



Embedded Systems



Industrial IT



Lesson learned using NI's FPGA technology

Prevas have used NI's FPGA technology in our test systems since it was released.

For FPGA development we use both LabVIEW FPGA and ordinary VHDL tools.

This presentation gives examples from our different projects and also lesson learned from those cases.

AGENDA

- About Prevas
 - CoE test systems
- FPGA technology briefly
- HW used in projects
- Early projects
- Recent flex-RIO projects
 - FlexRIO Adapters
 - CLIP node example
- Simulink in NI target
- Distributed FPGA projects
- General lesson learned
- Questions

In Brief

- Founded in 1985
- Nordic leader in Embedded Systems
- Nordic leader within MES, EMI and Automation
- Management Consulting
- 600 employees – Sweden, Norway, Denmark and India.
- Listed on NASDAQ OMX
- ISO 9001:2008 Certification





Prevas Center of Excellence- Test System Design

KEY AREAS OF EXPERTISE:

- Test of embedded products
- Test system development
- Real-Time measurement and control systems

TEST OF EMBEDDED PRODUCTS

We help you to improve your test process, any part from requirements to test evaluation.

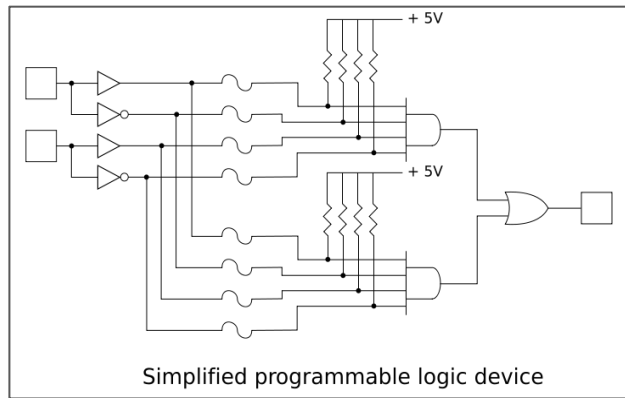
TEST SYSTEM DEVELOPMENT

We provide automatic testing of your current and future products by Prevas **cost effective solutions**

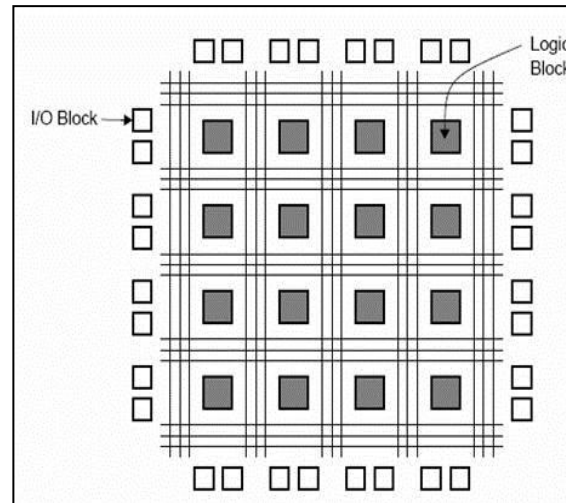


What is an FPGA ?

- Field-Programmable Gate Array
- Gate Array – Interconnect is done once with a specified function
- FPGA – Field-programmable gates and interconnects



