

FlexRIO Customer Success Stories

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Communications

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Big Physics

[Implementing FPGA-Based Feedback Control of a Single Atom With LabVIEW and NI FlexRIO](#)

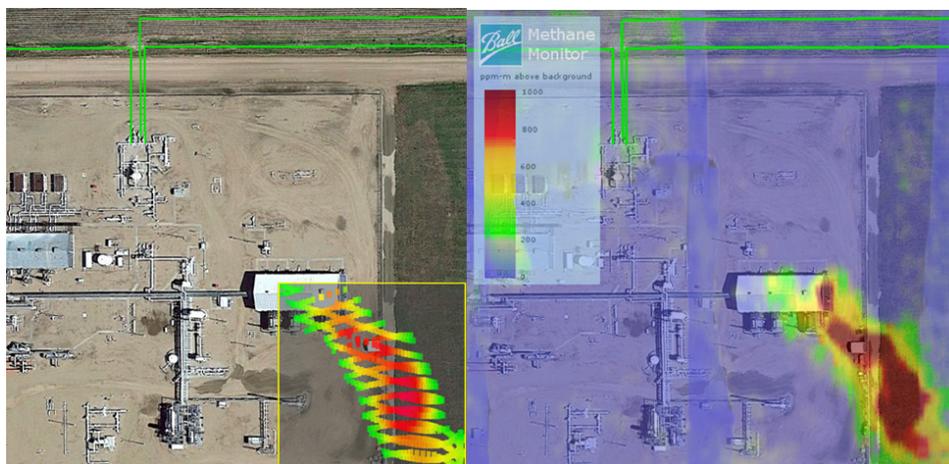
[Merlin: Developing a High-Speed X-Ray Imaging System for Synchrotron Beam Lines Using FlexRIO and LabVIEW](#)

Commercial

[Furuno Electric Co. Uses NI AWR and FlexRIO Platform to Develop Weather Radar in 40 Percent Less Time](#)

Energy

[Controlling a Hardware-in-the-Loop Grid Simulator for the World's Most Powerful Renewable Energy Test Facility](#)



“Proper location and tracking of targets, attitude correction, and geo-location of methane measurements require synchronization between every component in Methane Monitor. We found that a PXI Express chassis provides the ideal platform for several key components.”

–Steve Karcher
Ball Aerospace & Technologies

BALL AEROSPACE & TECHNOLOGIES

Embedded DIAL System for Measuring Fugitive Natural Gas Emissions

INDUSTRY

Aerospace & Defense

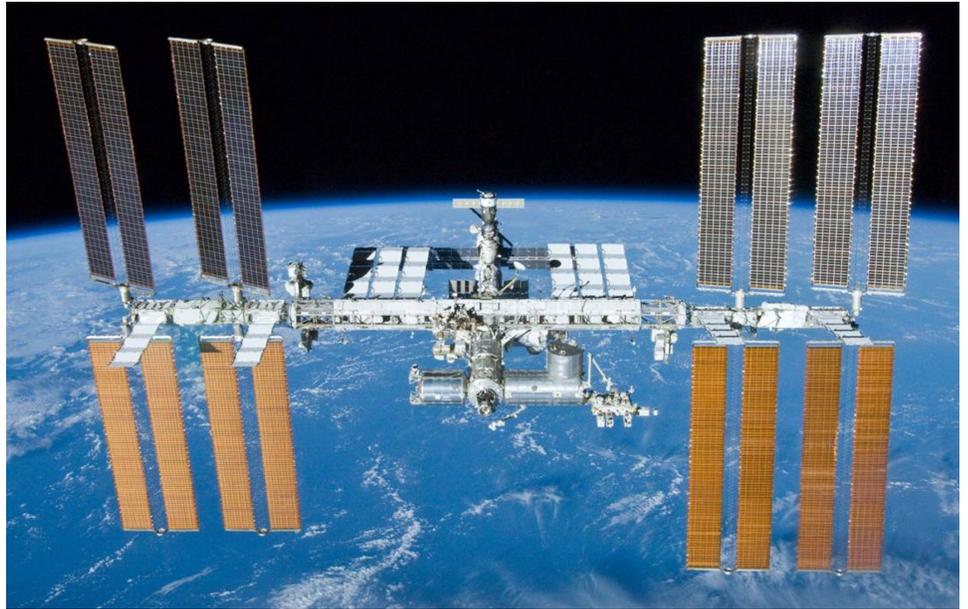
CHALLENGE

Developing a remote sensing instrument for real-time detection and quantification of fugitive natural gas emissions that must also adapt to evolving customer requirements driven by emerging industry regulations.

