

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

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

New York University, NY, 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

Springer

Berlin

Heidelberg

New York

Hong Kong

London

Milan

Paris

Tokyo

Markus Jakobsson Moti Yung
Jianying Zhou (Eds.)

Applied Cryptography and Network Security

Second International Conference, ACNS 2004
Yellow Mountain, China, June 8-11, 2004
Proceedings



Springer

Volume Editors

Markus Jakobsson
RSA Laboratories
1203 Garden Street, Hoboken, NJ 07030, USA
E-mail: mjakobsson@rsasecurity.com

Moti Yung
Columbia University, Computer Science Department
New York, NY 10027, USA
E-mail: moti@cs.columbia.edu

Jianying Zhou
Institute for Infocomm Research
21 Heng Mui Keng Terrace, Singapore 119613
E-mail: jyzhou@i2r.a-star.edu.sg

Library of Congress Control Number: 2004106759

CR Subject Classification (1998): E.3, C.2, D.4.6, H.3-4, K.4.4, K.6.5

ISSN 0302-9743

ISBN 3-540-22217-0 Springer-Verlag 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-Verlag. Violations are liable to prosecution under the German Copyright Law.

Springer-Verlag is a part of Springer Science+Business Media
springeronline.com

© Springer-Verlag Berlin Heidelberg 2004
Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Protago-TeX-Production GmbH
Printed on acid-free paper SPIN: 11014096 06/3142 5 4 3 2 1 0

Preface

The second International Conference on Applied Cryptography and Network Security (ACNS 2004) was sponsored and organized by ICISA (the International Communications and Information Security Association). It was held in Yellow Mountain, China, June 8–11, 2004. The conference proceedings, representing papers from the academic track, are published in this volume of the Lecture Notes in Computer Science (LNCS) of Springer-Verlag.

The area of research that ACNS covers has been gaining importance in recent years due to the development of the Internet, which, in turn, implies global exposure of computing resources. Many fields of research were covered by the program of this track, presented in this proceedings volume. We feel that the papers herein indeed reflect the state of the art in security and cryptography research, worldwide.

The program committee of the conference received a total of 297 submissions from all over the world, of which 36 submissions were selected for presentation during the academic track. In addition to this track, the conference also hosted a technical/industrial track of presentations that were carefully selected as well. All submissions were reviewed by experts in the relevant areas.

Starting from the first ACNS conference last year, ACNS has given best paper awards. Last year the best student paper award went to a paper that turned out to be the only paper written by a single student for ACNS 2003. It was Kwong H. Yung who got the award for his paper entitled “Using Feedback to Improve Masquerade Detection.” Continuing the “best paper tradition” this year, the committee decided to select two student papers among the many high-quality papers that were accepted for this conference, and to give them best student paper awards. These papers are: “Security Measurements of Steganographic Systems” by Weiming Zhang and Shiqu Li, and “Evaluating Security of Voting Schemes in the Universal Composability Framework” by Jens Groth. Both papers appear in this proceedings volume, and we would like to congratulate the recipients for their achievements.

Many people and organizations helped in making the conference a reality. We would like to take this opportunity to thank the program committee members and the external experts for their invaluable help in producing the conference’s program. We also wish to thank Thomas Herlea of KU Leuven for his extraordinary efforts in helping us to manage the submissions and for taking care of all the technical aspects of the review process. Thomas, single-handedly, served as the technical support committee of this conference! We extend our thanks also to the general chair Jianying Zhou (who also served as publication chair and helped in many other ways), the chairs of the technical/industrial track (Yongfei Han and Peter Landrock), the local organizers, who worked hard to assure that the conference took place, and the publicity chairs. We also thank the various

sponsoring companies and government bodies. Finally, we would like to thank all the authors who submitted papers to the conference.

