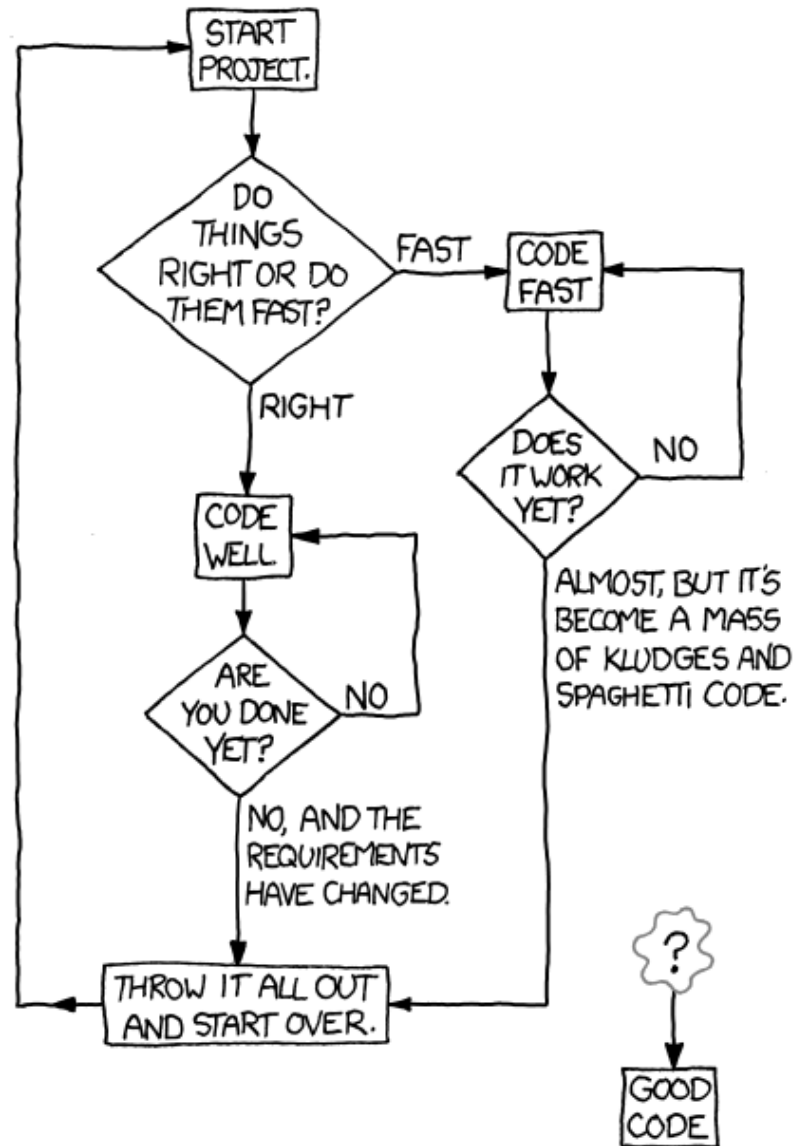
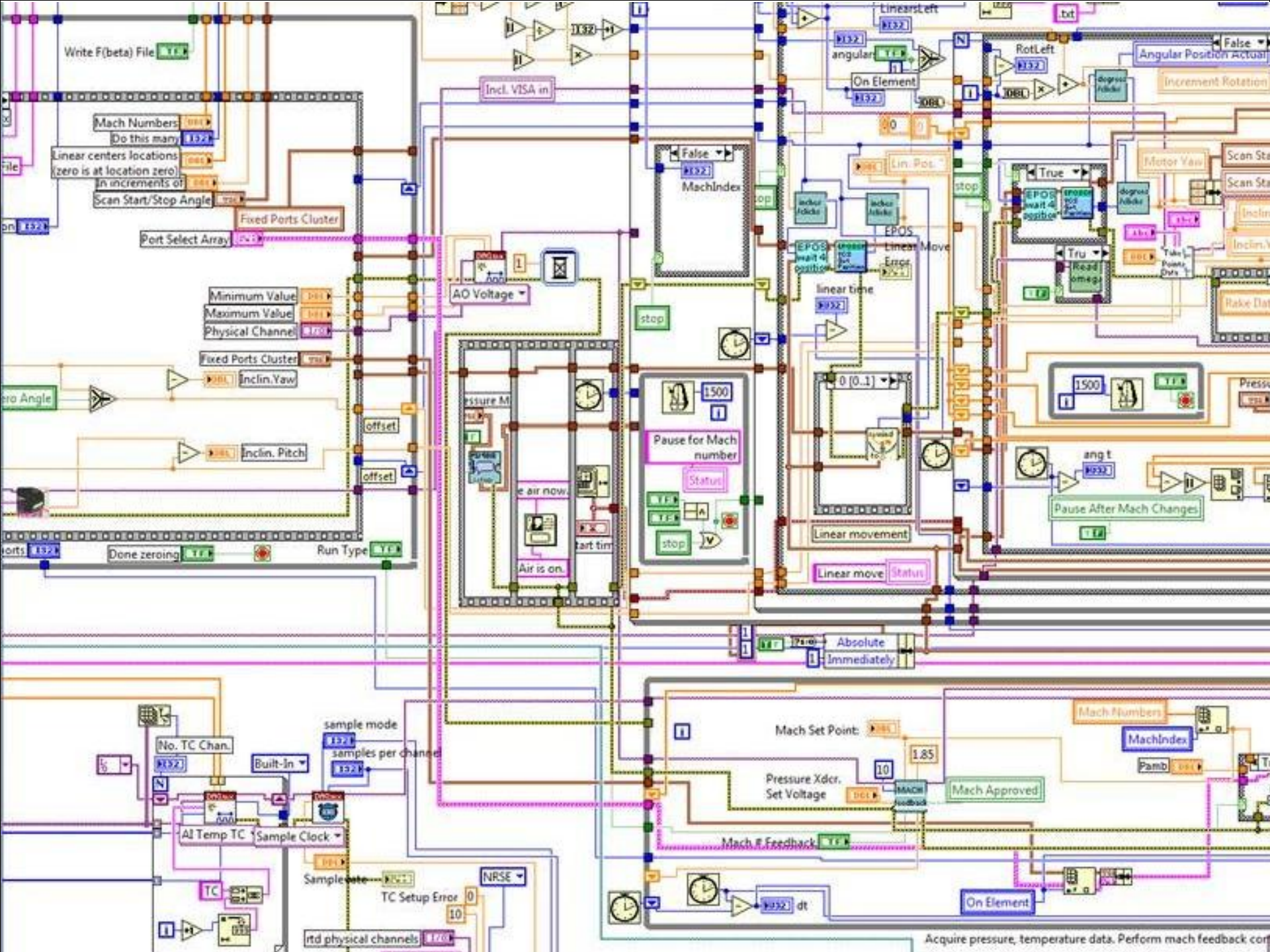


