2014 IEEE 28th International Parallel & Distributed Processing Symposium Workshops

IPDPSW 2014

Table of Contents

Message from the General Chair ................................................................. xxiii
Message from the Workshops Chair .......................................................... xxv

Workshop 1: HCW — Heterogeneity in Computing Workshop

HCW Introduction ....................................................................................... 1
Behrooz Shirazi and Uwe Schwiegelshohn

Message from the HCW Steering Committee Chair ................................... 3
Behrooz Shirazi

Message from the HCW General Chair ...................................................... 4
Uwe Schwiegelshohn

Message from the HCW Program Chair ................................................... 5
Shoukat Ali

HCW 2014 Keynote Talk ............................................................................. 6
David Abramson

HCW Session 1: Heterogeneous Environments for Basic Linear Algebra

Hybrid Multi-elimination ILU Preconditioners on GPUs ............................. 7
Dimitar Lukarski, Hartwig Anzt, Stanimire Tomov, and Jack Dongarra

Searching for the Optimal Data Partitioning Shape for Parallel Matrix Matrix Multiplication on 3 Heterogeneous Processors ....................................................... 17
Ashley DeFlumere and Alexey Lastovetsky

Taking Advantage of Hybrid Systems for Sparse Direct Solvers via Task-Based Runtimes ................................................................. 29
Xavier Lacoste, Mathieu Faverge, George Bosilca, Pierre Ramet, and Samuel Thibault

Topology-Aware Optimization of Communications for Parallel Matrix Multiplication on Hierarchical Heterogeneous HPC Platform ........................................ 39
Tania Malik, Vladimir Rychkov, Alexey Lastovetsky, and Jean-Noël Quintin
HCW Session 2: Scheduling and Resource Allocation

Scheduling Methods for Accelerating Applications on Architectures with Heterogeneous Cores .................................................................48

Linchuan Chen, Xin Huo, and Gagan Agrawal

Utility Driven Dynamic Resource Management in an Oversubscribed Energy-Constrained Heterogeneous System ........................................................58

Bhavesh Khemka, Ryan Friese, Sudeep Pasricha, Anthony A. Maciejewski, Howard Jay Siegel, Gregory A. Koenig, Sarah Powers, Marcia Hilton, Rajendra Rambharos, and Steve Poole

An Efficient Algorithm for Scheduling Jobs in Volunteer Computing Platforms ................................................................................................68

Adel Essafi, Denis Trystram, and Zied Zaidi

HCW Session 3: Resource-Related Performance Optimization

Resource Centered Computing Delivering High Parallel Performance ............................................................................................................77

Jens Gustedt, Stephane Vialle, and Patrick Mercier

Point-to-Point and Congestion Bandwidth Estimation: Experimental Evaluation on PlanetLab Data ........................................................................................................89

Lionel Eyraud-Dubois and Przemysław Uznański

Runtime Behavior Comparison of Modern Accelerators and Coprocessors .....................................................................................................97

Ayman Tarakji and Niels Ole Salscheider

Workshop 2: RAW — Reconfigurable Architectures Workshop

RAW Introduction and Committees ..................................................................................................................................................................109

Jürgen Becker, Ramachandran Vaidyanathan, Marco Santambrogio, Jim Torresen, Ron Sass, and Philip Leong

RAW 2014 Keynotes ................................................................................................................................................................................................111

Joshua Walstrom and Maya Gokhale

RAW Session 1: Compilers and Binary Translation for Reconfigurable Architectures

Twill: A Hybrid Microcontroller-FPGA Framework for Parallelizing Single-Threaded C Programs ........................................................................................................112

Doug Gallatin, Aaron Keen, Chris Lupo, and John Oliver

A New Dataflow Compiler IR for Accelerating Control-Intensive Code in Spatial Hardware .............................................................................122

Ali Mustafa Zaidi and David Greaves

Efficient Software-Based Runtime Binary Translation for Coarse-Grained Reconfigurable Architectures ..................................................................................132

Toan X. Mai and Jongeun Lee
RAW Session 2: New Reconfigurable Architectures

A Dependable Coarse-Grain Reconfigurable Multicore Array

Georgios Smaragdos, Danish Anis Khan, Ioannis Sourdis, Christos Strydis, Alirad Malek, and Stavros Tzilis

Automated Hybrid Interconnect Design for FPGA Accelerators Using Data Communication Profiling

Cuong Pham-Quoc, Zaid Al-Ars, and Koen Bertels

SmartBricks: A Visual Environment to Design and Explore Novel Custom Domain-Specific Architectures

Anil Kumar Sistla, Xiaozhong Luo, Mukund Malladi, Marc Reisner, Rajasekhar Ganduri, and Gayatri Mehta

RAW Session 3: ViPES Papers

A Framework for Mapping Dynamic Virtual Kernels onto Heterogeneous Reconfigurable Platforms

Harry Sidiropoulos, Kostas Siozios, and Dimitrios Soudris

A Hybrid ILP-CP Model for Mapping Directed Acyclic Task Graphs to Multicore Architectures

