Grant ANR-12-INSE-0011

ANR INS GEMOC

D0.1.3 - Project Activity and Management Report, Period 2

Task 0.1

Version 1.0

DOCUMENT CONTROL

	–: 12/11/2014	A: 24/11/2014	B: 01/12/2013	C: 03/12/2013	D:
Written by Signature	B. Combemale	B. Combemale	B. Combemale	B. Combemale	

Revision index	Modifications
–	Initial structure
A	Partial draft
B	Complete draft
C	Final version
D	

Authors

Author	Partner	Role
Benoit Combemale	Inria	Lead author
All partner coordinators	Inria, I3S, ENSTA, IRIT, Obeo and Thales	Contributor
All WP leaders	Inria, I3S, ENSTA, IRIT, Obeo and Thales	Contributor

Contents

Project Activity and Management Report, Period 2

1. Introduction

1.1 Purpose

This document (*D0.1.3 – Project Activity and Management Report, Period 2*) collects the overall activity of the ANR INS project GEMOC (grant #ANR-12-INSE-0011) during its second year. This document provides a detailed description of the current status of the project, both in terms of research & development activities, and management.

1.2 Perimeter

The overall period considered in this document is the second year of the project GEMOC (Period 2), from December 1^{st}, 2013 (t0+12) to November 31^{st}, 2014 (t0+24).

1.3 Definitions, Acronyms and Abbreviations

- **Model**: model which contributes to the convent of a View
- **Language workbench**: a language workbench offers the facilities for designing and implementing modeling languages.
- **Language designer**: a language designer is the user of the langage workbench.
- **Modeling workbench**: a modeling workbench offers all the required facilities for editing and animating domain specific models according to a given modeling language.
- **Domain engineer**: user of the modeling workbench.
- **GEMOC Studio**: Eclipse-based studio integrating both a language workbench and the corresponding modeling workbenches.
- **DSML**: Domain Specific Modeling Language
- **xDSML**: Executable Domain Specific Modeling Language
- **AS**: Abstract Syntax
- **MOC**: Model of Computation
- **DSA**: Domain Specific Action
- **DSE**: Domain Specific Event
- **GUI**: Graphical User Interface
- **Eclipse Plugin**: an eclipse plugin is a java project with associated metadata that allow to be bundled and deployed as a contribution to an Eclipse based IDE.

2. Project Description

The ANR Project GEMOC (French Agency for Research, grant #ANR-12-INSE-0011) focuses on a generic framework for heterogeneous software model execution and dynamic analysis. This work has the ambition to propose an innovative environment for the design of complex software-intensive systems by providing:

- a formal framework that integrates state-of-the-art in model-driven engineering (MDE) to build domain-specific modeling languages (DSMLs), and models of computation (MoC) to reason over the composition of heterogeneous concerns;
- an open-source language workbench associated to a well-defined method for the definition of DSMLs, MoCs and rigorous composition of all concerns for execution and analysis purposes.
- an open-source modeling workbench that support the edition, execution, simulation and graphical animation of, possibly heterogeneous, models.

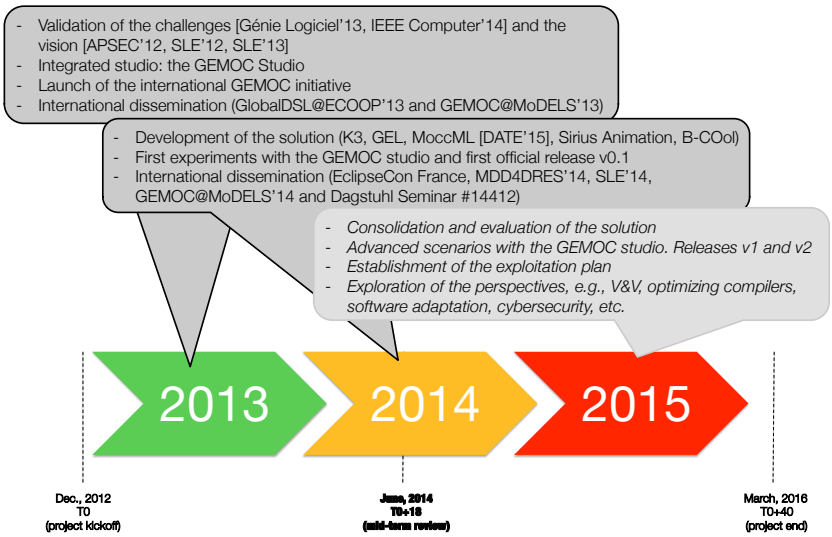
This requires addressing two major scientific issues: the design and verification of a formal framework to combine several different DSMLs relying on distinct MoCs; the design and validation of a methodology for DSMLs and MoC development. GEMOC aims at participating in the development of next generation MDE environments through a rigorous, tool-supported process for the definition of executable DSMLs (xDSMLs) and the simulation of heterogeneous models.

