Lecture Notes in Computer Science

11605

Founding Editors

Gerhard Goos Karlsruhe Institute of Technology, Karlsruhe, Germany Juris Hartmanis Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino Purdue University, West Lafayette, IN, USA
Wen Gao Peking University, Beijing, China
Bernhard Steffen TU Dortmund University, Dortmund, Germany
Gerhard Woeginger RWTH Aachen, Aachen, Germany
Moti Yung Columbia University, New York, NY, USA More information about this series at http://www.springer.com/series/7410

Jianying Zhou · Robert Deng · Zhou Li · Suryadipta Majumdar · Weizhi Meng · Lingyu Wang · Kehuan Zhang (Eds.)

Applied Cryptography and Network Security Workshops

ACNS 2019 Satellite Workshops, SiMLA, Cloud S&P, AIBlock, and AIoTS Bogota, Colombia, June 5–7, 2019 Proceedings



Editors Jianying Zhou Singapore University of Technology and Design Singapore, Singapore

Zhou Li University of California Irvine, USA

Weizhi Meng Technical University of Denmark Kongens Lyngby, Denmark

Kehuan Zhang Chinese University of Hong Kong Shatin, Hong Kong Robert Deng Singapore Management University Singapore, Singapore

Suryadipta Majumdar D Massry Center for Business University at Albany-SUNY Albany, NY, USA

Lingyu Wang D Concordia University Montreal, QC, Canada

ISSN 0302-9743 ISSN 1611-3349 (electronic) Lecture Notes in Computer Science ISBN 978-3-030-29728-2 ISBN 978-3-030-29729-9 (eBook) https://doi.org/10.1007/978-3-030-29729-9

LNCS Sublibrary: SL4 - Security and Cryptology

© Springer Nature Switzerland AG 2019

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 Switzerland AG The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This post-proceedings contains the papers selected for presentation at ACNS 2019 satellite workshops, which were held in conjunction with the main conference (the 17th International Conference on Applied Cryptography and Network Security) during June 5–7, 2019, in Bogota, Colombia. The local organization was in the capable hands of Professors Valerie Gauthier-Umana from Universidad del Rosario, Colombia, and Martin Ochoa, Universidad del Rosario and Cyxtera Technologies; we are deeply indebted to them for their generous support and leadership to ensure the success of the event.

It was a new initiative for ACNS to set up satellite workshops in 2019. Each workshop provided a forum to address a specific topic at the forefront of cybersecurity research. In response to this year's call for workshop proposals, the following five workshops were launched.

- AIBlock First International Workshop on Application Intelligence and Block-chain Security
- AIoTS First International Workshop on Artificial Intelligence and Industrial Internet-of-Things Security
- Cloud S&P First International Workshop on Cloud Security and Privacy
- PriDA First International Workshop on Privacy-preserving Distributed Data Analysis
- SiMLA First International Workshop on Security in Machine Learning and its Applications

This year, we received a total of 30 submissions. Each workshop had its own Program Committee (PC) in charge of the review process. These papers were evaluated on the basis of their significance, novelty, and technical quality. The review process was double-blind. In the end, 10 papers were selected for presentation at four workshops (PriDA was canceled), with an acceptance rate of 33%. The following paper received the ACNS 2019 Best Workshop Paper Award.

 "Risk-based Static Authentication in Web Applications with Behavioural Biometrics and Session Context Analytics," by Jesus Solano, Luis Camacho, Alejandro Correa, Claudio Deiro, Javier Vargas, and Martin Ochoa.

A couple of papers from the post-proceedings will be nominated for submission of an extended version to a special issue in the *International Journal of Information Security* published by Springer.

ACNS 2019 workshops were made possible by the joint efforts of many individuals and organizations. We appreciate Springer's strong support on our new initiative. We sincerely thank the authors of all submissions. We are grateful to the program chairs and PC members of each workshop for their great effort in providing professional reviews and interesting feedback to authors in a tight time schedule. We thank all the external reviewers for assisting the PC in their particular areas of expertise. We also thank the organizing team members of the main conference as well as each workshop for their help in various aspects.

