

# Annual Dissemination Report

<b>Project</b>	ADVANCE			<b>Document Nr.</b>	CSWT-EUADV-2012-RPT-00197	
<b>Reporting period</b>	from	1 <sup>st</sup> October 2011	to	30 <sup>th</sup> September 2012	<b>Revision</b>	2.0
<b>Identification</b>						
Customer	European Union					
Project Coordinator	John Colley (University of Southampton)					
Project Manager	Luke Walsh (Critical Software Technologies)					
<b>Document Overview</b>						
This document is designed to provide a details of the dissemination activities of the Advance consortium for the above stated reporting period. Below are lists of papers published related to Advance, Conferences and Seminars attended where Advance was discussed/promoted, and workshops/tutorials that have been run to further educate interested parties in the concepts being developed in Advance.						
<b>Press Releases/Newsletters</b>						
Date	Publication			Consortium Member		
2011	University of Southampton Press Release (see Appendix)			University of Southampton		
2012	CS World Newsletter			Critical Software Technologies		
<b>Web Dissemination Activities</b>						
In order to improve the dissemination of activities and developments from the ADVANCE project the following has been undertaken:						
<ul style="list-style-type: none"> <li>• Creation of an ADVANCE website (<a href="http://www.advance-ict.eu/">http://www.advance-ict.eu/</a>)</li> <li>• Creation of an ADVANCE specific Linked In group (<a href="http://www.linkedin.com/groups/Advance-FP7-Formal-Methods-4498315">http://www.linkedin.com/groups/Advance-FP7-Formal-Methods-4498315</a>)</li> <li>• Creation of an ADVANCE Twitter Feed (@advancefp7)</li> </ul>						
We are investigating the creation of a Facebook page to enhance the use of social media. Also, the ADVANCE consortium will be setting up channels on You Tube or Vimeo in order to post tutorials and any other relevant material online for general consumption. We hope that this will bring great exposure to the project and the tools we are developing.						
Critical Software Technologies have created a Formal Methods and Model Driven Development Flyer for distribution and exhibition information. It explains the involvement and goals of the ADVANCE project, as well as other related formal methods projects.						
University of Southampton have also distributed an ADVANCE specific fact sheet at the conferences and exhibitions they have attended.						

Several papers and tutorials on ADVANCE methods and tools were presented by members of the Consortium at various conferences and workshops during the first period as follows:

## Conference Presentations

- Edmunds, Andrew and Rezaadeh, Abdolbaghi and Butler, Michael (2012) *Formal modelling for Ada implementations: Tasking Event-B*. In: Ada-Europe 2012: 17th International Conference on Reliable Software Technologies, June 2012, Stockholm.

- Code generation from Event-B models is being developed in WP4 and this paper describes the approach to generating multi-tasking Ada from Event-B models. Ada-Europe is the main conference for Ada users and has strong participation from industrial embedded systems developers. Ada now has constructs for formal annotations and the need for formal modeling approaches to Ada development is becoming stronger. This paper was viewed by some participants as a useful contribution to this initiative.
- Edmunds, Andrew and Butler, Michael and Maamria, Issam and Silva, Renato and Lovell, Chris (2012) *Event-B code generation: type extension with theories*. In: ABZ 2012, 19-21 June 2012, Pisa, Italy.
  - This paper describes the way in which the code generation work of WP4 uses the term rewriting capability of the Rodin Theory plug-in to define program language specific translation rules for Event-B expressions and integrate this mechanism with the code generation framework. ABZ is an academic-oriented conference with a strong representation from researchers working on B and Event-B.
- Plagge, Daniel and Leuschel, Michael (2012) *Validating B, Z and TLA+ using ProB and Kodkod*. In: Proceedings FM'2012, August, 2012, Paris.
  - This paper describes a link between ProB and the SAT-based Kodkod constraint solver from MIT that allows some constraints to be solved using SAT solvers. For some constraints, Kodkod provides good results while for others the ProB Prolog-based solver provides better results. FM is the premier formal methods conference and includes a strong representation from industry.

#### Tutorial Presentations

- Butler, Michael (2012) *Mastering System Analysis and Design through Abstraction and Refinement*. Lectures at NATO Marktoberdorf 2012 Summer School on Engineering Dependable Systems, August 2012.
  - These lectures present an overview of abstraction and refinement using Event-B and Rodin. They also cover the decomposition techniques being supported through tools in WP3 and being used in the case studies in WP1 and WP2. The Marktoberdorf Summer School is aimed at top PhD students from leading universities across Europe, including Eastern Europe as well as some participants from the US and Australia.
- Butler, Michael (2012) *Mastering System Analysis and Design through Abstraction and Refinement*. Lectures at SERENE 2012 Autumn School on Software Engineering for Resilient Systems, September 2012, Pisa, Italy.
  - SERENE is aimed at European researchers who are partners in the SERENE network on dependable systems. The presentation was similar to the Marktoberdorf lectures.
- Colley, John (2012) *Tutorial: a Practical Introduction to using Event-B for Complex Hardware and Embedded System Specification and Design*. Tutorial at Forum on Design Languages (FDL), September 2012, Vienna.
  - FDL is a leading conference on design languages for hardware and embedded systems with a strong participation from industry. There was strong interest in this tutorial particularly driven by the increase in interest in the role of formal modeling and verification in safety certification.
- Reis, Bicknell, Butler, Colley, Snook: *A Practical Approach for Closed Systems Verification Using Event-B*, September 2012, SEFM2012, Thessaloniki, Greece
  - SEFM is a conference that brings academia and industry together to discuss the application of formal methods to software engineering. The presentation focused on the application of Event-B and Rodin to perform verification of closed systems. ADVANCE was promoted during the presentation.

