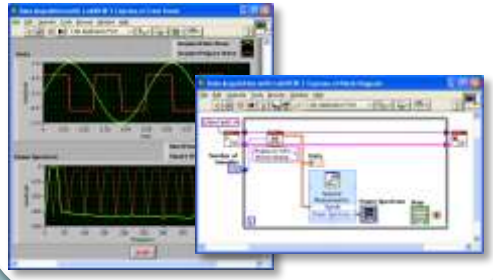
Welcome to NIDays 2009 !

William Baars – Area Sales Manager NI Netherlands

What We Do

Low-Cost Modular Measurement and Control Hardware

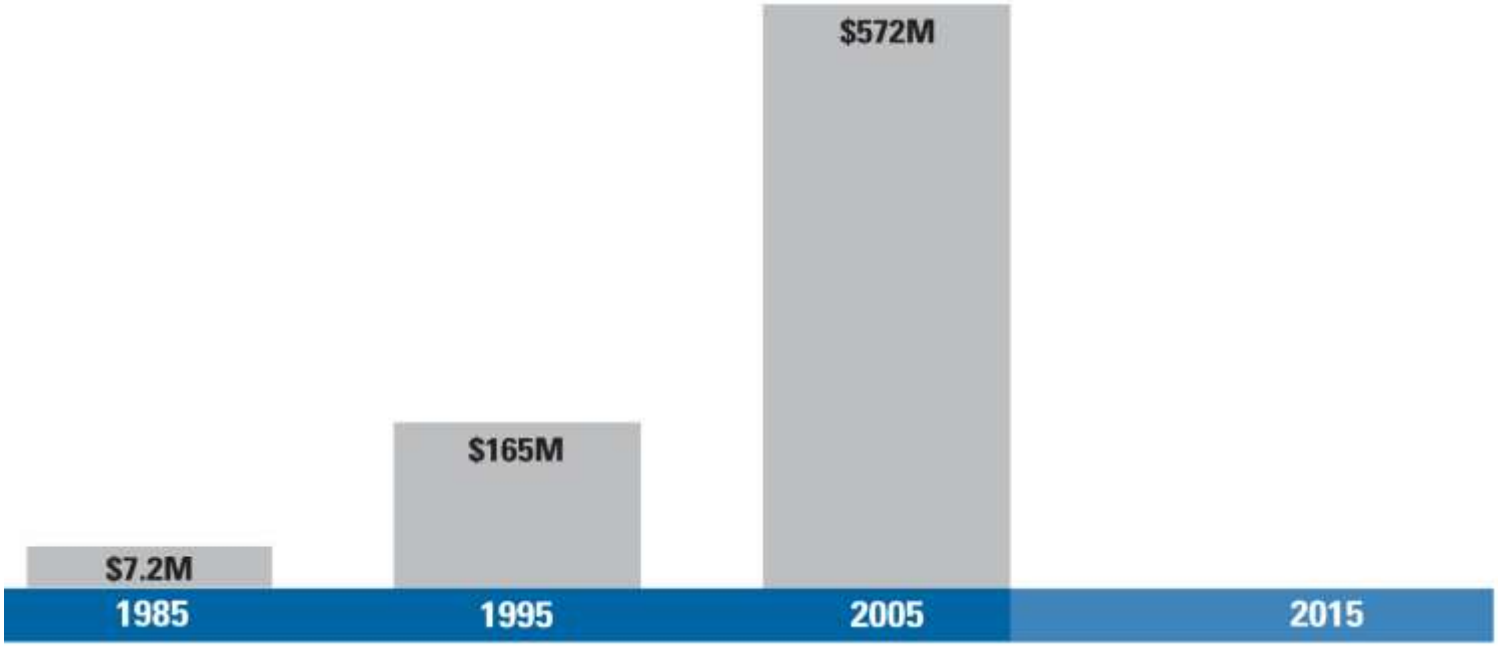
Productive Software Development Tools



Highly Integrated Systems Platforms

Used By Engineers and Scientists for Test, Design and Control

National Instruments: Decades of Innovations



First Decade

1985: Self-financing with GPIB

Second Decade

1995: Virtual Instrumentation with GPIB, NI LabVIEW, and DAQ

Third Decade

2005: Measurement and Automation (Modular Instruments and systems – PXI, FieldPoint, and CompactRIO)

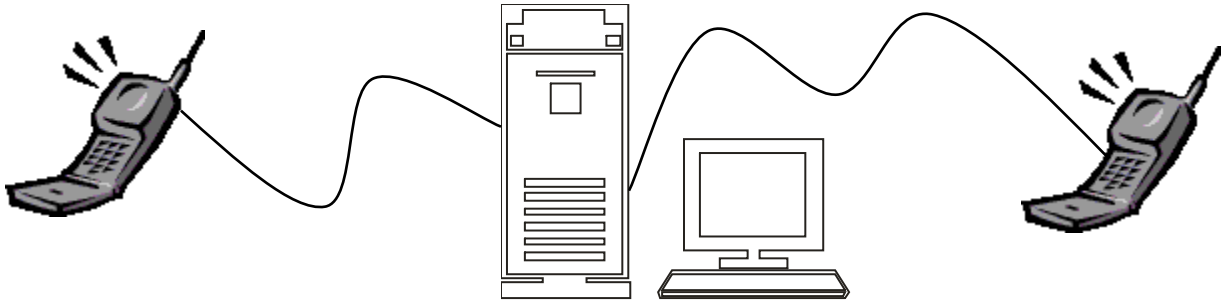
Fourth Decade

2015 : Test & Measurement and Graphical System Design

Automating measurements

GSM test system

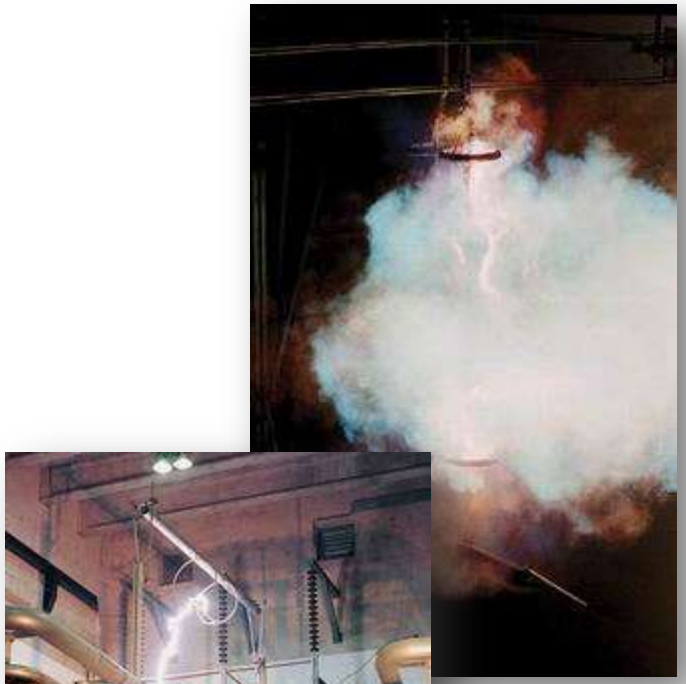
- Connect two GSM phones to a PC to test new communication coding standards



- Needed 10x speed improvement over the old system
- LabVIEW (with multithreading), DIO and Audio measurements
- Developed in 6 weeks *(of which 3 weeks for purchasing...)*

High Power Lab test system

- Testing insulators at 1 Million Volts and 1 Million Amps
- PXI and PXI Instruments:
  - PXI-6133, PXI-5122, PXI-1042Q



"With our new system we can acquire at a higher rate, we have less external connections and we have a lower system price. "

– Aert Jurriens, KEMA

Hardware in the loop testing

- Neopost developed a system to simulate the mechanical signals (encoders / motors / switches) of their mail handling machines. Based on PXI/RT/FPGA and LabVIEW
- This speeds up embedded software development since mechanics is not available at start of project.

Leveraging Technologies to Solve Next Generation Engineering Challenges

Shelley Gretlein

Senior Group Manager, Real-Time and Embedded

NIDays 2009

Engineering Grand Challenges

Make solar energy economical

Provide energy from fusion

Develop carbon sequestration methods

Manage the nitrogen cycle

Provide access to clean water

Restore and improve urban infrastructure

Advance health informatics

Engineer better medicines

Reverse-engineer the brain

Prevent nuclear terror

Secure cyberspace

Enhance virtual reality

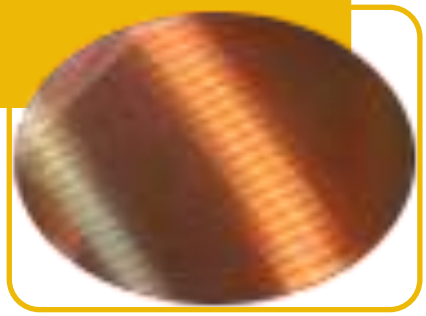
Advance personalized learning

Engineer the tools of scientific discovery

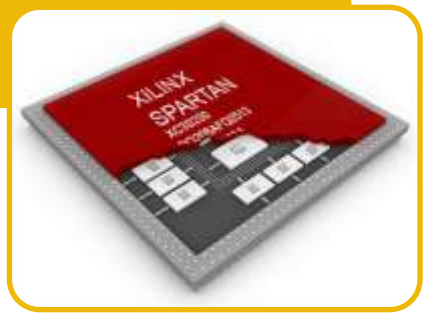
Source: www.engineeringchallenges.org
National Academy of Engineering

