

IAS Seminar

Topic: **Turning Centralized Coherence and Distributed Critical-Section Execution on their Head: A New Approach for Scalable Distributed Shared Memory**

Speaker: Prof. Stefanos Kaxiras, Computing Science Division, Uppsala University

Contents: A coherent global address space in a distributed system enables shared memory programming in a much larger scale than a single multicore or a single SMP. Without dedicated hardware support at this scale, the solution is a software distributed shared memory (DSM) system. However, traditional approaches to coherence (centralized via 'active' home-node directories) and critical-section execution (distributed across nodes and cores) are inherently unfit for such a scenario. Instead, it is crucial to make decisions locally and avoid the long latencies imposed by both network and software message handlers. Likewise, synchronization is fast if it rarely involves communication with distant nodes (or even other sockets).

To minimize the amount of long-latency communication required in both coherence and critical section execution, we propose a DSM system with a novel coherence protocol, and a novel hierarchical queue delegation locking approach. More specifically, we propose an approach, suitable for Data-Race-Free programs, based on self-invalidation, self-downgrade, and passive data classification directories that require no message handlers, thereby incurring no extra latency. For fast synchronization we extend Queue Delegation Locking to execute critical sections in large batches on a single core before passing execution along to other cores, sockets, or nodes, in that hierarchical order. The result is a software DSM system called Argo which localizes as many decisions as possible and allows high parallel performance with little overhead on synchronization when compared to prior DSM implementations.

Time: Monday, 25 April 2016, 14:30

Venue: Jülich Supercomputing Centre, Besprechungsraum 1, building 16.3, room 350

Anyone interested is cordially invited to participate in this seminar.

Contact: Dr. Sabine Höfler-Thierfeldt, JSC

sgd Prof. Dr. Dr. Thomas Lippert