SOLUTION

Using the timing and synchronization capabilities of the NI PXI platform, the integrated high-throughput I/O of a FlexRIO digitizer, and a LabVIEW-programmable FPGA to create the signal processing embedded system in a sophisticated differential absorption lidar product.

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STFC RAL SPACE

RAL Space Uses NI Platform to Develop HD, Live Streaming Earth Observation Cameras

INDUSTRY

Aerospace & Defense

"The combination of LabVIEW software with FlexRIO FPGA technology provided the throughput capability needed from test hardware to capture the image envelopes at the required rates and process what to keep and discard in real time."

–Mike Salter
STFC RAL Space

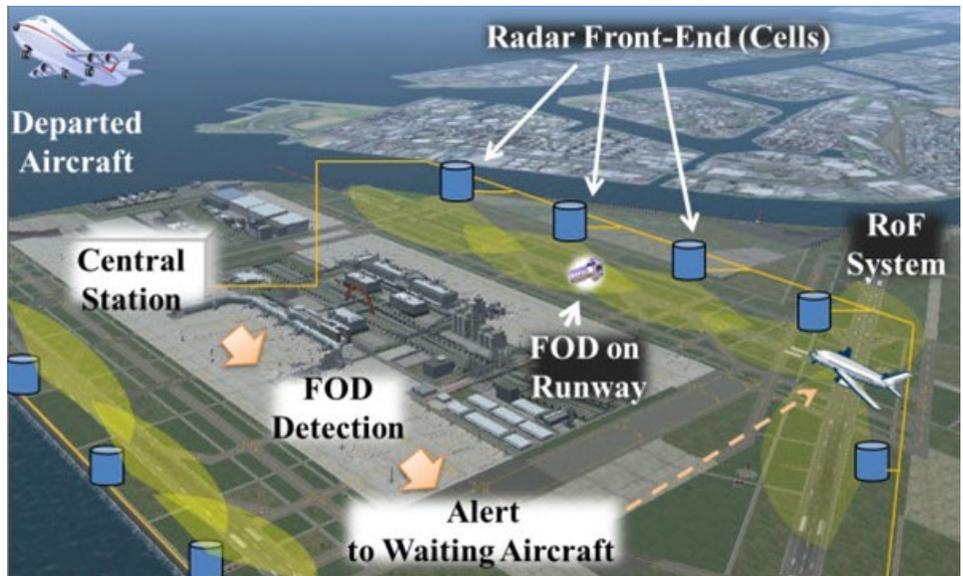
CHALLENGE

Developing and testing two cameras that will stream unprecedented images and video footage of planet Earth from space. The objective is to give everyone the chance to see, in near-real time, an astronaut's view of our planet by broadcasting the footage over the Internet via a commercial website. With live video tracking from above, we hope to unlock many new applications, such as providing moving pictures of major events, aiding agricultural efforts, and providing relief to regions of the Earth hit by natural disasters.

SOLUTION

Using LabVIEW and the NI PXI platform to develop and test the cameras. FlexRIO FPGA technology provided the means to retrieve and reconstruct image data in real time from sensors inside the cameras.

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ELECTRONIC NAVIGATION RESEARCH INSTITUTE (ENRI)

Creating an Airport Runway Foreign Object Debris Detection System Based on Millimeter-Wave Radar

“We successfully developed the prototype of the FOD detection millimeter-wave radar system for airport runways using LabVIEW and FlexRIO.”

–Shunichi Futatsumori
ENRI

INDUSTRY

Aerospace & Defense

CHALLENGE

Analyzing and displaying the GB/s class radar data from high-resolution 96 GHz millimeter-wave radar front ends to detect small debris on airport runways.

