Telelogic Rhapsody®

Collaborative Model-Driven Development

Telelogic
Requirements-Driven Innovation

Collaborative Model-Driven Development for Software, Systems and Test

How does a system engineer or software developer meet demands for complex, robust deliverables when there is little time to produce, let alone test the systems and software before they go into production?

In automotive electronics, avionic controls, and next-generation wireless infrastructures, systems engineers and software designers face intense global competition. To meet these challenges, Telelogic introduces Telelogic Rhapsody®, the embedded market's leading OMG Systems Modeling Language (SysML)/Unified Modeling Language™ (UML®) 2.1 Model-Driven Development™ (MDD™) environment. Rhapsody uniquely addresses the needs of both systems engineers and software developers. The winner of several prestigious embedded industry awards, Rhapsody is recognized as the best-in-class MDD solution by engineers and developers in a wide variety of industries ranging from automotive and aerospace to medical and transportation.

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With Rhapsody's powerful, flexible modeling solution, you can quickly develop and deliver high-quality solutions. Rhapsody provides a complete systems and software development solution that operates seamlessly through the requirements, specification, design, implementation, and test development phases of the development lifecycle.

Rhapsody accelerates development, improves testability, and reduces costs while improving quality by leveraging UML and SysML with advanced systems design and analysis capabilities. The result is a complete MDD environment that spans the entire process, from requirements capture through analysis, design, implementation, and test. Quite simply, the Rhapsody solution reduces complexity, drives productivity, and keeps systems and software engineers collaborating to produce faster, better quality results the first time through the design process.

"The model and the code are simply different views of the same information. This ensures that the design and code remain in sync and consistent throughout the entire development process."

Dorit Katz
Software Development Manager, ECI Telecom

Model-Driven Development for Systems Engineering and Software Development

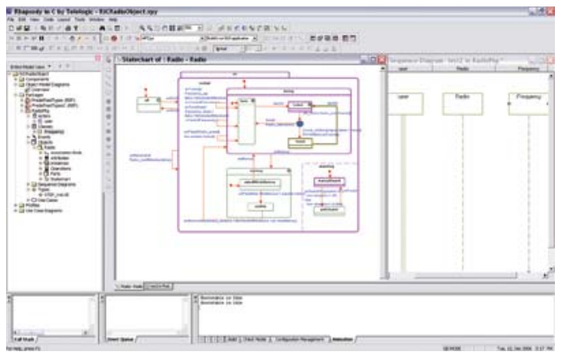
Rhapsody provides systems engineers and software developers with UML/SysML compliant products that can be extended for domain-specific modeling, providing a truly collaborative development environment that allows both large and small teams to communicate effectively and productively. Integrated requirements management and traceability features ensure that the design always meets the requirements. Design for Testability (DFT) capabilities reduce defects early in the process and always validate against the requirements. Rhapsody accelerates development by generating full applications, not just code frames. These technologies, packaged in an easy-to-use format, make Rhapsody the solution for the software and systems engineers.

Model-Driven Development ensures higher productivity compared to traditional document-driven approaches because it enables users to specify the system design and architecture graphically, and to simulate and automatically validate the system as it is being built. With MDD, engineers and developers produce a systems specification that is complete, correct, and unambiguous. Through Rhapsody's support for Model Driven Architecture® (MDA®), you can rapidly target the Platform Independent Model (PIM) to a real-time embedded operating system in seconds. Rhapsody promotes a design approach in which you repeatedly execute and validate the software on the host environment, then bring it right down to the embedded target for testing.

Model-Driven Development (MDD) technology enables professionals to achieve unparalleled productivity gains over traditional document driven approaches by enabling users to specify the system design and architecture graphically, simulate and automatically validate the system as it is being built. This allows engineers and developers to ultimately produce a quality systems specification that is correct, non-ambiguous and completely satisfies original requirements. Through Rhapsody's Model Driven Architecture (MDA) support, one can rapidly target the Platform Independent Model (PIM) to a real-time embedded operating system in seconds. Rhapsody lends itself to a design approach where the software can be

Rhapsody accelerates development by generating full applications, not just code frames

constantly executed and validated on the host environment, then brought right down to the embedded target for target based testing. By fully integrating the specific demands of the systems engineer and the software developer, Rhapsody places a powerful, feature-loaded tool in the user's hands so they can develop high quality systems and software in a shorter time.



Rhapsody's advanced graphical modeling offers realistic design capture for better communications amongst peers.

Rhapsody For Systems Engineers

Systems engineers can now ensure that they have specified a system correctly, and they can communicate the system more effectively to all stakeholders in the development process. Additionally, Rhapsody's simulation capability enables systems engineers to eliminate errors in the model early in the development process, when the cost of fixing errors is significantly cheaper than fixing them during testing or deployment.

