NIDays

WORLDWIDE GRAPHICAL SYSTEM DESIGN

CONFERENCE

NATIONAL INSTRUMENTS™

Welcome

Branch Manager NI Denmark

Gert Nilsson

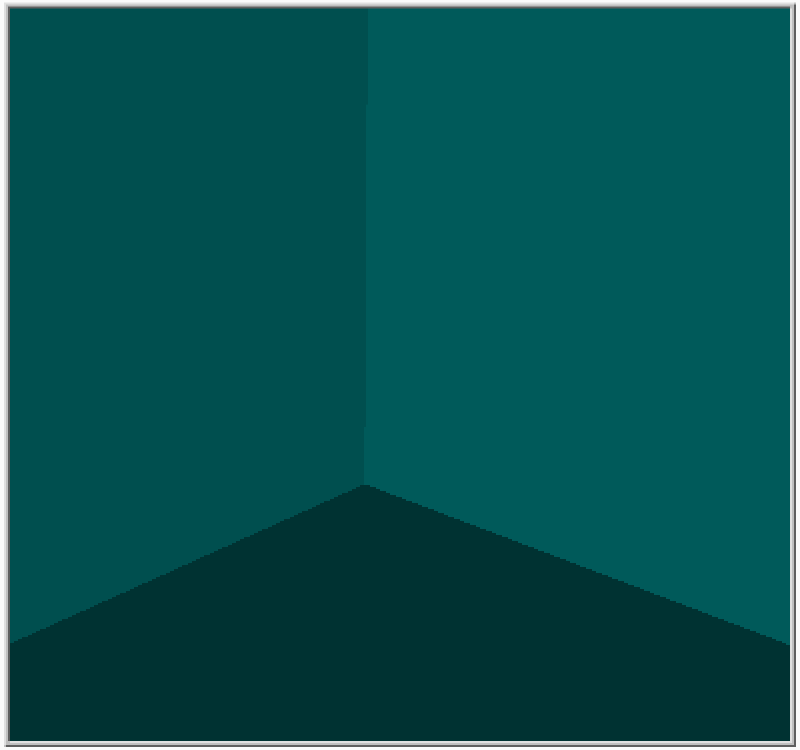
Do More Innovation with Graphical System Design

Do More Innovation with Graphical System Design

Senior product manager for energy efficiency and renewable energy

Brian MacCleery

Calculations Per Second (CPS) for $1



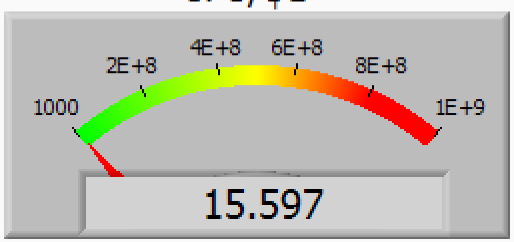
Date

12/01/1975

Ratio to Start

1

CPS/$1

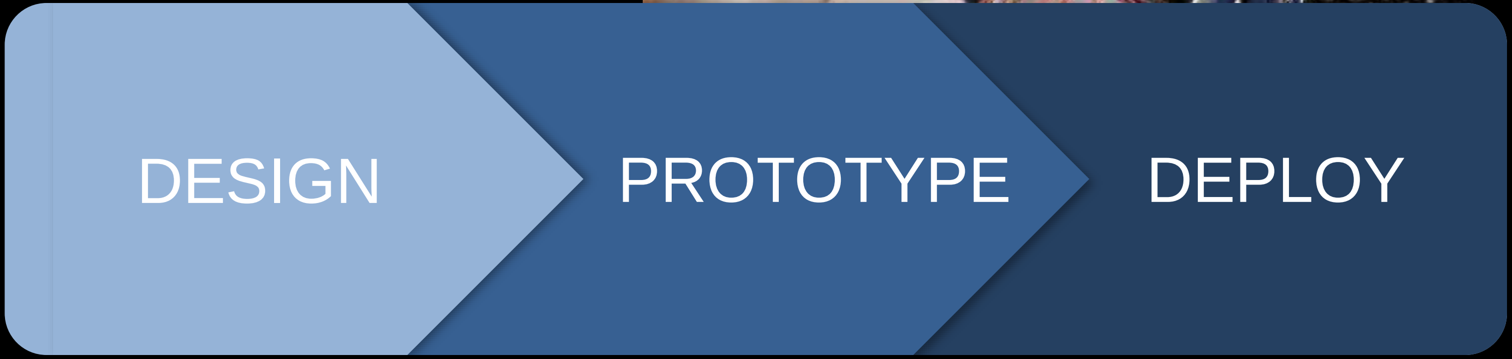



“As long as the lawyers and lobbyist
are part of this…
progress isn’t going to be made.
As soon as both sides of the aisles
say it’s going to happen,
it’s then assigned to the engineers…
and progress is made.”

[Steven Chu, U.S. Secretary of Energy]

