



LabVIEW User Group Meeting

Long Island Chapter
September 11th 2008





LabVIEW FPGA and CompactRIO

Wei Lin, PhD

Department of Biomedical Engineering
Stony Brook University

631-632-1639

Email: wei.lin@sunysb.edu

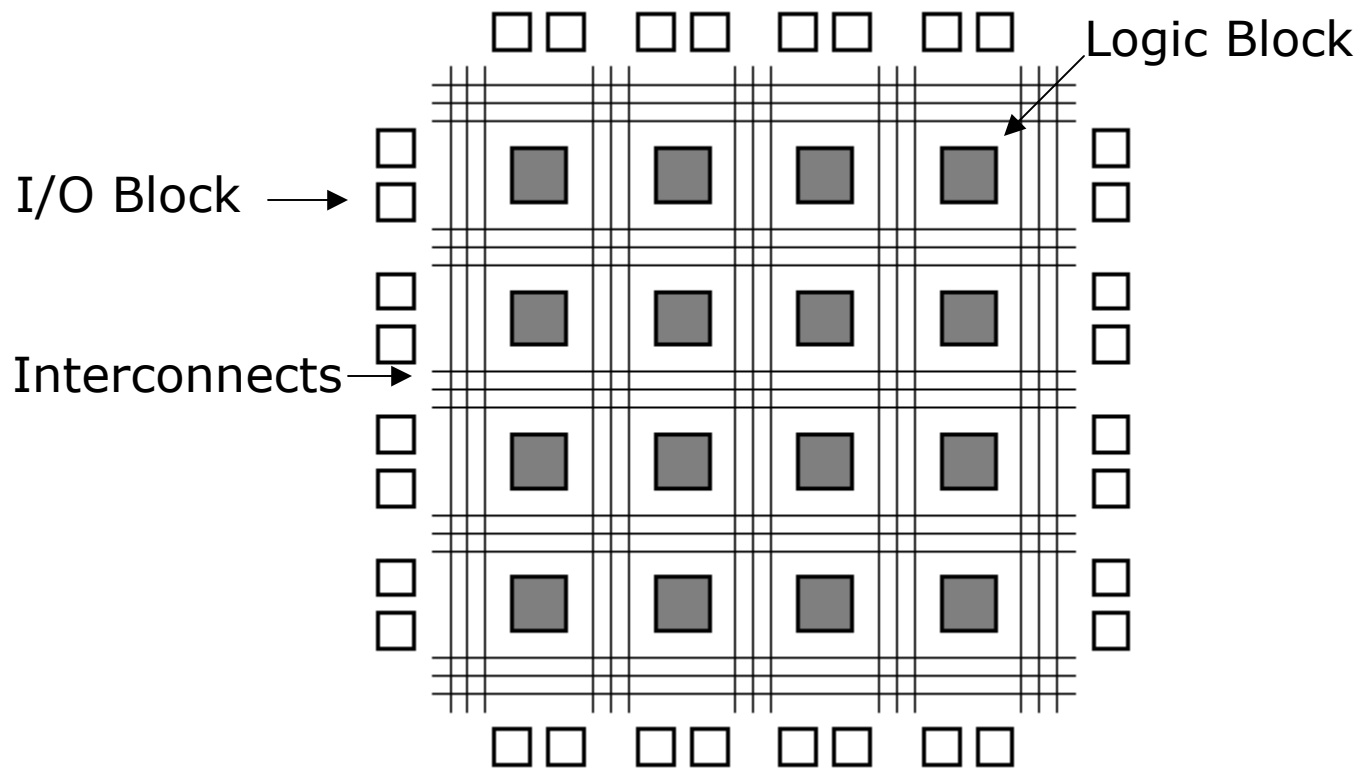


What is FPGA?

