Multicore Design Technologies and HW Security – From Academia to Industry

Rainer Leupers, RWTH Aachen University, Germany

Abstract: Virtually all digital IC platforms today are based on flexible programmable processor cores, with a trend towards multi/manycore architectures comprising 100+ cores. This trend is imposed by high performance and energy efficiency demands. Specifically in competitive embedded application domains like smartphones, mobile radio infrastructure, IoT and automotive, there are tight efficiency constraints on power, energy, timing, design cost, and security of the underlying HW/SW platforms. The need for flexibility and efficiency leads to heterogeneous platform architectures, composed of off-the-shelf (yet partially customizable) IP cores and custom application-specific processors, such as DSPs or ML accelerators. This presentation covers various advanced system-level design methodologies and tools for managing the skyrocketing HW/SW platform design complexity, while simultaneously optimizing systems and components for performance, power, security and cost. Special focus will be on the implications of current megatrends like RISC-V and neuromorphic computing in system-level design. We will also exemplify how to successfully organize academia-to-industry technology transfer in the above domains.

Rainer Leupers received the M.Sc. (Dipl.-Inform.) and Ph.D. (Dr. rer. nat.) degrees in Computer Science with honors from TU Dortmund in 1992 and 1997. From 1997-2001 he was the Chief Engineer at the Embedded Systems Chair at TU Dortmund. In 2002, he joined RWTH Aachen University as a professor for Software for Systems on Silicon. His research comprises embedded software development tools, system-on-chip architectures, hardware security, and electronic design automation. He served in committees of the leading international EDA conferences and received various scientific awards, including Best Paper Awards at DAC and twice at DATE, as well as several industrial awards. Dr. Leupers is also engaged as an entrepreneur and in turning research results into innovations. He co-founded LISATek (now with Synopsys), Silexica (acquired by Xilinx/AMD), Hensoldt Cyber (via Secure Elements), and MachineWare. As the coordinator of the TETRACOM and TETRAMAX EU projects, he created a structured approach to academia-to-industry technology transfer with 100+ successful instances across Europe.