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Final Public Report

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1. INTRODUCTION

The ESPRIT/OMI MODISTARC Programme Nr 25332 was awarded by the CEC in 1997. It has been achieved over a 20 month period lasting from September 1997 to April 1999. MODISTARC stands for Methods and Tools for the validation of OSEK/VDX based DISTributed ARChitectures.

This report summarizes the work accomplished in the project, the main results obtained and the overall conclusions from the companies or institutes participating in the project consortium.

2. PROJECT SUMMARY

2.1 MOTIVATIONS

Through the OSEK/VDX consortium activities, the European car industry has defined a common software architecture for Electronic Control Units (ECUs). Clearly, the goals of this initiative are to save costs and development time of distributed automotive applications by enabling portability and reusability of application software as well as network interoperability. The OSEK/VDX architecture includes three basic modules defining an Operating System (OS), as well as Communication (COM) and Network Management (NM) protocols. The related standards specify the interfaces and functionnality of the basic modules. MODISTARC aims at supporting this standardisation effort by providing the relevant test methods and tools to assess the conformance of OS, COM and NM implementations to the OSEK/VDX specifications. This way MODISTARC has helped the European car industry to keep its leading position in implementation of network based architectures inside vehicles.

2.2 CONSORTIUM

The MODISTARC consortium was balanced between experts in the conformance testing area and major representatives of the European car industry. It consisted of twelve companies or institutes, as follows:

- 4 car manufacturers: PSA, BMW, Opel, Renault,
- 4 automotive equipment suppliers: Motorola, Sagem, Siemens Automotive and Siemens AG,
- 3 conformance experts: Dassault Electronique (who moved to Thomson-CSF Detexis on January 1st, 1999), ForschungsZentrum Informatik (FZI) and Institut National de la Recherche en Informatique et Automatique (INRIA),
- the Institute of Industrial Information Technology (IIIT) of the University of Karlsruhe who is also the coodinator of the OSEK/VDX activities.

It should be noticed that six in the MODISTARC companies/institutes are also members of the OSEK/VDX steering committee: BMW, Opel, Renault, PSA, Siemens and the IIIT Karlsruhe.

The project leader was Dassault Electronique (now Thomson-CSF Detexis).

2.3 WORK PROGRAMME

To achieve its objectives, the MODISTARC programme has been split into 9 workpackages including 7 technical workpackages:

- WP2: Conformance testing methodology.

The goals of this workpackage are to develop a conformance testing approach adapted to the OSEK/VDX specifications and to the constraints of the automotive environment.

- WP3: Test suites definition for OS.

  The goals of this workpackage are to define the tests that OS implementations must pass in order to conform to the OSEK/VDX OS specification.

- WP4: Test suites definition for COM and NM

  The goals of this workpackage are to define the tests that COM and NM implementations must pass in order to conform to the OSEK/VDX COM and OSEK/VDX NM specifications respectively.

- WP5: Conformance tool development for OS

  The goals of this workpackage are to develop a software tool implementing the OS test suites defined in WP3.

- WP6: Conformance tool development for COM and NM

  The goals of this workpackage are to develop a software tool implementing the COM and NM test suites defined in WP4 .

- WP7: OSEK/VDX implementation adaptation

  The goals of this workpackage are firstly to update OSEK/VDX implementations according to the last versions of OSEK/VDX specifications published during the project and secondly to prepare the implementations for conformance testing.

- WP8: Conformance test campaign

  The goals of this workpackage are firstly to validate the conformance tools developed in WP5 and WP6 by executing the test suites against the OSEK/VDX implementations developed in WP7. In a second step, interoperability tests are planned on a network platform interconnecting the previously certified OSEK/VDX implementations.

Moreover, a new task has been created in the course of the project in order to define the procedures and rules that OSEK/VDX suppliers will have to follow to get the OSEK/VDX certificate.

2.4 MAIN ISSUES

The Modistarc project has concluded successfully. All tasks of the work programme have been achieved. The project has issued new standards about conformance testing agreed by the OSEK/VDX consortium. All documents are available at the OSEK/VDX web site: www.osek-vdx.org, including:

- Conformance methodology 2.0.

  The developed methodology is largely inspired from the ISO standard 9646 defining the conformance methodology for ISO network protocol implementations. The document also specifies the applicable test architectures and it describes the techniques used to generate the test cases from the OSEK/VDX specification: classification tree method for the OS, tree analysis of SDL specifications for COM and NM.