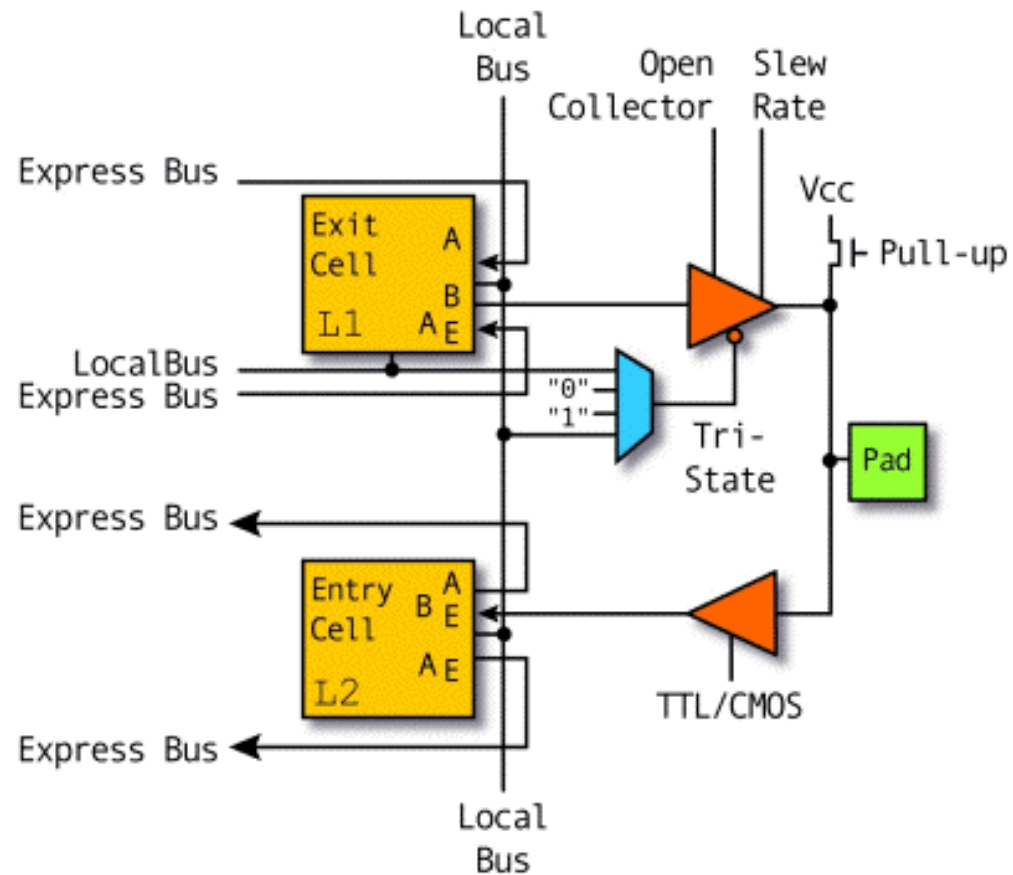
- A field-programmable gate array is a semiconductor device containing programmable logic components called "logic blocks", and programmable interconnects.

