

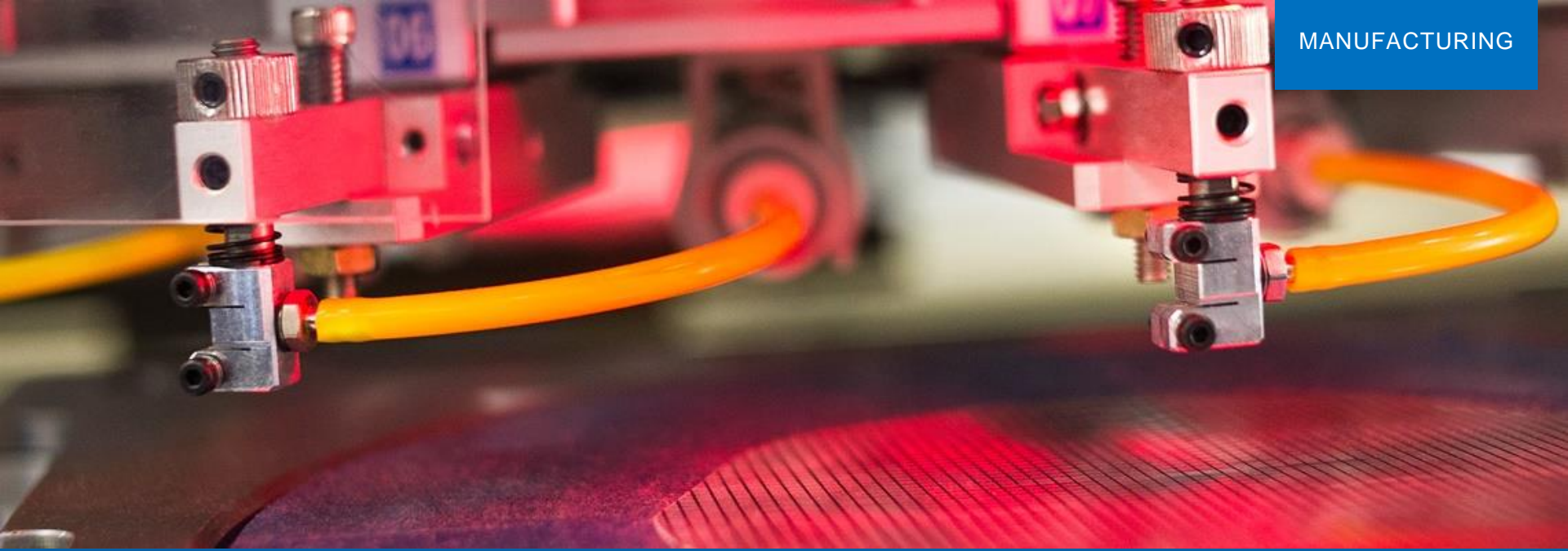
The Measurable Impact of the NI Embedded Design Platform

Amy Kennedy
Inside Sales Engineer

Mission Statement



NI equips engineers and scientists with systems that accelerate productivity, innovation, and discovery.



“The combination of the [CompactRIO] controller and Kollmorgen AKD motor drives, with direct integration through LabVIEW NI SoftMotion, helped us simplify and rapidly complete the development of the machine’s control system.”

—Kennes Wang, Master Machinery



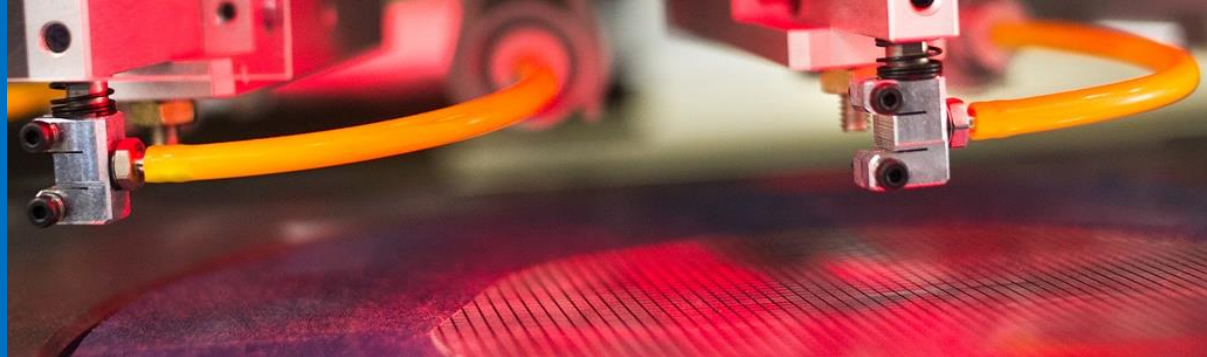
“[The NI platform] just brings a level of control that I don’t know exists in any other platform.”

