

**2017 IEEE 19th International
Conference on High Performance
Computing and Communications;
IEEE 15th International Conference
on Smart City; IEEE 3rd International
Conference on Data Science and
Systems (HPCC/SmartCity/DSS 2017)**

**Bangkok, Thailand
18 – 20 December 2017**



**IEEE Catalog Number: CFP1789E-POD
ISBN: 978-1-5386-2589-7**

**Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP1789E-POD
ISBN (Print-On-Demand):	978-1-5386-2589-7
ISBN (Online):	978-1-5386-2588-0

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2017 IEEE 19th International
 Conference on High
 Performance Computing
 and Communications; IEEE
 15th International Conference
 on Smart City; IEEE 3rd
 International Conference
 on Data Science and Systems

HPCC-SmartCity-DSS 2017

Table of Contents

HPCC/SmartCity/DSS 2017 Message from the General Chairs	xv
HPCC 2017 Message from the Program Chairs	xvii
SmartCity 2017 Message from the Program Chairs	xix
DSS 2017 Message from the Program Chairs	xx
HPCC 2017 Organizing Committee	xxi
SmartCity 2017 Organizing Committee	xxii
DSS 2017 Organizing Committee	xxiii
HPCC 2017 Program Committee	xxiv
SmartCity 2017 Program Committee	xxvi
DSS 2017 Program Committee	xxviii
HPCC 2017 Steering Committee	xxx
SmartCity 2017 Steering Committee	xxxi
DSS 2017 Steering Committee	xxxii
Sponsors	xxxiii
HPCC/SmartCity/DSS 2017 Proceedings Co-Editors	xxxiv

**Plenary Panel: Convergence
of High-Performance Computing
and Communication, Smart City, and Data
Sciences and Systems: Fields Helping Grand
Challenges and Each Other.....xxxv**

Session 1: HPCC Best Paper Finalists

Analysis and Modeling of the End-to-End I/O Performance on OLCF's Titan
Supercomputer1
*Lipeng Wan, Matthew Wolf, Feiyi Wang, Jong Youl Choi, George Ostrouchov,
and Scott Klasky*

Portable Parallel Design of Weighted Multi-Dimensional Scaling for Real-Time
Data Analysis10
Sajal Dash, Anshuman Verma, Chris North, and Wu-chun Feng

A Machine Learning Approach to Automatic Creation of Architecture-Sensitive
Performance Heuristics18
Biplab Kumar Saha, Tiffany A. Connors, Saami Rahman, and Apan Qasem

Comparative Performance Modeling of Parallel Preconditioned Krylov
Methods26
Kanika Sood, Boyana Norris, and Elizabeth Jessup

Libsec: A Hardware Virtualization-Based Isolation for Shared Library34
Weizhong Qiang, Yong Cao, Weiqi Dai, Deqing Zou, Hai Jin, and Benxi Liu

Session 2A: Smart Data and Learning (SmartCity)

Urban Waterlogging Detection and Severity Prediction Using Artificial Neural
Networks42
Apoorv Gupta, Aman Bansal, Rishab Gupta, Deepika Naryani, and Apoorvi Sood

Role of Deep LSTM Neural Networks and Wi-Fi Networks in Support
of Occupancy Prediction in Smart Buildings50
Basheer Qolomany, Ala Al-Fuqaha, Driss Benhaddou, and Ajay Gupta

Multi-agent Based Smart Grid System Development for Building Energy
and Comfort Management58
Aigerim Altayeva, Batyrkhan Omarov, Andrey Giyenko, and Young Im Cho

Session 2B: Computational Tuning (HPCC)

ATF: A Generic Auto-Tuning Framework	64
<i>Ari Rasch, Michael Haidl, and Sergei Gorlatch</i>	
Revisiting Online Autotuning for Sparse-Matrix Vector Multiplication Kernels on Next-Generation Architectures	72
<i>Simon Garcia De Gonzalo, Simon D. Hammond, Christian R. Trott, and and Wen-Mei Hwu</i>	
A Novel Heuristic for Data Distribution in Massively Parallel Phylogenetic Inference Using Site Repeats	81
<i>Benoit Morel, Tomáš Flouri, and Alexandros Stamatakis</i>	

