



IBM Rational Software Conference 2009  
As Real as It Gets!



## IBM Rational Software Conference 2009

Extending Your Existing IBM Rational Solutions with Rational® Rhapsody®

**Alberto Sardini**  
IT Specialist, IBM Rational  
[alberto\\_sardini@it.ibm.com](mailto:alberto_sardini@it.ibm.com)

**Rational.** software

# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A



# Agenda

- **Market Dynamics**
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A



# Companies Are Facing an Unparalleled Rate of Change

*Innovation is Considered the Key to Success*

**Globalization**

**Intensified  
competition**

**Workforce issues**

**Escalating  
customer  
expectations**

**66% of CEOs  
expect their  
organizations  
to be inundated  
with change**

**Technological  
advances**

**Unexpected  
market shifts**

**Regulatory  
concerns**

*"We will fight our battles not on the low road to commoditization, but on the high road of innovation."*

*Howard Stringer, Chairman and CEO, Sony*

# Challenges and Opportunities abound



## Business Challenges

Product missed customer needs	46%
Late to market/missed demand	33%
Poor commercialization / promotion	26%
Product quality	24%
Pricing	23%
No clear product differentiation	19%

The CIO's Guide to the PERFECT Launch: Translating Innovation to Business Benefit, AMR Research, 2005



## Engineering Opportunities

<b>Improve communication and collaboration across disciplines</b>	<b>71%</b>
<b>Increase visibility into status of requirements</b>	<b>49%</b>
<b>Increase ability to predict system behavior prior to testing</b>	<b>46%</b>
<b>Implement or alter new product development processes for a multi-disciplinary approach</b>	<b>43%</b>
Increase real time visibility of product Bill of Materials (BOM) throughout the development process	39%

Aberdeen Group, System Design: New Product Development for Mechatronics, Michelle Boucher, David Houlihan, January, 2008

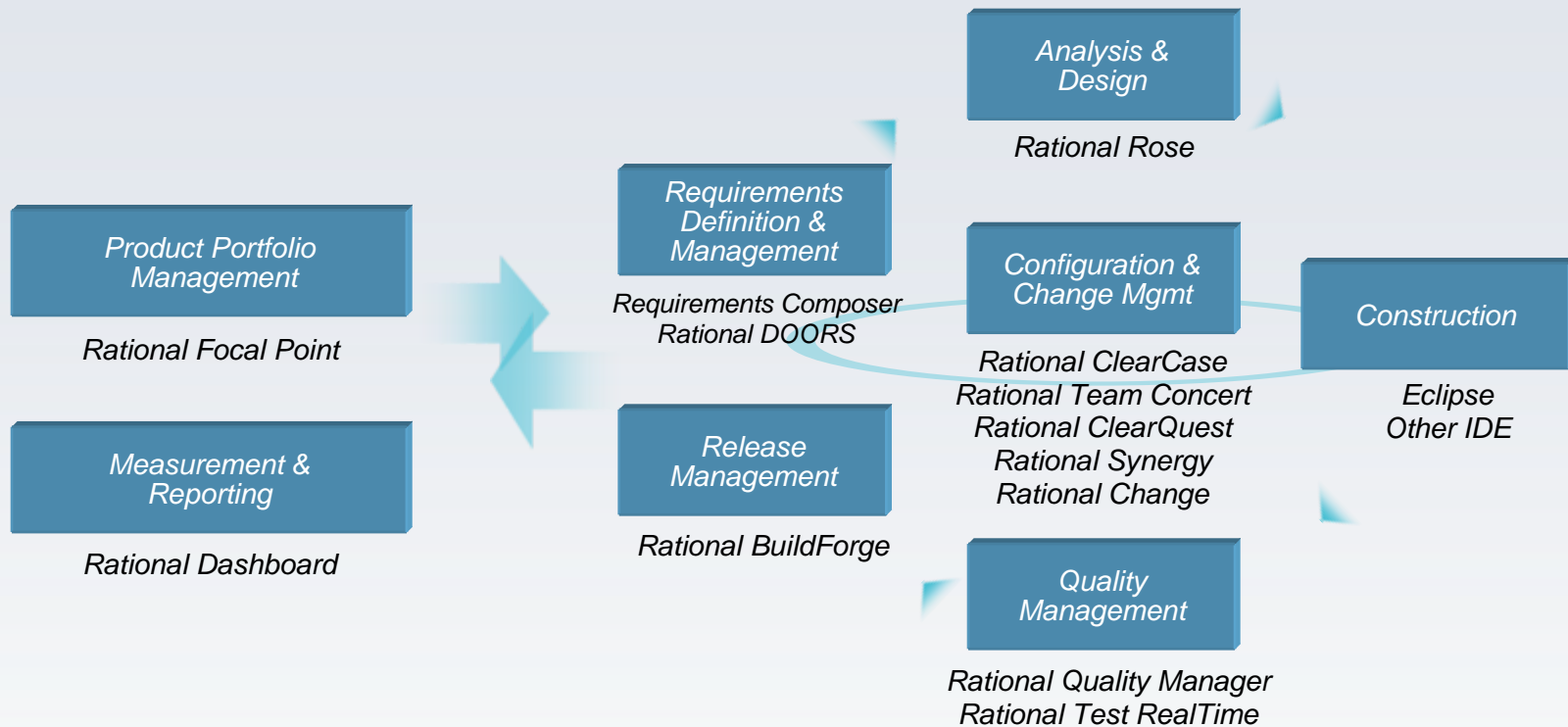
# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A



# The Rational Portfolio – Systems

## *Where have you invested?*



System Lifecycle Process Management

Rational Method Composer, Rational Harmony, RUP-SE

# Agenda

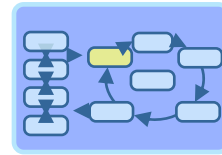
- Market Dynamics
- Your current investment in Rational
- **Extend value with Rhapsody**
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A



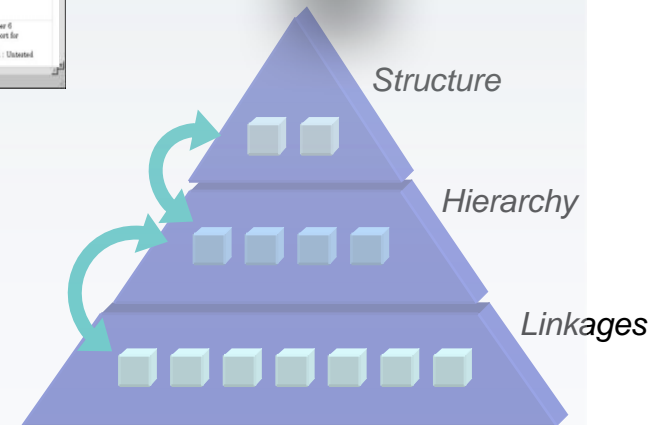
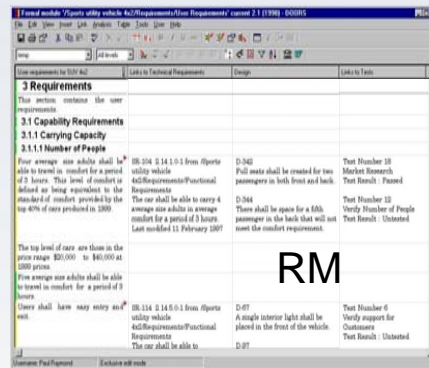
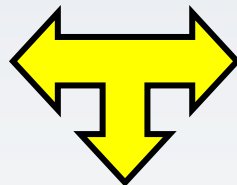
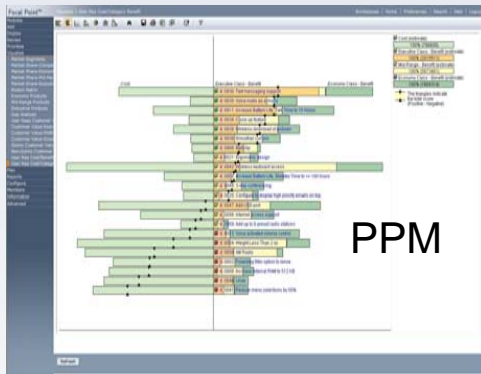


# Requirements Definition and Management

*To Ensure You are Building What the Customer Will Buy*

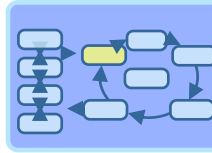


- Automate the capture of ideas and select features based on business value
- Capture customer requirements and set up change impact and traceability



# Rational Focal Point

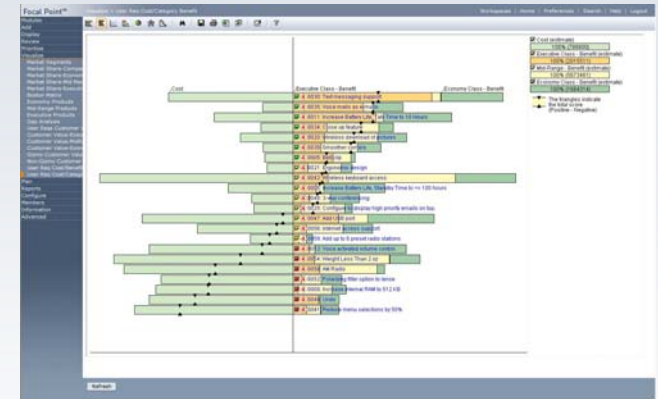
## *Product and Portfolio Management*



## Rational Focal Point

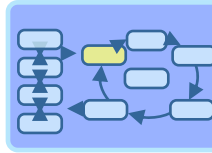
*Best in class product and portfolio management*

