Special issue on Selected Papers of The 6th IFIP Workshop on
Software Technologies for Future Embedded and Ubiquitous Systems (SEUS 2008)

Guest Editorial

Embedded and ubiquitous computing systems have considerably increased their scope of application over the past few years, and they include nowadays also mission- and business- critical scenarios. The advances call for a variety of compelling issues, including dependability, security, quality-of-service, modeling, autonomy, middleware support, new applications, real-time, development techniques, etc.

This Special Issue is based on innovative ideas on embedded and ubiquitous systems discussed during the 6th IFIP Workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS), held in Anacapri, Capri Island (Italy), in October 2008.

SEUS is a flagship event of the IFIP Working Group 10.2 on embedded systems which brings together experts in the field of embedded and ubiquitous computing systems with the aim of exchanging ideas and advancing the state-of-art about the above mentioned issues.

Selected papers have been invited out of the 38 papers published in the SEUS 2008 proceedings. Authors of invited papers were required to enrich their work with substantial new material with respect to the original SEUS contributions. Rigorous review of received submissions led to the selection of 12 high quality manuscripts, included in this Special Issue.

The Special Issue is conceptually divided into three sections, each of them composed of four papers.

The first section is about "Middleware and Applications". Especially in ubiquitous and distributed embedded systems, middleware is a vital system part enabling various functions and features for the designated applications. The first paper of this section entitled *"Exploring Delay-Aware Transactions in Heterogeneous Mobile Environments"*, authored by N. Suri et al., deals with transaction handling for database, banking or stock applications on mobile embedded devices. It investigates the impact of typical mobile perturbations on transaction handling and the appropriate design of mobile transactions. The second paper called *"Multi-hop Multi-path Cooperative Connectivity Guided by Mobility, Throughput, and Energy Awareness: a Middleware Approach"*, and authored by A. Corradi et al., also targets mobile devices. Here, new middleware concepts to achieve best possible tradeoffs between mobility, throughput and energy consumptions are researched. The third paper named *"CARISMA – A Service-Oriented, Real-Time Organic Middleware Architecture"*, authored by U. Brinkschulte et al., focuses on the aspect of self-organization in middleware for embedded and ubiquitous systems with real-time properties. Service agents are introduced as compact and smart entities to realize self-organisation, self-configuration, self-healing, etc. features well known in biology. The final paper of this first section is entitled *"A Comparison of GIS Architectures for Mobile Indoor Location-based Services"*, authored by C. Prehofer et al. It is an experience report on building a geographic information system for indoor applications. As a very interesting aspect, the system was build by combining open source software with novel research prototypes. All four papers of this section represent leading edge research in the field of ubiquitous and distributed embedded systems.

The second section addresses the "Modeling, Management and Evaluation of Non-Functional Properties". The evaluation and fulfillment of non-functional properties, such as dependability, security, and quality of service, is widely recognized as a challenging objective for the development of computer systems in general. This also applies to future embedded and ubiquitous systems, where this field is still unexplored. The section presents four cutting edge research papers on this topic. The first paper, entitled *"QoS Perceived by Users of Ubiquitous UMTS: Compositional Models and Thorough Analysis"*, authored by A. Bondavalli et al., provides a thorough QoS analysis of a dynamic UMTS network by adopting a compositional modeling approach based on Stocastic Activity Network (SAN) formalism. Authors also investigate the impact of users' mobility on the selected QoS indicators by combining the SAN modeling approach with an ad-hoc mobility simulator. The second paper of the section is entitled *"Fault and Error Containment of Gateways in Distributed Real-Time Systems"*, and it is authored by R. Obermaisser. The paper investigates the use of gateways, normally used to compose large embedded computer systems out of heterogeneous clusters, to tackle with common mode failures that could be induced by the propagation of faults between clusters. The third paper named *"An Overview of VeryIDX – A Privacy-Preserving Digital Identity Management System for Mobile Devices"*, authored by E. Bertino et al., deals with privacy-preserving issues in future mobile ubiquitous systems, which can easily be the target of several security attacks. The paper presents an approach to secure the management of user identity attributes trough the definition of an innovative cryptographic primitive. The final paper of this section, authored by M. Cinque et al., is entitled *"Modeling and Analyzing the Dependability of Short Range Wireless Technologies via Field Failure Data Analysis"*. The paper shows how field failure data can play a key role to fill the gap on understanding the dependability behavior of future ubiquitous systems, based on wireless technologies. To this aim, authors propose a novel combined approach for modeling and analyzing the dependability of such technologies.

