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April 25-29, 2006

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Convention Center

Rhodes Island, Greece



Sponsored by

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International Parallel & Distributed
Processing Symposium



*International Parallel & Distributed
Processing Symposium*

Proceedings

20th International Parallel and Distributed Processing Symposium

IPDPS 2006

Abstracts and CD-ROM



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Summary of Contents

Detailed Table of Contents	vii
International Parallel and Distributed Processing Symposium	1
Heterogeneous Computing Workshop	151
Workshop on Parallel and Distributed Real-Time Systems	165
Reconfigurable Architectures Workshop	183
Posters: Reconfigurable Architectures Workshop	205
Workshop on High-Level Parallel Programming Models and Supportive Environments	221
Java for Parallel and Distributed Computing Workshop	229
Workshop on Nature Inspired Distributed Computing	237
Workshop on High Performance Computational Biology	249
Advances in Parallel and Distributed Computing Models	257
Communication Architecture for Clusters	269
NSF Next Generation Software Program Meeting	277
High-Performance Power-Aware Computing	295
Workshop on Parallel and Distributed Scientific and Engineering Computing	303
Performance Modeling, Evaluation, and Optimization of Parallel and Distributed Systems	315
High-Performance Grid Computing Workshop	333
Dependable Parallel, Distributed and Network-Centric Systems	341
International Workshop on Security in Systems and Networks	349
Workshop on System Management Tools for Large-Scale Parallel Systems	359
International Workshop on Hot Topics in Peer-to-Peer Systems	369
Workshop on Performance Optimization for High-Level Languages and Libraries	379
Index	387

Detailed Table of Contents

Detailed Table of Contents	vii
International Parallel and Distributed Processing Symposium	1
Message from the General Co-Chairs	2
Greetings from the Program Chair	4
Message from the General Vice-Chair, Local Organization	6
Message from the General Vice-Chair	7
Message from the Steering Co-Chairs	8
IPDPS 2006 Organization	9
IPDPS 2006 Technical Program	13
IPDPS 2006 Reviewers	16
Plenary Session: BEST PAPERS	19
On Collaborative Content Distribution using Multi-Message Gossip	
<i>C. Fernandess and D. Malkhi</i>	20
Assembling Genomes on Large-Scale Parallel Computers	
<i>A. Kalyanaraman, S. J. Emrich, P. S. Schnable, and S. Aluru</i>	20
Quantifying and Reducing the Effects of Wrong-Path Memory References in Cache-Coherent Multiprocessor Systems	
<i>R. Sendag, A. Yilmazer, J. J. Yi, and A. K. Uht</i>	21
Making Lockless Synchronization Fast: Performance Implications of Memory Reclamation	
<i>T. E. Hart, P. E. Mckenney, and A. D. Brown</i>	21
Session 1: SCHEDULING	23
Centralized Versus Distributed Schedulers for Multiple bag-of-task applications	
<i>O. Beaumont, L. Carter, J. Ferrante, A. Legrand, L. Marchal, and Y. Robert</i>	24
A Strategyproof Mechanism for Scheduling Divisible Loads in Tree Networks	
<i>T. E. Carroll and D. Grosu</i>	24

Real-Time Task Mapping and Scheduling for Collaborative In-Network Processing in DVS-Enabled Wireless Sensor Networks	
<i>Y. Tian, J. Boangoat, E. Ekici, and F. Ozguner</i>	25
Flexible Tardiness Bounds for Sporadic Real-Time Task Systems on Multiprocessors	
<i>U. Devi and J. H. Anderson</i>	25
Session 2: P2P and GRID COMPUTING, 1	27
Ad-hoc Distributed Spatial Joins on Mobile Devices	
<i>P. Kalnis, N. Mamoulis, S. Bakiras, and X. Li</i>	28
WaveGrid: a Scalable Fast-turnaround Heterogeneous Peer-based Desktop Grid System	
<i>D. Zhou and V. Lo</i>	28
Trust Overlay Networks for Global Reputation Aggregation in P2P Grid Computing	
<i>R. Zhou and K. Hwang</i>	29
An Adaptive Stabilization Framework for Distributed Hash Tables	
<i>G. Ghinita and Y. M. Teo</i>	29
Session 3: MEMORY SYSTEMS and CACHES	31
Enhancing L2 Organization for CMPs with a Center Cell	
<i>C. Liu, A. Sivasubramaniam, M. Kandemir, and M. J. Irwin</i>	32
Improving Cache Locality for Thread-Level Speculation	
<i>S. L. C. Fung and J. G. Steffan</i>	32
On the Effectiveness of Speculative and Selective Memory Fences	
<i>O. Trachsel, C. V. Praun, and T. R. Gross</i>	33
Exploiting Locality: A Flexible DSM Approach	
<i>H. Zeffner, Z. Radovic, and E. Hagersten</i>	33
Session 4: CONSISTENCY in GRIDS	35
On Consistency Maintenance In Service Discovery	
<i>V. Sundramoorthy, P. Hartel, and H. Scholten</i>	36
Evaluation of UDDI as a Provider of Resource Discovery Services for OGSA-based Grids	
<i>E. Benson, G. Wasson, and M. Humphrey</i>	36
Monitoring Remotely Executing Shared Memory Programs in Software DSMs	
<i>L. Fei, X. Fang, Y. C. Hu, and S. P. Midkiff</i>	37
A Segment-Based DSM Supporting Large Shared Object Space	
<i>B. W. Cheung and C. Wang</i>	37
Session 5: HASHING	39
D1HT: A Distributed One Hop Hash Table	
<i>L. R. Monnerat and C. L. D. Amorim</i>	40

Hash-based Proximity Clustering for Load Balancing in Heterogeneous DHT Networks	
<i>H. Shen and C. Xu</i>	40
DiST: Fully Decentralized Indexing for Querying Distributed Multidimensional Datasets	
<i>B. Nam and A. Sussman</i>	41
Session 6: PARALLEL and DISTRIBUTED ALGORITHMS	43
Distributed Coloring in $\tilde{O}(\sqrt{\log n})$ Bit Rounds	
<i>K. Kothapalli, M. Onus, C. Scheideler, and C. Schindelhauer</i>	44
Distributed Algorithm for a Color Assignment on Asynchronous Rings	
<i>G. D. Marco, M. Leoncini, and M. Montangelo</i>	44
On the Packing of Selfish Items	
<i>V. Bilò</i>	45
GPU-ABISort: Optimal Parallel Sorting on Stream Architectures	
<i>A. Greß and G. Zachmann</i>	45
Session 7: P2P and GRID COMPUTING, 2	47
An Authentication Protocol in Web-computing	
<i>S. Wong</i>	48
A Design of Overlay Anonymous Multicast Protocol	
<i>L. Xiao, X. Liu, W. Gu, D. Xuan, and Y. Liu</i>	48
IP over P2P: Enabling Self-configuring Virtual IP Networks for Grid Computing	
<i>A. Ganguly, A. Agrawal, P. O. Boykin, and R. Figueiredo</i>	49
Efficient Client-to-Server Assignments for Distributed Virtual Environments	
<i>D. N. B. Ta and S. Zhou</i>	49
Session 8: PROCESSOR DESIGNS	51
Exploiting Dataflow to Extract Java Instruction Level Parallelism on a Tag-based Multi-Issue Semi In-Order (TMSI) Processor	
<i>H. Wang and C. Yuen</i>	52
SAMIE-LSQ: Set-Associative Multiple-Instruction Entry Load/Store Queue	
<i>J. Abella and A. González</i>	52
Compiler Assisted Dynamic Management of Registers for Network Processors	
<i>R. Collins, F. Alegre, X. Zhuang, and S. Pande</i>	53
Session 9: LOAD BALANCING	55
A New Analytical Method for Parallel, Diffusion-type Load Balancing	
<i>P. Berenbrink, T. Friedetzky, and Z. Hu</i>	56
Load Balancing in the Presence of Random Node Failure and Recovery	
<i>S. Dhakal, M. M. Hayat, J. E. Pezoa, C. T. Abdallah, J. D. Birdwell, and J. Chiasson</i>	56

Dynamic Structured Partitioning for Parallel Scientific Applications with Pointwise Varying Workloads	
<i>S. Chandra, M. Parashar, and J. Ray</i>	57
Accelerating Shape Optimizing Load Balancing for Parallel FEM Simulations by Algebraic Multigrid	
<i>H. Meyerhenke, B. Monien, and S. Schamberger</i>	57
Session 10: COMPUTATIONAL SCIENCE: BIOLOGY, CHEMISTRY, and PHYSICS	59
Parallelization and Performance Characterization of Protein 3D Structure Prediction of Rosetta	
<i>W. Li, T. Wang, E. Li, D. Baker, L. Jin, S. Ge, Y. Chen, and Y. Zhang</i>	60
Grid solutions for biological and physical cross-site simulations on the TeraGrid	
<i>S. Dong, N.T. Karonis, and G.E. Karniadakis</i>	60
Achieving Strong Scaling with NAMD on Blue Gene/L	
<i>S. Kumar, C. Huang, G. Almasi, and L. V. Kale</i>	61
Parallel ICA Methods for EEG Neuroimaging	
<i>D. B. Keith, C. C. Hoge, R. M. Frank, and A. D. Malony</i>	61
Session 11: PERFORMANCE EVALUATION and MODELS	63
Early Evaluation of the Cray XT3	
<i>J. S. Vetter, S. R. Alam, T. H. Dunigan, Jr., M. R. Fahey, P. C. Roth, and P. H. Worley</i>	64
A Study of the On-Chip Interconnection Network for the IBM Cyclops64 Multi-Core Architecture	
<i>Y. P. Zhang, T. Jeong, F. Chen, H. Wu, R. Nitzsche, and G. R. Gao</i>	64
A Performance Model for Fine-Grain Accesses in UPC	
<i>Z. Zhang and S. R. Seidel</i>	65
Analytical Performance Modelling of Adaptive Wormhole Routing in the Star Interconnection Network	
<i>A. E. Kiasari, H. Sarbazi-azad, and M. Ould-khaoua</i>	65
Session 12: INPUT/OUTPUT	67
Bitmap Indexes for Large Scientific Data Sets: A Case Study	
<i>R. R. Sinha, S. Mitra, and M. Winslett</i>	68
MPI-IO/L: Efficient Remote I/O for MPI-IO via Logistical Networking	
<i>J. Lee, R. Ross, S. Atchley, M. Beck, and R. Thakur</i>	68
Evaluating I/O Characteristics and Methods for Storing Structured Scientific Data	
<i>A. Ching, A. Choudhary, W. Liao, L. Ward, and N. Pundit</i>	69
Dual-Layered File Cache On cc-NUMA System	
<i>Z. Yingchao, M. Dan, and M. Jie</i>	69
Session 13: SCHEDULING, 2	71
Dynamic Multi Phase Scheduling for Heterogeneous Clusters	
<i>F. M. Ciorba, T. Andronikos, I. Riakiotakis, A. T. Chronopoulos, and G. Papakonstantinou</i>	72
Using Virtual Grids to Simplify Application Scheduling	
<i>R. Huang, H. Casanova, and A. A. Chien</i>	72