A Partnership in Innovation

Your Domain Knowledge
and
Graphical System Design
Tools of Innovation



Automated Test and Manufacturing

Production Test

Performance Characterization

Vision Inspection

Machine and Process Control

Field Monitoring and Control

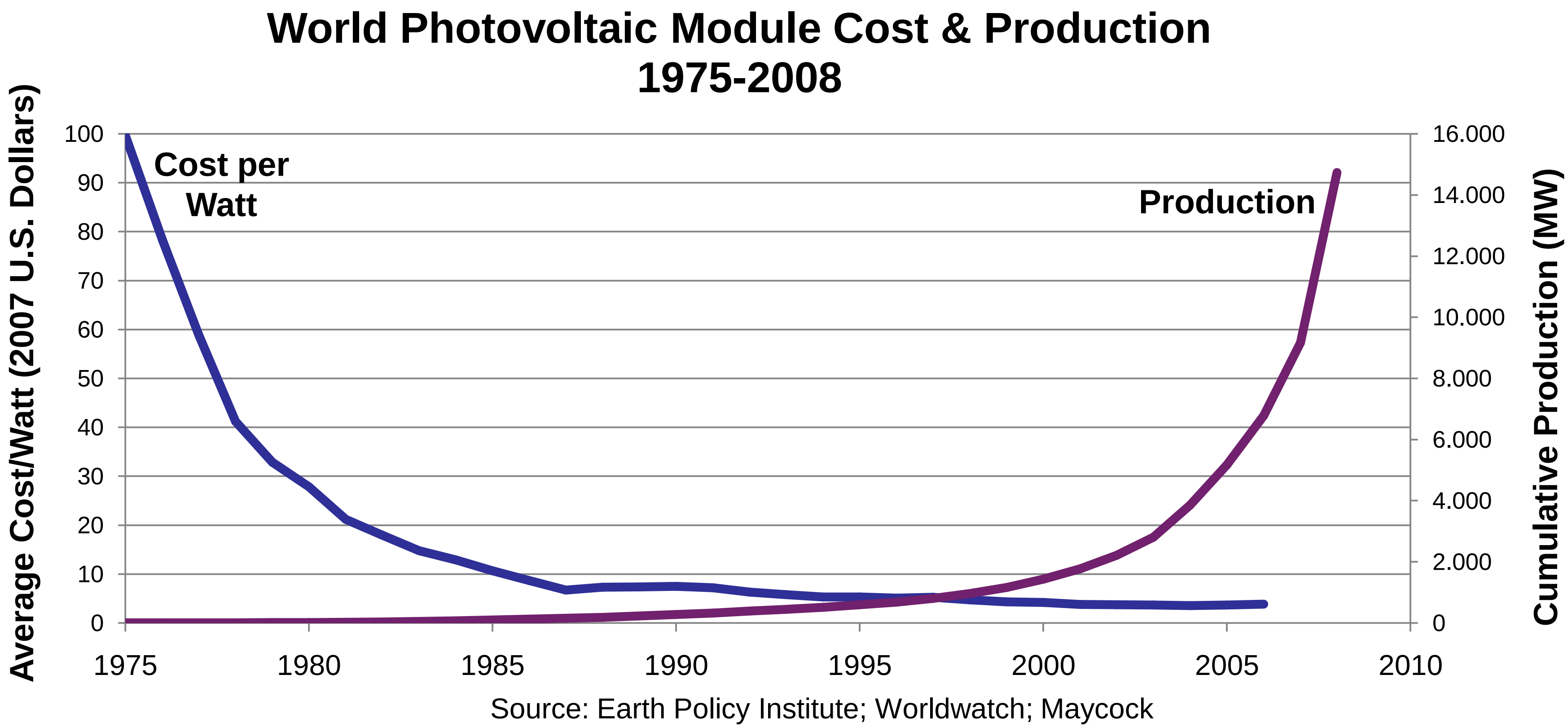
Wireless Sensor Networks

Power and Environmental Monitoring

Machine Predictive Maintenance

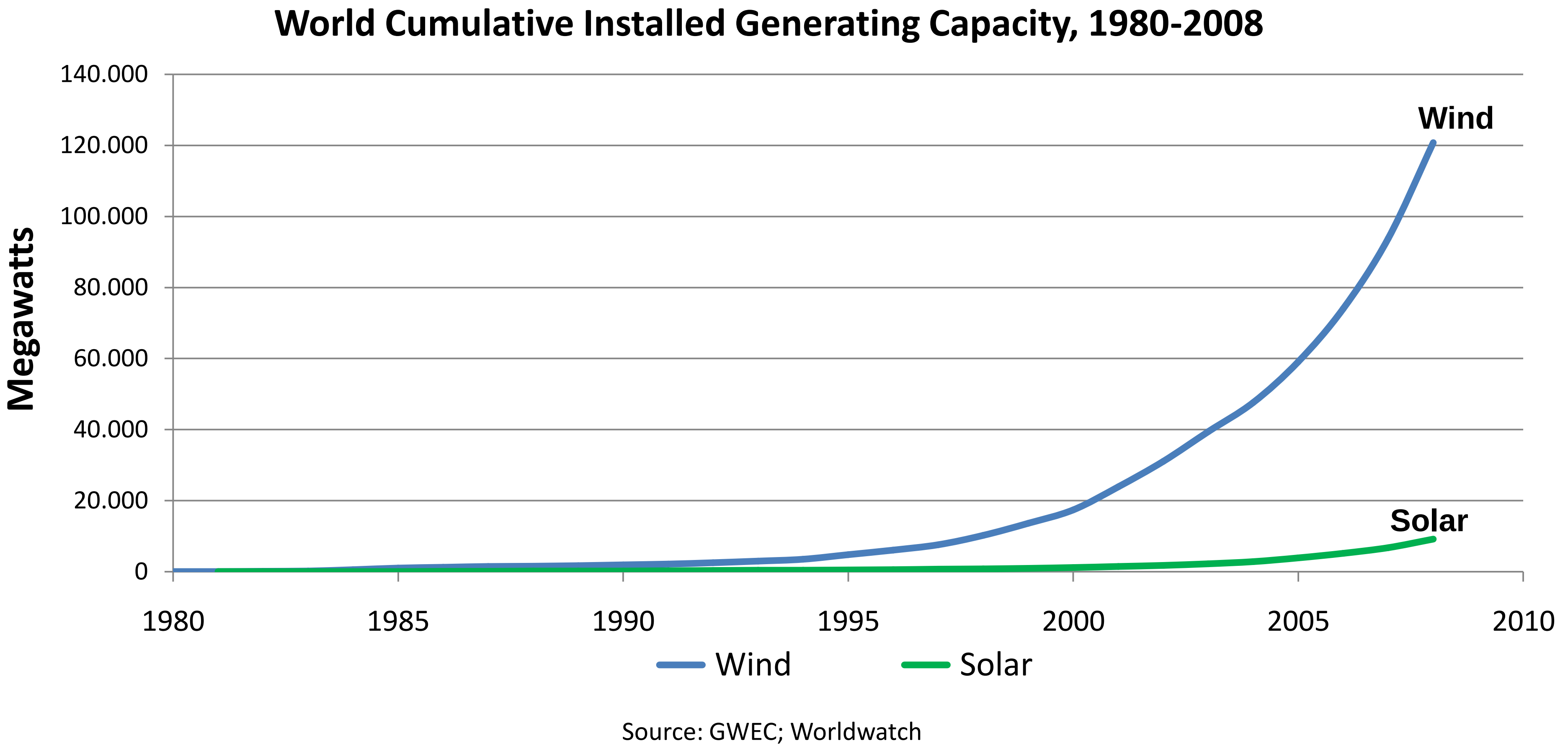
Power Electronics Control

World Installed Capacity



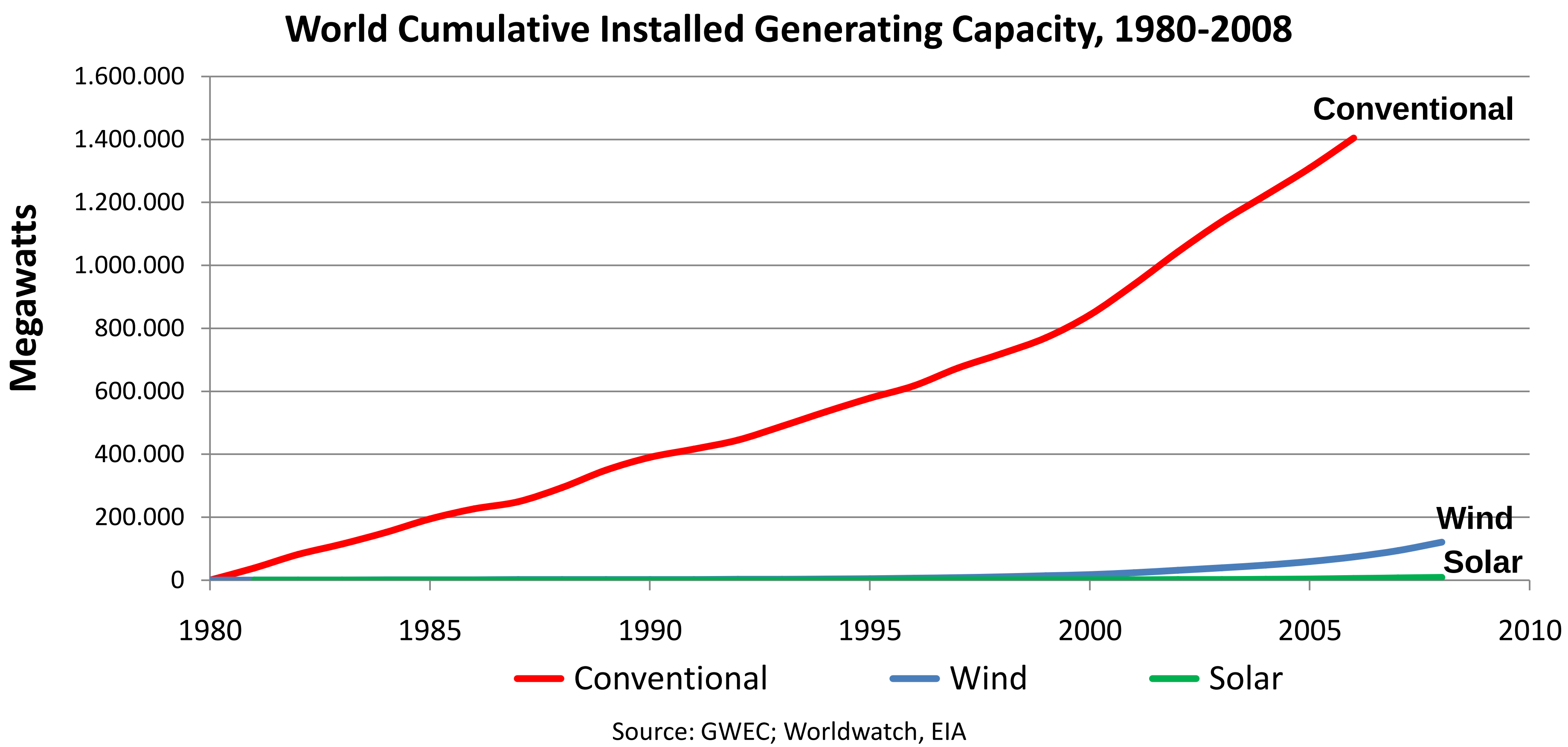
- Market value: $30B (2009)
- Production: 30% CAGR, doubling every 2.4 years
- Cost per Watt: -10% CAGR, halving every 7 years

World Installed Capacity



- Solar: 30% CAGR, Doubling every 2.4 years
- Wind: 27% CAGR, Doubling every 2.6 years

World Installed Capacity



- Solar: 30% CAGR, Doubling every 2.4 years
- Wind: 27% CAGR, Doubling every 2.6 years
- Conventional: 9% CAGR, Doubling every 7.9 years

- Seeds promising renewable energy startups with up to $25,000 in needed LabVIEW training and software
- Typically includes a one year unlimited training membership for one engineer or scientist
- Competitive worldwide application process

ni.com/greengrant

NIWeek Energy Technology Summit

Transition to Sustainability

August 3–5, Austin, Texas

National Instruments
Green Engineering
DESIGN PROTOTYPE DEPLOY

- How do engineers and scientists work together to transition world energy production to clean, sustainable technologies?

Focus Areas

- Cutting-edge graphical system design techniques for clean energy entrepreneurs
- Best practices for implementing embedded monitoring, control, and test applications
- The how-to of energy technology commercialization and mass deployment

Critical Smart Grid Technologies for Energy Revolution

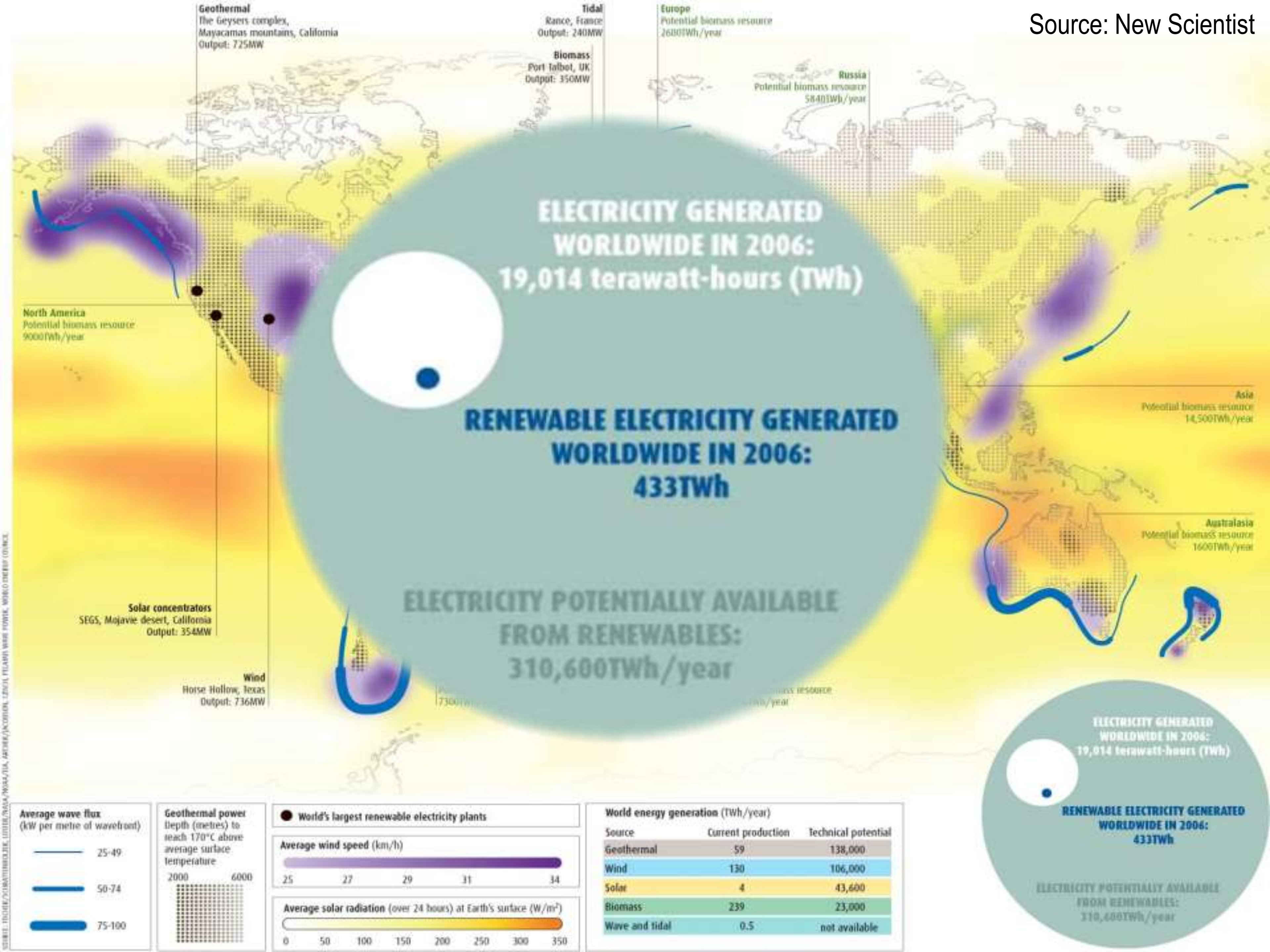
Allan Schurr, VP of Strategy, IBM Global Energy and Utilities

Welcome to the 'Enernet'

Robert Metcalfe, Co-inventor of Ethernet, Founder of 3Com

ni.com/niweek

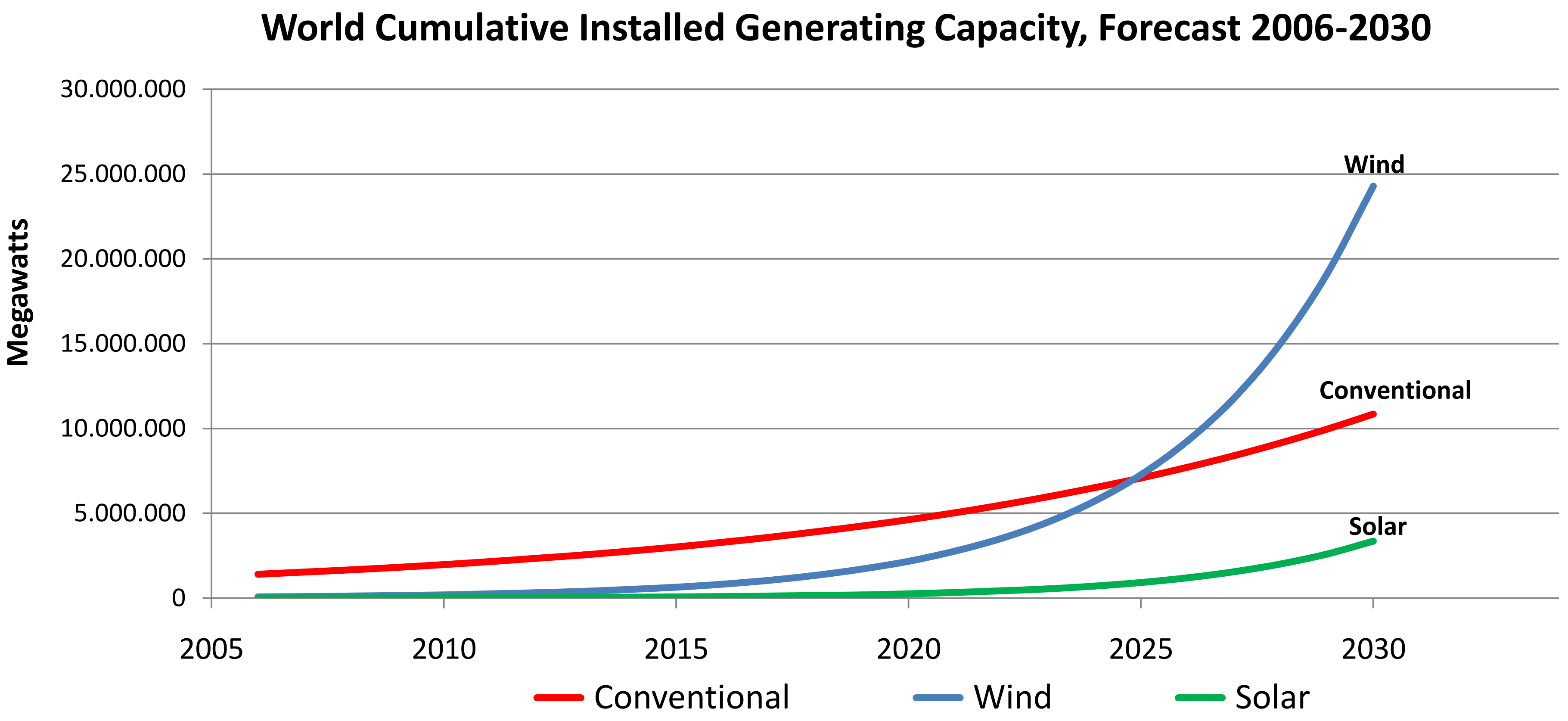
Source: New Scientist



World energy generation (TWh/year)

Source	Current production	Technical potential
Geothermal	59	138,000
Wind	130	106,000
Solar	4	43,600
Biomass	239	23,000
Wave and tidal	0.5	not available

