

USENIX ATC '14:
2014 USENIX Annual Technical Conference
June 19–20, 2014
Philadelphia, PA

Message from the Program Co-Chairs..... vii

Thursday, June 19

Big Data

ShuffleWatcher: Shuffle-aware Scheduling in Multi-tenant MapReduce Clusters	1
Faraz Ahmad, <i>Teradata Aster and Purdue University</i> ; Srimat T. Chakradhar, <i>NEC Laboratories America</i> ; Anand Raghunathan and T. N. Vijaykumar, <i>Purdue University</i>	
Violet: A Storage Stack for IOPS/Capacity Bifurcated Storage Environments	13
Douglas Santry and Kaladhar Voruganti, <i>NetApp, Inc.</i>	
ELF: Efficient Lightweight Fast Stream Processing at Scale	25
Liting Hu, Karsten Schwan, Hrishikesh Amur, and Xin Chen, <i>Georgia Institute of Technology</i>	
Exploiting Bounded Staleness to Speed Up Big Data Analytics	37
Henggang Cui, James Cipar, Qirong Ho, Jin Kyu Kim, Seunghak Lee, Abhimanyu Kumar, Jinliang Wei, Wei Dai, and Gregory R. Ganger, <i>Carnegie Mellon University</i> ; Phillip B. Gibbons, <i>Intel Labs</i> ; Garth A. Gibson and Eric P. Xing, <i>Carnegie Mellon University</i>	
Making State Explicit for Imperative Big Data Processing	49
Raul Castro Fernandez, <i>Imperial College London</i> ; Matteo Migliavacca, <i>University of Kent</i> ; Evangelia Kalyvianaki, <i>City University London</i> ; Peter Pietzuch, <i>Imperial College London</i>	

Virtualization

OSv—Optimizing the Operating System for Virtual Machines.....	61
Avi Kivity, Dor Laor, Glauber Costa, Pekka Enberg, Nadav Har’El, Don Marti, and Vlad Zolotarov, <i>Cloudius Systems</i>	
Gleaner: Mitigating the Blocked-Waiter Wakeup Problem for Virtualized Multicore Applications.....	73
Xiaoning Ding, <i>New Jersey Institute of Technology</i> ; Phillip B. Gibbons and Michael A. Kozuch, <i>Intel Labs Pittsburgh</i> ; Jianchen Shan, <i>New Jersey Institute of Technology</i>	
HYPERSHELL: A Practical Hypervisor Layer Guest OS Shell for Automated In-VM Management.....	85
Yangchun Fu, Junyuan Zeng, and Zhiqiang Lin, <i>The University of Texas at Dallas</i>	
XvMotion: Unified Virtual Machine Migration over Long Distance.....	97
Ali José Mashtizadeh, <i>Stanford University</i> ; Min Cai, Gabriel Tarasuk-Levin, and Ricardo Koller, <i>VMware, Inc.</i> ; Tal Garfinkel; Sreekanth Setty, <i>VMware, Inc.</i>	
GPUvm: Why Not Virtualizing GPUs at the Hypervisor?	109
Yusuke Suzuki, <i>Keio University</i> ; Shinpei Kato, <i>Nagoya University</i> ; Hiroshi Yamada, <i>Tokyo University of Agriculture and Technology</i> ; Kenji Kono, <i>Keio University</i>	
A Full GPU Virtualization Solution with Mediated Pass-Through.....	121
Kun Tian, Yaozu Dong, and David Cowperthwaite, <i>Intel Corporation</i>	

(Thursday, June 19, continues on p. iv)

Storage

vCacheShare: Automated Server Flash Cache Space Management in a Virtualization Environment	133
Fei Meng, <i>North Carolina State University</i> ; Li Zhou, <i>Facebook</i> ; Xiaosong Ma, <i>North Carolina State University and Qatar Computing Research Institute</i> ; Sandeep Uttamchandani, <i>VMware Inc.</i> ; Deng Liu, <i>Twitter</i>	
Missive: Fast Application Launch From an Untrusted Buffer Cache	145
Jon Howell, Jeremy Elson, Bryan Parno, and John R. Douceur, <i>Microsoft Research</i>	
A Modular and Efficient Past State System for Berkeley DB	157
Ross Shaull, <i>Nuodb</i> ; Liuba Shrira, <i>Brandeis University</i> ; Barbara Liskov, <i>MIT/CSAIL</i>	
SCFS: A Shared Cloud-backed File System	169
Alysson Bessani, Ricardo Mendes, Tiago Oliveira, and Nuno Neves, <i>Faculdade de Ciências and LaSIGE</i> ; Miguel Correia, <i>INESC-ID and Instituto Superior Técnico, University of Lisbon</i> ; Marcelo Pasin, <i>Université de Neuchâtel</i> ; Paulo Verissimo, <i>Faculdade de Ciências and LaSIGE</i>	
Accelerating Restore and Garbage Collection in Deduplication-based Backup Systems via Exploiting Historical Information	181
Min Fu, Dan Feng, and Yu Hua, <i>Huazhong University of Science and Technology</i> ; Xubin He, <i>Virginia Commonwealth University</i> ; Zuoning Chen, <i>National Engineering Research Center for Parallel Computer</i> ; Wen Xia, Fangting Huang, and Qing Liu, <i>Huazhong University of Science and Technology</i>	

