

Session Index

Keynote Addresses

Panel

- Session 1 [Compiler Optimization](#)
- Session 2 [Scientific/Engineering Applications](#)
- Session 3 [Distributed Memory Systems](#)
- Session 4 [Shared Memory Systems](#)
- Session 5 [Algorithms](#)
- Session 6 [Programming Languages](#)
- Session 7 [Communication I](#)
- Session 8 [Implementation of Primitive Operations](#)
- Session 9 [Resource Allocation and Management](#)
- Session 10 [Communication II](#)
- Session 11 [Algorithms: Implementation](#)
- Session 12 [Performance Evaluation and Prediction](#)
- Session 13 [Synchronization, Virtual Memory, and Runtime System Support](#)
- Session 14 [Arrays and Hypercubes](#)
- Session 15 [Mathematical Methods](#)
- Session 16 [Interconnection Networks](#)
- Session 17 [Bus-Based Algorithms](#)
- Session 18 [Image and Radar Processing](#)
- Session 19 [Special-Purpose Applications](#)
- Session 20 [Communication III](#)
- Session 21 [Clusters and Domain Decomposition](#)

Industrial Track

- Session-I [Parallel Architectures — Implementation, Programming, and Performance](#)
- Session-II [Networking and Distributed Computing](#)

Keynote I [“Can Multithreaded Programming Save Massively Parallel Computing?”](#)

Speaker: Charles E. Leiserson — *Massachusetts Institute of Technology*

Keynote II [“MPPs versus Clusters”](#)

Speaker: Charles L. Seitz – *Myricom, Inc.*

Keynote III [“Clusters for Commercial Computing: An Invisible Architecture”](#)

Speaker: Gregory F. Pfister – *IBM Server Group, Austin*

Panel – [“For a Massive Number of Massively Parallel Machines: What are the Target Applications, Who are the Target Users, and What New R&D is Needed to Hit the Target?”](#)

Moderator: Howard Jay Siegel – *Purdue University*

Panelists: William Farmer – *Integrated Computing Engines, Inc.*

Richard Freund – *NRaD*

Mark Furtney – *Cray Research, Inc.*

Paul Messina – *Caltech*

Lionel M. Ni – *National Science Foundation*

Charles L. Seitz – *Myricom, Inc.*

Marc Snir – *IBM T.J. Watson Research Center*

Session 1 — Compiler Optimization

Chair: Prith Banerjee – *University of Illinois, Urbana*

[Eliminating Stale Data References through Array Data-Flow Analysis](#)

L. Choi and P-C. Yew

[Commutativity Analysis: A Technique for Automatically Parallelizing Pointer-Based Computations](#)

M. Rinard and P. Diniz

[Profiling Dependence Vectors for Loop Parallelization](#)

S-Y. Tseng, C-T. King, and C-Y. Tang

[A Method for Register Allocation to Loops in Multiple Register File Architectures](#)

D.J. Kolson, A. Nicolau, N. Dutt, and K. Kennedy

[Affine-by-Statement Transformations of Imperfectly Nested Loops](#)

J. Xue

[The Combined Effectiveness of Unimodular Transformations, Tiling, and Software Prefetching](#)

R.H. Saavedra, W. Mao, D. Park, J. Chame, and S. Moon

Session 2 — Scientific/Engineering Applications

Chair: José D.P. Rolim – *University of Geneva*

[Ocean Circulation on the Intel Paragon: Modeling and Implementation](#)

K-C. Leung, I. Ahmad, and H-M. Hsu

[Implementation of an Automatic Semi-Fluid Motion Analysis Algorithm on a Massively Parallel Computer](#)

K. Palaniappan, M. Faisal, C. Kambhamettu, and A.F. Hasler

[NAS Experiences of Porting CM Fortran Codes to HPF on IBM SP2 and SGI Power Challenge](#)