Project Identification

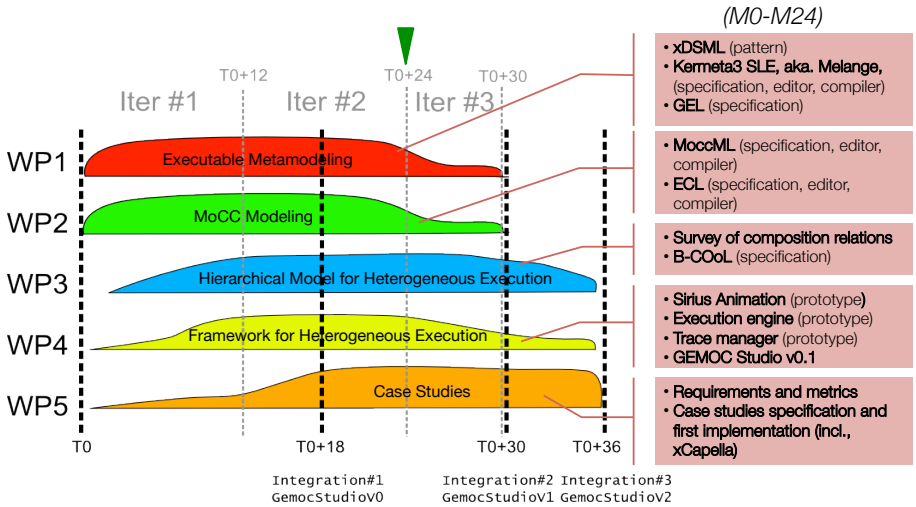
- Consortium: ENSTA Bretagne, Inria, IRIT, I3S, Obeo, Thales Research & Technology
- Project leader: Inria (Benoit Combemale)
- Duration: 01.12.12 – 30.03.16 (40 months)
- Funded by the French Agency for Research (ANR), Program INS (Ingénierie Numérique & Sécurité). Grant ANR-12-INSE-0011
- Labels from the competitiveness clusters: Image & Réseaux, Aerospace Valley, Systematic

3. Achievements

3.1 Overall Timeline



3.2 Progresses per WP (M0-M24)



4. Deliverables and Milestones

The following table present the current status of the deliverables, and when they were delivered (mentioned "done") at M6, M12, M18 or M24. The table also gives a brief recap about the ongoing tasks (mentioned "in progress") that already started but without formal deliverables at M24. Consequently, the table gives an overview of the progresses at M24.

#	Deliverables	Type	Leader	Participants	Due on	Status (M6)	Status (M12)	Status (M18)	Status (M24)
D0.1.1	**Project web site facility**	Web Site	INRIA	ALL	M6	done			
D0.1.2	**Project Activity and Management Report, Period 1**	Report	INRIA	ALL	M12		done		
D0.1.3	**Project Activity and Management Report, Period 2**	Report	INRIA	ALL	M24				done
D0.1.4	**Final Project Report**	Report	INRIA	ALL	M36				
D0.2.1	**Whitepaper including bibliography of scientific papers**	Report	INRIA	ALL	M36				
D0.2.2	**Definition of the long-term strategy for the GEMOC Exploitation**	Report	THALES	ALL	M36				
D1.1.1	**Metaprogramming with Kermeta and xDSML pattern guidelines**	Report	IRIT	INRIA, IRIT	V0: M6	done			
					V1: M12		done		
					V2: M24				done
D1.2.1	**DSML behavioral semantics definition tools**	Software	INRIA	INRIA, IRIT, OBEO	V0: M12		done		
					V1: M24				done
					V2: M30				
D1.3.1	**xDSML/MoCC mapping language, tools and methodology**	Report, Software	IRIT *(formerly ENSTA-B)*	ENSTA-B, I3S, INRIA, IRIT	V0: M12		(postponed at M18)	done	
					V1: M24				done
					V2: M30				
D2.1.1	**Ecore-based metamodel of the MoCC modeling language**	Report, Metamodel	I3S	I3S, IRIT, ENSTA-B, INRIA	V0:M6	done			
					V1:M12		done		
D2.2.1	**Model editor and Operational semantics of the MoCC modelling language**	Software	ENSTA/B	ENSTA/B, I3S, OBEO	V0:M12		done		
					V1:M24				done
					V2:M30				
D3.1.1	**Identification and formal characterization of the operator for composition, and Eclipse-based hierarchical component metamodel**	Report	I3S	I3S, IRIT, INRIA	V0:M6	done			
					V1:M12		done		
D3.1.2	**Language composition operators**	Report	I3S	I3S, INRIA	V1: M24				done
D3.2.1	**Description of the denotational semantics of the WP2 metamodel**	Report	I3S	I3S, IRIT	M18			done	
D3.3.1	**Formalization and restriction for the DSL operational semantics**	Report	IRIT	IRIT, I3S, INRIA	V1: M18			done	
					V2: M24				done
D3.4.1	**Encoding of the formal model (composition operators and MoCCs/xDSMLs)**	Report, Software	ENSTA-B *(formerly IRIT)*	IRIT, I3S, ENSTA-B	M24				done
D3.4.2	**Experimental validation (comparison with WP4 prototype)**	Report	ENSTA-B	IRIT, I3S, ENSTA-B	M36				
D4.1.1	**GEMOC architectural description**	Report	INRIA	INRIA, ENSTA-B, I3S, OBEO, IRIT	M6	done			
D4.1.2	**Eclipse-based tool to model heterogeneous model execution and GEMOC studio**	Software	OBEO	OBEO, INRIA	V0: M18			done	
					V1: M30				*in progress*
					V2: M36				
D4.2.1	**Generic Engine for heterogeneous models execution**	Software	IRIT	OBEO, INRIA, IRIT, ENSTA-B	V0: M12		done		
					V1: M24				done
					V2: M30				
D4.3.1	**Animation engine Eclipse-based plugins**	Software	OBEO	OBEO, INRIA, IRIT	V0: M24				done
					V1: M30				
D4.4.1	**API for Trace Management**	Report, Metamodel	I3S	INRIA, OBEO, IRIT, I3S	V1: M24				done
					V2: M30				
D5.1.1	**Technical requirements, uses-cases specification and metrics**	Report	THALES	THALES, OBEO, IRIT, INRIA	v0: M6	done			
					v1: M18			done	
D5.2.1	**DSL and MOCC for Use Cases**	Software	IRIT	OBEO, I3S, INRIA, IRIT, ENSTA-B, THALES	V0: M18			done	
					V1: M24				done
D5.3.1	**Uses-case models and simulation**	Software	THALES	IRIT, ENSTA, THALES, I3S	V0: M24				done
					V1: M36				
D5.4.1	**Experimentation results analysis**	Report	OBEO	THALES, OBEO, IRIT, INRIA	M36				*in progress*

All the deliverables of the ANR INS project GEMOC are available at `http://gemoc.org/ins-deliverables` (password: ins12.0011). The detailed description of the progresses is given in Chapter 5 (Project activity) and Chapter 6 (Dissemination). All deviations with the initial plan are described in Section 7.2.