Andreas Emeretlis, George Theodoridis, Panayiotis Alefragis, and Nikolaos Voros

A Framework for Customizing Virtual 3-D Reconfigurable Platforms at Run-Time

Kostas Siozios, Dimitrios Soudris, and Michael Hübner

RAW Session 4: Circuit-Level Applications

Over-clocking of Linear Projection Designs through Device Specific Optimisations

Rui Policarpo Duarte and Christos-Savvas Bouganis

Influence of Magnetic Fields and X-Radiation on Ring Oscillators in FPGAs

Michael Raitza, Markus Vogt, Christian Hochberger, and Thilo Pionteck

Radiation Tolerance of Color Configuration on an Optically Reconfigurable Gate Array

Takumi Fujimori and Minoru Watanabe

RAW Session 5: Numerical Reconfigurable Computing Applications

Adaptive Booth Algorithm for Three-Integers Multiplication for Reconfigurable Mesh

Esti Stein and Yosi Ben Asher

An FPGA Implementation of the Hestenes-Jacobi Algorithm for Singular Value Decomposition

Xinying Wang and Joseph Zambreno

RAW Session 6: Applications of Reconfigurable Computing

CyGraph: A Reconfigurable Architecture for Parallel Breadth-First Search

Osama G. Attia, Tyler Johnson, Kevin Townsend, Philip Jones, and Joseph Zambreno

Adaptive Raytracing Implementation Using Partial Dynamic Reconfiguration

Gianluca Durelli, Fabrizio Spada, Riccardo Cattaneo, Christian Pilato, Danilo Pau, and Marco D. Santambrogio
PaRA-Sched: A Reconfiguration-Aware Scheduler for Reconfigurable Architectures .................................................................243

Riccardo Cattaneo, Riccardo Bellini, Gianluca Durelli, Christian Pilato, Marco D. Santambrogio, and Donatella Sciuto

RAW Poster Session 1

An ILP-Based Optimal Circuit Mapping Method for PLDs ...........................................................................................................251

Hiroki Nishiyama, Masato Inagi, Shin‘ichi Wakabayashi, Shinobu Nagayama, Keisuke Inoue, and Mineo Kaneko

High-Level Synthesis from C vs. a DSL-Based Approach .............................................................................................................257

Cristiano Bacelar de Oliveira, João M. P. Cardoso, and Eduardo Marques

An Evaluation of User Satisfaction Driven Scheduling in a Polymorphic Embedded System .......................................................263

Zhang Zhang, Swamy D. Ponpandi, and Akhilesh Tyagi

A Low-Latency Algorithm and FPGA Design for the Min-Search of LDPC Decoders .................................................................269

Georgios Tzimpragos, Christoforos Kachris, Dimitrios Soudris, and Ioannis Tomkos

FPGA Redundancy Configurations: An Automated Design Space Exploration .................................................................275

Jahanzeb Anwer, Marco Platzner, and Sebastian Meisner

RAW Poster Session 2

Hierarchical Pipeline Optimization of Coarse Grained Reconfigurable Processor for Multimedia

Applications .....................................................................................................................................................................................281

Chen Mei, Peng Cao, Yang Zhang, Bo Liu, and Leibo Liu

Module Placement Using Constraint Programming in Run-Time Reconfigurable Systems .........................................................287

Alexander Wold, Andreas Agne, and Jim Torresen

An Efficient Heterogeneous Register File Implementation for FPGAs ..........................................................................................293

Hasan Erdem Yantir and Arda Yurdakul

Minimizing Scrubbing Effort through Automatic Netlist Partitioning and Floorplanning .............................................................299

Bernhard Schmidt, Daniel Ziener, and Jürgen Teich

Virtualization Support for FPGA-Based Coprocessors Connected via PCI Express to an Intel Multicore Platform .................................................................305

Duy Viet Vu, Timo Sandmann, Steffen Baehr, Oliver Sander, and Juergen Becker

Workshop 3: HIPS — Workshop on High-Level Parallel Programming Models and Supportive Environments

HIPS Introduction and Committees ....................................................................................................................................................311

John Cavazos

HIPS Session 1: System Support

Bohrium: A Virtual Machine Approach to Portable Parallelism ..................................................................................................312

Mads R.B. Kristensen, Simon A.F. Lund, Troels Blum, Kenneth Skovhede, and Brian Vinter

HATI: Hardware Assisted Thread Isolation for Concurrent C/C++ Programs .................................................................................322

Juan Carlos Martinez Santos and Yunsi Fei
A General Model Checking Framework for Various Memory Consistency Models .......................................................... 332

Tatsuya Abe and Toshiyuki Maeda

HIPS Session 2: Optimization

Autotuning Tensor Transposition ........................................................................................................................................ 342

Lai Wei and John Mellor-Crummey

Automatic MPI-IO Tuning with the Periscope Tuning Framework .................................................................................. 352

Weifeng Liu, Isaías A. Comprés Ureña, Michael Gerndt, and Bin Gong

Optimizing Collective Communication in UPC .......................................................................................................................... 361

Jithin Jose, Khaled Hamidouche, Jie Zhang, Akshay Venkatesh, and Dhabaleswar K. (DK) Panda

HIPS Session 3: Effective Communication

SWIFT: A Transparent and Flexible Communication Layer for PCIe-Coupled Accelerators and (Co-)Processors .......................................................... 371

Simon Pickartz, Pablo Reble, Carsten Clauss, and Stefan Lankes

Deterministic Synchronization of Multi-threaded Programs with Operational Transformation ............................................. 381

