Designing for Innovation: Systems & Software Engineering in the Ecosystem

Richard Crisp

Director, Systems Engineering, Rational Software

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The Good Old Days – Manual process

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Innovation…Introduces Complexity

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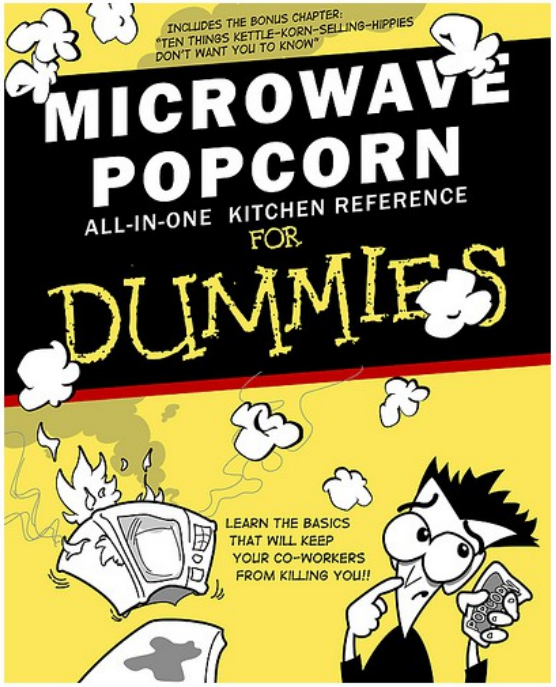
We'll fix it with Best Practices and Automation ☺



Barcode scanning microwave

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"Too Much Plane"

- Boeing Model 299 (ultimately the B-17)
- US Army Air Corps new bomber competition
- October 30, 1935; Dayton, Ohio
- NY Times reported *"too much plane for one man to fly"*

- *Elevator lock was not properly released*
- Solution: Creation of a *Pilot Checklist*

Today: Software is the invisible thread of Innovation

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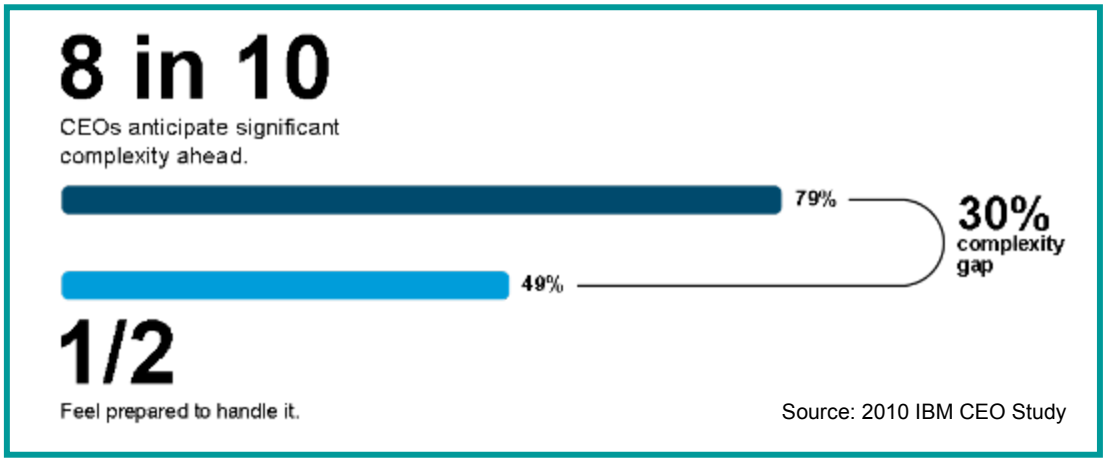
Drivers of our business

Innovation is increasingly becoming a driver of business goals

- Attract new customers
- Improve customer service
- Create new revenue streams

Software is increasingly driving value in manufactured products

- F-35 JSF ~ 5.7M lines of code*
- Average 2010 Ford auto ~ 10M lines of code*
- Average luxury auto ~ 100M lines of code*



Introduction of SW brings complexity yet few are prepared to handle it

- Manufacturers are now faced with developing a core competency in Software and Systems Engineering

* Sources IEEE: Automotive DesignLine

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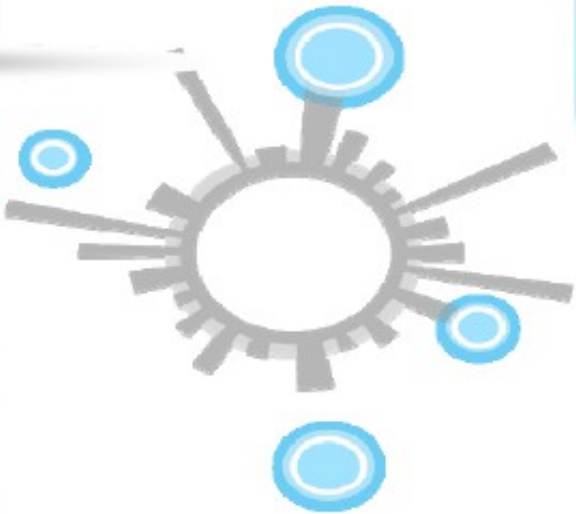
What we are hearing from our customers…

"We want an Integrated engineering toolset"

"We want to increase system and software level reuse"

"We want to: 'design anywhere, build anywhere' with standardized scalable tools/process"



"We want to automate and optimize testing from unit-level to subsystem to acceptance"

"We want to improve collaboration across engineering disciplines, teams and sometimes programs"

"We want to manage engineering tooling more effectively"

