

Intégration des outils de tests dans une plateforme de développement

Karine Rouelle

Business Development Manager – Embedded Systems Design and Test

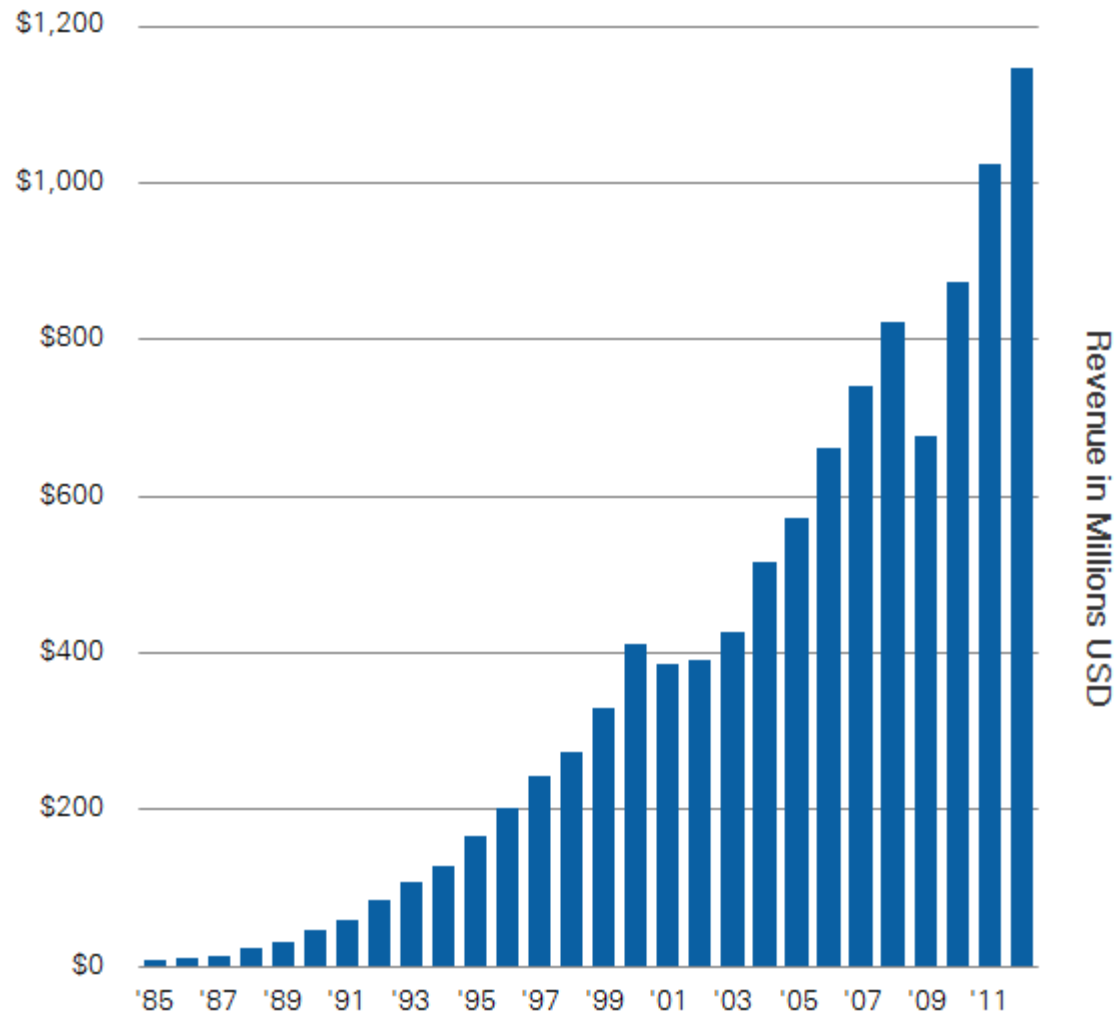
National Instruments France

Agenda

- NI Solutions
- IBM Rational
- Embedded systems design challenges
- National Instruments and IBM rational plug-in
- Conclusion

Long-Term Track Record of Growth

- **Revenue:** 1,14 M\$ in 2012
- **Global Operations:** Approximately 7,100 employees; operations in more than 40 countries
- **Broad customer base:** More than 35,000 companies served annually
- **Diversity:** No industry >15% of revenue
- **Culture:** Ranked among top 25 companies to work for worldwide by the Great Places to Work Institute
- **Strong Cash Position:** Cash and short-term investments of \$327M at March 31, 2013



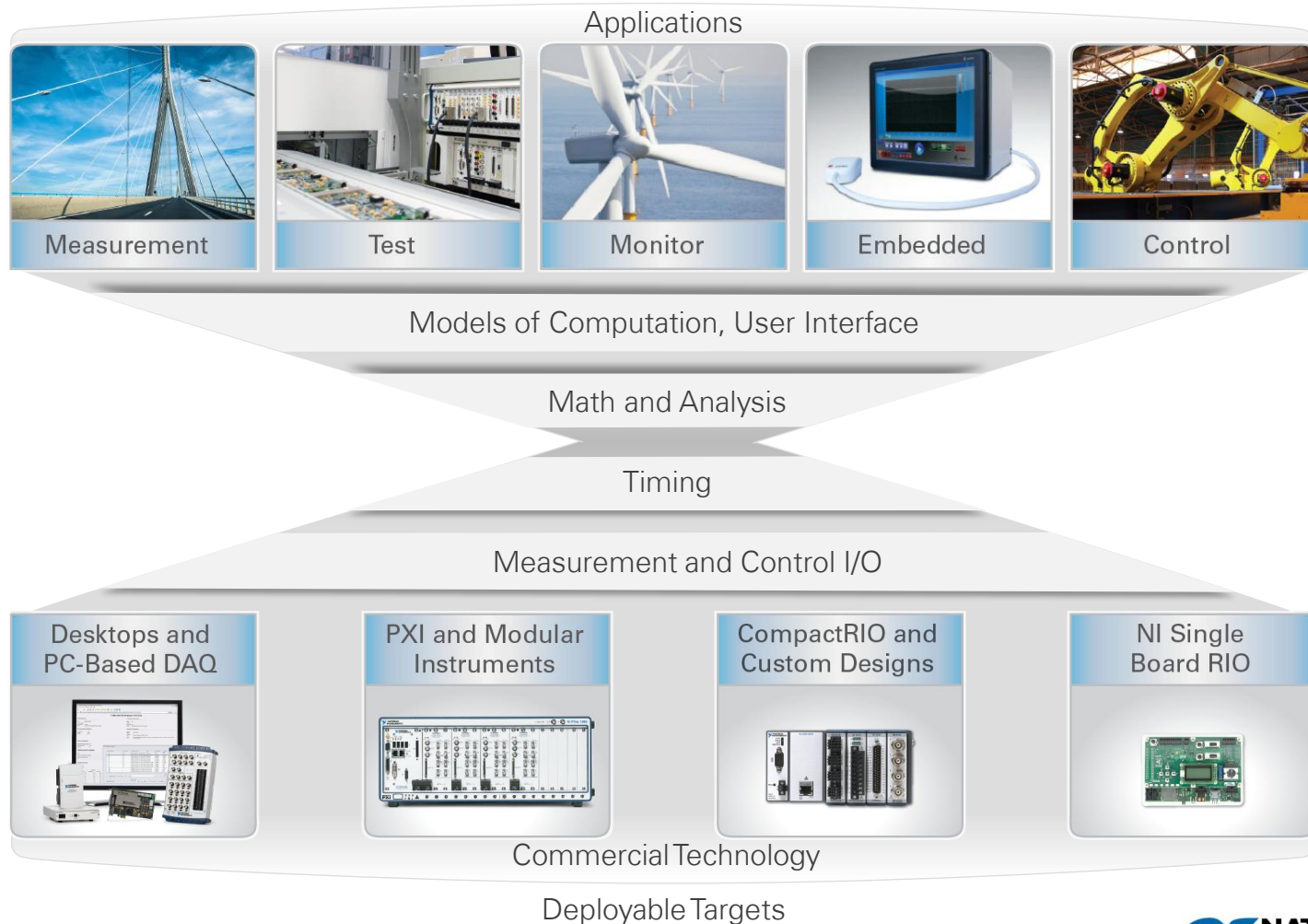
Committed to Your Success

- Global team of technical sales engineers available direct in more than 40 countries
- Systems engineers to assist with reference and application designs
- Local technical support worldwide
- World-class NI services
- 700+ NI Alliance Partners worldwide



