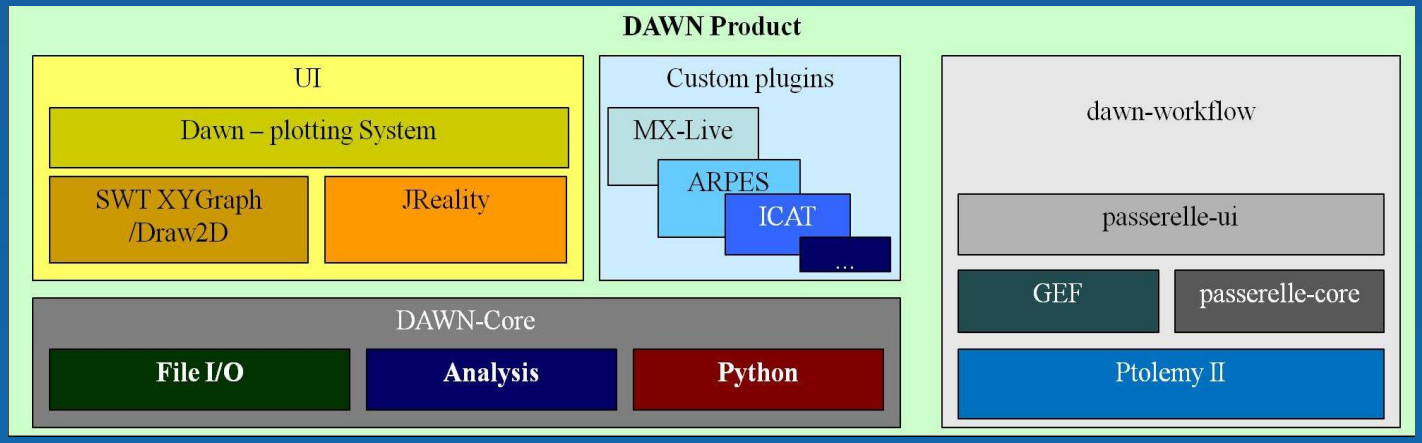
2D Detectors

- Available detector plug-ins:

Detector	Interface
Basler	GigE
Prosilica	GigE
Ueye (IDS)	GigE
Pilatus (Dectris)	300K, 1M,2M,6M, 6M-F
PCO Edge	Camera-Link
Pco Dimax	GigE + Camera-Link
PhotonicScience 4022	USB
RoperScientific	PVCAM SDK
Andor I-Kon	USB
PerkinElmer Flat-Panel	Proprietary board
ADSC 315r	Proprietary board
MarCcd 165	Proprietary board
Mythen (strip detector)	Proprietary board
XPAD	Proprietary board
Maxipix (ESRF)	Espia
Frelon 2K (ESRF)	Espia

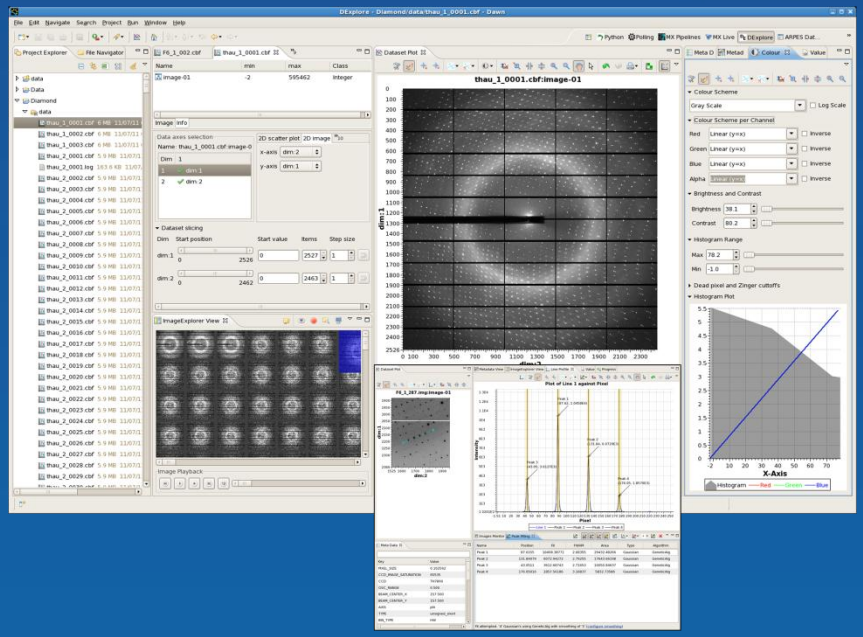
Data Analysis Workbench

- Data analysis workbench with a workflow editor
  - Developed by DIAMOND and ESRF
  - Viewing scientific data: 1D, 2D and 3D datasets
  - Data exploring, data analysis and data saving
  - Importing and running other tools based on Eclipse RCP
  - Editing and running python scripts for data analysis
  - Web site : http://www.dawnsci.org