5. Activity Summary

5.1 Work-Package Activity

5.1.1 WP1 – Executable Metamodeling

During this second year, the WP1 has been working on all the tasks associated to the WP.

Task 1.1: xDSML definition methodology While the case studies were developed, the methodology has been completed and refined. Good and bad practices have been identified and will be compiled in a kind of FAQ accessible from the online help of the GEMOC Studio. A tutorial has been proposed to illustrate the methodology. It has been considered the better and more productive way to present the methodology and to get started with the GEMOC Studio for the new users. This tutorial is available on the Wiki of the project and is part of T1.2 deliverable.

The v2 version of the deliverable has been delivered at M24.

Task 1.2: xDSML definition tools INRIA has enriched the GEMOC studio with new tools, in particular a new view of the xDSML components allows to quickly launch the different wizards and give direct access to the main components. A tutorial has been developed to illustrate the methodology proposed in D1.1.1 and demonstrate the use of the GEMOC Studio for new users.

The v1 version of the deliverables D1.2.1 has been delivered on time (M24). It includes a tutorial to use the GEMOC Studio.

Task 1.3: xDSML and MoCC mapping To put together DSA and MoCC, we have defined a mapping between them that exposes elements that defines the interface of the language and will be the base to coordinate heterogeneous models execution. Furthermore, a mechanism has been defined to express feedbacks from execution functions to MoCC. It allows to choose the right path in the simulation according to the actual data managed in the DSA. Work has been started on the metaprogramming aspects including composite DSA, composite DSE and relations with the MoCC.

Due to a change in the lead of this task. The initial version of the deliverable was postponed at M18 – instead of M12. V0 (M18) and v1 (24) have been delivered.

5.1.2 WP2 – Timed Models of Concurrent Entities

Task 2.2 After a first prototype of the MoCC language editor, the main goal of this second year was to finalize the metamodel of the MoCC language (named MOCCML) and to develop the first version of the MoCCML editor. This editor is able to edit libraries and MoCCML models based on state machines and clock constraints. This graphical and textual editor was used to define the MoCC models on a representative language example, SigPML. For this language definition, we have made several experiments on MoCC definitions to evaluate the MoCCML language and editor capabilities. These experiments have provided several feedbacks to improve the editor and to apply the MoCCML language on the industrial use cases of the project. During this year, we have updated the editor version 1 based on the Sirius component and we have deployed the editor component in the GEMOC Studio.

5.1.3 WP3 – Formalization of the Connection between Different MoCs

During the second year of the GEMOC project, the WP3 focused on the composition of different executable languages. This work has been split in four related part according to the task identified in the GEMOC proposal.

Task 3.1: Hierarchical component model with heterogeneous MoCC composition operators This task was supposed to finish at T0+12, we made a major update of the D.3.1.1 deliverable. This is due to the identification of interesting possibilities regarding the specification of Behavioral Coordination Operator at the language level without any underlying component model. This update results in BCOoL, the Behavioral Coordination Operator Language. From this update, we are currently writing a paper journal.

Task 3.2: Denotational semantics of the MoCC metamodel The second task focused on the formalization of MoCCML (see WP2). According to the partner previous experiments, we took the decision to give an operational formalization of MoCCML instead of a denotational one to keep the MOCCML definition formal while easing the writing of the associated tools (i.e. the generic execution engine). Preliminary results were accepted for publication in the date conference[1]. This is important to us since we made efforts to communicate the WP3 results outside of the modeling community.

Task 3.3: Integration of DSLs operational semantics The third task results in a final update of the deliverable that defines the link between the specification of the MoCC and the specification of the Domain Specific Action. It also defines the mandatory restriction allowing the couple MoCC/DSA to be tractable.

Task 3.4: Formalization proof In the fourth task, we provided a beta version of the deliverable expected for T0+30. Its goal is to share with the other partners the results about xDSML model checking as soon as possible. It is important since it could necessitate the annotation of the DSA to ease the abstraction used during model checking. Note that a beta version of the model checker, that does not take the execution data into account is available in the GEMOC studio.

5.1.4 WP4 – Generic Execution Framework for Heterogeneous Models

Task 4.1: Execution Environment for Heterogeneous Models Thanks to the use of a continuous integration server, the V0 version of the deliverable D4.1.2 (*The GEMOC Studio*) has been released on time at M18. It ensures a correct integration of the other deliverables at both a technical point of view and at the end user point of view. and As an major result for the project, the GEMOC Studio can be downloaded from the GEMOC web site as a fully integrated Eclipse package, available for all platforms: `http://gemoc.org/studio-download/`. Yet, the GEMOC studio already includes the exploratory use cases as examples, to demonstrate some of the achievements of the project and a basic user documentation(V0). An online version of this user documentation is available from: `http://gemoc.github.io/gemoc-studio/`.