- Conformance test suites for OS consisting of two documents:
  - OS Test Plan 2.0
  - OS Test Procedure 2.0

According to the methodology, the test plan consists of test purposes extracted from the OSEK/OS specification. The test plan specifies the sequence of the interactions between the test application and the implementation to verify one or more test purposes.

- Conformance test suites for COM and NM consisting of four documents:
  - COM Test Plan 2.0
  - COM Test Procedure 2.0
  - NM Test Plan 2.0
  - NM Test Procedure 2.0

  Here, test plan and test procedure mean the same as above for OS. The test architecture matches the "distributed" method defined in ISO 9646. The test cases are specified in TTCN language (ISO 9646-3).

The project has also issued the associated Conformance Tools developed by FZI for OS and by Thomson-CSF Detexis for COM and NM. Both tools are going to be marketed by Thomson-CSF Detexis. The products will be launched at the next OSEK/VDX workshop end of 1999. They have been validated against OSEK/VDX implementations provided by BMW, Motorola, Sagem and Siemens Automotive. As a consequence, those implementations are the first ones that can be considered truly "OSEK/VDX compliant".

Each tool provides with a user friendly interface allowing to configure the tester, select and execute the test cases, analyse and display the test results. It runs on PC/Windows NT with an additional CAN board for COM and NM tests.

2.5 OSEK/VDX CERTIFICATION PROCEDURE

The certification procedure of OSEK/VDX implementations is currently defined as follows:

1. Each individual supplier of an OSEK/VDX implementation shall perform the certification process for each new software release as documented in Modistarc.
2. Independent entities authorised by the OSEK/VDX Steering Committee (STC) shall audit the certification performed by the supplier and its corresponding results.
3. The auditing entity issues a certificate upon a successful auditing of an OSEK/VDX implementation according to the certification process for a given time duration.
4. Based upon such certificate Siemens AG as TradeMark owner on behalf of the OSEK/VDX STC partners shall grant the right to the supplier to use the OSEK/VDX TradeMark on its certified OSEK/VDX implementation.

EXPERTS AND TOOL DEVELOPERS

3. THOMSON-CSF DETEXIS

3.1 ROLE IN THE PROJECT

Dassault Electronique (now Thomson-CSF Detexis) has been a European leader in the field of real-time networks on the avionics, aerospace and defence markets for about 25 years. Through this experience, the company has gained strong skills that were successfully applied to the automotive sector in Modistarc.

Thomson-CSF Detexis took the leadership of the project and as such was in charge of all tasks connected to administrative management and technical work organisation. Moreover, as an expert in networking techniques, the company was also leader of WP2 (Conformance Testing Methodology), WP4 (Conformance Test Suites for COM and NM) and WP6 (Conformance Test tools for COM and NM). Its role was to develop the appropriate methodology, to specify the test suites and to implement the conformance tools devoted to OSEK/VDX COM and NM.

3.2 WORK ACCOMPLISHED

- Development of conformance methodology for OSEK/COM and OSEK/NM implementations, including:
  - analysis of the OSEK specification, selection of relevant interfaces for testing and relevant protocol information,
  - definition of methods do derive conformance tests from the SDL specification and obtain the best coverage of the specification by the tests,
  - definition of the test architecture based on the ISO 9646 distributed method and comprising a Lower Tester and an Upper Tester. The Lower Tester exchanges data with the implementation under test (IUT) through the network. The Upper Tester exchanges data with the IUT through the API.
- Development of the Test Plans and the Test Procedures for OSEK/COM and OSEK/NM implementations, including:
  - definition of a Test Management Protocol allowing to synchronize the respective actions of the Lower Tester and the Upper Tester,
  - definition of the test suites in TTCN comprising about 125 test cases for the COM and 150 test cases for the NM,
  - validation of the cases by simulation of the TTCN sequences against the SDL models of the COM and NM specifications.
- Development of the OSEK/COM and OSEK/NM conformance tools, including:
  - the Lower Tester implemented as a Windows/NT application consisting of a graphical user interface, the test suite issued by automatic C code generation from the TTCN specification and an adaptor that interfaces the test suite with the PC/NT environnement and the CAN network,
  - the Upper Tester implementing the Test Management Protocol and delivered as a C code to be installed by customers in the target equipment (e.g. ECU) along with the OSEK/VDX implementation,

– technical support of the OSEK/VDX suppliers Motorola, Sagem and Siemens during the conformance test campaign.