Last but not least, we thank everyone else, speakers and session chairs, for their contribution to the program of ACNS 2019 workshops.

We believe this is a good start for the success of ACNS satellite workshops. We hope the existing workshops will keep growing and new workshops on emerging topics will be launched in the coming years. We expect it could provide a stimulating platform to discuss open problems at the forefront of cybersecurity research.

July 2019

Jianying Zhou ACNS 2019 Workshop Chair

SiMLA 2019

First International Workshop on Security in Machine Learning and its Applications

Bogota, Colombia June 5, 2019

Program Chairs

Zhou Li	University of California Irvine, USA
Kehuan Zhang	The Chinese University of Hong Kong, SAR China

Program Committee

Ninghui Li	Purdue University, USA
Yinqian Zhang	Ohio State University, USA
Di Tang	The Chinese University of Hong Kong, SAR China
Xiaokui Shu	IBM, USA
Jialong Zhang	ByteDance AI Lab, USA
Mohammad Al Faruque	University of California Irvine, USA
Xiapu Daniel Luo	The Hong Kong Polytechnic University, SAR China
Kai Chen	Institute of Information Engineering, Chinese Academy
	of Science, China
Zhe Zhou	Fudan University, China

Additional Reviewers

Guo, Zhixiu Lu, Haochuan Tan, Mingtian Yuan, Xuejing

CLOUD S&P 2019

First International Workshop on Cloud Security and Privacy

Bogota, Colombia June 5, 2019

Program Chairs

Suryadipta Majumdar	University at Albany, USA
Lingyu Wang	Concordia University, Canada

Web Chair

Sudershan L T

Concordia University, Canada

Program Committee

Vijay Atluri	Rutgers University, USA
Mauro Conti	University of Padua, Italy
Sabrina De Capitani di	Universitá degli studi di Milano, Italy
Vimercati	
Sara Foresti	Universitá degli Studi di Milano, Italy
Xinwen Fu	University of Central Florida, USA
Yuan Hong	Illinois Institute of Technology, USA
Patrick Hung	University of Ontario Institute of Technology, Canada
Yosr Jarraya	Ericsson Security, Canada
Ram Krishnan	University of Texas at San Antonio, USA
Zheli Liu	Nankai University, China
Rongxing Lu	University of New Brunswick, Canada
Ali Miri	Ryerson University, Canada
Makan Pourzandi	Ericsson Security, Canada
Indrakshi Ray	Colorado State University, USA
Pierangela Samarati	Universitá degli studi di Milano, Italy
Vijay Varadharajan	University of Newcastle, Australia
Mohammad Zulkernine	Queen's University, Canada

Additional Reviewers

Karmakar, Kallol Krishna Shojafar, Mohammad Zhang, Mengyuan

AIBlock 2019

First International Workshop on Application Intelligence and Blockchain Security

Bogota, Colombia June 5, 2019

Program Chairs

Weizhi Meng	Technical University of Denmark, Denmark
Zhiqiang Liu	Shanghai Jiao Tong University, China
Chunhua Su	University of Aizu, Japan

Program Committee

Ashiq Anjum	University of Derby, UK
Man Ho Au	The Hong Kong Polytechnic University, SAR China
Raja Naeem Akram	Royal Holloway, University of London, UK
David Chadwick	University of Kent, UK
Konstantinos Chalkias	R3, UK and USA
Taolue Chen	Oxford University, UK
Dieter Gollmann	Hamburg University of Technology, Germany
Debiao He	Wuhan University, China
Georgios Kambourakis	University of the Aegean, Greece
Hyoungshick Kim	Sungkyunkwan University, South Korea
Hiroaki Kikuchi	Meiji University, Japan
Peter Lewis	Aston University, UK
Jiqiang Lu	Beihang University, China
Xiapu Luo	The Hong Kong Polytechnic University, SAR China
Felix Gomez Marmol	University of Murcia, Spain
Petr Novotny	IBM, USA
Jun Shao	Zhejiang Gongshang University, China
Seungwon Shin	KAIST, South Korea
Paolo Tasca	University College London, UK
Andreas Veneris	University of Toronto, Canada
Qianhong Wu	Beihang University, China

