

# **2019 29th International Telecommunication Networks and Applications Conference (ITNAC 2019)**

**Auckland, New Zealand  
27 – 29 November 2019**



**IEEE Catalog Number: CFP1918D-POD  
ISBN: 978-1-7281-3674-5**

**Copyright © 2019 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:	CFP1918D-POD
ISBN (Print-On-Demand):	978-1-7281-3674-5
ISBN (Online):	978-1-7281-3673-8
ISSN:	2474-1531

**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

# 2019 29th International Telecommunication Networks and Applications Conference (ITNAC)

## Session 3: IoT

<i>Adaptive Control of Nonstatistical Sensor Data Aggregation to Minimize Latency in IoT Gateway</i> Hideaki Yoshino (Nippon Institute of Technology, Japan), Kenko Ota (Nippon Institute of Technology, Japan), Takefumi Hiraguri (Nippon Institute of Technology, Japan) .....	1
<i>Outdoor Signal Performance of LoRaWAN Technology for Campus-Scale IoT Connectivity</i> Husna Zainol Abidin (Universiti Teknologi MARA, Malaysia), Fadhlan Hafizhelmi Kamaru Zaman (Universiti Teknologi MARA, Malaysia), Syahrul Afzal Che Abdullah (Universiti Teknologi MARA, Malaysia) .....	7
<i>Demystifying LoRaWAN Security and Capacity</i> Michael Santamaria (Bucknell University, USA), Alan Marchiori (Bucknell University, USA) .....	13

## Session 1: Satellite and Wireless

<i>Download Traffic Scheduling for CubeSats Swarms with Inter-Satellite Links</i> Yawen Zheng (University of Wollongong, Australia), Kwan-Wu Chin (University of Wollongong, Australia), Luyao Wang (Beijing University of Technology, China) .....	20
<i>Hierarchical Architecture for Computational Offloading in Autonomous Vehicle Environment</i> Arslan Rasheed (Auckland University of Technology, New Zealand), Asim Anwar (UoL, Pakistan), Arun Kumar (NIT Rourkela, India), Peter Han Joo Chong (Auckland University of Technology, New Zealand), Xue Jun Li (Auckland University of Technology, New Zealand) .....	26

## Session 2: SDN

<i>Green Multi-Stage Upgrade for Bundled-Link SDNs with Budget Constraint</i> Lely Hiryanto (Curtin University, Australia & Tarumanagara University, Indonesia), Sieteng Soh (Curtin University, Australia), Kwan-Wu Chin (University of Wollongong, Australia), Mihai M Lazarescu (Curtin University, Australia) .....	32
<i>Load-balancing In Software-Defined Networking: An Investigation On Influential System Parameters</i> Amirhossein Moravejosharieh (Auckland Institute of Studies, New Zealand), Francisco Claudio Palmeira (Auckland Institute of Studies, New Zealand) .....	39
<i>Realization of congestion-aware energy-aware virtual link embedding</i> Minh Pham (University of Technology Sydney, Australia), Doan B Hoang (University of Technology Sydney, Australia), Zenon D Chaczko (University of Technology, Sydney & SEDE, Australia) .....	45

## Session 6: Security

<i>An Encryption Algorithm to Prevent Domain Name System Cache Poisoning Attacks</i> Xue Jun Li (Auckland University of Technology, New Zealand), Maode Ma (Nanyang Technological University, Singapore), Narayanan Arjun (Nanyang Technological University, Singapore) .....	51
<i>Mitigating Time-Constrained Stolen-Credentials Content Poisoning in an NDN Setting</i> Jerzy Konorski (Gdansk University of Technology, Poland) .....	57
<i>A Novel Entitlement-based Blockchain-enabled Security Architecture for IoT</i> Fariza Sabrina (Central Queensland University, Australia) .....	64

## Session 4: IoT

<i>UAV-aided Data Collection in Self Organized IoT Network for Social Augmented Reality</i> Zhenjie Tan (Xi'an Jiaotong University, China), Hua Qu (Xi'an Jiaotong University, China), Jihong Zhao (Xi'an Jiaotong University, China), Shiyu Zhou (Southwestern University of Finance and Economics, China), Wenjie Wang (Xi'an Jiaotong University, China) .....	71
--	----