- ▶ Automate the capture of ideas
- ▶ Select features based on business value
- ▶ Analyze the market to ensure feature alignment



# Rational Requirements Composer

## *Requirements Definition*



## Rational Requirements Composer

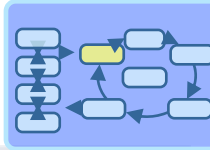
*Requirements definition and collaboration based on Jazz*

- ▶ Visually capture requirements
- ▶ Use process sketches, storyboards, user-interface sketches, and rich text
- ▶ Reduce risk by gaining agreement of requirements early
- ▶ Iterate quickly with stakeholders



# Rational DOORS

*Market Leading Requirements Management Product for Systems*



- Provides end-to-end visibility of requirements
- Comprehensive support for recording, structuring, managing, and analyzing requirements and their traceability
- Requirements are persistent at all levels of decomposition
- Scalability for large projects
- Trace requirements to development tasks and design models
- Maintain a complete audit trail

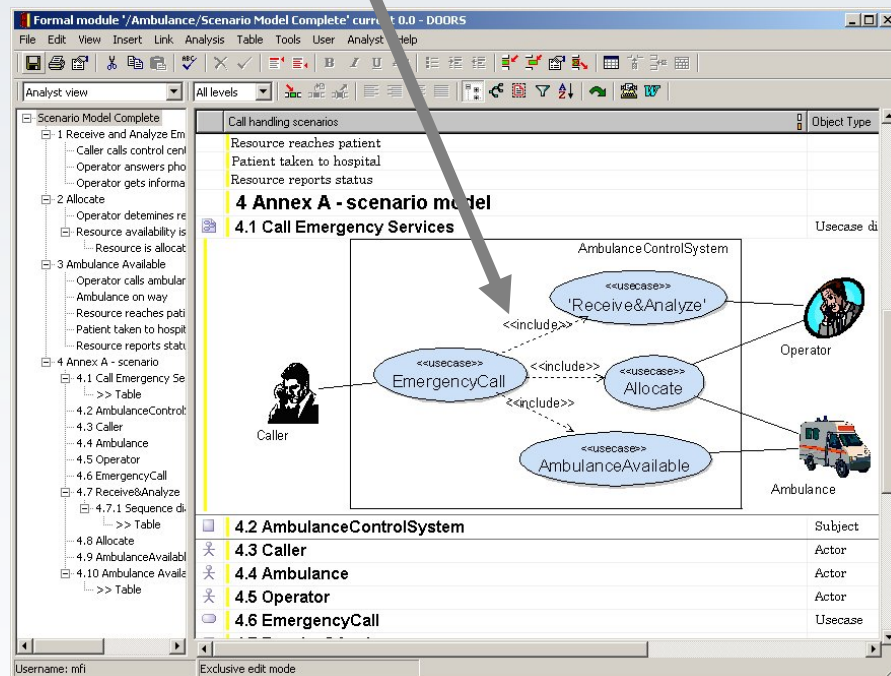
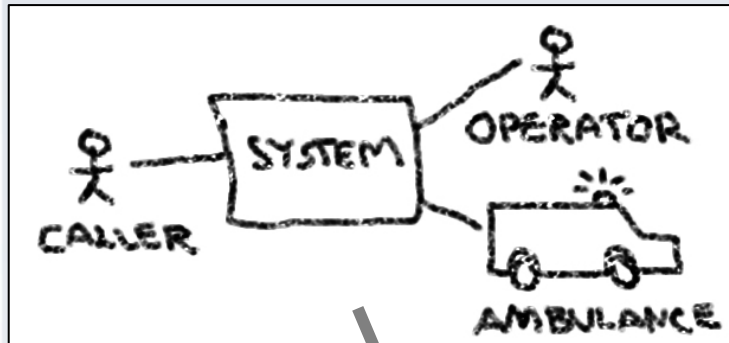
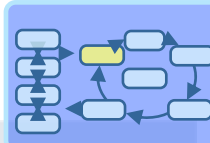


*“DOORS (Telelogic) provides the best coverage of our list of requirements. It stands out in our four assessment dimensions. DOORS demonstrates strengths in capturing, linking and analyzing the requirements during their whole lifecycle.”*

**Yphise**

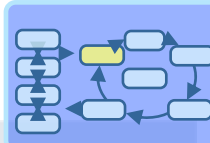
*Agile Requirements-Driven Development,  
Yphise,  
March 2008*

# Rhapsody extends Requirements Capabilities

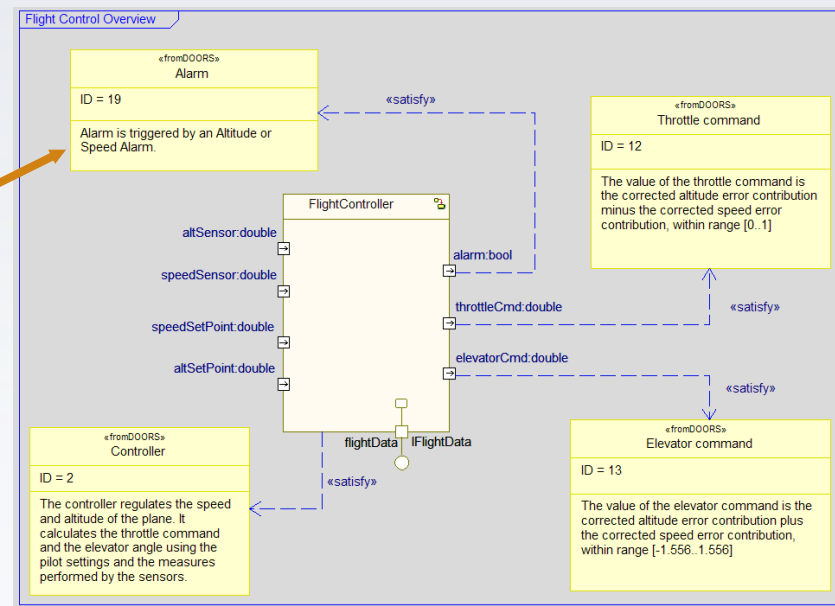
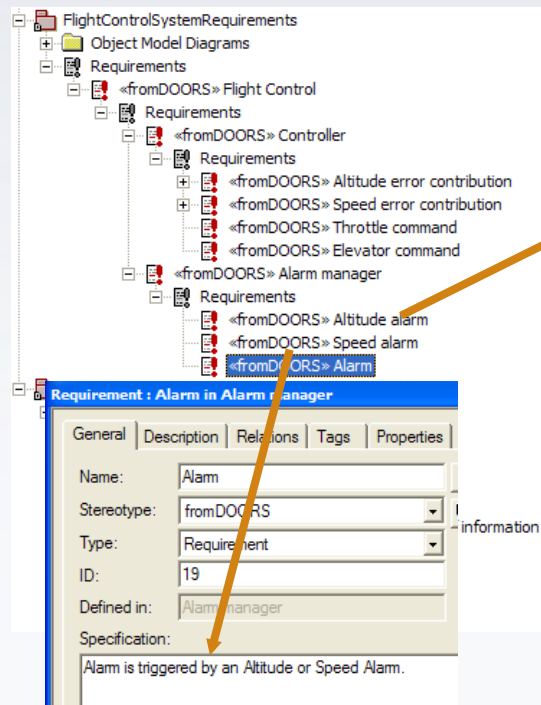


- Increase the effectiveness of Requirements Engineering
- Models and Requirements complement each other
- Diagrams help clarify understanding of requirements
- Build a bridge from Requirements Engineering to Software Development
- Maintain a detailed requirements workflow with full traceability to generated code and documentation
- A formalized but flexible graphical notation enables expressive, 'people friendly' diagrams
- Easily visualize, model and validate requirements to avoid costly rework

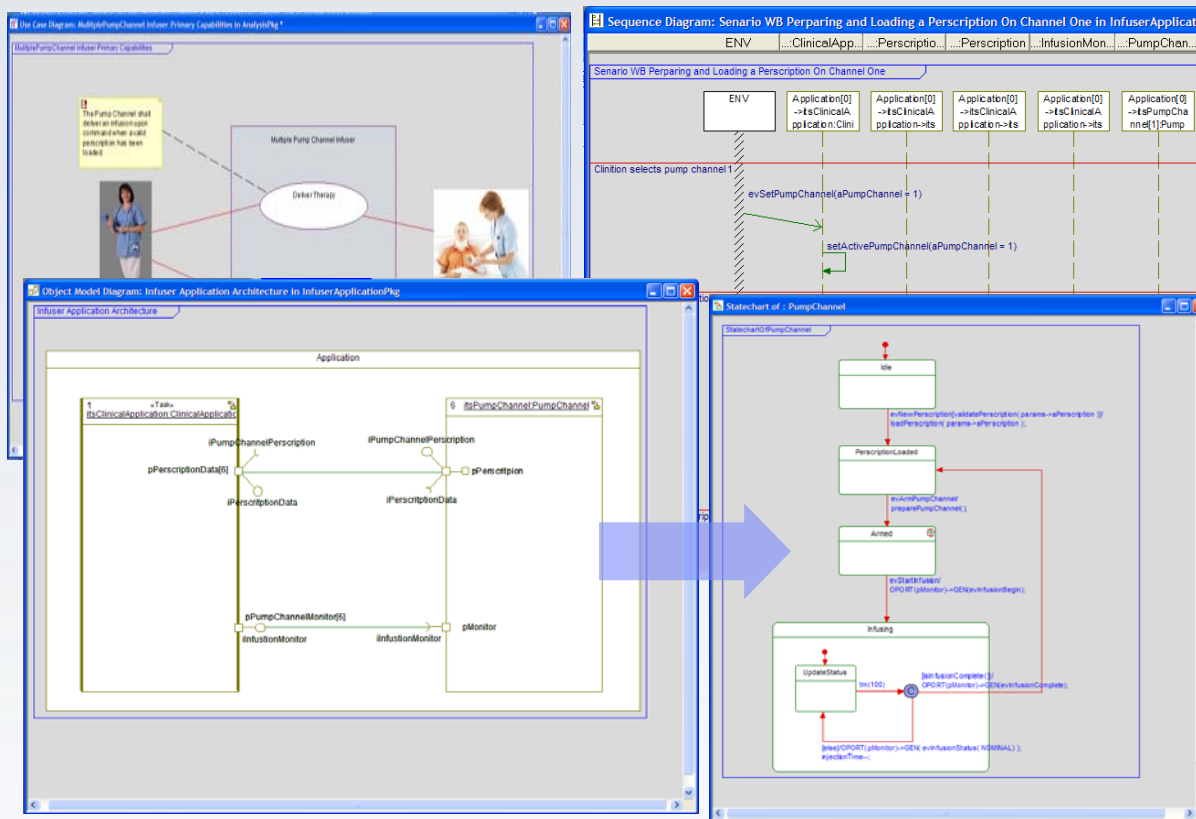
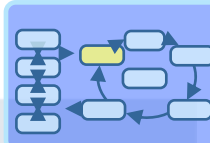
# Rhapsody delivers visual requirements capture



