INTEGRATION OF PLC's IN TANGO CONTROL SYSTEMS USING PyPLC

ALBA Synchrotron Barcelona

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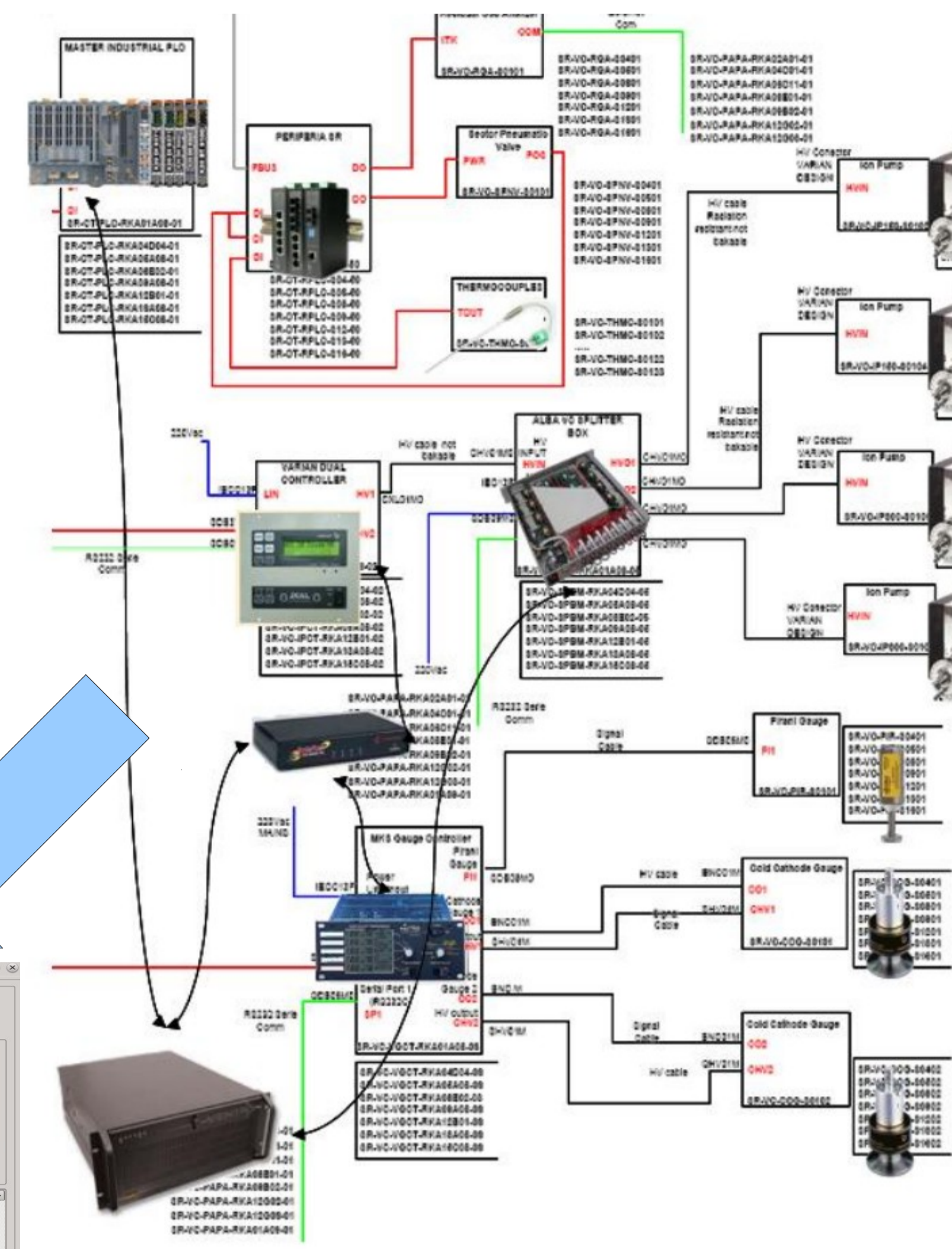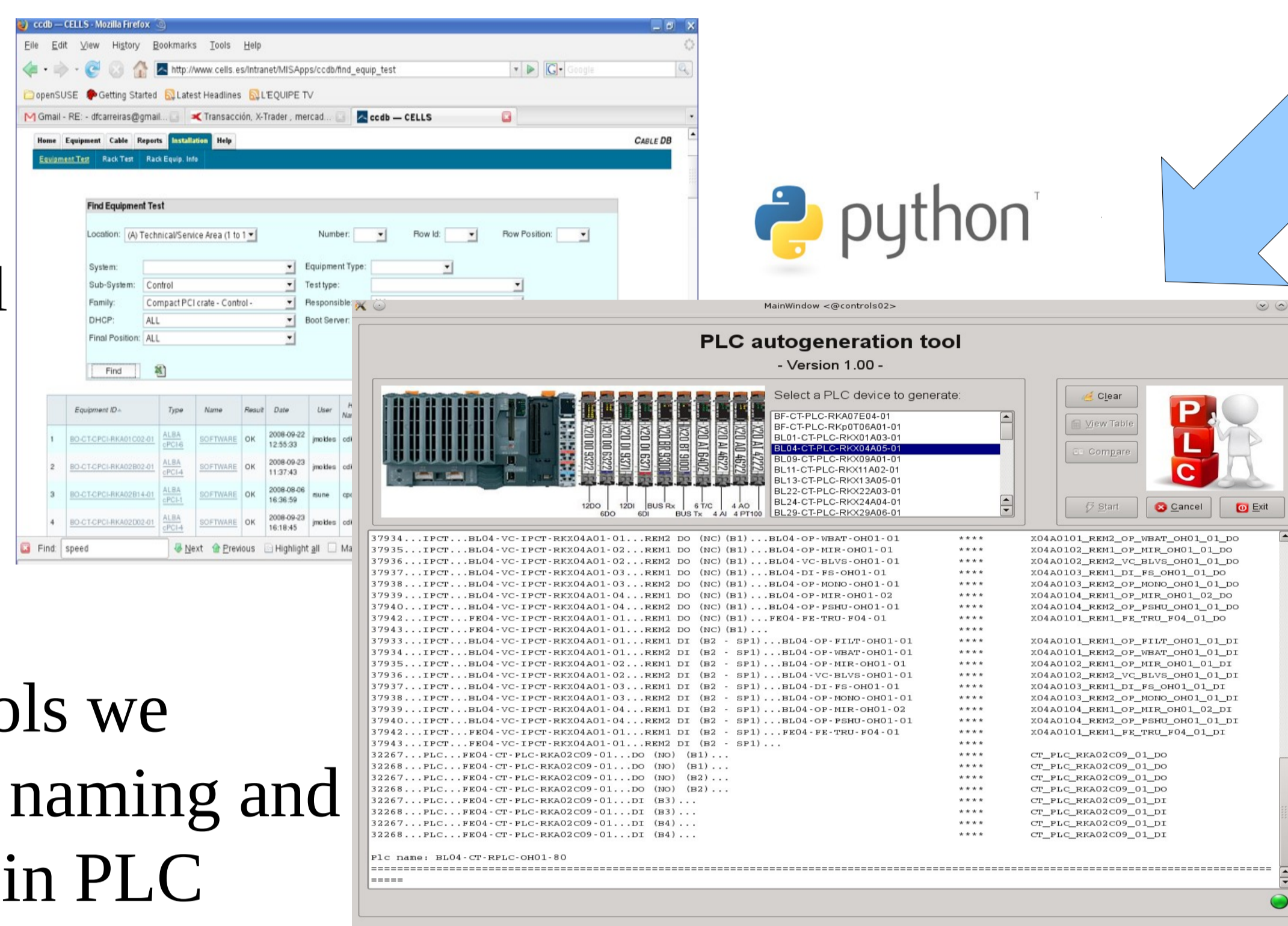**ICALEPCS 2015, Melbourne, Australia**