Gate Array



FPGA

National Instruments FPGA Targets over the years



2006



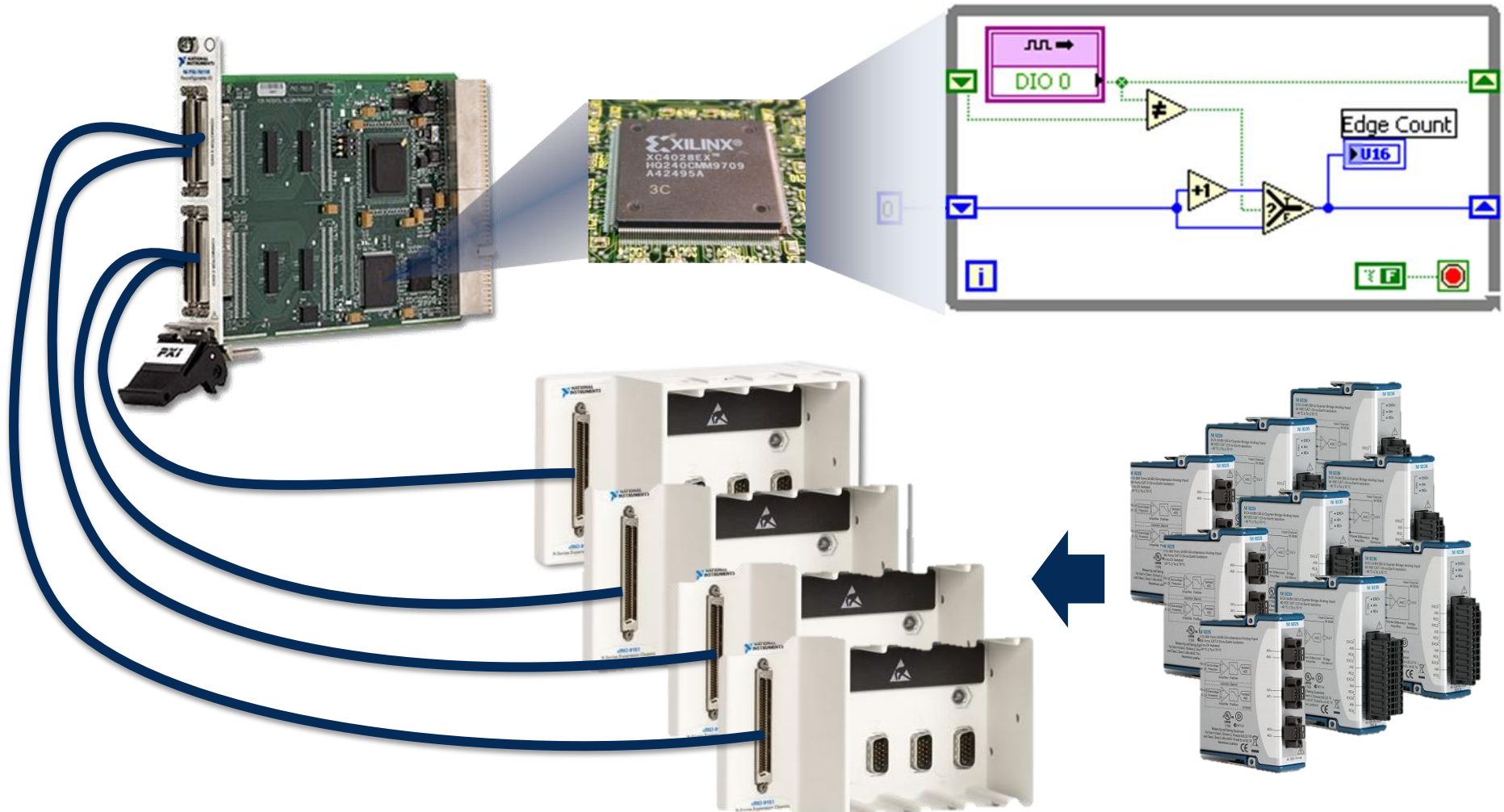
2009



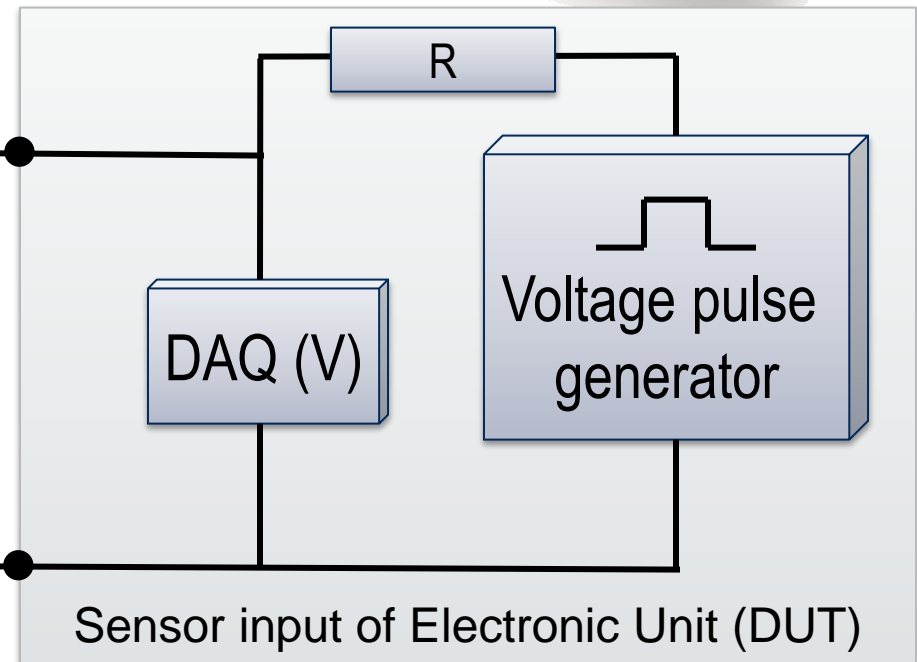
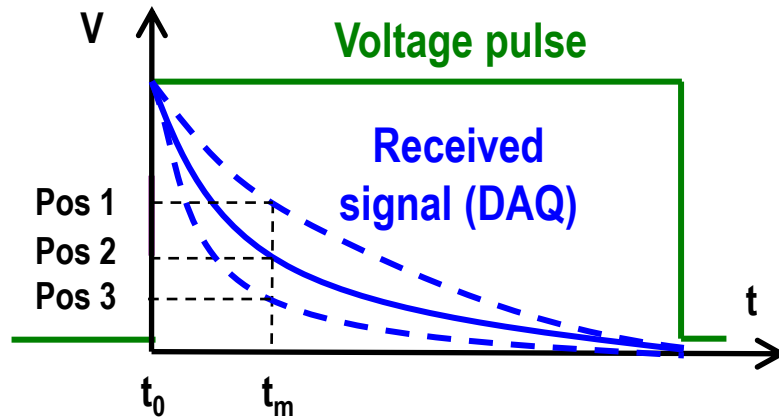
2011



