Complex Embedded Automotive Control Systems
CEmACS

DaimlerChrysler
SINTEF
Glasgow University
Hamilton Institute
Lund University

Public
Deliverable D18
Plan for using and disseminating the knowledge

Second issue
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Executive Summary

This is the third issue of the plan for using and disseminating the knowledge of the CEMACS project (corresponding to the deliverable D18 at milestone MS3). This document costitutes an annex to the periodic activity report (deliverable D17 at MS3). The main objective of this plan is to provide a systematic and consistent framework for disseminating and exploiting the CEMACS results. The plan will be regularly updated and extended and a final issue will be provided at the end of the next reporting period.

In the plan we define the following main paths of dissemination and exploitation:

- Dissemination of generic results (theoretical, design methodology) via publications and a project workshop on theory,
- Exploitation of software (design/observer software,
- Dissemination of commercially non-sensitive applicational results in in peer review journals, at major automotive conferences in Europe and at a project workshop on industrial applications. One workshop dedicated to industrial applications.
- Direct exploitation by transferring the project results to the passenger cars and commercial vehicle development departments of DaimlerChrysler.
- Exploitation of spin-offs for other applications,
- Establishing contacts to other related FP6 projects.

The Project objectives are well integrated with the current R&D activities of the industrial partner and the automotive industry in general; this will enable an efficient industrial exploitation of the CEmACS results.

Contents

1 Objectives

According to the nature of the different technical workpackages the dissemination/exploitation strategy can be subdivided in four principal activities:

1. *Dissemination of generic results (theoretical, design methodology):* Generic results wich are mainly the results of WP3 and WP4 will be disseminated freely via publications in peer review journals and in major academic and industrial conferences. Preprints of the publications will be provided as annexes to the deliverables D5, D18 and D23. One scientifically-orientated workshop will be organised by one of the university-based partners following the end of the first project year approximately at month 15. This workshop will constitute the deliverable D19 at MS3.

2. *Exploitation of software (design/observer software):* All partner will aim on exploitation and commercialisation of generic software arising from WP3 and WP4. The progress in software exploitation will periodically monitored and reported in the dissemination/exploitation plans.

3. *Dissemination/Exploitation of applicational results:* There will be a dissemination of the commercially non-sensitive results of WP1-2 and WP5 in peer review journals and in major automotive conferences in Europe. One workshop dedicated to industrial applications will be organised by DC in Germany around month 30 (deliverable D24). The results of WP1 will be directly exploited by transferring them to the passenger cars and commercial vehicle development departments of DaimlerChrysler. This transfer will be carried out in connection with ongoing internal research projects and via the DC control systems and active safety steering commitees. Selected team leaders from the development departments will be invited to the review meetings and presentations to provide the review panel with feedback on the exploitability of the CEMACS research results. Within WP2/WP5 an experimental tool for emulating vehicle dynamics will be developed. This test vehicle will be directly used within DC research and development for analysing and designing driving dynamics with the objective of making the design process more efficient.

4. *Exploitation of spin-offs:* Spin-offs from the test vehicles and from the methodology of the project for other applications will also be investigated. Expected spin-offs may arise with respect to other automotive and non-automotive applications. In particular, the ICC methods of WP2 can be used to study the interaction between and coordination of production-type active steering, brake-by-wire and active suspension systems. Also, the state observation methods used in WP4 can be expected to create a spin-off for other vehicle applications.

Exploitation of project results will not be constrained to DaimlerChrysler. The SINTEF, GU, LU and NUIM staff have strong, long-standing links with industry and a track record in technology transfer and exploitation of intellectual property. These links will be used to encourage technology transfer and exploitation through direct contact with interested parties. Intellectual capital generated by the project

will be developed commercially where appropriate. Many of the results of CEMACS will be generic and there is a potential for application not only within the European automotive industry but also within process industries, power systems, aerospace industries and marine vehicles.

2 Activities and achievements

2.1 Dissemination of generic results

The dissemination of generic results was continued as planned. Since the start of the project 14 papers have been submitted to peer-review journals [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14], of which 10 papers have been accepted for publication and 3 published. 24 papers have been submitted to major conferences [15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 24] of which 13 have been accepted. 6 papers are in preparation [38, 39, 40, 41, 42, 43]. Many of these papers have been prepared as a joint effort of two or more partners of the consortium.

In addition to the publication there is also a patent application [44] on multiple-model-based vehicle load estimation.

The CEMACS workshop on theory was held in Lund at month 23 (June 1-2). The workshop was a joint event with the FP6 network HYCON strengthening the collaboration between the projects. The CEMACS consortium contributed three papers at this workshop [26, 33, 45]. In the two panel discussions which where attended by a number of industrial participants Jens Kalkkuhl gave an overview of the CEMACS project.

The *Hamilton Institute* was involved in organising a special issue of the IEE Proceedings-Part D, September 2006, on the topic of Hybrid Systems. Three papers from the consortium have been published in this issue.