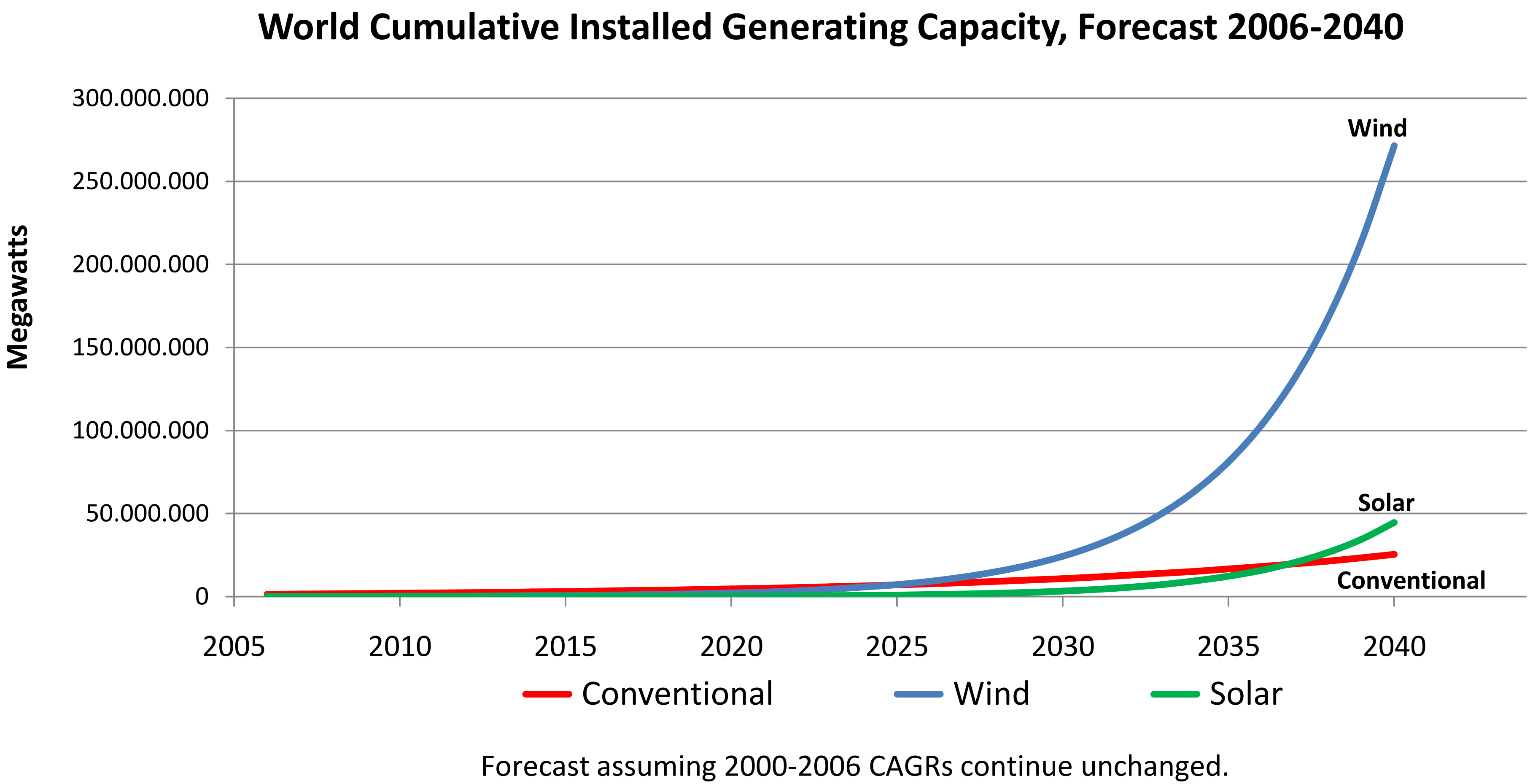
World Installed Capacity - Forecast



Forecast assuming 2000-2006 CAGRs continue unchanged.

- Wind: Passes conventional energy in 2025

World Installed Capacity - Forecast



- Wind: Passes conventional energy in 2025
- Solar: Passes conventional energy in 2037

Engineering Grand Challenges

Advance health informatics

Engineer the tools of scientific discovery

Reverse-engineer the brain

Provide energy from fusion

Engineer better medicines

Provide access to clean water

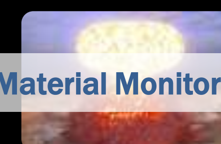
Enhance virtual reality

Restore and improve urban infrastructure

Develop carbon sequestration methods

Advance personalized learning

Make solar energy economical



Prevent nuclear terror

Secure cyberspace

Manage the nitrogen cycle

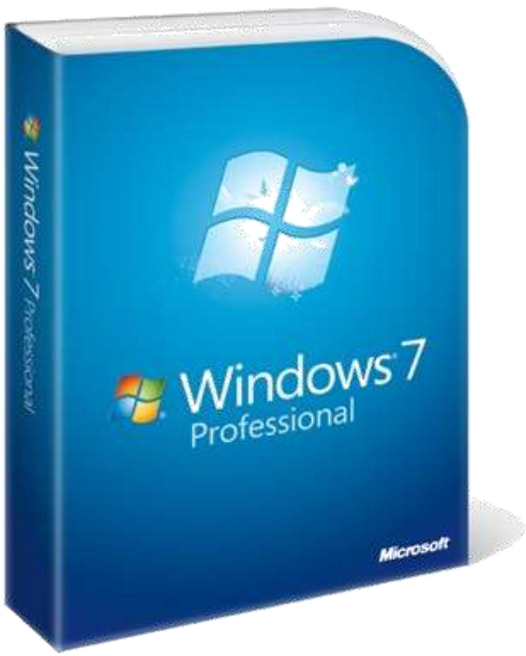
Source: National Academy of Engineering

Do More

[with NI LabVIEW]

Supporting the Next OS: Windows 7

- Tested driver support
- Increased USB DAQ throughput
- Improved multicore/multitasking
- Enhanced performance with 64-bit



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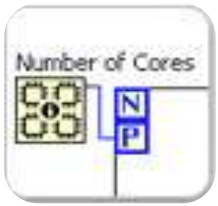
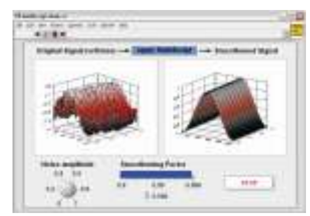
LabVIEW™ 2009



Multicore Processors
Personal Supercomputing

FPGA Technology
Rapid Embedded Design and Prototyping

Wireless Systems
Intelligent Distributed Systems



Real-Time Math
Deterministic Algorithm Deployment

Fixed-Point Casting Functions

Data Value References

New Dynamic Data Express VI

Command-Line Differencing

Using Xpath to Query XML Documents

Group Digital Signals Express VI

TDMS and NI-DAQmx Logging Integration

RSS-Driven Getting Started Window

VI Snippets

Guaranteed Downcasting of Classes

New System Directory VIs

Enhanced Curve-Fitting Functionality

LabVIEW DataFinder Toolkit

New VI Analyzer Tests

Sound VIs on Mac

Native Recursion

New Signal Processing VIs

Enhanced Icon Editor

SSL Security for Web Services

NATIONAL INSTRUMENTS LabVIEW™ 2009

CPU Information Palette

Quick Drop Improvements

VI Hierarchy Window Enhancements

Bus/Line Configuration in Digital Waveform Graph

Partial Differential Equation Palette

Domain Account Manager Enhancements

Generate .NET Interop Assemblies

Probe Watch Window

New In-Place Element Structure I/O Nodes

New Matrix Functions

Feedback Node Configuration Options

LabVIEW MathScript RT Module

Parallel For Loops

New 2D and 3D Plots

Enhanced Block Diagram Cleanup

TDMS File Format Improvements

Search Algorithm Enhancements

Graphical Scripting for LabVIEW

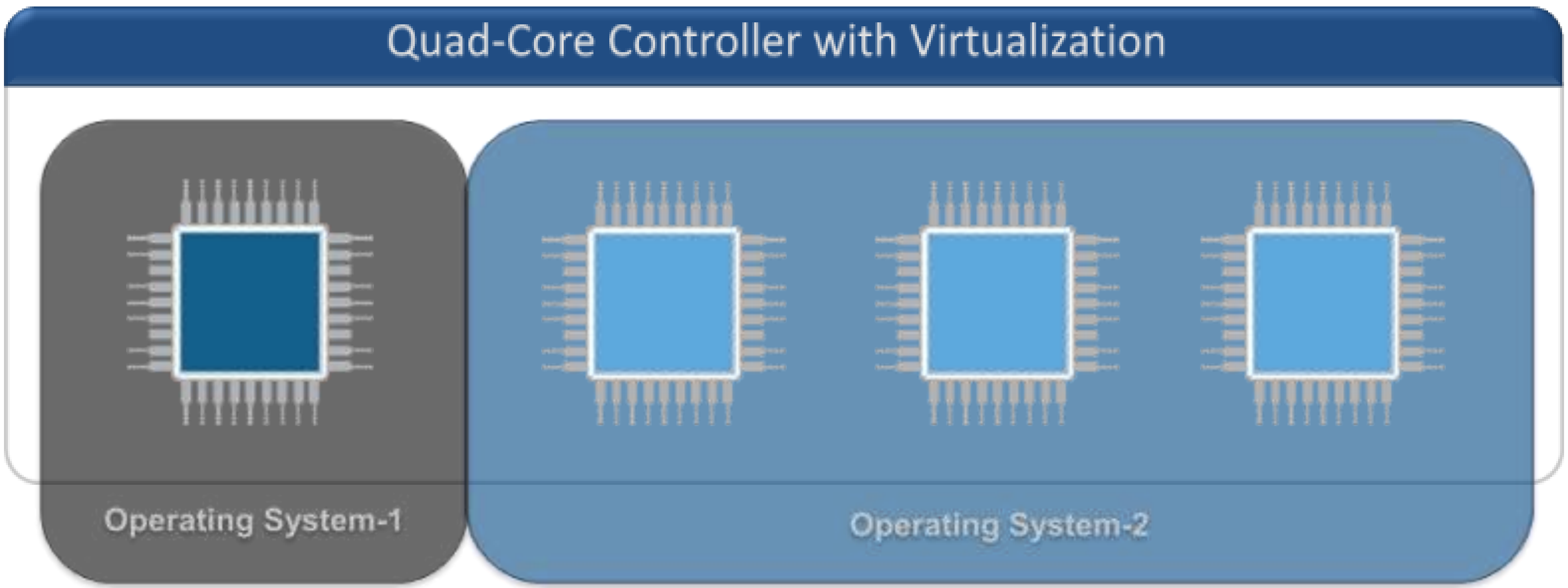
Erik van Hilten

Do More

[Multicore]

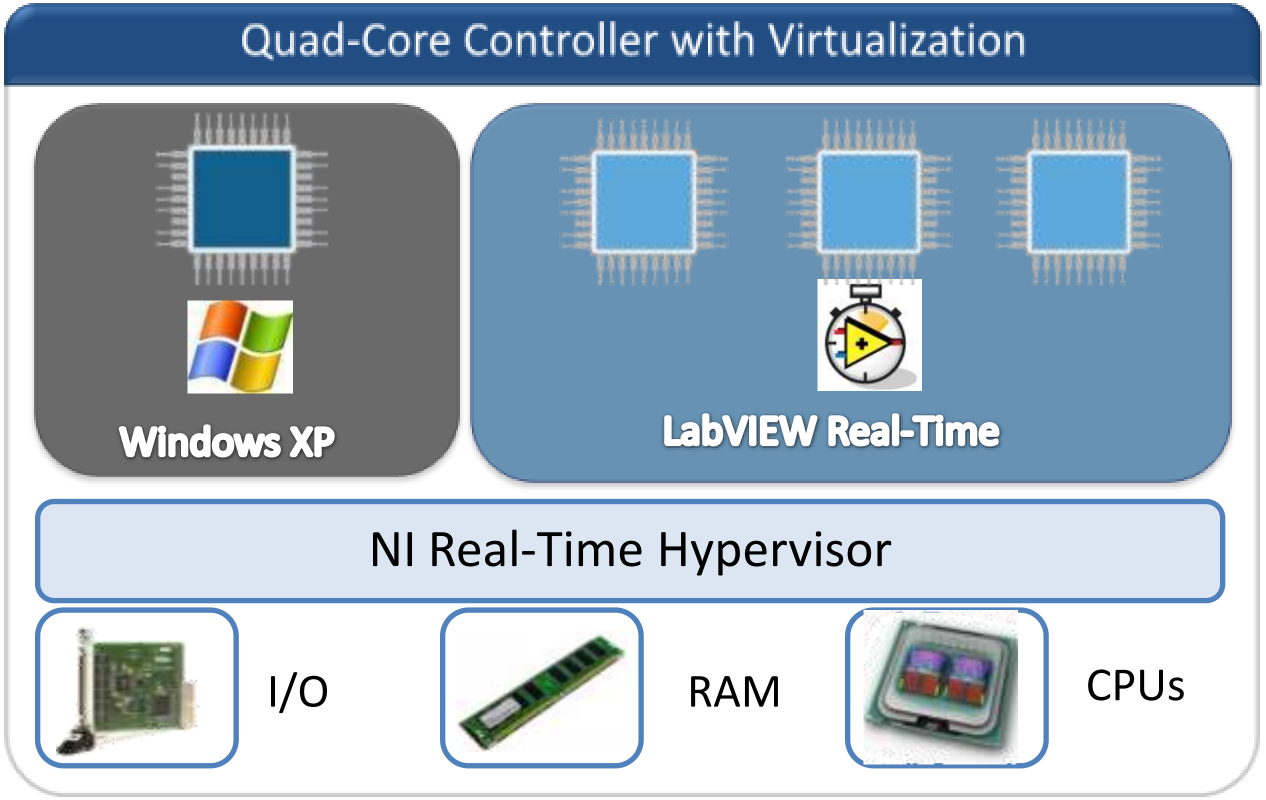

Applications
Graphics
Services
Windows XP
LabVIEW Real-Time
Determinism
Real-Time I/O
Timing