Session 2C: Memory and File Systems (HPCC)

SNFS: Small Writes Optimization for Log-Structured File System Based-on Non-Volatile Main Memory	89
<i>Yang Li Fang Liu Nong Xiao Jianqiang Zeng Lingyu Zhu</i>	
Boosting Disk Performance by Compressing On-board Disk Cache	98
<i>Wen Jiang, Yuhui Deng, Xiaohua Meng, Cheng Hu, and Yongtao Zhou</i>	
KV-FTL: A Novel Key-Value-Based FTL Scheme for Large Scale SSDs	106
<i>Juan Li, Zhengguo Chen, Zhiguang Chen, Nong Xiao, Fang Liu, and Wei Chen</i>	

Session 3A: Smart Communication (SmartCity)

Management of Distributed Electrical Storage in Wide Area Communication Systems	115
<i>Heinz Ulrich Boehmer Feihn, Mark A. Hinkle, Richard Wallace Kenyon, and Alan Mickelson</i>	
Exploring Home and Work Locations in a City from Mobile Phone Data	123
<i>Lumpsum Tongsinoot and Veera Muangsin</i>	
Metrics-Based Assessment of Sustainability in Demand Response	130
<i>Swagata Sharma, Venkat Durvasulu, Berk Celik, Siddharth Suryanarayanan, Timothy M. Hansen, Anthony A. Maciejewski, and Howard Jay Siegel</i>	

Session 3B: Parallel Algorithm Applications I (HPCC)

Hierarchical Parallelization of Multi-coloring Algorithms for Block IC Preconditioners	138
<i>Masatoshi Kawai, Akihiro Ida, and Kengo Nakajima</i>	
DCEIL: Distributed Community Detection with the CEIL Score	146
<i>Akash Jain, Rupesh Nasre, and Balaraman Ravindran</i>	

A Multi-core Multicast Approach for Delay and Delay Variation Multicast Routing	154
<i>Hovhanness A. Harutyunyan and Meghrig Terzian</i>	

Session 3C: Energy-aware Scheduling of Virtual Machines (HPCC)

Energy-Aware VM Placement with Periodical Dynamic Demands in Cloud Datacenters	162
<i>Qian Zhang, Hua Wang, Fangjin Zhu, Shanwen Yi, Kang Feng, and Linbo Zhai</i>	
Energy Efficient Scheduling of Scientific Workflows in Cloud Environment	170
<i>Manojit Ghose, Pratyush Verma, Sushanta Karmakar, and Aryabartta Sahu</i>	
Energy Efficient Scheduling of Real-Time Tasks in Cloud Environment	178
<i>Sawinder Kaur, Manojit Ghose, and Aryabartta Sahu</i>	

Session 3D: Smart City Applications (SmartCity)

Autonomous Grocery Delivery Service in Urban Areas	186
<i>Mihai Kocsis, Johannes Buyer, Nico Sußmann, Raoul Zöllner, and Gheorghe Mogan</i>	
The Smart Cheap City: Efficient Waste Management on a Budget	192
<i>Massimo Marchiori</i>	
An Analytical Study Towards the UAE Universities Smart Education Innovated Approaches	200
<i>Shaikha Saleh Mohamed, Nedaa Baker Al Barghuthi, and Huwida Said</i>	

Session 4A: Parallel Programming Model Optimizations (HPCC)

Process-Based Asynchronous Progress Model for MPI Point-to-Point Communication	206
<i>Min Si and Pavan Balaji</i>	
Model-Based Scheduling for Stream Processing Systems	215
<i>Yidan Wang, Zahir Tari, M.Reza HoseinyFarahabady, and Albert Y. Zomaya</i>	

Session 4B: Optimizations for Deep Learning II (HPCC)

Towards Scalable Deep Learning via I/O Analysis and Optimization	223
<i>Sarunya Pumma, Min Si, Wu-chun Feng, and Pavan Balaji</i>	
iRDMA: Efficient Use of RDMA in Distributed Deep Learning Systems	231
<i>Yufei Ren, Xingbo Wu, Li Zhang, Yandong Wang, Wei Zhang, Zijun Wang, Michel Hack, and Song Jiang</i>	

Session 4C: Machine Learning (HPCC)

