



NATIONAL INSTRUMENTS

LabVIEW™

2012

# What's New in LabVIEW 2012

Terry Stratoudakis

Automation Laboratory Experts - ALE LLC

*Presented to the IEEE Long Island Section Instrumentation & Measurement Society and the Long Island LabVIEW Users Group (LILUG) on Thursday December 6, 2012*

# Graphical System Design

A Platform-Based Approach for Measurement and Control

Test



Monitor



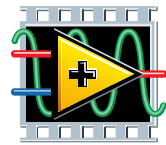
Embedded



Control



Cyber Physical



NATIONAL INSTRUMENTS

# LabVIEW™



Desktops and  
PC-Based DAQ



PXI and Modular  
Instruments



RIO and Custom  
Designs

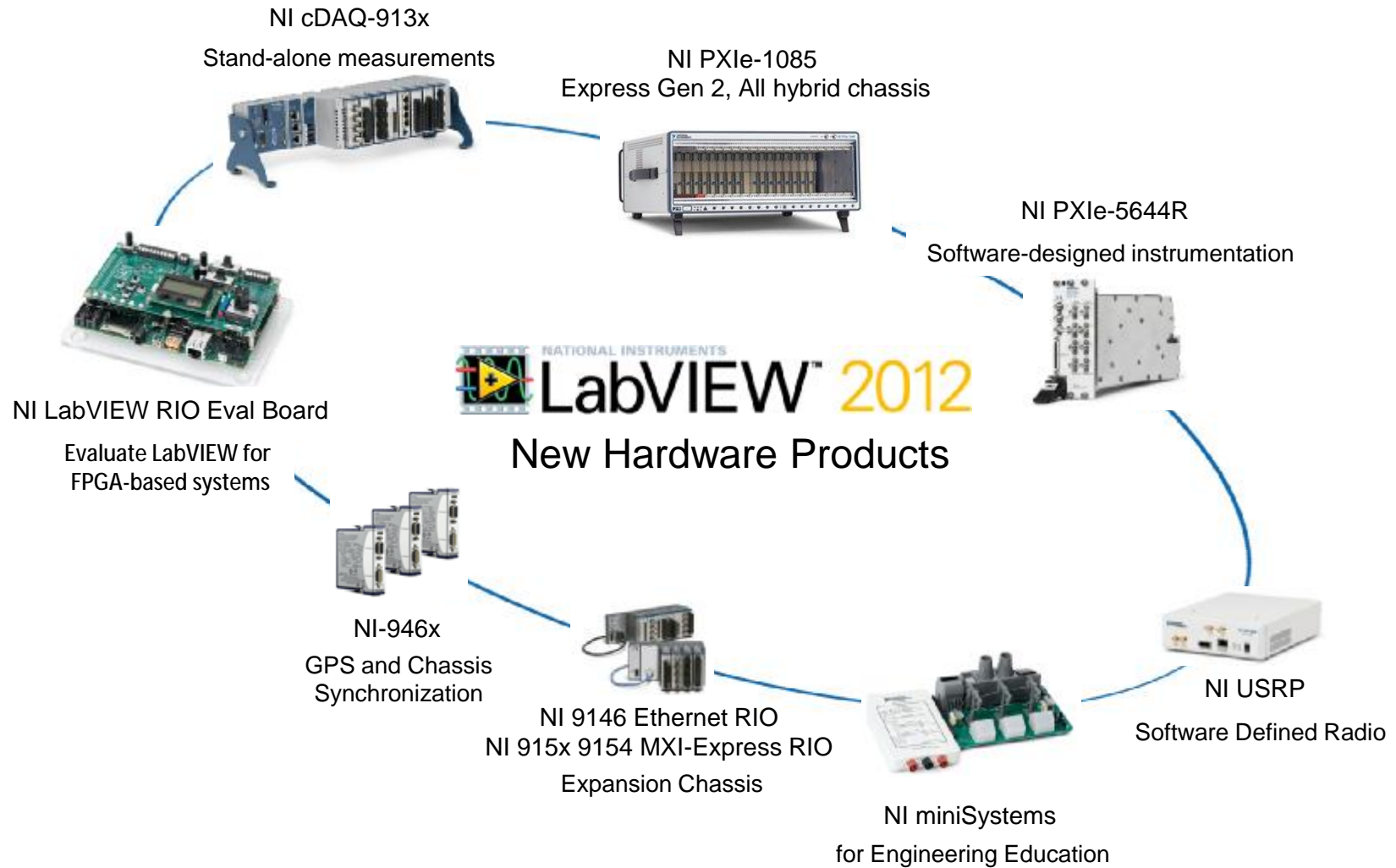
**GPIB**  
IEEE-488

ETHERNET

HI-SPEED  
CERTIFIED  
**USB**  
™

Open Connectivity  
With Third-Party I/O

# Unrivaled Integration with the Latest Technology





NATIONAL INSTRUMENTS

# LabVIEW™

## System Design Software

### Project Explorer

Manage and organize all system resources, including I/O and deployment targets

### Deployment Targets

Deploy LabVIEW code to the leading desktop, real-time, and FPGA hardware targets

### Instant Compilation

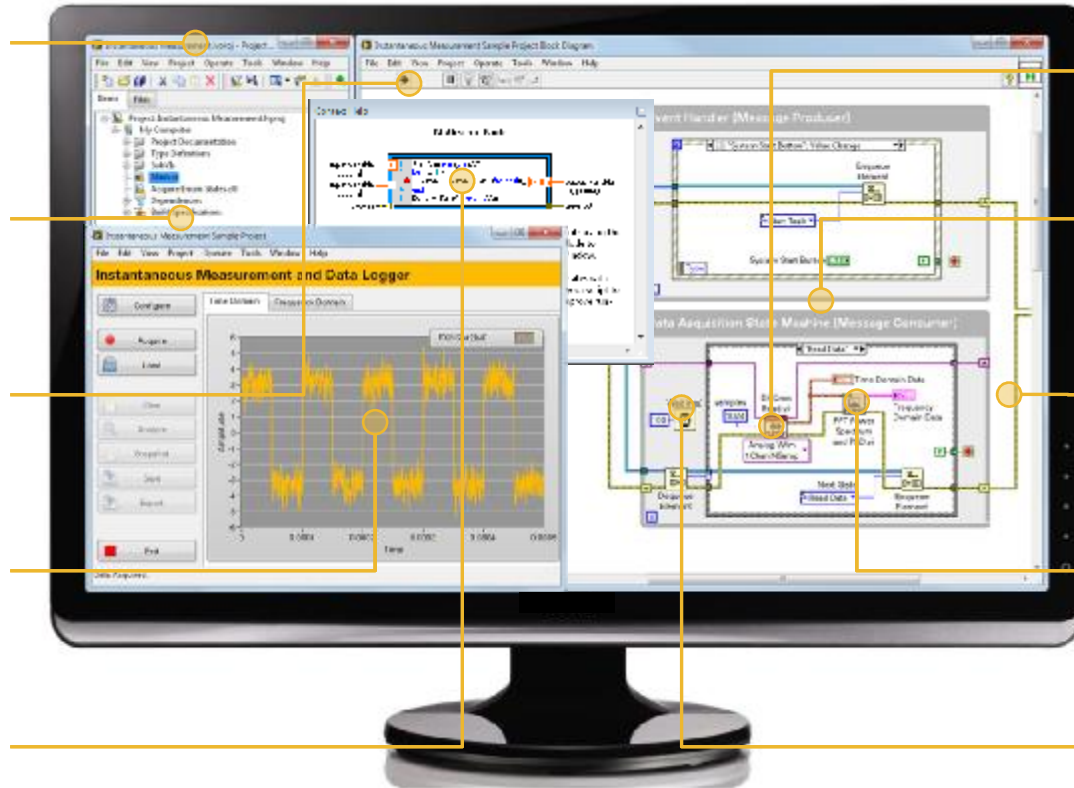
See the state of your application at all times, instantly

### Front Panel

Create event-driven user interfaces to control systems and display measurements

### Models of Computation

Combine and reuse .m files, C code, and HDL with graphical code



### Hardware Connectivity

Bring real-world signals into LabVIEW from any I/O on any instrument

### Parallel Programming

Create independent loops that automatically execute in parallel

### Block Diagram

Define and customize the behavior of your system using graphical programming

### Analysis Libraries

Use high-performance analysis libraries designed for engineering and science

### Timing

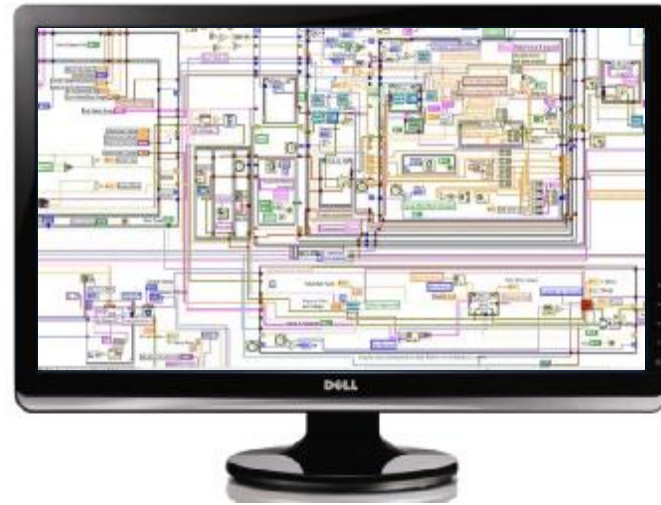
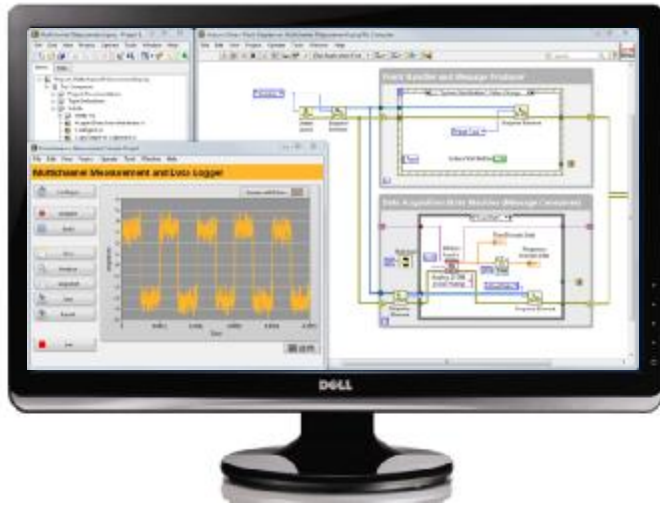
Define explicit execution order and timing with sequential data flow

## Accelerates Your Success

By abstracting low-level complexity and integrating all of the tools you need to build any measurement or control system

# Build This. Not That.

LabVIEW 2012 helps you eliminate spaghetti code



Start your application from recommended building blocks using **Templates and Sample Projects**

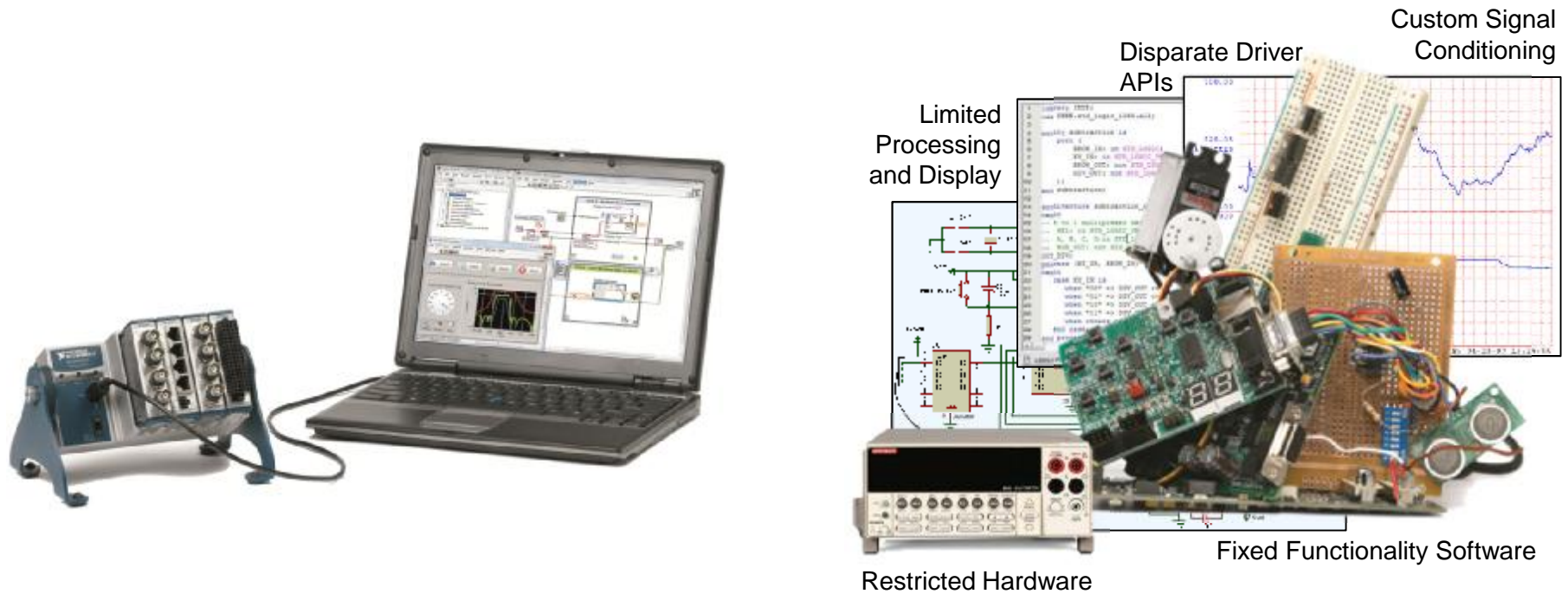
Access extensive training on LabVIEW programming concepts anytime on ni.com with **Self-Paced Online Training**

Innovate with confidence thanks to continued investment in **stability** and reliability



NATIONAL INSTRUMENTS

# LabVIEW™ 2012



## Build This. Not That.

LabVIEW 2012 delivers all the tools you need to move from measurement to decision, faster