Enhancing Downlink Performance in Wireless Networks by Simultaneous Multiple Packet Transmission	
<i>Z. Zhang and Y. Yang</i>	73
Instability in Parallel Job Scheduling Simulation: The Role of Workload Flurries	
<i>D. Tsafirir and D. G. Feitelson</i>	73
Session 14: DATA-INTENSIVE APPLICATIONS	75
Supporting Self-Adaptation in Streaming Data Mining Applications	
<i>L. Chen and G. Agrawal</i>	76
Distributed Antipole Clustering for Efficient Data Search and Management in Euclidean and Metric Spaces	
<i>A. Ferro, R. Giugno, M. Mongiovì, G. Pigola, and A. Pulvirenti</i>	76
Exploiting Programmable Network Interfaces for Parallel Query Execution in Workstation Clusters	
<i>S. Kumar, M. J. Thazhuthaveetil, and R. Govindarajan</i>	77
Design and Analysis of a Multi-dimensional Data Sampling Service for Large Scale Data Analysis Applications	
<i>X. Zhang, T. Kurc, J. Saltz, and S. Parthasarathy</i>	77
Session 15: ENERGY CONSIDERATIONS	79
Parallel Algorithms for Inductance Extraction of VLSI Circuits	
<i>H. Mahawar and V. Sarin</i>	80
Leakage-Aware Multiprocessor Scheduling for Low Power	
<i>P. D. Langen and B. Juurlink</i>	80
A Dependable Infrastructure of the Electric Network for E-textiles	
<i>N. Zheng, Z. Wu, M. Lin, and M. Zhao</i>	81
Battery-Aware Router Scheduling in Wireless Mesh Networks	
<i>C. Ma, Z. Zhang, and Y. Yang</i>	81
Session 16: COMPILERS and OPTIMIZATION	83
Optimizing Bandwidth Limited Problems Using One-Sided Communication and Overlap	
<i>C. Bell, D. Bonachea, R. Nishtala, and K. Yelick</i>	84
Performance analysis of parallel programs via message-passing graph traversal	
<i>M. J. Sottile, V. P. Chandu, and D. A. Bader</i>	84
A Compiler-based Communication Analysis Approach for Multiprocessor Systems	
<i>S. Shao, A. K. Jones, and R. Melhem</i>	85
A Code Motion Technique for Accelerating General-Purpose Computation on the GPU	
<i>T. Ikeda, F. Ino, and K. Hagihara</i>	85
Session 17: MEMORY SHARING	87
A Distributed Paging RAM Grid System for Wide-Area Memory Sharing	
<i>R. Chu, N. Xiao, Y. Zhuang, Y. Liu, and X. Lu</i>	88
Detecting Phases in Parallel Applications on Shared Memory Architectures	
<i>E. Perelman, M. Polito, J. Bouguet, J. Sampson, B. Calder, and C. Dulong</i>	88

Coterminous Locality and Coterminous Group Data Prefetching on Chip-Multiprocessors	
<i>X. Shi, Z. Yang, J. Peir, L. Peng, Y. Chen, V. Lee, and B. Liang</i>	89
Session 18: COMMUNICATION and COORDINATION	91
Concurrent Counting is Harder than Queuing	
<i>S. Tirthapura and C. Busch</i>	92
Relationships between communication models in networks using atomic registers	
<i>L. Higham and C. Johnen</i>	92
RAPID: An End-System Aware Protocol for Intelligent Data Transfer over Lambda Grids	
<i>A. Banerjee, W. Feng, B. Mukherjee, and D. Ghosal</i>	93
Session 19: FAULT and FAILURE TOLERANCE	95
The Interleaved Authentication for Filtering False Reports in Multipath Routing based Sensor Networks	
<i>Y. Zhang, J. Yang, and H. T. Vu</i>	96
Necessary and Sufficient Conditions for 1-adaptivity	
<i>J. Beauquier, S. Delaet, and S. Haddad</i>	96
A Proactive Fault-detection Mechanism in Large-scale Cluster Systems	
<i>W. Linping, M. Dan, G. Wen, and Z. Jianfeng</i>	97
Algorithm-Based Checkpoint-Free Fault Tolerance for Parallel Matrix Computations on Volatile Resources	
<i>Z. Chen and J. Dongarra</i>	97
Session 20: MPI	99
Collective Operations in NEC's High-performance MPI Libraries	
<i>J. L. Traff and H. Ritzdorf</i>	100
Infiniband Scalability in Open MPI	
<i>G. M. Shipman, T. S. Woodall, R. L. Graham, A. B. Maccabe, and P. G. Bridges</i>	100
Shared Receive Queue based Scalable MPI Design for InfiniBand Clusters	
<i>S. Sur, L. Chai, H. Jin, and D. K. Panda</i>	101
Executing MPI Programs on Virtual Machines in an Internet Sharing System	
<i>Z. Pan, X. Ren, R. Eigenmann, and D. Xu</i>	101
Adaptive Connection Management for Scalable MPI over InfiniBand	
<i>W. Yu, Q. Gao, and D. K. Panda</i>	102
Session 21: ROUTING	103
An Integrated Approach for Density Control and Routing in Wireless Sensor Networks	
<i>I. G. Siqueira, C. M. S. Figueiredo, A. A. F. Loureiro, J. M. Nogueira, and L. B. Ruiz</i>	104
A Distributed Method for Dynamic Resolution of BGP Oscillations	
<i>A. Ehoud, K. Jean-claude, and S. Clément</i>	104
Segment-Based Routing: An Efficient Fault-Tolerant Routing Algorithm for Meshes and Tori	
<i>A. Mejia, J. Flich, J. Duato, S. Reinemo, and T. Skeie</i>	105

Network Uncertainty in Selfish Routing	
<i>C. Georgiou, T. Pavlides, and A. Philippou</i>	105
Session 22: IMAGE PROCESSING and VISUALIZATION	107
MPEG-2 Decoding in a Stream Programming Language	
<i>M. Drake, H. Hoffmann, R. Rabbah, and S. Amarasinghe</i>	108
An Efficient and Scalable Parallel Algorithm for Out-of-Core Isosurface Extraction and Rendering	
<i>Q. Wang, J. Jaja, and A. Varshney</i>	108
Parallel Morphological Processing of Hyperspectral Image Data on Heterogeneous Networks of Computers	
<i>A. J. Plaza</i>	109
Acceleration of a Content-Based Image-Retrieval Application on the RDISK Cluster	
<i>A. Noumsi, S. Derrien, and P. Quinton</i>	109
Session 23: RECONFIGURABLE and MULTIPLE-WIDTH SYSTEMS	111
Parallel FPGA-based All-Pairs Shortest-Paths in a Directed Graph	
<i>U. Bondhugula, A. Devulapalli, J. Fernando, P. Wyckoff, and P. Sadayappan</i>	112
Design flow for Optimizing Performance in Processor Systems with on-chip Coarse-Grain Reconfigurable Logic	
<i>M. D. Galanis, G. Dimitoulakos, and C. E. Goutis</i>	112
Exploring the Design Space of an Optimized Compiler Approach for Mesh-Like Coarse-Grained Reconfigurable Architectures	
<i>G. Dimitroulakos, M. D. Galanis, and C. E. Goutis</i>	113
Empowering a Helper Cluster through Data-Width Aware Instruction Selection Policies	
<i>O. S. Unsal, X. Vera, A. González, and O. Ergin</i>	113
Session 24: PROGRAMMING ABSTRACTIONS	115
Algorithmic Skeletons for Stream Programming in Embedded Heterogeneous Parallel Image Processing Applications	
<i>W. Caarls, P. Jonker, and H. Corporaal</i>	116
Incrementally Developing Parallel Applications with AspectJ	
<i>J. L. F. Sobral</i>	116
Auto-Pipe and the X Language: A Pipeline Design Tool and Description Language	
<i>M. A. Franklin, E. J. Tyson, J. Buckley, and P. Crowley</i>	117
Enabling Efficient and Flexible Coupling of Parallel Scientific Applications	
<i>L. Zhang and M. Parashar</i>	117
Session 25: RESOURCE ALLOCATION	119
Skewed Allocation of Non-Uniform Data for Broadcasting over Multiple Channels	
<i>A.A. Bertossi and C.M. Pinotti</i>	120
Comparative Study of Price-based Resource Allocation Algorithms for Ad Hoc Networks	
<i>M. Luethi, S. Nadjm-tehrani, and C. Curescu</i>	120