—Steven Aposhian, FireFly Equipment

“This platform and method of development changed our development time from 72 weeks to 24 weeks....These tools take design to the next level.”

—Kyle Clark, Dynapower Company

What Do These
Applications Have In
Common?



Needs Of The Design Team

Fundamental need:

Bring our equipment/machine to market on time with limited resources that serves our target customers better than our competition

Design overhead limits our growth

Development cost, time, and risk are increasing

Technology is getting more complex, requiring more effort than before

We don't test sufficiently before field deployment

We deliver minimum viable product, not all the features our customers want

We struggle to find time for features our customers want

Supporting old designs consumes too many resources

We often can't explain our failures

Only a couple engineers understand our design

Making changes is too expensive and error prone

Too many engineering dollars are spent on necessary but undifferentiating tasks



Do What You Do Best and Let NI Do The Rest

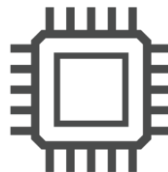
NI's accelerated Custom Embedded (ACE) Design Platform allows you to focus on innovation and competitive differentiation while leaving the foundational elements of your embedded design to us



Monetize Your Effort



**A True Platform
Approach**



Customizable



Rugged Design

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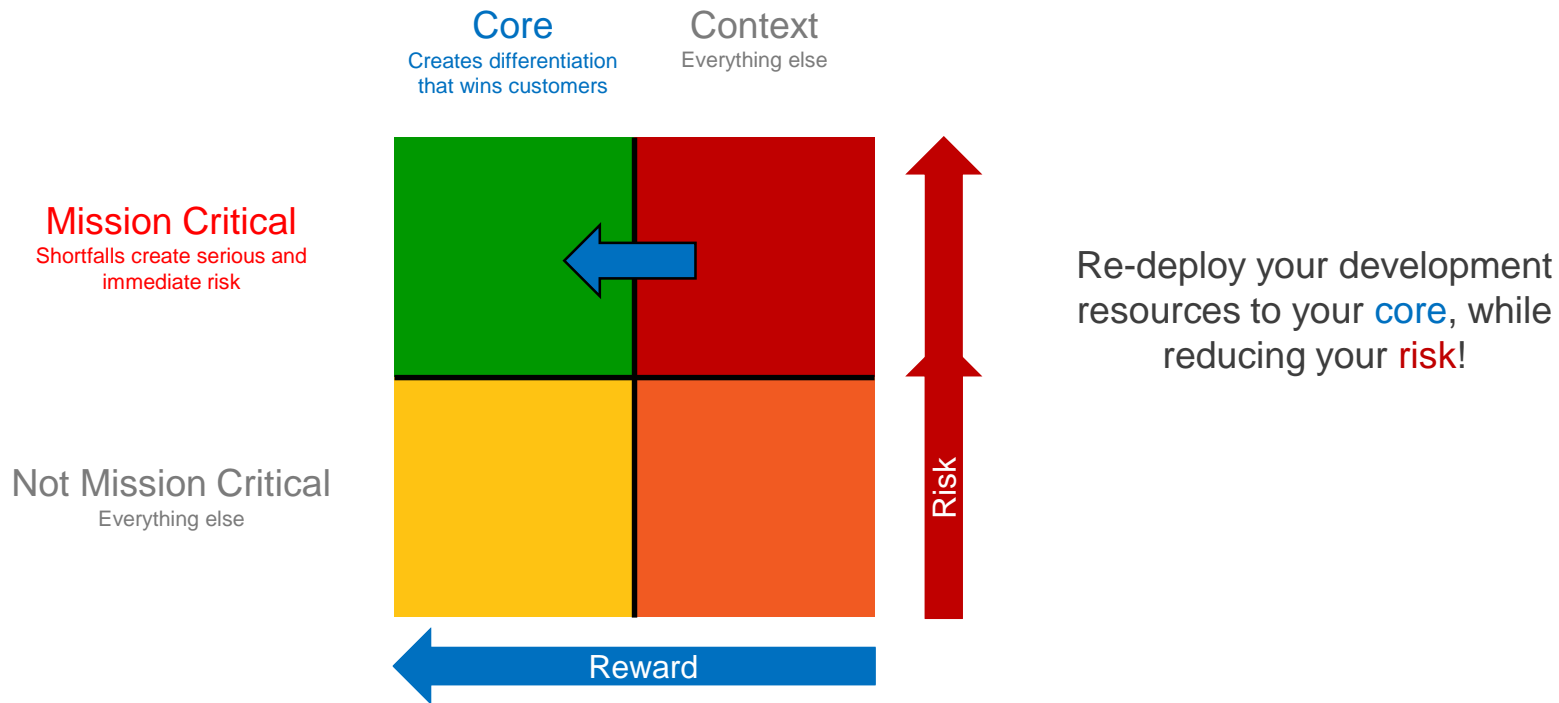