NATIONAL INSTRUMENTS

# LabVIEW™ 2012



## Build This. Not That.

Build a custom and flexible test system  
in less time with LabVIEW 2012



NATIONAL INSTRUMENTS

# LabVIEW™ 2012

Board Support Package

Device Drivers

Application Software

PCB Design and Layout

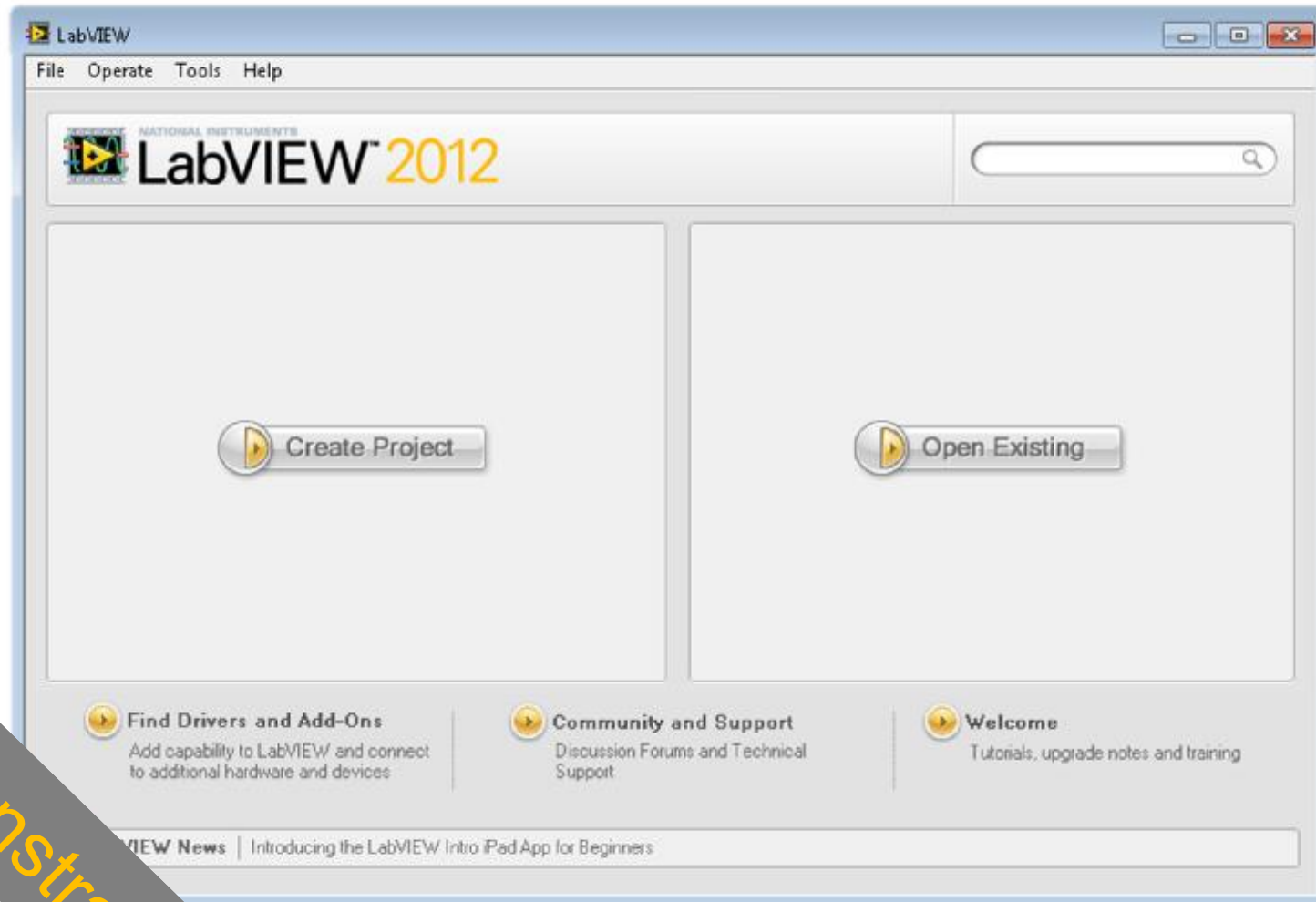
VHDL

## Build This. Not That.

End-to-end integration means you can deploy an embedded system faster



# LabVIEW 2012 Getting Started Window



Demonstration

# Online LabVIEW Skills Guide

**NATIONAL INSTRUMENTS** Cart | Help Search  25  
Hello Elijah (This is not me)

**NIWeek 2012**

[MyNI](#) | [Contact Us](#) | **[Products & Services](#)** | [Solutions](#) | [Support](#) | [NI Developer Zone](#) | [Academic](#) | [Events](#) | [Company](#)


[NI Home](#) > [Products & Services](#) > [Academic Products](#) > [NI myDAQ](#) > [Purchasing Options](#) > [Accessories for NI myDAQ](#)

## NI LabVIEW Skills Guide


Identify the skills you need and find learning resources to help you successfully develop a LabVIEW application with your hardware.

Step 1: LabVIEW Software Skills
Step 2: Hardware Skills


Choose the hardware platform you are using with LabVIEW. Then identify the category that best describes how your application will use that hardware. Expand your chosen category to view the skills you need and resources to help you get there.




**Data Acquisition**  
M Series, X Series, CompactDAQ, and Stand-Alone DAQ



**Instrument Control**  
GPIB, Serial, USB, and Ethernet



**Embedded Control and Monitoring**  
CompactRIO and NI Single-Board RIO



**Automated Test**  
PXI and Modular Instruments Hardware, NI TestStand and NI VeriStand Software

**Basic Performance (Scan Engine) Prototype**      Build a functional prototype or short-term use system  
 Sample or update all I/O channels at <math>\sim 500\text{ Hz}</math> and use software-based control or safety logic.

▼ Sound like you?

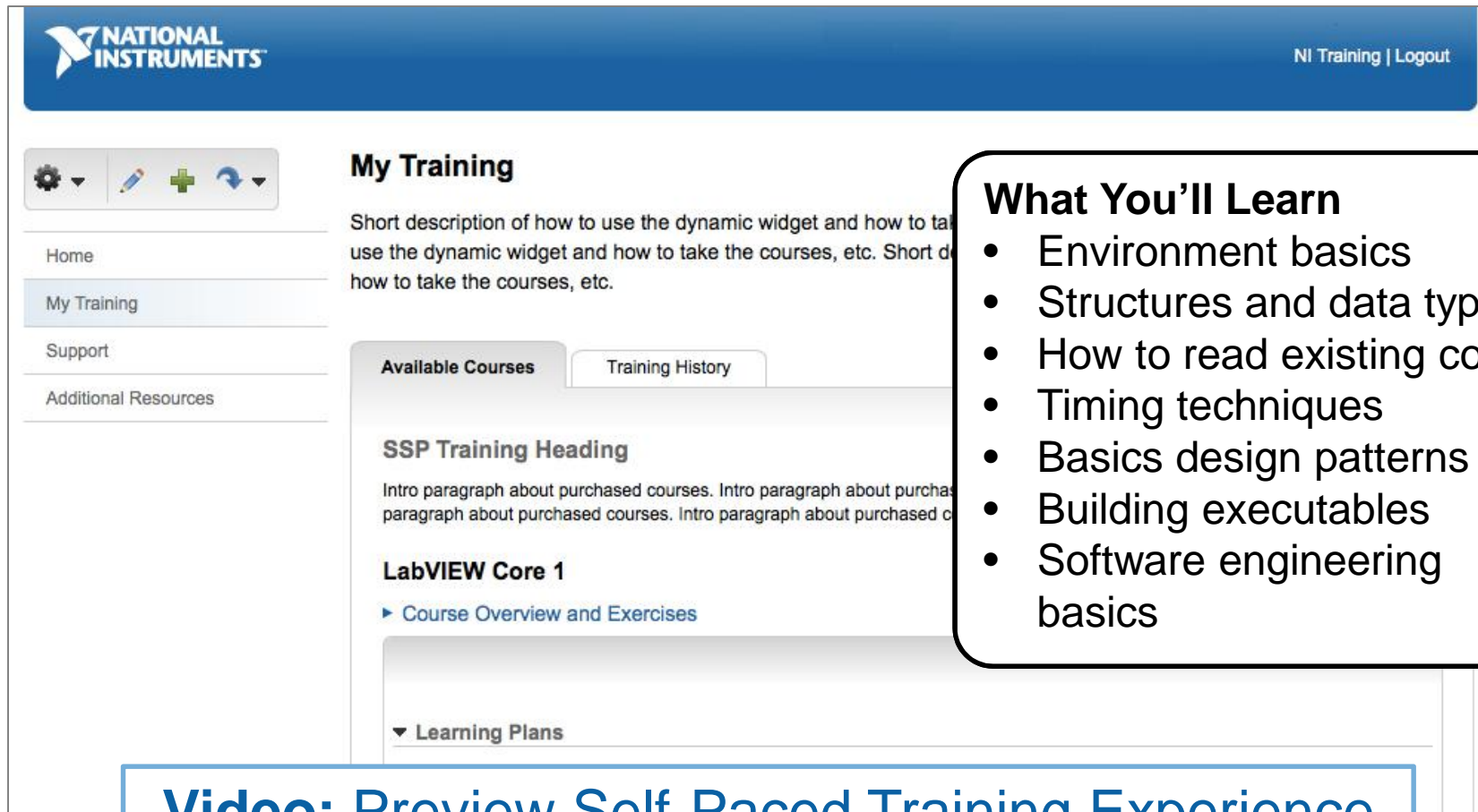
Required Skills		Online Product Documentation	Instructor-Led Training
Setup	Install and configure CompactRIO hardware and LabVIEW software	Free written documentation available 24/7 on ni.com	Live classes taught online or in a classroom by certified instructors; provides exercises and hands-on hardware experience; available for purchase
Implement Windows Host Application	Design a host application that can handle user events and display data Implement network communication between Windows host and real-time application	<a href="#">Getting Started</a>	
Implement Deploy Time	Interface to I/O with NI Scan Engine I/O variables Implement network communication between Windows host and real-time application	<a href="#">LabVIEW for CompactRIO Developer's Guide</a>	<a href="#">LabVIEW Real-Time 1</a>

Sample or update all I/O channels at <math>\sim 500\text{ Hz}</math> and use software-based control or safety logic

Demonstration

# Introducing Self-Paced Online Training

Core LabVIEW skills included with your software subscription



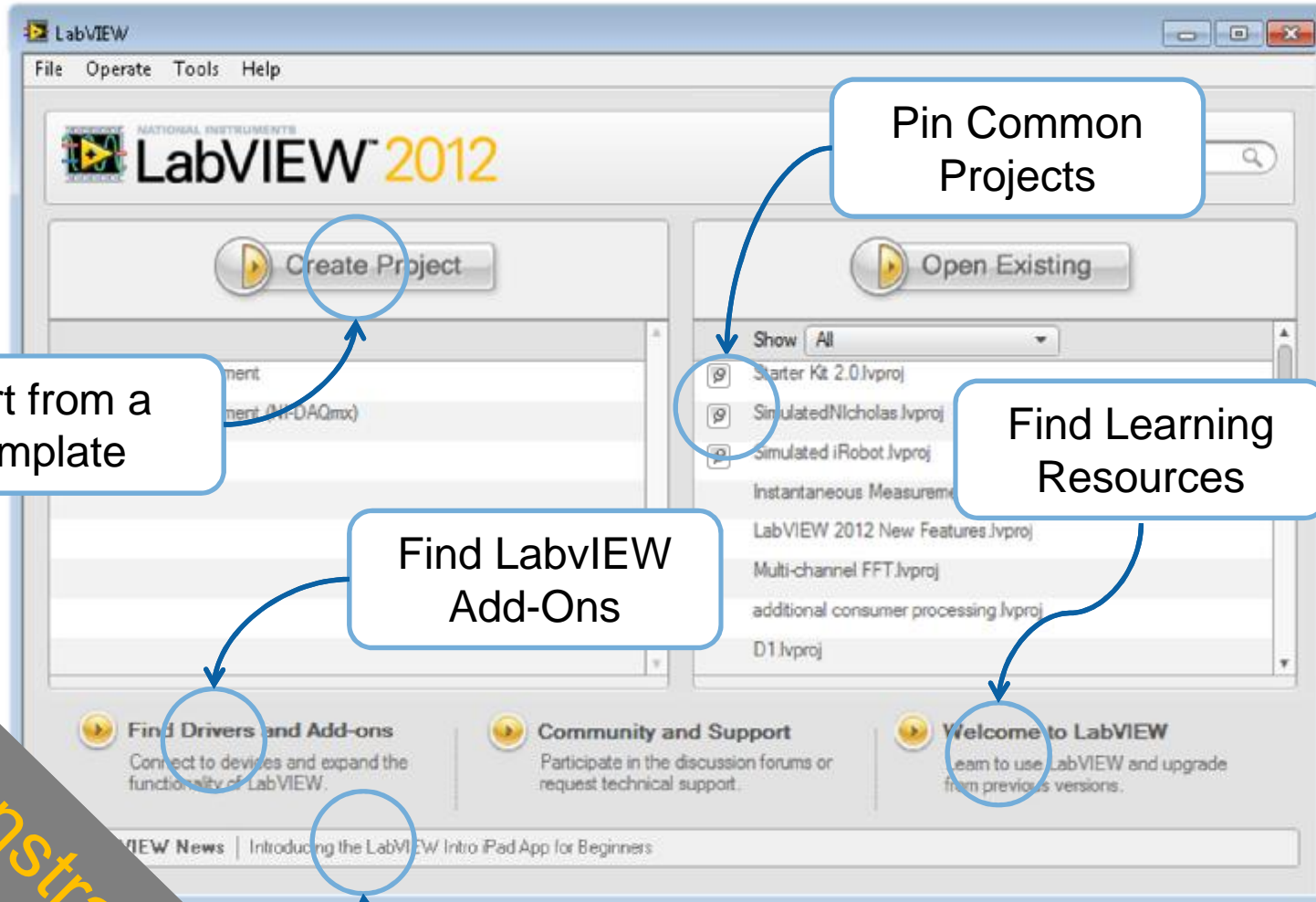
The screenshot displays the National Instruments My Training interface. At the top left is the National Instruments logo, and at the top right is the text "NI Training | Logout". A navigation sidebar on the left includes links for Home, My Training (which is highlighted), Support, and Additional Resources. The main content area is titled "My Training" and contains a short description of how to use dynamic widgets and take courses. Below this, there are two tabs: "Available Courses" and "Training History". Under the "Available Courses" tab, there is a section for "SSP Training Heading" with an introductory paragraph. Below that is a section for "LabVIEW Core 1" with a sub-link for "Course Overview and Exercises". At the bottom of the visible content, there is a "Learning Plans" section with a dropdown arrow.

**What You'll Learn**

- Environment basics
- Structures and data types
- How to read existing code
- Timing techniques
- Basics design patterns
- Building executables
- Software engineering basics

[Video: Preview Self-Paced Training Experience](#)