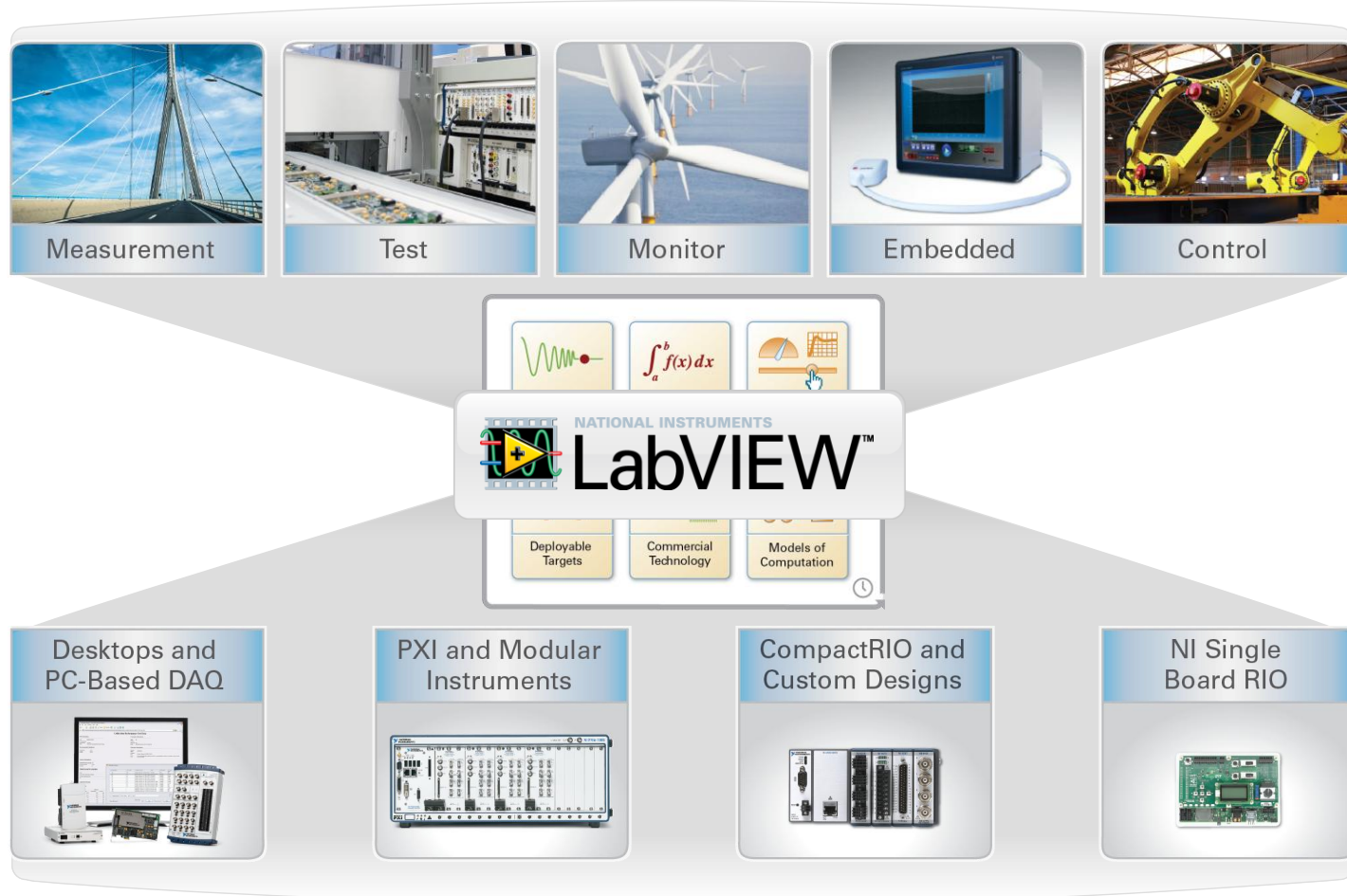
Graphical System Design Platform

A platform based approach for control design and measurement

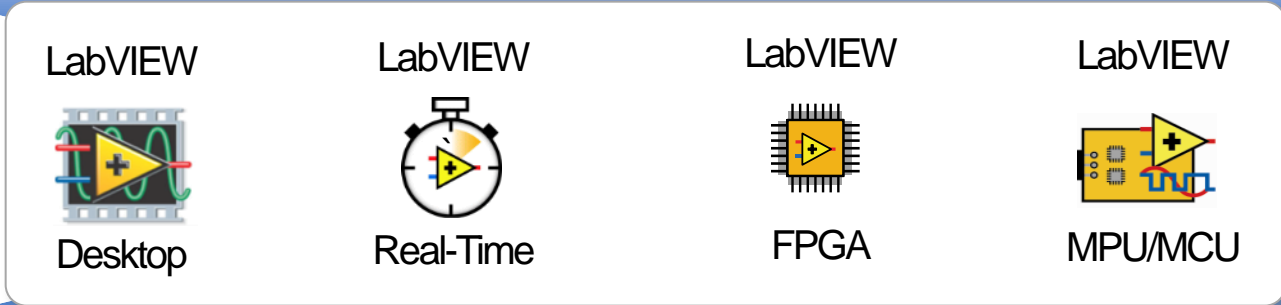
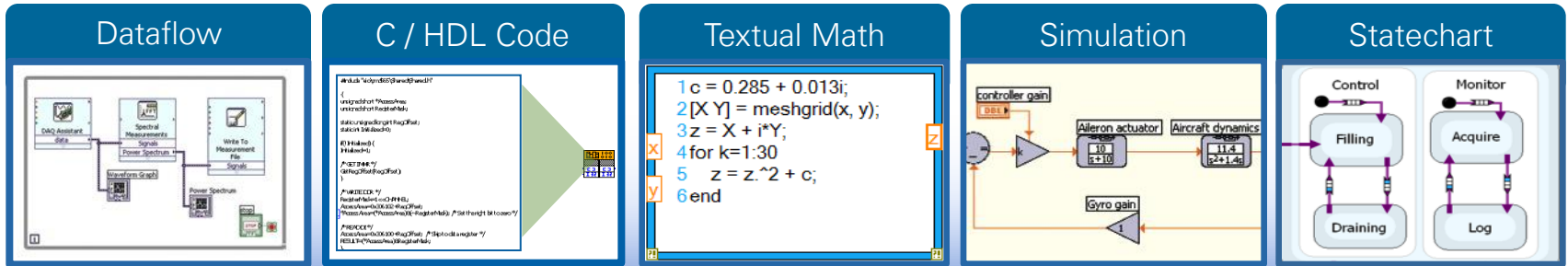