Evolution of Multicore



NI Real-Time Hypervisor

Run LabVIEW RealTime and Windows XP simultaneously

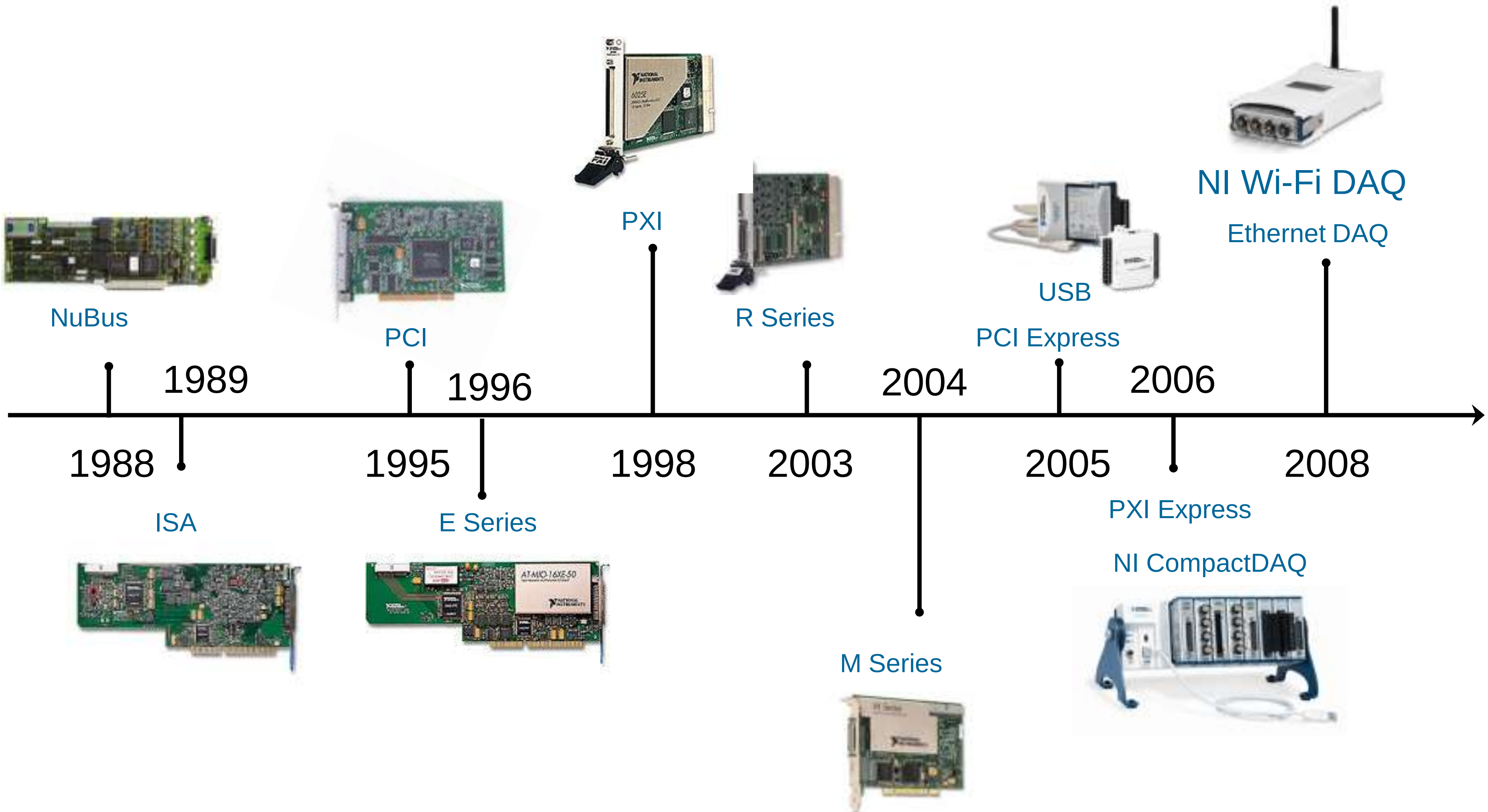


Available on multicore PXI and industrial controllers

Do More

[Data Acquisition]

20 Years | NI Data Acquisition



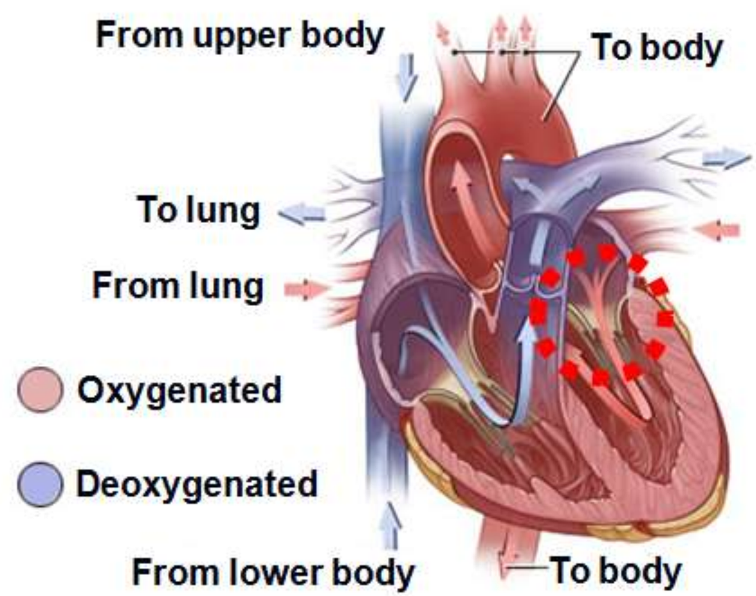
Biomedical Engineering Case Study
Engineering College Aarhus

Morten Jensen

Case Study – Engineering Collage of Aarhus

Building a bridge between engineering and life sciences

- Experimental heart surgery
- Co-operation between engineers and medical doctors
- Measuring the performance of the heart
- Synchronizing strain gauge, hemodynamic, and physiological measurements
- LabVIEW and CompactDAQ
- Results recognized around the world



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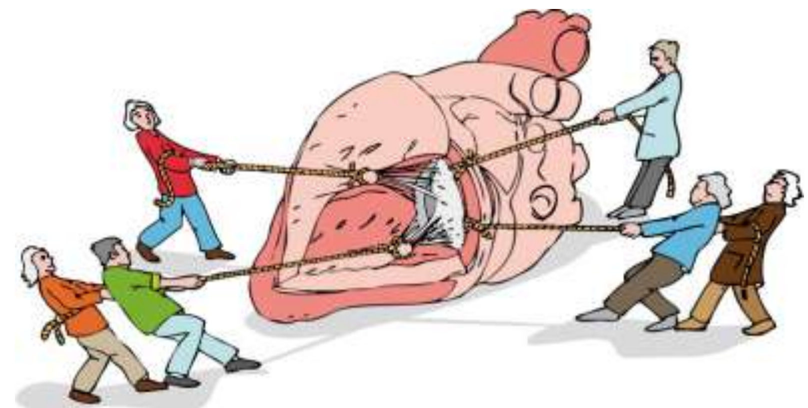

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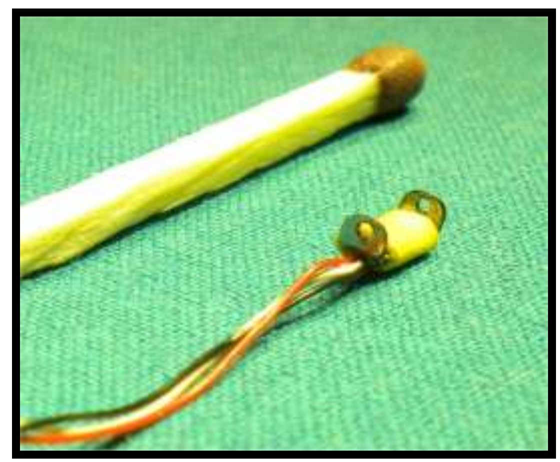

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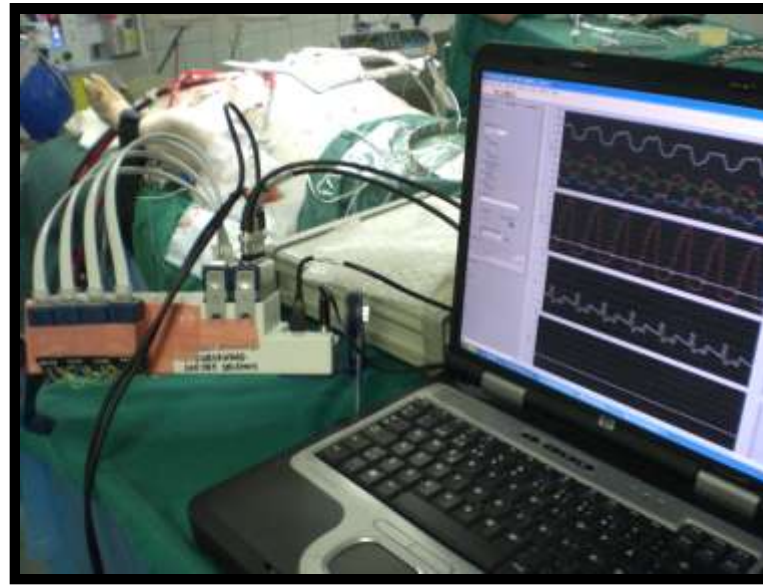

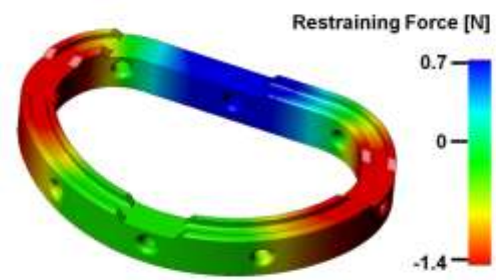

New Products | NI CompactDAQ

- Three AI timing engines
- Built-in BNC triggers
- Four counters
- Locking USB cable
- 9 to 30 VDC power
- Four-slot option

New Products | NI X Series Multifunction DAQ

- 16 PCI Express and PXI Express devices
- Enhanced **NI-STC3**
  - 4 enhanced counters
  - **100 MHz** timebase
  - Independent analog/digital timing engines
- Higher throughput and lower latency
  - Native x1 **PCI/PXI Express** interface
  - **8 DMA channels** for parallel data stream

X Series Data Acquisition Demo

Aku Wilenius

Introducing| SC Express

High Channel Count DAQ Systems

1 Increased Accuracy

- Up to 24-bit resolution
- Delta-Sigma A/D converters
- Anti-aliasing filters per channel

2 High Bandwidth

- PCI Express - Dedicated bandwidth/device
- Dynamic strain measurements
- ADC per channel

3 Best-in-Class Synchronization

- 100 MHz reference clock built-in chassis
- ns synchronization with DAQmx Multi-Device
- Automatic synchronization with DSA & X Series

4 Easy to Use

- Same DAQmx driver as DAQ & DSA
- New Bridge Channel Type in DAQmx
- Modules & Terminal Blocks auto-recognized

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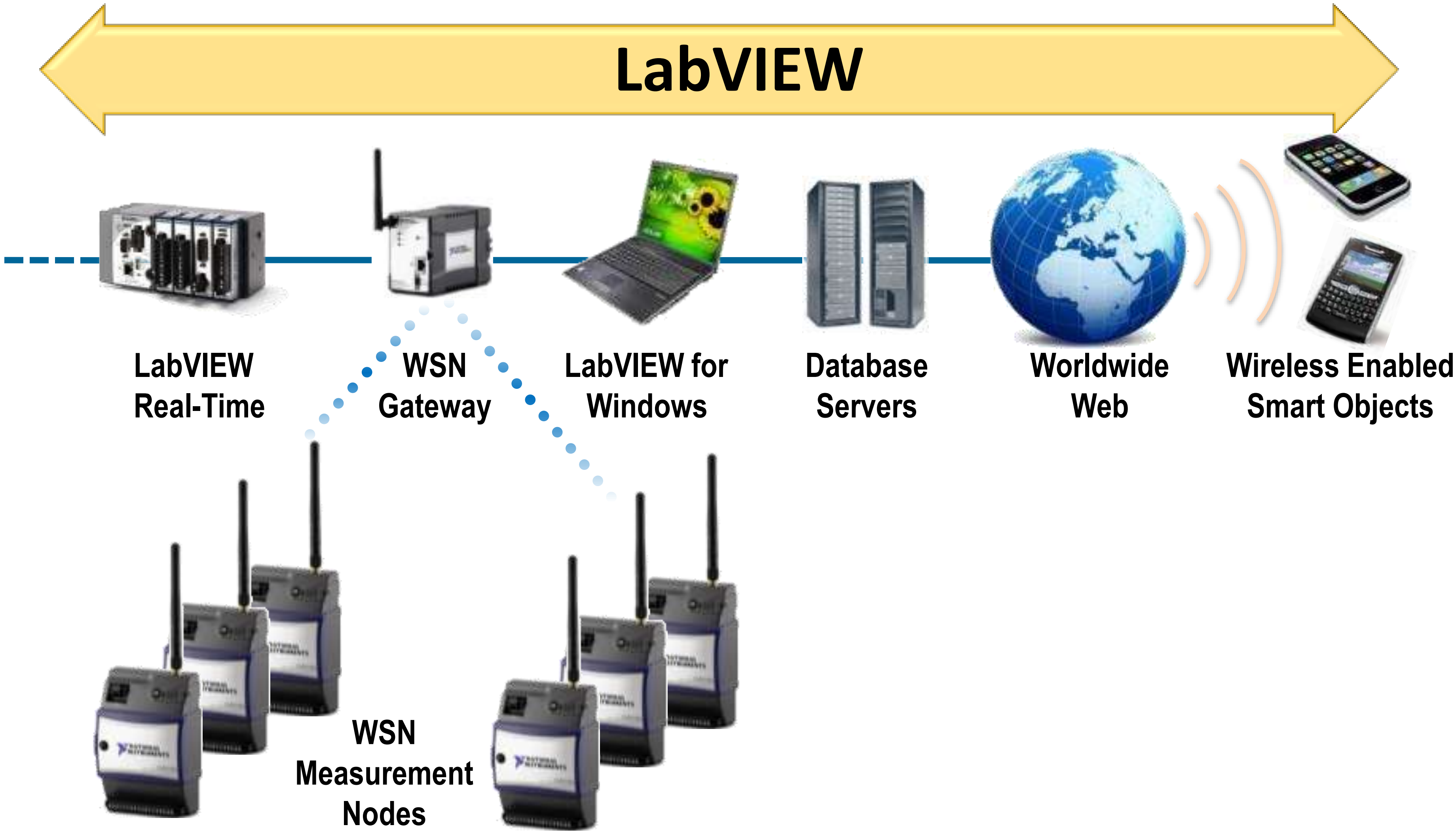
Do More

[Wireless Measurements]

NI Wireless Sensor Networks
Low Power. Reliable.

