

IRIO. Intelligent instrumentation for adaptative integration

IRIO consists on a methodology and a set of software tools that drastically simplify your intelligent data-acquisition system development cycle. With IRIO, FPGA implementations are automatically integrated into EPICS.

Big Science facilities use complex control systems like EPICS to control their plant systems. The integration of reconfigurable hardware (FPGA) is particularly complicated. To aid on this integration IRIO creates a solution that intelligently detects hardware and substantially reduces integration time on the control systems.

IRIO can help on the several stages that are required for the development of these systems, reducing initial expertise on the control systems by more than 160 hours of work and reducing implementation time by 70%. It is also a convenient tool that eases maintenance work.

IRIO is currently part of ITER instrumentation and control. To evaluate ITER control systems. KSTAR tokamak (an ITER-like facility) uses IRIO on already working systems.

Technology solution supported by the Technical University of Madrid

Technology solution

Big Science experiments use complex control mechanisms to control their plant systems in a distributed and robust way. A major part of the sector uses a software collection named EPICS to do so.

The integration of the different instruments is a very time-consuming task. In particular, FPGA-based systems, which are reconfigurable multi-purpose systems, require additional development effort on integration.

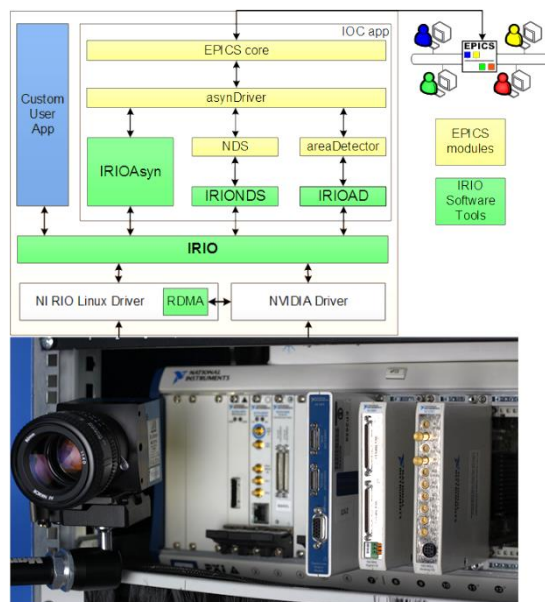
The interesting feature of FPGA systems, meaning, their reconfiguration capabilities, are handicapped because EPICS cannot detect hardware resource changes on its own.

IRIO automatizes the integration of these data-acquisition systems, by intelligently detecting the resources used on the hardware reducing, at the same time, the implementation time and maintenance costs.

Areas of application

- ICT applied to embedded systems and components:
 - Big Science
 - Industrial
 - Medical

"IRIO simplifies Hardware design integration onto your plant systems, reducing development time and enabling easier testing in the process"



Market demands

- Big science experiments move slow and require of lots of resources. For this reason, Big science facilities use open-software based solutions and FPGA-based hardware. They look for long collaborations with the businesses they trust to integrate the systems and do not want to be constrained by closed solutions.
- An example of such efforts is reflected in recent interests of big companies like Altera and Xilinx which lead the market on FPGA sales and patent production, to also push on the open-software initiative named OpenCL for developing with FPGAs. These companies are exploring mechanisms that aid on integration of diverse control and processing systems. The potential of OpenCL also attracted companies like: Apple, IBM, Texas Instruments, NVIDIA, Intel and many more.
- Other areas of application requiring the integration of diverse electronic devices with high performance are the automotive sector, with Tesla leading on innovation for autonomous driving; Industrial processes that highly value reduced maintenance time and cost; Medical applications using accelerators for proton therapy are the primary markets.
- To relieve the pain of integrating systems, some companies are offering solutions, for instance, the companies focused in the Big Science market, such as Observatory Sciences or Cosylab. Although, these companies still rely on conventional custom solutions.

“Simplify the Integration of your intelligent Instrumentation system in EPICS with IRIO reducing the cost and development time to the minimum”

Market potential

- There are more than 39 big science facilities around the world using EPICS. With budgets for these facilities spanning from 10M€ to 10Billion€.
- The most remarkable example is ITER with more than 16 Billion euros of budget forecasted. ITER estimated the cost of the instrumentation and control (I&C) systems at 7% of the total budget. A project involving one of these I&C systems, has a typical cost ranged 1M€-10M€ and is composed of several stages: Design, Development, Test, commissioning, and maintenance.
- For ITER, dozens of these I&C systems are required. The integration of each of these I&C systems into a whole robust EPICS controlled installation is a critical task. Using IRIO reduces time and costs of each stage.

Competitive advantages

- Less implementation hours: working with IRIO is easier than straight implementation with EPICS. When working with our tools, development time is reduced around 70%.
- More design adaptability: hardware changes don't require a software change. Unlocking FPGA potential.
- Lower initial expertise: reduced EPICS knowledge needs. Learning EPICS-basics for a senior engineer may take 160 hours, mastering will take years.
- Lower commissioning & maintenance costs: simple changes require no additional work with IRIO. Major changes benefit as much as normal implementations.

References

- IRIO is already part of ITER control system, the most ambitious research effort in the world to generate clean and sustainable energy from fusion. The ITER project forecasts a 16 Billion euros budget.
- IRIO is also used in KSTAR control systems as part evaluation of ITER control system. The KSTAR is the Korean tokamak (ITER-like facility).
- IRIO is also contracted to aid in the integration of I&C systems at IFMIF. This research facility will test new materials for nuclear fusion reactors (like ITER) or the next generation of nuclear fission reactors.

IPR

- Software registration M-4824/2016

Development stage

- | | |
|-------------------------------------|---|
| <input type="radio"/> Concept | <input checked="" type="radio"/> Industrial Prototype |
| <input type="radio"/> R & D | <input type="radio"/> Production |
| <input type="radio"/> Lab Prototype | |

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