SUPERVISION APPLICATION FOR THE NEW POWER SUPPLY OF THE CERN PS (POPS)

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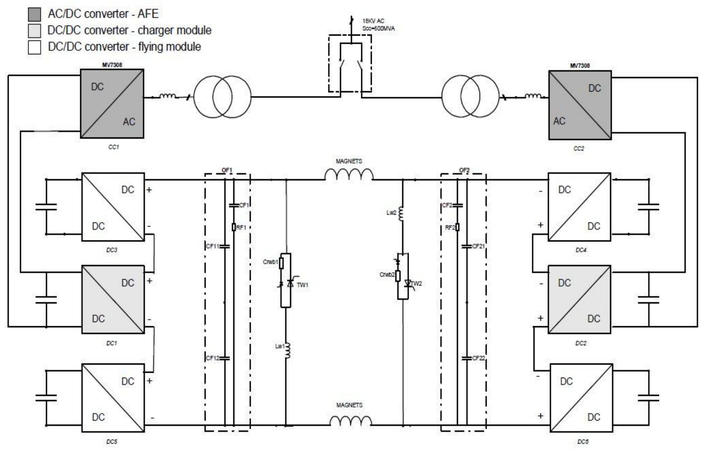
Introduction

Magnets of the Proton-Synchrotron (PS) accelerator at CERN are supplied by a new capacitive power system called POPS. It replaces the existing power system, a 40 years old rotating machine.

Hardware
- The Function Generator/Controller (FGC), giving the reference voltage.
- The controller from CONVERTEAM, an external company, maintaining this voltage under the magnet load.

Software
- CONVERTEAM own proprietary control environment, P80i.
- Supervision developed at CERN using existing internal frameworks.

Topology



Max. DC current	Mac. DC voltage	Max. energy	Peak power
6 kA	10 kV	14 MJ	60 MW

Three-level converters

Electrical network
↓ AC/DC converters
Capacitors banks
↓ DC/DC converters
Load

Putting it all together

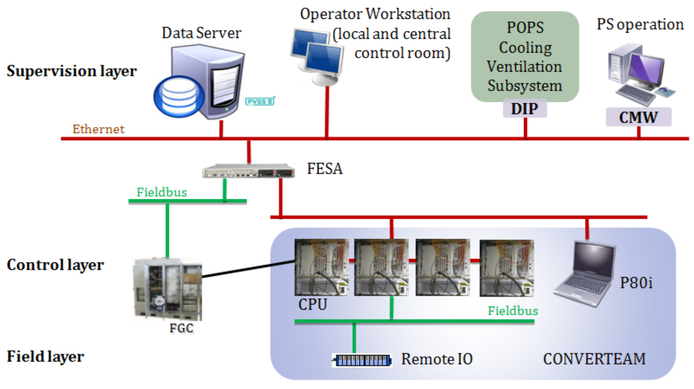
SCADA framework
Based on SIMATIC WinCC Open Architecture (WinCC OA, previsouly PVSS).

Uses the UNICOS framework for control applications developed at CERN.

Allows developers to rapidly develop full control or monitoring applications.

Provides operators ways to interact with simple (e.g. I/O channels) and high level composite devices in the process.
Offers tools to diagnose problems in the process, the control system and to access and operate the devices without specific development.

Interfaces Supervision - CONVERTEAM
Two possible interfaces:
- OPC, used initially.
- Proprietary protocol based on TCP/IP, used in a second phase with a dedicated FESA application.

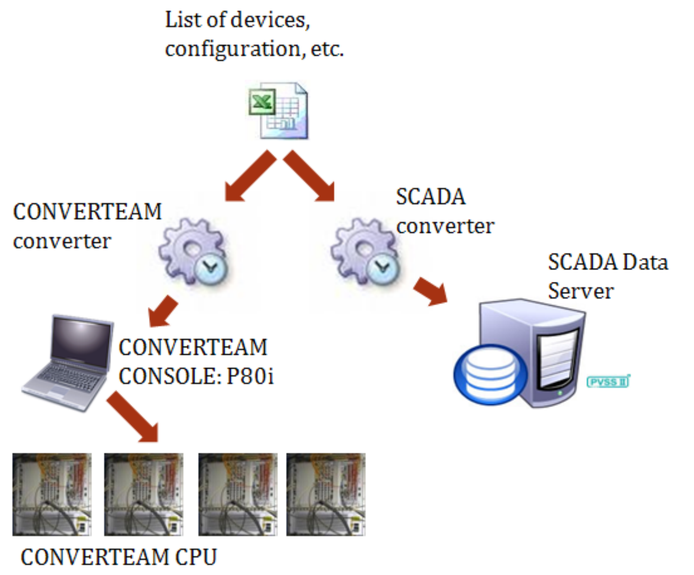


Control architecture
Field layer: ProfiBus WAGO IO modules.

