Proceedings of the
Third Italian Conference on Cybersecurity
Scientific and Technical Track

ITASEC19

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Edited by

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PREFACE

ITASEC19 is the third edition of the Italian Conference on Cybersecurity, an annual event started in 2017 under the support of the CINI Cybersecurity National Laboratory with the aim of fostering networking of cybersecurity researchers and professionals coming from universities, companies, and government institutions. ITASEC19 was held on February 13-15, 2019 in Pisa and was structured into a main cybersecurity science and technology track devoted to contributed talks; a demo track devoted to prototypes developed by companies, research centers and universities; tutorials of interest for the cybersecurity community at large; workshops providing a forum for interactively exchanging opinions, presenting ideas, and discussing preliminary results; and special sessions where domestic cybersecurity startups presented their ongoing activities.

The conference solicited two types of submissions: unpublished contributions to be included in the conference proceedings and presentation-only contributions of already published work, preliminary work and position papers. There were 56 submissions from 10 countries around the world. Among these there were 34 in the unpublished category and 22 in the presentation-only one. Each submission was reviewed by at least 3 programme committee members, with the exception of four with two reviews, only.

The committee decided to accept 13 papers out of the 34 submitted in the unpublished category, which are included in this proceedings volume. Other 18 papers from the presentation-only category have been accepted, and have been presented at the conference without being included in this volume. The peer reviewing process has been dealt with through EasyChair. We would like to thank the programme committee members and all the external reviewers, as well as the authors of all submitted papers.

Besides the 31 presentations, the programme of the technical science and technology track included this year two invited talks by Prof. David Basin, ETH Zurich and Prof. Peter Y A Ryan, Université du Luxembourg, two leading scientists in the wide area of software security, whom we warmly thank.

Prof. Basin's keynote, entitled "SCION: Highly Secure, High Performance Internet Routing," presented his recent work on building a more secure and performant interdomain routing infrastructure that is already in productive use in Europe by financial institutions and government agencies. It offers solutions to problems of today's Internet including: protection against DDoS attacks, freedom from route hijacking, no globally trusted entities, path control enabling geofencing, and true multipath communication. A distinctive feature of SCION is that large parts of its infrastructure have been formally verified.

The keynote by Prof. Ryan addressed the security issues arising in electronic voting, because the increasing digitalisation of democracy brings with it novel and poorly understood attacks. Thus, an electronic election should deliver, along with the outcome, sufficient evidence to convince all, especially the losers, that the announced outcome is valid. And of course, this must be achieved without undermining ballot privacy or coercion resistance. A new scheme, Electryo, has been presented that provides formal means for intuitive and transparent voter verification, coercion mitigation and supports risk limiting audits.

We would like to thank all the people involved in the organization of ITASEC19 and its tracks, in particular Paolo Prinetto, Executive Director of the CINI Cybersecurity National Laboratory, the General Chairs of the entire conference, Marco Conti and Rocco De Nicola.

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The editors of this volume
Pierpaolo Degano and Roberto Zunino

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Programme of the Scientific and Technical Track

You can find below the ITASEC19 scientific and technical sessions. We point out the 13 papers contained in these proceeding in **bold** font. All the remaining 18 presentation-only papers are not contained therein, and they have been presented at the conference.

Security Analysis I

– **Elia Geretto, Cédric Tessier and Fabio Massacci**
  A QBDI-based Fuzzer Taming Magic Bytes
– Valentina Casola, Alessandra De Benedictis and Roberto Nardone
  Towards Model-based Security Assessment of Cloud Applications
– **Federico Concone, Giuseppe Lo Re, Marco Morana and Claudio Ruocco**
  Twitter Spam Account Detection by Effective Labeling

Security Analysis II

– Salvatore Manfredi, Silvio Ranise and Giada Sciarretta
  TLSAssistant: a Comprehensive Tool for Identifying and Mitigating TLS Vulnerabilities
– Gabriele Costa, Andrea Valenza and Alessandro Armando
  Why Charles Can Pen-test: an Evolutionary Approach to Vulnerability Testing
– Daniele Cono D'Elia, Emilio Coppa, Federico Palmaro, Lorenzo Cavallaro and Camil Demetrescu
  Reconciling Automatic and Manual Malware Analysis

