

## FOREWORD

Dear Colleague,

Welcome to the **DATE 06** Conference Proceedings. DATE combines the world's favourite electronic systems design conference and Europe's leading international exhibition for electronic design, automation and test. The *DATE 06 event* features a technical program with 78 sessions covering the latest in system design and embedded software, IC design methodologies and EDA tool developments, together with an exhibition with the leading EDA, silicon and IP providers showing their new products and services. Challenges that you all face or soon will face in your daily practice are the increasing design complexity of highly integrated systems, the introduction of reconfigurability and embedded software, and the control of power and variability in nanometer IC designs. All these issues will be addressed in this year's DATE event.

DATE 06 is the 9<sup>th</sup> edition of the Design Automation and Test in Europe conference and it has again reached a record number (834) of submissions, compared to previous years and compared to other EDA conferences worldwide. With submissions coming from all five continents and almost fifty countries, DATE has truly become an international conference. DATE is now the world's premier event in electronic system design. The submissions have been reviewed by the more than 350 members of the Technical Programme Committee. After a thorough review and selection process (with an average of 5 reviews per paper), finally 233 papers (including Designer's Forum) were selected for presentation at the conference. In addition, 45 papers were selected for Interactive Presentations. Together with the invited special sessions (panels, embedded tutorials and hot topic sessions) this has resulted in a **high-quality technical programme** with 78 sessions covering the latest in system design and embedded software, IC design methodologies and EDA tool developments. One of the main strengths of the conference is a wide but high-quality coverage of design, design automation and test topics, from the system level (including PCB and FPGA) to the integrated circuit level. In addition, for the second year a special **embedded software track** is offered to allow for the increasing importance of software in embedded systems. Compared with previous years, submissions in design, test and embedded software have grown significantly, showing a clear trend toward a holistic view and a comprehensive system design focus.

The DATE week opens on Monday March 6, 2006 at the Munich ICM Messe with the offer of **pre-conference tutorials**. This year the three full-day tutorials cover topics of great interest to industrial designers. The first tutorial is in the domain of processor architecture, unveiling all the secrets of the CELL processor, a new family of processors for the broadband era. The second one focuses on the design of System-on Chip, considering and comparing new system-level methodologies on the application of a high-definition video codec. The third tutorial covers the aspects of Design for Manufacturability and design methodologies that will become mainstream with 65 nm and below technologies. Furthermore, eight half-day tutorials are also proposed, four in the morning and four in the afternoon, covering aspects related to system-level design, test and modeling.

The main conference opens on Tuesday March 7, 2006 with two very interesting **keynote speeches**. René Penning de Vries, CTO of Philips Semiconductors, will talk about EDA challenges in the converging application world, and Walden

Rhines, Chairman and CEO of Mentor Graphics and Chairman of the EDA Consortium, will speak about the sociology of design and EDA.

The new ***System Design Records initiative***, launched this year, will be presented in two sessions after the keynote speeches. These sessions present the papers selected by a specific committee on novel ideas and proof of concept of actual system design experiences that can prove to reach a record in terms of performance, power management, size, innovation in applications or that show any other concrete advantage with respect to state of the art applications. The system designs are embedded or integrated systems, including Systems on Chip, Systems in a Package, FPGA-based or reconfigurable platforms, up to large boards.

Following the success of previous years, Tuesday DATE 06 will again host a full-day ***Executive Track*** of presentations by company CEOs, CTOs, VPs and other senior executives from CAD vendors, IP suppliers, semiconductor and system houses.

On Wednesday March 8, 2006 a ***special full-day track is devoted to 4G Telecommunication Applications and Design***. The telecommunications and semiconductor industry are inseparably linked. More than sixty percent of the revenue of the semiconductor industry is attributed to communications and multimedia applications. On the other hand wireless communications (and multimedia) applications demand ultra-high computational performance and therefore have become technology drivers for the semiconductor industry. The need for getting ready for cellular 4G solutions has become a reality. The single most important aspect of designing and, successfully deploying 4G, is its cross-disciplinary character, ranging from semiconductors to services to deployment to business. In this DATE focus day the various issues involved in defining, designing, and deploying 4G are addressed. Particular attention will be paid to the system-level design of complex SoCs.