<i>Relay Selection Scheme for Energy Harvesting IoT Networks with Direct Link</i> Chenchen Liu (CETC, China), Yuyang Zhenq (CETC 38, China), Zhengyu Zhang (CETC, China), Weilong Ren (CETC38 China Electronic Technology Group Corporation, China) .....	78
<i>Ambient Intelligence for Smart Home using The Internet of Things</i> Hakilo Sabit (Auckland University of Technology, New Zealand), Peter Han Joo Chong (Auckland University of Technology, New Zealand), Jeff Kilby (Auckland University of Technology, New Zealand) .....	82

## Session 5: SDN

<i>Unsplittable flow Edge Load factor Balancing in SDN using P4 Runtime</i> Eiichiro Kawauchi (Graduate School of Engineering, Soka University, Japan), Norihiko Shinomiya (Soka University, Japan), Hikaru Kasuga (Graduate School of Engineering, Soka University, Japan) .....	85
<i>SDN-based Wireless Access Networks utilising BBR TCP Congestion Control</i> Hoang Minh Do (RMIT University, Australia), Mark A. Gregory (RMIT University, Australia), Shuo Li (RMIT University, Australia) .....	91
<i>A method for comparing OpenFlow and P4</i> Paul Zanna (RMIT University, Australia), Pj Radcliffe (RMIT University, Australia), Karina Mabel Gomez (RMIT University, Australia) .....	99

## Session 8: Mobile Cellular and IoT

<i>Decoding Latency of LDPC Codes in 5G NR</i> Hao Wu (ZTE Corporation, China), Huayong Wang (ZTE Corporation, China) .....	102
<i>Analysis of Staircase Power Distributions for Reduced Number of Power Levels for 5G Planar Array Antenna Analog Beamforming</i> Muhsin Hassan (Monash University, Australia), Nazmus Shaker Nafi (MIT, Australia), Nguyen Vo (Victoria Institute of Technology, Australia), Rahul Thakkar (Victoria Institute of Technology, Australia), Mark A. Gregory (RMIT University, Australia) .....	107
<i>A Weight Based Channel Scheduling for LTE-A Femtocells</i> Mark A. Gregory (RMIT University, Australia), Abdullah Omar Arafat (RMIT University, Australia) .....	111
<i>Device to Device Collaboration Architecture for Real-Time Identification of User and Abnormal Activities in Home</i> Seong Su Keum (Kyungpook National University, Korea (South)), Cheol Hwan Lee (Kyungpook National University, Korea (South)), Soon Ju Kang (Kyungpook National University, Korea (South)) .....	116

## Session 9: Security

<i>Dynamic RNN-CNN based Malware Classifier for deep learning algorithm</i> Youngbok Cho (dept. Information Security Daejeon University, Korea (South)) .....	119
<i>The inference Graph of Cybersecurity Rules</i> Dawood Sallem Hussien Shenar (University of Southern Queensland & Thi-Qar University, Australia), Nabeel Hadaad (Southern Queensland, Australia), Ron Addie (University of Southern Queensland, Australia) .....	125
<i>Steganalysis of Storage-based Covert Channels Using Entropy</i> Jun O Seo (University of Auckland, New Zealand), Sathiamoorthy Manoharan (The University of Auckland, New Zealand), Ulrich Speidel (University of Auckland, New Zealand) .....	131
<i>Improvised MANET Selfish Node Detection using Artificial Immune System based Decision Tree</i> Lincy Elizabeth Jim (Melbourne Institute of Technology, Australia), Mark A. Gregory (RMIT University, Australia) .....	137

## Session 7: Transmission

<i>Frame Synchronization Performance of Optical-Wireless Hybrid BPPM-OOK System</i> Tomohiro Kikuchi (Graduate School of Science and Engineering, Ibaraki University & Major in Computer and Information Sciences, Japan), Hiromasa Habuchi (Ibaraki University, Japan), Ran Sun (Ibaraki University, Japan), Yusuke Kozawa (Ibaraki University, Japan) .....	143
--	-----

