Lecture Notes in Computer Science

4833

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

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

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Kaoru Kurosawa (Ed.)

Advances in Cryptology – ASIACRYPT 2007

13th International Conference on the Theory and Application of Cryptology and Information Security Kuching, Malaysia, December 2-6, 2007 Proceedings



Volume Editor

Kaoru Kurosawa Ibaraki University Department of Computer and Information Sciences 4-12-1 Nakanarusawa

Hitachi, Ibaraki 316-8511, Japan E-mail: kurosawa@mx.ibaraki.ac.jp

Library of Congress Control Number: 2007939450

CR Subject Classification (1998): E.3, D.4.6, F.2.1-2, K.6.5, C.2, J.1, G.2

LNCS Sublibrary: SL 4 – Security and Cryptology

ISSN 0302-9743

ISBN-10 3-540-76899-8 Springer Berlin Heidelberg New York ISBN-13 978-3-540-76899-9 Springer Berlin Heidelberg New York

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.

Springer is a part of Springer Science+Business Media

springer.com

©International Association for Cryptology Research 2007 Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India Printed on acid-free paper SPIN: 12194407 06/3180 5 4 3 2 1 0

Preface

ASIACRYPT 2007 was held in Kuching, Sarawak, Malaysia, during December 2–6, 2007. This was the 13th ASIACRYPT conference, and was sponsored by the International Association for Cryptologic Research (IACR), in cooperation with the Information Security Research (iSECURES) Lab of Swinburne University of Technology (Sarawak Campus) and the Sarawak Development Institute (SDI), and was financially supported by the Sarawak Government. The General Chair was Raphael Phan and I had the privilege of serving as the Program Chair.

The conference received 223 submissions (from which one submission was withdrawn). Each paper was reviewed by at least three members of the Program Committee, while submissions co-authored by a Program Committee member were reviewed by at least five members. (Each PC member could submit at most one paper.) Many high-quality papers were submitted, but due to the relatively small number which could be accepted, many very good papers had to be rejected. After 11 weeks of reviewing, the Program Committee selected 33 papers for presentation (two papers were merged). The proceedings contain the revised versions of the accepted papers. These revised papers were not subject to editorial review and the authors bear full responsibility for their contents.

The Committee selected the following two papers as the best papers: "Cryptanalysis of Grindahl" by Thomas Peyrin; and "Faster Addition and Doubling on Elliptic Curves" by Daniel J. Bernstein and Tanja Lange. The authors of these two papers were invited to submit the full version of their paper to the *Journal of Cryptology*. The author of the first paper, Thomas Peyrin, received the Best Paper Award.

The conference featured invited lectures by Ran Canetti and Tatsuaki Okamoto. Ran Canetti's paper "Treading the Impossible: A Tour of Set-Up Assumptions for Obtaining Universally Composable Security" and Tatsuaki Okamoto's paper "Authenticated Key Exchange and Key Encapsulation in the Standard Model" have been included in this volume.

There are many people who contributed to the success of ASIACRYPT 2007. I would like to thank many authors from around the world for submitting their papers. I am deeply grateful to the Program Committee for their hard work to ensure that each paper received a thorough and fair review. I gratefully acknowledge the external reviewers listed on the following pages. I am also grateful to Arjen Lenstra, Bart Preneel, and Andy Clark for their advice as the directors of IACR. Finally, I would like to thank the General Chair, Raphael Phan, for organizing the conference and Shai Halevi for developing and maintaining his very nice Web Submission and Review System.

September 2007 Kaoru Kurosawa

Asiacrypt 2007

December 2–6, 2007, Kuching, Sarawak, Malaysia

 $Sponsored\ by$ the International Association for Cryptologic Research (IACR)

in cooperation with

Security Research (iSECURES)

the Information Security Research (iSECURES) Lab of Swinburne University of Technology (Sarawak Campus)

and the Sarawak Development Institute (SDI)

and

financially supported by the Sarawak Government

General Chair

Raphael C.-W. Phan, EPFL, Switzerland

Program Chair

Kaoru Kurosawa, Ibaraki University, Japan

Program Commitee

Masayuki Abe NTT, Japan

Alex Biryukov University of Luxembourg, Luxembourg
Alexandra Boldyreva Georgia Institute of Technology, USA
Jung Hee Cheon Seoul National University, Korea

