MAENAD

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Revision chart and history log

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0.1	2010-12-07	First internal release
0.2	2011-31-07	Exploitation questionnaire added
0.3	2011-21-02	Inputs from TUB added
0.4	2011-21-02	Inputs from UOH added
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0.7	2011-22-02	Input from KTH
0.8	2011-26-02	Input from 4SG
0.9	2011-03-01	Release for Review
1.0	2011-03-11	Intermediate release

List of abbreviations

Abbreviation	Description
OEM	Original Equipment Manufacturer
SME	Small to Medium Enterprise

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1 Introduction

The main aim of this task (WT 7.2) is for all consortium members to seek exploitation of the results of the MAENAD project. The first purpose of this deliverable is to describe the envisaged exploitation strategies of each partner. Therefore, all partners are part of the task. At the end of the project, a concrete exploitation plan will be delivered based on the achieved results including concrete steps to transfer technology to industry.

There is a strong link between actions aimed to promote results of MAENAD project and actions aimed to achieve a widespread use of the results. For this reason, the exploitation task is closely related to dissemination and standardization activities. In particular, the work on the demonstrator and example systems (WP 6) will be very important to illustrate what can be achieved with the MAENAD outcomes. In addition, tools developed (WP5) allows companies to start using project results including support and training. In many cases dissemination and exploitation activities will be partly overlapping. This is particularly true for academic partners. For example, the utilization of MAENAD case results can be applied in undergraduate education at universities and at the same time provide dissemination example.

2 Exploitation strategies

In the following, the exploitation strategies considering the following stake-holders and issues are described:

- automotive industries (OEMs, subsystem suppliers and SMEs)
- tool suppliers
- standardization efforts
- research and education efforts.

The following questionnaire aims to investigate about the MAENAD partners' exploitation intentions of MAENAD's outcomes.

The questionnaire had the following content:

How do you plan to exploit the main results of MAENAD and to deploy them within your organization?

Which MAENAD results do you think are of most interest to your organization?

Which kind of dissemination activities will you carry out to share the outcomes from MAENAD?

- *Do you plan, for example, to disseminate knowledge and MAENAD experience by training and education of your employees?*

Describe the steps you will take towards deploying the MAENAD's results in your organization as follows:

- *Type the steps you will take, or the activities that you will start to ensure the project result will be exploited within or by your organization*
- *Type the expected result and effect from your exploitation activity here.*
- *What concrete product may/will come out of your work (i.e. definition of concrete feasible transfer steps, perceived improvement of process quality, Time & Cost reduction..)?*
  Which (measurable) result do you expect to occur in your organization or in client organizations?

What could MAENAD do (or should consider) in order to facilitate adoption of the EAST-ADL or the related tools?

What (expected) results might be relevant to standardize?

- *If so, in which forum/organization?*

The responses to the questionnaire are summarized in the following section.

2.1 Strategies with respect to adoption within automotive industries

The automotive partners part of the project represent OEMs (Fiat, VTEC), subsystem suppliers (Continental, Delphi/Mecel) and SME (4S). OEMs intend to exploit the MAENAD outcomes starting from dissemination activities in their engineering groups, and after demonstration activities, they will exploit the MAENAD results to their companies. Subsystem supplier intend to exploit the project outcomes to promote EAST-ADL as the preferred solution for model-driven design in the automotive industry. Furthermore, SMEs are interested to exploit the results of Maenad to increase

their knowledge on advanced methods and tools, in order to be able to provide an ever-better support to the customers in the development of E/E systems, especially in the automotive field.

Specific efforts by the industrial partners are described in the following:

Volvo Technology:

Volvo Technology has a strategic position in the Volvo group with a direct connection to all product companies. New methodology and results are therefore very quickly disseminated to the engineering departments and put into practice. The ongoing integration of the Volvo companies will make direct use of the engineering information support expected from MAENAD.

Volvo has a strong focus on safety and will for this reason have a particular interest in the results related to safety assessment and safety arguing. As an OEM, early phase analysis and optimization is a key concern, and such results are also valuable. AUTOSAR is a key technology at Volvo, which makes early phase methodology that is tailored for AUTOSAR highly relevant. As Volvo consists of several business areas (trucks, buses, construction equipment, etc.), there is a variety of tool chains and processes in place. A well-established EAST-ADL exchange format and tools for editing, analysis and synthesis are therefore critical for the exploitation of results.

