



LHC POWERING CIRCUIT OVERVIEW: A MIXED INDUSTRIAL AND CLASSIC ACCELERATOR CONTROL APPLICATION



F. Bernard, H. Milcent (CERN, Geneva, Switzerland)

INTRODUCTION

Three main systems are involved in the powering and protection of the LHC magnet circuit:

- QPS (Quench Protection Systems).
- PIC (Powering Interlock Controllers).
- Power Converters.

They have been developed and managed by different teams. Each system has its own control and expert software.

The first Hardware tests during LHC commissioning have shown the need of common graphical interfaces to monitor the data from a single access point.

The PVSS II[®] industrial SCADA system with the UNICOS framework has been chosen for this application.

PVSS II[®] SCADA (Supervisory Control And Data Acquisition)

PVSS II[®] from ETM selected as common SCADA at CERN in 2003:

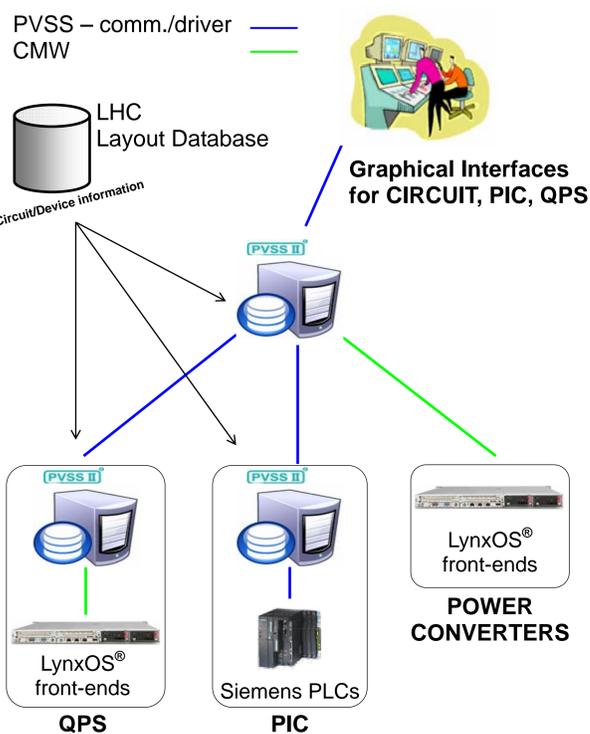
- Device oriented / Easily customized and extended directly in C/C++ / Real Time DB.
- Windows and Linux platforms / Several PVSS II[®] projects can be linked together.

UNICOS (Unified Industrial Control System) framework

The UNICOS framework: to produce control applications for three-layer industrial control systems.

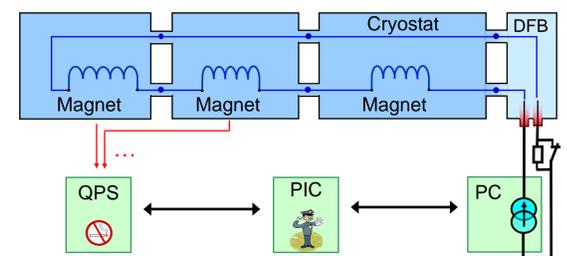
The PVSS II[®] UNICOS framework:

- An open framework where new devices and components can easily be added.
- Interfaces to Schneider, Siemens and FESA (Front-End Software Architecture) front-ends.
- User interface components libraries and general-purpose facilities to be used in the Accelerator Control environment.



