


Christoph Böhm
Maximilian Hofer

Physical Unclonable Functions in Theory and Practice

Physical Unclonable Functions In Theory And Practice

**Ivana Cerná, Tibor Gyimóthy, Juraj
Hromkovič, Keith Jeffery, Rastislav
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Physical Unclonable Functions In Theory And Practice:

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Physical Unclonable Functions in Theory and Practice Christoph Böhm, Maximilian Hofer, 2012-10-16 In *Physical Unclonable Functions in Theory and Practice* the authors present an in depth overview of various topics concerning PUFs providing theoretical background and application details This book concentrates on the practical issues of PUF hardware design focusing on dedicated microelectronic PUF circuits Additionally the authors discuss the whole process of circuit design layout and chip verification The book also offers coverage of Different published approaches focusing on dedicated microelectronic PUF circuits Specification of PUF circuits General design issues Minimizing error rate from the circuit s perspective Transistor modeling issues of Montecarlo mismatch simulation and solutions Examples of PUF circuits including an accurate description of the circuits and testing measurement results Different error rate reducing pre selection techniques This monograph gives insight into PUFs in general and provides knowledge in the field of PUF circuit design and implementation It could be of interest for all circuit designers confronted with PUF design and also for professionals and students being introduced to the topic

Physical Unclonable Functions in Theory and Practice Springer, 2012-10-01

Physically Unclonable Functions Roel Maes, 2013-11-19 Physically unclonable functions PUFs are innovative physical security primitives that produce unclonable and inherent instance specific measurements of physical objects in many ways they are the inanimate equivalent of biometrics for human beings Since they are able to securely generate and store secrets they allow us to bootstrap the physical implementation of an information security system In this book the author discusses PUFs in all their facets the multitude of their physical constructions the algorithmic and physical properties which describe them and the techniques required to deploy them in security applications The author first presents an extensive overview and classification of PUF constructions with a focus on so called intrinsic PUFs He identifies subclasses implementation properties and design techniques used to amplify submicroscopic physical

distinctions into observable digital response vectors He lists the useful qualities attributed to PUFs and captures them in descriptive definitions identifying the truly PUF defining properties in the process and he also presents the details of a formal framework for deploying PUFs and similar physical primitives in cryptographic reductions The author then describes a silicon test platform carrying different intrinsic PUF structures which was used to objectively compare their reliability uniqueness and unpredictability based on experimental data In the final chapters the author explains techniques for PUF based entity identification entity authentication and secure key generation He proposes practical schemes that implement these techniques and derives and calculates measures for assessing different PUF constructions in these applications based on the quality of their response statistics Finally he presents a fully functional prototype implementation of a PUF based cryptographic key generator demonstrating the full benefit of using PUFs and the efficiency of the processing techniques described This is a suitable introduction and reference for security researchers and engineers and graduate students in information security and cryptography

Embedded Cryptography 2 Emmanuel Prouff,Guenaël Renault,Mattieu Rivain,Colin O'Flynn,2025-01-14 Embedded Cryptography provides a comprehensive exploration of cryptographic techniques tailored for embedded systems addressing the growing importance of security in devices such as mobile systems and IoT The books explore the evolution of embedded cryptography since its inception in the mid 90s and cover both theoretical and practical aspects as well as discussing the implementation of cryptographic algorithms such as AES RSA ECC and post quantum algorithms The work is structured into three volumes spanning forty chapters and nine parts and is enriched with pedagogical materials and real world case studies designed for researchers professionals and students alike offering insights into both foundational and advanced topics in the field Embedded Cryptography 2 is dedicated to masking and cryptographic implementations as well as hardware security

Blockchain-enabled Fog and Edge Computing: Concepts, Architectures and Applications Muhammad Maaz Rehan,Mubashir Husain Rehmani,2020-07-27 This comprehensive book unveils the working relationship of blockchain and the fog edge computing The contents of the book have been designed in such a way that the reader will not only understand blockchain and fog edge computing but will also understand their co existence and their collaborative power to solve a range of versatile problems The first part of the book covers fundamental concepts and the applications of blockchain enabled fog and edge computing These include Internet of Things Tactile Internet Smart City and E challan in the Internet of Vehicles The second part of the book covers security and privacy related issues of blockchain enabled fog and edge computing These include hardware primitive based Physical Unclonable Functions Secure Management Systems security of Edge and Cloud in the presence of blockchain secure storage in fog using blockchain and using differential privacy for edge based Smart Grid over blockchain This book is written for students computer scientists researchers and developers who wish to work in the domain of blockchain and fog edge computing One of the unique features of this book is highlighting the issues challenges and future research directions associated with

Blockchain enabled fog and edge computing paradigm We hope the readers will consider this book a valuable addition in the domain of Blockchain and fog edge computing Machine Learning for Embedded System Security Basel Halak,2022-04-22