VTEC intend to disseminate MAENAD results through academic publications as well as through presentations at seminars and workshops. VTEC is a part of various networks and associations, such as SNART (Swedish National Real-Time Association) and EUCAR (European Council for Automotive Research and Development) which is also an important dissemination opportunity.

VTEC will take several steps to ensure project results will be exploited within the organization:

- An internal reference group with representatives from the Volvo companies is formed, and will receive results and provide feedback continuously.
- An internal seminar is planned to inform about project results.
- MAENAD results will be demonstrated on an existing Volvo system. Such use of concrete examples is an important means to explain and validate project results in practice.

MAENAD results have the potential to improve processes and increase safety and quality of Volvo products. The EAST-ADL exchange format provides a bridge between existing tools and MAENAD tools, and makes it possible to exploit MAENAD optimization and analysis in parallel with existing tool chains.

Continental Automotive:

Continental is strongly engaged in several standardization activities in the automotive industry, e.g. as AUTOSAR core team member, and represented in the ISO to support the definition of the new upcoming functional safety standard ISO26262. Furthermore, Continental is strongly involved in R&D activities at national as well as European level, especially TIMMO-2-USE (developing a timing description language compatible with AUTOSAR and EAST-ADL) and ID4EV (Intelligent Dynamics for Fully Electric Vehicles).

By means of these standardization bodies and projects, Continental is promoting EAST-ADL as the preferred solution for model-driven design in the automotive industry.

Centro Ricerche Fiat:

Centro Ricerche Fiat S.C.p.A. (CRF) is a reference centre for the activities of innovation and research of Fiat Group, participated by the Group's Companies. CRF has a direct connection with the following Fiat Group's Companies: Fiat Group Automobiles, Ferrari, Magneti Marelli. Starting from this strategic position in Fiat Group, CRF will exploit the MAENAD results to the Fiat Group's Companies, focusing on the "functional safety approach".

New adequate engineering methods and tools for FEV development and engineering support on the field of “safety requirements”, “safety analysis”, “functional safety”, “suppliers relationship”, compliant with the new standard ISO26262, are expected from the Fiat Group’s Companies, the MAENAD approach is a useful opportunity. The first step of exploitation of the results will be an internal dissemination to promote, by means of internal workshops, the MAENAD results. Moreover CRF will select a pilot application to apply the EAST-ADL meta-model resulting from the MAENAD project. The result will allow the refining of the method by adapting it to CRF needs. The results will be evaluated and shared to Fiat Group’s companies.

Delphi/Mecel:

With EAST-ADL growing in maturity we will further look at uses around safety and functionality modeling. The results from MAENAD in these sections will be looked at with great interest.

Another topic that is important is to look at how AUTOSAR is modeled on system level and how EAST-ADL can be used in this area. As Mecel is developing AUTOSAR SW and tools it is important to understand more how new research can be used in actual projects.

We will also push the use, of at least the principles around EAST-ADL modeling, in research projects where this is relevant.

4S:

The strategic objective of 4S is the increase of knowledge on advanced methods and tools, in order to be able to provide an ever-better support to the customers in the development of E/E systems, especially in the automotive field and the other ones that can be synergic, such as agricultural, construction and working machines. The specific methodology and technology areas of interest are functional safety, electronic architectures, electric and hybrid systems. In addition, 4S is developing with other partners, in the field of a national research project, methods and tools aimed to help electronic designers to manage functional safety during the product development (project Sisma). Therefore 4S is much interested to exploit the results of Maenad not only by using the tools that will be the results of the project or that will be realized as a consequence of the project, but also to transfer the methodological achievements to the software tools under development as internal R&D investment, as to produce advanced software products, capable to meet the expected market demand in the field of CASE tools for the development of E/E systems.

Among the other results, the expected achievements of MAENAD, which can be considered competitive assets for the future 4S’s business, are the design methodology covering functional safety aspects, the focus of the methodology on electric vehicle aspects, and the availability of EAST-ADL based tools, which could be integrated in the design environment under development by 4S and by his associated partners in Sisma.

