



Project DEPLOY  
Grant Agreement 214158

*“Industrial deployment of advanced system engineering methods  
for high productivity and dependability”*



*DEPLOY Deliverable D17*

**D10.3 Initial Port of Technology Transfer  
Material**

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# Chapter 1

## Introduction

The DEPLOY Integrated Project (Industrial deployment of advanced system engineering methods for high productivity and dependability) started on the 1st of February, 2008. The main objective of the project is to make major advances in engineering methods for dependable systems through the deployment of formal engineering methods. The industrial deployment of the project is in different sectors: automotive, rail transportation, space systems and business information. As a result, the DEPLOY project not only involves several academic partners, but also industrial partners from these above mentioned sectors.

In order for the industrial partners to be able to apply the method and tools and subsequently transfer these technologies into development, they must have adequate knowledge. The aim of the technology transfer workpackage (WP10) is to provide the industrialists with necessary knowledge in all aspects in order to successfully apply the Event-B methodology and use the associated tool supports. These aspects include requirements analysis, modelling techniques, refinement proofs and incorporating these activities within the development processes.

This deliverable contains the initial porting of the material developed for technology transfer, to the technology transfer platform, e.g. the Web Platform at [event-b.org](http://event-b.org) [EBb], DEPLOY repository [DEP] and the Wiki Documentation System [EBa]. This report gives an overview of the available material including domain-specific one.

# Chapter 2

## Description of Material

This chapter describes the details of the technology transfer material including those for general purpose of technology transfer as described in Section 2.1 and domain-specific material as described in Section 2.2.

### 2.1 General Technology Transfer Material

The material described in this section is for general technology transfer purpose about the Event-B method and the Rodin Platform.

#### 2.1.1 Material for the Initial Block Course

Note that the material in this section has been developed and ported to the technology transfer platform in the first year of the DEPLOY project. This has been reported in details in our earlier deliverable D10.1 [AHS09]. We give a summary of the material here.

**Summary Material:** Summary slides which were sent in advance to the attendees of the block course. The direct URL location is <http://deploy-eprints.ecs.soton.ac.uk/53/>.

**Lectures:** Material for the lectures, including slides corresponding to chapters of [Abr09] and a reference card for the course. The direct URL location is <http://deploy-eprints.ecs.soton.ac.uk/54/>.

**Tutorial:** Material for the tutorials, including exercises and solutions. The direct URL location is <http://deploy-eprints.ecs.soton.ac.uk/55/>.

**Developments:** RODIN platform archives of the examples used in the summary slides, lectures and tutorials. The direct URL location is <http://deploy-eprints.ecs.soton.ac.uk/56/>.

### 2.1.2 Material Related to[Abr09]

The material in this section related to the upcoming book by Jean-Raymond Abrial titled “Modeling in Event-B: System and Software Engineering” [EBa]. The material has been ported to the DEPLOY repository [DEP] with links from the Wiki documentation system [EBa]. The direct URL location at the Wiki is [http://wiki.event-b.org/index.php/Event-B\\_Language](http://wiki.event-b.org/index.php/Event-B_Language).

**Sample Chapters:** Two sample chapters of the book are available at the Event-B website [EBb]: Chapter 1 titled “Introduction” and Chapter 2 titled “Controlling Cars on a Bridge”.

**Slides and Developments:** The following slides and developments corresponding to the various chapters of the books are made available.

- Chapter 1: Introduction.  
<http://deploy-eprints.ecs.soton.ac.uk/111/>.
- Chapter 2: Controlling Cars on a Bridge.  
<http://deploy-eprints.ecs.soton.ac.uk/112/>.
- Chapter 3: A Mechanical Press Controller.  
<http://deploy-eprints.ecs.soton.ac.uk/113/>.
- Chapter 4: File Transfer Protocol.  
<http://deploy-eprints.ecs.soton.ac.uk/114/>.
- Chapter 6: The Bounded Re-transmission Protocol.  
<http://deploy-eprints.ecs.soton.ac.uk/115/>.
- Chapter 7: Concurrent Program Development.  
<http://deploy-eprints.ecs.soton.ac.uk/116/>.
- Chapter 8: Electronic Circuits Development.  
<http://deploy-eprints.ecs.soton.ac.uk/117/>.
- Chapter 10: Leader Election on a Ring-shaped Network.  
<http://deploy-eprints.ecs.soton.ac.uk/118/>.
- Chapter 11: Synchronizing Processes on a Tree Network.  
<http://deploy-eprints.ecs.soton.ac.uk/119/>.
- Chapter 12: Routing Algorithm for Mobile Agent.  
<http://deploy-eprints.ecs.soton.ac.uk/120/>.