Christopher Boelmann, Lorenz Schwittmann, and Torben Weis

ABC2: Adaptively Balancing Computation and Communication in a DSM Cluster of Multicores for Irregular Applications .......................................................................................................................................................... 391

Sai Charan Koduru, Keval Vora, and Rajiv Gupta

Workshop 4: NIDISC — Workshop on Nature Inspired Distributed Computing

NIDISC Introduction and Committees ........................................................................................................................................ 401

Pascal Bouvry, Franciszek Seredyński, and El-Ghazali Talbi

NIDISC Session 1: Applications of Bio-Inspired Algorithms

Using Physical Stigmergy in Decentralized Optimization under Multiple Non-separable Constraints: Formal Methods and an Intelligent Lighting Example .................................................................................................................. 402

Theodore P. Pavlic

Hybrid Metaheuristic for Annual Hydropower Generation Optimization .............................................................................. 412

A. Nakib, El-Ghazali Talbi, and A. Fuser


Fatima Adly, Paul D. Yoo, Sami Muhaidat, and Yousif Al-Hammadi

Data Quality, Consistency, and Interpretation Management for Wind Farms by Using Neural Networks .................................................. 430

Alain Fuser, Florent Fontaine, and Jack Copper
NIDISC Session 2: Wireless Networks and Mobility Management
Graph-Based Cellular Automata Approach to Maximum Lifetime Coverage Problem in Wireless Sensor Networks ................................................................. 439
Antonina Tretyakova, Franciszek Seredynski, and Pascal Bouvry
GPU Accelerated Nature Inspired Methods for Modelling Large Scale Bi-directional Pedestrian Movement ................................................................. 448
Sankha Baran Dutta, Robert McLeod, and Marcia Friesen
Improving Bus Ride Comfort Using GLOSA-Based Dynamic Speed Optimisation ................................................................. 457
Marcin Seredynski, Patricia Ruiz, Krzysztof Szczyaptorski, and Djamel Khadraoui
A Genetic Algorithm-Based Sparse Coverage over Urban VANETs .................................................................................................................. 464
Huang Cheng, Xin Fei, Azzedine Boukerche, and Mohammed Almulla

NIDISC Session 3: Multi-objective Optimization
A Game-Theoretic Approach to Multiobjective Job Scheduling in Cloud Computing Systems ................................................................. 470
Jakub Gasior and Franciszek Seredynski
Multi-level and Multi-objective Survey on Cloud Scheduling .................................................................................................................. 480
Yacine Kessaci, Nouredine Melab, and El-Ghazali Talbi
Comparison of Multi-objective Optimization Algorithms for the JShadObf JavaScript Obfuscator .................................................................................................................. 489
Benoît Bertholon, Sébastien Varrette, and Pascal Bouvry

Workshop 5: HiCOMB — Workshop on High Performance Computational Biology
HiCOMB Introduction and Committees .................................................................................................................. 497
Alba Cristina Magalhaes Alves de Melo, Srinivas Aluru, and David A. Bader
HiCOMB Keynote and Invited Talks .................................................................................................................. 499
Stephen Larson, Ümit V. Çatalyürek, and Ananth Kalyanaraman

HiCOMB Session 1: Parallel Algorithms for Biological Sequence Analysis
Constructing Similarity Graphs from Large-Scale Biological Sequence Collections .................................................................................................................. 500
Jarosław Zola
Removing Sequential Bottlenecks in Analysis of Next-Generation Sequencing Data .................................................................................................................. 508
Yi Wang, Gagan Agrawal, Gulcin Ozer, and Kun Huang

HiCOMB Session 2: Parallel/Distributed Architectures for Biological Applications
Efficient Computation of the Phylogenetic Likelihood Function on the Intel MIC Architecture .................................................................................................................. 518
Alexey M. Kozlov, Christian Goll, and Alexandros Stamatakis
Process Simulation of Complex Biochemical Pathways in Explicit 3D Space Enabled by Heterogeneous Computing Platform .................................................................................................................. 528
Jie Li, Amin Salighehdar, and Narayan Ganesan
Exploring Large Scale Receptor-Ligand Pairs in Molecular Docking Workflows in HPC Clouds ...................................................536
  Kary Ocaña, Silvia Benza, Daniel de Oliveira, Jonas Dias, and Marta Mattoso

A Comparison of a Campus Cluster and Open Science Grid Platforms for Protein-Guided Assembly Using Pegasus Workflow Management System .............................................................................................................546
  Natasha Pavlovikj, Kevin Begcy, Sairam Behera, Malachy Campbell, Harkamal Walia, and Jitender S. Deogun

HiCOMB Session 3: Metagenomics and Assembly
Design and Optimization of a Metagenomics Analysis Workflow for NVRAM .................................................................556
  Sasha Ames, Jonathan E. Allen, David A. Hysom, G. Scott Lloyd, and Maya B. Gokhale

Parallelization of the Trinity Pipeline for De Novo Transcriptome Assembly ..............................................................................566
  V. Sachdeva, C.S. Kim, K.E. Jordan, and M.D. Winn

HiPGA: A High Performance Genome Assembler for Short Read Sequence Data .................................................................576
  Xiaohui Duan, Kun Zhao, and Weiguo Liu

Workshop 6: APDCM — Advances in Parallel and Distributed Computing Models
APDCM Introduction and Committees ...........................................................................................................................................585
  Oscar H. Ibarra

