IBM Rational Software Conference 2009

Extending Your Existing IBM Rational Solutions with Rational® Rhapsody®

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Rational. software

Go to IBM

Agenda

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

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Companies Are Facing an Unparalleled Rate of Change

Innovation is Considered the Key to Success

"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

Source: IBM Global CEO Study, 2006

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

Improve communication and collaboration across disciplines	**71%**
Increase visibility into status of requirements	**49%**
Increase ability to predict system behavior prior to testing	**46%**
Implement or alter new product development processes for a multi-disciplinary approach	**43%**
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

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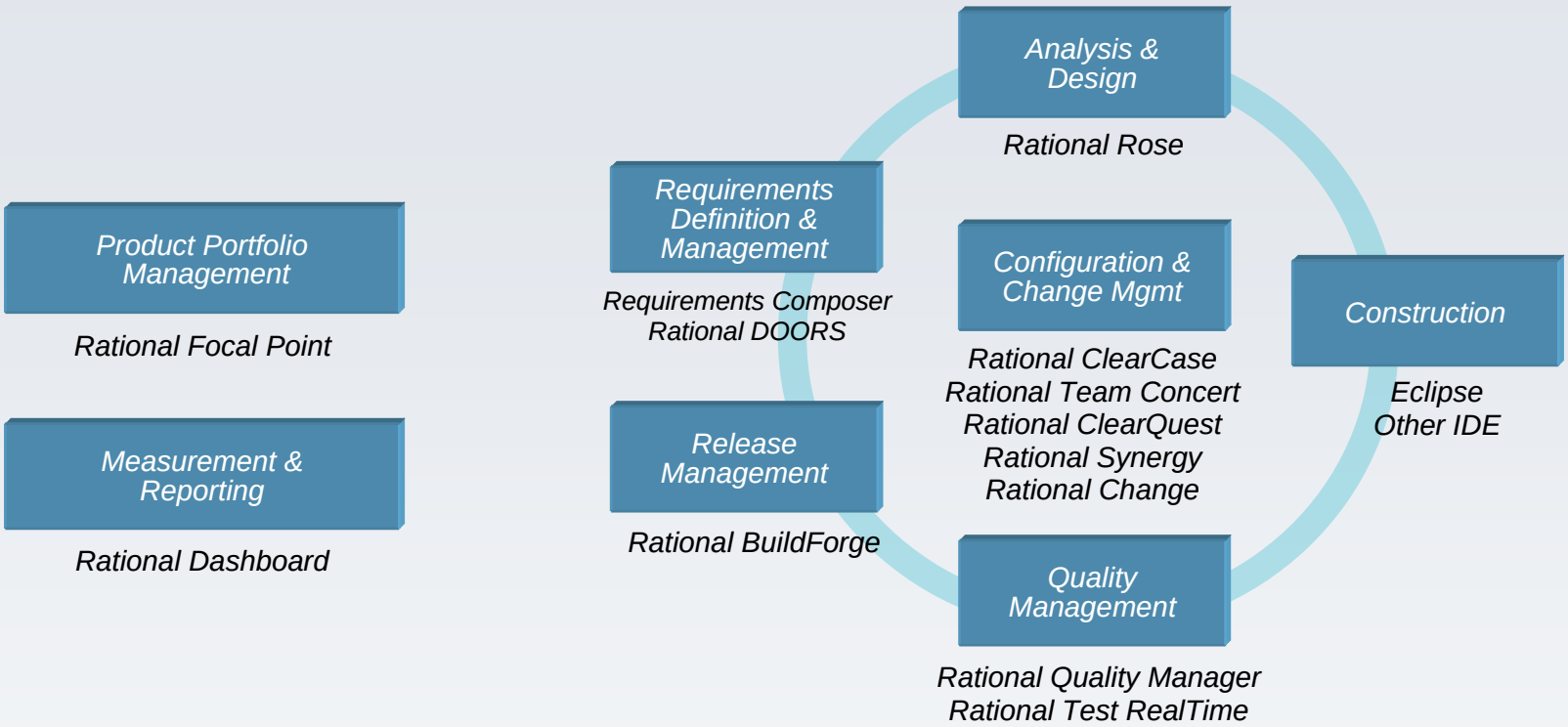
The Rational Portfolio – Systems

Where have you invested?



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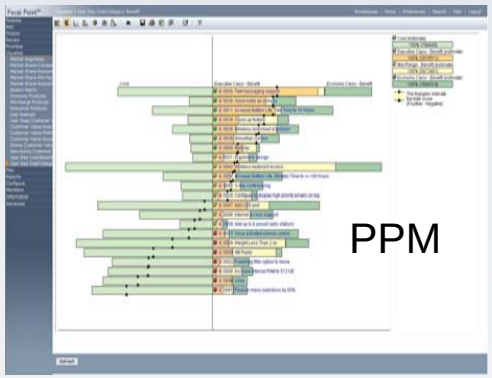
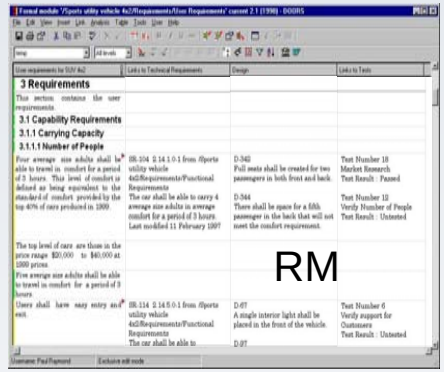
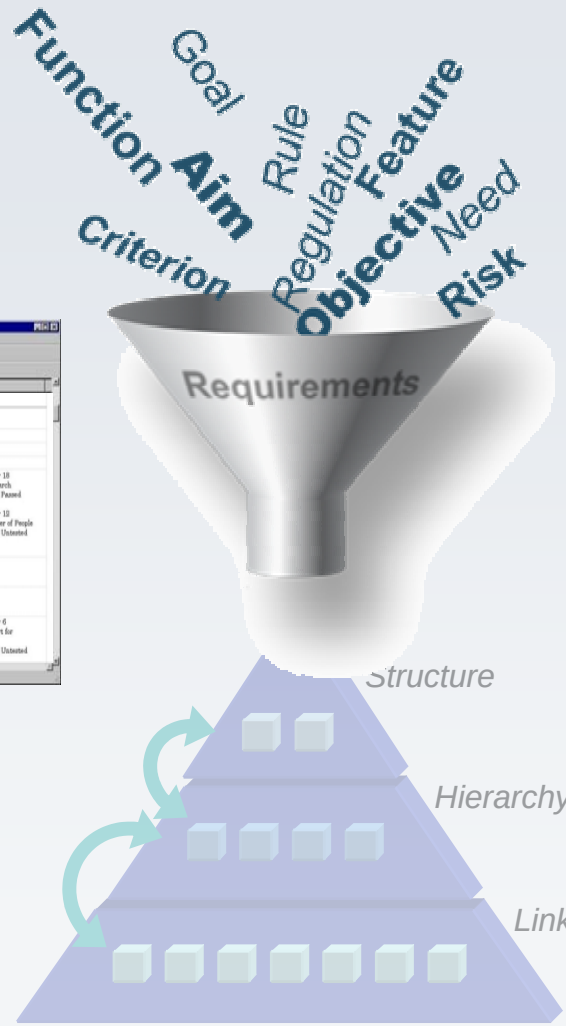
Requirements Definition and Management

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







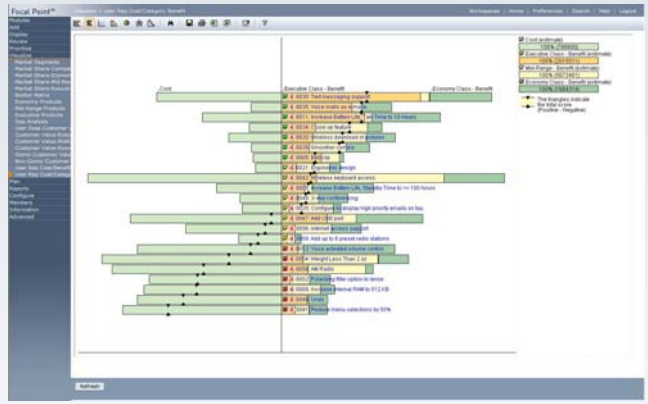
Rational Focal Point

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

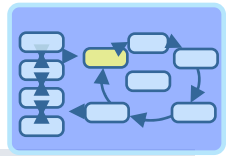
Rational Requirements Composer

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



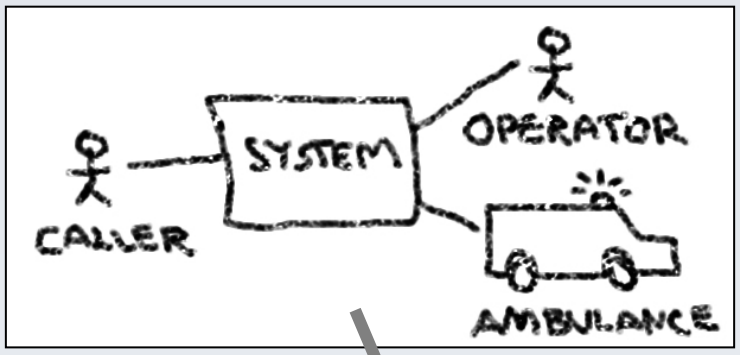
- Provides end-to-end visibility of requirements
- Comprehensive support for recording, structuring, managing, and analyzing requirements and their traceability
- Requirements are persistent at all levels of decomposition
- Scalability for large projects
- Trace requirements to development tasks and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

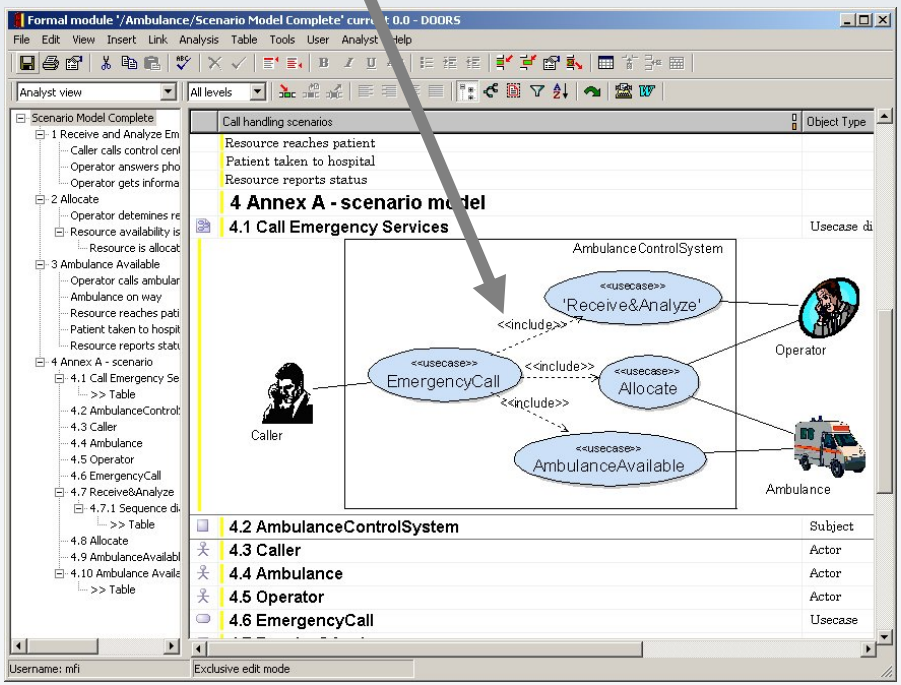
"DOORS (Telelogic) provides the best coverage of our list of requirements. It stands out in our four assessment dimensions. DOORS demonstrates strengths in capturing, linking and analyzing the requirements during their whole lifecycle."