Task 4.2: Generic Execution Engine During this second year, the execution engine has matured into a V1 that has been delivered on time at M24. It runs the execution engine using different implementations of the xDSML components. It makes possible to use various editors, DSA implementations or solver implementations. Several views have been developed to help controlling and understanding the execution flow of the engine.

[1] `http://www.date-conference.com`

Task 4.3: Generic Animator Framework A preliminary version (v0.1) of the animator designer and the generic debugger infrastructure have been released on time at M24. Based on Sirius framework, it is used to display several information about the running model. It allows to have visual feedback of the current logical step. Sirius offers to build several animation representations for a given xDSML. The first representation allows to visualize which element of the user model is active (e.g., debug). The second representation allows to visualize the execution data associated to the user model. These representations are coupled with the execution engine.

Task 4.4: API for Trace Management The first version of this deliverable has been released on time at M24. The trace metamodel is deployed in the studio. It is also currently used by the engine in order to provide enhanced features. Thanks to it, the engine is able to homogeneously displays the logical step informations. It is used in a timeline view which is coupled to the execution engine to show the execution flow. This timeline view is also used to navigate in the execution trace. This allows to reset the engine to a given state and to restart it from that point.

5.1.5 WP5 – GEMOC Experimentations

Task 5.2: Definition of DSLs and MoCs for use cases The industrial case studies rely on several heterogeneous cooperative xDSMLs relying on various MoCCs that are implemented using the GEMOC Studio provided by WP4, using the processes, methods and tools defined in WP1 and WP2 and the formal framework provided by WP3. After some experiments of the GEMOC studio delivered at T0+18, Thales has requested to the WP4 an improvement of the DSA editor from the GEMOC language workbench, in order to take into its industrial domain specific modelling language which is an aggregation of 20 meta-models. Two month later, Thales has validated the new release of the DSA editor. Thales also has requested to the WP4 an improvement of the MOCC/DSE compiler generator from the GEMOC language workbench in order to take into its industrial domain specific modelling language. Thales has validated the new release of this component in November, 2014. The usage of the GEMOC language workbench has been validated not only with academic language but also with a real industrial that will be publicly available at `https://www.polarsys.org/projects/polarsys.capella`. I3S and ENSTA-B have provided support in the definition of MoCCs for the Thales use case. Thales and IRIT respectively have defined its xDSML components for Capella and for the GeneAuto subset of Simulink and Stateflow needed for the Airbus provided case study. xDSML components have been developed according to the GEMOC methodology which has been defined in the WP1.

Task 5.3: Framework Experimentations In the context of the task 5.3, a first version of the Capella animation and debug viewpoints have been developed based on the Sirius technology by Obeo. For simulation purpose, a simplified radar model has been designed thanks to the Capella GEMOC modelling workbench. The designed models provided by IRIT, are mainly used to validate the language specifications.

5.1.6 WP0 – Management and Dissemination

Task 0.1: Project Management As the main leader of the project, Inria ensures the coordination and management of the project. Inria also provided all the required ressources for the project coordination and dissemination: a domain and a public website (`http://gemoc.org/ins`), and two projects on the Inria forge: one used as intranet with the mailing lists and a subversion server for collaborative writing (`https://gforge.inria.fr/projects/gemoc`), and one used as development server hosting the GIT repository and a feature-request/bug-tracking application (`https://gforge.inria.fr/projects/gemoc-dev`). Finally, the GEMOC Studio is publicly available on the Inria Continuous Integration server (`https://ci.inria.fr/gemoc`).

To ensure the coordination of the project, a board meeting (including all partner coordinators and WP leaders) has been organized at each face to face technical meeting (TM14.1, TM14.2, TM14.3 and TM14.4),

and an annual project meeting (PM14, co-located with TM14.4) has been organized to a retrospective of the past year. The overall management activity is detailed in Chapter 7.

Task 0.2: Project Dissemination and Exploitation The second year of the project was intensively devoted by all the partners to disseminate the first scientific and technological breakthroughs achieved during the project. The partners of the project have been invited to give various presentations, including demonstrations of the GEMOC Studio, and various scientific and industrial papers have been accepted and published. The overall dissemination activity is detailed in Chapter 6.

In terms of Exploitation, Thales Research & Technology experimented the GEMOC approach on the open source systems engineering workbench Capella[2].

5.2 Partner Activity

5.2.1 I3S

WP	Task	Deliverable	Activity
WP0	T0.2	–	I3S actively participated to the dissemination of the project (see dissemination)
WP1	T1.3	D1.3.1	I3S enriched the prototype of the xDSML/MOC mapping language (ECL), which continue to be used to experiment various mapping possibilities. For instance to take into account feedback from the DSA in the MoCC
WP2	T2.2	D2.2.1	In order to experiment MOCCML, I3S extended the TimeSquare tool and its underlying semantics with the one of MoCCML. I3S also extended TimeSquare to allow exhaustive simulation of MoCCML specifications
WP3	T3.1	D3.1.1	In collaboration with the other partners (and specifically INRIA) we update the approach proposed during the first year. After tests and errors, we understood that it is more appropriate to specify language coordination operators that describe model coordination. These coordination operators has been specified in a dedicated language named BCOoL (Behavioral Coordination Operator Language). The operators are based on a behavioral interface of the language containing at least the DSE but that still need more understanding and experiments.
WP3	T3.2	–	We published a denotational semantics specification of the CCSL language as a research report that could have been used as a basis for the denotational semantics of the MoCCML language. However, we decided that such a specification of the semantics is not really suitable to prove some of the properties. We defined in collaboration with ENSTA the formal operational semantics of MoCCML.
WP3	T3.3	–	I3S continued to inject feedback from its different experiments about the link between the DSA and the MoCC. It resulted in an alpha prototype about a model to describe such prototype and an extension of the ECL language. We are still looking for an adequate abstraction of the DSA so that it is amenable to check some properties of the assembly (*e.g.* race conditions)
WP4	T4.2	D4.4.1	I3S and Inria provided an extension of TimeSquare trace model for GEMOC. This extension enable tracing the runtime data together with the different events. As a side effect it also leads to an extension of TimeSquare to be able to dump and restore its internal state, allowing a rich and efficient API to explore the trace

