First edition
2020-12

Information security, cybersecurity and privacy protection — Physically unclonable functions —

Part 1: Security requirements

Sécurité de l'information, cybersécurité et protection de la vie privée — Fonctions non clonables physiquement —

Partie 1: Exigences de sécurité

Reference number
ISO/IEC 20897-1:2020(E)

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Published in Switzerland

Contents

Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 27, *Information security, cybersecurity and privacy protection*.

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Introduction

This document specifies the security requirements for physically unclonable functions (PUFs) for generating non-stored cryptographic parameters.

Cryptographic modules generate the certain class of critical security parameters such as a secret key using a random bit generator within the modules. Such modules can store generated security parameters in embedded non-volatile memory elements. For higher security, a combination of tamper response and zeroization techniques may be used for protecting stored security parameters from active unauthorized attempts of accessing such parameters. However, as the reverse-engineering technology advances, the risk of theft of such stored security parameters has become higher than ever.

The rapidly pervading technology called a PUF is promising to mitigate the above-mentioned risks by enabling security parameter management without storing such parameters. PUFs are hardware-based functions providing steadiness and randomness of their outputs and physical and mathematical unclonability of the functions themselves, taking advantage of intrinsic subtle variations in the device's physical properties, which are also considered object's fingerprints. PUFs can be used for security parameter generation (e.g. key, initialization vector, nonce and seed), entity authentication or device identification in cryptographic modules.

Now, security requirements of PUFs should be considered at system level, meaning that they should consider many possible attack paths, as detailed further in this document.

The purpose of this document is to define the security requirements of batches of PUFs and of single instances of PUF for assuring an adequate level of quality of the provided PUFs in cryptographic modules. This document is meant to be used for the following purposes.

a) In the procurement process of a PUF-equipped product, the procurement body specifies the security requirements of the PUF in accordance with this document. The product vendor evaluates the PUF whether the PUF satisfies all the specified security requirements, and reports the evaluation results to the procurement body.

b) The vendors evaluate the security of their PUF, publicize the evaluation results and clarify the security of their PUF.

It should be noted that all of the security requirements defined in this document are not necessarily quantitatively evaluable.

This document is related to ISO/IEC 19790 which specifies security requirements for cryptographic modules. In those modules, CSPs (e.g. key) and PSPs [e.g. identifier (ID)] are the assets to protect. PUF is one solution to avoid storing security parameters, thereby increasing the overall security of a cryptographic module.