SOLUTION

Using the NI PXI platform and FlexRIO to achieve the real-time radar signal processing based on the FPGA hardware clock with a high data throughput rate, and using LabVIEW code for the radar signal processing to reduce the development time by 90 percent that of the conventional programming method.

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“Together with an adapter module, we used the NI FlexRIO device to sample the IQ stream. We could program the FPGA graphically with the NI LabVIEW FPGA Module, rather than a text-based language, which made the implementation significantly easier and made it possible for us to consider a solution with an FPGA in the first place.”

–Anders Svensson
Novator Solutions

NOVATOR SOLUTIONS

Developing a Real-Time Spectrum Analyzer Recorder

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Aerospace & Defense

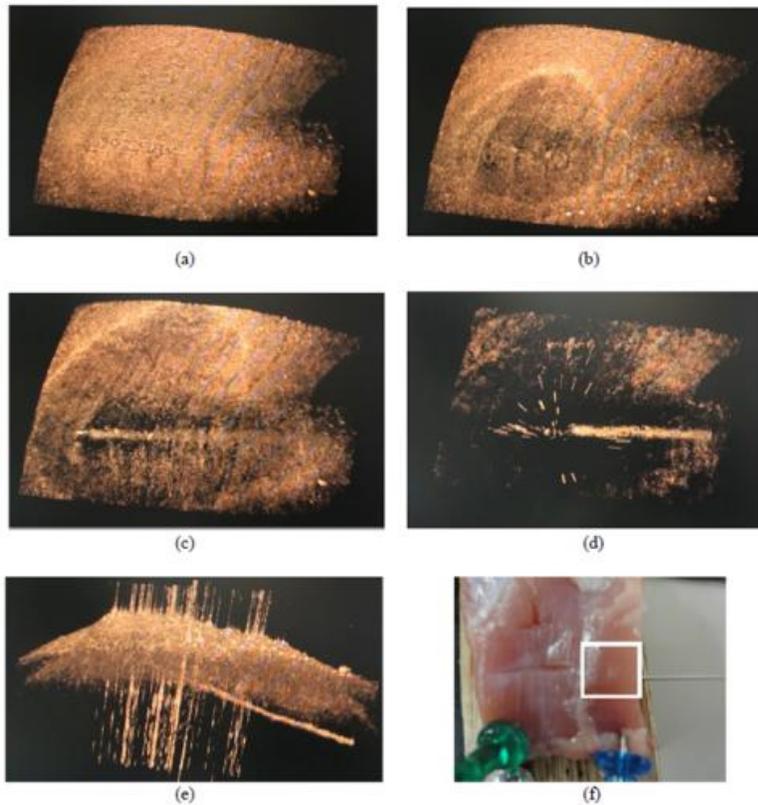
CHALLENGE

Developing a system to save several hours of data from a real-time spectrum analyzer (RSA), which produces huge amounts of data at high bandwidths but has limited storage space.

SOLUTION

Using the NI PXI platform to create an FPGA-based solution that stores data on a RAID system.

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“We leveraged the flexibility and scalability of the PXI platform and NI FlexRIO to develop the world’s first real-time 3D OCT imaging system. We used LabVIEW to program, integrate, and control the different parts of the system, combining high-channel-count acquisition with FPGA and GPU processing for real-time computation, rendering, and display.”

–Dr. Kohji Ohbayashi
Kitasato University

KITASATO UNIVESITY, GRADUATE SCHOOL OF MEDICAL SCIENCE

Developing the World’s First Real-Time 3D OCT Medical Imaging System With LabVIEW and NI FlexRIO

