

# **2015 Third International Symposium on Computing and Networking (CANDAR 2015)**

**Sapporo, Hokkaido, Japan  
8 – 11 December 2015**



IEEE Catalog Number: CFP1519X-POD  
ISBN: 978-1-4673-9798-8

**Copyright © 2015 by the Institute of Electrical and Electronic 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:	CFP1519X-POD
ISBN (Print-On-Demand):	978-1-4673-9798-8
ISBN (Online):	978-1-4673-9797-1
ISSN:	2379-1888

**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

# **2015 Third International Symposium on Computing and Networking**

## **CANDAR 2015**

### **Table of Contents**

<b>Message from Organizers .....</b>	xv
<b>Conference Organization.....</b>	xvi
<b>Program Committees .....</b>	xviii
<b>Reviewers.....</b>	xxiv

---

### **CANDAR 2015: Long Papers**

TPLCR: Time-Bound, Pre-copy Live Checkpointing and Parallel Restart of Virtual Machines Using Distributed Memory Servers .....	1
<i>Kasidit Chanchio</i>	
Efficient GPU Implementations for the Conway's Game of Life .....	11
<i>Toru Fujita, Daigo Nishikori, Koji Nakano, and Yasuaki Ito</i>	
Power Optimization Considering the Chip Temperature of Low Power Reconfigurable Accelerator CMA-SOTB .....	21
<i>Yu Fujita, Hyate Okuhara, Koichiro Masuyama, and Hideharu Amano</i>	
Parallelization Techniques for Error Diffusion with GPU Implementations .....	30
<i>Akihiko Kasagi, Koji Nakano, and Yasuaki Ito</i>	
Entropy Throttling: Towards Global Congestion Control of Interconnection Networks .....	40
<i>Takashi Yokota, Kanemitsu Ootsu, and Takeshi Ohkawa</i>	
A Practical Algorithm for Embedding Graphs on Torus .....	50
<i>Jiahua Yu and Qian-Ping Gu</i>	
Portable Implementation of Lattice-Based Cryptography Using JavaScript .....	58
<i>Ye Yuan, Chen-Mou Cheng, Shinsaku Kiyomoto, Yutaka Miyake, and Tsuyoshi Takagi</i>	

## CANDAR 2015: Regular Papers

Generalized-Star Cube: A New Class of Interconnection Topology for Massively Parallel Systems .....	68
<i>Daiki Arai and Yamin Li</i>	
Accelerating Reachability Analysis on Petri Net for Mutual Exclusion-Based Deadlock Detection .....	75
<i>Yunkai Du and Naijie Gu</i>	
Improving the I/O Performance in the Reduce Phase of Hadoop .....	82
<i>Eita Fujishima and Saneyasu Yamaguchi</i>	
Revisiting Authentication with Shoulder-Surfing Resistance for Smartphones .....	89
<i>Yuma Higashiyama, Naoto Yanai, Shingo Okamura, and Toru Fujiwara</i>	
A Warp-Synchronous Implementation for Multiple-Length Multiplication on the GPU .....	96
<i>Takumi Honda, Yasuaki Ito, and Koji Nakano</i>	
The Hamiltonian Property of Linear-Convex Supergrid Graphs .....	103
<i>Ruo-Wei Hung, Jun-Lin Li, Hao-Yu Chih, and Chien-Hui Hou</i>	
AP-assisted CTS-blocking for WiFi-ZigBee Coexistence .....	110
<i>Shigemi Ishida, Shigeaki Tagashira, and Akira Fukuda</i>	
Design of WiFi AP-RSS Monitoring System Using Sensor Nodes .....	115
<i>Kousaku Izumi, Shigemi Ishida, Shigeaki Tagashira, and Akira Fukuda</i>	
Volunteer Computing for Solving an Elliptic Curve Discrete Logarithm Problem .....	122
<i>Shoma Kajitani, Yasuyuki Nogami, Shunsuke Miyoshi, and Thomas Austin</i>	
An Efficient SAT Solving Algorithm Using Pseudo-Conflict Learning and Heterogeneous Computing .....	127
<i>Heng Liu, Wendy MacCauly, and Xu (Sunny) Wang</i>	
A Challenge for an Efficient AMI-based Cache System on FPGA Soft Processors .....	133
<i>Yuki Matsuda, Ryosuke Sasakawa, and Kenji Kise</i>	
Effective Parallel Simulation of ArchHDL under Manycore Environment .....	140
<i>Tomohiro Misono, Ryohei Kobayashi, Shimpei Sato, and Kenji Kise</i>	
Eliminating Cascading Stall on Hardware Transactional Memory .....	147
<i>Sho Miyake, Keisuke Mashita, Ryohei Yamada, and Tomoaki Tsumura</i>	
ARMPP: An Ant-Based Routing Algorithm with Multi-phase Pheromone and Power-Saving in Mobile Ad Hoc Networks .....	154
<i>Shohei Miyashita and Yamin Li</i>	
Active Caching for KVS Dynamic Scaling .....	161
<i>Shohei Miyokawa, Taiki Tokuda, and Saneyasu Yamaguchi</i>	