- Chapter 13: The Leader Election Protocol (IEEE 1394).  
<http://deploy-eprints.ecs.soton.ac.uk/121/>.
- Chapter 15: Sequential Program Development.  
<http://deploy-eprints.ecs.soton.ac.uk/122/>.
- Chapter 16: Location Access Controller.  
<http://deploy-eprints.ecs.soton.ac.uk/123/>.
- Chapter 17: Train System.  
<http://deploy-eprints.ecs.soton.ac.uk/124/>.

### 2.1.3 Event-B Examples

Some Event-B examples has been deposited at the DEPLOY repository [DEP] with links from the Event-B Wiki [EBa]. The direct URL location is [http://wiki.event-b.org/index.php/Event-B\\_Examples](http://wiki.event-b.org/index.php/Event-B_Examples). The list of the current examples is as follows.

- Redevelopment of an Industrial Case Study Using Event-B and Rodin
- Deliverable D8 D10.1 “Teaching Materials”.
- Modelling and Proof of a Tree-structured File System.
- Link State Routing Development.
- Development of a Network Topology Discovery Algorithm.
- MIDAS: A Formally Constructed Virtual Machine.
- UML-B Development of an ATM.
- Real-time Controller for a Water Tank.

### 2.1.4 User Documentations

The material described in this section are related to user of the Event-B method, the RODIN platform and RODIN platform plug-ins.

**Event-B Language:** The material is available at [http://wiki.event-b.org/index.php/Event-B\\_Language](http://wiki.event-b.org/index.php/Event-B_Language). There are an “Event-B Modelling Language” document and an “Event-B Mathematical Language” document. Moreover, there are sections at the website for “Modelling Tips” and “Proving Tips” which will be a place holder for material related to the topics. Currently, there is document in modelling tips about “Structured Types”.

**RODIN Platform** The material related to the RODIN platform is available at [http://wiki.event-b.org/index.php/Rodin\\_Platform](http://wiki.event-b.org/index.php/Rodin_Platform). This includes the “RODIN User Manual”, the “RODIN tutorial” and a document about “RODIN Provers”.

**RODIN Platform Plug-ins:** The material related to various plug-ins is available at [http://wiki.event-b.org/index.php/Rodin\\_Plug-ins](http://wiki.event-b.org/index.php/Rodin_Plug-ins). There are currently documentation for the following plug-ins.

**UML-B:** UML-like graphical front end for Event-B.

**Parallel Composition using Event-B:** Plug-in supporting “Shared Event Composition”.

**Feature Composition:** Plug-in allowing the composition of Event-B features (machines/contexts).

**Refactoring Framework:** Plug-in allowing the refactoring various modelling elements in Event-B.

**Pattern:** Plug-in allowing the reusing of existing models in order to save both modelling and proving effort.

**ProB:** An animator and model checker for the B-Method.

**AnimB:** An animator for the RODIN platform.

**ReqsManagement:** Plug-in supporting requirements management.

**B2Latex:** Plug-in allowing to typeset an Event-B model with LaTeX.

**Proof Purger:** Plug-in allowing to remove unused proofs.

**Proof Skeleton View:** Plug-in displaying skeleton of existing proofs.

**B2C:** Plug-in translating Event-B models to C source code.

Moreover, there are some existing tutorials associated with plug-ins such as: UML-B, Requirement Management and, Flash Animation with AnimB.

### 2.1.5 Developer Documents

The material described in this section for developers who would like to extend the RODIN platform by contributing plug-ins. The following information is currently available on-line at [http://wiki.event-b.org/index.php/Rodin\\_Developer\\_Support](http://wiki.event-b.org/index.php/Rodin_Developer_Support).

- RODIN platform overview with information about “Getting Started” for contributing to the platform.

- Detail information about the architecture of the RODIN platform (currently updating). This includes information about the RODIN platform core, user interface for Event-B and various Event-B Component Library.
- Information about extending different component of the platform such as the project explorer, proof manager, index manager, etc.
- Useful hints for developers about version control, testing, publishing, etc.
- Developer FAQ about the RODIN platform.

## 2.2 Domain-specific Material

The domain specific material is mainly related to the mini-pilots and pilots from the various industrial partners. The description of these mini-pilots and pilots are in our earlier deliverables [ABB+09]. They are typical systems of the corresponding deployment sectors that have been chosen for technology transfer purpose. Note that this technology transfer is bi-directional: the mini-pilots and pilots are for academic partners and technology providers to understand the domain-specific problem and also for deployment partners to understand the Event-B method and master the use of the RODIN platform.