Today's Technology: Core Value

Multicore



FPGA



Modular I/O

Today's Technology: Core Value

Multicore

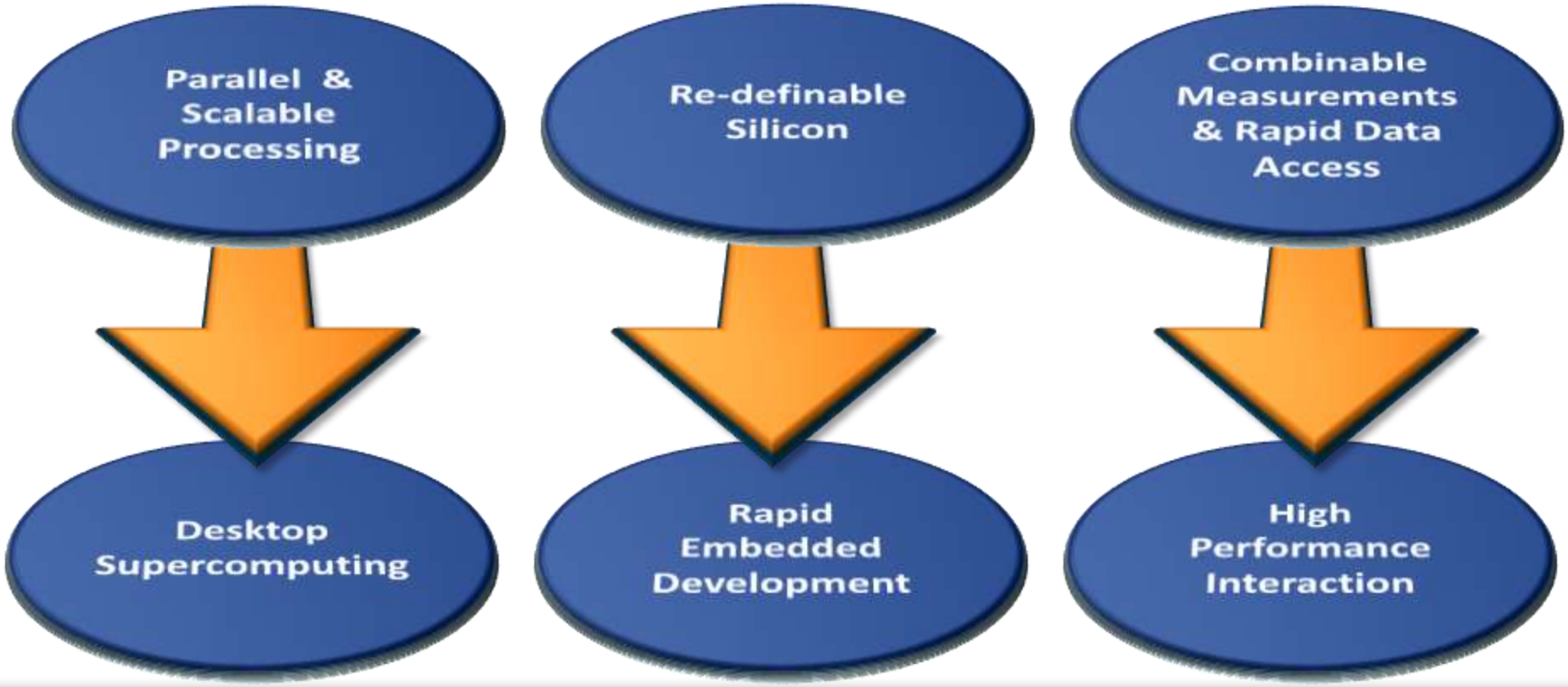
Parallel & Scalable Processing

FPGA

Re-definable Silicon

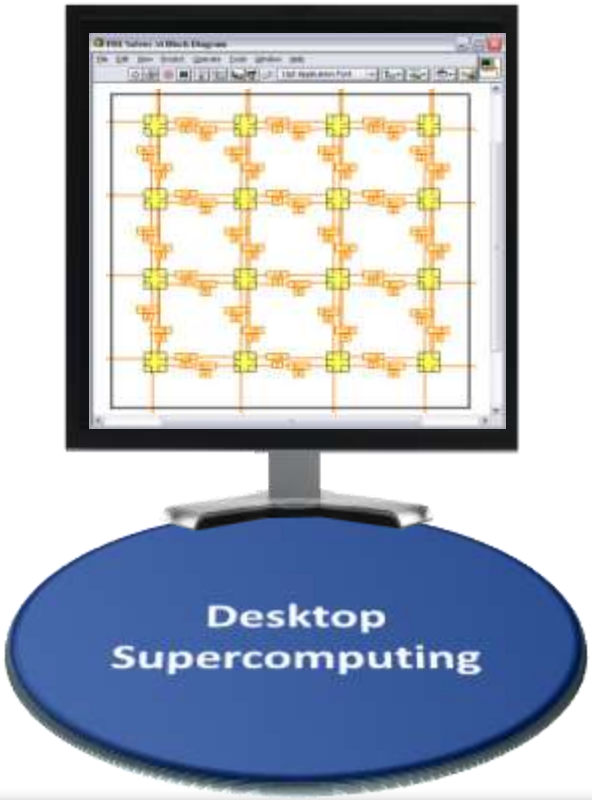
Modular I/O

Today's Technology Potential

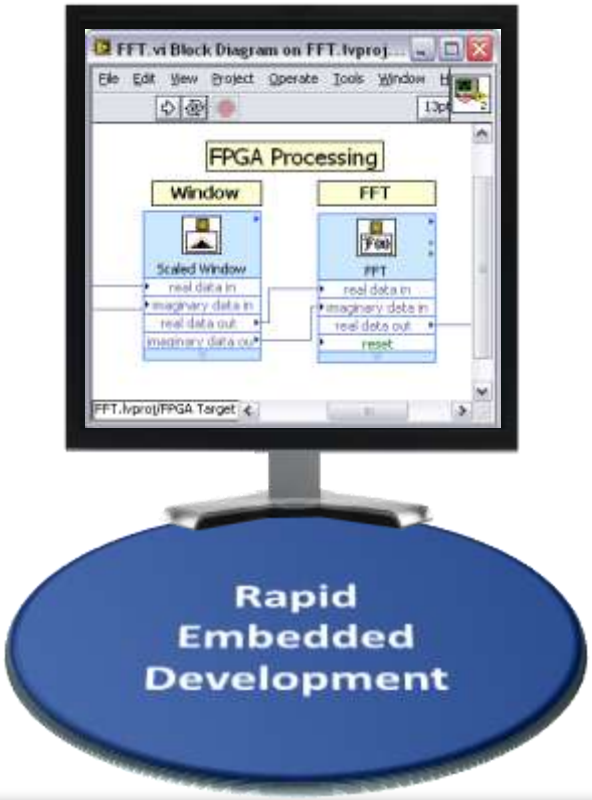


Access through Graphical Programming

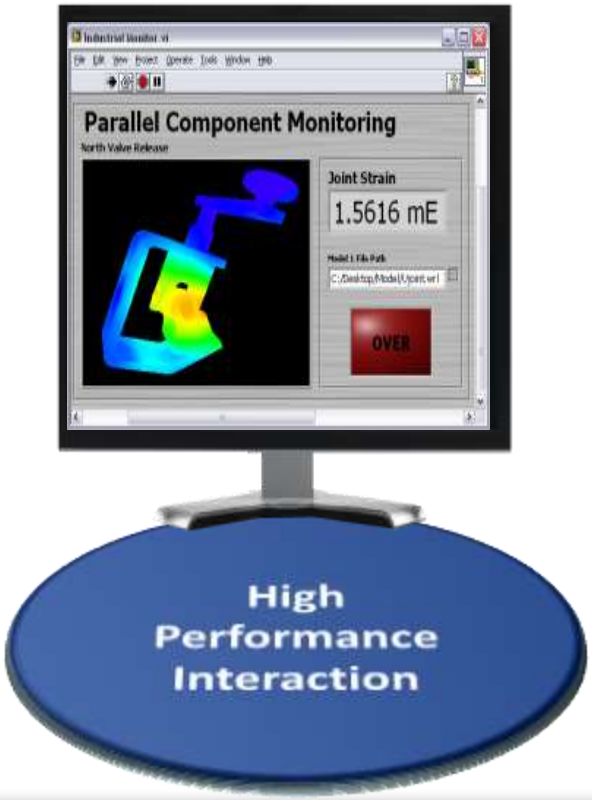
Multicore



FPGA



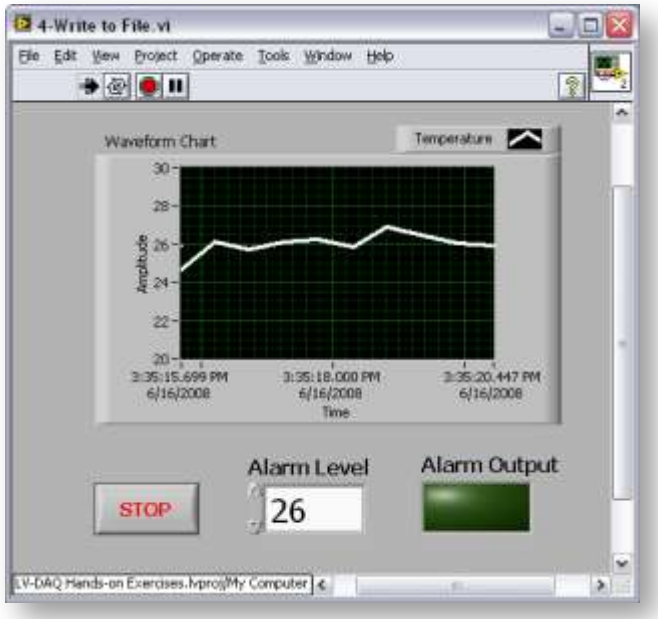
Modular I/O

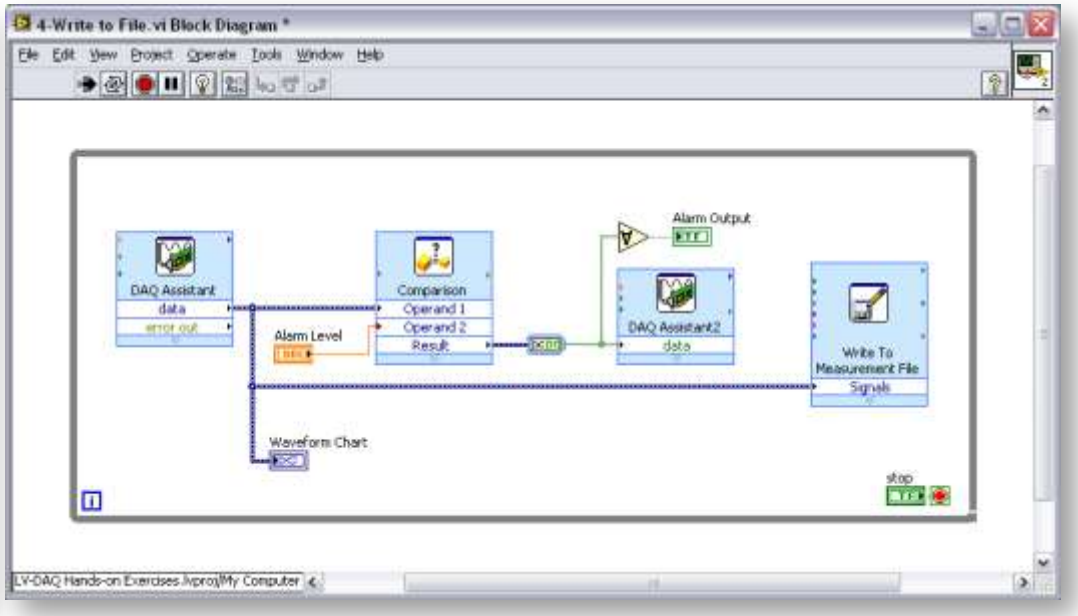


Graphical Programming:

Simplifying Design of Complex Engineering Systems

- Symbolic
- Dataflow
- Hierarchical
- Interactive
- Inherent User Interface





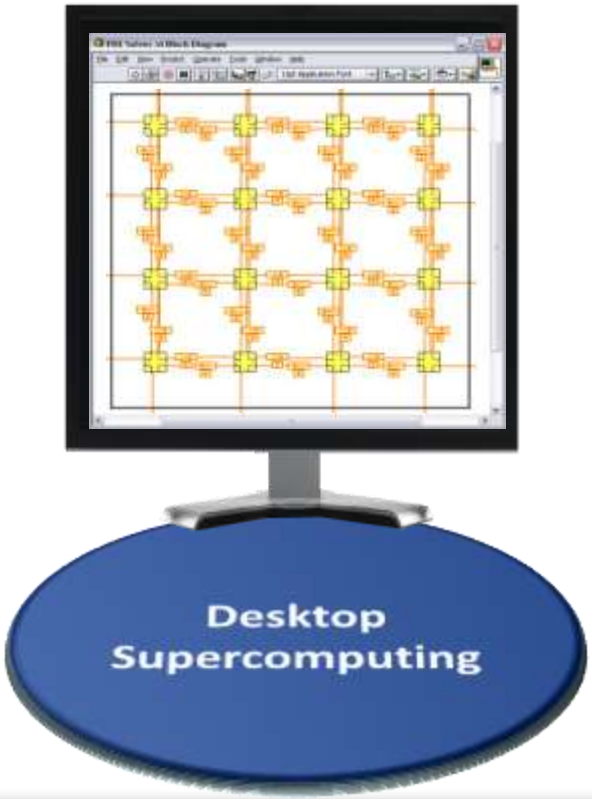
NATIONAL INSTRUMENTS

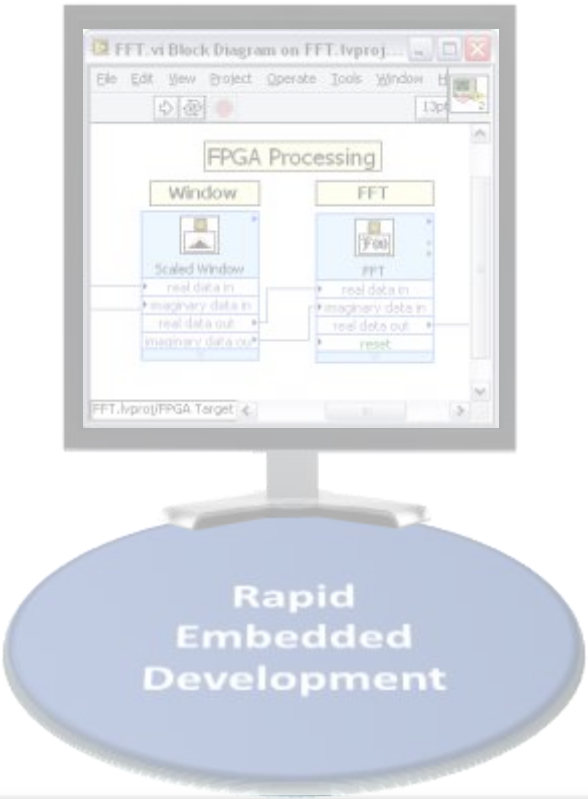
Access through Graphical Programming

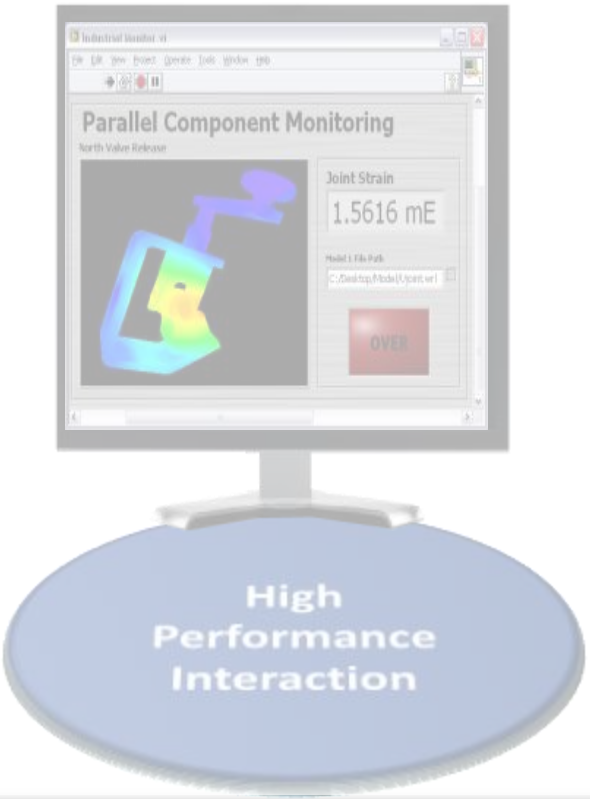
Multicore

FPGA

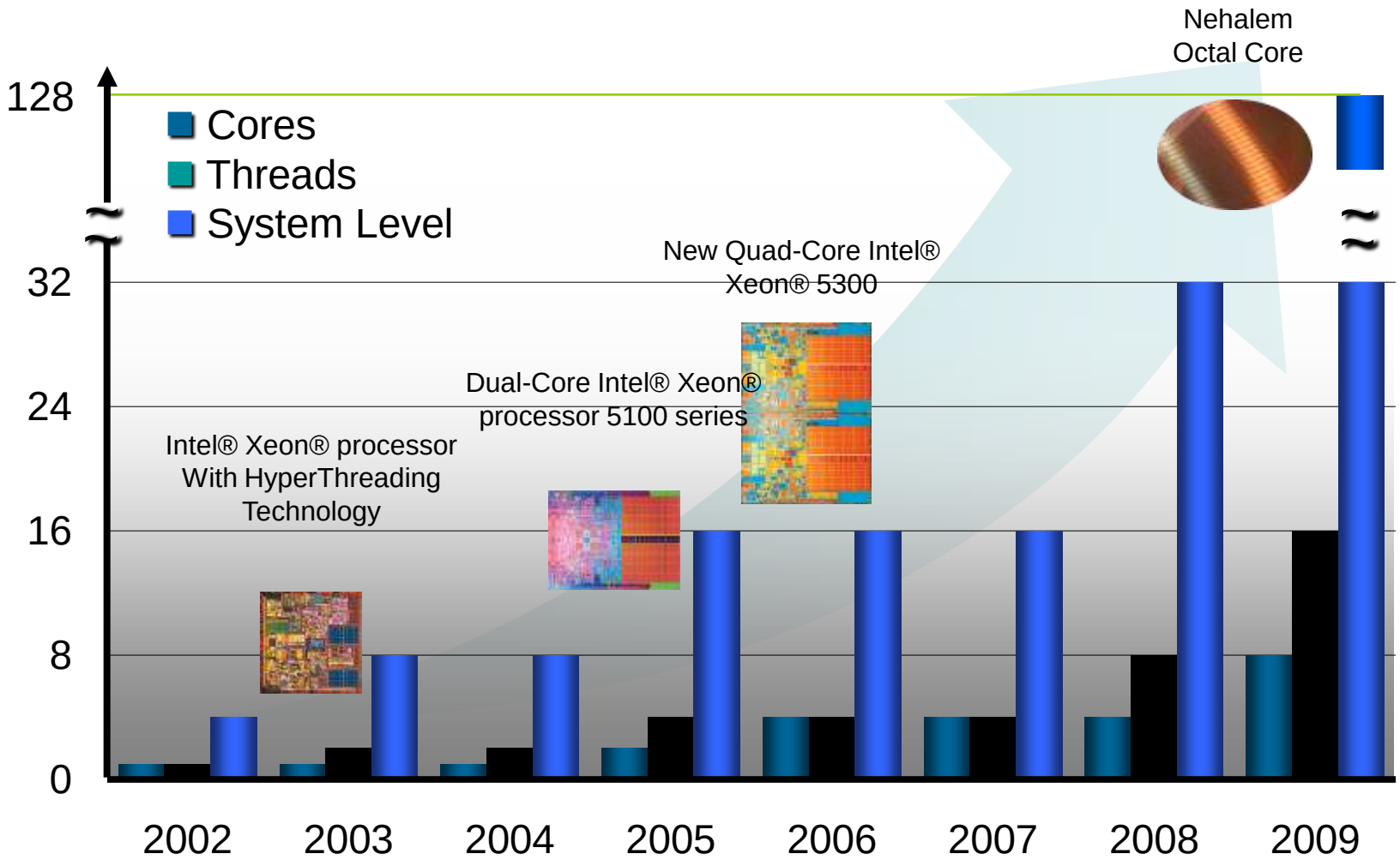
Modular I/O





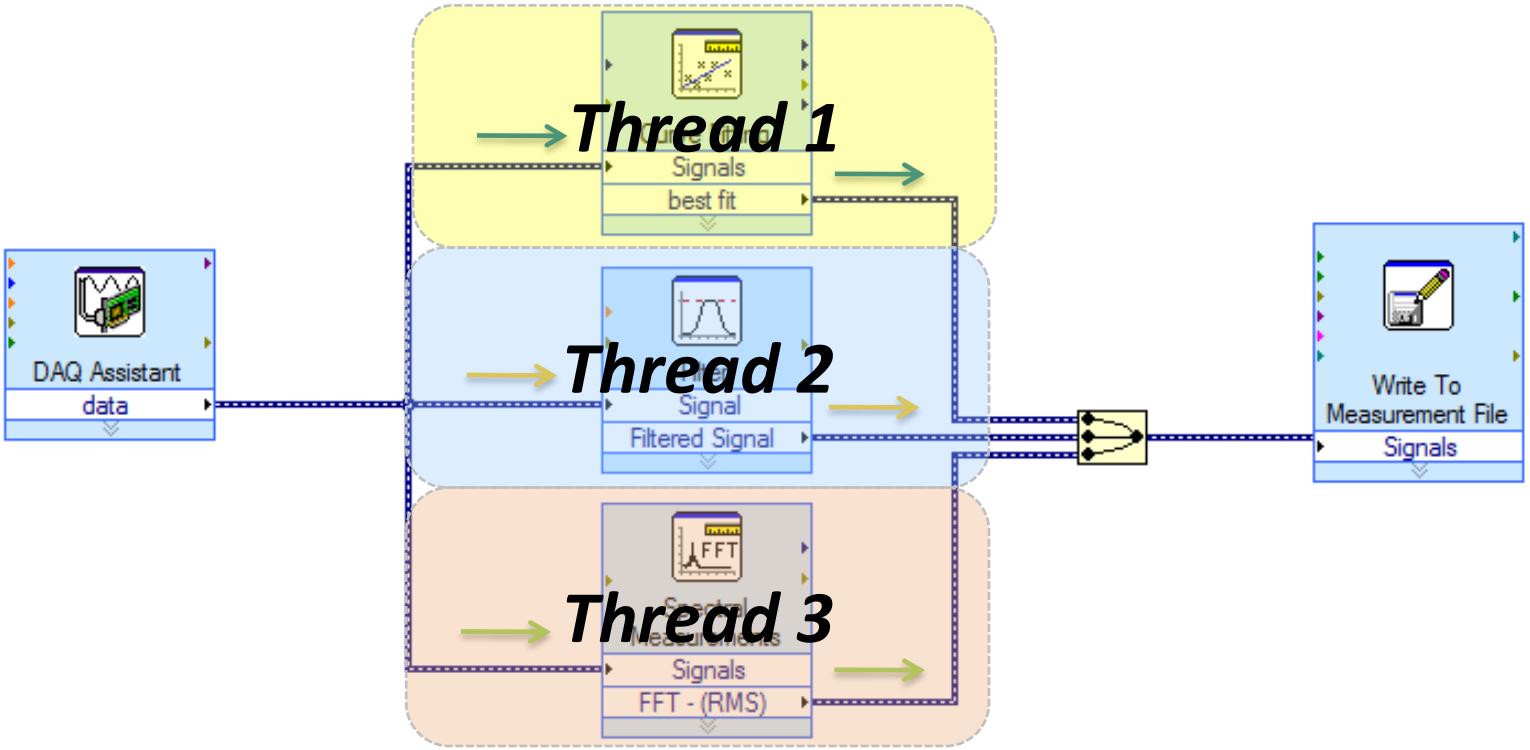


Multi-core: Scalable Parallel Processing

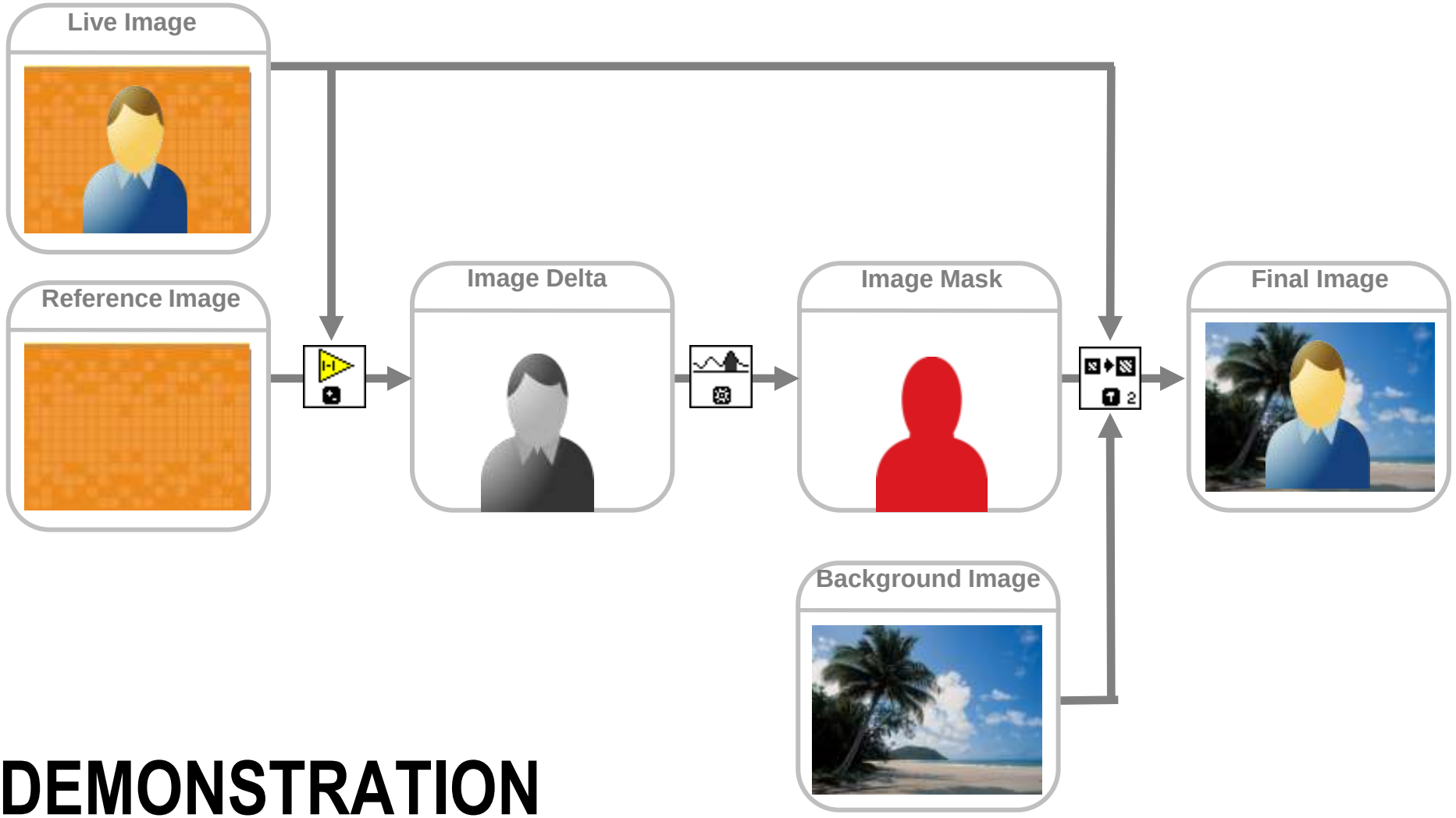


Courtesy: Intel Corporation

Realizing the Potential:
Inherent Access to Automatically Scalable Parallelism



