

Preface

Exascale supercomputers will deliver an unprecedented computing power of 10^{18} floating point operations per second through extreme parallelism likely achieved from hybrid computer architectures. Software and scientific applications running on exascale supercomputer face the challenge of effectively exploiting this computing power. To address this challenge, many potentially disruptive changes are needed in software and applications. The Exascale Applications and Software Conference (EASC) brings together all developers and researchers involved in solving the software challenges of the exascale era. This volume collected selected contributions from the second EASC in Stockholm during April 2–3, 2014. The volume is intended for use by researchers and students of computer science and computational physics. In particular, the volume is very well suited for use by developers of parallel codes, new programming models, run-time systems, and tools for petascale and exascale supercomputers.

This volume is organized into two parts. The first series of articles presents the new developments and algorithms in large scientific applications from different scientific domains, such as biochemistry, computational fluid dynamics, and neutronics. In particular, these articles show how to exploit different levels of parallelism (vector instructions, intra-node and inter-node levels) on hybrid supercomputers in the molecular dynamics GROMACS and computational fluid dynamics Nek5000 codes. Innovative algorithms for reducing memory storage in Monte Carlo methods for neutronics and for improving the quality of sparse domain decomposition in lattice-Boltzmann methods are presented. The second part of the volume presents advancements in software development environments for exascale. The performance modeling of the HPX-5 run-time system for the LULESH proxy application is presented and the co-design work is explained. One article analyzes the effect of system noise on distributed applications at large scale. The new developments in the MUST MPI correctness checker and the VAMPIR performance monitoring tool are presented. Finally, an article on the Vistle visualization tool for distributed environments concludes the volume.

January 2015

Stefano Markidis

Solving Software Challenges for Exascale
International Conference on Exascale Applications and
Software, EASC 2014, Stockholm, Sweden, April 2-3,
2014, Revised Selected Papers
Markidis, S.; Laure, E. (Eds.)
2015, VIII, 149 p. 61 illus., Softcover
ISBN: 978-3-319-15975-1