April 2004

Markus Jakobsson and Moti Yung

ACNS 2004
Second International Conference on Applied
Cryptography and Network Security
Yellow Mountain, China
June 8–11, 2004

Sponsored and organized by the
International Communications and Information Security Association (ICISA)

In co-operation with
MiAn Pte Ltd (ONETS), China
RSA Security Inc., USA
Ministry of Science and Technology, China
Yellow Mountain City Government, China

General Chair

Jianying Zhou Institute for Infocomm Research, Singapore

Program Chairs

Markus Jakobsson RSA Labs, USA
Moti Yung Columbia University, USA

Program Committee

Masayuki Abe NTT, Japan
N. Asokan Nokia, Finland
Feng Bao I2R, Singapore
Kijoon Chae Ewha Women's Univ., Korea
Ed Dawson QUT, Australia
Xiaotie Deng City Univ. of HK, China
Philippe Golle PARC, USA
Dieter Gollmann TU Hamburg, Germany
Goichiro Hanaoka Univ. of Tokyo, Japan
Els van Herreweghen IBM, Zurich
Chi-Sung Lai NCKU, Taiwan
Kwok-Yan Lam Tsinghua Univ., China
Heejo Lee Korea Univ., Korea

Pil Joong Lee	Postech, Korea
Helger Lipmaa	Helsinki Univ. of Tech., Finland
Javier Lopez	Univ. of Malaga, Spain
Charanjit Jutla	IBM T.J. Watson, USA
Hiroaki Kikuchi	Univ. of Tokai, Japan
Kwangjo Kim	Info. & Communication Univ., Korea
Wenbo Mao	HP Labs, UK
David Naccache	Gemplus, France
Chanathip Namprempre	Thammasat U., Thailand
Phong Nguyen	ENS, France
Adrian Perrig	Carnegie Mellon Univ., USA
Josef Pieprzyk	Macquarie University, Australia
Radha Poovendran	Univ. of Washington, USA
Tomas Sander	HP Labs, USA
Dawn Song	Carnegie Mellon Univ., USA
Julien Stern	Cryptolog International, France
Sal Stolfo	Columbia Univ., USA
Michael Szydlo	RSA Labs, USA
Wen-Guey Tzeng	NCTU, Taiwan
Shouhuai Xu	Univ. of Texas at San Antonio, USA
Bennet Yee	Google, USA
Yuliang Zheng	UNC Charlotte, USA

Chairs of Technical/Industrial Track

Yongfei Han	ONETS, China
Peter Landrock	Cryptomathic, Denmark

Publicity Chairs

Michael Szydlo	RSA Labs, USA
Guilin Wang	I2R, Singapore

Technical and Administrative Support

Thomas Herlea	KU Leuven, Belgium
Li Xue	ONETS, China

External Reviewers

Michel Abdalla, Nuttapong Attrapadung, Dan Bailey, Dirk Balfanz, Endre-Felix Bangerter, Alexandra Boldyreva, Colin Boyd, Eric Brier, Julien Brouchier, Sonja Buchegger, Christian Cachin, Jan Camenisch, Cedric Cardonnel, Haowen Chan, Xiaofeng Chen, Benoît Chevallier-Mames, Hung Chim, Jung-Hui Chiu, Jae-Gwi Choi, Chen-Kang Chu, Siu-Leung Chung, Andrew Clark, Scott Contini, Jean-Sébastien Coron, Yang Cui, Matthew Dailey,

