

**10th ISCA International
Conference on Parallel and
Distributed Computing Systems
1997**

**New Orleans, Louisiana, USA
1-3 October 1997**

Editors:

**A. El-Amawy
S.Q. Zheng**

ISBN: 978-1-61839-823-9

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (1997) by the International Society for Computers and Their Applications
All rights reserved. Reproduction in any form without the written consent of ISCA is prohibited.

Original ISBN: 1-880843-21-8 (Out of Print)
Reprint ISBN: 978-1-61839-823-9

Printed by Curran Associates, Inc. (2012)

For permission requests, please contact the International Society for Computers and Their Applications
at the address below.

International Society for Computers and Their Applications
975 Walnut Street, Suite 132
Cary, NC 27511-4216

Phone: (919) 467-5559
Fax: (919) 467-3430

isca@ipass.net

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

INTERNATIONAL SOCIETY FOR COMPUTERS AND THEIR APPLICATIONS

10th International Conference on Parallel and Distributed Computing Systems

October 1 – 3, 1997
Radisson Hotel New Orleans, New Orleans, Louisiana USA

TECHNICAL PAPER INDEX

SESSION 1A: I/O and Memory Subsystems

1.	A Disconnected File System for Mobile Linux Nodes Ethendranath N. Bommaiah and Timothy A. Gonsalves (Indian Institute of Technology)	1
2.	Hierarchical I/O Memory System for High Speed Data Communication Qi Gan, Reda A. Ammar (University of Connecticut), Mahmoud Abdalla (University of Zagazig)	9
3.	Analytical Performance Model for Disk Drives Hichem Kaddeche (Institut National des Télécommunications and Université de Paris 6), André-luc Beylot (Université de St Quentin Yvelines), and Monique Becker (Institut National des Télécommunications and Université de Paris 6)	16

SESSION 1B: Algorithms I

1.	How to Share Random Bits Marius Zimand (Georgia Southwestern State University)	23
2.	Parallel Point Location Algorithms on Hypercubes Ke Qiu (Acadia University) and Selim G. Akl (Queen's University)	27
3.	Optimal High Performance Parallel Text Retrieval via FAT Trees B. Mamalis, P. Spirakis (Computer Technology Institute) and B. Tampakas (Computer Technology Institute and Technical Educational Institute of Patras)	31
4.	On the Complexity of Determining Communication Schedules on the Hypercube Eunice E. Santos (Lehigh University)	36

SESSION 1C: Fault Tolerance I

1.	Fault-Tolerant Broadcasting Algorithms in Two Dimensional Circuit-Switched Torus Networks N. W. Lo, Bradley S. Carlson, and D. L. Tao (SUNY at Stony Brook)	40
2.	Optimal Constructions of Fault-Tolerant Multistage Interconnection Networks Charles Chenggong Fan, Jehoshua Bruck (California Institute of Technology)	46

3. HAV: Providing High Availability for Clustered Systems	
Richard King, Avraham Leff, Daniel M. Dias (IBM T. J. Watson Research Center), and Rajat Mukherjee (IBM Almaden Research Center)	51
4. Checkpointing with Sample Comparison for Reliable Parallel Systems	
Gyung-Leen Park, Hee Yong Youn, and Behrooz Shirazi (University of Texas at Arlington)	59

SESSION 2A: Interconnection Networks I

1. Complete Exchange in General Multidimensional Mesh Networks	
Young-Joo Suh, Kang G. Shin (University of Michigan) and Sudhakar Yalamanchili (Georgia Institute of Technology)	65
2. Tuning the Number of Virtual Channels in Networks of Workstations	
F. Silla and J. Duato (Universidad Politécnica de Valencia)	72
3. The r-Truncated Benes Networks and Their Randomized Routing Algorithms	
Hoda El-Sayed and Abdou Youssef (The George Washington University)	76
4. A Methodology for Optimal Interconnection Network Design	
R. Alcover, P. López, J. Duato, and L. Zúñica (Universidad Politécnica de Valencia)	81

SESSION 2B: Databases I

1. Performance Evaluation for a Parallel Transaction Management Approach	
Julia C. Lee (Argonne National Laboratory) and Lawrence J. Henschen (Northwestern University)	85
2. Communication Cost Minimization for SQL Query Mapping onto a Shared-Nothing Multiprocessor Architecture	
Sophie Bonneau, Abdelkader Hameurlain (Université Paul Sabatier)	89
3. Preprocessing Embedded Database Queries in a Process-Oriented Programming Language for Distributed Systems	
Qiang Zhu (University of Michigan – Dearborn)	94
4. A New Transaction Management Scheme for Mobile Computing Environments	
Khalil M. Ahmed, Mohamed A. Ismail, Nagwa M. El-Makky and Khaled M. Nagi (Alexandria University)	102