Oblivious Parallel Probabilistic Channel Utilization without Control Channels	
<i>C. Schindelhauer and K. Voss</i>	121
Non-cooperative, Semi-cooperative, and Cooperative Games-based Grid Resource Allocation	
<i>S. U. Khan and I. Ahmad</i>	121
Session 26: PARTITIONING and REFINEMENT	123
Parallel Hypergraph Partitioning for Scientific Computing	
<i>K. D. Devine, E. G. Boman, R. T. Heaphy, R. H. Bisseling, and U. V. Catalyurek</i>	124
Multilevel Algorithms for Partitioning Power-Law Graphs	
<i>A. Abou-rjeili and G. Karypis</i>	124
Effective Out-of-Core Parallel Delaunay Mesh Refinement using Off-the-Shelf Software	
<i>A. Kot, A. Chernikov, and N. Chrisochoides</i>	125
Fast Distributed Graph Partition and Application (Extended Abstract)	
<i>B. Derbel, M. Mosbah, and A. Zemmari</i>	125
Session 27: COLLECTIVE COMMUNICATION	127
Application-Oriented Adaptive MPIBcast for Grids	
<i>R. Gupta and S. Vadhiyar</i>	128
Pipelined Broadcast on Ethernet Switched Clusters	
<i>P. Patarasuk, A. Faraj, and X. Yuan</i>	128
k-anycast Routing Schemes for Mobile Ad Hoc Networks	
<i>B. Wu and J. Wu</i>	129
DVoDP2P: Distributed P2P Assisted Multicast VoD Architecture	
<i>X. Yang, P. Hernández, F. Cores, L. Souza, A. Ripoll, R. Suppi, and E. Luque</i>	129
Session 28: DISTRIBUTED COORDINATION	131
Composite Abortable Locks	
<i>V. J. Marathe, M. Moir, and N. Shavit</i>	132
Cooperative Checkpointing Theory	
<i>A. J. Oliner, L. Rudolph, and R. K. Sahoo</i>	132
Structural and Algorithmic Issues of Dynamic Protocol Update	
<i>O. Rütti, P. T. Wojciechowski, and A. Schiper</i>	133
On Efficient Distributed Deadlock Avoidance for Real-Time and Embedded Systems	
<i>C. Sanchez, H. B. Sipma, Z. Manna, V. Subramonian, and C. Gill</i>	133
Session 29: SYMBOLIC COMPUTING APPLICATIONS	135
A Dynamic Firing Speculation to Speedup Distributed Symbolic State-space Generation	
<i>M. Chung and G. Ciardo</i>	136
Parallelizing Post-Placement Timing Optimization	
<i>J. Kim, M. C. Papaefthymiou, and J. L. Neves</i>	136

Sim-X: Parallel System Software for Interactive Multi-Experiment Computational Studies	
<i>S. Yau, E. Grinspun, V. Karamcheti, and D. Zorin</i>	137
Session 30: MULTITHREADING	139
Exploiting Unbalanced Thread Scheduling for Energy and Performance on a CMP of SMT Processors	
<i>M. Devuyst, R. Kumar, and D. M. Tullsen</i>	140
Helper Thread Prefetching for Loosely-Coupled Multiprocessor Systems	
<i>C. Jung, D. Lim, J. Lee, and Y. Solihin</i>	140
Compatible Phase Co-Scheduling on a CMP of Multi-Threaded Processors	
<i>A. El-moursy, R. Garg, D. H. Albonesi, and S. Dwarkadas</i>	141
Session 31: RUNTIME OPTIMIZATIONS	143
Selecting the Tile Shape to Reduce the Total Communication Volume	
<i>N. Drosinos, G. Goumas, and N. Koziris</i>	144
Application Classification through Monitoring and Learning of Resource Consumption Patterns	
<i>J. Zhang and R. Figueiredo</i>	144
Topology-aware Task Mapping for Reducing Communication Contention on Large Parallel Machines	
<i>T. Agarwal, A. Sharma, and L. V. Kale</i>	145
Session 32: DISTRIBUTED SYSTEMS	147
A Virtual Network (ViNe) Architecture for Grid Computing	
<i>M. Tsugawa and J. A. B. Fortes</i>	148
Wire-Speed Total Order	
<i>T. Anker, G. Greenman, D. Dolev, and I. Shnayderman</i>	148
Free Network Measurement For Adaptive Virtualized Distributed Computing	
<i>A. Gupta, M. Zangrilli, A. I. Sundararaj, A. I. Huang, P. A. Dinda, and B. B. Lowekamp</i>	149
Heterogeneous Computing Workshop	151
HCW Introduction	152
Message from the Heterogeneous Computing Workshop Steering Committee Chair	153
Message from the HCW General Chair	154
Message from the HCW Program Chair	155
HCW Keynote: Aspects of Heterogeneous Computing in the Open MPI Environment	
<i>R. L. Graham</i>	156
HCW Panel: Programming heterogeneous systems - Less pain! Better performance!	
<i>J. Fortes</i>	157
The impact of heterogeneity on master-slave on-line scheduling	
<i>J. Pineau, Y. Robert, and F. Vivien</i>	158
Wrekavoc: a Tool for Emulating Heterogeneity	
<i>L. Canon and E. Jeannot</i>	158

Scheduling Multiple DAGs onto Heterogeneous Systems	
<i>H. Zhao and R. Sakellariou</i>	159
Scheduling of Tasks with Batch-shared I/O on Heterogeneous Systems	
<i>N. Vydyanathan, G. Khanna, U. Catalyurek, T. Kurc, P. Sadayappan, and J. Saltz</i>	159
A Task Duplication Based Bottom-Up Scheduling Algorithm for Heterogeneous Environments	
<i>D. Bozdağ, U. Catalyurek, and F. Ozgüner</i>	160
FIFO scheduling of divisible loads with return messages under the one-port model	
<i>O. Beaumont, L. Marchal, V. Rehn, and Y. Robert</i>	160
Using SCTP to hide latency in MPI programs	
<i>H. Kamal, B. Penoff, M. Tsai, E. Vong, and A. Wagner</i>	161
A Brokering Framework for Large-Scale Heterogeneous Systems	
<i>X. Bai, L. Boloni, D. C. Marinescu, H. J. Siegel, R. A. Daley, and I. Wang</i>	161
Cooperative Load Balancing for a Network of Heterogeneous Computers	
<i>S. Penmatsa and A. T. Chronopoulos</i>	162
An Economy-driven Mapping Heuristic for Hierarchical Master-Slave Applications in Grid Systems	
<i>N. Rinaldo and E. Zimeo</i>	162
Plan Switching: An Approach to Plan Execution in Changing Environments	
<i>H. Yu, D. C. Marinescu, A. S. Wu, H. J. Siegel, R. A. Daley, and I. Wang</i>	163
Integrating heterogeneous information services using JNDI	
<i>D. Gorissen, P. Wendykier, D. Kurzyniec, and V. Sunderam</i>	163
Workshop on Parallel and Distributed Real-Time Systems	165
WPDRTS Introduction	166
WPDRTS Keynote: Component-based Construction of Embedded Systems	
<i>J. Sifakis</i>	167
Decentralized and Dynamic Bandwidth Allocation in Networked Control Systems	
<i>A. T. Al-hammouri, M. S. Branicky, V. Liberatore, and S. M. Phillips</i>	167
The Robot Software Communications Architecture (RSCA): Embedded Middleware for Networked Service Robots	
<i>S. Hong, J. Lee, H. Eom, and G. Jeon</i>	168
Schedulability Analysis of AR-TP, a Ravenscar Compliant Communication Protocol for High-Integrity Distributed Systems	
<i>S. Urueña, J. Zamorano, D. Berjón, J. A. Pulido, and J. A. D. L. Puente</i>	168
Realization of Virtual Networks in the DECOS Integrated Architecture	
<i>R. Obermaisser and P. Peti</i>	169
A Portable Real-time Emulator for Testing Multi-Radio MANETs	
<i>W. Jiang and C. Zhang</i>	169

Battery Aware Dynamic Scheduling for Periodic Task Graphs	
<i>V. Rao, G. Singhal, N. Navet, A. Kumar, and G.S Visweswaran</i>	170
Scheduling of Tasks with Precedence Delays and Relative Deadlines - Framework for Time-optimal Dynamic Reconfiguration of FPGAs	
<i>P. Sucha and Z. Hanzalek</i>	170
A Hierarchical Scheduling Model for Component-Based Real-Time Systems	
<i>J. L. Lorente, G. Lipari, and E. Bini</i>	171
Schedulability Analysis of Non-Preemptive Recurring Real-Time Tasks	
<i>S. K. Baruah and S. Chakraborty</i>	171
Towards an Analysis of Race Carrier Conditions in Real-time Java	
<i>M. T. Higuera-toledano</i>	172
Fault Tolerance with Real-Time Java	
<i>D. Masson and S. Midonnet</i>	172
A Probabilistic Approach for Fault Tolerant Multiprocessor Real-time Scheduling	
<i>V. Berten, J. Goossens, and E. Jeannot</i>	173
A Real-Time PES Supporting Runtime State Restoration after Transient Hardware-Faults	
<i>Skambraks</i>	173
Honeybees: Combining Replication and Evasion for Mitigating Base-station Jamming in Sensor Network	
<i>S. Khattab, D. Mossé, and R. Melhem</i>	174
Murphy Loves Potatoes: Experiences from a Pilot Sensor Network Deployment in Precision Agriculture	
<i>K. Langendoen, A. Baggio, and O. Visser</i>	174
An Overview of Data Aggregation Architecture for Real-Time Tracking with Sensor Networks	
<i>T. He, L. Gu, L. Luo, T. Yan, J. A. Stankovic, and S. H. Son</i>	175
Formal Modeling and Analysis of Wireless Sensor Network Algorithms in Real-Time Maude	
<i>P. C. Olveczky and S. Thorvaldsen</i>	175
GTS Allocation Analysis in IEEE 802.15.4 for Real-Time Wireless Sensor Networks	
<i>A. Koubaa, M. Alves, and E. Tovar</i>	176
Power-Aware Data Dissemination Protocols in Wireless Sensor Networks	
<i>S. Nikolettseas</i>	176
Algorithmic Models for Sensor Networks	
<i>S. Schmid and R. Wattenhofer</i>	177
Solving Generic Role Assignment Exactly	
<i>C. Frank and K. Römer</i>	177
Similarity-Aware Query Processing in Sensor Networks	
<i>P. Xia, P. K. Chrysanthis, and A. Labrinidis</i>	178