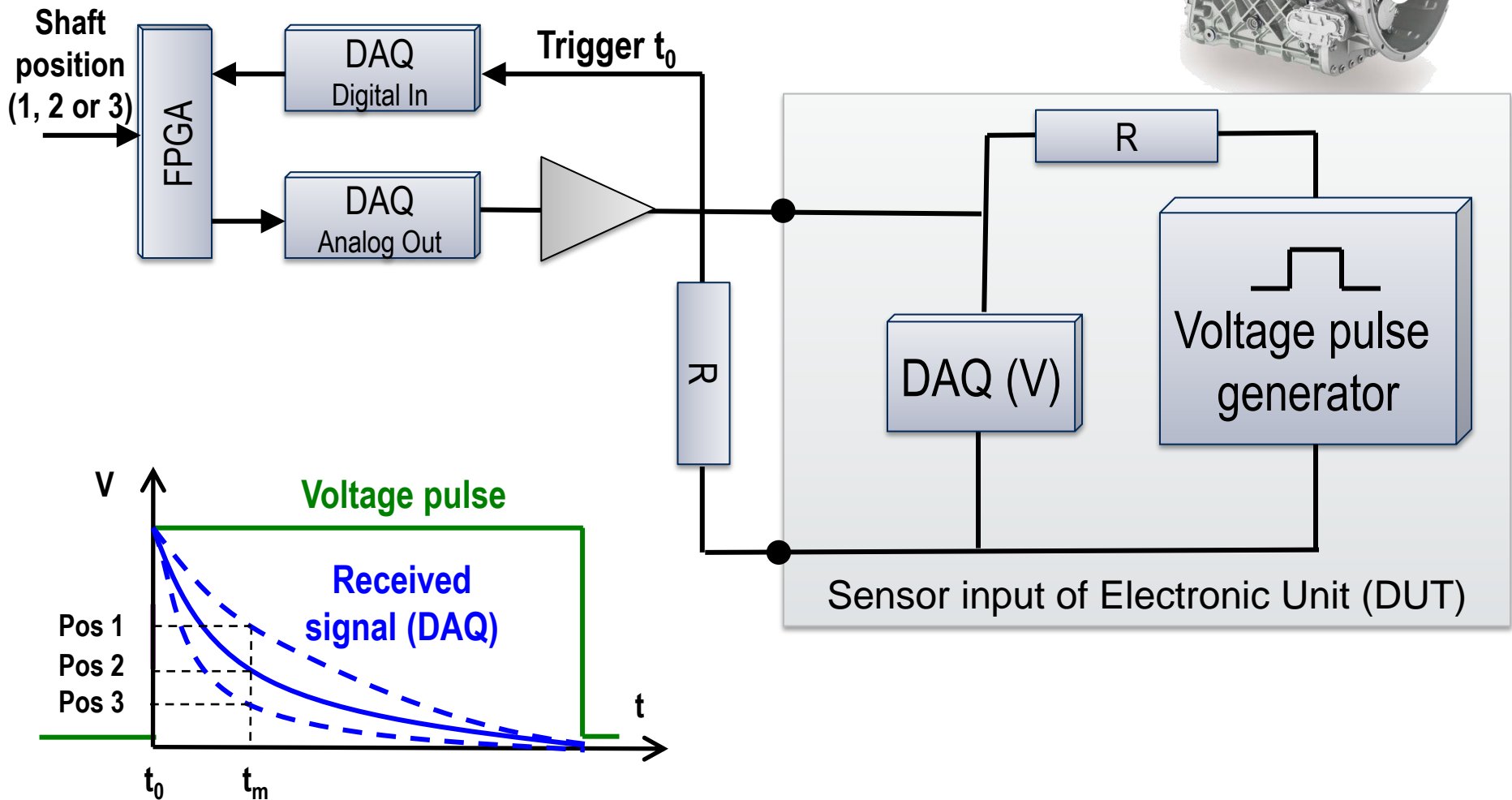
First generation FPGA boards



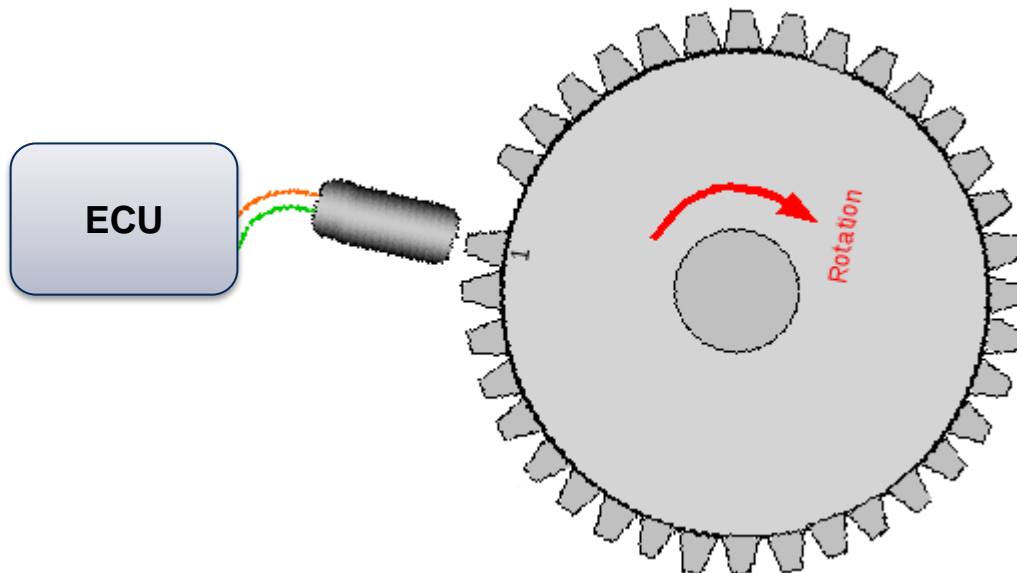
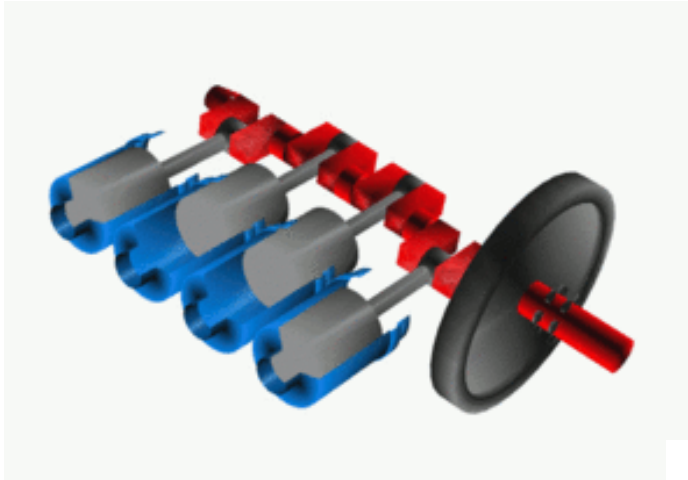
Position sensor emulator



