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The workshop held at the High Performance Computing Center Stuttgart (HLRS) was the second of this kind. The ?rst one had been held in May 2004. At both workshops hardware and software issues were presented and applications were discussed that have the potential to scale and achieve a very high level of sustained performance.

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**High Performance Computing on Vector Systems 2005 ...**

The Arm Scalable Vector Extension, or SVE, is an extension for the AArch64 instruction set of the Armv8 architecture. It is a key technology furthering the ability of Arm processors to efficiently address the computation requirements of HPC, Data Analytics, Machine Learning, and other applications. With the arrival of the first SVE-enabled hardware platform from Fujitsu, we are gaining experience with SVE.

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The book presents the state of the art in high performance computing and simulation on modern supercomputer architectures. It covers trends in hardware and software development in general and specifically the future of vector-based systems and heterogeneous architectures. The application contributions cover computational fluid dynamics, material science, medical applications and climate research. Innovative fields like coupled multi-physics or multi-scale simulations are presented. All papers were chosen from presentations given at the 13th Teraflop Workshop held in October 2010 at Tohoku University, Japan.

This book covers the results of the Tera op Workbench, other projects related to High Performance Computing, and the usage of HPC installations at HLRS. The Tera op Workbench project is a collaboration between the High Performance C- puting Center Stuttgart (HLRS) and NEC Deutschland GmbH (NEC-HPCE) to s- port users in achieving their research goals using High Performance Computing. The rst stage of the Tera op Workbench project (2004–2008) concentrated on user's applications and their optimization for the former ag ship of HLRS, a - node NEC SX-8 installation. During this stage, numerous individual codes, dev- oped and maintained by researchers or commercial organizations, have been a- lyzed and optimized. Within the project, several of the codes have shown the ability to outreach the TFlop/s threshold of sustained performance. This created the pos- bility for new science and a deeper understanding of the underlying physics. The second stage of the Tera op Workbench project (2008–2012) focuses on c- rent and future trends of hardware and software developments. We observe a strong tendency to heterogeneous environments on the hardware level, while at the same time, applications become increasingly heterogeneous by including multi-physics or multi-scale effects. The goal of the current studies of the Tera op Workbench is to gain insight in the developments of both components. The overall target is to help scientists to run their application in the most ef cient and most convenient way on the hardware best suited for their purposes.

The book presents the state-of-the-art in high performance computing and simulation on modern supercomputer architectures. It covers trends in high performance application software development in general and specifically for parallel vector architectures. The contributions cover among others the field of computational fluid dynamics, physics, chemistry, and meteorology. Innovative application fields like reactive flow simulations and nano technology are presented.

This book covers the results of the 11th and 12th Tera?op Workshop and continued a series initiated by NEC and the HLRS in 2004. As part of the Tera?op 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 perf- mance. The Tera?op Workbench Project is a collaboration between the High Perf- mance Computing Center Stuttgart (HLRS) and NEC Deutschland GmbH (NEC HPCE) to support users to achieve their research goals using High Performance Computing. The ?rst stage of the Tera?op Workbench project (2004–2008) c- centrated 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 - timized. Several of the codes have shown the ability to outreach the TFlop/s thre- old of sustained performance. This created the possibility for new science and a deeper understanding of the underlying physics.

This book covers the results obtained in the Tera op Workbench project during a four years period from 2004 to 2008. The Tera op Workbench project is a colla- ration betweenthe High PerformanceComputingCenter Stuttgart (HLRS) and NEC Deutschland GmbH (NEC-HPCE) to support users to achieve their research goals using high performance computing. The Tera op Workbench supports users of the HLRS systems to enable and - cilitate leading edge scienti c research. This is achieved by optimizing their codes and improving the process work ow which results from the integration of diff- ent modules into a "hybrid vector system". The assessment and demonstration of industrial relevance is another goal of the cooperation. The Tera op Workbench project consists of numerous individual codes, grouped together by application area and developed and maintained by researchers or c- mercial organizations. Within the project, several of the codes have shown the ab- ity to reach beyond the TFlop/s threshold of sustained performance. This created the possibility for new science and a deeper understanding of the underlying physics. The papers in this book demonstrate the value of the project for different scienti c areas.

This book contains papers presented at the fifth and sixth Teraflop Workshop. It presents the state-of-the-art in high performance computing and simulation on modern supercomputer architectures. It covers trends in hardware and software development in general and specifically the future of vector-based systems and heterogeneous architectures. It covers computational fluid dynamics, fluid-structure interaction, physics, chemistry, astrophysics, and climate research.

The book presents the state of the art in high performance computing and simulation on modern supercomputer architectures. It covers trends in hardware and software development in general and specifically the future of vector-based systems and heterogeneous architectures. The application contributions include computational fluid dynamics, physics, chemistry, astrophysics, and biology. Innovative application fields like multiphysics simulations and material science are presented.

This book presents the state-of-the-art in simulation on supercomputers. Leading researchers present results achieved on systems of the High Performance Computing Center Stuttgart (HLRS) for the year 2010. The reports cover all fields of computational science and engineering, ranging from CFD to computational physics and chemistry to computer science, with a special emphasis on industrially relevant applications. Presenting results for both vector systems and microprocessor-based systems, the book makes it possible to compare the performance levels and usability of various architectures. As HLRS operates the largest NEC SX-8 vector system in the world, this book gives an excellent insight into the potential of vector systems, covering the main methods in high performance computing. Its outstanding results in achieving the highest performance for production codes are of particular interest for both scientists and engineers. The book includes a wealth of color illustrations and tables.