

# **2017 IEEE 23rd International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2017)**

**Hsinchu, Taiwan  
16 – 18 August 2017**



**IEEE Catalog Number: CFP17066-POD  
ISBN: 978-1-5386-2977-2**

**Copyright © 2017 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:	CFP17066-POD
ISBN (Print-On-Demand):	978-1-5386-2977-2
ISBN (Online):	978-1-5386-1898-1
ISSN:	1533-2312

**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

## Program

Invited Session 1: Flexible and Reliable Models in Cyber-Physical Systems

Session Chair: Jian-Jia Chen

**State of the Art for Scheduling and Analyzing Self-Suspending Sporadic Real-Time Tasks**

Jian-Jia Chen, Georg von der Brüggen, Wen-Hung Huang, and Cong Liu.....1

**Benchmarking OpenMP Programs for Real-Time Scheduling**

Yang Wang, Nan Guan, Jinghao Sun, Mingsong Lv, Qingqiang He, Tianzhang He, Wang Yi.....11

**A Generic Framework Facilitating Early Analysis of Data Propagation Delays in Multi-Rate Systems**

Matthias Becker, Saad Mubeen, Dakshina Dasari, Moris Behnam, and Thomas Nolte.....21

Invited Session 2: Non-Volatile Processor

Session Chair: Chun Jason Xue

**Distillation: A Light-Weight Data Separation Design to Boost Performance of NVDIMM Main Memory**

Che-Wei Tsao, Yuan-Hao Chang, Tei-Wei Kuo, and Shau-Yin Tseng.....32

**Maximize Energy Utilization for Ultra-Low Energy Harvesting Powered Embedded Systems**

Chen Pan, Mimi Xie, and Jingtong Hu.....39

**Retention State-Enabled and Progress-Driven Energy Management for Self-powered Non-volatile Processors**

Zhiyao Gong, Keni Qiu, Dongqin Zhou, Weiwen Chen, Yuanchao Xu, Xin Shi and Yongpan Liu.....45

**Energy-aware Morphable Cache Management for Self-powered Non-volatile Processors**

Yang Zhou, Mengying Zhao, Lei Ju, Chun Jason Xue, Xin Li, Zhiping Jia.....53

Session 1: Designs for Mobile Devices and Networked Systems

Session Chair: Jingtong Hu

**Effectively Utilizing Elastic Resources in Networked Control Systems**

Michael Balszun, Debayan Roy, Licong Zhang, Wanli Chang, and Samarjit Chakraborty.....60

**An Empirical Study of F2FS on Mobile Devices**

Yu Liang, Chenchen Fu, Yajuan Du, Aosong Deng, Mengying Zhao, Liang Shi, and Chun Jason Xue.....70

**A Reliable MAC for Delay-Bounded and Energy-Efficient WSNs**

Philip Parsch and Alejandro Masrur.....79

Session 2: Towards IoT and CPS

Session Chair: Eduardo Tovar

**A Configurable Synchronous Intersection Protocol for Self-Driving Vehicles**

Shunsuke Aoki and Raj Rajkumar.....88

**Real-Time Dense Wired Sensor Network Based on Traffic Shaping**

João Loureiro, Raghuraman Rangarajan, Borislav Nolic, Leandro Indrusiak, and Eduardo Tovar.....99

**Exploiting Space Buffers for Emergency Braking in Highly Efficient Platoons**

Dharshan Krishna Murthy, and Alejandro Masrur.....109

Session 3: GPUs and Resource Sharing

Session Chair: Ya-Shu Chen

**A Server-based Approach for Predictable GPU Access Control**

Hyoseung Kim, Pratyush Patel, Shige Wang, and Raj Rajkumar.....119

**An Optimal Spin-Lock Priority Assignment Algorithm for Real-Time Multi-core Systems**

Sara Afshar, Moris Behnam, Reinder J. Bril, and Thomas Nolte.....129

**New Schedulability Analysis for MrrsP**

Shuai Zhao, Jorge Garrido, Alan Burns, and Andy Wellings.....140

Session 4: Multiprocessors and Multicore Processors

Session Chair: Hyoseung Kim

**Fixed-Priority Scheduling of Mixed Soft and Hard Real-Time Tasks on Multiprocessors**

Jian-Jia Chen, Wen-Hung Huang, Zheng Dong, and Cong Liu.....150

**Schedulability Analysis for Global Fixed-Priority Scheduling of the 3-Phase Task Model**

Cláudio Maia, Geoffrey Nelissen, Luís Nogueira, Luis Miguel Pinho, and Daniel Gracia Pérez.....160