- 16-bit voltage input node
- 24-bit thermocouple node
- Up to 3-year battery life
- 2.4 GHz, IEEE 802.15.4 radio
- Programmable nodes

WSN System Architecture



Solar Farm Monitoring

Wind

Panel/String

- DC power
- I-V performance

Solar Irradiance

Inverter

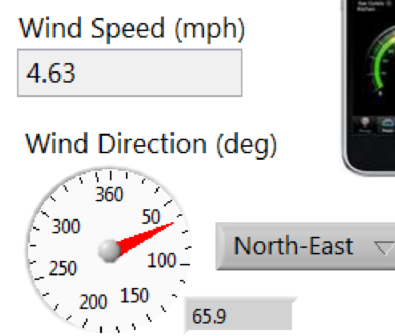
- DC to AC Efficiency
- AC power factor
- Harmonics/distortion
- Array utilization

Temperature

- Ambient
- Panel
- Inverter

Remote Monitoring

- Historical data
- Current conditions
- Thin-client interface



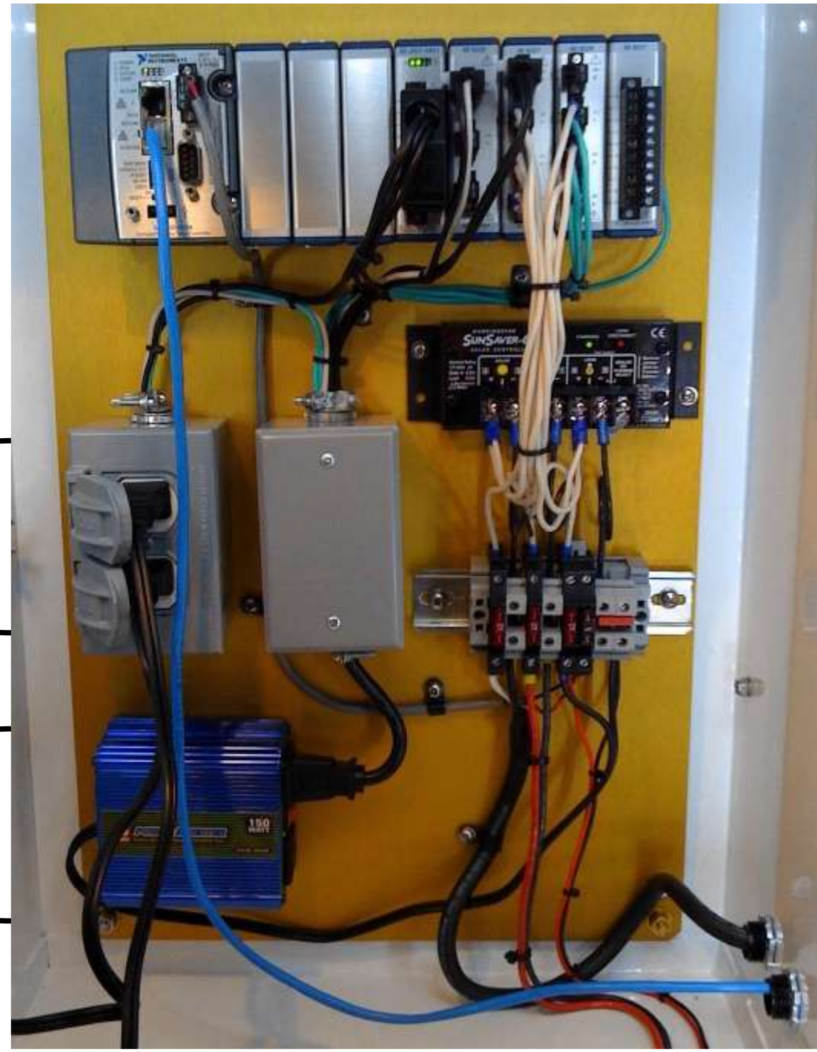
NI Solar Monitoring System

NI Solar Monitoring System

NI WSN
Wireless
Sensor
Networks

AC MicroGrid
Switched through Relay Module

DC/AC Inverter
150 W



NI CompactRIO

Solar Charge Controller

Interconnect
Battery/Panel/Inverter

Data Link

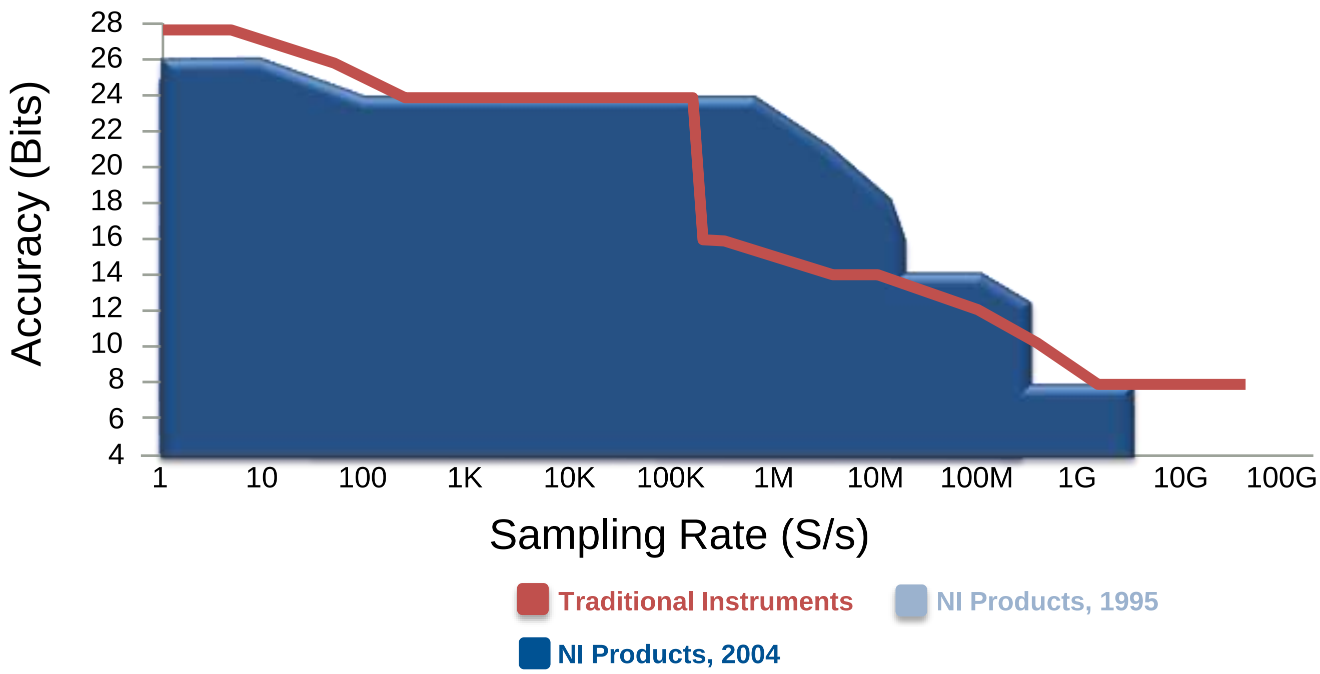
Starter toolkit available soon, visit ni.com/solar.

NATIONAL INSTRUMENTS

Do More

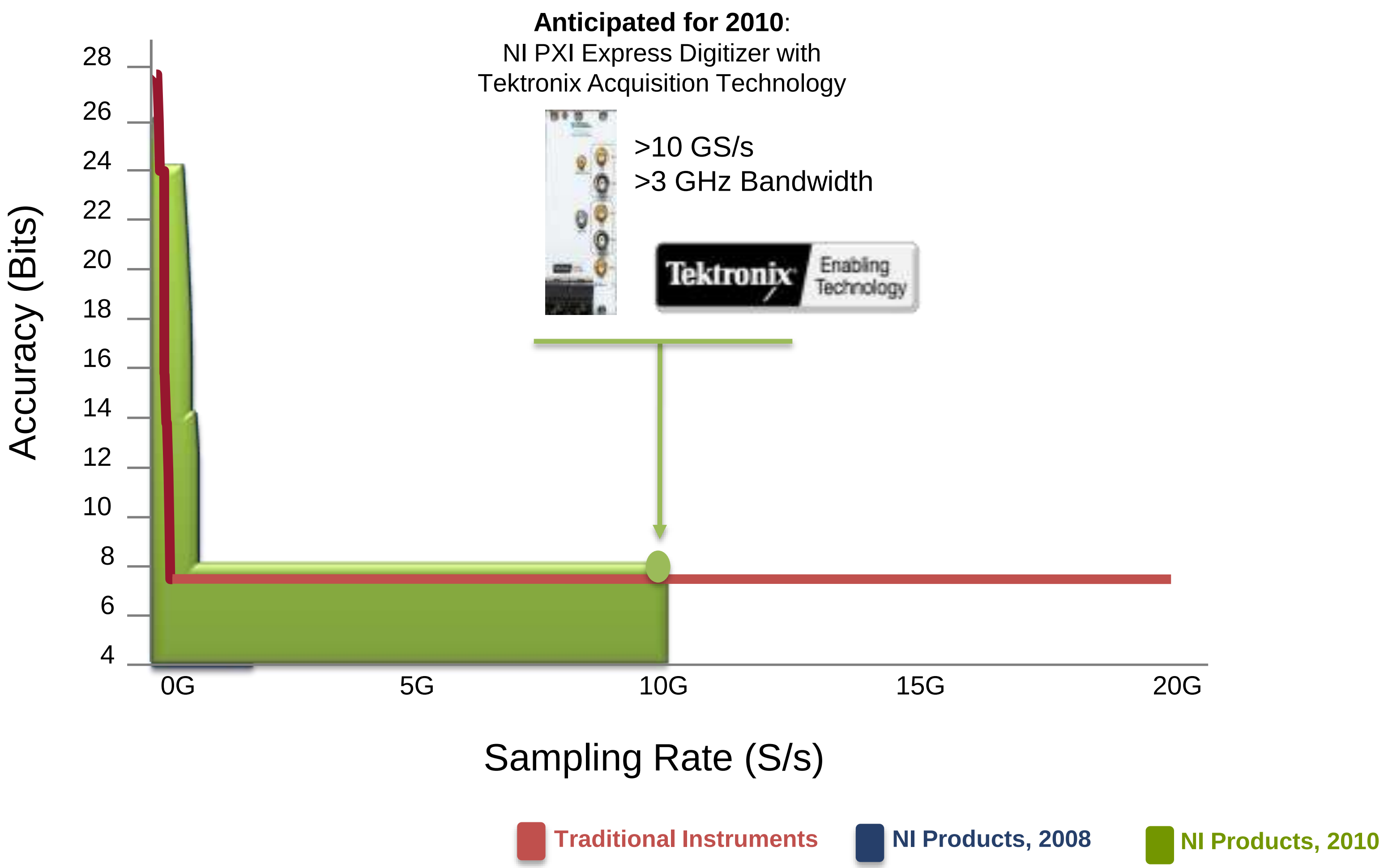
[Automated Test]

