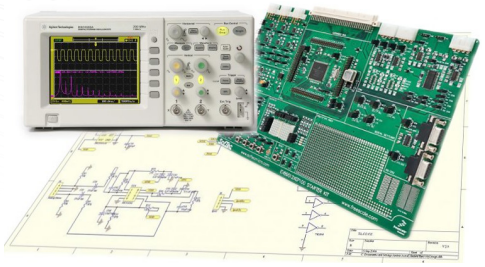
COSYLAB
CONTROL SYSTEM LABORATORY

FPGA & Custom Hardware Development

Service Description

Introduction

When FPGA programming and custom hardware development projects are a burden to your lab, why not consider outsouring them to Cosylab.



We do many types of projects— **FPGA/ CPLD programming, PCB design, signal acquisition, motion control, high-voltage design**, and more.

Depending on the needs, we can work on any part of the development at your lab in close contact with your people.

Why is FPGA so hard?

While harvesting the power of both software and hardware development, FPGA projects also suffer from the difficulties and pitfalls of both. The software side requires managing complexity and version control, and the FPGA tools are not on-par here with conventional SDK's. The hardware side adds for example massive parallellism, pipelining, clock domain crossing while meta-stable states and glitches make debugging really hard.

FPGA programming is not merely prototyping with a development kit: it is an engineering discipline that requires mastering of both software and hardware aspects.

Cosylab masters FPGAs

Cosylab's FPGA team is world-class in its field. We meticulously recruit the best talent and complete their technical training with our domain specific FPGA academy. Our FPGA development methodology is aligned with our software development processes, specifically to manage the complexity of large scale projects.

FPGAs are used in demanding subsystems, such as timing and sychronization. We developed intensive partnership relations with technology suppliers for these systems, e.g. Micro Research Finland and National Instruments.

Specialized in Big Physics

With Cosylab as your trusted partner you benefit from our **best practices** and **workflow processes** tailored to serving the Big Physics community. Familiar with scientific environments we know requirements change as part of the evolving machine design. We have built our processes around that fact. We:

- **gather requirements** and document them,
- **explore available** solutions in a technology study and an optional proof-of-concept,
- **choose** the best architecture and **propose implementation** in the design document,
- handle complete **development, production and testing**.

All the while we regularly involve you, the customer, in our work, so we can address evolving insights. In short: a flexible, but managed process.

Cosylab, September 2013
Service Description version 1.0

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FPGA & Custom Hardware Development
(Continued from front side)

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Integration into the Control System

The device or subsystem for which you have an FPGA / custom hardware solution in mind, will have to be integrated into the machine's overall Control System. Cosylab is a world leader in this kind of work. Ask for our Service Descriptions on EPICS, TANGO and LabVIEW device integration for more details on what this part of the work entails.

Recent Example

Power Converter Controller, MedAustron, Wiener Neustadt, Austria

MedAustron is a medical synchrotron that requires precise synchronization of its 260 magnet power converters in order to generate the beam.

To achieve the required precision of 1 µs among all power converters, the most critical parts of the functionality have been implemented by Cosylab using FPGAs and custom designed hardware.

For the host side, we have developed a custom PXIe FlexRIO FPGA module that implements generation of reference values and acquisition of measurements.

On the device side, a custom FPGA-based front end device acts as a gateway between the power converter and the host FPGA fiber optic link. The host and the device FPGA implement a custom real-time protocol on the fiber optic link which guarantees deterministic latency.

To achieve the required performance, the host FPGA has access to a DRAM, where it buffers measurements from the power converters and reads out the new reference values provided by the system controller. To achieve the highest throughput, data in DRAM is accessed using DMA.

Cosylab delivered the project to customer satisfaction, on time and in budget.

How to make it happen

Simply by contacting us; either by e-mail (see left) or by contacting someone you already know at Cosylab.

You can provide us with any form of specifications you already have, or tell us the wish-list of improvements for your current systems. If we need to know more before we can start with the work, we typically propose a 3-day site visit to produce a requirements specification document.

We quote all effort and expenses upfront. Invoicing after acceptance of deliverables. "No cure, no pay"!

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