# LabVIEW 2012 Getting Started Window Summary



Start from a Template

Pin Common Projects

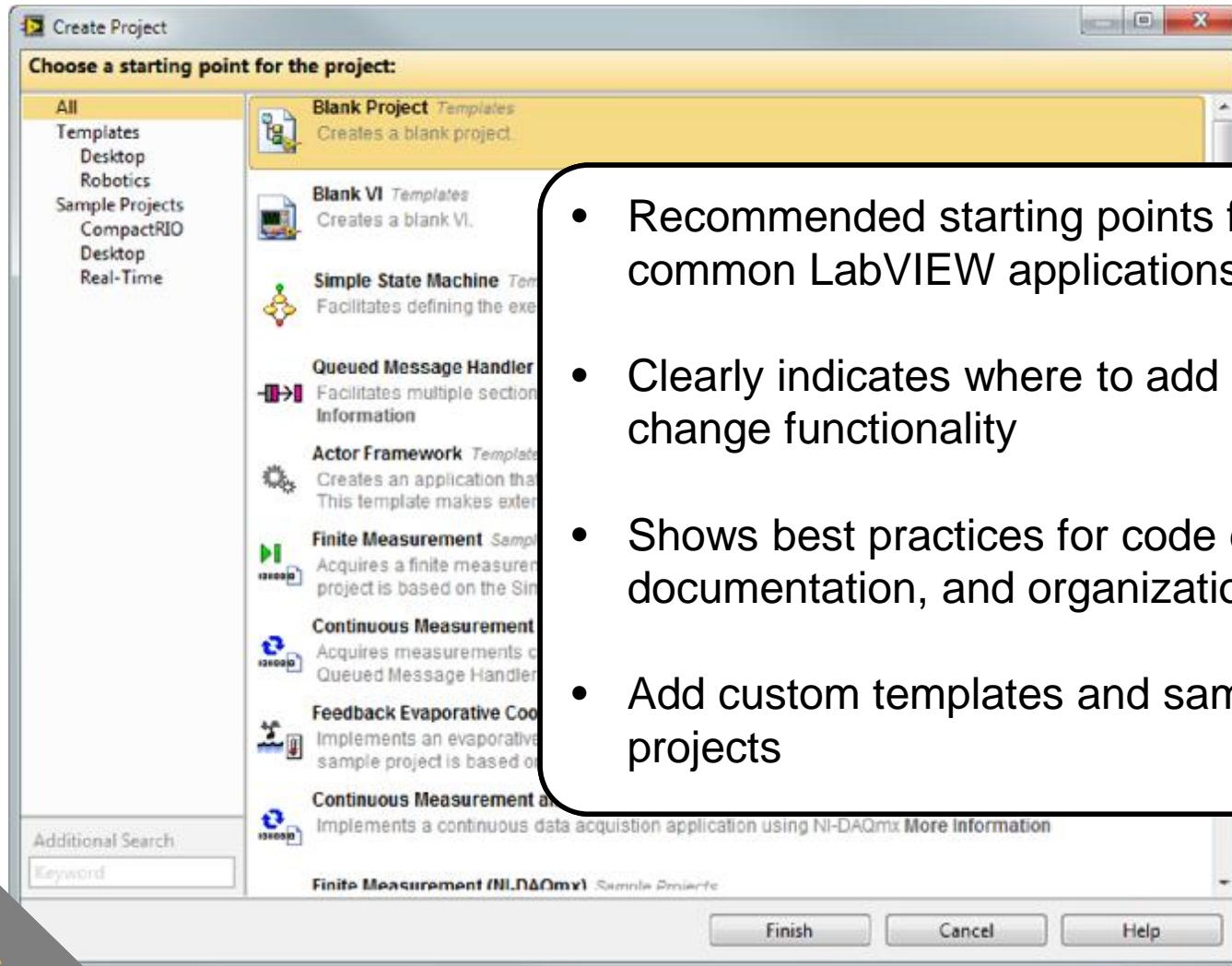
Find Learning Resources

Find LabVIEW Add-Ons

RSS News and Announcements

Demonstration

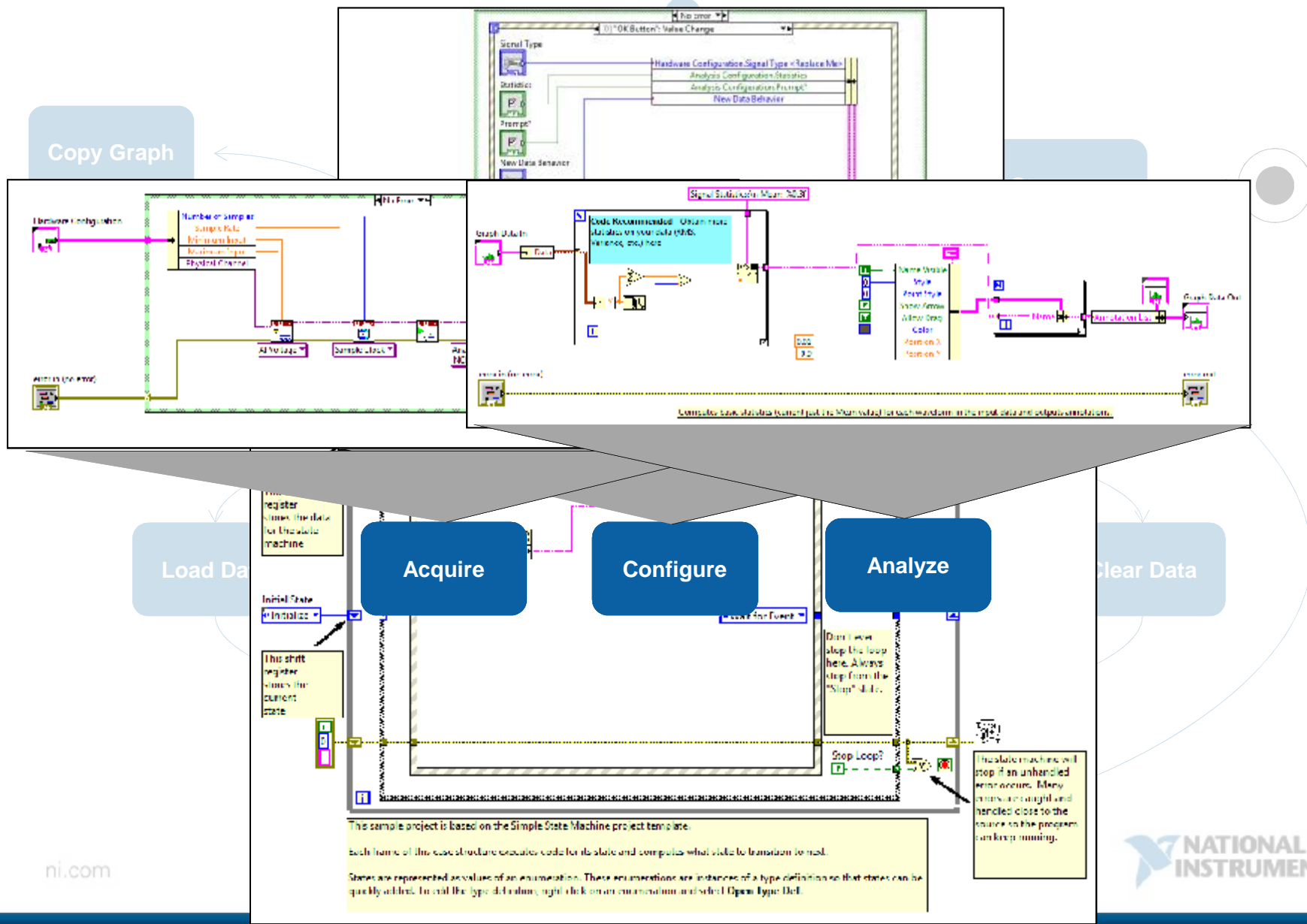
# Introducing Templates and Sample Projects



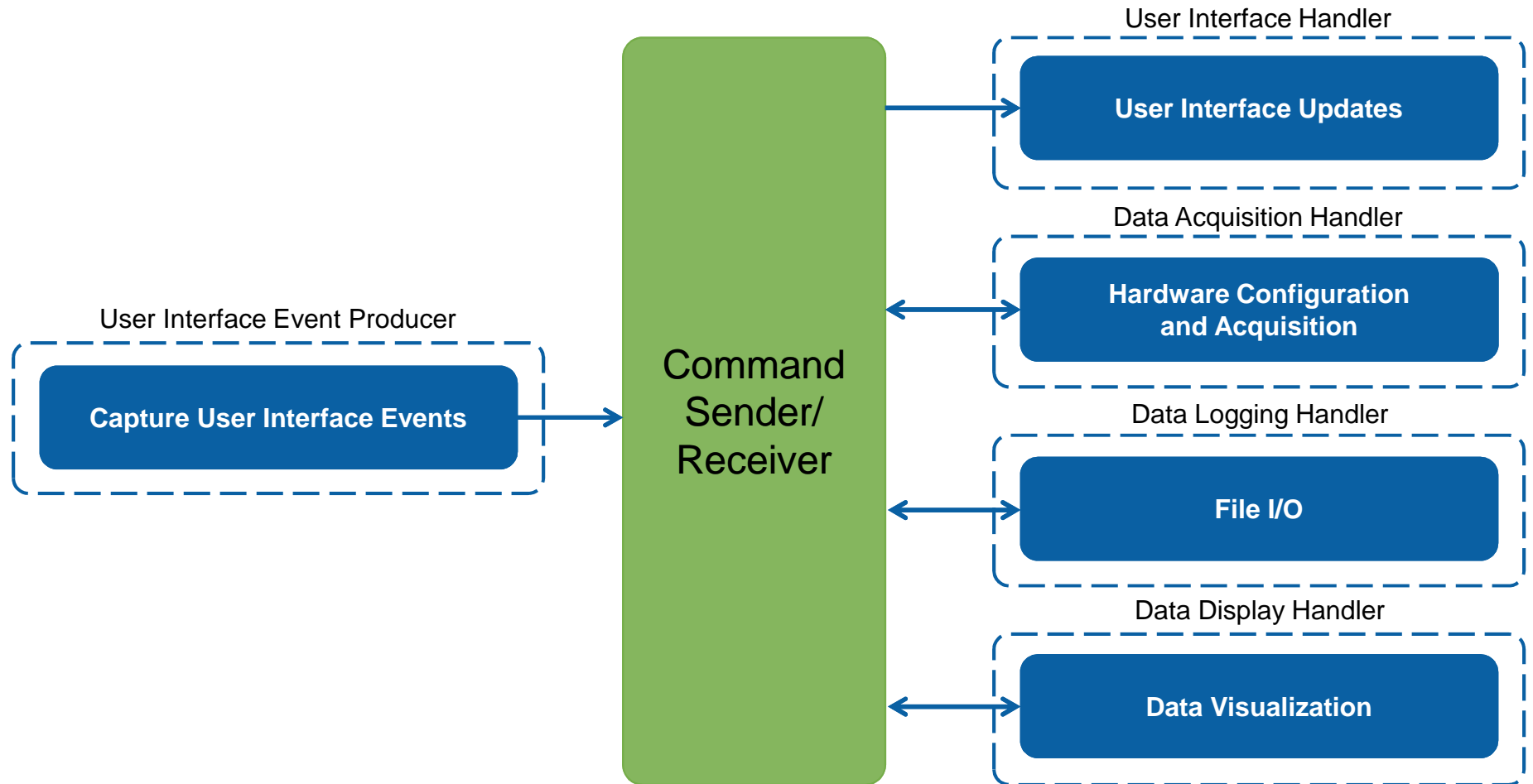
- Recommended starting points for common LabVIEW applications
- Clearly indicates where to add or change functionality
- Shows best practices for code design, documentation, and organization
- Add custom templates and sample projects

Demonstration

# Finite Measurement Sample Project State Diagram

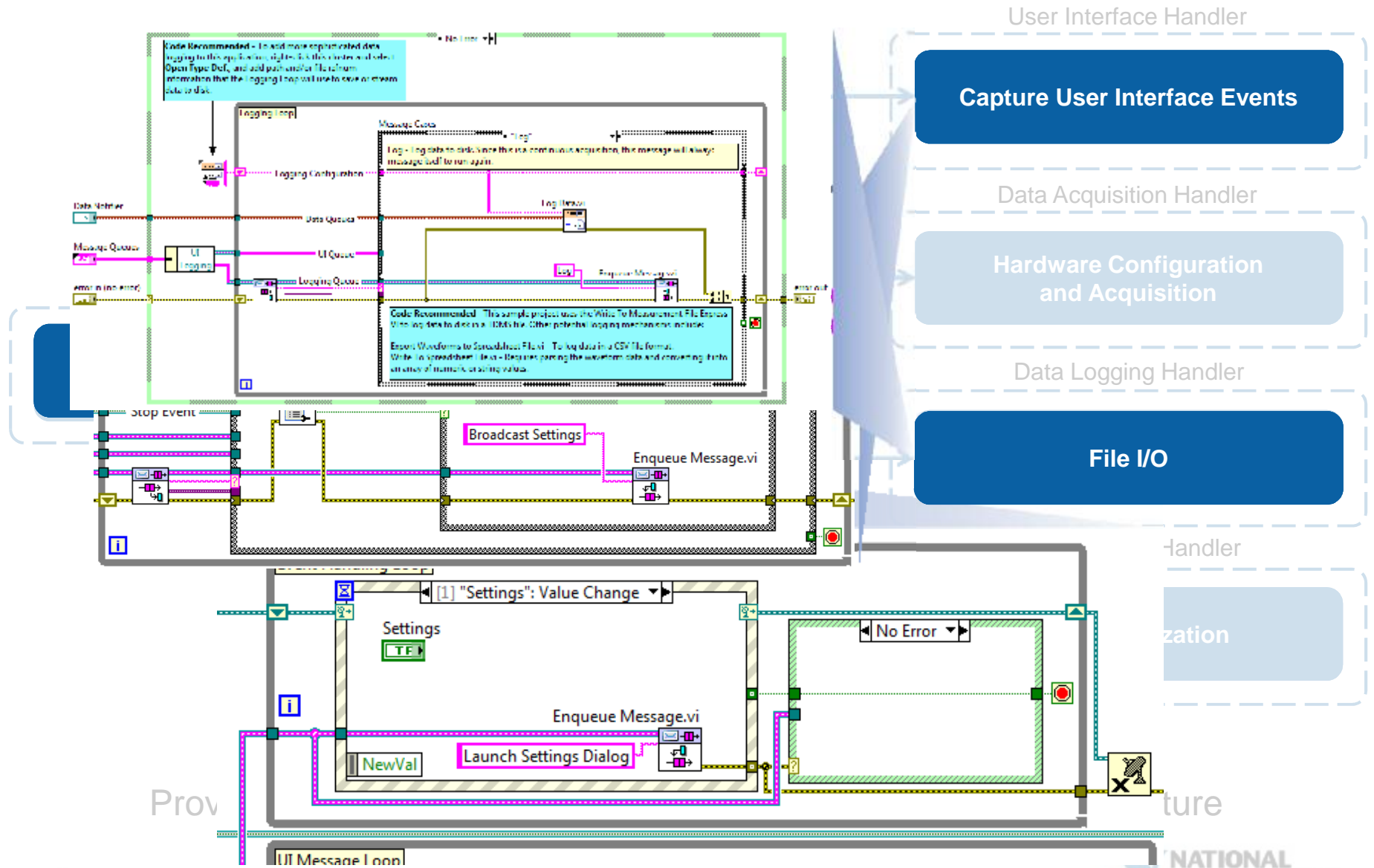


# LabVIEW Continuous Measurement Architecture



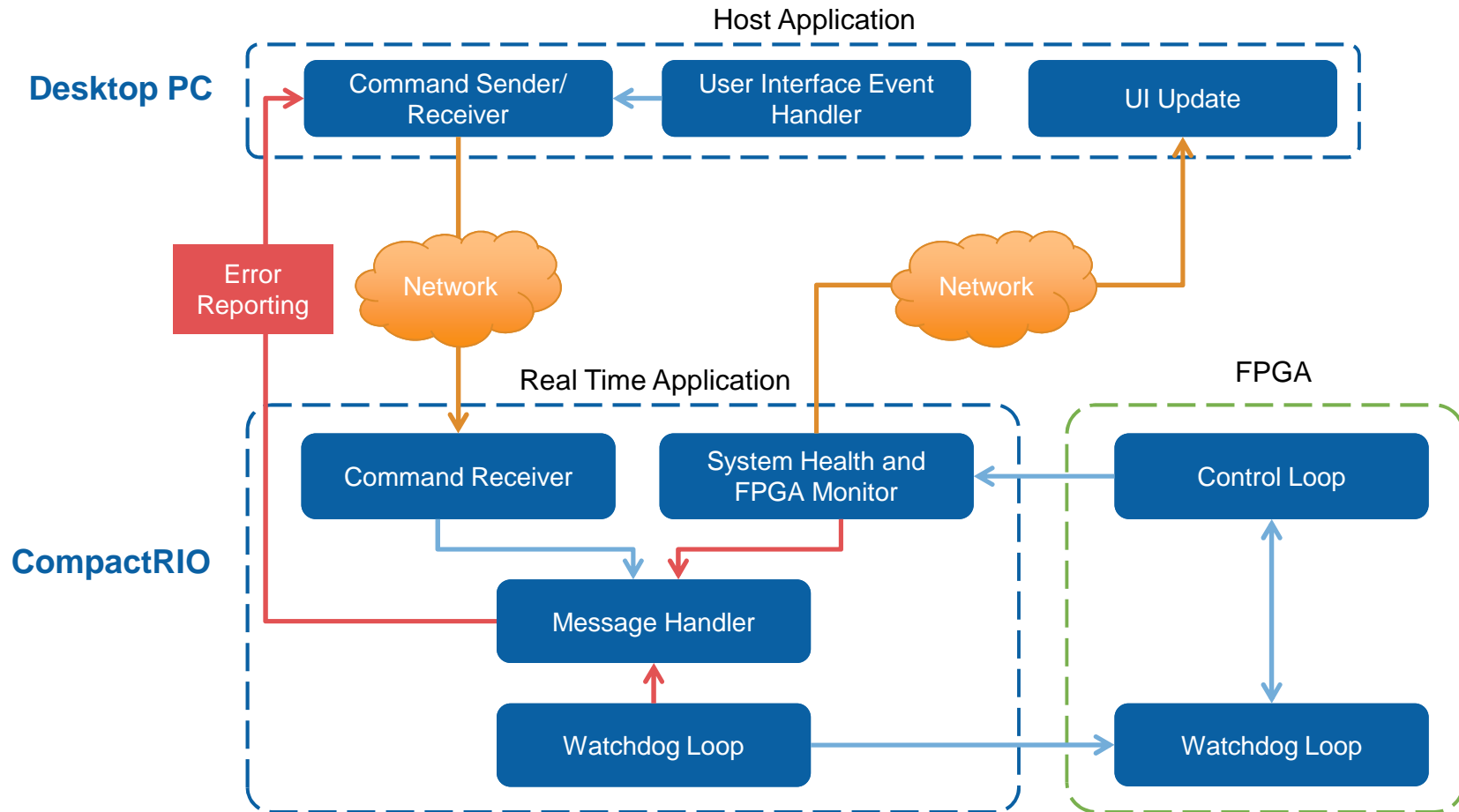
Provides a **ready-to-run** starting point using a **scalable** architecture