- Use requirements and use case diagrams to define requirements
- Supplement definitions and descriptions with tags and constraints
- Describe requirements behavior using sequence, activity and state diagrams
- Include advanced graphics and icons with domain-specific modeling



# Rhapsody enhances requirement understanding



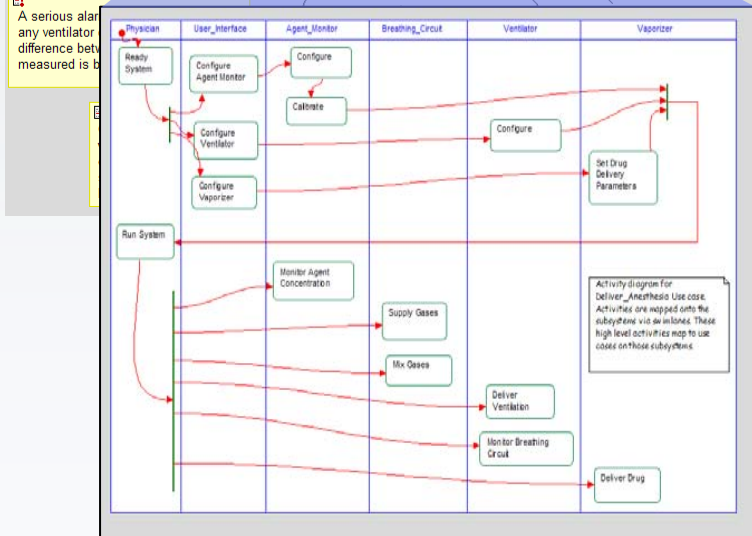
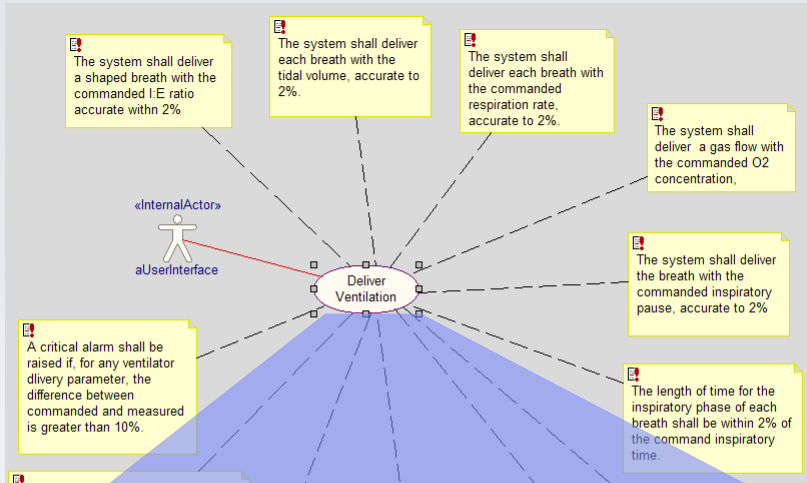
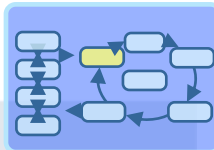
- Visualize:
  - ▶ Requirements
  - ▶ Structure
  - ▶ Behavior
  - ▶ Interaction
  - ▶ Constraints
- Improved Communication
- Enhanced Collaboration
- Industry Standard, Formal Language
  - ▶ Unambiguous
- Compliance: DoDAF, MODAF, AUTOSAR, etc.

“Rhapsody is the leading UML 2.1 compliant solution for embedded systems.  
Reducing OEM development Costs and Enabling Embedded Design Efficiencies  
Using the Unified Modeling Language (UML 2.1)”

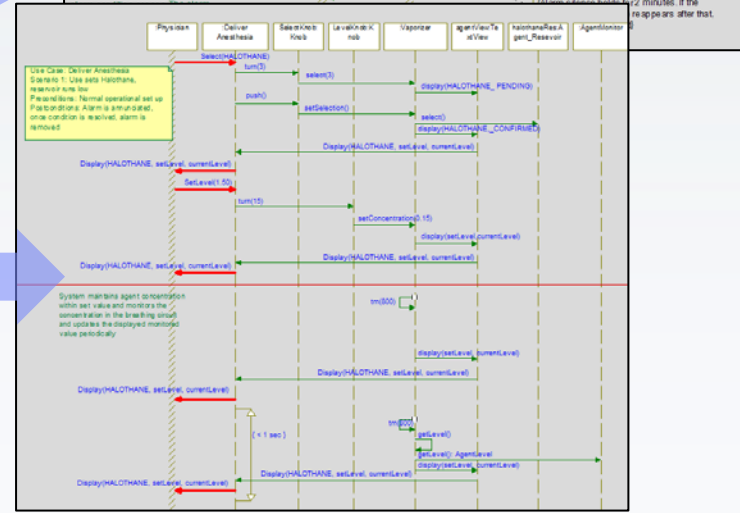
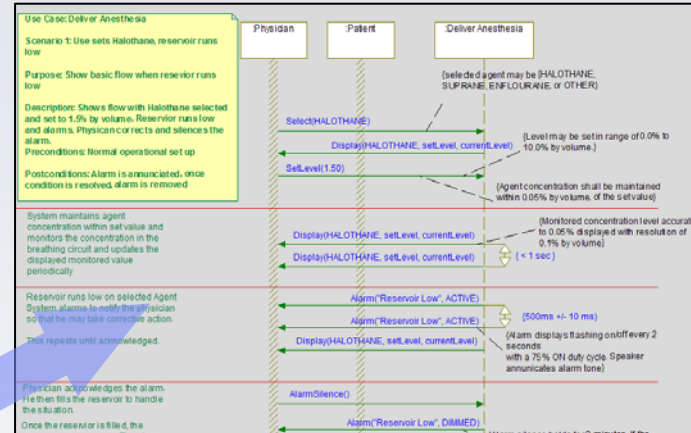
Source: “Reducing OEM Development Costs and Enabling Embedded Design Efficiencies Using the Unified Modeling Language (UML 2.0)”, Embedded Market Forecasters



# Rhapsody enables visualized requirements



shall be e 1 hour be of



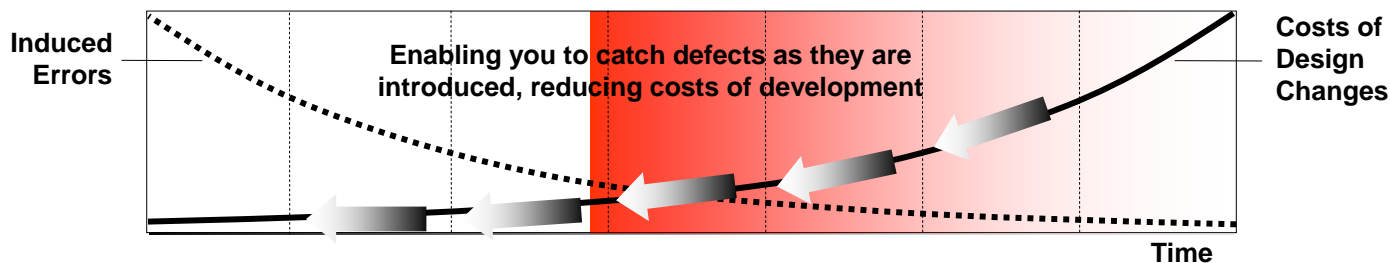


# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A



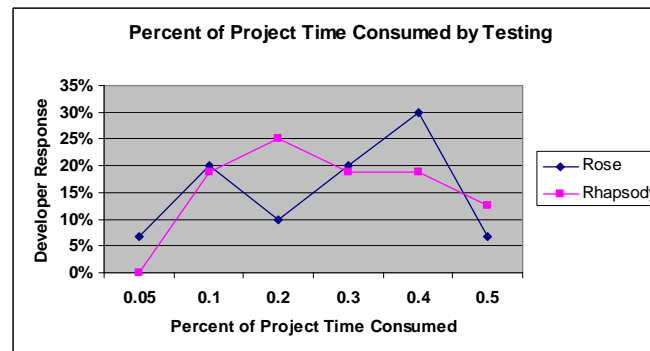
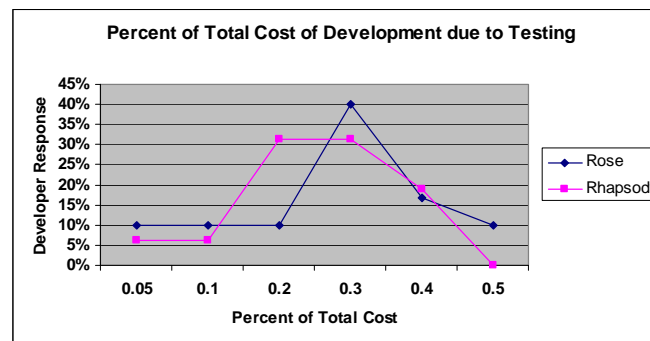
# Rhapsody delivers benefits of MDD approach