3.3 RESULTS

The Conformance Methodology and the Test Plans and Test Procedures are new OSEK/VDX standards that complete the set of applicable documents and will help automotive suppliers to develop reliable OSEK/VDX implementations. Feedback from the project will also help the OSEK specification groups to improve quality and readability of the specification in future releases.

The conformance tools are available and supported by the OSEK/VDX steering committee. They will be marketed and largely publicised through conferences, demonstrations and advertisements in the next months. They represent a key milestone of the conformance acceptation procedure that is going to be put in place by the steering committee. For end users, they will guarantee the installation of compliant OSEK implementations onboard vehicles and improve confidence in quality and security of automotive systems.

4. FZI

4.1 ROLE IN MODISTARC

FZI was engaged in the OSEK/OS part of MODISTARC. This includes the development of the conformance testing methodology, the specification of the test suite, and the development of the certification tools.

4.2 WORK ACCOMPLISHED

- Development of the methods and techniques for certification of OSEK/OS implementations.
- Preparation of the OS part of the conformance methodology document.
- Specification of test cases by means of the classification-tree method
- Preparation of the OSEK/OS test plan and OSEK/OS test procedure document
- Specification of the test sequences using formal methods (Statecharts) and automated C code generation
- Development of test analysis tools which allow an automated verification of the test results.

4.3 RESULT / CONCLUSION

The OSEK/OS conformance tools developed in MODISTARC consist of the test suite, a test configuration tool, and a test analysis tool. The test configuration tool is used to select the test sequences of the test suite that are to be run on the implementation under test. At the end of a test run, the test analysis tool is used to verify automatically the test results. These tools have been successfully run on OSEK/OS implementations of BMW, Motorola, Siemens Automotive, and Sagem.

5. INSTITUTE OF INDUSTRIAL INFORMATION TECHNOLOGY, UNIVERSITY OF KARLSRUHE

The Institute of Industrial Information Technology (IIIT) of the University of Karlsruhe works as co-ordinator of the OSEK/VDX project since 1994. With the IIIT chosen then as a neutral and valued partner, all the activities of the IIIT aimed at the progress and success of the OSEK/VDX project by moving forward and supporting the installation of an effective structure as it exists and as it has proven by now. After all, these facts have lead to a relatively quick release of the first OSEK/VDX specifications, defining a newly created standard in automotive. Being one basic research activity at the IIIT in the first place, the technology involved in this area has been promoted by current activities and contacts in the industrial field.

In September 1997, with the start of the ESPRIT project MODISTARC of the information technologies (IT) programme project - as it is managed by the Directorate General for Industry of the European Commission - the main goal of a project like MODISTARC was to support the effort of the European car industry towards the development and standardisation of networking architectures within an integrated programme of industrial R&D projects. At that time, with the recently issued three new standards defining respectively the OSEK/VDX Operating System, Communication and Network, the goals of MODISTARC were aiming at supporting OSEK/VDX.

The IIIT decided to contribute within the MODISTARC project and to focus on the success by bringing their experience gathered ever since the start of the OSEK/VDX project and by applying the tasks within OSEK/VDX, as this work is strongly related towards MODISTARC.

During the MODISTARC project, the IIIT took care of ensuring relations to and close co-operation with the OSEK/VDX consortium. This included:

- the communication and report of interests, progress and evolutions (on a technical as well as on an organisational basis) between MODISTARC and OSEK/VDX consortium,
- the provision of feedback to both projects respectively,
- the organisation of opportunities for joined discussions whenever the provision of a direct exchange became obvious and fruitful,
- the addressing of first steps towards a certification jointly driven on behalf of both MODISTARC and OSEK/VDX in their common interest of completing the purpose and goals of MODISTARC,
- the dissemination of the MODISTARC project and results within and outside of the OSEK/VDX consortium (OSEK/VDX Working Group meetings, establishing and maintaining an internet homepage dedicated to the MODISTARC project and its officially released documents, presentation of MODISTARC on conferences all over the world, promotion of a workshop for giving each partner an opportunity of presenting the results of the MODISTARC project)
- and - last but not least - basic organisational issues (invitation to MODISTARC project meetings, writing the minutes of these meetings and providing them to all partners).