[2] Cf/ `https://www.polarsys.org/projects/polarsys.capella`

5.2.2 Inria

WP	Task	Deliverable	Activity
WP0	T0.1	–	As project leader, Inria provided the mid-term report to ANR at M18, and ensures the coordination of the various activities in the project.
WP0	T0.1	D0.1.3	Inria was the main contributor and led the collaborative writing of the entire deliverable.
WP0	T0.2	–	As project leader, Inria was extremely devoted into the dissemination of the project results. Many presentation of the project have been done in specific seminars and to external collaborators (both from academia and industry). The poster about the project has been also updated to reflect the new results and to be presented in various industrial and academic events as well as to be disseminated on the GEMOC website.
WP1	T1.1	D1.1.1	Inria participated to the technical discussions of this task, and on the writing of the new version of the deliverable.
WP1	T1.2	D1.2.1	Inria has developed the xDSML definition tool. This tool offers a dashboard for building an xDSML. This dashboard reuses or extends technology-based wizards for helping the user in his activity. Inria also developed MELANGE, a language engineering workbench that support metamodel extensions, especially to support the extension of metamodels with execution data included into the DSAs.
WP1	T1.3	–	Inria participated to the technical discussions of this task, and developed a first prototype to support asynchronous execution functions.
WP2	T2.2	–	Inria participated to the technical discussions of this task, and participated to the writing of the scientific paper about MoccML.
WP3	T3.2	D3.2.1	Inria participated to the technical discussions of this task.
WP3	T3.3	–	Inria participated to the technical discussions of this task.
WP4	T4.1	D4.1.1	Inria has produced updates of the document delivered at M6 according to reflect the current state of the GEMOC studio.
WP4	T4.1	D4.1.2	Inria maintains the overall GEMOC studio, integrating the various contributions of the different partners. The first stable version 0.1 was delivered at M18. Inria also helped tightly the other partners in the packaging of their contributions in a suitable deliverable form. Inria also provided an infrastructure for the user documentation, which help each partner to contribute regarding the tools it provides into the GEMOC studio.
WP4	T4.2	D4.2.1	Inria has developed the execution engine of the GEMOC studio to coordinate the DSA, the MoC and the animator.
WP4	T4.3	D4.3.1	Inria provided the interface enabling the communication between the engine and the simulation view. Inria also provide a strong support to assess the first versions of the animator designer.
WP4	T4.4	D4.4.1	Inria participated to the discussions about the trace management. Inria developed the first version of the metamodel integrated into the GEMOC-studio, as well as different views to manipulate the execution trace (step back/forward, record, replay, etc.).
WP5	T5.1	D5.1.1	Inria provided the description of the fUML use case.
WP5	T5.2	D5.2.1	Inria, in collaboration with I3S, provided the first prototype implementation of the exploratory use case (incl. fUML and TFSM).

5.2.3 ENSTA Bretagne

WP2	T2.2	D2.2.1	ENSTA Bretagne has developed the MoCC language editor to be able to edit libraries and MoCC models based on state machine and clock constraints. This graphical and textual editor was used to define the modeling languages integrating MoCC definitions.
WP3	T3.3	D3.3.1	ENSTA Bretagne was involved in the deliverable related to the work on the MoCC editor done in the WP2.
WP3	T3.4	D3.4.1	ENSTA Bretagne has specified the verification and validation phases of the model languages created by the GEMOC Studio. The verification and validation phases were developed by the implementation of model transformations from the DSA, DSE and the MoCC models to the exhaustive exploration tooling. This tooling is available as plugin components in the GEMOC studio.

5.2.4 IRIT

WP	Task	Deliverable	Activity
WP1	T1.1	D1.1.1	IRIT, with the other partners, has updated and completed the methodology for defining an xDSML according to the feedbacks of the experiments and case studies. It has been illustrated in a tutorial (see T1.2).
WP1	T1.2	D1.2.1	A tutorial has been developed to illustrate the methodology proposed in D1.1.1 and demonstrate the use of the GEMOC Studio for new users.
WP1	T1.3	D1.3.1	The mapping between MoCC and execution functions has been refined. A mechanism has been defined to express feedbacks from execution functions to MoCC. It allows to choose the right path in the simulation according to the actual data managed in the DSA. Work has been started on the metaprogramming aspects including composite DSA, composite DSE and relations with the MoCC.
WP3	T3.3	D3.3.1	This activity is based on the results of T1.3. This activity has identified the constraints that must be assessed the xDSML component and more specifically on the DSE and its execution functions. Static verifications have been proposed to check that GEMOC design decisions are indeed respected in the implementation of the DSA. To ensure the consistency of the GEMOC approach, the language engineer is not allowed to use all the power of the Kermeta 3 language.
WP4	T4.2	D4.2.1	IRIT has, in collaboration with Inria and I3S, participated to the development of the execution engine orchestrating the different components of a xDSML.
WP5	T5.2	D5.2.1	In the full project proposal, IRIT proposed to implement an Airbus provided use case. Currently, the appropriate NDA between Airbus and IRIT could not be signed due to legal and administrative issues. As this use case relies on the Data flow and State machine diagrams xDSMLs, IRIT started implementing the corresponding languages derived from the GeneAuto and P projects where Airbus and IRIT were both partners. Currently, the data flow diagram part has been finished.
WP5	T5.3	D5.3.1	As Airbus could not provide to IRIT the models for the use case, IRIT focused on unit and integration models that allow to validate the data flow diagram xDSMLs implementations.