Additional Reviewers

Dai, Xiaopeng Recchia, Alessandro Wu, Lei

AIoTS 2019

First International Workshop on Artificial Intelligence and Industrial Internet-of-Things Security

Bagota, Colombia June 5, 2019

Program Chairs

Robert Deng	Singapore Management University, Singapore
Sandra Rueda	Universidad de los Andes, Colombia

Organizing Chairs

Sridhar Adepu	SUTD, Singapore
John Henry Castellanos	SUTD, Singapore
Chuadhry Mujeeb Ahmed	SUTD, Singapore

Publicity Chair

Program Committee

Alvaro Cardenas Ee-Chien Chang Debin Gao Luis Garcia Dieter Gollmann Pieter Hartel Eunsuk Kang Junyu Lai Elena Lisova Javier Lopez Di Ma Chris Poskitt Pandu Rangan Rajib Ranjan Majti	University of California Santa Cruz, USA National University of Singapore, Singapore Singapore Management University, Singapore University of California Los Angeles, USA TU Hamburg, Germany TU Delft, The Netherlands Carnegie Mellon University, USA UESTC, China Malardalen University, Sweden University of Malaga, Spain University of Malaga, Spain University of Michigan, USA SUTD, Singapore ITT Madras, India BITS-Hyderabad, India
e	,
Rajib Ranjan Maiti	BITS-Hyderabad, India
Giedre Sabaliauskaite	SUTD, Singapore

Phani Vadrevu Yousheng Zhou University of New Orleans, USA CQUPT, China

Additional Reviewers

Adepu, Sridhar Ahmed, Chuadhry Mujeeb

Contents

SiMLA - Security in Machine Learning and its Applications

Risk-Based Static Authentication in Web Applications with Behavioral Biometrics and Session Context Analytics	3
Jesus Solano, Luis Camacho, Alejandro Correa, Claudio Deiro, Javier Vargas, and Martín Ochoa	5
Using Honeypots in a Decentralized Framework to Defend Against Adversarial Machine-Learning Attacks <i>Fadi Younis and Ali Miri</i>	24
Cloud S&P - Cloud Security and Privacy	
Graphene: A Secure Cloud Communication Architecture Abu Faisal and Mohammad Zulkernine	51
A Survey on Machine Learning Applications for Software Defined Network Security	70
AIBlock - Application Intelligence and Blockchain Security	
A New Proof of Work for Blockchain Based on Random Multivariate Quadratic Equations <i>Jintai Ding</i>	97
BSIEM-IoT: A Blockchain-Based and Distributed SIEM for the Internet of Things	108
Andrés Pardo Mesa, Fabián Ardila Rodríguez, Daniel Díaz López, and Félix Gómez Mármol	108
Towards Blockchained Challenge-Based Collaborative Intrusion Detection Wenjuan Li, Yu Wang, Jin Li, and Man Ho Au	122
AIoTS - Artificial Intelligence and Industrial Internet-of-Things Security	
Enhancement to the Privacy-Aware Authentication for Wi-Fi Based	1.42
Indoor Positioning Systems	143

Design of a FDIA Resilient Protection Scheme for Power Networks	
by Securing Minimal Sensor Set	156
Tanmoy Kanti Das, Subhojit Ghosh, Ebha Koley, and Jianying Zhou	
Strong Leakage Resilient Encryption by Hiding Partial Ciphertext Jia Xu and Jianying Zhou	172
Author Index	193