Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Project Management

D0.2.2 - Industrial dissemination results and definition of the long-term strategy for the GEMOC Exploitation

Task 0.2

Version 0.1

 Ó Consortium GEMOC, 2012- 2016

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

DOCUMENT CONTROL

	- :	A :	B :	C :	D :
Written by Signature	Le Noir (TRT)				
Approved by Signature					

Revision index	Modifications
A	
B	
C	
D	

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Authors

Author	Partner	Role
Jérôme Le Noir	TRT	Lead author

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

Table des matières

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Introduction

The GEMOC project targets a language design studio providing methods and tools to ease the design and integration of new MoCCs and executable DSMLs (xDSMLs).

Purpose

The objective of task T0.2 GEMOC exploitation coordination is to encourage and catalog exploitation of the GEMOC method and tools by consortium partners and others, to facilitate the transition from research to real-world application.

Definitions & acronyms

- **AS:** Abstract Syntax.
- **API:** Application Programming Interface.
- **Behavioral Semantics:** see **Execution semantics.**
- **CCSL: Clock-Constraint Specification Language**.
- **Domain Engineer:** user of the Modeling Workbench.
- **DSA:** Domain-Specific Action.
- **DSE:** Domain-Specific Event.
- **DSML:** Domain-Specific (Modeling) Language.

Grant ANR-12-INSE-0011

- **Dynamic Semantics:** see **Execution semantics.**
- **Eclipse Plugin:** an Eclipse plugin is a Java project with associated metadata that can be bundled and deployed as a contribution to an Eclipse-based IDE.
- **ED:** Execution Data.
- **Execution Semantics:** Defines when and how elements of a language will produce a model behavior.
- **GEMOC Studio:** Eclipse-based studio integrating both a language workbench and the corresponding modeling workbenches.
- **GUI:** Graphical User Interface.
- **Language Workbench:** a language workbench offers the facilities for designing and implementing modeling languages.
- **Language Designer:** a language designer is the user of the language workbench.
- **MoCC:** Model of Concurrency and Communication.
- **Model:** model which contributes to the convent of a View.
- **Modeling Workbench:** a modeling workbench offers all the required facilities for editing and animating domain specific models according to a given modeling language.
- **MSA:** Model-Specific Action.
- **MSE:** Model-Specific Event.
- **RTD:** RunTime Data.
- **Static semantics:** Constraints on a model that cannot be expressed in the metamodel. For example, static semantics can be expressed as OCL invariants.
- **TESL:** Tagged Events Specification Language.
- **xDSML:** Executable Domain-Specific Modeling Language

.

Intended Audience

This document mainly targets GEMOC partners, interested parties and the funding agency (i.e., ANR).

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

Summary

This report is organized as follows: Section 2 provides information about industrials dissemination. Section 3 provide information about of all technical items which are candidates for exploitation. The structure of this section was inspired by the derived reference list of GEMOC technical building blocks identified in the GEMOC studio architecture; and the technical items have been grouped into features for exploitation.

For each items the following information is given:

- Owner(s) and IPR
- Description
- Maturity
- Addressed customers
- Licence model
- Exploitation strategy.

Section 4 provides the exploitation plans of the partners in GEMOC. These provide mainly strategies for internal exploitation but address also external exploitation plans.

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Industrial dissemination results

- “Breathe life into your Designer!” at EclipseCon France 2015 (Obeo and INRIA).
- Poster “GEMOC ANR Project” at EclipseCon France 2014.
- Poster “GEMOC ANR Project” at ECOOP, ECSA and ECMFA 2013 at Montpellier, France.
- "On the globalization of the modeling languages", cf. http://neptune.irit.fr/images/Neptune_2013/transparents/P02_BCombemale.pdf.
- Invited talk at Neptune 2013 (J. Le Noir, TRT): "Les langages de modélisation en ingénierie du logiciel et système : un point de vue industriel sur l’état de la pratique et les perspectives", cf. http://neptune.irit.fr/images/Neptune_2013/transparents/P03_JLenoir.pdf.
- Invited talk at "journée IDM et modèles scientifiques du réseaux CNRS DevLog" (B. Combemale, INRIA): "Modélisation, composition et simulation de modèles métiers hétérogènes: l'initiative GEMOC", cf. http://devlog.cnrs.fr/_media/idm-devlog10102013web_gemoc_combemale.pdf
- Invited talk at the 5th Bellairs Modelling Workshop (B. Combemale, INRIA): On the globalization of the modeling languages. Cf. http://www.cs.mcgill.ca/~joerg/SEL/AOM_Bellairs_2013.html.
- Présentation projet GEMOC (Jérôme Le Noir, TRT) Thales système aéroporté Brest, 2013.
- Présentation GEMOCStudio (Jérôme Le Noir et Ali Koudri, TRT).60 ième "Journée de Palaiseau", 2013