For more information about MODISTARC, OSEK/VDX or the IIIT, please have a look at the respective internet home pages related to:

- MODISTARC **http://www.osek-vdx.org/Modistarc.html**
- OSEK/VDX: **http://www.osek-vdx.org/**
- IIIT **http://www-iiit.etec.uni-karlsruhe.de** (Click on „Research“)

The IIIT has ever been and always will be open for projects and developments especially - but not exclusively - in the automotive field or around OSEK/VDX, MODISTARC and related areas.

Emphasizing its strong interest, the IIIT will put its experience, knowledge and support at the disposal of new projects or interested parties.

6. INRIA

The contribution of INRIA to the Modistarc project consisted in a participation to the definition of the testing methodology and architecture described in the "Conformance Testing Methodology" document and then in a careful review of the test-objectives expressed in the COM, NM and OS "Test Plan" documents.

6.1 CONTRIBUTION TO THE DEFINITION OF THE TESTING METHODOLOGY AND ARCHITECTURE

A testing methodology based on the widely accepted ISO-9646 standard has been advocated. ISO-9646 is the state-of-the-art testing methodology standard in the telecommunication industry. However it had to be adapted to both the stringent requirements of OSEK certification and the specific constraints imposed by the architecture of OSEK automotive embedded systems, for instance:

1. The strict limitation of RAM/ROM memory available on ECUs (a few k-bytes) in which the upper-tester had to be fitted
2. The difficulty of synchronising upper and lower testers while minimising the interference with the COM and NM implementations under test.

Automatic generation of some of the test cases for COM and NM has been advocated and evaluated (using the prototype tool TGV of INRIA/VERIMAG). For this purpose, TGV has been interfaced to SDT, the SDL tool suite marketed by Telelogic. Unfortunately this had to be dismissed later in the course of the project when it became evident that the SDL formal specifications of COM and NM provided to us by the OSEK consortium lacked maturity and stability.

6.2 REVIEW AND EVALUATION OF TEST PLANS

INRIA has undertaken a careful review of the "Test Plan" documents for COM, NM and most particularly OS. It aimed at checking the test objectives contained in these documents against the general requirements of OSEK certification and the OSEK specifications of OS, COM and NM.

CAR MANUFACTURERS

7. ADAM OPEL AG

7.1 WORK ACCOMPLISHED

The International Technical Development Center of the Adam Opel AG participated in the work package 2 (WP2), work package 3 (WP3) and work package 8 (WP8) of the MODISTARC project. Opel contributed input during the different work group meetings. The scope of WP2, at the beginning of the project, was the definition of the conformance testing methodology. During the following WP3 the test suites for the OSEK/VDX operating system were defined. Opel hosted the second EC review meeting in October 1998. During WP8, at the project end, the results of the different work packages were used in a conformance test campaign. Opel got in contact with the TÜV-Rheinland for a test witnessing procedure. The test witnessing procedure is required to close the gap between the MODISTARC test procedures performed by the OSEK/VDX implementers and the issue of the OSEK/VDX trademark.

7.2 RESULTS

The deliverable of WP2 was the OSEK/VDX document ‘Conformance Testing Methodology’ that was made public on the MODISTARC homepage. The results of the WP3 were the certification test plan for the OSEK/VDX operating system and the certification procedure document for the OSEK/VDX operating system. These documents were the base for development of the conformance test tool for the OSEK/VDX operating system by the ‘Forschungszentrum für Informatik’ in Karlsruhe (FZI). During WP8 the tools and the human interfaces of the tools showed some insufficiencies that could be changed. The contact to the TÜV-Rheinland leaded to brainstorming meetings. The output of these meetings will be the base for future definitions of test witnessing procedures by an appointed institute.

7.3 CONCLUSION

The work, like conformance methodology and conformance procedures, done by the MODISTARC project is a flexible base for adapting the conformance tests to future versions of the OSEK/VDX specifications. The existing conformance test suites and tools support the confidence of Opel in OSEK/VDX. The definition of a strategy for the maintenance and the adoption to next versions of the OSEK/VDX specifications is one of the future challenges. Set-up of test witnessing procedures to enable the issuing of the OSEK/VDX trademark is another future challenge. Extensions of the conformance tests with respect to the performance of OSEK/VDX implementations and the interchangability of OSEK/VDX applications are desirable.

