Table of Contents

Message from the General Chairs and Program Chair ................................................................. xxviii
Organizing Committee ................................................................................................................... xxx
Program Committee .................................................................................................................... xxi
Keynotes .................................................................................................................................... xli

Research Track

Research 1: Distributed Fault Tolerance and Dependability
Timely, Reliable, and Cost-Effective Internet Transport Service Using Dissemination Graphs ................................................................. 1
Amy Babay, Emily Wagner, Michael Dinitz, and Yair Amir
Pronto: Efficient Test Packet Generation for Dynamic Network Data Planes .............................. 13
Yu Zhao, Huazhe Wang, Xin Lin, Tingting Yu, and Chen Qian
Agar: A Caching System for Erasure-Coded Data ...................................................................... 23
Raluca Halalai, Pascal Felber, Anne-Marie Kermarrec, and François Taïani
High Performance Recovery for Parallel State Machine Replication ....................................... 34
Odorico Machado Mendizabal, Fernando Luis Dotti, and Fernando Pedone
On Data Parallelism of Erasure Coding in Distributed Storage Systems ................................... 45
Jun Li and Baochun Li
MeteorShower: Minimizing Request Latency for Majority Quorum-Based Data
Consistency Algorithms in Multiple Data Centers ....................................................................... 57
Ying Liu, Xi Guan, Vladimir Vlassov, and Seif Haridi

Research 2: Distributed Operating Systems and Middleware
LSbM-tree: Re-Enabling Buffer Caching in Data Management for Mixed Reads and Writes ............................................................... 68
Dejun Teng, Lei Guo, Rubao Lee, Feng Chen, Siyuan Ma, Yanfeng Zhang, and Xiaodong Zhang
Research 3: Security and Privacy in Distributed Systems I

Consensus Robustness and Transaction De-Anonymization in the Ripple Currency
Exchange System ................................................................. 140
Adriano Di Luzio, Alessandro Mei, and Julinda Stefa

Learning Privacy Habits of PDS Owners .......................................................... 151
Bikash Chandra Singh, Barbara Carminati, and Elena Ferrari

City-Hunter: Hunting Smartphones in Urban Areas .......................................... 162
Xuefeng Liu, Jiaqi Wen, Shaojie Tang, Jianrong Cao, and Jiaxing Shen

When Seeing Isn’t Believing: On Feasibility and Detectability of Scapegoating
in Network Tomography .................................................................................. 172
Shangqing Zhao, Zhuo Lu, and Cliff Wang

You Can Hear But You Cannot Steal: Defending Against Voice Impersonation Attacks
on Smartphones .............................................................................................. 183
Si Chen, Kui Ren, Sixu Piao, Cong Wang, Qian Wang, Jian Weng, Lu Su,
and Aziz Mohaisen

Flow Reconnaissance via Timing Attacks on SDN Switches .............................. 196
Sheng Liu, Michael K. Reiter, and Vyas Sekar

Research 4: Cloud Computing and Data Center Systems

A Study of Long-Tail Latency in n-Tier Systems: RPC vs. Asynchronous Invocations .............................................. 207
Qingyang Wang, Chien-An Lai, Yasuhiko Kanemasa, Shungeng Zhang, and Calton Pu

Rain or Shine? — Making Sense of Cloudy Reliability Data ............................. 218
Iyswarya Narayanan, Bikash Sharma, Di Wang, Sriram Govindan, Laura Caulfield,
Anand Sivasubramaniam, Aman Kansal, Jie Liu, Badriddine Khessib, and Kushagra Vaid

Right-Sizing Geo-distributed Data Centers for Availability and Latency ....... 230
Iyswarya Narayanan, Aman Kansal, and Anand Sivasubramaniam
PerformanceDrivenResourceSharingMarketsfortheSmallCloud ..................................................241
Sung-HanLin,RanjanPal,MarcoPaolieri,andleanaGolubchik

Fault-ScalableVirtualizedInfrastructureManagement ...........................................................................252
MukilKesavan,AdaGavrilovska,andKarstenSchwan

DeltaCFS:BoostingDeltaSyncforCloudStorageservicesbyLearningfromNFS ........................................264
QuanluZhang,ZhenhuaLi,ZhiYang,ShenglongLi,ShouyangLi,YangzeGuo,andYafeiDai

Research5:EdgeandFogComputing

Cachier:Edge-CachingforRecognitionApplications ................................................................................276
UtsavDrolia,KatherineGuo,JiaqiTan,RajeevGandhi,andPriyaNarasimhan

ContentCentricPeerDataSharinginPervasiveEdgeComputingEnvironments ...........................................287
XinongSong,YaodongHuang,QianZhou,FanYe,YuanyuanYang,andXiaomingLi

FLARE:CoordinatedRateAdaptationforHTTPAdaptiveStreaminginCellular

Networks ................................................................................................................................................298
YoungbinIm,JinyoungHan,JIHoonLee,YoonKwon,CarleeJoe-Wong,
Ted(Taekyoung)Kwon,andSangtaeHa

NetworkedDroneCamerasforSportsStreaming .......................................................................................308
XiaoliWang,AakankshaChowdhery,andMungChiang

Chronus:ConsistentDataPlaneUpdatesinTimedSDNs .............................................................................319
JiaqiZheng,GuihaiChen,StefanSchmid,HaipengDai,andJieWu

DistributedDeepNeuralNetworksOvertheCloud,theEdgeandEndDevices .................................................328
SuratTeerapittayanon,BradleyMcDanel,andHT.Kung

Research6:DistributedGreenComputingandEnergyManagement

DynamicControlofFlowCompletionTimeforPowerEfficiencyofDataCenter

Networks ................................................................................................................................................340
KuangyuZhengandXiaoruiWang

OnEnergy-EfficientCongestionControlforMultipathTCP ........................................................................351
JiaZhao,JiachuanLiu,andHaiyangWang

AMechanismforCooperativeDemand-SideManagement .........................................................................361
GuangchaoYuan,Chung-WeiHang,MichaelN.Huhns,andMunindarP.Singh

AHierarchicalFrameworkofCloudResourceAllocationandPowerManagementUsing

DeepReinforcementLearning ...................................................................................................................372
NingLiu,ZheLi,JielongXu,ZhiyuanXu,ShengLin,QinruQiu,JianTang,
andYanzhiWang

SunChase:Energy-EfficientRoutePlanningforSolar-PoweredEVs ..........................................................383
LanduJiang,YuHua,ChenMa,andXueLiu
Research 7: Internet of Things, Smart Cities, and Cyber-Physical Systems

Persistent Traffic Measurement Through Vehicle-to-Infrastructure Communications .......................................................... 394
He Huang, Yu-E Sun, Shigang Chen, Hongli Xu, and Yian Zhou

TagBreathe: Monitor Breathing with Commodity RFID Systems .................................................................................. 404
Yuxiao Hou, Yanwen Wang, and Yuanqing Zheng

Double-Edged Sword: Incentivized Verifiable Product Path Query for RFID-Enabled Supply Chain ........................................ 414
Saiyu Qi, Yuanqing Zheng, Xiaofeng Chen, Jianfeng Ma, and Yong Qi

Towards Accurate Corruption Estimation in ZigBee Under Cross-Technology Interference ................................................. 425
Gonglong Chen, Wei Dong, Zhiwei Zhao, and Tao Gu

Unseen Activity Recognitions: A Hierarchical Active Transfer Learning Approach ..................................................... 436
Mohammad Arif Ul Alam and Nirmalya Roy

RFIPad: Enabling Cost-Efficient and Device-Free In-air Handwriting Using Passive Tags .................................................... 447
Han Ding, Chen Qian, Jinsong Han, Ge Wang, Wei Xi, Kun Zhao, and Jizhong Zhao