La plateforme NI: la conception graphique de systèmes

Une approche basée plate-forme pour la mesure et le contrôle/commande

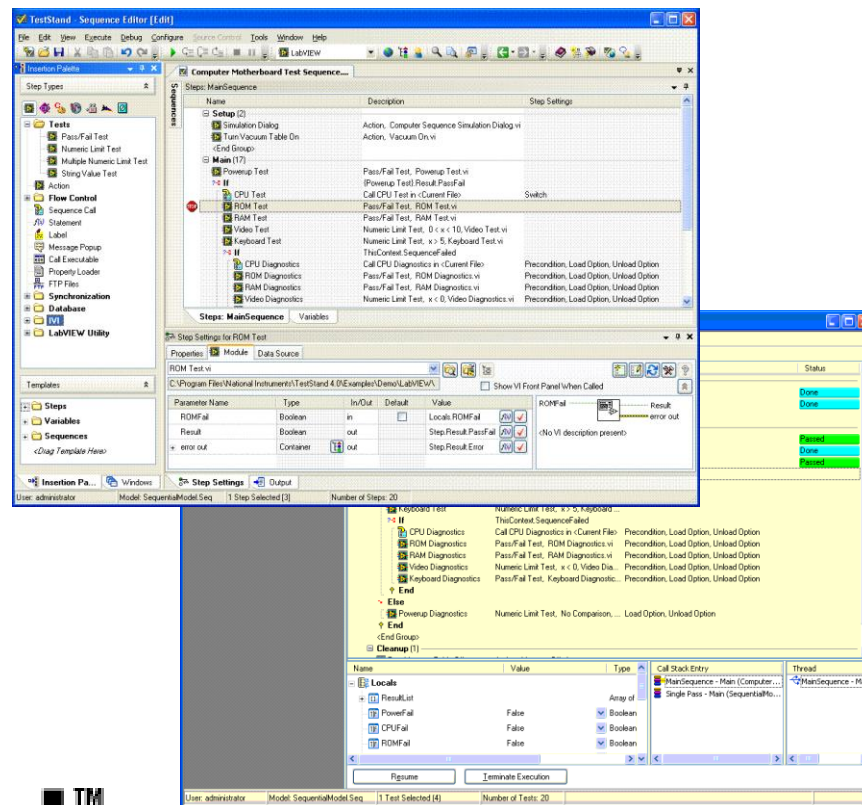


LabVIEW Graphical System Design



NI TestStand—Test Management Software

- Graphical sequence editor environment
- Automate tests written in any language
- Multithreaded sequence execution
- ASCII, HTML/Web, XML, and ATML report generation
- Access, Oracle, SQL Server database connectivity



NI TestStand™

The NI TestStand Ecosystem

1000+ companies worldwide
10000+ existing developers
20+ partner products

100+ consultants and integrators
2 levels of development certification



NI TestStand™

500+ new developers trained annually since 2007
40+ worldwide branches providing support
10+ programming languages supported



NI VeriStand™

Real-Time Testing and Simulation Software

- RT Stimulus Generation
- Data Logging
- Test Automation
- Single-Point I/O
- Alarming
- Calculated Channels
- Deterministic Model Execution
- User Account Management
- Multi-Chassis Synchronization
- Multi-Chassis Data Sharing
- Closed-Loop Control
- Scaling and Calibration



Multi-Chassis Systems



PXI



CompactRIO*



Single-Board RIO*

** 128MB DRAM or great required*



Ready to use data search and mining

Easy, flexible access to databases and files

Interactive analysis and report generation

Automation through VBScript

NI CompactDAQ Platform

Gigabit Ethernet

More than 50 I/O Modules

1-Slot, 4-Slot, and 8-Slot Chassis

802.11g Wi-Fi

Built-in Signal Conditioning

USB 2.0

PCI eXtensions for Instrumentation

- PCI electrical-bus with the rugged, modular, Eurocard mechanical packaging of CompactPCI
- Advanced timing and synchronization features
- Support for real-time multicore processors

Real-Time Processor
Controller



I/O Interface
Modules

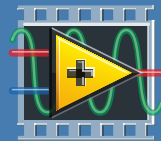
More than 1,500 PXI Products Available!

A global Platform

Services and support

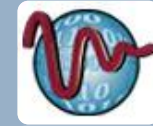
Systems management softwares
NI TestStand, NI VeriStand,
Switch Executive, DIAdem, Requirements Gateway

LabWindows/CVI



NATIONAL INSTRUMENTS
LabVIEW™

Measurement Studio



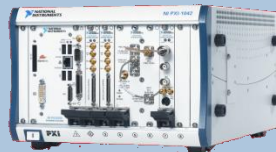
Drivers and measurement tools

NI-DAQmx, NI-VISA, Measurement and Automation Explorer (MAX)

Data acquisition and
conditioning



Modular Instruments



Control of programable
automation



Instruments
communication



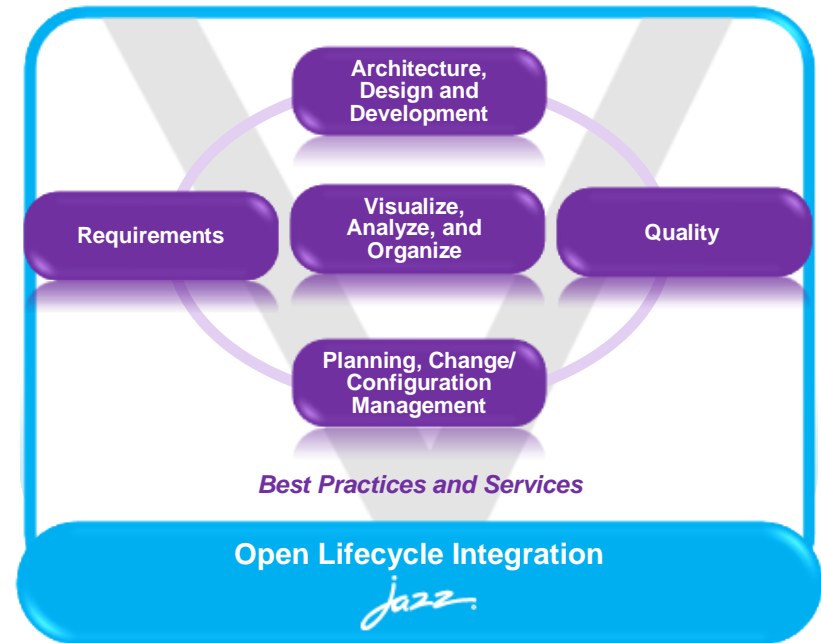
Introduction to IBM Rational

IBM Rational Solution for Systems and Software Engineering



- Specify, design, implement and validate complex products and the software that powers them with an integrated set of tools, practices, and services.
- Improve quality, predictability and consistency with best practices and process guidance.
- Assess and manage changes throughout your systems lifecycle.
- Unify software, electrical and mechanical engineering through a federated, linked data approach.
- Increase agility in embedded software development.

