

# **2015 IEEE International Conference on Cluster Computing (Cluster 2015)**

**Chicago, Illinois, USA  
8 – 11 September 2015**



**IEEE Catalog Number: CFP15235-POD  
ISBN: 978-1-4673-6599-4**

# 2015 IEEE International Conference on Cluster Computing

## CLUSTER 2015

### Table of Contents

<b>CLUSTER 2015 General Co-Chairs Welcome</b>	
Message.....	xviii
<b>CLUSTER 2015 Message from the Program</b>	
Chair.....	xxi
CLUSTER 2015 Organizing Committee.....	xxiii
CLUSTER 2015 Program Committee.....	xxiv
CLUSTER 2015 External Reviewers.....	xxvii
CLUSTER 2015 Sponsors.....	xxviii
HUCAA 2015 Workshop Welcome Message.....	xxix
HUCAA 2015 Program Committee.....	xxx
<b>HPCMASPA 2015 Workshop Welcome</b>	
Message.....	xxxi
HPCMASPA 2015 Program Committee.....	xxxii
HiPINEB 2015 Workshop Welcome Message.....	xxxiii
HiPINEB 2015 Organizing Committees.....	xxxiv
Campus Bridging Workshop Overview.....	xxxv

---

### **Session 1: Best Paper Candidates**

Parallel Modularity-Based Community Detection on Large-Scale Graphs .....	1
<i>Jianping Zeng and Hongfeng Yu</i>	
Optimizing Explicit Hydrodynamics for Power, Energy, and Performance .....	11
<i>Edgar A. León, Ian Karlin, and Ryan E. Grant</i>	
Machines Tuning Machines: Configuring Distributed Stream Processors with Bayesian Optimization .....	22
<i>Lorenz Fischer, Shen Gao, and Abraham Bernstein</i>	

Workload-Aware Resource Reservation for Multi-tenant NoSQL .....	32
<i>Jiaan Zeng and Beth Plale</i>	

## Session 2: Task Parallel Computing

Automatic Command Queue Scheduling for Task-Parallel Workloads in OpenCL .....	42
<i>Ashwin Mandayam Aji, Antonio J. Peña, Pavan Balaji, and Wu-chun Feng</i>	

## Session 3: Big Data Processing

Taming Non-local Stragglers Using Efficient Prefetching in MapReduce .....	52
<i>Ze Yu, Min Li, Xin Yang, Han Zhao, and Xiaolin Li</i>	
IOSIG+: On the Role of I/O Tracing and Analysis for Hadoop Systems .....	62
<i>Bo Feng, Xi Yang, Kun Feng, Yanlong Yin, and Xian-He Sun</i>	
Exploring Memory Hierarchy to Improve Scientific Data Read Performance .....	66
<i>Wenzhao Zhang, Houjun Tang, Xiaocheng Zou, Steven Harenberg, Qing Liu, Scott Klasky, and Nagiza F. Samatova</i>	
A Case Study of Optimizing Big Data Analytical Stacks Using Structured Data Shuffling .....	70
<i>Dixin Tang, Taoying Liu, Rubao Lee, Hong Liu, and Wei Li</i>	
An SSD-HDD Integrated Storage Architecture for Write-Once-Read-Once Applications on Clusters .....	74
<i>Cailiang Xu, Wei Wang, Deng Zhou, and Tao Xie</i>	

