

# **Advanced data acquisition and processing applications using NIRIO FPGAs-based technology and NVIDIA GPUs. Integration in EPICS**

## **PART I**

### **1 DAQ AND FPGA-BASED DAQ SYSTEMS**

- 1.1 Description of a basic data acquisition device
- 1.2 DAQs devices with FPGAs
- 1.3 Description of RIO platform from National Instruments
- 1.4 IMAQ acquisition systems

### **2 USING RIO IN LABVIEW/FPGA**

- 2.1 Developing FPGA-based applications with LabVIEW for FPGA
- 2.2 Examples for advanced DAQ and Image acquisition
- 2.3 *Demo*: Using LabVIEW for FPGA in Windows, High Speed analog data acquisition

### **3 USING RIO IN LINUX**

- 3.1 Description of the Linux architecture (kernel module and API). Basic examples using NI-RIO Linux Device Driver
- 3.2 *Demo (video)*: using a cRIO system for analog and digital input/output.

### **4 IRIO PROJECT**

- 4.1 Software tools for the development of applications using FlexRIO and cRIO

- 4.2 Basic principles of IRIO. Software modules
- 4.3 Design rules. Profiles, examples (DAQ and IMQ)
- 4.4 *Demo (Video)*: Example, using cRIO system
- 4.5 Integration in EPICS
  - 4.5.1 What EPICS is? EPICS (IOC) CA server y CA clients
  - 4.5.2 Connecting hardware devices to an EPICs IOC, methods, examples
  - 4.5.3 IRIO solution for EPICS: NI-RIO EPICS Device driver. Image acquisition example.

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### **PART II**

## **5 USING GPUS**

- 5.1 Basic description of a GPU. Designing software application with GPUS (NVIDIA SDK)
  - 5.1.1 GPUS integration in DAQ solutions (RDMA)
  - 5.1.2 NI-RIO Linux Device Driver with RDMA support
  - 5.1.3 Using GPUS in IRIO
- 5.2 *Demo*: Integration in EPICS. Image acquisition and processing application
  - 5.2.1 Developing an application with NDS. GPU Classes