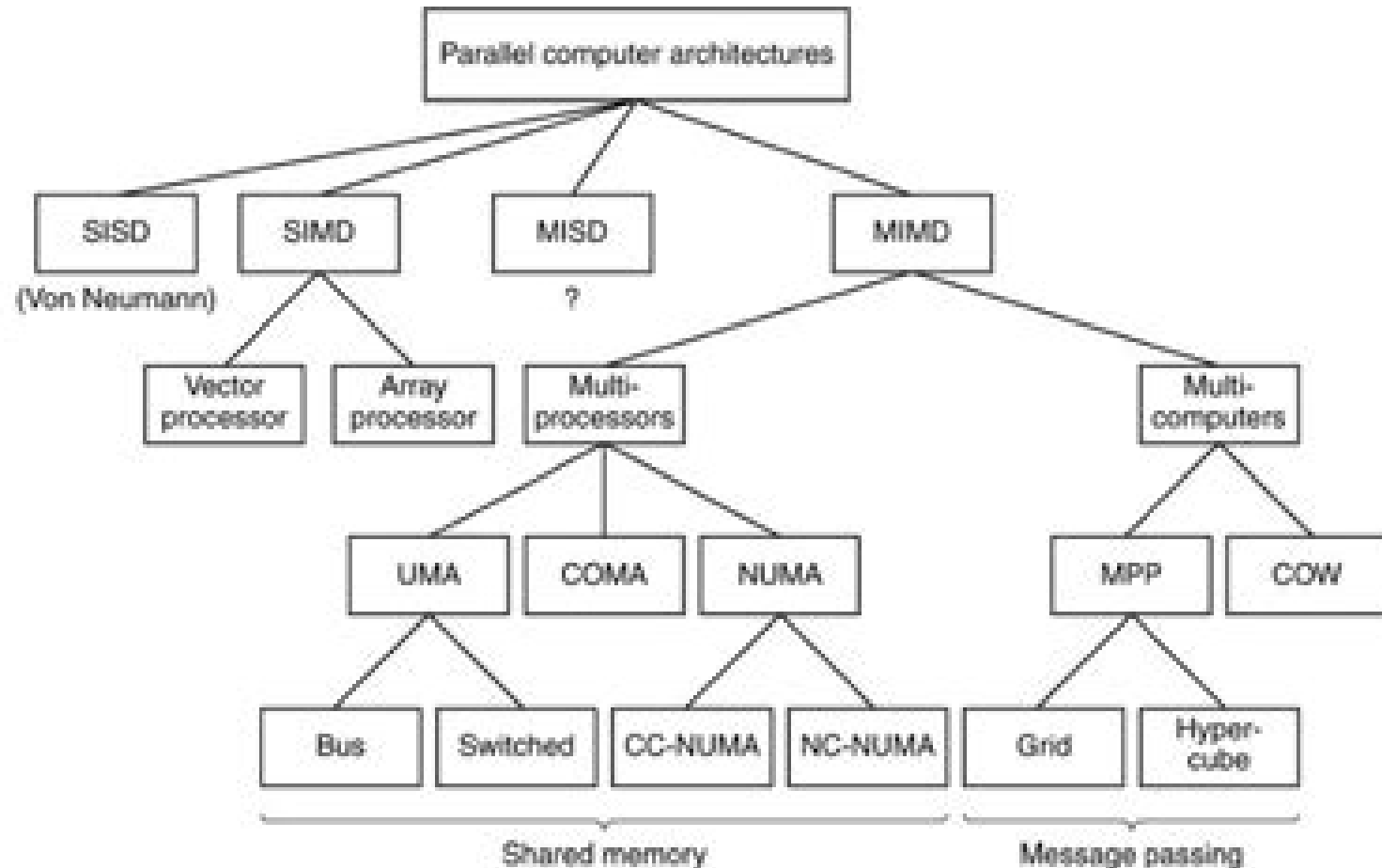


Taxonomy of Parallel Computers (2)



A taxonomy of parallel computers.

Parallel Computers

Hans J Herrmann, Frithjof Karsch



Parallel Computers:

Data Organization in Parallel Computers Harry A.G. Wijshoff, 2012-12-06 The organization of data is clearly of great importance in the design of high performance algorithms and architectures Although there are several landmark papers on this subject no comprehensive treatment has appeared This monograph is intended to fill that gap We introduce a model of computation for parallel computer architectures by which we are able to express the intrinsic complexity of data organization for specific architectures We apply this model of computation to several existing parallel computer architectures e g the CDC 205 and CRAY vector computers and the MPP binary array processor The study of data organization in parallel computations was introduced as early as 1970 During the development of the ILLIAC IV system there was a need for a theory of possible data arrangements in interleaved memory systems The resulting theory dealt primarily with storage schemes also called skewing schemes for 2 dimensional matrices i e mappings from a dimensional array to a number of memory banks By means of the model of computation we are able to apply the theory of skewing schemes to various kinds of parallel computer architectures This results in a number of consequences for both the design of parallel computer architectures and for applications of parallel processing