On Thursday March 9, 2006 a second ***special full-day track focuses on wireless sensor networks***. Wireless sensor networks are a trend of the recent few years, and they involve deploying a large number of small low-cost nodes, which then sense environmental changes and report them to other nodes over a flexible network architecture. Sensor nodes are great for deployment in hostile environments or over large geographical areas, and they have been useful in different application domains such as environmental observation, military monitoring, building monitoring and health care. Due to their small size they have many limitations. This special track focuses on the main issues involved in the design of such sensor networks, like the hardware platforms for sensor nodes addressing the resource limitation issues (for example: low power, limited memory, small size,...). In addition, it discusses the power communication issues, the distributed data processing addressing new ways to handle data coming from many different sensors and fuse them into useful data, and finally reviews today's applications and open research aspects.

Besides these special tracks, the ***main conference is organized in six parallel tracks of sessions***, three devoted to tools and methodologies for the design of electronic systems from system level down to manufacturing, one dedicated to test issues, one specific to designer's issues in terms of applications, tools and architectures and real industrial design demonstrations, and one dedicated to embedded software. New this year is the expansion to architectures and micro-architecture design sessions, and an increasing and stronger program in system-level methodologies and tools as well as in low-power solutions. In fact, thirty-five percent of the sessions of the main conference program relate to embedded

systems design methods, architectures and software; seventeen percent are on test issues; fifteen percent relate to digital design methodologies and tools; ten percent on low power techniques, while eight percent are on analog system design and fifteen percent on design applications. Novel ideas are presented in specific Interactive Presentation sessions.

**Seven special sessions** complement the main conference program, with embedded tutorials, hot topics and panels on the most interesting issues today in electronic design. In particular, communication-based design is the topic of two special sessions, one that reviews the design challenges, while the other focuses on the automotive applications. Automotive microelectronics is also the focus of the test-related special session that introduces test and reliability challenges and possible solutions through practical experiences brought by car supplier representatives. Among the topics with increasing importance today are the new methodologies and their industrial applications for Design for Manufacturability and Yield that will be introduced in an embedded tutorial followed by a discussion panel. Power consumption remains one of the strongest topics of research and an embedded tutorial will first overview the state-of-the-art in design technologies for dynamic and leakage power minimization, followed by a public "trial", in which OEMs, IDMs, IP and fabless semiconductor vendors will play the role of the public prosecutor against the EDA vendors to identify if the EDA industry is taking low-power matters seriously or not, and what should be their near-future targets. Finally, a system-level embedded tutorial on model-based design shows the application of Simulink, Matlab and UML in the design of embedded systems.

Friday March 10 is the day for the **DATE workshops**. DATE offers the possibility to attend workshops as a complement to the regular conference. Five workshops will run in parallel, covering emerging and important design topics including FPGA-based computing, future trends in automotive electronics, design issues in communication-centric systems, interconnects and network on chips and CAD tools for biochips. Each workshop is structured into presentations from highly distinguished academic and industrial researchers.

Finally, throughout the conference days the **DATE Exhibition** is open to designers. The more than hundred exhibitors include the leading EDA, silicon, FPGA and IP providers showing their new products and services. In addition, there is an **Exhibition Theatre** featuring talks from engineering managers of the leading electronic manufacturers on first-hand design experiences of commercial EDA tools. This year, the exhibition program offers also **designers' solutions workshops**, which are short training sessions organized by vendors on specific topics such as SystemVerilog, SystemC, verification and FPGA design. On Thursday March 9, as part of the Exhibition program, the **PCB symposium** will also take place in parallel to the main conference. The focus this year will be on the integration of FPGAs/ICs with PCBs in system designs.

The DATE week will also be a possibility for students and universities to show their research works, through the PhD Forum on Monday and the University Booth in the exhibition where hardware and software demonstrations will be shown by different universities on a rotation schedule.

The DATE 06 event's program will be particularly attractive to industrial designers, both at IC, FPGA and embedded system level, to researchers and academics as well as to design managers, and an increasing attendance is anticipated.

We therefore invite you to take full advantage of the many opportunities offered to you by DATE 06, to improve and extend your knowledge and/or business in

electronic system's design and for socializing with peers and colleagues. We hope that you fully enjoy the DATE 06 event.



Georges Gielen  
Katholieke Universiteit Leuven  
DATE 06 General Chair



Donatella Sciuto  
Politecnico di Milano  
DATE 06 Programme Chair