An Optimal Approach to the Task Allocation Problem on Hierarchical Architectures	
<i>A. Metzner, M. Fraenzle, C. Herde, and I. Stierand</i>	178
Schedulability Analysis of AADL Models	
<i>O. Sokolsky, I. Lee, and D. Clarke</i>	179
Timed Automata Based Analysis of Embedded System Architectures	
<i>M. Hendriks and M. Verhoef</i>	179
Time Abstraction in Timed μ CRL à la Regions	
<i>J. F. Groote, M. A. Reniers, and Y. S. Usenko</i>	180
Schedulability analysis of flows scheduled with FIFO: Application to the Expedited Forwarding class	
<i>S. Martin and P. Minet</i>	180
Real-Time Systems for Multi-Processor Architectures	
<i>Piel, P. Marquet, J. Soula, and J. Dekeyser</i>	181
QoS-based Management of Multiple Shared Resource in Dynamic Real-Time Systems	
<i>K. Ecker, F. Drews, and J. Lichtenberg</i>	181
Adaptability Management and Deterministic Scheduling of Media Flows on Parallel Storage Servers	
<i>C. Mourlas</i>	182
Reconfigurable Architectures Workshop	183
RAW Introduction	184
RAW Keynote 1: The Outer Limits: Reconfigurable Computing in Space and In Orbit	
<i>M. Gokhale</i>	185
RAW Keynote 2: New Horizons of Very High Performance Computing (VHPC): Hurdles and Chances	
<i>R. Hartenstein</i>	186
Analysis of a Reconfigurable Network Processor	
<i>C. Kachris and S. Vassiliadis</i>	187
Performance and Power Analysis of Time-multiplexed Execution on Dynamically Reconfigurable Processor	
<i>Y. Hasegawa, S. Abe, S. Kurotaki, V. M. Tuan, N. Katsura, T. Nakamura, T. Nishimura, and H. Amano</i>	187
2D Defragmentation Heuristics for Hardware Multitasking on Reconfigurable Devices	
<i>J. Septién, H. Mecha, D. Mozos, and J. Tabero</i>	188
A Cost-Effective Context Memory Structure for Dynamically Reconfigurable Processors	
<i>M. Suzuki, Y. Hasegawa, V. M. Tuan, S. Abe, and H. Amano</i>	188
Performance of FPGA Implementation of Bit-split Architecture for Intrusion Detection Systems	
<i>H. Jung, Z. K. Baker, and V. K. Prasanna</i>	189
A Configuration Memory Hierarchy for Fast Reconfiguration with Reduced Energy Consumption Overhead	
<i>E. P. Ramo, J. Resano, D. Mozos, and F. Catthoor</i>	189
Maximum Edge Matching for Reconfigurable Computing	
<i>M. Rullmann and R. Merker</i>	190

FPGA implementation of a license plate recognition SoC using automatically generated streaming accelerators	
<i>N. Bellas, S. Chai, M. Dwyer, and Dan</i>	190
A High-level Target-precise Model for Designing Reconfigurable HW Tasks	
<i>M. Boden, S. Ruelke, and J. Becker</i>	191
Rapid Development of High Performance Floating-Point Pipelines for Scientific Simulation	
<i>G. Lienhart, A. Kugel, and R. Maenner</i>	191
An Optimal Architecture for a DDC	
<i>T. Bijlsma, P. T. Wolkotte, and G. J. M. Smit</i>	192
Reconfigurable Memory Based AES Co-Processor	
<i>R. Chaves, G. Kuzmanov, S. Vassiliadis, and L. Sousa</i>	192
Communication Concept for Adaptive Intelligent Run-Time Systems Supporting Distributed Reconfigurable Embedded Systems	
<i>M. Ullmann and J. Becker</i>	193
FPGA based Architecture for DNA Sequence Comparison and Database Search	
<i>E. Sotiriades, C. Kozanitis, and A. Dollas</i>	193
Accelerating DTI Tractography using FPGAs	
<i>A. Kwatra, V. Prasanna, and M. Singh</i>	194
An Adaptive System-on-Chip for Network Applications	
<i>R. Koch, T. Pionteck, C. Albrecht, and E. Maehle</i>	194
Dedicated Module Access in Dynamically Reconfigurable Systems	
<i>Hagemeyer, Jens, Kettelhoit, Boris, Porrmann, and Mario</i>	195
Exploiting dynamic reconfiguration of platform FPGAs: Implementation issues	
<i>M. L. Silva and J. C. Ferreira</i>	195
A Distributed Object System Approach for Dynamic Reconfiguration	
<i>R. Hecht, S. Kubisch, H. Michelsen, E. Zeeb, and D. Timmermann</i>	196
Elementary Block Based 2-Dimensional Dynamic and Partial Reconfiguration for Virtex-II FPGAs	
<i>M. Hübner, C. Schuck, and J. Becker</i>	196
Physically-aware Exploitation of Component Reuse in a Partially Reconfigurable Architecture	
<i>L. Singhal and E. Bozorgzadeh</i>	197
Partitioned Scheduling of Periodic Real-Time Tasks onto Reconfigurable Hardware	
<i>K. Danne and M. Platzner</i>	197
A Pattern Selection Algorithm for Multi-Pattern Scheduling	
<i>Y. Guo, C. Hoede, and G. J.M. Smit</i>	198
Mapping DSP Applications on Processor Systems with Coarse-Grain Reconfigurable Hardware	
<i>M. D. Galanis, G. Dimitroulakis, and C. E. Goutis</i>	198

VoC: A Reconfigurable Matrix for Stereo Vision Processing	
<i>R. P. Jacobi, R. B. Cardoso, and G. Borges</i>	199
Selection of Instruction Set Extensions for an FPGA Embedded Processor Core	
<i>B. F. Veale, J. K. Antonio, M. P. Tull, and S. A. Jones</i>	199
Dynamic Configuration Steering for a Reconfigurable Superscalar Processor	
<i>N. A. Mould, B. F. Veale, M. P. Tull, and J. K. Antonio</i>	200
Automatic Application-Specific Microarchitecture Reconfiguration	
<i>S. Padmanabhan, R. K. Cytron, R. D. Chamberlain, and J. W. Lockwood</i>	200
Accelerating CABAC Encoding for Multi-standard Media with Configurability	
<i>O. Flordal, D. Wu, and D. Liu</i>	201
Exploiting Processing Locality through Paging Configurations in Multitasked Reconfigurable Systems	
<i>M. Taher and T. El-ghazawi</i>	201
Investigation into Programmability for Layer 2 Protocol Frame Delineation Architectures	
<i>C. Toal and S. Sezer</i>	202
Multi-level Reconfigurable Architectures in the Switch Model	
<i>S. Lange and M. Middendorf</i>	202
Platform-based FPGA Architecture: Designing High-Performance and Low-Power Routing Structure for Realizing DSP Applications	
<i>K. Siozios, K. Tatas, D. Soudris, and A. Thanailakis</i>	203
Multi-Clock Pipelined Design of an IEEE 802.11a Physical Layer Transmitter	
<i>M. Mizani and D. Rakhmatov</i>	203
Posters: Reconfigurable Architectures Workshop	205
On-chip and On-line Self-Reconfigurable Adaptable Platform: the Non-Uniform Cellular Automata Case	
<i>A. Upegui and E. Sanchez</i>	206
Increasing Analog Programmability in SoCs	
<i>E. Schüler and L. Carro</i>	206
Partial and dynamic Reconfiguration of FPGAs : a top down design methodology for an automatic implementation	
<i>F. Berthelot, F. Nouvel, and D. Houzet</i>	207
Architecture of a Multi-Context FPGA Using a hybrid Multiple-Valued/Binary Context Switching Signal	
<i>Y. Nakatani, M. Hariyama, and M. Kameyama</i>	207
A High Level SoC Power Estimation Based on IP Modeling	
<i>D. Elleouet, N. Julien, and D. Houzet</i>	208
Implementation of a Reconfigurable Hard Real-Time Control System for Mechatronic and Automotive Applications	
<i>S. Toscher, R. Kasper, and T. Reinemann</i>	208

Run-Time Reconfiguration of Communication in SIMD Architectures	
<i>H. Fatemi, B. Mesman, H. Corporaal, T. Basten, and P. Jonker</i>	209
Coupling of a Reconfigurable Architecture and a Multithreaded Processor Core with Integrated Real-Time	
<i>S. Uhrig, S. Maier, G. Kuzmanov, and T. Ungerer</i>	209
Reconfiguration of Embedded Java Applications	
<i>J. C. S. Otero, F. R. Wagner, and L. Carro</i>	210
Speech Silicon AM: An FPGA-Based Acoustic Modeling Pipeline for Hidden Markov Model based Speech Recognition	
<i>J. W. Schuster, R. Hoare, and K. Gupta</i>	210
Implementation of a Programmable Array Processor Architecture for Approximate String Matching Algorithms on FPGAs	
<i>P. D. Michailidis and K. G. Margaritis</i>	211
ReConfigME: A Detailed Implementation of an Operating System for Reconfigurable Computing	
<i>G. Wigley, D. Kearney, and M. Jasiunas</i>	211
An Automated Development Framework for a RISC Processor with Reconfigurable Instruction Set Extensions	
<i>N. Vassiliadis, G. Theodoridis, and S. Nikolaidis</i>	212
High-Level Synthesis with Reconfigurable Datapath Components	
<i>G. Economakos</i>	212
An Optically Differential Reconfigurable Gate Array with a Holographic Memory	
<i>M. Watanabe, M. Miyano, and F. Kobayashi</i>	213
A Stochastic Multi-Objective Algorithm for the Design of High Performance Reconfigurable Architectures	
<i>W. O. Fung and T. Arslan</i>	213
Reconfigurable Communications for Image Processing Applications	
<i>A. B. Soares, L. Carro, and A. A. Susin</i>	214
Design and Analysis of Matching Circuit Architectures for a Closest Match Lookup	
<i>K. Mclaughlin, F. Kupzog, H. Blume, S. Sezer, T. Noll, and J. Mccanny</i>	214
RTOS Extensions for dynamic hardware / software monitoring and configuration management	
<i>Y. Eustache, J. Diguët, and M. E. Khodary</i>	215
Securing Embedded Programmable Gate Arrays in Secure Circuits	
<i>N. Valette, L. Torres, G. Sassatelli, and F. Bancel</i>	215
Design Space Exploration for Low-Power Reconfigurable Fabrics	
<i>G. Mehta, R. R. Hoare, J. Stander, and A. K. Jones</i>	216
Exploiting Dynamic Reconfiguration Techniques: The 2D-VLIW Approach	
<i>R. Santos, R. Azevedo, and G. Araujo</i>	216