<i>Compact Multiband Frequency Reconfigurable Antenna for 5G Communications</i> Adnan Ghaffar (Auckland University of Technology, New Zealand), Xue Jun Li (Auckland University of Technology, New Zealand), Boon-Chong Seet (Auckland University of Technology, New Zealand), Wahaj Abbas Awan (COMSATS, Sahiwal, Pakistan), Niamat Hussain (Chungbuk National University, Korea (South))	149
<i>Blockchain Enabled Opportunistic Fog-based Radio Access Network: A Position Paper</i> Jofina Jijin (Auckland University of Technology, New Zealand), Boon-Chong Seet (Auckland University of Technology, New Zealand), Peter Han Joo Chong (Auckland University of Technology, New Zealand)	152

## Session 11: Applications

<i>Early Warning System with Real Time Tilt Monitoring</i> Baden Parr (Massey University, New Zealand), Daniel Konings (Massey University, New Zealand), Mathew Legg (Massey University, New Zealand), Fakhru Alam (Massey University, New Zealand)	155
<i>Leveraging CNN and Transfer Learning for Vision-based Human Activity Recognition</i> Samundra Deep (Macquarie University, Australia), Xi Zheng (Macquarie University & School of Engineering, Australia)	158
<i>An Orientation Aware Learning MAC for Multi-UAVs Networks</i> Saadullah Kalwar (University of Wollongong, Australia), Kwan-Wu Chin (University of Wollongong, Australia), Luyao Wang (Beijing University of Technology, China)	162
<i>Development of a Supply Chain Product Monitoring Network</i> Darryn Wells (Massey University, New Zealand), Fakhru Alam (Massey University, New Zealand), Yi Chen (Scion, New Zealand), Robert Abbel (Scion, New Zealand), Kate Parker (Scion, New Zealand)	166

## Session 10: Wireless

<i>Two-Tier Spectrum Trading Strategy for Heterogeneous Cognitive Radio Networks</i> Xiaowen Huang (Minnan Normal University, China), Wenjie Zhang (Minnan Normal University, China), Liwei Yang (China Agricultural University, China), Chai Kiat Yeo (Nanyang Technological University, Singapore), Shengyu Chen (Indiana University, USA)	170
<i>Theoretical Analysis of Equal-Weight (2, 2) VSS on VN-CSK Illumination Light Communication</i> Keisuke Manaka (Ibaraki University, Japan), Liyuan Chen (Ibaraki University, Japan), Hiromasa Habuchi (Ibaraki University, Japan), Yusuke Kozawa (Ibaraki University, Japan)	176
<i>Design and Implementation of Wi-Fi Based Attendance System Using Raspberry Pi</i> Archana Banepali (Melbourne Institute of Technology (MIT), Australia), Rajan Kadel (Melbourne Institute of Technology, Australia), Deepani B. Guruge (Melbourne Institute of Technology (MIT), Australia), Sharly J. Halder (Melbourne Institute of Technology (MIT), Australia)	182
<i>Dynamic Resource Allocation for Visible Light Communications (VLC)-WiFi Heterogeneous Systems</i> Liwei Yang (China Agricultural University, China), Wenjie Zhang (Minnan Normal University, China), Lining Deng (China Agricultural University, China), Junning Zhang (Chinese Academy of Agricultural Mechanization Sciences, China)	188

## Session 13: Cloud and Applications

<i>Feature Selection: Multi-source and Multi-view Data Limitations, Capabilities and Potentials</i> Marianne Cherrington (University of Huddersfield, United Kingdom (Great Britain)), David Osemeojie Airehrour (Auckland University of Technology, New Zealand), Qianq Xu (University of Huddersfield, New Zealand), Joan Lu (Huddersfield University, United Kingdom (Great Britain)), Fadi Thabtah (Principal Lecturer, New Zealand), Samaneh Madanian (Auckland University of Technology, New Zealand)	194
<i>Supercomputer Networks in the Datacenter: Benchmarking the Evolution of Communication Granularity from Macroscale down to Nanoscale</i> Sayan Kumar Ray (Manukau Institute of Technology, New Zealand), Firas Al-Ali (Senior Lecturer, Manukau Institute of Technology, New Zealand), Thilina Gamage (Student, Manukau Institute of Technology, New Zealand), Hewa Nanayakkara (Student, Manukau Institute of Technology, New Zealand), Farhad Mehdipour (Otago Polytechnic - Auckland International Campus, New Zealand)	200
<i>A Cloud-Based Traffic Flow Framework for Tactile Internet using SDN and Fog Computing</i> Vaibhav Fanibhare (Auckland University of Technology, New Zealand), Nurul I Sarkar (Auckland University of Technology, New Zealand), Adnan Al-Anbuky (Auckland University of Technology, New Zealand)	206