IBM Rational Solution for Systems and Software Engineering



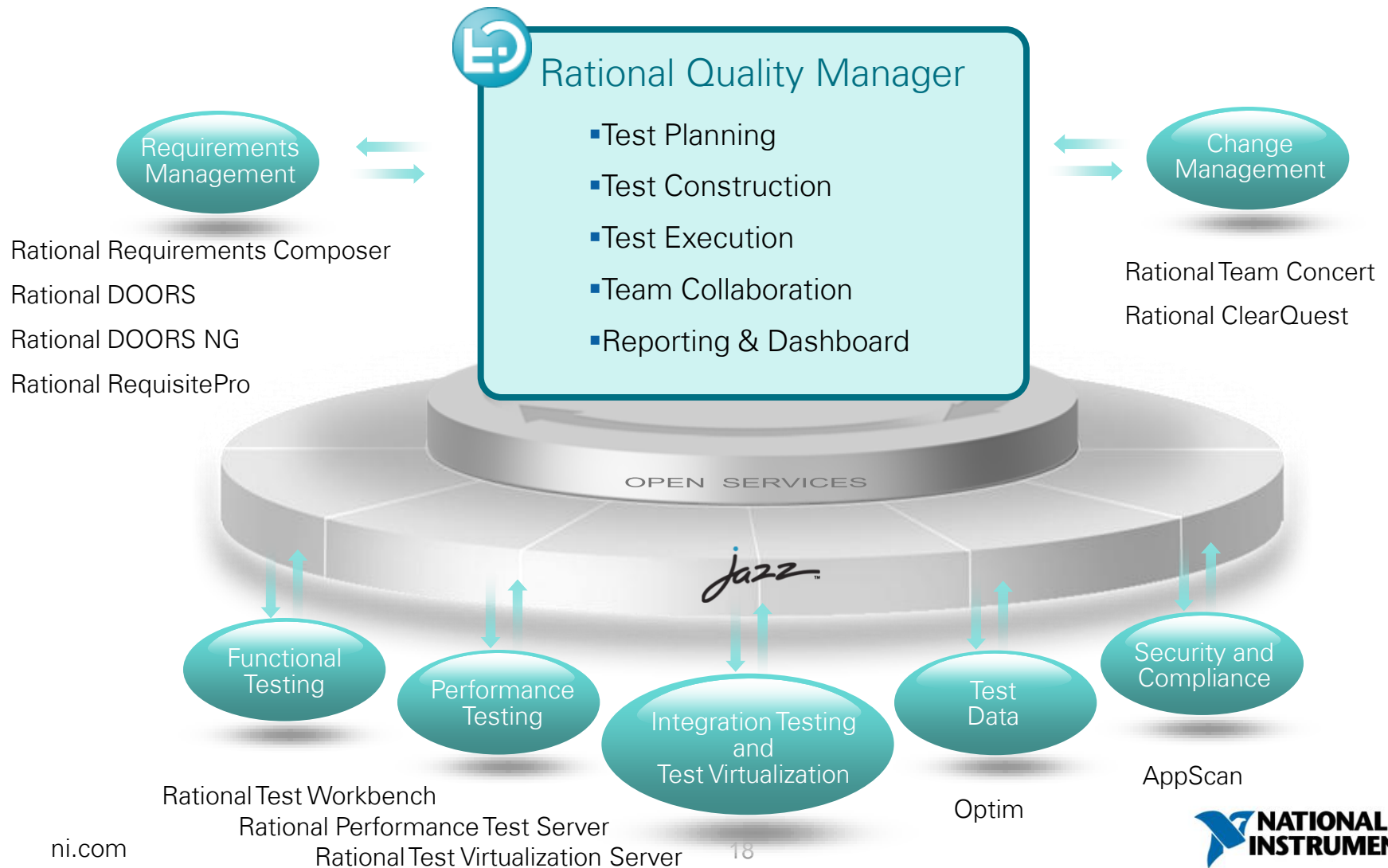
Systems Engineering

- Optimize design alternatives
- Link design and test
- Manage change across domains

Embedded Software Engineering

- Develop against changing requirements
- Reduce compliance overhead
- Integrate HW/SW development

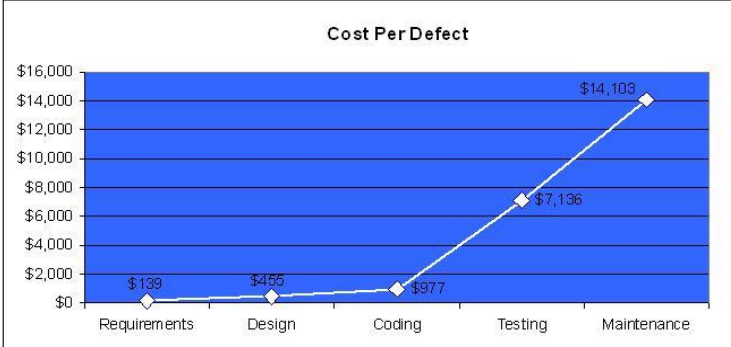
Rational Quality Manager: Central Hub for Quality Management



Embedded Software Quality Challenge

Managing the cost of software errors

	Smart Washing Machine	Commercial Aircraft	Luxury Automobile
			
Lines of Code	100k	6.5 Mil	10 Mil
10-20 defects produced per 1,000 lines of code*			
Defects	1k – 2k	65k - 130k	100k – 200k



* The Economists. May 16th, 2010. *Tech. View: Cars and software bugs.* www.economist.com

Challenges in Systems and Software Engineering



jazz

Aerospace and Defense

- DO-178B/C
- DoDAF, MODAF, and UPDM
- SysML

Automotive

- ISO 26262
- AUTOSAR
- GENIVI

Architecture, Design,
and Development

Requirements

Systems
Lifecycle
Management

Quality

Change/Configuration
Management

Electronics

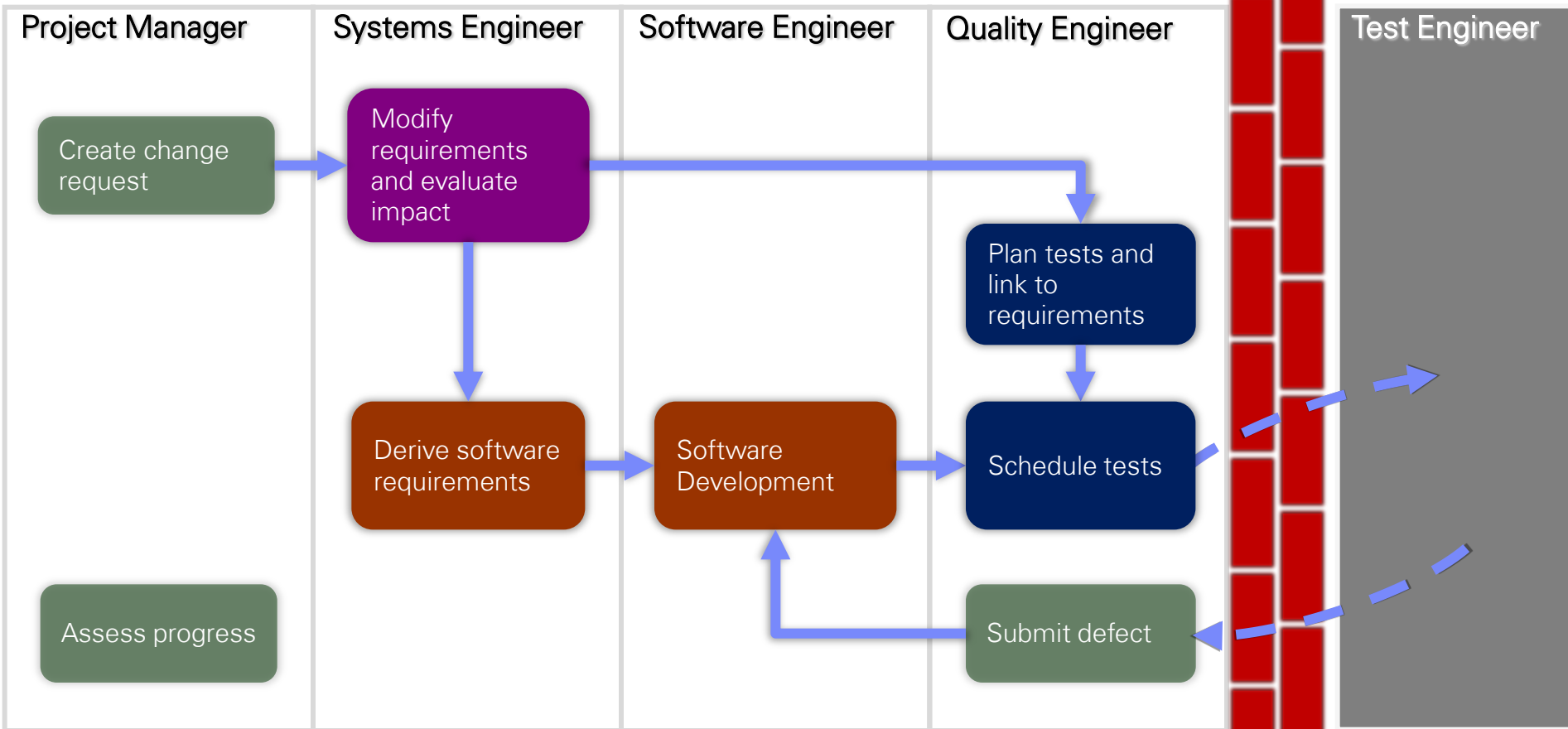
- Hardware Software Co-Design
- EDA Integrations