## Session 4: GPU Computing

Exploiting GPUDirect RDMA in Designing High Performance OpenSHMEM for NVIDIA GPU Clusters .....	78
<i>Khaled Hamidouche, Akshay Venkatesh, Ammar Ahmad Awan, Hari Subramoni, Ching-Hsiang Chu, and Dhabaleswar K. (DK) Panda</i>	
Improving Strong-Scaling on GPU Cluster Based on Tightly Coupled Accelerators Architecture .....	88
<i>Toshihiro Hanawa, Hisafumi Fujii, Norihisa Fujita, Tetsuya Odajima, Kazuya Matsumoto, Yuetsu Kodama, and Taisuke Boku</i>	
Exploring the Suitability of Remote GPGPU Virtualization for the OpenACC Programming Model Using rCUDA .....	92
<i>Adrián Castelló, Antonio J. Peña, Rafael Mayo, Pavan Balaji, and Enrique S. Quintana-Ortí</i>	
PLB-HeC: A Profile-Based Load-Balancing Algorithm for Heterogeneous CPU-GPU Clusters .....	96
<i>Luis Sant'Ana, Daniel Cordeiro, and Raphael Camargo</i>	

A TSQR Based Krylov Basis Computation Method on Hybrid GPU Cluster .....	106
<i>Langshi Chen and Serge Petiton</i>	

## **Session 5: Machine Learning and Data Mining**

Fast and Accurate Support Vector Machines on Large Scale Systems .....	110
<i>Abhinav Vishnu, Jeyanthi Narasimhan, Lawrence Holder, Darren Kerbyson, and Adolfy Hoisie</i>	
A Machine-Learning Approach for Communication Prediction of Large-Scale Applications .....	120
<i>Nikela Papadopoulou, Georgios Goumas, and Nectarios Koziris</i>	
An Efficient Parallel Approach of Parsing and Indexing for Large-Scale XML Datasets .....	124
<i>Song Kunfang and Lu Hongwei</i>	
Collective I/O Tuning Using Analytical and Machine Learning Models .....	128
<i>Florin Isaila, Prasanna Balaprakash, Stefan M. Wild, Dries Kimpe, Rob Latham, Rob Ross, and Paul Hovland</i>	
Large Scale Frequent Pattern Mining Using MPI One-Sided Model .....	138
<i>Abhinav Vishnu and Khushbu Agarwal</i>	

## **Session 6: Resilience and Reliability**

Fast Fault Injection and Sensitivity Analysis for Collective Communications .....	148
<i>Kun Feng, Manjunath Gorentla Venkata, Dong Li, and Xian-He Sun</i>	
A Practical Approach for Handling Soft Errors in Iterative Applications .....	158
<i>Jiaqi Liu, Mehmet Can Kurt, and Gagan Agrawal</i>	
Ensuring Data Durability with Increasingly Interdependent Content .....	162
<i>Veronica Estrada Galinanes and Pascal Felber</i>	
On the Need for Reproducible Numerical Accuracy through Intelligent Runtime Selection of Reduction Algorithms at the Extreme Scale .....	166
<i>Dylan Chapp, Travis Johnston, and Michela Taufer</i>	
Towards Building Resilient Scientific Applications: Resilience Analysis on the Impact of Soft Error and Transient Error Tolerance with the CLAMR Hydrodynamics Mini-App .....	176
<i>Qiang Guan, Nathan DeBardeleben, Brian Artkinson, Robert Robey, and William M. Jones</i>	
DINO: Divergent Node Cloning for Sustained Redundancy in HPC .....	180
<i>Arash Rezaei and Frank Mueller</i>	

## Session 7: High Performance I/O

Dynamic Model-Driven Parallel I/O Performance Tuning .....	184
<i>Babak Behzad, Surendra Byna, Stefan M. Wild, Prabhat, and Marc Snir</i>	
TRIO: Burst Buffer Based I/O Orchestration .....	194
<i>Teng Wang, Sarp Oral, Michael Pritchard, Bin Wang, and Weikuan Yu</i>	
BPS: A Balanced Partial Stripe Write Scheme to Improve the Write Performance of RAID-6 .....	204
<i>Congjin Du, Chentao Wu, Jie Li, Minyi Guo, and Xubin He</i>	
RDMA-Based Direct Transfer of File Data to Remote Page Cache .....	214
<i>Shin Sasaki, Kazushi Takahashi, Yoshihiro Oyama, and Osamu Tatebe</i>	

