1st International Workshop on Domain-Specific Multicore Computing (DSMC) ICCAD, San Jose, November 8, 2012

The steady advances in semiconductor technology allow for increasingly complex SoCs, including multiple (heterogeneous) micro processors, large on-chip memories sophisticated interconnection networks, and peripherals. The downside of this technological progress is that computing has hit already a power and complexity wall. In order to scale computing performance in the future, systems' energy efficiency has to be significantly improved. The design of heterogeneous hardware with different specialized resources, such as accelerators dedicated for one application domain is a promising solution to address this challenge. However, design, test and verification, as well as parallel programming of such heterogeneous systems introduce new challenges.

Compared to general-purpose multicore computing, domain-specific multicore computing is tailored for one application domain or problem field, and thus, can enhance performance and energy-efficiency of the system, as well as productivity and portability of the software, and eventually, scalability of the entire system. To realize such systems, significant advances are required in multiple related aspects.

First, methodologies for designing customizable architecture platforms are required. Second, domain-specific languages are needed to permit non-computing domain experts to concentrate on algorithm development rather than on low level implementation details. Third, compilation and code generation techniques as well as methods for run-time management have to identify parallel computation patterns and must employ domain-specific knowledge in order to achieve a reasonable performance.

This workshop aims at bringing researches and experts from both academia and industry together to discuss and exchange research advances on domain-specific computing. A distinctive feature of the workshop is its cross section through all the aforementioned levels, ranging from programming down to custom hardware. Thus, the workshop is targeted for all of those who are interested in understanding the big picture and the potential of domain-specific computing, its challenges, available solutions, and enables for collaboration of the different domains.

The workshop will feature invited talks by reputed researchers and cover the following areas

- Domain-specific hardware platforms, domain-specific heterogeneous multi processor systems-on-a-chip, domain-specific accelerators
- Domain-specific languages and application design
- Domain-specific compilation and mapping methods, and run-time support

Furthermore, a special issue in ACM TECS dedicated to the subject of "Domain-Specific Multicore Computing" has recently been proposed by the workshop organizers

and also got accepted. This special issue might also attract submissions from workshop participants to publish their presented work after ICCAD.

Workshop Agenda:

8.30 – 10.00 Keynotes:

Architecting Domain-specific Solutions: Challenges and Opportunities
Ravi Iyer, Director SoC Platform Architecture (SPA) group, Intel Labs, USA

Reconfigurable multi-cores for streaming DSP
Paul Heysters, CEO Recore Systems, The Netherlands

10.00 – 10.30 Coffee Break

10.30 – 12.00 Session 1: "Domain-specific Hardware Platforms"

1. *TOPSTREAM: A Scalable Heterogeneous Multicore Platform*
   Yukoh Matsumoto, CEO TOPS Systems, Tsukuba, Japan
2. *Domain-specific Architectures for Emerging Data-Centric Workloads*
   Kevin Lim, HP, USA
3. *Invasive Tightly-Coupled Processor Arrays*
   Frank Hannig, University of Erlangen-Nuremberg, Germany

12.00 – 1.00 Lunch Break

1.00 – 2.30 Session 2: "Domain-specific Computing Systems"

1. *GreenDroid: An Architecture for the Dark Silicon Age*
   Michael Taylor, UCSD, USA
2. *Streaming Similarity Computing on FPGAs*
   Wang Yu, Tsinghua University, China
3. *Domain Specific Accelerators: Opportunities for Software Library Replacement*
   John Davis, Microsoft Research, USA

2.30 – 3.00 Coffee Break

3.00 – 4.00 Session 3: "Domain-specific Languages"

1. *Scalable Development of High Performance Domain-Specific Languages with Delite*
   Kunle Olukotun, Stanford University, USA
2. *Bridging the Productivity-Performance Gap with Selective Embedded Just-in-Time Specialization*
   Shoaib Kamil, UC Berkeley, USA

4.00 – 6.00 Session 4: "Domain-specific Compilation and Mapping Methods"

1. *The Softer Side of Software Defined Radio*
   Yuan Lin, MediaTek, USA

2. *Building Predictable Cyber-Physical Systems from Dynamic Applications and Platforms*
   Sander Stuijk, Eindhoven University, The Netherlands
3. *Design Methodologies and Tools for Energy Efficient Multi-Core Architecture Platforms*
   Nagu Dhanwada, IBM, USA
4. *Dynamic Behavior Specification and Dynamic Mapping for Real-time Embedded Systems in HOPES*
   Soonhoi Ha, Seoul National University, Korea

Workshop Organizers:

- Vijaykrishnan Narayanan, The Pennsylvania State University, PA, USA
- Jürgen Teich, University of Erlangen-Nuremberg, Germany