S. Saini

[Dynamic Alignment and Distribution of Irregularly Coupled Data Arrays for Scalable Parallelization of Particle-in-Cell Problems](#)

W-K. Liao, C-W. Ou, and S. Ranka

[A Hierarchical Parallel Processing System for the Multipass-Rendering Method](#)

H. Kobayashi, H. Yamauchi, Y. Toh, and T. Nakamura

[Performance Modeling and Composition: A Case Study in Cell Simulation](#)

S.G. Steinberg, J. Yang, and K. Yelick

Session 3 — Distributed Memory Systems

Chair: Behrooz Shirazi – *University of Texas, Arlington*

[A Study of High-Performance Communication Mechanism for Multicomputer Systems](#)

H. Murayama, S. Yoshizawa, T. Aimoto, H. Inouchi, S. Murase, T. Hayashi, and H. Iwamoto

[A TeraFLOP Supercomputer in 1996: The ASCI TFLOP System](#)

T.G. Mattson, D. Scott, and S. Wheat

[Experience with Parallel Computing on the AN2 Network](#)

D.J. Scales, M. Burrows, and C.A. Thekkath

[Achieving a Balanced Low-Cost Architecture for Mass Storage Management through Multiple Fast Ethernet Channels on the Beowulf Parallel Workstation](#)

T. Sterling, D.J. Becker, D. Savarese, M.R. Berry, and C. Reschke
[Exploiting the Capabilities of Communications Co-Processors](#)
K.E. Schauser, C.J. Scheiman, J.M. Ferguson, and P.Z. Kolano
[Effects of Multithreading on Data and Workload Distribution for Distributed-Memory Multiprocessors](#)
A. Sohn, M. Sato, N. Yoo, and J-L. Gaudiot

Session 4 — Shared Memory Systems

Chair: Rudolf G. Hackenberg – *Technische Universität München*

[Formal Verification of Delayed Consistency Protocols](#)
F. Pong and M. Dubois
[Dag-Consistent Distributed Shared Memory](#)
R.D. Blumofe, M. Frigo, C.F. Joerg, C.E. Leiserson, and K.H. Randall
[Categorizing Network Traffic in Update-Based Protocols on Scalable Multiprocessors](#)
R. Bianchini, T.J. LeBlanc, and J.E. Veenstra
[Implementing the Data Diffusion Machine Using Crossbar Routers](#)
H.L. Muller, P.W.A. Stallard, and D.H.D. Warren
[A Memory Controller for Improved Performance of Streamed Computations on Symmetric Multiprocessors](#)
S.A. McKee and W.A. Wulf
[Kiloprocessor Extensions to SCI](#)
S. Kaxiras

Session 5 — Algorithms

Chair: Joseph JáJá – *University of Maryland*

[Approximate Compaction and Padded-Sorting on Exclusive Write PRAMs](#)
M. Kutylowski and T. Wierzbicki
[A Parallel Solution to the Extended Set Union Problem with Unlimited Backtracking](#)
M.C. Pinotti, V.A. Crupi, and S.K. Das
[A Parallel Algorithm for Minimization of Finite Automata](#)
B. Ravikumar and X. Xiong
[A Randomized Algorithm for Voronoi Diagram of Line Segments on Coarse-Grained Multiprocessors](#)
X. Deng and B. Zhu
[Self-Timed Resynchronization: A Post-Optimization for Static Multiprocessor Schedules](#)
S.S. Bhattacharyya, S. Sriram, and E.A. Lee
[Constructing the Spanners of Graphs in Parallel](#)
W. Liang and R.P. Brent

Session 6 — Programming Languages

Chair: Gul Agha – *University of Illinois, Urbana*

[Converse: An Interoperable Framework for Parallel Programming](#)
L.V. Kalé, M. Bhandarkar, N. Jagathesan, S. Krishnan, and J. Yelon
[Dome: Parallel Programming in a Distributed Computing Environment](#)
J.N.C. Áraabe, A. Beguelin, B. Lowekamp, E. Seligman, M. Starkey, and P. Stephan

