Acronyme / Acronym	**GEMOC**		
Titre du projet	Un framework de modèles de calcul génériques pour l'exécution et l'analyse dynamique de modèles		
Proposal title	A *Generic Models of Computation Framework* for Model Execution and Dynamic Analysis		
Axe(s) thématique(s) / theme(s)	☐ 1 ☒ 2 ☒ 3 ☐ 4 ☐ 5		
Type de recherche / Type of research	☒ Recherche Fondamentale / Basic Research ☐ Recherche Industrielle / Industrial Research ☐ Développement Expérimental : Experimental Development		
Coopération internationale (si applicable) / International cooperation (if applicable)	Le projet propose une coopération internationale / International cooperation with : ☐ avec un ou des pays spécifiquement mentionnés dans l'appel à projets / countries explicitely cited in the call for proposal ☐ autres pays / other countries		
Aide totale demandée / Grant requested	982 720 €	**Durée du projet / Projet duration**	40 months (36+4)

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1. CV, RESUME

1.1. INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE (INRIA)

INRIA, the French national institute for research in computer science and control, operating under the joint authority of the Ministries of Research and of Industry, is dedicated to fundamental and applied research in information and communication science and technology (ICST). Throughout its eight research centres located, INRIA has a workforce of 4 100 (3 150 of whom are scientists from INRIA or from INRIA's partner organizations such as CNRS (the French National Center for Scientific Research), universities and leading engineering schools. They work in about 200 project-teams. Many INRIA researchers are also professors who supervise around 1000 doctoral students, their theses work contributing to INRIA research projects. INRIA has an annual budget of 217 million euros, 20% of which comes from its own research contracts and development products.
In its 2008-2012 Strategic Plan, INRIA has defined seven scientific priorities: Modelling, simulation and optimization of complex dynamic systems; Programming: security and reliability of computing systems; Communication, information, and ubiquitous computing; Interaction with real and virtual worlds; Computational engineering; Computational sciences; Computational medicine.
As its strategy closely combines scientific excellence with technology transfer INRIA develops many partnerships with industry and fosters technology transfer and entrepreneurship in the field of ICST - some hundred companies have been founded since 1984.
INRIA asserts its presence in the international research particularly in contributing to the development of the European Research Area through its implication EUREKA and participation in the FP7; INRIA being indeed involved in more than 100 selected proposals. In the ICT theme of the Cooperation programme, INRIA is partner in 65 selected proposals.

Triskell is one of the project-teams, carrying out research on Model-Driven Engineering of Software Product Lines with a special focus on the domain of component based reactive distributed systems with quality of service constraints, including reliability, performance, timeliness etc. Triskell evolved in numerous national projects such as Movida, Domino and OpenEmbeDD. Triskell also participates to several European projects, including the AOSD-Europe and S-Cube networks of Excellence, as well as the FP6 SPEEDS project and the FP7 DiVA project. Triskell is at the frontier of two fields of software: the field of specification and formal proof, and that of design that, though informal, is organized around best practices (e.g.; separation of concerns with aspects, models, design patterns, or the use of off-the-shelf components). We believe that the use of our techniques will make it possible to improve the transition between these two worlds, and will contribute to the fluidity of the processes of design, implementation and testing of software. Triskell is also interested in models at runtime to monitor and adapt component-based systems during their executions, using a model-driven approach.

- *Profile of Key Members*

Dr Benoit Baudry received a Master's degree from Université de Rennes 1 in 2000 and a PhD degree in Computer Science from Université de Rennes 1 in 2003. He first worked at CEA before joining INRIA in 2004. He is now a researcher in software engineering in the Triskell team of the IRISA lab. In December 2010 he received his Habilitation à Diriger des Recherches from the University of Rennes 1. His research interests concern software analysis, fault localization, model composition, model-based testing, requirements analysis, security. In 2008 he was a visiting scientist in Colorado State University. He is PI in the MoCAA équipe associée, he is vice-president for the IEEE ICST steering committe. Benoit Baudry is the authors in the last five years of more than 40 publications in international journals and conferences in related fields to the project, including:

- Estimating Footprints of Model Operations (Cédric Jeanneret, Martin Glinz, Benoit Baudry), In International Conference on Software Engineering (ICSE'11), IEEE, 2011.
- Modeling Modeling Modeling (Pierre-Alain Muller, Frédéric Fondement, Benoit Baudry, Benoit Combemale), In Journal of Software and Systems Modeling (SoSyM), Springer-Verlag, 2010.
- Barriers to Systematic Model Transformation Testing (Benoit Baudry, Sudipto Ghosh, Franck Fleurey, Robert France, Yves Le Traon, Jean-Marie Mottu), In Communications of the ACM, ACM, volume 53, 2010
- Inquiring the usage of aspect-oriented programming: an empirical study (Freddy Munoz, Benoit Baudry, Romain Delamare, Yves Le Traon), In 25th IEEE International Conference on Software Maintenance (ICSM'09), 2009.
- Providing Support for Model Composition in Metamodels (Robert France, Franck Fleurey, Raghu Reddy, Benoit Baudry, Sudipto Ghosh), In EDOC'07 (Entreprise Distributed Object Computing Conference), 2007.

Dr Benoit Combemale received a master's degree from the University of Toulouse, France in 2005 and, a Ph.D. degree in Computer Science from the University of Toulouse, France in 2008. His PhD received the Leopold Escande Award 2008, and was realized in the ACADIE team of the IRIT laboratory from 2005 to 2008. After having a postdoctoral fellow (funded by INRIA) in the AtlanMod team at the Ecole des Mines de Nantes, he is currently associate professor at University of Rennes 1 and a member of the Triskell project-team (INRIA & IRISA). His research interest in software engineering include model driven engineering, software language engineering and V&V. Benoit Combemale has co-authored in the last five years 2 books, and more than 35 international and national papers in related fields to the project, including:

- Benoit Combemale, Laure Gonnord, Vlad Rusu , A Generic Tool for Tracing Executions Back to a DSML's Operational Semantics, In 7th European Conference on Modelling Foundations and Applications (ECMFA 2011), Springer, volume 6698, 2011.
- Antoine Floch, Tomofumi Yuki, Clément Guy, Steven Derrien, Benoit Combemale, Sanjay Rajopadhye, Robert France, Model-Driven Engineering and Optimizing Compilers: A bridge too far?, In Proceedings of the 14th international conference on Model driven engineering languages and systems (MODELS'11), Springer, volume 6981, 2011.
- Kezadri Mounira, Benoit Combemale, Marc Pantel, Xavier Thirioux, A Proof Assistant Based Formalization of MDE Components, In 8th International Symposium on Formal Aspects of Component Software (FACS 2011), Springer.
- Pierre-Alain Muller, Frédéric Fondement, Benoit Baudry, Benoit Combemale, Modeling Modeling Modeling, In Software and Systems Modeling (SoSyM), 2010.
- Xavier Crégut, Benoit Combemale, Marc Pantel, Raphael Faudoux, Jonatas Pavei, Generative technologies for model animation in the TopCased platform, In 6th European Conference on Modelling Foundations and Applications (ECMFA 2010), Springer, volume 6138, 2010.
- B. Combemale, X. Crégut, P.-L. Garoche and X. Thirioux, Essay on Semantics Definition in MDE. An Instrumented Approach for Model Verification, published in "Journal of Software" (JSW) (4:6 2009), Academy Publisher.

Dr. Olivier Barais received an engineering degree from the Ecole des Mines de Douai, France in 2002 and a PhD in computer science from the University of Lille 1, France in 2005. After having been a PhD student in the Jacquard INRIA research team, he is currently associate professor at University of Rennes 1 and a member of the Triskell INRIA group. His research interests include Component Based Software Design, Model-Driven Engineering and Aspect Oriented Modeling. Olivier Barais has co-authored 25 international conference papers, 2 book chapters and 6 journals. These papers have been published in conferences and journals such as MoDELS, CBSE, ICSE, or IEEE computer.

