

MACUP: A PROJECT FOCUSING ON DAQ HARDWARE ARCHITECTURE UPGRADES FOR SOLEIL

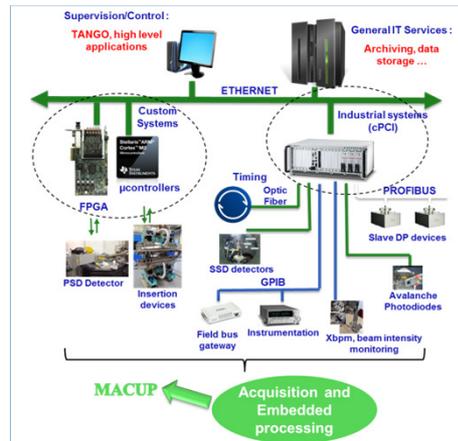


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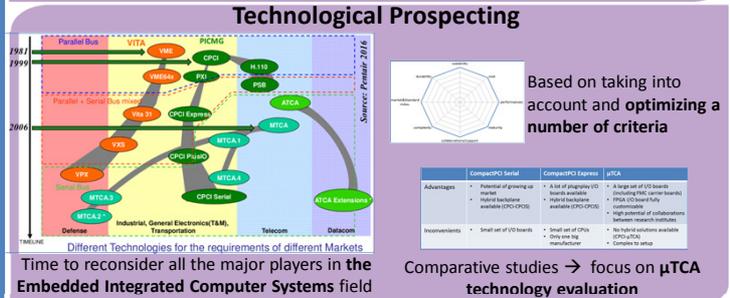
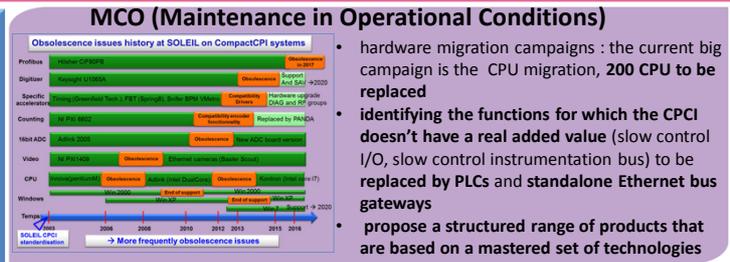
Context : SOLEIL (France) all **the hardware acquisition and embedded processes** of the **accelerators, beamlines** and **laboratory infrastructure devices**, are covered by Industrial COTS **CompactPCI solutions** and **in-house custom solutions**, all are communicating over the TANGO software framework. **Obsolescence issues** for these solutions, **in operation for more than 10 years**, have been on an increase the last few years. In this context the **MACUP (Material for Acquisition Upgrade)** project was initiated in 2014 with two objectives:

- **Ensure the operational continuity of the systems** in production through MCO strategy (**Maintenance in Operational Conditions**)
- **Improve acquisition systems** by introducing **more performance and improved on-board processing** capability through technological surveys



Applications using **fast analog/digital, instrumentation and field bus processes**

10 years of operation of Soleil DAQ technologies
More than **1000 boards** to maintain
→ **Obsolescence issues is increasing**



MACUP Methodology:

- **Organization:**
 - Establishment of an **advisory committee** (largely cover requirements from all field of activity or science)
 - **Census of future projects**
- **Analyzing factors**
 - Reassessing the existing architecture
 - Technology Prospecting
- **External Exchanges**
 - Industrial Partners
 - Institutions, partnership facility

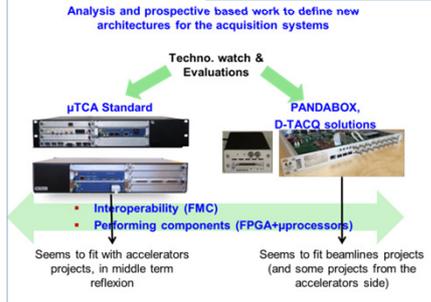
Census Results:

- **47 applications have been identified:** 13 from the accelerators, 34 from the beamlines and detectors fields.
- All these applications require new functionalities
 - Embedding the **processing algorithms at the hardware level** (developing embedded image processing...)
 - **Better performances** (higher ADC resolutions, sampling frequencies...)
 - Ability to **embed third party processes** or hardware.

New platforms orientations:

The census showed a **real expectation in terms of new solutions in material acquisition**. To adapt the offer of services taking into account the degree of **customizable and collaborative platform** versus turnkey solutions with a **scalable range of performance**, two categories of platforms selected for investigation:

- **µTCA** based technology well adapted for accelerators requirement
- **Zynq SOM (Picozed)** technology based custom solutions (PandABox is one of these platforms nearly available for users) well adapted for beamline requirement



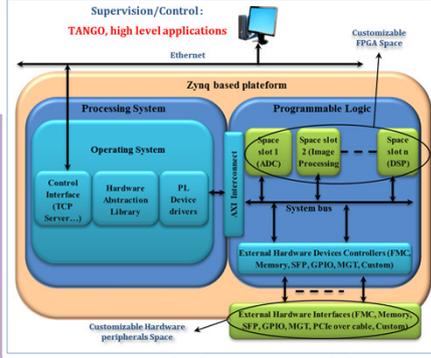
Conclusion and perspectives

The MACUP project will permit to **extend the life time (maybe for another 10 years)** of the current in-production acquisitions systems.

It will also **provide new platforms** in order to address **new futures challenges for beamlines and accelerators**.

Providing collaborative platforms :

From both categories, a common objective of providing **collaborative platforms based on open FPGA and µprocessor architectures** of which it is possible for the user to embed their process. A reflexion on the existing frameworks is under way.



Our opened platform model

- The next steps of the project are:
- **Conduct MCO activity** according to the defined orientations
 - **Evaluate µTCA platforms**
 - **Develop in-house skills centered on µTCA and SoC Zynq technologies** (test platforms, training sessions) in order to optimize design cycles from development to operational solutions
 - **Develop and structure the set of services for these new platforms** (standardization of hardware and software new components)
 - Conduct and support **the identified new projects**