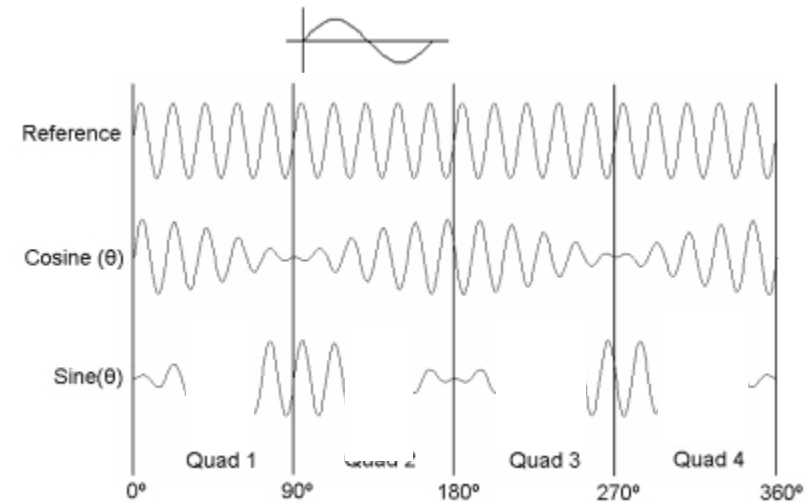
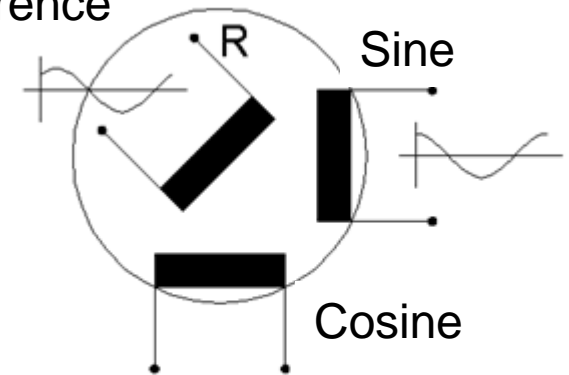
Position sensor emulator



Camshaft and syncro emulator



Reference



Faster FPGA, FlexRIO

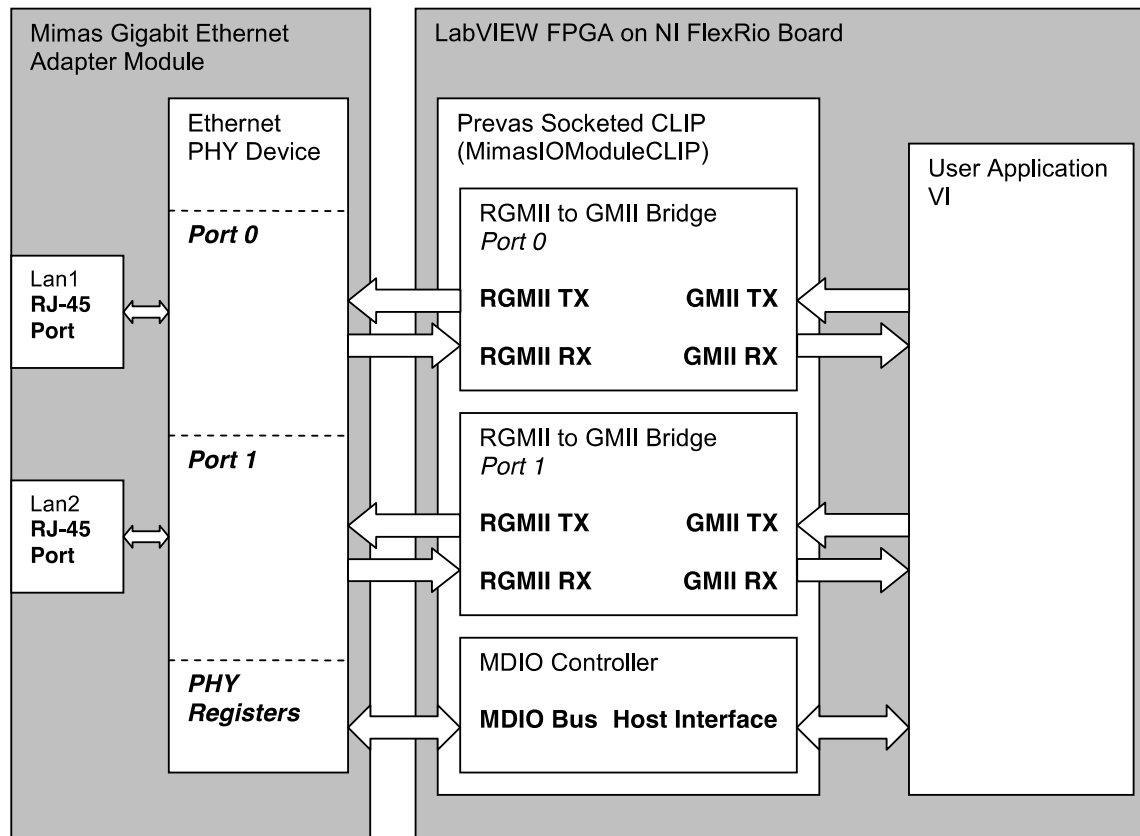
First generation Flex RIO

- Virtex-5 clocked at 400Mhz
- Access to 132 FPGA pins
 - LVDS pairs up to 1 Gb/s
- 128 MB onboard memory