Research 8: Mobile and Wireless Computing Systems I

Robust Incentive Tree Design for Mobile Crowdsensing ................................................................................................. 458
Xiang Zhang, Guoliang Xue, Ruozhou Yu, Dejun Yang, and Jian Tang

WearLock: Unlocking Your Phone via Acoustics Using Smartwatch ........................................................................... 469
Shanhe Yi, Zhengrui Qin, Nancy Carter, and Qun Li

Modeling Mobile Code Acceleration in the Cloud ........................................................................................................ 480
Huber Flores, Xiang Su, Vassilis Kostakos, Jukka Riekk, Eemil Lagerspetz, Sasu Tarkoma, Pan Hui, Yong Li, and Jukka Manner

E-Android: A New Energy Profiling Tool for Smartphones ....................................................................................... 492
Xing Gao, Dachuan Liu, Daiping Liu, Haining Wang, and Angelos Stavrou

Local and Low-Cost White Space Detection ................................................................................................................. 503
Ahmed Saeed, Khaled A. Harras, Ellen Zegura, and Mostafa Ammar

General Analysis of Incentive Mechanisms for Peer-to-Peer Transmissions: A Quantum Game Perspective .................. 517
Weiman Sun and Shengling Wang

Research 9: Distributed Big Data Systems

High-Performance and Resilient Key-Value Store with Online Erasure Coding for Big Data Workloads ................................... 527
Dipti Shankar, Xiaoyi Lu, and Dhabaleswar K. Panda

Modeling and Analyzing Latency in the Memcached system ...................................................................................... 538
Wenxue Cheng, Fengyuan Ren, Wanchun Jiang, and Tong Zhang
Speculative Slot Reservation: Enforcing Service Isolation for Dependent Data-Parallel Computations ..............................................................................................................................................................549
Chen Chen, Wei Wang, and Bo Li

Optimizing Shuffle in Wide-Area Data Analytics ........................................................................................................................................................................................................................560
Shuhao Liu, Hao Wang, and Baochun Li

Job Scheduling without Prior Information in Big Data Processing Systems ..................................................................................................................................................................................572
Zhiming Hu, Baochun Li, Zheng Qin, and Rick Siow Mong Goh

Distributed Load Balancing in Key-Value Networked Caches ..........................................................................................................................................................................................................................583
Sikder Huq, Zubair Shafiq, Sukumar Ghosh, Amir Khakpour, and Harkeerat Bedi

Research 10: Distributed Algorithms and Theory I

Cognitive Context-Aware Distributed Storage Optimization in Mobile Cloud Computing:
A Stable Matching Based Approach ........................................................................................................................................................................................................................594
Dong Han, Ye Yan, Tao Shu, Liuqing Yang, and Shuguang Cui

Fair Caching Algorithms for Peer Data Sharing in Pervasive Edge Computing Environments ......................................................................................................................................................................................................605
Yaodong Huang, Xintong Song, Fan Ye, Yuanyuan Yang, and Xiaoming Li

Latency-Driven Cooperative Task Computing in Multi-user Fog-Radio Access Networks ..................................................................................................................................................................................................615
Ai-Chun Pang, Wei-Ho Chung, Te-Chuan Chiu, and Junshan Zhang

Approximation and Online Algorithms for NFV-Enabled Multicasting in SDNs ........................................................................................................................................................................................................625
Zichuan Xu, Weifa Liang, Meitian Huang, Mike Jia, Song Guo, and Alex Galis

Distributed Auctions for Task Assignment and Scheduling in Mobile Crowdsensing Systems ..................................................................................................................................................................................................635
Zhuojun Duan, Wei Li, and Zhipeng Cai

Effective Mobile Data Trading in Secondary Ad-hoc Market with Heterogeneous and Dynamic Environment ..................................................................................................................................................................................................645
Hengky Susanto, Honggang Zhang, Shing-Yip Ho, and Benyuan Liu

Research 11: Security and privacy in Distributed Systems II

Kalis — A System for Knowledge-Driven Adaptable Intrusion Detection for the Internet of Things ........................................................................................................................................................................................................656
Daniele Midi, Antonino Rullo, Anand Mudgerikar, and Elisa Bertino

Fuzzy Extractors for Biometric Identification ........................................................................................................................................................................................................................................667
Nan Li, Fuchun Guo, Yi Mu, Willy Susilo, and Surya Nepal

Smartphone Privacy Leakage of Social Relationships and Demographics from Surrounding Access Points ..................................................................................................................................................................................................678
Chen Wang, Chuyu Wang, Yingying Chen, Lei Xie, and Sanglu Lu

EV-Matching: Bridging Large Visual Data and Electronic Data for Efficient Surveillance ..................................................................................................................................................................................................689
Gang Li, Fan Yang, Guoxing Chen, Qiang Zhai, Xinfeng Li, Jin Teng, Junda Zhu, Dong Xuan, Biao Chen, and Wei Zhao

Adaptive Reconnaissance Attacks with Near-Optimal Parallel Batching ........................................................................................................................................................................................................699
Xiang Li, J. David Smith, and My T. Thai
### Research 12: Cloud Computing and Distributed Data Analytics

- **Service Overlay Forest Embedding for Software-Defined Cloud Networks**
  - Jian-Jhih Kuo, Shan-Hsiang Shen, Ming-Hong Yang, De-Nian Yang, Ming-Jer Tsai, and Wen-Tsuen Chen

- **Joint Optimization of Chain Placement and Request Scheduling for Network Function Virtualization**
  - Qixia Zhang, Yikai Xiao, Fangming Liu, John C.S. Lui, Jian Guo, and Tao Wang

- **BIG Cache Abstraction for Cache Networks**
  - Eman Ramadan, Arvind Narayanan, Zhi-Li Zhang, Runhui Li, and Gong Zhang

- **Distributed QR Decomposition Framework for Training Support Vector Machines**
  - Jyotikrishna Dass, V.N.S. Prithvi Sakuru, Vivek Sarin, and Rabi N. Mahapatra

- **Distributively Computing Random Walk Betweenness Centrality in Linear Time**
  - Qiang-Sheng Hua, Ming Ai, Hai Jin, Dongxiao Yu, and Xuanhua Shi

- **DeGPar: Large Scale Topic Detection Using Node-Cut Partitioning on Dense Weighted Graphs**
  - Kambiz Ghoochian, Sarunas Girdzijauskas, and Fatemeh Rahimian

### Research 13: Distributed Algorithms and Theory II

- **Networked Stochastic Multi-armed Bandits with Combinatorial Strategies**
  - Shaojie Tang, Yaqin Zhou, Kai Han, Zhao Zhang, Jing Yuan, and Weili Wu

- **Computability of Perpetual Exploration in Highly Dynamic Rings**
  - Marjorie Bournat, Swan Dubois, and Franck Petit

- **Locally Self-Adjusting Skip Graphs**
  - Sikder Huq and Sukumar Ghosh

- **Online to Offline Business: Urban Taxi Dispatching with Passenger-Driver Matching Stability**
  - Huanyang Zheng and Jie Wu

- **An Optimization Framework for Online Ride-Sharing Markets**
  - Yongzheng Jia, Wei Xu, and Xue Liu

- **Fast and Accurate Tracking of Population Dynamics in RFID Systems**
  - Muhammad Shahzad and Alex X. Liu

### Research 14: Mobile and Wireless Computing Systems II

- **Robust Indoor Wireless Localization Using Sparse Recovery**
  - Wei Gong and Jiangchuan Liu

- **Max-Min Fair Resource Allocation in HetNets: Distributed Algorithms and Hybrid Architecture**
  - Ehsan Aryafar, Alireza Keshavarz-Haddad, Carlee Joe-Wong, and Mung Chiang
Optimization of Full-View Barrier Coverage with Rotatable Camera Sensors .................................................................870
   Xiaofeng Gao, Rui Yang, Fan Wu, Guihai Chen, and Jinguang Zhou

