NSDI ’11: 8th USENIX Symposium on Networked Systems Design and Implementation
March 30–April 1, 2011
Boston, MA, USA

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

Wednesday, March 30

Speed, Speed, and More Speed

SSLShader: Cheap SSL Acceleration with Commodity Processors ............................. 1
Keon Jang and Sangjin Han, KAIST; Seungyeop Han, University of Washington; Sue Moon and Kyoungsoo Park, KAIST

ServerSwitch: A Programmable and High Performance Platform for Data Center Networks ..................... 15
Guohan Lu, Chuanxiong Guo, Yulong Li, Zhiquiang Zhou, Tong Yuan, Haitao Wu, Yongqiang Xiong, Rui Gao, and Yongguang Zhang, Microsoft Research Asia

TritonSort: A Balanced Large-Scale Sorting System ............................................. 29
Alexander Rasmussen, George Porter, and Michael Conley, University of California, San Diego; Harsha V. Madhyastha, University of California, Riverside; Radhika Niranjan Mysore, University of California, San Diego; Alexander Pucher, Vienna University of Technology; Amin Vahdat, University of California, San Diego

Performance Diagnosis

Diagnosing Performance Changes by Comparing Request Flows .............................. 43
Raja R. Sambasivan, Carnegie Mellon University; Alice X. Zheng, Microsoft Research; Michael De Rosa, Google; Elie Krevat, Spencer Whitman, Michael Stroucken, William Wang, Lianghong Xu, and Gregory R. Ganger, Carnegie Mellon University

Profiling Network Performance for Multi-tier Data Center Applications ..................... 57
Minlan Yu, Princeton University; Albert Greenberg and Dave Maltz, Microsoft; Jennifer Rexford, Princeton University; Lihua Yuan, Srikanth Kandula, and Changhoon Kim, Microsoft

Nothing but Net

Efficiently Measuring Bandwidth at All Time Scales ............................................. 71
Frank Uyeda, University of California, San Diego; Luca Foschini, University of California, Santa Barbara; Fred Baker, Cisco; Subhash Suri, University of California, Santa Barbara; George Varghese, University of California, San Diego

ETTM: A Scalable Fault Tolerant Network Manager ............................................. 85
Colin Dixon, Hardeep Uppal, Vjekoslav Brajkoovic, Dane Brandon, Thomas Anderson, and Arvind Krishnamurthy, University of Washington

Design, Implementation and Evaluation of Congestion Control for Multipath TCP .............. 99
Damon Wischik, Costin Raiciu, Adam Greenhalgh, and Mark Handley, University College London
Wednesday, March 30 (continued)

Data-Intensive Computing

Ciel: A Universal Execution Engine for Distributed Data-Flow Computing .......................................................... 113
Derek G. Murray, Malte Schwarzkopf, Christopher Smowton, Steven Smith, Anil Madhavapeddy, and Steven Hand, University of Cambridge Computer Laboratory

A Semantic Framework for Data Analysis in Networked Systems ................................................................. 127
Arun Viswanathan, University of Southern California Information Sciences Institute; Alefiya Hussain, University of Southern California Information Sciences Institute and Sparta Inc.; Jelena Mirkovic, University of Southern California Information Sciences Institute; Stephen Schwab, Sparta Inc.; John Wroclawski, University of Southern California Information Sciences Institute

Paxos Replicated State Machines as the Basis of a High-Performance Data Store ........................................... 141
William J. Bolosky, Microsoft Research; Dexter Bradshaw, Randolph B. Haagens, Norbert P. Kusters, and Peng Li, Microsoft

Thursday, March 31

Security and Privacy

Bootstrapping Accountability in the Internet We Have ................................................................. 155
Ang Li, Xin Liu, and Xiaowei Yang, Duke University

Privad: Practical Privacy in Online Advertising ................................................................. 169
Saikat Guha, Microsoft Research India; Bin Cheng and Paul Francis, MPI-SWS

Bazaar: Strengthening User Reputations in Online Marketplaces ................................................................. 183
Ansley Post, MPI-SWS and Rice University; Vijit Shah and Alan Mislove, Northeastern University

Energy and Storage

Dewdrop: An Energy-Aware Runtime for Computational RFID ................................................................. 197
Michael Buettner, University of Washington; Benjamin Greenstein, Intel Labs Seattle; David Wetherall, University of Washington and Intel Labs Seattle

SSDAlloc: Hybrid SSD/RAM Memory Management Made Easy ................................................................. 211
Anirudh Badam and Vivek S. Pai, Princeton University

Debugging and Correctness

Model Checking a Networked System Without the Network ................................................................. 225
Rachid Guerraoui and Maysam Yabandeh, EPFL

Fate and Destini: A Framework for Cloud Recovery Testing ................................................................. 239
Haryadi S. Gunawi, University of California, Berkeley; Thanh Do, University of Wisconsin, Madison; Pallavi Joshi, Peter Alvaro, and Joseph M. Hellerstein, University of California, Berkeley; Andrea C. Arpaci-Dusseau and Remzi H. Arpaci-Dusseau, University of Wisconsin, Madison; Koushik Sen, University of California, Berkeley; Dhruba Borthakur, Facebook

SliceTime: A Platform for Scalable and Accurate Network Emulation ................................................................. 253
Elias Weingärtner, Florian Schmidt, Hendrik vom Lehn, Tobias Heer, and Klaus Wehrle, RWTH Aachen University
Thursday, March 31 (continued)

Mobile Wireless

Accurate, Low-Energy Trajectory Mapping for Mobile Devices ............................................. 267
Arvind Thiagarajan, Lenin Ravindranath, Hari Balakrishnan, Samuel Madden, and Lewis Girod, MIT
Computer Science and Artificial Intelligence Laboratory

Improving Wireless Network Performance Using Sensor Hints ............................................. 281
Lenin Ravindranath, Calvin Newport, Hari Balakrishnan, and Samuel Madden, MIT Computer Science and
Artificial Intelligence Laboratory

Friday, April 1

Datacenters Learning to Share

Mesos: A Platform for Fine-Grained Resource Sharing in the Data Center ................................. 295
Shenker, and Ion Stoica, University of California, Berkeley

Sharing the Data Center Network ............................................................................................. 309
Alan Shieh, Microsoft Research and Cornell University; Srikanth Kandula, Microsoft Research; Albert
Greenberg and Changhoon Kim, Windows Azure; Bikas Saha, Microsoft Bing

Dominant Resource Fairness: Fair Allocation of Multiple Resource Types ................................. 323
Ali Ghodsi, Matei Zaharia, Benjamin Hindman, Andy Konwinski, Scott Shenker, and Ion Stoica, University of
California, Berkeley

Wireless and More

PIE in the Sky: Online Passive Interference Estimation for Enterprise WLANs .......................... 337
Vivek Shrivastava, Shravan Rayanchu, and Suman Banerjee, University of Wisconsin—Madison; Konstantina
Papagiannaki, Intel Labs, Pittsburgh

SpecNet: Spectrum Sensing Sans Frontières ............................................................................. 351
Anand Padmanabha Iyer, Krishna Chintalapudi, Vishnu Navda, Ramachandran Ramjee, and Venkata N.
Padmanabhan, Microsoft Research India; Chandra R. Murthy, Indian Institute of Science

Towards Street-Level Client-Independent IP Geolocation ......................................................... 365
Yong Wang, UESTC and Northwestern University; Daniel Burgener, Marcel Flores, and Aleksandar
Kuzmanovic, Northwestern University; Cheng Huang, Microsoft Research