# LabVIEW Continuous Measurement Architecture



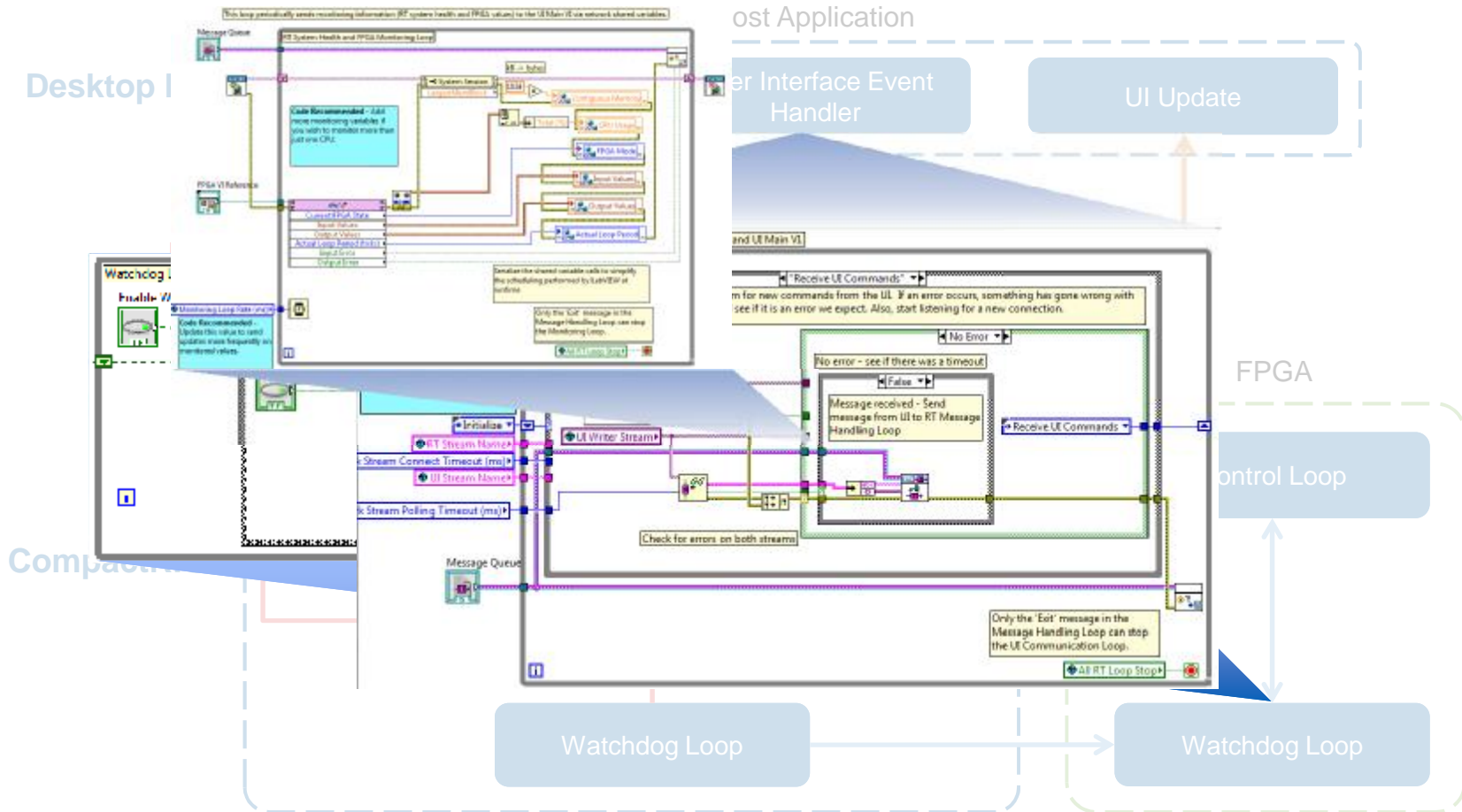


# LabVIEW FPGA Control Sample Project



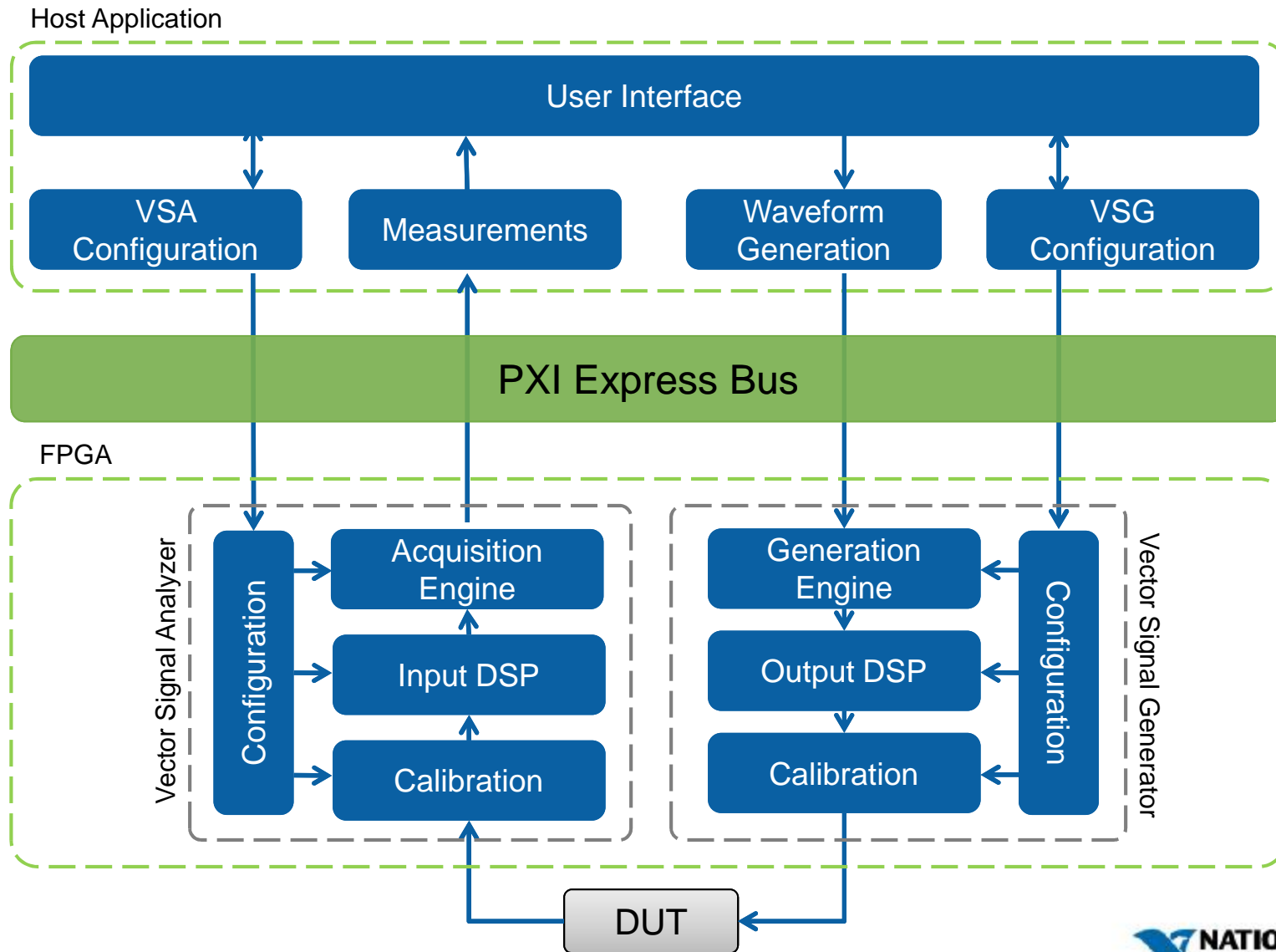
Provides a recommended starting point using a scalable architecture

# LabVIEW FPGA Control Sample Project

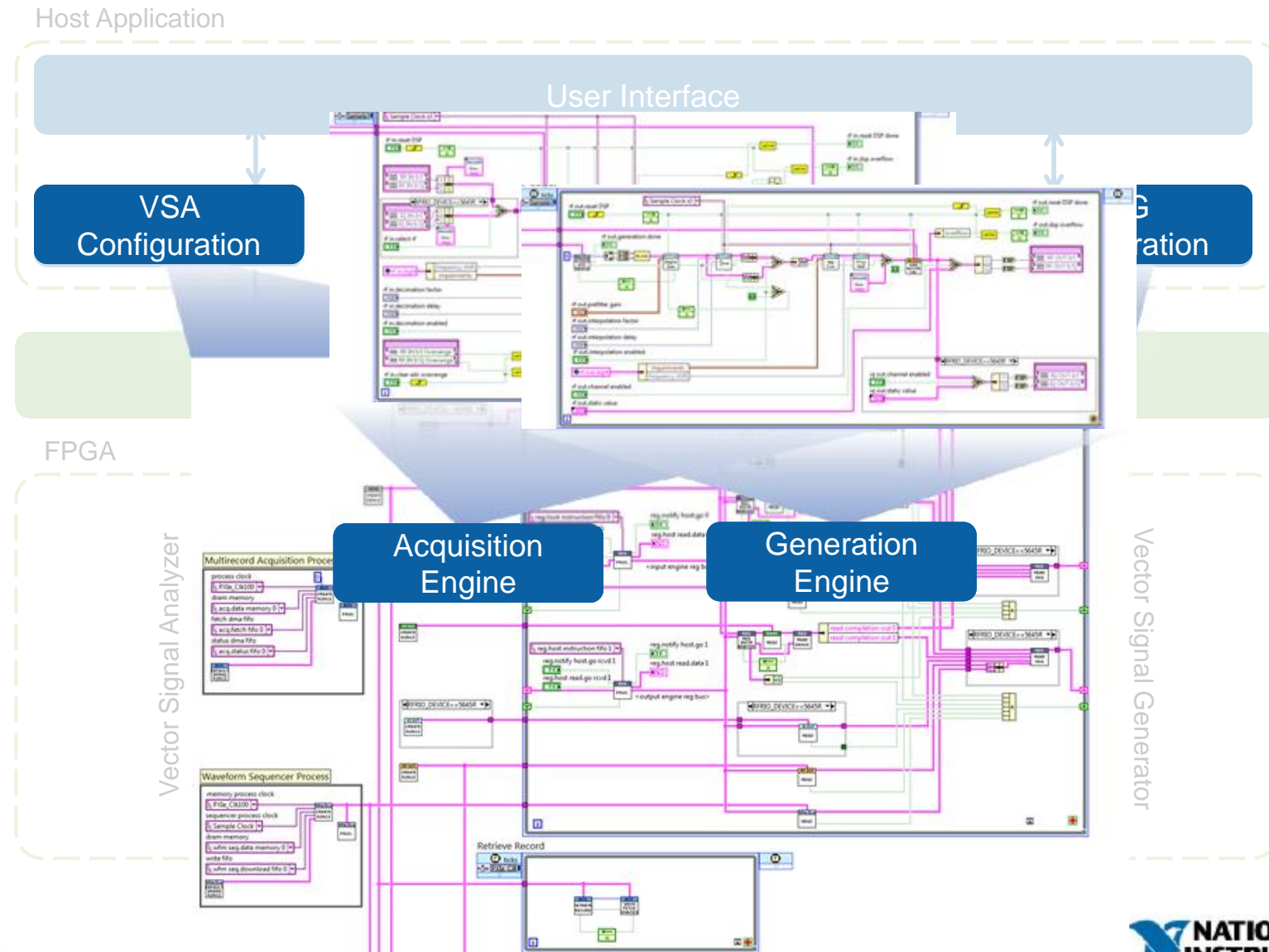


Provides a recommended starting point using a scalable architecture

# Simple VSA + VSG Sample Project for VST



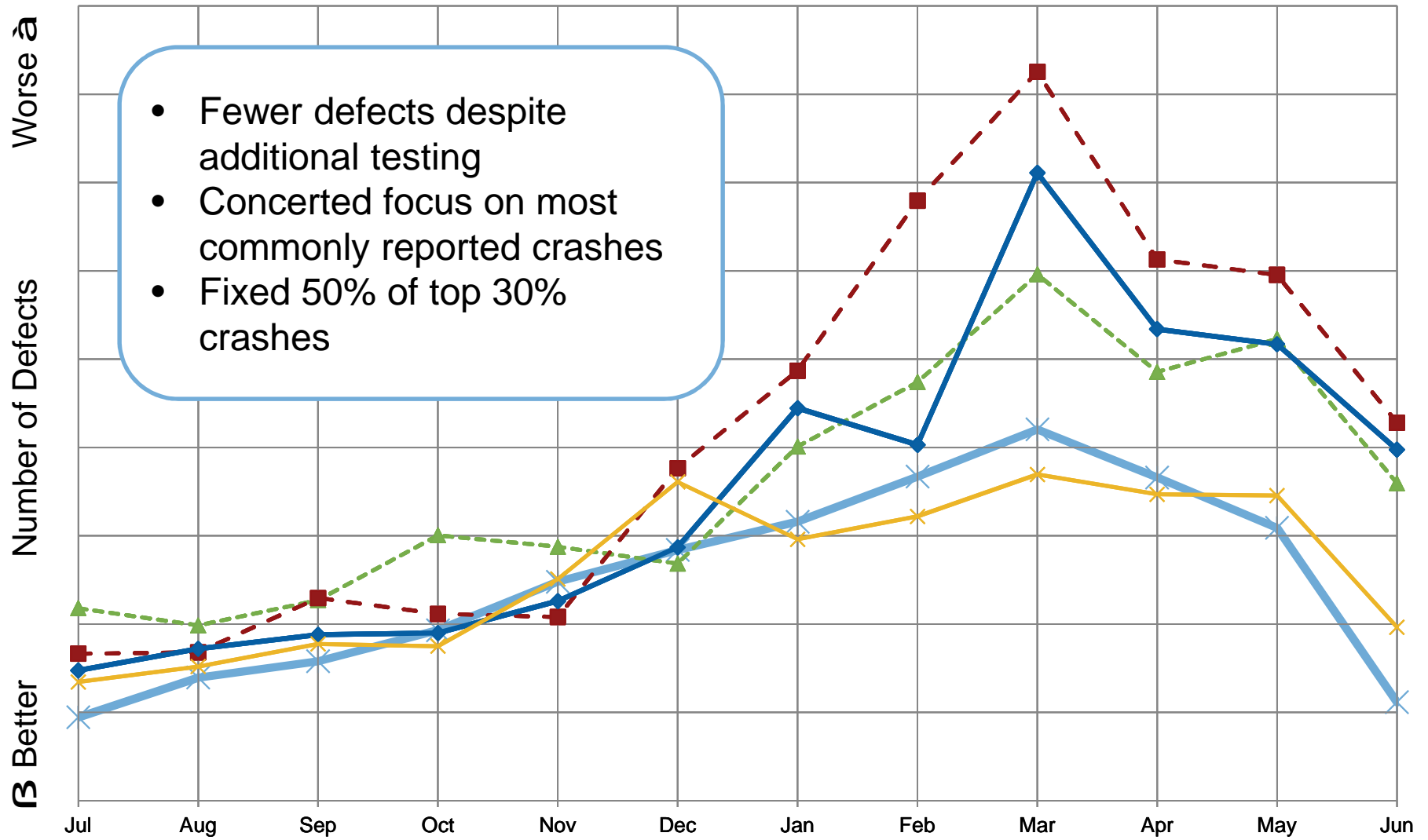
# Simple VSA + VSG Sample Project for VST