Control layer: VME cards, holding the closed control loops and the voltage and capacitors control.

Supervision layer: provide process views, archiving, trending and alarm handling.

Configuration
- A common source in Excel spreadsheet.
- Specific extractor for each tool.

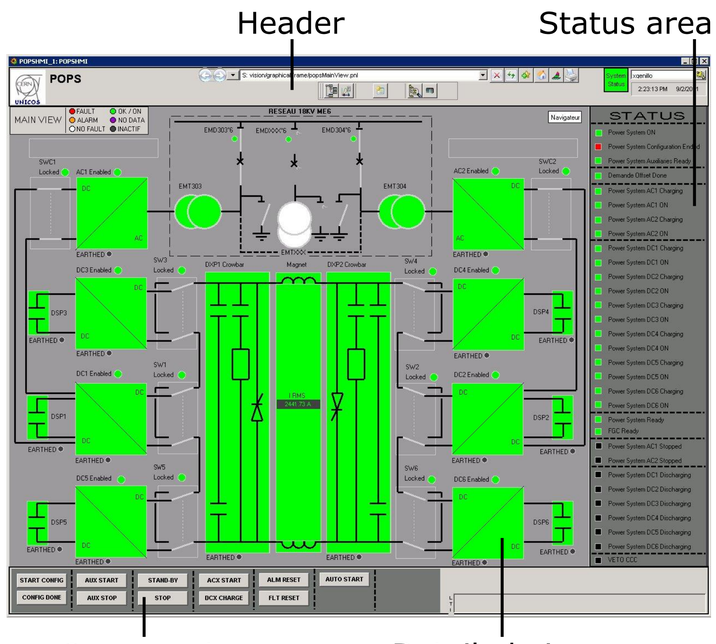


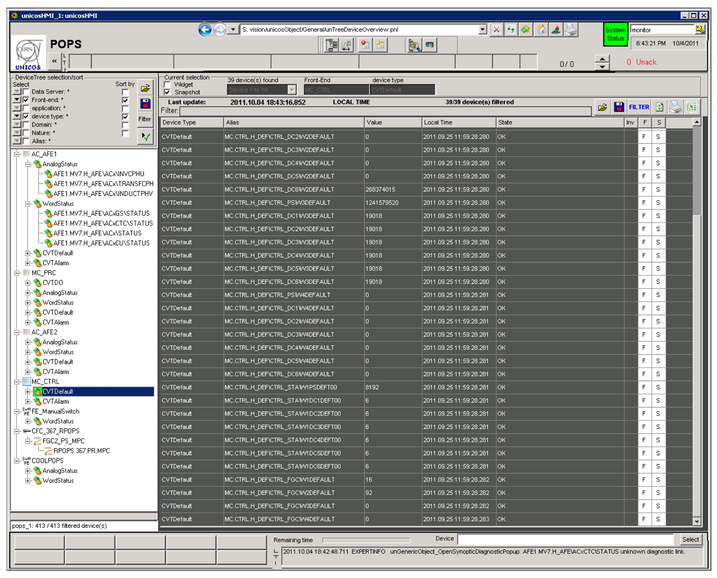
Initial operational experience

The supervision layer was successfully used during the commissioning and the operation of POPS.

Graphical interface
- Local control room for development or commissioning.
- Central control room for daily operations.

Built-in UNICOS features
- *Tree Device Overview*, used during the commissioning to test the complete control chain (sensors up to supervision).
- *Event list*, useful to understand the sequence of faults in case of the powering failure.
- *Flexible configuration* to release the complete POPS graphical interface. An expert having no deep knowledge of WinCC OA made the views with the high level widgets.
- *LHC software suite*, used to interface to the PS operation.





Conclusion

- POPS supervision system uses the same tools than the LHC and experiments use.
- Developed in a short time frame and with a small team.
- Seamless integration in the CERN controls infrastructure.
- Any future maintenance and upgrades will also be simplified.

Project timeline

Phase I
- Uses low-level dedicated devices interfaced via OPC to the control layer.
- Validation of the equipment and the feedback control loops.

Phase II
- Uses the FESA interface instead of OPC.
- Addition of high level device widgets encapsulating the low-level devices.
- Creation of the process views by the operators and the control experts.

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