Communication through Symbol Silence: Towards Free Control Messages in Indoor WLANs ..................................................880
   Bing Feng, Jianqing Liu, Chi Zhang, and Yuguang Fang

Secure Connectivity of Wireless Sensor Networks Under Key Predistribution with on/off Channels ..........................................889
   Jun Zhao

iUpdater: Low Cost RSS Fingerprints Updating for Device-Free Localization .........................................................................900
   Liqiong Chang, Jie Xiong, Yu Wang, Xiaojiang Chen, Junhao Hu, and Dingyi Fang

Research 15: Social Networks and Crowdsourcing

Influence Maximization in a Many Cascades World .................................................................911
   Iouliana Litou, Vana Kalogeraki, and Dimitrios Gunopulos

Expertise-Aware Truth Analysis and Task Allocation in Mobile Crowdsourcing .........................................................922
   Xiaomei Zhang, Yibo Wu, Lifu Huang, Heng Ji, and Guohong Cao

MELODY: A Long-Term Dynamic Quality-Aware Incentive Mechanism for Crowdsourcing ..............................................933
   Hongwei Wang, Song Guo, Jiannong Cao, and Minyi Guo

The Strong Link Graph for Enhancing Sybil Defenses ...............................................................................................944
   Suhendry Effendy and Roland H. C. Yap

Mechanism Design for Mobile Crowdsensing with Execution Uncertainty .................................................................955
   Zhenzhe Zheng, Zhaoxiong Yang, Fan Wu, and Guihai Chen

Towards Scalable and Dynamic Social Sensing Using A Distributed Computing Framework ..............................................966
   Daniel (Yue) Zhang, Chao Zheng, Dong Wang, Doug Thain, Xin Mu, Greg Madey, and Chao Huang

Industry and Experimentation Track

Industry 1: Cloud Data Centers and Performance

Phoenix: A Constraint-Aware Scheduler for Heterogeneous Datacenters ...........................................................................977
   Prashanth Thinakaran, Jashwant Raj Gunasekaran, Bikash Sharma, Mahmut Taylan Kandemir, and Chita R. Das

Dual Scaling VMs and Queries: Cost-Effective Latency Curtailment ..............................................................................988
   Juan F. Pérez, Robert Birke, Mathias Björkqvist, and Lydia Y. Chen

A Framework for Enabling Security Services Collaboration Across Multiple Domains .................................................999
   Daniel Migault, Marcos A. Simplicio Jr., Bruno M. Barros, Makan Pourzandi, Thiago R. M. Almeida, Ewerton R. Andrade, and Tereza C. M. B. Carvalho

Group Clustering Using Inter-Group Dissimilarities ...........................................................................................1011
   Debessay Fesehay, Lenin Singaraveluy, Chien-Chia Chen, Xiaobo Huang, Amitabha Banerjee, Ruijin Zhou, and Rajesh Somasundaran
Comprehensive Measurement and Analysis of the User-Perceived I/O Performance in a Production Leadership-Class Storage System .............................................................1022

Lipeng Wan, Matthew Wolf, Feiyi Wang, Jong Youl Choi, George Ostrouchov, and Scott Klasky

Industry 2: Mobile Computing and Internet of Things

On the Limits of Subsampling of Location Traces .....................................................................................................1032

Mudhakar Srivatsa, Raghu Ganti, and Prasant Mohapatra

SOM-TC: Self-Organizing Map for Hierarchical Trajectory Clustering .................................................................1042

Pranita Dewan, Raghu Ganti, and Mudhakar Srivatsa

Processing Encrypted and Compressed Time Series Data .........................................................................................1053

Matúš Harvan, Samuel Kimoto, Thomas Locher, Yvonne-Anne Pignolet, and Johannes Schneider

Calvin Constrained — A Framework for IoT Applications in Heterogeneous Environments ................................................ ........................................1063

Amardeep Mehta, Rami Baddour, Fredrik Svensson, Harald Gustafsson, and Erik Elmroth

Applications and Experiences Track

Application 1: Security, Privacy, Trust in Distributed Systems

Privacy Preserving User-Based Recommender System ...............................................................................................1074

Shahriar Badsha, Xun Yi, Ibrahim Khalil, and Elisa Bertino

Privacy Preserving Optimization of Participatory Sensing in Mobile Cloud Computing ...........................................1084

Ye Yan, Dong Han, and Tao Shu

SPHINX: A Password Store that Perfectly Hides Passwords from Itself .................................................................1094

Maliheh Shirvanian, Stanislaw Jarecki, Hugo Krawczyk, and Nitesh Saxena

When Smart TV Meets CRN: Privacy-Preserving Fine-Grained Spectrum Access .....................................................1105

Chaowen Guan, Aziz Mohaisen, Zhi Sun, Lu Su, Kui Ren, and Yaling Yang

Revisiting Security Risks of Asymmetric Scalar Product Preserving Encryption and Its Variants .................................................................1116

Weipeng Lin, Ke Wang, ZhiLin Zhang, and Hong Chen

An Adversary-Centric Behavior Modeling of DDoS Attacks ......................................................................................1126

An Wang, Aziz Mohaisen, and Songqing Chen

Application 2: Social Networks and Crowdsourcing

Anti-Malicious Crowdsourcing Using the Zero-Determinant Strategy ........................................................................1137

Qin Hu, Shengling Wang, Liran Ma, Rongfang Bie, and XiuZhen Cheng

JPR: Exploring Joint Partitioning and Replication for Traffic Minimization in Online Social Networks .................................1147

Jingya Zhou and Jianxi Fan
Optimizing Source Selection in Social Sensing in the Presence of Influence Graphs ..................................................1157
Huajie Shao, Shiguang Wang, Shen Li, Shuochao Yao, Yiran Zhao, Tanvir Amin, Tarek Abdelzaher, and Lance Kaplan

Dynamic Contract Design for Heterogenous Workers in Crowdsourcing for Quality Control ..................................................1168
Chenxi Qiu, Anna Cinzia Squicciarini, Sarah Michele Rajtmajer, and James Caverlee

Joint Request Balancing and Content Aggregation in Crowdsourced CDN ..........................................................1178
Ming Ma, Zhi Wang, Kun Yi, Jiangchuan Liu, and Lifeng Sun

Shrink: A Breast Cancer Risk Assessment Model Based on Medical Social Network ..................................................1189
Ali Li, Rui Wang, and Lei Xu

Application 3: Internet of Things, Smart Cities, and Cyber-Physical Systems

Opportunistic Energy Sharing Between Power Grid and Electric Vehicles: A Game Theory-Based Pricing Policy ..................................................1197
Ankur Sarker, Zhuozhao Li, William Kolodzey, and Haiying Shen

Energy Efficient Object Detection in Camera Sensor Networks ..............................................................................1208
Tuan Dao, Karim Khalil, Amit K. Roy-Chowdhury, Srikanth V. Krishnamurthy, and Lance Kaplan

DeepOpp: Context-Aware Mobile Access to Social Media Content on Underground Metro Systems ..................................................1219
Di Wu, Dmitri I. Arkhipov, Thomas Przepiora, Qiang Liu, Julie A. McCann, and Amelia C. Regan

PhaseBeat: Exploiting CSI Phase Data for Vital Sign Monitoring with Commodity WiFi Devices ..................................................1230
Xuyu Wang, Chao Yang, and Shiwen Mao

REX: Rapid Ensemble Classification System for Landslide Detection Using Social Media ..................................................1240
Aibek Musaev, De Wang, Jiateng Xie, and Calton Pu

Toward An Integrated Approach to Localizing Failures in Community Water Networks ..................................................1250
Qing Han, Phu Nguyen, Ronald T. Eguchi, Kuo-Lin Hsu, and Nalini Venkatasubramanian