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Delivery of smarter products and services will require new investments in systems and software

Connect multiple products and services into a *"system of systems"* to deliver unique value

Leverage *systems engineering* to accelerate time to market, improve quality and reduce costs

Develop a core competency in *software delivery* to produce products that are differentiated

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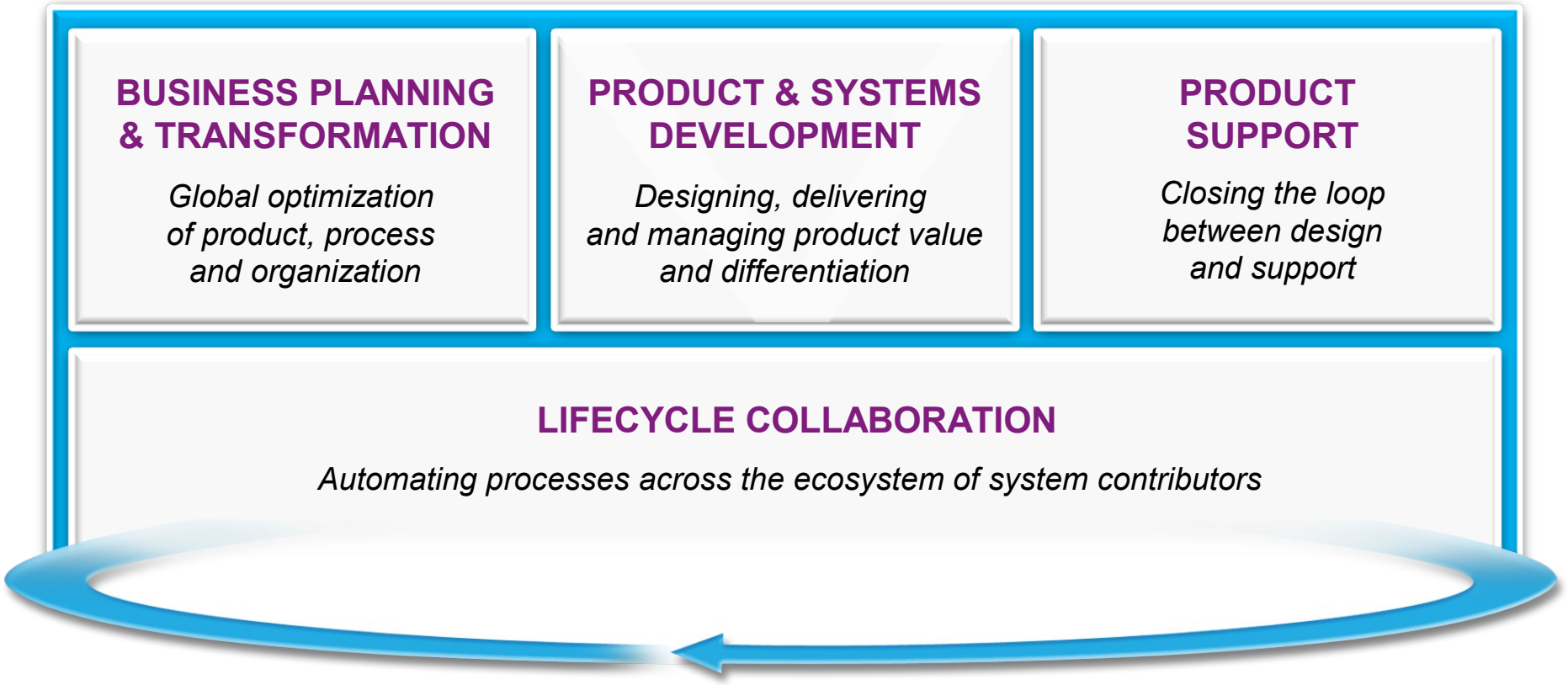
Insight and Product Innovation

Software, hardware and services from IBM for building smarter products



IBM's unique set of capabilities for building smarter products; from concept, through product development, to end of life, all while collaborating throughout the process both inside and outside of your 'four walls'

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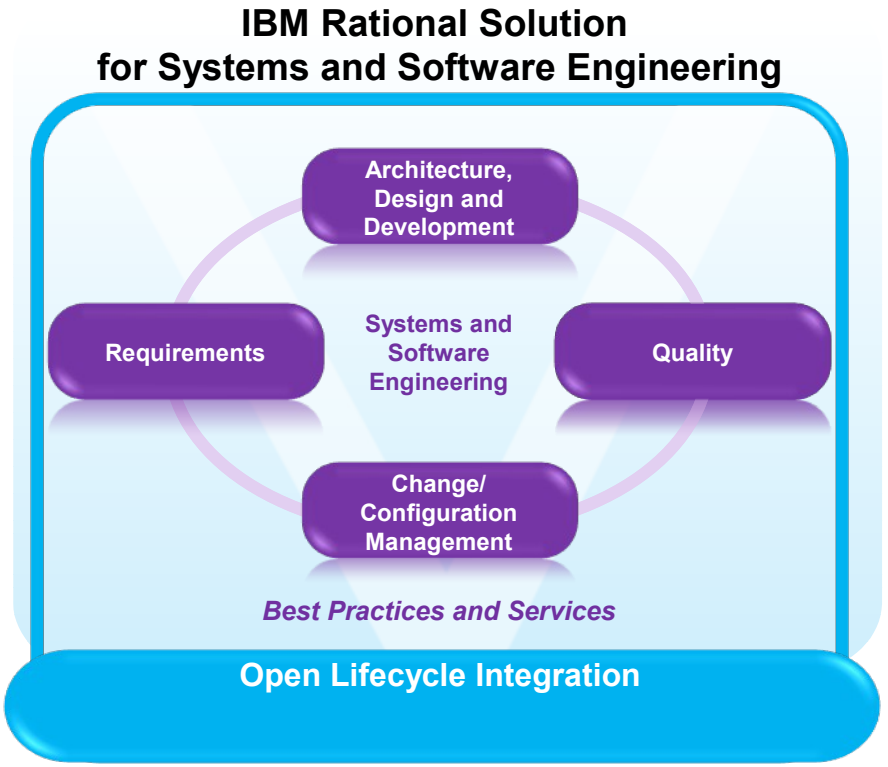
IBM Rational Solution for Systems and Software Engineering

