
(CCGrid 2012)

Ottawa, Ontario, Canada
13 – 16 May 2012

CCGrid 2012

Table of Contents

Message from the General Chair ................................................................. xviii
Message from the Program Co-Chairs .................................................... xx
Chairs and Committees ........................................................................xxxii
Program Committee Members .............................................................. xxiv
Steering Committee ............................................................................. xxvii
External Reviewers .............................................................................. xxviii
Keynote Addresses ............................................................................... xxxi

Session 1A: Programming Models and File Systems

Design and Implementation of Portable and Efficient Non-blocking Collective Communication ................................................................. 1

Akihiro Nomura, Yutaka Ishikawa, Naoya Maruyama, and Satoshi Matsuoka

Productive Parallel Linear Algebra Programming with Unstructured Topology Adaption .................................................................................. 9

Peter Gottschling and Torsten Hoefler

User Transparent Data and Task Parallel Multimedia Computing with Pyxis-DT .................................................................................. 17

Timo van Kessel, Niels Drost, Jason Maassen, Henri E. Bal, and Frank J. Seinstra

CEFLS: A Cost-Effective File Lookup Service in a Distributed Metadata File System .................................................................................. 25

Xiuqiao Li, Bin Dong, Limin Xiao, Li Ruan, and Dongmei Liu

Fine-Grained Access Control in the Chirp Distributed File System .................................................................................. 33

Patrick Donnelly and Douglas Thain
**Session 1B: Map Reduce and Workflows**

Towards Trusted Services: Result Verification Schemes for MapReduce ..................................................41  
  *Chu Huang, Sencun Zhu, and Dinghao Wu*

MARLA: MapReduce for Heterogeneous Clusters ..............................................................................................49  
  *Zacharia Fadika, Elif Dede, Jessica Hartog, and Madhusudhan Govindaraju*

A Map-Reduce Based Framework for Heterogeneous Processing Element  
Cluster Environments ..................................................................................................................................57  
  *Yu Shyang Tan, Bu-Sung Lee, Bingsheng He, and Roy H. Campbell*

Workflow Scheduling to Minimize Data Movement Using Multi-constraint Graph Partitioning .........................................................65  
  *Masahiro Tanaka and Osamu Tatebe*

Decentralized Orchestration of Data-centric Workflows Using the Object Modeling System ........................................................73  
  *Bahman Javadi, Martin Tomko, and Richard O. Sinnott*

**Session 1C: QoS and Architecture**

Efficient Disk I/O Scheduling with QoS Guarantee for Xen-based Hosting Platforms ..................................................................................81  
  *Xiao Ling, Hai Jin, Shadi Ibrahim, Wenzhi Cao, and Song Wu*

MORPHOSYS: Efficient Colocation of QoS-Constrained Workloads in the Cloud ..................................................90  
  *Vatche Ishakian and Azer Bestavros*

Reward Scheduling for QoS in Cloud Applications ..............................................................................................98  
  *Ahmed Elnably, Kai Du, and Peter Varman*

Evaluating Dynamics and Bottlenecks of Memory Collaboration in Cluster Systems ..................................................107  
  *Ahmad Samih, Ren Wang, Christian Maciocco, Tsung-Yuan Charlie Tai, Ronghui Duan, Jiangang Duan, and Yan Solihin*

Energy- and Cost-Efficiency Analysis of ARM-Based Clusters ..............................................................................115  
  *Zhonghong Ou, Bo Pang, Yang Deng, Jukka K. Nurminen, Antti Ylä-Jääski, and Pan Hui*
**Session 2A: GPU**

Transparent Accelerator Migration in a Virtualized GPU Environment ..................................................124  
  Shucai Xiao, Pavan Balaji, James Dinan, Qian Zhu, Rajeev Thakur,  
  Susan Coghlan, Heshan Lin, Gaojin Wen, Jue Hong, and Wu-chun Feng  

GPU Performance Enhancement via Communication Cost Reduction: Case Studies of Radix Sort and WSN Relay Node Placement Problem ............................................................132  
  Che-Rung Lee, Shih-Hsiang Lo, Nan-Hsi Chen, Yeh-Ching Chung,  
  and I-Hsin Chung  

Scheduling Concurrent Applications on a Cluster of CPU-GPU Nodes ...................................................140  
  Vignesh T. Ravi, Michela Becchi, Wei Jiang, Gagan Agrawal,  
  and Srimat Chakradhar  