# System Design in the Software Era

# HOW TO WRITE GOOD CODE:



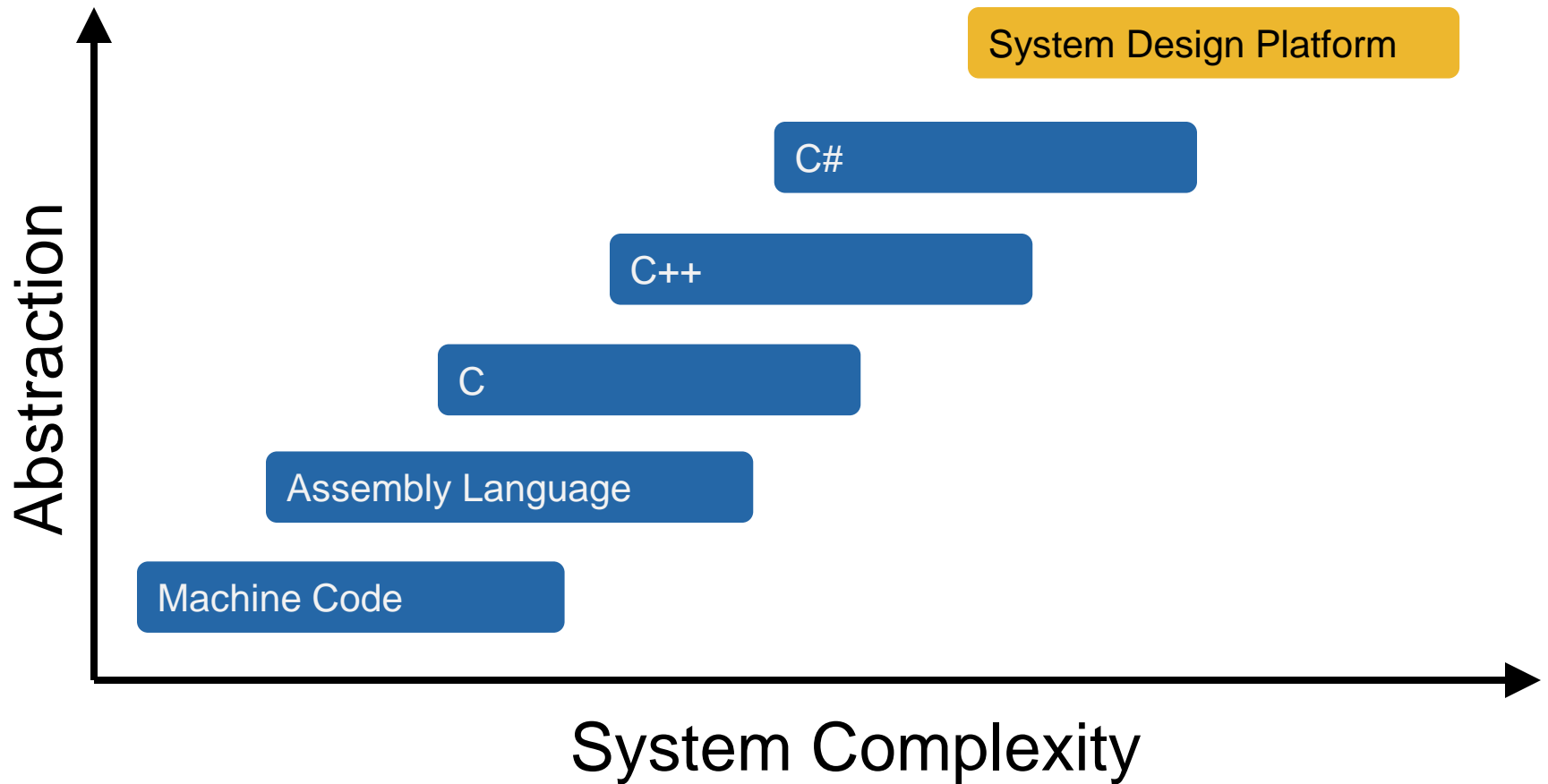


# The Cost of a Software Defect

Development Phase	Cost Ratio
Requirements	1
Design	3-6x
Implementation	10x
Development Testing	15-40x
Acceptance Testing	30-70x
Post Release	40-1000x

Based on an analysis of 63 software development projects at companies including IBM, GTE and TRW

