

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 of Computer Science, Saarbruecken, Germany

Mikhail J. Atallah Nicholas J. Hopper (Eds.)

Privacy Enhancing Technologies

10th International Symposium, PETS 2010
Berlin, Germany, July 21-23, 2010
Proceedings

Volume Editors

Mikhail J. Atallah
Purdue University
Department of Computer Science
West Lafayette, IN 47907-2107, USA
E-mail: mja@cs.purdue.edu

Nicholas J. Hopper
University of Minnesota
Department of Computer Science & Engineering
Minneapolis, MN 55455, USA
E-mail: hopper@cs.umn.edu

Library of Congress Control Number: 2010930652

CR Subject Classification (1998): K.6.5, E.3, C.2, D.4.6, H.5, E.4

LNCS Sublibrary: SL 4 – Security and Cryptology

ISSN 0302-9743
ISBN-10 3-642-14526-4 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-14526-1 Springer Berlin Heidelberg New York

© Springer-Verlag Berlin Heidelberg 2010

springer.com

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper 06/3180

*The original version of the book frontmatter was revised:
The copyright line was incorrect. The Erratum
to the book frontmatter is available at
DOI: [10.1007/978-3-642-14527-8_17](https://doi.org/10.1007/978-3-642-14527-8_17)*

Message from the Program Chairs

The 2010 Privacy-Enhancing Technologies Symposium was held at the Hotel Berlin in Berlin during July 21-23, 2010. It was the 10th in this series of meetings, and the third after the transition from workshop to symposium. PETS remains a premier forum for publishing research on both the theory and the practice of privacy-enhancing technologies, and has a broad scope that includes all facets of the field.

The PETS program this year included a diverse set of 16 peer-reviewed papers, selected from 57 submissions. Each submission was reviewed by at least three members of the Program Committee. This was the third year of the popular HotPETS session, designed as a venue to present exciting but still preliminary and evolving ideas, rather than formal and rigorous completed research results. HotPETS this year included a program of 11 presentations of 10–20 minutes each; as was the case in each of the last two years, there were no published proceedings for HotPETS. PETS also included the traditional “rump session,” with brief presentations on a variety of topics.

We are grateful to all of the authors who submitted, to the PETS and HotPETS speakers who presented their work selected for the program, and to the rump session participants. We are also grateful to the Program Committee members, and to the external reviewers who assisted them, for their thorough reviews and participation in discussions – they were central to the resulting high-quality program. The following subset of these reviewers gracefully volunteered to continue their work as shepherds helping the authors improve their papers and address the reviewer comments and suggestions: Nikita Borisov, Rachel Greenstadt, Aaron Johnson, and Meredith Patterson. It is also a pleasure to acknowledge the contribution of our General Chair, Hannes Federrath, and our webmaster since 2007, Jeremy Clark, who did his usual outstanding job at evolving and maintaining the symposium’s website. Our gratitude also goes to the HotPETS Chairs, Carmela Troncoso and Andrei Serjantov, who put together an outstanding HotPETS program. Finally, we are particularly grateful to Microsoft for its continued sponsorship and support.

May 2010

Mikhail Atallah
Nicholas Hopper

Organization

General Chair	Hannes Federrath, Universitaet Regensburg, Germany
Program Chairs	Mikhail Atallah, Purdue University, USA Nicholas Hopper, University of Minnesota, USA
PET Award Chair	Cynthia Dwork, Microsoft, USA
Stipends Chair	Roger Dingledine, The Tor Project, USA
HotPETS Chairs	Carmela Troncoso, K.U. Leuven, Belgium Andrei Serjantov, The Free Haven Project, UK