Medical Devices

- FDA QSR Standard
- International Standards (IEC 62304)



Traditional Development Process



Quality Engineer

Plan tests and link to requirements



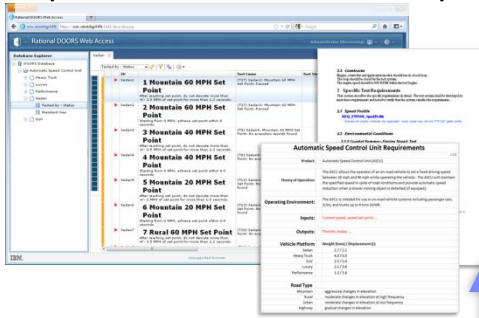
Schedule tests

Submit defect



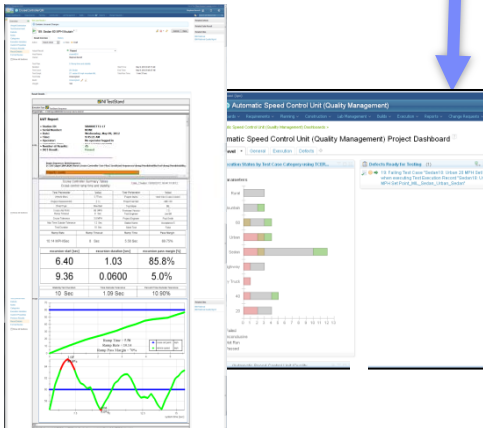
Test Engineer

Requirements Documents (DOORS, .docx, .xlsx, ...)



IBM Rational Quality Manager

Test Plans Execution Records
Test Cases Requirement Links
Test Schedules Quality Dashboards



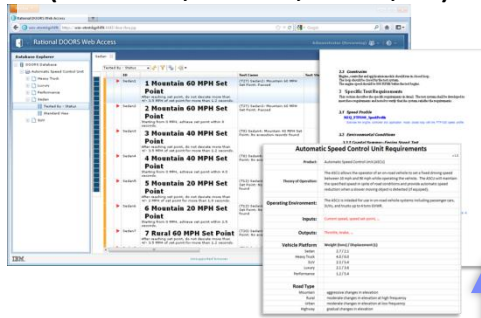
Execution Records, Defect Management, Test Plan Documentation



Test Engineer

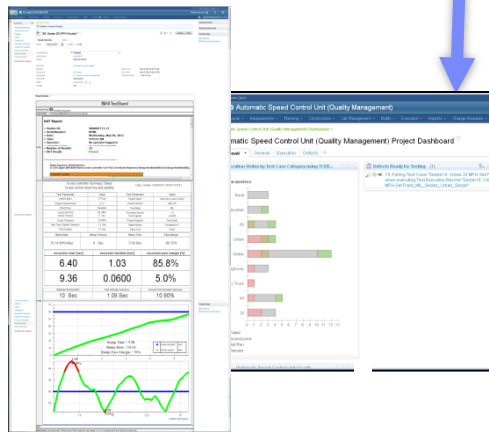
Requirements Documents

(DOORS, .docx, .xlsx, ...)



IBM Rational Quality Manager

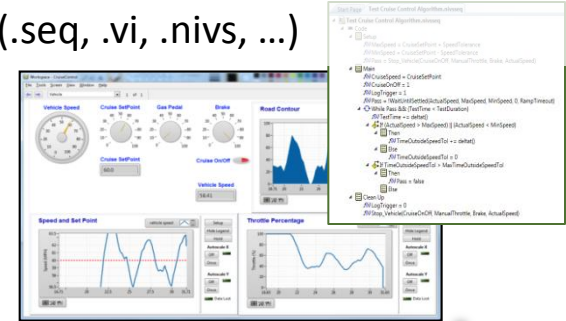
- Test Plans
- Test Cases
- Test Schedules
- Execution Records
- Requirement Links
- Quality Dashboards



Execution Records, Defect Management, Test Plan Documentation

National Instruments Test Components

(.seq, .vi, .nivs, ...)



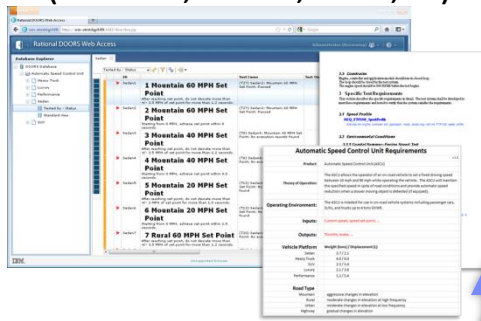
NI TestStand

- Sequences
- Parameter Files
- Code Modules
- Execution Records
- Requirement Links
- Quality Dashboards

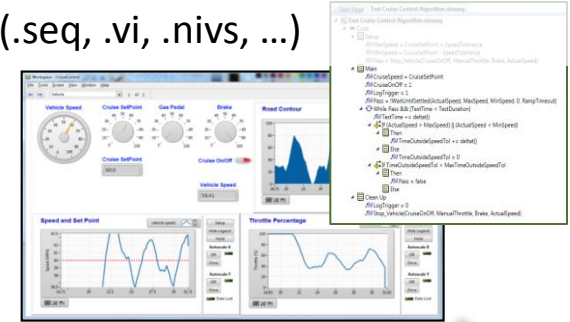
Test Results
(.html, .pdf, .tdms, .jpg, ...)



Requirements Documents (DOORS, .docx, .xlsx, ...)



National Instruments Test Components (.seq, .vi, .nivs, ...)

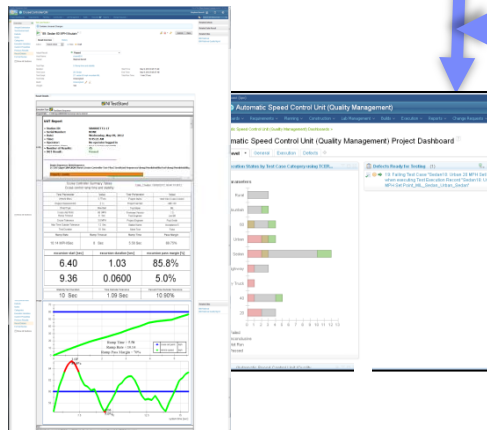


IBM Rational Quality Manager

- Test Plans
- Test Cases
- Test Schedules
- Execution Records
- Requirement Links
- Quality Dashboards

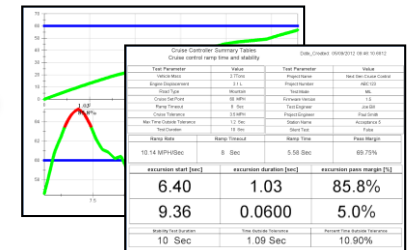
NI TestStand

- Sequences
- Parameter Files
- Code Modules
- Execution Records
- Requirement Links
- Quality Dashboards