# Scalable Software Abstraction





# Graphical System Design

A Platform-Based Approach for Measurement and Control

Test



Monitor



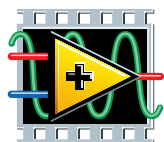
Embedded



Control



Cyber Physical



NATIONAL INSTRUMENTS

# LabVIEW™



Desktops and  
PC-Based DAQ



PXI and Modular  
Instruments



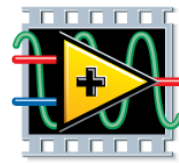
RIO and Custom  
Designs

**GPB**  
IEEE-488

**ETHERNET**

**HI-SPEED**  
CERTIFIED  
**USB**

Open Connectivity  
With Third-Party I/O



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

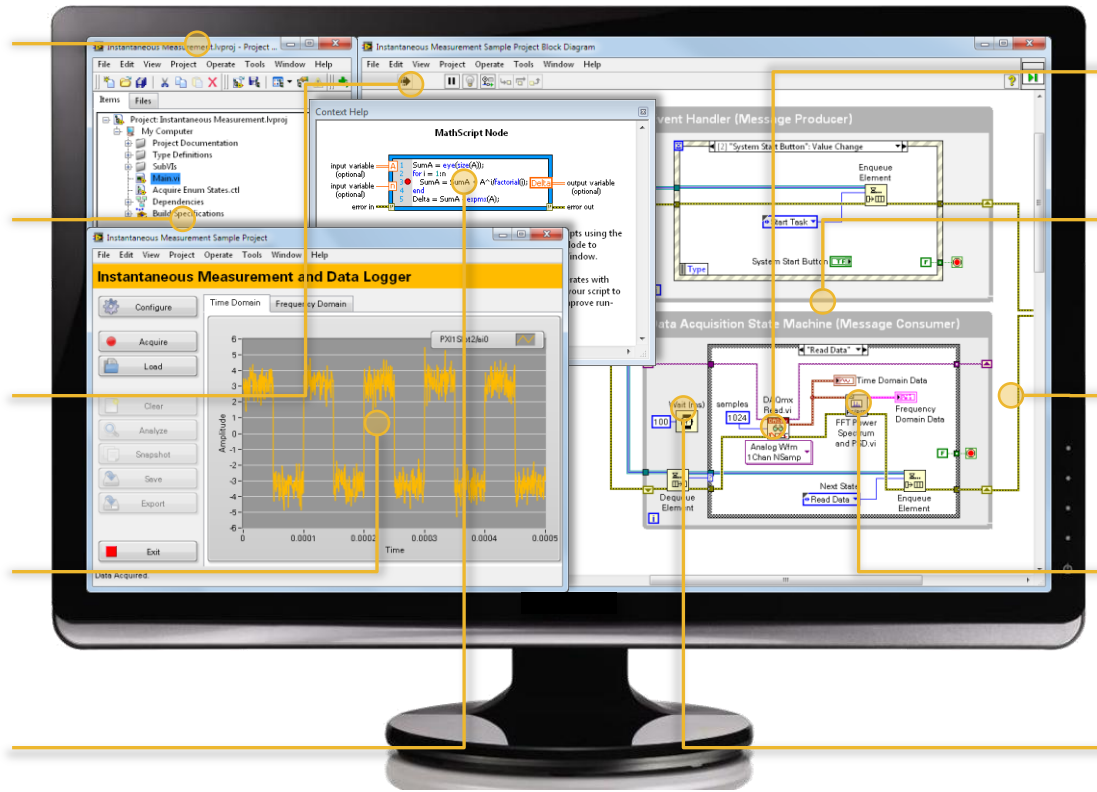
Define and customize the behavior of your system using graphical programming

### 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



NATIONAL INSTRUMENTS

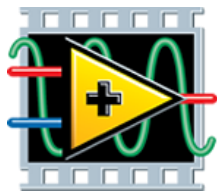
# LabVIEW™ 2012



## Build This. Not That.

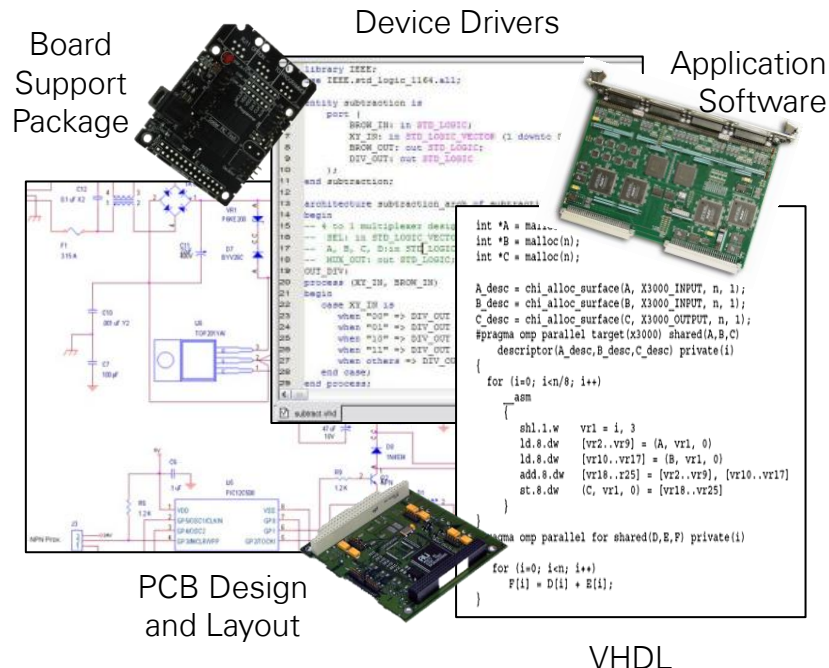
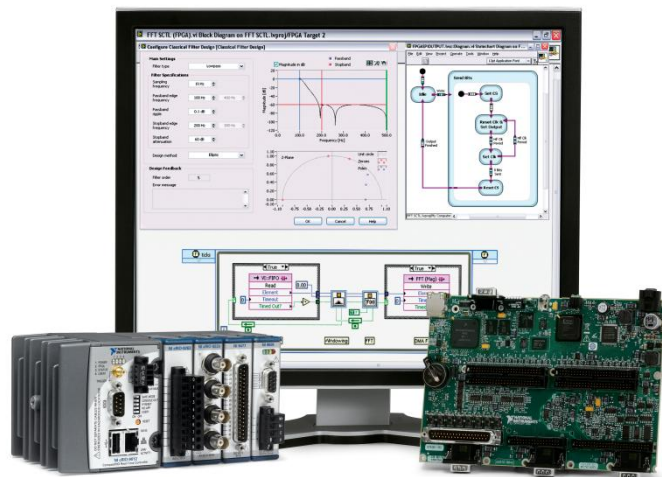
Build a custom and flexible test system  
in less time with LabVIEW 2012