Monetize Your Effort

Focus on the core expertise of your business while leaving the foundational elements of your embedded design to us. Deliver innovation and competitive differentiations with less engineering expense, effort, and risk.

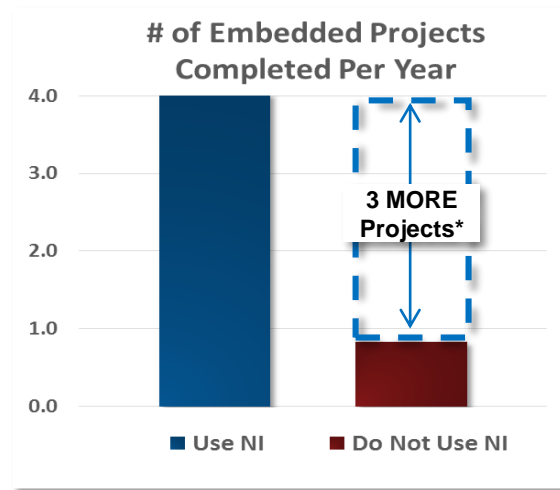
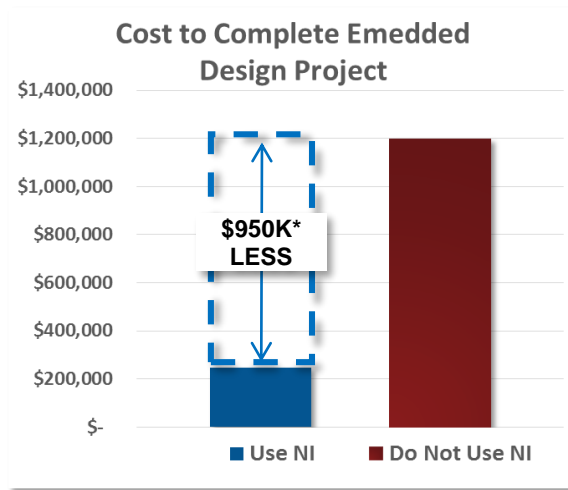
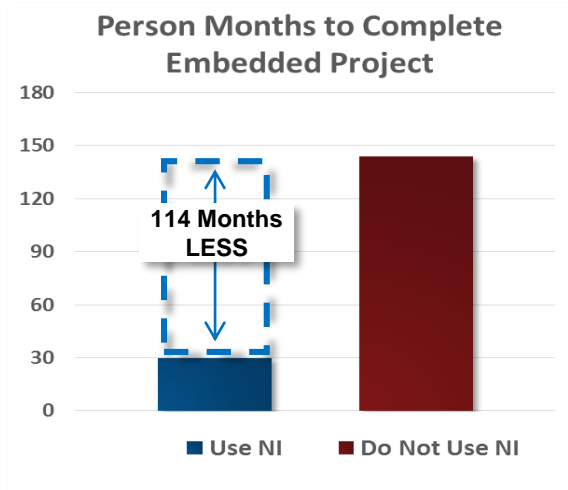
Monetize Your Effort

Where are your resources deployed?



The 4X Advantage

NI Accelerated Custom EMBEDDED



Based on data from Wilson Research Group, 2012 National Instruments/UBM Survey of Embedded Markets, January – April 2012

*Assumes \$100K per engineer fully burdened cost/year and a \$1M/year R&D budget

Does not include additional costs such as high-end EDA tools required for high layer count, high speed custom PCB design, level of design and validation for high EMC, wide temperature, high shock/vibration, long lifetime field deployment, etc.. If included your advantage using NI increases.

