# Lecture Notes in Computer Science

2467

Edited by G. Goos, J. Hartmanis, and J. van Leeuwen

## Springer Berlin

Berlin Heidelberg New York Barcelona Hong Kong London Milan Paris Tokyo Bruce Christianson Bruno Crispo James A. Malcolm Michael Roe (Eds.)

# **Security Protocols**

9th International Workshop Cambridge, UK, April 25-27, 2001 Revised Papers



#### Series Editors

Gerhard Goos, Karlsruhe University, Germany Juris Hartmanis, Cornell University, NY, USA Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Bruce Christianson James A. Malcolm

University of Hertfordshire, Department of Computer Science

Faculty of Engineering and Information Sciences

College Lane, Hatfield, Herts, AL10 9AB, UK

E-mail: {b.christianson/J.A.Malcolm}@herts.ac.uk

Bruno Crispo

Vrije Universiteit, Department of Computer Science

De Boelelaan 1081A, 1081 HV Amsterdam, The Netherlands

E-mail: crispo@cs.vu.nl

Michael Roe

Microsoft Research Limited

7 J J Thomson Avenue, Cambridge, CB3 0FB, UK

E-mail: mroe@microsoft.com

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Security protocols: 9th international workshop, Cambridge, UK, April 25 - 27,

2001 ; revised papers / Bruce Christianson ... (ed.). - Berlin ; Heidelberg ;

New York; Hong Kong; London; Milan; Paris; Tokyo: Springer, 2002

(Lecture notes in computer science; Vol. 2467)

ISBN 3-540-44263-4

CR Subject Classification (1998): E.3, F.2.1-2, C.2, K.6.5, J.1, K.4.1, D.4.6

ISSN 0302-9743

ISBN 3-540-44263-4 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 for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York a member of BertelsmannSpringer Science+Business Media GmbH

http://www.springer.de

© Springer-Verlag Berlin Heidelberg 2002 Printed in Germany

Typesetting: Camera-ready by author, data conversion by Olgun Computergrafik Printed on acid-free paper SPIN 10871275 06/3142 5 4 3 2 1 0

### **Preface**

Hello and welcome. These are the proceedings of the 9th International Workshop on Security Protocols, the first to be held in the new millennium. This year our theme was "mobile computing versus immobile security". As usual, the insights and challenges which emerged during the workshop are reflected in the position papers, which appear here in rewritten form.

Transcripts are also included of the discussions which took place in Cambridge as the initial versions were presented. These transcripts are intended to provide a perspective on lines of argument which are worth pursuing further. Our desire is that you will join with us in this activity, and that as a result you will, like many of our participants, feel moved to propound something quite different from what you originally planned.

Our thanks as always to Prof. Roger Needham, FRS and to Microsoft Research Ltd. (Cambridge) for the use of the meeting room and coffee machine. Thanks also to Lori Klimaszewska of the University of Cambridge Computing Service for transcribing the audio tapes (and for revealing in "Audrey James" a previously unsuspected double life of a well-known double agent), and to Dr. Mary Buchanan for her assistance in editing the transcripts into a Thucydidean mould.

Actually, we are often asked how we go about producing the transcripts, especially upon those occasions when, for various reasons, no audio recording was made. This year we bow to pressure and reveal the details of our methodology in the Afterword.

We hope you find these proceedings enjoyable, infuriating, and fruitful. And we look forward to hearing from you.

Christmas Eve 2001

Bruce Christianson Bruno Crispo James Malcolm Michael Roe

### Previous Proceedings in This Series

The proceedings of previous International Workshops on Security Protocols were also published by Springer-Verlag as Lecture Notes in Computer Science, and are occasionally referred to in the text:

8th Workshop (2000), LNCS 2133, ISBN 3-540-42566-7

7th Workshop (1999), LNCS 1796, ISBN 3-540-67381-4

6th Workshop (1998), LNCS 1550, ISBN 3-540-65663-4

5th Workshop (1997), LNCS 1361, ISBN 3-540-64040-1

4th Workshop (1996), LNCS 1189, ISBN 3-540-63494-5

## Table of Contents

Reynote Address: Mobile Computing versus Immobile Security	1
Experiences of Mobile IP Security (Transcript of Discussion)	4
Denial-of-Service, Address Ownership, and Early Authentication in the IPv6 World	12
Denial of Service, Address Ownership, and Early Authentication in the IPv6 World (Transcript of Discussion)	22
Efficient, DoS-Resistant, Secure Key Exchange for Internet Protocols William Aiello, Steven M. Bellovin, Matt Blaze, Ran Canetti, John Ioannidis, Angelos D. Keromytis, Omer Reingold	27
Efficient, DoS-Resistant, Secure Key Exchange for Internet Protocols (Transcript of Discussion)	40
Thwarting Timing Attacks Using ATM Networks	49
Thwarting Timing Attacks Using ATM Networks (Transcript of Discussion)	59
Towards a Survivable Security Architecture for Ad-Hoc Networks	63
Towards a Survivable Security Architecture for Ad-Hoc Networks (Transcript of Discussion)	74
PIM Security	80
PIM Security (Transcript of Discussion)	82
Merkle Puzzles Revisited – Finding Matching Elements between Lists Bruce Christianson, David Wheeler	87

Merkle Puzzles Revisited (Transcript of Discussion)
Encapsulating Rules of Prudent Security Engineering (Position Paper) 95 $Jan~J\ddot{u}rjens$
Encapsulating Rules of Prudent Security Engineering (Transcript of Discussion)
A Multi-OS Approach to Trusted Computer Systems
A Multi-OS Approach to Trusted Computer Systems (Transcript of Discussion)
A Proof of Non-repudiation
A Proof of Non-repudiation (Transcript of Discussion)
Using Authority Certificates to Create  Management Structures
Using Attribute Certificates for Creating Management Structures (Transcript of Discussion)
Trust Management and Whether to Delegate
Trust Management and Whether to Delegate (Transcript of Discussion)
You Can't Take It with You (Transcript of Discussion)
Protocols Using Keys from Faulty Data
Protocols Using Keys from Faulty Data (Transcript of Discussion) 180  David Wheeler

On the Negotiation of Access Control Policies
Negotiation of Access Control Policies (Transcript of Discussion) 202 Virgil D. Gligor
Intrusion-Tolerant Group Management in Enclaves (Transcript of Discussion)
Lightweight Authentication in a Mobile Network (Transcript of Discussion)
Bluetooth Security — Fact or Fiction? (Transcript of Discussion)
Concluding Discussion When Does Confidentiality Harm Security? 229 Chair: Bruce Christianson
The Last Word
Author Index