Program Committee

Alessandro Acquisti	Carnegie Mellon University, USA
Kevin Bauer	University of Colorado, USA
Alastair Beresford	University of Cambridge, UK
Nikita Borisov	University of Illinois at Urbana-Champaign, USA
Sabrina De Capitani di Vimercati	University of Milan, Italy
Claudia Diaz	K.U. Leuven, Belgium
Cynthia Dwork	Microsoft, USA
Simone Fischer-Huebner	Karlstad University, Sweden
Rachel Greenstadt	Drexel University, USA
Thomas Heydt-Benjamin	ETH Zurich, Switzerland
Aaron Johnson	University of Texas at Austin, USA
Apu Kapadia	Indiana University, USA
Bradley Malin	Vanderbilt University, USA
Tal Malkin	Columbia University, USA
Nick Mathewson	The Tor Project, USA
Aleecia McDonald	Carnegie Mellon University, USA
Shishir Nagaraja	IIIT Delhi, India
Benny Pinkas	University of Haifa, Israel
Andreas Pfitzmann	Dresden University of Technology, Germany
Rob Reeder	Microsoft, USA
Len Sassaman	K.U. Leuven, Belgium
Andrei Serjantov	The Free Haven Project, UK
Paul Syverson	Naval Research Laboratory, USA
Carmela Troncoso	K.U. Leuven, Belgium
Ting Yu	North Carolina State University, USA

External Reviewers

Elli Androulaki
Stefan Berthold
Scott Coull
Dana Dachman-Soled
Roger Dingledine
Elizabeth Durham
Seung Geol Choi
Xun Gong
Hans Hedbom
Man Ho Allen Au
Sonia Jahid
Meredith L. Patterson
Michael Locasto

Grigorios Loukides
Damon McCoy
Prateek Mittal
David Molnar
Mariana Raykova
Alfredo Rial
Sherman S. M. Chow
Stefan Schiffner
Eugene Vasserman
Qiyang Wang
Matthew Wright
Ge Zhang

Table of Contents

2010 Privacy Enhancing Technologies Symposium

How Unique Is Your Web Browser?	1
<i>Peter Eckersley</i>	
On the Privacy of Web Search Based on Query Obfuscation: A Case Study of TrackMeNot	19
<i>Sai Teja Peddinti and Nitesh Saxena</i>	
Private Information Disclosure from Web Searches	38
<i>Claude Castelluccia, Emiliano De Cristofaro, and Daniele Perito</i>	
Collaborative, Privacy-Preserving Data Aggregation at Scale	56
<i>Benny Applebaum, Haakon Ringberg, Michael J. Freedman, Matthew Caesar, and Jennifer Rexford</i>	
Privacy-Preserving Queries over Relational Databases	75
<i>Femi Olumofin and Ian Goldberg</i>	
Achieving Efficient Query Privacy for Location Based Services	93
<i>Femi Olumofin, Piotr K. Tysowski, Ian Goldberg, and Urs Hengartner</i>	
Making a Nymbler Nymble Using VERBS	111
<i>Ryan Henry, Kevin Henry, and Ian Goldberg</i>	
Anonymous Webs of Trust	130
<i>Michael Backes, Stefan Lorenz, Matteo Maffei, and Kim Pecina</i>	
Taming Big Brother Ambitions: More Privacy for Secret Handshakes ...	149
<i>Mark Manulis, Bertram Poettering, and Gene Tsudik</i>	
Preventing Active Timing Attacks in Low-Latency Anonymous Communication (Extended Abstract)	166
<i>Joan Feigenbaum, Aaron Johnson, and Paul Syverson</i>	
Impact of Network Topology on Anonymity and Overhead in Low-Latency Anonymity Networks	184
<i>Claudia Diaz, Steven J. Murdoch, and Carmela Troncoso</i>	
Drac: An Architecture for Anonymous Low-Volume Communications ...	202
<i>George Danezis, Claudia Diaz, Carmela Troncoso, and Ben Laurie</i>	
Private Web Search with Malicious Adversaries	220
<i>Yehuda Lindell and Erez Waisbard</i>	

unFriendly: Multi-party Privacy Risks in Social Networks	236
<i>Kurt Thomas, Chris Grier, and David M. Nicol</i>	
The Impact of Unlinkability on Adversarial Community Detection: Effects and Countermeasures	253
<i>Shishir Nagaraja</i>	
How to Share Your Favourite Search Results while Preserving Privacy and Quality	273
<i>George Danezis, Tuomas Aura, Shuo Chen, and Emre Kıcıman</i>	
Erratum to: Privacy Enhancing Technologies	E1
<i>Mikhail J. Atallah and Nicholas J. Hopper</i>	
Author Index	291