

2016 IEEE 24th International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS 2016)

**London, United Kingdom
19-21 September 2016**



**IEEE Catalog Number: CFP16010-POD
ISBN: 978-1-5090-3433-8**

**Copyright © 2016 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 publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP16010-POD
ISBN (Print-On-Demand):	978-1-5090-3433-8
ISBN (Online):	978-1-5090-3432-1
ISSN:	1526-7539

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

2016 IEEE 24th International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems

MASCOTS 2016

Table of Contents

Foreword from the General Chair.....	xii
Message from the Program Chairs.....	xiv
Organizing Committee.....	xv
Reviewers.....	xvii
Keynote Talks	xviii

Optimising the Cloud I

A Better Model for Job Redundancy: Decoupling Server Slowdown and Job Size	1
<i>Kristen Gardner, Mor Harchol-Balter, and Alan Scheller-Wolf</i>	
Exact Analysis of Energy-Aware Multiserver Queueing Systems with Setup Times	11
<i>Vincent J. Maccio and Douglas G. Down</i>	
Optimal Provision of Multiple Service Types	21
<i>Paul Ezhilchelvan and Isi Mitrani</i>	

Exploiting Big Data

Picky: Efficient and Reproducible Sharing of Large Datasets Using Merkle-Trees	30
<i>Daniel Hintze and Andrew Rice</i>	
An Uncertainty-Aware Approach to Optimal Configuration of Stream Processing Systems	39
<i>Pooyan Jamshidi and Giuliano Casale</i>	

Parallel Graph Processing on Modern Multi-core Servers: New Findings and Remaining Challenges	49
<i>Assaf Eisenman, Lucy Cherkasova, Guilherme Magalhaes, Qiong Cai, and Sachin Katti</i>	

Performance of Storage Systems I

Performance Evaluation of a Tape Library System	59
<i>Ilias Iliadis, Yusik Kim, Slavisa Sarafijanovic, and Vinodh Venkatesan</i>	
Stochastic Modeling of Hybrid Cache Systems	69
<i>Gaoying Ju, Yongkun Li, Yinlong Xu, Jiqiang Chen, and John C. S. Lui</i>	
Exploiting Replication for Energy Efficiency of Heterogeneous Storage Systems	79
<i>Everett Neil Rush and Nihat Altiparmak</i>	

Energy Consumption

Modeling the Energy-Time Performance of MIC Architecture System	85
<i>Lavanya Ramapantulu, Thy Dao, Dumitrel Loghin, Nam Thoai, and Yong Meng Teo</i>	
ALUPower: Data Dependent Power Consumption in GPUs	95
<i>Jan Lucas and Ben Juurlink</i>	
Experimental Calibration and Validation of a Speed Scaling Simulator	105
<i>Arsham Skrenes and Carey Williamson</i>	
Static Program Analysis for Identifying Energy Bugs in Graphics-Intensive Mobile Apps	115
<i>Chang Hwan Peter Kim, Daniel Kroening, and Marta Kwiatkowska</i>	

Stochastic Models

Performance Modeling of Virtual Switching Systems	125
<i>Guillaume Artero Gallardo, Bruno Baynat, and Thomas Begin</i>	
Evacuee Flow Optimisation Using G-Network with Multiple Classes of Positive Customers	135
<i>Huibo Bi</i>	
Modeling Energy Packets Networks in the Presence of Failures	144
<i>Jean-Michel Fournau, Andrea Marin, and Simonetta Balsamo</i>	
A Diffusion Model for Energy Harvesting Sensor Nodes	154
<i>Omer H. Abdelrahman and Erol Gelenbe</i>	

Performance Analysis Automation

Performance Model Derivation of Operational Systems through Log Analysis	159
<i>Mahmoud Awad and Daniel A. Menascé</i>	
Pilot: A Framework that Understands How to Do Performance Benchmarks the Right Way	169
<i>Yan Li, Yash Gupta, Ethan L. Miller, and Darrell D. E. Long</i>	

Telecommunication Networks

QoS-Aware CAPEX Minimization in Urban Off-Grid Radio Access Networks	179
<i>Gianluca Rizzo and Marco Ajmone Marsan</i>	
Vertical Integration of CDN and Network Operator: Model and Analysis	189
<i>Patrick Maillé, Gwendal Simon, and Bruno Tuffin</i>	
Cloud-Based Spectrum Sharing in Virtual Wireless Networks	196
<i>Fatemeh Shirzad and Majid Ghaderi</i>	
Geographic Routing in Extreme-Scale Highly-Dynamic Mobile Ad Hoc Networks	205
<i>Ben Newton, Jay Aikat, and Kevin Jeffay</i>	