ALBA is a 3GeV Synchrotron facility in Barcelona (Catalonia, Spain, EU), with 7 operational beamlines and 2 in construction. PLC systems at ALBA are used for Equipment and Personnel Protection as well as diagnostics and monitoring.

The PyPLC Tango Device Server provides a common layer to integrate PLCs from different vendors (B&R, Pilz, Allen Bradley, ...) within a Tango Control System, automating both the development and integration of the PLC variables and enabling high-level interaction.
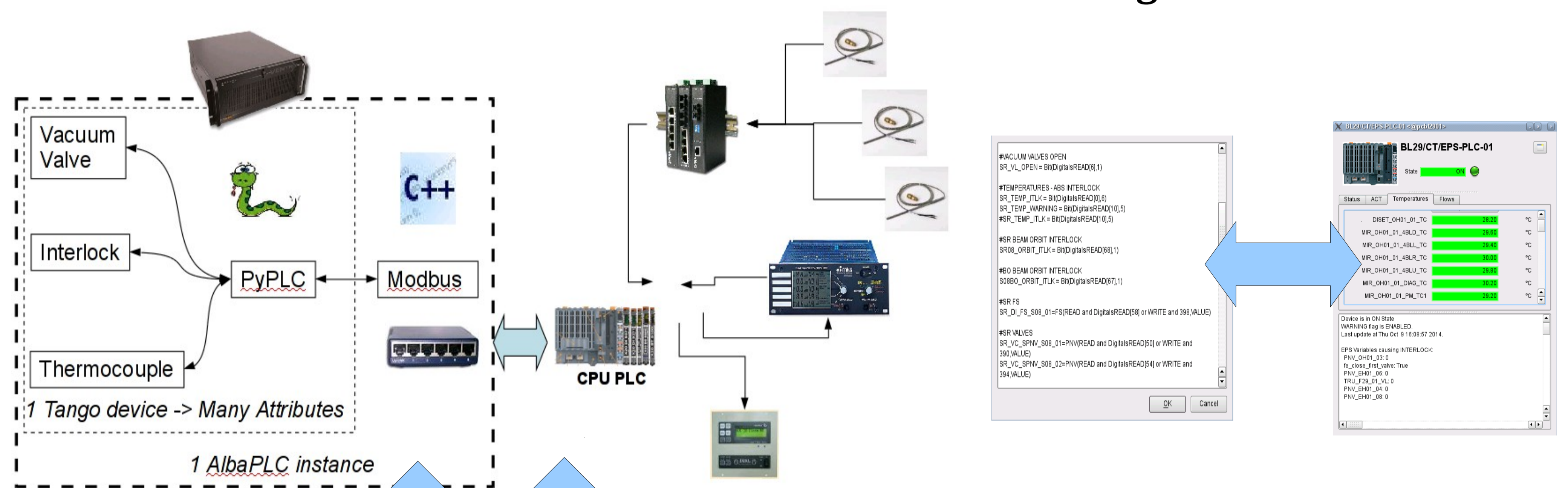
1) The **ALBA Cabling Database** provides an automated repository with all the equipment connected to PLC's at ALBA.

2) Using **python**-based tools we autogenerate the variables naming and mapping that will be used in PLC programs, and later exported to **Tango** attributes using Modbus protocol and PyPLC device server s