- Deliver software that meets the requirements
- Ensure delivered system is in synch with architecture
- Reduce costs in testing
- Reduce time spent testing

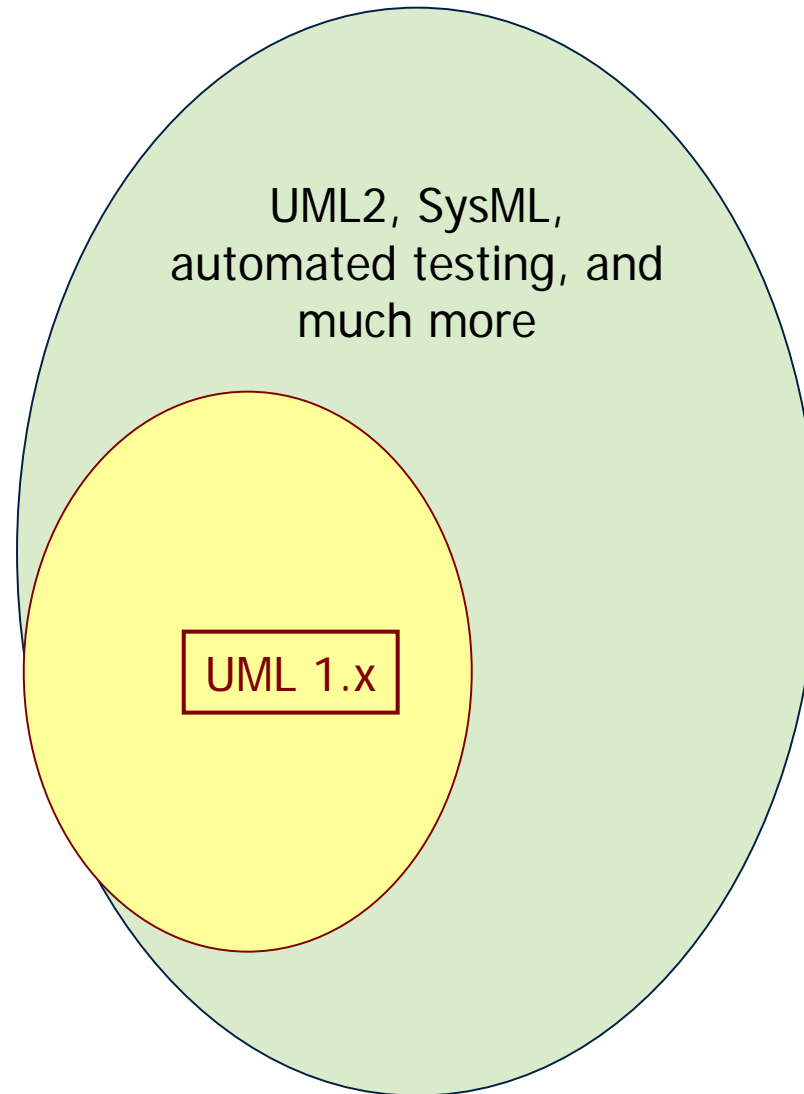
Percent of Final Designs within 30% of Pre-Design Expectation

	Rose	Rhapsody
Performance	73.3%	86.6%
Systems Functionality	73.3%	80.0%
Features & Schedule	66.7%	73.4%



# Rhapsody and key benefits of the transition

- Test your system and software at the level of your design
  - ▶ Model driven testing
- Define your system using concepts from your domain
  - ▶ Enriched domain specific modeling support
- Share design knowledge and experience
  - ▶ Advanced collaboration & documentation
- Work at the level you desire
  - ▶ Code centric workflows
- Reuse the design
  - ▶ Plug and Play development



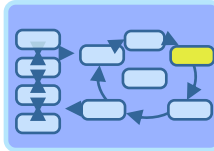
Rose

Rhapsody

# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - **Construction**
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A





# Rhapsody brings MDSD into Eclipse

- Integrated MDD within Eclipse environment
- Navigate between model and code views
- Leverage Eclipse to tailor environment for your needs

The screenshot displays the Rhapsody Eclipse IDE interface. The top window shows the UML/SysML Diagram Editors, displaying a class diagram with packages, classes, and associations. The bottom window shows the Eclipse Code Editor, displaying the source code for Connection.h and Connection.c. Two callout boxes highlight the UML/SysML Diagram Editors and the Eclipse Code Editor.

**UML/SysML Diagram Editors**

**Eclipse Code Editor**

```

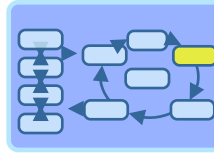
22
23/** package Architecture::ConnectionManagement */
24
25
26/* This File tracks the number of valid connections. */
27
28/** class TopLevel::Connection */
29
30/* counter for number of connections*/
31/** attribute connection */
32extern int connection;
33
34/* Keeps track to active connections*/
35/** statechart_method */
36void addConnection();
37
38
39
40#endif
41/*****
42  File Path  : SystemBuild\Target\Architecture\ConnectionManagement\Connection
43 *****/
44
45

```

```

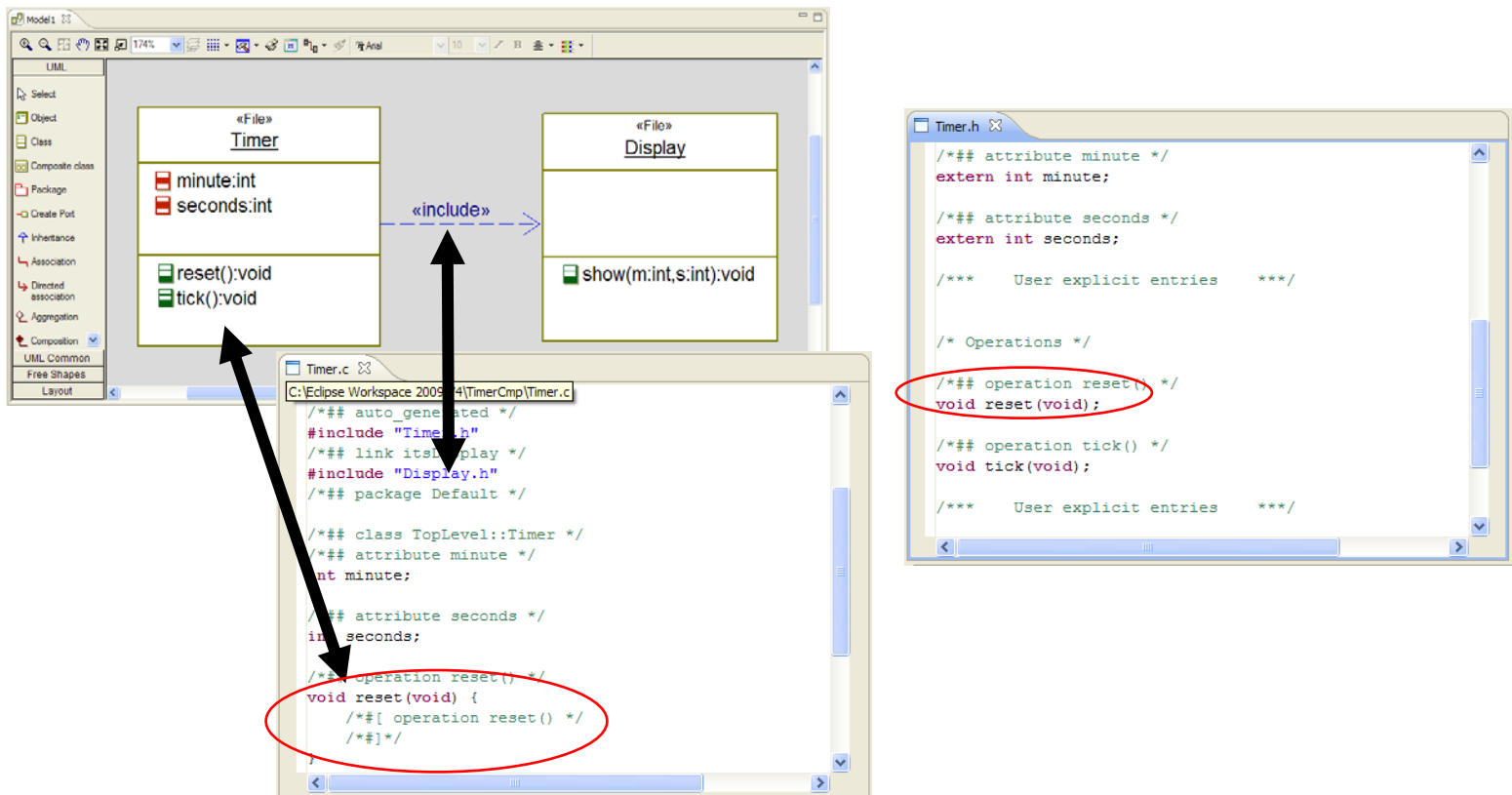
1/*****
2  Rhapsody in C  : 7.2
3  Login         : uspauc
4  Component    : SystemBuild
5  Configuration : Target
6  Model Element : Connection
7// Generated Date : Wed, 9, Jan 2009
8  File Path    : SystemBuild\Target\Architecture\ConnectionManagement\Connection
9 *****/
10
11#include "Architecture\ConnectionManagement\Connection.h"
12
13/*****
14 Architecture\ConnectionManagement\Connection.c
15 *****/
16
17/** package Architecture::ConnectionManagement */
18
19/** class TopLevel::Connection */
20
21/** attribute connection */
22int connection;
23
24void AddConnection();

