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High Performance Computing in Science





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High Performance Computing In Science And Engineering Munich 2004

A. Deane, Gunther Brenner, David R. Emerson, James McDonough, Damien Tromeur-Dervout, N. Satofuka, A. Ecer, Jacques Periaux

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High Performance Computing in Science and Engineering, Munich 2004 Siegfried Wagner, Werner Hanke, Arndt Bode, Franz Durst, 2005-12-06 Leading edge research groups in the field of scientific computing present their outstanding projects using the High Performance Computer in Bavaria HLRB Hitachi SR8000 F1 one of the top level supercomputers for academic research in Germany The projects address modelling and simulation in the disciplines Biosciences Chemistry Chemical Physics Solid State Physics High Energy Physics Astrophysics Geophysics Computational Fluid Dynamics and Computer Science The authors describe their scientific background their resource requirements with respect to top level supercomputers and their methods for efficient utilization of the costly high performance computing power Contributions of interdisciplinary research projects that have been supported by the Competence Network for Scientific High Performance Computing in Bavaria KONWIHR complete the broad range of supercomputer research and applications covered by this volume High Performance Computing in Science and Engineering, Garching/Munich 2007 Siegfried Wagner, Matthias Steinmetz, Arndt Bode, Matthias Brehm, 2008-10-22 For the fourth time the Leibniz Supercomputing Centre LRZ and the Com tence Network for Technical Scienti c High Performance Computing in Bavaria KONWIHR publishes the results from scienti c projects conducted on the c puter systems HLRB I and II High Performance Computer in Bavaria This book reports the research carried out on the HLRB systems within the last three years and compiles the proceedings of the Third Joint HLRB and KONWIHR Result and Reviewing Workshop 3rd and 4th December 2007 in Garching In 2000 HLRB I was the rst system in Europe that was capable of performing more than one Tera op s or one billion oating point operations per second In 2006 it was replaced by HLRB II After a substantial upgrade it now achieves a peak performance of more than 62 Tera op s To install and operate this powerful system LRZ had to move to its new facilities in Garching However the situation regarding the need for more computation cycles has not changed much since 2000 The demand for higher performance is still present a trend that is likely to continue for the foreseeable future Other resources like memory and disk space are currently in suf cient abundance on this new system High Performance Computing in Science and Engineering, Garching 2004 Arndt Bode, Franz Durst, 2006-01-20 This volume of High Performance Computing in Science and Engineering is fully dedicated to the final report of KONWIHR the Bavarian Competence Network for Technical and Scientific High Performance Computing It includes the transactions of the final KONWIHR workshop that was held at Technische Universit t M nchen October 14 15 2004 as well as additional reports of KONWIHR research groups KONWIHR was established by the Bavarian State Government in order to support the broad application of high performance computing in science and technology throughout the country KONWIHR is a supporting action to the installation of the German supercomputer Hitachi SR 8000 in the Leibniz Computing Center of the Bavarian Academy of Sciences The report covers projects from basic research in computer science to develop tools for high performance computing as well as applications from biology chemistry electrical