## Session 8: MPI

High Performance MPI Datatype Support with User-Mode Memory Registration: Challenges, Designs, and Benefits .....	226
<i>Mingzhe Li, Hari Subramoni, Khaled Hamidouche, Xiaoyi Lu, and Dhabaleswar K. (DK) Panda</i>	

## Session 9: Distributed Data Processing

Overcoming Hadoop Scaling Limitations through Distributed Task Execution .....	236
<i>Ke Wang, Ning Liu, Iman Sadooghi, Xi Yang, Xiaobing Zhou, Tonglin Li, Michael Lang, Xian-He Sun, and Ioan Raicu</i>	
SideWalk: A Facility of Lightweight Out-of-Band Communications for Augmenting Distributed Data Processing Flows .....	246
<i>Yin Huai, Yuan Yuan, Rubao Lee, and Xiaodong Zhang</i>	
High-Performance, Distributed Dictionary Encoding of RDF Datasets .....	250
<i>Alessandro Morari, Jesse Weaver, Oreste Villa, David Haglin, Antonino Tumeo, Vito Giovanni Castellana, and John Feo</i>	
I/O-Aware Batch Scheduling for Petascale Computing Systems .....	254
<i>Zhou Zhou, Xu Yang, Dongfang Zhao, Paul Rich, Wei Tang, Jia Wang, and Zhiling Lan</i>	

## Session 10: Energy Efficiency

Performance-to-Power Ratio Aware Virtual Machine (VM) Allocation in Energy-Efficient Clouds .....	264
<i>Xiaojun Ruan and Haiquan Chen</i>	
A Workload-Aware Energy Model for Virtual Machine Migration .....	274
<i>Vincenzo De Maio, Gabor Kecskemeti, and Radu Prodan</i>	

## Session 11: Graph Processing

GraphTrek: Asynchronous Graph Traversal for Property Graph-Based Metadata Management .....	284
<i>Dong Dai, Philip Carns, Robert B. Ross, John Jenkins, Kyle Blauer, and Yong Chen</i>	
Towards Multi-site Metadata Management for Geographically Distributed Cloud Workflows .....	294
<i>Luis Pineda-Morales, Alexandru Costan, and Gabriel Antoniu</i>	

## Session 12: Application Acceleration

PaRSEC in Practice: Optimizing a Legacy Chemistry Application through Distributed Task-Based Execution .....	304
<i>Anthony Danalis, Heike Jagode, George Bosilca, and Jack Dongarra</i>	
Optimizing I/O for Petascale Seismic Simulations on Unstructured Meshes .....	314
<i>Sebastian Rettenberger and Michael Bader</i>	
LBM-HPC - An Open-Source Tool for Fluid Simulations. Case Study: Unified Parallel C (UPC-PGAS) .....	318
<i>Pedro Valero-Lara and Johan Jansson</i>	
Scaling Data Intensive Physics Applications to 10k Cores on Non-dedicated Clusters with Lobster .....	322
<i>Anna Woodard, Matthias Wolf, Charles Mueller, Nil Valls, Ben Tovar, Patrick Donnelly, Peter Ivie, Kenyi Hurtado Anampa, Paul Brenner, Douglas Thain, Kevin Lannon, and Michael Hildreth</i>	
RE-PAGE: Domain-Specific REplication and PArallel Processing of GENomic Data .....	332
<i>Mucahid Kutlu and Gagan Agrawal</i>	

## Session 13: Network and High Performance Communication

Re-evaluating Network Onload vs. Offload for the Many-Core Era .....	342
<i>Matthew G.F. Dosanjh, Ryan E. Grant, Patrick G. Bridges, and Ron Brightwell</i>	
Fast Calculation of Max-Min Fair Rates for Multi-commodity Flows in Fat-Tree Networks .....	351
<i>Md Atiqul Mollah, Xin Yuan, Scott Pakin, and Michael Lang</i>	
Comparing Global Link Arrangements for Dragonfly Networks .....	361
<i>Emily Hastings, David Rincon-Cruz, Marc Spehlmann, Sofia Meyers, Anda Xu, David P. Bunde, and Vitus J. Leung</i>	
Towards the InfiniBand SR-IOV vSwitch Architecture .....	371
<i>Evangelos Tasoulas, Ernst Gunnar Gran, Bjørn Dag Johnsen, Kyrre Begnum, and Tor Skeie</i>	