Yphise

Agile Requirements-Driven Development, Yphise, March 2008

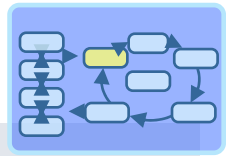
Rhapsody extends Requirements Capabilities



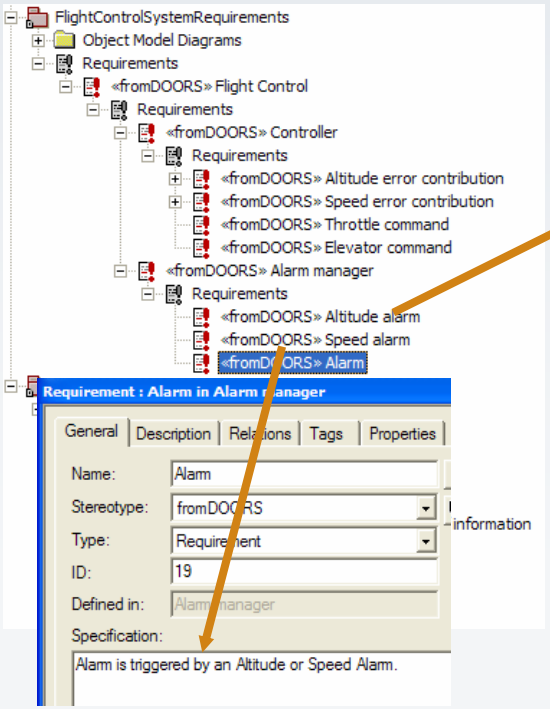


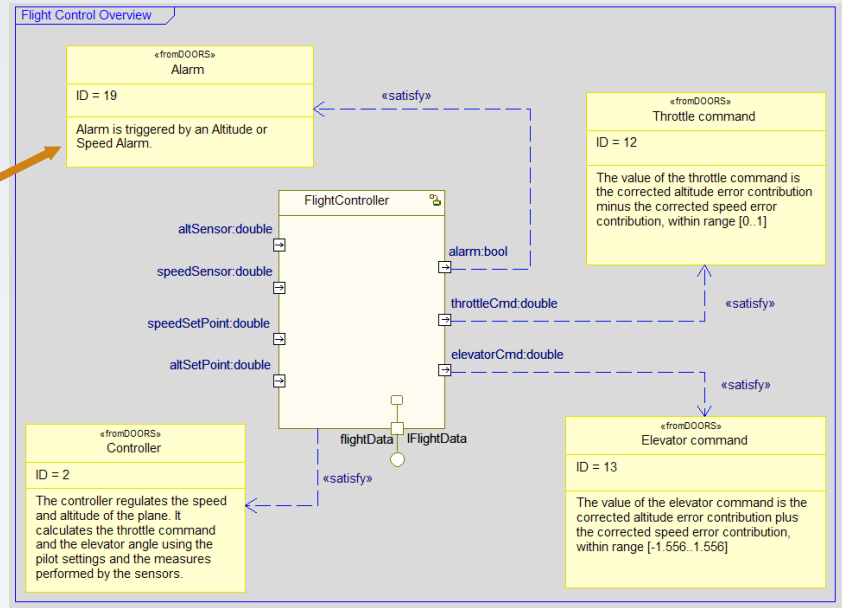
- Increase the effectiveness of Requirements Engineering
- Models and Requirements complement each other
- Diagrams help clarify understanding of requirements
- Build a bridge from Requirements Engineering to Software Development
- Maintain a detailed requirements workflow with full traceability to generated 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

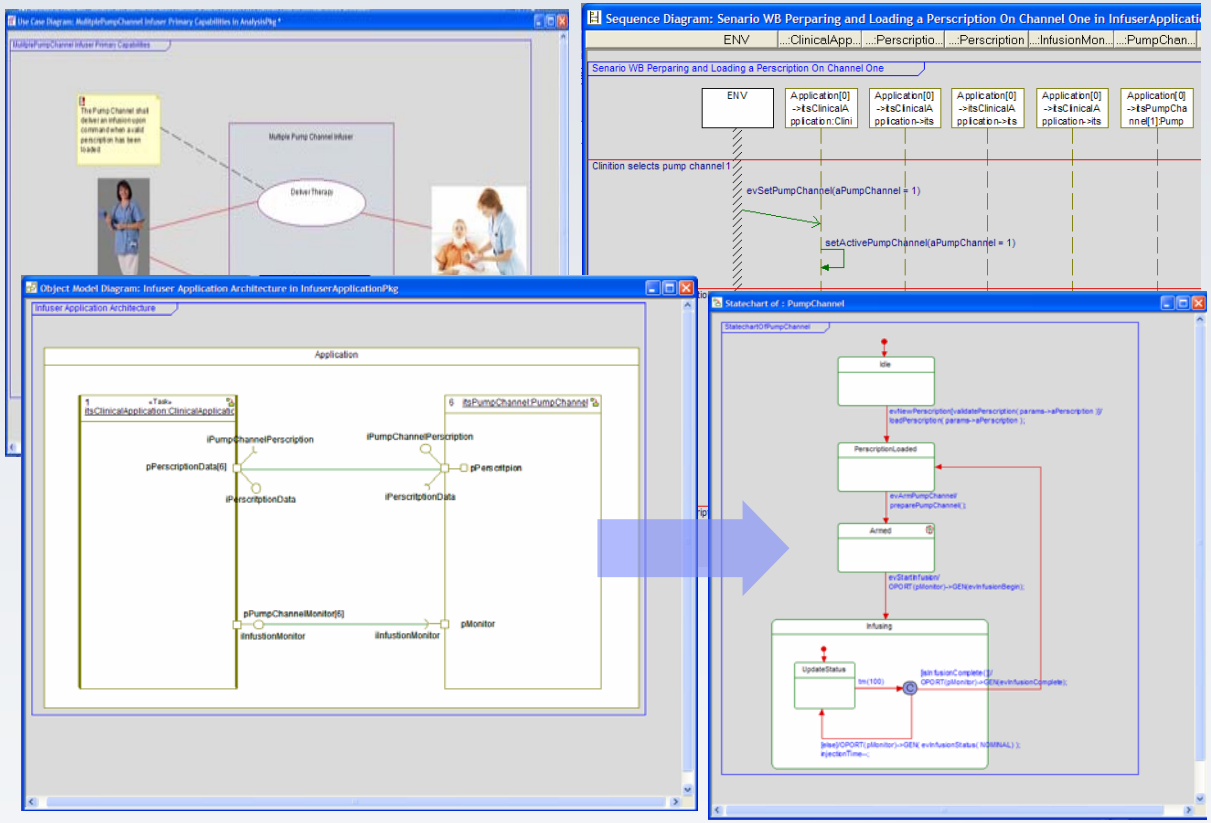


- Use requirements and use case diagrams to define requirements
- Supplement definitions and descriptions with tags and constraints
- Describe requirements behavior using sequence, activity and state diagrams
- Include advanced graphics and icons with domain-specific modeling





Rhapsody enhances requirement understanding

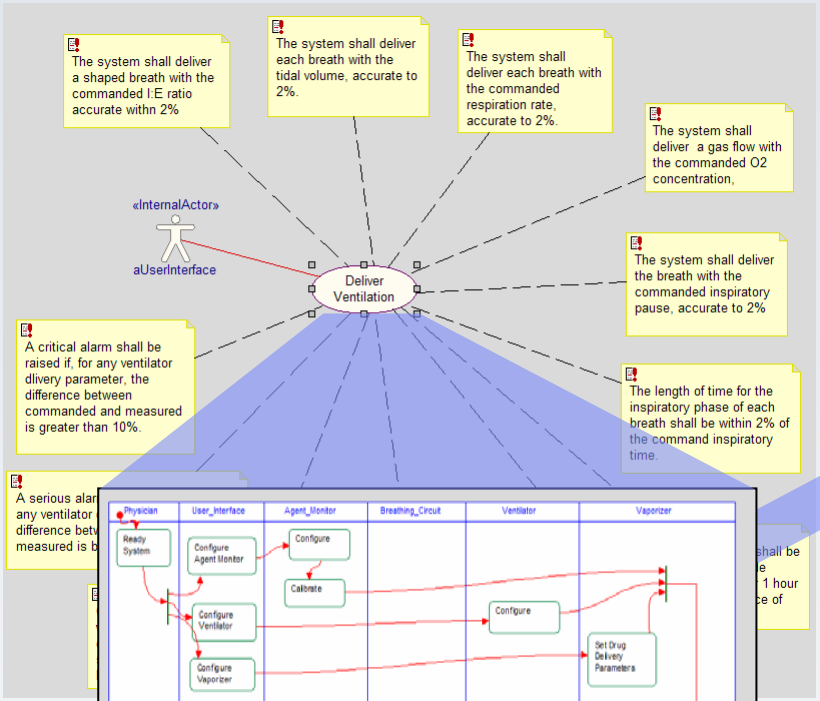


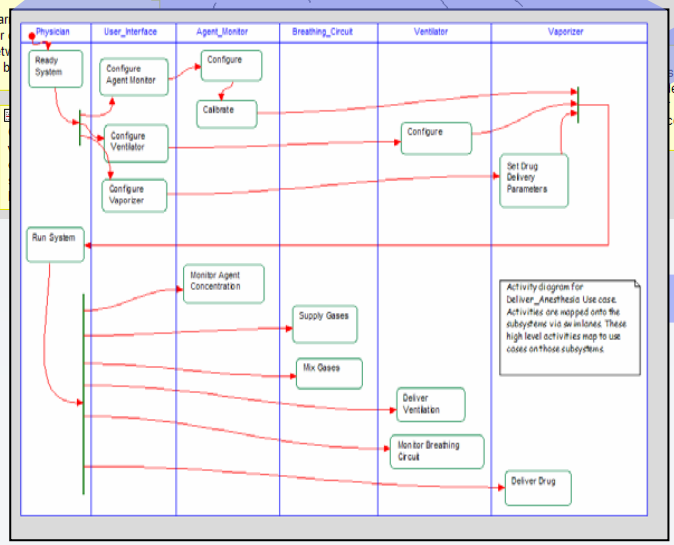
- Visualize:
  - Requirements
  - Structure
  - Behavior
  - Interaction
  - Constraints
- Improved Communication
- Enhanced Collaboration
- Industry Standard, Formal Language
  - Unambiguous
- Compliance: DoDAF, MODAF, AUTOSAR, etc.