Applying Single Processor Algorithms to Schedule Tasks on Reconfigurable Devices Respecting Reconfiguration Times	
<i>F. Dittmann and M. Götz</i>	217
Dynamically Reconfigurable Cache Architecture Using Adaptive Block Allocation Policy	
<i>M. B. Carvalho, L. F. W. Góes, and C. A. P. D. S. Martins</i>	217
Practical Design of a Computation and Energy Efficient Hardware Task Scheduler in Embedded Reconfigurable Computing Systems	
<i>T. T. Kwok and Y. Kwok</i>	218
Reconfigurable Context-Free Grammar Based Data Processing Hardware with Error Recovery	
<i>J. Moscola, Y. H. Cho, and J. W. Lockwood</i>	218
Power Consumption Advantage of a Dynamic Optically Reconfigurable Gate Array	
<i>M. Watanabe and F. Kobayashi</i>	219
VHDL to FPGA automatic ICore generation: A case study on Xilinx design flow	
<i>F. Ferrandi, G. Ferrara, R. Palazzo, V. Rana, and M. D. Santambrogio</i>	219
Workshop on High-Level Parallel Programming Models and Supportive Environments	221
HIPS Introduction	222
HIPS Keynote: Towards a Sophisticated Grid Workflow Development and Computing Environment	
keynote	
<i>T. Fahringer</i>	223
Tree-based Overlay Networks for Scalable Applications	
<i>D. C. Arnold, G. D. Pack, and B. P. Miller</i>	223
Towards a Universal Client for Grid Monitoring Systems: Design and Implementation of the Ovid Browser	
<i>M. D. Dikaiakos, A. Artemiou, and G. Tsouloupas</i>	224
The Monitoring Request Interface (MRI)	
<i>E. Kereku and M. Gerndt</i>	224
Modeling and executing Master-Worker applications	
<i>H. L. Bouziane, C. Pèrez, and T. Priol</i>	225
Towards MPI progression layer elimination with TCP and SCTP	
<i>B. Penoff and A. Wagner</i>	225
Babylon v2.0:Middleware for Distributed, Parallel, and Mobile Java Applications	
<i>W. V. Heiningen, T. Brecht, and S. Macdonald</i>	226
Iterators in Chapel	
<i>M. Joyner, B. L. Chamberlain, and S. J. Deitz</i>	226
Automatic Code Generation for Distributed Memory Architectures in the Polytope Model	
<i>M. Claßen and M. Griebel</i>	227

Techniques Supporting threadprivate in OpenMP	
<i>X. Martorell, M. Gonzalez, A. Duran, J. Balart, R. Ferrer, E. Ayguade, and J. Labarta</i>	227
A Configurable Framework for Stream Programming Exploration in Baseband Applications	
<i>J. Bengtsson and B. Svensson</i>	228
Java for Parallel and Distributed Computing Workshop	229
JAVAPDC Introduction	230
More on JACE: New Functionalities, New Experiments	
<i>J. M. Bahi, S. Domas, and K. Mazouzi</i>	231
Exploiting Dynamic Proxies in Middleware for Distributed, Parallel, and Mobile Java Applications	
<i>W. V. Heiningen, T. Brecht, and S. Macdonald</i>	231
Performance Analysis of Java Concurrent Programming: A Case Study of Video Mining System	
<i>W. Li, E. Li, R. Meng, T. Wang, and C. Dulong</i>	232
High-Level Execution and Communication Support for Parallel Grid Applications in JGrid	
<i>S. Pota and Z. Juhasz</i>	232
Fault Injection in Distributed Java Applications	
<i>W. Hoarau, S. Tixeuil, and F. Vauchelles</i>	233
Saburo, a tool for I/O and concurrency management in servers	
<i>G. Loyauté, R. Forax, and G. Roussel</i>	233
Chedar: Peer-to-Peer Middleware	
<i>A. Auvinen, M. Vapa, M. Weber, N. Kotilainen, and J. Vuori</i>	234
Workflow Fine-grained Concurrency with Automatic Continuation	
<i>G. Tretola and E. Zimeo</i>	234
Distributed Monte Carlo Simulation of Light Transportation in Tissue	
<i>A. J. Page, S. Coyle, T. M. Keane, T. J. Naughton, C. Markham, and T. Ward</i>	235
The Benefits of Java and Jini in the JGrid System	
<i>S. Pota and Z. Juhasz</i>	235
Workshop on Nature Inspired Distributed Computing	237
NIDISC Introduction	238
A nature-inspired algorithm for the disjoint paths problem	
<i>M. J. Blesa and C. Blum</i>	239
A Parallel Memetic Algorithm Applied to the Total Tardiness Machine Scheduling Problem	
<i>V. J. Garcia, P. M. França, A. D. S. Mendes, and P. Moscato</i>	239
Sharing ressources with artificial ants	
<i>C. Guéret, N. Monmarché, and M. Slimane</i>	240

Ant Stigmergy on the Grid: Optimizing the Cooling Process in Continuous Steel Casting	
<i>P. Korosec, J. Silc, B. Filipic, and E. Laitinen</i>	240
Distributed Workflow Coordination: Molecules and Reactions	
<i>Z. Nemeth, C. Perez, and T. Priol</i>	241
A metaheuristic based on fusion and fission for partitioning problems	
<i>C. Bichot</i>	241
A Nonself Space Approach to Network Anomaly Detection	
<i>M. Ostaszewski, F. Seredynski, and P. Bouvry</i>	242
Parallel Implementation of Evolutionary Strategies on Heterogeneous Clusters with Load Balancing	
<i>J. F. Garamendi and J. L. Bosque</i>	242
Placement and Routing of Boolean Functions in constrained FPGAs using a Distributed Genetic Algorithm and Local Search.	
<i>M. R. D. Solar, J. M. S. Pérez, J. A. G. Pulido, and M. V. Rodríguez</i>	243
Evaluating Parallel Simulated Evolution Strategies for VLSI Cell Placement	
<i>S. M. Sait, M. I. Ali, and A. M. Zaidi</i>	243
A Proposal of Metaheuristics Based in the Cooperation between Operators in Combinatorial Optimization Problems	
<i>A. Sancho-royo, D. Pelta, and J. L. Verdegay</i>	244
Advances in Applying Genetic Programming to Machine Learning, Focussing on Classification Problems	
<i>S. Winkler, M. Affenzeller, and S. Wagner</i>	244
A Parallel Exact Hybrid Approach for Solving Multi-Objective Problems on the Computational Grid	
<i>M. Mezamaz, N. Melab, and E. Talbi</i>	245
A Combined Genetic-Neural Algorithm for Mobility Management	
<i>J. Taheri and A. Y. Zomaya</i>	245
Workforce Planning with Parallel Algorithms	
<i>E. Alba, G. Luque, and F. Luna</i>	246
Self-Organized Task Allocation for Computing Systems with Reconfigurable Components	
<i>D. Merkle, M. Middendorf, and A. Scheidler</i>	246
A Multiple Task Allocation Framework for Biological Sequence Comparison in a Grid Environment	
<i>A. Boukerche, M. S. Sousa, and A. C. M. A. D. Melo</i>	247
A Physical Particle and Plane Framework for Load Balancing in Multiprocessors	
<i>N. Imani and H. S. Azad</i>	247
Workshop on High Performance Computational Biology	249
HiCOMB Introduction	250
Bio-Sequence Database Scanning on a GPU	
<i>W. Liu, B. Schmidt, G. Voss, A. Schroder, and W. Muller-wittig</i>	251

Some Initial Results on Hardware BLAST Acceleration with a Reconfigurable Architecture	
<i>E. Sotiriades, C. Kozanitis, and A. Dollas</i>	251
Phylospaces: Reconstructing Evolutionary Trees in Tuple Space	
<i>M. L. Smith and T. L. Williams</i>	252
Parallel Implementation of a Quartet-Based Algorithm for Phylogenetic Analysis	
<i>B. B. Zhou, D. Chu, M. Tarawneh, P. Wang, C. Wang, A. Y. Zomaya, and R. P. Brent</i>	252
Phylogenetic Models of Rate Heterogeneity: A High Performance Computing Perspective	
<i>A. Stamatakis</i>	253
Parallel Multiple Sequence Alignment with Local Phylogeny Search by Simulated Annealing	
<i>J. Zola, D. Trystram, A. Tchernykh, and C. Brizuela</i>	253
MT-ClustalW: Multithreading Multiple Sequence Alignment	
<i>K. Chaichoompu, S. Kittitornkun, and S. Tongsima</i>	254
Parallel Implementation of the Replica Exchange Molecular Dynamics Algorithm on Blue Gene/L	
<i>M. Eleftheriou, A. Rayshubski, J. W. Pitera, B. G. Fitch, R. Zhou, and R. S. Germain</i>	254
Application Re-Structuring and Data Management on a GRID Environment: a Case Study for Bioinformatics	
<i>G. Ciriello, M. Comin, and C. Guerra</i>	255
A Method to Improve Structural Modeling Based on Conserved Domain Clusters	
<i>F. Zhang, L. Xu, and B. Yuan</i>	255
An Experimental Study of Optimizing Bioinformatics Applications	
<i>G. Tan, L. Xu, S. Feng, and N. Sun</i>	256
Advances in Parallel and Distributed Computing Models	257
APDCM Introduction	258
APDCM Keynote: Learning Computing Models from Cells and Tissues: P Systems	
<i>G. Paun</i>	259
Optimal Map Contruction of an Unknown Torus	
<i>H. Becha and P. Flocchini</i>	259
Ant-inspired Query Routing Performance in Dynamic Peer-to-Peer Networks	
<i>M. Ciglaric and T. Vidmar</i>	260
Decontamination of Chordal Rings and Tori	
<i>P. Flocchini, M. Huang, and F. Luccio</i>	260
Reducing the Associativity and Size of Step Caches in CRCW Operation	
<i>M. Forsell</i>	261
Simulating a PR-Mesh on an LARPBS	
<i>M. Gopalan, A. G. Bourgeois, and J. A. F. Zepeda</i>	261
A Strategyproof Mechanism for Scheduling Divisible Loads in Bus Networks without Control Processors	
<i>T. E. Carroll and D. Grosu</i>	262

