Preface

This book covers the results of the 11th and 12th Teraflop Workshop and continued a series initiated by NEC and the HLRS in 2004. As part of the Teraflop Workbench, it has become a meeting platform for scientists, application developers, international experts and hardware designers to discuss the current state and future directions of supercomputing with the aim of achieving the highest sustained application performance.

The Teraflop Workbench Project is a collaboration between the High Performance Computing Center Stuttgart (HLRS) and NEC Deutschland GmbH (NEC HPCE) to support users to achieve their research goals using High Performance Computing. The first stage of the Teraflop Workbench project (2004–2008) concentrated on user’s applications and their optimization for the 72-node NEC SX-8 installation at HLRS. During this stage, numerous individual codes, developed and maintained by researchers or commercial organizations, have been analyzed and optimized. Several of the codes have shown the ability to outreach the TFlop/s threshold of sustained performance. This created the possibility for new science and a deeper understanding of the underlying physics.

The second stage of the Teraflop Workbench project (2008–2012) focuses on current and future trends of hardware and software developments. We observe a strong tendency to heterogeneous environments at the hardware level. At the same time, applications become increasingly heterogeneous by including multi-physics or multi-scale effects. The goal of the current studies of the Teraflop Workbench is to gain inside into the developments of both components. The overall target is to help scientists to run their application in the most efficient and most convenient way on the hardware best suited for their purposes.

The papers in this book draw a bow from leading edge operating system development to the needs and results of real life applications in various scientific areas. They put the different views of hardware specialists, supercomputing centers, and users on a common topic up to discussions, namely to enable and facilitate leading edge scientific research.

The work in the Teraflop Workbench project gives us insight into the applications and requirements for current and future HPC systems. We observe the emergence
of multi-scale and multi-physics applications, the increase in interdisciplinary tasks and the growing tendency to use today’s stand-alone application codes as modules in prospective, more complex coupled simulations. At the same time, we notice the current lack of support for those applications. Our goal is to offer an environment that allows users to concentrate on their area of expertise without spending too much time on computer science itself.

We would like to thank all the contributors of this book and the Teraflop Workbench project. We thank especially Prof. Hiroaki Kobayashi for the close collaboration over the past years and are looking forward to intensify our cooperation in the future.

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