Expanding Measurement Capabilities



NATIONAL INSTRUMENTS

Expanding Measurement Capabilities



NI PXI Semiconductor Suite

Source Measure Unit

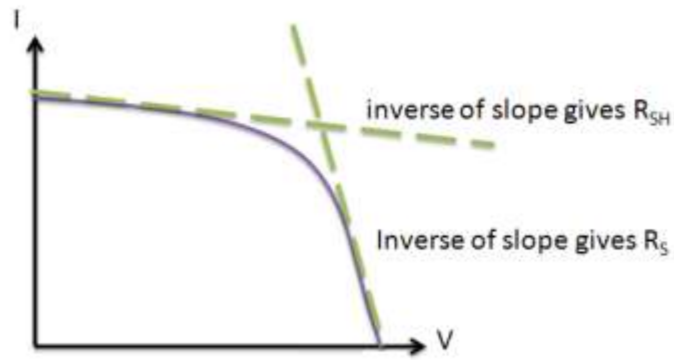
High-Speed Signal
Insertion Switch

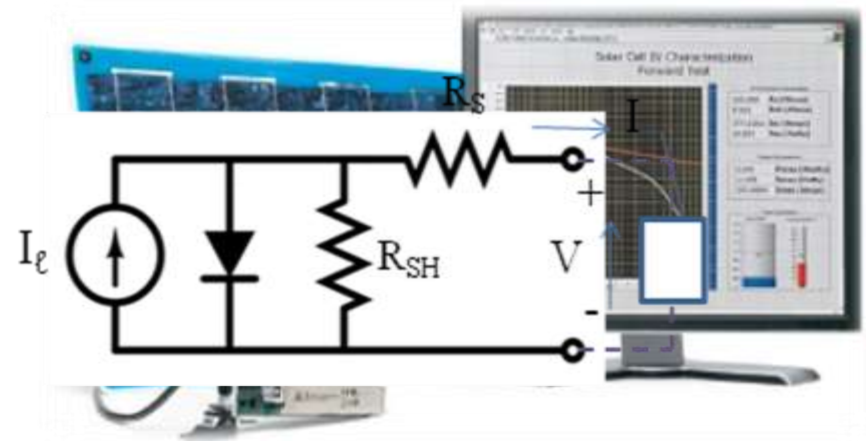
High-Speed Digital
I/O

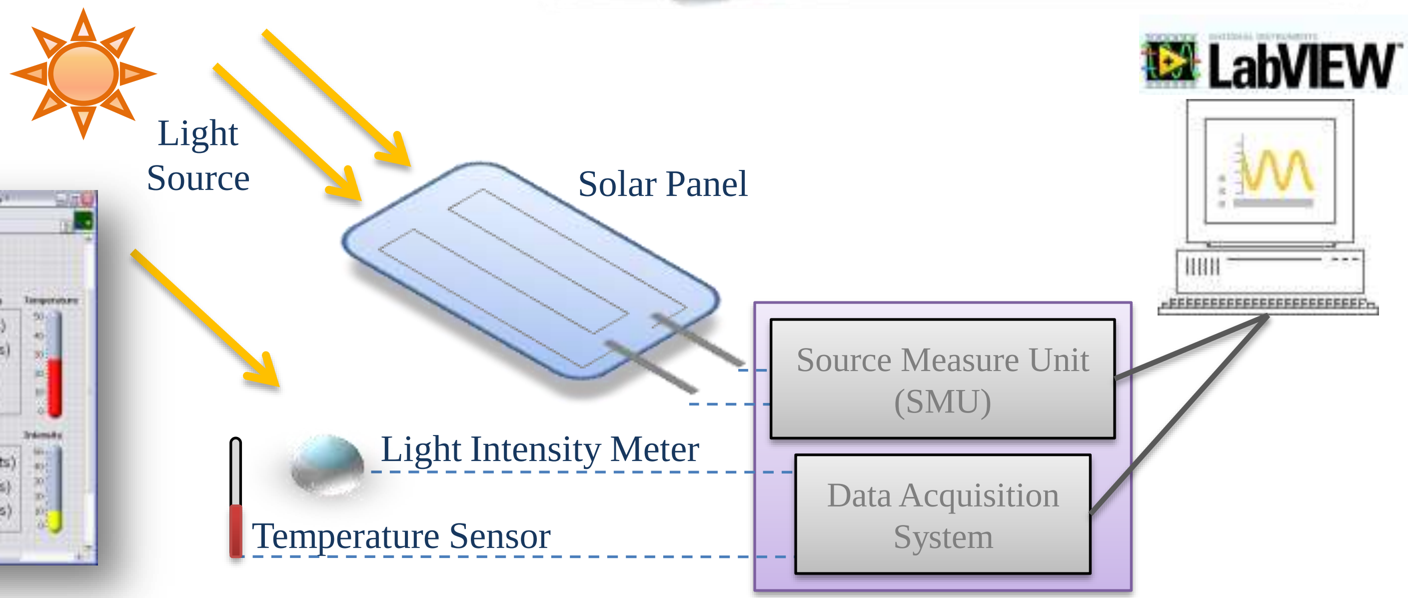
RF 6.6 GHz
VSA/VSG

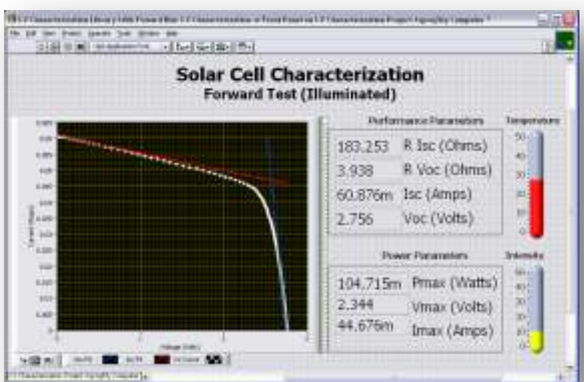
WGL/STIL
Importing
Software

Solar Cell I-V Characterization Testing



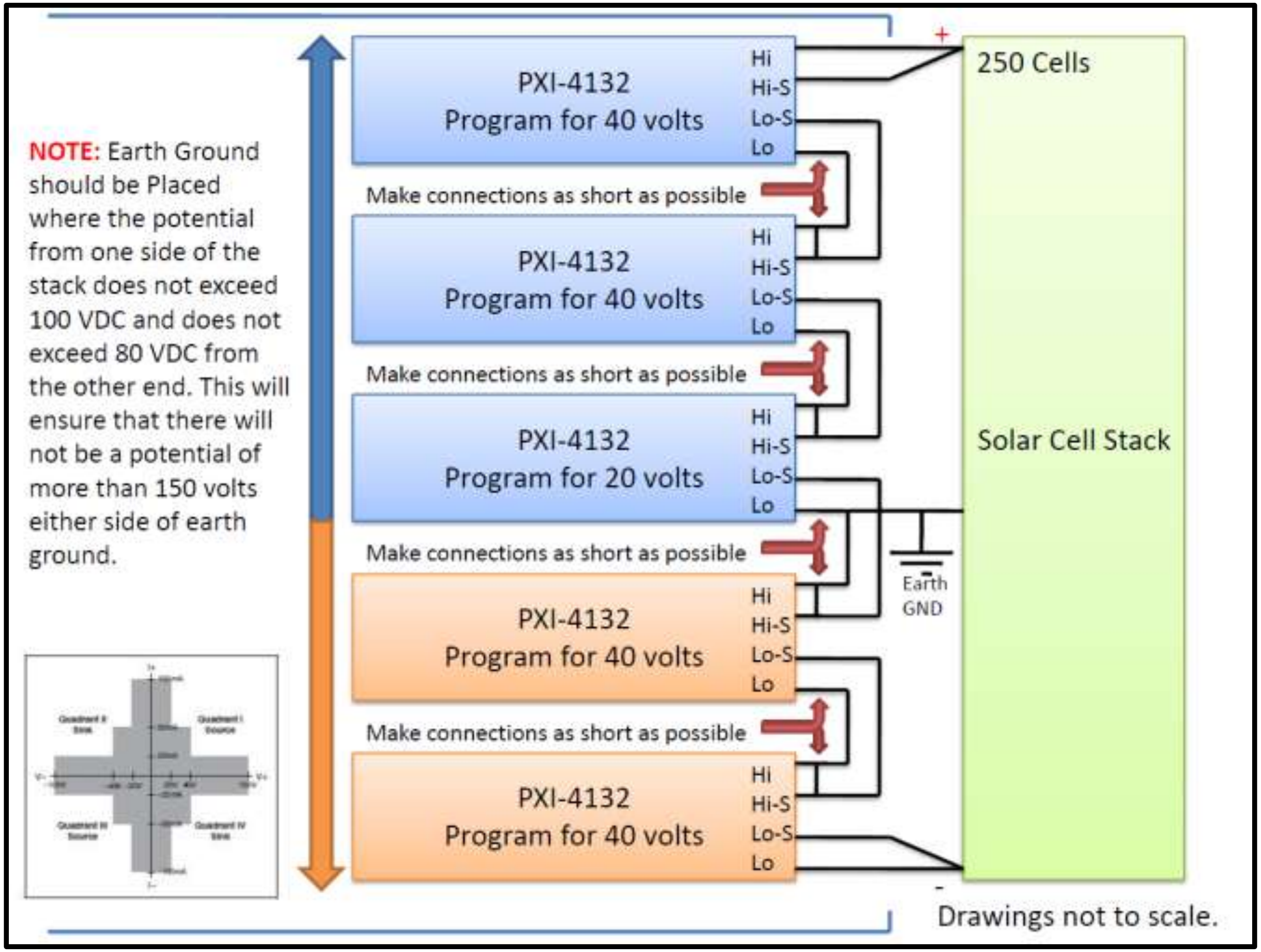






To download the toolkit, visit ni.com/solar.

Wiring Diagram of NI SMUs Configured for 180V, 50mA Solar Panel Test

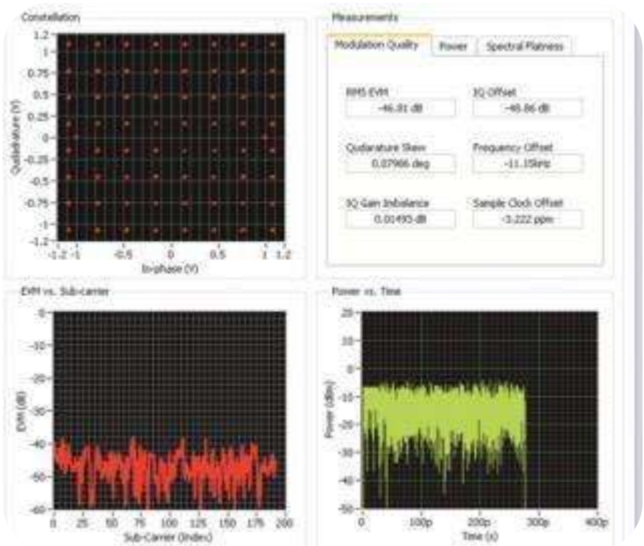


Do More

[Radio Frequency Test]

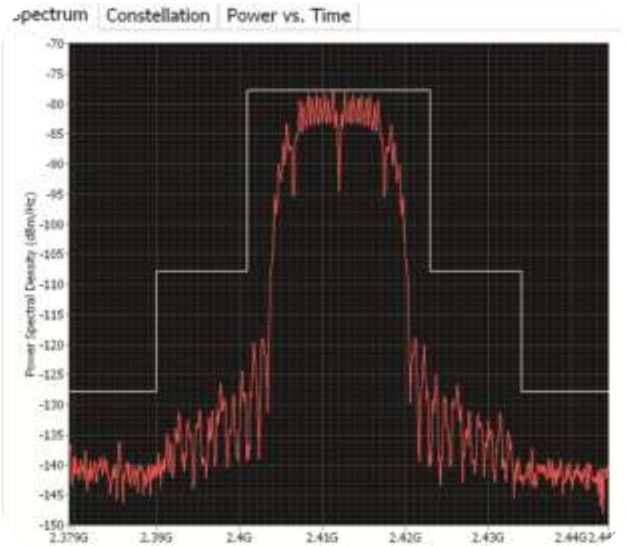
New RF Toolkits | LabVIEW and LabWindows™/CVI

WLAN Toolkit



GPS Simulation Toolkit

WiMAX Toolkit



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NI FlexRIO | Reconfigurable FPGAs for Test

Announced November 2008

NI PXI-795x PCI-based FlexRIO FPGA Modules

- Virtex-5 **LX** Series FPGAs
- **128 MB** onboard DRAM

Announced February 2010

NI PXIe-796x PCI Express-based FlexRIO Modules

- Virtex-5 **SXT** Series FPGAs
- **512 MB** onboard DRAM
- **Co-processing** for other instruments

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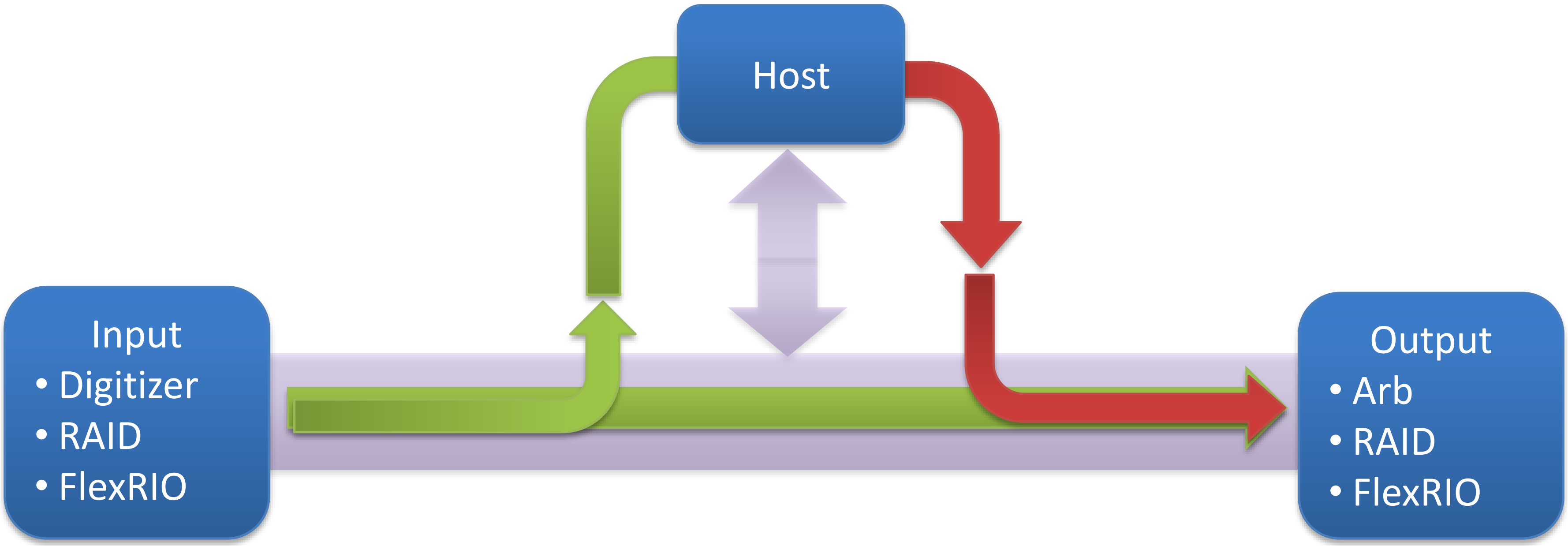
Data Streaming | Traditional Model