5.2.5 Obeo

WP1	T1.2	D1.2.1	Obeo experimented with the concept of a Process Dashboard view in the context of UML Designer in order to get end-user feedback regarding how a methodology can be presented in a modeling environment.
WP2	T2.2	D2.2.1	Obeo supported the other partners in building an editor to describe the MoC.
WP4	T4.1	D4.1.2	Obeo provided feedback and reviews regarding the design of the GEMOC studio.
WP4	T4.2	D4.2.1	Obeo helped the other partners through feedback and reviews in building the generic execution engine and making sure it can be integrated with other Eclipse Modeling Technologies.
WP4	T4.3	D4.3.1	Obeo implemented a first version of the animator designer as an extension of Obeo designer, and provided capabilities to support breakpoints on model elements and model specific events, and streamlining the integration with the Eclipse technologies.
WP4	T4.4	D4.4.1	Obeo provided capabilities to leverage and browse through the trace history in a scalable way.
WP5	T5.2	D5.2.1	Obeo worked on some demonstrative examples with the partners to test the approaches and disseminate the project results.
WP5	T5.3	D5.3.1	Obeo experimented on integrating an fUML execution engine with UML Designer and Sirius through the technology developped in the WP4.

5.2.6 Thales Research & Technology

WP	Task	Deliverable	Activity
WP0	T0.1	D0.1.2	TRT has mainly contributed as leader of WP5.
WP2	T2.1	–	TRT has participated to the technical discussions to provide the Thales use case needs.
WP3	T3.1	–	TRT has participated to the technical discussions to provide the Thales use case needs.
WP4	T4.1	–	TRT has participated to the technical discussions about the definition of the GEMOC studio.
WP4	T4.1	D4.1.2	TRT has experienced the GEMOC Studio provided by the continuous integration service.
WP4	T4.3	–	TRT participated to the technical discussions to share industrial practices.
WP5	T5.1	D5.1.1 V1	As task leader, TRT has coordinated the collaborative writing of this deliverable.
WP5	T5.2	D5.2.1 V1	TRT has provided the definition of its xCapella DSML components
WP5	T5.3	D5.3.1 V0	TRT has adapted a new version of its Capella language in order to use it in the GEMOC studio. A model for simulation purpose has been designed.

6. Dissemination

6.1 Scientific Dissemination

6.1.1 Publications

Here is the list of the publications accepted or published during the second year of the ANR INS project GEMOC (period 2) on the results of the project. In **bold** are the publications written in collaboration with different partners of the project.

[ACC14] Mathieu Acher, Benoit Combemale, and Philippe Collet. Metamorphic Domain-Specific Languages: A Journey Into the Shapes of a Language. In *Onward! Essays*, Portland, United States, September 2014.

[BCB14a] Erwan Bousse, Benoit Combemale, and Benoit Baudry. Scalable Armies of Model Clones through Data Sharing. In *17th International Conference on Model Driven Engineering Languages and Systems (MODELS 2014)*, Valencia, Spain, 2014. Springer.

[BCB14b] Erwan Bousse, Benoit Combemale, and Benoit Baudry. Towards Scalable Multidimensional Execution Traces for xDSMLs. In *11th Workshop on Model Design, Verification and Validation Integrating Verification and Validation in MDE (MoDeVVa'14)*, Valencia, Spain, September 2014.

[CCF13] Benoît Combemale, Walter Cazzola, and Robert B. France, editors. *Proceedings of the First Workshop on the Globalization of Domain Specific Languages (GlobalDSL '13)*, New York, NY, USA, 2013. ACM.

[CDB+14] Benoit Combemale, Julien Deantoni, Benoit Baudry, Robert France, Jean-Marc Jézéquel, and Jeff Gray. Globalizing Modeling Languages. *Computer*, pages 68–71, June 2014.

[CDF+13a] Benoit Combemale, Julien Deantoni, Robert France, Frédéric Boulanger, Sébastien Mosser, Marc Pantel, Bernhard Rumpe, Rick Salay, and Martin Schindler. First Workshop On the Globalization of Modeling Languages (GEMOC 2013). In CEUR-WS, editor, *GEMOC - 1st International Workshop On the Globalization of Modeling Languages*, pages 3–13. Benoit Combemale, Julien DeAntoni, Robert France, September 2013.

[CDF+13b] Benoît Combemale, Julien DeAntoni, Robert B. France, Balbir Barn, Tony Clark, Ulrich Frank, Vinay Kulkarni, and Dan Turk, editors. *Joint Proceedings of the First International Workshop On the Globalization of Modeling Languages (GEMOC 2013) and the First International Workshop: Towards the Model Driven Organization (AMINO 2013) Co-located with the 16th International Conference on Model Driven Engineering Languages and Systems (MODELS 2013), Miami, USA, September 29 - October 04, 2013*, volume 1102 of *CEUR Workshop Proceedings*. CEUR-WS.org, 2013.