Radio Overlapping Reduced Multipath Routing Method by Utilizing Control Packet Overhearing to Counter Eavesdropping on Data Packets for Ad Hoc Networks .....	167
<i>Tetsuya Murakami, Eitaro Kohno, and Yoshiaki Kakuda</i>	
On the Hamiltonicity, Connectivity, and Broadcasting Algorithm of the KCube .....	174
<i>Keivan Noroozi and Ke Qiu</i>	
Dynamic Task Scheduling Scheme for a GPGPU Programming Framework .....	181
<i>Kazuhiko Ohno and Rei Yamamoto</i>	
A Fast Approximate String Matching Algorithm on GPU .....	188
<i>Lucas S.N. Nunes, Jacir L. Bordim, Koji Nakano, and Yasuaki Ito</i>	
Truthful Virtual Machine Allocation in Clouds Based on LP-relaxation .....	193
<i>Kasthuri Srinivasan and Satoshi Fujita</i>	
An Efficient Content Searching Method Using Query Transmission Records with Content Cache Routers in Unstructured Peer-to-Peer Networks .....	200
<i>Daiki Takeda, Shinji Sugawara, Norishige Fukushima, and Yutaka Ishibashi</i>	
Delivery Delay in 3D MANETs with Packet Redundancy .....	207
<i>Wu Wang, Bin Yang, Osamu Takahashi, and Xiaohong Jiang</i>	
Selecting Key Person of Social Network Using Skyline Query in MapReduce Framework .....	213
<i>Asif Zaman, Md. Anisuzzaman Siddique, Annisa, and Yasuhiko Morimoto</i>	

## **ASON 2015: (Eighth International Workshop on Autonomous Self-Organizing Networks) Regular Papers**

An Adaptive Control Parameter Setting Method for Priority Control Based on Media Access Control SP-MAC over WLAN .....	220
<i>Ryoma Ando, Ryo Hamamoto, Hiroyasu Obata, Chisa Takano, and Kenji Ishida</i>	
Improvement of Throughput Prediction Method for Access Point in Multi-rate WLANs Considering Media Access Control and Frame Collision .....	227
<i>Ryo Hamamoto, Chisa Takano, Hiroyasu Obata, and Kenji Ishida</i>	
Adaptive MIMO Detector for Spatial Modulation .....	234
<i>I-Wei Lai, Hong-Wei Chen, and Yuan-Hao Huang</i>	
An Energy-Efficient Data Collection Scheme in Body Area Nanonetworks .....	240
<i>Bo Liu, Yuanyu Zhang, Xiaohong Jiang, and Zhenqiang Wu</i>	
Active Access-Point Configuration Algorithm with Dynamic Mobile Router Placement for Elastic WLAN System .....	246
<i>Md. Selim Al Mamun, Md. Ezhariul Islam, Nobuo Funabiki, and I-Wei Lai</i>	
A Study on Detection Method of Selfish Terminal Using Manipulated MAC Parameters over WLAN .....	253
<i>Hiroyasu Obata, Chisa Takano, and Kenji Ishida</i>	