This book comprehensively covers the state of the art security applications of machine learning techniques The first part explains the emerging solutions for anti tamper design IC Counterfeits detection and hardware Trojan identification It also explains the latest development of deep learning based modeling attacks on physically unclonable functions and outlines the design principles of more resilient PUF architectures The second discusses the use of machine learning to mitigate the risks of security attacks on cyber physical systems with a particular focus on power plants The third part provides an in depth insight into the principles of malware analysis in embedded systems and describes how the usage of supervised learning techniques provides an effective approach to tackle software vulnerabilities **Lightweight Hardware Security and**

Physically Unclonable Functions Kasem Khalil,Haytham Idriss,Tarek Idriss,Magdy Bayoumi,2025-01-07 This book discusses the design and evaluation of Physically Unclonable Functions PUFs that are suitable for securing highly energy constrained devices while at the same time classifying the many applications and devices that would benefit from various PUF designs The authors provide a comprehensive study of the various approaches that are used to mitigate PUFs shortcomings while at the same time highlighting those that are most efficient Coverage also includes state of the art approaches to designing PUFs with high resilience to machine learning attacks and hardware implementation of area efficient and high performing PUF architectures The authors also classify different IoT applications and devices depending on their security needs and limitations offering a new perspective on how different PUF designs fit in the overall scope of IoT security *Information Security Theory and Practice: Security and Privacy of Mobile Devices in Wireless Communication*

Claudio Agostino Ardagna,Jianying Zhou,2011-06-03 This volume constitutes the refereed proceedings of the 5th IFIP WG 11.2 International Workshop on Information Security Theory and Practices Security and Privacy of Mobile Devices in Wireless Communication WISTP 2011 held in Heraklion Crete Greece in June 2011 The 19 revised full papers and 8 short papers presented together with a keynote speech were carefully reviewed and selected from 80 submissions They are organized in topical sections on mobile authentication and access control lightweight authentication algorithms hardware implementation security and cryptography security attacks and measures security attacks security and trust and mobile application security and privacy **Physically Unclonable Functions (PUFs)** Christian Wachsmann,Ahmad-Reza Sadeghi,2022-05-31 Today

embedded systems are used in many security critical applications from access control electronic tickets sensors and smart devices e g wearables to automotive applications and critical infrastructures These systems are increasingly used to produce and process both security critical and privacy sensitive data which bear many security and privacy risks Establishing trust in the underlying devices and making them resistant to software and hardware attacks is a fundamental requirement in many applications and a challenging yet unsolved task Solutions solely based on software can never ensure their own integrity and

trustworthiness while resource constraints and economic factors often prevent the integration of sophisticated security hardware and cryptographic co processors In this context Physically Unclonable Functions PUFs are an emerging and promising technology to establish trust in embedded systems with minimal hardware requirements This book explores the design of trusted embedded systems based on PUFs Specifically it focuses on the integration of PUFs into secure and efficient cryptographic protocols that are suitable for a variety of embedded systems It exemplarily discusses how PUFs can be integrated into lightweight device authentication and attestation schemes which are popular and highly relevant applications of PUFs in practice For the integration of PUFs into secure cryptographic systems it is essential to have a clear view of their properties This book gives an overview of different approaches to evaluate the properties of PUF implementations and presents the results of a large scale security analysis of different PUF types implemented in application specific integrated circuits ASICs To analyze the security of PUF based schemes as is common in modern cryptography it is necessary to have a security framework for PUFs and PUF based systems In this book we give a flavor of the formal modeling of PUFs that is in its beginning and that is still undergoing further refinement in current research The objective of this book is to provide a comprehensive overview of the current state of secure PUF based cryptographic system design and the related challenges and limitations

Table of Contents Preface Introduction Basics of Physically Unclonable Functions Attacks on PUFs and PUF based Systems Advanced PUF Concepts PUF Implementations and Evaluation PUF based Cryptographic Protocols Security Model for PUF based Systems Conclusion Terms and Abbreviations Bibliography Authors Biographies **ECCWS 2020 19th European Conference on Cyber Warfare and Security** Dr Thaddeus Eze, Dr Lee Speakman, Dr Cyril Onwubiko, 2020-06-25 These proceedings represent the work of contributors to the 19th European Conference on Cyber Warfare and Security ECCWS 2020 supported by University of Chester UK on 25 26 June 2020 The Conference Co chairs are Dr Thaddeus Eze and Dr Lee Speakman both from University of Chester and the Programme Chair is Dr Cyril Onwubiko from IEEE and Director Cyber Security Intelligence at Research Series Limited ECCWS is a well established event on the academic research calendar and now in its 19th year the key aim remains the opportunity for participants to share ideas and meet The conference was due to be held at University of Chester UK but due to the global Covid 19 pandemic it was moved online to be held as a virtual event The scope of papers will ensure an interesting conference The subjects covered illustrate the wide range of topics that fall into this important and ever growing area of research *VLSI Design Theory and Practice*, 2013 SOFSEM 2011: Theory and Practice of Computer Science Ivana Cerná, Tibor Gyimóthy, Juraj Hromkovič, Keith Jeffery, Rastislav Kralovic, Marko Vukolic, Stefan Wolf, 2011-01-10 This book constitutes the refereed proceedings of the 37th Conference on Current Trends in Theory and Practice of Computer Science SOFSEM 2011 held in Nov Smokovec Slovakia in January 2011 The 41 revised full papers presented together with 5 invited contributions were carefully reviewed and selected from 122 submissions SOFSEM 2011 was organized around the following four tracks foundations of computer science

