RODIN Deliverable D32

Dissemination and exploitation report

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http://rodin.cs.ncl.ac.uk/
Contributors:

Alexander Romanovsky (University of Newcastle)
Michael Butler (University of Southampton)
Laurent Voisin (ETH Zurich)
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1 Introduction

This document aims at exposing the progress made in the RODIN project concerning the dissemination and exploitation of existing results and the raising of public awareness and participation. This document complements:
- D3 Initial dissemination report,
- D12 Dissemination and exploitation report year 1 and
- D20 Dissemination and exploitation report year 2.

It contains only new information, unless clearly stated.

2 Dissemination and exploitation

This section presents our dissemination and exploitation strategy (unchanged since D12), action items undertaken or to be undertaken in order to achieve our objective, and the status of the dissemination/exploitation activities.

2.1 Strategy (unchanged)

Our objective is to obtain a tested, open platform, fit for use by industry for the development of fault-tolerant systems. This platform should fulfil the “three U rule”, ie Useful, Usable, Used. To verify this rule, we consider that the following assertions should hold:

- [A1] The platform has successfully analysed the 5 case-studies of the project. Positive feedback has been collected among project partners.
- [A2] Positive feedback has been collected among IIG members. Some of them have provided plug-in specification and/or complementary case-study, have initiated assessment project, and/or have started to use/contribute to the platform.
- [A3] Positive feedback has been collected from academic world. The platform is explicitly supported by several universities outside the consortium. They will provide for example
  o tested and packaged releases of the platform in an easy-to-install form;
  o documentation and examples of use for the platform and selected plug-ins;
  o creation of basic plug-ins for client tools.
A pool of developers has been set up and contributes to the platform.

- [A4] Some dedicated plug-ins are commercially available and have been sold/are about to be sold to companies.

[A1], [A2] and [A3] are the criteria for assessing the technical interest of the platform. If [A1] is part of WP1, [A2] and [A3] require a specific dissemination policy in order to enlarge the community around the platform as much as possible, and to ensure technical support from the open-source world.

[A4] is the main criterion for building a realistic business plan and envisaging a commercial future for the platform. These criterions would only be checked at the end of the project, as advanced platform will not be delivered before the last year of the project. Though, identification of commercial plug-ins should be performed before the last year, in order to have time to develop them.

The following action items are entirely driven by those four criteria [A1], [A2], [A3] and [A4].
2.2 **Action items**

2.2.1 **Internal dissemination.**

Several project events were organised during year 3:

**Dusseldorf Technical workshop.** A 2-day technical workshop was organized in Zurich (November 20-21 2006). It was the occasion to present platform architecture and plugin integration. A hands-on session was organized the second day.

**Helsinki Technical workshop.** A 1-day technical workshop was organized in Helsinki (January 25 2006), centered on Fault Tolerance and Formal Methods.

**Newcastle working session.** A 2-day working session was organized in Newcastle (January 2007). Farhad Metha (ETH) presented the platform and its usage to the Ncl group, the school and the students.

**Winchester plenary meeting.** A 2-day meeting was organized in Winchester (March 28-29 2007).

The Rodin platform has been presented / promoted internally by each partner\(^1\).

All documents written by project members are freely accessible on the BSCW server hosted by Newcastle University.

2.2.2 **External dissemination.**

This action item aims at improving the awareness of the platform among both industry and academic worlds. Envisaged targets are entities involved in the software development, formal methods, mobile agent, fault tolerant systems and/or system-level modeling.

2.2.2.1 **Dissemination to industry and technology adaptors.**

**Industry Day.** The main achievement of this year was the latest release of the RODIN platform and its presentation to IIG and associates. At that occasion, a second industry day (RID) was organized in Paris (September 10 2007).