2.2 Strategies with respect to tool vendors

Tool vendors involved in the project (MetaCase, Pulse-AR, Sistemite) are interested to exploit MAENAD outcomes extending the capability of their commercial development platform and tool suite in supporting EAST-ADL modelling language, with the aim to increase their competitiveness in the automotive market. Specific efforts by the tool vendors are described in the following:

MetaCase:

MetaCase aims to utilize the results of the project by providing a commercial, industry-strength modeling tool for EAST-ADL. This tool environment is provided with maintenance and support

program as well as training and consulting services. The services are related to teaching EAST-ADL and extending it for company-specific needs, like mapping to existing frameworks (e.g. in-house, AUTOSAR, JASPAR), linking to other tooling, such as fault tolerance, performance analysis and behavioral modeling tools, and to support processes in place.

In the short timeframe, the main users of the created tooling will be the other MAENAD partners. If this deployment is successful, the tool support will be marketed then to the broader automotive field. In parallel, EAST-ADL support will be made available to current customers, which cover OEMs, 1st level suppliers and their subcontractors, focusing on architecture modeling.

To guarantee applicable results, aka working modeling tools, the tool support is created incrementally and applied by the MAENAD partners, and by the current customers when possible, to test and verify the implemented language support. For MetaCase it is most relevant that industrial partners apply the created tooling in the case studies. Business wise the main risks deal with the acceptance and willingness of using the languages and tools developed within the project.

Pulse-AR:

pulse-AR intends to use the results of the Maenad project for the integration in its tool suite “Quasar” of EAST-ADL support for modeling / validation / code generation. This integration is in line with the ongoing development which is currently mainly focused on AUTOSAR support.

Indeed EAST-ADL with its functional focus is a good complement to AUTOSAR which is focused on software aspects. Supporting both languages enables to build a solution that increases the coverage of an automotive product development lifecycle.

SYSTEMITE:

Systemite provides the SystemWeaver development platform to large product developing organizations.

SystemWeaver has a programmable metamodel, and Systemite has successfully deployed SystemWeaver adaptations based on EAST-ADL, adaptations that since 2004 have been used for developing commercial Truck and Construction Equipment Electric/Electronic systems. These organizations have so far exploited many of the possibilities of EAST-ADL, for instance automatic generation of AUTOSAR system templates from the system model, and the use of RIF (Requirements Interchange Format) to exchange requirement information with suppliers. The use of EAST-ADL has furthermore been deployed on a wide and global scale in these organizations, with hundreds of developers in countries like Sweden, France, US, India and Korea.

The organizations are currently in the process of adopting ISO 26262, so an off-the-shelf solution for ISO 26262 has a direct commercial application with these customers. A project was started in 2010 towards a construction equipment manufacturer where one of the planned outcomes is an adaptation of the Dependability extension of EAST-ADL and the adoption of the MAENAD methodology.

Systemite has previously initiated industrial conferences and seminars, and has initiated a seminar for Swedish truck, car, and construction equipment manufacturers to be performed in March 2011, where EAST-ADL and the approach towards ISO 26262 will be presented. This means that exploitation will not only be based on tool applications, but also on the process and methodology, meaning that the impact will be on an even deeper level.

2.3 Strategies with respect to research and education

The University partners, KTH, TUB and UoH will introduce MAENAD results as appropriate within relevant courses. Exploitation in education will also take several additional forms including:

- Use of EAST-ADL as basis of diploma/M.Sc. theses
- Use of EAST-ADL as part of courses that involve ingredients on model-based development, including courses on automotive software engineering and embedded control systems development. Both KTH and TUB expect that the work on developing the EAST-ADL may be the source for new research topics.

In the context of existing or prospective collaborations with industry, there are also substantial opportunities for technology transfer and commercialisation by academic partners.

Commissariat à l'Energie Atomique

In MAENAD CEA List is responsible for the implementation of a dedicated support for EAST-ADL as an extension to its UML2 model editor Papyrus. CEA List intends to have this support maintained even after the conclusion of the project so as to contribute to the language promotion. CEA List intends to pursue the standardization effort in link with the MARTE language initiated in ATESST2 and continued in MAENAD in the forthcoming versions of the MARTE profile by defending this at the OMG meetings. Also CEA List intends to use the EAST-ADL UML profile as an example of domain specific realization of a profile in lectures and for master theses. Issues that will be gathered during the MAENAD project will provide interesting guidelines for future research both at conceptual (fundamental relations between both specifications), technical (enhancement of tools) and design process levels (how to guide inexperienced users in this task). This will also serve as examples for lectures.