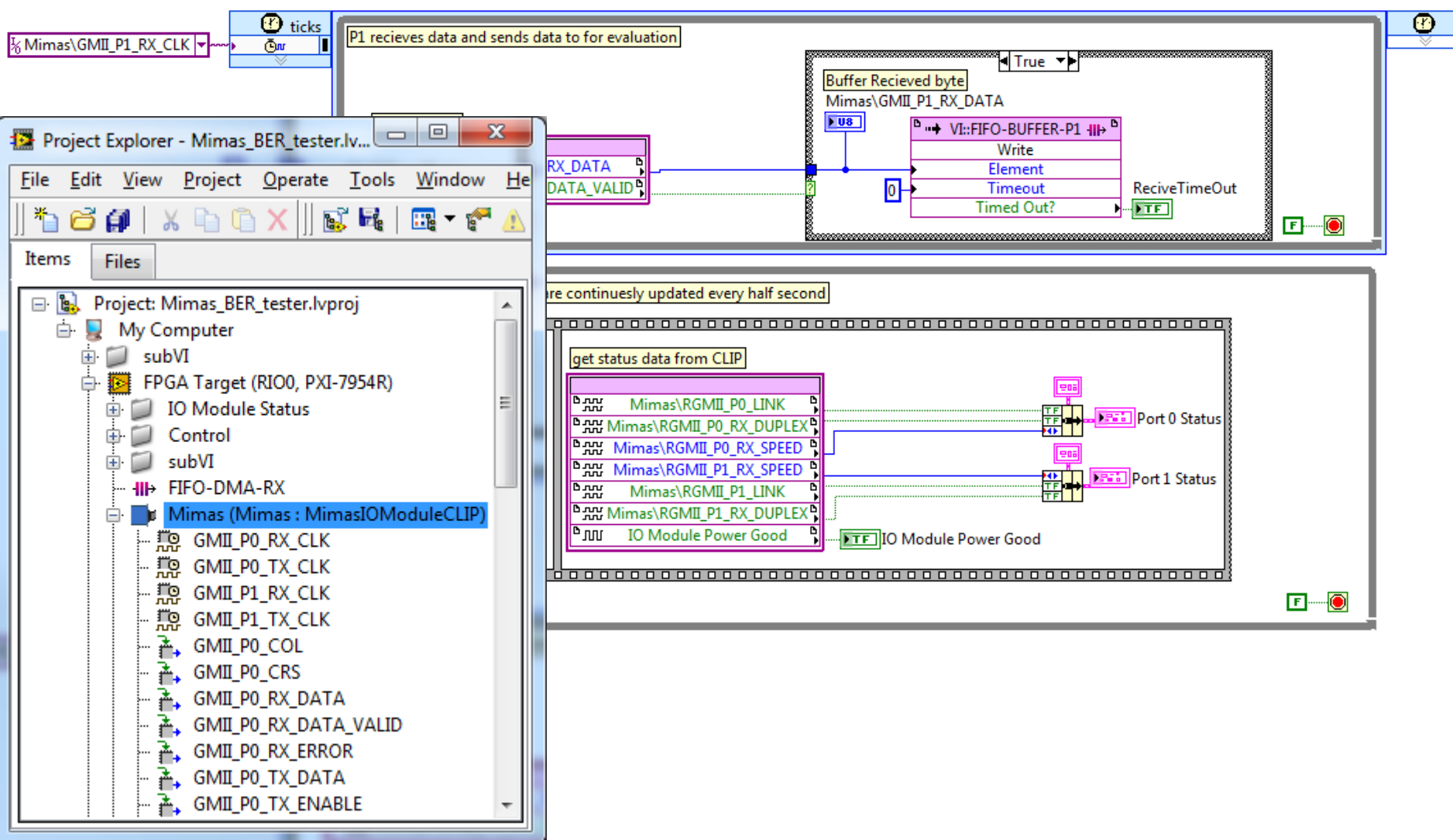


Prevas FlexRIO Adapter

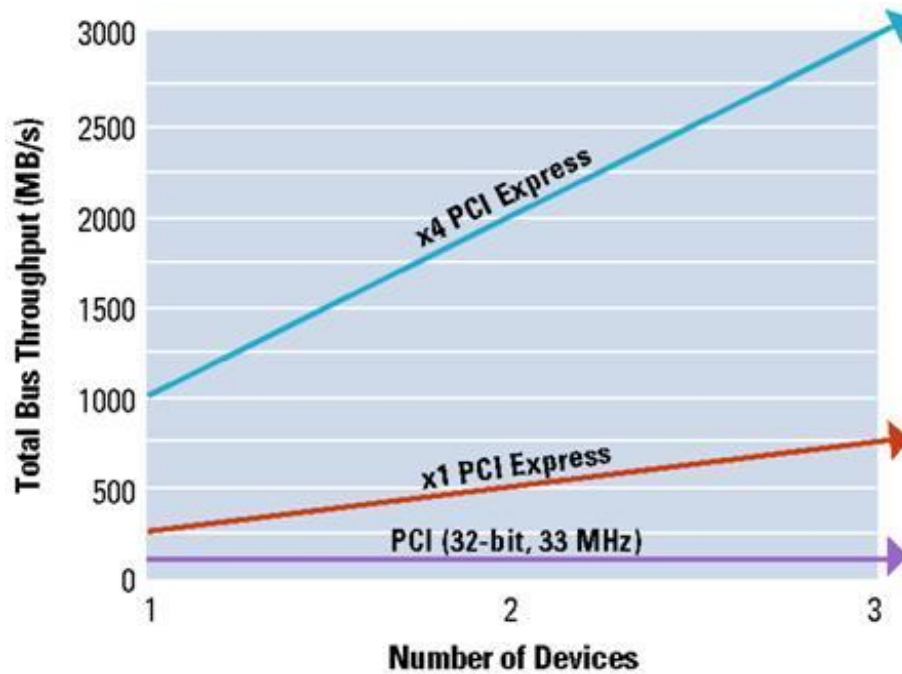
2 x 1Gbit Ethernet ports



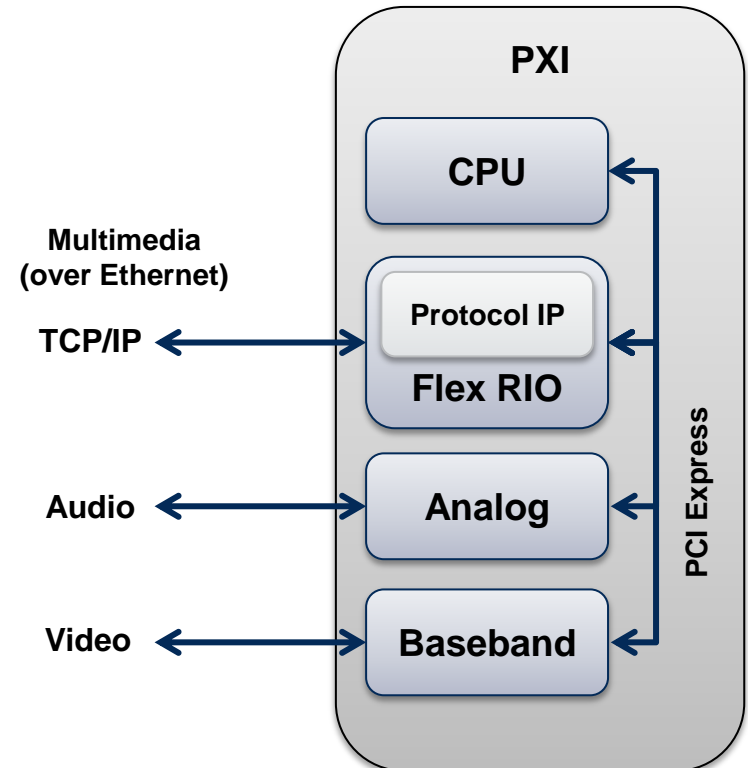