A Highly Parallel Multi-class Pattern Classification on GPU .................................................................148  
  Mahdi Nabiyouni and Delasa Aghamirzaie

**Session 2B: Cloud Services I**

Client Classification Policies for SLA Enforcement in Shared Cloud Datacenters ..........................................................156  
  Mario Macías and Jordi Guitart  

Policy-Based Automation of SLA Establishment for Cloud Computing Services ..................................................164  
  Mohan Baruwal Chhetri, Quoc Bao Vo, and Ryszard Kowalczyk  

SLA-based Optimization of Power and Migration Cost in Cloud Computing .............................................172  
  Hadi Goudarzi, Mohammad Ghasemazar, and Massoud Pedram  

Service Level Agreement for Distributed Mutual Exclusion in Cloud Computing .............................................180  
  Jonathan Lejeune, Luciana Arantes, Julien Sopena, and Pierre Sens

**Session 2C: I/O and File Systems**

On Urgency of I/O Operations ..................................................................................................................188  
  Mahmut Kandemir, Taylan Yemliha, Ramya Prabhakar, and Myoungsoo Jung  

Boosting Application-Specific Parallel I/O Optimization Using IOSIG .....................................................196  
  Yanlong Yin, Surendra Byna, Huaiming Song, Xian-He Sun, and Rajeev Thakur  

SERAA-IO: Integrating Energy Consciousness into Parallel I/O Middleware ..............................................204  
  Rong Ge, Xizhou Feng, and Xian-He Sun
Supporting User-Defined Subsetting and Aggregation over Parallel NetCDF Datasets .................................................................212
Yu Su and Gagan Agrawal

Session 3A: Communication and Networks

Scalable Multi-purpose Network Representation for Large Scale Distributed System Simulation .........................................................220
Laurent Bobelin, Arnaud Legrand, David A. González Márquez,
Pierre Navarro, Martin Quinson, Frédéric Suter, and Christophe Thiéry

Topology Agnostic Dynamic Quick Reconfiguration for Large-Scale Interconnection Networks ........................................................228
Frank Olaf Sem-Jacobsen and Olav Lysne

Scalable Memcached Design for InfiniBand Clusters Using Hybrid Transports ........................................................................236
Jithin Jose, Hari Subramoni, Krishna Kandalla, Md. Wasi-ur-Rahman,
Hao Wang, Sundeep Naravula, and Dhabaleswar K. Panda

Lowering Inter-datacenter Bandwidth Costs via Bulk Data Scheduling ......................................................................................244
Thyaga Nandagopal and Krishna P.N. Puttaswamy

A Scalable Parallel Debugging Library with Pluggable Communication Protocols ........................................................................252
Chao Jin, David Abramson, Minh Ngoc Dinh, Andrew Gontarek,
Robert Moench, and Luiz DeRose

Session 3B: Faults, Failures and Reliability

Task Scheduling Algorithm for Multicore Processor System for Minimizing Recovery Time in Case of Single Node Fault .........................260
Shohei Gotoda, Minoru Ito, and Naoki Shibata

Speculative Memory State Transfer for Active-Active Fault Tolerance ......................................................................................268
Maohua Lu and Tzi-cker Chiueh

Checkpointing Orchestration: Toward a Scalable HPC Fault-Tolerant Environment .......................................................................276
Hui Jin, Tao Ke, Yong Chen, and Xian-He Sun

An Autonomous Reliability-Aware Negotiation Strategy for Cloud Computing Environments .....................................................................................284
Amir Vahid Dastjerdi and Rajkumar Buyya

Separating Performance Anomalies from Workload-Explained Failures in Streaming Servers .................................................................292
Carlos Augusto Cunha and Luis Moura e Silva
Session 3C: Workflows

A Multi-objective Approach for Workflow Scheduling in Heterogeneous Environments

Hamid Mohammadi Fard, Radu Prodan, Juan Jose Durillo Barrionuevo, and Thomas Fahringer

Automating Data-Throttling Analysis for Data-Intensive Workflows

Ricardo J. Rodriguez, Rafael Tolosana-Calasanz, and Omer F. Rana

Self-Healing of Operational Workflow Incidents on Distributed Computing Infrastructures