engineering geology mathematics physics computational fluid dynamics materials science and computer science High <u>Performance Computing in Science and Engineering '07</u> Wolfgang E. Nagel, 2007-12-18 This book presents the state of the art in simulation on supercomputers Leading researchers present results achieved on systems of the Stuttgart High Performance Computing Center in 2007 The reports cover all fields of computational science and engineering with emphasis on industrially relevant applications Presenting results for both vector based and microprocessor based systems the book allows comparison between performance levels and usability of various architectures **High Performance Computing in** Science and Engineering, Munich 2002 Siegfried Wagner, Werner Hanke, Arndt Bode, Franz Durst, 2012-12-06 High Performance Computers HPC have initiated a revolutionary develop ment in research and technology since many complex and challenging prob lems in this area can only be solved by HPC and a network in modeling algo rithms and software In 1998 the Deutsche Forschungsgemeinschaft German Research Association recommended to install an additional Federal High Performance Computer followed by the one in Stuttgart In January 1999 the Wissenschaftsrat German Science Council decided that the Leibniz Rechenzentrum Computing Center of the Bavarian Academy of Sciences in Munich should run the second Federal High Performance Computer in Ger many The investment cost of this Hochstleistungsrechner in Bayern HLRB was borne by the Federal Government of Germany and the Free State of Bavaria whereas the operating cost was at the expense of the Bavarian Gov ernment only The operation of the HLRB is organized in combination with the Leibniz Rechenzentrum LRZ of the Bavarian Academy of Sciences as the operating authority of the HLRB Steering Committee of the HLRB Competence Network for Technical Scientific High Performance Comp ing in Bavaria KONWIHR In 2000 a Hitachi SR8000 Fl was installed It was the first Teraflops Com puter in Germany and reached a peak performance of two Teraflops after an extension at the end of 2001 The goal of HLRB is to provide computer facilities necessary to solve challenging scientific and technological problems that cannot be solved on big servers but require large storage high performance very fast computers and efficient software High Performance Computing in Science and Engineering, Garching/Munich 2009 Siegfried Wagner, Matthias Steinmetz, Arndt Bode, Markus Michael Müller, 2010-08-12 The Leibniz Supercomputing Centre LRZ and the Bayarian Competence Network for Technical and Scienti c High Performance Computing KONWIHR publish in the present book results of numerical simulations facilitated by the High P formance Computer System in Bavaria HLRB II within the last two years The papers were presented at the Fourth Joint HLRB and KONWIHR Review and sult Workshop in Garching on 8th and 9th December 2009 and were selected from all progress reports of projects that use the HLRB II Similar to the workshop two years ago the majority of the contributed papers belong to the area of computational uid dynamics CFD condensed matter physics astrophysics chemistry computer sciences and high energy physics We note a considerable increase of the user c munity in some areas Compared to 2007 the number of papers increased from 6 to 12 in condensed matter physics and from 2 to 5 in high energy physics Bio s ences contributed only one paper in 2007 but four papers in 2009

This indicates that the area of application of supercomputers is continuously growing and entering new elds of research The year 2007 saw two major events of particular importance for the LRZ First after a substantial upgrade with dual core processors the SGI Altix 4700 superc puter reached a peak performance of more than 62 Tera op s And second the n pro t organization Gauss Centre for Supercomputing e V GCS was founded on April 13th **High Performance Computing in** Science and Engineering, Munich 2004 Siegfried Wagner, Werner Hanke, Arndt Bode, Franz Durst, 2004-09-22 Leading edge research groups in the field of scientific computing present their outstanding projects using the High Performance Computer in Bavaria HLRB Hitachi SR8000 F1 one of the top level supercomputers for academic research in Germany The projects address modelling and simulation in the disciplines Biosciences Chemistry Chemical Physics Solid State Physics High Energy Physics Astrophysics Geophysics Computational Fluid Dynamics and Computer Science The authors describe their scientific background their resource requirements with respect to top level supercomputers and their methods for efficient utilization of the costly high performance computing power Contributions of interdisciplinary research projects that have been supported by the Competence Network for Scientific High Performance Computing in Bavaria KONWIHR complete the broad range of supercomputer research and applications covered by this volume High Performance Computing in Science and Engineering '12 Wolfgang E. Nagel, Dietmar H. Kröner, Michael M. Resch, 2013-02-15 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 2012 The reports cover all fields of computational science and engineering ranging from CFD via computational physics and chemistry to computer science with a special emphasis on industrially relevant applications Presenting results for both vector systems and micro processor based systems the book allows to compare performance levels and usability of various architectures As HLRS operates not only a large cluster system but also one of the largest NEC vector systems in the world this book gives an excellent insight also into the potential of vector systems. The book covers the main methods in high performance computing Its outstanding results in achieving highest performance for production codes are of particular interest for both the scientist and the engineer The book comes **High Performance Computing in Science and** with a wealth of coloured illustrations and tables of results **Engineering '05** Wolfgang E. Nagel, Willi Jäger, 2006-03-06 Provides the advances in modelling and simulation on supercomputers Presenting results achieved on systems of the High Performance Computing Center Stuttgart HLRS for the year 2005 these reports cover various fields of computational science and engineering ranging from CFD via computational physics and chemistry to computer science High Performance Computing in Science and Engineering '09 Wolfgang E. Nagel, 2010-04-28 At the end of the year 2008 we have seen a strategic step towards a funct ning HPC infrastructure on Tier 0 level in Germany Based on an agreement Verwaltungsabkommen between the Federal Ministry of Education and Research BMBF and the state ministries for research of Baden Wurttem berg Bayern and Nordrhein Westfalen a budget of overall 400