# Template and Sample Project FAQ

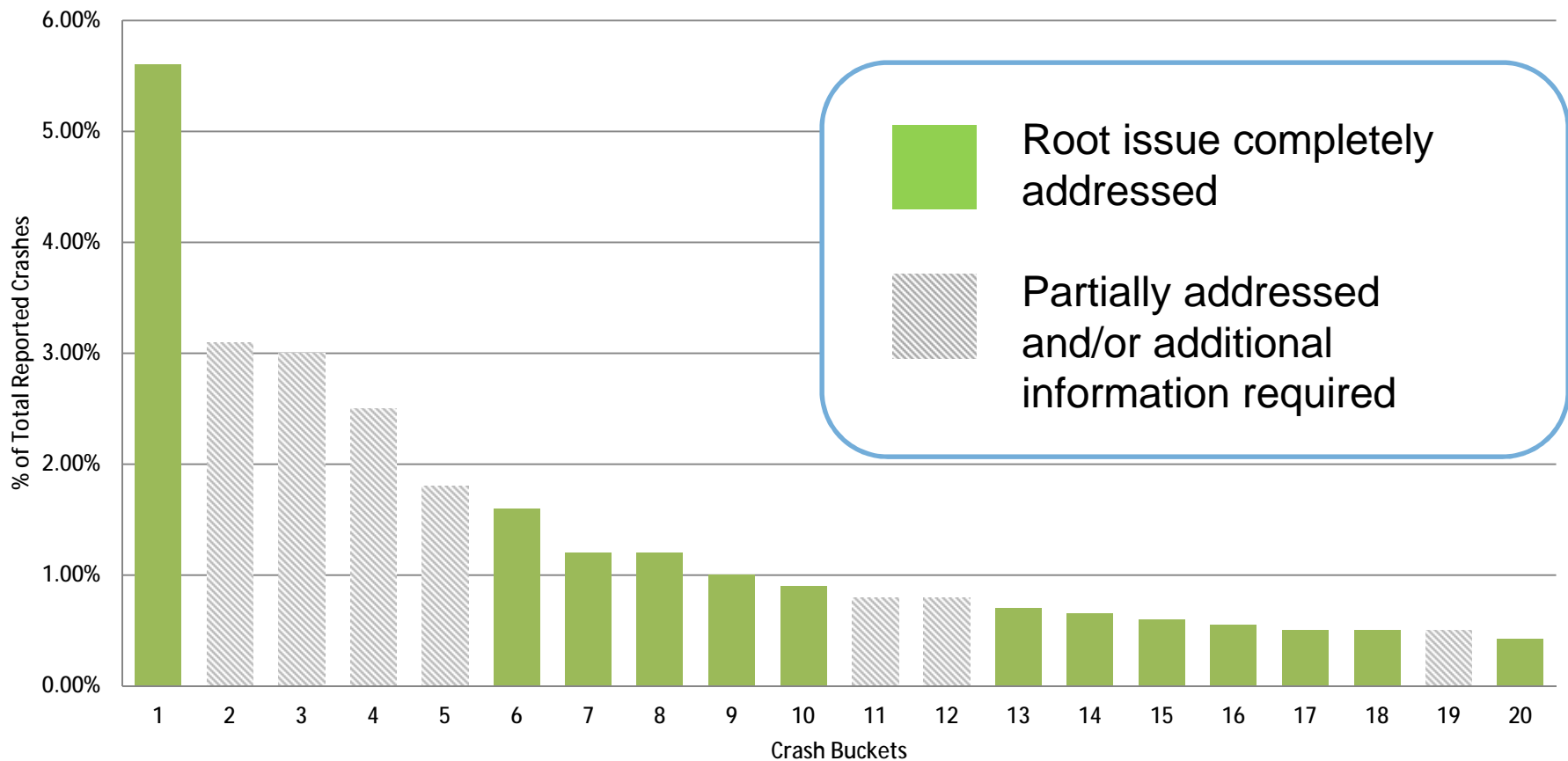
- The list of available templates and sample projects depends on the modules and drivers that are installed
- Creating a project from a template or sample project does not modify the original project, as a new copy of code is created and saved on disk.
- Sample projects that are designed for deployment on Real-Time and FPGA targets require additional configuration to map the hardware and I/O
- Blue comments are used throughout the code to clearly indicate where code is either recommended or needed
- Users can create and add their own templates and sample projects

# Pre-Release LabVIEW Defect Flow



# Continuous Investment In Stability

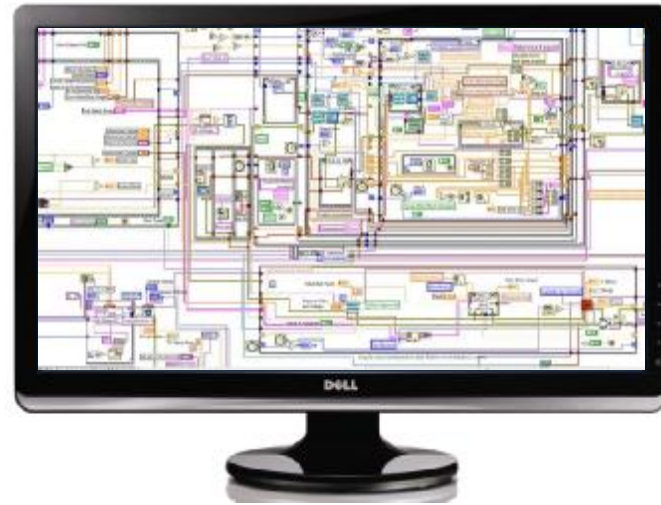
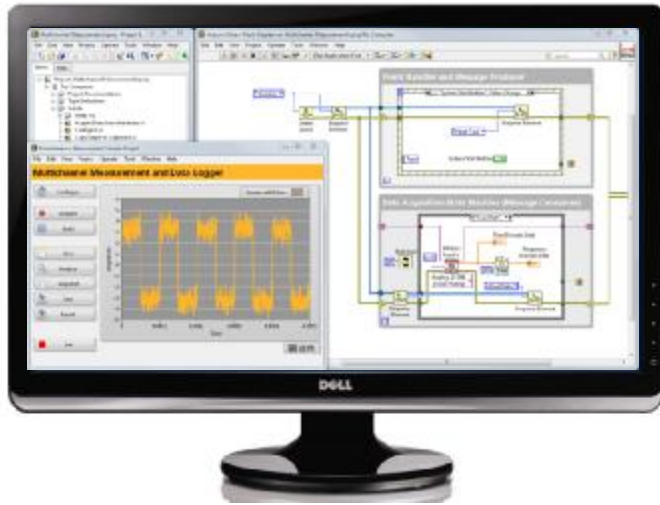
Top 20 LV 2011 NIER Reported Crashes (30% of all reported crashes)



Over half of the top reported crashes were fixed in 2012

# Build This. Not That.

LabVIEW 2012 helps you eliminate spaghetti code



Start your application from recommended building blocks using **Templates and Sample Projects**

Access extensive training on LabVIEW programming concepts anytime on ni.com with **Self-Paced Online Training**

Innovate with confidence thanks to continued investment in **stability** and reliability



---

# Productivity Enhancements

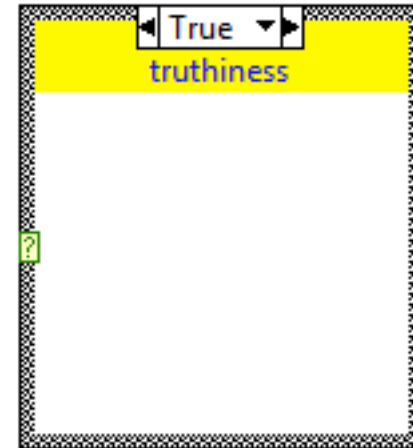
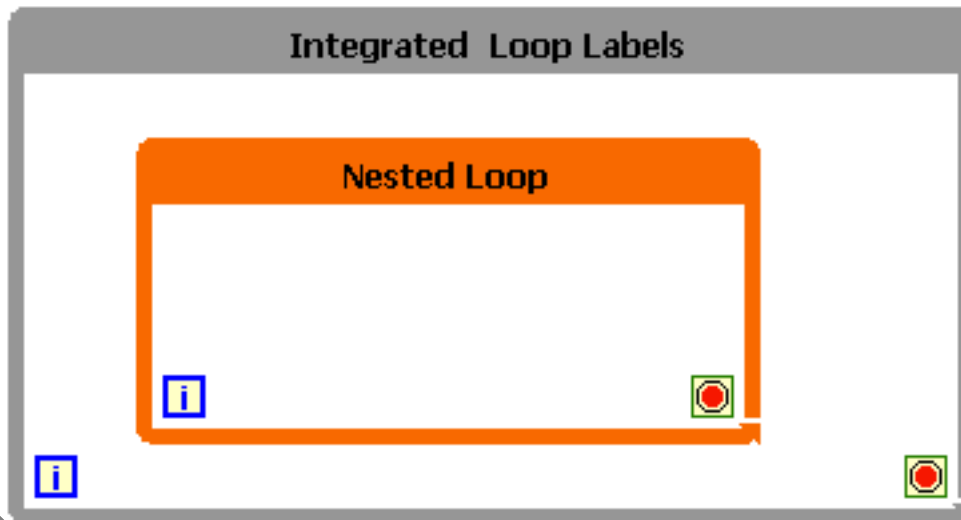
## 12 Productivity Enhancements From the LabVIEW Idea Exchange

- Subdiagram Labels
- Enumerated dialog enhancements
- Removing selected broken wires
- Icon Editor API
- Contextual Help for Data Conversion
- Event Structure in Base version
- Conditionally writing values to loop output tunnels
- Concatenate indexing
- Right-click menu for multiple items
- Long file path truncation
- Separate label locations for controls and indicators
- String editing dialog box

Demonstration

# Idea Exchange Features

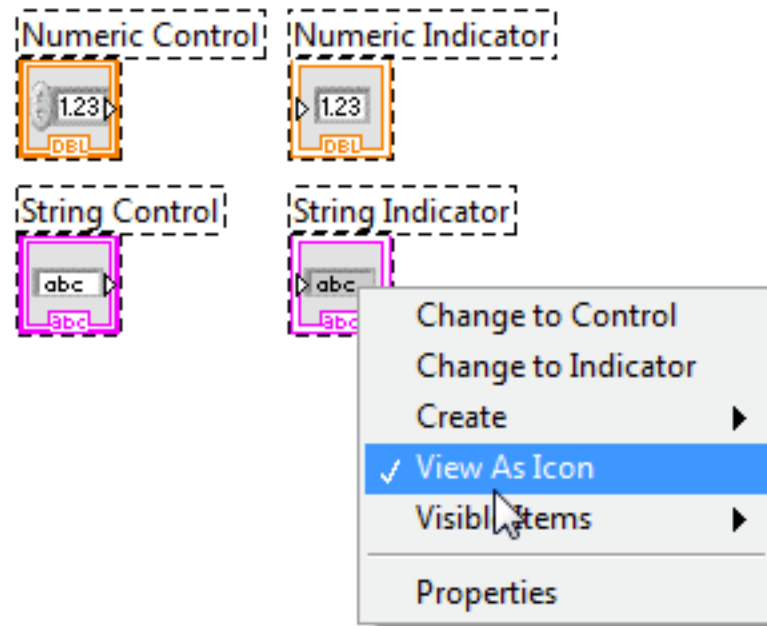
## Integrated Subdiagram Labels



Create labels that move and resize  
with any structure

# Idea Exchange Features

## Pop-up Menus for Multiple Selected Objects



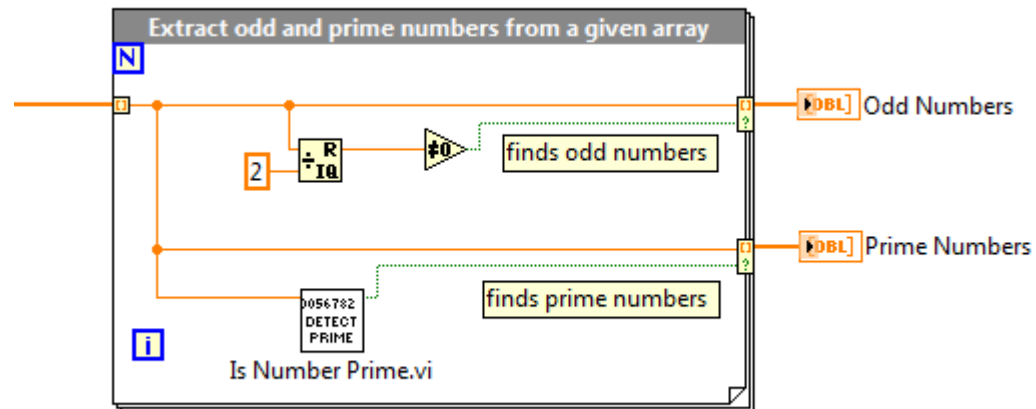
Save the time required to manually apply settings to multiple items

Demonstration

# Idea Exchange Features

## Conditional Loop Tunnel

Simplified approach

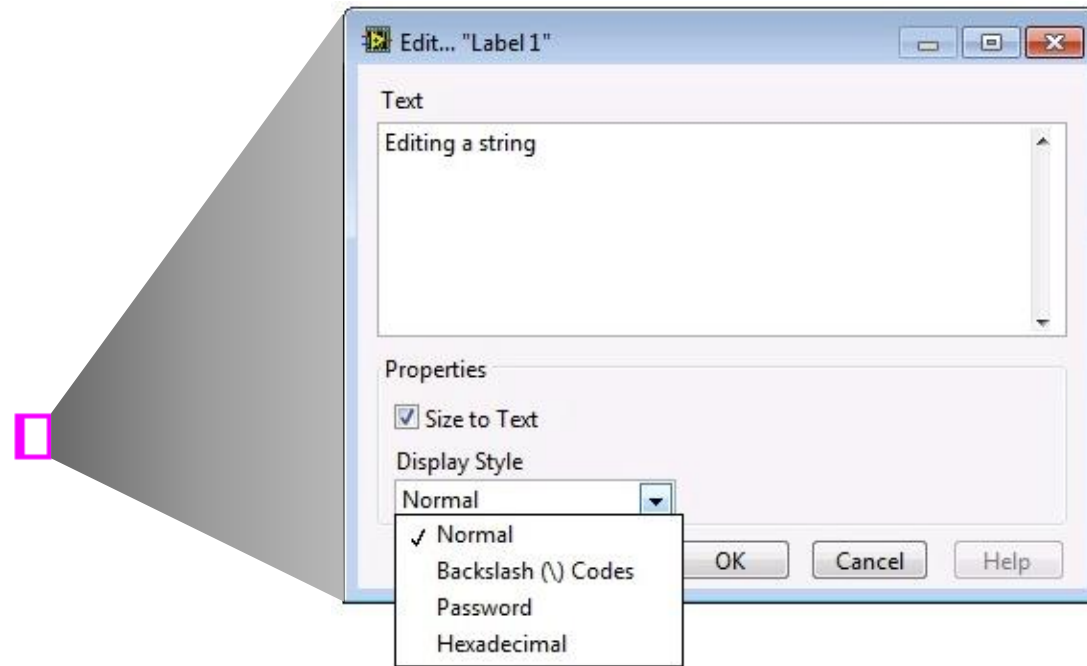


Demonstration

Simplifies common coding practices for conditionally building arrays

# Idea Exchange Features

## Edit String Constant Dialog



Help keep code looking clean by enabling users to edit large blocks of text without expanding the string constant