[Nested Parallel Call Optimization](#)

E. Pontelli and G. Gupta

[The Parallel Break Construct, or How to Kill an Activity Tree](#)

Y.I. Friedman, D.G. Feitelson, and I. Exman

[Optimizing COOP Languages: Study of a Protein Dynamics Program](#)

X. Zhang, V. Karamcheti, T. Ng, and A.A. Chien

[Support for Extensibility and Reusability in a Concurrent Object-Oriented Programming Language](#)

R. Pandey and J.C. Browne

Session 7 — Communication I

Chair: Cho-Li Wang – *University of Hong Kong*

[Modeling the Communication Performance of the IBM SP2](#)

G.A. Abandah and E.S. Davidson

[Adaptive Source Routing in Multistage Interconnection Networks](#)

Y. Aydogan, C.B. Stunkel, C. Aykanat, and B. Abali

[The Effects of Network Contention on Processor Allocation Strategies](#)

S.Q. Moore and L.M. Ni

[ServerNet Deadlock Avoidance and Fractahedral Topologies](#)

R. Horst

[Analysis of Memory Interference in Buffered Multiprocessor Systems in Presence of Hot Spots and Favorite Memories](#)

S.K. Das and S.K. Sen

[Benefits of Processor Clustering in Designing Large Parallel Systems: When and How?](#)

D. Basak, D.K. Panda, and M. Banikazemi

Session 8 — Implementation of Primitive Operations

Chair: Gregory Plaxton – *University of Texas, Austin*

[Practical Parallel Algorithms for Dynamic Data Redistribution, Median Finding, and Selection](#)

D.A. Bader and J. JáJá

[Parallel Implementation of Borůvka's Minimum Spanning Tree Algorithm](#)

S. Chung and A. Condon

[Practical Algorithms for Selection on Coarse-Grained Parallel Computers](#)

I. Al-furiah, S. Aluru, S. Goil, and S. Ranka

[Parallel Multilevel Graph Partitioning](#)

G. Karypis and V. Kumar

[PACK/UNPACK on Coarse-Grained Distributed Memory Parallel Machines](#)

S. Bae and S. Ranka

[Random Seeking: A General, Efficient, and Informed Randomized Scheme for Dynamic Load Balancing](#)

N.R. Mahapatra and S. Dutt

Session 9 — Resource Allocation and Management

Chair: Rafael H. Saavedra – *University of Southern California*

[Resource Placement in Torus-Based Networks](#)

- M.M. Bae and B. Bose*
[Simultaneous Compression of Makespan and Number of Processors Using CRP](#)
Y. Ge and D.Y.Y. Yun
- [Implementation of Scalable Blocking Locks Using an Adaptive Thread Scheduler](#)
B. Mukherjee and K. Schwan
- [Hector: Automated Task Allocation for MPI](#)
S.H. Russ, B. Flachs, J. Robinson, and B. Heckel
- [An Adaptive Approach to Data Placement](#)
D.K. Lowenthal and G.R. Andrews
- [Complete Parallelization of Computations: Integration of Data Partitioning and Functional Parallelism for Dynamic Data Structures](#)
D. Banerjee and J.C. Browne

Session 10 — Communication II

Chair: Louise Moser – *University of California, Santa Barbara*

- [Generating Realignment-Based Communication for HPF Programs](#)
T. Kamachi, K. Kusano, K. Suehiro, Y. Seo, M. Tamura, and S. Sakon
- [Software Support for Virtual Memory-Mapped Communication](#)
C. Dubnicki, L. Iftode, E.W. Felten, and K. Li
- [How to Optimize Residual Communications?](#)
M. Dion, C. Randriamaro, and Y. Robert
- [A Comparative Study of Methods for Time-Deterministic Message Delivery in a Multiprocessor Architecture](#)
J. Jonsson and J. Vasell
- [ECO: Efficient Collective Operations for Communication on Heterogeneous Networks](#)
B.B. Lowekamp and A. Beguelin
- [Software Techniques for Improving MPP Bulk-Transfer Performance](#)
E.A. Brewer, P. Gauthier, A. Fox, and A. Schuett