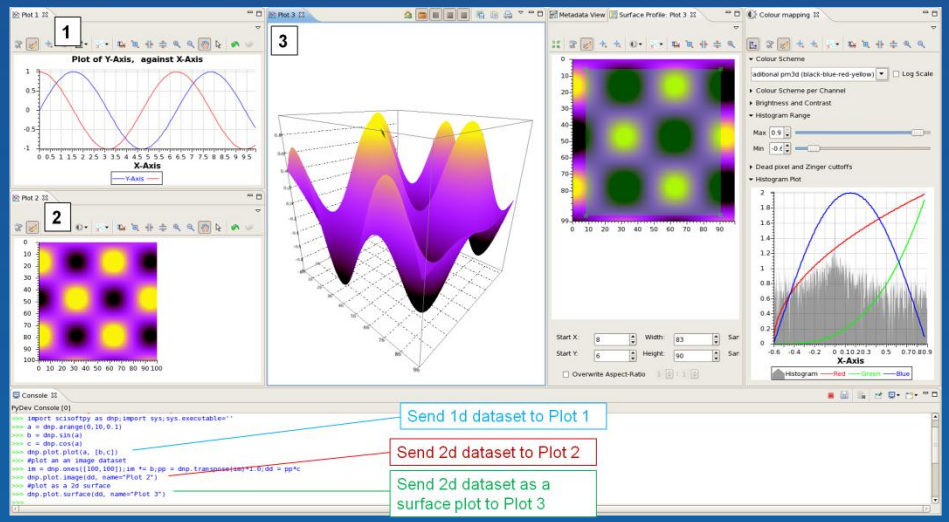


Data Analysis Workbench

Data Explorer Perspective

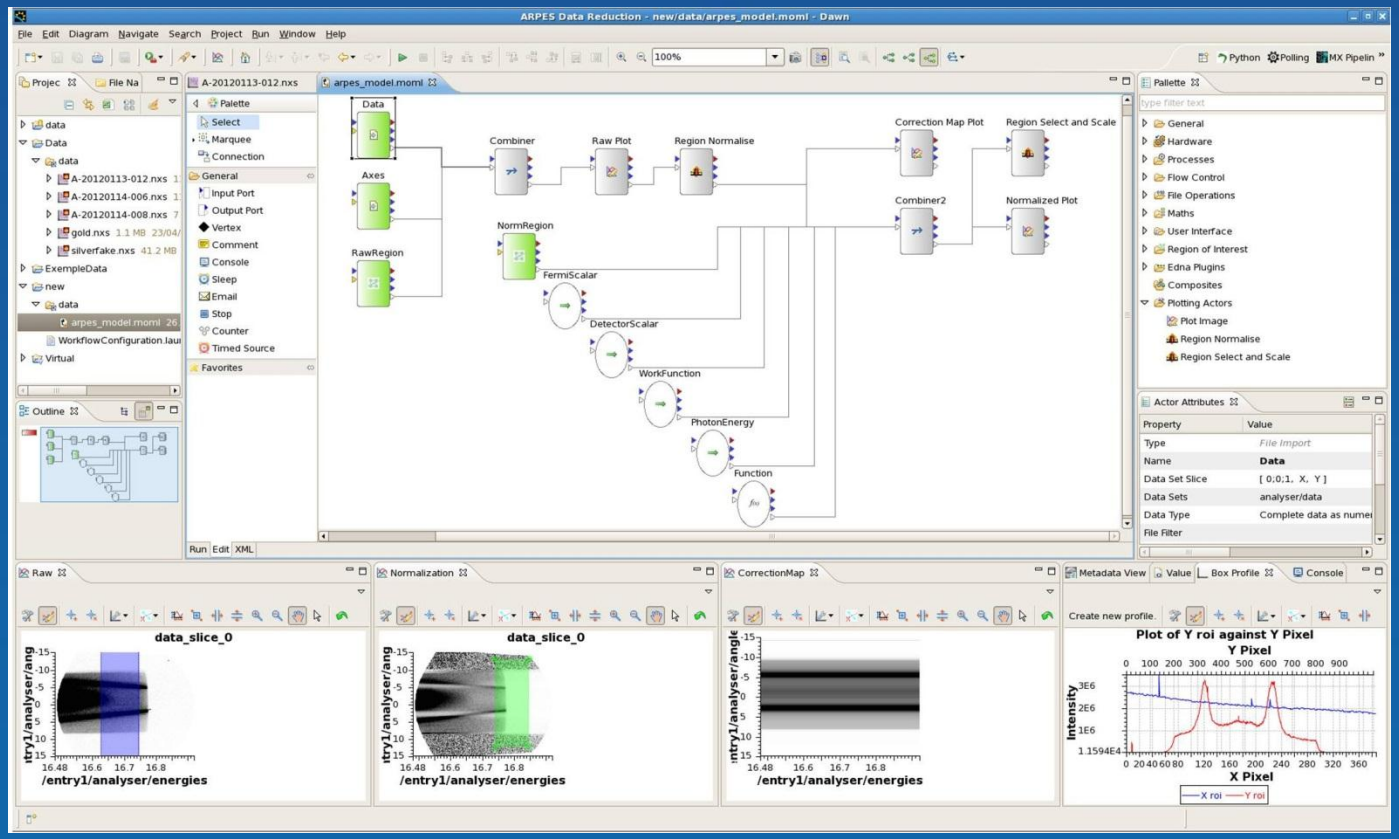


Python Perspective



Data Analysis Workbench

- Designing pipelines for data analysis
  - Workflow editor Passerelle
  - Customized with a library of data analysis actuators



How to try it?

- Binary Packages
  - Available for Ubuntu (Debian) Linux in the standard distribution
  - Available for Windows on the Tango web site
- The Tango Box
  - A virtual Linux machine with most of the Tango packages installed and configured for easy testing
  - Runs with VMware Player

- Common Tango web site : http://www.tango-controls.org
- A mailing list for all questions and propositions to the community