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\(^1\) For example, SDIA advanced MSc students in Newcastle did group work using CAMA and the Rodin platform as part of their study.
IIG and associates attendees were:

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
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</thead>
<tbody>
<tr>
<td>Fernando Meija</td>
<td>Alstom</td>
</tr>
<tr>
<td>Neil Ewans</td>
<td>AWE</td>
</tr>
<tr>
<td>Neil Grant</td>
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</tr>
<tr>
<td>Alun Lewis</td>
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<td>Colin Marsh</td>
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<tr>
<td>Christophe Ponsard</td>
<td>Cetic</td>
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<tr>
<td>Paul Simon</td>
<td>DGA</td>
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<tr>
<td>Diana Moisuc</td>
<td>Keesda</td>
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<tr>
<td>Salimeh Behnia</td>
<td>RATP</td>
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<td>François Bustany</td>
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</tr>
<tr>
<td>Christophe Metayer</td>
<td>Systérel</td>
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<tr>
<td>Jean-Marc Mota</td>
<td>UTC</td>
</tr>
</tbody>
</table>

Several other industry companies and universities/laboratories were present:
- Bosch, SAP, Siemens Transportation Systems, SGDN/DCSSI, CNES
- Usto, INRETS, Bordeaux 1 Univ., Tesside Univ., Paris 12 Univ., IUT Nantes, La Rochelle Univ., INT, Loria Nancy, Valenciennes Univ., Dusseldorf Univ., Babes Bolay Univ., INRIA, India National Institute of Technology, LRI, King’s College

Agenda is given below:

10h00 **Presentation of the RODIN platform** (Alexander Romanovski, Elena Troubitsyna)

- Introduction to Rodin (Alexander Romanovski)
- Rodin Methods to develop fault tolerant systems (Elena Troubitsyna)
- Rodin platform & demonstration (Jean Raymond Abrial)
- Introduction to Rodin plug-ins (Michael Butler)
  - UMLB (Colin Snook)
  - Mobility (Apostolos Niaouris)
  - Pro B (Michael Leuschel)
  - Brama (Antoine Requet)

14h00 **Industrial use of Rodin:**

- From Grafcet to B: an experiment (RATP, ClearSy)
- Validation of Microkernel-based Systems B models with Brama (STmicroelectronics, ClearSy)
- Towards the formal validation of a Java processor in Event-B (AWE)
- Modeling platform screen doors systems (ClearSy)
- Modeling an interlocking system with the Rodin platform (Systerel).

17h00 **End of RODIN Industrial Open Day**

Stable version of tools and plug-ins (platform, proB animator/model checker, mobility plugin, Uml-B, Brama) were presented to the 67 participants. Presentations of projects making use of the Rodin platform for industrial projects were given by IIG.

All the slides are available at http://www.clearsy.com/html/RODIN_en.html.
Plug-in development. A hands-on session was organized in Dusseldorf 21 November 2006. This event was aimed at explaining how to contribute to the platform and how to develop plug-ins for it, in absence of developer documentation. Around 20 persons attended the day.

Relations with industry. Several presentations / training sessions / support sessions were organized for IIG (DGA, RATP, STMicroelectronics) and for other industry (CNES, etc). Following these events, several R&D projects have been initiated to experiment the platform on target domains:

- Contribution to embedded system rigorous design (STMicroelectronics, ClearSy)
- Interlocking regulation (RATP, Systerel)
- Speed control system (RATP, ClearSy)
- System of System modelling (DGA, ClearSy)
- Distributed embedded navigation software (CNES, ClearSy)

2.2.2.2 Dissemination to software engineering community


2.2.2.3 Dissemination to the Formal Methods community

A Workshop on Methods, Models and Tools for Fault Tolerance was organized in Oxford (July 3 2007) at IFM 2007: Integrated Formal Methods. 17 talks were given in 4 sessions:

- Fault tolerance: Modelling in B,
- Fault tolerance: requirements, modeling and verification,
- Fault tolerant applications, formal verification
- Processes and architectures

A one-day tutorial session was organized at the occasion of the B’2007 Conference in Besancon.

2.2.2.4 Dissemination to the dependability community

A workshop on Methods, Models and Tools for Fault Tolerance was organized by RODIN (July 3 2007).

RODIN was presented at the occasion of the SAFECOMP conference (September 18 2007) during a full day session: presentation of the platform, ProB and UML-B plugins in the morning, and demonstrations in the afternoon.
RODIN was presented at the occasion of several events:
- DSN 2007: Newcastle short presentation,
- ISORC 07: Newcastle and Aabo joint paper,
- COMPSAC 2007: Newcastle and Aabo joint paper


2.2.2.5 **Links with MDA/UML community**


2.2.2.6 **Links with other IST projects**

A joint workshop on software dependability was organized with Dedisys and Gorda IST projects in Nuremberg (September 18 2007). Projects results were presented and demonstrated during a full day.


