

EXPLOITING ADAPTABILITY IN MODERN COMPUTING SYSTEMS THROUGH DYNAMIC RECONFIGURATION

The number of computing devices is expected to more than triple by 2020, with each one contributing to the overall ICT carbon footprint. This growth is sustained by the use of high performance (and high power consumption) systems, designed to be able to serve large workloads with high-performance requirements.

However, we are moving towards an on-demand computing scenario, characterized by varying workloads, constituted of diverse applications with different performance requirements, and criticality.

An approach to gather the best out of this scenario is to better exploit specialised computing resources integrated in a heterogeneous system architecture (HSA), by pooling them and taking advantage of their individual characteristics to optimise the performance/energy trade-off for the overall system.

The availability of heterogeneous resources is characterizing modern computing systems at every scale, from mobile platforms with integrated GPUs to High end HPC systems exploiting FPGAs as both interconnections and computational elements. These systems have the twofold advantage of providing a better flexibility through the use of reconfigurable HW and to provide, in general, a better performance per Watt figure. Despite this great potential, it is still difficult to fully exploit these systems due to the lack of tools and models that capture their intrinsic complexity and provide useful metrics and decision mechanism to implement adaptable systems. This session will present models and tools able to help designers to exploit modern computing systems and implement flexible solutions able to exploit adaptability for both performance and energy efficiency.

We will discuss the requirements and challenges of implementing adaptability in these platforms and will present the latest research results achieved in the field as well as first industrial successes in this domain.

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Short Curriculum Vitae

Prof. Wayne Luk is a Co-Founder of Bluebee B.V. Prof. Luk serves as Professor of Computer Engineering at Imperial College London, where he founded and leads Computer Systems Section and the Custom Computing Group in Department of Computing. He serves as Member of the Advisory Board at Bluebee Holding B.V. He is fellow of the Royal Academy of Engineering and the IEEE.

He teaches and research in Department of Computing at Imperial College London. He leads the Programming Languages and Systems Section and the Custom Computing Research Group, and He directs the EPSRC Centre for Doctoral Training in High-performance Embedded and Distributed Systems and the Centre for Advanced Financial Engineering and he was Visiting Professor at Stanford University from November 2006 until August 2009.

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Short Curriculum Vitae

Dr. Marco Domenico Santambrogio is an Assistant professor at Politecnico di Milano. He received his laurea (M.Sc. equivalent) degree in Computer Engineering from the Politecnico di Milano (2004), his second M. Sc. degree in Computer Science from the University of Illinois at Chicago (UIC) in 2005 and his PhD degree in Computer Engineering from the Politecnico di Milano (2008). Marco, since 2009, is an adjunct professor at the University of Illinois at Chicago and he has been an MIT Research Affiliate (2010-2015). Dr. Santambrogio was, in 2009-2010, a postdoc fellow at CSAIL, MIT, and he has also held visiting positions at the Department of Electrical Engineering and Computer Science of the Northwestern University (2006 and 2007) and Heinz Nixdorf Institut (2006).

Marco D. Santambrogio is a senior member of the IEEE (since 2011) and ACM (since 2013). Since 2013 he is a member of the IEEE Italy Section as Student Activities Coordinator, and starting in 2015 he is Vice-Chairs of the IEEE Italian Chapter of the Computer Society.

He has been with the NECST Lab at the Politecnico di Milano, where he founded the Dynamic Reconfigurability in Embedded System Design (DRESD) project in 2004 and the CHANGE (self-adaptive computing system) project in 2010.

He conducts research and teaches in the areas of reconfigurable computing, self-aware and autonomic systems, hardware/software co-design, embedded systems, and high performance processors and systems.