Build *superior* industrial equipment & machines *faster*



Business Impact Case Study: SPECS Zurich

Beating the
Competition to Market

Rapid Growth—Startup to
Market Leadership

Better Quality
and Stability

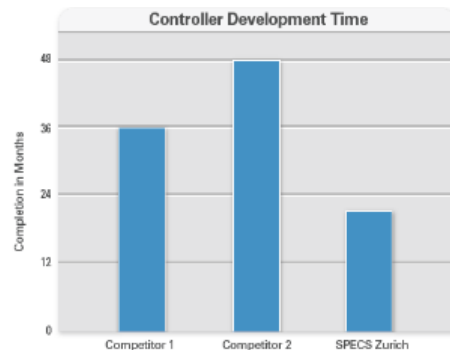


Results

49% faster reaching the market
than competitors

50% market share achieved in
six years

58% CAGR since inception



“By choosing commercial off-the-shelf technology based on the LabVIEW RIO architecture, we were able to deliver a high-quality, differentiated SPM controller to the market with much smaller design teams and in a fraction of the development time it took our main competitors. The fact that our SPM domain experts were able to program the systems themselves really boosted productivity.”

—Dr. Oliver Schaff, CTO, SPECS Zurich

DAQ & Control | Design

FireFly Equipment improved productivity by 4x and saved hundreds of thousands of dollars in development time and cost

- **40** hydraulic valves
- **5-axes** of high performance motion
- **150+** channels analog/digital IO
- Over **30** parallel control loops
- Integrated vision and HMI
- **ONE** CompactRIO CONTROLLER



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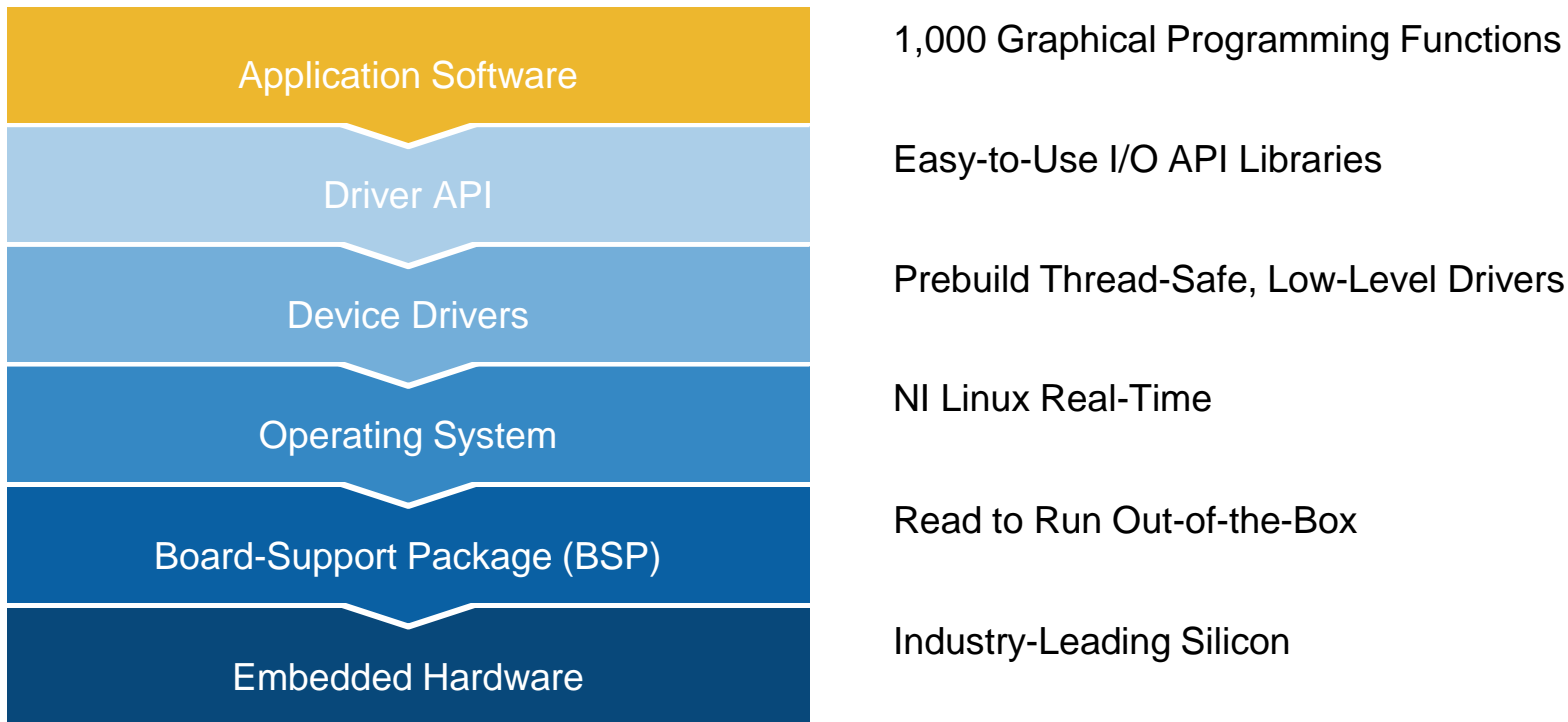