The design of next-generation of embedded systems will increasingly revolve around issues related to distributed architectures, QoS-driven metrics, stringent timing requirements, and high level models targeting multi-core platforms. The final installment of this special issue addresses such "Real-Time and System Development Issues". We present four excellent papers on this topic. The first paper is entitled "*Model Based Synthesis of Embedded Software*" and is authored by Gajski et al. This paper presents software (SW) synthesis using Embedded System Environment (ESE), a tool set of design of multi-core embedded systems. The proposed methodology starts with an application captured in C-language processes communicating via abstract message passing channels and maps it to a multi-core compute platform. The second paper is entitled "*Deterministic Service Guarantees for NAND Flash using Partial Block Cleaning*" and is authored by Givargis et al. This paper presents a NAND flash translation layer called GFTL that guarantees fixed upper bounds for reads and writes to the flash devices. Deterministic access to NAND devices enables the use of this emerging memory fabric in hard real-time applications. The third paper is entitled "*Chemical Programming of Future Service-oriented Architectures*" and is authored by Banatre et al. This paper presents an unconventional new approach for service-based infrastructure composition of next generation distributed computing systems based on a programming language, inspired by a chemical metaphor. The final paper of this section is entitled "*DRACON: QoS Management for Large-Scale Distributed Real-Time Databases*" and is authored by Kang et al. This paper presents the design of a distributed real-time database architecture called DRACON, which enables QoS guarantees for large-scale distributed real-time application.

We would like to thank the authors who submitted their contributions to this special issue, and all the reviewers, who ensured the quality of the selections. Editing this special issue would not have been possible with their dedication and hard work.

Guest Editors:

Uwe Brinkschulte, Johann Wolfgang Goethe University, Frankfurt am Main, Germany
Marcello Cinque, Department of Computer and Systems Engineering, University of Naples Federico II, Italy
Tony Givargis, Department of Computer Science, University of California, Irvine, CA, USA
Stefano Russo, Department of Computer and Systems Engineering, Federico II University of Naples, Italy

Prof. Dr. **Uwe Brinkschulte**, born in 1959, studied Electrical Engineering at the University of Karlsruhe. In 1990, he received his doctor degree with a thesis on processor architecture. From 1990 to 1993, he worked as CEO for the ITV GmbH, Heiligenberg. In 1993, he became professor for Computer Science at the University of Applied Science, Heidelberg and in 1995, he received a full professorship for Computer Science at the University of Karlsruhe. In 2008, he became full professor and chair for Embedded Systems at the Johann Wolfgang Goethe University, Frankfurt am Main. His main research interests are embedded and distributed real-time systems, self-organizing systems and organic computing. Since February 2009, he is vice chairman of the German advisory board of the International Federation of Information Processing (IFIP).

Marcello Cinque, PhD, IEEE Member, was born in Naples, Italy, in 1980. He is Assistant Professor of Computer Engineering at the Department of Computer and Systems Engineering (DIS) of the University of Naples Federico II, where he teaches the course of Operating Systems. He graduated from University of Naples, Italy, in 2003, where he received the PhD degree in computer science engineering in 2006. He is/has been chair of several technical conferences and workshops on embedded, mobile, and pervasive systems. His main research interests include on-field dependability analysis of mobile and sensor systems, and middleware solutions for mobile ubiquitous and multimedia systems.

Professor **Tony Givargis** is an Associate Professor in the Department of Computer Science at University of California, Irvine. He received his Ph.D. from University of California, Riverside in 2001. His research is in the area of Software for Embedded Systems, in particular, investigating issues related to Real-Time Operating System (RTOS) synthesis, high-confidence embedded software, serializing compilers, and algorithmic code transformation techniques targeting embedded software. He is the co-author of a popular text-book entitled Embedded System Design: A Unified Hardware/Software Introduction.

Stefano Russo, PhD, IEEE Member, was born in Naples, Italy, in 1963. He is Professor and Deputy Head at the Department of Computer and Systems Engineering (DIS) of the Federico II University of Naples, Italy, where he leads the Distributed and Mobile Computing Group. He graduated in Electronic Engineering in 1988, and became Ph.D. in 1993; he was Assistant Professor at DIS from 1994 to 1998, and Associate Professor from 1998 to 2002. He is Chairman of the Curriculum in Computer Engineering, and Director of the National Laboratory of CINI (National Inter-universities Consortium for Informatics) in Naples. He teaches the courses of Advanced Programming and Distributed Systems. His current scientific interests are in the following areas:
– distributed software engineering;
– middleware technologies;
– mobile computing.