APDCM Session 1
Bulk Execution of Oblivious Algorithms on the Unified Memory Machine, with GPU Implementation .................................................................................................................................586
  Kazuya Tani, Daisuke Takafuji, Koji Nakano, and Yasuaki Ito

A Linear Performance-Breakdown Model for GPU Programming Optimization Guidance ..........................................................596
  Mario A. Chapa M. and Sato Hiroyuki

A Hybrid Parallel Tridiagonal Solver on Multi-core Architectures .................................................................................................604
  Guangping Tang, Kenli Li, Keqin Li, Hang Chen, and Jiayi Du

A Novel Computational Model for GPUs with Application to I/O Optimal Sorting Algorithms ...................................................614
  Atsushi Koike and Kunihiko Sadakane

Predicting Cache Contention for Multithread Applications at Compile Time ..................................................................................624
  Munara Tolubaeva, Yonghong Yan, and Barbara Chapman

APDCM Session 2
Parallelism Extraction Algorithm from Stream-Based Processing Flow Applying Spanning Tree ..............................................632
  Guyue Wang, Shinichi Yamagawa, and Koichi Wada

EEWA: Energy-Efficient Workload-Aware Task Scheduling in Multi-core Architectures ..............................................................642
  Quan Chen, Long Zheng, Minyi Guo, and Zhiyi Huang

A Platform-Specific Code Smell Alert System for High Performance Computing Applications ..................................................652
  Chunyan Wang, Shoichi Hirassawa, Hiroyluki Takizawa, and Hiroaki Kobayashi

Optimizing Buffer Sizes for Pipeline Workflow Scheduling with Setup Times ..............................................................................662
  Anne Benoit, Jean-Marc Nicod, and Veronika Rehn-Sonigo
Metrics for Evaluating Energy Saving Techniques for Resilient HPC Systems .................................................................790
Ryan E. Grant, Stephen L. Olivier, James H. Laros III, Ron Brightwell, and Allan K. Porterfield

HPPAC Session 2: Power-Efficient Hardware
Reducing Static and Dynamic Power of L1 Data Caches in GPGPUs .................................................................798
Ehsan Atoofian
Exploiting DMA for Performance and Energy Optimized STREAM on a DSP ..........................................................805
Gilbert Netzer, Lennart Johnsson, Daniel Ahlin, Eric Stotzer, Pekka Varis, and Erwin Laure
A Study of Energy and Locality Effects Using Space-Filling Curves .................................................................815
Nico Reissman, Jan Christian Meyer, and Magnus Jahre

HPPAC Session 3: Large Scale Power Management
Energy-Aware Load Balancing Policies for the Cloud Ecosystem .................................................................823
Ashkan Paya and Dan C. Marinescu
Bag-of-Task Scheduling on Power-Aware Clusters Using a DVFS-Based Mechanism ........................................833
George Terzopoulos and Helen D. Karatza
A Criticality-Aware DVFS Runtime Utility for Optimizing Power Efficiency of Multithreaded Applications .................................841
Haibo Zhang, Wenting Han, Feng Li, Songtao He, Yichao Cheng, Hong An, and Zhitao Chen

Workshop 8: HPGC — High-Performance Grid and Cloud Computing Workshop
HPGC Introduction and Committees .................................................................849
Eric Aubanel, Virendrakumar C. Bhavsar, and Michael Frumkin
HPGC Keynotes .................................................................850
Rajkumar Buyya and Derek Murray

HPGC Session 1
Evaluating GPU Passthrough in Xen for High Performance Cloud Computing ................................................852
Andrew J. Younge, John Paul Walters, Stephen Crago, and Geoffrey C. Fox
Scalable System Environment Caching and Sharing for Distributed Virtual Machines ....................................860
Teng Long, Ilchul Yoon, Alan Sussman, Adam Porter, and Atif Memon
Mega Data Center for Elastic Internet Applications .................................................................868
Hangwei Qian and Michael Rabinovich

HPGC Session 2
Cloud-Based Simulation of a Smart Power Grid .................................................................875
Ashkan Paya and Dan C. Marinescu
Analyzing Reliability of Virtual Machine Instances with Dynamic Pricing in the Public Cloud ........................................885
Seung-Hwan Lim, Gautam S. Thakur, and James L. Horey
Security of Applications Involving Multiple Organizations and Order Preserving Encryption in Hybrid Cloud Environments

Mohammad Ahmadian, Ashkan Paya, and Dan C. Marinescu

Workshop 9: AsHES — Accelerators and Hybrid Exascale Systems

AsHES Introduction and Committees

Yunquan Zhang

AsHES Keynote

Jeffrey Vetter

AsHES Session 1: Programming Model and Performance Optimizations

Scalable Critical Path Analysis for Hybrid MPI-CUDA Applications

Felix Schmitt, Robert Dietrich, and Guido Juckeland

Dymaxion++: A Directive-Based API to Optimize Data Layout and Memory Mapping for Heterogeneous Systems

Shuai Che, Jiayuan Meng, and Kevin Skadron

Comparison of Parallel Programming Models on Intel MIC Computer Cluster

Chenggang Lai, Zhijun Hao, Miaoqing Huang, Xuan Shi, and Haitang You

CoAdELL: Adaptivity and Compression for Improving Sparse Matrix-Vector Multiplication on GPUs

