Peter P. Hofmann, Andy Schürr (Eds.)

OMER –
Object-oriented Modeling of
Embedded Real-Time Systems

Postworkshop Proceedings of
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OMER-2: May 10-12 2001, Herrsching am Ammersee

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Foreword

In today’s world embedded realtime systems are everywhere. Often more or less unnoticed they fulfill the task to control the behavior of technical systems in our homes, cars, and offices, in the hospital and at various other places. In all these cases the complexity and number of functions realized in software increases rapidly. Often this software is still developed using software engineering technologies of the eighties. As a consequence, it does not fulfill our expectations concerning the needed quality expressed in terms of reliability, security, timeliness, maintainability, reusability, and other "ilities". Furthermore, it often suffers from a separation of functions and data as well as from the lack of well-defined subsystem boundaries with precisely documented interfaces.

These are the reasons why object-oriented and component-based methods are nowadays more or less accepted means for the development of embedded RT system software. They promise to facilitate the development, deployment, and reuse of software components with well-defined interfaces. This line of development started at the end of the last millenium with the announcement of the first generation of CASE tools that were able to generate code for embedded system targets from high-level models e.g. defined in the Unified Modeling Language (UML).

At that time we organized the first OMER workshop on "Object-oriented Modelling of Embedded Realtime systems" (http://ist.unibw-muenchen.de/GROOM/OMER). This workshop addressed all aspects of the development and application of object-oriented methods (languages, tools, and processes) for the analysis, design, and implementation of embedded RT software. It served as a platform for academia and industry as well as for tool developers and their clients to exchange their first experiences with OO development of embedded RT systems and to discuss new trends concerning e.g. the development of an UML standard extension (profile) for realtime modeling purposes.

First, OMER was planned to be a small workshop of the German Society of Informatics (GI) with about 20 to 30 participants. But after a while we had to recognize that it was not feasible to keep the number of participants as small as intended - finally about 60 persons from six different countries attended the workshop. Quite a number of researchers from different countries were very interested to present their products, experiences, and future plans in this area. Therefore, we had to switch the workshop language from German to English and to rearrange many other things. Finally, the workshop proceedings contained a total of 28 short position papers. Based on these contributions we were able to organize sessions addressing topics such as "RT System Architectures", "Unified Modeling Language Extensions", "RT CASE Tools and Programming Languages". Furthermore, we were especially honored that two distinguished experts accepted the invitation to present their latest research activities in this area. David Harel (among other things Dean of the Faculty of Mathematics and Computer Science at the Weizmann Institute of Science and cofounder of I-Logix Inc.) gave a talk "On the Behavioral Modeling of Complex Object-Oriented Systems", whereas Bran Selic (at that time Vice President of Advanced Technology at Objectime Limited) spoke about "Using UML to Model Complex Real-Time Architectures".
Two years later we organized a second OMER workshop (http://ist.unibw-muenchen.de/-GROOM/OMER-2) at the same place - the conference building of the Bavarian Farmers Association in Herrsching am Ammersee nearby Munich. This time about 80 participants from all over the world used the workshop to discuss new experiences, insights, plans, etc. concerning the object-oriented development of embedded RT systems. It is worthwhile to notice that in contrast to the predecessor workshop - the accepted submissions build clusters with respect to the addressed application domains: (1) automotive systems, (2) automation and production control systems, and (3) telecommunication systems. Furthermore, the topic of component-oriented modeling languages played a more important role than two years ago; about one half of the accepted 16 presentations dealt with component-oriented technologies for software development purposes.

In addition to the regular talks related to accepted position papers there were also a number of invited talks of distinguished RT system development experts: Bruce Douglas (Chief Evangelist of I-Logix Inc.), Morgan Björkander (method specialist from Telelogic AB), and Michael Kircher (senior engineer at Siemens AG Corporate Technology). They addressed the following topics: "Using the UML Profile for Schedulability, Performance and Time", "Real-time Systems and the UML", and "Using Real-time CORBA effectively".

Furthermore, we organized a number of tutorials, where representatives from Rational Software Corp., Telelogic AB, and ARTiSAN Software presented the latest features of their CASE tools, as well as two panel sessions. The first one was about "OO Development of Distributed Systems, a Critical Assessment" with Manfred Broy (TU München) as Chair and with Theodor Tempelmeier (FH Rosenheim), Martin Wirsing (LMU München), and Jürgen Ziegler (Nokia Helsinki) on the panelists. The second late evening panel about "The Missing Concepts of UML for Designing Embedded RT Systems" was organized as a kind of talk show. Peter Hruschka (System-Bauhaus) and Chris Rupp (SOPHIST GmbH) acted as moderators, whereas Morgan Björkander (Telelogic AB), Georg Färber (TU München), and Volker Kopetzky (Rational Software Corp.) were the to be interviewed guests.

One highlight of the OMER-2 workshop was the "Object-Oriented Realtime Modeling Contest" organized and sponsored by DaimlerChrysler Research & Technology. The challenge of this contest was to design a typical automotive control function using an object-oriented technique. Starting with about 80 registered participating parties the contest was a great success. Finally, three different groups from the University of Northampton (place 3), Validas Model Validation AG (place 2) and St. Petersburg State Technical University/XJ Technologies (winners of the contest) were invited to present their solutions at the workshop.

Right after the second workshop we decided to ask all speakers of both OMER happenings to submit longer updated versions of their research activities presented at the workshops. After another thorough review process we were finally glad to accept 10 long papers and 5 short papers, the contents of this postworkshop proceedings. We hope that these contributions provide you with an overall impression about the state-of-the-art of object-oriented development of embedded RT software in industry as well as about still to be solved problems and ongoing research activities in this area.
We also hope that you enjoy reading these papers as much as all the participants of the two OMER workshops enjoyed the two events including a visit of the famous monastery "Kloster Andechs", one of the eldest Bavarian places of Pilgrimage and beer production.

Last but not least we would like to thank all persons, who spent a lot of time and efforts to make the two workshops such a success and who made it possible to publish the OMER proceedings: the authors, speakers, programme committee members, and participants of the two events, the reviewers of the contributions of this volume, the local staff of the "Tagungsstätte des Bayerischen Bauernverbandes", the local workshop organization team from the Institute of Software Technology at the University of the German Armed Forces, and the following sponsors of OMER-2: ARTiSAN Software, I-Logix Inc., Rational Software Corporation, and Telelogic AB.

The Program Co-Chairs

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Andy Schürr, Realtime System Lab, Darmstadt University of Technology
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R. Resch, Berner & Mattner GmbH, Munich, Germany
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B. Selic, ObjecTime Limited, Kanata, Canada
A. Shaw, University of Washington, Seattle, USA
H.-C. von der Wense, Motorola GmbH, Munich, Germany
J. Ziegler, Nokia, Helsinki, Finland
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