2.2 Exploitation of software

Although software development is not a main objective of CEMACS the consortium aims at exploiting and commercialising software arising from workpackages WP3 and WP4. In this respect the nonlinear observation and individual channel analysis and design software is of particular interest. *SINTEF*, *Glasgow University* and the *Hamilton Institute* will use the prototypical applications within CEMACS for further validation and as a platform for promoting their software.

2.3 Dissemination and exploitation of applicational results

A primary route to assessment of the industrial impact of CEMACS will be the application case studies (experimental validation) of WP1-2 and WP5 in the automotive sector, carried out within DaimlerChrysler Research and Technology. The validation experiments will be crucial for a successful exploitation of the applicational project work. In addition to the A class and S class based test vehicle a commercial van with single-wheel braking will be used by the project to test roll-over protection strategies under real-life conditions. The presentation of all workpackage results in

suitable test vehicles will constitute an excellent basis for dissemination in industry. A successful real-life presentation of the nonlinear observer to team leaders of the DC passenger car department took place on the test track in Sindelfingen in at month 24. At this event the estimates of the side-slip angle from the nonlinear observer where displayed along with the Kalman filter estimate and the value measured by the optical speed sensor.

Contact where also established to the DC Commercial Van development department which is interested in using the results of workpackage WP2 (vehicle dynamics emulation) to assess design modifications made in Vans. The department supplied measurement data of a Viano van for the set up of a realistic reference model to be used in Integrated Chassis Control. Two presentations of the Pegasos test vehicle were given to developers of this department at months 22 and 23. There are more presentations to come in the third year of the project (months 28 and 32).

In addition to the DC internal presentations selected experimental results will also be presented at major conferences on automotive control applications such as appropriate SAE symposia [24, 27]. This is scheduled mainly the third year of the project.

Another dissemination activity which emerged in the second year is the collaboration with the *AUTOSAR* consortium (AUTOSAR = **Aut**omotive **O**pen **S**ystem **Ar**chitecture, `www.autosar.org`). The objective of AUTOSAR is the establishment of an open standard for automotive system architecture. It will serve as a basic infrastructure for the management of functions within both future applications and standard software modules. DaimlerChrysler as a Core Partner of AUTOSAR will built an S-class based demonstrator car demonstrating the modular scalable transferable and reusable architecture and the standardised interfaces wich are the objective of the consortium. It is planned to incorporate functions developed within the CEMACS project into the AUTOSAR demonstrator (see figure 1). Hereby, the focus will be mainly on the results of workpackage WP4. The demonstrator car will be available at month 29 and, prior to the adoption of the AUTOSAR architecture a rapid prototyping version of the functions based on Matlab/Simulink will be implemented. The exploitation of CEMACS results in the framework of AUTSAR will have a considerable impact on dissemination since the AUTOSAR consortium comprises all the major European automotive OEMs and suppliers. Also, the embedded systems aspect of the CEMACS project will be strengthened.

2.4 Collaboration with related FP6 activities

A collaboration with the FP6 STREP project SPARC (Secure Propulsion using Advanced Redundant Control) has been established. This includes regular meetings, exchange of research results and joint activities such as organisation of workshops. A first meeting of the project coordinators took place at month 7 of the CEMACS project. At this meeting details of the collaboration have been worked out. This was followed by a demonstration of the SPARC results to members of the CEMACS consortium. A presentation of applicational CEMACS results is scheduled towards the end of the project. Other links will include related projects such as ARTIST2 (Advanced Real-Time SysTems) and HYCON in the fields of real-time control and