5 Example, Gigabit adapter (Component Level IP)



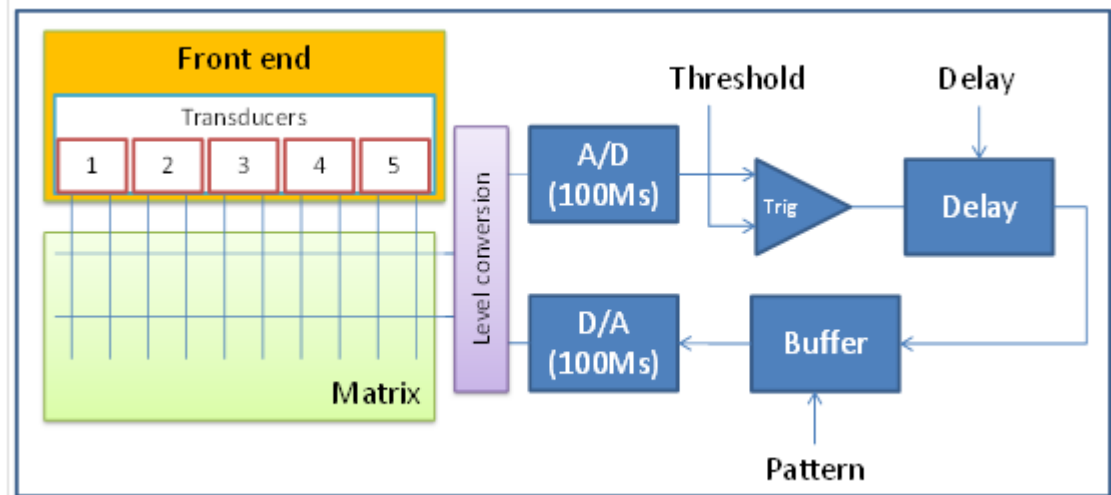
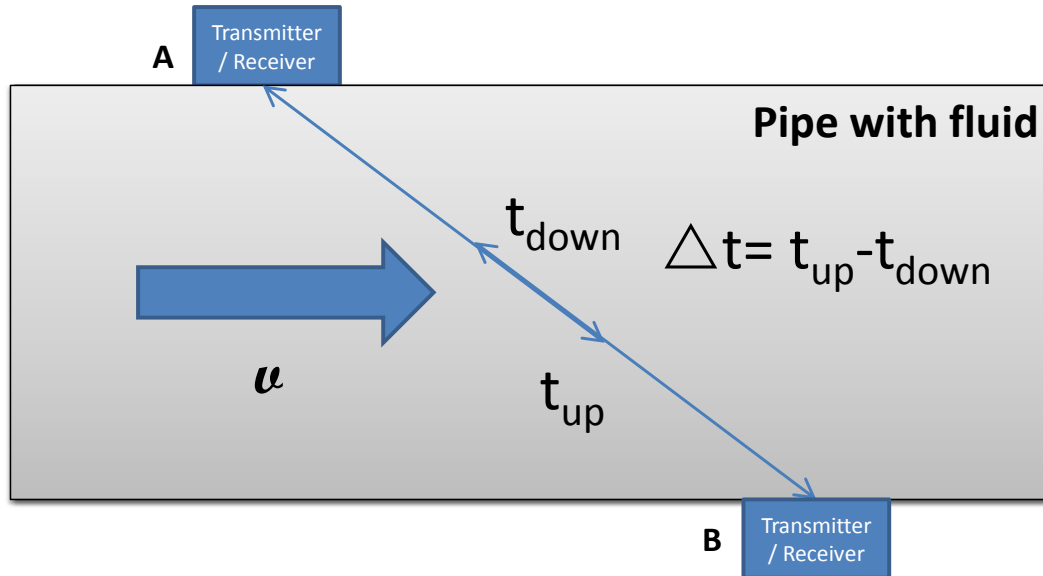
NI FPGA and PXI Express