Redundancy Setting Method for TCP Congestion Control Based on FEC over Wireless LAN .....	259
---	-----

*Fumiya Teshima, Hiroyasu Obata, Ryo Hamamoto, and Kenji Ishida*

Performance Evaluation of Control Method to Guarantee Throughput Based on Media Access Control SP-MAC over WLAN .....	265
---	-----

*Yuuki Yamamoto, Ryo Hamamoto, Hiroyasu Obata, Chisa Takano, and Kenji Ishida*

## **ASON 2015: (Eighth International Workshop on Autonomous Self-Organizing Networks) Poster Papers**

Experimental Evaluation of Location-Based Mobile Agent Migration	
--	--

Mechanism for Information Dissemination Scheme in VANETs .....	271
--	-----

*Junichi Aoki, Takeshi Hashimoto, Tomoyuki Ohta, and Yoshiaki Kakuda*

Experimental Evaluation of Information Dissemination Scheme Based on Autonomous Clustering and P2P Network in VANETs .....	275
--	-----

*Yuto Aoki, Tomoyuki Ohta, and Yoshiaki Kakuda*

A Worker Implementation on Windows OS for User-PC Computing System .....	279
--	-----

*Nobuo Funabiki, Yusuke Asai, Yuuki Aoyagi, and Wen-Chung Kao*

Experimental Evaluation of a Distributed Sensor Network Applying Source Node Grouping .....	283
---	-----

*Yohsuke Ishikawa, Hiraku Okada, Katsuhiro Naito, Kentaro Kobayashi, and Masaaki Katayama*

Dynamic Ant Colony Optimization for Routing in Mobile Content Oriented Networks: Case of Moving Request Nodes .....	287
---	-----

*Shintaro Manome and Takuya Asaka*

An Efficient Localization Algorithm in Wireless Sensor Networks .....	291
---	-----

*Shikai Shen, Bin Yang, Kaiguo Qian, and Xiaohong Jiang*

An Efficient Cache Grouping Strategy for Multinode Cache Networks .....	295
---	-----

*Takayuki Shiroma, Takuma Nakajima, Kouta Nojima, Masato Yoshimi, and Tsutomu Yoshinaga*

Performance Evaluation on Control Parameters for Segmented File Download Method Using PR-SCTP .....	299
---	-----

*Kazuya Takeda and Junichi Funasaka*

## **PDA 2015: (Seventh International Workshop on Parallel, Distributed Algorithms, Applications) Regular Papers**

Fast LZW Compression Using a GPU .....	303
--	-----

*Shunji Funasaka, Koji Nakano, and Yasuaki Ito*

Efficient Exploration Strategies for Artificial Bee Colony .....	309
--	-----

*Chun-Ling Lin, Sheng-Ta Hsieh, and Shih-Yuan Chiu*

A 3+Omega(1) Lower Bound for Page Migration .....	314
<i>Akira Matsubayashi</i>	
Bounding Dilation and Edge-Congestion of Separator-Based Graph	
Embeddings into Grids .....	321
<i>Akira Matsubayashi</i>	
Asynchronous P Systems for a Compare-and-Exchange Operation	
and Sorting .....	328
<i>Yutaka Nishida and Akihiro Fujiwara</i>	
Performance Comparison of Open-Source Parallel Sorting with OpenMP .....	334
<i>Takayuki Umeda and Shuhei Oya</i>	
A Line-Based Connected Component Labeling Algorithm Using GPUs .....	341
<i>Kensaku Yonehara and Kunio Aizawa</i>	

## **PDA 2015: (Seventh International Workshop on Parallel, Distributed Algorithms, Applications) Poster Papers**

An Efficient Parallel Algorithm for Simpson Cumulative Integration on GPU .....	346
<i>I. Wayan Aditya Swardiana, Taufiq Wirahman, and Rifki Sadikin</i>	