SESSION 2C: Processor Allocation

1. A High-Performance Processor Allocation Strategy	
J. Morris Chang (Illinois Institute of Technology)	110
2. A Distributed Submesh Allocation Scheme for Two-Dimensional Mesh-Connected Parallel Computers	
Priyalal D. Kulasinghe (Clarkson University)	115
3. Minimizing Message-Passing Contention in Fragmentation-Free Processor Allocation	
Jens Mache, Virginia Lo, Kurt Windisch (University of Oregon)	120

SESSION 3A: Scheduling and Mapping

1. An Improved Algorithm for Task Assignment	
Alaaeldin A. Aly, Anup Kumar and Khaled A. Kamel (University of Louisville)	125
2. The Multi-Stage Block Data Flow Paradigm for Crossbar Multiprocessors	
R. Cucchiara, A. Callipo and M. Piccardi (Università di Ferrara)	131
3. Conditional Task Scheduling on Loosely-Coupled Distributed Processors	
Michael J. Oudshoorn and Lin Huang (The University of Adelaide)	136

SESSION 3B: Applications I

1. Fractal Image Compression Using a Circulating Pipeline Computation Model	
David Jeff Jackson and Thomas Blom (The University of Alabama)	141
2. Performability Analysis of the Commanding Component of NASA's Earth Observing System	
V. Mogulothu, H. H. Ammar, K. Lateef, T. Nikzadeh and Z. Miao (West Virginia University)	145
3. Extension of the Dependence Analysis for Sparse Computation	
F. Delaplace, R. Adle (University of Evry)	151
4. Performance Tuning of Small Scale Shared Memory Multiprocessor Applications Using Visualisation	
Mats Brorsson (Lund University)	155

SESSION 3C: Performance Evaluation I

1. Experimental Evaluation of Communication Latency in Multicomputer Systems	
Chung-yen Chang and Prasant Mohapatra (Iowa State University)	163
2. LogP Performance Comparison of MPI on MPP and Workstation Clusters	
Csaba Andras Moritz (Royal Institute of Technology), Khalid Al-Tawil (King Fahd University of Petroleum and Minerals) and Basilio B. Fraguela (University of La Coruña)	167
3. A Simulation Study of Packed Exponential Connection Network	
Xin Liao (Sun Microsystems, Inc.) and Xian-He Sun (Louisiana State University)	173
4. STAP Benchmark Evaluation of the T3D, SP2, and Paragon	
Choming Wang (University of Southern California), Cho-li Wang and Kai Hwang (The University of Hong Kong)	181

SESSION 4A: Communication Techniques

1. A Simple Efficient Flow Control Using Header Population of Routers	
Hasan Çam (King Fahd University of Petroleum and Minerals)	189
2. The Challenges of Low-Overhead Message-Passing Communication Using Commodity Superscalar Processors	
Brian Grayson and Craig Chase (The University of Texas at Austin)	193
3. SCORE: An Efficient Technique to Reduce Congestion in Parallel Systems	
David R. Surma, Edwin H.-M. Sha and Peter M. Kogge (University of Notre Dame)	198
4. Experimental Results on Minimizing Communication Phases on a Network of Workstations	
David Tremaine, Xiaotie Deng and Patrick Dymond (York University)	204

SESSION 4B: Algorithms II

1. **An Optimal Systolic Algorithm for Generating P-Sequences**
Vincent Vajnovszki (Université de Bourgogne) and Chris Phillips (University of Newcastle) 209
2. **An NC Algorithm for the Perfect Matching Problem in Very Sparse Graphs**
J. Lakhal and L. Litzler (Institut National des Télécommunications) 213
3. **Running Weak Hypercube Algorithms on Multiple Bus Networks**
Subraya T. Kamath (Sprint Corporation) and Ramachandran Vaidyanathan (Louisiana State University) 217