Performance of Storage Systems II

RESAR: Reliable Storage at Exabyte Scale	211
<i>Thomas Schwarz, Ahmed Amer, Thomas Kroege, Ethan Miller, Darrell Long, and Jehan-François Pâris</i>	
I/O Scheduling Schemes for Better I/O Proportionality on Flash-Based SSDs	221
<i>Jaeho Kim, Eunjae Lee, and Sam H. Noh</i>	
An Empirical Evaluation of Enterprise and SATA-Based Transactional Solid-State Drives	231
<i>Yongseok Son, Hara Kang, Jin-Yong Ha, Jongseong Lee, Hyuck Han, Hyungsoo Jung, and Heon Young Yeom</i>	

Workload and Program Analysis

Diplomat: Mapping of Multi-kernel Applications Using a Static Dataflow Abstraction	241
<i>Bruno Bodin, Luigi Nardi, Paul H. J. Kelly, and Michael F. P. O'Boyle</i>	
Prospects for Shaping User-Centric Mobile Application Workloads to Benefit the Cloud	251
<i>Maciej Swiech, Huaqian Cai, Peter Dinda, and Gang Huang</i>	
Configurable and Efficient Memory Access Tracing via Selective Expression-Based x86 Binary Instrumentation	261
<i>Simone Economo, Davide Cingolani, Alessandro Pellegrini, and Francesco Quaglia</i>	

Optimising the Cloud II

Robust Server Consolidation: Coping with Peak Demand Underestimation	271
<i>Diarmuid Grimes, Deepak Mehta, Barry O’Sullivan, Robert Birke, Lydia Chen, Thomas Scherer, and Ignacio Castineiras</i>	
A Model Predictive Controller for Contention-Aware Resource Allocation in Virtualized Data Centers	277
<i>M. Reza HoseinyFarahabady, Young Choon Lee, Albert Y. Zomaya, Zahir Tari, and Andy Song</i>	
Optimizing Secure SDN-Enabled Inter-Data Centre Overlay Networks through Cognitive Routing	283
<i>Frederic Francois and Erol Gelenbe</i>	
Energy Efficient Policies for Upstream Content Server Selection	289
<i>Sachin Sahane and Ricardo Lent</i>	
Online Work Distribution to Clouds	295
<i>Lan Wang</i>	

System and Network Performance

Queueing Analysis of Software Defined Network with Realistic OpenFlow-Based Switch Model	301
<i>Yuki Goto, Hiroyuki Masuyama, Bryan Ng, Winston K. G. Seah, and Yutaka Takahashi</i>	
Autoscaling Effects in Speed Scaling Systems	307
<i>Maryam Elahi and Carey Williamson</i>	
Achieving Efficiency without Sacrificing Model Accuracy: Network Calculus on Compact Domains	313
<i>Kai Lampka, Steffen Bondorf, and Jens Schmitt</i>	
Bounding Aggregations on Phase-Type Arrivals for Performance Analysis of Clouds	319
<i>Farah Ait-Salaht and Hind Castel-Taleb</i>	
A Performance Approach to Mobile Security	325
<i>Mihajlo Pavloski</i>	

Wireless Communications

Is Multipath TCP (MPTCP) Beneficial for Video Streaming over DASH?	331
<i>Cyriac James, Emir Halepovic, Mea Wang, Rittwik Jana, and N. K. Shankaranarayanan</i>	
Parallel HTTP for Video Streaming in Wireless Networks	337
<i>Mohsen Ansari and Majid Ghaderi</i>	

Optimal Cell Assignment Algorithms for Pico-Cell Networks	343
<i>Bart Post and Sem Borst</i>	

Hello Packet Interval Effects on the Overall Network Performance of a Wireless Network after Next (WNaN) Radio Network	349
<i>Elizabeth Serena Bentley, Joseph Suprenant, and Stephen Reichhart</i>	

Markov Processes

Performance Evaluation of Fischer's Protocol through Steady-State Analysis of Markov Regenerative Processes	355
<i>Stefano Martina, Marco Paolieri, Tommaso Papini, and Enrico Vicario</i>	