TANGO
Connecting things together

3) **PyPLC** device attributes are imported from PLC project or created on demand from 1-line formulas in the Tango Database. States and calculations can be easily modified at runtime with **no need of restarting the PLC.**
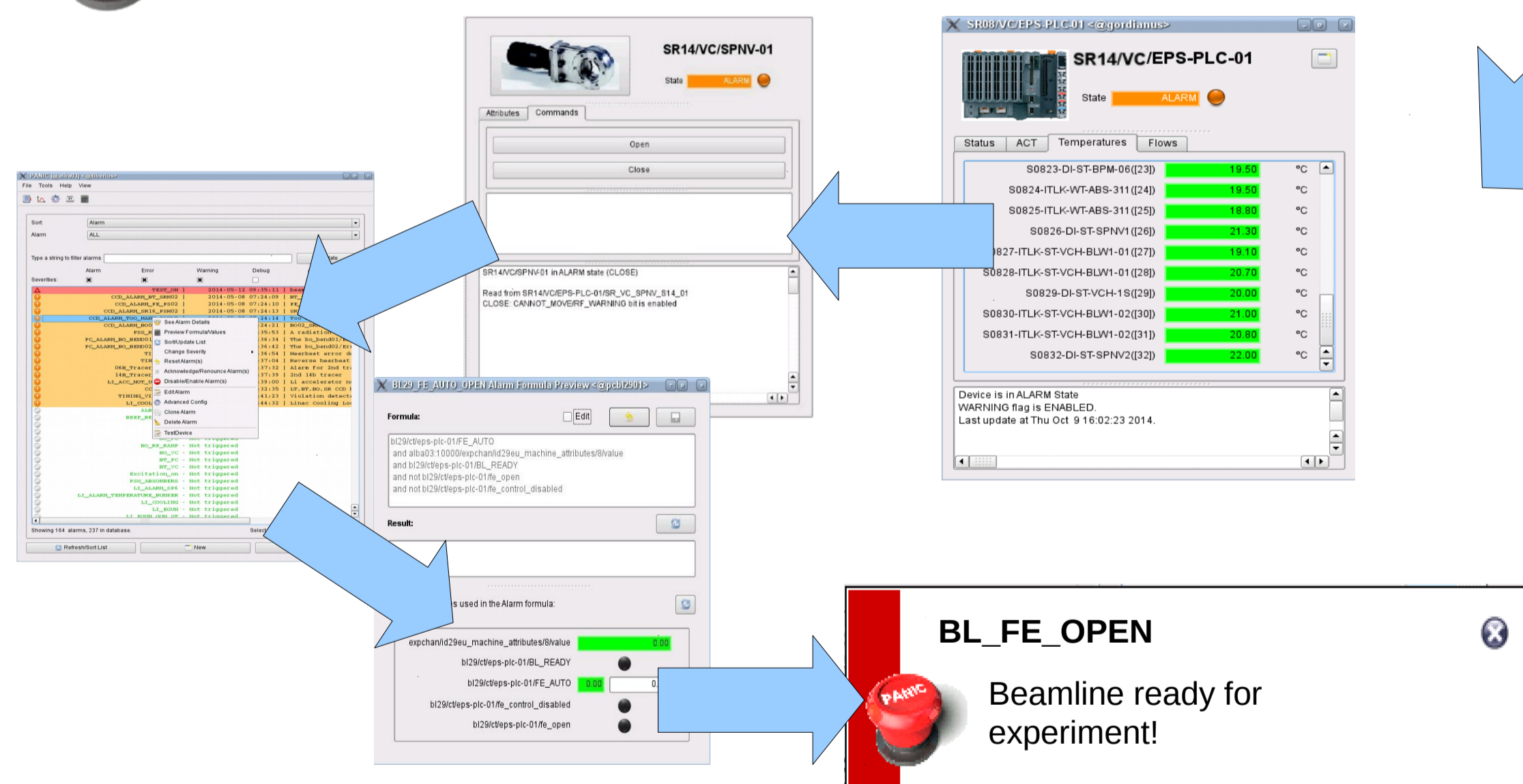
4) Tango **Dynamic Attributes** allowed to extend PLC's behavior and automate high-level actions, either from our Alarm System (**PANIC**) or our **Sardana** Macro Executor.

Vacuum Valve — Interlock — Thermocouple → PyPLC → Modbus

1 Tango device -> Many Attributes

1 AlbaPLC instance

CPU PLC

Package for Alarms and Notification of Incidences from Controls

BL_FE_OPEN
Beamline ready for experiment!

Those automated actions may include interaction with Storage Ring front-ends or automation of movable elements during the experiment. Complex interactions are achieved subclassing PyPLC with custom behaviors embedded.

