

# **2020 International Symposium on Reliable Distributed Systems (SRDS 2020)**

**Shanghai, China  
21 – 24 September 2020**



**IEEE Catalog Number: CFP20059-POD  
ISBN: 978-1-7281-7627-7**

**Copyright © 2020 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 is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20059-POD
ISBN (Print-On-Demand):	978-1-7281-7627-7
ISBN (Online):	978-1-7281-7626-0
ISSN:	1060-9857

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2020 International Symposium on Reliable Distributed Systems (SRDS) **SRDS 2020**

## Table of Contents

Message from the General Chair x.....  
Message from the Technical Program Co-Chairs xii.....  
Reviewers xiii.....

### Session 1: Fault-Tolerance and Coordination

Self-Stabilizing Construction of a Minimal Weakly ST-Reachable Directed Acyclic Graph .1.....  
*Junya Nakamura (Toyohashi University of Technology), Masahiro Shibata (Kyushu Institute of Technology), Yuichi Sudo (Osaka University), and Yonghwan Kim (Nagoya Institute of Technology)*

Benefits of Stabilization versus Rollback in Self-Stabilizing Graph-Based Applications on Eventually Consistent Key-Value Stores .11.....  
*Duong Nguyen (Michigan State University) and Sandeep S. Kulkarni (Michigan State University)*

Consensus beyond Thresholds: Generalized Byzantine Quorums Made Live .21.....  
*Orestis Alpos (University of Bern) and Christian Cachin (University of Bern)*

### Session 2: Blockchain

TZ4Fabric: Executing Smart Contracts with ARM TrustZone .31.....  
*Christina Muller (University of Bern), Marcus Brandenburger (IBM Research Zurich, University of Bern), Christian Cachin (University of Bern), Pascal Felber (University of Neuchatel), Christian Gottel (University of Neuchatel), and Valerio Schiavoni (University of Neuchatel)*

NF-Crowd: Nearly-Free Blockchain-Based Crowdsourcing .41.....  
*Chao Li (Beijing Jiaotong University), Balaji Palanisamy (University of Pittsburgh), Runhua Xu (University of Pittsburgh), Jian Wang (Beijing Jiaotong University), and Jiqiang Liu (Beijing Jiaotong University)*

An Efficient Query Scheme for Hybrid Storage Blockchains Based on Merkle Semantic Trie .51.....  
*Qingqi Pei (Xidian University), Enyuan Zhou (Xidian University), Yang Xiao (Xidian University), Deyu Zhang (Xidian University), and Dongxiao Zhao (Xidian University)*

Protect Your Smart Contract against Unfair Payment .61.....  
*Yue Li (Oxford-Hainan Blockchain Research Institute), Han Liu (Oxford-Hainan Blockchain Research Institute), Zhiqiang Yang (Oxford-Hainan Blockchain Research Institute), Bin Wang (Oxford-Hainan Blockchain Research Institute), Qian Ren (Oxford-Hainan Blockchain Research Institute), Lei Wang (Shanghai Jiao Tong University, Oxford-Hainan Blockchain Research Institute), and Bangdao Chen (Oxford-Hainan Blockchain Research Institute)*

### Session 3: Learning I

Fast and Robust Distributed Learning in High Dimension .71.....  
*El-Mahdi El-Mhamdi (EPFL), Rachid Guerraoui (EPFL), and Sébastien Rouault (EPFL)*

Double Insurance: Incentivized Federated Learning with Differential Privacy in Mobile  
 Crowdsensing .81.....  
*Chenhao Ying (Shanghai Jiao Tong University), Haiming Jin (Shanghai Jiao Tong University), Xudong Wang (Shanghai Jiao Tong University), and Yuan Luo (Shanghai Jiao Tong University)*