- **Describe, build 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.



Let's have a look at some recent advancements in the solution…

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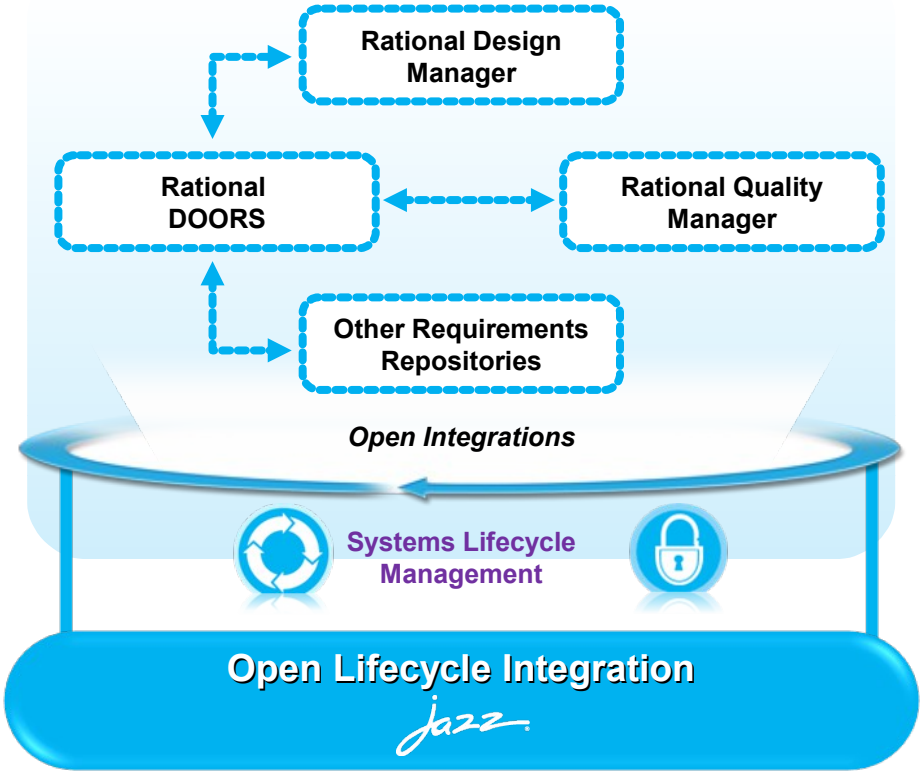
Requirements Management
IBM Rational DOORS v9.4

- Open integrations more flexible and scalable
  - Quality and test
  - Architecture, design and development
  - Other requirements management repositories
- Even more secure with new server-side authentication
- Usability enhancements



"Our ability to maximize the breadth of the IBM software let us provide NASA with demand-based statistics while maintaining control of the costs."

Joseph Dress, Requirements Management,
Constellation Software Engineering Corporation

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The NEXT SSE: Where we're going in requirements

IBM Rational DOORS Next Generation

Rational DOORS Next Generation (Beta)

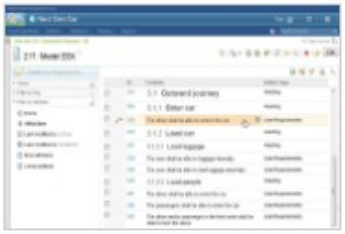
Requirements engineering for complex systems

Download 4.0.1 Beta 4
August 16, 2012

Features and capabilities

Modules

Modules provide structured documents with individually managed requirements in them.

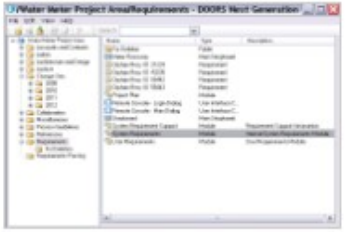


Built-in dashboards

Dashboards provide information and team visibility.

DOORS rich client for Microsoft Windows systems

Rich client improves productivity when working on large modules.

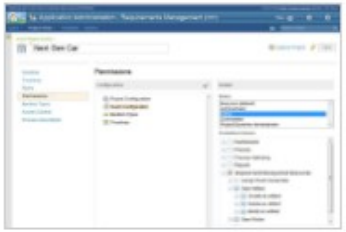


DOORS web client

Fully functional web client for authoring and analysis.

Shared type system

Define and reuse artifact types and their attributes.



Common administration

Common user, server and project administration with the Jazz Team Server.