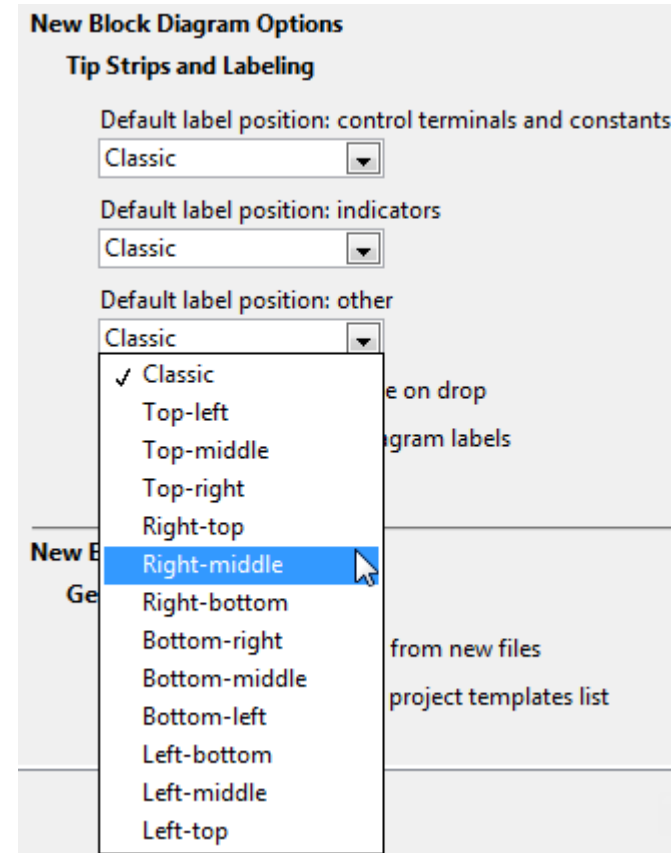
Demonstration

# Idea Exchange Features

## Separate Default Label Locations for Control & Indicator Terminals

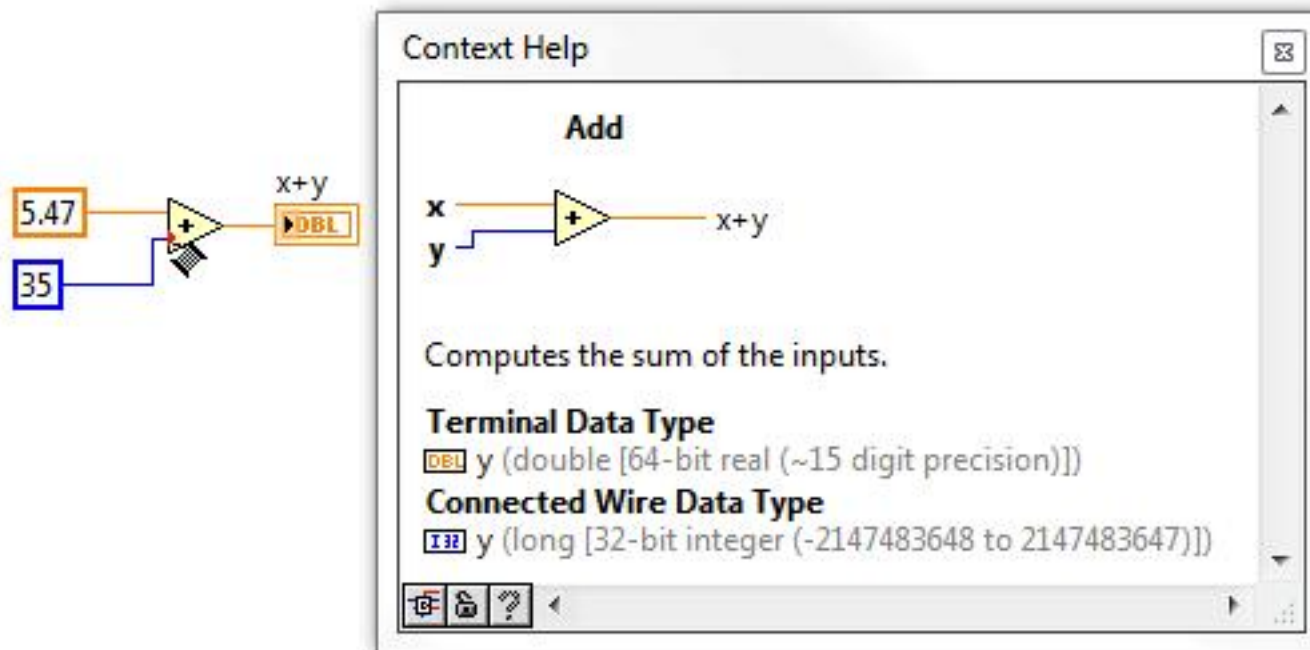


Enables block diagram clean up to be used without rearranging labels



# Idea Exchange Features

## Context Help for Coercion Dots



Quickly identify the reason for the data coercion



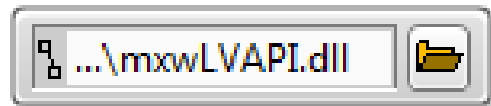
# Idea Exchange Features

## Truncate Long Paths

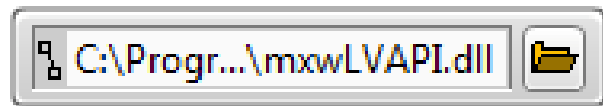
Original Path



File Path Control 1



File Path Control 2

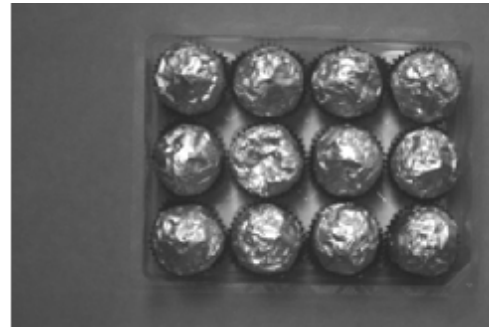


Makes it simple to display long paths using standard conventions

---

# High-Performance Analysis

# 3D Stereo Vision in LabVIEW 2012

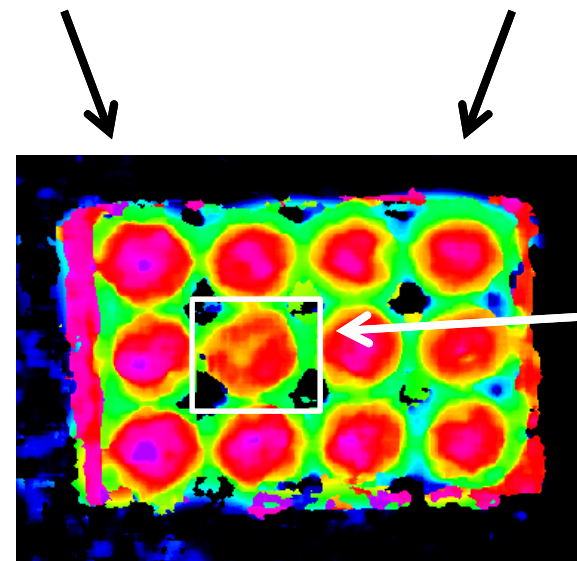


Left Image



Right Image

- New 3D Stereo Vision Features in Vision Development Module
- Calibrate cameras to analyze left and right images
- Generate depth and disparity maps



Defective Chocolate

Combined Image for Depth Information

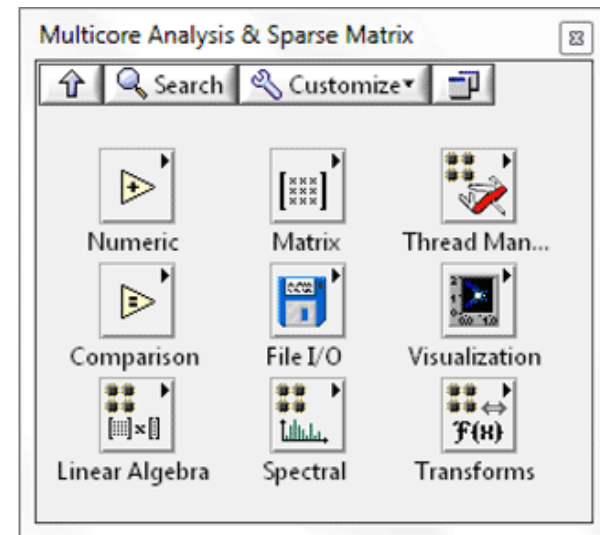
Demonstration

# LabVIEW Multicore Analysis and Sparse Matrix Toolkit

Continued investment in advanced multicore capabilities

Support for sparse matrices  
across a variety of linear  
algebra, matrix manipulation,  
and other functions

Support for both double and  
single-precision data

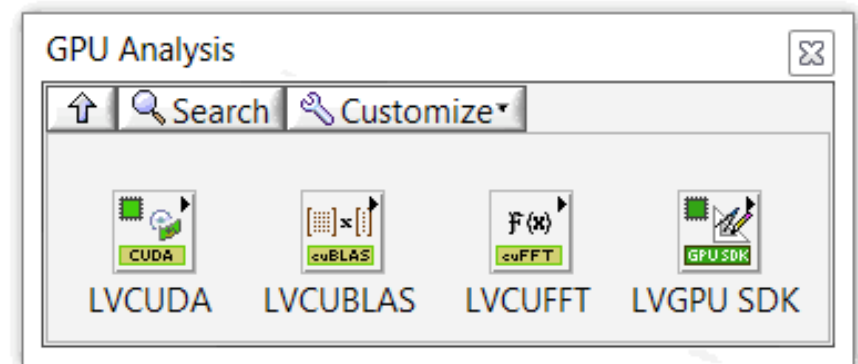


Demonstration

# LabVIEW GPU Analysis Toolkit

Support for NVIDIA® CUDA™ GPUs

- Communicate with NVIDIA® CUDA™ GPUs from LabVIEW applications
- Quickly prototype GPU algorithms using cuBLAS and cuFFT functions wrapped in LabVIEW
- Access documentation on calling custom GPU code from LabVIEW
- Select GPU devices and manage resources using CUDA Runtime and Driver APIs



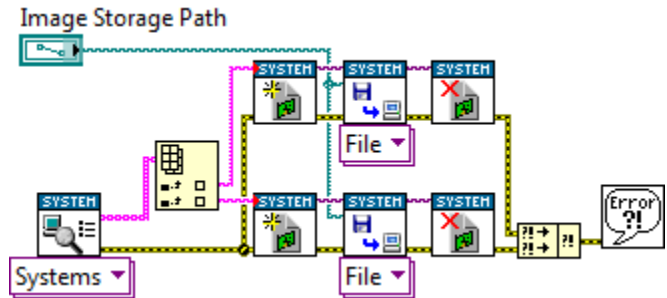
---

# Real-Time and FPGA

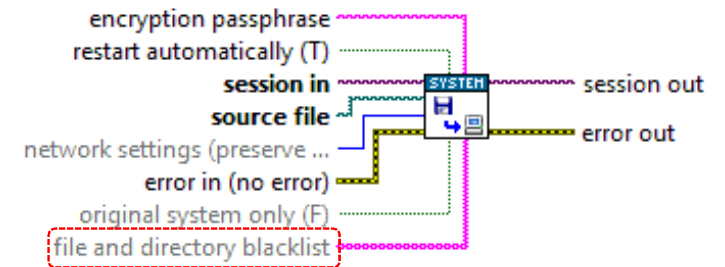
# Real-Time Image Deployment Improvements

- Parallel image deployment to targets
- 30% faster image retrieval and deployment
- File and directory blacklist option
- Improved and expanded web configuration

## Parallel Image Deployment



## File & Directory Blacklisting



**CUSTED-PC : System Settings**

Hostname	CustEd-PC
DNS Name	CustEd-PC
Vendor	National Instruments
Model	NI PXI-8108 Embedded Controller
Serial Number	Not Applicable
Firmware Revision	2.0.0
Operating System	Microsoft Windows 7 Enterprise
Status	Present
System Start Time	7/11/2012 10:52:04 AM
Description	

**CUSTED-PC : System Resources**

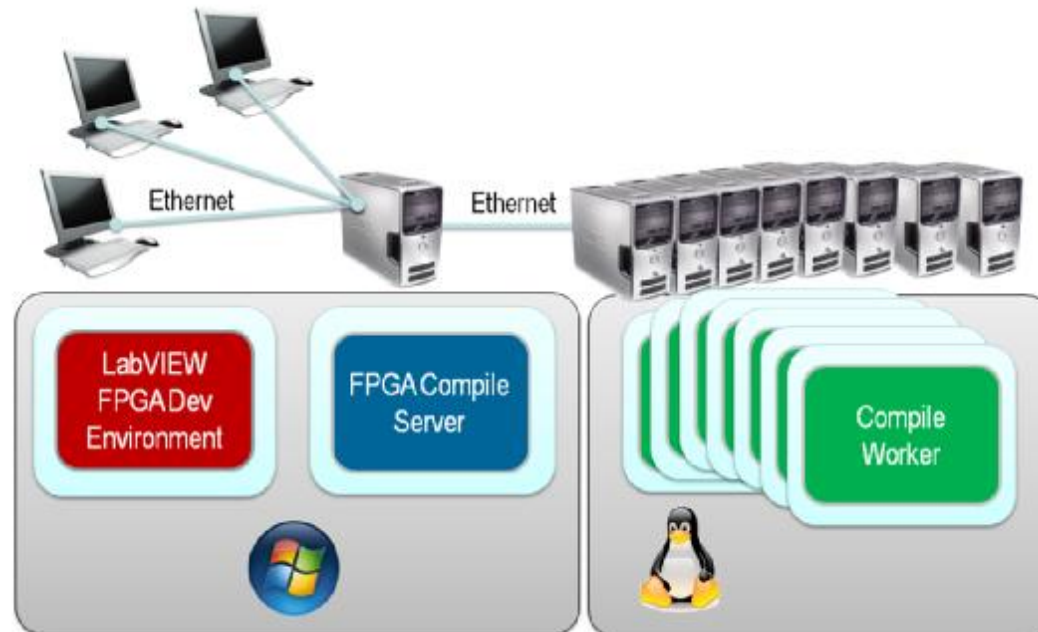
Total Physical Memory	987 MB
Free Physical Memory	212 MB
Total Virtual Memory	1.96 GB
Free Virtual Memory	453 MB
Primary Disk Capacity	71.7 GB
Primary Disk Free Space	13.1 GB

