Communications in Computer and Information Science 1208

Commenced Publication in 2007
Founding and Former Series Editors:
Simone Diniz Junqueira Barbosa, Phoebe Chen, Alfredo Cuzzocrea, Xiaoyong Du, Orhun Kara, Ting Liu, Krishna M. Sivalingam, Dominik Ślęzak, Takashi Washio, Xiaokang Yang, and Junsong Yuan

Editorial Board Members

Joaquim Filipe
Polytechnic Institute of Setúbal, Setúbal, Portugal

Ashish Ghosh
Indian Statistical Institute, Kolkata, India

Igor Kotenko
St. Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences, St. Petersburg, Russia

Raquel Oliveira Prates
Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

Lizhu Zhou
Tsinghua University, Beijing, China

More information about this series at http://www.springer.com/series/7899

Sabu M. Thampi · Gregorio Martinez Perez ·
Ryan Ko · Danda B. Rawat (Eds.)

Security in Computing and Communications

7th International Symposium, SSCC 2019
Trivandrum, India, December 18–21, 2019
Revised Selected Papers

Springer

Editors
Sabu M. Thampi
Indian Institute of Information Technology and Management
Trivandrum, India

Ryan Ko
University of Queensland
Brisbane, QLD, Australia

Gregorio Martinez Perez
University of Murcia
Espinardo, Murcia, Spain

Danda B. Rawat
Howard University
Washington, DC, USA

ISSN 1865-0929 ISSN 1865-0937 (electronic)
Communications in Computer and Information Science
ISBN 978-981-15-4824-6 ISBN 978-981-15-4825-3 (eBook)
https://doi.org/10.1007/978-981-15-4825-3

© Springer Nature Singapore Pte Ltd. 2020
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

These proceedings contain the papers presented at the 7th International Symposium on Security in Computing and Communications (SSCC 2019). SSCC aims to provide the most relevant opportunity to bring together researchers and practitioners from both academia and industry to exchange their knowledge and discuss their research findings. The symposium was held in Trivandrum, Kerala, India, during December 18–21, 2019. SSCC 2019 was hosted by the Indian Institute of Information Technology and Management-Kerala (IIITM-K). The symposium was colocated with the International Conference on Applied soft computing and Communication Networks (ACN 2019).

In response to the call for papers, 61 papers were submitted for presentation and inclusion in the proceedings of the conference. The papers were evaluated and ranked on the basis of their significance, novelty, and technical quality. A double-blind review process was conducted to ensure that the author names and affiliations were unknown to the Technical Program Committee (TPC). Each paper was reviewed by the members of the TPC and finally, 22 regular papers and 7 short papers were selected for presentation at the symposium.

We thank the program chairs for their wise advice and brilliant suggestions in organizing the technical program. We would like to extend our deepest appreciation to the Advisory Committee members. Thanks to all members of the TPC, and the external reviewers, for their hard work in evaluating and discussing papers. We wish to thank all the members of the Organizing Committee, whose work and commitment were invaluable. Our most sincere thanks go to all the keynote speakers who shared with us their expertise and knowledge. We wish to thank all the authors who submitted papers and all participants and contributors of fruitful discussions. The EDAS conference system proved very helpful during the submission, review, and editing phases.

We thank IIITM-K for hosting the conference. Our sincere thanks to Dr. Saji Gopinath, Director at IIITM-K, for his continued support and cooperation. Recognition also goes to the Local Organizing Committee members who all worked extremely hard on every detail of the conference programs and social activities. We appreciate the contributions of all the faculty and staff of IIITM-K and the student volunteers who contributed their time to make the conference a great success.

We wish to express our gratitude to the team at Springer for their help and cooperation.

December 2019

Sabu M. Thampi
Gregorio Martinez Perez
Ryan Ko
Danda B. Rawat

Organization

Chief Patron

Madhavan Nambiar IAS (Rtd.)	IIITM-K, India

Patron

Saji Gopinath	IIITM-K, India

Honorary General Chair

Ravi Sandhu	University of Texas at San Antonio, USA

General Chairs

Mauro Conti	University of Padua, Italy
Sabu M. Thampi	IIITM-K, India
Gregorio Martinez Perez	University of Murcia, Spain

Technical Program Chairs

Ryan Ko	The University of Queensland, Australia
Danda B. Rawat	Howard University, USA
Jose M. Alcaraz Calero	University of the West of Scotland, UK