```

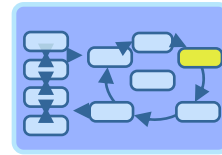


# Rhapsody enables synchronization

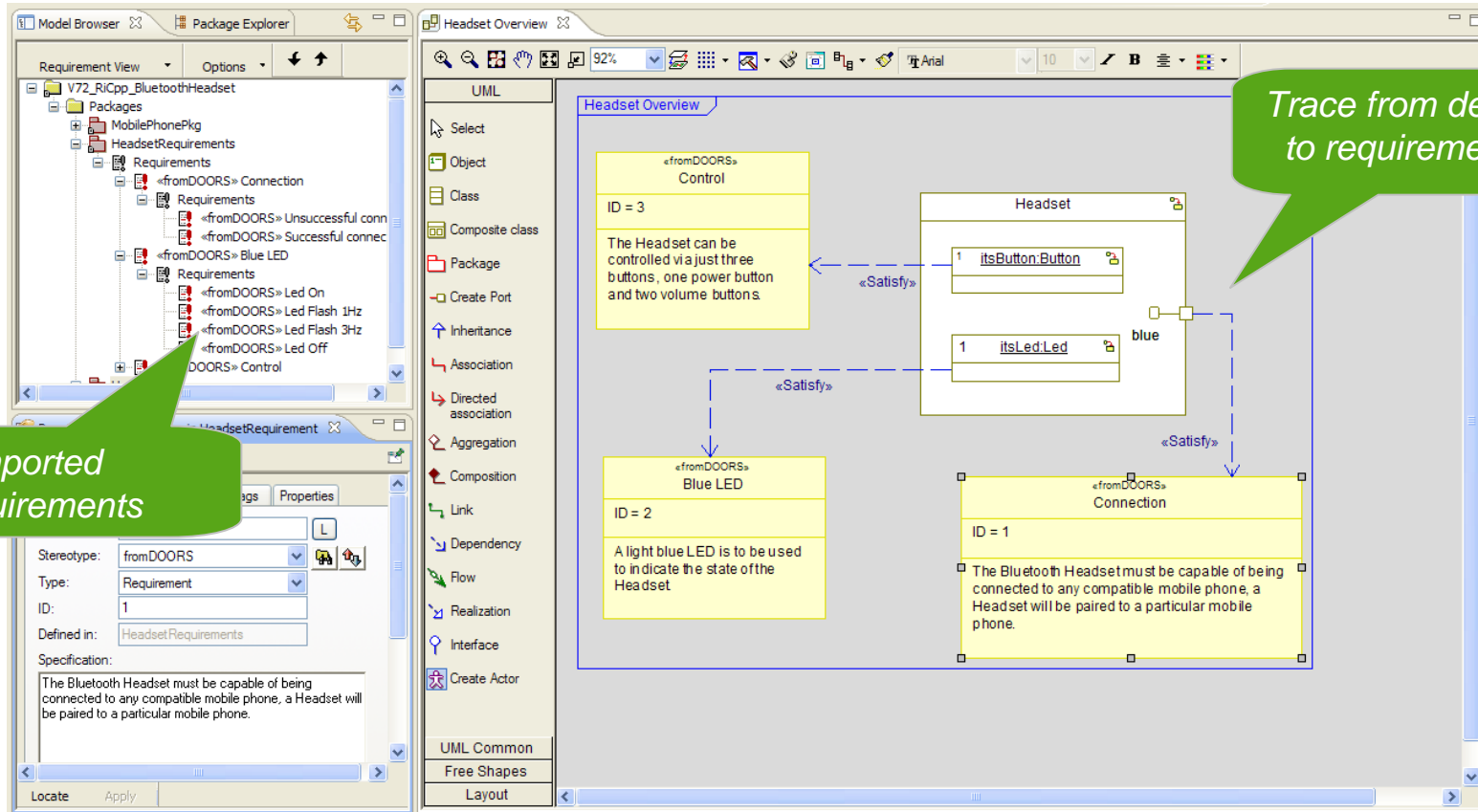
- Code and model stay synchronized
- Model generated into code eliminates manual typing
- Code edits are updated into the model



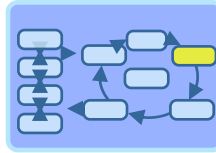
# Rhapsody ensures traceability



- Requirements traced to design and generated code
- Perform impact analysis as change occurs
- Helps identify requirements are implemented
- Import requirements from various sources



# Rhapsody extends design and debug



- Natural workflow for code-centric developers
- Perform design or code level debugging in single environment
- Custom perspectives tailor the development environment

View Model Information

Use Eclipse Intellisense

Graphical View of Design

View Build Errors from IDE

The screenshot displays the Rhapsody IDE interface. The central pane shows C++ code for `AcmeJet::rootState_entDef()` and `AcmeJet::rootState_processEvent()`. The left pane shows a project browser with a tree view of the design. The bottom pane shows a graphical design diagram titled "Acme Dishwasher Product Line" with various components like `AcmeFactory`, `AcmeTank`, `AcmeJet`, and `AcmeHeater`. The right pane shows a list of build errors, including "Invalid project path: Include path not found".



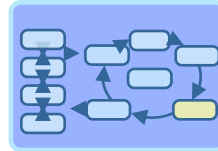
# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - **Quality Management**
  - Configuration & Change Management
- Conclusion
- Q&A

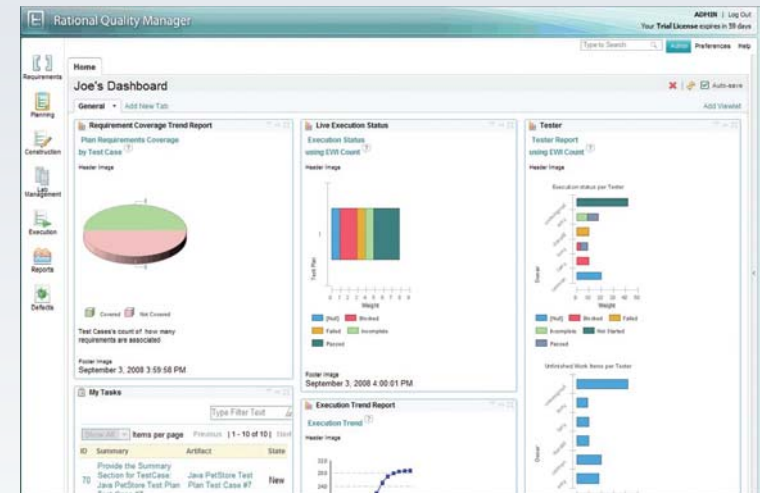


# Rational Quality Manager

## *A Central Hub for Business-driven Software Quality*

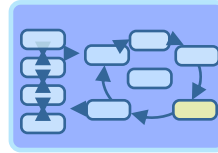


- Mitigate risk with collaboration
  - ▶ Stakeholder and team coordination
  - ▶ Automated process workflow
  - ▶ Upstream and downstream quality
- Improve operational efficiency with automation
  - ▶ Lab efficiency and asset utilization
  - ▶ Test coverage optimization
  - ▶ Environment and lifecycle coverage
- Make confident decisions with effortless reporting
  - ▶ Ongoing process improvement
  - ▶ Proactive risk management
  - ▶ Greater predictability



# Rational Rhapsody TestConductor & Rational Test Realtime

## *Validation and Verification*



## Rational Rhapsody TestConductor

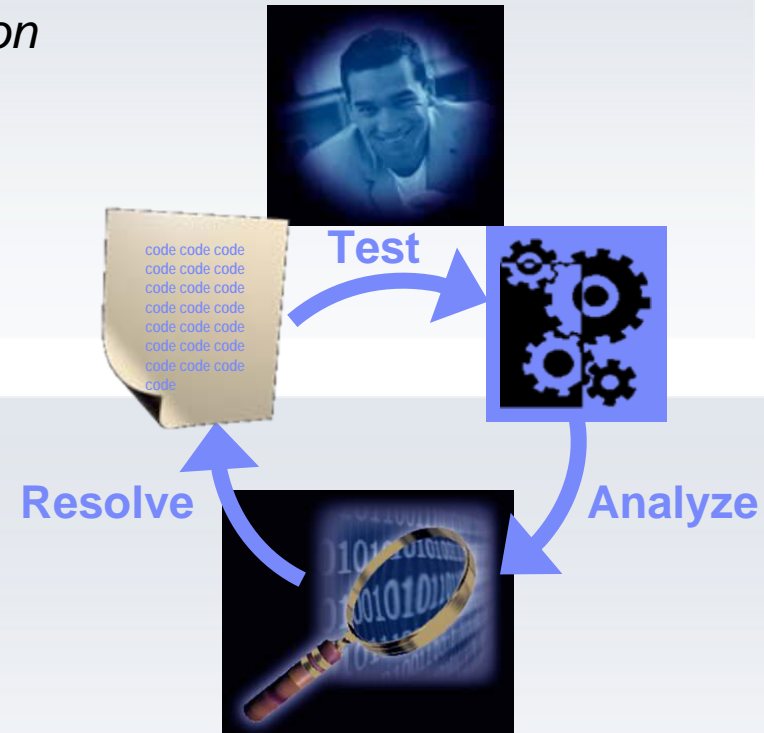
*Scenario based test case generation and validation*