NATIONAL INSTRUMENTS

# LabVIEW™ 2012



## Build This. Not That.

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



High-Volume Production Test



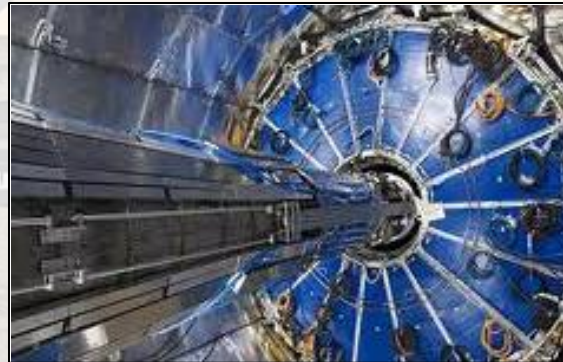
Structural Health Monitoring



Medical Devices



Robotics and Mechatronics



Large Physics Applications



Avionics Applications

# Large System Development

Powered by LabVIEW

# Software Quality Standards

*Company wide certification standard*

## ISO 9000

*Voluntary certification standard for consistent processes*

## CMMI

*Process improvement model sponsored by the National Defense Industrial Association*

*Product specific certification for quality*

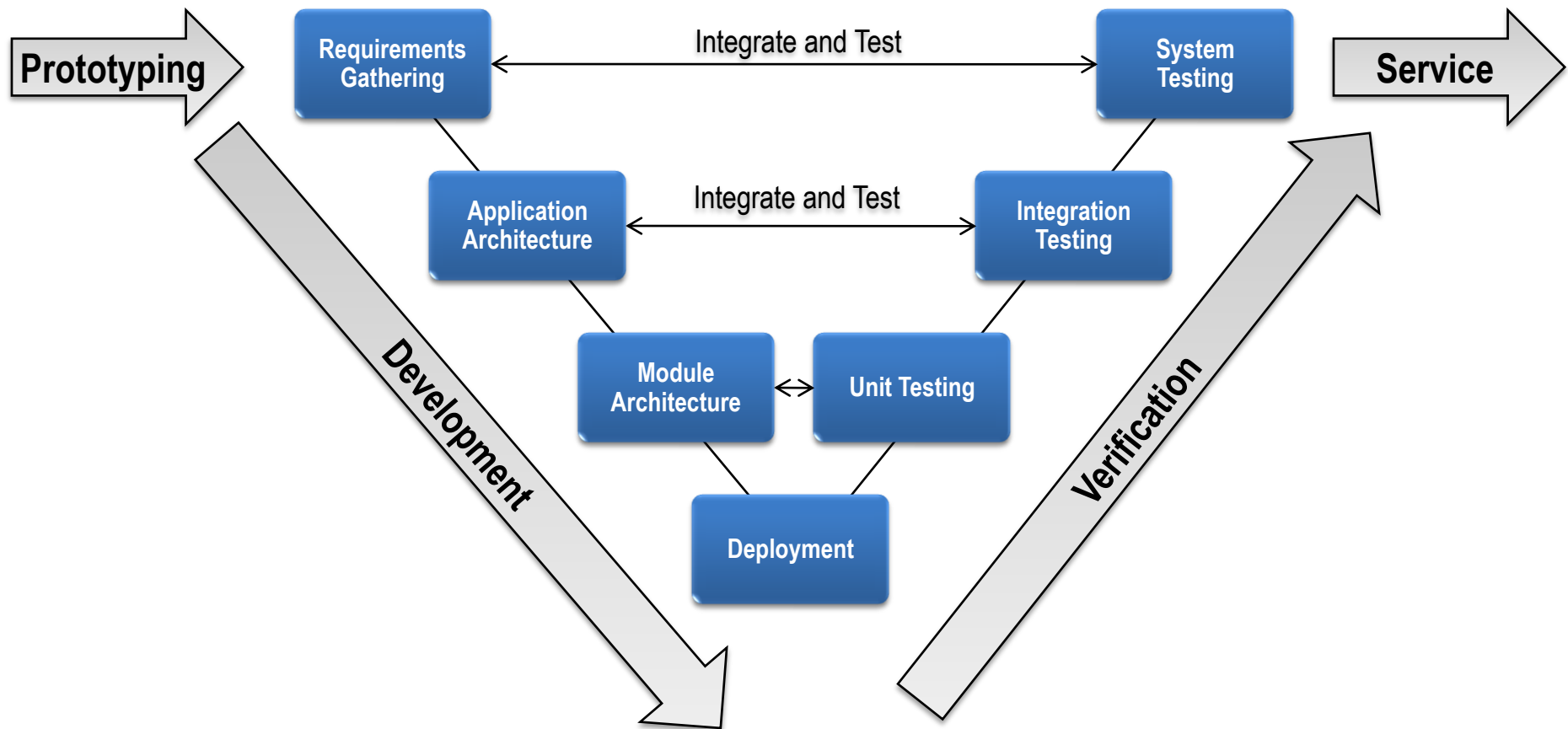
## DO-178C / ED-12B

*FAA standard for avionics software*