**CUSTED-PC : Device List**

Device	Name	IP Address	Model	Serial Number	State	Comment
CDAC		10.31.8.83	NI cDAQ-9188	01590730	Running	
NI-01829876-016A8658		10.31.8.80	1802-9024	016A8658	Running	
KPAZ05-PC		10.32.4.126	Latitude E5520	785W651	Running	
Gui800-PC		10.31.8.81	NI PXI-8108 Embedded Controller	Not Applicable	Running	
NI-9234-2F113304		10.31.8.100	PXI-8204	2F113304	Running	

# LabVIEW 2012 FPGA Linux Compile Worker

- Approximately 30% faster compilations with Linux OS
- Support across all FPGA compilation options
  - Remote Machine Compilation
  - LabVIEW FPGA Compile Farm Toolkit
  - LabVIEW FPGA Compile Cloud Service

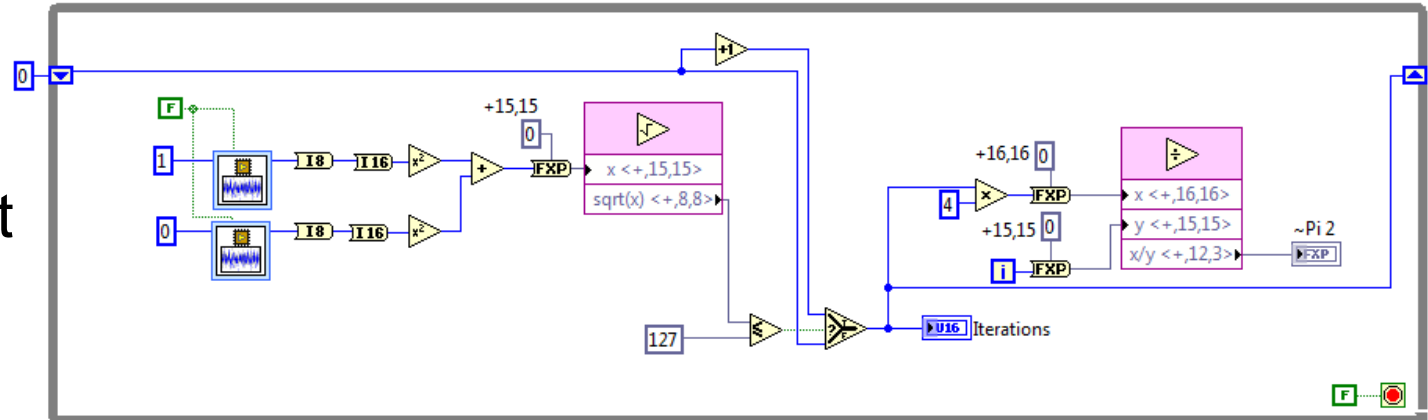




# LabVIEW FPGA Floating Point Data Type Support

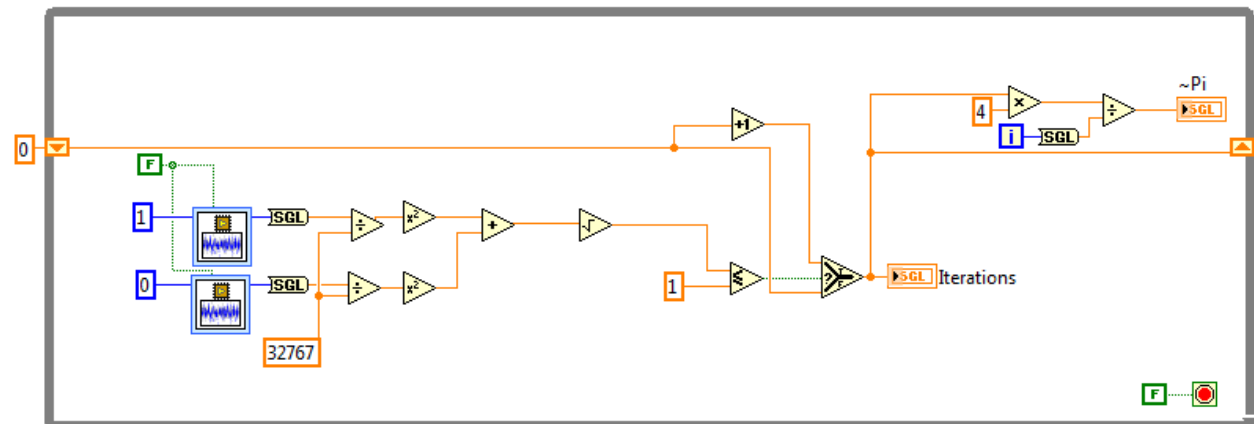
Monte Carlo Algorithm for Approximating Pi

Fixed-Point



Monte Carlo Algorithm for Approximating Pi

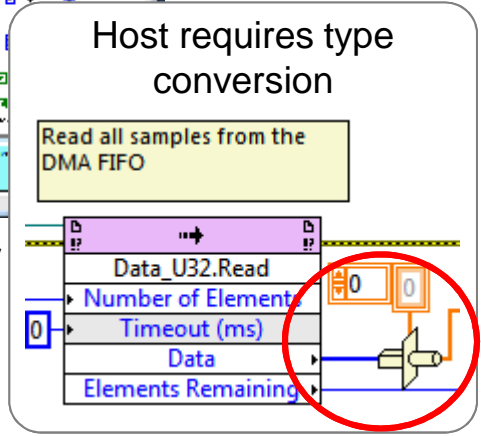
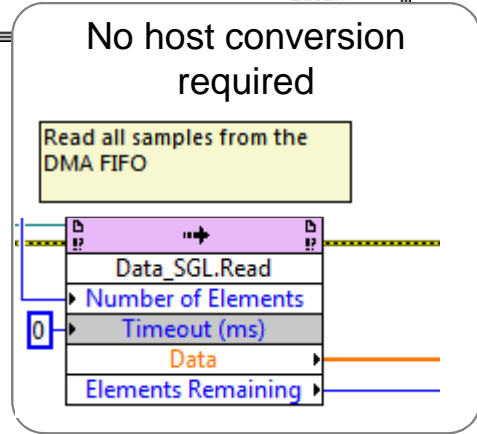
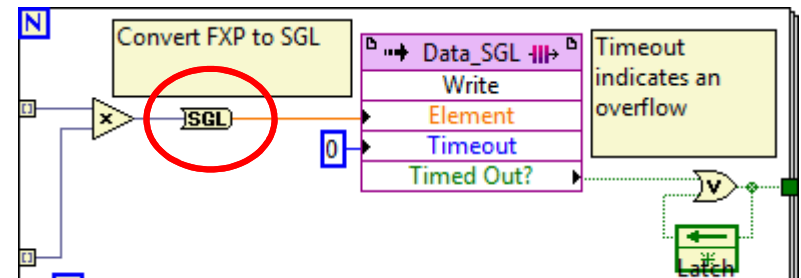
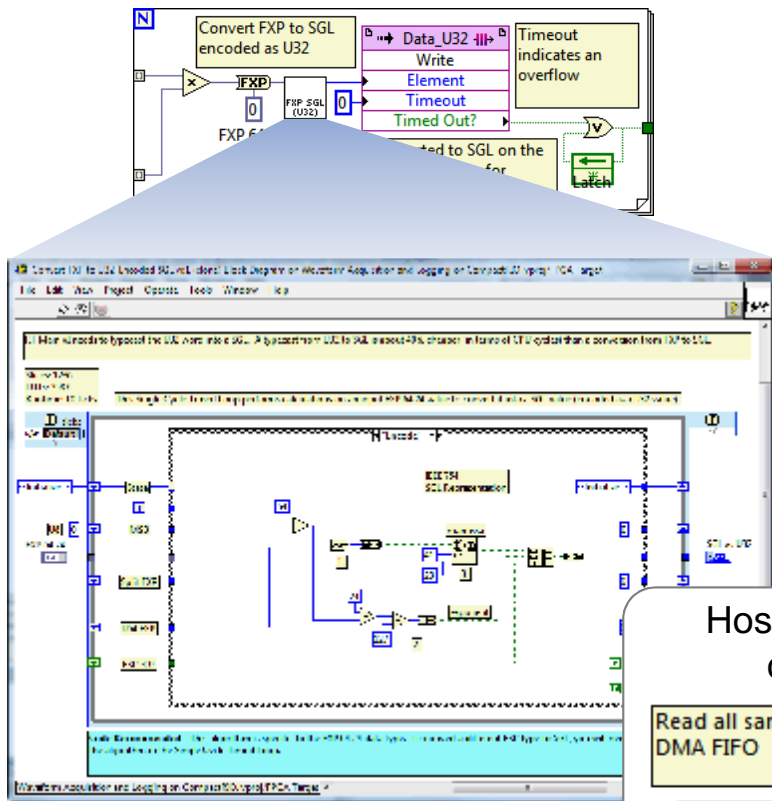
Floating Point  
New in 2012



# LabVIEW FPGA Floating Point Data Type Support

Sending Fixed-Point Data to Host as Single Precision Floating-Point

The same conversion in LabVIEW FPGA 2012

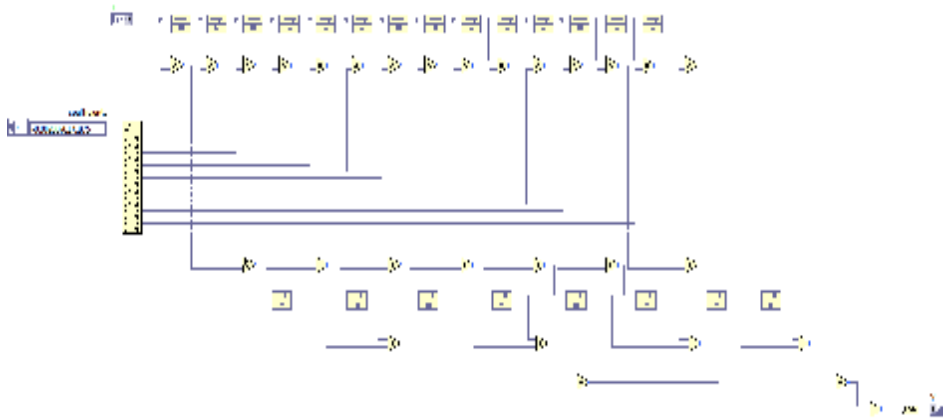


# LabVIEW FPGA IP Builder

*Generate optimized FPGA IP from high-level LabVIEW algorithms*

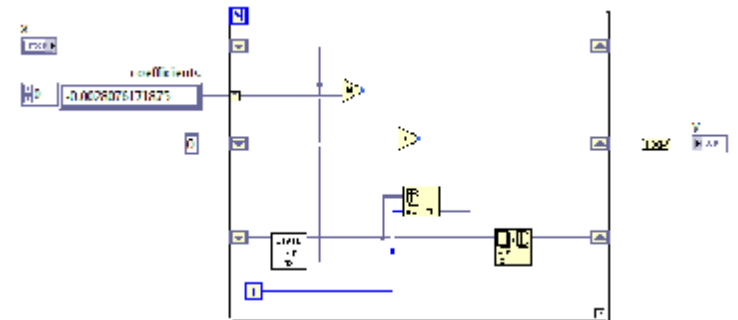
- Rapidly develop high performance algorithms for FPGAs
- Quickly explore design tradeoffs using directives
- Reuse IP to meet new design requirements

## LabVIEW FPGA VI



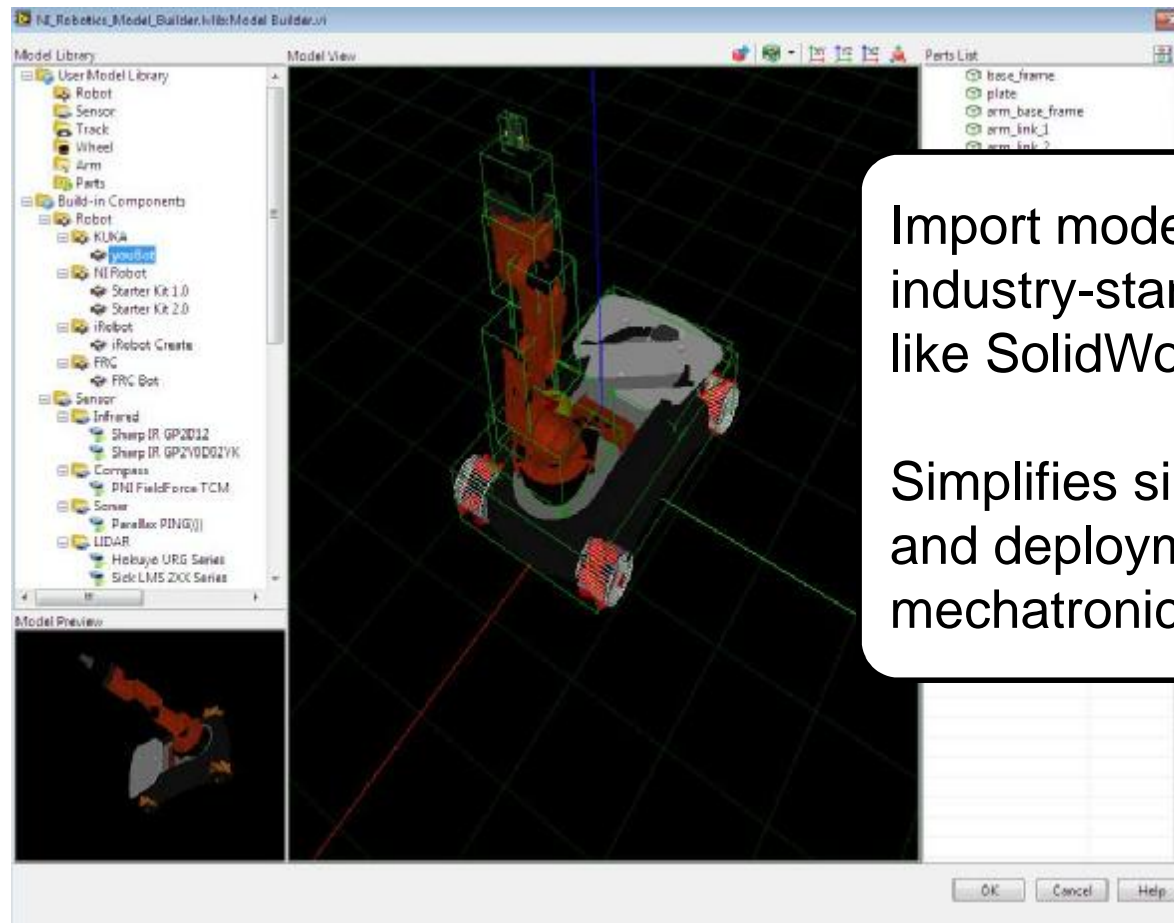
*Manual optimization required*

## LabVIEW FPGA IP Builder VI



*Optimization using high-level synthesis*

# Compatibility with industry-standard modeling environments for system simulation



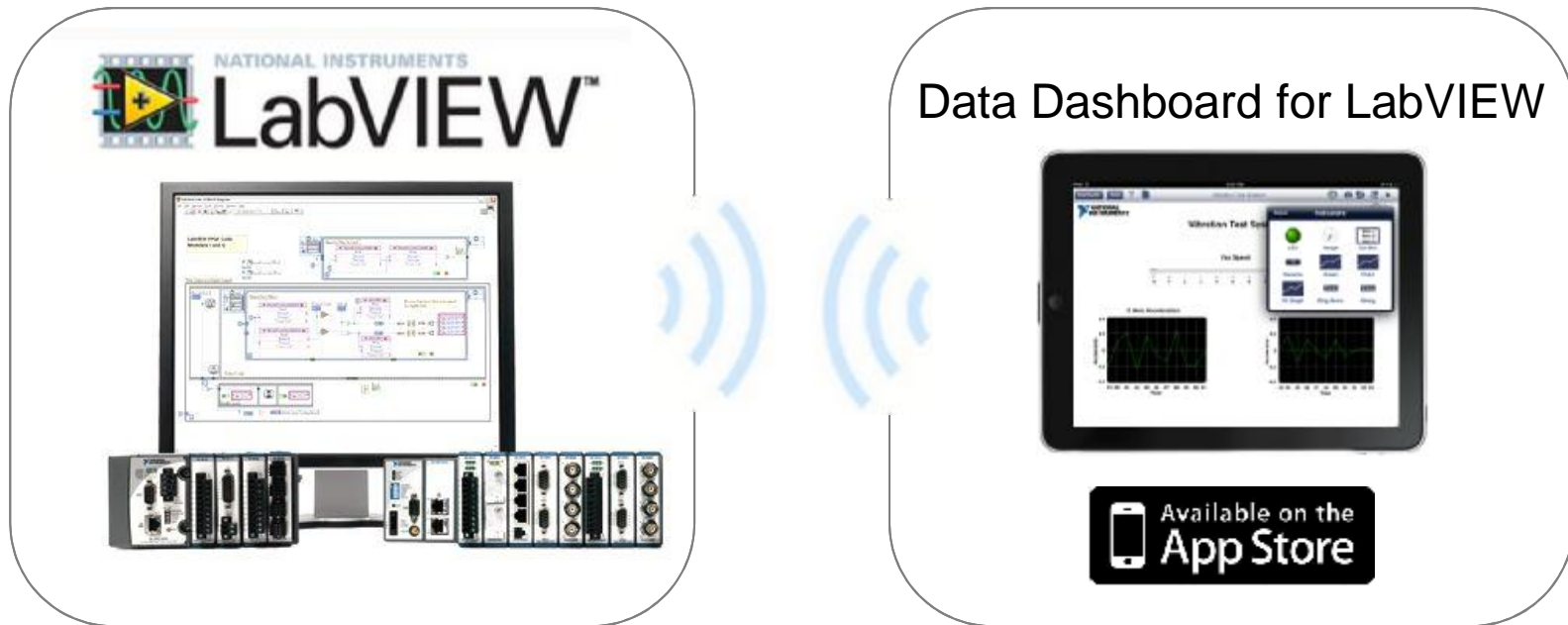
Import models from industry-standard tools like SolidWorks

