Lecture Notes in Computer Science

7631

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

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Alfred Kobsa

University of California, Irvine, CA, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbruecken, Germany

Advances in Information and Computer Security

7th International Workshop on Security, IWSEC 2012 Fukuoka, Japan, November 7-9, 2012 Proceedings



Volume Editors

Goichiro Hanaoka

National Institute of Advanced Industrial Science and Technology (AIST) Research Institute for Secure Systems (RISEC)

1-1-1 Umezono, 305-8568 Tsukuba, Japan

E-mail: hanaoka-goichiro@aist.go.jp

Toshihiro Yamauchi Okayama University Graduate School of Natural Science and Technology 3-1-1 Tsushima-naka, 700-8530 Okayama, Japan E-mail: yamauchi@cs.okayama-u.ac.jp

ISSN 0302-9743 e-ISSN 1611-3349 ISBN 978-3-642-34116-8 e-ISBN 978-3-642-34117-5 DOI 10.1007/978-3-642-34117-5 Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012948601

CR Subject Classification (1998): E.3, G.2.1, D.4.6, K.6.5, K.4.4, F.2.1, C.2

LNCS Sublibrary: SL 4 – Security and Cryptology

© Springer-Verlag Berlin Heidelberg 2012

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, 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.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

The 7th International Workshop on Security (IWSEC 2012) was held at Nishi-jin Plaza, Kyushu University, in Fukuoka, Japan, during November 7–9, 2012. The workshop was co-organized by ISEC in ESS of IEICE (Technical Committee on Information Security in Engineering Sciences Society of the Institute of Electronics, Information and Communication Engineers) and CSEC of IPSJ (Special Interest Group on Computer Security of Information Processing Society of Japan).

This year, the workshop received 53 submissions, of which 16 were accepted for presentation. Each submission was anonymously reviewed by at least five reviewers, and these proceedings contain the revised versions of the accepted papers. In addition to the presentations of the papers, the workshop also featured a poster session and four invited talks. The invited talks were given by James Hughes, Matt Bishop, Suguru Yamaguchi, and Katsuyuki Takashima.

The best paper award was given to "Boomerang Distinguishers for Full HAS-160 Compression Function" by Yu Sasaki, Lei Wang, Yasuhiro Takasaki, Kazuo Sakiyama, and Kazuo Ohta, and the best student paper award was given to "Efficient Concurrent Oblivious Transfer in Super-Polynomial-Simulation Security" by Susumu Kiyoshima, Yoshifumi Manabe, and Tatsuaki Okamoto.

A number of people contributed to the success of IWSEC 2012. We would like to thank the authors for submitting their papers to the workshop. The selection of the papers was a challenging and delicate task, and we are deeply grateful to the members of Program Committee and the external reviewers for their indepth reviews and detailed discussions. We are also grateful to Andrei Voronkov for developing EasyChair, which was used for the paper submission, reviews, discussions, and preparation of these proceedings.

Last but not least, we would like to thank the General Co-chairs, Tsutomu Matsumoto and Kanta Matsuura, for leading the Local Organizing Committee, and we also would like to thank the members of the Local Organizing Committee for their efforts to ensure the smooth running of the workshop.

August 2012

Goichiro Hanaoka Toshihiro Yamauchi

IWSEC 2012 7th International Workshop on Security

Fukuoka, Japan, November 7–9, 2012

Co-organized by

ISEC in ESS of IEICE

(Technical Committee on Information Security in Engineering Sciences Society of the Institute of Electronics, Information and Communication Engineers)

and

CSEC of IPSJ

(Special Interest Group on Computer Security of Information Processing Society of Japan)

General Co-chairs

Tsutomu Matsumoto Yokohama National University, Japan Kanta Matsuura The University of Tokyo, Japan

Advisory Committee

Hideki Imai Chuo University, Japan

Kwangjo Kim Korea Advanced Institute of Science and

Technology, Korea

Günter Müller University of Freiburg, Germany Yuko Murayama Iwate Prefectural University, Japan Koji Nakao National Institute of Information and

Communications Technology, Japan

Eiji Okamoto University of Tsukuba, Japan

C. Pandu Rangan Indian Institute of Technology, Madras, India

Program Co-chairs

Goichiro Hanaoka AIST, Japan

Toshihiro Yamauchi Okayama University, Japan

Local Organizing Committee

Yoshiaki Hori Kyushu University, Japan Takuro Hosoi The University of Tokyo, Japan

Mitsugu Iwamoto The University of Electro-Communications,

Japan

VIII IWSEC 2012

Takehisa Kato Toshiba Solutions Corporation, Japan Akinori Kawachi Tokyo Institute of Technology, Japan

Fagen Li Kyushu University, Japan Kirill Morozov Kyushu University, Japan Takashi Nishide Kyushu University, Japan

Masayuki Numao The University of Electro-Communications,

Japan

Naoyuki Shinohara National Institute of Information and

Communications Technology, Japan National Institute of Information and

Mio Suzuki National Institute of Information and Communications Technology, Japan

Tsuyoshi Takagi Kyushu University, Japan

Kenji Yasunaga Institute of Systems, Information Technologies

and Nanotechnologies, Japan

Program Committee

Rafael Accorsi University of Freiburg, Germany Claudio Ardagna Università degli Studi di Milano, Italy

Nuttapong Attrapadung AIST, Japan

Andrey Bogdanov Katholieke Universiteit Leuven, Belgium

Kevin Butler University of Oregon, USA
Sanjit Chatterjee Indian Institute of Science, India
Haibo Chen Shanghai Jiao Tong University, China