Hardware and Low-level Techniques

The TURBO Diaries: Application-controlled Frequency Scaling Explained	193
Jons-Tobias Wamhoff, Stephan Diestelhorst, and Christof Fetzer, <i>Technische Universität Dresden</i> ; Patrick Marlier and Pascal Felber, <i>Université de Neuchâtel</i> ; Dave Dice, <i>Oracle Labs</i>	
Implementing a Leading Loads Performance Predictor on Commodity Processors	205
Bo Su, <i>National University of Defense Technology</i> ; Joseph L. Greathouse, Junli Gu, and Michael Boyer, <i>AMD Research</i> ; Li Shen and Zhiying Wang, <i>National University of Defense Technology</i>	
HaPPy: Hyperthread-aware Power Profiling Dynamically	211
Yan Zhai, <i>University of Wisconsin</i> ; Xiao Zhang and Stephane Eranian, <i>Google Inc.</i> ; Lingjia Tang and Jason Mars, <i>University of Michigan</i>	
Scalable Read-mostly Synchronization Using Passive Reader-Writer Locks	219
Ran Liu, <i>Fudan University and Shanghai Jiao Tong University</i> ; Heng Zhang and Haibo Chen, <i>Shanghai Jiao Tong University</i>	
Large Pages May Be Harmful on NUMA Systems	231
Fabien Gaud, <i>Simon Fraser University</i> ; Baptiste Lepers, <i>CNRS</i> ; Jeremie Decouchant, <i>Grenoble University</i> ; Justin Funston and Alexandra Fedorova, <i>Simon Fraser University</i> ; Vivien Quéma, <i>Grenoble INP</i>	
Efficient Tracing of Cold Code via Bias-Free Sampling	243
Baris Kasikci, <i>École Polytechnique Fédérale de Lausanne (EPFL)</i> ; Thomas Ball, <i>Microsoft</i> ; George Canea, <i>École Polytechnique Fédérale de Lausanne (EPFL)</i> ; John Erickson and Madanlal Musuvathi, <i>Microsoft</i>	

Friday, June 20, 2014

Distributed Systems

Gestalt: Fast, Unified Fault Localization for Networked Systems255
Radhika Niranjan Mysore, <i>Google</i> ; Ratul Mahajan, <i>Microsoft Research</i> ; Amin Vahdat, <i>Google</i> ; George Varghese, <i>Microsoft Research</i>	
Insight: In-situ Online Service Failure Path Inference in Production Computing Infrastructures269
Hiep Nguyen, Daniel J. Dean, Kamal Kc, and Xiaohui Gu, <i>North Carolina State University</i>	
Automating the Choice of Consistency Levels in Replicated Systems281
Cheng Li, <i>Max Planck Institute for Software Systems (MPI-SWS)</i> ; Joao Leitão, <i>NOVA University of Lisbon/CITI/NOVA-LINCS</i> ; Allen Clement, <i>Max Planck Institute for Software Systems (MPI-SWS)</i> ; Nuno Preguiça and Rodrigo Rodrigues, <i>NOVA University of Lisbon/CITI/NOVA-LINCS</i> ; Viktor Vafeiadis, <i>Max Planck Institute for Software Systems (MPI-SWS)</i>	
Sirius: Distributing and Coordinating Application Reference Data293
Michael Bevilacqua-Linn, Maulan Byron, Peter Cline, Jon Moore, and Steve Muir, <i>Comcast Cable</i>	
In Search of an Understandable Consensus Algorithm305
Diego Ongaro and John Ousterhout, <i>Stanford University</i>	