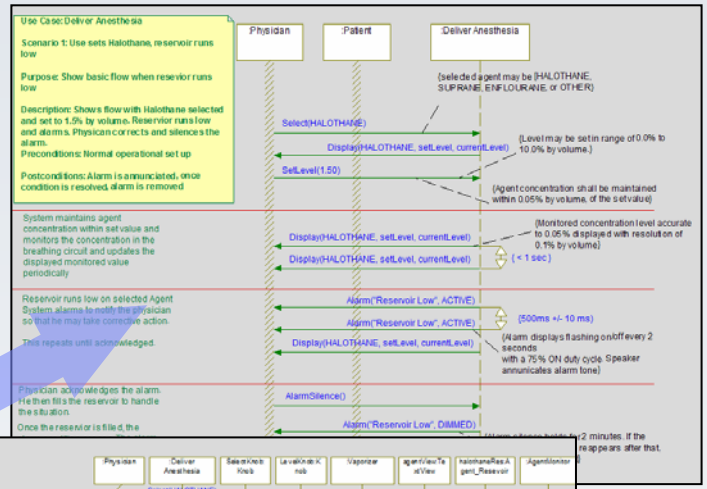
"Rhapsody is the leading UML 2.1 compliant solution for embedded systems. Reducing OEM development Costs and Enabling Embedded Design Efficiencies Using the Unified Modeling Language (UML 2.1)"

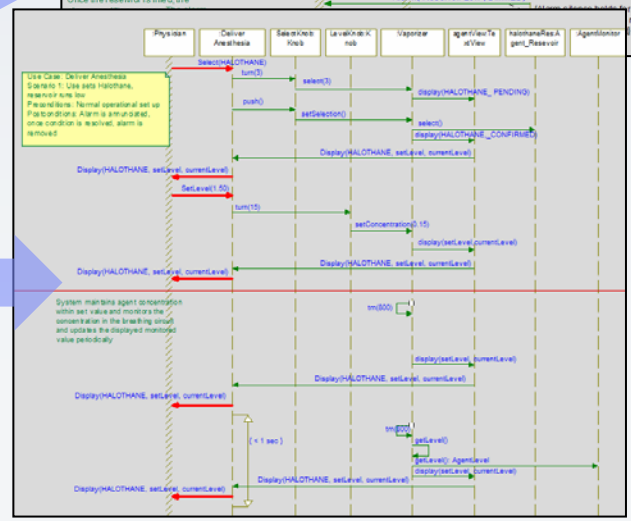
Source: "Reducing OEM Development Costs and Enabling Embedded Design Efficiencies Using the Unified Modeling Language (UML 2.0)", Embedded Market Forecasters

Rhapsody enables visualized requirements









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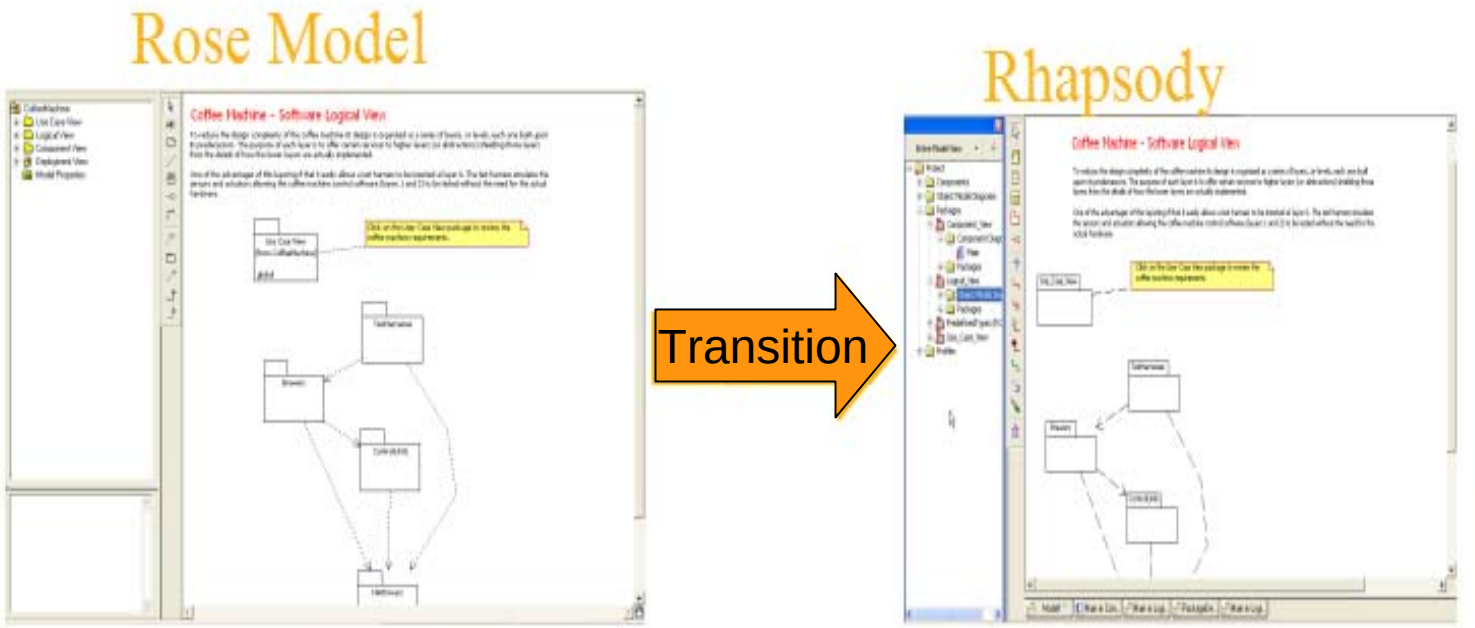
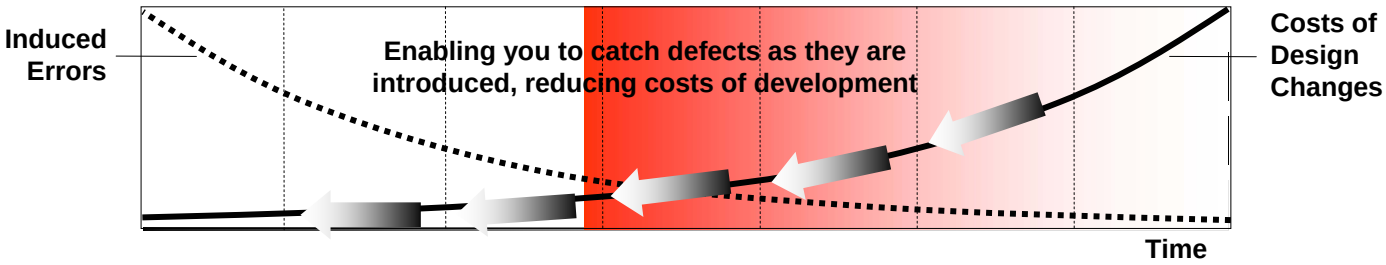
Rhapsody provides logical next step from Rose



"IBM Rational's acquisition of Telelogic uniquely establishes them in both the embedded and enterprise development and systems marketplace. Embedded development technologies have far more stringent requirements than does the "five-nines" requirements of enterprise deployments. This is why embedded solutions are becoming pervasive in enterprise applications. If deployed embedded systems were to adopt enterprise requirements, it is estimated that 200 airplanes would fall out of the sky every day. With the unique attributes of Telelogic's Rhapsody product, IBM has added significantly to their market dominance."

Jerry Krasner, Embedded Market Forecasters, September 3, 2008

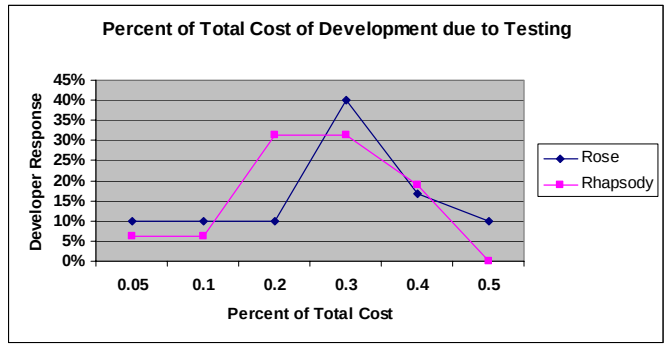
Rhapsody delivers benefits of MDD approach

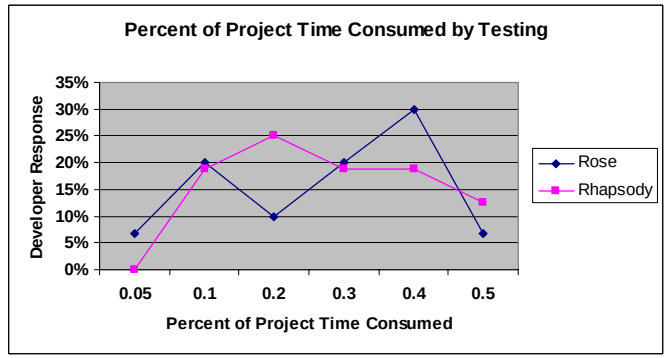


- Deliver software that meets the requirements
- Ensure delivered system is in synch with architecture
- Reduce costs in testing
- Reduce time spent testing