- Clavreul, Mickael, Barais, Olivier and Jézéquel, Jean-Marc (2010) Integrating Legacy Systems with MDE. In ICSE'10: Proceedings of the 32nd ACM/IEEE International Conference on Software Engineering (ICSE 2010).
- Morin, Brice, Barais, Olivier, Jézéquel, Jean-Marc, Fleurey, Franck and Solberg, Arnor, Models at Runtime to Support Dynamic Adaptation. IEEE Computer, 2009.
- Morin, Brice, Barais, Olivier, Nain, Grégory and Jézéquel, Jean-Marc (2009) Taming Dynamically Adaptive Systems with Models and Aspects. In 31st International Conference on Software Engineering (ICSE 2009).
- F. Munoz, B. Baudry, and O. Barais. Improving Maintenance in AOP Through an Interaction Specification Framework. In Proceedings of ICSM'08. Beijing, China, September 2008.
- Olivier Barais, Julia Lawall, Anne-Françoise Le Meur and Laurence Duchien (2008) Software Architecture Evolution. In Software Evolution, Springer Verlag, pages 233-262.

Ing. Didier Vojtisek has graduated an engineering degree from ENSSAT in 1997. He has joined INRIA as a research engineer since 2001. He is involved in the research activities of the Triskell team on model driven technologies. As such, he is chief architect on the development of the exectable metalanguage platform Kermeta. He is also part of the SED (Service d'Expérimentation et de Développement) for code quality, integration, transfer and dissemination actions. He has participated in several French and European projects such as OpenEmbeDD (ANR) or Mopcomsoc (ANR).

1.2. LABORATOIRE D'INFORMATIQUE, SIGNAUX ET SYSTÈMES DE SOPHIA-ANTIPOLIS (I3S)

Dr Frédéric Mallet received a Master of Sciences and an Engineering degree in 1997 and a PhD degree in Computer Science from Nice-Sophia Antipolis University in 2000. After working two years as a Research Scientist at Edinburgh University (UK), he became an associate Professor at Nice-Sophia Antipolis University in 2003. In November 2010, he received his *Habilitation à Diriger des Recherches* from Nice-Sophia Antipolis University. His research interests concern the definition of formal models for the modeling and analysis of real-time and embedded systems. Since 2006, he has been heavily involved in the standardization process of the UML Profile for MARTE. Since 2007, he is a voting member of the OMG task forces for MARTE and SysML. Frédéric Mallet is the author of four publications in international journals, 35 communications published in the proceedings of international conferences, four book chapters and two monographs.

- Yin Ling, Frédéric Mallet and Jing Liu. Verification of MARTE/CCSL Time Requirements with Promela/SPIN. In 16th Int. Conf. on Engineering of Complex Computer Systems (ICECCS'11), USA, April 2011.
- Charles André, Julien DeAntoni, Frédéric Mallet, Robert de Simone. The Time Model of Logical Clocks available in the OMG MARTE profile. In Synthesis of Embedded Software: Frameworks and Methodologies for Correctness by Construction, Sandeep K. Shukla, Jean-Pierre Talpin (eds.), Chap. 7, pp. 201-227, Springer Science+Business Media, LLC 2010, July 2010.
- Charles André, Frédéric Mallet. Specification and Verification of Time Requirements with CCSL and Esterel. In Languages, Compilers, and Tools for Embedded Systems ACM SIGPLAN Notices, Christoph Kirsch, Mahmut Kandemir (eds.), Volume 44, Pages 167-176, Irland Dublin, 2009.

- Frédéric Mallet. CCSL: specifying clock constraints with UML/Marte. Innovations in Systems and Software Engineering, 4(3):309-314, 2008.
- Charles André, Frédéric Mallet, Robert de Simone. Modeling Time(s). In 10th Int. Conf on Model Driven Engineering Languages and Systems (MoDELS '07), LNCS, Pages 559-573, Nashville, TN, USA, September 2007.

Dr Julien DeAntoni received a master's degree from the University of Lyon, France in 2005 and, a Ph.D. degree in Computer Science from the INSA-Lyon engineering school, France in 2007. His Ph.D was realized in the embedded systems team of the CITI laboratory from 2004 to 2007 where he successfully participated to international robotic challenges to highlight the benefits of his research approach. After having a postdoctoral fellow (funded by the European SPEEDS project) in the Triskell team at INRIA Rennes, he is currently associate professor at University of Nice and a member of the AOSTE project-team (INRIA & I3S). His research interest concerns the use and the definition of formal methods and tools dedicated to model driven engineering for embedded systems. Julien DeAntoni has co-authored 9 international papers, 1 international journal and 2 book chapter in relation with the GEMOC project.

- Glitia Calin, Deantoni Julien, Mallet Frédéric. Logical Time @ Work: Capturing Data Dependencies and Platform Constraints. Kaźmierski, Tom J. J. and Morawiec, Adam. System Specification and Design Languages, 106, Springer New York, pp. 223-238, 2012, Lecture Notes in Electrical Engineering
- Charles André, Julien DeAntoni, Frédéric Mallet, Robert de Simone. The *Time Model of Logical Clocks available in the OMG MARTE profile*. In Synthesis of Embedded Software: Frameworks and Methodologies for Correctness by Construction, Sandeep K. Shukla, Jean-Pierre Talpin (eds.), Chap. 7, pp. 201-227, Springer Science+Business Media, LLC 2010, July 2010.
- Frédéric Mallet, Julien DeAntoni, Charles André, Robert de Simone. *The clock constraint specification language for building timed causality models - Application to synchronous data flow graphs*. Journal of Innovations in System Software Engineering, pp. 99-106, Springer 2010.
- Frédéric Mallet, Charles André, Julien DeAntoni. *Executing AADL Models with UML/MARTE*. In the proceedings of the 14th IEEE International Conference on Engineering of Complex Computer Systems, pp. 371-376, IEEE computer society, 2009.
- Julien DeAntoni, Jean-Philippe Babau. *A MDA-based approach for real time systems simulation*, In the proceedings of the 9th IEEE International Symposium on Distributed Simulation and Real-Time Applications, IEEE, pp. 257-264, 2005.

1.3. INSTITUT DE RECHERCHE EN INFORMATIQUE DE TOULOUSE (IRIT)

Institut National Polytechnique de Toulouse is a French federation of 3 Higher Engineering Schools ("Grandes Ecoles" - ENSAT, ENSEEIHT, ENSIACET) providing education/continuous education and conducting research in the fields of Agronomy, Chemical Sciences, Electronics, Electrical Engineering, Fluid Mechanics, Computer Sciences, Telecommunications, Chemical Engineering… The Institute awards about 600 Engineers diploma and 100 PhD per year. A thousand researchers and PhD students work within 14 research units, most of which are associated with the CNRS or with the INRA organizations.
INP is involved in several international programs (54 cooperation agreements, more than 700 student exchanges), including European Education ones (Erasmus, Tempus, Leonardo, Human Capital and Mobility/TMR…). Industrial partnership is widely developed and encouraged within INP (10 Million Euro worth collaborative research contracts per year), and technology transfer is a priority (creation of SME's, licensing policy, about 120 French patents filed by INP or industrial partners, 40+ INP international patents…). 24 R&D projects have been performed under the Fifth framework program with 4 million Euros of financial support from the European Commission.