Peer to Peer Streaming | A New Model



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Peer-to-Peer Streaming Demo

Leif Johansson

NI FlexRIO | New Adapter Modules for Test

NI 5752 32-Channel Digitizer Adapter module

Optimized for nondestructive test and ultrasound applications:

- 50 MS/s with 12-bit resolution on all channels
- 100 Ω differential inputs
- AC coupling
- Selectable antialias filters
- Programmable time-variable gain control

NI 5781 Baseband Transceiver Adaptor Module

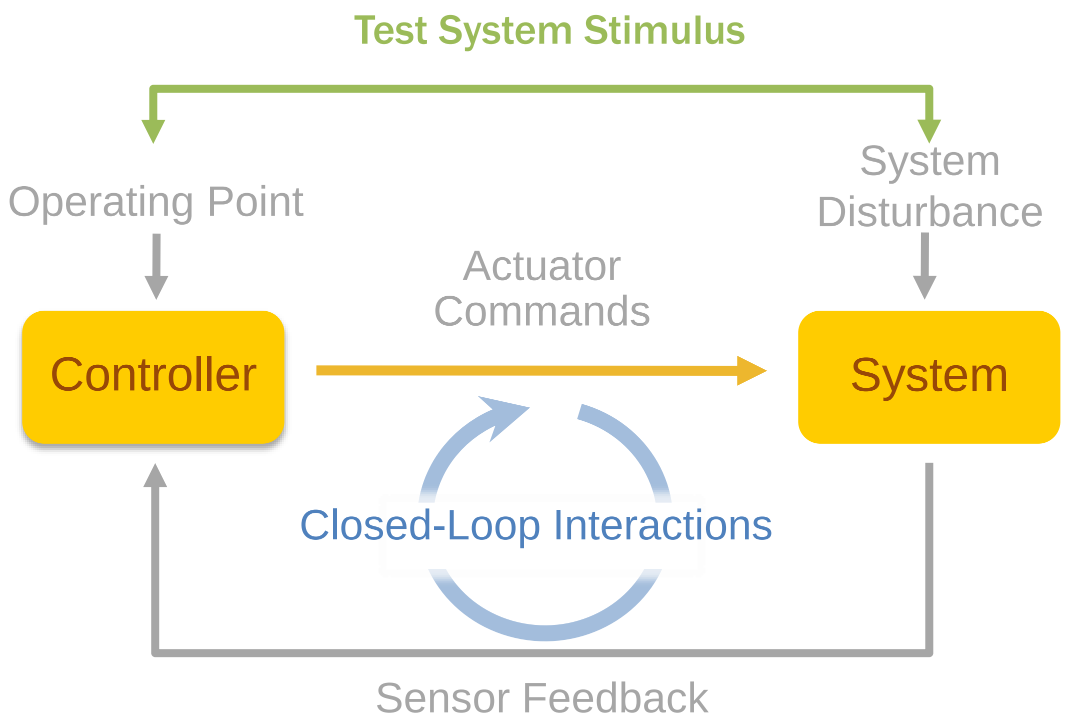
Implement custom RF modulation and demodulation, channel emulation, bit error rate testing, or spectral monitoring and jamming.

- Two 100 MS/s, 14-bit, differential, DC-coupled inputs and outputs (outputs 16-bit)
- 40 MHz bandwidth (-3 dB)

Do More

[Real-Time Test]

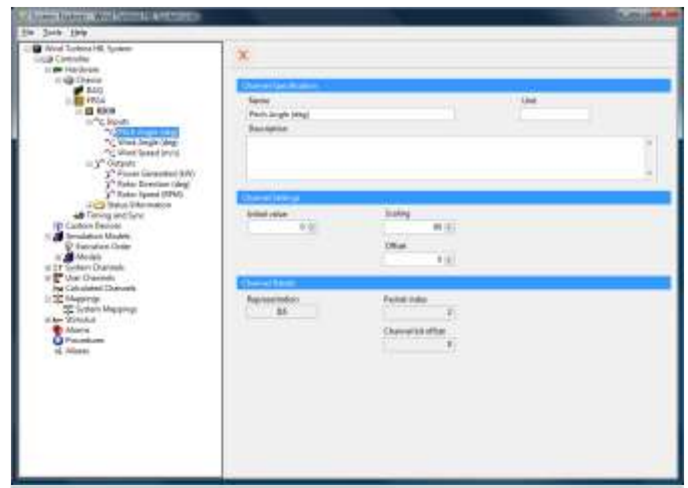
Real-Time Testing and Simulation



NI VeriStand™

Real-Time Testing and Simulation Software

- Hardware I/O
- Models
- Stimulus Profiles
- Data Logging
- Calculated Channels
- Alarming



Ready to configure and use

VeriStand Control System Testing

Eirikur Orn-Runarsson

Do More

[Embedded Control]

NI RIO Technology Platform

Processor

Enet | USB | RTOS

Analysis | Control

Logging | Comm

FPGA

Analysis IP | Control IP

Timing IP | Comm IP

IPNet | 3rd party IP

I/O

Analog I/O | Digital I/O

Comm I/O | Motion I/O

3rd party I/O

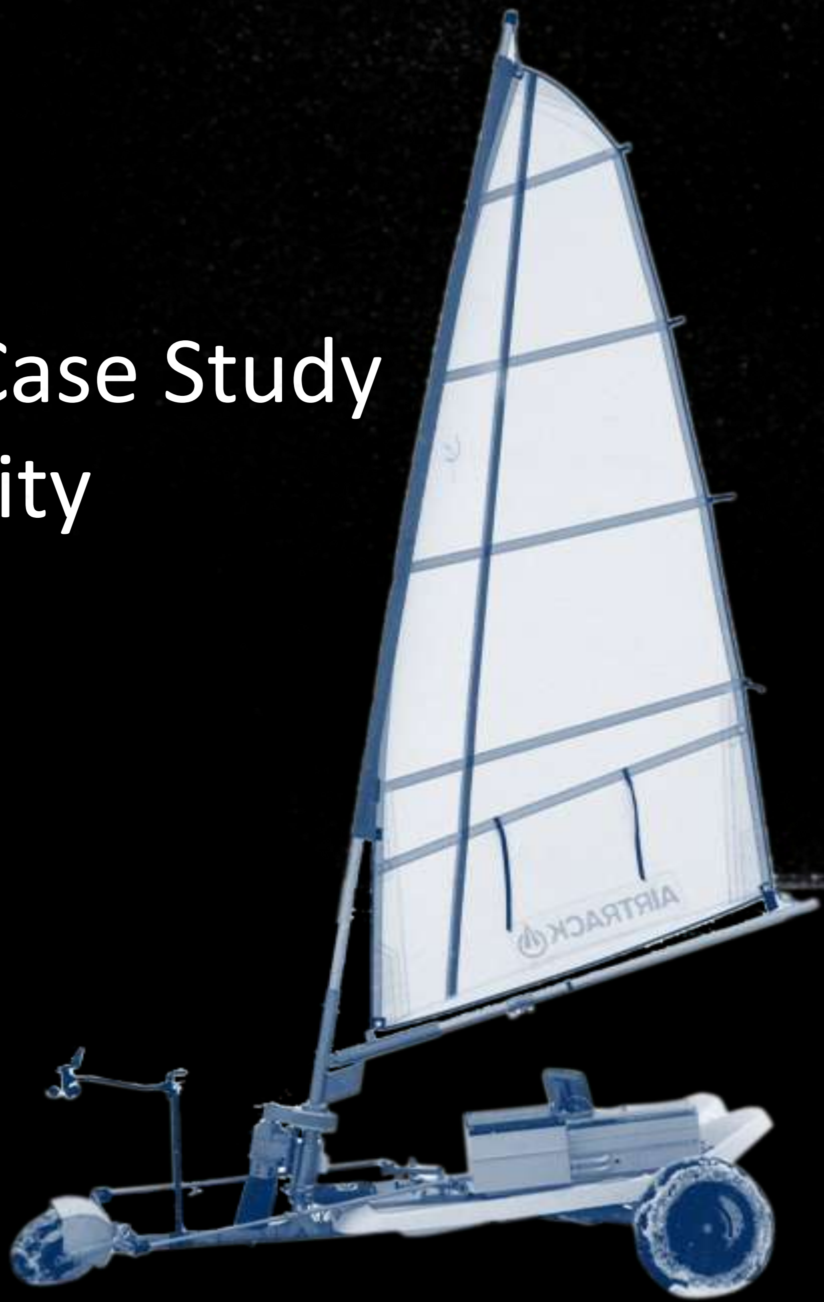
NATIONAL INSTRUMENTS LabVIEW™

NI RIO Hardware

Packaged

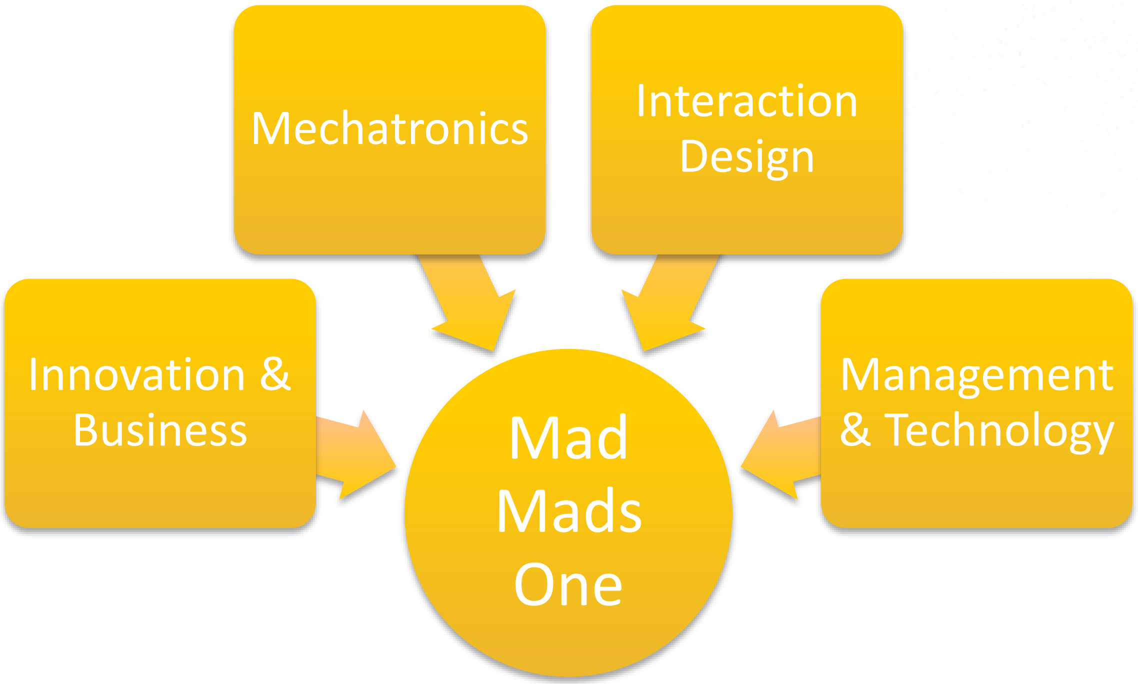
Board-Level

Autonomous Land Yacht Case Study
Syd Dansk University



Professor Egon Villumsen
Mikkel Børlum Petersen

Cybersailing | Mad Mads One



18 Engineering students from SDU
Developing the worlds first
autonomous land yacht

mci mads clausen institute

University of Southern Denmark

Cybersailing

National Instruments

Cybersailing | Mad Mads One

CompactRIO

CompactRIO Modules

NATIONAL INSTRUMENTS
LabVIEW

- Autonomous land yacht
- Route calculator
- Google Earth integrated user interface
- Joystick takeover
- Emergency functions

mci mads clausen institute

University of Southern Denmark

CYBERSAILING

NATIONAL INSTRUMENTS

CompactRIO Evolution | Hardware & Software

cRIO 9023 and cRIO 9025
New Rugged Performance RT Controllers

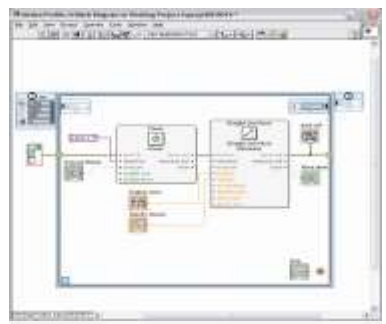
cRIO 911x
Virtex-5 LX family CompactRIO Reconfigurable Chassis

- Real Time Mathscript
- Vision Capabilities
- File I/O throughput
- Model execution
- Math IP Fixed point
- Signal processing and measurements