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%

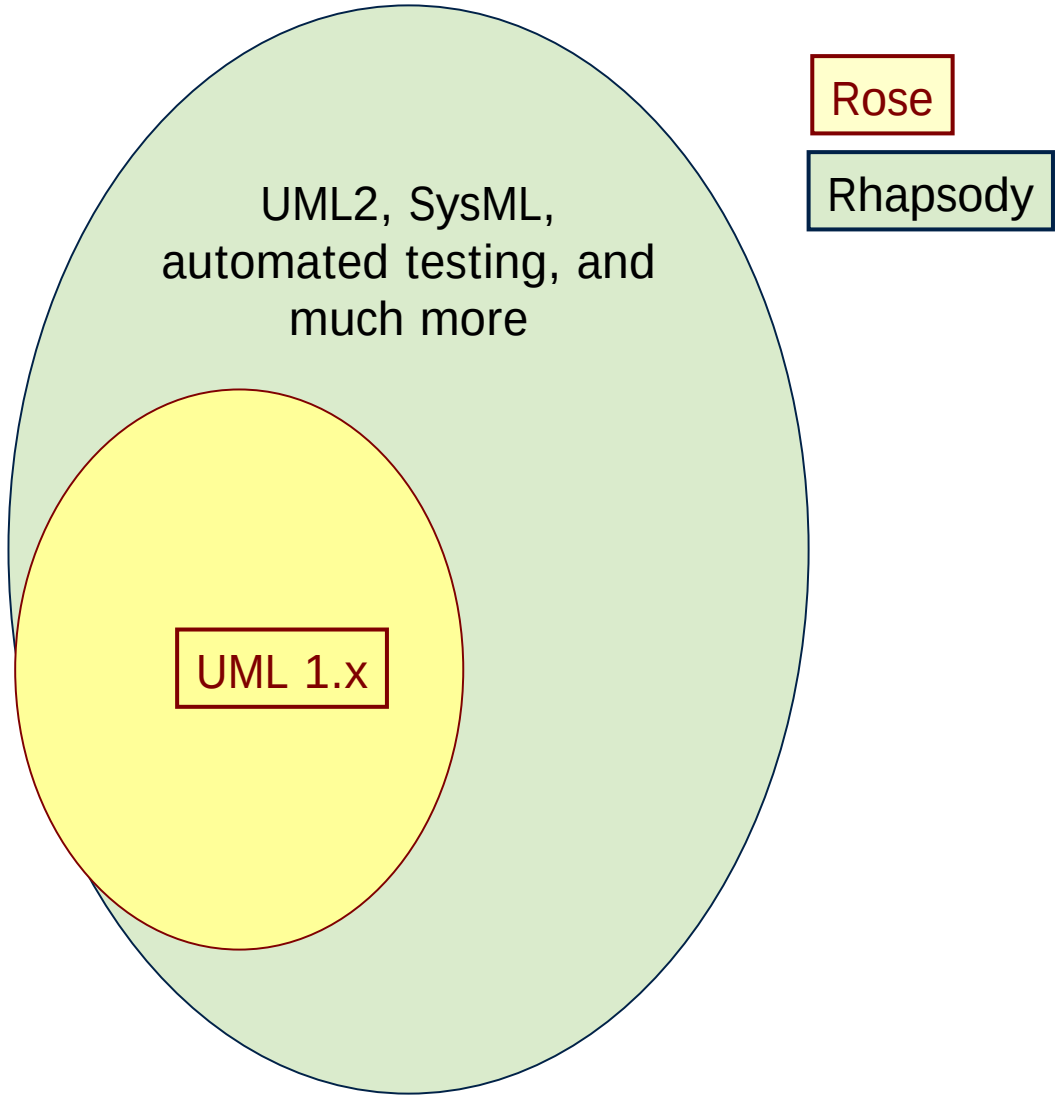




Source: Embedded Market Forecasters

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



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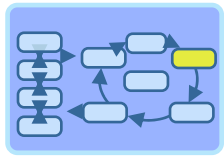
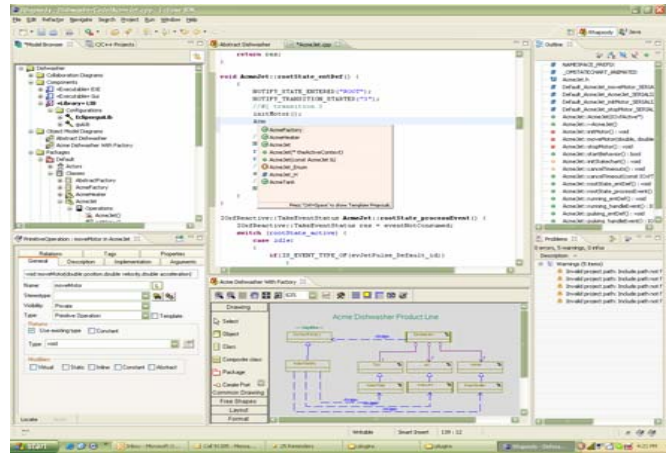
Rhapsody enhances Eclipse based design

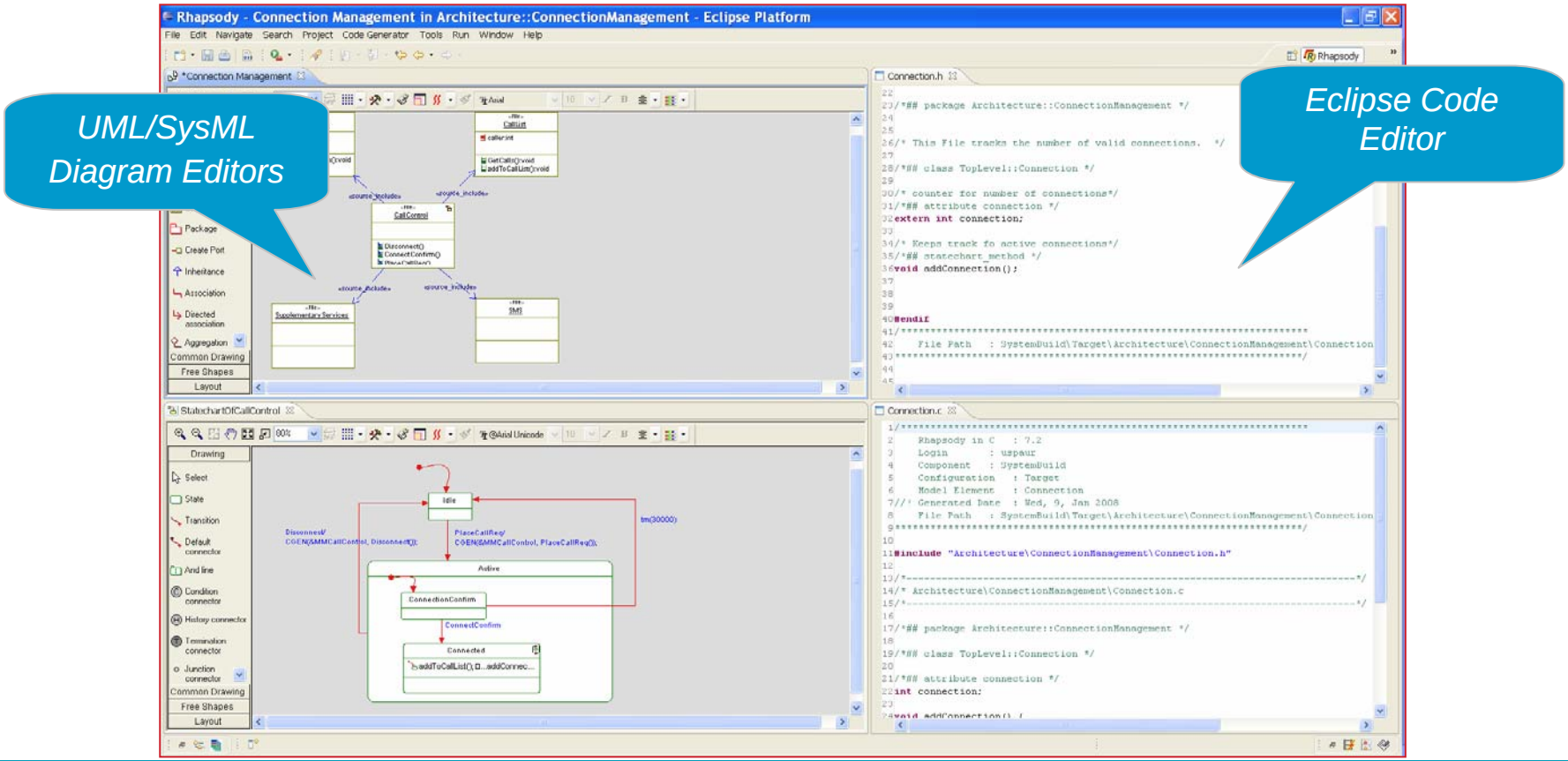


- Visualize existing Eclipse code
  - A picture is worth a thousand words
  - Documents code using customizable formats
  - View structure and architecture of current design
  - Automated documentation for your application
- Work the way you want
  - Leverage Eclipse code editing capabilities combined with synchronized graphical model
  - Define your own perspectives
  - Automates tedious coding tasks
- Discover defects early with design level debugging
- Define your own perspectives to tailor your workspace
- Reduce learning curve with common development environment
- Integrate development lifecycle products



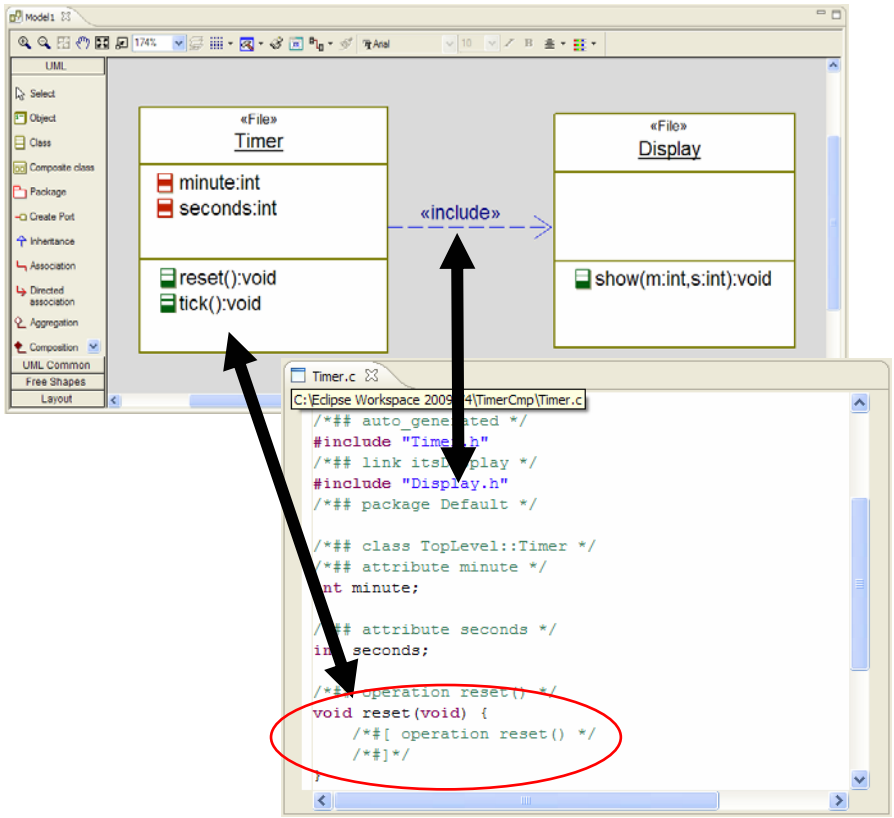
Rhapsody brings MDD into Eclipse

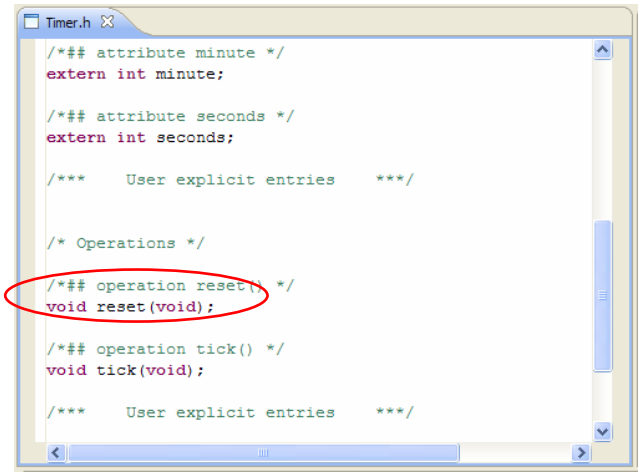
- Integrated MDD within Eclipse environment
- Navigate between model and code views
- Leverage Eclipse to tailor environment for your needs