Jean-François Dhem, Xuhua Ding, Glenn Durfee, Pasi Eronen, Chun-I Fan, Serge Fehr, Atsushi Fujioka, Eiichiro Fujisaki, Debin Gao, Philip Ginzboorg, Juanma Gonzalez-Nieto, Louis Goubin, Zhi Guo, Shin Seong Han, Yumiko Hanaoka, Helena Handschuh, Matt Henricksen, Sha Huang, Yong Ho Hwang, Tetsuya Izu, Moon Su Jang, Ari Juels, Burt Kaliski, Bong Hwan Kim, Byung Joon Kim, Dong Jin Kim, Ha Won Kim, Kihyun Kim, Tae-Hyung Kim, Yuna Kim, Lea Kissner, Tetsutaro Kobayashi, Byoungcheon Lee, Dong Hoon Lee, Hui-Lung Lee, Chin-Laung Lei, Jung-Shian Li, Mingyan Li, Minming Li, Tiejian Li, Becky Jie Liu, Krystian Matusiewicz, Bill Millan, Ilya Mironov, David M'Raihi, Yasusige Nakayama, Gregory Neven, James Newsome, Valtteri Niemi, Takashi Nishi, Kaisa Nyberg, Luke O'Connor, Kazuto Ogawa, Miyako Ohkubo, Jose A. Onieva, Pascal Paillier, Dong Jin Park, Heejae Park, Jae Hwan Park, Joonhah Park, Leonid Peshkin, Birgit Pfitzmann, James Rior-dan, Rodrigo Roman, Ludovic Rousseau, Markku-Juhani Saarinen, Radha Sampigethaya, Paolo Scotton, Elaine Shi, Sang Uk Shin, Diana Smetters, Miguel Soriano, Jessica Staddon, Ron Steinfeld, Reto Strobl, Hong-Wei Sun, Koutarou Suzuki, Vanessa Teague, Lawrence Teo, Ali Tosun, Johan Wallen, Guilin Wang, Huaxiong Wang, Yuji Watanabe, Yoo Jae Won, Yongdong Wu, Yeon Hyeong Yang, Tommy Guoming Yang, Sung Ho Yoo, Young Tae Youn, Dae Hyun Yum, Rui Zhang, Xinwen Zhang, Hong Zhao, Xi-Bin Zhao, Yunlei Zhao, Huafei Zhu

Table of Contents

Security and Storage

CamouflageFS: Increasing the Effective Key Length in Cryptographic Filesystems on the Cheap	1
<i>Michael E. Locasto, Angelos D. Keromytis</i>	
Private Keyword-Based Push and Pull with Applications to Anonymous Communication	16
<i>Lea Kissner, Alina Oprea, Michael K. Reiter, Dawn Song, Ke Yang</i>	
Secure Conjunctive Keyword Search over Encrypted Data	31
<i>Philippe Golle, Jessica Staddon, Brent Waters</i>	

Provably Secure Constructions

Evaluating Security of Voting Schemes in the Universal Composability Framework	46
<i>Jens Groth</i>	
Verifiable Shuffles: A Formal Model and a Paillier-Based Efficient Construction with Provable Security	61
<i>Lan Nguyen, Rei Safavi-Naini, Kaoru Kurosawa</i>	
On the Security of Cryptosystems with All-or-Nothing Transform	76
<i>Rui Zhang, Goichiro Hanaoka, Hideki Imai</i>	

Internet Security

Centralized Management of Virtual Security Zones in IP Networks	91
<i>Antti Peltonen, Teemupekka Virtanen, Esa Turtiainen</i>	
S-RIP: A Secure Distance Vector Routing Protocol	103
<i>Tao Wan, Evangelos Kranakis, Paul C. van Oorschot</i>	
A Pay-per-Use DoS Protection Mechanism for the Web	120
<i>Angelos Stavrou, John Ioannidis, Angelos D. Keromytis, Vishal Misra, Dan Rubenstein</i>	

Digital Signature

Limited Verifier Signature from Bilinear Pairings	135
<i>Xiaofeng Chen, Fangguo Zhang, Kwangjo Kim</i>	

Deniable Ring Authentication Revisited	149
<i>Willy Susilo, Yi Mu</i>	

A Fully-Functional Group Signature Scheme over Only Known-Order Group	164
<i>Atsuko Miyaji, Kozue Umeda</i>	

Security Modelling

Some Observations on Zap and Its Applications	180
<i>Yunlei Zhao, C.H. Lee, Yiming Zhao, Hong Zhu</i>	

Security Measurements of Steganographic Systems	194
<i>Weiming Zhang, Shiqu Li</i>	

X ² Rep: Enhanced Trust Semantics for the XRep Protocol	205
<i>Nathan Curtis, Rei Safavi-Naini, Willy Susilo</i>	

