## Contents

**The 1st International Workshop on Data Reduction for Big Scientific Data (DRBSD-1)**

Toward Decoupling the Selection of Compression Algorithms from Quality Constraints ........................................... 3  
*Julian Kunkel, Anastasiia Novikova, Eugen Betke, and Armin Schaare*  

On the Scalability of Data Reduction Techniques in Current and Upcoming HPC Systems from an Application Perspective ................ 15  
*Axel Huebl, René Widera, Felix Schmitt, Alexander Matthes, Norbert Podhorszki, Jong Youl Choi, Scott Klasky, and Michael Bussmann*  

Toward a Multi-method Approach: Lossy Data Compression for Climate Simulation Data ................................ 30  
*Allison H. Baker, Haiying Xu, Dorit M. Hammerling, Shaomeng Li, and John P. Clyne*  

Exploration of Pattern-Matching Techniques for Lossy Compression on Cosmology Simulation Data Sets ....................... 43  
*Dingwen Tao, Sheng Di, Zizhong Chen, and Franck Cappello*  

**Third International Workshop on Communication Architectures for HPC, Big Data, Deep Learning and Clouds at Extreme Scale (ExaComm)**

Design Space Exploration of the Dragonfly Topology .............. 57  
*Min Yee Teh, Jeremiah J. Wilke, Keren Bergman, and Sébastien Rumley*  

High-Throughput Sockets over RDMA for the Intel Xeon Phi Coprocessor ............................................. 75  
*Aram Santogidis and Spyros Lalis*  

**Workshop on HPC Computing in a Post Moore’s Law World (HCPM)**

Reconfigurable Silicon Photonic Interconnect for Many-Core Architecture . . . 89  
*Hang Guan, Sébastien Rumley, Ke Wen, David Donofrio, John Shalf, and Keren Bergman*  

Instruction Set Architectures for Quantum Processing Units ............... 98  
*Keith A. Britt and Travis S. Humble*
Eliminating Dark Bandwidth: A Data-Centric View of Scalable, Efficient Performance, Post-Moore ........................................... 106
  Jonathan C. Beard and Joshua Randall

Towards an Integrated Strategy to Preserve Digital Computing Performance Scaling Using Emerging Technologies ........................................... 115
  Dilip Vasudevan, Anastasiia Butko, George Michelogiannakis,
  David Donofrio, and John Shalf

HPC I/O in the Data Center (HPC-IODC)

HPC I/O in the Data Center Workshop (HPC-IODC) ........................................... 127
  Julian Kunkel, Jay Lofstead, and Colin McMurtrie

Simulation of Hierarchical Storage Systems for TCO and QoS ........................... 132
  Jakob Luettgau and Julian Kunkel

GPU Erasure Coding for Campaign Storage ........................................... 145
  Walker Haddock, Matthew L. Curry, Purushotham V. Bangalore,
  and Anthony Skjellum

PIOM-PX: A Framework for Modeling the I/O Behavior of Parallel Scientific Applications ........................................... 160
  Pilar Gomez-Sanchez, Sandra Mendez, Dolores Rexachs,
  and Emilio Luque

Real-Time I/O-Monitoring of HPC Applications with SIOX,
Elasticsearch, Grafana and FUSE ........................................... 174
  Eugen Betke and Julian Kunkel

Output Performance Study on a Production Petascale Filesystem ......................... 187
  Bing Xie, Jeffrey S. Chase, David Dillow, Scott Klasky, Jay Lofstead,
  Sarp Oral, and Norbert Podhorszki

Second International Workshop on OpenPOWER for HPC (IWOPH’17)

GPU-Accelerated Particle-in-Cell Code on Minsky ........................................... 205
  Andreas Herten, Dirk Brömmel, and Dirk Pleiter

Pushing Big Data into Accelerators: Can the JVM
Saturate Our Hardware? ........................................... 220
  Johan Peltenburg, Ahmad Hesam, and Zaid Al-Ars