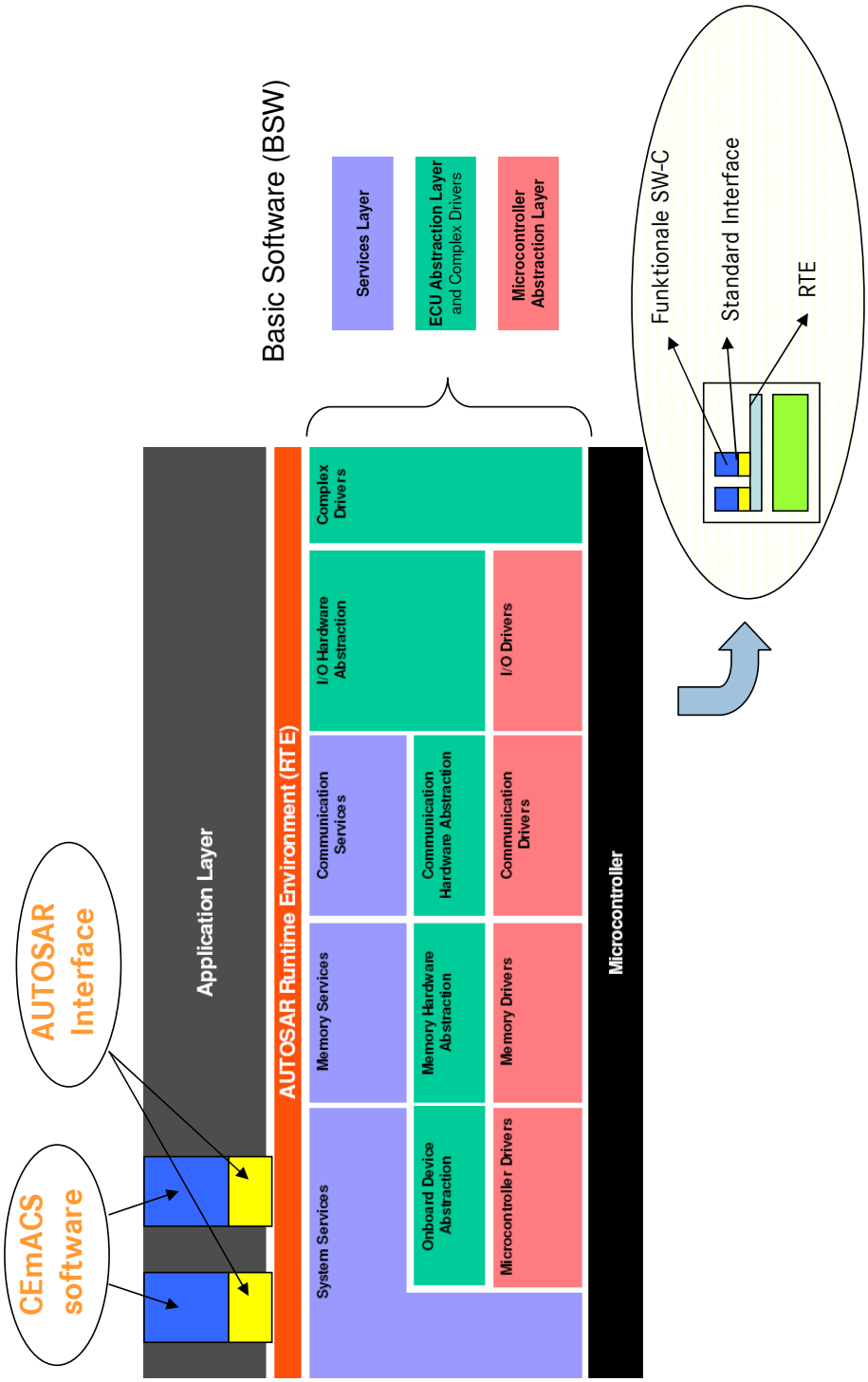

Figure 1: CEMACS Autosar Architecture

hybrid control. The coordinators of CEMACS and HYCON met in Brussels at the fringes of the workshop "'Control in FP7"'. A further meeting took place at month 23 at the joint CEMACS and HYCON workshop in Lund.

2.5 Enhancing the profile of the CEMACS project

To highten the awareness of about the project a CEMACS website has been set up and is regularly updated. The project website is linked to the official FP6 website. Information material (flyers) will be issued and distributed both, externally (at conferences and workshops) as well as internally (e.g. within the different DC development departments).

3 Timetable of Dissemination Activities

In Figure 2 a preliminary timetable for the exploitation and dissemination activities is shown.

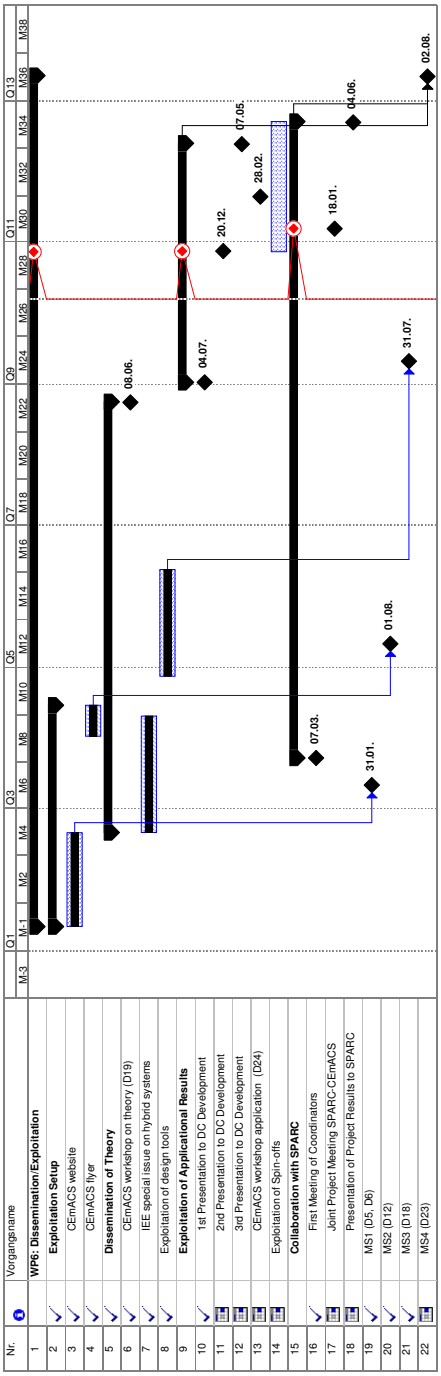

Figure 2: CEMACS Exploitation and Dissemination Activities

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