End-to-End Evaluation of Federated Learning and Split Learning for Internet of Things .91.....  
*Yansong Gao (Cyber Security Cooperative Research Centre, Data61), Minki Kim (Data61, Sungkyunkwan University), Sharif Abuadbba (Cyber Security Cooperative Research Centre, Data61), Yeonjae Kim (Data61, Sungkyunkwan University), Chandra Thapa (Data61), Kyuyeon Kim (Data61, Sungkyunkwan University), Seyit A. Camtepe (Data61), Hyoungshick Kim (Data61, Sungkyunkwan University), and Surya Nepal (Cyber Security Cooperative Research Centre, Data61)*

### Session 4: Formal Methods

A Formally Verified Protocol for Log Replication with Byzantine Fault Tolerance .101.....  
*Joel Wanner (ETH Zürich), Laurent Chuat (ETH Zürich), and Adrian Perrig (ETH Zürich)*

Using Model Checking to Formally Verify Rendezvous Algorithms for Robots with Lights in  
 Euclidean Space .113.....  
*Xavier Défago (Tokyo Institute of Technology), Adam Heriban (Sorbonne Université), Sébastien Tixeuil (Sorbonne Université), and Koichi Wada (Hosei University)*

Efficient Two-Layered Monitor for Partially Synchronous Distributed Systems .123.....  
*Vidhya Tekken Valapil (Michigan State University), Sandeep Kulkarni (Michigan State University), Eric Torng (Michigan State University), and Gabe Appleton (Michigan State University)*

## Session 5: Replication

- Parallel State Machine Replication from Generalized Consensus .133.....  
*Tarcisio Ceolin Junior (Pontificia Universidade Católica do Rio Grande do Sul), Fernando Dotti (Pontificia Universidade Católica do Rio Grande do Sul), and Fernando Pedone (Università della Svizzera Italiana)*
- A Generic Specification Framework for Weakly Consistent Replicated Data Types .143.....  
*Xue Jiang (Nanjing University), Hengfeng Wei (Nanjing University), and Yu Huang (Nanjing University)*
- PnyxDB: a Lightweight Leaderless Democratic Byzantine Fault Tolerant Replicated Datastore .155  
*Loïck Bonniot (InterDigital, University de Rennes), Christoph Neumann (InterDigital), and François Taïani (University de Rennes)*
- Self-Optimising Application-Agnostic Multithreading for Replicated State Machines .165.....  
*Gerhard Habiger (Ulm University), Franz J. Hauck (Ulm University), Hans P. Reiser (University of Passau), and Johannes Köstler (University of Passau)*

## Session 6: Security and Privacy I

- Secure Embedding of Rooted Spanning Trees for Scalable Routing in Topology-Restricted Networks .175.....  
*Martin Byrenheid (TU Dresden), Thorsten Strufe (KIT Karlsruhe and Centre for Tactile Internet / TU Dresden), and Stefanie Roos (Delft University of Technology)*
- On the Detection of Shilling Attacks in Federated Collaborative Filtering .185.....  
*Yangfan Jiang (Sun Yat-sen University), Yipeng Zhou (Macquarie University), Di Wu (Sun Yat-sen University), Chao Li (Tencent), and Yan Wang (Macquarie University)*
- Anomaly Detection via Mining Numerical Workflow Relations from Logs .195.....  
*Bo Zhang (The University of Newcastle), Hongyu Zhang (The University of Newcastle), Pablo Moscato (The University of Newcastle), and Aozhong Zhang (Sun Yat-sen University)*
- TLP-IDS: A Two-Layer Intrusion Detection System for Integrated Electronic Systems .205.....  
*Xiaoxia Liu (East China Normal University), Daojing He (East China Normal University), Yun Gao (East China Normal University), Sencun Zhu (Pennsylvania State University), and Sammy Chan (City University of Hong Kong)*

## Session 7: Distributed Storage

- Audinet: A Decentralized Auditing System for Cloud Storage .215.....  
*Meng Yan (Nankai University), Jiajia Xu (Nankai University), Trent G. Marbach (Ryerson University), Haitao Li (Nankai University), Gang Wang (Nankai University), and Xiaoguang Liu (Nankai University)*

