

TUTORIAL 2

REAL-TIME OPERATING SYSTEMS FOR EMBEDDED COMPUTING

Speakers:

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Background: Embedded DSPs and CPUs are already commonplace in board-level systems and are becoming increasingly popular on systems-on-silicon. As embedded software grows in size and complexity, real-time operating systems (RTOSs) are required to manage the embedded processor and ensure real-time response. This tutorial will introduce the attendee to real-time operating systems for embedded computing and their use in the design of embedded software, with both basic principles and advanced practice.

Description: The tutorial will start with an introduction to real-time scheduling and RTOSs. Basic scheduling theory sets the stage for the services provided by RTOSs. Design examples will be used to illustrate important points. The tutorial will then consider the Eonic Virtuoso RTOS as an example, as described by Virtuoso's lead designer. Developing an RTOS for DSP puts some heavy demands on the designer, that are not found on more general purpose microprocessors: the peripherals are tightly integrated with the core and need fast response times; and memory is at a premium. The use of a real-time operating system in a complex system will be used to illustrate the use of RTOSs. The Alcatel ADSL modem integrates a DSP for modem functions and a microprocessor on one chip, with software handling both signal processing and control functions.

Finally, the tutorial will survey the world of RTOSs, considering advances in scheduling, portability, and integration with compilers, using design examples to illustrate key concepts.

Serge Hustin is an engineer in the VLSI design department of Alcatel in Antwerp, Belgium. He received M.S. in EECS from UC Berkeley in 1988. After working at Cadence for 6 years, he joined Alcatel in 1995, where he worked on the Alcatel ADSL modem.

Miodrag Potkonjak received the Ph.D. in EECS from UC Berkeley in 1991. He worked as a Member of Technical Staff at the NEC USA Research Laboratories until 1995. Since then, he has been an Assistant Professor in the Computer Science Department at University of California at Los Angeles (UCLA). He has published numerous papers on embedded computing, VLSI CAD, and other topics, and holds 5 U.S. patents.

Eric Verhulst graduated as an electronics engineer in 1979. After a career in defense related systems, he founded Eonic Systems specializing in parallel processing in 1989. One of the first products developed was an RTOS for the INMOS transputer, followed with a move into DSP in 1992. Eonic's Virtuoso RTOS is now the leading edge RTOS for DSP.

Wayne Wolf is Professor of Electrical Engineering at Princeton University. Before joining Princeton, he was with AT&T Bell Laboratories until 1989. He received all three degrees in electrical engineering from Stanford University. His research interests include hardware/software co-design, embedded computing, and multimedia computing. He is a Fellow of the IEEE.