### 2.2.1 Automotive Sector

The mini-pilots from Bosch is about different types of switches and buttons which are typical sub-systems of the sector. Details about the mini-pilots are in Chapter 2 of our deliverable JD1 [ABB+09]. The following related material are available.

- The model of the mini-pilot by Michael Butler. [But09]
- The model of the mini-pilot by Jean-Raymond Abrial.

They have been documented in the same chapter of the deliverable.

### 2.2.2 Transportation Sector

The mini-pilot from Siemens Transportation Systems (STS) is the function “Manage Operating Modes” in train system. Details can be found in Chapter 3 of the deliverable JD1 [ABB+09]. There are different models of the mini-pilot.

- The model of the mini-pilot from STS as documented in the Appendix A of the deliverable JD1 [ABB<sup>+</sup>09].
- The model of the mini-pilot from Southampton as documented in the Appendix B of the same deliverable.

### 2.2.3 Space Sector

The mini-pilot from Space System Finland (SSF) is a part of the full pilot about the BepiColombo (BC). The mini-pilot concerns with the MIXS/SIXS on-board instrument software. The description can be found in Chapter 4 of the deliverable JD1 [ABB<sup>+</sup>09]. There are different models of the mini-pilot and the pilot available.

- The model of the mini-pilot from SSF [IV08b].
- The UML-B model of the mini-pilot from University of Southampton [But08].
- The Event-B model of the mini-pilot from University of Newcastle [III08].
- The Event-B model of the mini-pilot from Aabo Akademi [LT08].
- Model of the pilot (BepiColombo) from SSF [IV08a].
- Model of the pilot (BepiColombo) from University of Newcastle and Aabo Akademi [LTIR08, Lai08].

### 2.2.4 Business Information Sector

There are two mini-pilots from SAP: Seller/Buyer B2B Communication and Order/Supply Chain A2A Communication. The description of these mini-pilots are in Chapter 5 of the deliverable JD1 [ABB<sup>+</sup>09]. The following material is related to technology transfer in this deployment sector.

- Modelling and Analysis of Business Information Applications with Fault tolerant middleware [BFRR08].
- Model of the Seller/Buyer B2B Communication in Event-B using pattern approach from ETHZ [Hoa08].
- Model of the Order/Supply Chain A2A Communication in Event-B using pattern approach from ETHZ [Für09].

# Chapter 3

## Conclusion

In conclusion, the initial port of the technology transfer material to the web platform consists of the general training material as well as some domain specific material in different deployment sector. These material can be reused and applied effectively both for people who want to understand domain specific problems and for people who want to learn the Event-B method and to use the RODIN platform. Moreover, developers who want to extend the RODIN platform can find material about the core RODIN platform and various RODIN plug-ins.

Nevertheless, the material is not completed and being updated constantly with missing material as well as new material, while the method and the tool are evolving. New training material are being developed, such as the “Cookbook” (a guide about developing systems in Event-B) and will be ported to the technology transfer platform.

For the effectiveness of technology transfer material within the DEPLOY project, we are developing a planner which contains the requested material from deployment partners as well as the material that are going to be provided by academic partners and technology providers. The material is associated with estimated date of deliver and the responsible partners. The material are ranging from general material to domain specific material for different deployment sectors.

As an example, some entries in this planner can be as in Table 3.1 on the following page. During the course of the DEPLOY project, this planner will be keep up-to-date as new requests come along and/or the priority of the material changed. This planner will help to make the process of developing technology transfer material transparent within the DEPLOY project.

No.	Description	Req. by	Resp. partner	Expected	Completed	Information
1	HowTo for the use of automatic provers	Bosch, SSF, SAP	ETHZ	31/05/2009	07/06/2009	<a href="http://wiki.event-b.org/index.php/Rodin_Provers">http://wiki.event-b.org/index.php/Rodin_Provers</a>
...	...	...	...	...	...	...
5	HowTo for manual proofs	Bosch, SSF	Systerel	30/09/2009		What is the good practises / strategies
...	...	...	...	...	...	...
10	HowTo on Event-B semantics	Bosch, SSF, SAP, Siemens	Soton, ETHZ	31/07/2009		Meaning of Event-B modelling elements, proofs etc.

Table 3.1: Example of the Technology Transfer Planner

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