Rafael Ferreira da Silva, Tristan Glatard, and Frédéric Desprez

A Workflow-Aware Storage System: An Opportunity Study

Emalayan Vairavanathan, Samer Al-Kiswany, Lauro Beltrão Costa, Zhao Zhang, Daniel S. Katz, Michael Wilde, and Matei Ripeanu

Using Model Checking to Analyze the System Behavior of the LHC Production Grid

Daniela Remenska, Tim A.C. Willemse, Kees Verstoep, Wan Fokkink, Jeff Templon, and Henri Bal

Session 3D: Scheduling and Monitoring

WSCOM: Online Task Scheduling with Data Transfers

Jean-Noël Quintin and Frédéric Wagner

Improving Grid Resource Usage: Metrics for Measuring Fragmentation

Luis Tomás, Blanca Caminero, and Carmen Carrión

Malleable Model Coupling with Prediction

Daihee Kim, J. Walter Larson, and Kenneth Chiu

Load Balancing Query Processing in Metric-Space Similarity Search

Veronica Gil-Costa and Mauricio Marin

Distributed Monitoring with Collaborative Prediction

Dawei Feng, Cécile Germain-Renaud, and Tristan Glatard

Session 4A: Programming Models

Delta Send-Recv for Dynamic Pipelining in MPI Programs

Bin Bao, Chen Ding, Yaoqing Gao, and Roch Archambault

Global Futures: A Multithreaded Execution Model for Global Arrays-based Applications

Daniel Chavarria-Miranda, Sriram Krishnamoorthi, and Abhinav Vishnu
Productivity and Performance of Global-View Programming with XcalableMP
PGAS Language ........................................................................................................................................402
Masahiro Nakao, Jinpil Lee, Taisuke Boku, and Mitsuhisa Sato

Distributed S-Net: Cluster and Grid Computing without the Hassle ..............................................410
Clemens Grelck, Jukka Julku, and Frank Penczek

Session 4B: Map Reduce
Investigation of Data Locality in MapReduce ...........................................................................................419
Zhenhua Guo, Geoffrey Fox, and Mo Zhou
TomusBlobs: Towards Communication-Efficient Storage for MapReduce
Applications in Azure ................................................................................................................................427
Radu Tudoran, Alexandru Costan, Gabriel Antoniu, and Hakan Soncu
Maestro: Replica-Aware Map Scheduling for MapReduce .................................................................435
Shadi Ibrahim, Hai Jin, Lu Lu, Bingsheng He, Gabriel Antoniu, and Song Wu
SciMATE: A Novel MapReduce-Like Framework for Multiple Scientific Data
Formats ......................................................................................................................................................443
Yi Wang, Wei Jiang, and Gagan Agrawal

Session 4C: Cloud Computing I
Pricing Cloud Compute Commodities: A Novel Financial Economic Model ........................................451
Bhanu Sharma, Ruppa K. Thulasiram, Parimala Thulasiraman,
Saurabh K. Garg, and Rajkumar Buyya
A Time-Series Pattern Based Noise Generation Strategy for Privacy Protection
in Cloud Computing ................................................................................................................................458
Gaofeng Zhang, Yun Yang, Xiao Liu, and Jinjun Chen
COCA: Computation Offload to Clouds Using AOP ........................................................................466
Hsing-Yu Chen, Yue-Hsun Lin, and Chen-Mou Cheng
ParaLite: Supporting Collective Queries in Database System to Parallelize
User-Defined Executable .......................................................................................................................474
Ting Chen and Kenjiro Taura

Session 5A: Virtualization
Snooze: A Scalable and Autonomic Virtual Machine Management Framework
for Private Clouds ........................................................................................................................................482
Eugen Feller, Louis Rilling, and Christine Morin
RO-BURST: A Robust Virtualization Cost Model for Workload Consolidation over Clouds .............................................................. 490
  Jianzong Wang, Rui Hua, Yifeng Zhu, Jiguang Wan, Changsheng Xie, and Yanjun Chen

A Stable Network-Aware VM Placement for Cloud Systems ......................................................... 498
  Ofer Biran, Antonio Corradi, Mario Fanelli, Luca Foschini, Alexander Nus, Danny Raz, and Ezra Silvera

Surreptitious Deployment and Execution of Kernel Agents in Windows Guests .......................... 507
  Tzi-cker Chiueh, Matthew Conover, and Bruce Montague

Session 5B: Cloud Services II

Cloud Service Negotiation: Concession vs. Tradeoff Approaches ................................................. 515
  Xianrong Zheng, Patrick Martin, and Kathryn Brohman