INDUSTRY

Life Sciences

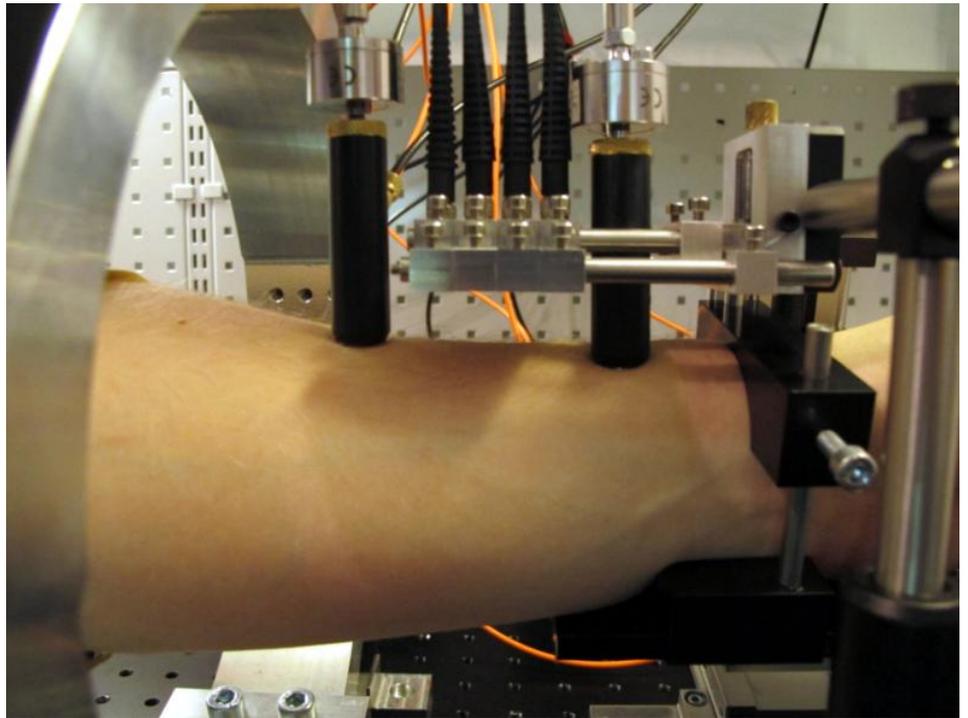
CHALLENGE

Creating a medical instrument that can detect cancer during medical checkups without requiring the patient to undergo the severe stress of a biopsy.

SOLUTION

Using optical coherence tomography (OCT) and a 320-channel data acquisition system combining NI FlexRIO FPGA hardware and GPU processing to create the world’s first real-time 3D OCT imaging system.

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"The development work was fast and easy because the NI products we chose gave us quick prototyping for cutting-edge medical research. With NI products, we bridged academic proof-of-concept studies and clinical trials."

–Pasi Karppinen
University of Helsinki

UNIVERSITY OF HELSINKI

Using NI FlexRIO for Photoacoustic Quantitative Ultrasound

INDUSTRY

Life Sciences

CHALLENGE

Developing a real-time system to tune photoacoustic measurements to clinically assess osteoporosis.

SOLUTION

Using NI FlexRIO and NI LabVIEW to connect the ultrasonic signal to a time-delayed laser diode array for optimized photoacoustic excitation of ultrasound in the patient.

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"The NI hardware and software platform allowed us to build a state-of-the-art MR acquisition system with the resources of a start-up company. Customers benefit from the vast NI portfolio of I/O modules if they want to complement their MR Acquisition System with further sensoric or actoric capability."