10 Year Anniversary of Multithreading

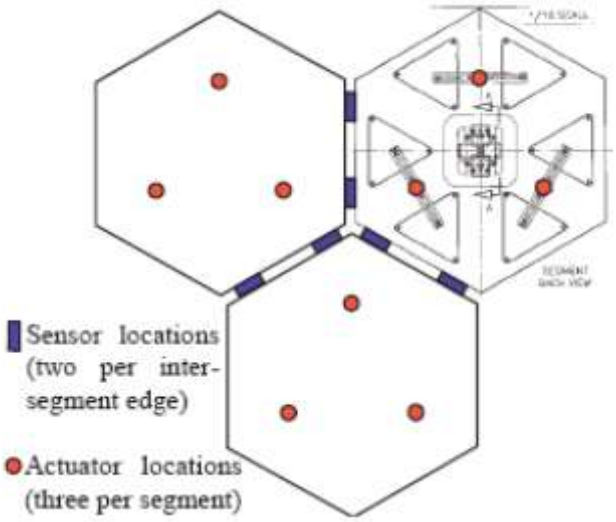


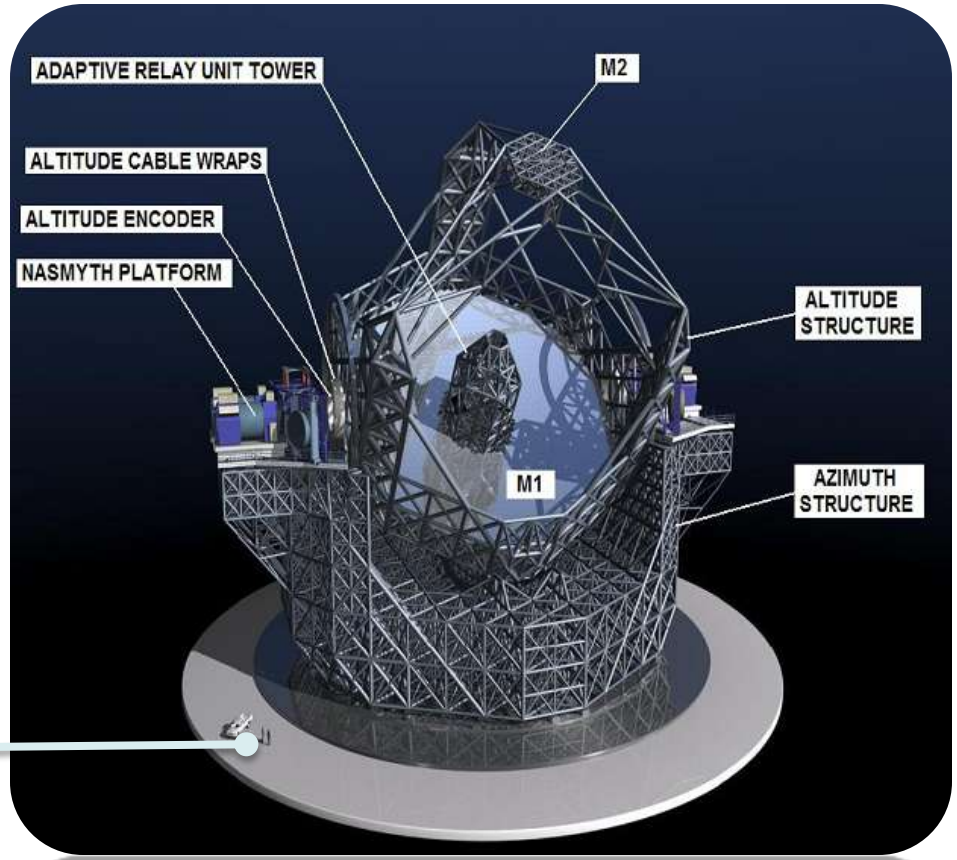
DEMONSTRATION

THE LABVIEW GREEN SCREEN

NATIONAL INSTRUMENTS

Case study: Extremely Large Telescope

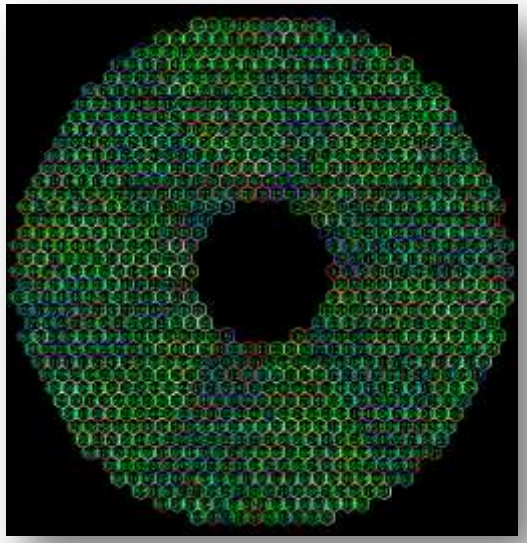




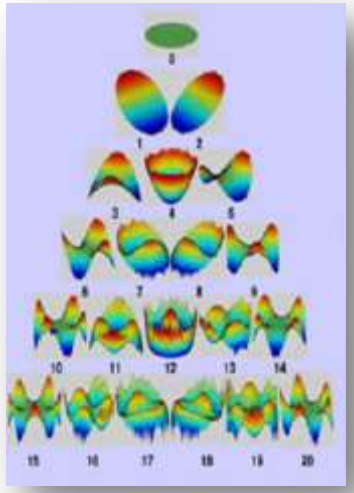
Physicists are getting smaller these days!

NATIONAL INSTRUMENTS

Case study: Extremely Large Telescope

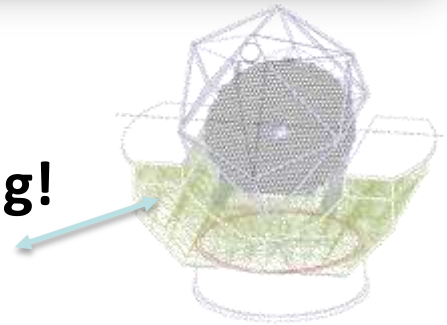


M1 – mirror
984 hexagonal mirrors
6 sensors/3 actuators each
1 ms

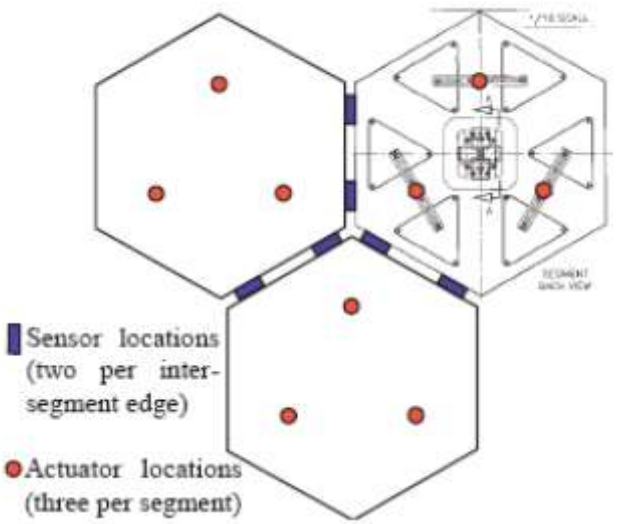


Fight the modes!
Translates into large matrix operations (3K-by-3K)

Shaking!