Session 11 — Algorithms: Implementation

Chair: Mikhail Atallah – *Purdue University*

- [Parallel Algorithms for Image Enhancement and Segmentation by Region Growing with an Experimental Study](#)
D.A. Bader, J. JáJá, D. Harwood, and L.S. Davis
- [The Chessboard Distance Transform and the Medial Axis Transform are Interchangeable](#)
Y-H. Lee and S-J. Horng
- [Parallel Algorithms for Image Processing: Practical Algorithms with Experiments](#)
A. Bäumer and W. Dittrich
- [Study of Scalable Declustering Algorithms for Parallel Grid Files](#)
B. Moon, A. Acharya, and J. Saltz
- [A Parallel Algorithm for Text Inference](#)
S.M. Harabagiu and D.I. Moldovan
- [A Direct Block-Five-Diagonal System Solver for the VLSI Parallel Model](#)
M. Vajteršić

Session 12 — Performance Evaluation and Prediction

Chair: John Gustafson – *Ames Laboratory*

[Efficient Execution of Parallel Applications in Multiprogrammed Multiprocessor Systems](#)

K.K. Yue and D.J. Lilja

[The Relation of Scalability and Execution Time](#)

X-H. Sun

[Maximizing Speedup through Self-Tuning of Processor Allocation](#)

T.D. Nguyen, R. Vaswani, and J. Zahorjan

[Profiling Optimized Code: A Profiling System for an HPF Compiler](#)

S. Kaneshiro and T. Shindo

[Toward Symbolic Performance Prediction of Parallel Programs](#)

T. Fahringer

[Performance Prediction with Benchmaps](#)

S. Toledo

Session 13 — Synchronization, Virtual Memory, and Runtime System Support

Chair: Francine Berman – *University of California, San Diego*

[CoCheck: Checkpointing and Process Migration for MPI](#)

G. Stellner

[Tulip: A Portable Run-Time System for Object-Parallel Systems](#)

P. Beckman and D. Gannon

[A Virtual Memory Model for Parallel Supercomputers](#)

V.L.M. Reis and I.D. Scherson

[A Partitioning Programming Environment for a Novel Parallel Architecture](#)

R. Hartenstein, J. Becker, M. Herz, R. Kress, and U. Nageldinger

[An Integrated Synchronization and Consistency Protocol for the Implementation of a High-Level Parallel Programming Language](#)

M.C. Rinard

[Implementation and Evaluation of Prefetching in the Intel Paragon Parallel File System](#)

M. Arunachalam, A. Choudhary, and B. Rullman

Session 14 — Arrays and Hypercubes

Chair: Oscar Ibarra – *University of California, Santa Barbara*

[Routing a Permutation in the Hypercube by Two Sets of Edge-Disjoint Paths](#)

Q-P. Gu and H. Tamaki

[Determining Asynchronous Acyclic Pipeline Execution Times](#)

V. Donaldson and J. Ferrante

[Distributing Tokens on a Hypercube without Error Accumulation](#)

B.S. Chlebus, J.D.P. Rolim, and G. Slutzki

[On Some Global Operations in Faulty SIMD Hypercubes](#)

A. Sengupta and C.S. Raghavendra

[An Improved Approximation Algorithm for Scheduling Task Trees on Linear Arrays](#)

H.K. Tadepalli and E.L. Lloyd

[Mapping Linear Recurrences onto Systolic Arrays](#)

Session 15 — Mathematical Methods

Chair: Dan I. Moldovan – *Southern Methodist University*

[Jacobi-like Algorithms for Eigenvalue Decomposition of a Real Normal Matrix Using Real Arithmetic](#)