Research done in Computer Science at INPT takes place at IRIT (Institut de Recherche en Informatique de Toulouse), the common research unit UMR 5505 of CNRS (Centre National de la Recherche Scientifique), INPT, UPS (Université Paul Sabatier) and UT1 (Université Toulouse 1 Sciences Sociales). IRIT was one of the members of the CNRS FéRIA federation with LAAS and ONERA. IRIT is one of the main French research centers in Computer Science, with more than 400 members (among which 210 researchers and faculty members, and 140 Ph.D. students). This partnership led to the creation of the AIRSYS research laboratory between FéRIA partners and AIRBUS.
Research at IRIT covers many research domains in Computer and Information Science: Information analysis and synthesis, Data indexing, retrieval and storage, Interaction, autonomy, dialogue and cooperation, Reasoning and decision, Applied maths, algorithms and high performance computing, Architecture, systems and networks and Safe software development. Applications domains include aeronautics and space industry, telecommunication, multimedia, health, transport, engineering, Internet…
IRIT Safe software development group aims at improving the costs and delays of software validation. This purpose is achieved by using, one point, formal approaches (type theory and proof assistant, design of proof certified development methods, distributing algorithm modeling and proof, domain specific languages, static analysis for distributed object-oriented technologies), and on the other point, Model Driven Engineering and Software process modeling. Most teams in the group are currently deeply involved in the ISAURE project from the French "pôle de compétitivité Aerospace Valley" and particularly in the ITEA projects GENEAUTO, SPICES, ES_PASS, OPEES and openETCS; EuroStars HiMoCo; FUI TOPCASED and Projet P; ANR ARPEGE SPaCIFY, SATRIMAP and ITEMIS; JU ARTEMIS CESAR.

- *Profile of Key Members*

Dr Marc Pantel graduated from ENSEEIHT in electrical engineering (master degree 1989) and in computer science (master degree 1991). He got a PhD in computer science from INPT in 1994 on the integration of object-oriented and functional programming paradigms relying on iterative transformations from end user languages to more abstract programming model calculi to manage the various complex programming constructs, and on static analysis to verify the program correctness. He has been associate-professor in computer science at ENSEEIHT/INPT in the IRIT laboratory since 1994 where he conducted research on the safe development of programs by relying on semantically well founded domain specific languages and static analysis. This work was applied until 2005 to distributed adaptable systems based on the actor model of computation, and since 2005 to safety critical embedded systems developed using MDE. He has been recently involved in many national and international collaborative research projects with industrial partners from aerospace and automative domains (FUI TOPCASED and Projet P; ITEA GENEAUTO, ESPASS, OPEES and openETCS; EuroStars HiMoCo; ANR SPACIFY; FRAE QUARTEFT; JU ARTEMIS CESAR). He is expert for the Luxemburg National Research Fund. He is member of the Aerospace Valley cluster ISAURE committee and of the EICOSE initiative inside ARTEMISIA. Marc Pantel has co-authored 18 international papers and 6 national and international journals in fields related to the project in the last 5 years including:

- Kezadri Mounira, Benoit Combemale, Marc Pantel, Xavier Thirioux, A Proof Assistant Based Formalization of MDE Components, In 8th International Symposium on Formal Aspects of Component Software (FACS 2011), Springer, 2011
- Nassima Izerrouken, Marc Pantel, Xavier Thirioux et Olivier Ssi Yan Kai, Expérimentations en Coq pour un générateur de code qualifiable, Revue des Sciences et Technologies de l'Information, Technique et Science Informatiques, Méthodes formelles à l'analyse et la compilation, Hermès Science Publications, 2011.
- Xavier Crégut, Benoit Combemale, Marc Pantel, Raphaël Faudoux, Jonatas Pavei. Generative Technologies for Model Animation in the TOPCASED Platform. Dans : European Conference on Modelling Foundations and Applications (ECMFA 2010), june 2010.
- Benoit Combemale, Xavier Crégut, Jean-Patrice Giacometti, Pierre Michel, Marc Pantel. Introducing Simulation and Model Animation in the MDE Topcased Toolkit. In European Congress on Embedded Real-Time Software (ERTS 2008), Toulouse, january 2008.
- Pierre-Loïc Garoche, Marc Pantel, Xavier Thirioux. Abstract Interpretation-based Static Safety for Actors. In Journal of Software, Academy Publisher, Finland, Vol. 2 N. 3, p. 87-98, september 2007.

Dr Xavier Thirioux obtained an engineering degree from ENSEEIHT in computer science and applied mathematics (1994) and a PhD in computer science from INPT (1999). He was then addressing the problem of automating proofs of formal functional specifications for models of concurrent applications. Since 2001, he is an associate professor at the ENSEEIHT engineering school, university of Toulouse. His current research activities mainly address the problem of certifying safety critical systems, on the one hand by static analysis of embedded C code, and on the other hand by automatic generation of correct-by-construction code from the proof of its specification within a proof assistant. Xavier Thirioux has co-authored 7 international papers and 4 national and international journals in fields related to the project during the last 5 years including:

- Kezadri Mounira, Benoit Combemale, Marc Pantel, Xavier Thirioux, A Proof Assistant Based Formalization of MDE Components, In 8th International Symposium on Formal Aspects of Component Software (FACS 2011), Springer, 2011
- Nassima Izerrouken, Marc Pantel, Xavier Thirioux et Olivier Ssi Yan Kai, Expérimentations en Coq pour un générateur de code qualifiable, Revue des Sciences et Technologies de l'Information, Technique et Science Informatiques, Méthodes formelles à l'analyse et la compilation, Hermès Science Publications, 2011.
- Benoît Combemale, Xavier Crégut, Pierre-Loïc Garoche and Xavier Thirioux, Essay on Semantics Definition in MDE. An Instrumented Approach for Model Verification, published in "Journal of Software" (JSW) (4:6 2009), Academy Publisher.
- Pierre-Loïc Garoche, Marc Pantel, Xavier Thirioux. Abstract Interpretation-based Static Safety for Actors. In Journal of Software, Academy Publisher, Finland, Vol. 2 N. 3, p. 87-98, september 2007.
- Xavier Thirioux, Benoit Combemale, Xavier Crégut, Pierre-Loïc Garoche. A Framework to formalise the MDE Foundations. Dans / In: International Workshop on Towers of Models (TOWERS 2007), Zurich, 25/06/2007, Richard Paige, Jean Bézivin (Eds.), Model Driven Engineering (MDE), p. 14-30, juin / june 2007.

Dr Xavier Crégut received an engineering degree from ENSEEIHT, Toulouse, France in 1992 and a Ph.D. degree in Computer Science from the Institut National Polytechnique de Toulouse, France in 1997. He is currently associate professor at the ENSEEIHT engineering school, University of Toulouse, France and member of the ACADIE IRIT team. His research interests include semantics of domain specific modeling languages (DSML) for validation and verification purpose, model driven engineering, and process modeling. Xavier Crégut has co-authored 11 international communications and 7 national and international publications during the last 5 years in fields related to the project including:

- Xavier Crégut, Benoit Combemale, Marc Pantel, Raphaël Faudoux, Jonatas Pavei. Generative Technologies for Model Animation in the TOPCASED Platform (regular paper). Dans : European Conference on Modelling Foundations and Applications (ECMFA 2010), Paris, 15/06/10-18/06/10, juin 2010.

- Benoît Combemale, Xavier Crégut, Pierre-Loïc Garoche and Xavier Thirioux, Essay on Semantics Definition in MDE. An Instrumented Approach for Model Verification, published in "Journal of Software" (JSW) (4:6 2009), Academy Publisher, 2009.
- Benoit Combemale, Xavier Crégut, Pierre-Loïc Garoche, Xavier Thirioux, F. Vernadat. A Property-Driven Approach to Formal Verification of Process Models. Dans : Enterprise Information Systems, Springer-Verlag, Numéro spécial LNBIP 12, ICEIS 2007, Revised Selected Papers, Vol. 12, p. 286-300, 2009.
- Benoît Combemale, Laurent Broto, Xavier Crégut, Michel Dayde and Daniel Hagimont, Autonomic Management Policy Specification: from UML to DSML, in Proceedings of ACM/IEEE 11th International Conference on Model Driven Engineering Languages and Systems (MoDELS 08). LNCS n°5301, pp. 584-599, Toulouse, France, October 2008.
- Reda Bendraou, Benoit Combemale, Xavier Crégut, Marie-Pierre Gervais. Definition of an Executable SPEM2.0. Dans : Asia-Pacific Software Engineering Conference (APSEC 2007), Nagoya, Japan, 04/12/07-07/12/07, IEEE Computer Society, p. 390-397, décembre 2007.

