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Information security, cybersecurity and privacy protection — Hardware monitoring technology for hardware security assessment

Sécurité de l'information, cybersécurité et protection de la vie privée — Technologie de surveillance des matériels pour l'évaluation de leur sécurité

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Foreword

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Introduction

Hardware components and the computing ecosystem are becoming increasingly complex. As a result, it becomes increasingly difficult to evaluate the security of hardware. Even in the design stage, it is quite difficult to identify abnormal parts that can cause flaws from among millions of source code lines or billions of transistors, as well as the physical connections between them. Other areas of technology use monitoring to assist with the evaluation aiming to mitigate such difficulties. In those technologies, runtime activities such as changes in internal or external status can be monitored to identify deviations from normal behaviour patterns, and by these means, the evaluation can focus on a small set of patterns that the monitored subject typically works with. This method now becomes an available option to assist in hardware security assessment. In such cases, either the target of security assessment is supposed to be "runtime hardware-behaviour-based security", or introduced as a proactive approach to security.

Many evaluation and assessment standards, such as ISO/IEC TS 30104, ISO/IEC 19790 and ISO/IEC 17825, focus on physical security (invasive/nonintrusive) at the hardware boundary. However, they do not focus on the monitoring data, either offline or in real time.

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Information security, cybersecurity and privacy protection — Hardware monitoring technology for hardware security assessment

1 Scope

This document surveys and summarizes the existing hardware monitoring methods, including research efforts and industrial applications. The explored monitoring technologies are classified by applied area, carrier type, target entity, objective pattern, and method of deployment. Moreover, this document summarizes the possible ways of utilizing monitoring technologies for hardware security assessment with some existing state-of-the-art security assessment approaches.

The hardware mentioned in this document refers only to the core processing hardware, such as the central processing unit (CPU), microcontroller unit (MCU), and system on a chip (SoC), in the von Neumann system and does not include single-input or single-output devices such as memory or displays.

The hardware monitoring technology discussed in this document has the following considerations and restrictions:

— the monitored target is for the post-silicon phase, not for the design-house phase (e.g. an RTL or netlist design);

— monitoring is only applied to the runtime system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15408-1, *Information security, cybersecurity and privacy protection — Evaluation criteria for IT security — Part 1: Introduction and general model*

ISO/IEC/TS 30104:2015, *Information Technology — Security Techniques — Physical Security Attacks, Mitigation Techniques and Security Requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15408-1, ISO/IEC TS 30104 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
hardware monitoring
hardware or software component allowing an individual to monitor devices connected to a computer

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