Monetize Your Effort

Our integrated run-time software and development environments combined with high-quality hardware, an expansive ecosystem, and global services and support can provide for the needs of your business and customers.

Software for the CompactRIO Platform

Middleware



Software for the CompactRIO Platform

Operating System

NI Linux Real-Time

Real-Time
Determinism

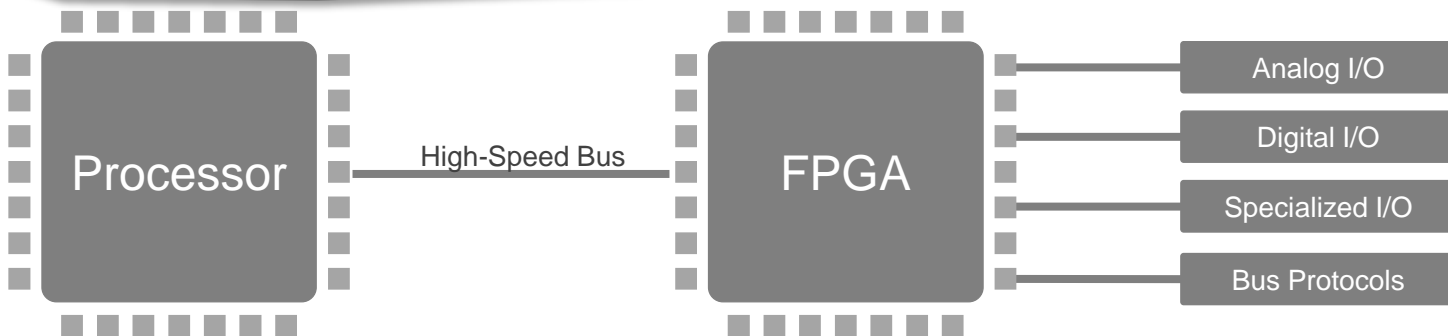
Open Source
Linux

Fully Tested
Hardware
Validated

1000's of
Validated
Packages

Yocto
Embedded
Standard

Security
Enhanced
Kernel



Embedded Hardware Options

CompactRIO Platform



Packaged Controllers



Board-Level Controllers

High-Performance Embedded



PXI



PC-Based

Machine Vision and Motion Control



Smart Cameras & Vision Systems



Motors & Drives



Cameras, Lenses, Lighting

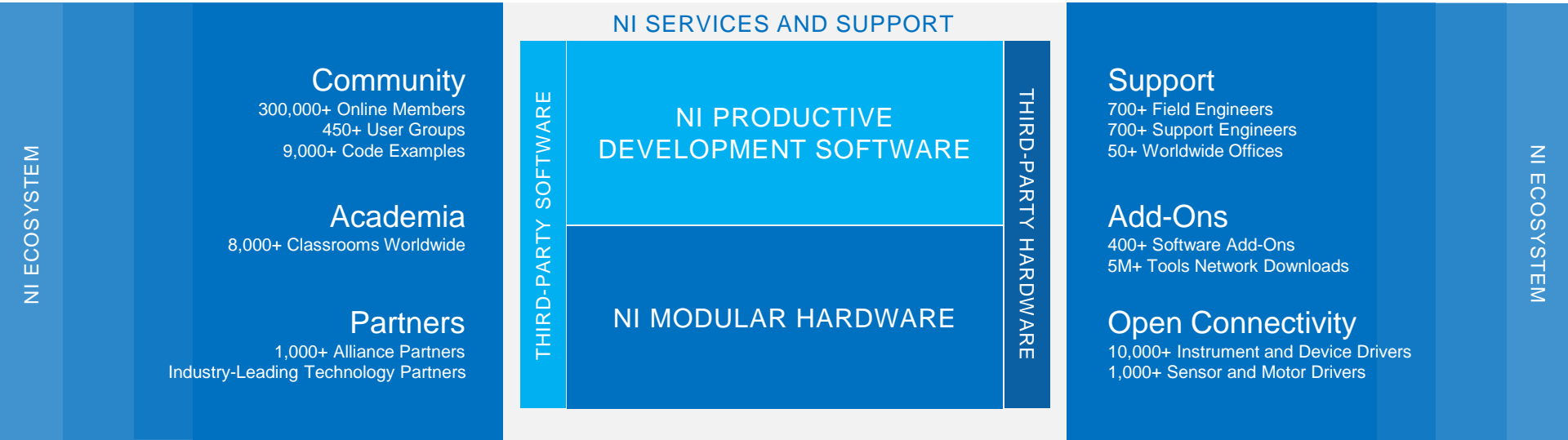
HMIs & Displays