Formal Methods

– **Matteo Busi and Letterio Galletta**
  A Brief Tour of Formally Secure Compilation
– Roberto Nardone, Ricardo J. Rodriguez and Stefano Marrone
  Formal Security Assessment of Modbus Protocol
– Marcello Cinque, Domenico Cotroneo and Antonio Pecchia
  Challenges and Directions in Security Information and Event Management (SIEM)

Network Security

– Manuel Cheminod, Luca Durante, Lucia Seno and Adriano Valenzano
  Performance Evaluation and Modeling of an Industrial Application-layer Firewall
– **Lorenzo Ceragioli, Letterio Galletta and Mauro Tempesta**
  From Firewalls to Functions and Back
– **Luca Deri, Samuele Sabella and Simone Mainardi**
  Combining System Visibility and Security Using eBPF

Dissemination

- Enrico Russo, Gabriele Costa and Alessandro Armando
  Scenario Design and Validation for Next Generation Cyber Ranges
- **Maria Teresa Baldassarre, Vita Santa Barletta, Danilo Caivano, Domenico Raguseo and Michele Scalera**
  Teaching Cyber Security: The HACK-SPACE Integrated Model
- **Antonello Calabrò, Said Daoudagh and Eda Marchetti**
  Integrating Access Control and Business Process for GDPR Compliance: A Preliminary Study

Machine Learning

- **Marino Miculan, Gian Luca Foresti and Claudio Piciarelli**
  Towards User Recognition by Shallow WEB Traffic Inspection
- Francesco Mercaldo, Vittoria Nardone and Antonella Santone
  An Assessment of Machine Learning Algorithms to Driver Detection
- Dario Stabili, Mirco Marchetti and Michele Colajanni
  Signal Extraction from Automotive Dataframes
- **Luca Demetrio, Battista Biggio, Giovanni Lagorio, Fabio Roli and Alessandro Armando**
  Explaining Vulnerabilities of Deep Learning to Adversarial Malware Binaries

Attacks

- Simone Aonzo, Alessio Merlo and Yanick Fratantonio
  Phishing Attacks on Modern Android
- **Enrico Cambiaso, Ivan Vaccari, Luca Patti and Maurizio Aiello**
  Darknet Security: A Categorization of Attacks to the Tor Network
- Davide Maiorca, Alessandro Medda and Giorgio Giacinto
  Macro-Oblivion: Extensive Analysis of Macro-Based Microsoft Office Malware

Critical Systems

- Giuseppe Bernieri, Mauro Conti and Federica Pascucci
  A Novel Architecture for Cyber-Physical Security in Industrial Control System Networks
- **Davide Cerotti, Daniele Codetta-Raiteri, Giovanna Dondossola, Lavinia Egidi, Giuliana Franceschinis, Luigi Portinale and Roberta Terruggia**
  A Bayesian Network Approach for the Interpretation of Cyber Attacks to Power Systems
- **Giulia Ferri, Giorgiomaria Cicero, Alessandro Biondi and Giorgio Buttazzo**
  Towards the Hypervision of Hardware-based Control Flow Integrity for Arm Platforms

Data-driven security

– Francesco Buccafurri, Gianluca Lax, Antonia Russo and Guillaume Zunino
  Allowing Accountable Transactions over Blockchain
– Roberto Baldoni, Giuseppe Antonio Di Luna, Luca Massarelli, Fabio Petroni and Leonardo Querzoni
  Unsupervised Features Extraction for Binary Similarity Using Graph Embedding Neural Networks
– Darius Sas, Francesca Arcelli Fontana and Marco Bessi
  Automatic Detection of Sources and Sinks in Arbitrary Java Libraries

Cryptography

– Marco Rasori, Pericle Perazzo and Gianluca Dini
  ABE-Cities: An Attribute-Based Encryption System for Smart Cities
– Costantino Agnesi, Luca Calderaro, Silvia Ceccato, Daniele Dequal, Francesco Vedovato, Matteo Schiavon, Alberto Santamato, Vincenza Luceri, Giuseppe Bianco, Giuseppe Vallone, Nicola Laurenti and Paolo Villoresi
  Secure Global Communications Enabled by GNSS Satellite-based Quantum Key Distribution
– **Tiziano Fagni, Leonardo Nizzoli, Marinella Petrocchi and Maurizio Tesconi**
  Six Things I Hate About You (in Italian) and Six Classification Strategies to More and More Effectively Find Them

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ADDITIONAL REFEREES