Device and Placement Aware Framework to Optimize Single Failure Recoveries and Reads for Erasure Coded Storage System with Heterogeneous Storage Devices .225.....  
*Yingxun Fu (North China University of Technology), Xun Liu (North China University of Technology), Jiwu Shu (Tsinghua University), Zhirong Shen (Xiamen University), Shiye Zhang (North China University of Technology), Jun Wu (North China University of Technology), Jianyong Duan (North China University of Technology), and Li Ma (North China University of Technology)*

AZ-Recovery: An Efficient Crossing-AZ Recovery Scheme for Erasure Coded Cloud Storage Systems .236.....  
*Xin Xie (Shanghai Jiao Tong University), Chentao Wu (Shanghai Jiao Tong University), Gen Yang (Shanghai Jiao Tong University), Zongxin Ye (Shanghai Jiao Tong University), Xubin He (Temple University), Jie Li (Shanghai Jiao Tong University), Minyi Guo (Shanghai Jiao Tong University), Guangtao Xue (Shanghai Jiao Tong University), Yuanyuan Dong (Alibaba Group), and Yafei Zhao (Alibaba Group)*

Enabling I/O-Efficient Redundancy Transitioning in Erasure-Coded KV Stores via Elastic Reed-Solomon Codes .246.....  
*Si Wu (The Chinese University of Hong Kong), Zhirong Shen (Xiamen University), and Patrick P. C. Lee (The Chinese University of Hong Kong)*

## Session 8: Emerging Technologies

MQT-TZ: Hardening IoT Brokers Using ARM TrustZone .256.....  
*Carlos Segarra (University of Neuchatel and CSEM), Ricard Delgado-Gonzalo (CSEM), and Valerio Schiavoni (University of Neuchatel)*

Solving Linear Systems on High Performance Hardware with Resilience to Multiple Hard Faults .266.....  
*Daniela Loreti (University of Bologna), Marcello Artioli (ENEA), and Anna Ciampolini (University of Bologna)*

Robust Cache-Aware Quantum Processor Layout .276.....  
*Travis LeCompte (LSU), Fang Qi (LSU), and Lu Peng (LSU)*

Performance Evaluation of the Impact of NUMA on One-Sided RDMA Interactions .288.....  
*Jacob Nelson (Lehigh University) and Roberto Palmieri (Lehigh University)*

## Session 9: Learning II + Security and Privacy II

Robust P2P Personalized Learning .299.....  
*Karim Boubouh (UM6P), Amine Boussetta (UM6P), Yahya Benkaouz (Mohammed V University), and Rachid Guerraoui (EPFL)*

Towards Efficient, Credible and Privacy-Preserving Service QoS Prediction in Unreliable Mobile Edge Environments .309.....  
*Yilei Zhang (Anhui Normal University), Peiyun Zhang (Anhui Normal University), Yonglong Luo (Anhui Normal University), and Liya Ji (Lenovo)*

Intrusion-Tolerant and Confidentiality-Preserving Publish/Subscribe Messaging .319.....  
*Sisi Duan (University of Maryland), Chao Liu (University of Maryland), Xin Wang (University of Maryland), Yusen Wu (University of Maryland), Shuai Xu (University of Maryland), Yelena Yesha (University of Maryland), and Haibin Zhang (University of Maryland)*

## **Session 10: Demo/Posters**

Poster: No More Slow Messages: Programmable Packet Handling in Hard IRQ .329.....  
*Ko Natori (Keio University), Takafumi Kikuchi (Keio University), and Kenji Kono (Keio University)*

Demo: A Proof-of-Concept Implementation of Guard Secure Routing Protocol .332.....  
*Sanaz Taheri-Boshrooyeh (Koc University), Ali Utkan Şahin (Koc University), Yahya Hassanzadeh-Nazarabadi (Koc University), and Öznur Özkasap (Koc University)*

Demo: Skip Graph Middleware Implementation .335.....  
*Yahya Hassanzadeh-Nazarabadi (Koc University), Nazir Nayal (Koc University), Shadi Sameh Hamdan (Koc University), Ali Utkan Şahin (Koc University), Öznur Özkasap (Koc University), and Alptekin Küpçü (Koc University)*

**Author Index 339** .....