## **CSA 2015: (Third International Workshop on Computer Systems, Architectures) Regular Papers**

MAD7F: A FPGA-based CMP Memory Architecture Simulation Framework .....	350
<i>Hadrien A. Clarke and Kazuaki J. Murakami</i>	
Enabling Ideal Job Mapping on Wireless Supercomputers and Datacenters .....	357
<i>Yao Hu, Ikki Fujiwara, and Michihiro Koibuchi</i>	
A Flexible-Length-Arithmetic Processor Based on FDFM Approach in FPGAs .....	364
<i>Tatsuya Kawamoto, Yasuaki Ito, and Koji Nakano</i>	
On-the-Fly Automated Storage Tiering with Caching and both Proactive	
and Observational Migration .....	371
<i>Kazuichi Oe, Takeshi Nanri, and Koji Okamura</i>	
An Approximate Computing Stack Based on Computation Reuse .....	378
<i>Yuuki Sato, Takanori Tsumura, Tomoaki Tsumura, and Yasuhiko Nakashima</i>	
A Distributed Memory Based Embedded CGRA for Accelerating Stencil	
Computations .....	385
<i>Shohei Takeuchi, Yuttakon Yuttakonkit, Shinya Takamaeda-Yamazaki,</i>	
<i>and Yasuhiko Nakashima</i>	

## **CSA 2015: (Third International Workshop on Computer Systems, Architectures) Poster Papers**

An Inductive Method to Select Simulation Points .....	392
<i>Minseong Choi, Takashi Fukuda, Masahiro Goshima, and Shuichi Sakai</i>	
Performance Evaluation of Sparse Matrix-Vector Multiplication Using GPU/MIC Cluster .....	396
<i>Hiroshi Maeda and Daisuke Takahashi</i>	
Yet Another Waiting Mechanism Based on Conflict Prediction for Hardware Transactional Memory .....	400
<i>Keisuke Mashita, Sho Miyake, Ryohei Yamada, and Tomoaki Tsumura</i>	
Using Dynamic Parallelism for Fine-Grained, Irregular Workloads: A Case Study of the N-Queens Problem .....	404
<i>Max Plauth, Frank Feinbube, Frank Schlegel, and Andreas Polze</i>	
On the Performance Improvement of an Architecture towards Sharing FPUs across Cores for the Design of Multithreading Multicore CPUs .....	408
<i>Kazuhiro Takaki, Takanori Kurihara, and Yamin Li</i>	

## **AFCA 2015: (Third International Workshop on Applications, Fundamentals of Cellular Automata) Regular Papers**

On Enumeration of Motion Representable Two-Dimensional Two-State Number-Conserving Cellular Automata .....	412
<i>Hisamichi Ishizaka, Yohei Takemura, and Katsunobu Imai</i>	
An Analyzable Method for Constructing a Cellular Automaton from a Continuous System .....	418
<i>Akane Kawaharada, Tomoyuki Miyaji, and Naoto Nakano</i>	
Proper Choice of Spatio-Temporal Scale and Dataset Subsampling for Empirical CA Construction .....	424
<i>Akane Kawaharada, Tomoyuki Miyaji, and Naoto Nakano</i>	
Efficient Computation Method for Identity Element of Abelian Sandpile Model .....	430
<i>Takumi Shibasaki and Takao Namiki</i>	
Prediction of Purchase Behavior of Customers in a Store by Cellular Automata .....	436
<i>Ryusuke Taniguchi, Yoshimitsu Ohtaka, and Shin Morishita</i>	
An Approach to Constructing and Simulating Block Cellular Automata by Gellular Automata .....	442
<i>Shaoyu Wang, Katsunobu Imai, and Masami Hagiya</i>	

