

Green Technologies for Intelligent and Connected Systems at the Trillion Scale - Without Trillions of Batteries

SPEAKER:

Prof. Massimo Alioto, Ph.D.

ECE - National University of Singapore

Homepage: <http://www.green-ic.org/>



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 connected 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 the key ideas and their silicon demonstrations to enable a new breed of always-on silicon systems from sensing, to computing and wireless communications with no battery inside (or any other energy storage). Highly power-scalable systems with 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.

Sensor interfaces, processors and wireless transceivers fitting existing infrastructure (e.g., WiFi) with power reductions by orders of magnitude are discussed and exemplified by numerous silicon demonstrations, and their system integration. Ultimately, the technological pathway discussed in this keynote supports sustainable growth of applications leveraging large-scale deployments of silicon systems, making our planet smarter. And greener too.