#### Workshop Presentations

- John Colley (2012). *Overview of the ADVANCE Project, Rodin User and Developer Workshop*, Fontainebleau, February 2012.
  - The Rodin User and Developer workshop is a specialist workshop for the Rodin community. The Rodin community includes several research institutions and companies who are not part of the ADVANCE consortium. There is strong interest in the results of ADVANCE in the Rodin community and this presentation gave an overview of ADVANCE aims and plans.

- Laurent Voisin, More Abstraction. Schloss Dagstuhl workshop on AI meets Formal Software Development, July 2012.
  - This Dagstuhl workshop brought together leading researchers in automated verification (model checking and theorem proving) with leading researchers in Artificial Intelligence. The aim was to identify ways in which AI techniques to increase the level of automation in formal development and verification. The presentation identified challenges involved in Event-B based development, in particular, highlighting the importance of modeling and refinement patterns and the role that AI techniques to play in facilitate in applying patterns during development.
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## Appendix A

### University of Southampton Press Release

[http://www.southampton.ac.uk/mediacentre/news/2011/sep/11\\_95.shtml](http://www.southampton.ac.uk/mediacentre/news/2011/sep/11_95.shtml)

News release

New software tools for railway signalling and energy distribution

Ref: 11/95

30 September 2011

New tools to improve the design of embedded software systems in automated railway signalling and smart energy distribution are being developed as part of a multi-million Euro project led by researchers at the University of Southampton.

Professor Michael Butler, Head of the Electronic and Software Systems Group at the University, is coordinating the Advanced Design and Verification Environment for Cyber-physical System Engineering Project (ADVANCE), which begins tomorrow (01 October).

The EU-funded ADVANCE project, which involves Alstom Transport, Critical Software Technologies Ltd, Systerel and two universities, Southampton and Düsseldorf, will deliver methods and tools for formal modelling, verification and validation, which will make it possible to produce precise models for embedded systems and help eliminate design errors before projects go into the manufacturing stage. The project will run for 30 months and these tools will be applied to by industrial partners in the project.

Professor Butler says: "Critical infrastructure, such as railways and energy distribution, rely on large complex software systems and software design errors are expensive to fix and can have a detrimental impact. We are producing formal modelling and verification tools so that system designs can be tested earlier and improvements made before any commitment is made to the final design."

"Formal modelling and verification can significantly improve the quality of the system validation process", says Jose Reis, Principal Consultant Engineer at Critical Software Technologies. "Formal methods improve the quality of the analysis phase by forcing the systems engineer to analyse a broader space of problems."

In ADVANCE, the consortium will use a software toolkit, named RODIN, which is open source and was initially developed in the EU FP6 Rigorous Open Development Environment for Complex Systems (RODIN) project 2004-2007 and the EU FP7 Industrial Deployment of System Engineering Methods Providing High Dependability and Productivity (DEPLOY) 2008-2012.

The major impact of the ADVANCE methods and tools will be to reduce the cost associated with formal modelling and verification while increasing the benefits obtained. This will provide a competitive edge to European systems engineering companies allowing them to further strengthen the leading position of Europe in development of high quality embedded systems.

## Appendix B

## Critical Software internal Newsletter

Critical
Subsidiaries



**Critical Software Technologies Starts Work on ADVANCE**

BY JOSÉ REIS

Critical Software Technologies is participating in an international consortium running a project focused on Advanced Design and Verification Environment for Cyberphysical System Engineering (ADVANCE).



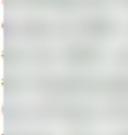
**Critical Software Technologies Starts Work on ADVANCE**

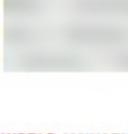
BY JOSÉ REIS

Critical Software Technologies is participating in an international consortium running a project focused on Advanced Design and Verification Environment for Cyberphysical System Engineering (ADVANCE).











**Advance**

The aim is to develop a unified tool-based framework for automated formal verification and simulation-based validation of cyber-physical systems. Critical's links with industry, in particular with the energy sector, together with our expertise in providing solutions for mission and business critical information systems will not only be used to deploy the advanced engineering method on a real case study but also to provide requirements for the development of the toolset. As well as managing the consortium, Critical's engineers will lead the exploitation of the ADVANCE framework using a Smart Energy Grid Case Study. Critical will model and formally verify the trusted, secure and reliable data interchange needed between supplier and consumer, with a view to achieving compliance with international standards for Smart Grid Interoperability, developed by the US National Institute of Standards and Technology. The other industrial partner on the project is Alstom Transport Information Solutions and we have two academic partners, Southampton University and the University of Dusseldorf, and one technological partner, SYSTEREL. ADVANCE is funded by the FP7 Information and Communication Technologies (ICT) Programme and it addresses Strategic Objective IST-2011.3.3 New Paradigms for Embedded Systems, Monitoring and Control towards Complex Systems Engineering.