## **AFCA 2015: (Third International Workshop on Applications, Fundamentals of Cellular Automata) Poster Papers**

Reconfiguration in Defect-Tolerant Asynchronous Cellular Automata .....	449
<i>Teijiro Isokawa, Tadashi Kunieda, Nobuyuki Matsui, and Ferdinand Peper</i>	
An FSSP on Torus .....	453
<i>Hiroshi Umeo and Keisuke Kubo</i>	

## **WICS 2015: (Second International Workshop on Information, Communication Security) Regular Papers**

Evaluation of Matching Accuracy of Template Matching Using a Steganography Algorithm .....	457
<i>Hirokazu Ishizuka, Koichi Sakurai, Isao Echizen, and Keiichi Iwamura</i>	
A Behavior Authentication Method Using Wi-Fi BSSIDs around Smartphone Carried by a User .....	463
<i>Ryosuke Kobayashi and Rie Shigetomi Yamaguchi</i>	
An Implementation of Secure Data Exchange System with Multi-hop Routing in Wireless Delay Tolerant Network Using Attribute-Based Encryption .....	470
<i>Amang Sudarsono and Toru Nakanishi</i>	
Constructing Pairing-Friendly Elliptic Curves Using Global Number Fields .....	477
<i>Takanori Yasuda, Tsuyoshi Takagi, and Kouichi Sakurai</i>	

## **WICS 2015: (Second International Workshop on Information, Communication Security) Poster Papers**

A Consideration on Crosscorrelation of a Kind of Trace Sequences over Finite Field .....	484
<i>Hiroto Ino, Yasuyuki Nogami, Nasima Begum, Satoshi Uehara, Robert Morelos-Zaragoza, and Tsuchiya Kazuyoshi</i>	
Storage-Efficient Tree Structure with Level-Ordered Unary Degree Sequence for Packet Classification .....	487
<i>Yuta Kitamura, Akira Iwata, Masami Mohri, and Yoshiaki Shiraishi</i>	
Attribute Revocable Attribute-Based Encryption for Decentralized Disruption-Tolerant Military Networks .....	491
<i>Kenta Nomura, Masami Mohri, Yoshiaki Shiraishi, and Masakatu Morii</i>	
Smart Device-Based Multimodal Biometric Authentication with the Function for Environment Recognition .....	495
<i>Ryo Okabe and Yasushi Yamazaki</i>	
An Efficient Generalized Clustering Method for Achieving K-Anonymization .....	499
<i>Xiaoshuang Xu and Masayuki Numao</i>	

## **LHAM 2015: (First International Workshop on Legacy HPC Application Migration) Regular Papers**

A Non-intrusive Technique for Interfacing Legacy Fortran Codes with Modern C++ Runtime Systems .....	503
<i>Zachary D. Byerly, Hartmut Kaiser, Steven Brus, and Andreas Schäfer</i>	
A Verification Framework for Streamlining Empirical Auto-Tuning .....	508
<i>Shoichi Hirasawa, Hiroyuki Takizawa, and Hiroaki Kobayashi</i>	
Migration of an Atmospheric Simulation Code to an OpenACC Platform Using the Xevolver Framework .....	515
<i>Kazuhiko Komatsu, Ryusuke Egawa, Shoichi Hirasawa, Hiroyuki Takizawa, Ken'ichi Itakura, and Hiroaki Kobayashi</i>	
A Case Study of Memory Optimization for Migration of a Plasmonics Simulation Application to SX-ACE .....	521
<i>Raghunandan Mathur, Hiroshi Matsuoka, Osamu Watanabe, Akihiro Musa, Ryusuke Egawa, and Hiroaki Kobayashi</i>	
Xvtgen: Fortran Code Transformer Generator for High Performance Scientific Codes .....	528
<i>Reiji Suda, Hiroyuki Takizawa, and Shoichi Hirasawa</i>	
A Case Study of User-Defined Code Transformations for Data Layout Optimizations .....	535
<i>Takeshi Yamada, Shoichi Hirasawa, Hiroyuki Takizawa, and Hiroaki Kobayashi</i>	