Marco Maggioni and Tanya Berger-Wolf

AsHES Session 2: Accelerating Applications

Optimizing Krylov Subspace Solvers on Graphics Processing Units

Hartwig Anzt, William Sawyer, Stanimire Tomov, Piotr Luszczek, Ichitaro Yamazaki, and Jack Dongarra

XSW: Accelerating Biological Database Search on Xeon Phi

Lipeng Wang, Yuandong Chan, Xiaohui Duan, Haidong Lan, Xiangxu Meng, and Weiguo Liu

Dynamically Balanced Synchronization-Avoiding LU Factorization with Multicore and GPUs

Simplice Donfack, Stanimire Tomov, and Jack Dongarra

Scalable Fast Multipole Accelerated Vortex Methods

Qi Hu, Nail A. Gumerov, Rio Yokota, Lorena Barba, and Ramani Duraiswami

AsHES Session 3: Emerging Hybrid Systems

Infiniband-Verbs on GPU: A Case Study of Controlling an Infiniband Network Device from the GPU

Lena Oden, Holger Fröning, and Franz-Joseph Pfreundt

Programming the Adapteva Epiphany 64-Core Network-on-Chip Coprocessor

Anish Varghese, Bob Edwards, Gaurav Mitra, and Alistair P. Rendell

High-Performance Zonal Histogramming on Large-Scale Geospatial Rasters Using GPUs and GPU-Accelerated Clusters

Jianting Zhang and Dali Wang
Workshop 10: PLC — Programming Models, Languages, and Compilers Workshop for Manycore and Heterogeneous Architectures

PLC Introduction and Committees................................................................................................................................................1001

Barbara Chapman

PLC Session 1: Programming and Compilation Techniques for GPUs

Transparent GPU Execution of NumPy Applications ...................................................................................................................1002

Troels Blum, Mads R.B. Kristensen, and Brian Vinter

KernelGen — The Design and Implementation of a Next Generation Compiler Platform

for Accelerating Numerical Models on GPUs .................................................................................................................................1011

Dmitry Mikushin, Nikolay Likhogrud, Eddy Z. Zhang, and Christopher Bergström

Using GPU Shared Memory with a Directive-Based Approach ........................................................................................................1021

Wei Ding, Ligang Lu, Mauricio Araya-Polo, Amik St-Cyr, Detlef Hohl, and Barbara M. Chapman

PLC Session 2: Libraries and Optimization Frameworks

CFD Builder: A Library Builder for Computational Fluid Dynamics ..............................................................................................1029

Jagan Jayaraj, Pei-Hung Lin, Paul R. Woodward, and Pen-Chung Yew

A Stream Processing Framework for On-Line Optimization of Performance and Energy

Efficiency on Heterogeneous Systems ...........................................................................................................................................1039

Benjamin Ranft, Oliver Denninger, and Philip Pfaffe

PLC Session 3: Tools and Performance Evaluation

OpenMP Task Scheduling Analysis via OpenMP Runtime API and Tool Visualization .................................................................1049

Ahmad Qawasmeh, Abid M. Malik, and Barbara M. Chapman

A Case Study in Coordination Programming: Performance Evaluation of S-Net vs Intel’s Concurrent Collections ..............................................................................................................................................1059

Pavel Zaichenkov, Bert Gjøisbergs, Clemens Greleck, Olga Tveretina, and Alex Shafarenko

Workshop 11: EduPar-NSF/TCPP Workshop on Parallel and Distributed Computing Education

EduPar Introduction and Committees ..............................................................................................................................................1068

Sushil K Prasad

EduPar Keynote .................................................................................................................................................................................1070

Randy H. Katz

EduPar Session: Introductory Course and Across Curriculum

Limited Time and Experience: Parallelism in CS1 ..........................................................................................................................1071

Steven A. Bogaerts

NSF/IEEE-TCPP Curriculum Implementation at the State University of Nizhni Novgorod ......................................................................1079

Viktor Gergel, Alexey Liniov, Iosif Meyerov, and Alexander Sysoyev

Parallel and Distributed Computing across the Computer Science Curriculum ..............................................................................1085

David J. John and Stan J. Thomas
EduPar Session: Software Engineering Courses
Service-Oriented Computing and Software Integration in Computing Curriculum ...............................1091
  Yinong Chen and Zhizheng Zhou
EA: Research-Infused Teaching of Parallel Programming Concepts for Undergraduate Software
Engineering Students .....................................................................................................................................1099
  Nasser Giacaman and Oliver Sinnen
Using Patterns to Teach Parallel Computing ......................................................................................1106
  Clayton Ferner, Barry Wilkinson, and Barbara Heath

EduPar Session: Miscellaneous
Teaching HDFS/MapReduce Systems Concepts to Undergraduates .....................................................1114
  Linh Bao Ngo, Edward B. Duffy, and Amy W. Apon
Interactively Exploring the Connection between Nested Dissection Orderings for Parallel
Cholesky Factorization and Vertex Separators ......................................................................................1122
  H. Martin Bücker and M. Ali Rostami
A Portable Cluster for Each Student .....................................................................................................1130
  David Toth

Workshop 12: GABB — Graph Algorithms Building Blocks
GABB Introduction .....................................................................................................................................1135
  Tim Mattson, David A. Bader, Aydın Buluç, John Gilbert, Joseph Gonzalez, and Jeremy Kepner