## Session 14: Parallel Algorithms

MPC: A Massively Parallel Compression Algorithm for Scientific Data .....	381
<i>Annie Yang, Hari Mukka, Farbod Hesaaraki, and Martin Burtcher</i>	
Balancing Thread-Level and Task-Level Parallelism for Data-Intensive Workloads on Clusters and Clouds .....	390
<i>Olivia Choudhury, Dinesh Rajan, Nicholas Hazekamp, Sandra Gesing, Douglas Thain, and Scott Emrich</i>	
LU Factorization: Towards Hiding Communication Overheads with a Lookahead-Free Algorithm .....	394
<i>Tan Nguyen and Scott B. Baden</i>	
Distributed-Memory Algorithms for Maximal Cardinality Matching Using Matrix Algebra .....	398
<i>Ariful Azad and Aydin Buluç</i>	

## Session 15: Task and Process Scheduling

The Cost of Synchronizing Imbalanced Processes in Message Passing Systems .....	408
<i>Ivy Bo Peng, Stefano Markidis, and Erwin Laure</i>	
An Approach to Selecting Thread + Process Mixes for Hybrid MPI + OpenMP Applications .....	418
<i>Hormozd Gahvari, Martin Schulz, and Ulrike Meier Yang</i>	
On the Application Task Granularity and the Interplay with the Scheduling Overhead in Many-Core Shared Memory Systems .....	428
<i>Dana Akhmetova, Gokcen Kestor, Roberto Gioiosa, Stefano Markidis, and Erwin Laure</i>	

## Session 16: PGAS and Shared Memory Programming

OpenSHMEM as a Portable Communication Layer for PGAS Models: A Case Study with Coarray Fortran .....	438
<i>Naveen Namashivayam, Deepak Eachempati, Dounia Khaldi, and Barbara Chapman</i>	
A Team-Based Methodology of Memory Hierarchy-Aware Runtime Support in Coarray Fortran .....	448
<i>Dounia Khaldi, Deepak Eachempati, Shiyao Ge, Pierre Jouvelot, and Barbara Chapman</i>	
Optimizing Caching DSM for Distributed Software Speculation .....	452
<i>Sai Charan Koduru, Keval Vora, and Rajiv Gupta</i>	

Empirical Comparison of Three Versioning Architectures .....	456
<i>Hajime Fujita, Kamil Iskra, Pavan Balaji, and Andrew A. Chien</i>	
Detecting Thread-Safety Violations in Hybrid OpenMP/MPI Programs .....	460
<i>Hongyi Ma, Liqiang Wang, and Krishanthan Krishnamoorthy</i>	

## Session 17: Cluster Tools

Toward Rapid Understanding of Production HPC Applications and Systems .....	464
<i>Anthony Agelastos, Benjamin Allan, Jim Brandt, Ann Gentile, Sophia Lefantzi, Steve Monk, Jeff Ogden, Mahesh Rajan, and Joel Stevenson</i>	
ObsCon: Integrated Monitoring and Control for Parallel, Real-Time Applications .....	474
<i>Alan Nussbaum, Shwetha Mathangi Chandra Choodamani, and Karsten Schwan</i>	
VecMeter: Measuring Vectorization on the Xeon Phi .....	478
<i>Joshua Peraza, Ananta Tiwari, William A. Ward, Jr., Roy Campbell, and Laura Carrington</i>	
Toward Interlanguage Parallel Scripting for Distributed-Memory Scientific Computing .....	482
<i>Justin M. Wozniak, Timothy G. Armstrong, Ketan C. Maheshwari, Daniel S. Katz, Michael Wilde, and Ian T. Foster</i>	