1.4. ENSTA-BRETAGNE

ENSTA-Bretagne is a high engineering school that educates future engineers on the field of embedded systems for mechanical, electronics and informatics parts. ENSTA-Bretagne's research component is organized in 2 laboratories in which StiCC/IDM team involved in the GEMOC project. This laboratory unites multidisciplinary expertise in the field of automation of embedded systems. The main disciplines are model driven engineering for embedded systems, software defined radio and reconfigurable electronic circuits and observatory marine systems including robotics systems.

The model driven engineering and codesign expertises are the main topics relevant to the GEMOC project with a system engineering culture developed through several industrial (Thales, Airbus, CNES, Thomson) and academics (INRIA, ONERA, IRIT, Telecom-Bretagne…) collaborations. The StiCC/IDM is involved in several collaborative national and European projects like iFEST, MEDON, Mopcom-Ing and Medusa, which are labelled locally by the French clusters "Image et Réseaux" or "Mer".

- *Profile of Key Members*

Joel Champeau. Joel has a PhD in computer sciences on FPGA synthesis with dedicated language at the Rennes University. He is now teacher-researcher in ENSTA-Bretagne since 1995 in the StiCC laboratory. This laboratory is associated with the LiSyC (Laboratoire Informatique des Systèmes Complexes) at the University of Brest. He is now the leader of the team StiCC/IDM focused on Model Driven Technologies for Embedded Systems.

He is involved in the modelling domain for embedded systems. He applies MDE methods and techniques on a system modelling framework based on modelling components and on platform modelling for software and hardware code generation. This work is related to industrial collaborations mainly with Thales, Airbus and Thomson. He has several academics collaboration with INRIA, IRIT and Telecom-Bretagne.

In collaboration with CEA/list, Nice University, Brest University and Pisa University, he organizes the international summer school on Model Driven Development for Distributed and Real Time Embedded Systems.

Joel Champeau is the author of several publications in international journals, proceedings of international conferences and book chapters, including:

- Martin Monperrus, Jean-Marc Jézéquel, Benoit Baudry, Joël Champeau, Brigitte Hoeltzener, *Model-driven Generative Development of Measurement Software.* In Software and Systems Modeling (SoSyM), Springer.

- Ali Koudri, Joël Champeau, *MODAL: A SPEM Extension to Improve Co-design Process Models*, International Conference on Software Process (ICSP'10), 8-9 june, 2010, Paderborn, Germany, 8-9 july 2010.
- Ali Koudri, Joël Champeau, Jean-Christophe Le Lann and Vincent Leilde, *MoPCoM Methodology: Focus on Models of Computation*, 6th European Conference on Modelling Foundations and Applications (ECMFA'10), 15-18 june, 2010, Paris.
- Koudri A., Champeau J., Aulagnier D., Soulard P. *MoPCoM/MARTE Process Applied to a Cognitive Radio System Design and Analysis*. In Proceedings of the 5th European Conference ECMDA-FA 2009.
- Monperrus, M., Jezequel, J.-M., Champeau, J., et Hoeltzener, B. *A model-driven measurement approach.* In Proceedings of the ACM/IEEE 11th International Conference on Model Driven Engineering Languages and Systems (MODELS'2008), Toulouse, oct. 2008.

Jean-Christophe Le Lann. Jean-Christophe holds a Master of Science (DEA) from Grenoble University in the field of Microelectronics and PhD in computer science from INRIA and Rennes University, related to Synchronous languages technologies. He was SoC Architect and designer for Thomson Silicon Components from 1999 to 2009, where he took part in the design of several multimedia multi-processor and DSP for Video and Audio Compression. Expert in HW/SW EDA tools methodologies, he represents Thomson in several collaborative projects (ANR, FP7...). He is reviewer for MEDEA/Catrene committee. He is now associated professor with ENSTA-Bretagne, in the field of Embedded System Design.

- Ali Koudri, Joël Champeau, Jean-Christophe Le Lann and Vincent Leilde, *MoPCoM Methodology: Focus on Models of Computation*, 6th European Conference on Modelling Foundations and Applications (ECMFA'10), 15-18 june, 2010, Paris.
- Paul Le Guernic, Jean-Pierre Talpin, Jean-Christophe Le Lann : *Polychrony for System Design*. Journal of Circuits, Systems and Computers. 2003
- Apostolos Kountouris, Christophe Wolinski, Jean-Christophe Le Lann : High-level synthesis using conditional dependency graphs in the CODESIS system. Journal of Systems Architecture, 2001.
- Ali Koudri, Joel Champeau, Jean Christophe Le Lann and Denis Aulagnier, "UML/MARTE Process for SoC/SoPC", ERTS'2010, Toulouse
- Koudri A, Vojtsiek D, Soulard P, Moy C, Champeau J, Vidal J et Le Lann J-c. Using MARTE in the MOPCOM SoC/SoPC Methodology. workshop MARTE. Munich. Mars 2008.
- G. Edelin, P. Bonnot, W. Gouja,K. Bertels, F. Thomas, A. Schneider,J. Knablein, B. Pottier, J.C. Le Lann "A programming toolset enabling exploitation of reconfiguration for increased flexibility in future system-on-chips" DATE 2007, Aprl 16-20 2007, Nice, France

1.5. THALES TRT

Dr. Laurent Rioux (laurent.rioux@thalesgroup.com) has a doctorate in computer science on real-time and embedded systems at the University of Orsay (Paris XI). Today, he is leading a R&D team in aim to handle Non-Functional Properties (NFP) in the Model-Driven Engineering approach for complex and real-time and embedded systems including system of systems. He was strongly involved in the MARTE standard process definition and currently the MARTE standard and contributes to the evolution of SysML. He is also mananging and contributing to the RT-Simex project for Thales. Today, most technologies previously developed by laurent have been introduced inside the THALES MDE solution for all divisions for their engineering of real-time and embedded systems.

Dr. Ali Koudri holds a Ph.D. in Computer Science. He worked as a research assistant at ENSIETA (Defense) and as a research engineer at THALES Airborne Systems (Aerospace) and CEA (Commissariat à l'Energie Atomique). He has expertise on Model Based

Engineering applied to: design and analysis of Real-time Embedded Systems, process modelling and enactment, language engineering, and models of computation and communication. He has worked on several R&T projects dealing with aforementioned domains.

1.6. OBEO

Cédric Brun is the CTO of OBEO. He leads the Eclipse EMF compare project, he is also an international conference speaker . In charge of the Acceleo community he works on software evolution, re-engineering and cartography of legacy systems through model driven processes. He has graduated both the Polytech' engineering school and a research Master at the University of Nantes and specialized himself in software engineering and model driven engineering.

Dr. Frédéric Thomas, received an engineering degree in real-time and embedded systems from the french engineering school ESEO in 2005, and a PhD in model driven engineering from the University of Evry, France in 2008. During his PhD at the CEA List laboratory, he worked on execution platform modeling. He contributed on the UML profile for Modeling and Analysis of Real-Time and Embedded systems (MARTE). He has joined Obeo in November, 2008 to work on model-driven technologies for real-time and embedded systems. He is thus the technical leader of the Obeo Designer for Real-Time product and leads R&D projects such as RT-Simex (execution trace reverse engineering) and IMOFIS (railway and automotive risk analyses).

- Frédéric Thomas, Etienne Juliot, Gonzague Reydet, Mariot Chauvin. Towards a Viewpoint-Based Framework for Reactive Systems Modeling. In Complex Systems Design & Management (CSDM), Paris, France, 2010.
- Fabien Belmonte,Frédéric Thomas, Luis-Fernando Mejia, Alain Blas. Risk Evaluation in Railway Systems Supported By Modeling Languages and Tool. In Lambda-Mu, 17ème Congrès de Maîtrise des Risques et de Sûreté de Fonctionnement (IMDR), La Rochelle, France, 2010.
- Frédéric Thomas, Jérôme Delatour, François Terrier and Sébastien Gérard Towards a Framework for Explicit Platform Based Transformations.. In 11th IEEE International Symposium on Object-oriented Real-time distributed Computing (ISORC 2008), pages 211-218, Orlando, FL, USA, May 2008.
- DeAntoni, Julien, Mallet, Frédéric, Thomas, Frédéric, Reydet, Gonzague, Babau, Jean-Philippe, Mraidha, Chokri, Gauthier, Ludovic, Rioux, Laurent and Sordon, Nicolas. RT-simex: retro-analysis of execution traces. In Proceedings of the eighteenth ACM SIGSOFT international symposium on Foundations of software engineering, pages 377-378, New York, NY, USA, 2010.