Robust Feature Selection for IM Applications at Early Stage Traffic Classification Using Machine Learning Algorithms	239
<i>Muhammad Shafiq, Xiangzhan Yu<sup>, and</sup> Dawei Wang</i>	
An Implementation of Number Plate Recognition without Segmentation Using Convolutional Neural Network	246
<i>Jie Liu, Xin Li, Hao Zhang, Chengcheng Liu, Lei Dou, and Lei Ju</i>	

Session 4D: Computational Analysis (HPCC)

Data Mining Based Root-Cause Analysis of Performance Bottleneck for Big Data Workload	254
<i>Weichen Qi, Yunchun Li, Hongang Zhou, Wei Li, and Hailong Yang</i>	
Quantifying and Mitigating Computational Inefficiency of Genomics Data Analysis	262
<i>Xueqi Li, Guangming Tan, Chunming Zhang, Xu Li, Zhonghai Zhang, and Ninghui Sun</i>	

Session 5A: Data Processing and Analytics (DSS)

An Efficient Type-Agnostic Approach for Finding Sub-sequences in Data	270
<i>Bertil Chapuis, Benoît Garbinato, and Periklis Andritsos</i>	
From Densification Power Law to Degree of Separation: A Case Study	278
<i>James She, Chen Zhao, Ming Cheung, and Hao Liang</i>	
Identifying Dominant Amino Acid Pairs of Known Protein-Protein Interactions via K-Means Clustering	286
<i>Sudsanguan Ngamsuriyaroj and Kittirat Thepsutum</i>	

Session 5B: Network Design and Monitoring (HPCC)

A Scalable Architecture for High Availability Seamless Redundancy (HSR)	292
<i>James T. Yu</i>	
An Optical Interconnect Network Design for Dynamically Composable Data Centers	299
<i>Mingwei Yang, Ivan B. Djordjevic, Cihan Tunc, Salim Hariri, and Ali Akoglu</i>	
The Model of the Queuing System with Adaptive Traffic	303
<i>Slawomir Hanczewski, Maciej Stasiak, and Joanna Weissenberg</i>	
EffiView: Trigger-Based Monitoring Approach with Low Cost in SDN	309
<i>Binfeng Wang, Jinshu Su, Junnan Li, and Biao Han</i>	

Session 5C: System-Based Optimizations (HPCC)

Deep and Shallow Convections in Atmosphere Models on Intel® Xeon Phi™ Coprocessor Systems	316
<i>Srinivasan Ramesh, Sathish Vadhiyar, Ravi Nanjundiah, and PN Vinayachandran</i>	
Efficient Mapping of Multi-threaded Applications onto 3D Stacked Chip-Multiprocessor	324
<i>Rakesh Pandey and Aryabartta Sahu</i>	
Cider: a Rapid Docker Container Deployment System through Sharing Network Storage	332
<i>Lian Du, Tianyu Wo, Renyu Yang, and Chunming Hu</i>	
Diluting the Scalability Boundaries: Exploring the Use of Disaggregated Architectures for High-Level Network Data Analysis	340
<i>Carlos Vega, Jose Fernando Zazo, Hugo Meyer, Ferad Zyulkyarov, S. Lopez-Buedo, and Javier Aracil</i>	

Session 5D: Parallel Data Structures and Algorithms (HPCC)

A Parallel Hybrid Intelligent Algorithm for Fuzzy Mean-CVaR Portfolio Model	348
<i>Chen Li, Zhonghua Lu, Yonghong Hu, Fang Liu, and Jue Wang</i>	
FatCBST: Concurrent Binary Search Tree with Fatnodes	356
<i>Praveen Alapati, Venkata Kalyan Tavva, and Madhu Mutyam</i>	
A Cache-Aware Approach to Adaptive Mesh Refinement in Parallel Stencil-Based Solvers	364
<i>Gaurav Saxena, Peter K. Jimack, and Mark A. Walkley</i>	
Sigcon: Simplifying a Graph Based on Degree Correlation and Clustering Coefficient	372
<i>Hojin Jung and Songkuk Kim</i>	

Session 6A: Data Applications (DSS)

