Lecture Notes in Computer Science

10327

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zurich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at http://www.springer.com/series/7410

Detection of Intrusions and Malware, and Vulnerability Assessment

14th International Conference, DIMVA 2017 Bonn, Germany, July 6–7, 2017 Proceedings



Editors
Michalis Polychronakis
Stony Brook University
Stony Brook, NY
USA

Michael Meier University of Bonn and Fraunhofer FKIE Bonn Germany

ISSN 0302-9743 ISSN 1611-3349 (electronic) Lecture Notes in Computer Science ISBN 978-3-319-60875-4 ISBN 978-3-319-60876-1 (eBook) DOI 10.1007/978-3-319-60876-1

Library of Congress Control Number: 2017943061

LNCS Sublibrary: SL4 - Security and Cryptology

© Springer International Publishing AG 2017

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, express 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.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

On behalf of the Program Committee, it is our pleasure to present the proceedings of the 14th International Conference on Detection of Intrusions and Malware and Vulnerability Assessment (DIMVA), which took place in Bonn, Germany, during July 6–7, 2017. Since 2004, DIMVA has been bringing together leading researchers and practitioners from academia, industry, and government to present and discuss novel security research in the broader areas of intrusion detection, malware analysis, and vulnerability assessment. DIMVA is organized by the Special Interest Group – Security, Intrusion Detection, and Response (SIDAR) – of the German Informatics Society (GI).

This year, DIMVA received 67 valid submissions from academic and industrial organizations from 25 different countries. Each submission was carefully reviewed by at least three Program Committee members or external experts. The submissions were evaluated on the basis of scientific novelty, importance to the field, and technical quality. The final selection of papers was decided during a day-long Program Committee meeting that took place at Stony Brook University, USA, on April 7, 2017. In all, 18 full papers were selected for presentation at the conference and publication in the proceedings, resulting in an acceptance rate of 26.9%. The accepted papers present novel ideas, techniques, and applications in important areas of computer security, including enclaves and isolation, malware analysis, cyber-physical systems, detection and protection, code analysis, and Web security. Beyond the research papers, the conference program also included two insightful keynote talks by Thomas Dullien (Google) and Prof. Christopher Kruegel (University of California at Santa Barbara).

A successful conference is the result of the joint effort of many people. We would like to express our appreciation to the Program Committee members and external reviewers for the time spent reviewing papers, participating in the online discussion, attending the Program Committee meeting in Stony Brook, and shepherding some of the papers to ensure the highest quality possible. We also deeply thank the members of the Organizing Committee for their hard work in making DIMVA 2017 such a successful event, and our invited speakers for their willingness to participate in the conference. We are wholeheartedly thankful to our sponsors ERNW, genua, Google, Huawei, Rohde & Schwarz Cybersecurity, Springer, and VMRay for generously supporting DIMVA 2017. We also thank Springer for publishing these proceedings as part of their LNCS series, and the DIMVA Steering Committee for their continuous support and assistance.

Finally, DIMVA 2017 would not have been possible without the authors who submitted their work and presented their contributions as well as the attendees who came to the conference. We would like to thank them all, and we look forward to their future contributions to DIMVA.

Organization

DIMVA was organized by the special interest group Security – Intrusion Detection and Response (SIDAR) of the German Informatics Society (GI).

Organizing Committee

General Chair

Michael Meier University of Bonn and Fraunhofer FKIE, Germany

Program Chair

Michalis Polychronakis Stony Brook University, USA

Steering Committee (Chairs)

Ulrich Flegel Infineon Technologies, Germany

Michael Meier University of Bonn and Fraunhofer FKIE, Germany

Steering Committee (Members)

Magnus Almgren Chalmers University of Technology, Sweden Herbert Bos Vrije Universiteit Amsterdam, The Netherlands

Danilo M. Bruschi Università degli Studi di Milano, Italy

Roland Bueschkes RWE AG, Germany

Juan Caballero IMDEA Software Institute, Spain

Lorenzo Cavallaro Royal Holloway, University of London, UK

Herve Debar Telecom SudParis, France

Sven Dietrich City University of New York, USA

Bernhard Haemmerli Acris GmbH and HSLU Lucerne, Switzerland

Thorsten Holz Ruhr University Bochum, Germany

Marko Jahnke CSIRT, German Federal Authority, Germany

Klaus Julisch Deloitte, Switzerland

Christian Kreibich ICSI, USA

Christopher Kruegel University of California, Santa Barbara, USA Pavel Laskov Huawei European Research Center, Germany