## Poster Papers

A Cache Management Scheme for Hiding Garbage Collection Latency in Flash-Based Solid State Drives .....	486
<i>Wei Xie and Yong Chen</i>	
A Performance Comparison of CUDA Remote GPU Virtualization Frameworks .....	488
<i>Carlos Reaño and Federico Silla</i>	
A Two-Tiered Approach to I/O Quality of Service in Docker Containers .....	490
<i>Sean McDaniel, Stephen Herbein, and Michela Taufer</i>	
Accelerating Laue Depth Reconstruction Algorithm with CUDA .....	492
<i>Ke Yue, Schwarz Nicholas, and Tischler Jonathan Z.</i>	
An FPGA-Based Accelerator for Neighborhood-Based Collaborative Filtering Recommendation Algorithms .....	494
<i>Xiang Ma, Chao Wang, Qi Yu, Xi Li, and Xuehai Zhou</i>	
Can Cloud Service Get His Family? A Step Towards Service Family Detecting .....	496
<i>Xinkui Zhao, Jianwei Yin, Chen Zhi, Pengxiang Lin, and Zuoning Chen</i>	
Design a Hash-Based Control Mechanism in vSwitch for Software-Defined Networking Environment .....	498
<i>Shih-Wen Hsu, Tseng-Yi Chen, Yun-Chun Chang, Shuo-Han Chen, Han-Chieh Chao, Tsen-Yeh Lin, and Wei-Kuan Shih</i>	

Development of MapReduce and MPI Programs for Motif Search .....	500
<i>Mejdl Safran, Saad Al-qahtani, Michelle Zhu, and Dunren Che</i>	
Distributed Modular Monitoring (DiMMon) Approach to Supercomputer Monitoring .....	502
<i>Konstantin Stefanov and Vladimir Voevodin</i>	
Efficient Distributed Data Clustering on Spark .....	504
<i>Jia Li, Dongsheng Li, and Yiming Zhang</i>	
Energy-Aware Job Management Approaches for Workflow in Cloud .....	506
<i>Mustafa Khaleel and Michelle M. Zhu</i>	
Evaluating R-Based Big Data Analytic Frameworks .....	508
<i>Mei Liang, Cesar Trejo, Lavanya Muthu, Linh B. Ngo, Andre Luckow, and Amy W. Apon</i>	
Evaluating the Support of MTC Applications on Intel Xeon Phi Many-Core Accelerators .....	510
<i>Poornima Nookala, Serapheim Dimitropoulos, Karl Stough, and Ioan Raicu</i>	
Flexible Error Recovery Using Versions in Global View Resilience .....	512
<i>Nan Dun, Hajime Fujita, Aiman Fang, Yan Liu, Andrew A. Chien, Pavan Balaj, Kamil Iskra, Wesley Bland, and Andrew Siegel</i>	
GO-Docker: A Batch Scheduling System with Docker Containers .....	514
<i>Olivier Sallou and Cyril Monjeaud</i>	
GRAPH/Z: A Key-Value Store Based Scalable Graph Processing System .....	516
<i>Tonglin Li, Chaoqi Ma, Jiabao Li, Xiaobing Zhou, Ke Wang, Dongfang Zhao, Iman Sadooghi, and Ioan Raicu</i>	
Highly Scalable Parallel Search-Tree Algorithms: The Virtual Topology Approach .....	518
<i>Faisal N. Abu-Khzam, Amer E. Mouawad, and Karim A. Jahed</i>	
HRDBMS: A NewSQL Database for Analytics .....	519
<i>Jason Arnold, Boris Glavic, and Ioan Raicu</i>	
Minimizing Data Transmission Latency by Bipartite Graph in MapReduce .....	521
<i>Jie Wei, Shangguang Wang, Lingyan Zhang, Ao Zhou, Qibo Sun, Ruisheng Shi, and Fangchun Yang</i>	
monBench: A Database Performance Benchmark for Cloud Monitoring System .....	523
<i>Xinkui Zhao, Jianwei Yin, Chen Zhi, Pengxiang Lin, Shichun Feng, Hao Wu, and Zuoning Chen</i>	
Mutated Near Optimal Vertex Cover Algorithm (NOVCA) Visualization on a Tile Display .....	525
<i>Sanjaya Gajurel and Roger Bielefeld</i>	
Network Quality of Service in Docker Containers .....	527
<i>Ayush Dusia, Yang Yang, and Michela Taufer</i>	