B.B. Zhou and R.P. Brent

[An Element-Based Concurrent Partitioner for Unstructured Finite Element Meshes](#)

H.Q. Ding and R.D. Ferraro

[Analysis of the Numerical Effects of Parallelism on a Parallel Genetic Algorithm](#)

W.E. Hart, S. Baden, R.K. Belew, and S. Kohn

[Compiling MATLAB Programs to ScaLAPACK: Exploiting Task and Data Parallelism](#)

S. Ramaswamy, E.W. Hodges IV, and P. Banerjee

[Mapping Techniques for Parallel Evaluation of Chains of Recurrences](#)

E.V. Zima, K.R. Vadivelu, and T.L. Casavant

[Performance of Asynchronous Linear Iterations with Random Delays](#)

A.C. Moga and M. Dubois

Session 16 — Interconnection Networks

Chair: D.K. Panda – *Ohio State University*

[Generic Methodologies for Deadlock-Free Routing](#)

H. Park and D.P. Agrawal

[Partitionability of the Multistage Interconnection Networks](#)

Y. Chang

[On Embedding Various Networks into the Hypercube Using Matrix Transformations](#)

M. Hamdi and S.W. Song

[Optimal Subcube Fault Tolerance in a Circuit-Switched Hypercube](#)

B.A. Izadi and F. Özgüner

[Fault-Tolerant Ring Embedding in Star Graphs](#)

Y-C. Tseng, S-H. Chang, and J-P. Sheu

[An Optical Interconnect Model for \$k\$ -ary \$n\$ -cube Wormhole Networks](#)

M. Raksapatcharawong and T.M. Pinkston

Session 17 — Bus-Based Algorithms

Chair: Sartaj Sahni – *University of Florida*

[Fault-Tolerant Multiple Bus Networks for Fan-In Algorithms](#)

R. Vaidyanathan and S. Nadella

[Coping with Sparse Inputs on Enhanced Meshes — Semigroup Computation with COMMON CRCW Buses](#)

P. Damaschke

[An Optimal Algorithm for the Angle-Restricted All Nearest Neighbor Problem on the Reconfigurable Mesh](#)

K. Nakano and S. Olariu

[Parallel Algorithms Using Unreliable Broadcasts](#)

J. Matthews and C. Martel

[Efficient Algorithms for the Hough Transform on Arrays with Reconfigurable Optical Buses](#)

S. Pavel and S.G. Akl

[Integer and Floating Point Matrix-Vector Multiplication on the Reconfigurable Mesh](#)

J.L. Trahan, C-M. Lu, and R. Vaidyanathan

Session 18 — Image and Radar Processing

Chair: D. Martinez – *MIT Lincoln Laboratory*

[Some Image Processing Algorithms on a RAP with Wider Bus Networks](#)

S-S. Lee, S-J. Horng, H-R. Tsai, and Y-H. Lee

[Parallel Synthetic Aperture Radar Processing on Workstation Networks](#)

P.G. Meisl, M.R. Ito, and I.G. Cumming

[The Evolution of a Massively Parallel Vision System for Real-Time Automotive Image Processing](#)

A. Broggi

[2D Object Recognition on a Reconfigurable Mesh](#)

C. Guerra

[Space-Time Adaptive Processing on the Mesh Synchronous Processor](#)

J.S. McMahon and K. Teitelbaum

[An Experimental Study of Input/Output Characteristics of NASA Earth and Space Sciences Applications](#)

M.R. Berry and T.A. El-Ghazawi

Session 19 — Special-Purpose Applications

Chair: Kang G. Shin – *University of Michigan, Ann Arbor*

[Bitonic Sorting on Beneš Networks](#)

B.M. Gocal and K.E. Batcher

[Designing Adaptable Real-Time Fault-Tolerant Parallel Systems](#)

C.E. Morón

[Improving Memory Performance for Indirect Accesses on SIMD Computers](#)

