HIGH-LEVEL SPECIFICATIONS TO COPE WITH DESIGN COMPLEXITY

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System-level specifications are the key entry point to many design flows, as well as the golden reference model throughout the design lifecycle. As such, their quality dramatically impacts the potential quality of the designed product. Specifications have to expose sufficient parallelism and orthogonally capture computation and communication to allow exploring a wide range of target platforms. On top of functional accuracy to capture the designer’s intent, they have to be expressive enough to allow extracting performance requirements and describe system-wide constraints (e.g. application quality metrics).

This tutorial discusses the topics of creating and validating a “good” system specification from complementary perspectives. The tutorial starts by introducing how high-level system requirements, captured in a natural language, can be translated into a testbench for validating the specifications’ correctness. Then, once the test bench has been created, it discusses how higher abstraction levels aid the designer in defining a behavioral specification traversing tradeoffs of quality, performance and traffic, illustrated by examples of embedded vision systems. The tutorial shows how UML/MARTE can be utilized to describe, simulate and automatically generate the software stacks on heterogeneous platforms.

Finally, the tutorial introduces opportunities how to tap into the abundantly available flat C-code and introduces a “designer-in-the-loop” modeling environment and methodology that aids the system designer in obtaining a model with safe parallelism.

This tutorial targets researchers and practitioners in system-level design who face the challenge of capturing and expressing complex specifications. It reviews opportunities of simplifying the specification process and evaluates alternative approaches. Participants will learn how high-level specifications can help the designers to cope with the complexity of current electronic systems.
SPEAKERS

Gunar Schirner, Assistant Professor at Northeastern University in Boston, MA received his Ph.D. degree (2008) and a M.S. degree (2005) in Electrical and Computer Engineering from the University of California, Irvine. Prior to joining the Northeastern faculty in 2009, he was an assistant project scientist at the Center for Embedded Computer Systems (CECS) at the University of California, Irvine. Gunar Schirner also has 5 years of industry experience at Alcatel (now Alcatel-Lucent) where he designed distributed embedded real-time software for telecommunication products. His research interests include embedded system modeling, system-level design, and the synthesis of embedded software.

Wolfgang Mueller is currently heading the Advanced Design Technologies group at C-LAB, a joint R&D lab of the University of Paderborn and Atos (formerly, Siemens Business Services). He received his Diploma in Computer Science in 1989 and his doctorial degree in 1996 from the University of Paderborn. Dr. Mueller is member of ACM and IEEE. Since 1989 he authored more than 200 national/international publications and edited several books. He was/is member of various program and executive committees of various conferences and workshops, e.g., program chair of the DATE 2010. His main interests focus on system design methodologies, languages, and integration technologies.

Eugenio Villar, Professor at the University of Cantabria in Spain, got his Ph.D. in Electronics from the University of Cantabria in 1984 where he is currently responsible for the area of HW/SW Embedded Systems Design at the Microelectronics Engineering Group. His main research interests cover embedded system specification and design and performance estimation where he has published several papers in international journals and proceedings of conferences. Prof. Villar is member of IFIP, ECSI, EDAA, ACM and IEEE, and Program Committee member of several international conferences such as DATE, DSD, FDL and SBCCI.

Rainer Dömer, Associate Professor at the University of California, Irvine, received his Ph.D. in Information and Computer Science from the University of Dortmund, Germany, in 2000. His work defined the SpecC language and methodology which created a world-wide impact in industry and academia. He received the prestigious NSF CAREER Award for his research on efficient modeling of embedded computer systems in 2008 and a teaching award as EECS Faculty of the Year in 2013. His research interests include system-level design and methodologies, specification modeling languages and parallel system simulation.