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Possible Candidates for Exploitation

GEMOC Studio

The GEMOC Studio is an eclipse package that contains components supporting the GEMOC methodology for building and composing executable Domain-Specific Modeling Languages (DSMLs). It includes two workbenches: the GEMOC Language Workbench and the GEMOC Modeling Workbench. The language workbench is intended to be used by language designers (aka domain experts), it allows building and composing new executable DSMLs. The Modeling Workbench is intended to be used by domain designers, it allows creating and executing heterogeneous models conforming to executable DSMLs.
The GEMOC Studio results in various integrated tools that belong into either the language workbench or the modeling workbench. The language workbench put together the following tools seamlessly integrated to the Eclipse Modeling Framework (EMF: https://eclipse.org/modeling/emf):

- { Melange (http://melange-lang.org), a tool-supported meta-language to modularly define executable modeling languages with execution functions and data, and to extend (EMF-based) existing modeling languages.
- { MoCCML, a tool-supported meta-language dedicated to the specification of a Model of Concurrency and Communication (MoCC) and its mapping to a specific abstract syntax of a modeling language.
- { GEL, a tool-supported meta-language dedicated to the specification of the protocol between the execution functions and the MoCC to support feedback of the runtime data and to support the callback of other expected execution functions.
- { BCOoL (http://timesquare.inria.fr/BCOoL), a tool-supported meta-language dedicated to the specification of language coordination patterns, to automatically coordinates the execution of, possibly heterogeneous, models.
    - { Sirius Animator, an extension to the model graphical syntax designer Sirius (https://github.com/SiriusLab) to create graphical animators for executable modeling languages.

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

The different concerns of an executable modeling language as defined with the tools of the language workbench are automatically deployed into the modeling workbench that provides the following tools:

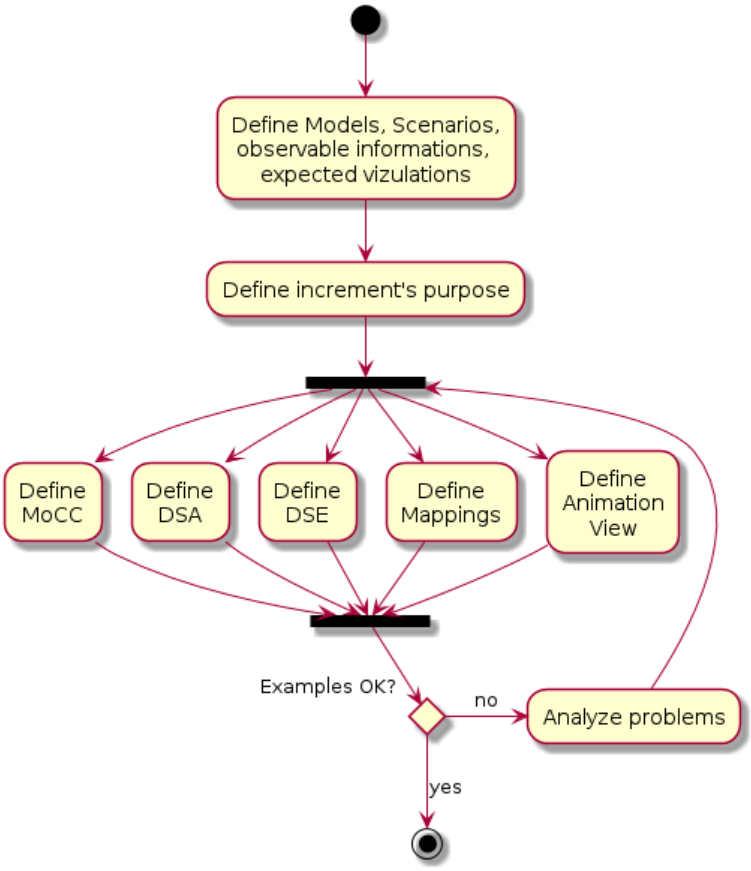
- { A Java-based execution engine (parameterized with the specification of the execution functions), possibly coupled with TimeSquare (http://timesquare.inria.fr) (parameterized with the MoCC), to support the concurrent execution and analysis of any conforming models.
- { A model animator parameterized by the graphical representation defined with Sirius Animator to animate executable models.
- { A generic trace manager, which allows system designers to visualize, save replay, and investigate difierent execution traces of their models.