Million Euro had been allocated equally shared between federal and state authorities in a ve year time frame to establish the next generation of HPC systems at the Gauss Centre for Supercomputing GCS consisting of the three nat nal supercomputing centres HLRS Stuttgart NIC JSC Julich and LRZ Munich As part of that strategic initiative in May 2009 already NIC JSC has installed the rst phase of the GCS HPC Tier 0 resources an IBM Blue Gene P with roughly 300 000 Cores this time in Julic h With that the GCS provides the most powerfulligh performance computing infrastructure in rope already today HLRS and its partners in the GCS have agreed on a common strategy for the installation of the next generation of leading edge HPC systems Over the next few years HLRS and LRZ as the other two GCS centers will upgrade their systems accordingly The plan is to have a Tier 0 HPC system within GCS operating at any time in this ve year period Asanintermediatestep HLRShasreplacedmostoftheirNECSX 8nodes by the NEC SX 9 12M192 a system with roughly 20 TFLOPs peak Performance Computing in Science and Engineering '06 Wolfgang E. Nagel, Willi Jäger, 2007-07-26 The last two years have been great for high performance computing in Baden W urttemberg and beyond In July 2005 the new building for HLRS as well as Stuttgart's new NEC supercomputer which is still leading edge in G many have been inaugurated In these days the SSC Karlsruhe is nalizing the installation of a very large high performance system complex from HP built from hundreds of Intel Itanium processors and more than three th sand AMD Opteron cores Additionally the fast network connection with a bandwidth of 40Gbit's and thus one of the rst installations of this kind in Germany brings the machine rooms of HLRS and SSC Karlsruhe very close together With the investment of more than 60 Million Euro we as the users of such a valuable infrastructure are not only thankful to science managers and politicians but also to the people running these components as part of their daily business on a 24 7 level Sinceabout18months therearelotsofactivities on allscienti c advisory and political levels to decide if Germany will install an even larger European supercomputer where the hardware costs alone will be around 200 Million Euro for a ve year period There are many good reasons to invest in such a program because beyond the infrastructure such a scienti c research tool will attract the best brains to tackle the problems related to the software and methodology challenges High Performance Computing in Science and Engineering '11 Wolfgang E. Nagel, Dietmar B. Kröner, Michael M. Resch, 2012-01-05 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 2011 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 allows readers to compare the performance levels and usability of various architectures As HLRS operates not only a large cluster system but also one of the largest NEC vector systems in the world this book also offers excellent insights into the potential of vector systems. The book covers the main methods used in high performance computing Its outstanding results in achieving highest performance for production codes are of particular