Authenticated Key Exchange

One-Round Protocols for Two-Party Authenticated Key Exchange	220
<i>Ik Rae Jeong, Jonathan Katz, Dong Hoon Lee</i>	

Password Authenticated Key Exchange Using Quadratic Residues	233
<i>Muxiang Zhang</i>	

Key Agreement Using Statically Keyed Authenticators	248
<i>Colin Boyd, Wenbo Mao, Kenneth G. Paterson</i>	

Security of Deployed Systems

Low-Latency Cryptographic Protection for SCADA Communications	263
<i>Andrew K. Wright, John A. Kinast, Joe McCarty</i>	

A Best Practice for Root CA Key Update in PKI	278
<i>InKyoung Jeun, Jongwook Park, TaeKyu Choi, SangWan Park, BaeHyo Park, ByungKwon Lee, YongSup Shin</i>	

SQLrand: Preventing SQL Injection Attacks	292
<i>Stephen W. Boyd, Angelos D. Keromytis</i>	

Cryptosystems: Design and Analysis

Cryptanalysis of a Knapsack Based Two-Lock Cryptosystem	303
<i>Bin Zhang, Hongjun Wu, Dengguo Feng, Feng Bao</i>	

Success Probability in χ^2 -Attacks	310
<i>Takashi Matsunaka, Atsuko Miyaji, Yuuki Takano</i>	

More Generalized Clock-Controlled Alternating Step Generator	326
<i>Ali A. Kalso</i>	

Cryptographic Protocols

FDLKH: Fully Decentralized Key Management Scheme on Logical Key Hierarchy	339
<i>Daisuke Inoue, Masahiro Kuroda</i>	

Unconditionally Non-interactive Verifiable Secret Sharing Secure against Faulty Majorities in the Commodity Based Model	355
<i>Anderson C.A. Nascimento, Joern Mueller-Quade, Akira Otsuka, Goichiro Hanaoka, Hideki Imai</i>	

Cryptanalysis of Two Anonymous Buyer-Seller Watermarking Protocols and an Improvement for True Anonymity	369
<i>Bok-Min Goi, Raphael C.-W. Phan, Yanjiang Yang, Feng Bao, Robert H. Deng, M.U. Siddiqi</i>	

Side Channels and Protocol Analysis

Security Analysis of CRT-Based Cryptosystems	383
<i>Katsuyuki Okeya, Tsuyoshi Takagi</i>	

Cryptanalysis of the Countermeasures Using Randomized Binary Signed Digits	398
<i>Dong-Guk Han, Katsuyuki Okeya, Tae Hyun Kim, Yoon Sung Hwang, Young-Ho Park, Souhwan Jung</i>	

Weaknesses of a Password-Authenticated Key Exchange Protocol between Clients with Different Passwords	414
<i>Shuhong Wang, Jie Wang, Maozhi Xu</i>	

Intrusion Detection and DoS

Advanced Packet Marking Mechanism with Pushback for IP Traceback	426
<i>Hyung-Woo Lee</i>	

A Parallel Intrusion Detection System for High-Speed Networks	439
<i>Haiguang Lai, Shengwen Cai, Hao Huang, Junyuan Xie, Hui Li</i>	

A Novel Framework for Alert Correlation and Understanding	452
<i>Dong Yu, Deborah Frincke</i>	

Cryptographic Algorithms

An Improved Algorithm for $uP + vQ$ Using JSF_3^1	467
<i>BaiJie Kuang, YueFei Zhu, YaJuan Zhang</i>	

New Table Look-Up Methods for Faster Frobenius Map Based
Scalar Multiplication Over $GF(p^n)$ 479
Palash Sarkar, Pradeep Kumar Mishra, Rana Barua

Batch Verification for Equality of Discrete Logarithms
and Threshold Decryptions 494
*Riza Aditya, Kun Peng, Colin Boyd, Ed Dawson,
Byoungcheon Lee*

Author Index 509