Mélanie Bats, received a master degree in software engineering from the French engineering school UTBM in 2005. She has joined Obeo in October 2011 to work on model-driven technologies for real-time and embedded systems. She has worked on RT-Simex R&D project (execution trace reverse engineering). She also contributed to the Obeo Designer for Real Time product.

2. STAFF INVOLVEMENT IN OTHER CONTRACTS

INRIA	Nom de la personne participant au projet	Personne. mois	Intitulé de l'appel à projets Source de financement Montant attribué	Titre du projet	Nom du coordinateur	Date début & Date fin
	Olivier Barais	9	ANR Infra	InfraJVM	Gaëlle Thomas	1/1/2012 - 31/12-2014

OBEO	Frédéric Thomas	7,3	ANR ARPEGE	RT-Simex	Etienne Juliot	15/01/08 – 15/01/12
	Mélanie Batz	10,3	ANR ARPEGE	RT-Simex	Etienne Juliot	15/01/08 – 15/01/12

I3S	Nom de la personne participant au projet / name	Personne. Mois / PM	Intitulé de l'appel à projets, source de financement, montant attribué / Project name, financing institution, grant allocated	Titre du projet : Project title	Nom du coordinateur / coordinator name	Date début & Date fin / Start and end dates
	Julien DeAntoni	1.2	ITEA	Timmo2use	Karlsson Daniel Wolfgang Mueller	01/11/10 - 31/10/12
	Frédéric Mallet	7.92	ARTEMIS	PRESTO	Christoforos KAVIADAS	01/04/11 – 31/03/14

ENSTA Bretagne	Nom de la personne participant au projet	Personne. mois	Intitulé de l'appel à projets Source de financement Montant attribué	Titre du projet	Nom du coordinateur	Date début & Date fin
	Joel Champeau Jean Christophe Le Lann	6 6	ARTEMIS Europe	iFEST	ABB	04/10 to 03/13

THALES	Laurent Rioux	12	ANR ARPEGE	RT-Simex	OBEO	15/01/08 – 15/04/12
	Laurent Rioux	12	ANR ARPEGE	PROTEUS	Dassault Aviation	01/11/09 – 30/10/12
	Ali Koudri	8	ARTEMIS	IFest	ABB	01/04/10 30/03/2013

IRIT	Nom de la personne participant au projet	Personne. mois	Intitulé de l'appel à projets Source de financement Montant attribué	Titre du projet	Nom du coordinateur	Date début & Date fin
	Marc Pantel Xavier Crégut	6 6	ITEA2	OPEES	OBEO	10/2008-12/2012
	Marc Pantel	6	JU ARTEMIS	CESAR	AVL	03/2010-06/2012
	Marc Pantel Xavier Thirioux	6 6	FUI	Projet P	Continental	10/2012-9/2015

3. SUMMARY OF THE EFFORT IN THE GEMOC PROJECT

In the following table, we summarize the effort (in Men-Month) of each partner in the work packages of the GEMOC Project.

	ENSTA-B	I3S	INRIA	IRIT	OBEO	THALES	TOTAL
WP0	4	4	6	2	2	3	**21**
WP1	10	6	15	15	1	0	**47**
WP2	24	21	6	3	2	3	**59**
WP3	4	24	9	18	0	4	**59**
WP4	12	4	36	4	13	2	**71**
WP5	6	1	6	6	12	24	**55**
TOTAL	**60**	**60**	**78**	**48**	**30**	**36**	**312**

4. EXTERNAL RECOMMANDATIONS AND SUPPORTS OF THE GEMOC PROJECT

4.1. FROM THE OPEES PROJECT

Blagnac, le 19 Décembre 2011

Objet : Support au projet Gemoc

Le consortium Opees regroupe des acteurs majeurs (industriels, PME, académiques) de l'embarqué en couvrant des domaines tel que l'avionique, l'aérospatiale et la télécommunication. L'objectif de Opees est d'assurer la disponibilité sur le très long terme d'outillages pour les systèmes embarqués et critiques afin de renforcer le développement et la compétitivité de l'industrie européenne. L'Open Source, élément central du projet, est un facilitateur pour permettre la disponibilité sur le long terme (jusqu'à 70 ans). Ainsi, OPEES a créé l'Industrial Working Group Polarsys, au sein de la fondation Eclipse, pour mettre en place les infrastructures et les processus de support à long terme dans le cadre d'une organisation pérenne.

Le périmètre du projet Gemoc explore un axe crucial des systèmes critiques à travers la fourniture d'un moteur d'exécution de modèles et de mécanismes permettant l'animation de modèles. Ce domaine de l'ingénierie système est actuellement pauvre en innovations, alors qu'il apporterait énormément de productivité et de compétitivité. Il manque notamment sur le marché des solutions généralisables à plusieurs langages et méthodes, afin de permettre une analyse multi-domaine. Une telle innovation aurait très certainement de nombreux débouchés et serait un avantage certain pour nos entreprises européennes, en augmentant la qualité des systèmes mis au point.

Le projet GeMoc s'inscrit complètement dans les problématiques du projet Opees de création, d'industrialisation, et de support à long terme, d'outils pour le cycle de développement des logiciels embarqués critiques. De plus, plusieurs acteurs du projet GeMoc sont déjà membres du consortium Opees et formeront un lien privilégié entre les deux projets. Ainsi, Opees entend pouvoir exploiter les résultats de GeMoc en entrée de son processus de valorisation/maturation/industrialisation de composants mis en œuvre dans Polarsys. De cette façon, le transfert technologique et l'exploitation des résultats de GeMoc seront facilités au sein de Polarsys.
Le consortium Opees apporte donc tout son soutien au projet GeMoc.

Cordialement,
Gaël Blondelle – Coordinateur du projet Opees.

4.2. FROM ATOS ORIGIN AND THE TOPCASED PLATFORM

Atos Intégration
6 impasse Alice Guy
BP 43045
31024 TOULOUSE Cedex 3 - France
Tél. : +33 (0)5 34 39 37 39
Fax : +33 (0)5 34 39 37 00
Atos.net

Lettre de soutien au projet GEMOC de la part d'AToS

Par la présente lettre nous exprimons notre engagement à assister et conseiller le projet ANR 2012 GEMOC au cours de son déroulement ainsi que pendant ses phases de dissémination en tant que membre consultatif et sans aucun financement de la part de l'ANR ni rétribution de la part du projet.

La définition de la sémantique d'exécution de modèles avec l'aide du langage fUML ainsi que les technologies d'implantation associées nous paraissent des champs d'investigation très prometteurs car ils permettent d'envisager l'exécution d'une spécification formalisée en UML ou SysML. GeMoC va non seulement étudier ces sujets mais va explorer des sujets encore plus innovants et intéressants puisqu'il s'agit aussi de prendre en compte les patterns de communication entre les différents modèles pour l'échange des données lors de cette exécution, et ceci dans un environnement de langages hétérogènes (pas seulement UML). C'est donc ici l'exécution de modèles de systèmes de systèmes qui voit le jour.