Workshop 13: PDSEC — Workshop on Parallel and Distributed Scientific and Engineering Computing
PDSEC Introduction and Committees .....................................................................................................1138
  Peter Strazdins, Raphaël Couturier, Michelle Mills Strout, Keita Teranishi, Thomas Rauber,
  Gudula Rünger, and Laurence T. Yang

PDSEC Session 1: Best Papers
llamaOS: A Solution for Virtualized High-Performance Computing Clusters ........................................1140
  William A. Magato and Philip A. Wilsey
New Algorithm for Computing Eigenvectors of the Symmetric Eigenvalue Problem ..........................1150
  Azzam Haidar, Piotr Luszczek, and Jack Dongarra

PDSEC Session 2: Algorithms (I)
Exhaustive Key Search on Clusters of GPUs ..........................................................................................1160
  Davide Barbieri, Valeria Cardellini, and Salvatore Filippone
Application Level Fault Recovery: Using Fault-Tolerant Open MPI in a PDE Solver .............................1169
  Md Mohsin Ali, James Southern, Peter Strazdins, and Brendan Harding
Nanoscale Cluster Detection in Massive Atom Probe Tomography Data ..............................................1179
  Sudip K. Seal, Srikanth B. Yoginath, and Michael K. Miller
Construction of Porous Networks Subjected to Geometric Restrictions by Using OpenMP

Angel González Méndez, Graciela Román Alonso, Fernando Rojas González, Miguel Alfonso Castro García, Miguel Aguilar Cornejo, and Salomón Cordero Sánchez

PDSEC Session 3: Systems and Performance Analysis

Integration and Evaluation of Decentralized Fairshare Prioritization (Aequus)

Daniel Espling, Per-Olov Östberg, and Erik Elmroth

Coordination Languages and MPI Perturbation Theory: The FOX Tuple Space Framework for Resilience

Jeremiah J. Wilke

DisSLib: CC: A Library for Distributed Search with a Central Common Search State

Tyson Kendon and Jörg Denzinger

Improving I/O Performance with Adaptive Data Compression for Big Data Applications

Hongbo Zou, Yongen Yu, Wei Tang, and Hsuanwei Michelle Chen

Analysis of MPI Shared-Memory Communication Performance from a Cache Coherence Perspective

Bertrand Putigny, Benoit Ruelle, and Brice Goglin

PDSEC Session 4: Algorithms (II)

Acceleration of GPU-Based Ultrasound Simulation via Data Compression

Andrew A. Haigh and Eric C. McCreath

Kd-Tree Based N-Body Simulations with Volume-Mass Heuristic on the GPU

Klaus Kofler, Dominik Steinhauser, Biagio Cosenza, Ivan Grasso, Sabine Schindler, and Thomas Fahringer

Nuclear Fusion Simulation Code Optimization and Performance Evaluation on GPU Cluster

Norihisa Fujita, Hideo Nuga, Taisuke Boku, and Yasuhiro Idomura

Acceleration of a Python-Based Tsunami Modelling Application via CUDA and OpenHMPP

Zhe Weng and Peter E. Strazdins

GPU Enhanced Path Finding for an Unmanned Aerial Vehicle

Roksana Hassain, Sebastian Magierowski, and Geoffrey G. Messier

Workshop 14: DPDNS — Dependable Parallel, Distributed, and Network-Centric Systems

DPDNS Introduction and Committees

Dimiter Avresky, Erik Maehle, and Salvatore Distefano

DPDNS Keynote

Edgar Nett
DPDNS Session: Applications
Maintaining Dependable Communication Service for Mobile Stations in Wireless Mesh Networks by Tracking Capacity Demands .....................................................................................................................1297
  Timo Lindhorst, Burkhard Weseloh, and Edgar Nett
A Load Balancing Behavior for Underwater Robot Swarms to Increase Mission Time and Fault Tolerance ............................................................................................................................................1306
  Ammar Amory, Thomas Tosik, and Erik Maehle
ExCovery — A Framework for Distributed System Experiments and a Case Study of Service Discovery .......................................................................................................................................................................................1314
  Andreas Dittrich, Stefan Wanja, and Mirosław Malek
Managing Soft-Errors in Transactional Systems ...........................................................................................................................1324
  Mohamed Mohamedin, Roberto Palmieri, and Binoy Ravindran

DPDNS Session: Theoretical Aspects
Standby System Reliability through DRBD ..................................................................................................................................1330
  Salvatore Distefano
Trust-Based Security for the Spanning Tree Protocol ...................................................................................................................1338
  Yingxu Lai, Qiuyue Pan, Zenghui Liu, Yinong Chen, and Zhizheng Zhou
Autonomy Requirements Engineering for Self-Adaptive Science Clouds ...........................................................................................................................1344
  Emil Vassev and Mike Hinchey

Workshop 15: MTAAP — Workshop on Multi-threaded Architectures and Applications
MTAAP Introduction and Committees .........................................................................................................................................1354
  Luiz DeRose

MTAAP Session: Algorithms and Position Papers
A New Parallel Algorithm for Two-Pass Connected Component Labeling .........................................................................................1355
  Siddharth Gupta, Diana Palsetia, Md. Mostofa Ali Patwary, Ankit Agrawal, and Alok Choudhary
Position Paper: Locality-Driven Scheduling of Tasks for Data-Dependent Multithreading .................................................................1363
  Jaime Arteaga, Stephane Zuckerman, Elik Garcia, and Guang Gao
Position Paper: Leveraging Strength-Based Dynamic Slicing to Identify Control Reconvergence
Instructions ....................................................................................................................................................................................1368
  Walid J. Ghandour and Nadine J. Ghandour