Pallas: An Application-Driven Task and Network Simulation Framework .....	529
<i>Yuming Ye, Ziyang Li, Dongsheng Li, Yiming Zhang, Feng Liu, and Yuxing Peng</i>	
Peer Comparison of XSEDE and NCAR Publication Data .....	531
<i>Gregor von Laszewski, Fugang Wang, Geoffrey C. Fox, David L. Hart, Thomas R. Furlani, Robert L. DeLeon, and Steven M. Gallo</i>	
Performance of the NVIDIA Jetson TK1 in HPC .....	533
<i>Yash Ukidave, David Kaeli, Umesh Gupta, and Kurt Keville.</i>	
Dynamic CPU Resource Allocation in Containerized Cloud Environments .....	535
<i>Jose Monsalve, Aaron Landwehr, and Michela Taufer</i>	
Toward Auto-tuned Krylov Basis Computation for Different Sparse Matrix Formats and Interconnects on GPU Clusters .....	537
<i>Langshi Chen and Serge Petition</i>	
Towards Building a Lightweight Key-Value Store on Parallel File System .....	539
<i>Jiaan Zeng and Beth Plale</i>	
Understanding the Propagation of Error Due to a Silent Data Corruption in a Sparse Matrix Vector Multiply .....	541
<i>Jon Calhoun, Marc Snir, Luke Olson, and Maria Garzaran</i>	

## **FTS 2015**

Exploiting Spatial Information in Datasets to Enable Fault Tolerant Sparse Matrix Solvers .....	543
<i>Rob Hunt and Simon McIntosh-Smith</i>	
Partial Differential Equations Preconditioner Resilient to Soft and Hard Faults .....	552
<i>Francesco Rizzi, Karla Morris, Khachik Sargsyan, Paul Mycek, Cosmin Safta, Olivier LeMaitre, Omar Knio, and Bert Debusschere</i>	
Fault-Tolerant Protocol for Hybrid Task-Parallel Message-Passing Applications .....	563
<i>Tatiana Martsinkevich, Omer Subasi, Osman Unsal, Franck Cappello, and Jesus Labarta</i>	
Programmer-Guided Reliability for Extreme-Scale Applications .....	571
<i>David E. Bernholdt, Wael R. Elwasif, Christos Kartsaklis, Seyong Lee, and Tiffany M. Mintz</i>	
Building a Fault Tolerant Application Using the GASPI Communication Layer .....	580
<i>Faisal Shahzad, Moritz Kreutzer, Thomas Zeiser, Rui Machado, Andreas Pieper, Georg Hager, and Gerhard Wellein</i>	
Stay Alive, Don't Give Up: DUE and SDC Reduction with Memory Repair .....	588
<i>Dong Wan Kim and Mattan Erez</i>	
Detecting and Correcting Data Corruption in Stencil Applications through Multivariate Interpolation .....	595
<i>Leonardo Arturo Bautista Gomez and Franck Cappello</i>	

