MAGNET POWER SUPPLY CONTROL MOCKUP FOR THE SPES PROJECT

M. Giacchini, M. Montis, M. Contran, INFN – Legnaro, Padova, Italy
M.A. Bellato, INFN- Padova, Padova, Italy

Abstract

The Legnaro National Laboratories employs about 100 Magnet Power Supplies (MPSs). The existing control infrastructure is a star architecture with a central coordinator and ethernet/serial multiplexers. In the context of the ongoing SPES project, a new magnet control system is being designed with EPICS[1][2] based software and low cost embedded hardware. A mockup has been setup as a test stand for validation. The paper reports a description of the prototype, together with first results.

INTRODUCTION

To improve the reproducibility and stability of the magnet control system used at LNL to the accelerators, the previous control system should be upgraded to a new one. The control system chosen for this task and to all site was EPICS. The previous system was based on terminal servers. The power supplies were connected to the terminal server which exports the serial interfaces to the central control workstation server. On this one a C program runs to manage the communications, and makes available the Graphical User Interface (GUI) to the operators.

This start architecture force the user to use only one GUI operator interface per time. The communication interface itself realize sub-groups concentrates them on terminal servers which relay on a serial interface converters; this makes, suddenly, communication problems in case of faults of only one power supply on the chain.

Basing on this experience and the strong EPICS architecture, the new system should have a great granularity, where, the communication shouldn't be concentrate, either the GUIs could be duplicated and moved without effort.

HARDWARE CONFIGURATION

The Input Output Controller (IOC) selected to this application is a low cost embedded PC (Figure 1). The power requirements necessary to this object is low enough to use the Power Over Ethernet technology. This makes extremely cheap the cabling, but requires the necessary power on the Ethernet switch. We are evaluating various kind of embedded PC which could play this role, the final decision has not been done, but the tests already done seems we have made a good technology selection.

The power supply of the magnets can use two kind of serial communications: RS232, RS422. The previous system has used the second one. The pros of that choice were the reduction of the amount of the lines, the reduction of the cabling which means a final reduction of the total cost; but the cons was quite bad, if someone of the serial controller of the power supplies on the line goes on communication fault state all the controllers on that lines are not controllable until the fault was fixed.

The new system makes all the communication independently using the RS232 connection, which realize a point to point connection between the controller and the embedded PC. Later, if this should be the case, we move back to the RS422, which is more strong in front of noises, but in any case we would use the point to point connection, to make the system robust as much as we can, minimizing communication delay.

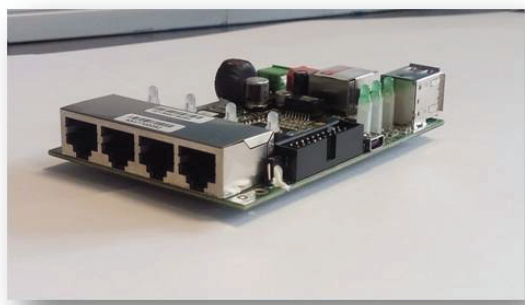

Figure 1: Example of embedded used as IOC for the magnet system.

SOFTWARE

The core of the software, the device communication was accomplished by using ASYN[3]. A basic version used on other site has been modified and customized to fit the requirements of our site. More works has requested the development of the GUI operator interface, based on Control system Studio (CSS), as visible in Figure 2.

After 20 years of operation on the old magnet system the operator itself, for a first time in the history of our laboratories, has been trained to design and realize the skeleton of that GUI. Themselves feels comfortable using a GUI designed by them, that is going to make the change of the control system more smooth.

