**Silicon Systems for a Greener and Smarter World**

**- Without a Single Battery**

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**SPEAKER:**

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**ABSTRACT** Recent semiconductor scaling trends continue to support the evolution of silicon systems beyond the inevitable end of technology scaling, growing the deployment of intelligent and connect chips towards the trillion range by the end of the decade. Such evolution vastly outranges any application ever deployed by human beings, and its sustained growth is now fundamentally impeded by batteries as conventional source of energy. From a silicon chip viewpoint, batteries at the trillion scale severely limit advances in cost, form factor, system lifespan and chip availability over time. From a societal perspective, batteries in the trillions threaten economic and environmental sustainability of the underlying scaling trend, and hence its feasibility.

This keynote introduces key concepts and silicon demonstrations of a new breed of always-on silicon systems with ultra-wide power adaptation down to nWs, and no battery inside (or other energy storage). Adaptation to the highly-fluctuating power profile of energy harvesters is shown to enable next-generation pervasive integrated systems with cost well below 1$, size of few millimeters, long lifetime well beyond the traditional shelf life of batteries, yet at near-100% up-time. The principles are exemplified by numerous silicon demonstrations of sensor interfaces, processing, power management and wireless communications, as well as of full systems. Ultimately, the technological pathway discussed in this keynote supports the sustained growth of applications leveraging large-scale deployments of silicon systems, making our planet smarter. And greener too.

**BIO** Massimo Alioto is a Professor at the ECE Department of the National University of Singapore, where he leads the Green IC group, the Integrated Circuits and Embedded Systems area, and the FD-fAbrICS center on intelligent&connected systems. Previously, he held positions at the University of Siena, Intel Labs – CRL (2013), University of Michigan - Ann Arbor (2011-2012), University of California – Berkeley (2009-2011), EPFL - Lausanne.

He is (co)author of 300+ publications on journals and conference proceedings, and four books with Springer. His primary research interests include ultra-low power and self-powered systems, green computing, circuits for machine intelligence, hardware security, and emerging technologies.

He is the Editor in Chief of the IEEE Transactions on VLSI Systems, Distinguished Lecturer for the IEEE Solid-State Circuits Society, and was Deputy Editor in Chief of the IEEE Journal on Emerging and Selected Topics in Circuits and Systems. Previously, Prof. Alioto was the Chair of the “VLSI Systems and Applications” Technical Committee of the IEEE Circuits and Systems Society (2010-2012), Distinguished Lecturer (2009-2010) and member of the Board of Governors (2015-2020). He served as Guest Editor of numerous journal special issues, Technical Program Chair of several IEEE conferences (ISCAS 2023, SOCC, PRIME, ICECS), and TPC member (ISSCC, ASSCC). Prof. Alioto is an IEEE Fellow.