## **WANC 2015: (Sixth International Workshop on Advances in Networking, Computing) Short Papers**

An Accelerator Chip for Ground-State Searches of the Ising Model with Asynchronous Random Pulse Distribution .....	542
<i>Masato Hayashi, Masanao Yamaoka, Chihiro Yoshimura, Takuya Okuyama, Hidetaka Aoki, and Hiroyuki Mizuno</i>	
An Intelligent Diagnosis Flu System Based on Adaptive Neuro-Fuzzy Classifier .....	547
<i>Sheng-Ta Hsieh and Chun-Ling Lin</i>	
Register Port Prediction for a Banked Register File .....	551
<i>Hiroaki Kawashima, Takahiro Sasaki, Yuki Fukazawa, and Toshio Kondo</i>	
Design of Trade-Off Processing Mechanism in User Information Disclosure Decision Method .....	556
<i>Keita Kayaba and Akiko Takahashi</i>	
An Architectural Framework of Snoopy Interconnection for Heterogeneous Cache Systems .....	561
<i>Seiji Miyoshi, Takahiro Sasaki, Yuki Fukazawa, and Toshio Kondo</i>	

Out of Memory Prevention Based on Memory Allocation Rate .....	566
<i>Gaku Nakagawa, Hirotaka Kawata, and Shuichi Oikawa</i>	
A Group-Based Job Scheduling Method for Parallel Volunteer Computing .....	571
<i>Kaworu Ochi and Masaru Fukushi</i>	
Sequential Combination of Two Classifier Algorithms for Binary Classification to Improve the Accuracy .....	576
<i>Sornxayya Phetlasy, Satoshi Ohzahata, Celimuge Wu, and Toshihiko Kato</i>	
Acceleration of Othello Computer Game Using an FPGA Tablet .....	581
<i>Tomoya Sato and Tetsu Narumi</i>	
Performance Improvement of Large-Scale Interconnection Network Simulator by Using GPU .....	585
<i>Yuki Suzuki, Takashi Yokota, Kanemitsu Ootsu, and Takeshi Ohkawa</i>	
Reducing Storage Power Consumption with File Layout Optimization in Virtualized Environment .....	590
<i>Shunsuke Yagai and Saneyasu Yamaguchi</i>	

## **WANC 2015: (Sixth International Workshop on Advances in Networking, Computing) Poster Papers**

Proposal of Highly Efficient Memory Access Method Using Locked-Cache on Soft-Core Processor with SIMD Operations .....	595
<i>Kosuke Hiraishi, Kanemitsu Ootsu, Takeshi Ohkawa, and Takashi Yokota</i>	
GPU Acceleration for Availability Scoring of Short Constituent Amino Acid Sequences .....	598
<i>Yuki Kakazu, Morikazu Nakamura, and Joji M. Otaki</i>	
Modeling Energy Consumption of Memory Systems .....	601
<i>Hirotaka Kawata, Gaku Nakagawa, Takahiro Hirofuchi, Ryousei Takano, and Shuichi Oikawa</i>	
Effective I/O Processing with Exception-Less System Calls for Low-Latency Devices .....	604
<i>Motoharu Nakajima and Shuichi Oikawa</i>	
Efficient Translation and Execution Method for Automated Parallel Processing System by Using Valgrind .....	607
<i>Hiroyuki Obuchi, Kanemitsu Ootsu, Takeshi Ohkawa, and Takashi Yokota</i>	
Deferred-Update Replication Supporting Multiple Consistency Models .....	610
<i>Atsushi Ohta, Ryota Kawashima, and Hiroshi Matsuo</i>	
Dynamic Memory Allocation in Virtual Machines Based on Cache Hit Ratio .....	613
<i>Masaki Sakamoto and Saneyasu Yamaguchi</i>	
Improved GPU Implementation of RainbowCrack .....	616
<i>Yuki Tabata, Keisuke Iwai, Hidema Tanaka, and Takakazu Kurokawa</i>	

<b>Author Index .....</b>	619
---------------------------	-----