SESSION 4C: Fault Tolerance II

1. **Gossiping in Distributed Networks with Faulty Links**
A. Bouabdallah (Université de Technologie de Compiègne) and C. Laforest (Université Paris-Sud) 223
2. **Color Optimal Self-Stabilizing Depth-First Token Circulation for Asynchronous Message-Passing Systems**
Franck Petit and Vincent Villain (Université de Picardie Jules Verne) 227
3. **A Step Toward Global Convergence in Partially Connected Networks**
M. H. Azadmanesh (University of Nebraska at Omaha) and A. W. Krings (University of Idaho) 234
4. **Recoverable Distributed Shared Memory System with Reduced Stable Logging**
Taesoon Park (Sejong University) and Heon Y. Yeom (Seoul National University) 242

SESSION 5A: Interconnection Networks II

1. **nD-MIN: Multistage Interconnection Network with Multi-Dimensional Structure**
Toshihiro Hanawa, Xiaoyan Zhu, Takayuki Kamei, Hideharu Amano (Keio University) 247
2. **An Analytical Setting and Mapping on the Product of Generalized de Bruijn Graphs**
Meghanad D. Wagh (Lehigh University) and Jiancheng C. Mo (Lucent Technologies) 253
3. **Strictly Non-blocking Generalized-Concentrators with Constrained Network Parameters**
H. K. Dai (University of North Dakota) 258
4. **An Interconnection Network Based on the Dual of a Hypercube**
Yueming Li (Louisiana State University), Jie Wu (Florida Atlantic University) and S. Q. Zheng (Louisiana State University) 263

SESSION 5B: Language Support

1. **Efficient and Portable Parallel Programming: An Open Distributed Shared Memory Implementation**
João Carreira, João Gabriel Silva (Universidade de Coimbra) and Koen Langendoen (Vrije Universiteit) 269
2. **Language Support for Context Driven Parallel Computations**
Valery Rancov (Friedrich, Klatt and Associates) and Jie Wu (Florida Atlantic University) 273
3. **Extending STL for Object-oriented Distributed Transaction Processing**
Malik Saheb (INRIA), Hartmut Vogler, Thomas Kunkelmann (Darmstadt University of Technology) and Eric Newcomer (Digital Equipment Corp) 279
4. **A Multi-Threaded Distributed Agent for Coarse-Grained Irregular Computation**
Eric A. Schweitz and Dharma P. Agrawal (North Carolina State University) 285

SESSION 5C: Signal Processing

1. **Fast Parallel Techniques for Discrete Hadamard Transformations**
Chen Wang and Ananth Grama (Purdue University) 291
2. **On the Implementation of Non-separable Two Dimensional Wavelet Transforms**
Patrick Lenders and Anne Sjöström (University of New England) 295
3. **Multi Polynomial Channel Residue Arithmetic for Digital Signal Processing**
Mohammad Abdallah (Intel Corporation) and Alexander Skavantzos (Louisiana State University) 301

SESSION 6A: Computer Networks

1. **The Role of Transitional Probability in Network Security Systems**
M. M. McMahon, H. A. Sholl (University of Connecticut) and L. B. Lancor (Southern Connecticut State University) 308
2. **Partition-Based Admission Control in Heterogeneous Networks for Hard Real-Time Connections**
Anirudha Sahoo, Wei Zhao (Texas A&M University) and Weijia Jia (City University of Hong Kong) 314
3. **Consequences of Ignoring Self-Similar Data Traffic in Telecommunications Modeling**
P. M. Fiorini and Lester Lipsky (University of Connecticut) 322
4. **An Efficient Communication Protocol for Distributed Systems**
Pietro Manzoni (Universidad Politécnica de Valencia) 328

SESSION 6B: Memories and Caches

1. **A Refinement-Based Validation of a Cache Coherence Protocol**
J.-P. Bodeveix, D. Carrière and M. Filali (IRIT, Université Paul Sabatier) 332
2. **Correctness Analysis of Snoopy Cache Coherence Protocols Using Petri Nets**
Ahmed Hassan and Imad Mahgoub (Florida Atlantic University) 338
3. **A Memory Coherence Protocol using Dynamic Page State Transition in Distributed Shared Memory**
Bohyung Han and Yookun Cho (Seoul National University) 344
4. **Defining and Comparing Memory Consistency Models**
Lisa Higham, Jalal Kawash and Nathaly Verwaal (University of Calgary) 349