Simplifies simulation and deployment of mechatronics systems

---

# Cloud and Mobile

# Mobile Applications to Control and Visualize Your Data



Control and visualize data from  
LabVIEW systems on an **iPad**

Demonstration

# Summary of New Features in the Enhanced Data Dashboard for LabVIEW App (Coming in September)

- Create custom layouts (place dashboard elements freely)
- Add controls as well as indicators
- Share dashboards via email or the NI Cloud
- Connect to data using secure or non-secure web services or network-published shared variables
- Customize the look and feel of individual dashboard elements
- Define background colors or use an image
- Create many dashboards and make single dashboards multi-page
- Access data from the NI Technical Data Cloud

---

# Advanced Features



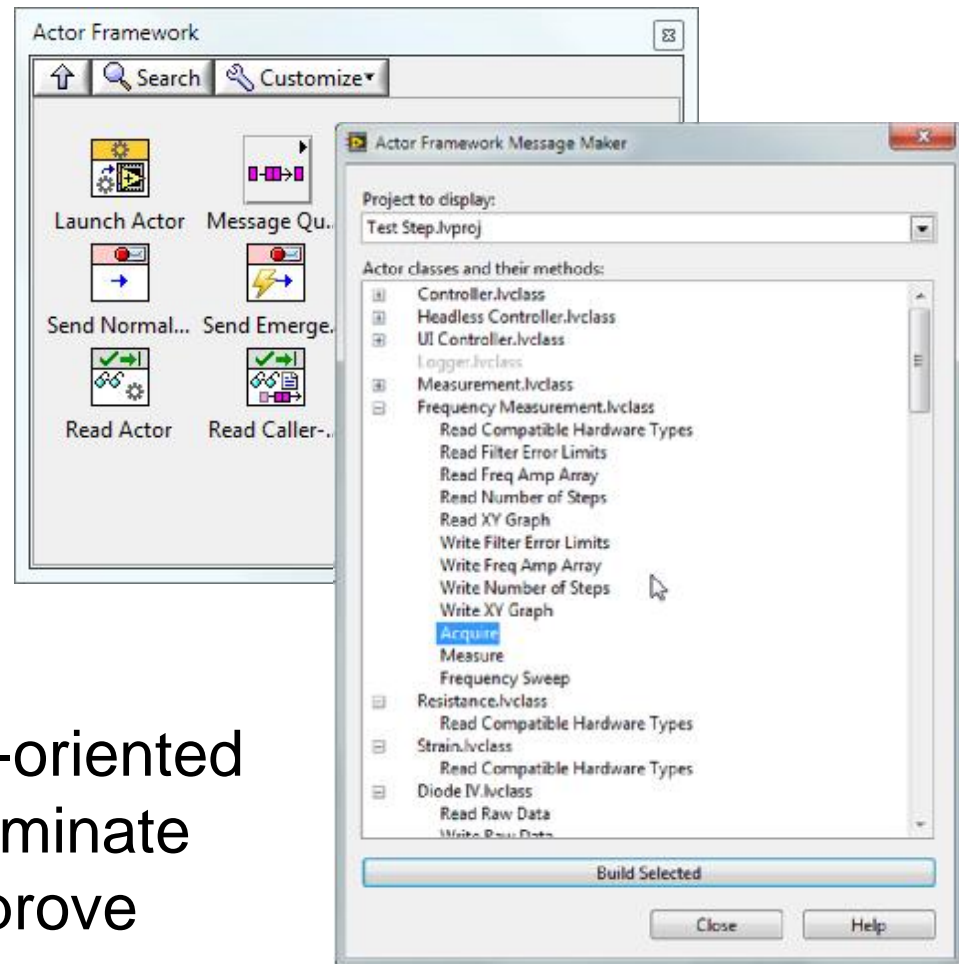
# New Framework for Multi-Process Systems

The Actor Framework designed for large multi-process applications

Includes utility for generating messages and invoking actor methods

For more information:  
[ni.com/actorframework](http://ni.com/actorframework)

Makes heavy use of object-oriented programming in order to eliminate duplication of code and improve system scalability

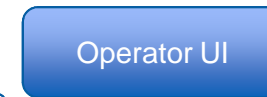


# New Framework for Multi-Process Systems

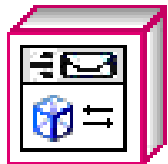
## Actors



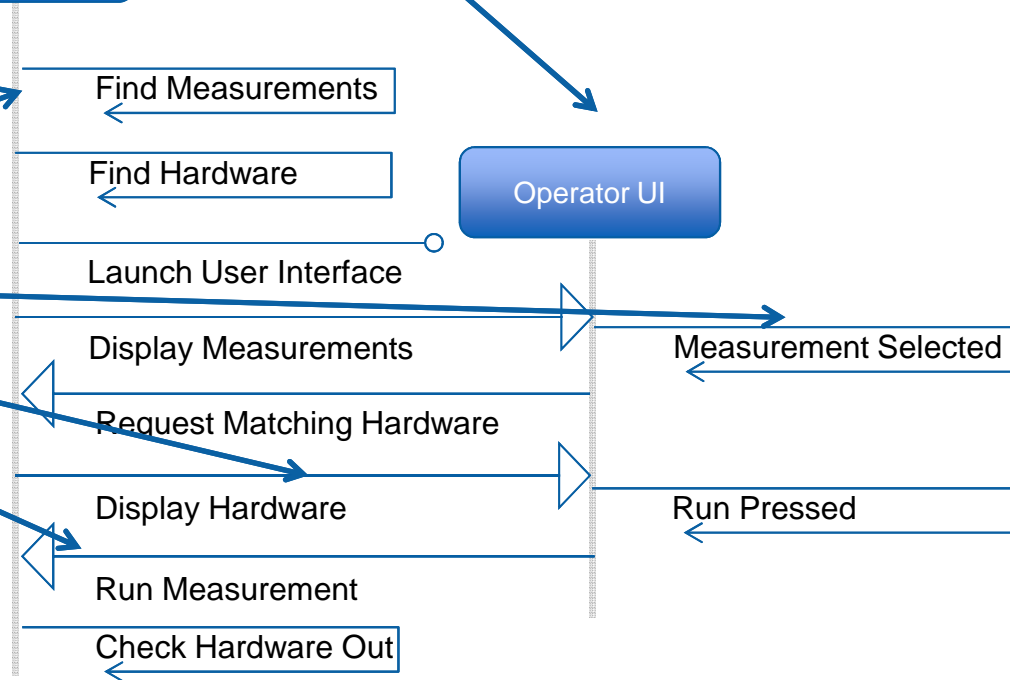
Children of the Actor Class are queued message handlers



## Messages



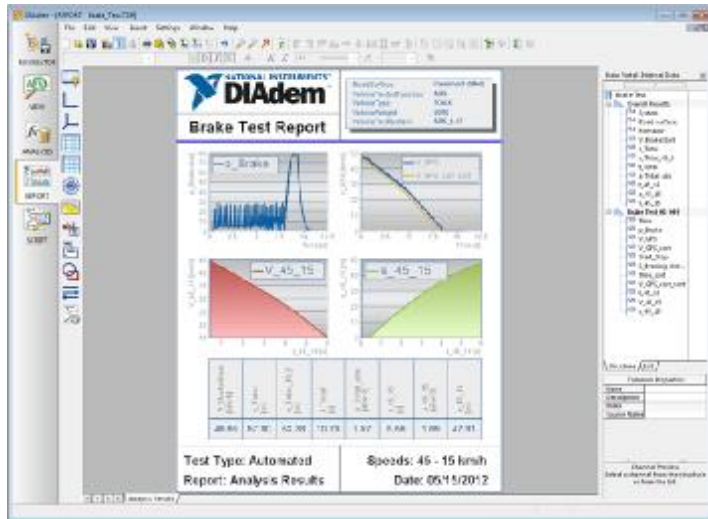
Children of the Message Class define the information that can be passed between actors



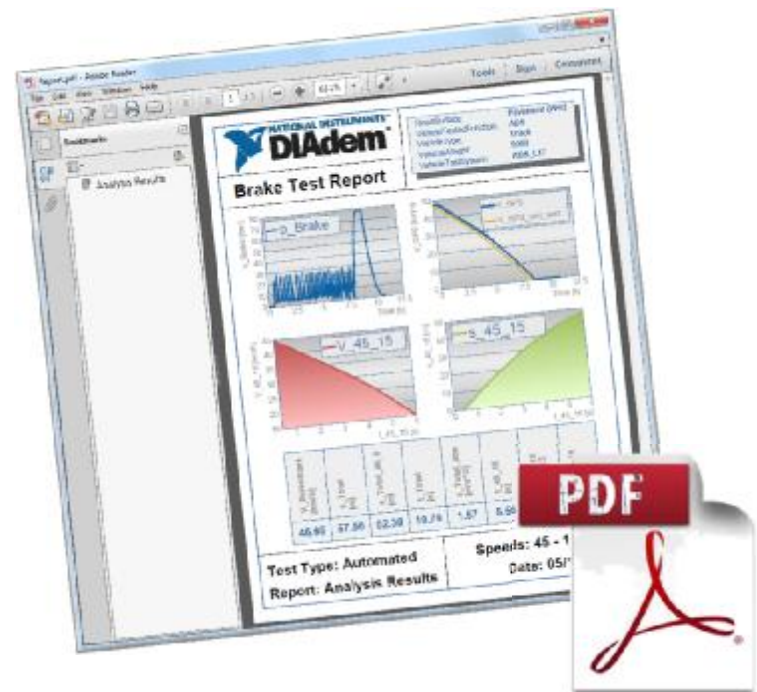
For more information:  
[ni.com/actorframework](http://ni.com/actorframework)

# Enhanced data management tools and technologies

- TDMS API available on Mac and Linux
- Improved reporting capabilities of DIAdem 2012



NI DIAdem 2012



New API makes creating detailed and highly-customized reports simple and fast

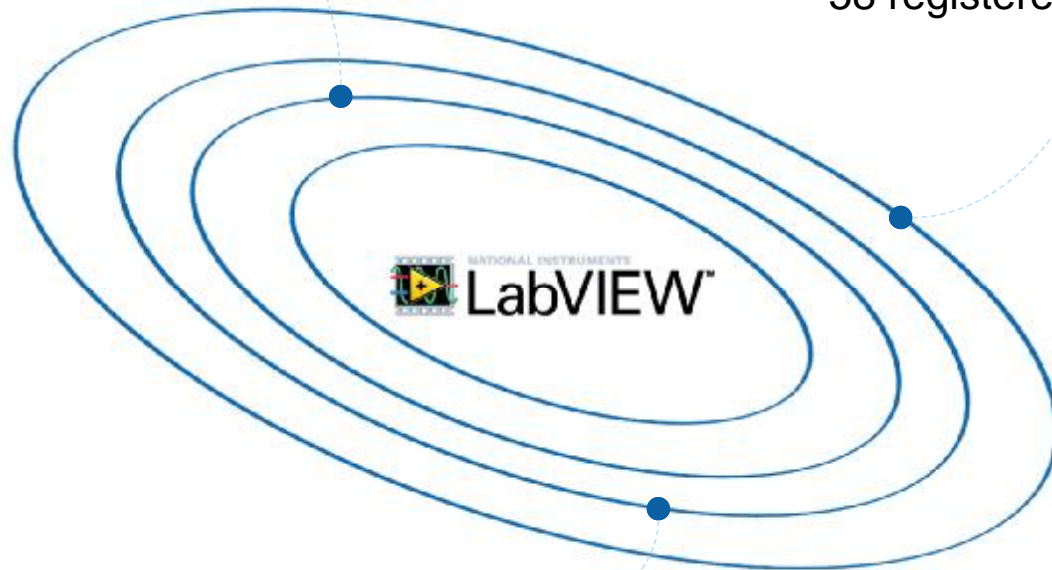
# LabVIEW Ecosystem Growth

## LabVIEW Tools Network

1,000,000 add-ons downloaded  
26 Certified Add-Ons  
Over 100 add-ons

## User Community

Over 9,000 certified users  
Over 700 alliance partners  
58 registered user groups



## Connectivity

Over 9,500 instrument drivers  
Any bus, any protocol, any platform  
Integration with third-party languages

# Overview of New Features in 2012

Start your application from recommended building blocks using **Templates and Sample Projects**

Access extensive training on LabVIEW programming concepts anytime on ni.com with **Self-Paced Online Training**

Innovate with confidence thanks to continued investment in **stability** and reliability

Control and visualize data from LabVIEW systems on an **iPad**

High-Performance **Analysis and Image Processing Capabilities**, including connectivity with NVIDIA (R) CUDA (TM) GPUs

New interactive **control design & analysis tools** with tight integration to simulation & real-time implementation

Simplify and speed development of **FPGA** applications with new optimization and productivity improvements

Import industry-standard models to design and **simulate complex control systems and robots**

Use **twelve productivity enhancements** powered by the developer community on the Idea Exchange

Simplify **report generation** with DIAdem 2012 and TDMS support for Mac and Linux

Improved **deployment** and imaging capabilities for Real-Time applications

Take advantage of a growing **ecosystem** of over 9,000 certified users and native integration with the LabVIEW Tools Network



NATIONAL INSTRUMENTS

# LabVIEW™ 2012

## Accelerates Your Success

By abstracting low-level complexity and integrating all of the tools you need to build any measurement or control system

### Measurement Systems



From sensors to decisions, build your measurement system faster

### Test Systems



Confidently meet the demands of any test system in less time

### RF Test Systems



Test the latest wireless devices faster

### Embedded Systems



Go from design to deployment faster than ever before

[ni.com/labview/whatsnew](http://ni.com/labview/whatsnew)