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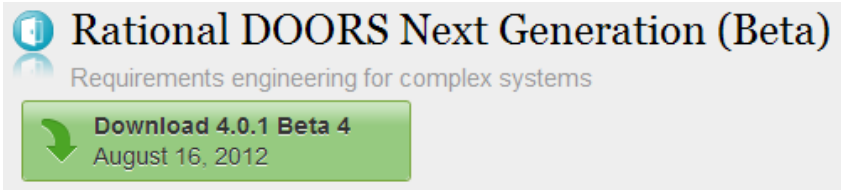
Adopt DOORS Next Generation at your own speed

Both Products can be used in parallel to ensure pragmatic low-risk stepwise migration

- Continue to work with DOORS and DWA
  - Gain the benefits of DOORS 9.x and future 9.x releases

- Use DOORS Next Generation with DOORS 9.x
  - “Recognizably DOORS” to aid adoption
  - Use DOORS Next Generation for new projects as it meets your needs
  - Data Import / Export between DOORS Next Generation and DOORS 9.x projects
  - Bi-directional linking between DOORS Next Generation and DOORS 9.x
  - Support for distributed RM development and Supply Chains

- Participate in DOORS & DWA beta programs
  - Follow DOORS Next Generation on jazz.net
  - Participate in the beta, managed or unmanaged
  - Download milestone releases
  - Participate in development discussions
  - Submit defects/enhancements



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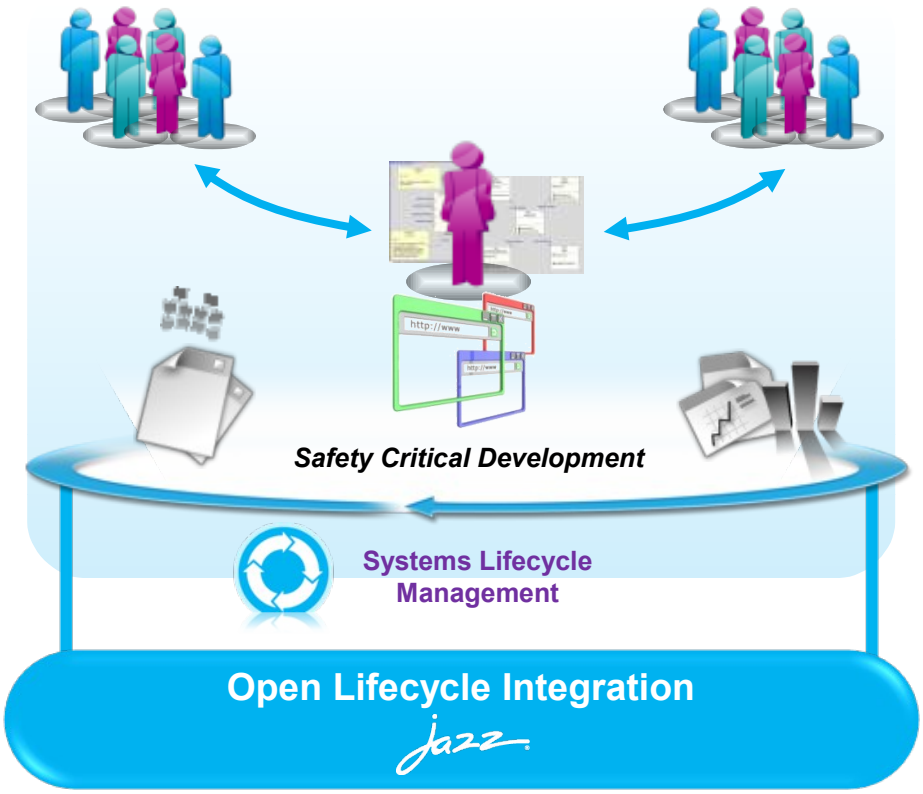
Architecture, Design, Development

IBM Rational Rhapsody with Design Manager

- Collaborate around architecture and design
- Optimize safety-critical process compliance with AUTOSAR and UPDM
- Integrate requirements and design across multiple design disciplines



"IBM Rational DOORS and Rational Rhapsody allow us to better manage complex architectures of our products, and help us prevent our development environment from becoming fragmented."

Gervin Fadda, Body and Security Business Unit
Continental Automotive Group

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Extend the value: Collaborative Design Management

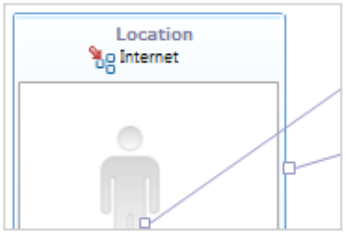
Enhance cross-team collaboration in systems & software design

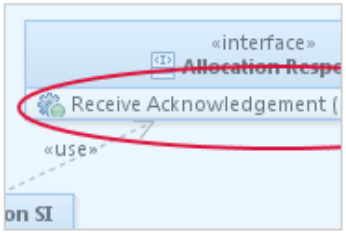
new

New! Download 4.0 Release
September 7, 2012

Design in context

Work seamlessly with analysts, developers, and testers using RRC, RTC, RQM, and DOORS. Make designs first class artifacts in your lifecycle projects.



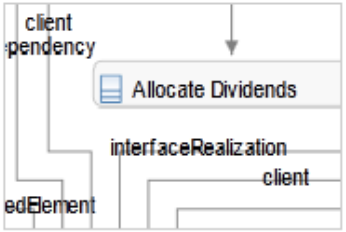


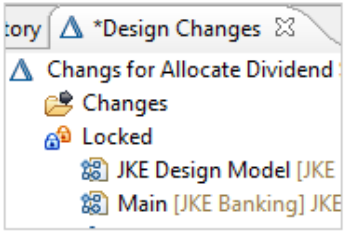
Collaborate

Invite users and other experts to collaborate on your designs. Use threaded comments, design mark-up, and automated design reviews. Sketch out ideas before turning them into designs.