Rhapsody enables synchronization

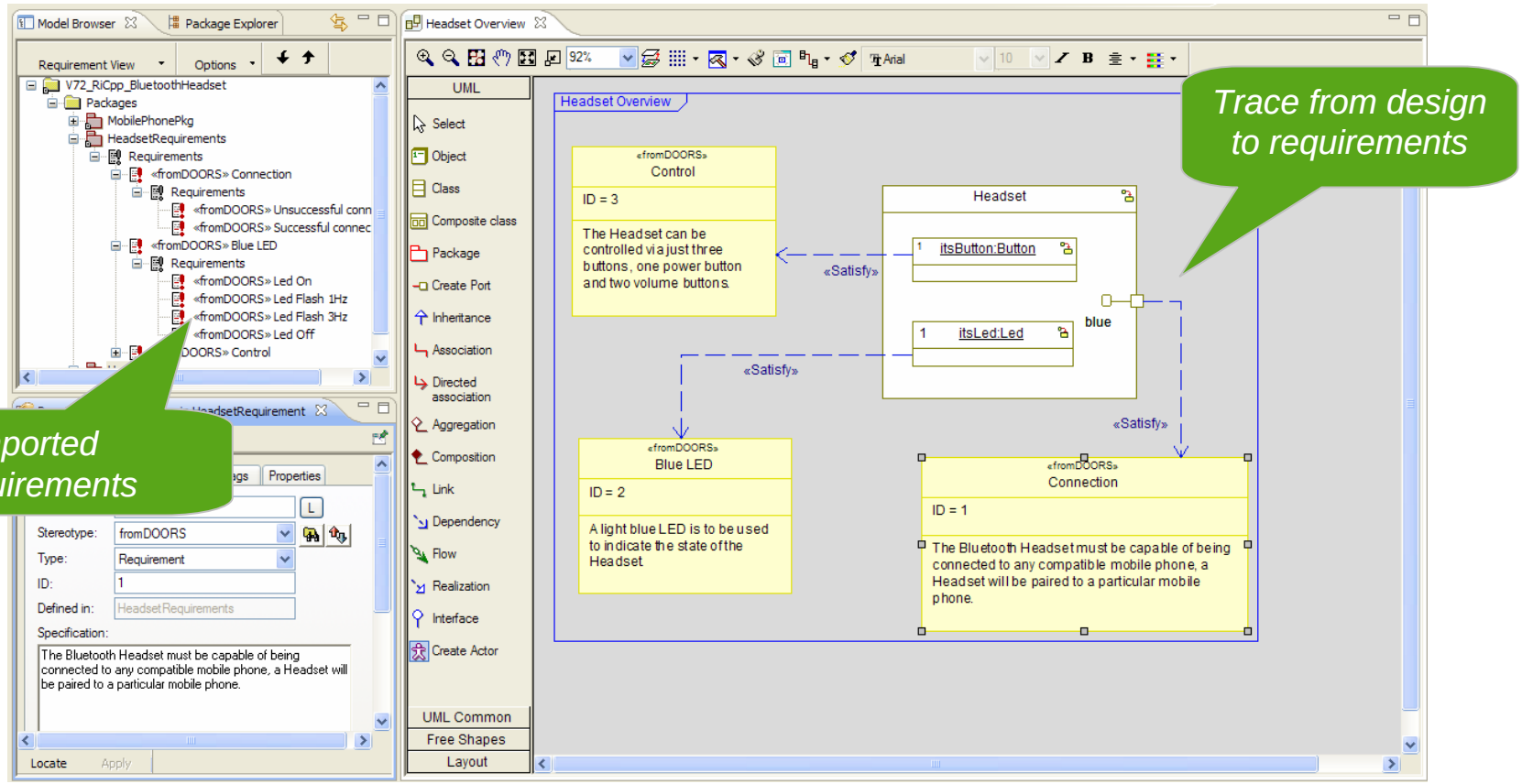
- Code and model stay synchronized
- Model generated into code eliminates manual typing
- Code edits are updated into the model





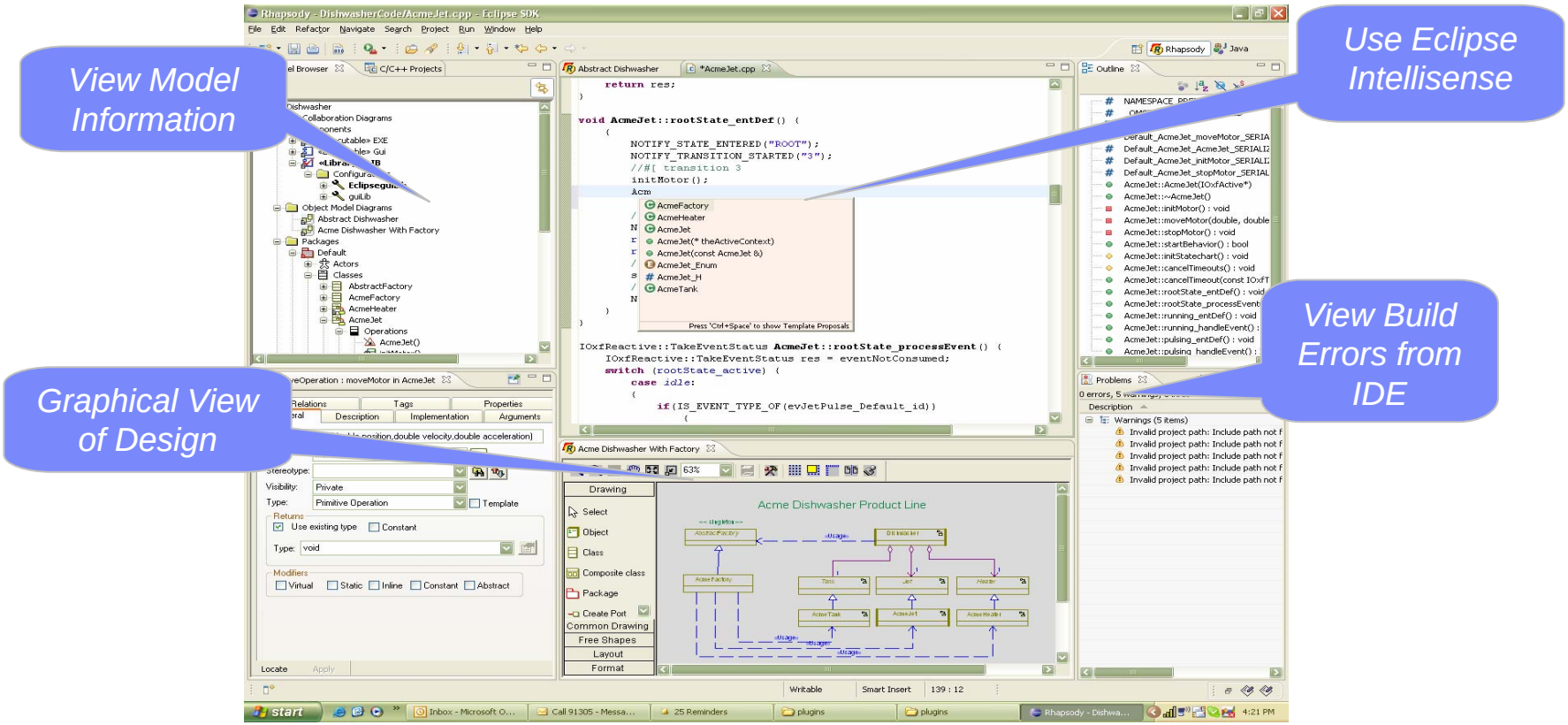
Rhapsody ensures traceability

- 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



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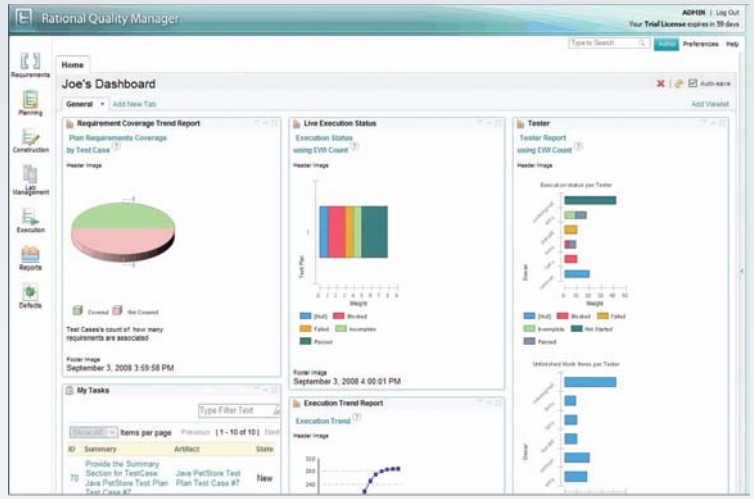
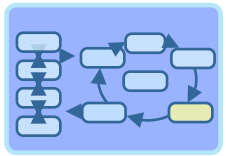
Rational Quality Manager

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





Validation and Verification

- Feature driven testing mainly address **Design Validation**
  - ***"Did we develop the right feature?"***
- Structure Based Testing mainly address **Design Verification**
  - ***"Did we develop the feature right?"***
- Verification and Validation answers the following question…
  - ***"Did we develop the [right feature] right?"***
  - ***The above phrases are common in the context of a "product"… but Testing should be performed as early as a feature becomes available, and not wait for the product!***

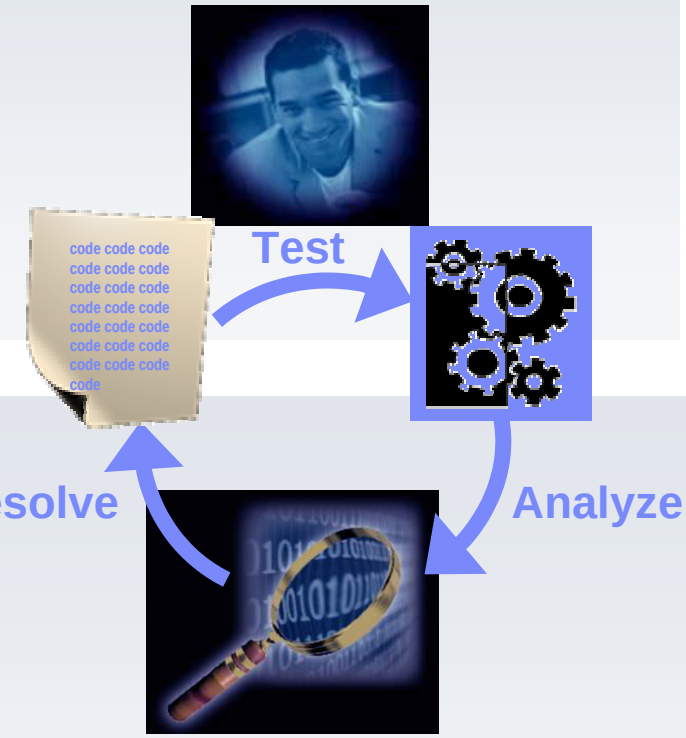
Rational Rhapsody TestConductor & Rational Test Realtime

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

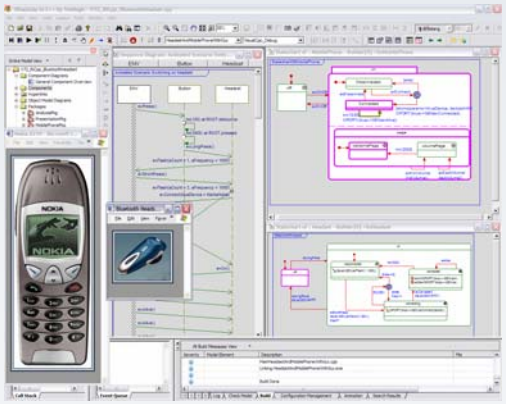
Fix your code before it breaks

- 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

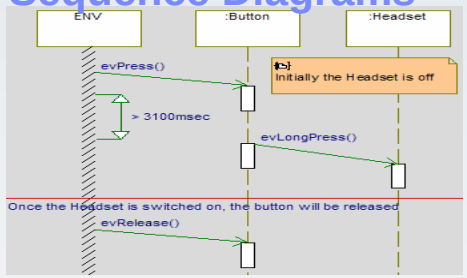
- Bring the benefits of abstraction and automation to testing
- Reduce defects early in the process when they are less costly to fix
- Deliver products meeting customer expectations