User Preference-Based Probability Spreading for Tag-Aware Content Recommendation	380
<i>Jan Friedrich, Christoph Lindemann, and Michael Petrifke</i>	
Dynamic Learning Optimization Algorithm for P2P-VoD Systems	388
<i>Amir Nakib, Thibaud Rohmer, El-Ghazali Talbi, and Abdelhamid Nafaa</i>	
The Paradox of the Shopping Mall: Costumers Flows and Market Efficiency	396
<i>Massimo Marchiori</i>	

Session 6B: Security (HPCC)

Lightweight Anonymous RFID Group Ownership Transfer Protocol in Multi-owner Environment	404
<i>Dali Zhu, Wenjing Rong, Di Wu, and Na Pang</i>	
GAKAV: Group Authentication and Key Agreement for LTE/LTE-A Vehicular Networks	412
<i>Cheng Xu, Xiaohong Huang, Maode Ma, and Hong Bao</i>	
The Best Defense Strategy against Session Hijacking Using Security Game in SDN	419
<i>Zhenping Lu, Fucai Chen, Guozhen Cheng, and Shuxin Li</i>	

Session 6C: GPUs (HPCC)

Block-Space GPU Mapping for Embedded Sierpi ski Gasket Fractals	427
<i>Cristóbal A. Navarro, Raimundo Vega, Benjamín Bustos, and Nancy Hitschfeld</i>	
Accelerating K-mer Frequency Counting with GPU and Non-Volatile Memory	434
<i>Nicola Cadenelli, Jordà Polo, and David Carrera</i>	
Automatically Selecting Profitable Thread Block Sizes for Accelerated Kernels	442
<i>Tiffany A. Connors and Apan Qasem</i>	

Session 6D: Parallel Algorithm Applications II (HPCC)

Integrated Quality Mesh Generation for Poisson Surface Reconstruction in HPC Applications	450
<i>Han Song, Yongxin Zhu, Junjie Hou, Han Wu, Long Li, Qian Wang, and Meikang Qiu</i>	
N2DLOF: A New Local Density-Based Outlier Detection Approach for Scattered Data	458
<i>Shubin Su, Limin Xiao, Zhoujie Zhang, Fei Gu, Li Ruan, Shupan Li, Zhenxue He, Zhisheng Huo, Baicheng Yan, Haitao Wang, and Shaobo Liu</i>	
Proof of Vote: A High-Performance Consensus Protocol Based on Vote Mechanism & Consortium Blockchain	466
<i>Kejiao Li, Hui Li, Hanxu Hou, Kedan Li, and Yongle Chen</i>	

Session 7A: Systems Scheduling (HPCC)

Enabling Interactive Video Streaming for Public Safety Monitoring through Batch Scheduling	474
<i>Matin Hosseini, Mohsen Amini Salehi, and Raju Gottumukkala</i>	

Periodic Scheduling of Profiling-Based Floating-Window Bandwidth Reservations for Scientific Collaboration	482
<i>Yongqiang Wang, Chase Q. Wu, and Aiqin Hou</i>	
Optimal Energy-Aware Scheduling in VFI-enabled Multicore Systems	490
<i>Shervin Hajiamini, Behrooz Shirazi, Chris Cain, and Hongbo Dong</i>	
Virtual Machine Provisioning for Applications with Multiple Deadlines in Resource-Constrained Clouds	498
<i>Rehana Begam, Wei Wang, and Dakai Zhu</i>	

Session 7B: The Cloud and Virtual Systems (HPCC)

Guarantee-Aware Cost Effective Virtual Machine Placement Algorithm for the Cloud	506
<i>Long Li and Ke Liu</i>	
Cost-Efficient Big Intermediate Data Placement in a Collaborative Cloud Storage Environment	514
<i>Sonia Ikken, Éric Renault, Amine Barkat, Abdelkamel Tari, and Tahar Kechad</i>	
Sherlock: Lightweight Detection of Performance Interference in Containerized Cloud Services	522
<i>Kartik Joshi, Arun Raj, and Dharanipragada Janakiram</i>	
vScope: A Fine-Grained Approach to Schedule vCPUs in NUMA Systems	531
<i>Qingtian Gan, Song Wu, Hai Jin, and Kun Wang</i>	