Application 4: Mobile, Wireless, and Edge Computing

MobiQoR: Pushing the Envelope of Mobile Edge Computing Via Quality-of-Result Optimization ..................................................1261
Yongbo Li, Yurong Chen, Tian Lan, and Guru Venkataramani

Truthful Auctions for User Data Allowance Trading in Mobile Networks ..................................................1271
Zhongxing Ming, Mingwei Xu, Ning Wang, Bingjie Gao, and Qi Li

Online Resource Allocation for Arbitrary User Mobility in Distributed Edge Clouds ..................................................1281
Lin Wang, Lei Jiao, Jun Li, and Max Mühlhäuser

Leveraging Target k-Coverage in Wireless Rechargeable Sensor Networks ..................................................1291
Pengzhan Zhou, Cong Wang, and Yuanyuan Yang
### Application 5: Cloud Computing and Data Center Systems

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-resource Load Balancing for Virtual Network Functions</td>
<td>1322</td>
</tr>
<tr>
<td>Tao Wang, Hong Xu, and Fangming Liu</td>
<td></td>
</tr>
<tr>
<td>Learning from Failure Across Multiple Clusters: A Trace-Driven Approach</td>
<td></td>
</tr>
<tr>
<td>to Understanding, Predicting, and Mitigating Job Terminations</td>
<td>1333</td>
</tr>
<tr>
<td>Nosayba El-Sayed, Hongyu Zhu, and Bianca Schroeder</td>
<td></td>
</tr>
<tr>
<td>RBAY: A Scalable and Extensible Information Plane for Federating Distributed Datacenter Resources</td>
<td>1345</td>
</tr>
<tr>
<td>Xin Chen, Liting Hu, Douglas M. Blough, Michael A. Kozuch, and Matthew Wolf</td>
<td></td>
</tr>
<tr>
<td>Task-aware TCP in Data Center Networks</td>
<td>1356</td>
</tr>
<tr>
<td>Sen Liu, Jiawei Huang, Yutao Zhou, Jianxin Wang, and Tian He</td>
<td></td>
</tr>
<tr>
<td>Limitations of Load Balancing Mechanisms for N-Tier Systems in the Presence of Millibottlenecks</td>
<td>1367</td>
</tr>
<tr>
<td>Tao Zhu, Jack Li, Josh Kimball, Junhee Park, Chien-An Lai, Calton Pu, and Qingyang Wang</td>
<td></td>
</tr>
<tr>
<td>Performance Analysis of Cloud Computing Centers Serving Parallelizable Rendering Jobs Using M/M/c</td>
<td>r Queuing Systems</td>
</tr>
<tr>
<td>Xiulin Li, Li Pan, Jiwei Huang, Shijun Liu, Yuliang Shi, Lizhen Cui, and Calton Pu</td>
<td></td>
</tr>
</tbody>
</table>

### Application 6: Big Data Systems and Distributed Data Management and Analytics

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of Deep Learning Frameworks Over Different HPC Architectures</td>
<td>1389</td>
</tr>
<tr>
<td>Shayan Shams, Richard Platania, Kisung Lee, and Seung-Jong Park</td>
<td></td>
</tr>
<tr>
<td>On Achieving Efficient Data Transfer for Graph Processing in Geo-Distributed Datacenters</td>
<td>1397</td>
</tr>
<tr>
<td>Amelie Chi Zhou, Shadi Ibrahim, and Bingsheng He</td>
<td></td>
</tr>
<tr>
<td>GBooster: Towards Acceleration of GPU-Intensive Mobile Applications</td>
<td>1408</td>
</tr>
<tr>
<td>Elliott Wen, Winston K.G. Seah, Bryan Ng, Xue Liu, Jiannong Cao, and Xuefeng Liu</td>
<td></td>
</tr>
<tr>
<td>Scaling k-Nearest Neighbours Queries (The Right Way)</td>
<td>1419</td>
</tr>
<tr>
<td>Atoshum Cahsai, Nikos Ntarmos, Christos Anagnostopoulos, and Peter Triantafillou</td>
<td></td>
</tr>
<tr>
<td>Parallelizing Big De Bruijn Graph Construction on Heterogeneous Processors</td>
<td>1431</td>
</tr>
<tr>
<td>Shuang Qiu and Qiong Luo</td>
<td></td>
</tr>
<tr>
<td>Private, Yet Practical, Multiparty Deep Learning</td>
<td>1442</td>
</tr>
<tr>
<td>Xinyang Zhang, Shouling Ji, Hui Wang, and Ting Wang</td>
<td></td>
</tr>
</tbody>
</table>
Application 7: Distributed Middleware Systems

Fast and Flexible Networking for Message-Oriented Middleware .................................................................................. 1453
Lars Kroll, Alexandru A. Ormenișan, and Jim Dowling

TailCut: Power Reduction under Quality and Latency Constraints in Distributed Search
Systems ........................................................................................................................................................................... 1465
Chih-Hsun Chou, Laxmi N. Bhuyan, and Shaolei Ren

StoArranger: Enabling Efficient Usage of Cloud Storage Services on Mobile Devices .............................................. 1476
Yongshu Bai and Yifan Zhang

Characterizing Performance and Energy-Efficiency of the RAMCloud Storage System ............................................ 1488
Yacine Taleb, Shadi Ibrahim, Gabriel Antoniu, and Toni Cortes

Proactively Secure Cloud-Enabled Storage .................................................................................................................. 1499
Karim Eldefrawy, Sky Faber, and Tyler Kaczmarek

BEES: Bandwidth- and Energy- Efficient Image Sharing for Real-Time Situation
Awareness ........................................................................................................................................................................ 1510
Pengfei Zuo, Yu Hua, Xue Liu, Dan Feng, Wen Xia, Shunde Cao, Jie Wu, Yuanyuan Sun, and Yuncheng Guo

Application 8: Distributed Systems and Optimizations

Transparent Fault-Tolerance Using Intra-Machine Full-Software-Stack Replication on Commodity Multicore Hardware ......................................................................................................................... 1521
Giuliano Losa, Antonio Barbalace, Yuzhong Wen, Ho-Ren Chuang, and Binoy Ravindran

A Preventive Auto-Parallelization Approach for Elastic Stream Processing ................................................................. 1532
Roland Kotto Kombi, Nicolas Lumineau, and Philippe Lamarre

Dependable Cloud Resources with Guardian .................................................................................................................. 1543
Bara Abusalah, Derek Schatzlein, Julian James Stephen, Masoud Saeida Ardekani, and Patrick Eugster

A Communication-Aware Container Re-Distribution Approach for High Performance VNFs ......................................................... 1555
Yuchao Zhang, Yusen Li, Ke Xu, Dan Wang, Minghui Li, Xuan Cao, and Qingqing Liang

Minimizing Cost in IaaS Clouds Via Scheduled Instance Reservation ........................................................................ 1565
Qiushi Wang, Ming Ming Tan, Xueyan Tang, and Wentong Cai

Efficient Distributed Coordination at WAN-Scale ......................................................................................................... 1575
Ailidani Ailijiang, Aleksey Charapko, Murat Demirbas, Bekir O. Turkkan, and Tevfik Kosar

Application 9: Distributed Systems and Applications

Specifying a Distributed Snapshot Algorithm as a Meta-Program and Model Checking it at Meta-Level ........................................................................................................................................................................... 1586
Ha Thi Thu Doan, Kazuhiro Ogata, and François Bonnet

Self-Evolving Subscriptions for Content-Based Publish/Subscribe Systems ...................................................................... 1597
César Canas, Kaiwen Zhang, Bettina Kemme, Jörg Kienzle, and Hans-Arno Jacobsen
Scalable Routing for Topic-Based Publish/Subscribe Systems Under Fluctuations ..................................................1608
Volker Turau and Gerry Siegemund