Workshop Chair

Tony Thomas	IIITM-K, India

Advisory Committee

Albert Y. Zomaya	The University of Sydney, Australia
Sudip Misra	IIT Kharagpur, India
Vijay Varadharajan	The University of Newcastle, Australia
Sanjay Madria	Missouri University of Science and Technology, USA
Mohan S. Kankanhalli	National University of Singapore, Singapore
Kim-Kwang Raymond Choo	University Texas at San Antonio, USA
Jiankun Hu	The University of New South Wales, Australia
Indrakshi Ray	Colorado State University, USA
Guojun Wang	Guangzhou University, China

Bharat Bhargava	Purdue University, USA
Chun-I Fan	National Sun Yat-sen University, Taiwan
Xavier Fernando	Ryerson University, Canada
B. M. Mehtre	IDRBT, India
Surya Nepal	CSIRO, Australia

Technical Program Committee

Pradeep Atrey	University at Albany, USA
Mario Goldenbaum	Princeton University, USA
Zbigniew Kalbarczyk	University of Illinois at Urbana Champaign, USA
Donghyun Kim	Kennesaw State University, USA
Seungmo Kim	Georgia Southern University, USA
Sanjeev Kumar	The University of Texas Rio Grande Valley, USA
Suryadipta Majumdar	University at Albany, USA
Kyriakos Manousakis	Applied Communication Sciences, USA
Vishnu Pendyala	Santa Clara University, USA
Sherif Rashad	Morehead State University, USA
Mukesh Singhal	University of California at Merced, USA
Bing Wu	Fayetteville State University, USA
Ping Yang	Binghamton University, USA
Meng Yu	Roosevelt University, USA
Peng Zhang	Stony Brook University, USA
Alberto Huertas Celdrán	University of Pennsylvania, USA
Giuseppe Raffa	Intel Corporation, USA
Zhiyuan Zheng	Texas A&M University, USA
Connie Justice	Purdue School of Engineering and Technology, IUPUI, USA
Thomas Austin	San Jose State University, USA
Sang-Yoon Chang	University of Colorado Colorado Springs, USA
Yang Xiao	The University of Alabama, USA
Ye Zhu	Cleveland State University, USA
Stavros Shiaeles	University of Plymouth, UK
Steven Furnell	University of Plymouth, UK
Mohamad Badra	CNRS, France, and Zayed University, UAE
Youssef Said	Tunisie Telecom, Tunisia
Chin-Chen Chang	Feng Chia University, Taiwan
Young-Long Chen	National Taichung University of Science and Technology, Taiwan
Chin-Laung Lei	National Taiwan University, Taiwan
Chung-Huang Yang	National Kaohsiung Normal University, Taiwan
Chang Wu Yu	Chung Hua University, Taiwan
Rolf Oppliger	eSECURITY Technologies, Switzerland
Martin Hell	Lund University, Sweden
Josep-Lluis Ferrer-Gomila	University of Balearic Islands, Spain
Antonio Ruiz-Martínez	University of Murcia, Spain

Houcine Hassan	Universidad Politecnica de Valencia, Spain
Hector Migallón	Miguel Hernandesz University, Spain
Jordi Forne	Technical University of Catalonia, Spain
Ximeng Liu	Singapore Management University, Singapore
Daisuke Mashima	Advanced Digital Sciences Center, Singapore
Geong-Sen Poh	National University of Singapore, Singapore
Chau Yuen	Singapore University of Technology and Design, Singapore
Imre Lendák	University of Novi Sad, Serbia
El-Sayed El-Alfy	King Fahd University of Petroleum and Minerals, Saudi Arabia
Nuno Garcia	Universidade da Beira Interior, Portugal
Jerzy Konorski	Gdansk University of Technology, Poland
Zbigniew Kotulski	Warsaw University of Technology, Poland
Chunxiao Jiang	Tsinghua University, China
Xiangxue Li	East China Normal University, China
Yangyang Li	China Academy of Electronics and Information Technology, China
Yuan Zhang	Nanjing University, China
Meng Li	Beijing Institute of Technology, China
Yang Li	Institute of Computing Technology, Chinese Academy of Sciences, China
Jinhui Liu	Shaanxi Normal University, China
Anjia Yang	Jinan University, China
Yuan Zhang	University of Electronic Science and Technology of China, China
Li Xu	Fujian Normal University, China
Mingfu Xue	Nanjing University of Aeronautics and Astronautics, China
Geng Yang	Nanjing University of Posts and Telecommunications, China
Jianhong Zhang	North China University of Technology, China
Hyoungshick Kim	Sungkyunkwan University, South Korea
Yoshifumi Manabe	Kogakuin University, Japan
Zongyang Zhang	Beihang University, Japan
Akihiro Yamamura	Akita University, Japan
Luca Caviglione	CNR, Italy
Angelo Genovese	Università degli Studi di Milano, Italy
Claudio Ardagna	Università degli Studi di Milano, Italy
Giovanni Livraga	Università degli Studi di Milano, Italy
Vincenzo Piuri	Università degli Studi di Milano, Italy
Maurizio Aiello	CNR-IEIIT, Italy
Aniello Castiglione	University of Naples Parthenope, Italy
Michele Colajanni	University of Modena and Reggio Emilia, Italy
Michele Pagano	University of Pisa, Italy
Francesco Palmieri	Università di Salerno, Italy