**A Scheduling Framework for Handling Integrated Modular Avionic Systems on Multicore Platforms**

Alessandra Melani, Renato Mancuso, Marco Caccamo, Giorgio Buttazzo, Johannes Freitag, and Sascha Uhrig.....170

Session 5: Scheduling and Adaptive System Reconfiguration

Session Chair: Chia-Heng Tu

**Using a Polymorphic VLIW Processor to Improve Schedulability and Performance for Mixed-Criticality Systems**

Joost Hoozemans, Jeroen van Straten, and Stephan Wong.....180

**Efficient and Balanced Charging of Reconfigurable Battery with Variable Power Supply**

Muhammad Shaheer, Nan Guan, Shuai Li, Q Wang, and Zili Shao.....189

**Online Energy-efficient Real-time Task Scheduling for Heterogeneous Multicore Systems**

Tien-Shun Yao, Ting-Hao Tsai, Ya-Shu Chen, Jing-Ho Chen, and Dai-Chang Chen.....195

Session 6: Real-time Scheduling

Session Chair: Reinder Bril

**Online Admission of Non-Preemptive Aperiodic Mixed-Critical Tasks in Hierarchic Schedules**

Ali Syed, Daniel Gracia Pérez, and Gerhard Fohler.....205

**Worst-case Timing Analysis of Ring Networks with Cyclic Dependencies using Network Calculus**

Ahmed Amari and Ahlem Mifdaoui.....215

**Restart-Based Fault-Tolerance: System Design and Schedulability Analysis**

Fardin Abdi Taghi Abad, Renato Mancuso, Rohan Tabish, and Marco Caccamo.....225

Short Paper Session 1

Session Chair: Che-Wei Chang

**Hybrid Self-Suspension Models in Real-Time Embedded Systems**

Georg von der Brüggen, Wen-Hung Huang, and Jian-Jia Chen.....235

**Artificial Skin for Human Prostheses, Enabled Through Wireless Sensor Networks**

Camilo Rojas and Jean-Dominique Decotignie.....244

**Towards the Design of Optimal Range Assignment for Elevator Groups under Fluctuant Traffic Loads**

Hailiang Dong, Edwin H.-M. Sha, Weiwen Jiang, Xianzhang Chen, Runyu Zhang, and Qingfeng Zhuge.....252

**A Survey of Energy-Efficient Task Synchronization for Real-Time Embedded Systems**

Jun Wu.....258

**Trading Utilization for Circuitry: Hardware-Software Co-design for Real-Time Software-Based Short-Circuit Protection**

Aaron Willcock and Nathan Fisher.....264

Short Paper Session 2

Session Chair: Duo Liu

**An Adaptive Closed-Loop Approach for Timely Data Services**

Dinuni Fernando, Kyoung-Don Kang, and Yan Zhou.....272

**GPU Acceleration for Kernel Samepage Merging**

Wei-Cheng Lin, Chia-Heng Tu, Chih-Wei Yeh, and Shih-Hao Hung.....279

**Energy-Aware Page Replacement for NVM-based Hybrid Main Memory System**

Yiming Zhang, Jinyu Zhan, Junhuan Yang, Wei Jiang, Lin Li, and Li Yixin.....285

**Dynamic Module Partitioning for Library based Placement on Heterogeneous FPGAs**

Fubing Mao, Wei Zhang, Bingsheng He, and Siew-Kei Lam.....291

**FitCNN: A Cloud-Assisted Lightweight Convolutional Neural Network Framework for Mobile Devices**

Shiming Li, Duo Liu, Chaoneng Xiang, Jianfeng Liu, Yingjian Ling, Tianjun Liao, and Liang Liang.....297