## FDA 21 CFR Part 820

*Medical device standard*

# Software Engineering V-Model



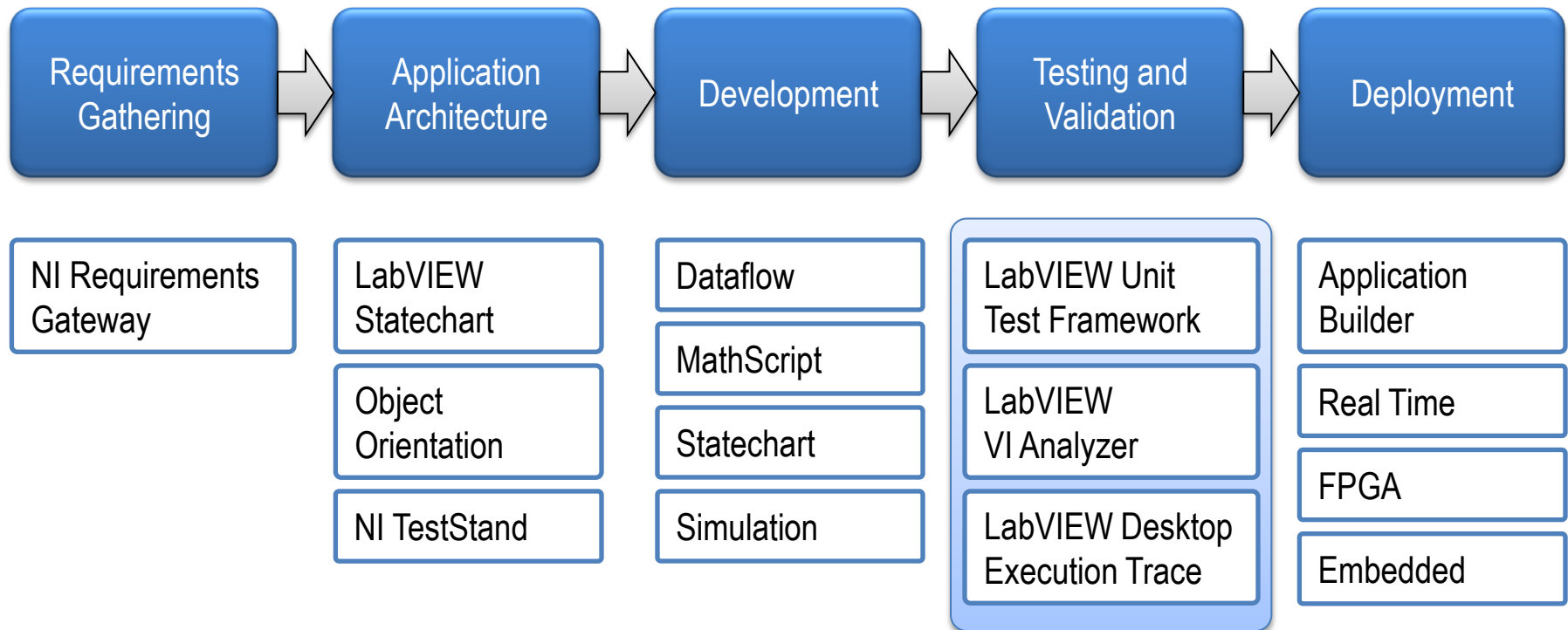
# Examples of Software Engineering Debt

(just *some* of the most common LabVIEW development mistakes)

- ✓ No source code control (or Project)
- ✓ Flat file hierarchy
- ✓ 'Stop' isn't tested regularly
- ✓ Wait until the 'end' of a project to build an application
- ✓ Few specifications / documentation / requirements
- ✓ No 'buddying' or code reviews
- ✓ Poor planning
- ✓ No test plans
- ✓ Poor error handling
- ✓ No consistent style
- ✓ Tight coupling, poor cohesion



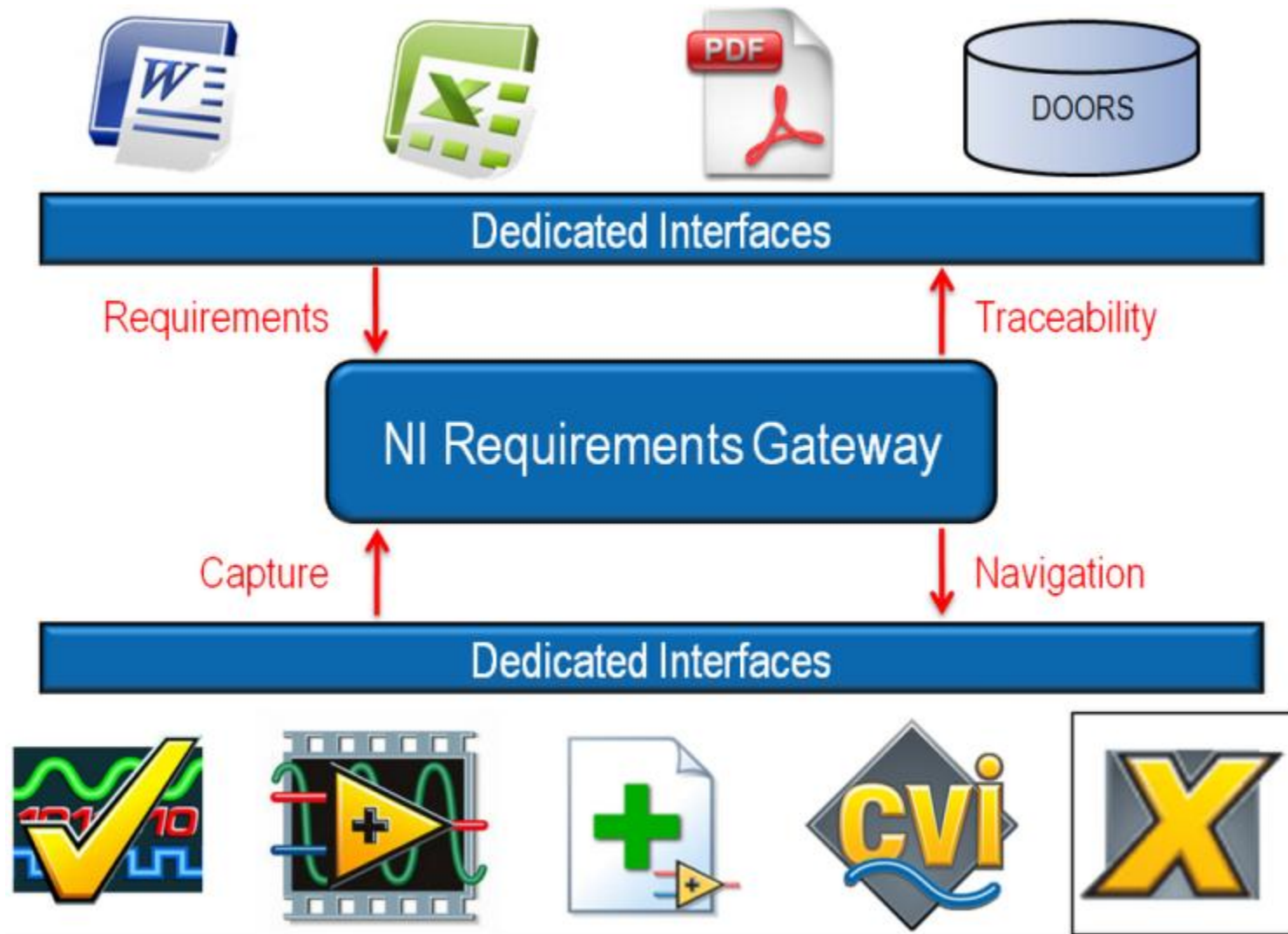
# The Software Engineering Process



## Prove it works.

Improve quality. Reduce risk. Save time.