–Dr. Christoph Barmet
Skope Magnetic Resonance
Technologies

SKOPE MAGNETIC RESONANCE TECHNOLOGIES LLC

Skope Dynamic Field Camera for Fast and Quantitative MRI

INDUSTRY

Life Sciences

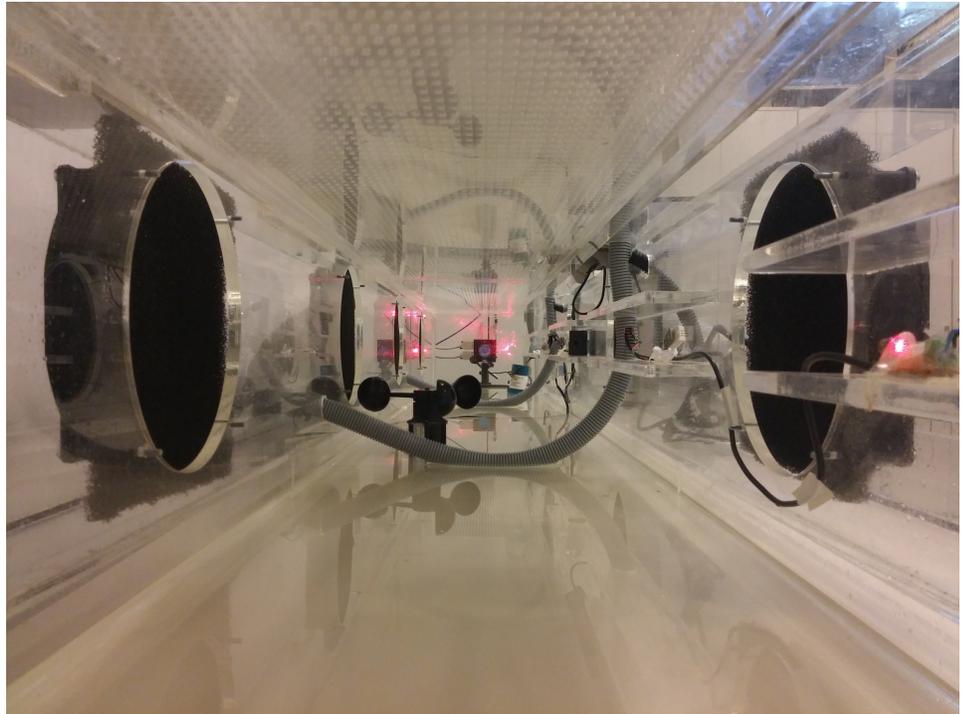
CHALLENGE

Creating a broad-band, multichannel RF receiver for the acquisition of signals between 50MHz and 500MHz. The receiver is targeted at the acquisition of magnetic resonance (MR) signals from an MR receive coil or a Field Camera used for measuring magnetic field dynamics in MR systems. The system must be open for flexible extension with other modules such as I/O units.

SOLUTION

Designing a scalable RF acquisition system including signal amplification, analog filtering, digitization, digital filtering, and post-processing with a controller and visualization back-end that allows for easy measurement setup and data analysis. This acquisition system is part of a Field Camera, a novel instrument for measuring, calibrating, and controlling field dynamics in MRI.

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OZYEGIN UNIVERSITY, CENTER OF EXCELLENCE IN OPTICAL WIRELESS COMMUNICATION TECHNOLOGIES

Using the NI PXI Platform for LiFi-Enabled Intelligent Transportation Systems

INDUSTRY
Communications

CHALLENGE

Developing high-performance, user-friendly, and highly customizable signal transceivers for the emerging visible light communication (LiFi) technology with applications in intelligent transportation systems (ITSs).

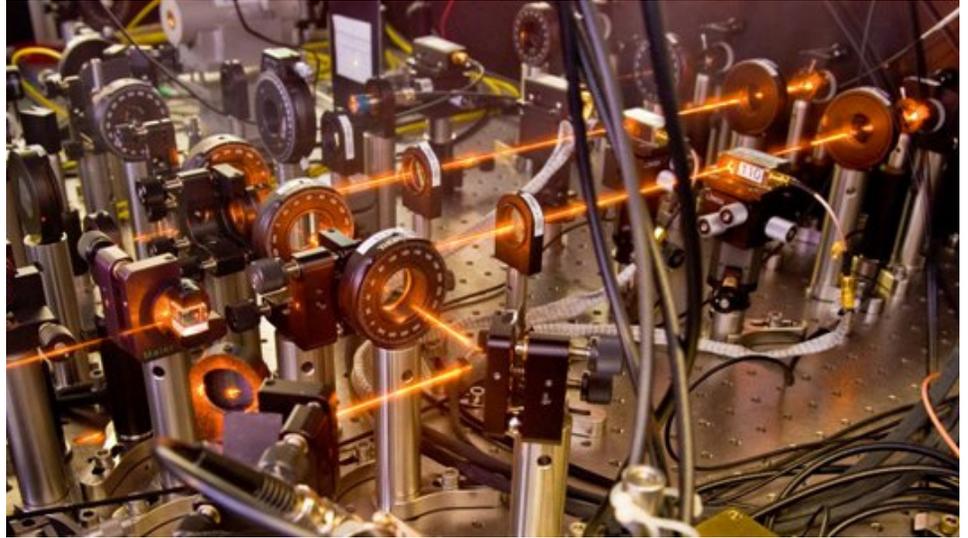
SOLUTION

Using PXI signal generators and receivers based on LabVIEW FPGA to leverage NI's existing RF toolset for the optical communication domain.