## HUCAA 2015

Pairwise Sequence Alignment with Gaps with GPU .....	603
<i>Thomas C. Carroll, Jude-Thaddeus Ojiaku, and Prudence W.H. Wong</i>	
Scalable Relativistic High-Resolution Shock-Capturing for Heterogeneous Computing .....	611
<i>Forrest Wolfgang Glines, Matthew Anderson, and David Neilsen</i>	
On the Execution of Computationally Intensive CPU-Based Libraries on Remote Accelerators for Increasing Performance: Early Experience with the OpenBLAS and FFTW Libraries .....	619
<i>Santiago Mislata Valero and Federico Silla</i>	
Hybrid Communication with TCA and InfiniBand on a Parallel Programming Language XcalableACC for GPU Clusters .....	627
<i>Tetsuya Odajima, Taisuke Boku, Toshihiro Hanawa, Hitoshi Murai, Masahiro Nakao, Akihiro Tabuchi, and Mitsuhsisa Sato</i>	
Evaluation of FFT for GPU Cluster Using Tightly Coupled Accelerators Architecture .....	635
<i>Toshihiro Hanawa, Hisafumi Fujii, Norihisa Fujita, Tetsuya Odajima, Kazuya Matsumoto, and Taisuke Boku</i>	

## HPCMASPA 2015

Analysis of XDMoD/SUPReMM Data Using Machine Learning Techniques .....	642
<i>Steven M. Gallo, Joseph P. White, Robert L. DeLeon, Thomas R. Furlani, Helen Ngo, Abani K. Patra, Matthew D. Jones, Jeffrey T. Palmer, Nikolay Simakov, Jeanette M. Sperhac, Martins Innus, Thomas Yearke, and Ryan Rathsam</i>	
Practical Resource Monitoring for Robust High Throughput Computing .....	650
<i>Gideon Juve, Benjamin Tovar, Rafael Ferreira da Silva, Dariusz Król, Douglas Thain, Ewa Deelman, William Allcock, and Miron Livny</i>	
New Systems, New Behaviors, New Patterns: Monitoring Insights from System Standup .....	658
<i>Jim Brandt, Ann Gentile, Cindy Martin, Jason Repik, and Narate Taerat</i>	
A LogP Extension for Modeling Tree Aggregation Networks .....	666
<i>Taylor Groves, Samuel K. Gutierrez, and Dorian Arnold</i>	
Push Me Pull You: Integrating Opposing Data Transport Modes for Efficient HPC Application Monitoring .....	674
<i>Omar Aaziz, Jonathan Cook, and Hadi Sharifi</i>	
The Performance Implication of Task Size for Applications on the HPX Runtime System .....	682
<i>Patricia Grubel, Hartmut Kaiser, Jeanine Cook, and Adrian Serio</i>	

Comparison of Vendor Supplied Environmental Data Collection Mechanisms .....	690
<i>Sean Wallace, Venkatram Vishwanath, Susan Coghlan, Zhiling Lan, and Michael E. Papka</i>	
WattProf: A Flexible Platform for Fine-Grained HPC Power Profiling .....	698
<i>Mohammad Rashti, Gerald Sabin, David Vansickle, and Boyana Norris</i>	
Real Time Visualization of Monitoring Data for Large Scale HPC Systems .....	706
<i>Michael Showerman</i>	
Evolution of Monitoring over the Lifetime of a High Performance Computing Cluster .....	710
<i>Adam DeConinck and Kathleen Kelly</i>	
Monitoring High Performance Computing Systems for the End User .....	714
<i>Christopher Lee Moore, Prabhu Singh Khalsa, Todd Alan Yilk, and Michael Mason</i>	
Extending LDMS to Enable Performance Monitoring in Multi-core Applications .....	717
<i>Steven Feldman, Deli Zhang, Damian Dechev, and James Brandt</i>	