Past, Present, Parallel Arthur Trew, Greg Wilson, 2012-12-06 Past Present Parallel is a survey of the current state of the parallel processing industry In the early 1980s parallel computers were generally regarded as academic curiosities whose natural environment was the research laboratory Today parallelism is being used by every major computer manufacturer although in very different ways to produce increasingly powerful and cost effective machines The first chapter introduces the basic concepts of parallel computing the subsequent chapters cover different forms of parallelism including descriptions of vector supercomputers SIMD computers shared memory multiprocessors hypercubes and transputer based machines Each section concentrates on a different manufacturer detailing its history and company profile the machines it currently produces the software environments it supports the market segment it is targetting and its future plans Supplementary chapters describe some of the companies which have been unsuccessful and discuss a number of the common software systems which have been developed to make parallel computers more usable The appendices describe the technologies which underpin parallelism Past Present Parallel is an invaluable reference work providing up to date material for commercial computer users and manufacturers and for researchers and postgraduate students with an interest in parallel computing

PARALLEL COMPUTERS ARCHITECTURE AND PROGRAMMING V. Rajaraman, , RAM MURTHY C. SIVA, 2016-03-11 Today all computers from tablet desktop computers to super computers work in parallel A basic knowledge of the architecture of parallel computers and how to program them is thus essential for students of computer science and IT professionals In its second edition the book retains the lucidity of the first edition and has added new material to reflect the advances in parallel computers It is designed as text for the final year undergraduate students of computer science and engineering and information technology It describes the principles of designing parallel computers and how to program them

This second edition while retaining the general structure of the earlier book has added two new chapters Core Level Parallel Processing and Grid and Cloud Computing based on the emergence of parallel computers on a single silicon chip popularly known as multicore processors and the rapid developments in Cloud Computing All chapters have been revised and some chapters are re written to reflect the emergence of multicore processors and the use of MapReduce in processing vast amounts of data The new edition begins with an introduction to how to solve problems in parallel and describes how parallelism is used in improving the performance of computers The topics discussed include instruction level parallel processing architecture of parallel computers multicore processors grid and cloud computing parallel algorithms parallel programming compiler transformations operating systems for parallel computers and performance evaluation of parallel computers

Parallel Computers Philip C. Treleaven, 1990-02-09 The book brings together in one source a comprehensive review of the work of ESPRIT Project 415 It also provides a good overview of the general area of novel parallel computer architectures and programming languages Chapter 1 provides a survey of parallel computing research in Europe chapter 2 provides a background to parallel computing techniques It comprises sections on the major application areas of parallel processing high level programming languages models of parallel computation parallel hardware architectures language implementation chapters 5 through 9 present Subprojects B to F respectively

Parallel Computers 2 R.W Hockney, C.R Jesshope, 1988-01-01 Since the publication of the first edition parallel computing technology has gained considerable momentum A large proportion of this has come from the improvement in VLSI techniques offering one to two orders of magnitude more devices than previously possible A second contributing factor in the fast development of the subject is commercialization The supercomputer is no longer restricted to a few well established research institutions and large companies A new computer breed combining the architectural advantages of the supercomputer with the advance of VLSI technology is now available at very attractive prices A pioneering device in this development is the transputer a VLSI processor specifically designed to operate in large concurrent systems

Parallel Computers 2 Architecture Programming and Algorithms reflects the shift in emphasis of parallel computing and tracks the development of supercomputers in the years since the first edition was published It looks at large scale parallelism as found in transputer ensembles This extensively rewritten second edition includes major new sections on the transputer and the OCCAM language The book contains specific information on the various types of machines available details of computer architecture and technologies and descriptions of programming languages and algorithms Aimed at an advanced undergraduate and postgraduate level this handbook is also useful for research workers machine designers and programmers concerned with parallel computers In addition it will serve as a guide for potential parallel computer users especially in disciplines where large amounts of computer time are regularly used

Past, Present, Parallel Arthur Trew, Greg Wilson, 1991-04-01 Past Present Parallel is a survey of the current state of the parallel processing industry In the early 1980s parallel computers were generally regarded as academic curiosities

whose natural environment was the research laboratory Today parallelism is being used by every major computer manufacturer although in very different ways to produce increasingly powerful and cost effective machines The first chapter introduces the basic concepts of parallel computing the subsequent chapters cover different forms of parallelism including descriptions of vector supercomputers SIMD computers shared memory multiprocessors hypercubes and transputer based machines Each section concentrates on a different manufacturer detailing its history and company profile the machines it currently produces the software environments it supports the market segment it is targetting and its future plans Supplementary chapters describe some of the companies which have been unsuccessful and discuss a number of the common software systems which have been developed to make parallel computers more usable The appendices describe the technologies which underpin parallelism Past Present Parallel is an invaluable reference work providing up to date material for commercial computer users and manufacturers and for researchers and postgraduate students with an interest in parallel computing