interest for scientists and engineers alike The book comes with a wealth of color illustrations and tables of results Computational Science and High Performance Computing II Egon Krause, Yurii I. Shokin, Nina Shokina, 2006-06-18 This volume contains 27 contributions to the Second Russian German Advanced Research Workshop on Computational Science and High Performance Computing presented in March 2005 at Stuttgart Germany Contributions range from computer science mathematics and high performance computing to applications in mechanical and aerospace engineering High Performance Computing in Science and Engineering '20 Wolfgang E. Nagel, Dietmar H. Kröner, Michael M. Resch, 2022-01-01 This book presents the state of the art in supercomputer simulation It includes the latest findings from leading researchers using systems from the High Performance Computing Center Stuttgart HLRS in 2020 The reports cover all fields of computational science and engineering ranging from CFD to computational physics and from chemistry to computer science with a special emphasis on industrially relevant applications Presenting findings of one of Europe's leading systems this volume covers a wide variety of applications that deliver a high level of sustained performance The book covers the main methods in high performance computing Its outstanding results in achieving the best performance for production codes are of particular interest for both scientists and engineers. The book comes with a wealth of color illustrations and tables of results High Performance Computing on Vector Systems 2005 Thomas Bönisch, Katharina Benkert, Toshiyuki Furui, Yoshiki Seo, Wolfgang Bez, 2007-05-31 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 Parallel Computing: Accelerating Computational Science and Engineering (CSE) M. Bader, A. Bode, H.-J. Bungartz, 2014-03-31 Parallel computing has been the enabling technology of high end machines for many years Now it has finally become the ubiquitous key to the efficient use of any kind of multi processor computer architecture from smart phones tablets embedded systems and cloud computing up to exascale computers x000D This book presents the proceedings of ParCo2013 the latest edition of the biennial International Conference on Parallel Computing held from 10 to 13 September 2013 in Garching Germany The conference focused on several key parallel computing areas Themes included parallel programming models for multi and manycore CPUs GPUs FPGAs and heterogeneous platforms the performance engineering processes that must be adapted to efficiently use these new and innovative platforms novel numerical algorithms and approaches to large scale simulations of problems in science and engineering x000D The conference programme also included twelve mini symposia including an industry session and a special PhD Symposium which comprehensively represented and intensified the discussion of current hot topics in high performance and parallel computing These special sessions covered large scale supercomputing novel challenges arising

from parallel architectures multi manycore heterogeneous platforms FPGAs multi level algorithms as well as multi scale multi physics and multi dimensional problems x000D. It is clear that parallel computing including the processing of large data sets Big Data will remain a persistent driver of research in all fields of innovative computing which makes this book relevant to all those with an interest in this field Introduction to High Performance Computing for Scientists and Engineers Georg Hager, Gerhard Wellein, 2010-07-02 Written by high performance computing HPC experts Introduction to High Performance Computing for Scientists and Engineers provides a solid introduction to current mainstream computer architecture dominant parallel programming models and useful optimization strategies for scientific HPC From working in a scientific computing center the author High Performance Computing and Communications Michael Gerndt, Dieter Kranzlmüller, 2006-09-09 This book constitutes the refereed proceedings of the Second International Conference on High Performance Computing and Communications HPCC 2006 The book presents 95 revised full papers addressing all current issues of parallel and distributed systems and high performance computing and communication Coverage includes networking protocols routing and algorithms languages and compilers for HPC parallel and distributed architectures and algorithms wireless mobile and pervasive computing Web services peer to peer computing and more 100 Volumes of 'Notes on Numerical Fluid Mechanics' Ernst Heinrich Hirschel, Egon Krause, 2009-05-19 In a book that will be required reading for engineers physicists and computer scientists the editors have collated a number of articles on fluid mechanics written by some of the world's leading researchers and practitioners in this important subject area Parallel Computational Fluid Dynamics 2005 A. Deane, Gunther Brenner, David R. Emerson, James McDonough, Damien Tromeur-Dervout, N. Satofuka, A. Ecer, Jacques Periaux, 2006-09-06 The proceedings from Parallel CFD 2005 covering all aspects of the theory and applications of parallel computational fluid dynamics from the traditional to the more contemporary issues Report on current research in the field in an area which is rapidly changing Subject is important to all interested in solving large fluid dynamics problems Interdisciplinary activity Contributions include scientists with a variety of backgrounds

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