Integrating testing into the development lifecycle

Engineering team collaboration with a quality management solution from IBM and National Instruments

The pervasiveness of embedded software is accelerating innovation as well as increasing complexity and introducing quality challenges for engineering departments. Consider that a “smart” washing machine may have 100,000 lines of code controlling its functions, whereas a luxury automobile may use 10 million lines of code. And these numbers will likely continue to rapidly rise in the coming years. Limiting coding defects is critically important because the cost of fixing such defects can rise exponentially the further into the product development and deployment process they are resolved.

IBM and National Instruments (NI), a global leader in automated test management software and embedded and real-time testing software, are offering a comprehensive quality management solution designed to break down the engineering silos that exist in many organizations. The combined solution enables testing to become an essential component of the development process from the beginning.
Enabling traceability from the start of engineering projects
Combining the rich solution portfolios of IBM® Rational® software and National Instruments enables new and enhanced capabilities, including comprehensive test case traceability, test case results management, and automated test scheduling and execution. Test results are made available to all teams so applications can be validated at virtually every point along the development path, from simulation and prototyping through deployment onto hardware and integration into the end system. And both operational efficiency and test accuracy can be improved through the ability to reuse test components throughout multiple project phases and even on different projects.

Improving collaboration between engineers to deliver better products
By bringing world-class technologies together, the joint solution improves collaboration between development teams—including test engineers. With the costs of defects so high—both in terms of pure finances and in terms of potential damage to the brand’s reputation—it is imperative to enable testing to be done early in the development process, so organizations can deliver better products faster and more consistently.

Integrating world-class components
The joint IBM–National Instruments solution features components that have been integrated to deliver specific business benefits. The components include the following software applications:

IBM Rational Quality Manager
IBM Rational Quality Manager software helps drive a more collaborative approach to software quality across the product and application lifecycle. A unified, shared hub enables integrated lifecycle support across virtually any platform and type of test. It offers a customizable, role-driven solution for quality and test management planning, execution, measurement, reporting, and defect management that can drive better business alignment and enhance overall project quality.

IBM Rational Team Concert
Designed to deliver an open-platform, all-in-one agile development team environment, IBM Rational Team Concert™ software includes development collaboration and test artifact source control and reporting on a common platform while easing communication and collaboration through live, shared dashboards.

IBM Rational Rhapsody
The IBM Rational Rhapsody® family of software products focuses on the needs of systems engineers and embedded software developers in a variety of industries. It provides collaborative design and development tools for creating real-time or embedded systems and software. These products help analyze and validate requirements, design rapidly with prototypes, and deliver more-consistent applications using Systems Modeling Language (SysML) and Unified Modeling Language (UML).

IBM Rational DOORS
IBM Rational DOORS® requirements management software has been optimized for the needs of today’s more complex and embedded systems development. Rational DOORS software enables teams to capture, trace, analyze and manage changes to requirements and aids in demonstrating compliance with regulations and standards.
**National Instruments TestStand**

Ready-to-run NI TestStand test management software is designed for faster development, execution and deployment of automated test and validation systems, including the rapid development of test sequences that integrate code modules written in practically any test programming language. Sequences can also specify execution flow, reporting, database logging and connectivity to other enterprise systems, and test systems can be easily deployed to production through intuitive operator interfaces.

**National Instruments VeriStand**

NI VeriStand delivers a software environment for configuring real-time testing applications such as hardware-in-the-loop simulators or test cell control and monitoring. It provides a configurable, multicore-ready, real-time engine to execute real-time stimulus generation, data logging, simulation model execution, and analog, digital and communication bus interfaces to the unit under test. NI VeriStand enables engineers to more quickly create system-level and component-level test applications at practically any development stage, from pure simulation to final system test.

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**Figure 1.** Test integration workflow with key components from IBM and National Instruments
National Instruments DIAdem
A component of the NI Technical Data Management (TDM) solution, DIAdem is a single software tool for quickly locating, loading, visualizing, analyzing and reporting measurement data collected during data acquisition or generated during simulations. Designed for the escalating demands of today’s testing environments, it enables quick access, processing and reporting on large volumes of scattered data in multiple custom formats, enabling faster, more-informed decisions.

National Instruments LabVIEW
LabVIEW system design software provides engineers and scientists with easy-to-learn, integrated tools and templates needed to create and deploy measurement and control systems. Unlike text-based programming tools, LabVIEW uses a graphical interface and deep hardware integration to help quickly solve problems, accelerate productivity and drive innovation.

Enhancing quality management
The following example shows how testing activities can be integrated into the development process from the start:

1. Testing begins with the capture of all requirements by IBM Rational DOORS requirements engineering software.
2. In Rational Quality Manager software, test plans are created and linked to requirements. Requirements can be easily viewed without having to leave the Rational Quality Manager interface, which allows traceability. National Instruments’ tests are configured and linked to Rational Quality Manager test plans, providing test component management, traceability and reuse.
3. Rational Quality Manager software automates testing using National Instruments TestStand, VeriStand, DIAdem and LabVIEW software. Results are automatically returned to Rational Quality Manager software and used to update an intuitive dashboard that also allows easy viewing and analysis of test run status by engineers.
4. With just a few clicks, defect reports can be created. Test artifact data from National Instruments’ applications is automatically encapsulated into a defect report, which is then assigned to appropriate personnel for retesting and resolution.
5. Defects can be reproduced using the same test components and configuration captured in the defect report, and a product revision resolving the defect can be submitted for testing using the identical environment. The ability to reuse test components and seamlessly communicate between testing and development teams helps save time and money while potentially reducing time to market for new products.
6. Rational Quality Manager software automatically locates the components required to run the test case again, runs the test and returns the new results.
7. Analysis confirms that the error is resolved.
8. The information about test cases, results and analysis, and supporting information is stored and easily accessible to the team as needed for documentation and future test case analysis.
Why IBM?
Quality management and testing solutions from IBM help organizations transform the way they create, validate and deliver software. Our integrated approach helps establish quality management and testing activities from the start, enabling agile software delivery and helping eliminate bottlenecks. We help control the costs of building in quality across the development and maintenance of composite applications across multiple technologies.

About National Instruments
Since 1976, National Instruments (www.ni.com) has equipped engineers and scientists with tools that accelerate productivity, innovation and discovery. NI’s graphical system design approach to engineering provides an integrated software and hardware platform that speeds the development of any systems needing measurement and control. The company’s long-term vision and focus on improving society through its technology supports the success of its customers, employees, suppliers and shareholders.
For more information
To learn more about IBM Rational solutions, contact your IBM sales representative or IBM Business Partner for a demonstration of the integration of National Instruments Test and IBM Rational solutions.


Learn about the IBM Rational Solutions for Software and Systems Engineering including the partnership with National Instruments at:
ibm.com/software/rational/announce/embedded/partner/

Watch the webcast *Taming the Complexities of Software Driven Innovation to Reduce Project Cost and Risk* which describes how the benefits of integrating testing in the development lifecycle at: http://spectrum.ieeee.org/webinar/2161970

Read the article *IBM, NI Plug Systems Engineering Gap*, describing how the solution helps break down quality management silos and allows for end-to-end traceability of requirements to test at:

View the demo *Using NI Test Applications with IBM Rational Quality Manager* at: us.ni.com/ibmrqm

Learn more about National Instruments at: www.ni.com

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Somers, NY 10589

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