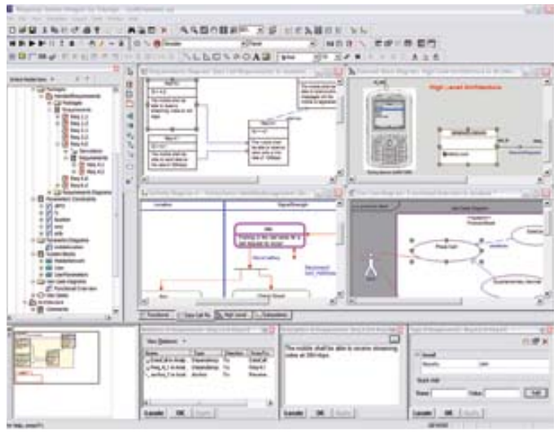
Rhapsody's System Designer package presents the product's features in a layout that systems designers will find natural and with a workflow that is intuitive.

By leveraging UML and SysML, systems engineers can clearly and unambiguously capture the systems requirements and design. Rhapsody's Check Model assures engineers that the model and its interfaces are complete and correct. Rhapsody's built-in simulation environment ensures that the design is free from behavioral errors.

The Rhapsody Gateway provides a powerful traceability solution that uses a bi-directional interface between the model

and leading requirements management and authoring products. With Gateway, engineers can ensure that the design covers the original requirements. Rhapsody ReporterPlus™ automatically produces customizable systems engineering specification documents at the push of a button.

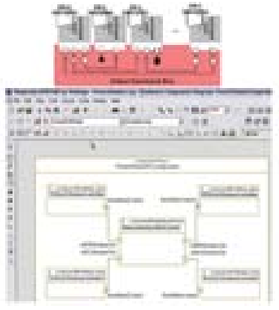
With powerful modeling capabilities and functions, Rhapsody provides you with an integrated solution that helps you overcome your most daunting design, collaboration, and test challenges. Enhancements like the new graphical user interface simplify domain-specific modeling, so that systems engineers can create domain-specific artifacts that improve design clarity. With features like white boarding, profiling, custom bitmaps, and advanced layouts, designing a complete system has never been easier.



Domain-specific white boarding capabilities allow users to easily capture systems architectures.

Rhapsody for Software Developers

The driving philosophy behind Rhapsody is to allow software developers to work in the most comfortable, intuitive environment available. Rhapsody generates complete applications in C, C++, Ada and Java for 8, 16, 32 and 64 bit applications using a real-time framework to allow rapid retargeting of code to a different RTOS, or even no RTOS at all. The developer may choose to make changes in the model or within the code, which results in both the model and the code dynamically updating each other. This Dynamic Model/Code Associativity (DMCA) feature offers the flexibility to design at any level of granularity, and ensures that the model and documentation are always consistent with the code.



Rhapsody enables users to model AUTOSAR systems using the terms and notations common to the automotive engineering world.

Rhapsody enables a code-centric workflow, easing MDD adoption by allowing developers to build models automatically from code and then to leverage these models for analysis and automatic documentation production. Developers, who prefer a model-based approach, can design at a higher level of abstraction, analyze and validate the design at the graphical level, and produce code and documentation automatically. A combination of these approaches is also possible, making Rhapsody the most flexible and productive MDD tool on the market.

For the software developer, Telelogic offers the Rhapsody Developer package, which provides developers with a feature-rich tool family from which to design, develop, test, collaborate, and implement robust, high quality code in an environment that has multiple domain specific language capabilities.

UML/SysML and Domain Specific Modeling

Rhapsody uses the industry's best modeling languages: SysML 1.0 and UML 2.1, as well as specific domain extensions for both C developers and DoDAF users. This enables systems and software engineers to work in the language best suited to the project's needs when describing system requirements, design, functionality, behavior and architecture. In addition, Rhapsody's advanced white boarding capabilities enable engineers to capture freeform shapes that are part of an existing diagram or to create stand-alone diagrams. These features enable Domain Specific Modeling (DSM), which enhances communication and improves documentation protocols.

Because all diagrams in a Rhapsody model are interrelated, changes to an element in one diagram are automatically propagated across the model. In addition, data consistency across the system is ensured, including interfaces with Rhapsody Check Model.

The Rhapsody DoDAF Pack, offered as an add-on, supports the design, construction, and analysis of fully compliant DoDAF architectures with standard DoDAF diagrams and notations. This capability enables you to validate your architecture by simulating the model, automatically generating the derived products and the complete DoDAF documentation while achieving full traceability in a requirements-driven environment. The Rhapsody DoDAF Pack dramatically improves communication between the DoD, the contractor, and the supplier by enabling users to define and construct DoDAF-compliant architectures in a common environment.