Algorithms, Software and Hardware of Parallel Computers J. Miklosko,V. J. Kotov,2013-04-17 Both algorithms and the software and hardware of automatic computers have gone through a rapid development in the past 35 years The dominant factor in this development was the advance in computer technology Computer parameters were systematically improved through electron tubes transistors and integrated circuits of ever increasing integration density which also influenced the development of new algorithms and programming methods Some years ago the situation in computers development was that no additional enhancement of their performance could be achieved by increasing the speed of their logical elements due to the physical barrier of the maximum transfer speed of electric signals Another enhancement of computer performance has been achieved by parallelism which makes it possible by a suitable organization of n processors to obtain a performance increase of up to n times Research into parallel computations has been carried out for several years in many countries and many results of fundamental importance have been obtained Many parallel computers have been designed and their algorithmic and programming systems built Such computers include ILLIAC IV DAP STARAN OMEN STAR 100 TEXAS INSTRUMENTS ASC CRAY 1 C mmp CM CLIP 3 PEPE This trend is supported by the fact that a many algorithms and programs are highly parallel in their structure b the new LSI and VLSI technologies have allowed processors to be combined into large parallel structures c greater and greater demands for speed and reliability of computers are made

Load Balancing in Parallel Computers Chenzhong Xu,Francis C.M. Lau,2007-08-26 Load Balancing in Parallel Computers Theory and Practice is about the essential software technique of load balancing in distributed memory message passing parallel computers also called multicomputers Each processor has its own address space and has to communicate with other processors by message passing In general a direct point to point interconnection network is used for the communications Many commercial parallel computers are of this class including the Intel Paragon the Thinking Machine CM 5 and the IBM SP2 Load Balancing in Parallel Computers Theory and Practice presents a comprehensive treatment of the

subject using rigorous mathematical analyses and practical implementations The focus is on nearest neighbor load balancing methods in which every processor at every step is restricted to balancing its workload with its direct neighbours only Nearest neighbor methods are iterative in nature because a global balanced state can be reached through processors successive local operations Since nearest neighbor methods have a relatively relaxed requirement for the spread of local load information across the system they are flexible in terms of allowing one to control the balancing quality effective for preserving communication locality and can be easily scaled in parallel computers with a direct communication network Load Balancing in Parallel Computers Theory and Practice serves as an excellent reference source and may be used as a text for advanced courses on the subject

Solving Partial Differential Equations on Parallel Computers Jianping Zhu, 1994 This is an introductory book on supercomputer applications written by a researcher who is working on solving scientific and engineering application problems on parallel computers The book is intended to quickly bring researchers and graduate students working on numerical solutions of partial differential equations with various applications into the area of parallel processing The book starts from the basic concepts of parallel processing like speedup efficiency and different parallel architectures then introduces the most frequently used algorithms for solving PDEs on parallel computers with practical examples Finally it discusses more advanced topics including different scalability metrics parallel time stepping algorithms and new architectures and heterogeneous computing networks which have emerged in the last few years of high performance computing Hundreds of references are also included in the book to direct interested readers to more detailed and in depth discussions of specific topics

Massively Parallel Processing Applications and Development L. Dekker, W. Smit, J.C. Zuidervart, 2013-10-22 The contributions of a diverse selection of international hardware and software specialists are assimilated in this book's exploration of the development of massively parallel processing MPP The emphasis is placed on industrial applications and collaboration with users and suppliers from within the industrial community consolidates the scope of the publication From a practical point of view massively parallel data processing is a vital step to further innovation in all areas where large amounts of data must be processed in parallel or in a distributed manner e.g. fluid dynamics meteorology seismics molecular engineering image processing parallel data base processing MPP technology can make the speed of computation higher and substantially reduce the computational costs However to achieve these features the MPP software has to be developed further to create user friendly programming systems and to become transparent for present day computer software Application of novel electro optic components and devices is continuing and will be a key for much more general and powerful architectures Vanishing of communication hardware limitations will result in the elimination of programming bottlenecks in parallel data processing Standardization of the functional characteristics of a programming model of massively parallel computers will become established Then efficient programming environments can be developed The result will be a widespread use of massively parallel processing systems in many areas of application