Gerardo Pelosi	Politecnico di Milano, Italy
Orazio Tomarchio	University of Catania, Italy
Aneel Rahim	Dublin Institute of Technology, Ireland
Karim Al-Saedi	Mustansiriyah University, Iraq
Abdalhossein Rezai	ACECR, Iran
Salman Abdul Moiz	University of Hyderabad, India
Ashok Kumar Das	IIIT Hyderabad, India
Dhananjoy Dey	DRDO, India
G. R. Gangadharan	IDRBT, India
Angelina Geetha	Hindustan Institute of Technology and Science, India
Shreenivas Jog	Savitribai Phule of Pune University, India
Jenila Livingston	VIT Chennai, India
Jinesh M. Kannimoola	Amrita Vishwa Vidyapeetham, India
Dheerendra Mishra	IIT Kharagpur, India
Purushothama R.	NIT Goa, India
Balaji Rajendran	Centre for Development of Advanced Computing, India
Sushmita Ruj	Indian Statistical Institute Kolkata, India
Navanath Saharia	IIIT Manipur, India
Pritam Shah	Dayananda Sagar University, India
Shina Sheen	PSG College of Technology, India
Tarun Yadav	Ministry of Defence (GOI), India
Dija S.	Centre for Development of Advanced Computing, India
Divya Vidyadharan	College of Engineering Trivandrum, India
Avishek Adhikari	Presidency University, India
Man Ho Au	The Hong Kong Polytechnic University, Hong Kong
Aldar Chun-Fai Chan	Hong Kong R&D Centre for LSCM, Hong Kong
Apostolos Fournaris	University of Patras, Greece
Sophia Petridou	University of Macedonia, Greece
Dimitrios Stratogiannis	National Technical University of Athens, Greece
Nikolaos Bardis	Hellenic Military Academy, Greece
Christos Bouras	University of Patras, CTI&P-Diophantus, Greece
Stefanos Gritzalis	University of the Aegean, Greece
Nicolas Sklavos	University of Patras, Greece
Feng Cheng	University of Potsdam, Germany
Andreas Dewald	ERNW Research GmbH, Germany
Thomas Gamer	ABB AG, Germany
Michael Steinke	Bundeswehr University Munich, Germany
Kira Kastell	Frankfurt University of Applied Sciences, Germany
Wolfgang Hommel	Bundeswehr University Munich, Germany
Andreas Noack	University of Applied Sciences Stralsund, Germany
Karima Boudaoud	University of Nice Sophia Antipolis, France
Mounir Kellil	CEA LIST, France
Turker Yilmaz	EURECOM, France
Badis Hammi	Télécom ParisTech, France

Francine Krief	University of Bordeaux, France
Pascal Lorenz	University of Haute Alsace, France
Mohamed Mosbah	LaBRI, Bordeaux University, France
Farid Nait-Abdesselam	Paris Descartes University, France
Kester Quist-Aphetsi	University of Brest France, France
Weizhi Meng	Technical University of Denmark, Denmark
Michael McGuire	University of Victoria, Canada
Reihaneh Safavi-Naini	University of Calgary, Canada
Omar Abdel Wahab	Concordia University, Canada
Dongxiao Liu	University of Waterloo, Canada
Hanine Tout	École de Technologie Supérieure, Canada
Maicon Stihler	Federal Center for Technological Education (CEFET-MG), Brazil
Paulo de Lira Gondim	Universidade de Brasilia, Brazil
Edward Moreno	Federal University of Sergipe, Brazil
Al-Sakib Khan Pathan	Southeast University, Bangladesh
Sasan Adibi	Deakin University, Australia
Mohiuddin Ahmed	Canberra Institute of Technology, Australia
Zubair Baig	Deakin University, Australia
Sheng Wen	Swinburn University, Australia
Robin Doss	Deakin University, Australia
Mourad Amad	Bouira University, Algeria

Organized by

IIITM-Kerala

Contents

Malware Detection in Android Applications Using Integrated Static Features 1
A. S. Ajeena Beegom and Gayatri Ashok