[CDF14] Benoît Combemale, Julien DeAntoni, and Robert B. France, editors. *Proceedings of the 2nd International Workshop on The Globalization of Modeling Languages co-located with ACM/IEEE 17th International Conference on Model Driven Engineering Languages and Systems, GEMOC@Models 2014, Valencia, - Spain, September 28, 2014*, volume 1236 of *CEUR Workshop Proceedings*. CEUR-WS.org, 2014.

[CPBV14] Benoît Combemale, David J. Pearce, Olivier Barais, and Jurgen J. Vinju, editors. *Proceedings of the 7th International Conference on Software Language Engineering, SLE 2014, Västerås, Sweden, September 15-16, 2014*, volume 8706 of *Lecture Notes in Computer Science*. Springer, 2014.

[DIDT+15] Julien Deantoni, Papa Issa Diallo, Ciprian Teodorov, Joël Champeau, and Benoit Combemale. Towards a Meta-Language for the Concurrency Concern in DSLs. In *Design, Automation and Test in Europe Conference and Exhibition (DATE'15)*, Grenoble, France, March 2015.

[HPCT14] Mounira Kezadri Hamiaz, Marc Pantel, Benoît Combemale, and Xavier Thirioux. Correct-by-construction model composition: Application to the invasive software composition method. In Barbora Buhnova, Lucia Happe, and Jan Kofron, editors, *11th International Workshop on Formal Engineering approaches to Software Components and Architectures (FESCA 2014)*, volume 147 of *EPTCS*, pages 108–122, 2014.

[JMD+14] Jean-Marc Jézéquel, David Mendez, Thomas Degueule, Benoit Combemale, and Olivier Barais. When Systems Engineering Meets Software Language Engineering. In *Complex Systems Design & Management (CSD&M'14)*, Paris, France, November 2014. Springer.

[KGD+14] Amani Khecharem, Carlos Gomez, Julien Deantoni, Frédéric Mallet, and Robert De Simone. Execution of Heterogeneous Models for Thermal Analysis with a Multi-view Approach. In *Forum on specification and Design Languages (FDL'14)*, Munich, Germany, October 2014. IEEE.

[KHD14] Thorsten Koch, Jörg Holtmann, and Julien Deantoni. Generating EAST-ADL Event Chains from Scenario-Based Requirements Specifications. In Avgeriou, Paris and Zdun, Uwe, editor, *European Conference on Software Architecture (ECSA'14)*, volume 8627 of *Lecture Notes in Computer Science*, pages 146–153, Vienna, Austria, August 2014. Springer International Publishing.

[KPCT14] Mounira Kezadri, Marc Pantel, Benoit Combemale, and Xavier Thirioux. A formal framework to prove the correctness of model driven engineering composition operators. In *16th International Conference on Formal Engineering Methods (ICFEM'14)*, Luxembourg, November 2014. Springer.

[VCCA14] Edoardo Vacchi, Walter Cazzola, Benoit Combemale, and Mathieu Acher. Automating Variability Model Inference for Component-Based Language Implementations. In Patrick Heymans and Julia Rubin, editors, *18th International Software Product Line Conference (SPLC'14)*, Florence, Italie, September 2014. ACM.

[VLDM14] Matias Ezequiel Vara Larsen, Julien Deantoni, and Frédéric Mallet. Framework for Heterogeneous Modeling and Composition. In *Conférence en IngénieriE du Logiciel (CIEL'14)*, page 81, Paris, France, June 2014.

The list of all the publications (period 1 and period 2) are available at `http://gemoc.org/publications`. This includes the preprints of all the publications.

6.1.2 Presentations

- *L'IDM par la pratique dans le contexte des modèles agronomiques*, invited talk at *Journée Devlog: IDM et modèles scientifiques* organized by the CNRS national network Devlog (Cf. `http://devlog.cnrs.fr/idm2014`). Talk given by B. Combemale (Inria) and available at `http://devlog.cnrs.fr/_media/idm2014_mdeandsle_combemale-web.pdf`.

- *When Systems Engineering Meets Software Language Engineering*, invited talk at *Complex Systems Design & Management* (CSD&M'14, cf. `http://www.csdm2014.csdm.fr`). Talk given by J.-M. Jézéquel (Inria).

- *Towards formal model driven engineering*, keynote at the *7th International Workshop on Model-Based Architecting and Construction of Embedded Systems*, in conjunction with MODELS 2014. Talk given by J. DeAntoni (I3S).

- *Towards formal model driven engineering*, keynote at the *2nd International Workshop on TowArds the Model DrIveN Organization* , in conjunction with MODELS 2014. Talk given by B. Combemale (Inria).

- *Hands on Logical Time for Event Based Semantics Specification*, Course at the *LIAMA Open Day and Summer School on Model and Verification Driven Engineering* 2014. Talk given by J. DeAntoni (I3S).

All the publications was also presented during the corresponding conferences (see publications).

6.1.3 Posters

A new poster about the ANR INS project GEMOC has been produced. The poster has been presented during EclipseCon France at Toulouse, France. The poster is also available on the GEMOC website: `http://gemoc.org/pub/gemoc-poster.pdf`.

During the summer school MDD4RES, Matias Vara Larsen (I3S) also presented a poster about his latest work on the composition of behavioral languages.

6.1.4 Events

Second International Workshop GEMOC 2014 (co-located with MODELS 2014) GEMOC 2014 was the second full-day workshop that brought together researchers and practitioners in the modeling languages community to discuss the challenges associated with integrating multiple, heterogeneous modeling languages. The languages of interest range from requirements to runtime languages, and include both general-purpose and domain-specific languages. Challenges related to engineering composable languages, semantic composition of languages and to reasoning about systems described using heterogeneous languages was of particular interest. More information at `http://gemoc.org/gemoc2014`.