Traceability and impact analysis

Link designs to requirements, test artifacts, work items, and other designs. Visualize relationships within a design and with other lifecycle resources. Know the impact of a design change.



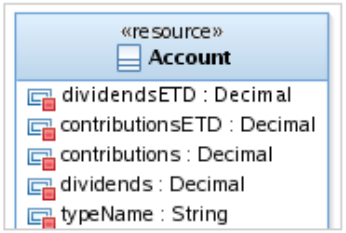


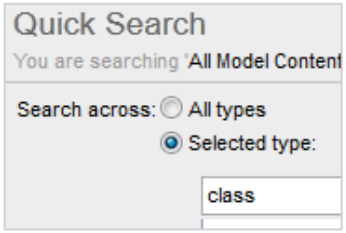
Manage change

Collaborate with your team on changes to the same designs without conflicts.

Publish design documents

Generate customized design documents from a template or create living design documents as part of your project.





Designs at your finger tips

Quickly search across designs to learn from past projects and find reusable design components.

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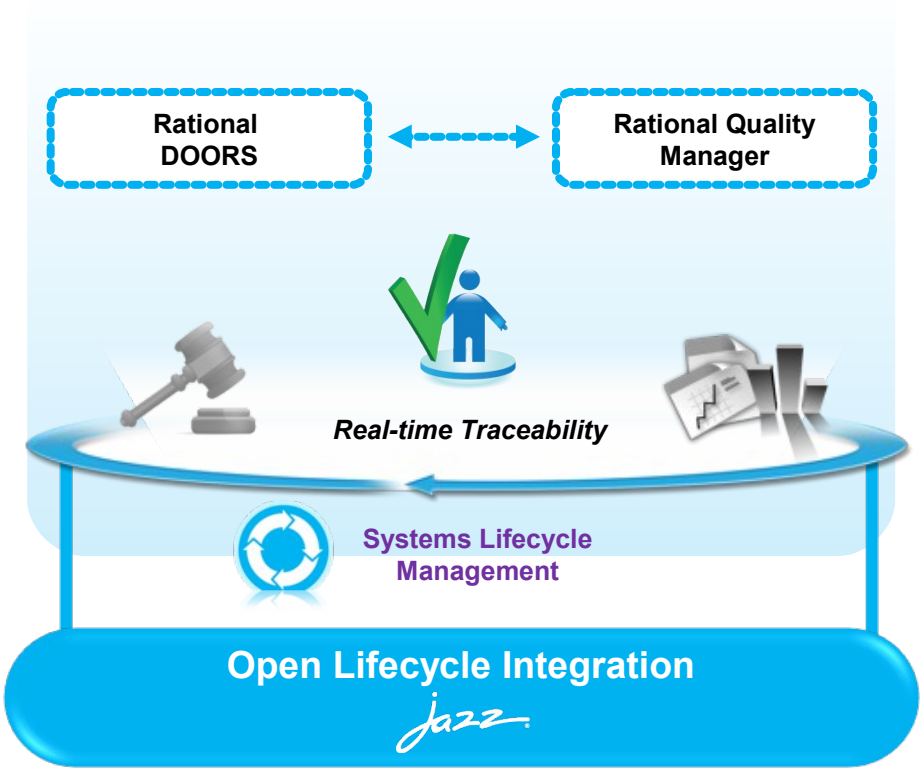
Quality and Test

IBM Rational Quality Manager v4.0

- Requirements-driven testing
  - Rational Requirements Management and Quality Management using OSLC
  - Live traceability views
  - Trace test steps to requirements
- More control over compliance and process enforcement
- Dashboards and reporting



"We have greater control to improve processes, greater test coverage and traceability, plus, vastly improved navigation and user friendliness."

– Beta test participant

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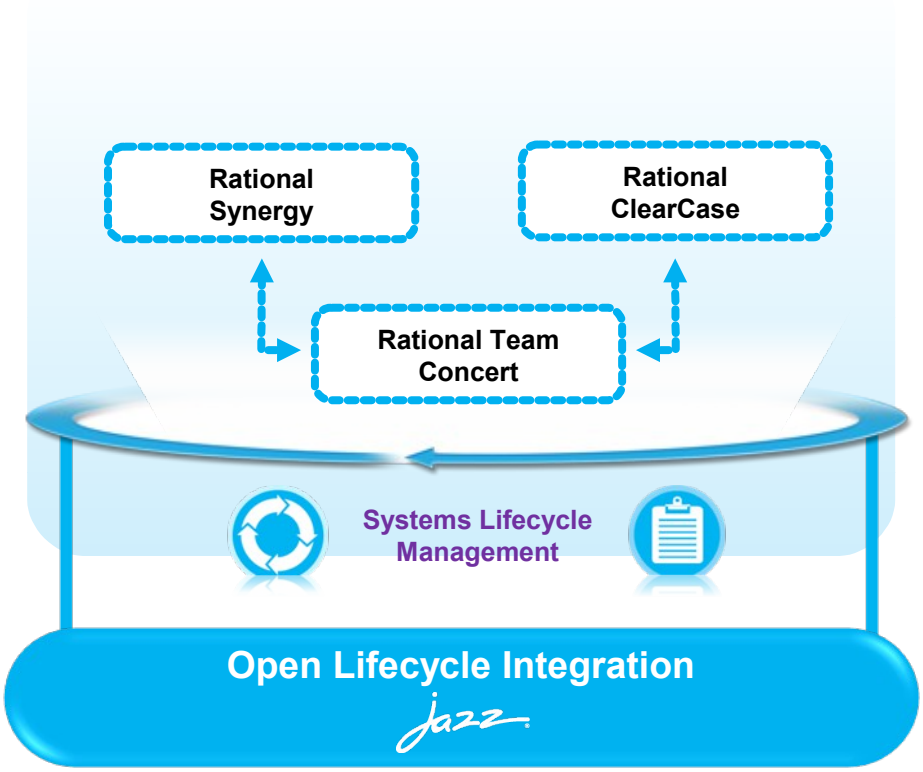
Change and Configuration Management