Intrusion Prediction and Detection with Deep Sequence Modeling. 11
Gaurav Sarraf and M. S. Swetha

Secure Authentication Using One Time Contextual QR Code 26
Divyans Mahansaria and Uttam Kumar Roy

A Proximity-Based Measure for Quantifying the Risk of Vulnerabilities 41
Ghanshyam S. Bopche, Gopal N. Rai, D. R. Denslin Brabin, and B. M. Mehtre

Man-in-the-browser Attack: A Case Study on Malicious Browser Extensions. 60
Sampsa Rauti

Detection and Analysis of Drive-by Downloads and Malicious Websites 72
Saeed Ibrahim, Nawwaf Al Herami, Ebrahim Al Naqbi, and Monther Aldwairi

Intrusion Detection Systems for Smart Home IoT Devices: Experimental Comparison Study. 87
Faisal Alsakran, Gueltoum Bendiab, Stavros Shiaeles, and Nicholas Kolokotronis

A Resilient Hierarchical Checkpointing Algorithm for Distributed Systems Running on Cluster Federation 99
Houssem Mansouri and Al-Sakib Khan Pathan

Towards Evaluating the Robustness of Deep Intrusion Detection Models in Adversarial Environment 111
S. Sriram, K. Simran, R. Vinayakumar, S. Akarsh, and K. P. Soman

Privacy Preserving Profile Matching in Mobile Social Networks: A Comprehensive Survey. 121
Rohini Bhosale and Madhumita Chatterjee

Deep Learning Approach for Enhanced Cyber Threat Indicators in Twitter Stream 135
K. Simran, Prathiksha Balakrishna, R. Vinayakumar, and K. P. Soman

Improving Sentiment Analysis of Arabic Tweets 146
Abdulrahman Alruban, Muhammed Abduallah, Gueltoum Bendiab, Stavros Shiaeles, and Marco Palomino

Energy Awareness and Secure Communication Protocols: The Era of Green Cybersecurity 159
Marco Castaldo, Aniello Castiglione, Barbara Masucci, Michele Nappi, and Chiara Pero

Towards a Privacy Web Scanner for End-Users 174
Myriam Massardier-Meca and Antonio Ruiz-Martínez

Security of Quantum Cryptography 186
Anindita Banerjee

The Impact of a Security Model in a Fog Computing Environment 198
Nhlakanipho C. Fakude, Paul Tarwireyi, and Mathew O. Adigun

Gotcha-I: A Multiview Human Videos Dataset 213
Paola Barra, Carmen Bisogni, Michele Nappi, David Freire-Obregón, and Modesto Castrillón-Santana

Enhancing Enterprise IT Security with a Visualization-Based Process Framework 225
Tanja Hanauer and Wolfgang Hommel

Pipelined Implementation of Millar-Rabin Primality Tester Using Altera FPGA Kit 237
Qasem Abu Al-Haija, Ibrahim Marouf, Mohammad M. Asad, and Pankaj Mishra

Realization of Re-configurable True Random Number Generator on FPGA 247
M. Priyatharishini and M. Nirmala Devi

Secret Image Sharing Scheme for Gray-Level Images Using Toeplitz Matrix Based Stream Cipher 257
Shailendra Kumar Tripathi, Bhupendra Gupta, K. K. Soundra Pandian, and Yumnam Jayanta Singh

On the Hardware Implementation Performance, of Face Recognition Techniques, for Digital Forensics 272
Maria Pantopoulou, Nicolas Sklavos, and Ivana Ognjanovic

Detecting the Zeus Banking Malware Using the Random Forest Binary Classification Algorithm and a Manual Feature Selection Process 286
Mohamed Ali Kazi, Steve Woodhead, and Diane Gan

Exploitation of HTTP/2 Proxies for Cryptojacking 298
Meenakshi Suresh, V. Anil Kumar, M. Sethumadhavan, and P. P. Amritha

Android Malware Detector Based on Sequences of System Calls and Bidirectional Recurrent Networks 309
Khaled Al-Thelaya and El-Sayed M. El-Alfy

Efficient Ciphertext Policy Attribute Based Encryption (ECP-ABE) for Data Deduplication in Cloud Storage 322
Abhishek Kumar and P. Syam Kumar

Controlling Uncertainty with Proactive Cyber Defense: A Clausewitzian Perspective 335
Sampsa Rauti

Protecting Computer Systems from Cyber Attacks with Internal Interface Diversification 348
Sampsa Rauti

Braille Based Steganography System Using Dynamic Key Exchange 360
Shreyas Sriram, Susheel Polani Sathishkumar, and J. Bhuvana

Author Index 375