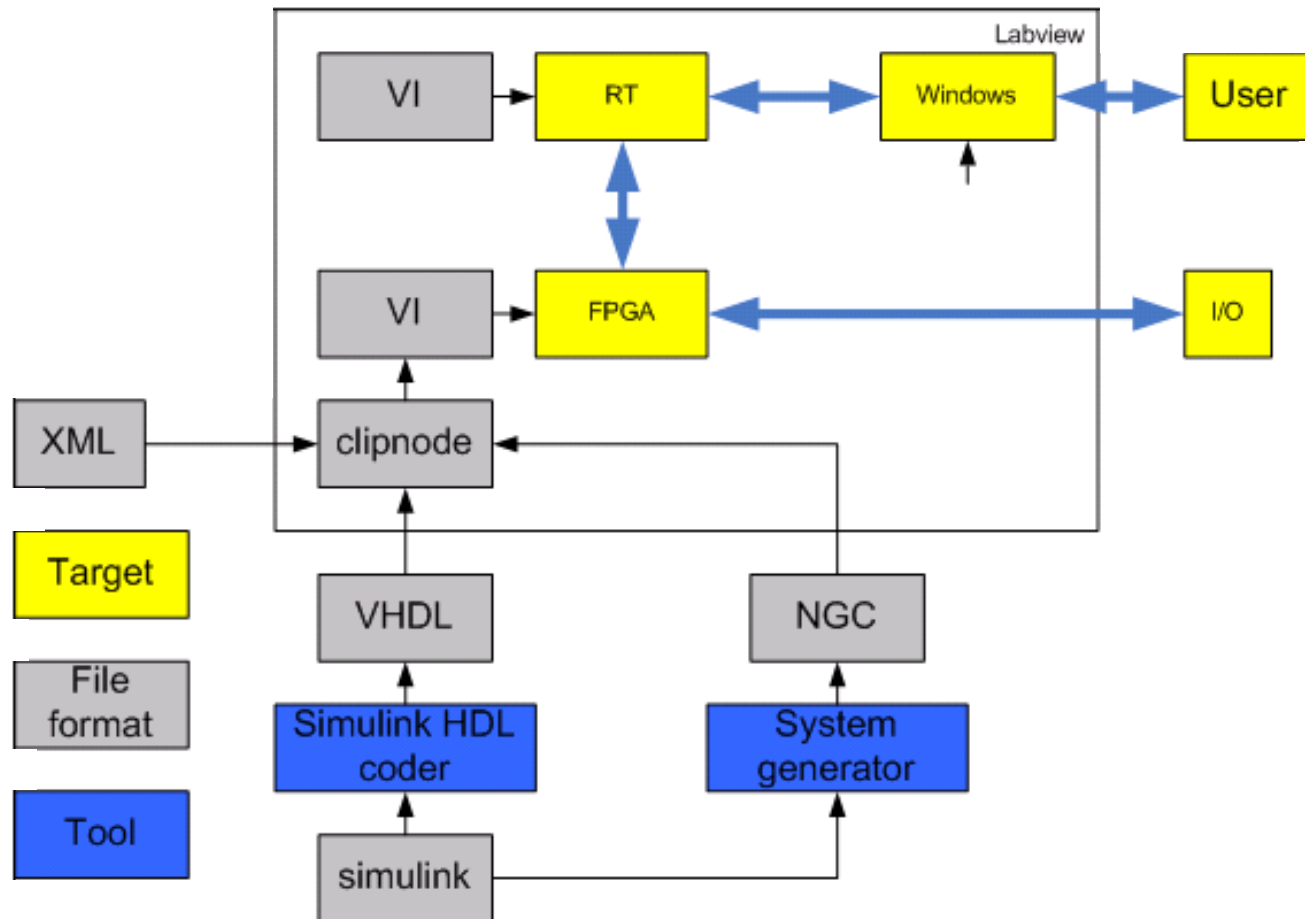
Multimedia test system



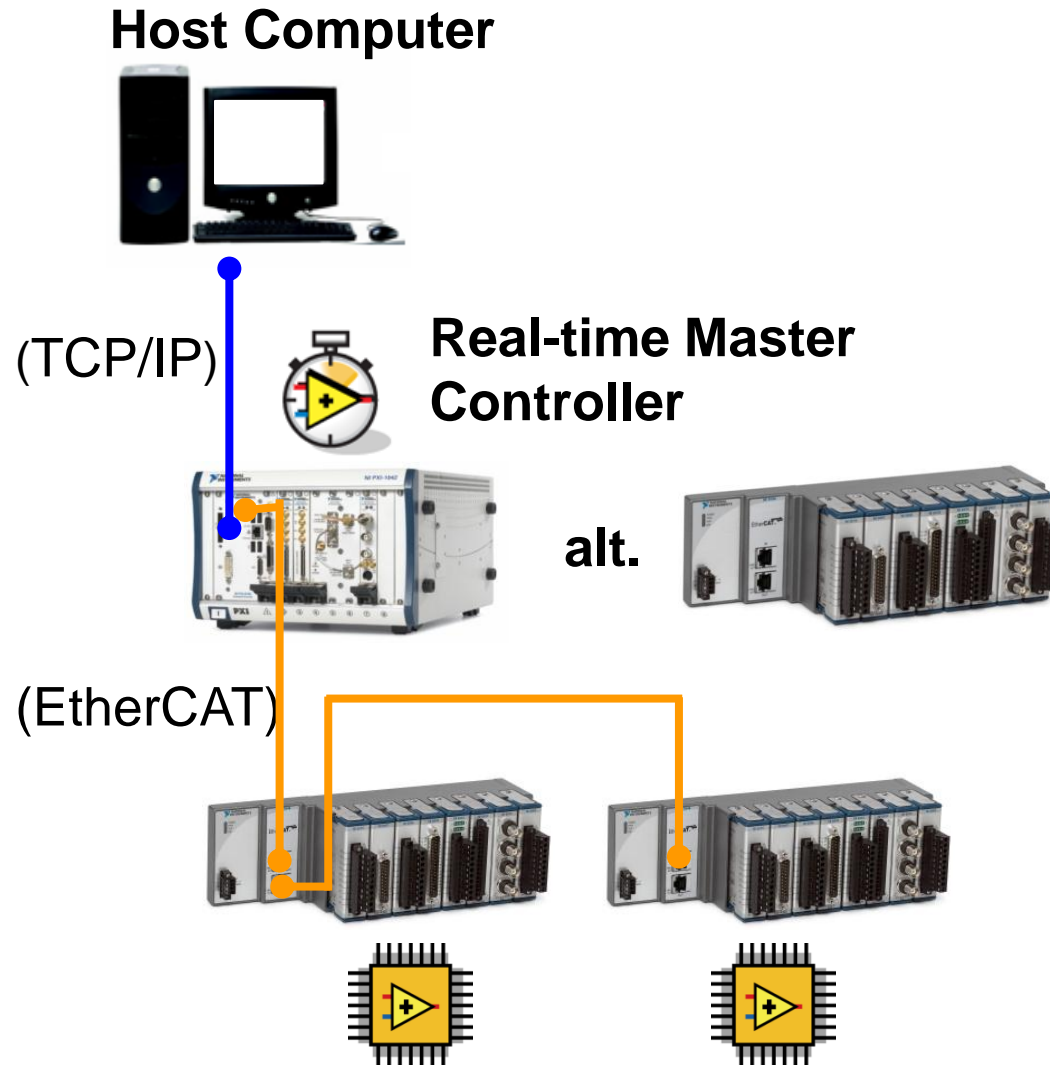
Example: Ultrasonic flow sensor simulator



Simulink on NI target



Our architecture today, EtherCAT



xMove

Host Computer



(TCP/IP)

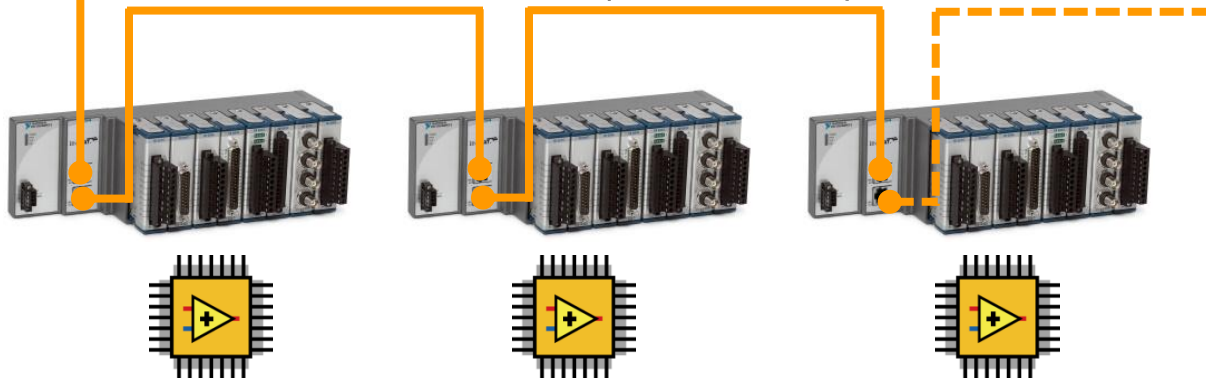


MXI Express



Real-time Master Controller

(EtherCAT)



General lesson learned

- If you are new to NI FPGA technology take NI FPGA courses.
- If you are to use clip nodes, take some VHDL training to understand the basic of the “language”.
- You also need to have an understanding of the xilinx compilation tools
- Using the FPGA to calculate parameters decrease the channel count and improves the system performance
- FPGA is also suitable for implementing simple protocols such as I2C, SPI etc.
- Be aware of the compilation time
 - Divide up your code in smaller parts and verify them separately
 - Do testbench
- Use NI guidelines to minimize timing violations
 - Reduce long combination paths
 - Use pipelining
 - Reduce number of case structures
 - Recompile if small violation

Questions

QUESTIONS ?