IBM Rational Team Concert v4.0

- More control over permissions and process
- Track delivery of source code changes to variants/branches of a product
- Manage cross-cutting plans and tasks across multiple projects
- Integrate Rational Synergy and Rational ClearCase for source code management with Rational Team Concert planning and change management
- Additional tool integrations via MS SCCI interface



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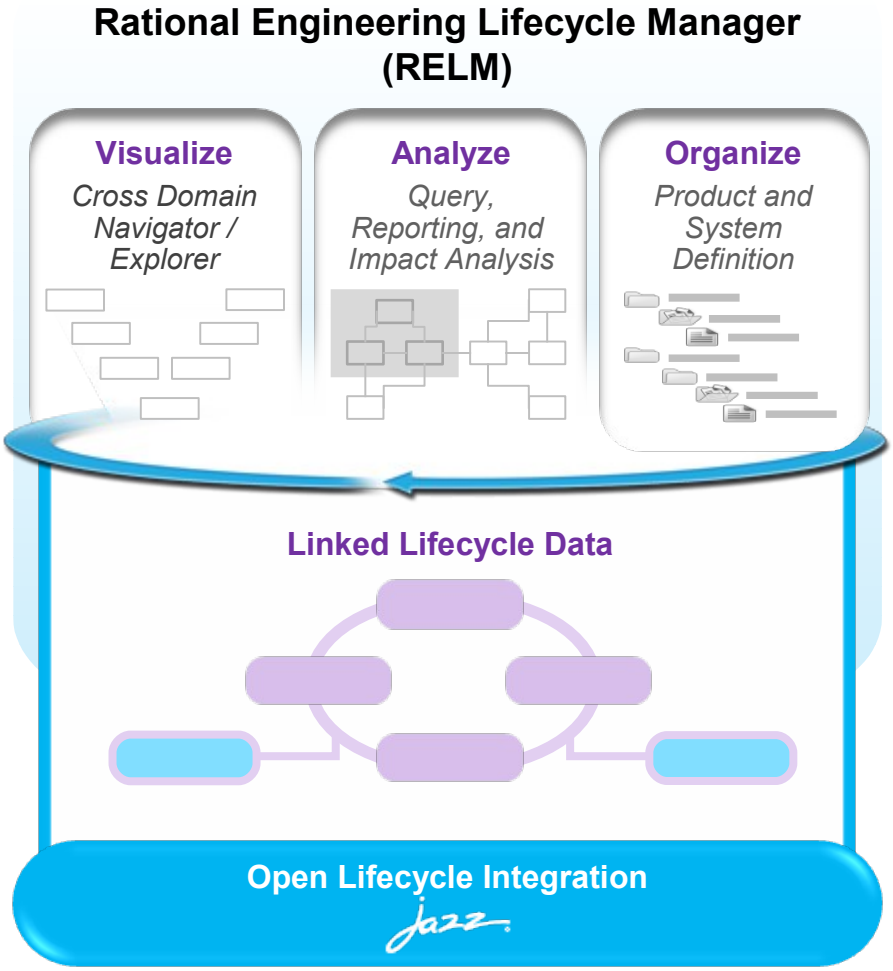
Introducing Rational Engineering Lifecycle Manager

Extending the Rational solution for systems and software engineering

- Uses a Linked Data approach to provide a platform that provides
  - ***Visibility*** – across many sources of data
  - ***Organization*** – information in context
  - **Analysis** - answer questions using that contextualized information

We'll take a closer look later today in a dedicated session on RELM…



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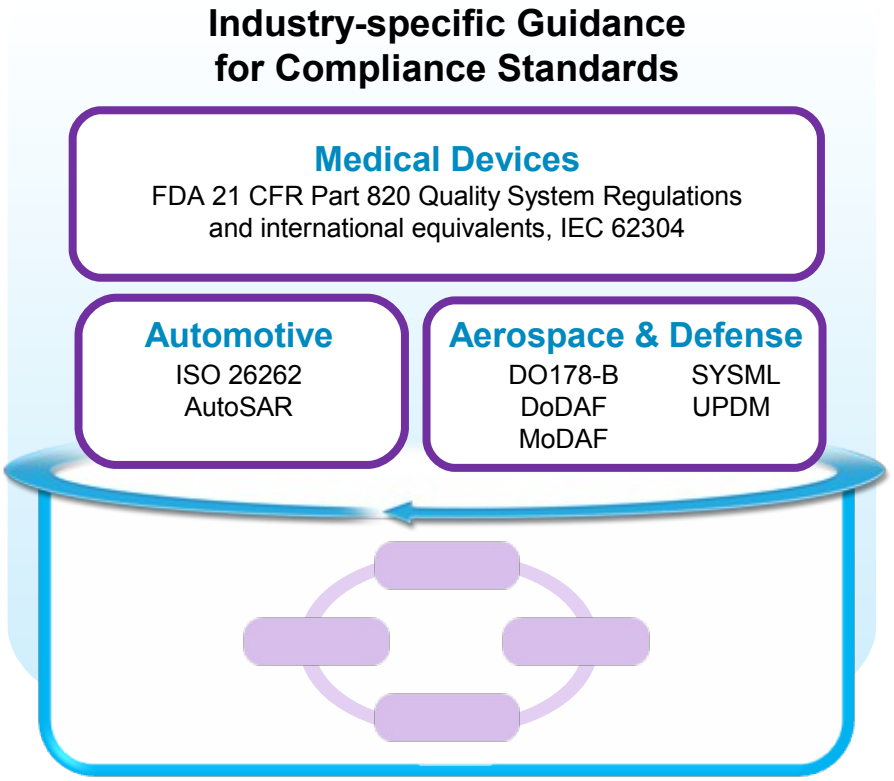
Reduce risk and cost in achieving compliance with industry specific guidance for compliance standards