Industrial Connectivity



ONE-PLATFORM APPROACH



What Does NI Offer For This Audience?

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Monetize Your Effort

Achieve custom capabilities without starting embedded design from the beginning. Use a prebuilt solution that is completely customizable through both software and hardware to meet your unique needs.

Software for the CompactRIO Platform

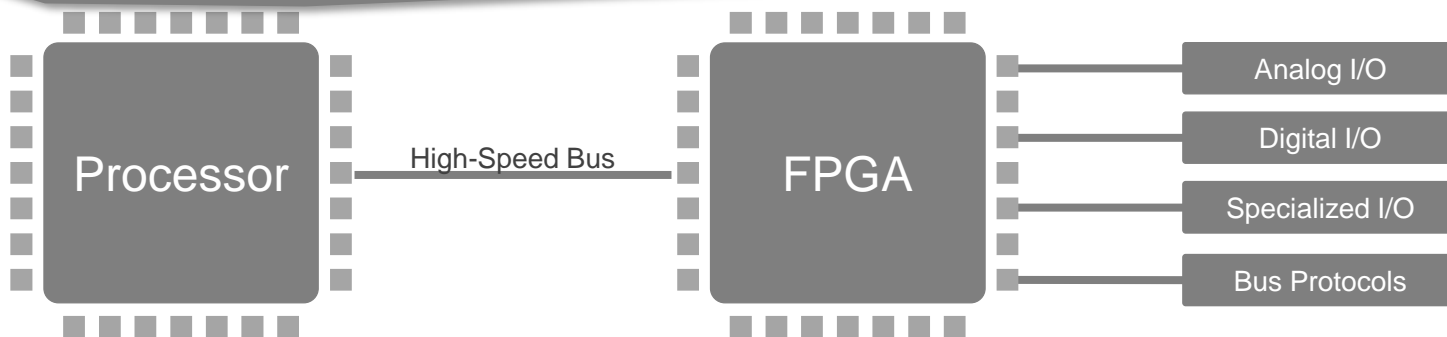
Application Software

LabVIEW Real-Time

- Single tool chain for simulation, prototyping, validation and deployment
- Constructs to manage real-time thread scheduling and memory
- Over 950 data analysis & comm. libraries
- Integrate .m, Python and C/C++ code

C/C++

- Eclipse IDE for development, debug and deployment
- Integrate existing code as libraries into LabVIEW Real-Time
- Compile C/C++ real-time applications for NI Linux Real-Time