Copyright © 2014 CC-BY-3.0 and by the respective authors

ISBN 978-3-95450-146-5

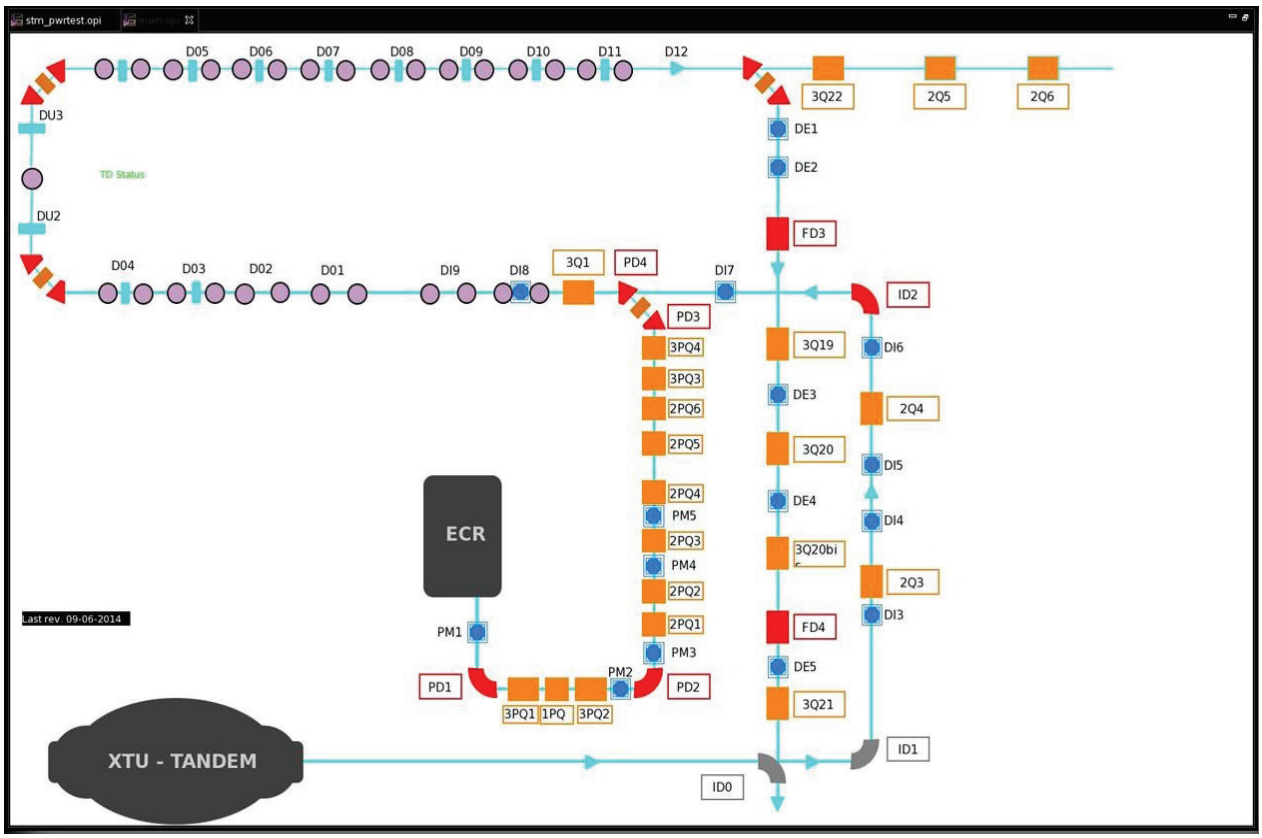

Figure 2: Main Control Panel for ALPI-PIAVE Accelerator.

Last, but not least, the operators has requested us a knobs interface (Figure 3). This requirement has been satisfied using a PSI knob-box-board. This knobs box has been enclosed into an instrumentation box which contains the same embedded PC which permits us to see that like another IOC.

Extremely useful during these test is the EPICS archiving system[4] which makes surveillance on the various IOCs and the relative variables.

FIRST RESULTS

The mock-up has been used on various installation. Unfortunately the continuous production of beam of the LNL accelerators machines has made impossible a large test bench. Small tests have been run continuously to many moths and the system has been tested on lab from one year.

As soon as possible, matching with the agenda of shifts and maintenance stages, a consistent large installation will be placed like a proof of concept of the software and hardware selection choice.

Figure 3: Knob system device realized for managing the magnet system.

CONCLUSION

A complete substitution of an old control system with new one, completely different on software and hardware profile, has to be taken with great care. The migration is keeping time in order to reduce possible bugs during debug stage. As consequence, the production phase will be already optimized.

The collaboration with the operators team is the first tentative to this kind but has already made great result on the handling of the control system and the related GUIs.

Copyright © 2014 CC-BY-3.0 and by the respective authors

ISBN 978-3-95450-146-5

ACKNOWLEDGMENTS

We are grateful for their help and collaboration to G. Martin (PSI) and to A. C. Mezger (PSI) for sharing their knowledge related to knob devices developed in EPICS environment. This works leveraged of years of experience on EPICS use from good engineers of other laboratories around the world: great acknowledgments to them.

REFERENCES

[1] EPICS website: http://www.aps.anl.gov/epics
[2] EPICS at LNL website: http://www.lnl.infn.it/~epics
[3] ASYN website: http://www.aps.anl.gov/epics/modules/soft/asyn/.
[4] M. Montis et al., "New data archive system for SPES project based on EPICS RDB Archiver with Postgresql backend", FPO014, PCAPAC'14, Karlsruhe, Germany (2014)

Copyright © 2014 CC-BY-3.0 and by the respective authors

ISBN 978-3-95450-146-5