"By using LabVIEW and LabVIEW FPGA with proper parameter selection, we demonstrated real-time transmission, which gave superior performance results over traditional CPU-based transceivers and simple on/off keying based systems."

–Murat Uysal
Ozyegin University

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"Using NI FlexRIO, we created our own high-performance custom hardware. With LabVIEW FPGA, we were able to quickly develop our FPGA code because of its high level of abstraction, while also integrating VHDL IP when applicable."

–Christian Sames
MAX-Planck Institute of Quantum Optics

MAX-PLANCK INSTITUTE OF QUANTUM OPTICS

Implementing FPGA-Based Feedback Control of a Single Atom With LabVIEW and NI FlexRIO

INDUSTRY

Big Physics

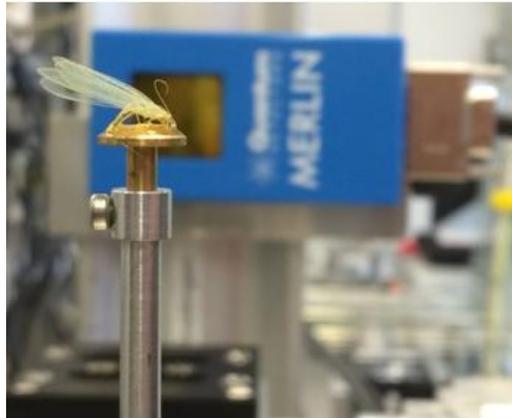
CHALLENGE

Developing a custom time digitizer to study fundamental quantum properties of light-matter interaction.

SOLUTION

Using NI FlexRIO and the NI LabVIEW FPGA Module to build a powerful and versatile custom instrument that allows us to implement real-time execution of time-critical tasks in hardware. This makes it possible to implement feedback control for systems as small as a single atom interacting with single photons.

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QUANTUM DETECTORS

Merlin: Developing a High-Speed X-Ray Imaging System for Synchrotron Beam Lines Using FlexRIO and LabVIEW

"Not only did the NI solution accelerate our initial development, it will mitigate against component obsolescence and allow us to implement future upgrades with minimal hardware and software redesign."

–Roger Goldsbrough
Quantum Detectors

INDUSTRY

Big Physics

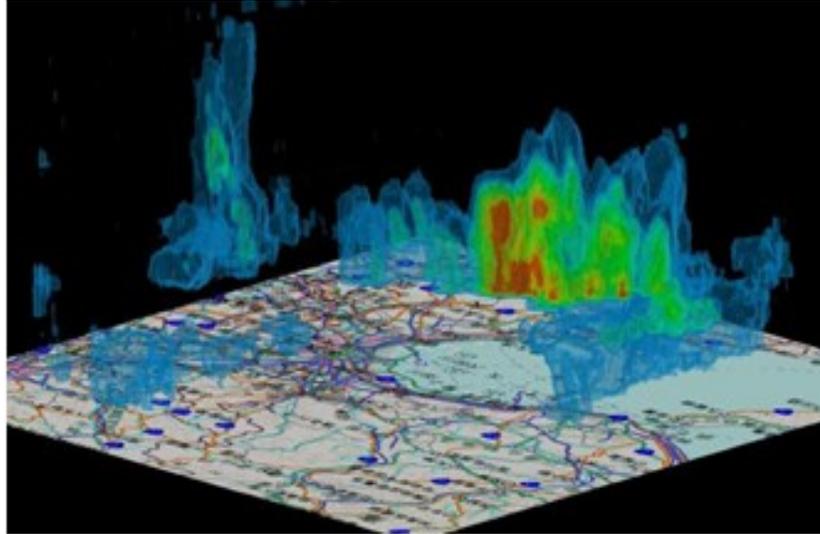
CHALLENGE

Our small team of domain experts, with minimal embedded design expertise, had to develop a ready-to-run, high-speed X-ray imaging system that is robust, accurate and easily upgradable. For the first time ever, this system would promote the wider adoption of the Medipix3 detector chips developed at CERN.