## Session 12: Mobile Cellular

<i>Performance Analysis of Defused VLC Channel for Mobile Environment</i> Shakir Ullah (Auckland University of Technology, New Zealand), Saeed Ur Rehman (Auckland University of Technology, New Zealand), Peter Han Joo Chong (Auckland University of Technology, New Zealand) .....	212
<i>Improving Prediction Accuracy for Power Consumption in Virtual Environments</i> Humaira Abdul Salam (University of Genoa, Italy & TUHH, Germany), Franco R. Davoli (University of Genoa & National Inter-University Consortium for Telecommunications (CNIT), Italy), Andreas Timm-Giel (Hamburg University of Technology, Germany) .....	218

## Huawei Welcome

<i>5G and the Future of Security in ICT</i> David Soldani (Huawei (Australia), Australia) .....	224
--	-----

## Session 14: Security

<i>Detecting IRC-based Botnets by Network Traffic Analysis Through Machine Learning</i> Xue Jun Li (Auckland University of Technology, New Zealand), Maode Ma (Nanyang Technological University, Singapore), Yi Lin Yen (Nanyang Technological University, Singapore) .....	232
<i>Hybrid Routing for Man-in-the-Middle (MITM) Attack Detection in IoT Networks</i> James Jin Kanq (Edith Cowan University, Australia), Kiran Fahd (Melbourne Polytechnic, Australia), Sitalakshmi Venkatraman (Melbourne Polytechnic, Australia), Rolando Trujillo (Deakin University, Australia), Paul Haskell-Dowland (Edith Cowan University, Australia) .....	238
<i>A Secure End-to-End Key Exchange Mechanism by Cooperation of Multiple Devices Using QR Codes</i> Yong Jin (Tokyo Institute of Technology, Japan), Masahiko Tomoishi (Tokyo Institute of Technology, Japan) .....	246
<i>Detecting Compromised Switches And Middlebox-Bypass Attacks In Service Function Chaining</i> Nguyen Canh Thang (Soongsil University, Korea (South)), Minh Park (Soongsil University, Korea (South)) .....	253

## Session 15: Workshop track

<i>Energy Efficiency Optimization in Energy Harvesting Two-Hop Half-duplex Relay Systems</i> Jinq Zhao (CETC, China), Chenchen Liu (CETC, China), Ming Zhao (University of Science and Technology of China, China), Zhengyu Zhang (CETC, China), Zhang Shi Bin (CHINA, China) .....	259
<i>Decentralized Interference Mitigation Technique for D2D Networks Using Game Theory Optimization</i> Saad Aslam (Massey University, New Zealand), Fakhru Alam (Massey University, New Zealand), Syed Faraz Hasan (Massey University, New Zealand), Mohammad Rashid (Massey University New Zealand, New Zealand) .....	265
<i>A Disaster Response Framework Based on IoT and D2D Communication under 5G Network Technology</i> Shakil Ahmed (Massey University, New Zealand), Mohammad Rashid (Massey University New Zealand, New Zealand), Bapon Fakhruddin (Tonkin and Taylor Ltd, New Zealand), Fakhru Alam (Massey University, New Zealand) .....	272
<i>Performance Analysis of Random Backoff based D2D Discovery in Cellular Networks</i> Zhongqiang Yu (Auckland University of Technology, New Zealand), Boon-Chong Seet (Auckland University of Technology, New Zealand) .....	278