Dagstuhl Seminar #14412 on the Globalization of Domain-Specific Languages This Dagstuhl seminar provided a forum for developing and launching a research initiative that broadens the current DSML research focus beyond the development of independent DSMLs to one that provides support for globalized DSMLs. In the globalized DSMLs vision, integrated DSMLs provide the means for teams working on systems that span many specialized domains and concerns to determine how their work on a particular aspect influences work on other aspects. A research roadmap will be published and will represent a key byproduct of this meeting.

This Dagstuhl seminar was organized in October, 2014, by Betty H. C. Cheng (Michigan State University, US), Robert B. France (Colorado State University, US), Jean-Marc Jezequel (University of Rennes, FR), Bernhard Rumpe (RWTH Aachen, DE) and Benoit Combemale (INRIA, FR). The More information at `http://www.dagstuhl.de/14412`.

Sponsored events The ANR project GEMOC was official sponsor of both the summer school MDD4DRES 2014 (cf. `http://www.mdd4dres.org`) where a panel was organized on the topic of the project, and the 7th International Conference on Software Language Engineering (SLE 2014, cf. `http://sleconf.org/2014/`.

6.2 Technological Dissemination

6.2.1 The GEMOC Studio

The tools resulting from the project are distributed via an integrated Eclipse-based studio called *the GEMOC studio*. This studio is built on a continuous integration server for early integration of the results of all the partners. It is used both internally to test the components in a homogeneous way, and externally to diffuse the latest results and associated technologies from the project. It is bundled with running examples for simplifying the demonstrations, and a comprehensive user documentation. It provides an all-in-one, easy to install software that is already used by several partners and contacts as a convenient language and modeling workbench as well as a development platform.

6.2.2 Demonstrations

Various demonstrations of the GEMOC studio and the results of the project was realized during the second year of the project. Among others demonstrations: MDD4DRES'14, Dagstuhl Seminar #14412, SLE'14, etc.

6.3 Industrial Dissemination

A demonstration of the GEMOC studio has been realized at Thales Palaiseau on May 28, 2014.

6.4 Dissemination in Education

I3S developed the supports for 8 hours of lectures, and the corresponding materials for labs, in the context of a course for a Master on Software Architecture and ambient computing.

6.5 The GEMOC Initiative

The GEMOC Initiative is an open and international initiative that aims to develop breakthrough software language engineering (SLE) approaches that support global software engineering through the use of multiple domain-specific languages. GEMOC researchers aim to provide effective SLE solutions to problems associated with the design and implementation of collaborative, interoperable and composable modeling languages.

The GEMOC initiative aims to provide a framework that facilitates collaborative work on the challenges of using multiple domain-specific languages in software development projects. The framework consists of mechanisms for coordinating the work of members, and for disseminating research results and other related information on GEMOC activities. The framework also provides the required infrastructure for sharing artifacts produced by members, including publications, case studies, and tools.

The Advisory Board is currently led by Dr. Benoit Combemale, also coordinator of the ANR INS project GEMOC. The role of the Advisory Board is to coordinate the GEMOC work and to ensure proper dissemination of work products and information about GEMOC events (e.g., meetings, workshops).

The GEMOC Initiative provides one of the main channels of dissemination of the project results. This situation ensures early dissemination of the project results to all outstanding researchers and practitioners in the fields of interest, and to benefit from early feedbacks. The project plays a key role in the federation of this international community, thus taking an international leading position in regards to the issues at hand.

7. Project Management

7.1 Project Coordination

All the project activities have been coordinated through regular face to face meetings and video-conferences.

The face-to-face meetings organized during the second year of the project are the following:

Date	Location	Participants	Purpose of the meeting
26/03/14	TRT, Palaiseau	ALL	Code camp
26-27/03/14	TRT, Palaiseau	ALL	Technical meeting (TM14.1, cf. `http://gemoc.org/tm14-1`)
21/05/14	ENSTA, Brest	ALL	Code camp
22-23/05/14	ENSTA, Brest	ALL	Technical meeting (TM14.2, cf. `http://gemoc.org/tm14-2`)
02/06/14	Paris	Board	Rehearsal of the ANR mid-term review
22-23/05/14	Paris	Board	ANR mid-term review (cf. `http://gemoc.org/ins-midtermreview`)
22/10/14	I3S, Nice	ALL	Code camp
13-14/11/13	I3S, Nice	ALL	Technical meeting (TM14.3, cf. `http://gemoc.org/tm14-3`)
10/12/14	Inria, Rennes	ALL	Code camp
11-12/12/12	Inria, Rennes	ALL	Technical meeting (TM14.4, cf. `http://gemoc.org/tm14-4`)

Additional physical technical meeting was also organized for specific scientific or technical issues.

Regular videoconferences are also held every two to three weeks to coordinate the work of all partners. All partners participate in video conferences. Each task is being addressed (progress, discussions on scientific and / or technical activities), and presentations on specific approaches can be organized by partners.

7.2 Major Risks & Deviations

No risk and deviation is reported during the second year of the project.

7.3 Additional Remarks

All project members provided a strong involvement during the second year of the project and an active participation in the various tasks. This provides a pleasant and efficient task force and working group for the project. Relying on a lot of work since the beginning of the project, the results achieved during the second year of the project is very encouraging. In particular, the second year helped to bring the contributions and tools with the production of an integrated studio to share and integrate the tools of the various partners. Many disseminations, both in academia and industry, are used to validate the first results of the ANR project GEMOC. The first results are also massively validated through high quality publications in the major conferences of the field.