Federico Maggi Trend Micro, Italy

Konrad Rieck TU Braunschweig, Germany

Robin Sommer ICSI/LBNL, USA

Urko Zurutuza Mondragon University, Spain

Program Committee

Magnus Almgren Chalmers University of Technology, Sweden

Leyla Bilge Symantec Research Labs, France

VIII Organization

Herbert Bos Vrije Universiteit Amsterdam, The Netherlands Lorenzo Cavallaro Royal Holloway, University of London, UK

Mauro Conti University of Padua, Italy

Baris Coskun Amazon, USA

Lucas Davi University of Duisburg-Essen, Germany

Herve Debar Telecom SudParis, France

Sven Dietrich City University of New York, USA

Brendan Dolan-Gavitt NYU, USA

Adam Doupé Arizona State University, USA
Zakir Durumeric University of Michigan, USA
Manuel Egele Boston University, USA

Ulrich Flegel Infineon Technologies AG, Germany

Cristiano Giuffrida Vrije Universiteit Amsterdam, The Netherlands

Martin Johns SAP Research, Germany

Alexandros Kapravelos North Carolina State University, USA

Vasileios Kemerlis Brown University, USA

Christian Kreibich ICSI, USA

Christopher Kruegel University of California, Santa Barbara, USA

Andrea Lanzi University of Milan, Italy

Pavel Laskov Huawei European Research Center, Germany

Corrado Leita Lastline, UK

Zhiqiang Lin University of Texas at Dallas, USA

Martina Lindorfer University of California, Santa Barbara, USA

Federico Maggi Trend Micro, Italy

Stefan Mangard Graz University of Technology, Austria

Michael Meier University of Bonn and Fraunhofer FKIE, Germany

Collin Mulliner Square, USA

Nick Nikiforakis Stony Brook University, USA Roberto Perdisci University of Georgia, USA

Jason Polakis University of Illinois at Chicago, USA

Konrad Rieck
Christian Rossow
Gianluca Stringhini
Urko Zurutuza

TU Braunschweig, Germany
Saarland University, Germany
University College London, UK
Mondragon University, Spain

Additional Reviewers

Tooska Dargahi Panagiotis Ilia Srdan Moraca Michalis Diamantaris Mikel Iturbe Raphael Otto

Patrick Duessel Daniele Lain Pablo Picazo-Sanchez

Hossein Fereidooni Clémentine Maurice Tobias Wahl

Daniel Gruss Veelasha Moonsamy

Contents

Enclaves and Isolation	
Malware Guard Extension: Using SGX to Conceal Cache Attacks	3
On the Trade-Offs in Oblivious Execution Techniques	25
MemPatrol: Reliable Sideline Integrity Monitoring for High-Performance Systems	48
Malware Analysis	
Measuring and Defeating Anti-Instrumentation-Equipped Malware	73
DynODet: Detecting Dynamic Obfuscation in Malware	97
Finding the Needle: A Study of the PE32 Rich Header and Respective Malware Triage	119
Cyber-physical Systems	
Last Line of Defense: A Novel IDS Approach Against Advanced Threats in Industrial Control Systems	141
LED-it-GO: Leaking (A Lot of) Data from Air-Gapped Computers via the (Small) Hard Drive LED	161

A Stealth, Selective, Link-Layer Denial-of-Service Attack Against Automotive Networks	18:
Andrea Palanca, Eric Evenchick, Federico Maggi, and Stefano Zanero	
Detection and Protection	
Quincy: Detecting Host-Based Code Injection Attacks in Memory Dumps Thomas Barabosch, Niklas Bergmann, Adrian Dombeck, and Elmar Padilla	209
SPEAKER: Split-Phase Execution of Application Containers Lingguang Lei, Jianhua Sun, Kun Sun, Chris Shenefiel, Rui Ma, Yuewu Wang, and Qi Li	230
Deep Ground Truth Analysis of Current Android Malware Fengguo Wei, Yuping Li, Sankardas Roy, Xinming Ou, and Wu Zhou	25
Code Analysis	
HumIDIFy: A Tool for Hidden Functionality Detection in Firmware Sam L. Thomas, Flavio D. Garcia, and Tom Chothia	27
BinShape: Scalable and Robust Binary Library Function Identification Using Function Shape	30
SCVD: A New Semantics-Based Approach for Cloned Vulnerable Code Detection	32:
Web Security	
On the Privacy Impacts of Publicly Leaked Password Databases Olivier Heen and Christoph Neumann	34′
Unsupervised Detection of APT C&C Channels using Web Request Graphs	36
Measuring Network Reputation in the Ad-Bidding Process	38
Author Index	41