From: Wikipedia

Typical FPGA Structure

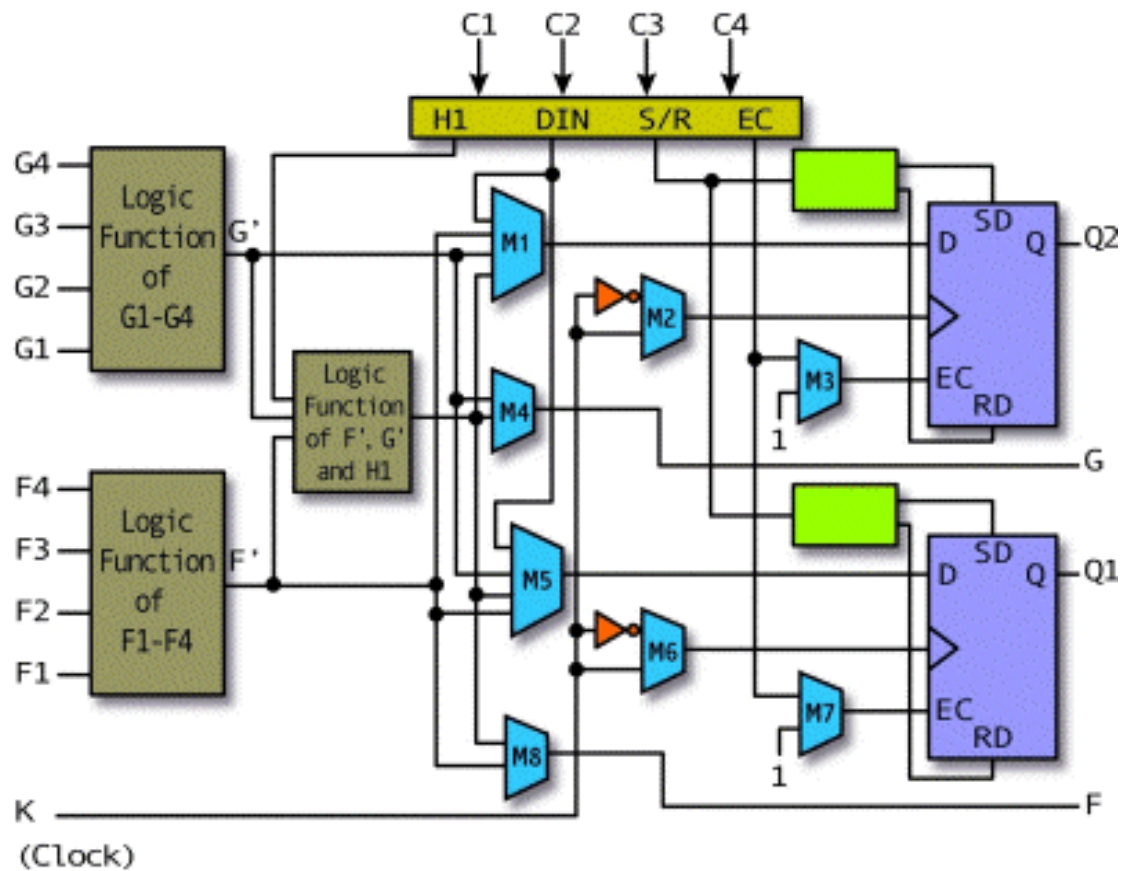


Inside the I/O Block



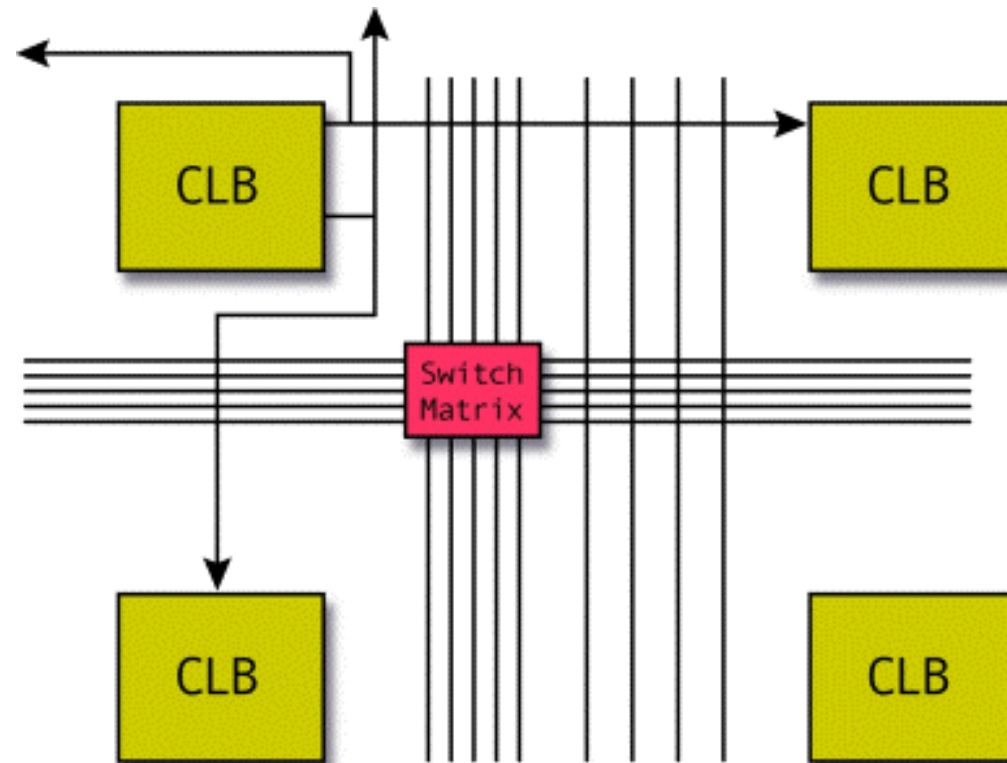
FPGA Configurable I/O block (Xilinx)

Inside the Logic Block



FPGA Configurable logic block (CLB) (Xilinx)

Inside Interconnect



FPGA programmable interconnect (Xilinx)
Two types of interconnect: Local and Global



FPGA Design Flow

- Design: determine functionality and describe the functionality using hardware description language such as VHDL.
- Verification: Use simulator to verify functionality.
- Synthesis: Use CAD tools generate optimized bit-stream file to program the FPGA.