Powering and protection of the magnet circuit

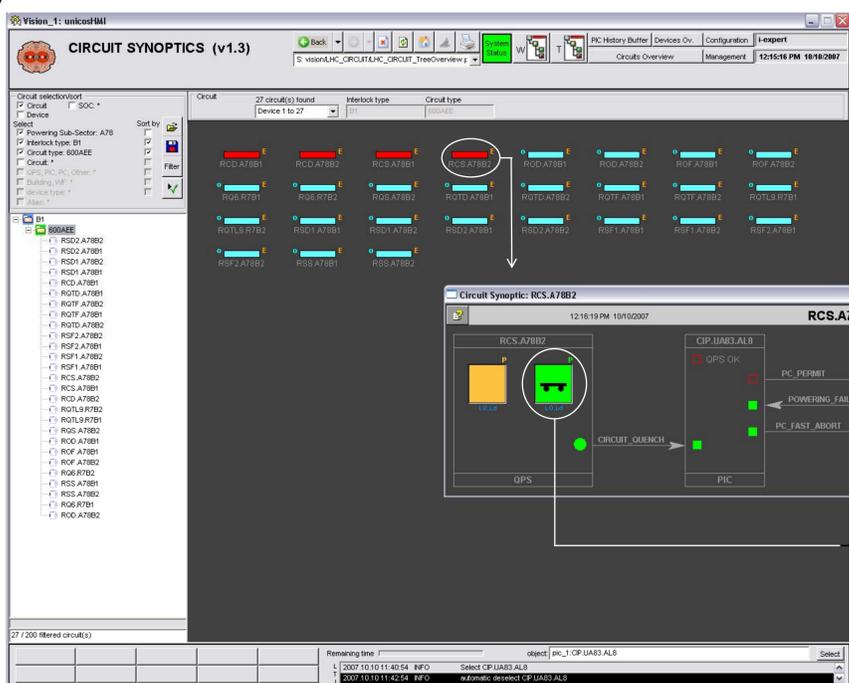
- The QPS guarantees the integrity of the superconducting elements.
- PIC checks good powering conditions for each electrical circuit.
- Power Converters are responsible for powering.
- Protection signals exchanged via hardwired current loops.
- No direct connection Magnet Protection – Converters.



Application features

- Summarise information from QPS, PIC and Power Converters systems for each powering sub sector and circuit.
- Provide one single access point and common interfaces.
- Mix trends from independent sources: QPS, PIC and Power Converters.
- QPS and PIC supervisions already developed on top of the UNICOS PVSS II[®] framework.
- Own data representation defined for each device type.
- Distributed functionality of PVSS II[®] used to access the data from the QPS and PIC systems without development.
- Electrical circuit is the common entity.
- All data defined in the LHC Layout Database reference.
- Tools used to deploy the devices on each system.
- CMW Middleware client interface provided by the UNICOS PVSS II[®] framework.

All the views used for operation and diagnostic are created dynamically, according to the circuit specifications and the devices involved.



Circuit overview

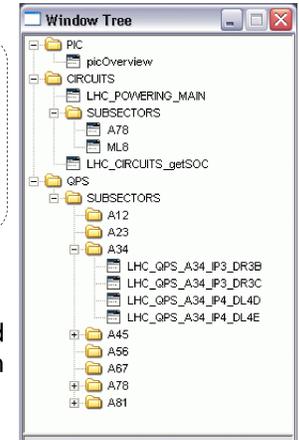
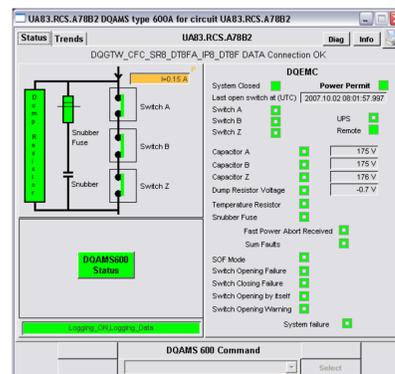
Each symbol represents a summary status of a circuit. The quality of the information is also displayed via additional letters and colours.

Functionality

- Switch from expert to circuit visualisation mode.
- Display data from a circuit overview down to a single device.
- Open the expert views from the Circuit supervision as if the user was directly on the corresponding supervision.

Circuit Synoptic view

The exchanged data between the QPS, PIC and Power Converters systems are monitored through a circuit synoptic view.



Navigation

From the circuit overview or directly from a window tree navigation interface.

Expert view

The device definition can be opened from the circuit synoptic view.

CONCLUSION

- Primary version used successfully during the first Hardware Commissioning of the LHC sector 7-8.
- Data acquired from three systems and presented through a common interface with summaries and detailed information.
- Relevant Cryogenic data for powering will be added in the circuit synoptic:
 - Cryogenic supervisions already based on PVSS II[®] UNICOS framework.
 - Integration will be straight forward as it was done for the PIC and QPS.