The Rhapsody AUTOSAR Pack for the specification and design of automotive systems and software applications is the first AUTOSAR-specific MDD environment to leverage UML and SysML. With the AUTOSAR Pack, automotive engineers can now reuse specifications for common vehicle features across multiple automobile product lines, improving time-to-market while increasing brand consistency among designs.

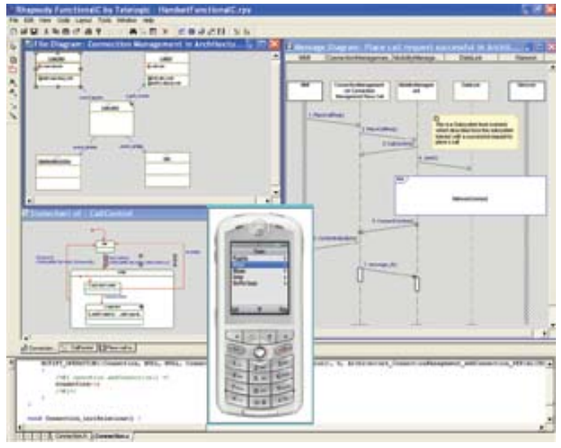
Rhapsody extends the benefits of MDD to the C developer by enabling designers to work in either a functional or object-oriented environment. Rhapsody includes blocks, flows, graphical files, functions, and data so that C developers can create models using familiar concepts.

Integrated Requirements Management and Traceability

Rhapsody is a completely integrated requirements management and traceability solution. No matter how complex the project, Rhapsody provides users with requirements capture, requirements traceability, and requirements analysis capabilities.

Requirements are captured using SysML Requirements Diagrams, Use Case Diagrams, Sequence Diagrams, Activity Diagrams, and State Charts. Rhapsody creates traceability links from the model to the requirements, automatically creating traceability documentation. Rhapsody Gateway presents a detailed view of requirements traceability information, enabling complete traceability analysis.

Designers can analyze the upstream and downstream impact of requirements changes at any level. The Rhapsody Gateway also provides a seamless bi-directional interface to third-party requirements management products, including Telelogic DOORS®, Rational Requisite Pro®, Microsoft® Word, and Excel®.



Using realistic simulation panels, designers can iteratively simulate and debug software.

Rhapsody's simulation capability enables systems engineers to eliminate errors in the model early in the development process

The Rhapsody DoDAF Pack dramatically improves communication between the DoD, the contractor, and the supplier

Collaborative Development

Rhapsody ReporterPLUS simplifies the delivery and maintenance of design documentation over the life of a project. ReporterPLUS ensures that the design, documentation, and code are always fully synchronized. ReporterPLUS generates documentation in HTML, RTF, text, PowerPoint®, or Word format directly from the design. For formal reports and design reviews, the documentation can be updated or regenerated each time the design changes. Wizard-based document generation provides flexibility, ease of use, and complete report customization. ReporterPLUS includes easily customized out-of-the box templates. Users can also produce HTML at the click of a mouse so that documentation can be published on the Web.

The configuration management (CM) interface promotes concurrent, collaborative engineering within Telelogic Rhapsody, enabling developers and engineers to create, review, share, and modify models across a project, organization, or globally distributed team via the Web or Internet connection. Rhapsody interfaces with all popular CM products, ensuring that project data is synchronized under configuration control. The CM product set includes several features, including a diff/merge capability so that users can graphically understand changes; panel graphics to Webify communications for an easy flow of ideas within the group; and Microsoft Net Meeting capabilities that enable Web-based collaboration.

ReporterPLUS ensures that the design, documentation, and code are always fully synchronized

"With Microsoft's announcement of UML adoption and IBM's acquisition of Rational, Model-Driven Development with UML has become a must have capability for software development. Rhapsody, capitalizing on Telelogic's UML expertise in the embedded systems market, has brought the latest UML 2.0 capabilities to embedded developers in an easy to use and robust environment."

Dr. Jerry Krasner
Embedded Market Forecasters

Design for Testability

Rhapsody introduces Design for Testability (DFT), a new paradigm that allows engineers to simulate a design to locate errors early in the process; incorporate requirements-based testing to validate the design against the requirements; and then utilize Auto Test Generator (ATG) capabilities to automatically create coverage tests from the design. With requirements-based testing, engineers and developers can pair-test functions contained within the requirements with the model and test it against the design specifications. Rhapsody's ATG capabilities validate the design with rigorous test standards that allow designers to locate issues in the model that traditional methods would not reveal.

With DFT, designers can simulate the system as it is being built, eliminating defects early and completely. Additionally, DFT tests are exportable to popular third-party testing products for target testing. These tests can be imported back into Rhapsody as requirements to ensure consistency between the model and the test cases. DFT combines simulation, requirements-based testing, and auto-test generation to create an end-to-end model-based testing solution, which ensures that quality and robustness goals are met during a project's design phase.