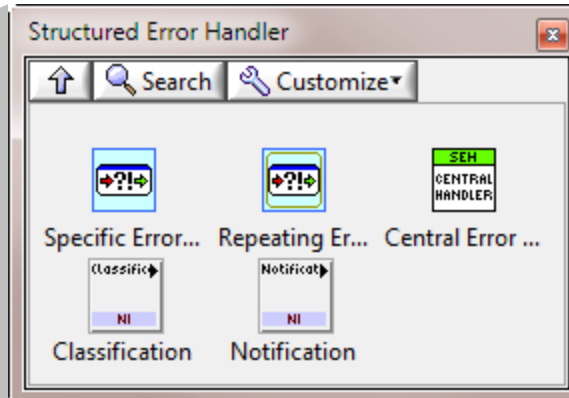
# Requirements Traceability Solution from NI



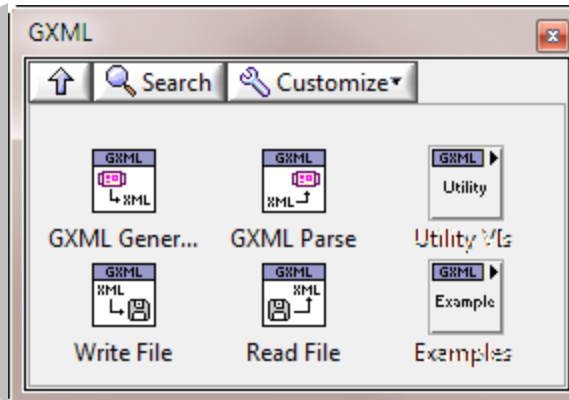
# Enabling Reuse through Design and Tools