- ▶ Test the design against the requirements
- ▶ Profile memory, performance and coverage

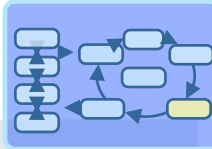
## Rational Test RealTime

*Fix your code before it breaks*

- ▶ Automates testing, analysis and bug solving early during development cycle
- ▶ Provides a low-overhead technology for enabling target-independent tests
- ▶ Extends model-driven development to include runtime analysis capabilities

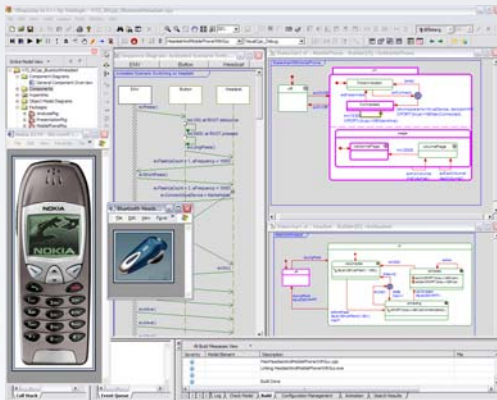


# Rhapsody delivers model driven testing



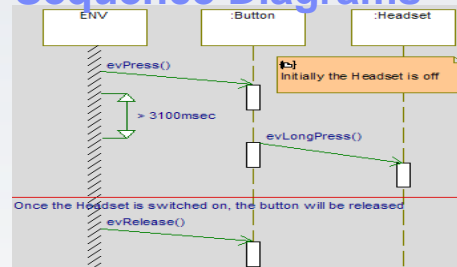
- Bring the benefits of abstraction and automation to testing
- Reduce defects early in the process when they are less costly to fix
- Deliver products meeting customer expectations

## Simulation

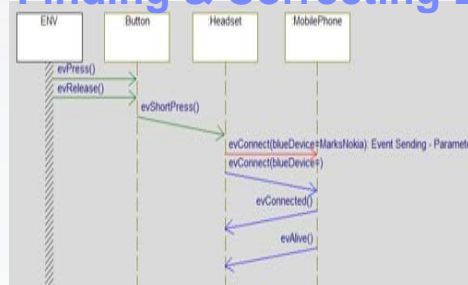


## Requirements-based testing

### Sequence Diagrams



### Finding & Correcting Errors



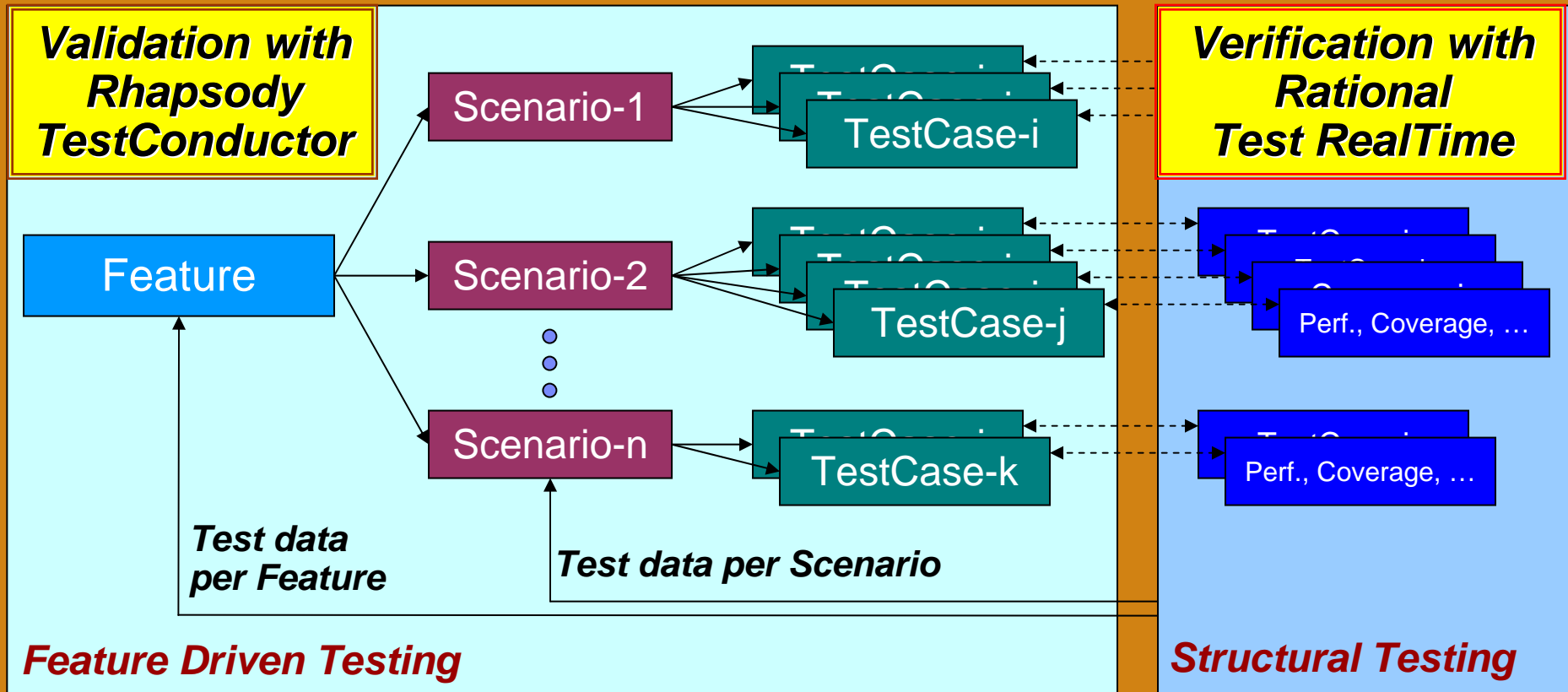
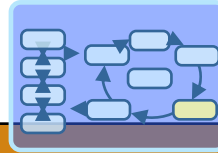
## Automated unit testing



Host based

Target based

## IBM's Unique Comprehensive Quality Management



## Test and Quality Management with Rational Quality Manager

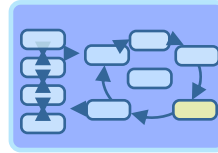
- Test data includes any run time information that is associated with executing a test case, such as Performance profiling, code coverage, run time complexity etc.)
- Structural Testing often provided by 3<sup>rd</sup> party tools and RTOS vendors

# Rhapsody Testing Solution

- Model Driven Development and Model Driven Testing Fully Integrated
  - ▶ Testing can be done early and as often as a design can be executed
  - ▶ Test cases are accessible from the Rhapsody browser, making Test cases part of the model, and can be CM'ed, included in Reports, etc.
- Supports Unit testing, white box (instrumented) and black box (non-instrumented) testing
  - ▶ Following the UML Testing Profile
  - ▶ Automatically generate a graphical test architecture
  - ▶ Graphical test cases and their behaviors
  - ▶ Test case behavior captured as Sequence Diagrams, Flowcharts and/or plain code
  - ▶ Offering test case code generation from the graphical test architecture and the associated test cases
- Open API to testing artifacts (such as test cases)

# Rhapsody Test Conductor

## Major Reasons to Adopt Model Driven Testing



- Being able to...
  - ▶ Integrate Testing into the Design process, allowing for frequent and early testing
  - ▶ Automatically create/update Test Architectures
    - Instead of writing test benches
  - ▶ Create and reuse of code based test cases into the model
  - ▶ Use of Sequence Diagrams as graphical test scripts
    - Much more powerful than writing textual scripts
    - Very easy and intuitive way to associate behaviors to test components (stubs)
  - ▶ Use of animated sequence diagrams as test scripts
    - Simulating a scenario is in effect a recording of a test case (as a SD)
  - ▶ Perform feature driven testing, while driving structural testing
- Results in
  - ▶ Higher Requirements/Model/Code coverage
  - ▶ Higher quality in lower cost and less time

# Agenda

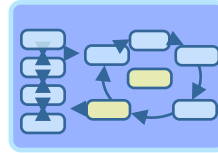
- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- Conclusion
- Q&A