Case study: Extremely Large Telescope



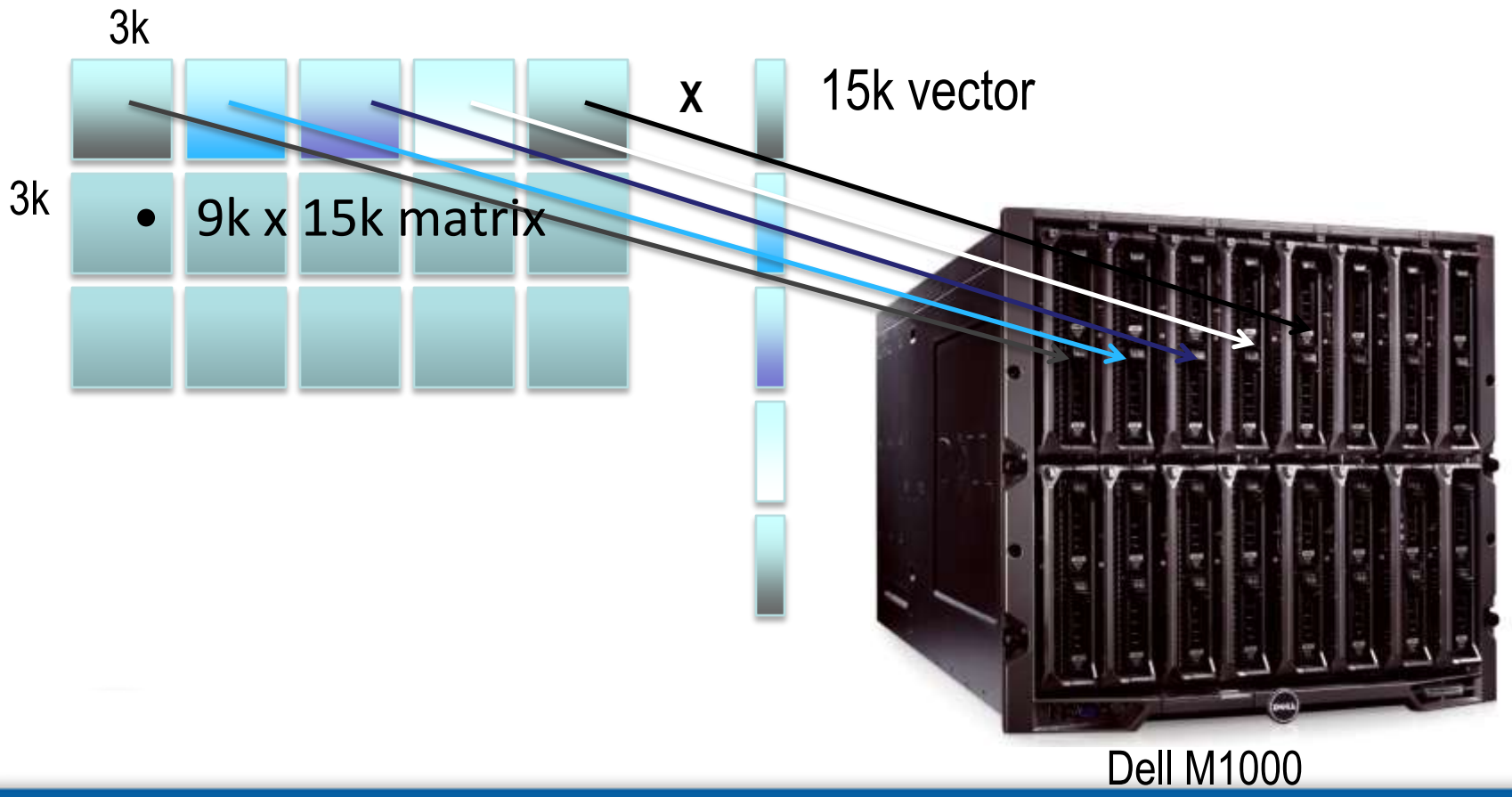
$$pinv(newIM) = (newIM^T newIM)^+ newIM^T$$
$$= ((IM - e_i a_i^T)^T (IM - e_i a_i^T))^+ (IM - e_i a_i^T)^T$$
$$= (IM^T IM - a_i a_i^T)^+ (IM^T - a_i e_i^T)$$

$$(IM^T IM - a_i a_i^T)^+ = (IM^T IM)^{-1} + \frac{(IM^T IM)^{-1} a_i a_i^T (IM^T IM)^{-1}}{1 - a_i^T (IM^T IM)^{-1} a_i}$$
$$= (IM^T IM)^{-1} + \frac{b_i b_i^T}{1 - a_i^T b_i}$$

$$pinv(newIM)ES = ((IM^T IM)^{-1} + \frac{1}{1 - a_i^T b_i} b_i b_i^T)(IM^T - a_i e_i^T)ES$$
$$= (IM^T IM)^{-1}(IM^T \cdot ES) - (IM^T IM)^{-1} a_i \cdot es_i +$$
$$\frac{b_i^T (IM^T \cdot ES) - (a_i^T b_i) \cdot es_i}{1 - a_i^T b_i} b_i$$

Requires to recalculate pinv of 3K-by-3K matrix in 100 ms
→ Sherman Morrison

Adaptive Optics
Distributing LabVIEW computations

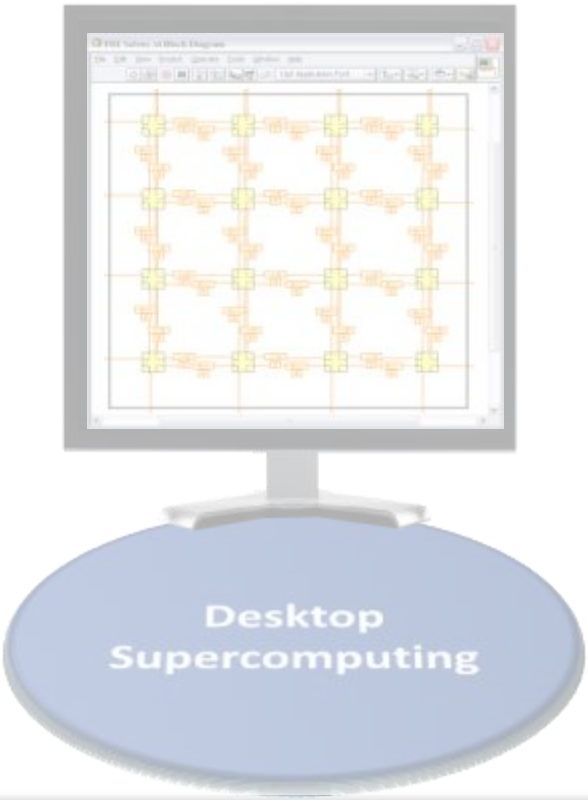


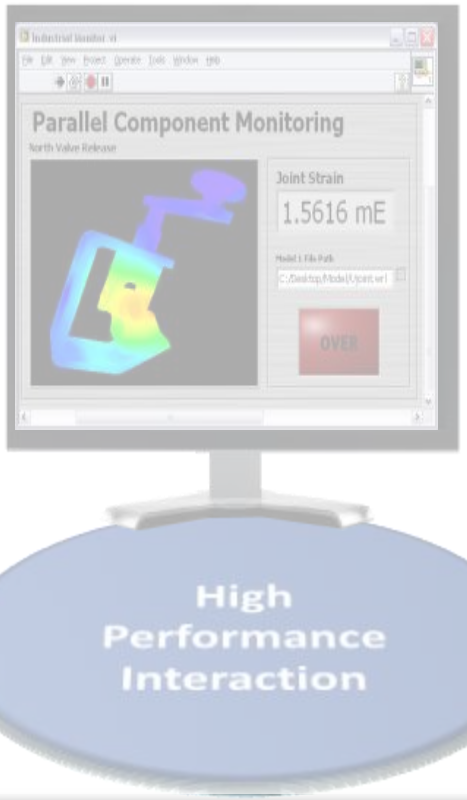
Access through Graphical Programming

Multicore

FPGA

Modular I/O





Desktop Supercomputing

Rapid Embedded Development

High Performance Interaction

Advances in FPGA Technology

Size

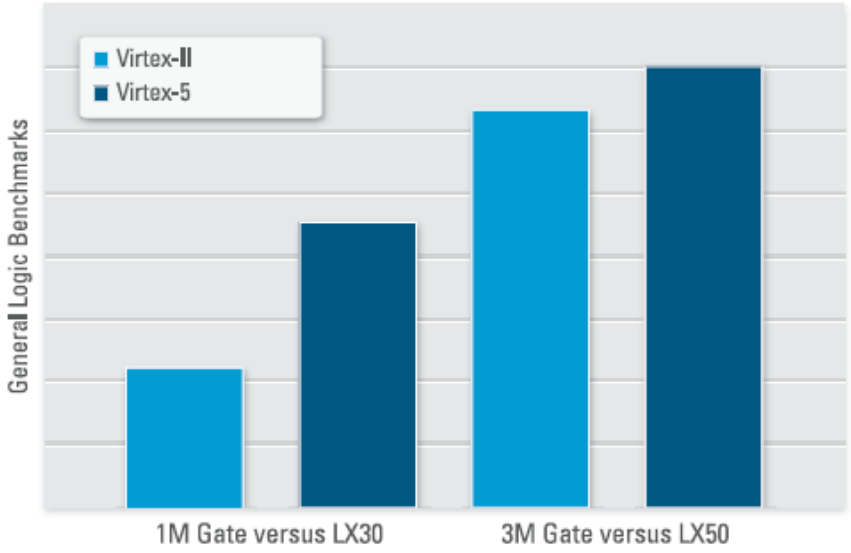


Figure 1. General logic benchmarks show that Virtex-5 FPGAs offer larger sizes when compared to Virtex-II FPGAs.

Speed

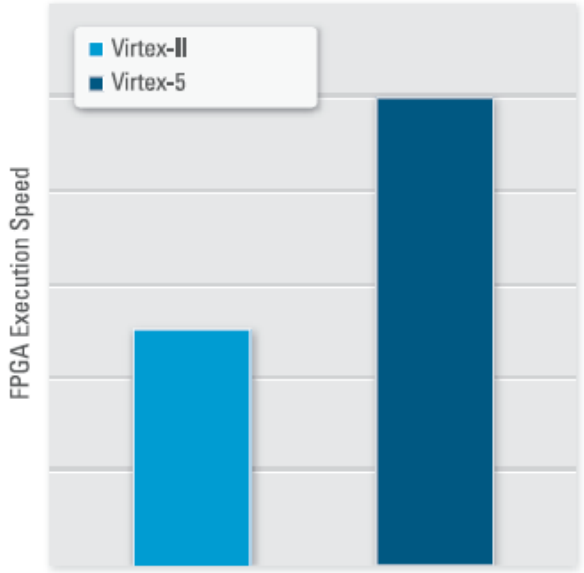
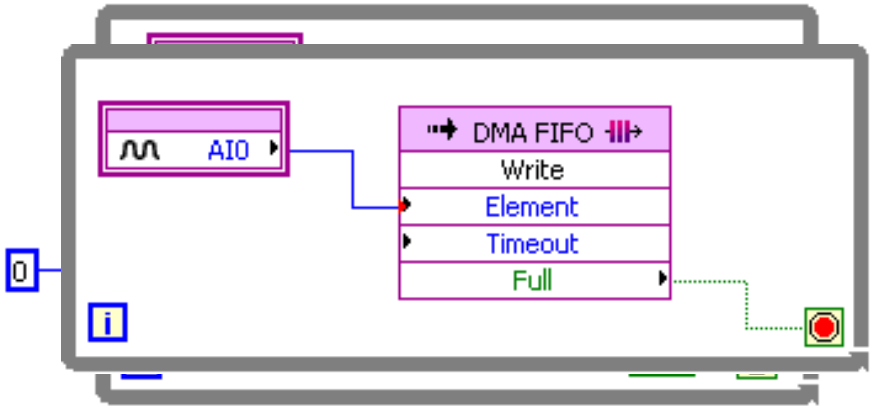


