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Performance Evaluation of Supercomputers using HPCC and IMB Benchmarks

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Abstract

The HPC Challenge (HPCC) benchmark suite and the Intel MPI Benchmark (IMB) are used to compare and evaluate the combined performance of processor, memory subsystem and interconnect fabric of five leading supercomputers - SGI Altix BX2, Cray X1, Cray Opteron Cluster, Dell Xeon cluster, and NEC SX-8. These five systems use five different networks (SGI NUMALINK4, Cray network, Myrinet, InfiniBand, and NEC IXS). The complete set of HPCC benchmarks are run on each of these systems. Additionally, we present Intel MPI Benchmarks results to study the performance of 11 MPI communication functions on these systems.

1. Introduction:

Performance of processor, memory subsystem and interconnect is a critical factor in the overall performance of computing system and thus the applications running on it. The HPC Challenge (HPCC) benchmark suite is designed to give a picture of overall supercomputer performance including floating point compute power, memory subsystem performance and global network issues [1,2]. In this paper, we use the HPCC suite as a first comparison of systems. Additionally, the message-passing paradigm has become the de facto standard in programming high-end parallel computers. As a result, the performance of a majority of applications depends on the performance of the MPI functions as implemented on these systems. Simple bandwidth and latency tests are two traditional metrics for assessing the performance of the interconnect fabric of the system. However, simple measures of these two are not adequate to predict the performance for real world applications. For instance, traditional methods highlight the performance of network by latency using zero byte message sizes and peak bandwidth for a very large message sizes ranging from 1 MB to 4 MB for small systems (typically 32 to 64 processors.) Yet, real world

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Janusz S. Kowalik

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   Supercomputer performance evaluation and the Perfect Benchmarks George Cybenko,1990 Abstract In the past three years the Perfect Benchmark superscript TM Suite has evolved from a supercomputer performance evaluation plan

presented by Kuck and Sameh at the 1987 International Conference on Supercomputing to a vigorous international activity This paper surveys the current state of supercomputer performance evaluation with particular focus on the methodology adopted by the Perfect effort While there has been considerable success in achieving the goals of the plan some issues remain unresolved and new questions have surfaced **The Student Supercomputer Challenge Guide** ASC Community,2018-03-26 This guide provides a comprehensive overview of High Performance Computing HPC to equip students with a full skill set including cluster setup network selection and a background of supercomputing competitions It covers the system architecture evaluating approaches and other practical supercomputing techniques As the world s largest supercomputing hackathon the ASC Student Supercomputer Challenge has attracted a growing number of new talent to supercomputing and has greatly promoted communications in the global HPC community Enclosed in this book readers will also find how to analyze and optimize supercomputing systems and applications in real science and engineering cases

Supercomputing Janusz S. Kowalik,2012-12-06 Supercomputing is an important science and technology that enables the scientist or the engineer to simulate numerically very complex physical phenomena related to large scale scientific industrial and military applications It has made considerable progress since the first NATO Workshop on High Speed Computation in 1983 Vol 7 of the same series This book is a collection of papers presented at the NATO Advanced Research Workshop held in Trondheim Norway in June 1989 It presents key research issues related to hardware systems architecture and performance compilers and programming tools user environments and visualization algorithms and applications Contributions include critical evaluations of the state of the art and many original research results Super Computers V. Rajaraman,1999 This book explains what a supercomputer is and why such a machine is needed to solve challenging problems in science and engineering The architecture of super computers which distinguishes them from other computers is explained and the need to vectorise programs to make effective use of supercomputers is brought out **An Agenda for Improved Evaluation of Supercomputer Performance** National Research Council,Division on Engineering and Physical Sciences,Commission on Engineering and Technical Systems,Energy Engineering Board,Committee on Supercomputer Performance and Development,1986-02-01 Supercomputing in Engineering Analysis Hojjat Adeli,2020-08-13 The first volume in this new series has a companion in volume 2 unseen Parallel processing in computational mechanics The first six contributions present general aspects of supercomputing from both hardware and software engineering points of view Subsequent chapters discuss homotopy algorithms **Proceedings: Supercomputer design, performance evaluation, and performance education** ,1987 Supercomputing Julian Martin Kunkel,Thomas Ludwig,Hans Meuer,2014-06-03 This book constitutes the refereed proceedings of the 29th International Supercomputing Conference ISC 2014 held in Leipzig Germany in June 2014 The 34 revised full papers presented together were carefully reviewed and selected from 79 submissions The papers cover the following topics scalable applications with 50K cores advances in algorithms scientific

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