Efficient Hardware Algorithms for n Choose k Counters	
<i>Y. Ito, K. Nakano, and Y. Yamagishi</i>	262
A Self-Stabilizing Minimal Dominating Set Algorithm with Safe Convergence	
<i>H. Kakugawa and T. Masuzawa</i>	263
A Framework for Developing Distributed Location Based Applications	
<i>A. Krevl and M. Ciglaric</i>	263
A Calculus of Functional BSP Programs with Projection	
<i>F. Loulergue</i>	264
Network Decontamination with Local Immunization	
<i>F. Luccio, L. Pagli, and N. Santoro</i>	264
An Advanced Performance Analysis of Self-stabilizing Protocols : Stabilization Time with Transient Faults during Convergence	
<i>Y. Nakaminami, H. Kakugawa, and T. Masuzawa</i>	265
Cache-Oblivious Simulation of Parallel Programs	
<i>A. Pietracaprina, G. Pucci, and F. Silvestri</i>	265
Enhancing the Performance of HLA-Based Simulation Systems via Software Diversity and Active Replication	
<i>F. Quaglia</i>	266
Broadcasting and Routing in Faulty Mesh Networks	
<i>M. Stojmenovic and A. Nayak</i>	266
Self-Stabilizing Distributed Algorithms for Graph Alliances	
<i>P. Srimani and Z. Xu</i>	267
Communication Architecture for Clusters	269
CAC Introduction	270
Seekable Sockets: A Mechanism to Reduce Copy Overheads in TCP-based Messaging	
<i>C. Douglas and V. S. Pai</i>	271
Asynchronous Zero-copy Communication for Synchronous Sockets in the Sockets Direct Protocol (SDP) over InfiniBand	
<i>P. Balaji, S. Bhagvat, H. W. Jin, and D. K. Panda</i>	271
Fast Barrier Synchronization for InfiniBand	
<i>T. Hoefler, T. Mehlan, F. Mietke, and W. Rehm</i>	272
Efficient SMP-Aware MPI-Level Broadcast over InfiniBand	
<i>A. R. Mamidala, L. Chai, H. Jin, and D. K. Panda</i>	272
Efficient RDMA-based Multi-port Collectives on Multi-rail QsNetII Clusters	
<i>Y. Qian and A. Afsahi</i>	273
Benefits of High Speed Interconnects to Cluster File Systems: A Case Study with Lustre	
<i>W. Yu, R. Noronha, S. Liang, and D. K. Panda</i>	273

iWarp Protocol Kernel Space Software Implementation	
<i>D. Dalessandro, A. Devulapalli, and P. Wyckoff</i>	274
A Look at Application Performance Sensitivity to the Bandwidth and Latency of Infiniband Networks.	
<i>D. J. Kerbyson</i>	274
Communication Patterns	
<i>R. Riesen</i>	275
A Preliminary Analysis of the InfiniPath and XDI Network Interfaces	
<i>R. Brightwell, D. Doerfler, and K. D. Underwood</i>	275
NSF Next Generation Software Program Meeting	277
NSFNGS Introduction	278
Techniques and Tools for Dynamic Optimization	
<i>J. D. Hiser, N. Kumar, M. Zhao, S. Zhou, B. R. Childers, J. W. Davidson, and M. L. Soffa</i>	279
Program Phase Detection and Exploitation	
<i>C. Ding, S. Dwarkadas, M. C. Huang, K. Shen, and J. B. Carter</i>	279
An overview of the ECO project	
<i>J. Chame, C. Chen, P. Diniz, M. Hall, Y. Lee, and R. F. Lucas</i>	280
Dynamic Program Phase Detection in Distributed Shared-Memory Multiprocessors	
<i>E. Ipek, J. F. Martínez, B. R. D. Supinski, S. A. Mckee, and M. Schulz</i>	280
Hierarchically Tiled Arrays for Parallelism and Locality	
<i>J. Guo, G. Bikshandi, D. Hoeflinger, G. Almasi, B. Fraguera, M. J. Garzarán, D. Padua, and C. V. Praun</i>	281
Hierarchical Multithreading: Programming Model and System Software	
<i>G. R. Gao, T. Sterling, R. Stevens, M. Hereld, and W. Zhu</i>	281
Recent Advances in Checkpoint/Recovery Systems	
<i>G. Bronevetsky, R. Fernandes, D. Marques, K. Pingali, and P. Stodghill</i>	282
Dynamic Aspects for Runtime Fault Determination and Recovery	
<i>J. Manson, J. Vitek, and S. Jagannathan</i>	282
An Extensible Global Address Space Framework with Decoupled Task and Data Abstractions	
<i>S. Krishnamoorthy, U. Catalyurek, J. Nieplocha, A. Rountev, and P. Sadayappan</i>	283
Toward Reliable and Efficient Message Passing Software Through Formal Analysis	
<i>G. Gopalakrishnan and R. M. Kirby</i>	284
Compiler-Assisted Software Verification Using Plug-Ins	
<i>S. Callanan, R. Grosu, X. Huang, S. A. Smolka, and E. Zadok</i>	285
An Overview of the Jahob Analysis System: Project Goals and Current Status	
<i>V. Kuncak and M. Rinard</i>	285
Verification of Software via Integration of Design and Implementation	
<i>A. S. Miner and S. Basu</i>	286

Unification of Verification and Validation Methods for Software Systems: Progress Report and Initial Case Study Formulation	
<i>J. C. Browne, C. Lin, K. Kane, Y. Cheon, and P. Teller</i>	286
Vision for Liquid Architecture	
<i>R. D. Chamberlain, R. K. Cytron, J. E. Fritts, and J. W. Lockwood</i>	287
Statistical Sampling of Microarchitecture Simulation	
<i>T. F. Wenisch, R. E. Wunderlich, B. Falsafi, and J. C. Hoe</i>	287
Designing Next Generation Data-Centers with Advanced Communication Protocols and Systems Services	
<i>P. Balaji, K. Vaidyanathan, S. Narravula, H. - Jin, and D. K. Panda</i>	288
I/O Conscious Algorithm Design and Systems Support for Data Analysis on Emerging Architectures	
<i>G. Buehrer, A. Ghoting, X. Zhang, S. Tatikonda, S. Parthasarathy, T. Kurc, and J. Saltz</i>	288
Virtual Playgrounds: Managing Virtual Resources in the Grid	
<i>K. Keahey, J. Chase, and I. Foster</i>	289
The GHS Grid Scheduling System: Implementation and Performance Comparison	
<i>M. Wu and X. Sun</i>	289
On Improving Performance and Energy Profiles of Sparse Scientific Applications	
<i>K. Malkowski, I. Lee, P. Raghavan, and M. J. Irwin</i>	290
An Automated Approach to Improve Communication-Computation Overlap in Clusters	
<i>L. Fishgold, A. Danalis, L. Pollock, and M. Swamy</i>	290
Decentralized Runtime Analysis of Multithreaded Applications	
<i>K. Sen, A. Vardhan, G. Agha, and G. Rosu</i>	291
Aligning Traces for Performance Evaluation	
<i>T. Mytkowicz, A. Diwan, M. Hauswirth, and P. F. Sweeney</i>	291
Model-driven Generative Techniques for Scalable Performability Analysis of Distributed Systems	
<i>A. Kogekar, D. Kaul, A. Gokhale, P. Vandal, U. Praphamontipong, S. Gokhale, J. Zhang, Y. Lin, and J. Gray</i>	292
Engineering Reliability into Hybrid Systems via Rich Design Models: Recent Results and Current Directions	
<i>S. Banerjee, L. Cheung, L. Golubchik, N. Medvidovic, R. Roshandel, and G. Sukhatme</i>	293
High-Performance Power-Aware Computing	295
HPPAC Introduction	296
Conjugate Gradient Sparse Solvers: Performance-Power Characteristics	
<i>K. Malkowski, I. Lee, P. Raghavan, and M. J. Irwin</i>	297
Integrated Link/CPU Voltage Scaling for Reducing Energy Consumption of Parallel Sparse Matrix Applications	
<i>S. W. Son, K. Malkowski, G. Chen, M. Kandemir, and P. Raghavan</i>	297
Profile-based Optimization of Power Performance by using Dynamic Voltage Scaling on a PC cluster	
<i>Y. Hotta, M. Sato, H. Kimura, S. Matsuoka, T. Boku, and D. Takahashi</i>	298

Online Strategies for High-Performance Power-Aware Thread Execution on Emerging Multiprocessors	
<i>M. Curtis-maury, J. Dzierwa, C. D. Antonopoulos, and D. S. Nikolopoulos</i>	298
Dynamic Power Saving in Fat-Tree Interconnection Networks Using On/Off Links	
<i>M. Alonso, S. Coll, J. Martinez, V. Santonja, P. Lopez, and J. Duato</i>	299
Making a Case for a Green500 List	
<i>S. Sharma, C. Hsu, and W. Feng</i>	299
Power-Performance Efficiency of Asymmetric Multiprocessors for Multi-threaded Scientific Applications	
<i>R. E. Grant and A. Afsahi</i>	300
Compiler And Runtime Support For Predictive Control Of Power And Cooling	
<i>H. G. Dietz and W. R. Dieter</i>	300
MegaProto/E: Power-Aware High-Performance Cluster with Commodity Technology	
<i>T. Boku, M. Sato, D. Takahashi, H. Nakashima, H. Nakamura, S. Matsuoka, and Y. Hotta</i>	301
Workshop on Parallel and Distributed Scientific and Engineering Computing	303
PDSEC Introduction	304
PDSEC Keynote: Facing the Challenges of Multicore Processor Technologies using Autonomic System Software	
<i>D. Nikolopoulos</i>	305
Simulation of a Hybrid Model for Image Denoising	
<i>R. Carino, I. Banicescu, H. Lim, N. Williams, and S. Kim</i>	305
Parallelisation of a Simulation Tool for Casting and Solidification Processes on Windows Platforms	
<i>C. Clauss, S. Schuch, R. Finocchiario, S. Lankes, and T. Bemmerl</i>	306
High-Performance Computing in Remotely Sensed Hyperspectral Imaging: The Pixel Purity Index Algorithm as a Case Study	
<i>A. Plaza, D. Valencia, and J. Plaza</i>	306
Parallel Calculation of Volcanoes for Cryptographic Uses	
<i>S. Martinez, R. Tomas, C. Roig, M. Valls, and R. Moreno</i>	307
Parallel Genetic Algorithm for SPICE Model Parameter Extraction	
<i>Y. Li and Y. Cho</i>	307
Parallelization of Module Network Structure Learning and Performance Tuning on SMP	
<i>H. Jiang, C. Lai, W. Chen, Y. Chen, W. Hu, W. Zheng, and Y. Zhang</i>	308
Reducing Reconfiguration Time of Reconfigurable Computing Systems in Integrated Temporal Partitioning and Physical Design Framework	
<i>F. Mehdipour, M. S. Zamani, H. R. Ahmadifar, M. Sedighi, and K. Murakami</i>	308
On the Performance of Parallel Normalized Explicit Preconditioned Conjugate Gradient Type Methods	
<i>G. A. Gravvanis and K. M. Giannoutakis</i>	309