DeDiSys, MADAM, GORDA and Rodin will organize a Dependable and Adaptive Distributed Systems DADS track at SAC March 16 - 20, 2008, Fortaleza, Ceara, Brazil. [http://www.dedisys.org/sac08](http://www.dedisys.org/sac08).

2.2.2.7 **Links with other R&D projects**

Several R&D projects are contributing directly to the Rodin platform:
- RIMEL (Loria Nancy, Bordeaux 1 Univ., ClearSy): design pattern editor
- COSYC (Marseilles Univ., Arboost Technologies, ClearSy): combination of functional and dysfunctional modeling for safety studies

2.2.2.8 **Links with IST**

Several RODIN members joined NESSI - Networked European Software & Services Initiative ([http://www.nessi-europe.com/](http://www.nessi-europe.com/)).
2.2.3 Internet

Three RODIN Web sites set up during the first months of RODIN have been continuously upgraded to present the current state of the project.

2.2.3.1 The official site.

This site is hosted by University of Newcastle and reachable at http://rodin.cs.ncl.ac.uk/. This site provides access to the background research papers and workshop presentations, as well as to all public RODIN deliverables.

![RODIN Logo](RODIN.png)

Rigorous Open Development Environment for Complex Systems

<table>
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<tr>
<th>Work Packages</th>
<th>Project Deliverables</th>
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<tr>
<td><strong>Events</strong></td>
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</table>

Deliverables D1-D20 are available for download, as well as some of the 89 referenced publications.

2.2.3.2 The developer site.

This site is hosted by sourceforge and reachable at http://rodin-b-sharp.sourceforge.net/. Several packages are available for download (platform, plug-ins, documentation, examples). Global statistics are represented in the 4 following graphs.
The Sourceforge website provides some facilities to evaluate Rodin platform popularity (downloads, website hits, trackers statistics, etc) But as downloads are anonymous, a careful analysis is required to

<table>
<thead>
<tr>
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</table>

Table 1: platform downloads over releases

The Rodin has been downloaded 3475 times, from March 2006 to September 2007, over 12 successive releases. Figures tend to stabilize and lead to 270 active users estimate.
The Rodin mathematical font (item "Brave Sans Mono Font"), mandatory to properly display models, has to be downloaded independently from the platform itself. Hence number of downloads of this font is a good indicator of how much people have tried to install the Rodin platform. This file has been downloaded 1171 times.

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**Figure 2: mathematical font downloads**

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Below are some statistics showing the number of bugs/feature request opened and closed during the last year of the project.

**Tracker Traffic Statistics**

**Tracker Traffic For RODIN**

*Last 12 months*

Below are the statistics representing the messages posted on the 5 different forums set up at the beginning of the project. 218 messages have been posted.

**Forum Traffic Statistics**

**Forum Traffic For RODIN**

*Last 12 months*
2.2.3.1 The platform web site

A one-page website has been set up at the occasion of the latest platform release. This page provides links to all resources available for Rodin, explains what is required to have it working and how to install these resources.

2.2.4 Publications

2.2.4.1 Journal papers and book chapters

A number of journal papers and book chapters have been published during year 3 of the project. They include:

  
  A mediator system for improving dependability of web services.
  

- A. Iliasov, A. Romanovsky.

  Structured Coordination Spaces for Fault Tolerant Mobile Agents.
  
Randell, B. and Ryan, P.Y.A. 
*Voting Technologies and Trust* 

Jones, C.B. and Randell, B. 
*The role of structure: a dependability perspective.* 

Randell, B. 
*Foreword* 


V. Khomenko and M. Koutny 
*Verification of Bounded Petri Nets Using Integer Programming.* 

Joey W. Coleman and Cliff B. Jones. 
*A structural proof of the soundness of rely/guarantee rules.* 

*UML-B: Formal modelling and design aided by UML.* 
ACM Transactions on Software Engineering and Methodology 15(1) pp. 92-122.

Dubravka Ilic, Elena Troubitsyna, Linas Laibinis, and Colin Snook. 
*Formal Development of Mechanisms for Tolerating Transient Faults.* 
2.2.4.2 Conference papers

A number of conference papers have been published during year 3 of the project. They include:

- R. Devillers, H. Klaudel and M. Koutny
  *A Petri Net Translation of p-Calculus Terms*
  Lecture Notes in Computer Science Volume 4281 pp. 138-152 Springer 2006

- B. Gallina, N. Guelfi, A. Romanovsky.