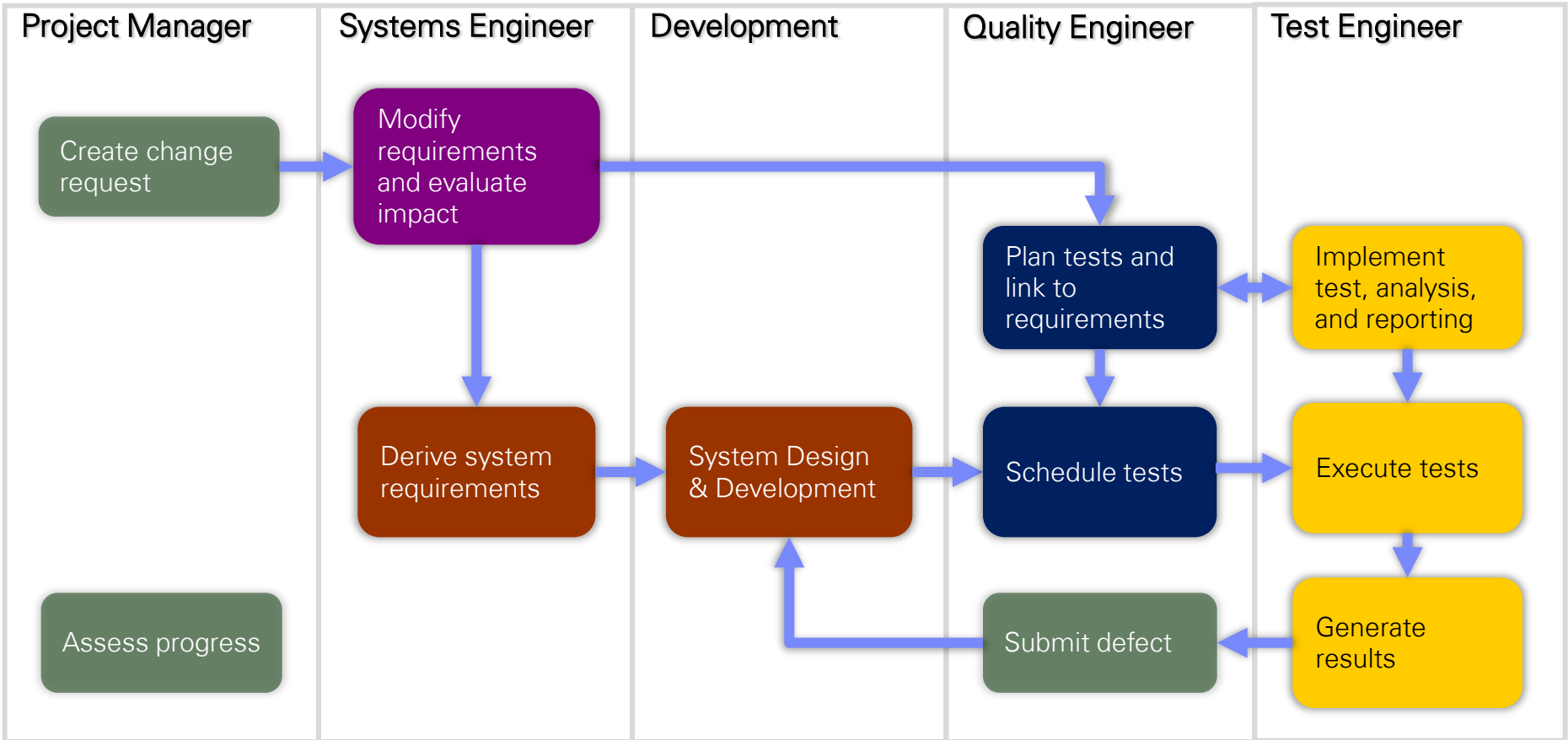


Execution Records, Defect Management, Test Plan Documentation

Test Results (.html, .pdf, .tdms, .jpg, ...)