SOLUTION

By using off-the-shelf NI technologies, we avoided the complexities of traditional embedded design. The NI FlexRIO platform minimized our custom electronics requirements, while LabVIEW removed the complexities of VHDL development. By choosing NI, we reduced expected development time by six months and enabled a clear path to future upgrades.

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FURUNO ELECTRIC CO., LTD.

Furuno Electric Co. Uses NI AWR and FlexRIO Platform to Develop Weather Radar in 40 Percent Less Time

"Compared to a conventional design approach used with similar new product developments, we estimate that we achieved a reduction in development time of more than 40 percent by adopting the NI solution."

–Takuo Kashiswa, Ph. D
Furuno Electric Co., Ltd.

INDUSTRY

Commercial

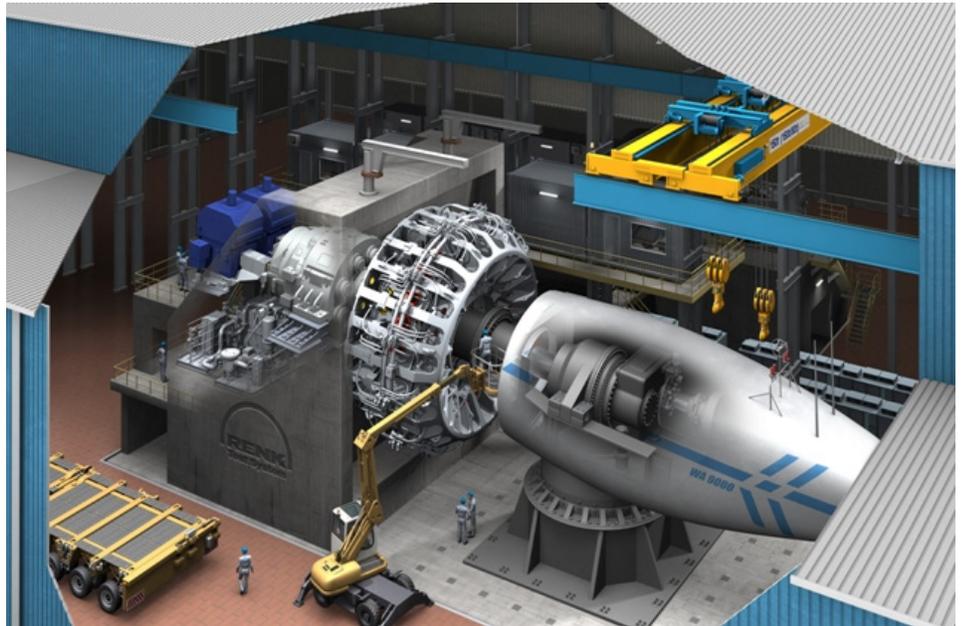
CHALLENGE

Developing a weather radar with flexibility in the signal processing unit to accommodate various potential design changes and incorporate a way to verify the system-level performance by co-simulating the digital and analog sections.

SOLUTION

Adopting the NI FlexRIO platform for digital section hardware, using graphical system design methodology to accommodate potential design changes in the software, and taking advantage of the co-simulation capability between AWR Visual System Simulator (VSS) and NI LabVIEW software to realize the system-level simulation of digital and analog sections together.

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CLEMSON UNIVERSITY RESTORATION INSTITUTE

Controlling a Hardware-in-the-Loop Grid Simulator for the World's Most Powerful Renewable Energy Test Facility

"The biggest advantage of this solution is that a relatively small development group with minimal FPGA or HDL experience ... was able to quickly develop a powerful FPGA solution using the LabVIEW FPGA Module."

—J. Curtiss Fox
Clemson University Restoration Institute

INDUSTRY

Energy

CHALLENGE

Providing energy companies and graduate students a state-of-the-art facility to test both the mechanical and electrical characteristics of a hardware innovation prototype for any energy resource on a utility scale (up to 15 MW) in a controlled and calibrated environment before deploying it on the actual grid.

SOLUTION

Delivering high-speed deterministic DAQ, control, and communications for a 15 MVA hardware-in-the-loop (HIL) grid simulator using NI LabVIEW system design software and NI PXI, NI CompactRIO, and NI FlexRIO hardware.

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