J.D. Allen and D.E. Schimmel

[A New Approach to Pipeline FFT Processor](#)

S. He and M. Torkelson

[Implementation of a SLiM Array Processor](#)

H.M. Chang, M.H. Sunwoo, and T-H. Cho

[Temporal Characterization of Demands for Data Movement on Parallel Programs](#)

B. Rodriguez, H. Jordan, and G. Alaghband

Session 20 — Communication III

Chair: Jean-Luc Gaudiot – *University of Southern California*

[Broadcasting Multiple Messages in the Multiport Model](#)

A. Bar-Noy and C-T. Ho

[The Necessary Conditions for Clos-Type Nonblocking Multicast Networks](#)

Y. Yang and G.M. Masson

[A Class of Interconnection Networks for Multicasting](#)

Y. Yang

[Performance Prediction of PVM Programs](#)

M.R. Steed and M.J. Clement

[Algorithms for All-to-All Personalized Exchange in 2D and 3D Tori](#)

Y-J. Suh and S. Yalamanchili

[Generalized Theory for Deadlock-Free Adaptive Wormhole Routing and its Application to Disha Concurrent](#)

A.K. Venkatramani, T.M. Pinkston, and J. Duato

Session 21 — Clusters and Domain Decomposition

Chair: Susamma Barua – *California State University, Fullerton*

[Efficient Run-Time Support for Irregular Task Computations with Mixed Granularities](#)

C. Fu and T. Yang

[A New Technique for 3-D Domain Decomposition on Multicomputers which Reduces Message-Passing](#)

J. Gil and A. Wagner

[Application Load Imbalance on Parallel Processors](#)

V. Govindan and M.A. Franklin

[Native ATM Application Programmer Interface Testbed for Cluster-Based Computing](#)

P.W. Dowd, T.M. Carrozzini, F.A. Pellegrino, and A.X. Chen

[SWEB: Towards a Scalable World Wide Web Server on Multicomputers](#)

D. Andresen, T. Yang, V. Holmedahl, and O.H. Ibarra

[Parallel Implementations of Irregular Problems Using High-Level Actor Language](#)

R.B. Panwar, W. Kim, and G.A. Agha

Industrial Track — Invited Presentations

Organizer: John K. Antonio – *Texas Tech University*

Session-I: Parallel Architectures — Implementation, Programming, and Performance

Chair: John K. Antonio – *Texas Tech University*

Cray Research, Inc.:

[Communication Latency and Bandwidth on the Cray Research T3E](#)

F.W. Chism

IBM System/390 Division:

[Overview of IBM System/390 Parallel Sysplex: A Commercial Parallel Processing System](#)

J.M. Nick, J-Y. Chung, and N.S. Bowen

Litton Guidance and Control Systems, Inc.:

[Implementing Parallel Processing in a Rugged Embeddable Environment](#)

A.L. Smeyne

Mercury Computer Systems, Inc.:

[Planned Direct Transfers: A Programming Model for Real-Time Applications](#)

G. Vichniac, B. Isenstein, C. Lund, and A. Pool

Session-II: Networking and Distributed Computing

Chair: Richard C. Metzger – *Rome Laboratory*

Centre for Development of Advanced Computing:

[DS-Link over Fiber: A High-Speed Interconnect for Cluster Computing](#)

Y. Abhyankar, A. Degwekar, and A. Karandikar

Electronics and Telecommunications Research Institute:

[A Multiprocessor Server with a New Highly Pipelined Bus](#)

W-J. Hahn, A. Ki, K-W. Rim, and S-W. Kim

Tandem Computers Incorporated:

[Performance Modeling of ServerNet™ Topologies](#)

B. Horst, D. Avresky, R. Wilkinson, D. Jewett, W. Watson, L. Young, and C. Cunningham

Virtual Computer Corporation:

[Distributed Virtual Computing](#)

J. Schewel, M. Thornburg, and S. Casselman