The Technological Roadmap of Parallware and Its Alignment with the OpenPOWER Ecosystem ........................................... 237
  Manuel Arenaz, Oscar Hernandez, and Dirk Pleiter
Contents XVII

Experiences Evaluating Functionality and Performance of IBM POWER8+ Systems .................................................. 254
Verónica G. Vergara Larrea, Wayne Joubert, Mark Berrill, Swen Boehm, Arnold Thrarrington, Wael R. Elwasif, and Don Maxwell

Power/Performance Controlling Techniques in OpenPOWER .... 275
Todd Rosedahl, Martha Broyles, Charles Lefurgy, Bjorn Christensen, and Wu Feng

Performance Evaluation of Container-Based High Performance Computing Ecosystem Using OpenPOWER ............. 290
Animesh Kuity and Sateesh Kumar Peddoju

Pre-exascale Architectures: OpenPOWER Performance and Usability Assessment for French Scientific Community .... 309
Gabriel Hautreux, Alfredo Buttari, Arnaud Beck, Victor Cameo, Dimitri Lecas, Dominique Aubert, Emeric Brun, Eric Boyer, Fausto Malvagi, Gabriel Staffelbach, Isabelle d’Ast, Joefrey Legaux, Ghislain Lartigue, Gilles Grasseau, Guillaume Latu, Juan Escobar, Julien Bigot, Julien Derouillat, Matthieu Haefele, Nicolas Renon, Philippe Parneauadeau, Philippe Wautelet, Pierre-Francois Lavalle, Pierre Kestener, Remi Lacroix, Stephane Requena, Anthony Scemama, Vincent Moureau, Jean-Mathieu Etancelin, and Yann Meurdesoif

Experiences on Intel Knights Landing at the One-Year Mark (IXPUG)

IXPUG: Experiences on Intel Knights Landing at the One Year Mark .... 327
Estela Suarez, Michael Lysaght, Simon J. Pennycook, and Richard A. Gerber

Analyzing Performance of Selected NESAP Applications on the Cori HPC System .................................................. 334
Thorsten Kurth, William Arndt, Taylor Barnes, Brandon Cook, Jack Deslippe, Doug Doerfler, Brian Friesen, Yun (Helen) He, Tuomas Koskela, Mathieu Lobet, Tareq Malas, Leonid Oliker, Andrey Ovsyannikov, Samuel Williams, Woo-Sun Yang, and Zhengji Zhao

On the Mitigation of Cache Hostile Memory Access Patterns on Many-Core CPU Architectures .................................... 348
Tom Deakin, Wayne Gaudin, and Simon McIntosh-Smith

From Knights Corner to Landing: A Case Study Based on a Hodgkin-Huxley Neuron Simulator .................................. 363
George Chatzikonstantis, Diego Jiménez, Esteban Meneses, Christos Strydis, Harry Sidiropoulos, and Dimitrios Soudris
Porting Tissue-Scale Cardiac Simulations to the Knights
Johannes Langguth, Chad Jarvis, and Xing Cai
376

KART – A Runtime Compilation Library for Improving HPC Application Performance
Matthias Noack, Florian Wende, Georg Zitzlsberger, Michael Klemm, and Thomas Steinke
389

Performance Evaluation of NWChem Ab-Initio Molecular Dynamics (AIMD) Simulations on the Intel® Xeon Phi™ Processor
Eric J. Bylaska, Mathias Jacquelin, Wibe A. de Jong, Jeff R. Hammond, and Michael Klemm
404

Performance Variability on Xeon Phi.
Brandon Cook, Thorsten Kurth, Brian Austin, Samuel Williams, and Jack Deslippe
419

Optimizing Fusion PIC Code Performance at Scale on Cori Phase Two
Tuomas Koskela and Jack Deslippe
430

amask: A Tool for Evaluating Affinity Masks in Many-Core Processors
Kent Milfeld
441

Second International Workshop on Performance Portable Programming Models for Accelerators (P^3MA)