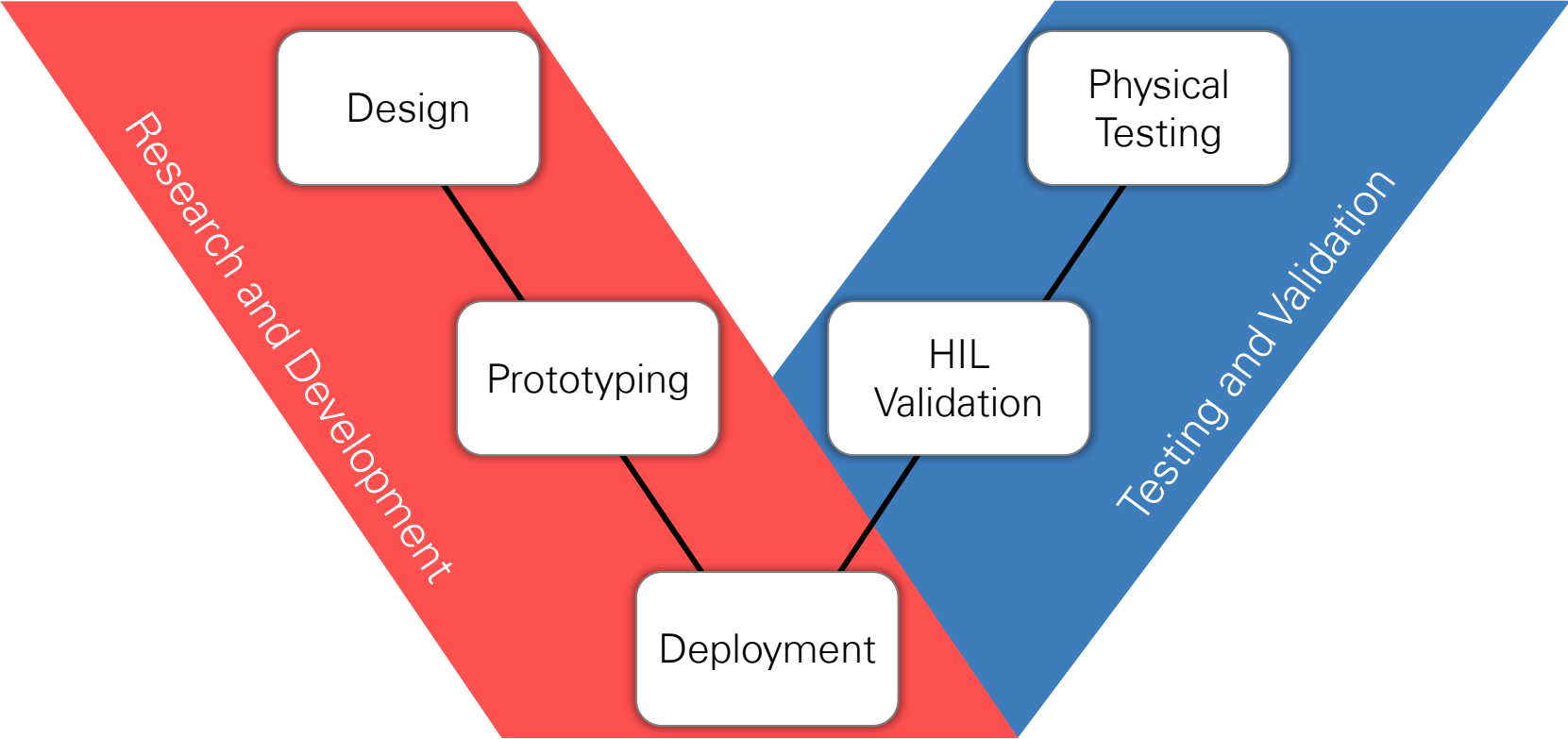


Next Generation Development Process

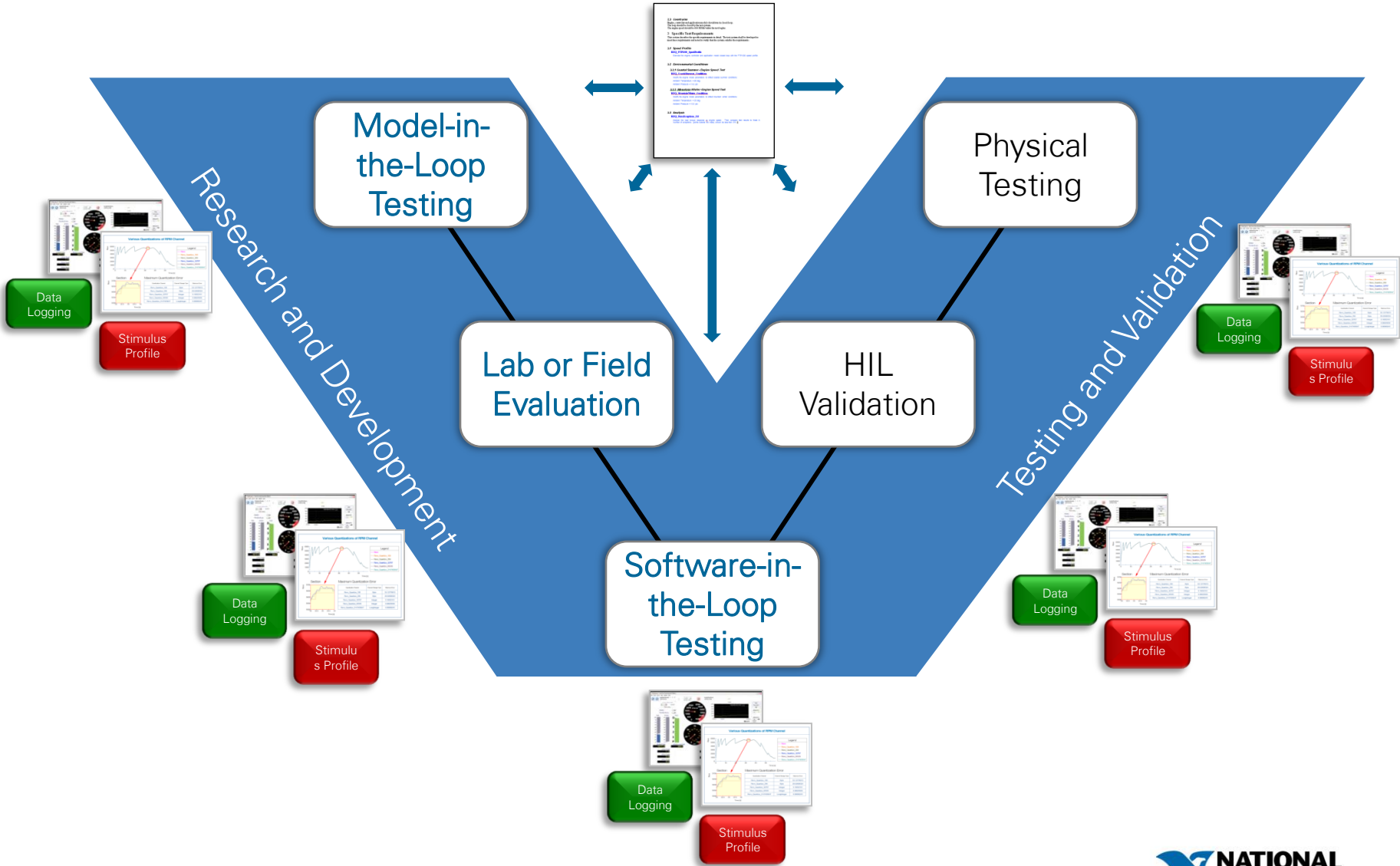


DOORS
Rhapsody
Team Concert
Quality Manager
NI TestStand | LabVIEW | NI VeriStand | DIAdem

Embedded Software Development Process



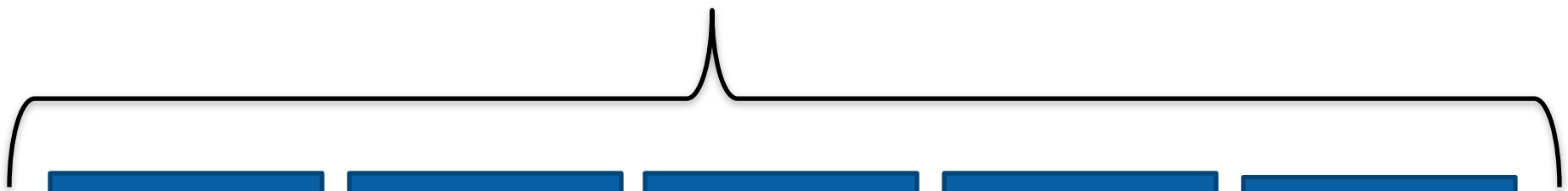
Test Continuity and Test Component Re-use



Test Asset Management and Automation

IBM Rational Quality Manager

- Test Plans
- Test Cases
- Test Schedules
- Execution Records
- Requirement Links
- Quality Dashboards



MIL Test System #1	HIL Test System #1	Integration System #1	Test Cell System #1	Field Test System #1
MIL Test System #2	HIL Test System #2	Integration System #2	Test Cell System #2	Field Test System #2
MIL Test System #3	HIL Test System #3	Integration System #3	Test Cell System #3	Field Test System #3

● Busy ● Available ● Offline

Defect Management

IBM Rational Quality Manager

Test Plans
Test Cases
Test Schedules

Execution Records
Requirement Links
Quality Dashboards

Defect Resolution
Collaboration

Defect Results and
Verification Items

The screenshot shows the 'Defect 30' page in the IBM Rational Quality Manager. The page title is 'Automatic Speed Control Unit (Change Management)'. The defect summary is 'Failing Test Case "Sedan10 Rural 40 MPH Set Point"'. The 'Overview' tab is selected, showing details such as Type: Defect, Filed Against: Automatic Speed Control Unit (Change Management), Severity: Normal, Found In: Unassigned, Project Area: Automatic Speed Control Unit (Change Management), Team Area: Automatic Speed Control Unit (Change Management), Creation Date: Nov 12, 2012 9:32 AM, Created By: Stephen Barrett, and Tags: [empty]. The description field contains the text 'check the SW calibration -- CPW'.

The screenshot shows the 'Execution Result - Quality Management' page for test case '11801: Sedan10 Rural 40 MPH Set Point'. The page title is 'Automatic Speed Control Unit (Quality Management)'. The 'Result Overview' tab is selected, showing the test result as 'Failed'. The test plan is 'ASCU ML Test', the test case is 'Sedan10 Rural 40 MPH Set Point', and the test script is 'Sedan 40 MPH Rural ML'. The test date is 'Unassigned' and the weight is '100'. The start time is 'Aug 2, 2013 11:52:46 AM' and the end time is 'Aug 2, 2013 11:59:06 AM'. The total run time is '1 min 11 sec'. The 'TestStand Report' section shows a table of test results:

Test Step	Status	Module Time
Run Cruise Control Test Sequence	Passed	0.9537953
Wait for sequence finish and get result	Failed	0.2367229
Get RQM Progress Percentage	Passed	0.0215592