NATIONAL INSTRUMENTS LabVIEW™ 2009

CompactRIO Motion Control

New LabVIEW
SolidWorks Interface
Simplified digital prototyping



New LabVIEW
NI SoftMotion Module
Simplified motion

New C Series Drive
Interface Modules
Servo drives | Stepper drives

SolidWorks

NATIONAL INSTRUMENTS

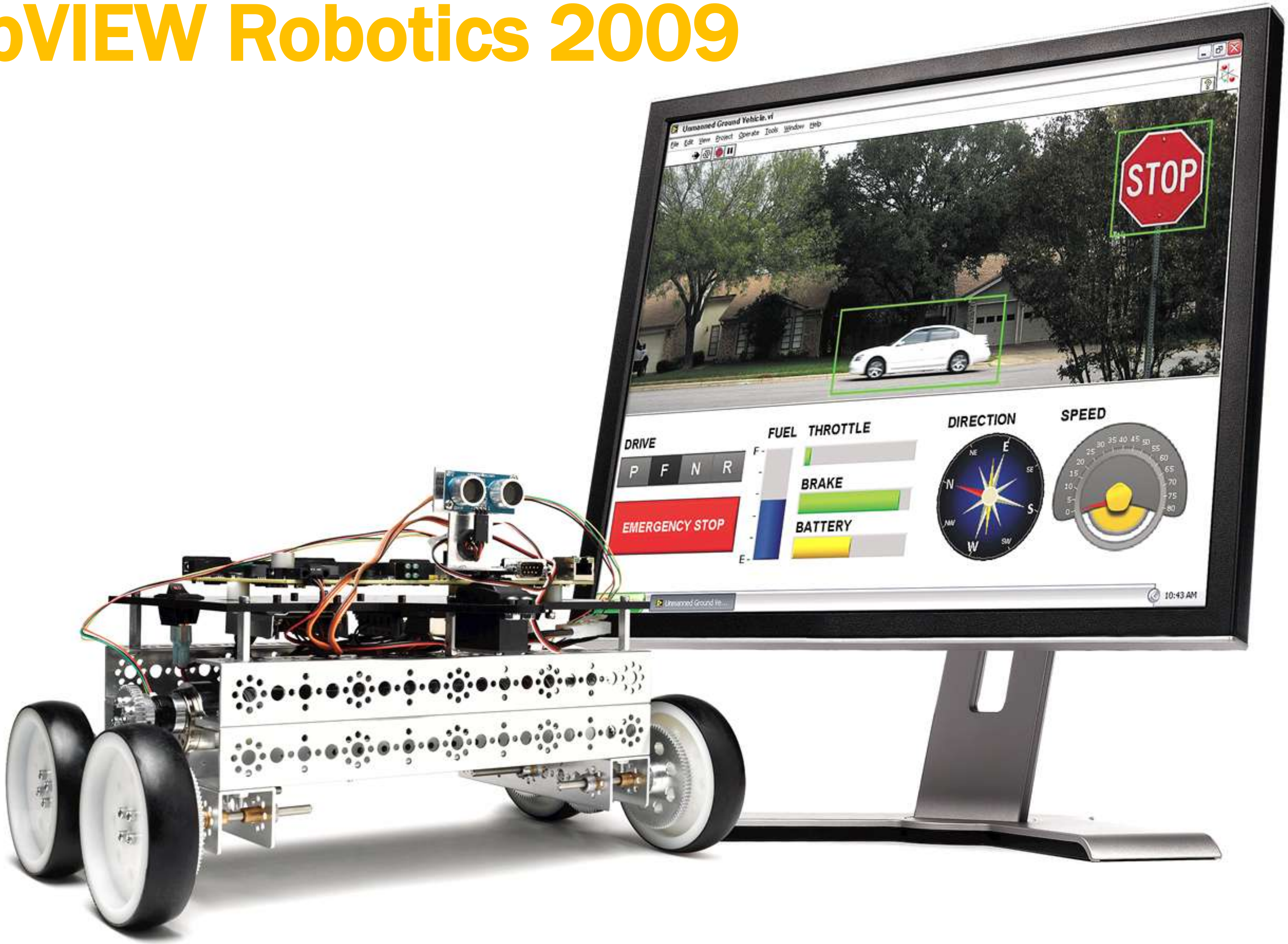
Delta Robot (Knife Trick)

Aku Wilenius

Do More

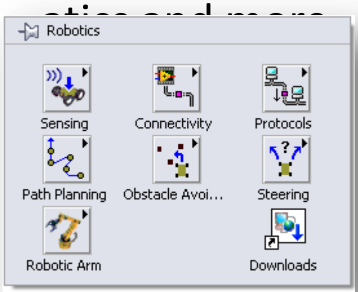
[Robotics]

LabVIEW Robotics 2009

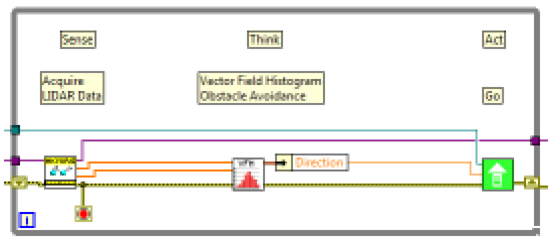


LabVIEW Robotics Key Offerings

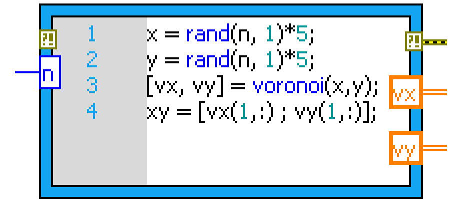
IP for navigation, steering, kinematics and more



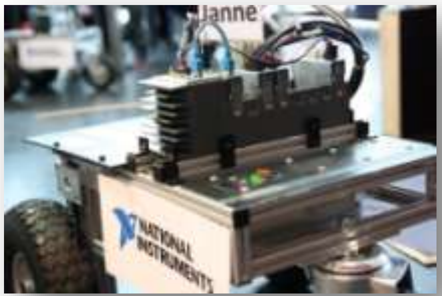
High-level **graphical programming**



Tools for integrating **text-based algorithms**

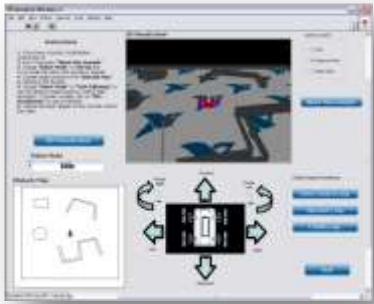


Deployment to Real-Time and FPGA hardware



Connectivity to sensors and actuators from top vendors

Examples of real-world applications



LabVIEW and Robotics World

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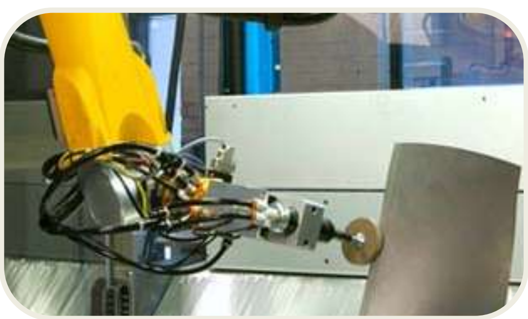
Advanced Robotics Applications

- **Pick & Place**

  Assembly
  Lab Automation
  Flexible Manufacturing

- **Test**

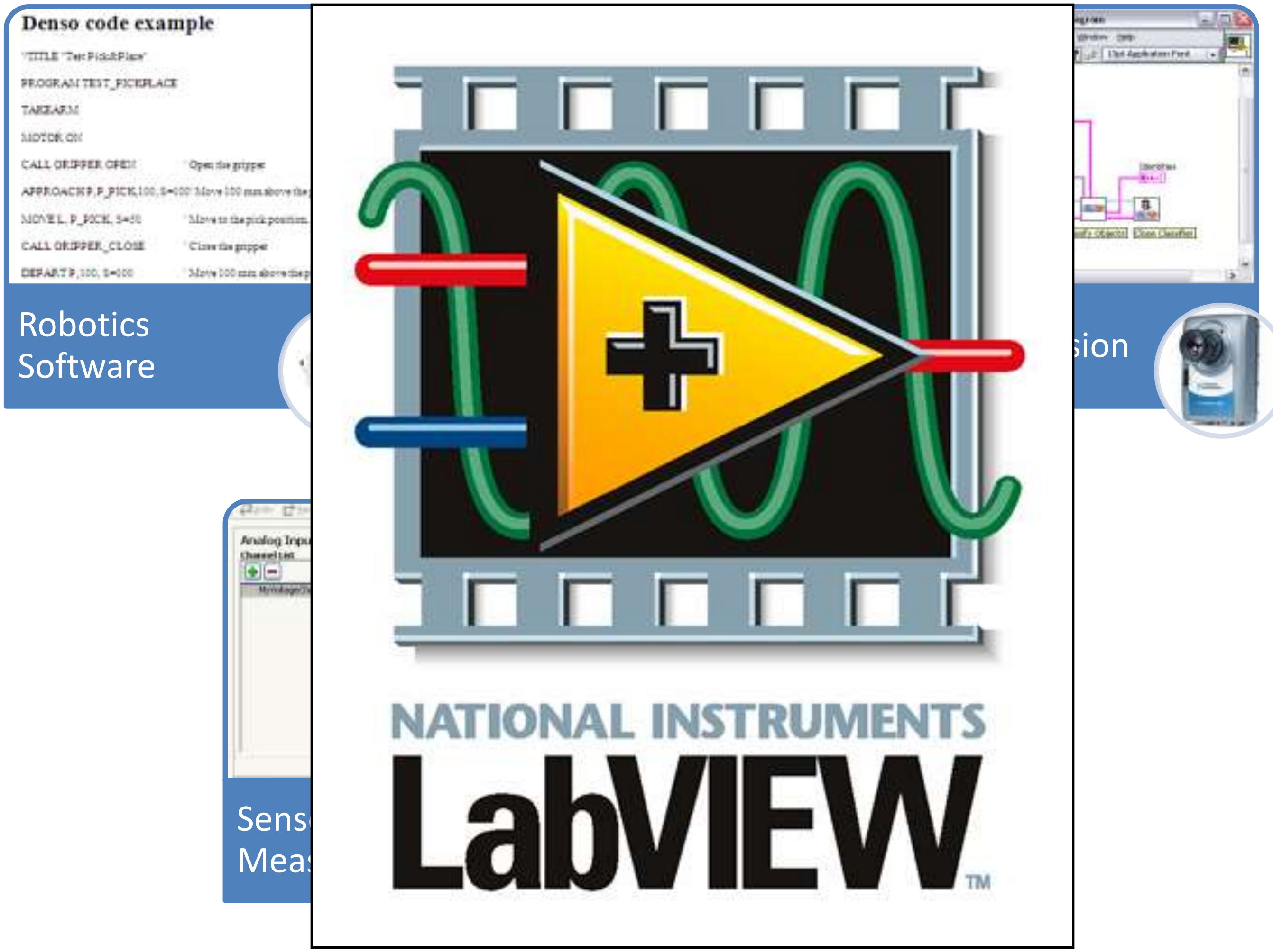
  Automated Test
  Visual Inspection
  Multiple Measurements



- **Material Work**

  Polishing
  Deburring
  Machining

Advanced Robotics Requires a Lot of Software



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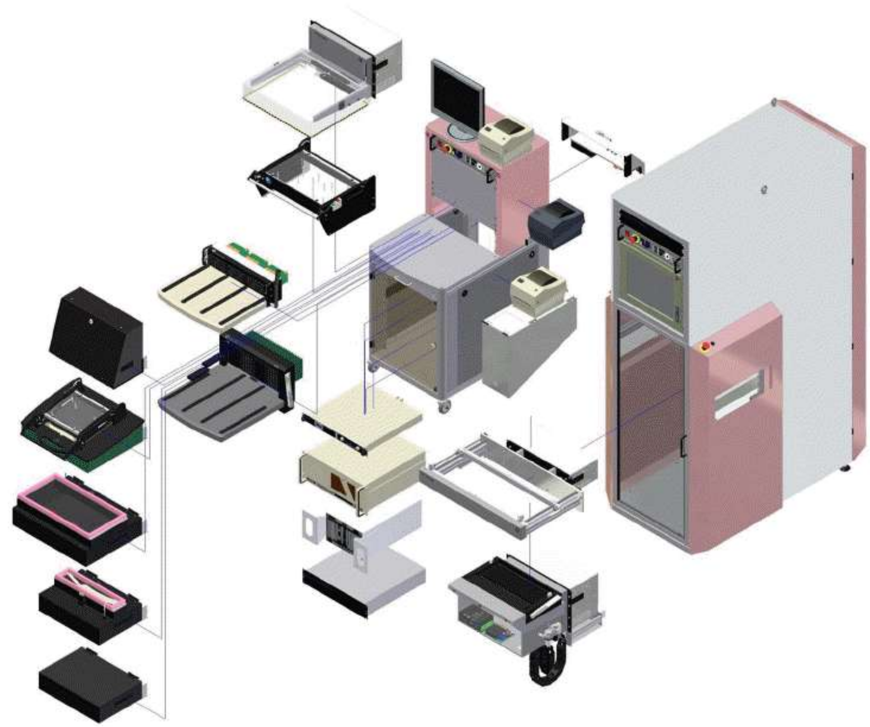

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