Product-Forms for Probabilistic Input/Output Automata	361
<i>Filippo Cavallin, Andrea Marin, and Sabina Rossi</i>	

Efficient Timeout Synthesis in Fixed-Delay CTMC Using Policy Iteration	367
<i>Luboš Korenčiak, Antonín Kučera, and Vojtěch Řehák</i>	

A Markov Reward Model Based Greedy Heuristic for the Virtual Network Embedding Problem	373
<i>Francesco Bianchi and Francesco Lo Presti</i>	

Reliability and Verification

A Platform for Run-Time Health Verification of Elastic Cyber-Physical Systems	379
<i>Daniel Moldovan and Hong-Linh Truong</i>	

Energy Storage in Smart Homes: Grid-Convenience Versus Self-Use and Survivability	385
<i>Jannik Hüels and Anne Remke</i>	

Towards Systemic Risk Aware Engineering of Large-Scale Networks: Complex Systems Perspective	391
<i>V. Marbukh</i>	

Towards a Scalable Test Solution for the Analysis of Interconnect Shorts in On-chip Networks	394
<i>Biswajit Bhowmik, Jatindra Kumar Deka, and Santosh Biswas</i>	

Storage III

LayerMover: Storage Migration of Virtual Machine across Data Centers Based on Three-Layer Image Structure	400
<i>Fei Zhang, Xiaoming Fu, and Ramin Yahyapour</i>	

Write Amplification with Write Skew	406
<i>Yue Yang and Jianwen Zhu</i>	

Bulk I/O Storage Management for Big Data Applications	412
<i>Pratik Mishra, Mayank Mishra, and Arun K. Somani</i>	

RAIDX: RAID without Striping	418
<i>András Fekete and Elizabeth Varki</i>	

Data Management

Efficient Routing for Cost Effective Scale-Out Data Architectures	424
<i>Ashwin Narayan, Vuk Marković, Natalia Postawa, Anna King, Alejandro Morales, K. Ashwin Kumar, and Petros Efstathopoulos</i>	
Efficient Memory Occupancy Models for In-memory Databases	430
<i>Karsten Molka and Giuliano Casale</i>	
Understanding the Energy, Performance, and Programming Effort Trade-Offs of Android Persistence Frameworks	433
<i>Jing Pu, Zheng (Jason) Song, and Eli Tilevich</i>	

Architectures

Behavior-Aware Integrated CPU-GPU Power Management for Mobile Games	439
<i>Zhinan Cheng, Xi Li, Beilei Sun, Jiachen Song, Chao Wang, and Xuehai Zhou</i>	
Designing and Enabling Simulation of Real-World GPU Network Applications with ns-3 and DCE	445
<i>Jared Ivey, George Riley, Brian Swenson, and Margaret Loper</i>	
Characterizing Performance and Power towards Efficient Synchronization of GPU Kernels	451
<i>Islam Harb and Wu-Chun Feng</i>	

Ad-hoc and Sensor Networks

Data Modelling with Gaussian Process in Sensor Networks for Urban Environmental Monitoring	457
<i>Xiuming Liu, Teng Xi, and Edith Ngai</i>	
TerrainLOS: An Outdoor Propagation Model for Realistic Sensor Network Simulation	463
<i>Sam Mansfield, Kerry Veenstra, and Katia Obraczka</i>	
Cooperation Stimulation and Security in Wireless Ad Hoc Networks — A Power-Efficient Bayesian Game Approach	469
<i>Jiexin Zhang, Xiaoxue Liu, and Peidong Zhu</i>	
Dynamic Clustering Algorithm for Tracking Target with High and Variable Celerity	475
<i>Mohamed Toumi, Abderrahim Maizate, Mohammed Ouzzif, and Med Said Salah</i>	

Memory

DIODE: Dynamic Inline-Offline DE Duplication Providing Efficient Space-Saving and Read/Write Performance for Primary Storage Systems	481
<i>Yan Tang, Jianwei Yin, Shuiguang Deng, and Ying Li</i>	
Improve Restore Speed in Deduplication Systems Using Segregated Cache	487
<i>Wenjie Liu, Ping Huang, Tao Lu, Xubin He, Hua Wang, and Ke Zhou</i>	
An Experimental Study on the Effect of Asymmetric Memory Latency of New Memory on Application Performance	493
<i>J. Hyun Kim, Young Je Moon, and Sam H. Noh</i>	
Author Index	499