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Presents

"Towards Computer-Aided Design of Electrical Energy Systems: Challenges and Solutions"

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Abstract: Electrical energy systems (EESs) include energy generation, distribution, storage, and consumption, and involve many diverse components and sub-systems to implement these tasks. In this talk we discuss fundamental concepts towards a first attempt in applying EDA design methodologies that are widely used for electronics systems design to the case of the design of EESs. CAD for EESs encompasses modeling, simulation, design and optimization and is a challenging task that mandates a multidisciplinary and heterogeneous approach. We identify similarities and differences between electrical energy systems and electronics systems in order to inherit as much as possible the profound legacy resources of EDA. The talk analyzes in deeper details the issue of representation, modeling, and simulation of EESs, tasks that naturally precede synthesis and optimization in a typical design flow.

We will first introduce a modeling and simulation environment based on standard and open tools and formalisms, namely SystemC/AMS and IP-XACT; we formally define the model interfaces for EES components by extending the IP-XACT standard; this allows (1) to define abstract “meta-models” for these components with which a model must comply, and (2) using the power configuration information contained in the IP-XACT descriptions, to seamlessly plug such components into the SystemC simulation framework. Our approach allows therefore designers of EESs to implement multi-level simulations, where different components can be simulated at different levels of details, while using a single, open simulation platform.

We compare the proposed methodology against traditional model-based approaches the use Matlab/Simulink and show how our approach can be more efficient, more flexible, and more extensible.

The talk also describes an automated modeling methodology that allows to semi-automatically derive models for batteries directly and solely from the information available in datasheets; the tools leverages the actually available data and generates a model whose level of accuracy matches the amount of information in the datasheet. This approach can also be used in the opposite way, that is, as a way to define standardized levels of accuracy for the models by identifying which information are required to achieve a given degree of accuracy.

Biography: Massimo Poncino is Full Professor of Computing Systems at Politecnico di Torino. Prior to that, he was an Associate Professor (from 2004 to 2006) at Politecnico di Torino, Associate Professor (from 2001 to

2004) at Università di Verona, and Assistant Professor (from 1995 to 2001) at Politecnico di Torino. From 1993 to 1994 he was a Visiting Scientist at the Department of Electrical and Computer Engineering of the University of Colorado, Boulder, USA. He holds a Dr. Eng. degree in Electrical Engineering (1989) and a PhD degree in Computer Engineering, both from Politecnico di Torino (1993).

His research interests include the design automation of digital systems, with emphasis on low-power embedded systems, modeling and the simulation of systems-on-chip, and automatic synthesis of digital systems. He has coauthored more than 300 publications in the above areas, including one book on energy-efficient memory design.

Massimo Poncino has served as member of Technical Program Committee of more than 50 IEEE and ACM conferences. He was the Technical Program Chair of the 2011 IEEE/ACM Symposium on Low-Power Electronics and Design and General co-Chair for the same conference in 2012. He has served in the Editorial Board of the IEEE Transactions on CAD from 2006 to 2011, and is currently serving in the Editorial Board of IEEE Design & Test and ACM Transactions on Design Automation of Electronic Systems (TODAES).

Prof. Poncino is a Senior Member of IEEE, member of the ACM SIGDA Low-Power Technical Committee, and a Member the Circuit and Systems Society.

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Engineering Hall 2430
Host: Mohammad Al Faruque