Session 7C: Tolerating and Preventing Storage Faults (HPCC)

A Diskless Checkpointing Scheme Based on Vertical Encoding to Lower Fault Tolerance Overhead	539
<i>Jin-Min Yang and Enquan Yan</i>	
Rejuvenating Shadows: Fault Tolerance with Forward Recovery	547
<i>Xiaolong Cui, Taieb Znati, and Rami Melhem</i>	
File Aware Wear Leveling for PCM-based Mobile Consumer Electronics	555
<i>Zheng Zhang, Dan Feng, Zhipeng Tan, Jianxi Chen, Wei Zhou, and Laurence T. Yang</i>	
A Load-Aware Data Migration Scheme for Distributed Surveillance Video Processing with Hybrid Storage Architecture	563
<i>Yangyang Gao, Haitao Zhang, Yanpei Zhu, Bingchang Tang, and Huadong Ma</i>	

Session 7D: Embedded Systems (HPCC)

Adaptive Deadlock Detection and Resolution in Real-Time Distributed Environments	571
<i>Waqar Haque, Matthew Fontaine, and Adam Vezina</i>	
A Time-Aware Programming Framework for Constructing Predictable Real-Time Systems	578
<i>Bo Wan, Haizhao Luo, Kaiqi Zhou, Xi Li, Chao Wang, Xianglan Chen, and Xuehai Zhou</i>	
Time Mode Based Next Position Prediction System	586
<i>Chongsheng Yu, Xin Li, Lei Ju, Yu Zhang, Jian Qin, Lei Dou, and Jie Liu</i>	
A Cost Efficient Design of a Multi-sink Multi-controller WSN in a Smart Factory	594
<i>Hamid Reza Faragardi, Hossein Fotouhi, Thomas Nolte, and Rahim Rahmani</i>	

HPCC Poster (Short) Papers

Efficient Asynchronous Communication between Virtual Machines in Embedded Systems	603
<i>Rui Wang, Libin Xu, Yuebin Bai, Zhongzhao Wang, Hailong Yang, and Lijun Zhang</i>	
Speeding up Coarse Grain Multicomputer Based Parallel Algorithm for Optimal Binary Search Tree by Minimizing Idleness of Processors	605
<i>Vianney Kengne Tchendji and Jean Frédéric Myoupo</i>	
A Study of Distributed MOEA/D Based on Spark Framework	609
<i>Defu Zhang, Yingdong Ma, and Jinxiu Chen</i>	
Measurement and Analysis of LTE Cell Range and Downlink Throughput in Suburban Area	611
<i>Yi Hua Chen, Chang Lueng Chu, and Kai Jen Chen</i>	
Tackling Gaps in Floating-Point Arithmetic: Unum Arithmetic Implementation on FPGA	615
<i>Junjie Hou, Yongxin Zhu, Yulan Shen, Mengjun Li, Han Wu, and Han Song</i>	
ConsortiumDNS: A Distributed Domain Name Service Based on Consortium Chain	617
<i>Xiangui Wang, Kedan Li, Hui Li, Yinghui Li, and Zhiwei Liang</i>	
Improving the Parallel Performance of an NBody Application Using Adaptive Techniques in HPX	621
<i>Zahra Khatami, Hartmut Kaiser, and J. Ramanujam</i>	
Towards the Reproduction of Selected Dynamic Loop Scheduling Experiments Using SimGrid-SimDag	623
<i>Ali Mohammed, Ahmed Eleliemy, and Florina M. Ciorba</i>	

SmartCity Poster (Short) Papers

Multi-objective Optimization for Smart Building Energy and Comfort Management as a Case Study of Smart City Platform	627
<i>Aigerim Altayeva, Batyrkhan Omarov, and Young Im Cho</i>	

DSS Poster (Short) Papers

Data Model Logger - Data Discovery for Extract-Transform-Load	629
<i>Manik Madhikermi, Andrea Buda, Bhargav Dave, and Kary Främling</i>	
GCG: General Consistencies Guarantee of Software-Defined Network Updates	631
<i>Zhe Wang, Chang Shu, Zhiwei Zhao, Yuntong Zhang, Luqi Yang, and Geyong Min</i>	

Author Index	633
---------------------------	------------