8. PSA

8.1 ROLE IN THE PROJECT

As car manufacturer, PSA is responsible for the integration of the electronic subsystems in its vehicles. It implies that the interaction between ECUs should be properly described and certified. OSEK/VDX give an answer to this problem, provided that the OSEK/VDX components used are certified to be in conformance with their specification to ensure interoperability between the ECUs. This is the aim of the MODISTARC program. At the end of the program interoperability of certified ECUs is demonstrated on a test platform

8.2 WORK ACCOMPLISHED

For this, PSA:

- participated to the analyse and definition of the conformance testing methodology and the test suites for COM and NM.
- defined, in agreement with the other participants, the test platform:
  - common interface,
  - modules (server or client) to be added in the ECUs,
  - interoperability tests to be executed on the platform.
- validated the test platform and executed the interoperability tests.

8.3 RESULTS

The interoperability has been demonstrated on a test platform using three ECUs previously certified using the tools developed in the MODISTARC program.

9. RENAULT

Renault has been an associated partner to the Modistarc since September 1997. On the Renault side, S. Boutin and L. Massimelli-Mathieu have been involved in the project.

9.1 WORK ACCOMPLISHED

- verification of the OSEK Network Management SDL specification, partial verification of the OSEK Communication SDL specification (for this part, Mr Stunault from Thomson-CSF Detexis performed most of the work). These actions had not been planned prior to the project but nevertheless essential as the SDL specifications were the basis from which Thomson-CSF issued conformance test cases.
- contribution to the test procedure documents: we advocated a test procedure allowing to perform the OSEK certification and the validation of ECUs with exactly the same tool. Unfortunately, our proposal was not implemented eventually.
- participation to all the project meetings by S. Boutin.
- support by L. Massimelli-Mathieu, for all the questions concerning Communication and Network Management.

9.2 RENAULT AND OSEK

Renault will already use embedded OSEK components in the new Megane by April 99. Moreover Renault clearly advocates OSEK and is an active member of the OSEK consortium. There are Renault representatives at the various OSEK working groups: OS, NM, COM, OIL.

9.3 INTEREST OF RENAULT THROUGH MODISTARC

OSEK certification (and more generally validation) is already performed at Renault following a "home made" procedure. Our aim is to externalize this proprietary procedure as soon as a rationalized and standard procedure will be available on the market place. To our point of view, suppliers and OSEK vendors ought to be the end users of the Modistarc project because they are able to perform the certification for a wider set of ECUs than Renault alone can do. So the Modistarc project should allow to lower the price of certification. For all these reasons (externalization, lower prices, standard pieces of

code) we are satisfied to see that the Modistarc project comes to its end successfully. So Renault advocates the use of the certification procedure issued in the Modistarc project.

10. BMW

10.1 ROLE IN THE PROJECT

At BMW the implementation of OSEK software modules is currently under investigation. Besides the extensive performance investigations, the conformance to OSEK is checked step by step with reference to the specifications. The implementation of a conformance testing tool is seen to be a significant gain in time, particularly in testing release updates from the different OSEK implementations.

10.2 WORK ACCOMPLISHED

BMW delivered the following inputs for the specification of the test plan and the test procedure elaborated in the WPs 2 to 6:

- Separate the different test runs according to Conformance Classes of OSEK OS.
- Review of the different versions of the test plans for OS, COM and NM.
- Test environment for the HW related parts of the communication channel.
- Confirmation of the testplans by hand-written test procedures outside of the scope of MODISTARC at the BMW Software Standard Core implementation with HC12 and C167 CPU's.
- Concept development for the integration of the OSEK compliant Operating System with the OS test suite from FZI.

10.3 RESULTS OBTAINED

In the framework of MODISTARC the BMW conformance test campaign concentrates on an OSEK operating system for PowerPC.

- Static test scenarios of alarm calls: The implemented OS uses a HW timer as a time reference for the alarm calls. The resolution of the time base is variable via a configurable prescaler unit of the HW.
- Test of TerminateTask: Every task of a test case in the test suite ends with a check of TerminateTask(). An OSEK-OS supports a call of TerminateTask() within a task.
- ChainTask: According to the OSEK specification the API function ChainTask() causes the current task to be terminated and activates the chained task. The implemented OS supports a call to TerminateTask() at the end of a task only. Therefore ChainTask() can only be used as the last function call within a task.
- Non interruptible ISR / interrupt processing: In the implemented operating system a non interruptible ISR can be implemented using interrupt disabling. The test suite supplies call-back functions in the prologue and epilogue of every test case.
- Resource access: The tested operating system supports resource access even within an ISR. The test suite provides test scenarios with resource accesses within ISR's.
- Error Hook: The parameter list of ErrorHook() in the test suite does not provide an optional parameter. It is possible to provide a software adapter to adjust the kernel to the test suite. It calls the kernel error hook with additional parameters.