Fluorescent screens

2xDI
1xDO
4xDI
2xDO
2xDI
1xDO

FSOTR

Valves
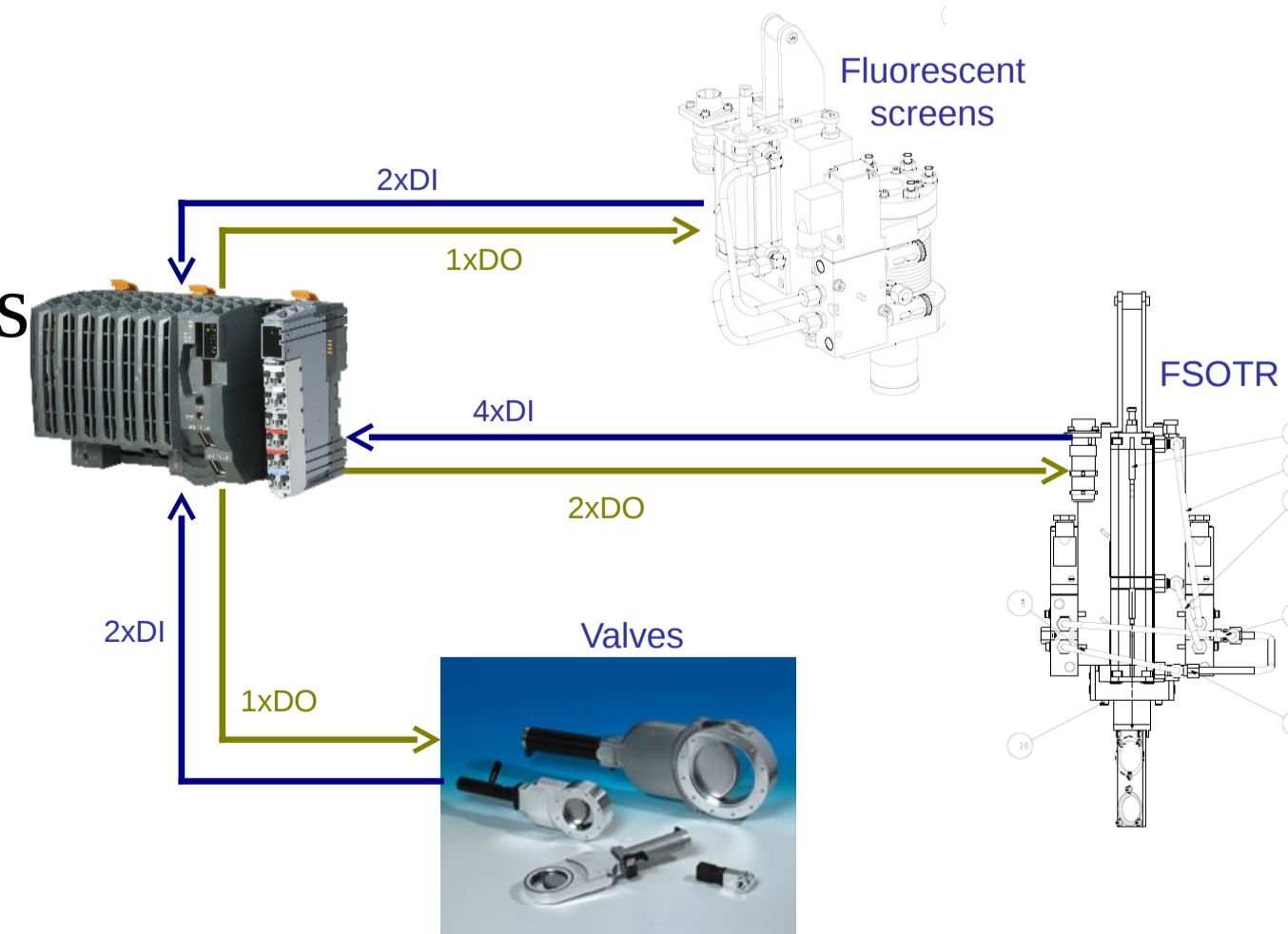
5) **Taurus** User Interfaces to PyPLC devices are generated dynamically, reloading changes on attributes lists and their alarm / status configuration.

We successfully automated the integration of PLC's in Tango, allowing high-level customization of PLC variables and its behavior. It reduced the number of changes needed in protection systems PLC's while boosting the scientist interaction with the system.