Pau-Chen Cheng IBM Thomas J. Watson Research Center, USA

Koji Chida NTT, Japan

Bart De Decker Katholieke Universiteit Leuven, Belgium Isao Echizen National Institute of Informatics, Japan

Dario Fiore New York University, USA Georg Fuchsbauer University of Bristol, UK

Eiichiro Fujisaki NTT, Japan

Steven Furnell University of Plymouth, UK David Galindo University of Malaga, Spain

Dieter Gollmann Hamburg University of Technology, Germany

Swee-Huay Heng Multimedia University, Malaysia Jin Hong Seoul National University, Korea

Tetsu Iwata Nagoya University, Japan Angelos D. Keromytis Columbia University, USA

Hyung Chan Kim ETRI, Korea

Takeshi Koshiba Saitama University, Japan Noboru Kunihiro University of Tokyo, Japan Kwok-Yan Lam Tsinghua University, China

Benoit Libert Université Catholique de Louvain, Belgium

Javier Lopez University of Malaga, Spain

Keith Martin Royal Holloway, University of London, UK

Masakatsu Nishigaki Shizuoka University, Japan

Wakaha Ogata Tokyo Institute of Technology, Japan

Thomas Peyrin Nanyang Technological University, Singapore

Raphael Phan Loughborough University, UK

Axel Poschmann

Bart Preneel

Katholieke University Singapore

Kai Rannenberg

Kazuo Sakiyama

Nanyang Technological University, Singapore

Katholieke Universiteit Leuven, Belgium

Goethe University Frankfurt, Germany

University of Electro-Communications, Japan

Nazuo Sakiyama University of Electro-Communications, Japar

Ryoichi Sasaki Tokyo Denki University, Japan Joshua Schiffman Pennsylvania State University, USA

Jae Hong Seo NICT, Japan

Francesco Sica University of Waterloo, Canada Tsuyoshi Takagi Kyushu University, Japan

Keisuke Takemori KDDI R&D Laboratories Inc., Japan Keisuke Tanaka Tokyo Institute of Technology, Japan

Masayuki Terada NTT DoCoMo, Japan

Ryuya Uda Tokyo University of Technology, Japan

Damien Vergnaud ENS, France

Sabrina De Capitani University of Milan, Italy

di Vimercati

Guilin Wang University of Wollongong, Australia

Jian Weng Jinan University, China

Sven Wohlgemuth Sirrix AG security technologies, Germany

Keita Xagawa NTT, Japan

Chung-Huang Yang National Kaohsiung Normal University, Taiwan

Kazuki Yoneyama NTT, Japan

Katsunari Yoshioka Yokohama National University, Japan

Hiroshi Yoshiura University of Electro-Communications, Japan

Rui Zhang CAS, China

Yunlei Zhao Fudan University, China

External Reviewers

Elena Andreeva Toshiyuki Isshiki Lejla Batina Malika Izabachene Ji-Jian Chin Charaniit Jutla Angelo De Caro Christian Kahl Junfeng Fan Chethan Kamath Poova Farshim Akinori Kawachi Yanfei Guo Ryo Kikuchi Keisuke Hakuta Ilva Kizhvatov Takuya Hayashi Ulrich Kuehn Jens Hermans Sebastian Kutzner Johann Hevszl Shugo Mikami Takashi Horiyama Kirill Morozov Kota Ideguchi Nicky Mouha

X IWSEC 2012

Divya Muthukumaran Phuong Ha Nguyen Hannah Pruse Arnab Roy Ahmad Sabouri Seog Chung Seo Kyoji Shibutani Wook Shin Ingo Stengel Mario Strefler

Susan Thomson

Leif Uhsadel Kerem Varici Hayawardh Vijayakumar Lei Wang Lei Wei Wun-She Yap Takanori Yasuda Kenji Yasunaga Wei-Chuen Yau Wei Zhang

Table of Contents

Implementation	
Model-Based Conformance Testing for Android	1
Application of Scalar Multiplication of Edwards Curves to Pairing-Based Cryptography	19
Standardized Signature Algorithms on Ultra-constrained 4-Bit MCU Chien-Ning Chen, Nisha Jacob, Sebastian Kutzner, San Ling, Axel Poschmann, and Sirote Saetang	37
Very Short Critical Path Implementation of AES with Direct Logic Gates	51
Encryption and Key Exchange	
One-Round Authenticated Key Exchange with Strong Forward Secrecy in the Standard Model against Constrained Adversary	69
Compact Stateful Encryption Schemes with Ciphertext Verifiability S. Sree Vivek, S. Sharmila Deva Selvi, and C. Pandu Rangan	87
Structured Encryption for Conceptual Graphs	105
Symmetric-Key Encryption Scheme with Multi-ciphertext Non-malleability	123
Cryptanalysis	
Slide Cryptanalysis of Lightweight Stream Cipher RAKAPOSHI	138
Boomerang Distinguishers for Full HAS-160 Compression Function Yu Sasaki, Lei Wang, Yasuhiro Takasaki, Kazuo Sakiyama, and	156

 $Kazuo\ Ohta$

XII Table of Contents

Polynomial-Advantage Cryptanalysis of 3D Cipher and 3D-Based Hash	170
Function	170
Annihilators of Fast Discrete Fourier Spectra Attacks	182
Meet-in-the-Middle Attack on Reduced Versions of the Camellia Block	40-
Cipher	197
Secure Protocols	
Efficient Concurrent Oblivious Transfer in Super-Polynomial-Simulation Security	216
Susumu Kiyoshima, Yoshifumi Manabe, and Tatsuaki Okamoto	
Efficient Secure Primitive for Privacy Preserving Distributed Computations	233
Generic Construction of GUC Secure Commitment in the KRK Model	244
Author Index	261