

IEEE COMMUNICATIONS SURVEYS & TUTORIALS

A PUBLICATION OF THE IEEE COMMUNICATIONS SOCIETY



SECOND QUARTER 2016

VOLUME 18

NUMBER 2

ICSTCF

(ISSN 1553-877X)

EDITORIAL

- Second Quarter 2016 IEEE Communications Surveys and Tutorials *Ekram Hossain* 899
-

WIRELESS COMMUNICATIONS, NETWORKS, AND 5G SYSTEMS

- A Comprehensive Survey of Pilot Contamination in Massive MIMO—5G System
..... *Olaunle Elijah, Chee Yen Leow, Tharek Abdul Rahman, Solomon Nunoo, and Solomon Zakwoi Iliya* 905
- A Survey of Channel Bonding for Wireless Networks and Guidelines of Channel Bonding for Futuristic Cognitive Radio Sensor Networks *Syed Hashim Raza Bukhari, Mubashir Husain Rehmani, and Sajid Siraj* 924
- Beamforming for Millimeter Wave Communications: An Inclusive Survey *Shajahan Kutty and Debarati Sen* 949
- Channel Measurements and Models for High-Speed Train Communication Systems: A Survey
..... *Cheng-Xiang Wang, Ammar Ghazal, Bo Ai, Yu Liu, and Pingzhi Fan* 974
- Channel Assignment Techniques for Multi-Radio Wireless Mesh Networks: A Survey
..... *A. B. M. Alim Al Islam, Md. Jahidul Islam, Novia Nurain, and Vijay Raghunathan* 988
- User Association in 5G Networks: A Survey and an Outlook
..... *Dantong Liu, Lifeng Wang, Yue Chen, Maged Elkashlan, Kai-Kit Wong, Robert Schober, and Lajos Hanzo* 1018
- New Perspectives on Future Smart FiWi Networks: Scalability, Reliability, and Energy Efficiency
..... *Jiajia Liu, Hongzhi Guo, Hiroki Nishiyama, Hirotaka Ujikawa, Kenichi Suzuki, and Nei Kato* 1045
- A Survey on Buffer-Aided Relay Selection *Nikolaos Nomikos, Themistoklis Charalambous,
Ioannis Krikidis, Dimitrios N. Skoutas, Demosthenes Vouyioukas, Mikael Johansson, and Charalabos Skianis* 1073
- A Survey of FPGA-Based LDPC Decoders
..... *Peter Hailes, Lei Xu, Robert G. Maunder, Bashir M. Al-Hashimi, and Lajos Hanzo* 1098
- Survey of Important Issues in UAV Communication Networks *Lav Gupta, Raj Jain, and Gabor Vaszkun* 1123

PROGRAMMABLE NETWORKS, SECURITY, AND INTERNET OF THINGS (IoT)

- A Survey of Data Mining and Machine Learning Methods for Cyber Security Intrusion Detection
..... *Anna L. Buczak and Erhan Guven* 1153
- A Survey of Mobile VPN Technologies *Abdullah Alshalan, Sandeep Pisharody, and Dijiang Huang* 1177
- Darknet as a Source of Cyber Intelligence: Survey, Taxonomy, and Characterization
..... *Claude Fachkha, and Mourad Debbabi* 1197
- The Virtual Object as a Major Element of the Internet of Things: A Survey
..... *Michele Nitti, Virginia Pilloni, Giuseppe Colistra, and Luigi Atzori* 1228
- M2M Security: Challenges and Solutions
..... *Amira Barki, Abdelmadjid Bouabdallah, Saïd Gharout, and Jacques Traoré* 1241
- A Software Engineering Perspective on SDN Programmability
..... *Felipe A. Lopes, Marcelo Santos, Robson Fidalgo, and Stenio Fernandes* 1255
- Rules Placement Problem in OpenFlow Networks: A Survey
..... *Xuan-Nam Nguyen, Damien Saucez, Chadi Barakat, and Thierry Turletti* 1273

(Contents Continued on Back Cover)



Trust-Distortion Resistant Trust Management Frameworks on Mobile Ad Hoc Networks: A Survey	Zeinab Movahedi, Zahra Hosseini, Fahimeh Bayan, and Guy Pujolle	1287
LTE/LTE-ADVANCED NETWORKS		
Classification of LTE Uplink Scheduling Techniques: An M2M Perspective	M. A. Mehaseb, Y. Gadallah, A. Elhamy, and H. Elhennawy	1310
The Evolution of LTE Physical Layer Control Channels	Mao Wang, Jingjing Zhang, Bingying Ren, Wenjie Yang, Jun Zou, Min Hua, and Xiaohu You	1336
Tutorial on LTE/LTE-A Cellular Network Dimensioning Using Iterative Statistical Analysis	Mona Jaber, Zaher Dawy, Naeem Akl, and Elias Yaacoub	1355
ENERGY EFFICIENCY AND GREEN NETWORKS		
Advances in Energy Harvesting Communications: Past, Present, and Future Challenges	Meng-Lin Ku, Wei Li, Yan Chen, and K. J. Ray Liu	1384
Wireless Charging Technologies: Fundamentals, Standards, and Network Applications	Xiao Lu, Ping Wang, Dusit Niyato, Dong In Kim, and Zhu Han	1413
A Survey on Energy-Aware Design and Operation of Core Networks	Filip Idzikowski, Luca Chiaraviglio, Antonio Cianfrani, Jorge López Vizcaíno, Marco Polverini, and Yabin Ye	1453
Smart Charging for Electric Vehicles: A Survey From the Algorithmic Perspective	Qinglong Wang, Xue Liu, Jian Du, and Fanxin Kong	1500