Jean-Sebastien Coron University of Luxembourg, Luxembourg

Joan Daemen STMicroelectronics, Belgium

Serge Fehr CWI, Netherlands

Steven Galbraith Royal Holloway University of London, UK

Craig Gentry Stanford University, USA Henri Gilbert France Telecom, France

Shai Halevi IBM T.J. Watson Research Center, USA

Helena Handschuh Spansion, France

Tetsu Iwata Nagoya University, Japan
Thomas Johansson Lund University, Sweden
Marc Joye Thomson R&D France, France
Jonathan Katz University of Maryland, USA

Lars R. Knudsen Technical University of Denmark, Denmark

VIII Organization

Hugo Krawczyk IBM T.J. Watson Research Center, USA

Kaoru Kurosawa Ibaraki University, Japan

Xuejia Lai Shanghai Jiaotong University, China Arjen K. Lenstra EPFL IC LACAL, Switzerland

Stefan Lucks Bauhaus University Weimar, Germany

Anna Lysyanskaya Brown University, USA

Alexander May Technische Universität Darmstadt, Germany

Jesper Buus Nielsen University of Aarhus, Denmark Elisabeth Oswald University of Bristol, UK

Josef Pieprzyk Macquarie University, Australia

Bart Preneel Katholieke Universiteit Leuven, Belgium Pandu Rangan Indian Institute of Technology, India Palash Sarkar Indian Statistical Institute, India

Nigel Smart Bristol University, UK

Tsuyoshi Takagi Future University-Hakodate, Japan

Serge Vaudenay EPFL, Switzerland
Brent Waters SRI International, USA
Stefan Wolf ETH Zurich, Switzerland

External Reviewers

Alexander Dent

Jesus Almansa Claus Diem Stuart Haber
Frederik Armknecht Yevgeniy Dodis Sang Geun Hahn
Gilles Van Assche Orr Dunkelman Safuat Hamdy
Georges Baatz Håkan Englund Daewan Han
Thomas Baignéres Pooya Farshim Wei Han

Boaz Barak Martin Feldhofer Goichiro Hanaoka Mira Belenkiy Marc Fischlin Martin Hell Waldyr Benits Matthias Fitzi Dennis Hofheinz Kamel Bentahar Ewan Fleischmann Xuan Hong

Come Berbain Eiichiro Fujisaki Nick Howgrave-Graham

Dan Bernstein Jun Furukawa Jim Hughes

Guido Bertoni Philippe Gaborit Sebastiaan Indesteeghe

Olivier Billet Nicolas Gama Tetsuya Izu Andrey Bogdanov Pierrick Gaudry Markus Jakobsson Stas Jarecki Arnaud Boscher Rosario Gennaro Xavier Boven Ralf Gerkmann Ellen Jochemsz Pascal Junod Ran Canetti Zheng Gong Christophe De Cannière Vipul Goyal Alexandre Karlov

Zhenfu Cao Rob Granger Ulrich Kühn
Chris Charnes Johann Großchädl Marcelo Kaihara
Sanjit Chatterjee Gaurav Gupta Yael Kalai

Scott Contini Frank Gurkaynak Alexandre Karlov Yang Cui Kil-Chan Ha Dmitry Khovratovich

Robbert de Haan Eike Kiltz

Vlastimal Klima Markulf Kohlweiss Yuichi Komano Chiu-Yuen Koo Ranjit Kumaresan Taekyoung Kwon Tanja Lange Jooyoung Lee Mun-Kyu Lee Frédéric Lefèbvre Hoon Wei Lim Yehuda Lindell Joseph Liu Yu Long Xianhui Lu Changshe Ma Subhamov Maitra Keith Martin Krystian Matusiewicz Florian Mendel Daniele Micciancio Wil Michiels Lorenz Minder Andrew Moss Siguna Mueller Toru Nakanishi Arvind Naravanan Gregory Neven Phong Nguyen Svetla Nikova Rvo Nishimaki Adam O'Neill Miyako Ohkubo