Simulation

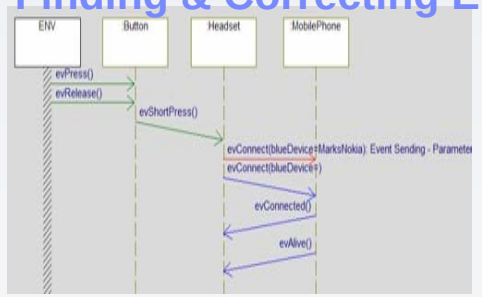


Requirements-based testing

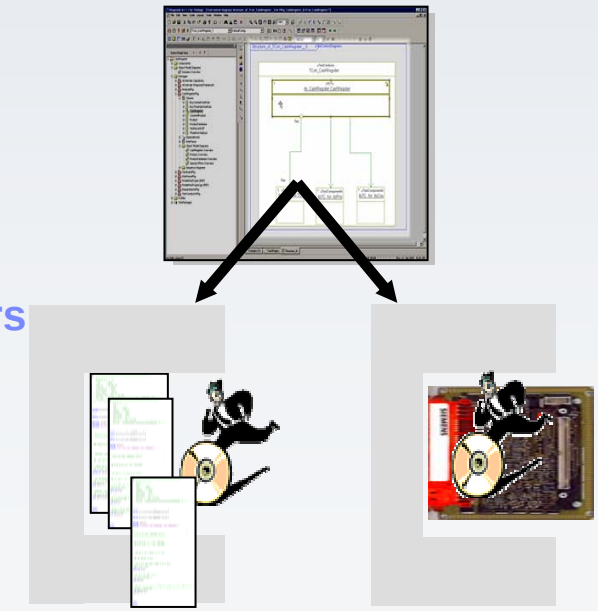
Sequence Diagrams



Finding & Correcting Errors



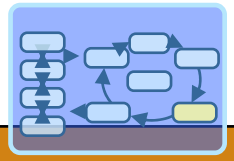
Automated unit testing

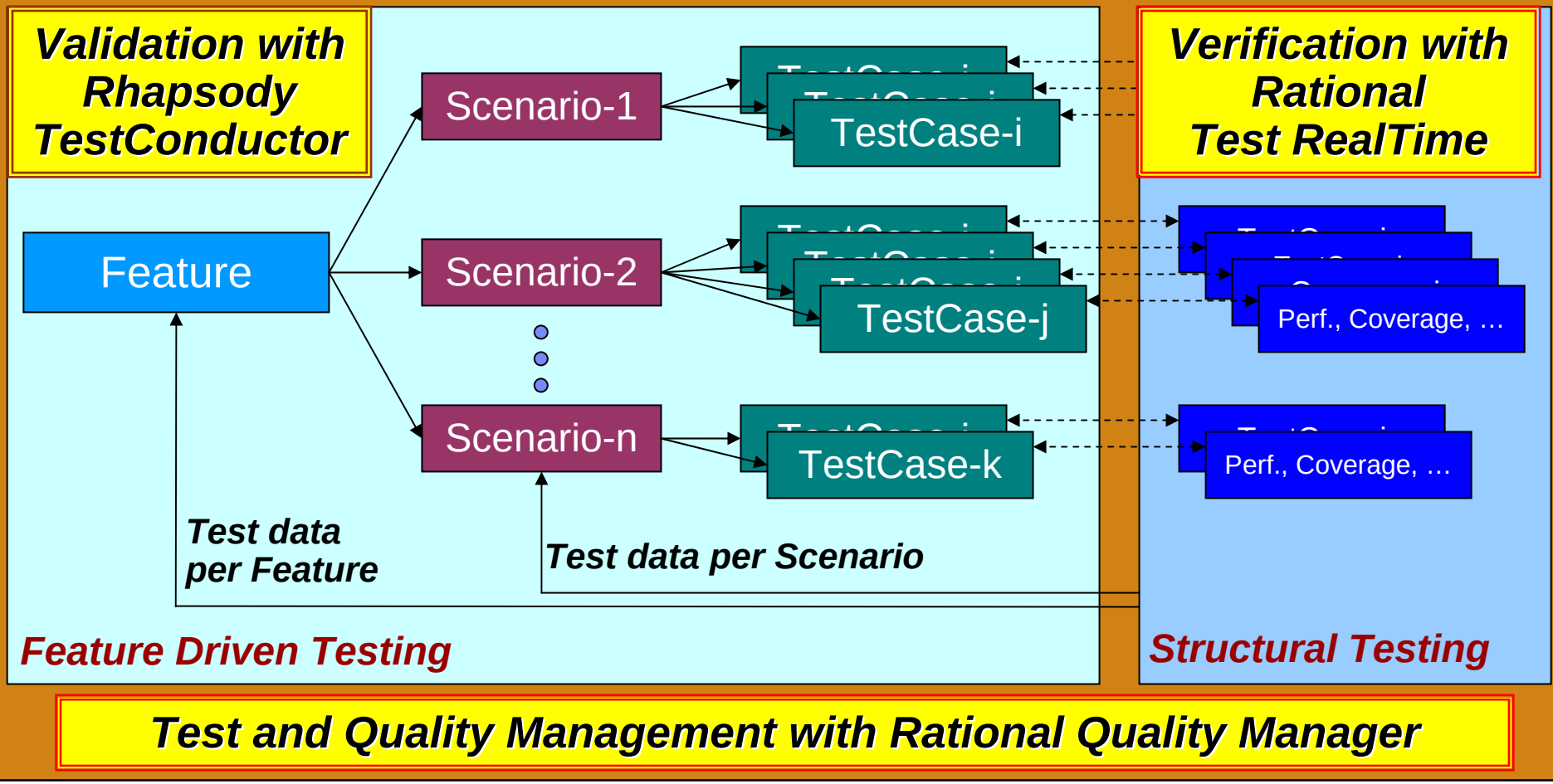


Host based

Target based

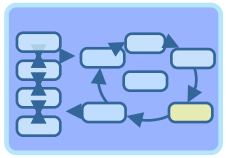
IBM's Unique Comprehensive Quality Management



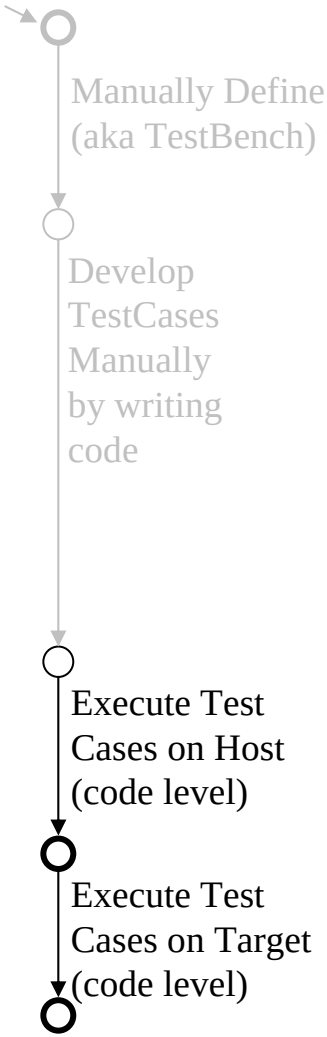


- ***Test data includes any run time information that is associated with executing a test case, such as Performance profiling, code coverage, run time complexity etc.)***
- *Structural Testing often provided by 3rd party tools and RTOS vendors*