Full Application Generation

Rhapsody users are able to create complete applications, not just code frames. Rhapsody generates code from all the structural and behavioral model views and combines them with a real-time framework to produce an executable application. The code is clean, readable, and easily debugged at the model or code-level using any commercial IDE that utilizes integrated code (C, C++, Java, and Ada) generation. The result is enhanced productivity and lower maintenance costs.

Rhapsody's unique Dynamic Model/Code Associativity (DMCA) enables developers to work at either the model- or code-level with the confidence that a change made to one will be reflected in the other. This dynamic bi-directional synchronization of the model and the code is possible because Rhapsody treats code as another view of the model. The ability to work at either the model- or the code-level increases design productivity because no additional time is needed to keep the design, documentation, and implementation synchronized.

The Rhapsody framework is a reusable infrastructure for RTOS applications, which provides implementation for the real-time semantics of the model. A major advantage of this approach is that it provides platform independence by abstracting away the platform APIs (RTOS). In addition, the framework is thin, open, extensible, and configurable, enabling easy migration to new or proprietary platforms with seamless integration of commercial or in-house middleware.

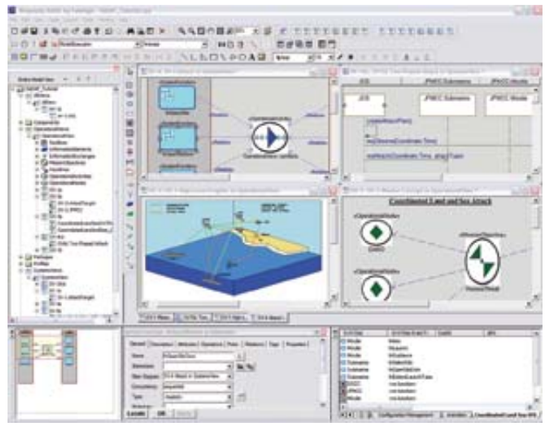
Of course, not all code will be developed in Rhapsody. To enable a seamless integration with code from external projects, code developed by a third party, or code generated from another product, the code can be either visualized or reverse engineered into the model.

Rhapsody's unique Dynamic Model/Code Associativity (DMCA) enables developers to work at either the model- or code-level

When the code is visualized, it is not touched or modified by Rhapsody, but instead a graphical representation of the code is provided within the model. This enables developers to integrate this code without editing or retesting it. When the code is reverse engineered into the model, it becomes part of the model, and the developer is free to apply all of Rhapsody's features on it.

The Rhapsody Product Family

The Rhapsody product family offers MDD environments for systems engineers and software developers with target implementations for C, C++, Java and Ada, generated from model-based designs. Designed for ease-of-use and increased productivity powered through a new graphical engine, there is a Rhapsody product family member appropriate for all your system and software development challenges. With selections ranging from Rhapsody System Designer to Rhapsody Developer, as well as add-ons like the DoDAF pack, Gateway, TestConductor and the ValuePack (which includes ReporterPLUS, interfaces to configuration management products, to name but a few features), the award-winning Rhapsody product family has a solution for even the most daunting MDD design challenge.



Rhapsody allows users to uniquely generate complete applications so that the entire application can be built in the model environment.

The First-in-Class MDD Solution

The Rhapsody MDD environment for embedded software, systems, and test concentrates on product depth for a truly best-in-class experience, one that has been hailed by critics as the modeling product of choice for systems, software, and test. By integrating and automating the systems and software engineering process to achieve deployable systems, Rhapsody's open architecture allows for new levels of quality and productivity.

Rhapsody's capabilities can be extended for domain-specific modeling, providing a truly collaborative development environment that allows teams both large and small to communicate effectively and productively. With integrated requirements management and traceability features, Rhapsody ensures that the design always meets the requirements. Engineers and developers can use Design for Testability to reduce defects early in the process and always validate against the requirements.

In addition, Rhapsody provides engineers and developers the capability to generate full applications, reducing development time, and enabling users to meet challenging time-to-market pressures. Innovative code visualization paired with powerful reverse engineering enables the integration of legacy code and reuse of existing intellectual property.

Features that make Rhapsody the first-in-class solution for the software and systems engineering community include white box code generation, full application synthesis, and model based testing. Rhapsody is a Model-Driven Development (MDD) systems and software modeling product that solves the challenges of communication, scalability, traceability, and cost reduction while optimizing embedded systems and software performance.

About Telelogic

Telelogic® is a leading global provider of solutions for automating and supporting best practices across the enterprise — from powerful modeling of business processes and enterprise architectures to requirements-driven development of advanced systems and software. Telelogic's solutions enable organizations to align product, systems, and software development lifecycles with business objectives and customer needs to dramatically improve quality and predictability, while significantly reducing time-to-market and overall costs.

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