The process has a steep learning curve.



LabVIEW FPGA

- The NI LabVIEW FPGA Module uses LabVIEW graphic program technology to generate bit-stream file for FPGA.
- LabVIEW FPGA Module can simulate the functionality of FPGA
- Advantages of LabVIEW FPGA module:
 - Easy to use, no requirement on the knowledge of HDL
 - The parallel processing of LabVIEW is well fit for FPGA
- Limitation of LabVIEW FPGA module:
 - It currently targets NI FPGA hardware such as CompactRIO.



LabVIEW FPGA Features

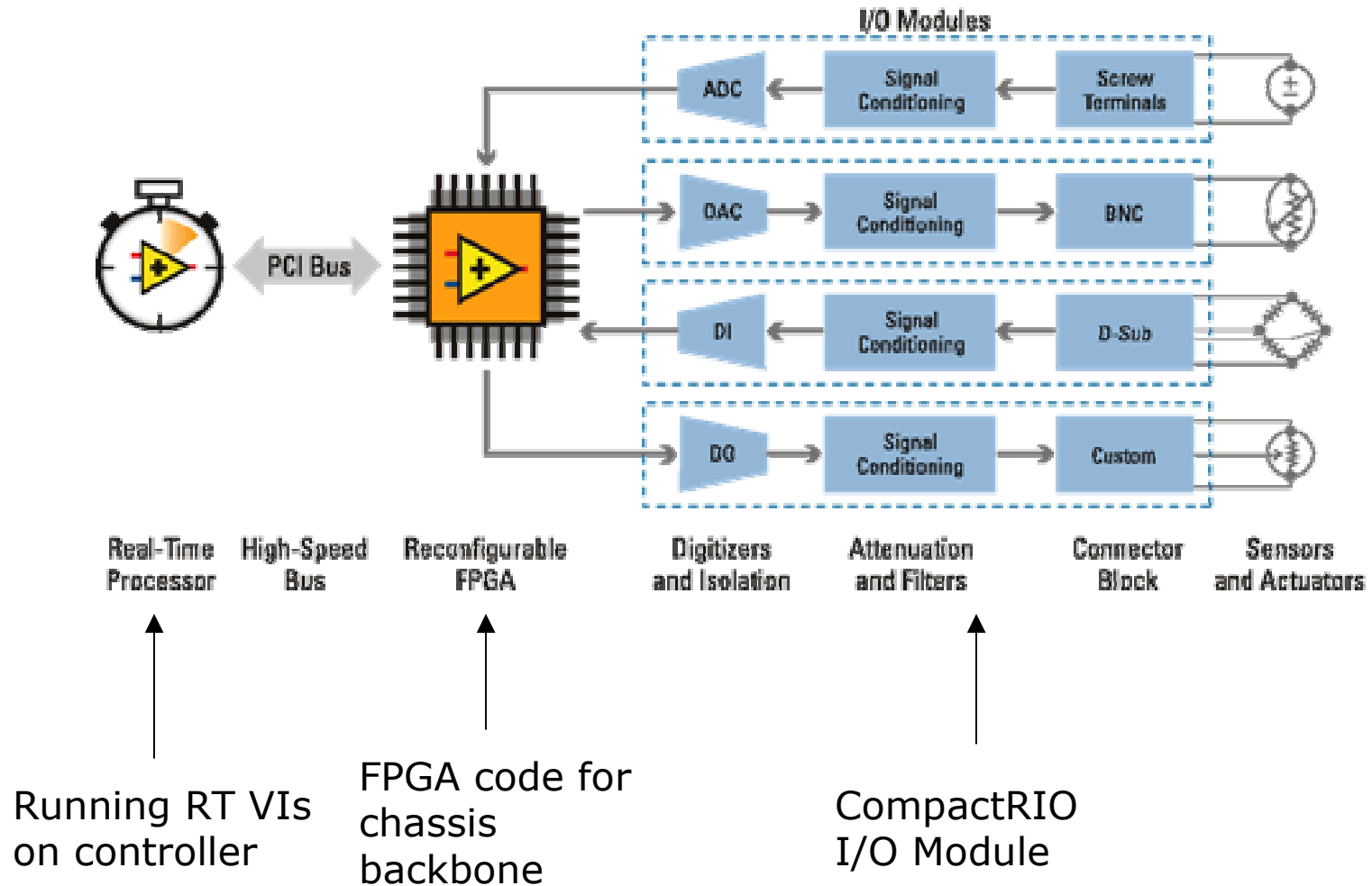
- Graphic Design
- Built-in VIs for Control, Filtering, and Signal Generation IP
- Implementation of FIFO, DMA and interrupt
- HDL Interface Node to import HDL code
- Fixed-point support
- Component-Level IP (CLIP)