Interactive Use of Cloud Services: Amazon SQS and S3 ............................................................ 523
  Hobin Yoon, Ada Gavrílovská, Karsten Schwan, and Jim Donahue

Dynamic Replication in Service-Oriented Systems .................................................................... 531
  Mathias Björkqvist, Lydia Y. Chen, and Walter Binder

Selling T-shirts and Time Shares in the Cloud .............................................................................. 539
  Daniel Gmach, Jerry Rolia, and Ludmila Cherkasova

Session 5C: Data on the Cloud

Scalable Join Queries in Cloud Data Stores .................................................................................. 547
  Zhou Wei, Guillaume Pierre, and Chi-Hung Chi

Privacy Preserving Access Control with Authentication for Securing Data in Clouds .............. 556
  Sushmita Ruj, Milos Stojmenovic, and Amiya Nayak

A Cost-Effective Mechanism for Cloud Data Reliability Management Based on Proactive Replica Checking ................................................................. 564
  Wenhao Li, Yun Yang, Jinjun Chen, and Dong Yuan

A Model and Decision Procedure for Data Storage in Cloud Computing ................................... 572
  Arkaitz Ruiz-Alvarez and Marty Humphrey

Session 6A: Multicore Architectures

A Bandwidth-Optimized Multi-core Architecture for Irregular Applications ............................. 580
  Simone Secchi, Antonino Tumeo, and Oreste Villa

Parallel Real-Time OLAP on Multi-core Processors ................................................................... 588
  Frank Dehne and Hamidreza Zaboli
Minimizing the Data Transfer Time Using Multicore End-System Aware Flow  
Vishal Ahuja, Dipak Ghosal, and Matthew Farrens  

Cache Conscious Task Regrouping on Multicore Processors  
Xiaoya Xiang, Bin Bao, Chen Ding, and Kai Shen

Session 6B: Cloud Computing II
An Analysis of Provisioning and Allocation Policies  
for Infrastructure-as-a-Service Clouds  
David Villegas, Athanasios Antoniou, Seyed Masoud Sadjadi, and Alexandru Iosup

The Impact of User Rationality in Federated Clouds  
Marian Mihailescu and Yong Meng Teo

Automated Tagging for the Retrieval of Software Resources in Grid and Cloud Infrastructures  
Ioannis Katakis, George Pallis, Marios D. Dikaiakos, and Onisiforos Onoufriou

Time and Cost Sensitive Data-Intensive Computing on Hybrid Clouds  
Tekin Bicer, David Chiu, and Gagan Agrawal

Session 6C: Applications
Lightweight Resource Scaling for Cloud Applications  
Rui Han, Li Guo, Moustafa M. Ghanem, and Yike Guo

Performance Modeling and Comparative Analysis of the MILC Lattice QCD Application su3_rmd  
Greg Bauer, Steven Gottlieb, and Torsten Hoefler

An Efficient Parallel Implementation for Three-Dimensional Incompressible Pipe Flow Based on SIMPLE  
Ji-Lin Zhang, Li-Ting Zhu, Jian Wan, Jie Mao, Xiang-Hua Xu, Cong-Feng Jiang, and Peng Di

Parallel Simulation of Peer-to-Peer Systems  
Martin Quinson, Cristian Rosa, and Christophe Thiéry

Poster Papers
Automated Construction of Performance Models for High Performance Distributed Applications  
Ahmad Mizan and Greg Franks
A Cloud Infrastructure for Optimization of a Massive Parallel Sequencing Workflow ...................................................................................................................................................678

Olivier Terzo, Lorenzo Mossucca, Andrea Acquaviva, Francesco Abate, and Rosalba Provenzano

Pseudo Random Number Generation for Parallelized Jobs on Clusters ........................................................................................................................................680

Mike Mikailov, Sithu D. Sudarsan, and Fu-Jyh Luo

Creating Your Own Private Cloud: Ezilla Toolkit—For Coordinated Storage, Computing, and Networking Services ...............................................................................................................682

Yi-Lun Pan, Chang-Hsing Wu, Hsi-En Yu, Hui-Shan Chen, and Weicheng Huang

On Effective Quality of Service Negotiation ...................................................................................................................................................684