## Session 17: Wireless and Applications

<i>A Context-Aware and Technology-Assisted Informal Caregiver Selection Method to support Medical Emergency</i> Sayan Kumar Ray (Manukau Institute of Technology, New Zealand), Akbar Hossain (Auckland University of Technology, New Zealand), Seyed Reza Shahamiri (Manuka Institute of Technology, New Zealand) .....	284
<i>Link Scheduling for Data Collection in SIC-Capable UAV Networks</i> Yawen Zheng (University of Wollongong, Australia), Kwan-Wu Chin (University of Wollongong, Australia) .....	290
<i>Digital Forensic Readiness In Wireless Medical Systems</i> Paula Lutui (Auckland University of Technology, New Zealand) .....	296

## Session 16: Workshop track

<i>Performance Analysis of Clustering Algorithms for Content-Sharing Based D2D Enabled 5G Networks</i>	
Saad Aslam (Massey University, New Zealand), Fakhrul Alam (Massey University, New Zealand), Syed Faraz Hasan (Massey University, New Zealand), Mohammad Rashid (Massey University New Zealand, New Zealand)	302
<i>A Novel Relaying Mechanism for Multi-Cast Transmission with Ground-Aerial NOMA</i>	
Syeda Kanwal Zaidi (Massey University, New Zealand), Syed Faraz Hasan (Massey University, New Zealand), Xiang Gui (Massey University, New Zealand)	309
<i>Non-Centralised and Non-GPS Navigation Mechanism using IoT sensors: challenges and trade-offs</i>	
Debraj Basu (University of California, Davis, USA), Xiang Gui (Massey University, New Zealand), Yi Zhang (Trinity College Dublin, Ireland), Avishek Nag (University College Dublin, Ireland)	315

## Session 19: Algorithms

<i>Rate Matching Pattern Estimation</i>	
Byoungjo Choi (Incheon National University, Korea (South)), Stevan Mirko Berber (University of Auckland, New Zealand)	321
<i>A proposal of information diffusion model using information vitality</i>	
Yuya Ota (Soka University, Japan), Norihiko Shinomiya (Soka University, Japan)	324
<i>Max-cut and min-flow theorem for coal-transportation networks based on fault-tolerant routing</i>	
Da-Ren Chen (National Taichung University of Science and Technology, Taiwan), Hao-Yen Chang (National Taichung University of Science and Technology, Taiwan), Ye-Zheng Chen (National Taichung University of Science and Technology, Taiwan)	327
<i>Evaluating TCP Connection Healthiness</i>	
Nils Rodday (Bundeswehr University Munich, Germany & University of Twente, The Netherlands), Raphael Labaca-Castro (Bundeswehr University Munich, Germany), Klement Streit (Bundeswehr University Munich, Germany), Gabi Dreo Rodosek (Universität der Bundeswehr München, Germany)	333
<i>Data Security Frameworks for Mobile Cloud Computing: A Comprehensive Review of the Literature</i>	
Noah Oghenefeqo Oqwarra (Auckland University of Technology, New Zealand), Krassie Petrova (Auckland University of Technology, New Zealand), Mee Loong Yang (Auckland University of Technology, New Zealand)	337

## Session18: SDN and Applications

<i>Music Response Based on Real-time Facial Expression Recognition</i>	
DaiLun Chianq (National Taiwan University, Taiwan), JihHsianq Yanq (National Taiwan University, Taiwan), ZiYuan Huang (National Taiwan University, Taiwan), Feipei Lai (National Taiwan University, Taiwan)	341
<i>Analog Least Mean Square Loop for Self-Interference Cancellation: Implementation and Measurements</i>	
Anh Tuyen Le (University of Technology Sydney, Australia), Le Chung Tran (University of Wollongong, Australia), Xiaojing Huang (University of Technology Sydney, Australia), Y. Jay Guo (University of Technology Sydney, Australia)	344
<i>Utilising SDN to Counter BGP Convergence Delays</i>	
Hamad Alotaibi (University of RMIT & RMIT, Australia), Shuo Li (RMIT University, Australia), Mark A. Gregory (RMIT University, Australia)	350
<i>Mininet Topology: Mirror of the Optical Switch Fabric</i>	
Sadia Qureshi (University of Technology Sydney, Australia), Robin Michael Braun (University of Technology, Sydney, Australia)	356