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

GEMOC Methodology

Identification of the main artefacts to be designed in a xDSML, and strong causalities.



Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

This methodology has been realized into the GEMOC dashboard

MoCCML

	MoCCML
Owner(s), IPR	I3S, ENSTA, INRIA
Description	*MoCCML is a state based language to specify constraints between events. It also contains a mapping between the constraints and the abstract syntax (a.k.a. ECL)*
Maturity	TRL3
License model	EPL

GEL

	GEL
Owner(s), IPR	INPT
Description	GEL is a language to specify the two-way protocol between the MoCC and the Execution Functions (EF). One way specifies the calling of one EF when an event from the MoCC occurs. The other way specifies which execution paths must be pruned according the Execution Data values (also called feedback protocol).
Maturity	TRL3
License model	EPL

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

BCOoL

	BCOoL
Owner(s), IPR	I3S, INRIA
Description	BCOoL is a meta language to specify behavioral coordination patterns between heterogeneous languages. Such specification can be used to automatically generate the coordination of specific models
Maturity	TRL3
License model	EPL

Sirius Animator

	Sirius Animator
Owner(s), IPR	OBEO
Description	Add-on runtime and tools to bring animation in your domain specific tooling built with Sirius and/or Eclipse Modeling Framework. Ease the integration with Eclipse Debug and Sirius diagramming.
Maturity	TRL 4
License model	EPL

Execution framework

	Execution Framework
Owner(s), IPR	INRIA
Description	Generic execution framework that bridges the launch configuration, a given execution engine,

	the animation framework, and the execution trace manager
Maturity	TRL4
License model	EPL

Java-based execution engine

	Java-based execution engine
Owner(s), IPR	INRIA
Description	Generic execution engine for Java-based operational semantics (incl., control of the execution e.g., pause).
Maturity	TRL4
License model	EPL

Concurrent-based execution engine

	Concurrent execution engine
Owner(s), IPR	INRIA, I3S
Description	This execution engine relies on TimeSquare to compute the partial ordering of the application of the execution functions from a MoCCML specification. It also provides a generic mechanism to bridge the gap between the partial ordering proposed by the solver, and the JVM to apply the execution functions.
Maturity	TRL3
License model	EPL

Coordination execution engine

	Coordination execution engine

Grant ANR-12-INSE-0011

GEMOC

ANR Project, Program INS

Owner(s), IPR	I3S
Description	The coordination language is configured by a BCOoL specification and constrains the relative execution of different execution engines (possibly executing heterogeneous models) to provide a consistent execution
Maturity	TRL3
License model	EPL

Trace manager and omniscient debugger

	Execution trace manager
Owner(s), IPR	INRIA
Description	The execution trace manager is a generative approach that provide an efficient domain-specific execution trace metamodel from a domain-specific metamodel. The resulting metamodel for efficient execution trace is completed with advance generic features for omniscient debugging (incl., forward and backward stepping).
Maturity	TRL3
License model	EPL

Grant ANR-12-INSE-0011

GEMOC
ANR Project, Program INS

Exploitation plans of the GEMOC partners

ENSTA Bretagne

Ensta is an engineering school with master level with different options from mechanical to IT, and research activity.

Language engineering with the Gemoc studio remains a huge task for students based on several definitions, so this kind of work is perfectly adapted to project activity with several milestones.
The student project activity is frequently used to provide a motivating goal and autonomy during the works. So domain specific language definition must be include as project goal more than classical courses.

For the research activity, the studies around the MoCML language and verification purpose will be extended and particularly for the ClockSystem explorator to provide an input language facilitating the interface between MocML and the explorator. Also, to ease the property verification on the MoC models, a property language can be also defined to facilitate the property expression on MoC model instances.