Katsuyuki Okeya

Dag Arne Osvik Khaled Ouafi Dan Page Pascal Paillier Sylvain Pasini Rafael Pass Viiavakrishnan Pasupathinathan Kenny Paterson Maura Paterson Thomas Pevrin Duong Hieu Phan Krzysztof Pietrzak Norbert Pramstaller Deike Priemuth-Schmid Prashant Punya Wenfeng Qi Tal Rabin Dominik Raub Christian Rechberger Tom Ristenpart Maike Ritzenhofen Matthieu Rivain Panagiotis Rizomiliotis Matthew Robshaw Kazuo Sakivama Joern-Marc Schmidt Yannick Seurin Runting Shi Masaaki Shirase Igor Shparlinski Tom Shrimpton Ben Smith

Martijn Stam

Ron Steinfeld Marc Stevens Koutarou Suzuki Christophe Tartary Emin Islam Tatli Isamu Teranishi Soren Thomsen Stefan Tillich Frederik Vercauteren Martin Vuagnoux Camille Vuillaume Zhongmei Wan Huaxiong Wang Bogdan Warinschi Hoeteck Wee Benne de Weger Ralf-Philipp Weinmann Mi Wen William Whyte Christopher Wolf Duncan Wong Hongjun Wu Juerg Wullschleger Go Yamamoto

Bo-Yin Yang

Aaram Yun

Erik Zenner

Yunlei Zhao

Jinmin Zhong

Xianmo Zhang

Jin Yuan

Table of Contents

Number Theory and Elliptic Curve	
A Kilobit Special Number Field Sieve Factorization	1
When e-th Roots Become Easier Than Factoring	13
Faster Addition and Doubling on Elliptic Curves	29
Protocol	
A Non-interactive Shuffle with Pairing Based Verifiability	51
On Privacy Models for RFID	68
Invited Talk I	
Obtaining Universally Composite Security: Towards the Bare Bones of Trust	88
Hash Function Design	
A Simple Variant of the Merkle-Damgård Scheme with a Permutation	113
Seven-Property-Preserving Iterated Hashing: ROX	130
How to Build a Hash Function from Any Collision-Resistant Function	147
Group/Broadcast Cryptography	
Fully Anonymous Group Signatures Without Random Oracles	164

Group Encryption	181
Identity-Based Broadcast Encryption with Constant Size Ciphertexts and Private Keys	200
MAC and Implementation	
Boosting Merkle-Damgård Hashing for Message Authentication	216
On Efficient Message Authentication Via Block Cipher Design Techniques	232
Symmetric Key Cryptography on Modern Graphics Hardware Jason Yang and James Goodman	249
Multiparty Computation I	
Blind Identity-Based Encryption and Simulatable Oblivious Transfer \dots Matthew Green and Susan Hohenberger	265
Multi-party Indirect Indexing and Applications	283
Two-Party Computing with Encrypted Data	298
Block Ciphers	
Known-Key Distinguishers for Some Block Ciphers	315
Generic Attacks on Unbalanced Feistel Schemes with Expanding Functions	325
On Tweaking Luby-Rackoff Blockciphers	342
Multiparty Computation II	
Secure Protocols with Asymmetric Trust	357

Table of Contents	XIII
Simple and Efficient Perfectly-Secure Asynchronous MPC	376
Efficient Byzantine Agreement with Faulty Minority	393
Information-Theoretic Security Without an Honest Majority	410
Foundation	
Black-Box Extension Fields and the Inexistence of Field-Homomorphic One-Way Permutations	427
Concurrent Statistical Zero-Knowledge Arguments for NP from One	
Way Functions	444
Anonymous Quantum Communication	460
Invited Talk II	
Authenticated Key Exchange and Key Encapsulation in the Standard Model	474
Public Key Encryption	
Miniature CCA2 PK Encryption: Tight Security Without Redundancy	485
Bounded CCA2-Secure Encryption	502
Relations Among Notions of Non-malleability for Encryption	519
Cryptanalysis	
Cryptanalysis of the Tiger Hash Function	536
Cryptanalysis of Grindahl Thomas Peyrin	551

XIV Table of Contents

A Key Recovery Attack on Edon80	568
Author Index	583