## **WRAP 2015**

Performance Evaluation of Unstructured Mesh Physics on Advanced Architectures .....	721
<i>Charles R. Ferenbaugh</i>	
Expressing Parallelism on Many-Core for Deterministic Discrete Ordinates Transport .....	729
<i>Tom Deakin, Simon McIntosh-Smith, and Wayne Gaudin</i>	
Design and Development of Domain Specific Active Libraries with Proxy Applications .....	738
<i>Istvan Zoltan Reguly, Gihan R. Mudalige, and Michael B. Giles</i>	
Enabling Tractable Exploration of the Performance of Adaptive Mesh Refinement .....	746
<i>Courtenay T. Vaughan and Richard F. Barrett</i>	
Developing MiniApps on Modern Platforms Using Multiple Programming Models .....	753
<i>O.E.B. Messer, E. D’Azevedo, J. Hill, W. Joubert, S. Laosooksathit, and A. Tharrington</i>	
Evaluation of Parallel Communication Models in Nekbone, a Nek5000 Mini-Application .....	760
<i>Ilya Ivanov, Jing Gong, Dana Akhmetova, Ivy Bo Peng, Stefano Markidis, Erwin Laure, Rui Machado, Mirko Rahn, Valeria Bartsch, Alistair Hart, and Paul Fischer</i>	
Mini-App Driven Optimisation of Inertial Confinement Fusion Codes .....	768
<i>R.F. Bird, P. Gillies, M.R. Bareford, J.A. Herdman, and S.A. Jarvis</i>	

Introducing and Exploiting Hierarchical Structural Information .....	777
<i>Daniel Rubio Bonilla, Colin W. Glass, Jan Kuper, and Robert de Groot</i>	
CMT-bone: A Mini-App for Compressible Multiphase Turbulence Simulation Software .....	785
<i>Nalini Kumar, Mrugesh Sringarpure, Tania Banerjee, Jason Hackl, S. Balachandar, Herman Lam, Alan George, and Sanjay Ranka</i>	

## **HiPINEB 2015**

Fault-Tolerant Routing for Exascale Supercomputer: The BXI Routing Architecture .....	793
<i>Pierre Vignéras and Jean-Noël Quintin</i>	
Throughput Unfairness in Dragonfly Networks under Realistic Traffic Patterns .....	801
<i>Pablo Fuentes, Enrique Vallejo, Cristóbal Camarero, Ramón Beivide, and Mateo Valero</i>	
Modeling a Large Data-Acquisition Network in a Simulation Framework .....	809
<i>Tommaso Colombo, Holger Fröning, Pedro Javier García, and Wainer Vandelli</i>	
Efficient Queuing Schemes for HoL-Blocking Reduction in Dragonfly Topologies with Minimal-Path Routing .....	817
<i>Pedro Yébenes, Jesus Escudero-Sahuquillo, Pedro J. García, and Francisco J. Quiles</i>	
InfiniBand Verbs Optimizations for Remote GPU Virtualization .....	825
<i>Carlos Reaño and Federico Silla</i>	
Multipath Load Balancing for M &#215; N Communication Patterns on the Blue Gene/Q Supercomputer Interconnection Network .....	833
<i>Huy Bui, Robert Jacob, Preeti Malakar, Venkatram Viswanath, Andrew Johnson, Micheal E. Papka, and Jason Leigh</i>	
VEF Traces: A Framework for Modelling MPI Traffic in Interconnection Network Simulators .....	841
<i>Franisco J. Andújar, Juan A. Villar, José L. Sánchez, Francisco J. Alfaro, and Jesus Escudero-Sahuquillo</i>	
SlimUpdate: Minimal Routing Update for Performance-Based Reconfigurations in Fat-Trees .....	849
<i>Feroz Zahid, Ernst Gunnar Gran, Bartosz Bogdanski, Bjørn Dag Johnsen, and Tor Skeie</i>	

## **Campus Bridging: Reducing Obstacles on the Path to Big Answers**

XCBC and XNIT - Tools for Cluster Implementation and Management in Research and Training .....	857
<i>Jeremy Fischer, Eric Coulter, Richard Knepper, Charles Peck, and Craig A. Stewart</i>	
Building Bridges from the Campus to XSEDE .....	865
<i>Lee Liming, Ian Foster, and Steven Tuecke</i>	
<b>Author Index</b> .....	869