OPPay: Design and Implementation of a Payment System for Opportunistic Data Services ..........................................................1618
Fengrui Shi, Zhijin Qin, and Julie A. McCann

Optimal Resource Allocation for Multi-user Video Streaming over mmWave Networks ..................................................1629
Zhifeng He and Shiwen Mao

A Multi-agent Parallel Approach to Analyzing Large Climate Data Sets ...............................................................................1639
Jason Woodring, Matthew Sell, Munehiro Fukuda, Hazeline Asuncion, and Eric Salathe

Application 10: Distributed Systems and Services

Energy Proportional Servers: Where Are We in 2016? ..........................................................................................1649
Congfeng Jiang, Yumei Wang, Dongyang Ou, Bing Luo, and Weisong Shi

Are HTTP/2 Servers Ready Yet? ..........................................................................................................................1661
Muhui Jiang, Xiapu Luo, TungNgai Miu, Shengtuo Hu, and Weixiong Rao

Data Integrity for Collaborative Applications over Hosted Services ...........................................................................1672
Ertem Esiner and Anwitaman Datta

Virtual Machine Power Accounting with Shapley Value ..........................................................................................1683
Weixiang Jiang, Fangming Liu, Guoming Tang, Kui Wu, and Hai Jin

A General Purpose Testbed for Mobile Data Gathering in Wireless Sensor Networks and a Case Study ..................................................1694
Ji Li, Cong Wang, and Yuanyuan Yang

On Directional Neighbor Discovery in mmWave Networks ..........................................................................................1704
Yu Wang, Shiwen Mao, and Theodore (Ted) S. Rappaport

Vision/Blue Sky Thinking Track

Vision 1: Internet of Things, Smart Cities and Cyber-Physical Systems

Observable-by-Design ...........................................................................................................................................1714
Masaru Kitsuregawa

An Architectural Vision for a Data-Centric IoT: Rethinking Things, Trust and Clouds ..................................................1717
Eve M. Schooler, David Zage, Jeff Sedayao, Hassnaa Moustafa, Andrew Brown, and Moreno Ambrosin

Edge Computing and IoT Based Research for Building Safe Smart Cities Resistant to Disasters ..................................................1729
Teruo Higashino, Hirozumi Yamaguchi, Akihito Hiromori, Akira Uchiyama, and Keiichi Yasumoto

The Internet of Things and Multiagent Systems: Decentralized Intelligence in Distributed Computing ..................................................1738
Munindar P. Singh and Amit K. Chopra
Vision 2: Future Networking and Cyberinfrastructure

A Vision for Zero-Hop Networking (ZeN) .................................................................1765
Mostafa Ammar, Ellen Zegura, and Yimeng Zhao

Structured Overlay Networks for a New Generation of Internet Services .......................................1771
Amy Babay, Claudiu Danilov, John Lane, Michal Miskin-Amir, Daniel Obenshain,
John Schultz, Jonathan Stanton, Thomas Tantillo, and Yair Amir

Ensuring Network Neutrality for Future Distributed Systems .................................................................1780
Thiago Garrett, Schahram Dustdar, Luis C. E. Bona, and Elias P. Duarte Jr.

Uncovering the Useful Structures of Complex Networks in Socially-Rich and Dynamic Environments ...........................................................................................................1787
Jie Wu

Future Networking Challenges: The Case of Mobile Augmented Reality .................................................................1796
Tristan Braud, Farshid Hassani Bjarbooneh, Dimitris Chatzopoulos, and Pan Hui

Software Defined Cyberinfrastructure ...........................................................................................................1808
Ian Foster, Ben Blaiszik, Kyle Chard, and Ryan Chard

Vision 3: Next Generation Cloud and Edge Services

Computing in the Continuum: Combining Pervasive Devices and Services to Support Data-Driven Applications .................................................................................................................................1815
Moustafa AbdelBaky, Mengsong Zou, Ali Reza Zamani, Eduard Renart,
Javier Diaz-Montes, and Manish Parashar

Decision-Driven Execution: A Distributed Resource Management Paradigm for the Age of IoT .................................................................................................................................1825
Tarek Abdelzaher, Md Tanvir A. Amin, Amotz Bar-Noy, William Dron,
Ramesh Govindan, Reginald Hobbs, Shaoan Hu, Jung-Eun Kim, Jongdeog Lee,
Kelvin Marcus, Shuochoa Yao, and Yiran Zhao

ACTICLOUD: Enabling the Next Generation of Cloud Applications .................................................................1836
Georgios Goumas, Konstantinos Nikas, Ewenu Bayuh Lakew, Christos Kotselidis,
Andrew Attwood, Erik Elmoth, Michail Flouris, Nikos Foutris, John Goodacre,
Davide Grohmann, Vasileios Karakostas, Panagiotis Koutsourakis, Martin Kersten,
Mikel Luján, Einar Rustad, John Thomson, Luis Tomás, Atle Vesterkjaer, Jim Webber,
Ying Zhang, and Nectarios Koziris

JointCloud: A Cross-Cloud Cooperation Architecture for Integrated Internet Service Customization .................................................................................................................................1846
Huaimin Wang, Peichang Shi, and Yiming Zhang

Supporting Data Analytics Applications Which Utilize Cognitive Services ..................................................1856
Arun Iyengar
Trillion Operations Key-Value Storage Engine: Revisiting the Mission Critical Analytics Storage Software Stack .................................................................1865
Sangeetha Seshadri, Paul Muench, and Lawrence Chiu

Vision 4: Security and Trust in Future Systems
How Computer Science Risks to Lose Its Innocence, and Should Attempt to Take Responsibility .........................................................................................................................1873
Karl Aberer
A Cognitive Policy Framework for Next-Generation Distributed Federated Systems:
Concepts and Research Directions .........................................................................................................................1876
Elisa Bertino, Seraphin Calo, Maroun Toma, Dinesh Verma, Christopher Williams,
and Brian Rivera
Machine to Machine Trust in Smart Cities .........................................................................................................................1887
Margaret L. Loper and Brian Swenson
Lateral Thinking for Trustworthy Apps .........................................................................................................................1890
Hermann Härtig, Michael Roitzsch, Carsten Weinhold, and Adam Lackorzynski
Rumor Initiator Detection in Infected Signed Networks .....................................................................................................1900
Jiawei Zhang, Charu C. Aggarwal, and Philip S. Yu
Addressing Smartphone-Based Multi-factor Authentication via Hardware-Rooted Technologies .................................................................................................................................1910
Zhongjie Ba and Kui Ren

Vision 5: Future Distributed Systems
Enabling Wide Area Data Analytics with Collaborative Distributed Processing Pipelines (CDPPs) .................................................................................................................................1915
Anja Feldmann, Manfred Hauswirth, and Volker Markl
The Millibottleneck Theory of Performance Bugs, and Its Experimental Verification .................................................1919
Calton Pu, Joshua Kimball, Chien-An Lai, Tao Zhu, Jack Li, Junhee Park,
Qingyang Wang, Deepal Jayasinghe, Pengcheng Xiong, Simon Malkowski, Qinyi Wu,
Gueyoung Jung, Younggyun Koh, and Galen Swint
Execuation: Enhancing Scientific Data Management for Exascale ......................................................................................1927
Scott Klasky, Eric Suchyta, Mark Ainsworth, Qing Liu, Ben Whitney, Matthew Wolf,
Jong Choi, Ian Foster, Mark Kim, Jeremy Logan, Kshitij Mehta, Todd Munson,
George Ostrovchov, Manish Parashar, Norbert Podhorszki, David Pugmire,
and Lipeng Wan
Hardware Acceleration Landscape for Distributed Real-Time Analytics: Virtues and Limitations ..................................1938
Mohammadreza Najafi, Kaiwen Zhang, Mohammad Sadoghi, and Hans-Arno Jacobsen
Coordinating Distributed Speaking Objects .....................................................................................................................1949
Marco Lippi, Marco Mamei, Stefano Mariani, and Franco Zambonelli
Model-Driven Domain-Specific Middleware .....................................................................................................................1961
Fabio M. Costa, Karl A. Morris, Fabio Kon, and Peter J. Clarke
Vision 6: Innovation in Big Data Systems