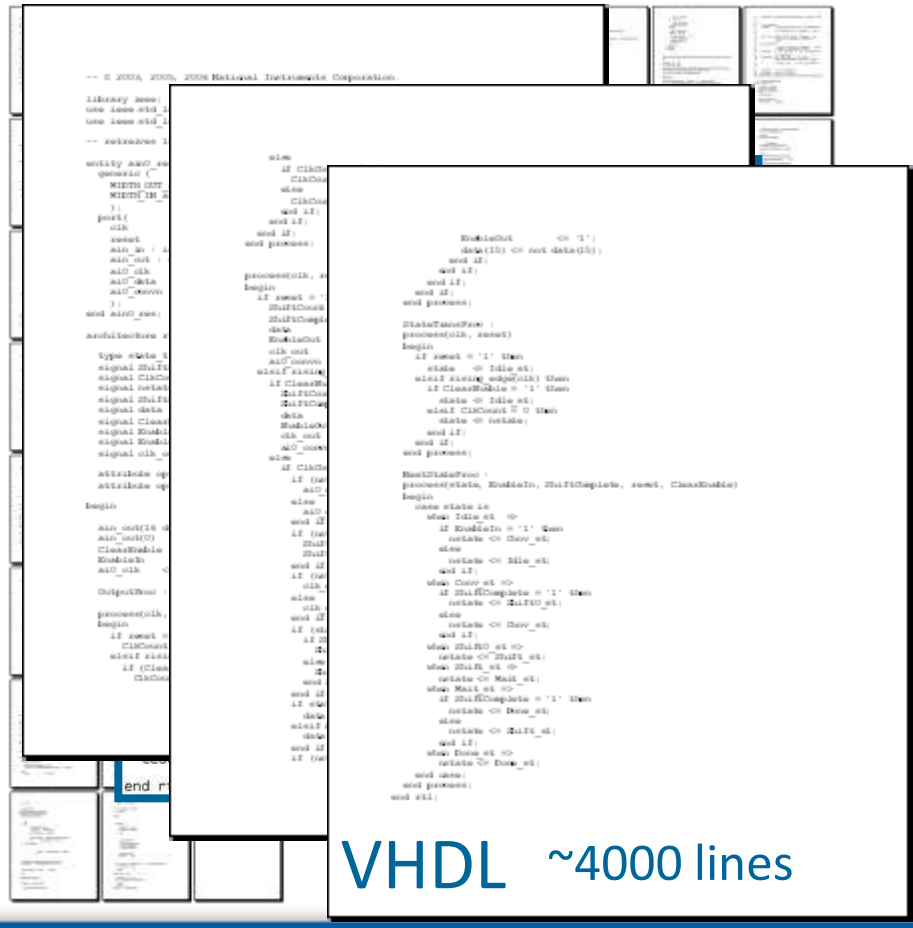
Figure 2. Execution speed benchmarks show that Virtex-5 FPGAs feature faster processing capabilities when compared to Virtex-II FPGAs.

Realizing the Potential: Simplify Access to FPGAs

Counter | **Analog I/O** | **I/O with DMA**



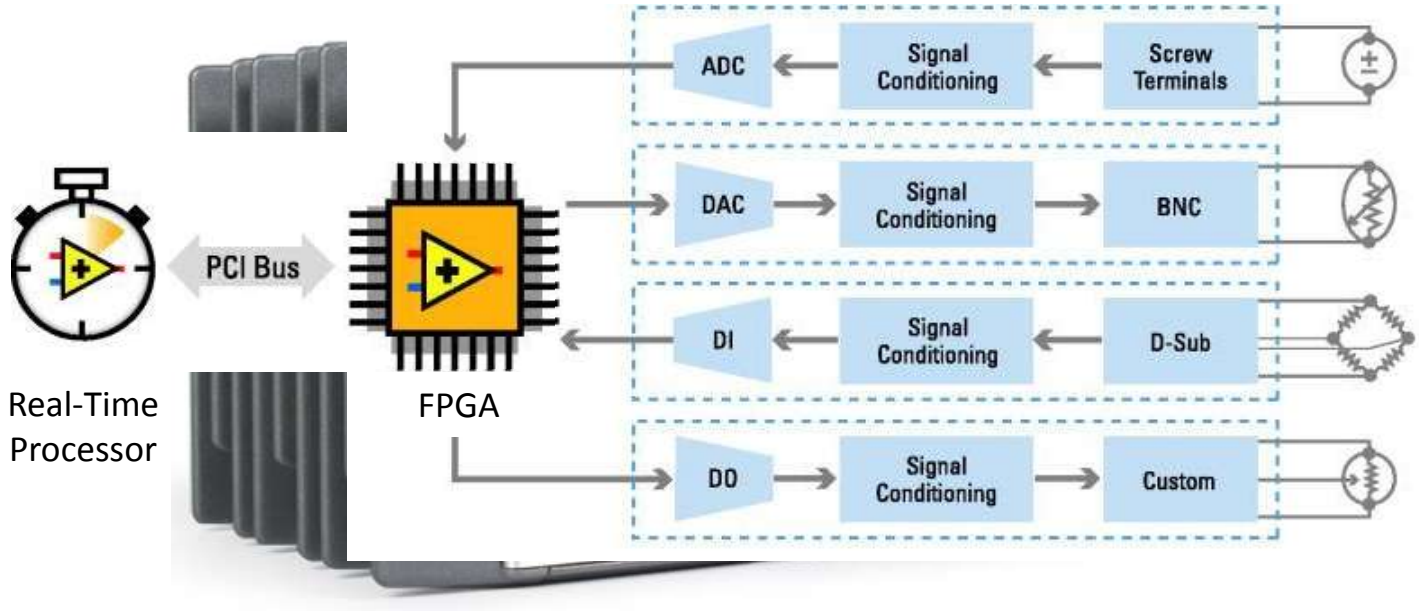
LabVIEW FPGA



VHDL ~4000 lines

NATIONAL INSTRUMENTS

Blending Technologies for New Architectures: CompactRIO



- **Reconfigurable FPGA** for high-speed and custom I/O timing, triggering, and control
- **I/O modules** with built-in signal conditioning for connection to sensors/actuators
- **Real-time processor** for reliable measurement, analysis, connectivity, and control

Blending Technologies for New Architectures: FlexRIO

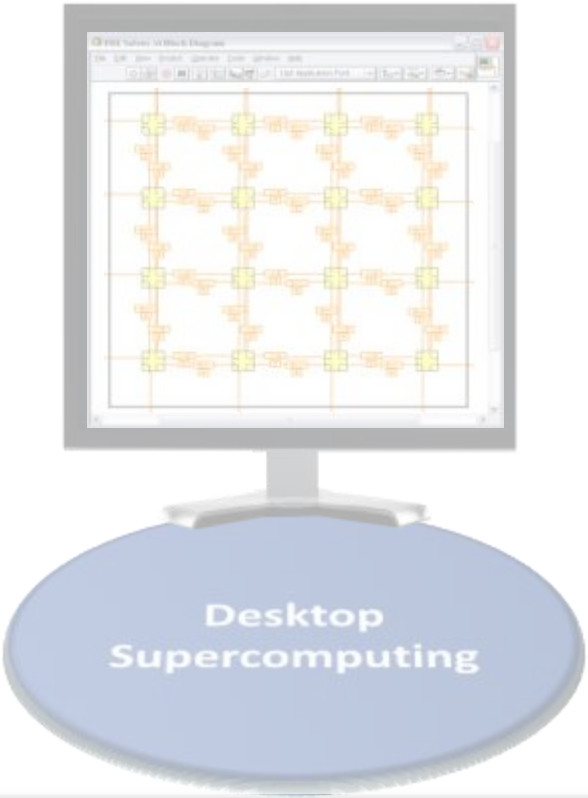
NI FlexRIO Adapter Module
- Interchangeable I/O
- Customizable by users
- Adapter Module Development Kit

NI FlexRIO FPGA Module
- Virtex-5 FPGA
- Up to 132 channels
- Up to 128 MB of DDR2 DRAM

Introducing NI FlexRIO

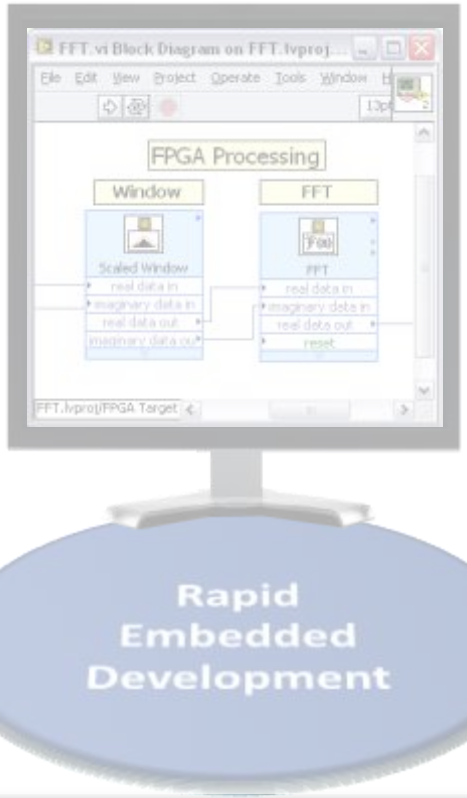
Access through Graphical Programming

Multicore



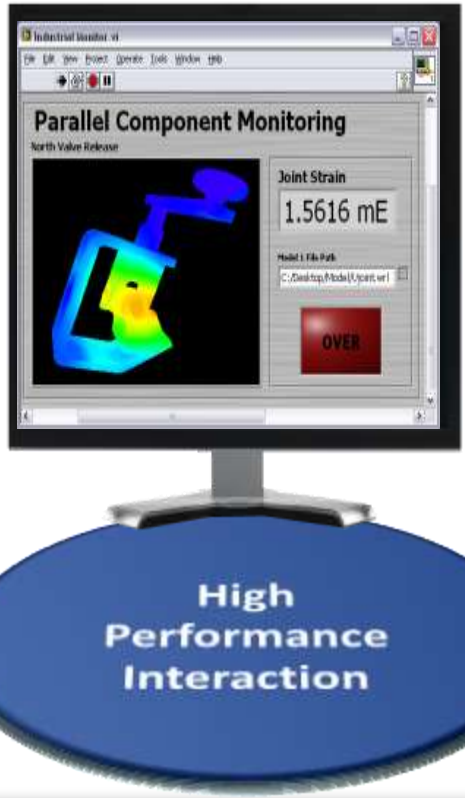
Desktop Supercomputing

FPGA



Rapid Embedded Development

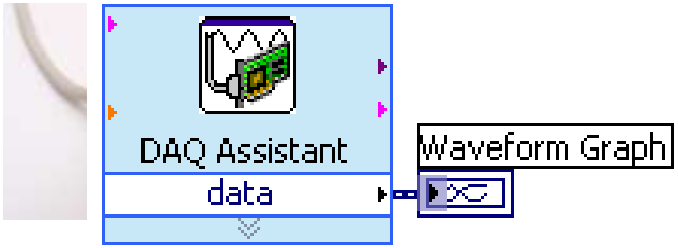
Modular I/O



High Performance Interaction

Modular I/O:
Combinable Measurements & Rapid Data Access

- Combinable Measurements
  - Mix and match I/O to meet exact requirements
  - Access to leading edge measurement technology
- Rapid Data Access
- ge latest bus technologies
- l synchronization
- integrated through a single, unified software language