SESSION 6C: Algorithms III

1. **A Parallel Solution of the Sequence Alignment Problem using BSR Model**
D. Semé and J.-F. Myoupo (Université de Picardie Jules Verne) 357
2. **Parallelizing the Multishift QR Algorithm for Eigenvalue Computation**
Dianqin Wang and Eleanor Chu (University of Guelph) 363
3. **A Parallel Algorithm for Optimal Stack Filter**
Byeong-Moon Jeon (Korea University), Ku-Yeong Nam (LG Electronics Inc.) and Chang-Sung Jeong (Korea University) 368
4. **Algorithms for Multimessage Multicasting with Forwarding**
T. F. Gonzalez (University of California) 372

SESSION 7A: Interconnection Networks III

1. **Deadlock Avoidance in Wormhole-Routed Networks**
Eric Fleury and Pierre Fraigniaud (Ecole Normale Supérieure de Lyon) 378
2. **A New Methodology for Deriving Deadlock-Free Routing Strategies in Processor Networks**
M. B. Hadim and I. Sakho (Ecole des Mines de St. Etienne) 385
3. **Efficient Parallel Implementation of the Cascade Correlation Algorithm on k-ary n-cubes**
Behnam S. Arad (California State University, Sacramento) and Ahmed El-Amawy
(Louisiana State University) 391
4. **Performance Analysis of the Bidirectional Ring-Based Multiprocessor**
Hitoshi Oi and N. Ranganathan (University of South Florida) 397

SESSION 7B: Caches

1. **Speculative Multiprocessor Cache Line Actions Using Instruction and Line History**
David M. Koppelman (Louisiana State University) 401
2. **Introducing the SCSD "Shared Cache for Shared Data" Multiprocessor Architecture**
Nagi N. Mekhiel (Ryerson Polytechnic University) 407
3. **Impact of L2-Cache Size Variations on Efficiency of Remote Caches in High Performance Multiprocessors**
Edward D. Moreno and Sergio T. Kofuji (Universidade de Sao Paulo) 412
4. **Reducing Cache Misses for CC-NUMA by Careful Page-Mapping**
Jian Huang (University of Minnesota) and Zhiyuan Li (Purdue University) 417

SESSION 7C: Distributed Systems

1. **Hierarchical Filtering-based Monitoring System for Large-scale Distributed Systems**
Ehab S. Al-Shaer, Hussein Abdel-Wahab and Kurt Maly (Old Dominion University) 422
2. **Performance Evaluation of the Group Two-Phase Locking Protocol**
Sujata Banerjee and Panos K. Chrysanthis (University of Pittsburgh) 428
3. **The Effect of Out-Dated State Information on File Migration**
R.T. Hurley (Trent University), J. W. Wong and J. P. Black (University of Waterloo) 433
4. **Deterministic Voting in Distributed Systems Using Error-Correcting Codes**
Lihao Xu and Jehoshua Bruck (California Institute of Technology) 438

SESSION 8A: Networks of Workstations

1. **Architectures for Parallel Query Processing on Networks of Workstations**
Sivarama P. Dandamudi and Gautam Jain (Carleton University) 444
2. **Communication Conflict Avoidance on Bus-Based Networks of Workstations with Load-Skewing Task Assignment**
Wei Xie and Wei-Ming Lin (University of Texas at San Antonio) 452
3. **A Comparative Study of Load Sharing on Networks of Workstations**
Anatol Piotrowski and Sivarama P. Dandamudi (Carleton University) 458

SESSION 8B: Fault Tolerance III

1. An Improvement of O(logN) Mutual Exclusion Algorithm to Make it Fault-tolerant A. Bouabdallah (Université de Technologie de Compiègne), J.-C. König, M. B. Yagoubi (Université d'Evry-Val-d'Essonne)	466
2. A Protocol for Weak Virtual Synchrony Yiwei Chiao, Masaaki Mizuno and Hemang Nadkami (Kansas State University)	470
3. Leader Election in Uniform Trees Tzong-Jye Liu and Shing-Tsaan Huang (National Tsing Hua University)	477
4. An Efficient and Reliable Atomic Multicast Protocol: Design and Analysis Weijia Jia and Wei Zhao (City University of Hong Kong)	481

SESSION 8C: Modeling and Analysis

1. On the Modelling of Communication Protocols with STATECHARTS: Formal Description Abderrahim Benslimane (Institut Polytechnique de Sevenans)	485
2. A Communication Framework for High Performance Computing Nagarajan Kandasamy and Reda A. Ammar (University of Connecticut)	489
3. The τ-Model: A Unified Communication Cost Model Yih-jia Tsai and Philip K. McKinley (Michigan State University)	496
4. Modeling Load Balancing Inside Groups Using Queuing Theory Michel Tréhel, Chantal Balayer, and Abdelghani Alloui (UFR des Sciences et des Techniques)	504