The Royal Institute of Technology

How do you plan to exploit the main results of MAENAD project and to deploy them on your organization?

Maenad project results are expected to be used as a basis for new research projects.

Which MAENAD results do you think are of most interest to your organization?

There are no results now in the beginning of the project, but results in behavior modeling, meta-model evolution, safety, and more are expected.

Which kind of dissemination activities will you carry out to share the outcomes from MAENAD?

EAST-ADL put forward as a basis for the Cesar Meta-Model (CMM) in the CESAR (and later MBAT) Artemis projects. KTH and Volvo are developing a strategy for harmonization of the CESAR meta-model and the EAST-ADL2.

Describe the steps you will take towards deploying the MAENAD's results in your organization:

KTH will adopt various results from MAENAD in education; master level (Embedded systems masters program and possibly in the Mechatronics masters program) and education for industry on safety critical embedded systems.

What could MAENAD do (or should consider) in order to facilitate adoption of the EAST-ADL or the related tools?

A white-paper, describing EAST-ADL at a technical level, and motivation why the language looks at it does today. The level of detail should be in between the concept presentations and the domain model. This would be valuable to have as a working material when discussing EAST-ADL with other researchers and companies. This is under development in WP7.

What (expected) results might be relevant to standardize?

KTH believes in the current plan of creating an EAST-ADL association for the language.

Technische Universität Berlin

As one of the largest German institutes of technology, Technische Universität Berlin (Berlin Institute of Technology) will exploit the results of MAENAD primarily within its academic course programme: project results might be presented as an example of latest research in a lecture, or form the basis of active research work by students in seminars or Master/Diploma theses. Such exchange between research and education is of high value not only for the students but also from the perspective of the MAENAD project, because it can help bring new ideas and concepts from research into industrial practice when students are leaving university and starting a career in industry. In addition to that, Technische Universität Berlin will employ the project results, where applicable, in the context of its numerous collaborations with other research institutions (e.g. Fraunhofer FIRST) and with industry (e.g. Carmeq GmbH, a subsidiary of Volkswagen AG).

University of Hull

The UOH is currently commercializing HiP-HOPS, the state-of-the-art dependability analysis tool that is being extended and harmonised to EAST-ADL within MAENAD. The tool is being commercialised in collaboration with ITI GmbH, a German software house, and, therefore, there is already a route to market for new developments in HiP-HOPS that will be delivered as a result of MAENAD. Such developments include provision of support for advanced multi-perspective dependability analysis, evolutionary improvement of designs and automatic allocation of safety requirements.

To maximise exploitation opportunities, HiP-HOPS is being developed as a plugin that can be potentially interfaced to a variety of system modelling and Computer Aided Engineering tools. There are therefore also opportunities for exploiting results of the project together with other partners, e.g. tool developers that participate in the project. In this front, there is an ongoing exploitation plan with ALL4TEC, a company specialising in safety tools and consultancy in France, but also discussions with tool vendors in MAENAD. Specific plans for joint exploitation among project partners will be made as part of the refinement of the exploitation strategy of the project.

New results will also be transferred to industry via a number of active collaborations that the UOH has with companies in the European and global transport and space industries. These include collaborations with Toyota, Denso, Ricardo, Jaguar, Embraer, Airbus, Honeywell, EADS Astrium, FEV, AVL, Germanischer Lloyd, Det Norske Veritas, the European Space Agency and NASA. All these organisations currently use HiP-HOPS and look forward to evaluating the new results on EAST-ADL and HiP-HOPS that will arise from MAENAD.

The UOH is active in the state-of-the-art on Model-Based Safety Analysis (MBSA) in Europe and globally and is exchanging new results in this area with leading research institutes in the area including ONERA (Seguin), the Fraunhofer Intsitute (Trapp), Fondazion Bruno Kessler (Bozzano), LIX-Ecole Polytechnique (Rauzy) and Ecole Normale Superieure de Cachan (Faure, Merle, Roussel). MAENAD results are expected to be taken up and benefit other European research in MBSA through collaboration and participation in appropriate forums. In this context, the MAENAD consortium is presenting first results of the project in an MBSA workshop organized by the French Safety Critical Systems Club (Toulouse, 15-16/03/2011).