Analyzing Offloading Inefficiencies in Scalable Heterogeneous Applications
Robert Dietrich, Ronny Tschüter, Guido Juckeland, and Andreas Knüpfer
457

Performance Portability Analysis for Real-Time Simulations of Smoke Propagation Using OpenACC
Anne Küsters, Sandra Wienke, and Lukas Arnold
477

Tuning and Optimization for a Variety of Many-Core Architectures Without Changing a Single Line of Implementation Code
Using the Alpaka Library
Alexander Matthes, René Widera, Erik Zenker, Benjamin Worpitz, Axel Huebl, and Michael Bussmann
496

An Embedded Domain Specific Language for General Purpose Vectorization
Przemysław Karpiński and John McDonald
515
Exploiting Auto-tuning to Analyze and Improve Performance Portability on Many-Core Architectures

*James Price and Simon McIntosh-Smith*

OpenACC 2.5 Validation Testsuite Targeting Multiple Architectures

*Kyle Friedline, Sunita Chandrasekaran, M. Graham Lopez, and Oscar Hernandez*

**12th Workshop on Virtualization in High-Performance Cloud Computing (VHPC’17)**

A Survey of Fast Packet I/O Technologies for Network Function Virtualization

*Giuseppe Lettieri, Vincenzo Maffione, and Luigi Rizzo*

Machine Learning Using Virtualized GPUs in Cloud Environments

*Uday Kurkure, Hari Sivaraman, and Lan Vu*

A Locality-Aware Communication Layer for Virtualized Clusters

*Simon Pickartz, Jonas Baude, Stefan Lankes, and Antonello Monti*

YASMIN: Efficient Intra-node Communication Using Generic Sockets

*Michalis Rozis, Stefanos Gerangelos, and Nectarios Koziris*

Dynamic Paging Method Switching - An Implementation for KVM

*Yu Zhang, Peter Tröger, and Matthias Werner*

Aggregating and Managing Memory Across Computing Nodes in Cloud Environments

*Luis A. Garrido and Paul Carpenter*

**Visualization at Scale: Deployment Case Studies and Experience Reports**

In-situ Visualization for Computation Workflows

*Alejandro Ribes, Ovidiu Mircescu, Anthony Geay, and Yvan Fournier*

From Big Data to Big Displays High-Performance Visualization at Blue Brain

*Stefan Eilemann, Marwan Abdellah, Nicolas Antille, Ahmet Bilgili, Grigory Chevtchenko, Raphael Dumusc, Cyrille Favreau, Juan Hernando, Daniel Nachbaur, Pawel Podhajski, Jafet Villafranca, and Felix Schürmann*
Workshop on Performance and Scalability of Storage Systems (WOPSSS)

An MPI-IO In-Memory Driver for Non-volatile Pooled Memory of the Kove XPD 679
    Julian Kunkel and Eugen Betke

HetFS: A Heterogeneous File System for Everyone 691
    Georgios Koloventzos, Ramon Nou, Alberto Miranda, and Toni Cortes

Scientific Applications Performance Evaluation on Burst Buffer 701
    George S. Markomanolis, Bilel Hadri, Rooh Khurram, and Saber Feki

JULEA: A Flexible Storage Framework for HPC 712
    Michael Kuhn

Delivering LHC Software to HPC Compute Elements with CernVM-FS 724
    Jakob Blomer, Gerardo Ganis, Nikola Hardi, and Radu Popescu

Scaling the EOS Namespace 731
    Andreas J. Peters, Elvin A. Sindrilaru, and Georgios Bitzes

Author Index 741
High Performance Computing
ISC High Performance 2017 International Workshops,
DRBSD, ExaComm, HCPM, HPC-IODC, IWOPH, IXPUG,
P^3MA, VHPC, Visualization at Scale, WOPSSS,
Frankfurt, Germany, June 18-22, 2017, Revised Selected
Papers
Kunkel, J.; Yokota, R.; Taufer, M.; Shalf, J. (Eds.)
2017, XX, 743 p. 266 illus., Softcover
ISBN: 978-3-319-67629-6