# Rational Synergy & Change

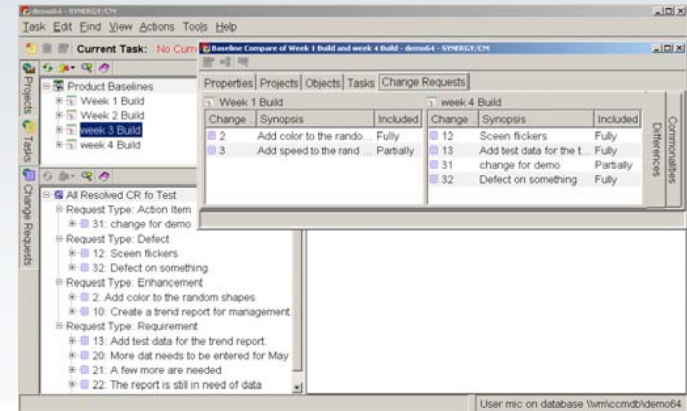
## Configuration and Change Management



### Rational Synergy

#### Task-based Configuration Management

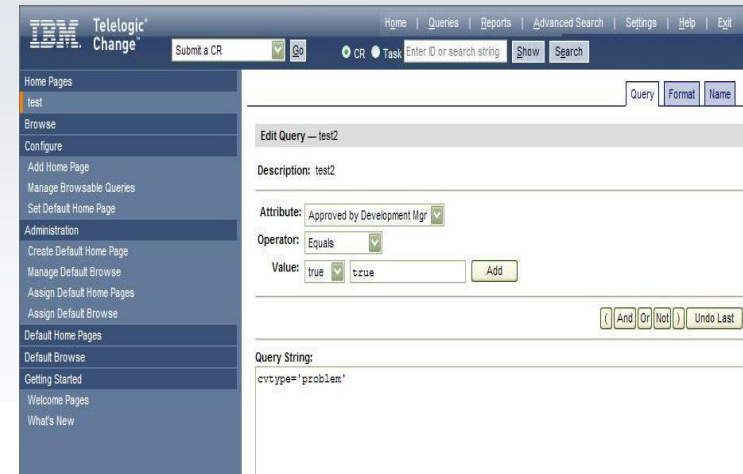
- ▶ Workflow and framework support from simple to complex business needs
- ▶ Support for quality initiatives and development methodologies
- ▶ Support for component-based development
- ▶ Advanced release and variant management



### Rational Change

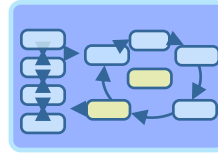
#### Enterprise Change Management Solution

- ▶ Web-based solution for managing and communicating change across the enterprise
- ▶ Manages the often 'disparate' processes for globally distributed teams
- ▶ Built-in lifecycle and task-based management support
- ▶ Extensive built-in reporting capabilities



# Rational ClearCase & ClearQuest

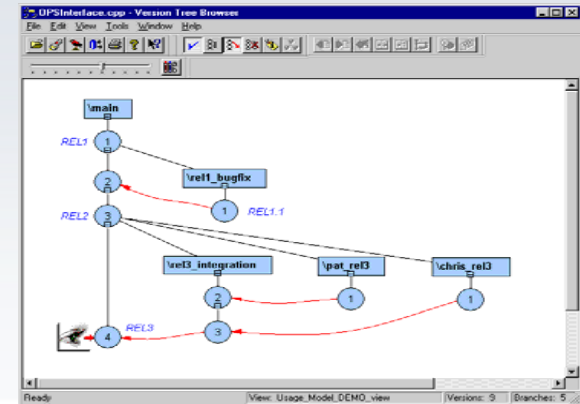
## Configuration and Change Management



### Rational ClearCase

*Complete software configuration management*

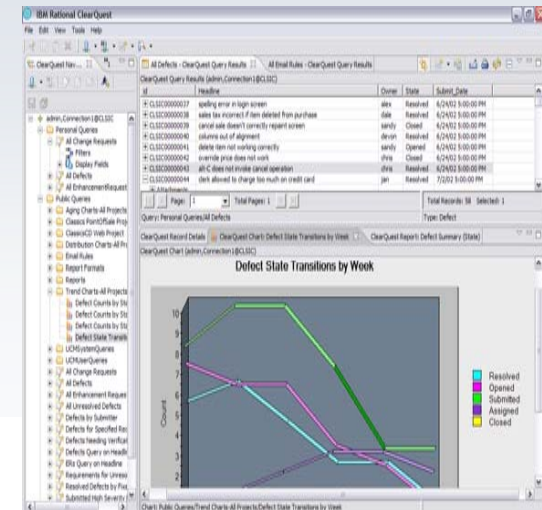
- ▶ Transparent real-time access to files and directories virtually anywhere in the organization
- ▶ Scales to any size team
- ▶ Sophisticated branching and graphical merge tools for concurrent access to files



### Rational ClearQuest

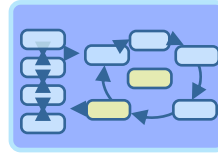
*Comprehensive software change management*

- ▶ Real-time reporting and process enforcement
- ▶ Automated workflows and e-mail notifications
- ▶ Test management
- ▶ Access control, electronic signatures, repeatable processes and audit trails



# Rational Team Concert

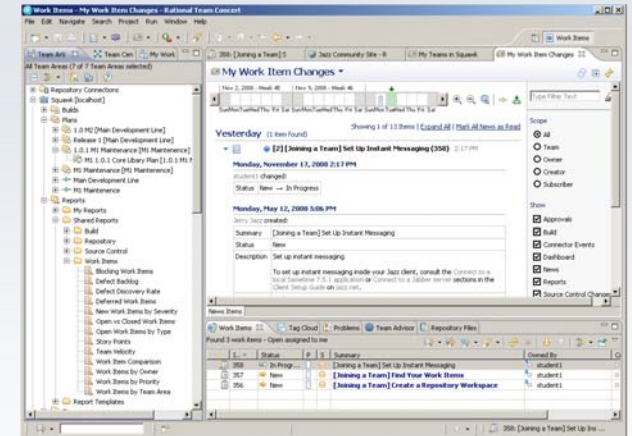
## Collaboration



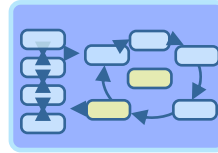
## Rational Team Concert

*Software innovation through collaboration*

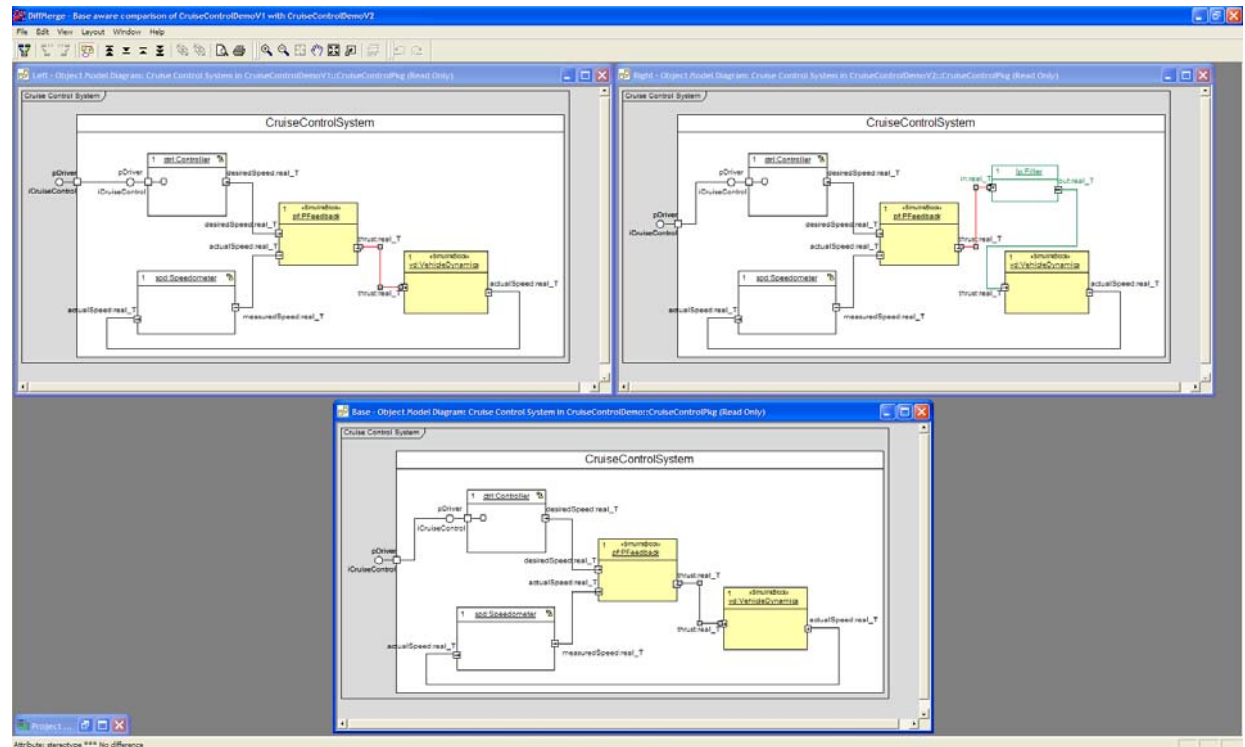
- ▶ Real time, in-context team collaboration
- ▶ Integrated source control, work item and build management
- ▶ Capture data automatically and unobtrusively
- ▶ Dynamic processes accelerate team workflow



# Rhapsody support for Team Collaboration



- Support for small and large scale development
- Manage parallel development with graphical differencing and merging
- Tight integration with Configuration Management (CM) including Rational ClearCase®, Rational Team Concert & Rational Synergy™



