



CONTACTLESS 3-D ICS A PROMISING ALTERNATIVE TO HETEROGENEOUS INTEGRATION

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ABSTRACT: Three-dimensional (3-D) or vertical integration is a promising system integration paradigm that can extend the microelectronics evolution for several more years. 3-D integrated systems can alleviate the challenge of continuous physical scaling, offering performance improvements equivalent to a technology node. More importantly, it can satisfy the growing need for computational and technological heterogeneity while simultaneously supporting multi-functional systems. This talk covers an unconventional approach of 3-D integration where communication between stacked dies is not based on wire connections but rather on electromagnetic coupling. This option offers specific advantages and opportunities for new exciting applications, in particular, where cost, heterogeneity, and real world constraints are paramount. I will discuss some of these applications and argue that applications envisaged early for this technology are not suitable. Alternatively, there is another set of applications where contactless 3-D circuits are highly suitable. The challenges related to this technology will also be discussed in this talk. Specific problems that arise from the use of inductive links for communication between dies are also described. In the last part of the talk, the design of a prototype two-tier 3-D circuit where both signal and power are wirelessly transferred will be discussed and related simulation results will be presented.

BIOGRAPHY: Vasilis Pavlidis is an Associate Professor in the School of Computer Science at the University of Manchester, UK. He holds an MSc and PhD degree from the University of Rochester, Rochester, NY, obtained in 2003 and 2008, respectively, all in Electrical and Computer Engineering. From 2008 to 2012, he was a post-doctoral researcher at the Integrated Systems Laboratory of EPFL, Switzerland. His research interests are in the area of interconnect modeling and analysis, 3-D integration, and other issues related to VLSI design. He is the leading author of the book *Three-Dimensional Integrated Circuit Design*, (1st and 2nd Editions), also translated in Chinese, and contributor to the software tool, Manchester Thermal Analyzer.