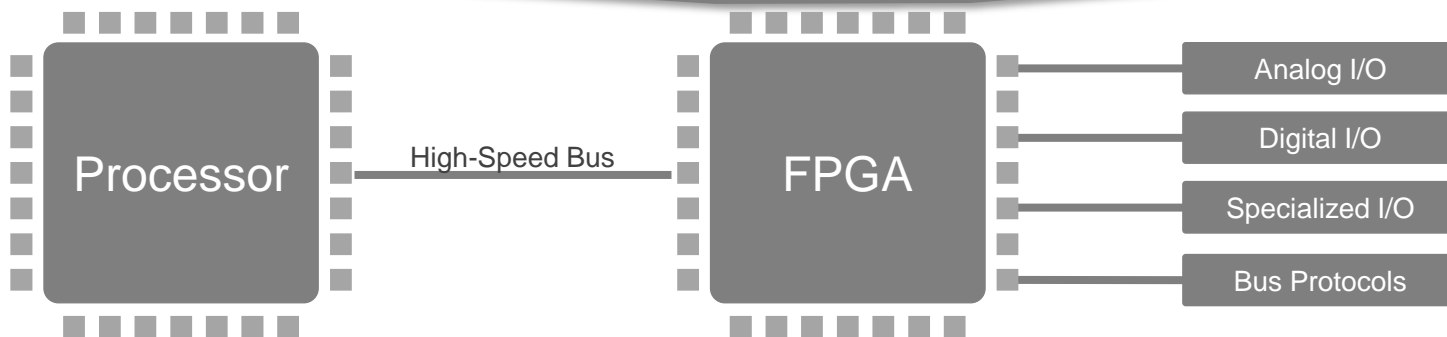


Software for the CompactRIO Platform

Application Software

LabVIEW FPGA

- Built-in language constructs to manage clocks/timing, memory, I/O, and data transfer (DMA)
- IP for complex mathematics, high-speed control, image processing, signal analysis, and more
- Cloud compile support to reduce compile times
- Support for HDL code integration
- Simulation and debugging capabilities
- Xilinx compiler and HLS technologies used to create optimized designs



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Monetize Your Effort

NI products are designed, tested, and validated per stringent design practices, ensuring reliable operation in any environment. As a worldwide leader in test and measurement, we have verification and validation in our DNA.

Managing Thermals for Industrial Temperatures

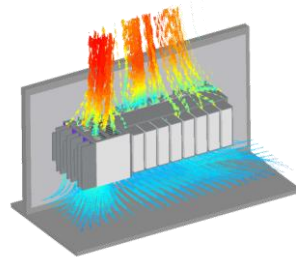
Design

- Design for worst case conditions
- Max processing, FPGA, power, I/O, peripherals, etc



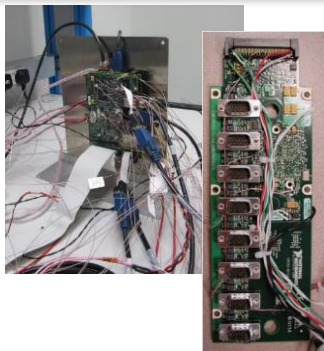
Simulate

- Calculations based on component worse case process
- Simulations in FlowTherm



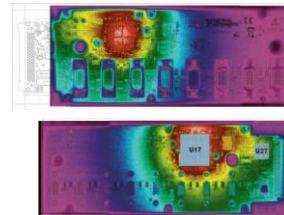
Test

- Worst case conditions
- All major components
- Temperature cycle
- Boot up at cold temperatures
- Many configurations