C Series Modular I/O Platform

More than 60 Measurement modules

POGO Stick

DEMONSTRATION

C Series Modular I/O Platform

More than 60 Measurement modules

NI System with Deterministic Distributed I/O

Host Computer

(TCP/IP)

NI cRIO-9074

(Deterministic Ethernet)

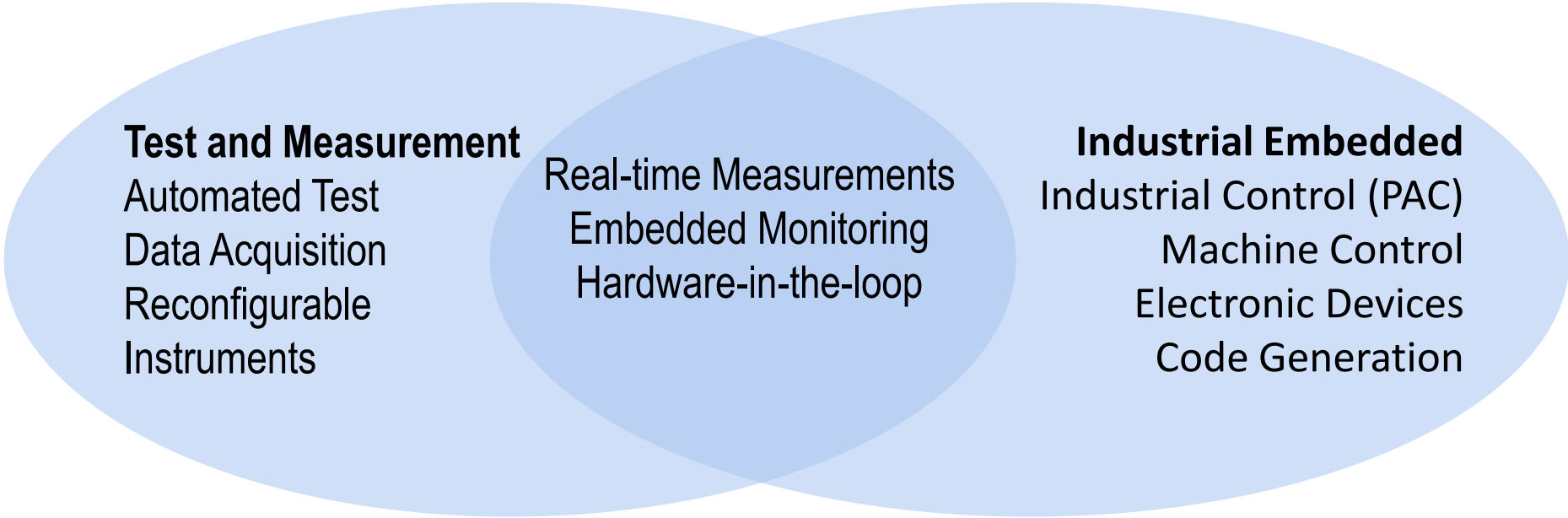
NI 9144 Expansion Chassis

The Engineering Design Transformation

NATIONAL INSTRUMENTS

National Instruments Vision

Graphical System Design

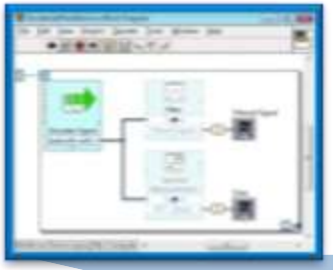


"To do for test and measurement what the spreadsheet did for financial analysis."

"To do for embedded what the PC did for the desktop."

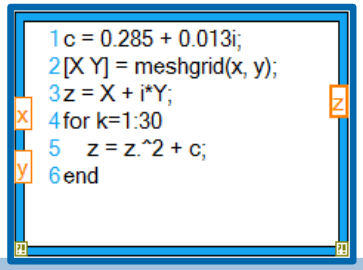
Models of Computation

Dataflow

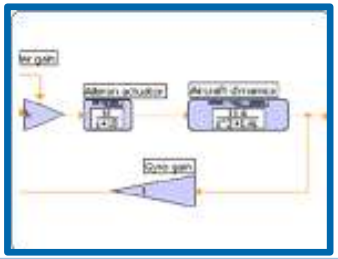


C / HDL Code

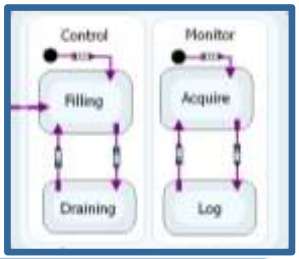
Textual Math



Simulation



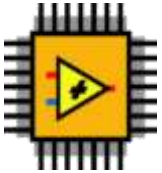
Statechart



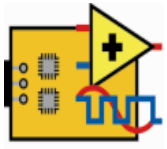
LabVIEW Desktop

LabVIEW Real-Time

LabVIEW FPGA



LabVIEW MPU/MCU



Personal Computers

PXI Systems

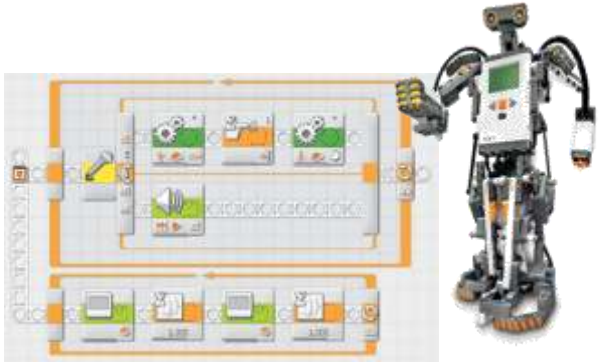
CompactRIO

Single-Board RIO

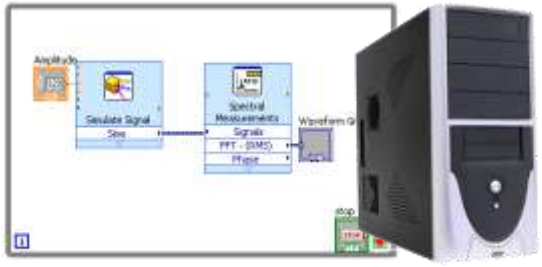
Custom Design

Graphical System Design:
From Kindergarten to Rocket Science

LEGO® Education WeDo Loop

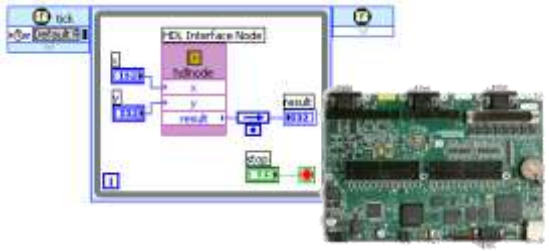


LEGO MINDSTORMS® NXT Loop

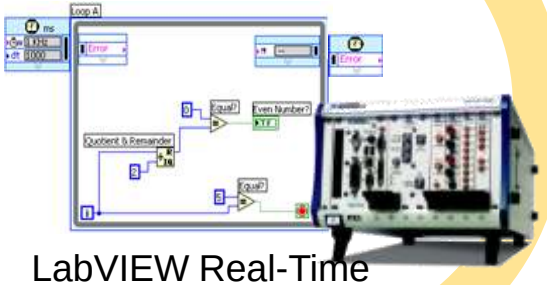


LabVIEW While Loop

LabVIEW Simulation Loop



LabVIEW FPGA
Single-Cycle Timed Loop



LabVIEW Real-Time
Timed Loop

Training and Certification

Together, the National Instruments training and certification programs deliver the fastest, most certain route to increased proficiency and productivity using NI software and hardware.

NI Training: Build Your Skills and Knowledge

NI Certification: Validate Your Expertise and Differentiate from the Competition

Visit **ni.com/training** to learn more

Engineering Grand Challenges

Make solar energy economical

Provide energy from fusion

Develop carbon sequestration methods

Manage the nitrogen cycle

Provide access to clean water

Restore and improve urban infrastructure

Advance health informatics

Engineer better medicines

Reverse-engineer the brain

Prevent nuclear terror

Secure cyberspace

Enhance virtual reality

Advance personalized learning

Engineer the tools of scientific discovery

Source: www.engineeringchallenges.org

Wind turbine HIL Testing

SIEMENS
Siemens Wind Power

Application:
Design a HIL test system that simulates the effects of wind, pitch and blade position to test turbine controller

Technologies:
- LabVIEW Control Design and Simulation
- LabVIEW Real-Time, LabVIEW FPGA
- PXI, multicore, FPGA

"Working in close collaboration with NI support engineers, we were able to successfully create a highly complex wind turbine hardware-in-the-loop test system based on the intuitive LabVIEW graphical programming environment and high-performance PXI platform."

Tumor Treatment Medical Device

Application

Design a prototype of a medical device for treatment of breast tumors in only four months (no room for firmware errors, strict regulatory guidelines (Class II).

Technologies:

- LabVIEW Real-Time, LabVIEW FPGA
- CompactRIO, Panel PC

"The CompactRIO embedded system and LabVIEW graphical tools from National Instruments gave us the power to design, prototype, and deploy the control system within our Visica2 medical device quickly and beat our time-to-market goals while saving money by eliminating the need for building custom hardware."

Jeff Stevens, Principal Systems Engineer, Sanarus Medical

Monitoring and control of a solar-powered race boat

Application:

Controlling and monitoring solar cells, lithium polymer batteries, maximum power point trackers (MPPTs), and a high-efficiency permanent magnet motor for a completely solar-powered race boat.

Technologies:

- LabVIEW Real-Time, LabVIEW FPGA
- CompactRIO, Panel PC

"CompactRIO provides a unique combination of I/O variety as well as control and processing capabilities in a small, power-efficient system"

Folkert Attema, Solar Team ROC Friese Poort

Testing proprietary computer hardware on naval vessels

Application

Replace an outdated and obsolete proprietary naval computer test system, used on-board of naval ships.

The Solution:

Use commercial-off-the shelf components such as NI PXI and the NI PMA-1115 together with LabVIEW FPGA to interface to the dedicated computer bus.

"Our naval engineers and technicians are very satisfied with the ease-of-use and performance of the NI FPGA PXI-based systems."