The General Matrix Multiply-Add Operation on 2D Torus	
<i>A. S. Zekri and S. G. Sedukhin</i>	309
Towards a parallel framework of grid-based numerical algorithms on DAGs	
<i>Z. Mo, A. Zhang, and X. Cao</i>	310
Efficient Parallel Implementation of a Weather Derivatives Pricing Algorithm based on the Fast Gauss Transform	
<i>Y. Yamamoto</i>	310
Parallel implementation and performance characterization of MUSCLE	
<i>X. Deng, E. Li, J. Shan, and W. Chen</i>	311
Multiple Sequence Alignment by Quantum Genetic Algorithm	
<i>L. Abdesslem, M. Souham, and B. Mohamed</i>	311
Node-Disjoint Paths in Hierarchical Hypercube Networks	
<i>R. Y. Wu, G. J. Chang, and G. H. Chen</i>	312
Coordinated Checkpoint from Message Payload in Pessimistic Sender-Based Message Logging	
<i>M. Aminian, M. K. Akbari, and B. Javadi</i>	312
Tree Partition based Parallel Frequent Pattern mining on Shared Memory Systems	
<i>D. Chen, C. Lai, W. Hu, W. Chen, Y. Zhang, and W. Zheng</i>	313
Performance Modeling, Evaluation, and Optimization of Parallel and Distributed Systems	315
PMEO Introduction	316
PMEO Keynote: Remove the Memory Wall: From performance modeling to architecture optimization	
<i>X. Sun</i>	317
Performance Evaluation of Supercomputers using HPCC and IMB Benchmarks	
<i>S. Saini, R. Ciotti, B. T. N. Gunney, T. E. Spelce, A. Koniges, D. Dossa, P. Adamidis, R. Rabenseifner, S. R. Tiyyagura, M. Mueller, and R. Fatoohi</i>	318
Multiprocessor on Chip : Beating the Simulation Wall Through Multiobjective Design Space Exploration with Direct Execution	
<i>R. B. Mouhoub and O. Hamami</i>	319
LogFP - A Model for small Messages in InfiniBand	
<i>T. Hoeftler, T. Mehlan, F. Mietke, and W. Rehm</i>	319
A Framework to Develop Symbolic Performance Models of Parallel Applications	
<i>S. R. Alam and J. S. Vetter</i>	320
Cost Evaluation from Specifications for BSP Programs	
<i>V. Niculescu</i>	320
Performance analysis of Stochastic Process Algebra models using Stochastic Simulation	
<i>J. T. Bradley, S. T. Gilmore, and N. Thomas</i>	321

An Adaptive Dynamic Grid-based Approach to Data Distribution Management	
<i>A. Boukerche, Y. Gu, and G. H. C. Araujo</i>	321
Modelling job allocation where service duration is unknown	
<i>N. Thomas</i>	322
A simulator for parallel applications with dynamically varying compute node allocation	
<i>B. Schaeli, S. Gerlach, and R. D. Hersch</i>	322
Comparison of MPI Benchmark Programs on an SGI Altix ccNUMA Shared Memory Machine	
<i>N. A. W. A. Hamid, P. Coddington, and F. Vaughan</i>	323
Interconnect Performance Evaluation of SGI Altix 3700 BX2, Cray X1, Cray Opteron Cluster, and Dell PowerEdge	
<i>R. Fatoohi, S. Saini, and R. Ciotti</i>	323
Towards Building a Highly-Available Cluster Based Model for High Performance Computing	
<i>A. Boukerche, R. Al-shaikh, and M. Sechi</i>	324
Scheduling Heuristics for Efficient Broadcast Operations on Grid Environments	
<i>L. A. B. Steffenel and G. Mounie</i>	324
Performance Evaluation of Scheduling Applications with DAG Topologies on Multiclusters with Independent Local Schedulers	
<i>L. He, S. A. Jarvis, D. P. Spooner, and G. R. Nudd</i>	325
On the Performance Analysis of Recursive Data Replication Scheme for File Sharing in Mobile Peer-to-Peer Devices Using the HyMIS Scheme	
<i>C. X. Mavromoustakis and H. D. Karatza</i>	325
A design environment for mobile applications	
<i>S. Gilmore, V. Haenel, J. Hillston, and J. Tenzer</i>	326
Efficient Broadcasting of Safety Messages in Multihop Vehicular Networks	
<i>C. Chiasserini, R. Gaeta, M. Garetto, M. Gribaudo, and M. Sereno</i>	326
Performance Analysis of the Reactor Pattern in Network Services	
<i>S. Gokhale, A. Gokhale, J. Gray, P. Vandal, and U. Praphamontripong</i>	327
Performance Evaluation of an Enhanced Distributed Channel Access Protocol under Heterogeneous Traffic	
<i>M. I. Abu-tair and G. Min</i>	327
Performance Evaluation of Wormhole Routed Network Processor-Memory Interconnects	
<i>T. Kocak and J. Engel</i>	328
On the Probability Distribution of Busy Virtual Channels	
<i>N. Alzeidi, A. Khonsari, M. Ould-khaoua, and L. Mackenzie</i>	328
A Comparative Performance Analysis of n-Cubes and Star Graphs	
<i>A. E. Kiasari and H. Sarbazi-azad</i>	329

Software-Based Fault-Tolerant Routing Algorithm in Multi-Dimensional Networks	
<i>F. Safaei, M. Rezazad, A. Khonsari, M. Fathy, M. Ould-khaoua, and N. Alzeidi</i>	329
A Systematic Multi-step Methodology for Performance Analysis of Communication Traces of Distributed Applications based on Hierarchical Clustering	
<i>G. Aguilera, P. J. Teller, M. Taufer, and F. Wolf</i>	330
TPCC-UVa: An Open-Source TPC-C Implementation for Parallel and Distributed Systems	
<i>D. R. Llanos and B. Palop</i>	330
An Entropy-Based Algorithm for Time-Driven Software Instrumentation in Parallel Systems	
<i>A. Özmen</i>	331
Analytical Performance Modelling of Partially Adaptive Routing in Hypercubes	
<i>A. Patooghy and H. Sarbazi-azad</i>	331
Approximated Tensor Sum Preconditioner for Stochastic Automata Networks	
<i>A. Touzene</i>	332
Using Stochastic Petri Nets for Performance Modelling of Application Servers	
<i>F. N. Souza, R. D. Arteiro, N. S. Rosa, and P. R. M. Maciel</i>	332
High-Performance Grid Computing Workshop	333
HPGC Introduction	334
HPGC Keynote: Major Grid Projects Around the World	
<i>W. Gentzsch</i>	335
Multisite Co-allocation Algorithms for Computational Grid	
<i>W. Zhang, A. M. K. Cheng, and M. Hu</i>	335
Price-based User-optimal Job Allocation Scheme for Grid Systems	
<i>S. Penmatsa and A. T. Chronopoulos</i>	336
An Evaluation of Heuristics for SLA Based Parallel Job Scheduling	
<i>V. Yarmolenko and R. Sakellariou</i>	336
Speeding up NGB with Distributed File Streaming Framework	
<i>B. Li, K. Chen, Z. Huang, H. L. Rajic, and R. H. Kuhn</i>	337
Anticipated Distributed Task Scheduling for Grid Environments	
<i>T. Rauber and G. Rünger</i>	337
Loosely-coupled Loop Scheduling in Computational Grid	
<i>J. Herrera, E. Huedo, R. S. Montero, and I. M. Llorente</i>	338
Execution and Composition of E-Science Applications using the WS-Resource Construct	
<i>E. Floros and Y. Cotronis</i>	338
A Job Monitoring System for the LCG Computing Grid	
<i>A. Hammad, T. Harenberg, D. Igdalov, P. Mättig, D. Meder, and P. Ueberholz</i>	339

SmartNetSolve: High-Level Programming System for High Performance Grid Computing	
<i>T. Brady, E. Konstantinov, and A. Lastovetsky</i>	339
IMAGE: An approach to building standards-based enterprise Grids	
<i>G. Mateescu and M. Sosonkina</i>	340
Dependable Parallel, Distributed and Network-Centric Systems	341
DPDNS Introduction	342
Scalable Resilience – The ReSIST Network of Excellence	
<i>J. Laprie</i>	343
Construction of Efficient OR-based Deletion-tolerant Coding Schemes	
<i>P. Sobe and K. Peter</i>	343
Analysis of Checksum-Based Execution Schemes for Pipelined Processors	
<i>B. Fechner</i>	344
Web Server Protection by Customized Instruction Set	
<i>B. Fechner, J. Keller, and A. Wohlfeld</i>	344
Evaluating a Clock Synchronization for Dependable Sensor Networks	
<i>S. Trikaliotis and G. Lukas</i>	345
Power-Dependable Transactions in Mobile Networks	
<i>A. Marowka and D. Semé</i>	345
Power Consumption Comparison for Regular Wireless Topologies using Fault-Tolerant Beacon Vector Routing	
<i>L. Demoracski and D. R. Avresky</i>	346
A Simulation Study of the Effects of Multi-path Approaches in e-Commerce Applications	
<i>P. Romano, F. Quaglia, and B. Ciciani</i>	346
Plan-Based Replication for Fault-Tolerant Multi-Agent Systems	
<i>A. D. L. Almeida, S. Aknine, J. Briot, and J. Malenfant</i>	347
User Perceived Unavailability due to Long Response Times	
<i>M. Martinello, M. Kaaniche, K. Kanoun, and C. A. Melchor</i>	347
Predicting Failures of Computer Systems: A Case Study for a Telecommunication System	
<i>F. Salfner, M. Schieschke, and M. Malek</i>	348
Dynamic Resource Allocation of Computer Clusters with Probabilistic Workloads	
<i>M. Sleiman, L. Lipsky, and R. Sheahan</i>	348
International Workshop on Security in Systems and Networks	349
SSN Introduction	350
Honeypot Back-propagation for Mitigating Spoofing Distributed Denial-of-Service Attacks	
<i>S. Khattab, R. Melhem, D. Mossé, and T. Znati</i>	351