Networking

GASPP: A GPU-Accelerated Stateful Packet Processing Framework321
Giorgos Vasiliadis and Lazaros Koromilas, <i>FORTH-ICS</i> ; Michalis Polychronakis, <i>Columbia University</i> ; Sotiris Ioannidis, <i>FORTH-ICS</i>	
Panopticon: Reaping the Benefits of Incremental SDN Deployment in Enterprise Networks333
Dan Levin, <i>Technische Universität Berlin</i> ; Marco Canini, <i>Université catholique de Louvain</i> ; Stefan Schmid, <i>Technische Universität Berlin and Telekom Innovation Labs</i> ; Fabian Schaffert and Anja Feldmann, <i>Technische Universität Berlin</i>	
Programmatic Orchestration of WiFi Networks347
Julius Schulz-Zander, Lalith Suresh, Nadi Sarrar, and Anja Feldmann, <i>Technische Universität Berlin</i> ; Thomas Hühn, <i>DAI-Labor and Technische Universität Berlin</i> ; Ruben Merz, <i>Swisscom</i>	
HACK: Hierarchical ACKs for Efficient Wireless Medium Utilization359
Lynne Salameh, Astrit Zhushi, Mark Handley, Kyle Jamieson, and Brad Karp, <i>University College London</i>	
Pythia: Diagnosing Performance Problems in Wide Area Providers371
Partha Kanuparthi, <i>Yahoo Labs</i> ; Constantine Dovrolis, <i>Georgia Institute of Technology</i>	
BISmark: A Testbed for Deploying Measurements and Applications in Broadband Access Networks383
Srikanth Sundaresan, Sam Burnett, and Nick Feamster, <i>Georgia Institute of Technology</i> ; Walter de Donato, <i>University of Naples Federico II</i>	

Security and Correctness

Application-Defined Decentralized Access Control395
Yuanzhong Xu and Alan M. Dunn, <i>The University of Texas at Austin</i> ; Owen S. Hofmann, <i>Google, Inc.</i> ; Michael Z. Lee, Syed Akbar Mehdi, and Emmett Witchel, <i>The University of Texas at Austin</i>	
MiniBox: A Two-Way Sandbox for x86 Native Code409
Yanlin Li, <i>CyLab/Carnegie Mellon University</i> ; Jonathan McCune and James Newsome, <i>CyLab/Carnegie Mellon University and Google, Inc.</i> ; Adrian Perrig, <i>CyLab/Carnegie Mellon University</i> ; Brandon Baker and Will Drewry, <i>Google, Inc.</i>	

(Friday, June 20, continues on p. vi)

Static Analysis of Variability in System Software: The 90,000 #ifdefs Issue	421
Reinhard Tartler, Christian Dietrich, Julio Sincero, Wolfgang Schröder-Preikschat, and Daniel Lohmann, <i>Friedrich-Alexander-Universität Erlangen-Nürnberg</i>	
Yat: A Validation Framework for Persistent Memory Software	433
Philip Lantz, Subramanya Dulloor, Sanjay Kumar, Rajesh Sankaran, and Jeff Jackson, <i>Intel Labs</i>	
Medusa: Managing Concurrency and Communication in Embedded Systems.....	439
Thomas W. Barr and Scott Rixner, <i>Rice University</i>	
 Flash	
Reliable Writeback for Client-side Flash Caches	451
Dai Qin, Angela Demke Brown, and Ashvin Goel, <i>University of Toronto</i>	
Flash on Rails: Consistent Flash Performance through Redundancy.....	463
Dimitris Skourtis, Dimitris Achlioptas, Noah Watkins, Carlos Maltzahn, and Scott Brandt, <i>University of California, Santa Cruz</i>	
I/O Speculation for the Microsecond Era.....	475
Michael Wei, <i>University of California, San Diego</i> ; Matias Bjørling and Philippe Bonnet, <i>IT University of Copenhagen</i> ; Steven Swanson, <i>University of California, San Diego</i>	
OS I/O Path Optimizations for Flash Solid-state Drives	483
Woong Shin, Qichen Chen, Myoungwon Oh, Hyeonsang Eom, and Heon Y. Yeom, <i>Seoul National University</i>	
FlexECC: Partially Relaxing ECC of MLC SSD for Better Cache Performance	489
Ping Huang, <i>Virginia Commonwealth University and Huazhong University of Science and Technology</i> ; Pradeep Subedi, <i>Virginia Commonwealth University</i> ; Xubin He, <i>Virginia Commonwealth University</i> ; Shuang He and Ke Zhou, <i>Huazhong University of Science and Technology</i>	
Nitro: A Capacity-Optimized SSD Cache for Primary Storage.....	501
Cheng Li, <i>Rutgers University</i> ; Philip Shilane, Fred Douglass, Hyong Shim, Stephen Smaldone, and Grant Wallace, <i>EMC Corporation</i>	