Holistic Scalable Performance Analysis of Distributed Applications on Many-Core Computers

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Where: Jakob-Haringer-Str. 2, Room T02

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Current many-core computer feature unprecedented computing resources at relatively low cost and low power. many-core computers usually rely on a very high-bandwidth, low-latency communication infrastructure (network-on-chip and/or interchip network) serving different tasks like memory access, dedicated inter-core communication, I/O routing, cache coherency protocol, ...). The system-wide communication infrastructure has become a single yet highly versatile shared resource. The high bandwidth and low latency alleviates many performance issues encountered in distributed applications on clusters. The dynamic behaviour of resource allocation, however, makes guarantees on available bandwidth extremely hard.
Today, we are only beginning to understand the implications of complex software stacks (Linux+MPI+...) onto inter-chip traffic patterns. This understanding is key to enabling efficient exploitation of future systems with increased core count. Available performance analysis tools make it extremely hard to identify root causes of observed inter-chip link saturation. I will present a tool based on DTrace allowing for this kind of root cause analysis encompassing the full software stack. I will present results from analysis of a distributed molecular dynamics simulation (CHARMM) on a 48-core (4 x AMD Magny-Cours, 256 GB RAM) computer. I will emphasise that this task must and can be accomplished without collecting traces.

DI Dr. Manfred Mücke is with the Research Lab Computational Technologies and Applications at the University of Vienna (rlcta.univie.ac.at). In his industrial past, he used to develop high-speed embedded industrial imaging solutions based on FPGAs. In 2003-2006, he was with CERN as a Research Engineer, exploring new approaches for integrating mathematical design space exploration into hardware description languages. His research focuses on enabling acceleration of distributed scientific applications through use of reconfigurable logic (FPGAs). This includes in-depth performance analysis of distributed applications on multi/many-core architectures.

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