- Gorbenko A., Kharchenko V., Romanovsky A.
  *On Composing Dependable Web Services Using Undependable Web Components.*

  *Formal Development of Fault Tolerant Transactions for a replicated Database using Ordered Broadcasts.*

- R. Devillers, H. Klaudel and M. Koutny
  *Modelling Mobility in High-Level Petri Nets*

  *CAA-DRIP: a framework for implementing Coordinated Atomic Actions.*
  In 17th International Symposium on Software Reliability Engineering (ISSRE’06), 2006. pp. 385-394

- B. Randell and M. Koutny
  *Failures: Their Definition, Modelling and Analysis*
  Lecture Notes in Computer Science Springer 2007 pp. 260-271
P. Boström, M. Neovius, I. Oliver and M. Waldén.

C. Snook and M. Waldén.
Refinement of Statemachines using Event B semantics

Budi Arief, Alexei Iliasov, and Alexander Romanovsky.
Rigorous Development of Ambient Campus Applications that can Recover from Errors.

Alexei Iliasov, Alexander Romanovsky, Budi Arief, Linas Laibinis and Elena Troubitsyna.
On Rigorous Design and Implementation of Fault Tolerant Ambient Systems.

Leuschel, M., Cansell, D. and Butler, M. (2007)
Validating and Animating Higher-Order Recursive Functions in B.

Automatic Testing from Formal Specifications.
In Proceedings of International Conference on Tests And Proofs (TAP) (in press), ETH Zurich, Switzerland.

Symmetry Reduction for B by Permutation Flooding.
In Proceedings of 7th International B Conference LNCS 4355, Besancon. France.

Ball, E. and Butler, M. (2007)
Event-B Patterns for Specifying Fault-Tolerance in Multi-Agent Interaction.
• M.Koutny, G.Pappalardo and M.Pietkiewicz-Koutny
  Compositional Abstractions for Interacting Processes
  International Conference on Principles of Information Technology and
  Applications (PITA’07), 2007

  An open extensible tool environment for Event-B.
  In Proceedings of ICFEM 2006 Lecture Notes in Computer Science 4260, Macau.
  Liu, Z. and He, J., Eds.

• T. Lecomte, T Servat, G. Pouzancre.
  Formal Methods in Safety-Critical Railway Systems
  August 2007, Outo Preto, Brazil.

  Experimental Comparison of the Comprehensibility of a UML-based Formal
  Specification versus a Textual One
  In Proc. 11th International Conference on Evaluation and Assessment in Software

• A. Iliasov, A. Romanovsky.
  Choosing Application Structuring and Fault Tolerance Using Assumptions.
  In Proc. Dependable Systems and Networks (DSN), 2007, Supplemental volume,

• Leavens, G. T., Abrial, J. R., Batory, D., Butler, M., Coglio, A., Fisler, K.,
  Hehner, E., Jones, C. B., Miller, D., Peyton-Jones, S., Sitaraman, M., Smith, D. R.
  Roadmap for Enhanced Languages and Methods to Aid Verification.
  In Proceedings of Generative Programming and Component Engineering, 5th
  International, Portland, Oregon.

• F. Mehta.
  Supporting Proof in a Reactive Development Environment.
  Proceedings of the 5th IEEE International Conference on Software Engineering

• Dubravka Ilie, Elena Troubitsyna, Linas Laibinis, and Sari Leppänen.
  Formal Verification of Consistency in Model-Driven Development of Distributed
  Communicating Systems and Communication Protocols.
  In Proceeding of the 2nd International Symposium on Leveraging Applications of
  Formal Methods, Verification and Validation. Paphos, Cyprus, November 2006
• Dubravka Ilic, Elena Troubitsyna, Linas Laibinis, and Colin Snook.  
  In Proceedings of Workshop on Methods, Models and Tools for Fault Tolerance,  
  page(s): 70-79, Oxford, July 2007

### 2.2.4.3 Workshop presentations

Several talks were given, in relation with RODIN. They are listed below:

- R. Razali, C. Snook, M. Poppleton and P. Garratt  
  Usability Assessment of a UML-based Formal Modelling Method  
  In Proc. 19th Annual Workshop of the Psychology of Programming Interest  
  Group (PPIG), pp. 56-71, Joensuu, Finland, July 2-6, 2007.