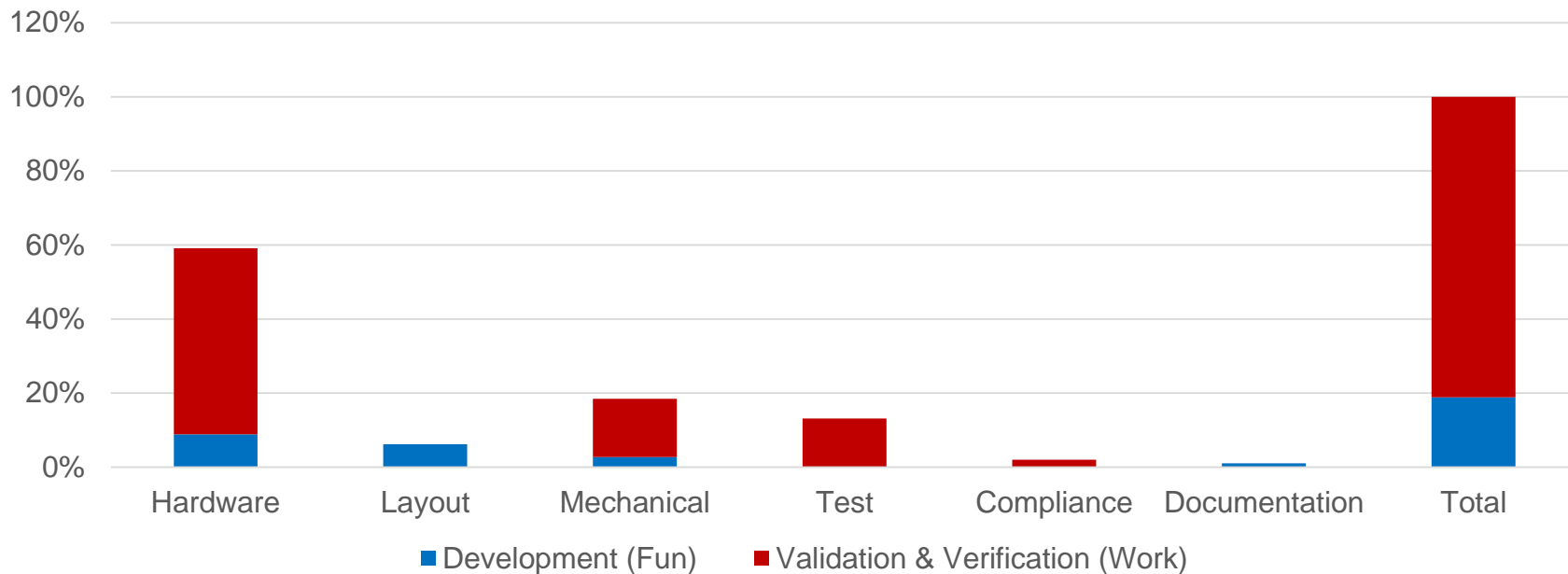
Inspect

- Failed or low margin components in test reports
- IR scans to identify hot components



Example R&D Investment for a Deployable, Industrial, Ruggedized, Embedded Board-Level Product

% of HW R&D Distribution



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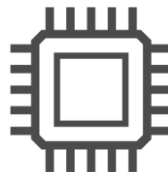
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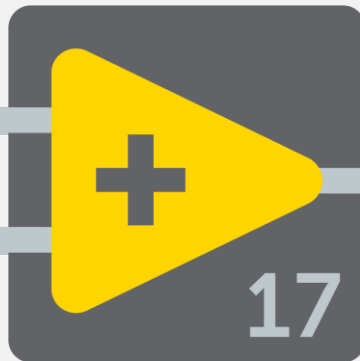
LabVIEW 2017

Complex applications. Distributed systems. Streamlined development.

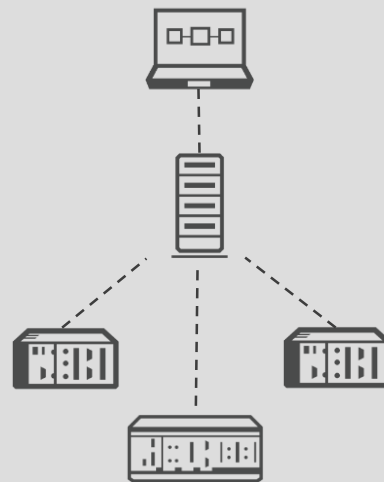
Leverage the Latest Design Trends
with New IP and Tools



Expanded Ecosystem with Hardware
and Software Interoperability



Streamline the Management
of Distributed Systems



LabVIEW 2017

Complex applications. Distributed systems. Streamlined development.

Con

FPGA

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SystemLink Early Access Release

System Management Software

SystemLink is a software platform for managing deployed and networked systems.

- Mass deploy software to remote hardware
- View and configure device settings
- Perform diagnostics and troubleshooting
- Automate data transfer with LabVIEW APIs

SystemLink Application

System	IP Address	Model Name	Serial Number	Connection	Comments
System 1	192.168.1.101	NI-9000	19000001	Connected	Monitoring station 1
System 2	192.168.1.102	NI-9000	19000002	Connected	Monitoring station 2
System 3	192.168.1.103	NI-9000	19000003	Connected	Monitoring station 3
System 4	192.168.1.104	NI-9000	19000004	Connected	Monitoring station 4
System 5	192.168.1.105	NI-9000	19000005	Connected	Test station 1
System 6	192.168.1.106	NI-9000	19000006	Connected	Test station 2

Server



Managed Systems