NI CompactRIO System

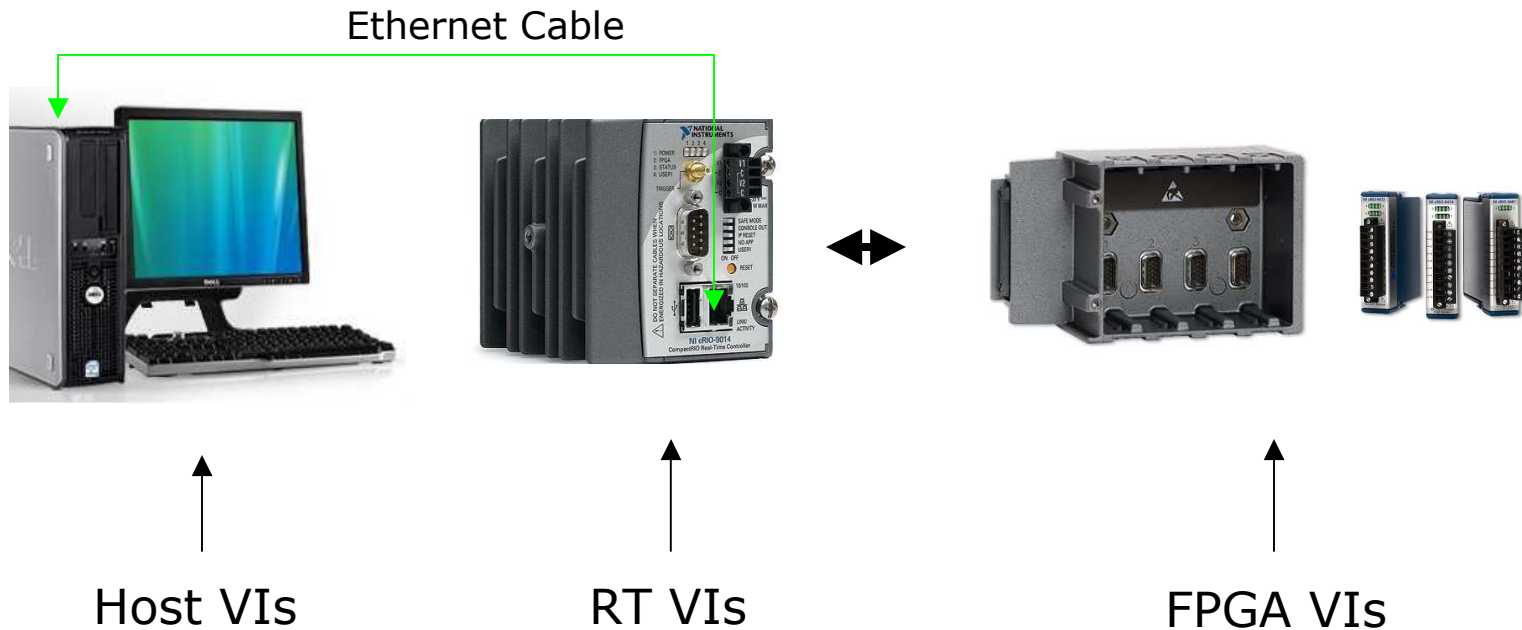


NI CompactRIO system is an advanced embedded system for data acquisition. Its open architecture, small form factor and extreme ruggedness enables engineers to quickly build custom embedded systems.

NI CompactRIO System



LabVIEW VI Design for CompactRIO



- Three types of VIs required.
- CompactRIO can run independently from host PC.



Applications of LabVIEW FPGA

- Embedded control system
- Communication protocol evaluation
- Hardware in the loop