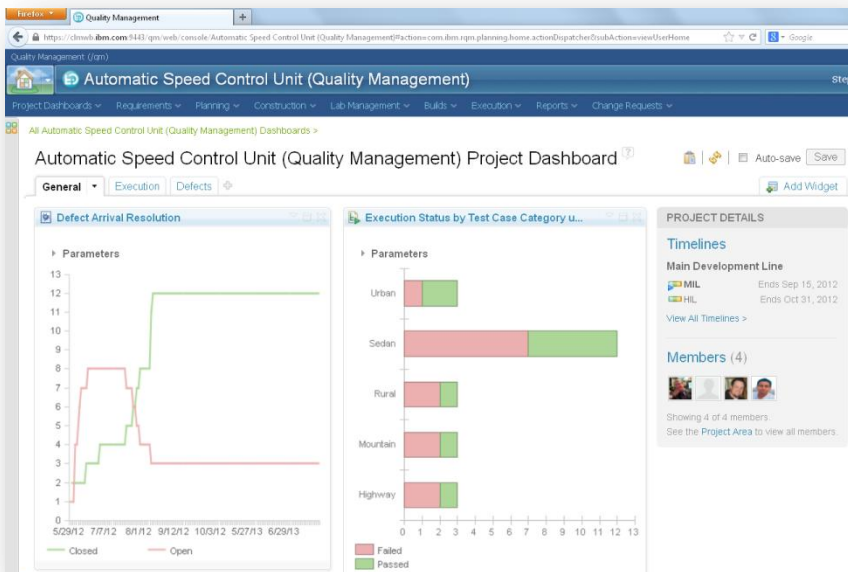
Project Documentation and Tracking

IBM Rational Quality Manager

Test Plans Execution Records
 Test Cases Requirement Links
Test Schedules **Quality Dashboards**

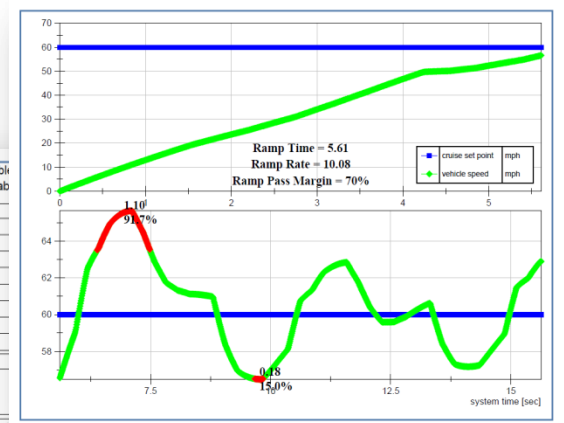
Project Dashboards

Test Results



Cruise Controller Summary Table
 Cruise control ramp time and stability

Test Parameter	Value
Vehicle Mass	2.7Tons
Engine Displacement	2.1 L
Road Type	Urban
Cruise Set Point	60 MPH
Ramp Timeout	8 Sec
Cruise Tolerance	3.5 MPH
Max Time Outside Tolerance	1.2 Sec
Test Duration	10 Sec



Ramp Rate	Ramp Timeout
10.08 MPH/Sec	8 Sec

excursion start [sec]	excursion duration [sec]	Pass Margin
6.39	1.1	91.7%
9.67	0.18	15.0%

Stability Test Duration	Time Outside Tolerance	Percent Time Outside Tolerance
10 Sec	1.28 Sec	12.80%

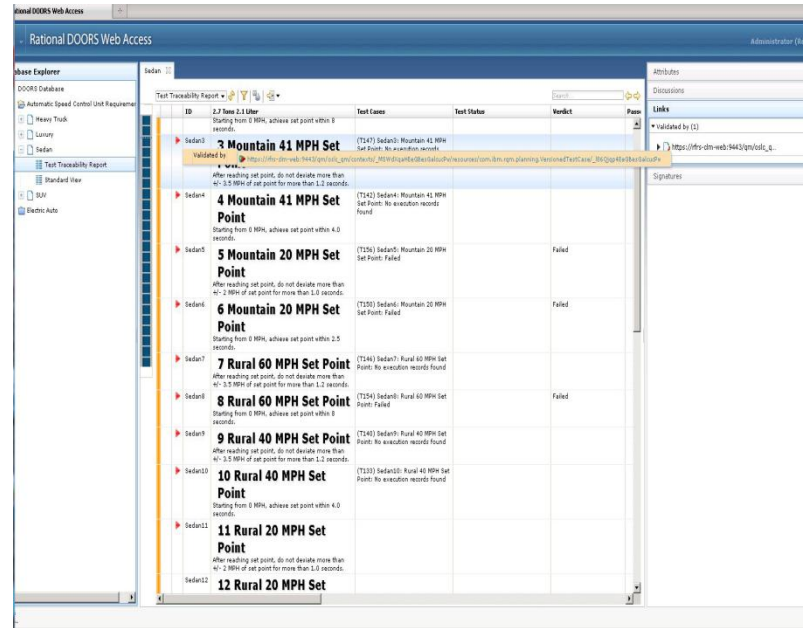
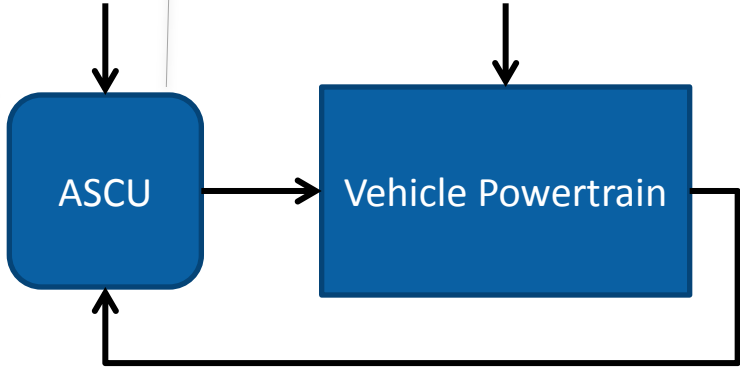
Demonstration Overview

- Validation of **Adaptive Speed Control Unit (ASCU)**
 - Intended operation in multiple Vehicle Powertrains (Truck, SUV, Luxury, ...)
 - Validate performance in all systems against multiple driving scenarios (Cruise Set Points / Road Loads)



Cruise Set Point

Road Load



Demo

1. Test Plan

2. Test Case

3. Test Script

4. Execution

5. Results and
Defects

6. Dashboard

Breaking the Quality Management Silos with Enhanced Collaboration and Traceability

IBM Rational and National Instruments are teaming together to provide an **end-to-end quality management solution**.

Traceability all the way to test and back with **Collaboration** between ALL teams, including test

- Test components and assets linked to and managed with quality plan test cases
- All test results available to all teams and linked to test cases and requirements

Promotes quality and test consideration from the outset, not an afterthought, **reducing cost and risk** of identifying and correcting defects

Enables **test component re-use** throughout project phases and between projects providing operational efficiency and accuracy



Questions?

Learn More:

- **Web pages:**
 - [IBM.com: IBM Rational and National Instruments](#)
 - [NI.com: Integrating Test Into Development Cycle](#)
 - [NI Test Integration Adapter Product page](#)
- **References:**
 - **Solution Brief:** [Break down engineering silos to improve quality](#)
 - **Article:** [To Build a Smarter Product, Stop Separating Design & Test](#) Ian Cannings, Danfoss Power Electronics
 - **Blog:** [Design News blog](#)
- **Media:**
 - **Webinar:** [Integrating National Instruments testing with RQM](#) (demo starts at min 24)
 - **Video:** [Interview Innovate 2013- Chris Washington, National Instruments...](#)
 - **Video:** [Innovate 2013 Interview and Demo at NI Booth](#)
 - **Video:** [NI Week 2012 Keynote: Embedded Software Quality Management](#)
 - **Webcast:** [Taming the Complexities of Software Driven Innovation to Reduce Project Cost and Risk](#)
 - **Podcast:** [Integrate testing into the development lifecycle](#)