- A. Iliasov.  
  Refinement patterns for rapid development of dependable systems.  
  Proc. Engineering Fault Tolerant Systems Workshop (at ESEC/FSE, Croatia),  
  ACM Digital Library. (September 4, 2007)

- Iliasov, A., Romanovsky, A., Arief, B., Laibinis L. and Troubitsyna, E.  
  A Framework for Open Distributed System Design.  
  In Proceedings of Computer Software & Applications Conference (COMPSAC  

### 2.2.4.4 Technical reports

A technical report was written, in relation with RODIN:

  Comprehensibility of UML-B - A Series of Controlled Experiments.  
  Technical Report, DSSE/ECS, University of Southampton.[Online].

### 2.2.5 IIG

The Industry Interest Group is today composed of 14 members:

- Adelard,
- Alstom,
- AWE,
- CETIC,
- DGA,
- Escher,
- Gemplus,
• IBM,
• ICC, 
• Qinetiq,
• RATP,
• Stmicroelectronics,
• Systerel
• VTT.

This group is stable.

Alstom, AWE, DGA, RATP and Systerel attended the RODIN Industry Day. AWE and Systerel gave presentations at that occasion.

### 2.2.6 Associates

We encourage academic researchers to register as associate, in order to have a privileged access to RODIN information. For the time being, several researchers are registered as associates:

- Carroll Morgan (University of New South Wales, Australia)
- Ron Van der Meyden (University of New South Wales, Australia)
- Nicolas Guelfi Ries (University of Luxembourg)
- Benoit Ries (University of Luxembourg)
- Reza Razavi (University of Luxembourg)
- Jean Louis Boulanger (Université Technologique de Compiègne, France)
- Pierre-Yves Schobbens (Facultés Universitaires Notre-Dame de la Paix / Namur, Belgium)
- Christophe Ponsard (CETIC Applied Research center / Charleroi, Belgium)
- Nicole Levy (University of Versailles, France)
- Jim Woodcock (University of York, UK)
- Dominique Cansell (Loria-Nancy, France)
- Cecilia Rubira (University of Campinas, Brazil)
- Fernando Castro Filho (University of Campinas, Brazil)
- Michael Leuschel (Dusseldorf University, Germany)
- Swapan Bhattacharya (Javadpur University, India)
- Friedrich von Henke (Ulm University, Germany)
- Fabrice Bouquet (Laboratoire d’Informatique de l’Université de Franche-Conté, France)
- Juan Bicarregui (RutherfordAppleton Lab / CCLRC)
- Shinichi Honiden (NII, University of Tokyo)
- Eric Platon (NII)

Juan Bicarregui, Shinichi Honiden and Eric Platon have joined the associates group during the reported period.

### 2.2.7 Plug-in identification

During the last year of the project, a new plug-in has been developed by Southampton university (B2Latex) to enable researchers to publish their models.
2.3 Status of the exploitation/dissemination activities

At the end of the project, the following facts have been established:
- The RODIN platform has been downloaded by 1171 distinct users
- The RODIN platform has 270 active users
- Courses based on the RODIN platform are given in universities: LORIA Nancy (France), ENSEIRB Bordeaux (France), University of New South Wales (Australia)
- One plug-in developed outside the project (ProB by Dusseldorf University)
- Four IIG members providing feedback on the platform (AWE, DGA, STmicroelectronics, Systerel),
- One IIG member using the platform for industrial project: Systerel
- One plug-in released as commercial product (Brama), with several customers.

So we can consider that our four criteria [A1], [A2], [A3] and [A4] are fulfilled. However [A4]

Some dedicated plug-ins are commercially available and have been sold/are about to be sold to companies.

is only partly addressed, as only one plug-in is available, developed by one project member. The main reason is that developer resources have not been made available before the end of the project. Another reason is that the RODIN platform hasn’t yet entered the industry field outside IIG: tool developments without industry user base can’t be easily funded, apart within R&D projects.

There is no real business plan to set up at the end of the project, as the stable release of the platform is recent (September 2007) and user base has to increase. The platform and its related plug-ins have to be advertised and demonstrated to apply to large size, industry strength systems / problems, mandatory condition for its deployment in the industry.