- Extend the Systems and Software Engineering Solution with industry-specific templates and tool mentors
- Efficiently comply with industry regulations
- Execute guidance on best practices



"We facilitated 100% compliance rate with ERTMS standards for code traceability and safety with the support of their IBM Rational solution."

- Invensys Rail Dimetronic

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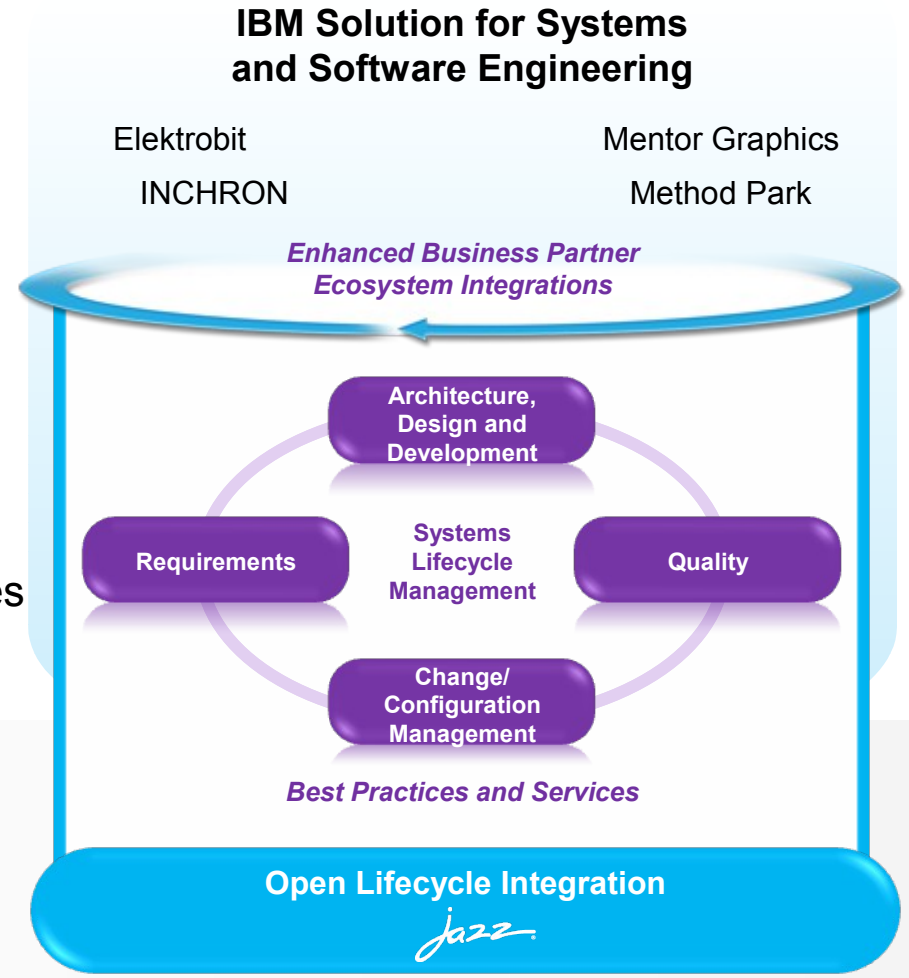
Reduce risk and cost in achieving compliance with industry specific guidance for compliance standards

Ecosystem

Address business and technical challenges with new and enhanced partnerships that help:

- Improve efficiency in AUTOSAR compliance *Elektrobit*
- Address the complexities of E/E systems development *Inchron*
- Speed design and implementation of vehicle systems *Mentor Graphics*
- Specify complex System Engineering processes *Method Park*