MTAAP Session: Graph Analytics
Parallel Heuristics for Scalable Community Detection .........................................................................................................................1374
  Hao Lu, Mahantesh Halappanavar, Ananth Kalyanaraman, and Sutnanay Choudhary
Hardware/Software Vectorization for Closeness Centrality on Multi-/Many-Core Architectures .........................................................1386
  Ahmet Erdem Sariyuce, Erik Saule, Kamer Kaya, and Ümit V. Çatalyürek
Revisiting Edge and Node Parallelism for Dynamic GPU Graph Analytics .................................................................1396
    *Adam McLaughlin and David A. Bader*

**MTAAP Session: Accelerators**

A Validation Testsuite for OpenACC 1.0 .................................................................1407
    *Cheng Wang, Rengan Xu, Sunita Chandrasekaran, Barbara Chapman, and Oscar Hernandez*

Extracting Maximal Exact Matches on GPU ..........................................................1417
    *Anas Abu-Doleh, Kamer Kaya, Mohamed Abouelhoda, and Ümit V. Çatalyürek*

Predicting an Optimal Sparse Matrix Format for SpMV Computation on GPU ...........................................................1427
    *B. Neelima, G. Ram Mohana Reddy, and Prakash S. Raghavendra*

**Workshop 16: LSPP — Workshop on Large-Scale Parallel Processing**

LSSP Introduction and Committees ........................................................................1437
    *Darren J. Kerbyson, Ram Rajamony, and Charles Weems*

**LSPP Session 1: Performance Analysis and Optimization**

Higher Dimensional Gaussian Networks ...............................................................1438
    *Arash Shamaei, Bella Bose, and Mary Flahive*

**LSPP Session 2: Modeling Performance for Scaling**

The Power-Performance Tradeoffs of the Intel Xeon Phi on HPC Applications ....1448
    *Bo Li, Hung-Ching Chang, Shuaiwen Song, Chun-Yi Su, Timmy Meyer, John Mooring,
and Kirk W. Cameron*

Performance Modeling for Hardware Thread-Level Speculation ..............................1457
    *Ying-Chieh Wang, Che-Rung Lee, Yeh-Ching Chung, I-Hsin Chung, and Michael Perrone*

HMC-Sim: A Simulation Framework for Hybrid Memory Cube Devices ......................1465
    *John D. Leidel and Yong Chen*

**LSPP Session 3: Large-Scale Systems**

Online Monitoring System for Performance Fault Detection ....................................1475
    *Roberto Gioiosa, Gokcen Kestor, and Darren J. Kerbyson*

**LSPP Session 4: Scheduling**

Towards Extreme-Scale Simulations with Next-Generation Trilinos: A Low Mach Fluid
Application Case Study .......................................................................................1485
    *Paul Lin, Matthew Bettencourt, Stefan Domino, Travis Fisher, Mark Hoemmen, Jonathan Hu,
Eric Phipps, Andrey Prokopenko, Sivasankaran Rajamanickam, Christopher Siefert, Eric Cyr,
and Stephen Kennon*

Design and Implementation of a Large Scale Tree-Based QR Decomposition Using a 3D Virtual Systolic Array and a Lightweight Runtime .........................................................1495
    *Ichitaro Yamazaki, Jakub Kurzak, Piotr Luszczek, and Jack Dongarra*
SupMR: Circumventing Disk and Memory Bandwidth Bottlenecks for Scale-up MapReduce ..............................................1505

Michael Sevilla, Ike Nassi, Kleoni Ioannidou, Scott Brandt, and Carlos Maltzahn

Workshop 17: PCO — Parallel Computing and Optimization

PCO Introduction and Committees ...............................................................................................................................................1515

Didier El-Baz

PCO Session 1: Optimization Techniques for Parallel or Distributed Architectures

Towards Energy Efficient Allocation for Applications in Volunteer Cloud ..................................................................................1516

Congfeng Jiang, Jian Wan, Christophe Cérin, Paolo Gianessi, and Yanik Ngoko

Fast Generation of Large Task Network Mappings ........................................................................................................................1526

Karl-Eduard Berger, François Galea, Bertrand Le Cun, and Renaud Sirdey

PCO Session 2: Parallel Optimization Algorithms

Adaptive N to P Portfolio for Solving Constraint Programming Problems on Top of the Parallel Bobpp Framework ............................................................................................................................................................1531

Tarek Menouer and Bertrand Le Cun

Dependent Walks in Parallel Local Search ................................................................................................................................1541

Yves Caniou and Philippe Codognet

A Parallel Large Neighborhood Search-Based Heuristic for the Disjunctively Constrained Knapsack Problem .........................................................................................................................................................................1547

Mhand Hifi, Stephane Negre, Toufik Saadi, Sagvan Saleh, and Lei Wu

Solving Hard MIPLIB2003 Problems with ParaSCIP on Supercomputers: An Update .............................................................................1552

Yuji Shinano, Tobias Achterberg, Timo Berthold, Stefan Heinz, Thorsten Koch, and Michael Winkler