On the Design of a Blockchain Platform for Clinical Trial and Precision Medicine ..............................................................1972
  Zonyin Shae and Jeffrey J.P. Tsai
Towards Dataflow-Based Graph Accelerator .................................................................1981
  Hai Jin, Pengcheng Yao, Xiaofei Liao, Long Zheng, and Xianliang Li
Towards a RISC Framework for Efficient Contextualisation in the IoT ..........................................................1993
  Dimitrios Georgakopoulos, Ali Yavari, Prem Prakash Jayaraman, and Rajiv Ranjan
The Future of the Semantic Web: Prototypes on a Global Distributed Filesystem ..........................................................1997
  Michael Cochez, Dominik Hüser, and Stefan Decker
On Broad Big Data ...................................................................................................................2007
  Steffen Staab

Short Papers

Short Paper 1: Distributed Operating Systems, Middleware, and Algorithms

SRLB: The Power of Choices in Load Balancing with Segment Routing ..............................................................2011
  Yoann Desmouceaux, Pierre Pfister, Jérôme Tollet, Mark Townsley, and Thomas Clausen
Improving Efficiency of Link Clustering on Multi-core Machines ..............................................................2017
  Guanhua Yan
S3: Joint Scheduling and Source Selection for Background Traffic in Erasure-Coded Storage ..............................................................2025
  Shijing Li, Tian Lan, Moo-Ryong Ra, and Rajesh Panta
On the Feasibility of Inter-Domain Routing via a Small Broker Set ..............................................................2031
  Dong Lin, David Hui, Weijie Wu, Tingwei Liu, Yating Yang, Yi Wang, John C.S. Lui, Gong Zhang, and Yingtao Li
Subscription Covering for Relevance-Based Filtering in Content-Based Publish/Subscribe Systems ..............................................................2039
  Kaiwen Zhang, Vinod Muthusamy, Mohammad Sadoghi, and Hans-Arno Jacobsen
Workflow Optimization in PAW ...................................................................................................................2045
  Maxim Filatov, Verena Kantere, and Iluju Kiringa
A First Look at Information Entropy-Based Data Pricing ....................................................................................2053
  Xijun Li, Jianguo Yao, Xue Liu, and Haibing Guan
Retrospective Lightweight Distributed Snapshots Using Loosely Synchronized Clocks ..............................................................2061
  Aleksey Charapko, Alidani Allijiang, Murat Demirbas, and Sandeep Kulkarni
Power-Aware Population Protocols ...................................................................................................................2067
  Chuan Xu, Janna Burman, and Joffrey Beauquier
MultiPub: Latency and Cost-Aware Global-Scale Cloud Publish/Subscribe ..............................................................2075
  Julien Gascon-Samson, Jörg Kienzle, and Bettina Kemme
Reachability in Binary Multithreaded Programs Is Polynomial ..............................................................2083
  Alexander Malkis and Steffen Borgwardt
Short Paper 2: Cloud and Data Center Systems and Networks

DCM: Dynamic Concurrency Management for Scaling n-Tier Applications in Cloud ..................................................2097
Hui Chen, Qingyang Wang, Balaji Palanisamy, and Pengcheng Xiong

More Peak, Less Differentiation: Towards A Pricing-aware Online Control Framework for Inter-Datacenter Transfers ..................................................2105
Wenxin Li, Xiaobo Zhou, Keqiu Li, Heng Qi, and Deke Guo

Robust Multi-tenant Server Consolidation in the Cloud for Data Analytics Workloads .............................................2111
Joseph Mate, Khuzaima Daudjee, and Shahin Kamali

Flow-Aware Adaptive Pacing to Mitigate TCP Incast in Data Center Networks ..................................................2119
Shaojun Zou, Jiawei Huang, Yutao Zhou, Jianxin Wang, and Tian He

Real-Time Power Cycling in Video on Demand Data Centres Using Online Bayesian Prediction ..................................................2125
Vicent Sanz Marco, Zheng Wang, and Barry Porter

A Distributed Access Control System for Cloud Federations ..................................................................................2131
Shorouq Alansari, Federica Paci, and Vladimiro Sassone

Voyager: Complete Container State Migration ..................................................................................................2137
Shripad Nadgowda, Sahil Suneja, Nilton Bila, and Canturk Isci

Keddah: Capturing Hadoop Network Behaviour .................................................................................................2143
Jie Deng, Gareth Tyson, Felix Cuadrado, and Steve Uhlig

A Scalable and Distributed Approach for NFV Service Chain Cost Minimization .............................................2151
Zijun Zhang, Zongpeng Li, Chuan Wu, and Chuanhe Huang

Elastic Paxos: A Dynamic Atomic Multicast Protocol ......................................................................................2157
Samuel Benz and Fernando Pedone

Boosting The Benefits of Hybrid SDN ............................................................................................................2165
Wen Wang, Wenbo He, and Jinshu Su

Adopting SDN Switch Buffer: Benefits Analysis and Mechanism Design ..........................................................2171
Fuliang Li, Jiannah Cao, Xingwei Wang, Yinchu Sun, Tian Pan, and Xuefeng Liu

Short Paper 3: Internet of Things, Smart Cities, and Cyber-Physical Systems

IoT SENTINEL: Automated Device-Type Identification for Security Enforcement in IoT ........................................2177
Markus Miettinen, Samuel Marchal, Ibbad Hafeez, N. Asokan, Ahmad-Reza Sadeghi, and Sasu Tarkoma

Efficient Z-Order Encoding Based Multi-Modal Data Compression in WSNs ..................................................2185
Xiaofei Cao, Sanjay Madria, and Takahiro Hara

PTrack: Enhancing the Applicability of Pedestrian Tracking with Wearables ....................................................2193
Yonghang Jiang, Zhenjiang Li, and Jianping Wang
Source Location Privacy-Aware Data Aggregation Scheduling for Wireless Sensor Networks .......................................................... 2200
  Jack Kirton, Matthew Bradbury, and Arshad Jhumka

Velocity Optimization of Pure Electric Vehicles with Traffic Dynamics Consideration ...................................................... 2206
  Liuwang Kang, Haiying Shen, and Ankur Sarker

PIANO: Proximity-Based User Authentication on Voice-Powered Internet-of-Things Devices .................................................. 2212
  Neil Zhenqiang Gong, Altay Ozen, Yu Wu, Xiaoyu Cao, Richard Shin, Dawn Song, Hongxia Jin, and Xuan Bao

Category Information Collection in RFID Systems ........................................................................................................... 2220
  Jia Liu, Shigang Chen, Bin Xiao, Yanyan Wang, and Lijun Chen

Scalable Role-Based Data Disclosure Control for the Internet of Things ................................................................. 2226
  Ali Yavari, Arefou Soltani Panah, Dimitrios Georgakopoulos, Prem Prakash Jayaraman, and Ron van Schyndel

Multi-representation Based Data Processing Architecture for IoT Applications .............................................................. 2234
  Vaibhav Arora, Faisal Nawab, Divyakant Agrawal, and Amr El Abbadi

Long Term Sensing via Battery Health Adaptation ........................................................................................................ 2240
  Greg Jackson, Zhijin Qin, and Julie A. McCann

Detecting Time Synchronization Attacks in Cyber-Physical Systems with Machine Learning Techniques ...................... 2246
  Jingxuan Wang, Wenting Tu, Lucas C.K. Hui, S.M. Yiu, and Eric Ke Wang