Nous souhaitons la pleine réussite de ce projet afin de fournir à la communauté des systèmes complexes et critiques les fondations nécessaires pour pouvoir valider plus rapidement les spécifications sur les futurs produits. C'est un champ d'application sur lequel AtoSest fortement appliqué, notamment avec le développement du composant « TOPCASED Simu » actuellement intégré et distribué au sein de la plateforme TOPCASED. Ce développement s'est effectué en collaboration avec Benoît Combemale de l'INRIA, Xavier Crégut et Marc Pantel de l'IRIT-INPT. Les travaux réalisés dans le projet GeMoC seront une aide précieuse pour les évolutions de ce composant. Plus généralement, ce sera un support formidable pour toutes les industries françaises des domaines concernés car cette approche permettra d'abaisser encore le délai de mise sur le marché d'un nouveau programme, offrant ainsi un moyen de rester compétitifs par rapport aux grands concurrents étrangers.

Nom du signataire : Raphaël Faudou

Fonction : Responsable R&D, méthodes et outils- systèmes embarqués et critiques

Date : 09/02/2012 - **Lieu** : Toulouse

4.3. FROM EADS AIRBUS

AIRBUS

Airbus Operation
316 Route de Bayonne
31060 Toulouse Cedex 9

To GeMoc project Partners,

Toulouse, February 10th, 2012

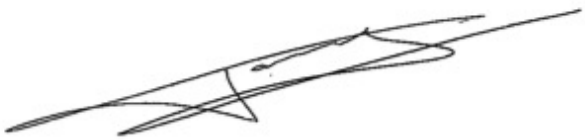
Dear GeMoc project partners,

This letter confirms the interest and support of Airbus Operation SAS for the ANR GeMoC project. We are strongly interested in the Model Based System Engineering as shown by our involvement as project leader of the Aerospace Valley FUI project TOPCASED, partners of the ITEA projects SPICES and OPEES, of the ARTEMIS project CESAR, of the ANR project OpenEmbeDD and in the AADL-SAE standardization committee. The GeMoC will bring fundamental results both on the theoretical and practical side for the simulation of heterogeneous models which are mandatory for the validation and verification activities in our future model based developments of functions and architectures.

We could participate in your initiative by providing some concrete use cases to validate GeMoC results.

Sincerely yours,

Patrick Farail
Head of Development Methods Support
EADS Expert on Software Engineering



4.4. FROM THE COLORADO STATE UNIVERSITY (USA)

Colorado State University

Computer Science Department
1873 Campus Delivery
Fort Collins, Colorado 80523-1873
(970) 491-5792
FAX: (970) 491-2466
http://www.cs.colostate.edu

March 6, 2012

Programme Ingeniere
ANR, France

To whom it may concern,

I write this letter to express my strong support for the Generic Models of Computation (GeMoC) project and to assert that I will work closely with the principal investigators if this project is funded by the ANR.

Today's large software systems must address multiple concerns (e.g., security, fault tolerance, availability, safety and usability concerns) and must accommodate a wide range of stakeholder with often divergent views of what the system must do to satisfy their needs. The diversity of concerns and requirements, coupled with the increasingly critical role that software plays in our society makes their development complex. Work in the model-driven software development community, and in particular work on domain-specific modeling languages and on associated formal software analysis techniques target this complexity. The GeMoC project aims to provide a solution to the challenging problem of formally analyzing large software systems that utilize different domain-specific languages that may be based on different underlying models of computations.

This is a problem that is of great interest to us at Colorado State University (CSU). We have had a long history of collaboration with researchers from France, particularly with the group from IRISA in Rennes dating back to the early 2000's. The collaborative research covers topics in the MDD area, including work on model composition and analysis, aspect-oriented modeling, testing model transformations, and on using models at runtime to support dynamically adaptive software. The research has been particularly productive, with a significant number of papers published in high quality journals and conference proceedings, and with some receiving best paper awards. I have made numerous trips to IRISA to work on research ideas and spent 6 months of my sabbatical there in 2007. Members of the IRISA team have also made numerous trips to CSU.

Colorado State University

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http://www.cs.colostate.edu

An international collaborative effort that focuses our collective expertise in MDD and formal analysis techniques can improve our chances of developing a usable framework for formally analyzing software systems developed using a variety of domain specific languages. To this end, I plan to form a collaborative team on the US side consisting of MDD researchers from Michigan State University (Prof. Betty Cheng) Florida International University (Dr. Peter Clarke), and the University of Alabama (Dr. Jeff Gray) that will write a proposal to fund the US end of a collaboration that focuses on the problem presented in the GeMoC proposal.

In summary, I strongly support this proposal and commit to collaborating with the French researchers on the research if funded.

Sincerely,

Robert B. France
Professor

5. DESCRIPTION OF THE NON PERMANENT POSITIONS (TENTATIVE)

5.1. INRIA

Post-Doctoral Position

Title	Heterogeneous Models Execution Keywords: MDE, DSML, Model Execution, Model Simulation
Lieu de travail	Université de Rennes 1 Campus de Beaulieu 35 000 Rennes
Theme	Software engineering
Team	Triskell (IRISA and INRIA)
Duration	24 months
Date	Between September and December 2012
Salary	~ 2500 Euros (net income)
Diploma required	Ph.D. in computer science
Mission	De nos jours, les méta-langages orientés-objet tel que le MOF (Meta-Object Facility) sont de plus en plus utilisé en Ingénierie Dirigée par les Modèles (IDM) pour définir des langages dédiés (*Domain Specific Modeling Language* – DSML). Cependant, ces méta-langages se focalisent que sur la définition de la structure du langage (i.e. le métamodèle), et ne permettent pas de prendre en compte le comportement. Pour cela, l'équipe Triskell (http://www.irisa.fr/triskell/) a développé le langage Kermeta (http://www.kermeta.org/) qui utilise la modélisation orientée aspect pour ajouter la description précise du comportement à un métamodèle. Kermeta est définit comme une extension du standard EMOF (Essential Meta-Object Facilities) pour permettre la définition du comportement. Il fournit un langage d'action déclaratif et orientée-objet permettant de définir le corps des opérations d'un métamodèle. Ainsi, Kermeta permet entre autre de donner une sémantique opérationnelle précise à un métamodèle de manière à pouvoir exécuter les modèles qui en sont conforme. Ces modèles peuvent être exécuté à l'aide soit de l'interpréteur soit du compilateur, tous les deux fournit par l'atelier. Il devient alors possible de simuler les modèles métiers de manière à pouvoir en valider le comportement au plus tôt dans le processus de développement. La simulation d'un modèle nécessite toutefois de compléter la sémantique opérationnelle de chaque DSML par le comportement du système vis-à-vis des interactions externes, décrites par exemple dans un scénario. Ce modèle de calcul peut être plus ou moins complexe en fonction du domaine d'application (temps discret ou continu, etc.) et des problématiques prisent en compte (e.g., distribution, parallélisme, etc.). D'autre part, il est également nécessaire de définir les propriétés à vérifier et l'outil permettant de les analyser automatiquement à partir des traces issues de la simulation.
Activity	L'objectif du stage post-doctoral est de proposer un outil générique permettant de capitaliser les modèles de calcul et de pouvoir automatiquement simuler les modèles construits à partir d'un DSML. Pour cela, un ou plusieurs modèles de calcul devront être définit de manière à pouvoir être réutilisé dans la définition de différents DSML à l'aide d'une architecture précise. Mettant en œuvre la modélisation orienté aspect et le typage de modèle, l'outil devra permettre de mettre en relation la sémantique opérationnelle du langage et le modèle de calcul choisi pour la simulation. S'appuyant ensuite sur la définition du DSML, il devra également offrir une interface dédiée pour contrôler la simulation et animer les modèles, ainsi que pour saisir les propriétés temporelles et les analyser automatiquement. L'outil devra faire l'objet d'une validation en l'utilisant sur différents cas d'utilisation en cours d'étude au sein de l'équipe (systèmes embarqués, domotique, traitement du signal, etc.).
Requirement and profile	- Connaissances en Ingénierie Dirigée par les Modèles (IDM) et bonne pratique des outils de la plateforme Eclipse supportant l'IDM (e.g., Kermeta, GMF, Topcased, EMF Text). - Compétences en génie logiciel, en programmation orientée objet (e.g. Java) et dans la mise en œuvre de patrons de conception. - Détenir un Doctorat en Informatique (une spécialité en Génie Logiciel serait un plus). - Avoir un bon niveau en anglais.
How to apply	Please send your application (PDF) as soon as possible. Screening of applications starts immediately and continues until the position is filled. Send cover letter including names of at least two references, CV and PDFs of PhD dissertation (or draft) and up to three most relevant publications to Benoit Combemale <benoit.combemale@irisa.fr> and Benoit Baudry <benoit.baudry@inria.fr>