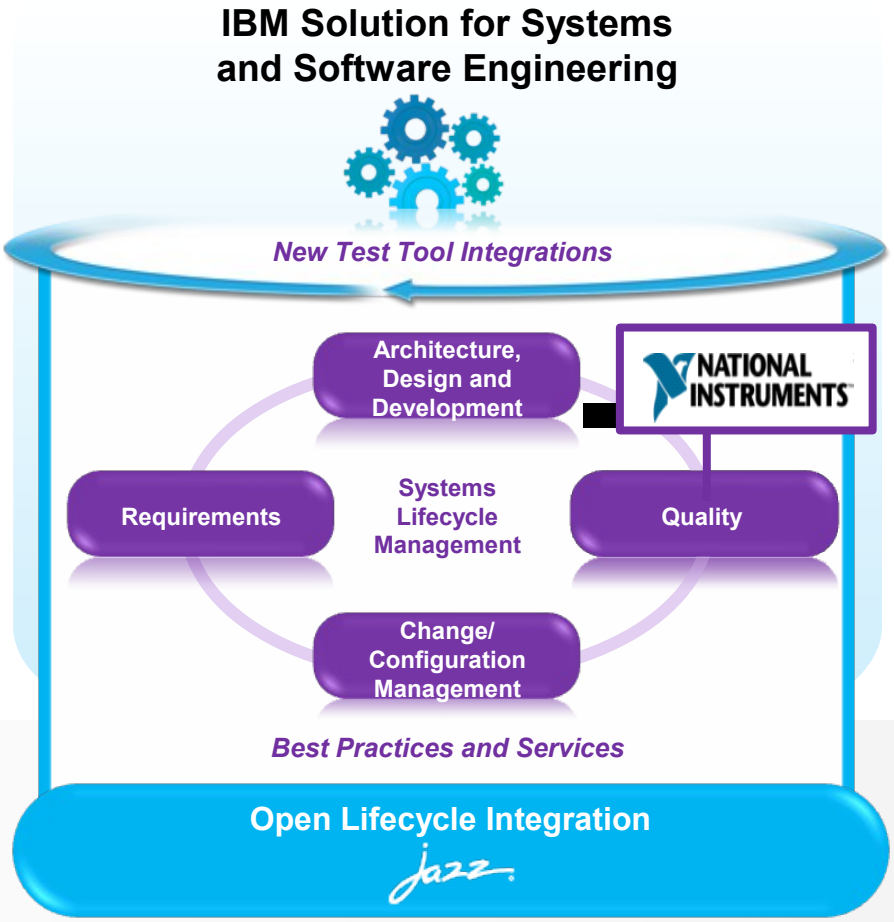


New partnership: Improve validation, test and traceability with IBM Rational and National Instruments

Ecosystem

This partnership will help:

- Establish lifecycle traceability
  - Link test data from tools to development artifacts
- Demonstrate compliance
  - Show end-to-end requirements to test execution
- Automate Quality Metric Reporting
  - Analyze release-to-release test result deltas
- Reduce time to resolve defects
  - Automate test workflows; Accelerate root cause analysis



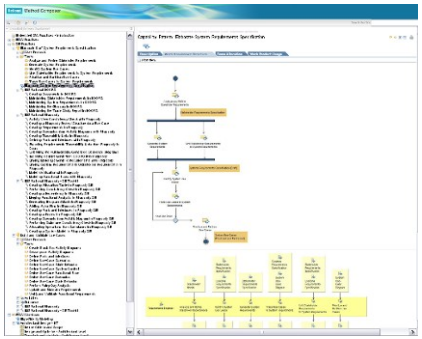
"IBM is a great partner. It plays an important role in improving the quality of embedded software development in SAIC."

IBM Confidential until June 4, 2012

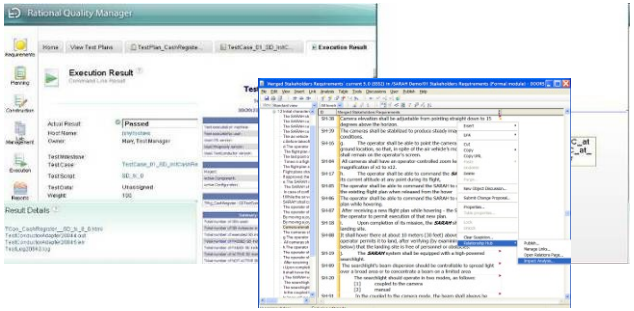
Going beyond technology

Tools, best practices, mentors, templates, services

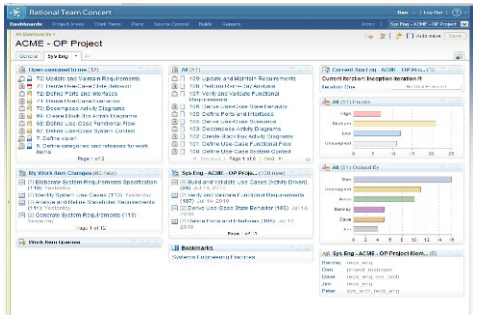
Practice library



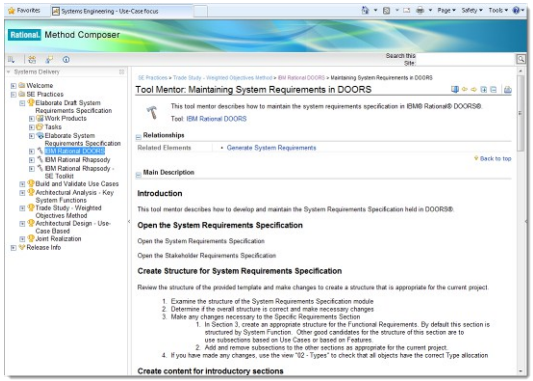
Starting templates



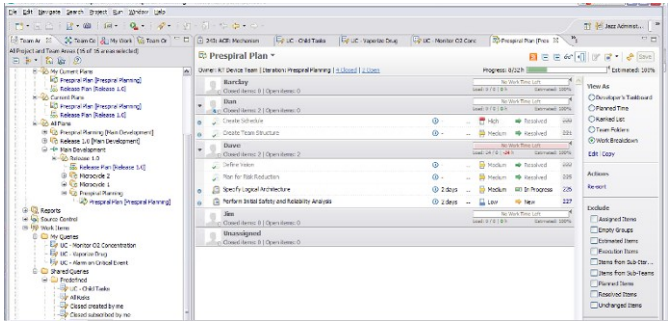
Dashboards



Tool mentors



Auto generation of practice work items



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