PCO Session 3: Task Scheduling and Miscellaneous

A Task Scheduling Algorithm Based on Replication for Maximizing Reliability on Heterogeneous Computing Systems ..................................................................................................................................................................................1562

Shuli Wang, Kenli Li, Jing Mei, Keqin Li, and Yan Wang

SkewControl: Gini Out of the Bottle ...............................................................................................................................................1572

Si Zheng, Yunhuai Liu, Tian He, Li Shanshan, and Xiangke Liao

The Heuristic Static Load-Balancing Algorithm Applied to the Community Earth System Model ..................................................................................1581

Yuri Alexeev, Sheri Mickelson, Sven Leyffer, Robert Jacob, and Anthony Craig

A Distributed Algorithm for a Reconfigurable Modular Surface ........................................................................................................1591

Didier El-Baz, Benoît Piranda, and Julien Bourgeois
Workshop 18: ParLearning — Workshop on Parallel and Distributed Computing for Large Scale Machine Learning and Big Data Analytics

ParLearning Introduction and Committees ........................................................................................................................................1599
   Abhinav Vishnu and Yinglong Xia

ParLearning Keynote ........................................................................................................................................................................1601
   Eric P. Xing

ParLearning Session 1

Wait-Free Primitives for Initializing Bayesian Network Structure Learning on Multicore Processors ........................................................................................................................................1602
   Hsuan-Yi Chu, Yinglong Xia, Anand Panangadan, and Viktor K. Prasanna

gpuRF and gpuERT: Efficient and Scalable GPU Algorithms for Decision Tree Ensembles ..................................................................................................................1612
   Karl Jansson, Håkan Sundell, and Henrik Boström

Training Large Scale Deep Neural Networks on the Intel Xeon Phi Many-Core Coprocessor ................................................................................................................................1622
   Lei Jin, Zhaokang Wang, Rong Gu, Chunfeng Yuan, and Yihua Huang

Parallel Bayesian Network Modelling for Pervasive Health Monitoring System ..................................................................................................................1631
   Xiujuan Qian, Yongli Wang, and Xiaohui Jiang

ParLearning Session 2

Portfolio-Based Selection of Robust Dynamic Loop Scheduling Algorithms Using Machine Learning ................................................................................................................................1638
   Nitin Sukhija, Brandon Malone, Srishti Srivastava, Ioana Banicescu, and Florina M. Ciorba

A General P2P Scheme for Constructing Large-Scale Virtual Environments .................................................................................................1648
   Wei Wang, Guisong Yang, Naixue Xiong, Xingyu He, and Wenzhong Guo

ParLearning Session 3

Large Scale Discriminative Metric Learning ........................................................................................................................................1656
   Peter D. Kirchner, Matthias Boehm, Berthold Reinwald, Daby Sow, Michael Schmidt, Deepak Turaga, and Alain Biem

YAFIM: A Parallel Frequent Itemset Mining Algorithm with Spark .........................................................................................................................1664
   Hongjian Qiu, Rong Gu, Chunfeng Yuan, and Yihua Huang

The Empirical Research of Virtual Enterprise Knowledge Transfer’s Effectiveness Faced to the Independent Innovation Ability ......................................................................................1672
   Yang Bo, Naixue Xiong, and Wenzhong Guo

A Distributed Speech Algorithm for Large Scale Data Communication Systems ................................................................................................1680
   Naixue Xiong, Guoxiang Tong, Wenzhong Guo, Jian Tan, and Guanning Wu
Workshop 19: HPDIC - High Performance Data Intensive Computing

HPDIC Introduction and Committees ................................................................................................................1688

Christophe Cerin and Cong-Feng Jiang

HPDIC Session 1: Memory, I/O, and Performance Enhancement

Compactor: Optimization Framework at Staging I/O Nodes ..................................................................................1689

Vishwanath Venkatesan, Mohamad Chaarawi, Quincey Koziol, and Edgar Gabriel

Hybrid BFS Approach Using Semi-external Memory ........................................................................................1698

Keita Iwabuchi, Hitoshi Sato, Ryo Mizote, Yuichiro Yasui, Katsuki Fujisawa, and Satoshi Matsuoka

Model-Driven Data Layout Selection for Improving Read Performance ............................................................1708

Jialin Liu, Surendra Byna, Bin Dong, Kesheng Wu, and Yong Chen

HPDIC Session 2: Clustering, Data Management, and Applications

Scalable and Reliable Data Broadcast with Kascade ..........................................................................................1717

Stéphane Martin, Tomasz Buchert, Pierric Willemet, Olivier Richard, Emmanuel Jeanvoine, and Lucas Nussbaum

SOM Clustering Using Spark-MapReduce ........................................................................................................1727

Tugdual Sarazin, Hanane Azzag, and Mustapha Lebbah

Optimizing the Join Operation on Hive to Accelerate Cross-Matching in Astronomy .....................................1735

Liang Li, Dixin Tang, Taoxing Liu, Hong Liu, Wei Li, and Chenzhou Cui

Workshop 20: JSSPP — Workshop on Job Scheduling Strategies for Parallel Processing

JSSPP Introduction and Committees ................................................................................................................1746

Walfredo Cirne and Narayan Desai

Workshop 21: CHIUW — Chapel Implementers and Users Workshop

CHIUW Introduction and Committees ..............................................................................................................1747

Brad Chamberlain

Author Index