Software Engineer Position

Title	Model Simulation Framework for Complex Software-Intensive Systems Keywords: MDE, DSML, Model Execution, Model Simulation
Lieu de travail	Université de Rennes 1 Campus de Beaulieu 35 000 Rennes
Theme	Software engineering
Team	Triskell (IRISA and INRIA)
Duration	18 months
Date	Between September and December 2012
Salary	~ 3000 Euros (net income)
Diploma required	Master or engineering school in computer science
Environment	L'IRISA (Institut de recherche en informatique et systèmes aléatoires), créé en 1975, est une unité mixte de recherche (UMR 6074) dont les établissements partenaires sont le CNRS, l'Université de Rennes 1 (établissement principal), l'Insa de Rennes et l'ENS Cachan (antenne de Bretagne). L'Irisa est très impliqué dans le tissu régional (pôle de compétitivité Images & réseaux, réseau Biogenouest, pôle de recherche et d'enseignement supérieur UEB), participe à un nombre important de projets financés par l'ANR ainsi qu'à de nombreux projets européens. Des collaborations significatives sont tissées avec le monde industriel, grands groupes et PME, et plusieurs start-up sont issues des recherches de l'Irisa. Par l'intermédiaire de ses enseignants-chercheurs et ses chercheurs, l'Irisa contribue aux formations dispensées à Rennes 1 (IFSIC, Enssat, ESIR), à l'INSA de Rennes (Département Informatique), à l'ENS Cachan (antenne de Bretagne, département Informatique), ainsi que dans d'autres structures. L'équipe de recherche Triskell étudie les techniques de l'ingénierie des modèles pour la construction fiable et efficace d'applications par assemblage de composants logiciels.
Mission	Le travail s'inscrit dans le cadre du projet GeMoC financé par l'Agence National pour la Recherche, en collaboration avec Thales, Obeo, l'ENSTA Bretagne et les laboratoires I3S et IRIT. L'ingénieur participera à une action de développement et d'expérimentation et à la gestion de projet dans une équipe de recherche. Ceci l'amènera à effectuer les activités suivantes: • Développement logiciel et expérimentations : conception par modèle, codage, tests, documentation ; • Participation aux choix techniques (architecture logicielle, outils de développement) avec le responsable scientifique, après étude de l'existant ; • Gestion du prototype et organisation de demonstrations ; • Gestion du projet
Requirement and profile	• Formation en informatique et connaissances du développement logiciel et des outils associés (gestionnaire de versions, compilation, documentation, tests, débogage, déploiement) ; • Langages de programmation : Java (très bon niveau) ; • Bonnes connaissances en ingénierie des modèles : UML, modélisation par objets, méta-modélisation • Maîtrise de l'anglais technique et scientifique • Bonnes aptitudes rédactionnelles • Compétences ou aptitudes appréciées : autonomie, organisation
How to apply	Please send your application (PDF) as soon as possible. Screening of applications starts immediately and continues until the position is filled. Send cover letter including names of at least two references, CV and PDFs of PhD dissertation (or draft) and up to three most relevant publications to Benoit Combemale <benoit.combemale@irisa.fr> and Benoit Baudry <benoit.baudry@inria.fr>

5.2. I3S

PhD Position

Intitulé du poste	Title: Toward a formal and hierarchical timed model for concurrent model Keywords: Model Driven Engineering, formal approach
Lieu de travail	Centre de Recherche INRIA Sophia Antipolis Route des Lucioles 06902 Sophia Antipolis
Thème	Formal Model Driven Engineering
Equipe-projet d'accueil	EPI Aoste (http://www-sop.inria.fr/aoste)
Durée du contrat	**36 months**
Date prévisible d'embauche	**Between September and December 2012**
Salaire proposé	1957 Euros brut soit 1596 Euros net
Diplôme requis	Bac + 5 (Master Recherche spécialité informatique, Master professionnel spécialité informatique, école d'ingénieur spécialité informatique)
Environnement et contexte	The thesis is located in the I3S laboratory, (CNRS UMR 7271). During her/his phd, the student will be considered as a full member of the Aoste team. She/He will be asked for implication in the scientific and social life of the team. The Aoste team is located in the « Institut national de recherche en informatique et automatique » (INRIA), in Sophia Antipolis. The research activities of Aoste address the use of formal model in the Model Driven Engineering field. The team is particularly active at the OMG (Object Management Group), through the definition of the UML profile named MARTE; dedicated to the modeling and analysis of embedded software. The main contrinution of the team is the introduction of polychronous multi-clock time in the Time model of MARTE.
Mission	The student will be assign to the GeMoC project. GeMoC is an ANR project with various academic and industrial partners (INRIA Triskell, IRIT, ENSTA, Thales and Obeo). The student's objective is twofolds. First she/he has to study the definition of a metamodel of hierarchical time for the modelization of concurrency inside models. This task requires a good comprehension of CCSL (a language proposed by the team: http://hal.inria.fr/inria-00464894) and the proposition of adequate extensions. Second she/he has to specify the denotational semantics of the proposed extensions. Both the extensions and the semantics must provide a solid formal background for composition of heterogeneous models. Moreover, the extensions must preserve the original CCSL good properties and should be suitable to integration in the associate tool TimeSquare: http://timesquare.inria.fr.
Activités	See above
Compétences et profil	We are looking for candidates that have a Master degree in computer science. Additionnaly, the candidate would ideally fulfill the following requirements: • A background in software engineering, object-oriented programming (e.g., Java). • A background in formal approach • Good English speaking and writing skills is obviously a plus.
Transmettre sa candidature **Contacts**	Please send your application (PDF format) as soon as possible. Send cover letter including CV and motivations to: • Frédéric Mallet (frederic.mallet@inria.fr) • Julien DeAntoni (julien.deantoni@inria.fr) For more information, please contact julien.deantoni@inria.fr

5.3. IRIT

Post-Doctoral Position

Title	Formalization of different Models of Computation and Communication (MoCCs) and integration in a proof-assistant. Keywords: MDE, Formalization, Proof assistant
Lieu de travail	IRIT 2, rue Charles Camichel 31000 TOULOUSE
Theme	Software engineering
Team	IRIT/ACADIE
Duration	12 months
Date	Between September and December 2012
Salary	~ 2000 Euros (net income)
Diploma required	Ph.D. in computer science
Environment	The ACADIE research group (Assistance à la Certification d'Applications Distribuées et Embarquées – Distributed and Embedded Application Certification Assistance) has been involved in the integration of formal specification and verification and Model Driven Engineering technologies in the last 10 years. The results of this work, expressed as the eXecutable Domain Specific Modeling Language metamodeling pattern and the Coq4MDE formal specification of Model Driven Engineering key technological elements, has been applied in the FUI TOPCASED project for the development of model Validation and Verification tools such as model animators (in collaboration with ATOS Origin and the LIUPPA Movies team) and model checkers (in collaboration with the CNRS-LAAS-OLC, INRIA-VASY and INRIA-ESPRESSO teams). This work has been published both on formal engineering, model driven engineering and industrial transfer conferences. These activities are currently being extended in many projects such as FRAE QUARTEFT, ITEA OPEES and JTI ARTEMIS CESAR. These activities have always been conducted in close relationship with industrial partners like Airbus, ATOS, CNES, CONTINENTAL, C-S, EADS-Astrium and THALES providing a seamless transfer of formal specification and verification technologies to industrial end users through model driven engineering.
Mission	The first mission is to participate in the final stages of the formalization of a denotational dynamic semantics for MoCCs provided in the other tasks of this package, in order to gear it towards a smoother integration in the Coq proof assistant and specifically Coq4MDE (a model formalization package in Coq). Then, the applicant will embed the whole formalization within Coq4MDE, building on the recent works on this package. He/she will also investigate the possibility of formal proofs regarding the correctness of the composition operators, but also more specific properties of some MoCCs and xDSMLs. We aim at proving typical temporal and behavioral properties such as preservation of invariant, absence of deadlocks, etc. The executable framework resulting from this work, even if not scalable and thus suitable for industrial use, will serve as a safe reference basis to confront the prototype issued from standard development techniques with.
Activity	• Formalization of MoCCs dynamic semantics. • Embedding formalization in the Coq proof assistant. • Proving properties of interest for some MoCCs. • Extraction of an executable framework and comparison with prototype issued from standard software development techniques.
Requirement and profile	We are looking for candidates that would ideally fulfil the following requirements: • Strong background in proof assistants and functional programming • Good knowledge in denotational semantics. • Good knowledge in temporal logic specification. • Technical English speaking and writing skills.
How to apply **Contacts**	Please send your application (PDF) as soon as possible. Screening of applications starts immediately and continues until the position is filled. Send cover letter including names of at least two references, CV and PDFs of PhD dissertation (or draft) and up to three most relevant publications to Xavier Thirioux <xavier.thirioux@enseeiht.fr> and Marc Pantel <marc.pantel@enseeiht.fr> For more information, contact: Xavier Thirioux <xavier.thirioux@enseeiht.fr>