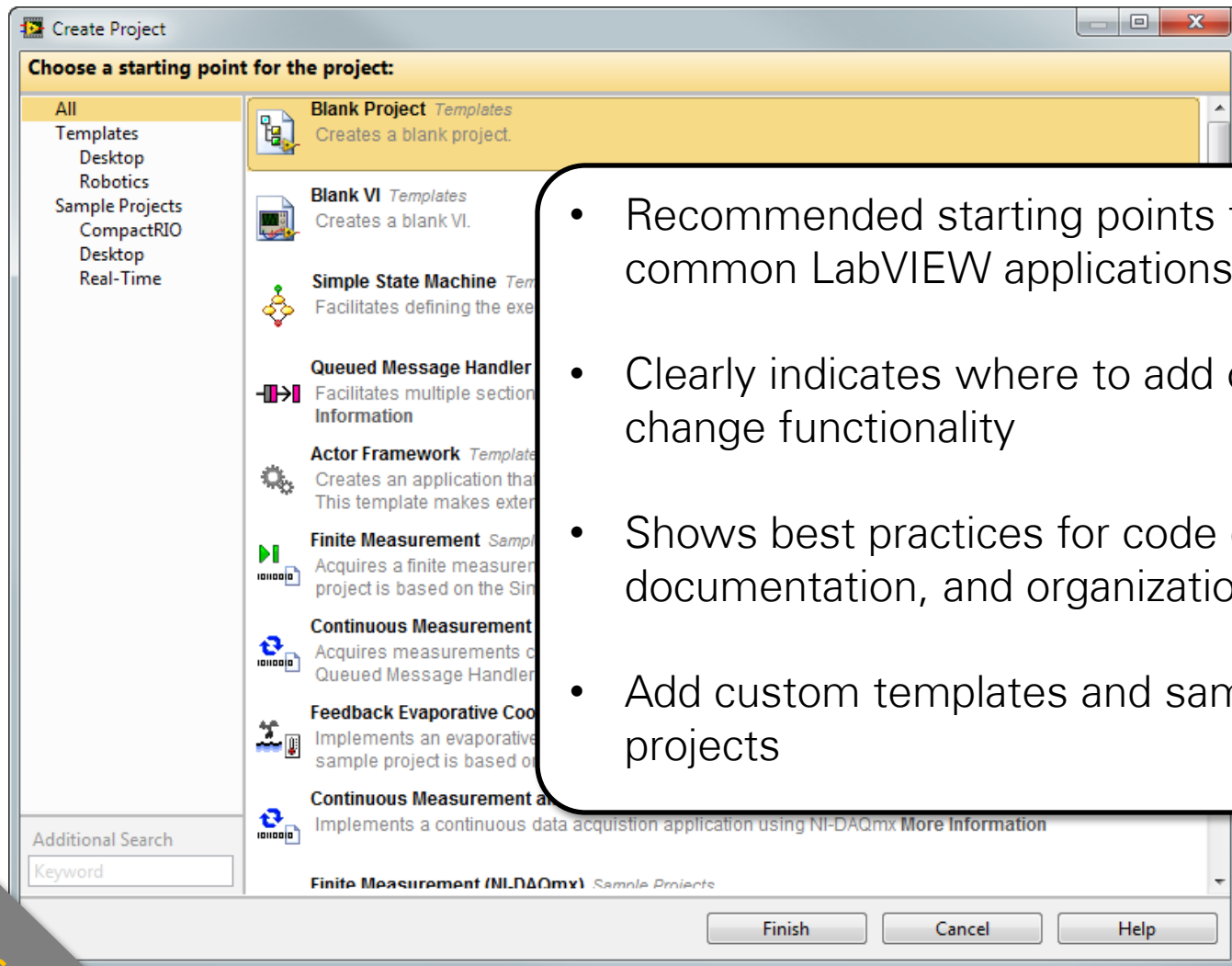
Structured Error Handler



GXML Library



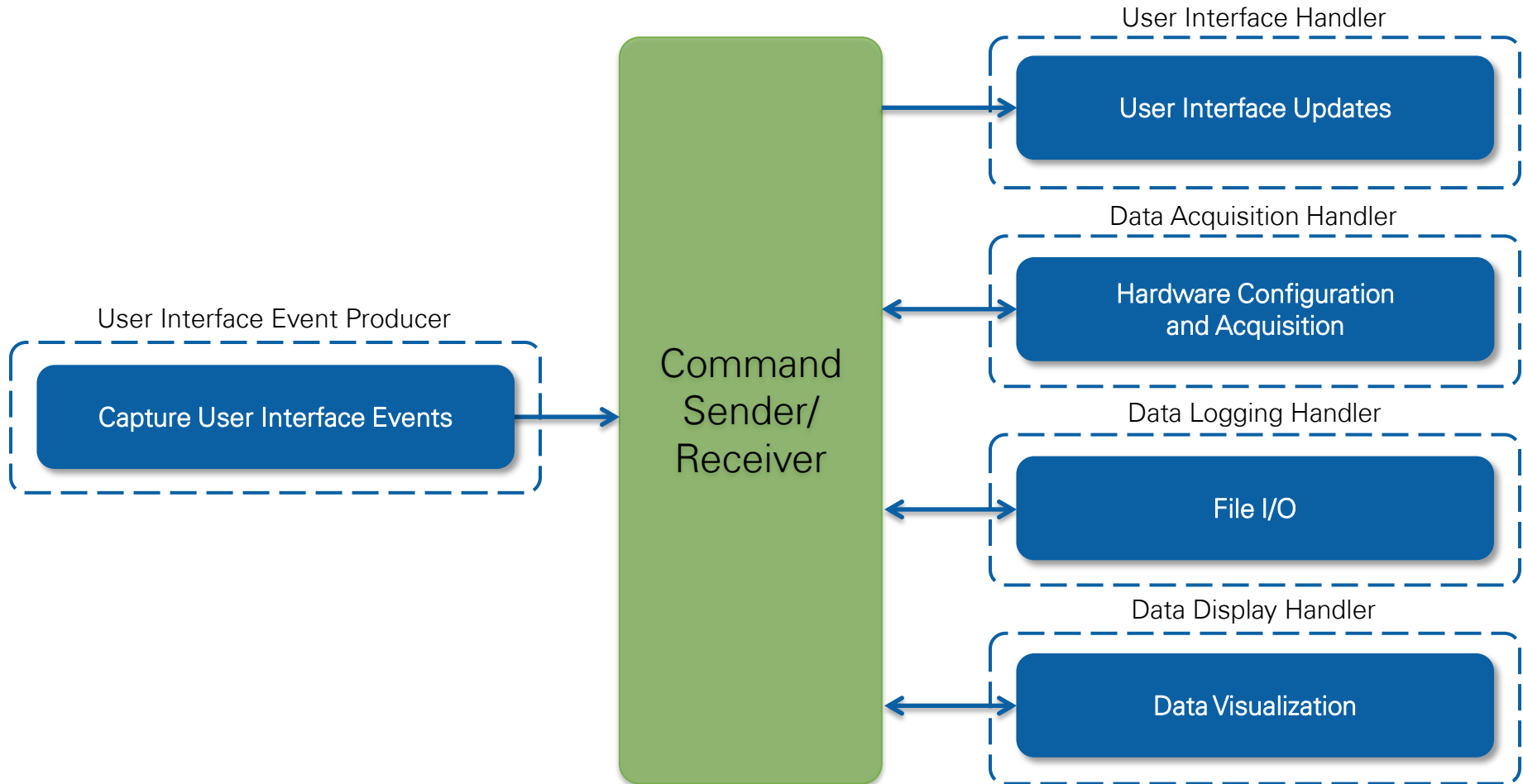
# Introducing Templates and Sample Projects



- 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

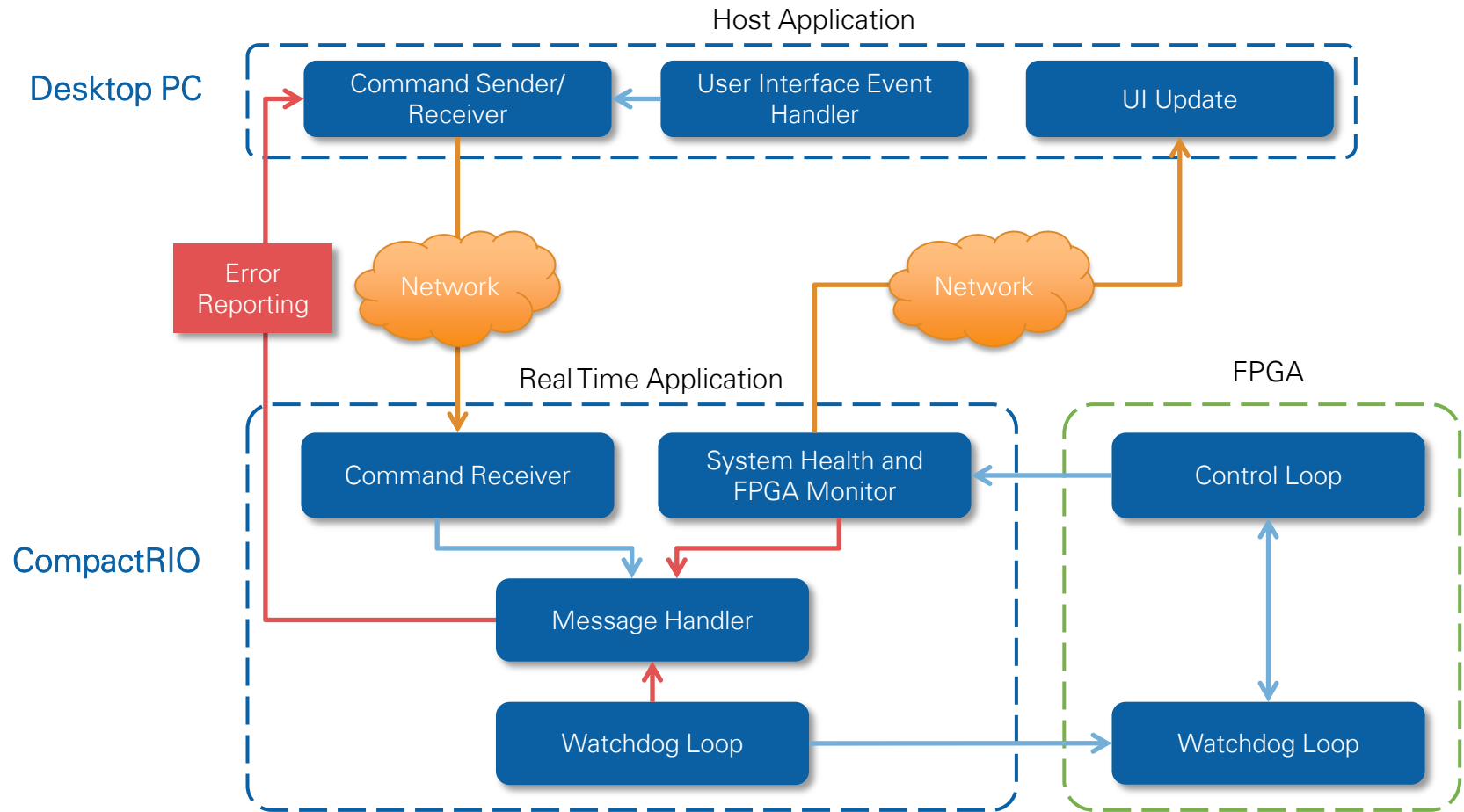
# LabVIEW 2012 Continuous Measurement Architecture



