

Energy-Quality Scalable Adaptive VLSI Circuits and Systems – The Way towards the Next 10X Energy Reduction



SPEAKER:

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ABSTRACT: In this talk, the general concept of energy-quality (EQ) scalable systems is introduced and explored, as novel design dimension to scale down energy in integrated systems for the Internet of Things (IoT). EQ-scalable systems explicitly trade off energy and quality at different levels of abstraction (“vertically”), and sub-systems (“horizontally”), creating new opportunities to improve energy efficiency for a given task and expected “quality”.

The concept of quality slack, a taxonomy of techniques to trade off energy and quality, and a general EQ-scalable architecture are introduced. The generality of the EQ-scaling concept is shown through several examples, ranging from logic to analog circuits, to memories and Analog-Digital Converters. Challenges, opportunities and expected energy gains are discussed to gain an understanding of the potential of the EQ-scalable integrated circuits and systems. Ultimately, EQ scalable systems are expected to substantially improve the energy efficiency of systems for IoT, compensating the limited energy gains that will be offered by technology and voltage scaling in the decade ahead.

BIO: Massimo Alioto is Associate Professor at the Department of Electrical and Computer Engineering, National University of Singapore, where he leads the Green IC group and the Integrated Circuits and Embedded Systems area (60+ people). He has also held positions at the University of Siena, Intel Labs – CRL (2013), University of Michigan - Ann Arbor (2011-2012), University of California – Berkeley (2009-2011) and EPFL – Lausanne (2007).

He is (co)author of 230 publications on journals (80, mostly IEEE Transactions) and conference proceedings, and three books with Springer. His primary research interests include ultra-low power VLSI circuits, self-powered and wireless nodes, near-threshold circuits for green computing, widely energy-scalable VLSI circuits, circuit techniques for emerging technologies, and hardware cybersecurity.

Prof. Alioto was the Chair of the “VLSI Systems and Applications” Technical Committee of the IEEE CASS (2010-2012), and Distinguished Lecturer (2009-2010). He is currently Associate Editor in Chief of the IEEE Transactions on VLSI Systems. He also serves or has served as Associate Editor of several journals (e.g., ACM Transactions on Design Automation of Electronic Systems, IEEE Transactions on CAS - part I/II). He served as Guest Editor of various journal special issues (including the up-coming issue on “Circuits and systems for the Internet of Things – from sensing to sensemaking” on IEEE Transactions on Circuits and Systems – part I). He was Technical Program Chair of the SOCC 2016, PRIME 2016, ICECS 2015, VARI 2015, ICECS 2013, NEWCAS 2012, ICM 2010 conferences, and Track Chair in several others (ICCD, ISCAS, ICECS, VLSI-SoC, APCCAS, ICM). He is currently member of the IEEE CASS Board of Governors. Prof. Alioto is an IEEE Fellow.