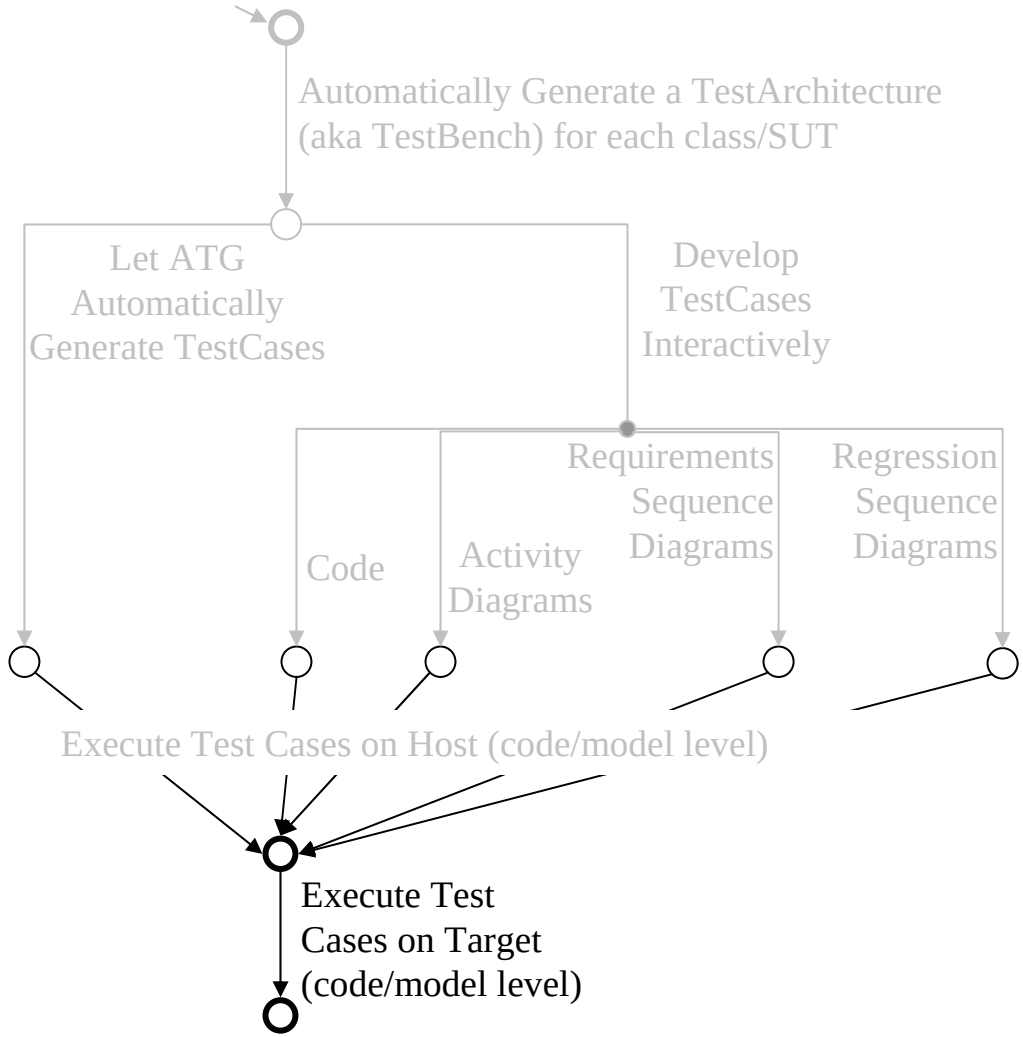
Basic Testing Process: Code vs. Model



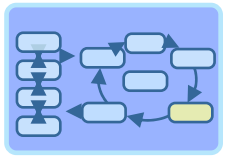
Code Level Testing



Model Driven Testing



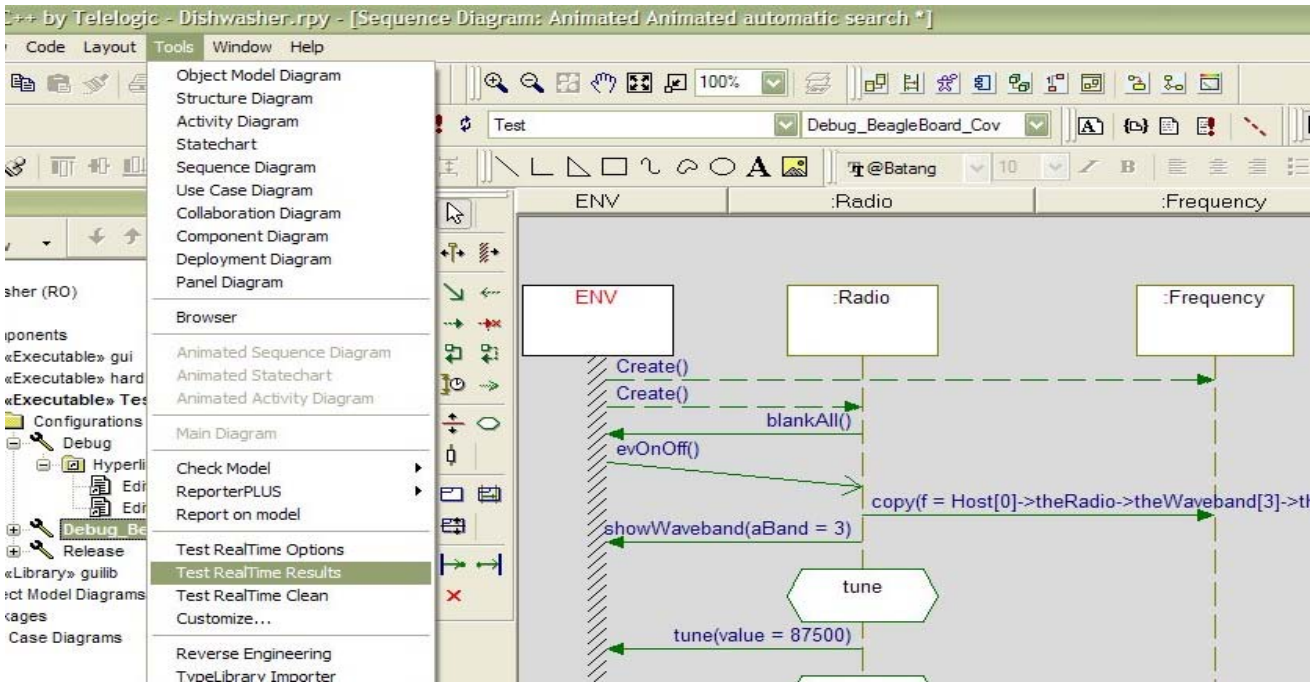
Rhapsody delivers MDT Testing Process:
Code vs. Model



Aspect	Code-Driven Testing	Model-Driven Testing
Traceability to Requirements	Requires external tools	Part of the Model
TestBench generation	Source code	Model, Graphical, Auto generated
Test Case authoring	Scripts, code	Code, Flowcharts, Sequence Diagrams
Automatic Test Case Generation	No	Yes, as Sequence Diagrams
Configuration managed artifacts	Source code	Models (and optionally source code)
Structural Testing	Code level	Code level – Transparent to user
Requirement Based Testing	Code; Hard to do; Done late	Models; Easy to do; Done very early
Communicating defects	Code and text	Model (defect sequence diagrams)
Typical Code Coverage	25-50%	Close to 100%
Typical Requirements Coverage	Very low; measured late	Very high very early
Porting test cases to new platform/OS	Review and rewrite all appropriate code	Change configuration parameters
Competitiveness	**Very Negative**	**Very Positive**

Rhapsody Test Conductor with Test RealTime

- Execute the model as usual from Rhapsody
- Results from Test RealTime linked into the model
- Tests and results traced back to originating requirements
- Full target support. Using the Linux based Beagleboard
  http://www.beagleboard.org

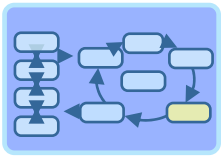


Rhapsody Testing Solution

- 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)

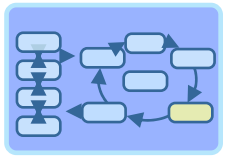
Rhapsody Test Conductor

Major Reasons to Adopt Model Driven Testing

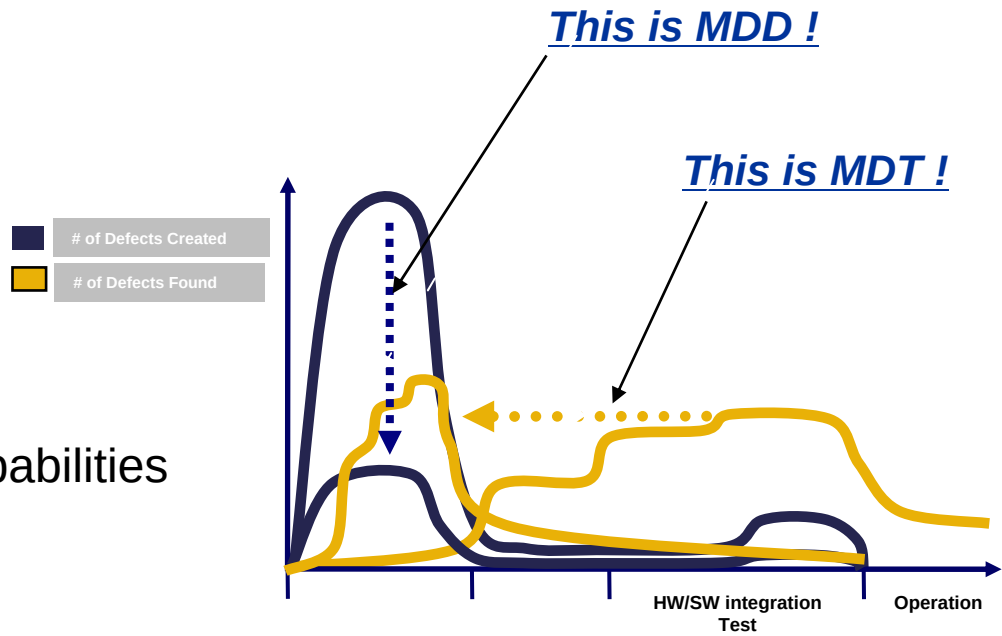


- Being able to…
  - Integrate Testing into the Design process, allowing for frequent and early testing
  - Automatically create/update Test Architectures
    - Instead of writing test benches
  - Create and reuse of code based test cases into the model
  - Use of Sequence Diagrams as graphical test 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

Rhapsody delivers on MDD and MDT promise



- Clear, traceable and testable Requirements
- Effective Communications
- Good Architectural Design
- Automatic Documentation
- Graphical Design Reviews
- Evolving/Iterative Prototypes
- Executable Designs
- Effective Debugging and Test Capabilities



http://www.embeddedforecast.com/SDforSystemsFINAL.pdf

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

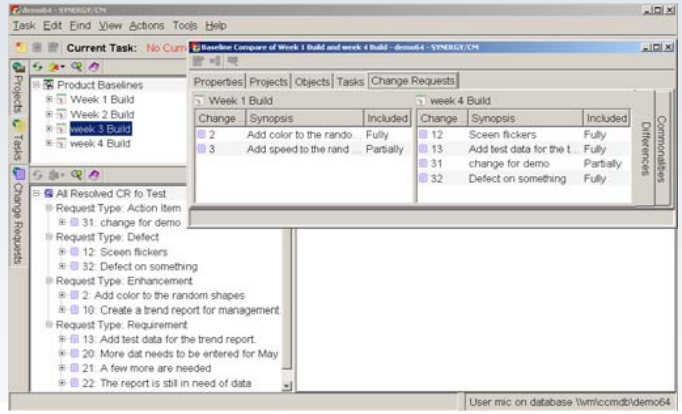
Rational Synergy & Change

Configuration and Change Management

Rational Synergy

Task-based Configuration Management

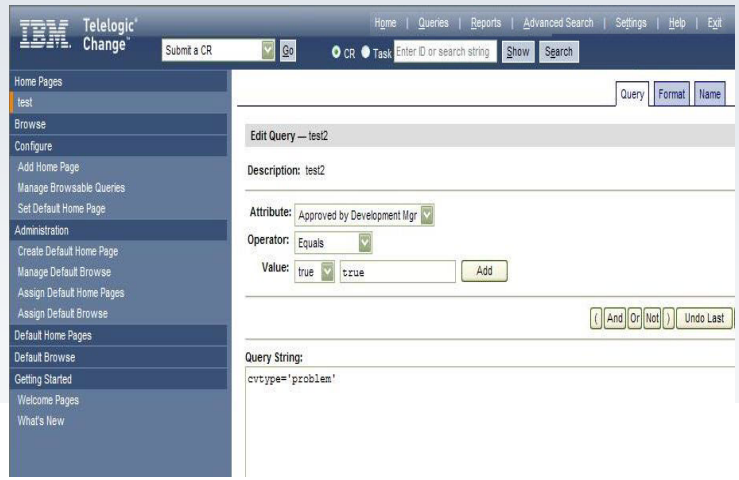
- Workflow and framework support from simple to complex business needs
- Support for quality initiatives and development methodologies
- Support for component-based development
- Advanced release and variant management



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



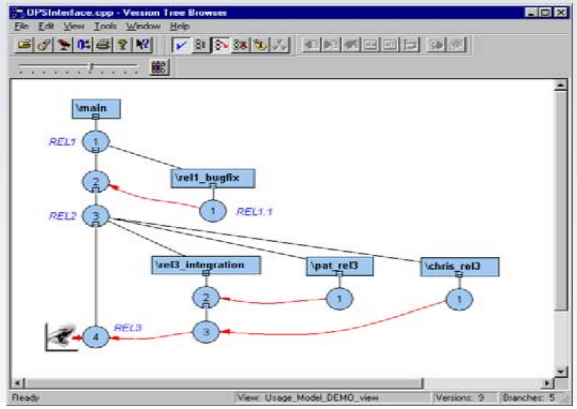
Rational ClearCase & ClearQuest

Configuration and Change Management

Rational ClearCase

Complete software configuration management

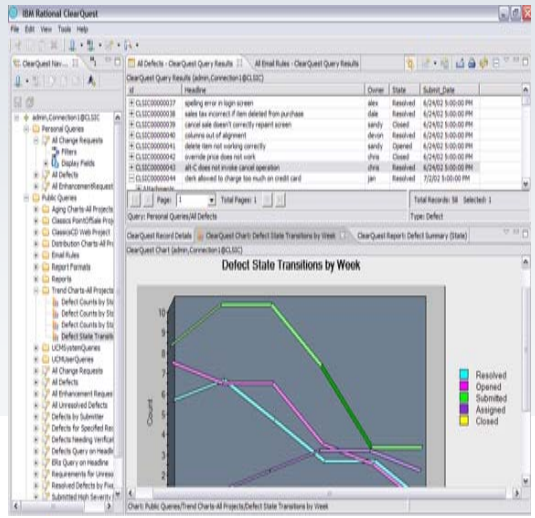
- Transparent real-time access to files and directories virtually anywhere in the organization
- Scales to any size team
- Sophisticated branching and graphical merge tools for concurrent access to files