Post-Doctoral Position

Intitulé du poste	Title: Methodology and tooling for Executable DSML Keywords: MDE
Lieu de travail	IRIT 2 rue Charles Camichel 31000 Toulouse
Thème	Génie Logiciel
Equipe-projet d'accueil	IRIT / Acadie (http://www.irit.fr/-Equipe-ACADIE-)
Durée du contrat	12 mois
Date prévisible d'embauche	Between September and December 2012
Salaire proposé	~ 2040 Euros
Diplôme requis	Ph.D. in computer science
Environnement et contexte	During her/his postdoc, the researcher will be considered as a full member of the Acadie team which is part of the « Institut de Recherche en Informatique de Toulouse » (IRIT), which is one of the leading research center in Computer Sciences in France. The ACADIE team (Assistance à la Certification d'Applications Distribuées et Embarquées – Distributed and Embedded Application Certification Assistance) has been involved in the integration of formal specification and verification and Model Driven Engineering technologies in the last 10 years. The results of this work, expressed as the eXecutable Domain Specific Modeling Language metamodeling pattern and the Coq4MDE formal specification of Model Driven Engineering key technological elements, has been applied in the FUI TOPCASED project for the development of model Validation and Verification tools such as model animators (in collaboration with ATOS Origin and the LIUPPA Movies team) and model checkers (in collaboration with the CNRS-LAAS-OLC, INRIA-VASY and INRIA-ESPRESSO teams). These activities have always been conducted in close relationship with industrial partners like Airbus, ATOS, CNES, CONTINENTAL, C-S, EADS-Astrium and THALES providing a seamless transfer of formal specification and verification technologies to industrial end users through model driven engineering.
Mission	Experiments conducted in the TOPCASED project on the simulation and verification of DSML (Domain Specific Modeling Languages) models have showed the need to explicitly define and structure information required for the definition on an executable semantics of DSML. It has been formalized as a metamodelling pattern. At this moment, we only consider integration of DSML that are based on the same MoCC (Model of Computation and Comunication). But a system is often modeled using several DSML based on different MoCC. In the context of this post-doctoral position, we propose to rely on a generic discrete-event MoCC in order to extend the existing metamodeling pattern to cope with the explicit definition of the behavioral semantics (including the definition of relations between language elements on the one side and the specification of the execution rules on the other side). The purpose is then to be able to bind xDSMLs (Executable DSML) together thanks to a mapping at the MoCC level. Tools have to be defined to express the behavioral semantics of an xDSML . These tools will rely on metamodeling technologies (automatic generation of tools based on the information available in the executable metamodels).
Activités	The researcher activities include : - the definition of the metamodeling pattern and the discrete-event generic MoCC - define the metamodel for binding between xDSMLs - develop the associated tooling based on MDE technologies
Compétences et profil	• A strong background in software engineering, object-oriented programming (e.g., Java) and in design patterns. • A good knowledge of MDE and practical experiences with Eclipse Modeling (e.g., EMF, EMF Text, GMF, and Topcased/Papyrus), Kermeta. • English speaking and writing skills.
Transmettre sa candidature	Send application in PDF to Marc.Pantel@enseeiht.fr and Xavier.Cregut@enseeiht.fr

5.4. ENSTA-B

Post-Doctoral Position

Intitulé du poste	Mots clés : Ingénierie des modèles, Modèles de calculs
Lieu de travail	ENSTA Bretagne 2 rue François Verny 29806 Brest Cedex
Thème	Génie Logiciel
Equipe-projet d'accueil	Pole STIC/IDM intégrée Lab STICC
Durée du contrat	30 mois
Date prévisible d'embauche	Entre Octobre et Décembre 2012
Salaire proposé	4000 Euros brut
Diplôme requis	Doctorat
Environnement et contexte	L'équipe STIC/IDM de l'ENSTA Bretagne intégrée au Lab-STIIC équipe MOCS du pole CACS est une unité mixte de recherche (UMR 3192) regroupe les établissements Télécom Bretagne, Université de Bretagne Occidentale, Université de Bretagne Sud, Ecole Nationale Ingénieur de Brest et ENSTA Bretagne. Le Lab STICC regroupe maintenant toutes les institutions du domaine STIC de Bretagne occidentale au sens large et par là même est très impliqué régionalement (les pôles de compétitivité Images & réseaux et Mer, pôle de recherche et d'enseignement supérieur UEB), participe à un nombre important de projets financés par l'ANR ainsi qu'à de nombreux projets européens. Des collaborations significatives sont tissées avec le monde industriel, grands groupes et PME, et plusieurs start-up sont issues des recherches du Lab STICC. Par l'intermédiaire de ses enseignants-chercheurs et ses chercheurs, le Lab STICC contribue sur tout le domaine des STIC dans les établissements constituants le laboratoire ainsi les établissements proches. L'équipe de recherche et développement de l'ENSTA Bretagne intégrée à l'équipe MOCS du pole CACS du Lab STICC étudie les techniques de l'ingénierie des modèles couplées aux techniques de validation formelle pour la modélisation de systèmes incluant du logiciel.
Mission	Le travail s'inscrivant dans le cadre de ce projet vise à d'abord s'approprier l'approche développée dans l'équipe autour du framework Cometa basée sur l'intégration dans l'ingénierie dirigée par les modèles des modèles de calcul. Ce framework a déjà permis des expérimentations sur des cas d'utilisation THALES ce qui servira également de base de travail pour ce projet. Cette prise de connaissances permettra notamment d'identifier les limites de l'approche pour ensuite être capable de prendre en compte les approches proposées par les autres partenaires et ainsi contribuer efficacement à la définition du metamodèle de la plateforme GeMoC et de sa formalisation.
Activités	Le post doctorant participera aux activités suivantes : • Définition du metamodèle de la plateforme GeMoC ; • Participation à la définition de la sémantique opérationnelle du metamodèle et veillera au respect de cette sémantique dans la formalisation effectuée dans le projet ; • Participation à l'élaboration prototype et à son utilisation sur le cas de démonstration THALES.
Compétences et profil	• Doctorat en Informatique orienté Génie Logiciel basé sur l'utilisation des modèles avec des compétences en modèles de calculs et simulation; • Langages de programmation : Java et programmation orientée objet; • Maîtrise de l'anglais technique et scientifique • Bonnes aptitudes rédactionnelles et relationnelles • Compétences ou aptitudes appréciées : autonomie.
Transmettre sa candidature	Transmettre CV et lettre de motivation à jean-christophe.le_lann@ensta-bretagne.fr et joel.champeau@ensta-bretagne.fr.