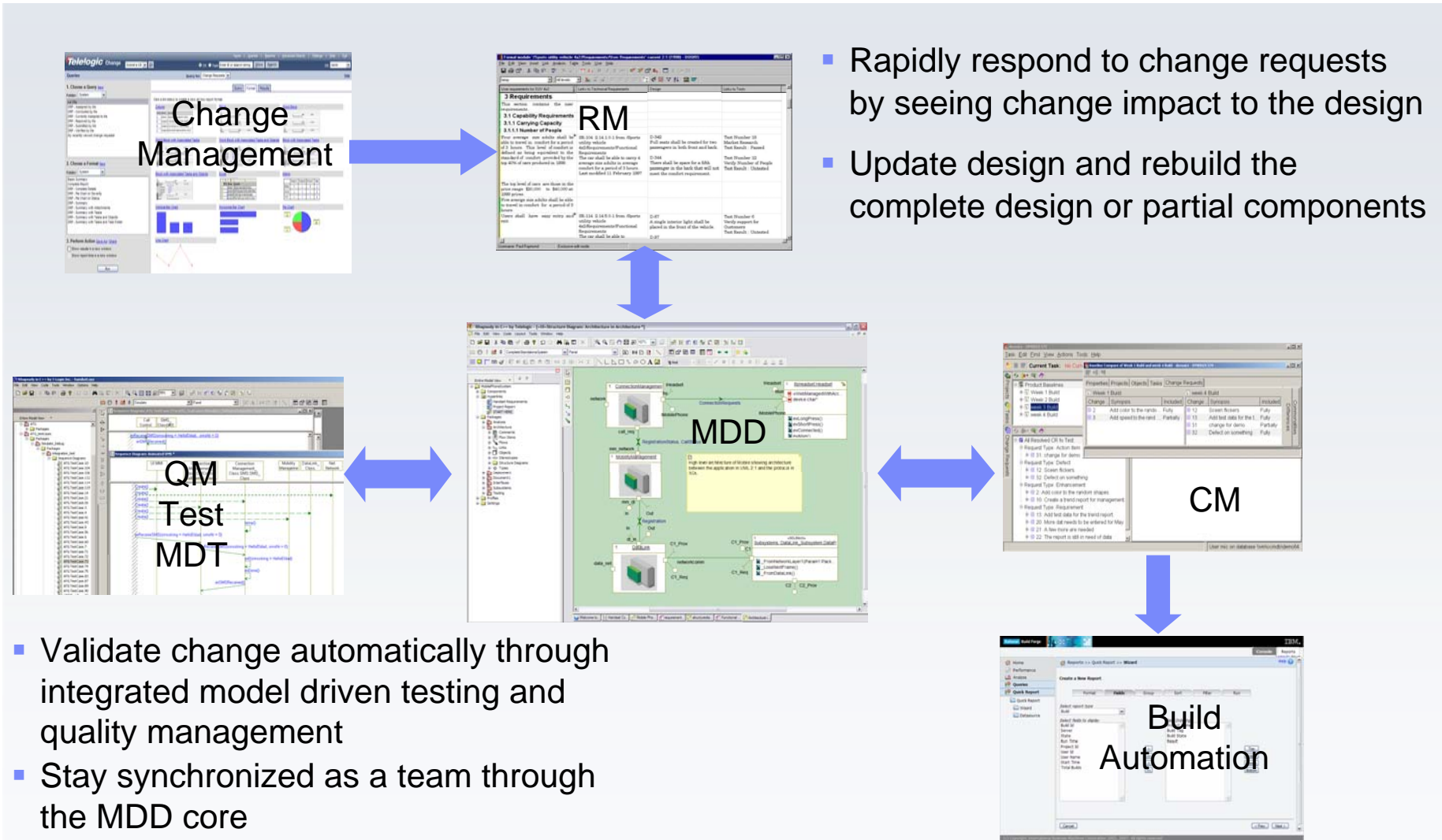
# Agenda

- Market Dynamics
- Your current investment in Rational
- Extend value with Rhapsody
  - Requirements Definition & Management
  - Analysis & Design
  - Construction
  - Quality Management
  - Configuration & Change Management
- **Conclusion**
- Q&A



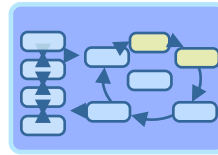
# The Rational Rhapsody Product Family

## *Extending the value of your Rational investments*

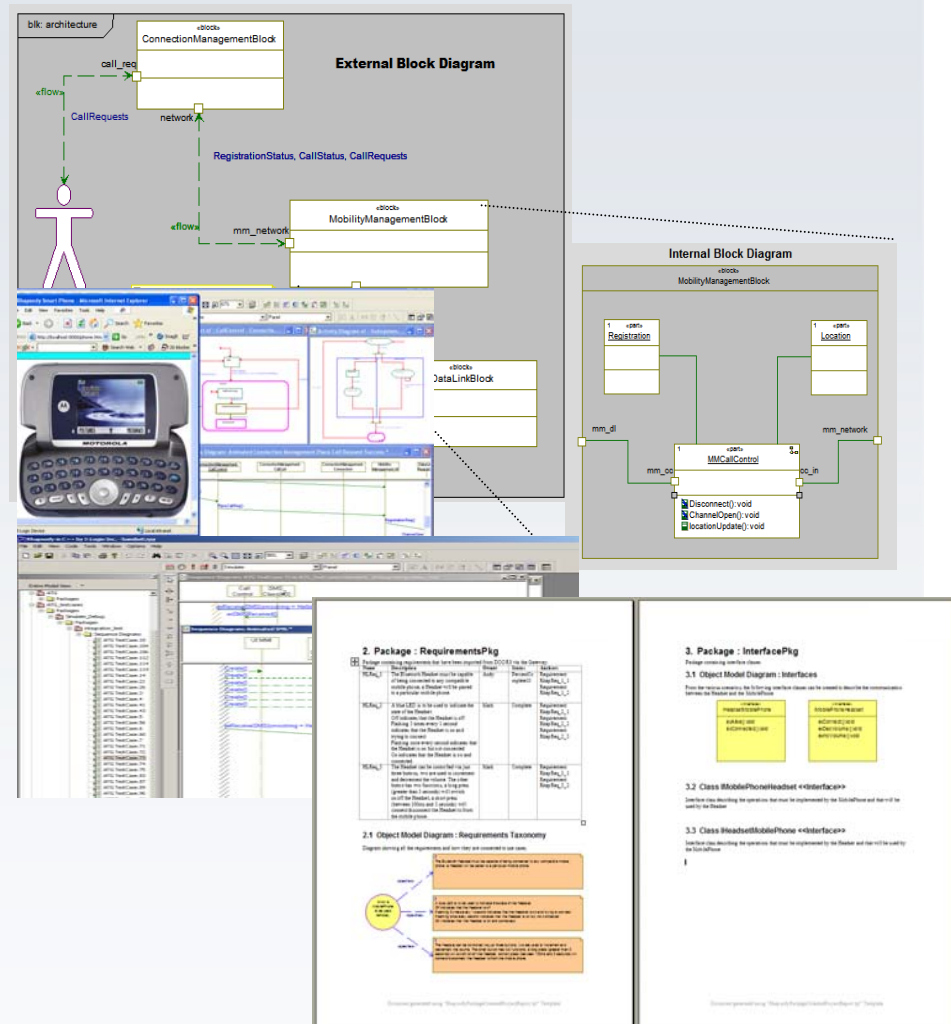


# IBM Rational Rhapsody

Market Leading Model Driven Development for Systems & Software



- Design and develop using industry standards and domain-specific extensions
- Validate and verify designs with model-based simulation and test throughout the product lifecycle
- Develop complete C, C++, Java and Ada solutions for embedded devices, with full synchronization between architectural model and code
- Example product deliverables
  - ▶ Systems specifications
  - ▶ Optimized application and device code
  - ▶ Requirements traceability reports
  - ▶ Specification, design & test documentation
  - ▶ Tests, test cases and scenarios



# IBM Rational Rhapsody: Business Challenges Solved



## Business Challenges

Product missed customer needs	46%
Late to market/missed demand	33%
Poor commercialization / promotion	26%
Product quality	24%
Pricing	23%
No clear product differentiation	19%

## Get products to market more quickly

- ▶ Focus on the mission with a consistent, program-wide *development environment*
- ▶ Overcome complexity challenges – see the big picture and drill down to the details
- ▶ Leverage investments and save money through re-use of existing designs



## Increase product quality while cutting costs

- ▶ Find errors early; when they are inexpensive to correct
- ▶ Ensure product meets expectations by continually simulating & testing during development
- ▶ Focus spending on required functionality; directly tie design features to their requirements



## Capitalize on distributed development

- ▶ Collaborate across diverse teams (systems architecture, software, mechanical, testing...) through a common, visual language
- ▶ Achieve division of labor – split up complex projects, specialists focus on the relevant pieces





# Questions

Thank  
You

© Copyright IBM Corporation 2009. All rights reserved. The information contained in these materials is provided for informational purposes only, and is provided AS IS without warranty of any kind, express or implied. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, these materials. Nothing contained in these materials is intended to, nor shall have the effect of, creating any warranties or representations from IBM or its suppliers or licensors, or altering the terms and conditions of the applicable license agreement governing the use of IBM software. References in these materials to IBM products, programs, or services do not imply that they will be available in all countries in which IBM operates. Product release dates and/or capabilities referenced in these materials may change at any time at IBM's sole discretion based on market opportunities or other factors, and are not intended to be a commitment to future product or feature availability in any way. IBM, the IBM logo, Rational, the Rational logo, Telelogic, the Telelogic logo, and other IBM products and services are trademarks of the International Business Machines Corporation, in the United States, other countries or both. Other company, product, or service names may be trademarks or service marks of others.