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

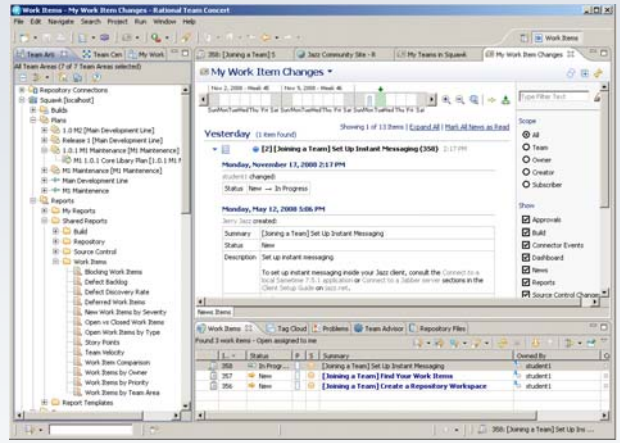


Rational Team Concert
Collaboration

Rational Team Concert

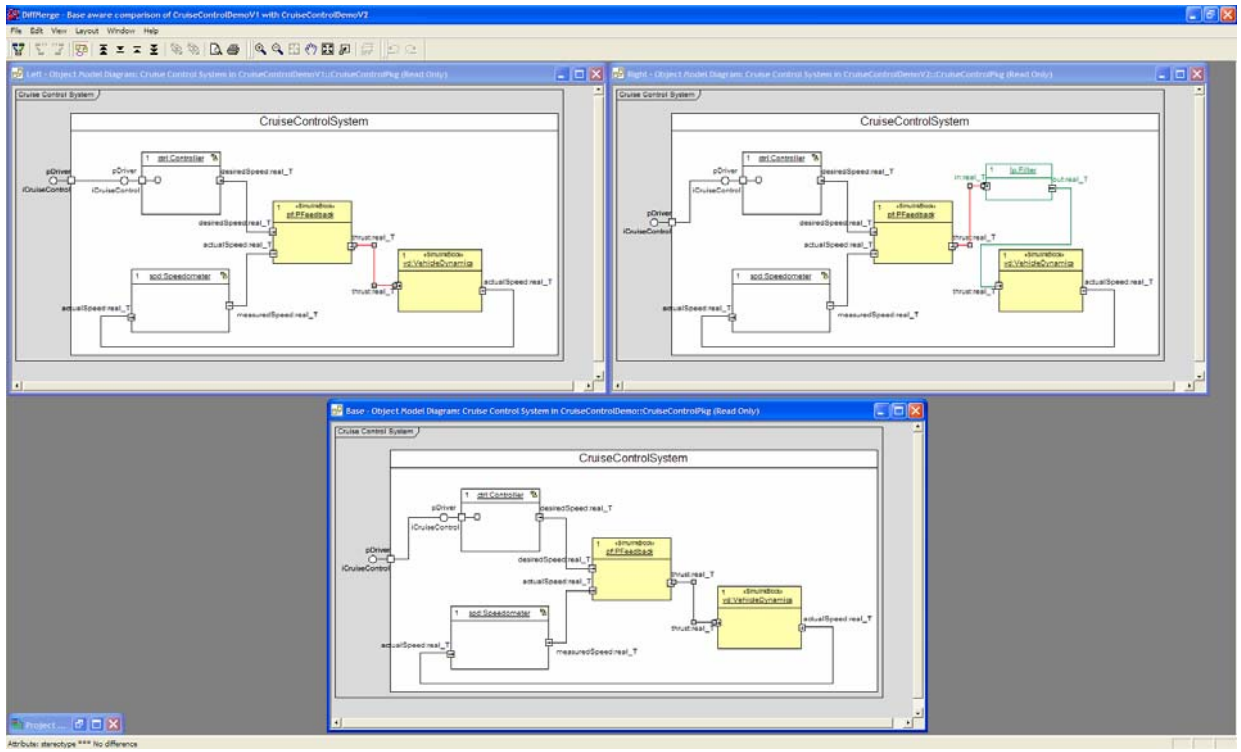
Software innovation through collaboration

- 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

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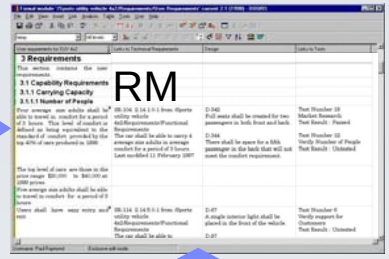
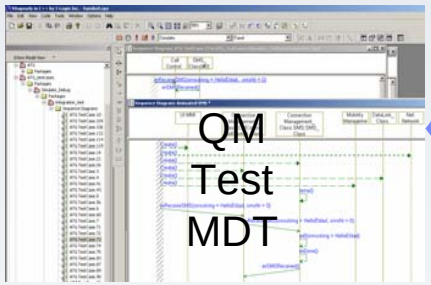
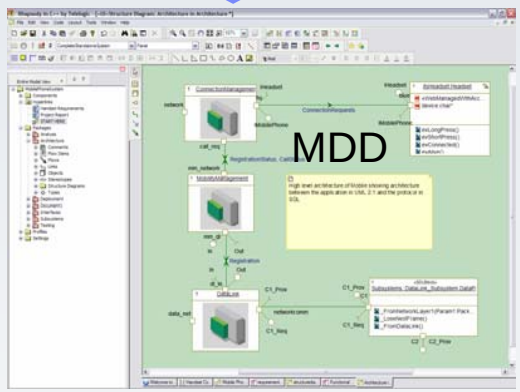
The Rational Rhapsody Product Family

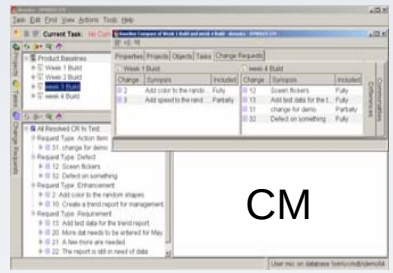
Extending the value of your Rational investments

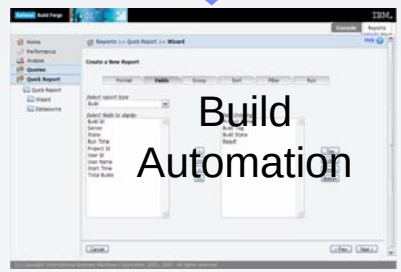


- Rapidly respond to change requests by seeing change impact to the design
- Update design and rebuild the complete design or partial components







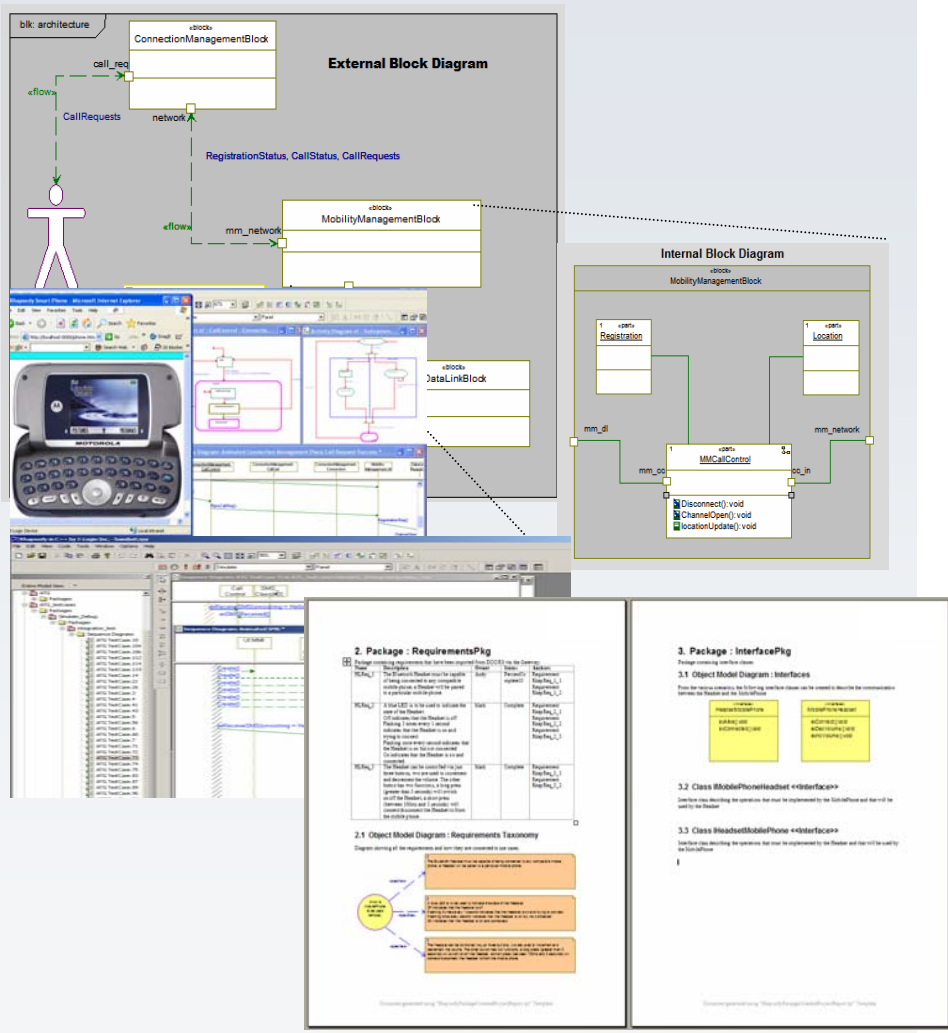


- Validate change automatically through integrated model driven testing and quality management
- Stay synchronized as a team through the MDD core

IBM Rational Rhapsody

Market Leading Model Driven Development for Systems & Software

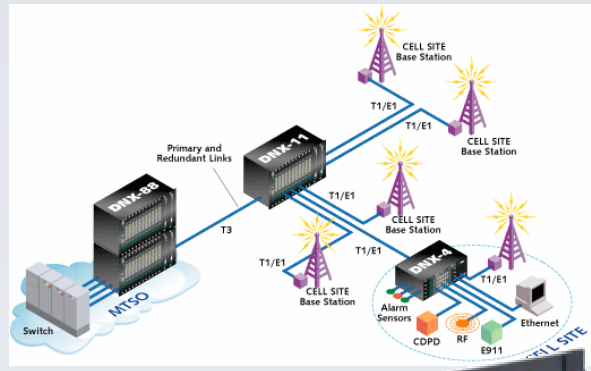
- Design and develop using industry standards and domain-specific extensions
- Validate and verify designs with model-based simulation and test throughout the product lifecycle
- Develop complete C, C++, Java and Ada solutions for embedded devices, with full synchronization between architectural model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



Model Driven Systems Development

Better Designs and More Predictable Outcomes

Design Improvements (Telecom Example)	Improvement with MDD
Months - start to shipment	19%
Designs cancelled	49%
Designs behind schedule	46%
Months behind schedule	22%



Embedded Market Forecasters, Gaining a Competitive Design Advantage in the New Telecom/Datacom Marketplace

Dr. Jerry Krasner, June 2008

IBM Rational Rhapsody:
Business Challenges Solved

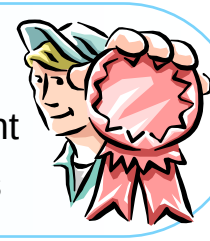
Business Challenges	
Product missed customer needs	46%
Late to market/missed demand	33%
Poor commercialization / promotion	26%
Product quality	24%
Pricing	23%
No clear product differentiation	19%

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

Case Study Systems - Eaton

Need: *Overcome major complexity challenges.* Reduce cost of prototyping and developing next-generation hydraulic hybrid vehicles (HHV) and the software that controls them

Solution: Rhapsody for complex systems simulation & design, software development and test. Professional Services for process, training and mentoring (more details next slide)

- Most complex hybrid hydraulic system ever designed by Eaton, or any other company in the world.
- Unproven, complex and mixed domain technologies all interoperating and dependent on each other (electrical, mechanical, hydraulic, etc.)
- Embedded computer requires relatively complex software . . . something Eaton's Hybrid Power Group had little to no experience developing and or testing.