I3S

The I3S Aoste team plans to exploit the GEMOC software components both for teaching and for future research work. The overall studio are already in use at the Engineering School from the University (Polytech'Nice) to help the students understanding and manipulating the behavioral semantics of languages. The software components are also used in the context of other projects like the Clarity project where it is used to define the reference semantics of

mode automata. It will also be used in further shared developments with some of the project partners (e.g. Inria Diverse).

INRIA DiverSE

The INRIA DiverSE team envision to exploit the resulting software components both for teaching and for future research work. The overall studio will be used in courses both at the University of Rennes 1 and the Engineering School ESIR to promote the cross fertilization of concurrency theory, algorithm theory and language design and implementation. The software components developed during the project will be maintain as open source projects (EPL) on Github. These components will be used as support for future research work (omniscient debugging, live modeling, formal execution trace analysis, trace comparison, etc.), and further shared developments with Obeo and I3S.

INPT

INPT plans to use the results of the GEMOC project both for teaching and for future research. On the teaching side, the GEMOC studio will be used in the model driven and language engineering courses. This it will help demonstrating the importance of the separation of concerns applied to the definition of executable Domain-Specific Modeling Languages. This will bridge the gap between several courses such as concurrency theory, language engineering, algorithms and software architecture which have to be used all together in modern systems. On the research side, the GEMOC studio and its components will be a good basis for further improvements in the definition of executable DSML in particular to favor the reuse of parts of DSML. In the context of the MOISE project (Methods and tools for model-based collaborative system engineering --- requirement engineering, multi-view modeling and verification, system engineering in extended enterprise) from the Saint-Exupery IRT (in which INP Toulouse is involved), a postdoctoral position is planned for 2016 in order to specify the semantics of the languages used in this project according to the GEMOC approach relying on the GEMOC studio. Furthermore, the clear separation of concurrency aspects and data manipulation aspects opens new possibilities in the verification of systems which at the heart of the targets of our research team. Currently, both a post-doctoral and doctoral students

have started the formal specification of the concurrent parts of the GEMOC approach to formalize relations between languages and preservation of model properties under the substitution of parts of the languages definition, for example to study the impact of semantic variation points.

Obeo

Obeo is a solution provider publishing open-source and commercial technologies and assisting customers to adapt it for their environment. The technologies resulting from GEMOC have the potential to integrate well with Obeo's offering as add-ons for existing adopters who wants to go further in the Domain Specific Models approach.

As such Obeo envision to make sure existing adopters are aware of these prototype capabilities and that the next step to go further is to apply those in the context of an operational environment through a pilot project with an industrial customer. These technologies being open-source removes any significant barrier in regard to such a scenario.

THALES

Thales is a global technology leader for the Defence & Security and the Aerospace & Transport markets. In 2010, the company generated revenues of over €13 billion with 68,000 employees in 50 countries. The Thales Group is organized, according to its business areas, into 7 Divisions. With respect to GEMOC results, all business areas are potentially relevant.

Internal Exploitation

Processes and tools that will result from GEMOC will form only one of the multiple enablers that will allow Thales to increase its position in the market, both civil and military. Therefore, more relevantthan market penetration is the internal adoption strategy that will result in some of the 12,000 Thales system/ software engineers using the adequate processes and tools to architect, design and develop systems.
Involvement of Thales entities in research projects is under the governance of the corporate technical directorate,

Grant ANR-12-INSE-0011

bringing a global view of long term needs in Thales. Thales is represented in this project by Thales Research & Technology, a set of corporate research laboratories in charge of feeding the Thales technology portfolio with research results, in particular from collaborative research projects such as GEMOC.
According to Thales internal R&T processes, technologies have to be evaluated in terms of technology readiness level (TRL) according to the NASA maturity scale. Collaborative research projects such as GEMOC are expected to generate results at different levels of maturity, ranging from TRL 2 to TRL 5.
The internal R&T process defines different paths according to TRL. On the topic of engineering tools, innovative results at TRL 5/6 are expected to be transferred to a dedicated entity in Thales, i.e. Thales Global Services (TGS) for deployment in Thales. Relevant results at TRL 3 or lower are further matured by Thales Research & Technology after the end of the project, either through self-funded studies, or through follow-up collaborative research projects.

Planned use of GEMOC project results

The GEMOC will be used in the context of the Clarity project [i] in order to specify the operational semantic of the Capella language.

External Exploitation

Thales is not a software publisher, so direct external exploitation of the GEMOC results is not considered.

[i] http://www.clarity-se.org/consortium/