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

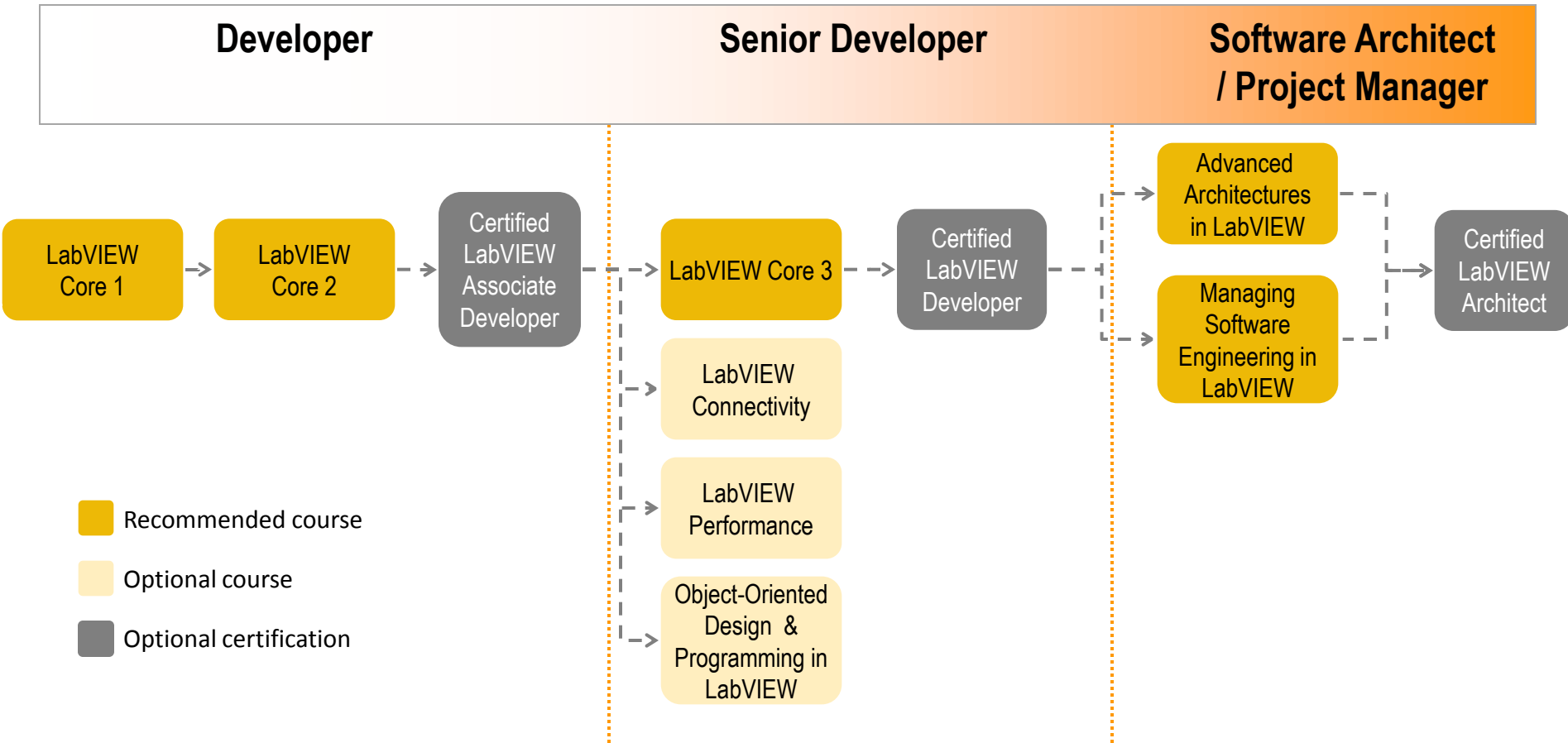


# LabVIEW FPGA Control Sample Project



Provides a recommended starting point using a scalable architecture

# NI LabVIEW Certifications Align with Training



***"Certification is an absolute must for anyone serious about calling himself a LabVIEW expert... At our organization, we require that every LabVIEW developer be on a professional path to become a Certified LabVIEW Architect."***

**- President, JKI Software, Inc.**

# Agenda Slide