Speed-Based Location Tracking in Usage-Based Automotive Insurance ........................................................... 2252
  Lu Zhou, Qingrong Chen, Zutian Luo, Haojin Zhu, and Cailian Chen

**Short Paper 4: Mobile, Wireless, Edge, and Crowd Computing**

On Efficient Offloading Control in Cloud Radio Access Network with Mobile Edge Computing .......................................................... 2258
  Tong Li, Chathura Sarathchandra Magurawalage, Kezhi Wang, Ke Xu, Kun Yang, and Haiyang Wang

Location Privacy in Mobile Edge Clouds ........................................................................................................... 2264
  Ting He, Ertugrul N. Ciftcioglu, Shiqiang Wang, and Kevin S. Chan

Approximation Designs for Cooperative Relay Deployment in Wireless Networks .............................................................. 2270
  Haotian Wang, Shilei Tian, Xiaofeng Gao, Lidong Wu, and Guihai Chen

Dispersing Social Content in Mobile Crowd through Opportunistic Contacts ........................................................... 2276
  Lei Zhang, Feng Wang, and Jiangchuan Liu

A Lightweight Recommendation Framework for Mobile User’s Link Selection in Dense Network .......................................................... 2282
  Ji Wang, Xiaomin Zhu, Weidong Bao, and Guanlin Wu

Making Smartphone Smart on Demand for Longer Battery Life ................................................................................... 2288
  Marco Brocanelli and Xiaorui Wang
Short Paper 6: Security, Privacy, Trust, and Fault Tolerance in Distributed Systems

Proximity Awareness Approach to Enhance Propagation Delay on the Bitcoin Peer-to-Peer Network
Muntadher Fadhil sallal, Gareth Owenson, and Mo Adda

Catch Me If You Can: Detecting Compromised Users Through Partial Observation on Networks
Derek Wang, Sheng Wen, Yang Xiang, Wanlei Zhou, Jun Zhang, and Surya Nepal

Location Privacy Breach: Apps Are Watching You in Background
Dachuan Liu, Xing Gao, and Haining Wang

Android Malware Detection Using Complex-Flows
Feng Shen, Justin Del Vecchio, Aziz Mohaisen, Steven Y. Ko, and Lukasz Ziarek

Privacy Implications of DNSSEC Look-Aside Validation
Aziz Mohaisen, Zhongshu Gu, and Kui Ren

FlipNet: Modeling Covert and Persistent Attacks on Networked Resources
Sudip Saha, Anil Vullikanti, and Mahantesh Halappanavar

Understanding the Market-Level and Network-Level Behaviors of the Android Malware Ecosystem
Chao Yang, Jialong Zhang, and Guofei Gu

EnGarde: Mutually-Trusted Inspection of SGX Enclaves
Hai Nguyen and Vinod Ganapathy

Truthful Online Auction for Cloud Instance Subletting
Yifei Zhu, Silvery Fu, Jiangchuan Liu, and Yong Cui

Giuseppe Antonio Di Luna, Paola Flocchini, Taisuke Izumi, Tomoko Izumi, Nicola Santoro, and Giovanni Viglietta

Distributed Fault Tolerant Linear System Solvers Based on Erasure Coding
Xuejiao Kang, David F. Gleich, Ahmed Sameh, and Ananth Grama

Preserving Incumbent Users’ Privacy in Exclusion-Zone-Based Spectrum Access Systems
Yanzhi Dou, He Li, Kexiong (Curtis) Zeng, Jinshan Liu, Yaling Yang, Bo Gao, and Kui Ren
Demonstration Track

Demo 1: Distributed Applications Cluster
LITMUS: Towards Multilingual Reporting of Landslides .................................................................2494
   Aibek Musaev, Qixuan Hou, Yang Yang, and Calton Pu
Pythia: A System for Online Topic Discovery of Social Media Posts ..................................................2497
   Iouliana Litou and Vana Kalogeraki
Data-Driven Serendipity Navigation in Urban Places ...........................................................................2501
   Xiaoyu Ge, Ameya Daphalapurkar, Manali Shimpi, Darpun Kohli,
   Konstantinos Pelechrinis, Panos K. Chrysanthis, and Demetrios Zeinalipour-Yazti
Toward an Integrated Approach to Localizing Failures in Community Water Networks
(DEMO) ................................................................................................................................................2505
   Qing Han, Phu Nguyen, Ronald T. Eguchi, Kuo-Lin Hsu, and Nalini Venkatasubramanian

Demo 2: Security and Privacy Cluster
PrivateGraph: A Cloud-Centric System for Spectral Analysis of Large Encrypted
Graphs ................................................................................................................................................2507
   Sagar Sharma and Keke Chen
IoT Sentinel Demo: Automated Device-Type Identification for Security Enforcement
in IoT ................................................................................................................................................2511
   Markus Miettinen, Samuel Marchal, Ibbad Hafeez, Tommaso Frassetto, N. Asokan,
   Ahmad-Reza Sadeghi, and Sasu Tarkoma
Rogue Access Point Detector Using Characteristics of Channel Overlapping in 802.11n ..................2515
   RhongHo Jang, Jeonil Kang, Aziz Mohaisen, and DaeHun Nyang
ReverseCloak: A Reversible Multi-level Location Privacy Protection System ......................................2521
   Chao Li, Balaji Palanisamy, Aravind Kalaivanan, and Sriram Raghunathan

Demo 3: Clouds and Virtualization Cluster
Hopworks: Improving User Experience and Development on Hadoop with Scalable,
Strongly Consistent Metadata ..............................................................................................................2525
   Mahmoud Ismail, Ermias Gebremeskel, Theofilos Kakantousis, Gautier Berthou,
   and Jim Dowling
Isolation in Docker through Layer Encryption ..........................................................................................2529
   Ioannis Giannakopoulos, Konstantinos Papazafeiropoulos, Katerina Doka,
   and Nectarios Koziris
Dela — Sharing Large Datasets between Hadoop Clusters ....................................................................2533
   Alexandru A. Ormeni şan and Jim Downling
In Vivo Evaluation of the Secure Opportunistic Schemes Middleware Using a Delay Tolerant Social Network ..................................................................................................................2537
   Corey E. Baker, Allen Starke, Tanisha G. Hill-Jarrett, and Janise McNair
Demo 4: Distributed Systems and Networking Cluster
Scaling and Load Testing Location-Based Publish and Subscribe .........................................................2543
Bertil Chapuis and Benoît Garbinato
A Distributed Event-Centric Collaborative Workflows Development System for IoT Application ........................................................................................................................................................................2547
Yongyang Cheng, Shuai Zhao, Bo Cheng, Shoulu Hou, Xiulei Zhang, and Junliang Chen
Incentive Mechanism for Data-Centric Message Delivery in Delay Tolerant Networks .......................2551
Himanshu Jethawa and Sanjay Madria
Performance of Cognitive Wireless Charger for Near-Field Wireless Charging ....................................2555
Sang-Yoon Chang, Sristi Lakshmi Sravana Kumar, and Yih-Chun Hu