Khalid Mansour, Ryszard Kowalczyk, and Mohan Baruwal Chhetri

IDSaaS: Intrusion Detection System as a Service in Public Clouds ........................................................................................................................................686

Turki Alharkan and Patrick Martin

Distributed Shared Memory and Compiler-Induced Scalable Locality for Scalable Cluster Performance ........................................................................................................................................688

Mohamed Abdalkader, Ian Burnette, Tim Douglas, and David G. Wonnacott

A Comparative Study of Cloud Computing Middleware ........................................................................................................................................690

Chaker El Amrani, Kaoutar Bahri Filali, Kaoutar Ben Ahmed, Amadou Tidiane Diallo, Stéphano Telolahy, and Tarek El-Ghazawi

Automatic Adaptive Page-Size Control for Remote Memory Paging ........................................................................................................................................694

Hiroko Midorikawa and Joe Uchiyama

Analyzing Effect of Network Processor’s Cache Dependent Parameter on MPI Broadcast Performance ........................................................................................................................................697

Kedar Kulkarni and Geetanjali Gadre

Advanced MAC in HPC Systems: Performance Improvement ........................................................................................................................................699

D. Gros, M. Blanc, J. Briffaut, and C. Toinard

Cluster as a Service for Self-Deployable Cloud Applications ........................................................................................................................................703

Shigetoshi Yokoyama and Nobukazu Yoshioka

Accelerating 2-opt and 3-opt Local Search Using GPU in the Travelling Salesman Problem ........................................................................................................................................705

Kamil Rocki and Reiji Suda

Distributed Shared Memory Programming in the Cloud ........................................................................................................................................707

Ahmad Anbar, Vikram K. Narayana, and Tarek El-Ghazawi

A Fault Tolerance Framework for High Performance Computing in Cloud ........................................................................................................................................709

Ifeanyi P. Egwutuoha, Shiping Chen, David Levy, and Bran Selic

Business Process Engine Simulator ........................................................................................................................................711

Suraj Pandey, Surya Nepal, and Shiping Chen
Improving MapReduce Performance in Heterogeneous Network Environments and Resource Utilization ................................................................. 714
   Zhenhua Guo and Geoffrey Fox
Perspectives of UnaCloud: An Opportunistic Cloud Computing Solution for Facilitating Research ........................................................................... 717
   Juan D. Osorio, Harold Castro, and Francisco Brasileiro
Provisioning-Based Resource Management for Effective Workflow Scheduling on Utility Grids ........................................................................ 719
   Vahid Khajevand, Hossein Pedram, and Mostafa Zandieh
Mining Concept Drifting Network Traffic in Cloud Computing Environments ...................................................................................... 721
   Sai Kiran Mukkavilli and Sachin Shetty

Doctoral Symposium

Cloud Scheduling

   José Simão and Luís Veiga
Combinatorial Auction-Based Mechanisms for VM Provisioning and Allocation in Clouds ........................................................................ 729
   Sharrukh Zaman and Daniel Grosu
Optimistic Scheduling with Geographically Replicated Services in the Cloud Environment (COLOR) ....................................................... 735
   Wenbo Zhu and Murray Woodside

Clusters and Data Centers

Kernel-Assisted MPI Collective Communication among Many-core Clusters ...................................................................................... 741
   Teng Ma
Enabling Application Resilience with and without the MPI Standard ...................................................................................... 746
   Wesley Bland
Leveraging Heterogeneity for Energy Minimization in Data Centers ...................................................................................... 752
   Marina Zapater, José L. Ayala, and José M. Moya

Workflows and MapReduce

Executing Data-Intensive Workloads in a Cloud ...................................................................................... 758
   Rizwan Mian and Patrick Martín
Integration of Workflow Partitioning and Resource Provisioning ............................................................764
  Weiwei Chen and Ewa Deelman
Hierarchical MapReduce Programming Model and Scheduling Algorithms .............................................769
  Yuan Luo and Beth Plale
Resource Management for Elastic Cloud Workflows ...............................................................................775
  Li Yu and Douglas Thain

Workshops

International Workshop on Cloud for Business, Industry and Enterprises (C4BIÉ 2012)