Elements of Parallel Computing V. Rajaraman, 2006 **PAX Computer** Tsutomu Hoshino, 1985 **Solution of Partial Differential Equations on Vector and Parallel Computers** James M. Ortega, Robert G. Voigt, 1985-01-01 This volume reviews in the context of partial differential equations algorithm development that has been specifically aimed at computers that exhibit some form of parallelism Emphasis is on the solution of PDEs because these are typically the problems that generate high computational demands The authors discuss architectural features of these computers inasmuch as they influence algorithm performance and provide insight into algorithm characteristics that allow effective use of hardware Large Scale Computational Physics On Massively Parallel Computers Hans J Herrmann, Frithjof Karsch, 1993-12-27 Contents A Lattice Solid Model for the Nonlinear Dynamics of Earthquakes P Mora D Place Vectorized and Parallelized Algorithms for Multi Million Particle MD Simulations W Form et al Green Function Method for Electronic Structure of Periodic Crystals R Zeller Parallelization of the Ising Simulation N Ito A Nonlocal Approach to Vertex Models and Quantum Spin Systems H G Evertz M Marcu The Static Quark Antiquark Potential A Classical Experiment on the Connection Machine CM 2 K Schilling G S Bali Determination of Monopole Current Clusters in Four Dimensional Quantum Electrodynamics A Bode et al QCD Calculations on the QCDPAX K Kanaya UKQCD Recent Results and Future Prospects R Kenway Programming Tools for Parallel Computers K J M Moriarity T Trappenberg Workstation Clusters One Way to Parallel Computing M Weber APE100 and Beyond R Tripiccone and other papers Readership Computational physicists keywords

Parallel Computer Organization and Design Michel Dubois, Murali Annavaram, Per Stenström, 2012-08-30 A design oriented text for advanced computer architecture courses covering parallelism complexity power reliability and performance

Parallel Computing on Distributed Memory Multiprocessors Füsün Özgüner, Fikret Ercal, 2012-12-06 Advances in microelectronic technology have made massively parallel computing a reality and triggered an outburst of research activity in parallel processing architectures and algorithms Distributed memory multiprocessors parallel computers that consist of microprocessors connected in a regular topology are increasingly being used to solve large problems in many application areas In order to use these computers for a specific application existing algorithms need to be restructured for the architecture and new algorithms developed The performance of a computation on a distributed memory multiprocessor is affected by the node and communication architecture the interconnection network topology the I O subsystem and the parallel algorithm and communication protocols Each of these parameters is a complex problem and solutions require an understanding of the interactions among them This book is based on the papers presented at the NATO Advanced Study Institute held at Bilkent University Turkey in July 1991 The book is organized in five parts Parallel computing structures and communication Parallel numerical algorithms Parallel programming Fault tolerance and Applications and algorithms

Computerworld , 1986-12-22 For more than 40 years Computerworld has been the leading source of technology news and information for IT influencers worldwide Computerworld s award winning Web site Computerworld com twice monthly

publication focused conference series and custom research form the hub of the world's largest global IT media network

Parallel Computing Barbara Chapman, 2010 From Multicores and GPUs to Petascale Parallel computing technologies have brought dramatic changes to mainstream computing the majority of today's PCs laptops and even notebooks incorporate multiprocessor chips with up to four processors Standard components are increasingly combined with GPUs Graphics Processing Unit originally designed for high speed graphics processing and FPGAs Free Programmable Gate Array to build parallel computers with a wide spectrum of high speed processing functions The scale of this powerful hardware is limited only by factors such as energy consumption and thermal control However in addition to Parallel Computers Roger W. Hockney, C. R. Jesshope, 1981 This volume traces the development of parallelism in large scale computers and explains the main principles of pipelined and array like machines introducing at the same time a novel structural notation for the classification of all computer architectures Several current designs like CRAY 1 CDC CYBER 205 FPS AP 120B ICL DAP and Burroughs BSP are analyzed in detail and their performances on a number of applications such as Poisson solving FFT and matrix operations are compared using a two parameter characterization *PARALLEL COMPUTERS* V. RAJARAMAN, C. SIVA RAM MURTHY, 2008-07-25 Today parallel computing arouses enormous interest among students and professionals as it is clear that as the new millennium progresses all computers will work in parallel A basic knowledge of the design and use of parallel computers is therefore essential for both students of computing and users of computers Designed as an introductory level textbook for the final year undergraduate students of computer science and engineering this well organized book covers state of the art principles and techniques for designing and programming parallel computers In the process Professor Rajaraman and Dr Siva Ram Murthy with their wealth of knowledge and years of teaching and research experience give a masterly analysis of the various aspects of parallel computing The book begins with an introduction to the current state and developments in parallel computing then it goes on to give a detailed discussion on such topics as instruction level parallel processing architecture of parallel computers parallel algorithms and parallel programming Besides the book gives an in depth coverage of compiler transformations and operating systems for parallel computers The text concludes with a chapter on performance evaluation of parallel computers Interspersed with copious examples and numerous exercises this timely book should prove to be a handy and treasured volume for students as well as professionals

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