Detecting Selective Forwarding Attacks in Wireless Sensor Networks	
<i>B. Yu and B. Xiao</i>	351
A Case for Exploit-Robust and Attack-Aware Protocol RFCs	
<i>V. Pathamsetty and P. Mateti</i>	352
Fault and Intrusion Tolerance of Wireless Sensor Networks	
<i>L. Wang, J. Ma, C. Wang, and A. C. Kot</i>	352
Network Intrusion Detection with Semantics-Aware Capability	
<i>W. Scheirer and M. C. Chuah</i>	353
Analysis of BGP Prefix Origins During Google's May 2005 Outage	
<i>T. Wan and P. C. V. Oorschot</i>	353
A Note on Broadcast Encryption Key Management with Applications to Large Scale Emergency Alert Systems	
<i>G. Shu, D. Lee, and M. Yannakakis</i>	354
Coordinate Transformation – A Solution for the Privacy Problem of Location Based Services?	
<i>A. Gutscher</i>	354
Preserving Source Location Privacy in Monitoring-Based Wireless Sensor Networks	
<i>Y. Xi, L. Schwiebert, and W. Shi</i>	355
Shubac: A Searchable P2P Network Utilizing Dynamic Paths for Client/Server Anonymity	
<i>A. Brodie and C. Xu</i>	355
Energy-Efficient ID-based Group Key Agreement Protocols for Wireless Networks	
<i>C. H. Tan and J. C. M. Teo</i>	356
Base Line Performance Measurements of Access Controls For Libraries and Modules	
<i>J. W. Kim and V. Prevelakis</i>	356
Automated Refinement of Security Protocols	
<i>A. M. Hagalisletto</i>	357
A Correctness Proof of the SRP Protocol	
<i>H. Yang, X. Zhang, and Y. Wang</i>	357
Checkpointing and Rollback-Recovery Protocol for Mobile Systems with MW Session Guarantee	
<i>J. Brzezinski, A. Kobusinska, and M. Szychowiak</i>	358
Workshop on System Management Tools for Large-Scale Parallel Systems	359
SMTSPS Introduction	360
SMTSPS Keynote: Research and Technology Advances in Systems Software for Large Scale Computing Systems	
<i>F. Darema</i>	361
On-the-Fly Kernel Updates for High-Performance Computing Clusters	
<i>K. Makris and K. D. Ryu</i>	361
A Tool for Environment Deployment in Clusters and light Grids	
<i>Y. Georgiou, J. Leduc, B. Videau, J. Peyrard, and O. Richard</i>	362

Lossless Compression for Large Scale Cluster Logs	
<i>R. Balakrishnan and R. K. Sahoo</i>	362
Evaluating Cooperative Checkpointing for Supercomputer Systems	
<i>A. J. Oliner and R. K. Sahoo</i>	363
Easy and Reliable Cluster Management: The Self-management Experience of Fire Phoenix	
<i>Z. Zhi-hong, M. Dan, Z. Jian-feng, W. Lei, W. Lin-ping, and H. Wei</i>	363
Resource Management with Stateful Support for Analytic Applications	
<i>L. L. Fong, C. H. Crawford, and H. Shaikh</i>	364
Improving Cluster Utilization through Intelligent Processor Sharing	
<i>G. Stiehr and R. D. Chamberlain</i>	364
A Database-centric Approach to System Management in the Blue Gene/L Supercomputer	
<i>R. Bellofatto, P. G. Crumley, D. Darrington, B. Knudson, M. Megerian, J. E. Moreira, A. S. Ohmacht, J. Orbeck, D. Reed, and G. Stewart</i>	365
OVIS: A Tool for Intelligent, Real-time Monitoring of Computational Clusters	
<i>J. M. Brandt, A. C. Gentile, D. J. Hale, and P. P. Pebay</i>	365
A Study of MPI Performance Analysis Tools on Blue Gene/L	
<i>I. Chung, R. E. Walkup, H. Wen, and H. Yu</i>	366
A Multiprocessor Architecture for the Massively Parallel Model GCA	
<i>W. Heenes, R. Hoffmann, and J. Jendrszczok</i>	366
Dynamic Performance Prediction of an Adaptive Mesh Application	
<i>M. M. Mathis and D. J. Kerbyson</i>	367
International Workshop on Hot Topics in Peer-to-Peer Systems	369
HOTP2P Introduction	370
Neighbourhood Maps: Decentralised Ranking in Small-World P2P Networks	
<i>M. Dell'amico</i>	371
Improving Cooperation in Peer-to-Peer Systems Using Social Networks	
<i>W. Wang, L. Zhao, and R. Yuan</i>	371
Modeling Malware Propagation in Gnutella Type Peer-to-Peer Networks	
<i>K. K. Ramachandran and B. Sikdar</i>	372
Privacy-aware Presence Management in Instant Messaging Systems	
<i>K. Loesing, M. Dorsch, M. Grote, K. Hildebrandt, M. Röglinger, M. Sehr, C. Wilms, and G. Wirtz</i>	372
Using incentives to increase availability in a DHT	
<i>F. Picconi and P. Sens</i>	373
Optimizing the finger table in Chord-like DHTs	
<i>G. Chiola, G. Cordasco, L. Gargano, A. Negro, and V. Scarano</i>	373

Linyphi: An IPv6-Compatible Implementation of SSR <i>P. Di, M. Marcon, and T. Fuhrmann</i>	374
Interceptor: Middleware-level Application Segregation and Scheduling for P2P Systems <i>C. Anglano</i>	374
A Scalable Algorithm to Monitor Chord-based P2P Systems at Runtime <i>A. Binzenhöfer, G. Kunzmann, and R. Henjes</i>	375
Lightweight Emulation to Study Peer-to-Peer Systems <i>L. Nussbaum and O. Richard</i>	375
Simulating and Optimizing A Peer-to-Peer Computing Framework <i>J. Ernst-desmulier, J. Bourgeois, M. T. Ngo, F. Spies, and J. Verbeke</i>	376
Model-based Evaluation of Search Strategies in peer-to-peer Networks <i>R. Gaeta and M. Sereno</i>	376
A formal framework for the performance analysis of P2P networks protocols <i>A. Spognardi and R. D. Pietro</i>	377
Workshop on Performance Optimization for High-Level Languages and Libraries	379
POHLL Introduction	380
POHLL Keynote: New Parallel Programming Abstractions and the Role of Compilers <i>L. V. Kale</i>	381
Automatically Translating a General Purpose C++ Image Processing Library for GPUs <i>J. L. T. Cornwall, O. Beckmann, and P. H. J. Kelly</i>	381
Memory Minimization for Tensor Contractions using Integer Linear Programming <i>A. Allam, J. Ramanujam, G. Baumgartner, and P. Sadayappan</i>	382
Improving Locality of Nonserial Polyadic Dynamic Programming <i>G. Tan, N. Sun, and D. Bu</i>	382
An Approach to Locality-Conscious Load Balancing and Transparent Memory Hierarchy Management with a Global-Address-Space Parallel Programming Model <i>S. Krishnamoorthy, U. Catalyurek, J. Nieplocha, and P. Sadayappan</i>	383
Support for Adaptivity in ARMCI Using Migratable Objects <i>C. Huang, C. W. Lee, and L. V. Kale</i>	383
A Decomposition Approach for Optimizing the Performance of MPI Libraries <i>O. Hartmann, M. Kühnemann, T. Rauber, and G. Rünger</i>	384
Annotating User-Defined Abstractions for Optimization <i>D. Quinlan, M. Schordan, R. Vuduc, and Q. Yi</i>	384
Effecting Parallel Graph Eigensolvers Through Library Composition <i>A. Breuer, P. Gottschling, D. Gregor, and A. Lumsdaine</i>	385

On the impact of data input sets on statistical compiler tuning

M. Haneda, P. M. W. Knijnenburg, and H. A. G. Wijshoff 385

A General Data Dependence Analysis to Nested Loop Using Integer Interval Theory

Z. Jing and Z. Guosun 386

Index **387**

Parallel Morphological Processing of Hyperspectral Image Data on Heterogeneous Networks of Computers

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Recent advances in space and computer technologies are revolutionizing the way remotely sensed data is collected, managed and interpreted. The development of efficient techniques for transforming the massive amount of collected data into scientific understanding is critical for space-based Earth science and planetary exploration. Although most currently available parallel processing strategies for hyperspectral image analysis assume homogeneity in the computing platform, heterogeneous networks of computers represent a very promising cost-effective solution expected to play a major role in the design of high-performance computing platforms for many on-going and planned remote sensing missions. This paper explores techniques for mapping morphological hyperspectral analysis algorithms, characterized by their scalability and sub-pixel accuracy, onto heterogeneous parallel computers. Important aspects in algorithm design are illustrated by using both homogeneous and heterogeneous parallel computing facilities available at NASA's Goddard Space Flight Center and University of Maryland. Experiments reveal that heterogeneous networks of workstations represent a source of computational power that is both accessible and applicable in many remote sensing studies.

Acceleration of a Content-Based Image-Retrieval Application on the RDISK Cluster

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Because of the growing use of multimedia content over Internet, Content-Based Image Retrieval (CBIR) has recently received a lot of interest. While accurate search techniques based on local image descriptors exist, they suffer from very long execution time. We propose to accelerate CBIR on the RDISK machine, a cluster of FPGA-enhanced hard-drives, that follows the philosophy of smart-disks. Our platform combines coarse and fine grain parallelism thanks to the concurrent use of the cluster nodes and of a programmable logic device. The implementation of the CBIR application on this mixed hardware/software platform follows a strict methodology, that was validated on realistic data-set (image database of more than 30,000 images). This methodology allows us to adapt the original algorithm to suit a hardware implementation, and to select the values of some key design parameters to maximize global performance. Our preliminary results indicate that speed-ups between 120 and 200 could be obtained for a cluster of 32 nodes compared with a software implementation running on a standard desktop PC.