Enhanced Energy-Efficient Scheduling for Parallel Applications in Cloud .............................................781
  Qingjia Huang, Sen Su, Jian Li, Peng Xu, Kai Shuang, and Xiao Huang
The Cloud: Requirements for a Better Service ..................................................................................................787
  Eileen Marie Hanna, Nader Mohamed, and Jameela Al-Jaroodi
Reducing Operational Costs through Consolidation with Resource Prediction in the Cloud ............................793
  Jian Li, Kai Shuang, Sen Su, Qingjia Huang, Peng Xu, Xiang Cheng, and Jie Wang
  Brandon C. Judd and Corey A. Graves
Design and Implementation of a Secure Healthcare Social Cloud System ..................................................805
  Ryan Wooten, Roger Klink, Frank Sinek, Yan Bai, and Meeta Sharma

Workshop on Cloud Computing Optimization (CCOPT 2012)

Optimizing Completion Time and Resource Provisioning of Pig Programs .............................................811
  Zhuoyao Zhang, Ludmila Cherkasova, Abhishek Verma, and Boon Thau Loo
Pricing and Resource Allocation in a Cloud Computing Market .................................................................817
  Linna Du
Towards the Automated Engineering of Dependable Adaptive Services ..................................................823
  Thar Baker, Martin Randles, and A. Taleb-Bendiab
Integrity Verification of Multiple Data Copies over Untrusted Cloud Servers .............................................829
  Ayad F. Barsoum and M. Anwar Hasan
Optimal Reconfiguration of the Cloud Network for Maximum Energy Savings ........................................835
  Burak Kantarci and Hussein T. Mouftah
Optimal Location of Data Centers and Software Components in Cloud Computing Network Design .................................................................841
   Federico Larumbe and Brunilde Sansò

Workshop on Modeling and Simulation on Grid and Cloud Computing (MSGC 2012)

Reducing Complexity in Management of eScience Computations ...............................................................845
   Per-Olov Östberg, Andreas Hellander, Brian Drawert, Erik Elmroth, Sverker Holmgren, and Linda Petzold

Conservative Distributed Discrete Event Simulation on Amazon EC2 ..........................................................853
   Kurt Vanmechelen, Silas De Munck, and Jan Broeckhove

Integrating HLA and Service-Oriented Architecture in a Simulation Framework ..............................................861
   Monica Dragoicea, Laurentiu Bucur, Wei-Tek Tsai, and Hessam Sarjoughian

Simulation in the Cloud Using Handheld Devices ......................................................................................867
   Emilio Mancini, Gabriel Wainer, Khaldoon Al-Zoubi, and Olivier Dalle

Goal-Directed Grid-Enabled Computing for Legacy Simulations .................................................................873
   Ernest H. Page, Laurie Litwin, Matthew T. McMahon, Brian Wickham, Mike Shadid, and Elizabeth Chang

U.S. Army Modeling and Simulation Executable Architecture Deployment Cloud Virtualization Strategy ..................................................880
   Shaun Murphy, Scott Gallant, Chris Gaughan, and Manny Diego

Simulation Processes in the Cloud for Emergency Planning ........................................................................886
   Judicaël Ribault and Gabriel Wainer

Development of a Metamodel for Medical Database Management on a Grid Network: Application to Health Watch and Epidemiology for Cancer and Perinatal Health ..................................................892
   Sébastien Cipière, Paul De Vlieger, David Sarramia, David R.C. Hill, and Lydia Maigne
First International Workshop on Data-Intensive Process Management in Large-Scale Sensor Systems (DPMSS 2012)

Towards Ontology-based Data Quality Inference in Large-Scale Sensor Networks .................................................. 898

Sam Esswein, Sebastien Goasguen, Chris Post, Jason Hallstrom, David White, and Gene Eidson

End-to-End QoS on Shared Clouds for Highly Dynamic, Large-Scale Sensing Data Streams ........................................... 904

Rafael Tolosana-Calasanz, Jose Angel Banares, Congduc Pham, and Omer Rana

Human Postures Recognition Based on D-S Evidence Theory and Multi-sensor Data Fusion .................................................. 912

Wenfeng Li, Junrong Bao, Xiuwen Fu, Giancarlo Fortino, and Stefano Galzarano

On Managing Very Large Sensor-Network Data Using Bigtable .................................................................................. 918

Byunggu Yu, Alfredo Cuzzocrea, Dong Jeong, and Sergey Maydebura

Data Outsourcing Simplified: Generating Data Connectors from Confidentiality and Access Policies .................................. 923

Konrad Juenemann, Jens Kohler, and Hannes Hartenstein

Author Index .................................................................................................................................................. 931