Royal Dutch Navy

Engineering Grand Challenges

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Source: www.engineeringchallenges.org

Partner Introductions

National Instruments
Technical Symposium 2008

Actemium
Lintronics

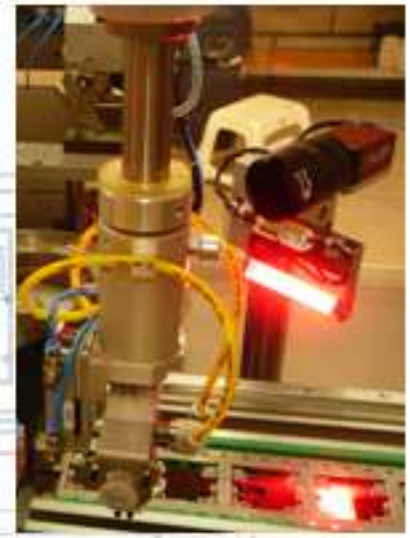
ES International - CIT Engineering GROUP

ENGINEERING SOLUTIONS INTERNATIONAL

CIT ENGINEERING

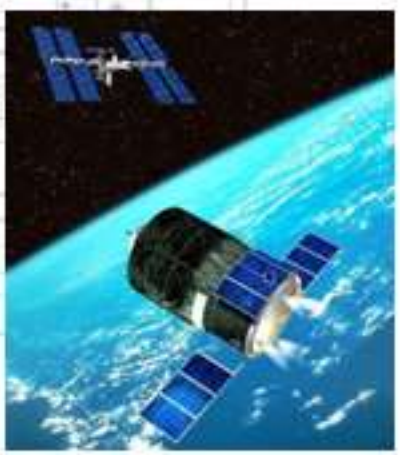
Profile

- Alliance Member for over 10 years
- System integrator
- Specialist in Test & Measurement
- Turn-Key Solutions
- Concurrent Engineering Partner



Business Units

- Virtual Instrumentation
- Industrial Vision
- Electrical & Mechanical design
- Inkjet Proofing Systems
- Lighting – Spectroscopic Analysis
- Training Centre



NATIONAL INSTRUMENTS Certified Alliance Partner

Microsoft® Windows® Embedded Partner

Microsoft Certified Solution Provider

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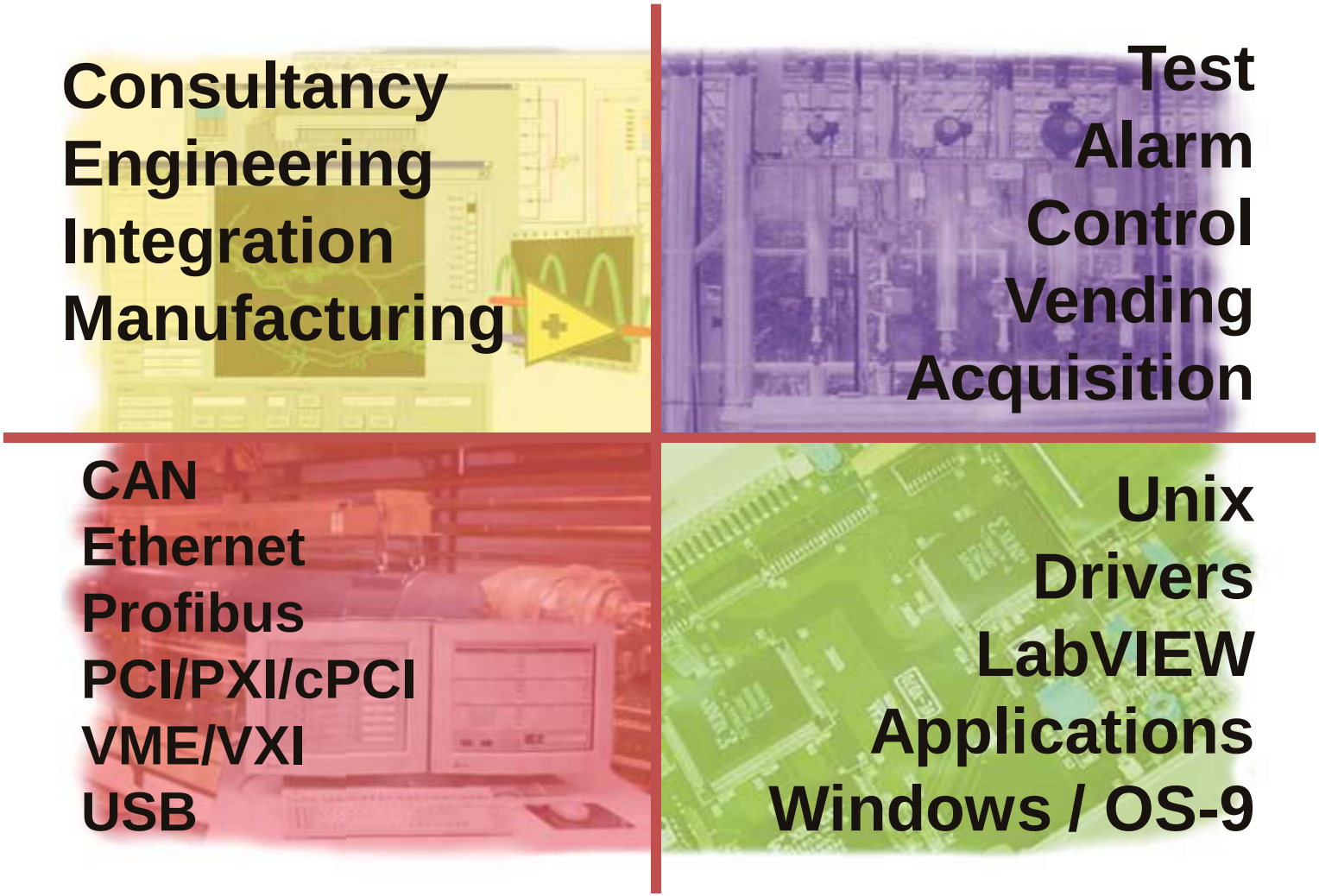
INCAA Computers B.V.



Test Solutions Hasselt, Belgium

JABIL HASSELT

- Design
- Prototpying NPI
- Product Validation
- Total Test Solutions

- Design For Test
- Test Strategy Proposals
- Test Spec Development
- Functional Testers
- SW, HW, BS and Mechanical engineering
- GOS TD Proj.Manag.

→ For internal JABIL
→ For JABIL customers
→ For Local for Local customers

JABIL

Confidential – Jabil Proprietary Information

13:30 – 14:25 Presentatie LVUG.NL

The Exploding While-loop

"Object-Oriented Software Architecture and Design Patterns"

LabVIEW Solutions
Training and consultancy

VI Technologies

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Netherlands

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Fax: +31 495 549458
E-mail: info@vi-tech.nl
website: http://www.vi-tech.nl/

LabVIEW
Certified Architect

LVUG.NL
LabVIEW User Group

www.maxonmotor.nl

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driven by precision

wereldwijd de vooraanstaande producent van precisieaandrijvingen en aandrijfsystemen.

Als het om precisie draait. Daag ons uit!

NIDays 09

Worldwide Virtual Instrumentation Conference

NBG

NBG

- Ontwikkeling van hardware, embedded en PC-software voor industriële en medische toepassingen

LabVIEW

- Ontwerpen/programmeren van grote en complexe applicaties
- Testsystemen
- Ruime elektronica kennis
- Turnkey projecten
- Consultancy

Tot ziens op de stand

- Henri van den Bongarth

NATIONAL INSTRUMENTS
Certified Alliance Partner

NATIONAL INSTRUMENTS LabVIEW
Certified Developer

ISO 9001:2000
ISO 13485:2003

NBG Industrial Automation B.V., *Contact: Geert Bruinsma, Commercieel Directeur - Tjeu Naus, Technisch Directeur*
Hulsenweg 19 - NL-6031 SP Nederweert - T: +31 495 633221 - F: +31 495 634495 - info@nbg-industrial.nl - www.nbg-industrial.nl

Key expertice

xMove

Complex test solutions for electronic control units, used in automotive and other industry.

Application areas:
- Functional test
- Hardware In the Loop (HIL) test
- Repair test

HSDH-RT

High **S**peed **D**ata **H**andling - in **R**eal **T**ime
Complex solutions for telecom, defence and data applications.

Application areas:
- Simulators in general
- High speed data
- RF simulations and analyses

Large RT-Systems

Real Time systems used in control, measurement and test applications for a number of industries.

Main caracteristics:
- Real Time
- Gbps data rate
- >20 interconnected computers
- Handling >2000 signals
- Scalable
- Distributed

The Göteborg design centre
-Engineering expertise in: LabVIEW, LabVIEW-RT, Multicore etc.
-Engineering expertise in: HW-design, FPGA, RF, interface design etc.

Prevas
Scandinavia's largest integrator of embedded electronics
Founded 1985, 550 employees, ISO 9001:2000

T&M Solutions

- Founded in 2001, >7 years experience in delivering Test & Measurement Solutions.
- More than 300 projects succeeded in different industries.
- Offices in Arnhem and Eindhoven,
- Total of 11 technical skilled employees.
- Experienced in small and large LabVIEW projects.

Mission:

"T&M Solutions BV goal is to increase customer satisfaction in Test & Measurement automation by being a reliable engineering partner. We can achieve this goal with the help of graphical system design tools."

What Virinco do...

...we specialize in:

- Automatic Test Equipment
- NI TestStand
- Test Data Management

... helping customers to:

- Organize test & repair data
- Improve production **YIELD**
- Improve product **QUALITY**

VI Technologies

NIDays09
WORLDWIDE GRAPHICAL SYSTEM DESIGN CONFERENCE

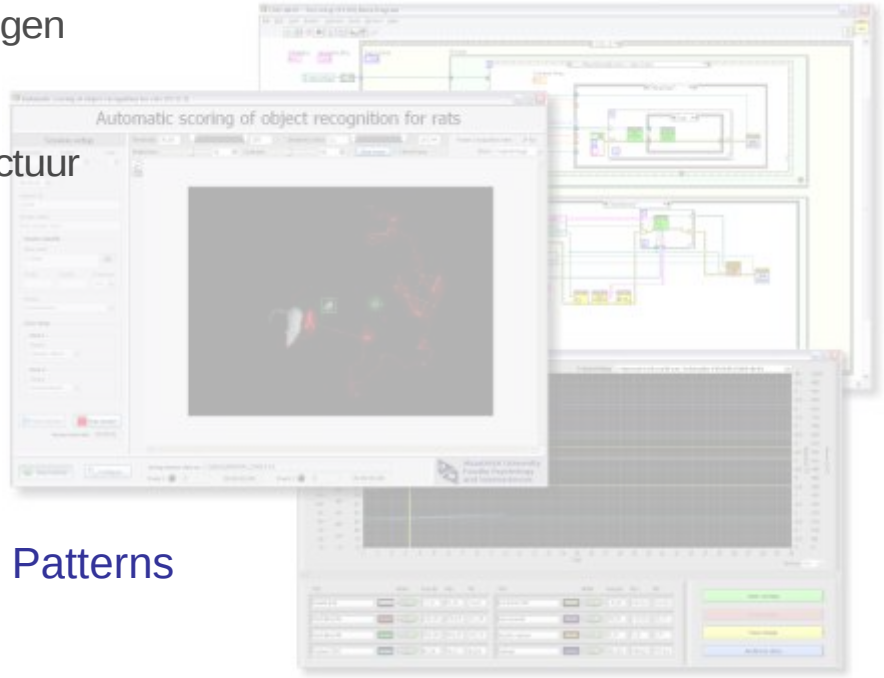
VI Technologies levert diensten op het gebied van de technische automatisering en is met name gespecialiseerd in het leveren van oplossingen op basis van LabVIEW.

- ✓ Ondersteuning en consultancy op het gebied van measurement en automation applicaties op basis van LabVIEW en/of TestStand
- ✓ Maatwerk LabVIEW software ontwikkeling
- ✓ Systeem integratie en turnkey automatiserings oplossingen op basis van LabVIEW
- ✓ Training in LabVIEW (Object Oriented) software architectuur
- ✓ LabVIEW Realtime, FPGA en Embedded

NATIONAL INSTRUMENTS Certified Alliance Partner

LabVIEW Certified Architect

Jeffrey Habets



Track D 13:30: The Exploding While Loop Part III, Object-Oriented Software Architecture and Design Patterns

VI Technologies & LVUG.NL

VPC (Eurolectron)

National Instruments
Technical Symposium 2008

Today's highlights

- >30 people took the CLAD Exam
- 18 Different technical/case study presentations
- 18 Partners in the exhibition area
- New products booth
- 5 Try-it-yourself demo stations
- "Quote of the Day"
- LEGO Mindstorms lottery – keep your lottery ticket
- Feedback forms
- USB sticks with presentations