Poster Track

Poster 1: Distributed Applications Cluster
Toward Vehicle Sensing: An Integrated Application with Sparse Video Vameras and Intelligent Taxicabs ........................................................................................................................................................................2557
Yang Wang, Wuji Chen, Wei Zheng He Huang, Wen Zhang, and Hengchang Liu
Segmentation of Time Series Based on Kinetic Characteristics for Storage Consumption Prediction ........................................................................................................................................................................2559
Beibei Miao, Yu Chen, Xuebo Jin, Bo Wang, Xianping Qu, Shimin Tao, Dong Wang, and Zhi Zang
A Multi-stage Hierarchical Window Model with Application to Real-Time Graph Analysis ..................2561
Sachini Jayasekara, Shanika Karunasekera, and Aaron Harwood
Dynamic Pricing at Electric Vehicle Charging Stations for Queueing Delay Reduction .......................2565
Peng Xu, Jinyang Li, Xiaoshan Sun, Wei Zheng, and Hengchang Liu
Pairwise Ranking Aggregation by Non-interactive Crowdsourcing with Budget Constraints ........................................................................................................................................................................2567
Changjiang Cai, Haipei Sun, Boxiang Dong, Bo Zhang, Ting Wang, and Hui (Wendy) Wang
Buffer-Based Reinforcement Learning for Adaptive Streaming ................................................................2569
Yue Zhang and Yao Liu
The Case for Using Content-Centric Networking for Distributing High-Energy Physics Software ........................................................................................................................................................................2571
Mohammad Alhowaidi, Byrav Ramamurthy, Brian Bockelman, and David Swanson
LAVEA: Latency-Aware Video Analytics on Edge Computing Platform ..................................................2573
Shanhe Yi, Zijiang Hao, Qingyang Zhang, Quan Zhang, Weisong Shi, and Qun Li
Complete Tolerance Relation Based Filling Algorithm Using Spark ......................................................2575
Jingling Yuan, Yao Xiang, Xian Zhong, Mincheng Chen, and Tao Li
Poster 2: Security and Privacy Cluster
Towards Secure Public Directory for Privacy-Preserving Data Sharing ......................................................... 2577
   Amin Fallahi, Xi Liu, Yuzhe Tang, Shuang Wang, and Rui Zhang
Anonymous Routing to Maximize Delivery Rates in DTNs .................................................................................. 2579
   Kazuya Sakai, Min-Te Sun, Wei-Shinn Ku, and Jie Wu
Evaluating Connection Resilience for the Overlay Network Kademlia ............................................................. 2581
   Henner Heck, Olga Kieselmann, and Arno Wacker
Shortfall-Based Optimal Security Provisioning for Internet of Things ............................................................... 2585
   Antonino Rullo, Edoardo Serra, Elisa Bertino, and Jorge Lobo
Group Differential Privacy-Preserving Disclosure of Multi-level Association Graphs ........................................ 2587
   Balaji Palanisamy, Chao Li, and Prashant Krishnamurthy
Tracking Information Flow in Cyber-Physical Systems .......................................................................................... 2589
   Stefan Gries, Marc Hesenius, and Volker Gruhn
Privacy-Preserving Matchmaking in Geosocial Networks with Untrusted Servers ........................................... 2591
   Qiuxiang Dong and Dijiang Huang
You’ve Been Tricked! A User Study of the Effectiveness of Typosquatting Techniques ................................... 2593
   Jeffrey Spaulding, Shambhu Upadhyaya, and Aziz Mohaisen
Real-Time Detection of Illegal File Transfers in the Cloud ............................................................................. 2597
   Adam Bowers, Dan Lin, Anna Squicciarini, and Ali Hurson
Eyes of the Swarm: Streamers’ Detection in BT ................................................................................................. 2601
   Daniel Vasconcelos Correa da Silva and Antonio Augusto de Aragao Rocha

Poster 3: Clouds and Virtualization Cluster
Load Prediction for Energy-Aware Scheduling for Cloud Computing Platforms ................................................. 2604
   Alexandre Dambreville, Joanna Tomasik, Johanne Cohen, and Fabien Dufoulon
Learn-as-You-Go with Megh: Efficient Live Migration of Virtual Machines .................................................... 2608
   Debabrata Basu, Xiayang Wang, Yang Hong, Haibo Chen, and Stéphane Bressan
Machine-Learning Based Performance Estimation for Distributed Parallel Applications in Virtualized Heterogeneous Clusters ........................................................................................................ 2610
   Seontae Kim, Nguyen Pham, Woongki Baek, and Young-ri Choi
Incremental Elasticity for NoSQL Data Stores .................................................................................................... 2612
   Antonis Papaioannou and Kostas Magouitis
A Framework for Efficient Energy Scheduling of Spark Workloads ................................................................. 2614
   Stathis Maroulis, Nikos Zacheilas, and Vana Kalogeraki
Towards a Complete Virtual Data Center Embedding Algorithm Using Hybrid Strategy ............................... 2616
   M. P. Giles, S. D. Madhu Kumar, Lillykutty Jacob, and Umesh Bellur
Federating Consistency for Partition-Prone Networks ......................................................................................... 2618
   Benjamin Bengfort and Pete Keleher
Mitigating Nesting-Agnostic Hypervisor Policies in Derivative Clouds .......................................................... 2620
   Chandra Prakash, Prashanth, Prushottam Kulkami, and Umesh Bellur
A Novel Architecture for Efficient Fog to Cloud Data Management in Smart Cities ..........................................................2622
  Amir Sinaeepourfard, Jordi Garcia, Xavier Masip-Bruin, and Eva Marin-Tordera

Networklet: Concept and Deployment ..................................................................................................................................2624
  Sheng Zhang, Yu Liang, Zhuzhong Qian, Mingjun Xiao, Jie Wu, Fanyu Kong, and Sanglu Lu

Optimistic Causal Consistency for Geo-Replicated Key-Value Stores ...................................................................................2626
  Kristina Spirovksa, Diego Didona, and Willy Zwaenepoel

Automated Performance Evaluation for Multi-tier Cloud Service Systems Subject to Mixed Workloads ........................................2630
  Xudong Zhao, Jiwei Huang, Lei Liu, Shijun Liu, Calton Pu, and Lizhen Cui

Decentralised Runtime Monitoring for Access Control Systems in Cloud Federations ..........................................................2632
  Md Sadek Ferdous, Andrea Margheri, Federica Paci, Mu Yang, and Vladimiro Sassone

**Poster 4: Distributed Systems and Networking Cluster**

DuoFS: An Attempt at Energy-Saving and Retaining Reliability of Storage Systems .................................................................2634
  Bing Jiao, Xiaomin Zhu, Xiaojun Ruan, Xiao Qin, and Shu Yin

A Proposal of an Efficient Traffic Matrix Estimation Under Packet Drops ................................................................................2636
  Kohei Watabe, Toru Mano, Kimihiro Mizutani, Osamu Akashi, Kenji Nakagawa, and Takeru Inoue

Straggler Mitigation for Distributed Behavioral Simulation .........................................................................................................2638
  Eman Bin Khunayn, Shanika Karunasekera, Hairuo Xie, and Kotagiri Ramamohanarao

Supporting Resource Control for Actor Systems in Akka ................................................................................................................2642
  Ahmed Abdel Moamen, Dezhong Wang, and Nadeem Jamali

A Distributed Operating System Network Stack and Device Driver for Multicores .................................................................2646
  Saif Ansary, Antonio Barbalace, Ho-Ren Chuang, Thomas Lazor, and Binoy Ravindran

Cache Potentiality of MONs: A Prime ........................................................................................................................................2650
  Peiyan Yuan, Honghai Wu, Xiaoyan Zhao, and Zhengnan Dong

Oak: User-Targeted Web Performance ........................................................................................................................................2654
  Marcel Flores, Alexander Wenzel, and Aleksandar Kuzmanovic

A Self-Organizing Distributed and In-Band SDN Control Plane .................................................................................................2656
  Marco Canini, Iosif Salem, Liron Schiff, Elad M. Schiller, and Stefan Schmid

**Tutorials**

Serverless Programming (Function as a Service) .........................................................................................................................2658
  Paul Castro, Vatche Ishakian, Vinod Muthusamy, and Aleksander Słominski

Sensor Cloud: A Cloud of Sensor Networks ..................................................................................................................................2660
  Sanjay K. Madria

**Author Index** .............................................................................................................................................................................2662