SESSION 9A: Performance Evaluation II

1. Restricted Injection Flow Control for k-ary n-cube Networks C. Izu (University of Adelaide), C. Carrion, J.A. Gregorio and R. Beivide (Universidad de Cantabria)	511
2. Performance of Fork-Join Constructs in Data-Dependent Distributed Environments Julius Dichter (University of Bridgeport) and Howard Sholl (University of Connecticut)	519
3. Performance Comparison of Adaptive and Hierarchical Load Sharing in Heterogeneous Distributed Systems Michael Kwok Cheong Lo (Nortel), Sivarama P. Dandamudi (Carleton University)	524
4. Reducing ATM Switch Cell Delay and Delay Variance Using Distribute-Merge Technique D. Abu-Saymeh, G. M. Chaudhry, and M. Guizani (University of Missouri – Columbia/Kansas City)	529

SESSION 9B: Wormhole Routing

1. Efficient Multicast in Hypercubes with Multidestination Wormhole Routing Vivek Halwan and Füsun Özgüner (The Ohio State University)	533
2. The Impact of Output Selection Function Choice on the Performance of Adaptive Wormhole Routing Loren Schwiebert and Renelius Bell (Wayne State University)	539

3.	Near-optimal Path-based Wormhole Broadcast in Hypercubes Shahram Latifi, Myung Hoon Lee (University of Nevada - Las Vegas), Pradip K. Srimani (Colorado State University)	545
4.	Fault-Tolerant Wormhole Routing in Mesh Networks with Non-rectangular Fault Regions W. H. Ho and Y. S. Cheung (The University of Hong Kong)	551

SESSION 9C: Scalability

1.	A Scalability Study of ServerNet Topologies V. Shurbanov and D. R. Avresky (Boston University), R. Horst, W. Watson, L. Young, and D. Jewett (Tandem Computers Inc.)	558
2.	Scalable Basic Algorithms on a Linear Array with a Reconfigurable Pipelined Bus System Jerry L. Trahan (Louisiana State University), Yi Pan (University of Dayton), Ramachandran Vaidyanathan and Anu G. Bourgeois (Louisiana State University)	564
3.	Scalable Software System Architecture for Parallel Logic Simulation Tao Shinn Chen (Tarek Parallel Systems), Hee Yong Youn and Krishna M. Kavi (University of Texas at Arlington)	570
4.	Scalability Analysis of Large Code Using Factorial Designs on the IBM SP2 M. Alabdulkareem (King Saud University), S. Lakshmivarahan and S. K. Dhall (University of Oklahoma)	574

SESSION 10A: Applications II

1.	Increasing the Granularity of Parallelism in the P³ Parallel Evaluation Scheme of Functional Languages N. Melab and M. P. Lecouffe (Laboratoire d'Informatique Fondamentale de Lille), N. Devesa and B. Tousrel (Laboratoire d'Informatique Fondamentale de Lille and Ecole Universitaire D'Ingénieurs de Lille)	578
2.	An Approach for Visualizing the Performance of Distributed Simulations Irfan S. Karachiwala, James H. Graham and Adel S. Elmaghreby (University of Louisville)	584
3.	Estimation of the Atmospheric Point Spread Function Using the Neural Network Approach Bin Cong (South Dakota State University)	589

SESSION 10B: Processes Concurrency

1.	A Principle of Dynamic Control of Parallel Computing Processes on the Basis of Static Forecasting Vladislav V. Ignatushchenko (Russian Academy of Sciences)	593
2.	The Synchronization Cost of On-line Quorum Adaptation Mark J. Bearden and Ronald P. Bianchini, Jr. (Carnegie Mellon University)	598
3.	Deadlock Analysis of an Abstract Model of the Rendezvous B. Belhouche and B. Geraci (Tulane University)	606

SESSION 10C: Databases II

1.	Parallel Algorithms for Indexing and Retrieval in Audio Databases S. R. Subramanya and Abdou Youssef (The George Washington University)	611
2.	A Translation Process Between Cooperating Heterogeneous Database Systems Christophe Nicolle, Nadine Cullot and Kokou Yetongnon (Université de Bourgogne)	619
3.	A Distributed Object Oriented Model for Heterogeneous Spatial Databases Eric Leclercq, Djamel Benslimane and Kokou Yetongnon (Université de Bourgogne)	625