



Department of Electrical and Computer Engineering

Title: *Applying the Network-on-Chip principles to systems overlaid on the FPGA fabric*

Dr. Georgios Dimitrakopoulos
Electrical and Computer Engineering
Democritus University of Thrace
Xanthi, Greece

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Abstract: The rapidly-growing capacity of Field Programmable Gate Arrays (FPGAs), combined with the steady introduction of hardwired support for a multitude of diverse interfaces and functionalities, has promoted FPGAs to an attractive and capable platform for hosting even extended System-on-Chip (SoC) designs. The integration of the overlaid (on-FPGA or soft) platform and the communication of its components requires also an efficient overlaid communication mechanism. Scalable interconnection networks that use a network of switches connected with point-to-point links can parallelize the communication between soft modules and improve performance significantly. Such on-chip interconnection networks are already a mainstream technology for ASICs, while they are becoming a need and critical in FPGA-based systems. ASIC-oriented interconnection networks even if appropriately customized for the on-chip environment, still lead to sub-optimal designs when transferred directly to FPGAs. This deficit is attributed to the inefficient mapping of the network's switches and their components to the configurable logic array of the FPGA, which is a peculiar hardware realization substrate in terms of the relative speed and cost of logic vs. wires vs. memory. This talk presents the implementation constraints set by the FPGA fabric for the design of soft interconnection networks and presents new FPGA-targeted architectures. The described techniques focus on the fine-grained decomposition of the switch and the adoption of an elastic flow control mechanism.

Biography: Georgios Dimitrakopoulos received the Diploma in Computer Engineering from the Computer Engineering and Informatics Dept. of the University of Patras in 2001. In 2003 he completed the M.Sc. in "Integrated Hardware- Software Systems" and in 2007 he earned the PhD from the same department. Between 2008 and 2010 he worked as a Postdoctoral fellow at the Computer architecture and VLSI Systems Lab of the Institute of Computer Science (ICS) of the Foundation for Research and Technology Hellas (FORTH) and at the University of Crete. Later on, he was appointed as a Lecturer to the Informatics and Communication Engineering Department, of the University of West Macedonia, Kozani, Greece. Since January 2012, he is a Lecturer of Digital Integrated Circuits in the Electrical and Computer Engineering Department of the Democritus University of Thrace (DUTH), Xanthi, Greece.

G. Dimitrakopoulos has served as a program-cochair of INA-OCMC 2012-2013 workshops co-located with HIPEAC conference. He also served on the technical program committee FPL (2011, 2012), DATE (2011, 2013), and ICECS 2011, conferences, as well as INAOCMC (2010-2011), NoCArch (2008-2012), UCHPC 2012 and UMHI 2012 workshops. He is guest co-editor of the IET-Computer and Digital Techniques special issue on Interconnection Network Architectures, while he regularly serves as a reviewer for other various IEEE journals and conferences. His research interests lie in the broad areas of digital integrated circuits and computer architecture, and more specifically, he is interested in the design of on-chip interconnection networks for both ASIC and FPGA fabrics, in ultra low power digital design, as well as energy-efficient reconfigurable computing. In these areas he has published more than 30 journal and conference papers and book chapters. He is a member of the HIPEAC network of excellence and the IEEE.