software systems and services processing large datasets and cryptography security and trust **Innovative Security Solutions for Information Technology and Communications** Jean-Louis Lanet, Cristian Toma, 2019-02-05 This book constitutes the thoroughly refereed proceedings of the 11th International Conference on Security for Information Technology and Communications SecITC 2018 held in Bucharest Romania in November 2018 The 35 revised full papers presented together with 3 invited talks were carefully reviewed and selected from 70 submissions The papers present advances in the theory design implementation analysis verification or evaluation of secure systems and algorithms **Cryptographic Security Solutions for the Internet of Things** Banday, Mohammad Tariq, 2019-01-18 The Internet of Things is a technological revolution that represents the future of computing and communications Even though efforts have been made to standardize Internet of Things devices and how they communicate with the web a uniform architecture is not followed This inconsistency directly impacts and limits security standards that need to be put in place to secure the data being exchanged across networks Cryptographic Security Solutions for the Internet of Things is an essential reference source that discusses novel designs and recent developments in cryptographic security control procedures to improve the efficiency of existing security mechanisms that can help in securing sensors devices networks communication and data in the Internet of Things With discussions on cryptographic algorithms encryption techniques and authentication procedures this book is ideally designed for managers IT consultants startup companies ICT procurement managers systems and network integrators infrastructure service providers students researchers and academic professionals **Information Security Theory and Practice** Raja Naeem Akram, Sushil Jajodia, 2015-08-21 This volume constitutes the refereed proceedings of the 9th IFIP WG 11.2 International Conference formerly Workshop on Information Security Theory and Practices WISTP 2015 held in Heraklion Crete Greece in August 2015 The 14 revised full papers and 4 short papers presented together were carefully reviewed and selected from 52 submissions WISTP 2015 sought original submissions from academia and industry presenting novel research on all theoretical and practical aspects of security and privacy as well as experimental studies of elded systems the application of security technology the implementation of systems and lessons learned We encouraged submissions from other communities such as law business and policy that present these communities perspectives on technological issues Physically Unclonable Functions Basel Halak, 2018-04-18 This book discusses the design principles of physically unclonable functions PUFs and how these can be employed in hardware based security applications in particular the book provides readers with a comprehensive overview of security threats and existing countermeasures This book has many features that make it a unique source for students engineers and educators including more than 80 problems and worked exercises in addition to approximately 200 references which give extensive direction for further reading *ECCWS 2021 20th European Conference on Cyber Warfare and Security* Dr Thaddeus Eze, 2021-06-24 Conferences Proceedings of 20th European Conference on Cyber Warfare and Security *Cryptology and Network Security* Srdjan Capkun, Sherman S.

M. Chow, 2018-11-09 This book contains revised versions of all the papers presented at the 16th International Conference on Cryptology and Network Security CANS 2017 held in Hong Kong China in November December 2017 The 20 full papers presented together with 8 short papers were carefully reviewed and selected from 88 submissions The full papers are organized in the following topical sections foundation of applied cryptography processing encrypted data predicate encryption credentials and authentication web security Bitcoin and blockchain embedded system security anonymous and virtual private networks and wireless and physical layer security Information Security Theory and Practice. Smart Devices, Pervasive Systems, and Ubiquitous Networks Olivier Markowitch, Angelos Bilas, Jaap-Henk Hoepman, Chris J. Mitchell, Jean-Jacques Quisquater, 2009-08-28 This volume contains the 12 papers presented at the WISTP 2009 conference held in Brussels Belgium in September 2009 WISTP 2009 was the third international workshop devoted to information security theory and practice WISTP 2009 built on the successful WISTP 2007 and 2008 conferences held in Heraklion Crete Greece and Seville Spain in May 2007 and May 2008 respectively The proceedings of WISTP 2007 and WISTP 2008 were published as volumes 4462 and 5019 of the Lecture Notes in Computer Science series This workshop received the following support Co sponsored by IFIP WG 11.2 Small System Security Co sponsored by VDE ITG Technical sponsorship of the IEEE Systems Man Cybernetics Society Supported by the Technical Committee on Systems Safety and Security Organized in cooperation with the ACM SIGSAC Supported by ENISA Supported by the Institute for Systems and Technologies of Information Control and Communication INSTICC These proceedings contain 12 original papers covering a range of theoretical and practical topics in information security For the purposes of the organization of the WISTP program the papers were divided into four main categories namely Mobility Attacks and Secure Implementations Performance and Security Cryptography The 12 papers included here were selected from a total of 27 submissions The refereeing process was rigorous involving at least three and mostly four or five independent reports being prepared for each submission

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