10.4 CONCLUSION

BMW has made good experiences using MODISTARC documents and the test suite from FZI. There are only problems with test cases for dynamic alarms using the functions „CertInitCounter“ and „CertTriggerCounter“. The test suite assumes a Counter API which is not standardly provided by implementations of OSEK OS. This is a situation to be addressed because there is no specification of a Counter API in OSEK OS V2.0 R1.

BMW expects an open commercial usage of tools for the certification process for OSEK compliant products as soon as possible. The certification tools have to able to be updated according the current and upcoming versions of the OSEK specifications.

In addition a clear conformance testing business plan as well the evaluation of the OSEK modules as the certification of the final ECU implementations are required.

EQUIPMENT SUPPLIERS

11. MOTOROLA

11.1 COMPANY COMMITMENT

Motorola considered MODISTARC project as an opportunity to make sure that Motorola OSEK development strategy was in line with certification needs. One of the key features of the OSEK/VDX standard is the "interoperability" of OSEK ECU's which leads to easier and faster integration of ECU's. There must be a means of verifying that all OSEK implementations are compliant to the OSEK specification. Also, it is important for Motorola as an OSEK software supplier to be certified as we expect our customers in the automotive industry to require it.

In the framework of the MODISTARC project Motorola was committed to participate in the following tasks:

- Conformance tool for OS development (work package 5)
- Conformance tool for COM & NM development (work package 5)
- OSEK OS/PC implementation (work package 7)
- OSEK NM/PC implementation (work package 7)
- OSEK COM/PC implementation (work package 7)
- OSEK OS/PC certification (work package 8)
- OSEK NM/PC certification (work package 8)
- OSEK COM/PC certification (work package 8)

11.2 WORK ACCOMPLISHED

All the activities the company was committed to accomplish (listed above), have been performed in accordance with project schedule.

11.3 RESULTS

As a result of participation in the project, Motorola developed:

- OSEK OS/PC implementation operating on PC under WindowsNT.

  All Basic and Extended Conformance Classes, scheduling policies, both Basic Status and Extended Status were supported.

  All the certification tests passed on this implementation.

- OSEK COM/NM/PC implementation operating on PC under WindowsNT.

  All Communication Conformance Classes for COM, Direct and Indirect management for NM were supported.

  Due to a number of ambiguous statements/requirements in COM and NM specifications, 6 of 125 COM tests and 8 of 153 NM tests did not pass yet.

  At the moment, a work on fixing the issue is being performed in cooperation with the COM/NM conformance tool supplier.

11.4 CONCLUSION

In addition to MODISTARC activity, Motorola is developing OSEK OS, COM and NM as commercial products, not only for Windows NT but also for various microcontrollers. Motorola intends to certify our microcontroller versions of OSEK as well.

OSEK OS, COM and NM conformance tools developed in the framework of the project are used by the company as a part of OSEK System Software Testing.

12. SAGEM

No Input.

13. SIEMENS AUTOMOTIVE S.A.

13.1 ROLE IN THE PROJECT

As member of OSEK consortium Siemens brings its know how of OSEK specification to the Modistarc project, in order to establish the test suites for OSEK certification.

By the way the main action from Siemens is related to OSEK software implementation and certification of these implementation. As results Siemens validated on its OSEK implementation the certification tool provided by FZI and Thomson Detexis.

13.2 RESULTS

The outcome we have from the certification is :

- OSEK operating system v2.1 r1 ; certified for conformance class BCC1
- OSEK communication v2.1 r1 ; certified for conformance class CCC0 with segmentation protocol certified as well (needed for « diagnostic on CAN »)
- OSEK network management v2.5 ; certified for core functionnality

The certification allowed us to correct wrong interpretation of OSEK specifications, thus to be conform to the specifications.

In order to demonstrate the relevance of the methods and tools used for the certification, Siemens participated to the conformance test campaign. This conformance test campaign showed that electronic control unit with OSEK certified software can exchange messages on a CAN bus without additional work at the car manufacturer side.

13.3 CONCLUSION

Today Siemens is developing software module based on 3 differents OSEK environment for customer oriented projects. With OSEK certification we will be able to reuse SW module written in different OSEK environments.

Furthermore additional items have been identified during Modistarc project. This improves mainly performance criteria for OSEK implementions