INTERNATIONAL STANDARD

ISO/IEC 17839-1

First edition
2014-07-01

Information technology — Biometric System-on-Card —

Part 1: Core requirements

Technologies de l'information — Système biométrique sur carte — Partie 1: Exigences de base

Reference number
ISO/IEC 17839-1:2014(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The Committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

ISO/IEC 17839 consists of the following parts, under the general title *Information technology — Biometric System-on-Card*:

— *Part 1: Core requirements*

— *Part 2: Physical characteristics*

— *Part 3: Logical information interchange mechanism*

Introduction

In the context of this International Standard, a *Biometric System-on-Card* is a portable card size device including the following entities: biometric acquisition, data processing, storage, comparison, decision. It is a functional extension to *on-card biometric comparison* by physically and logically integrating the sensor and signal processing into the card.

ISO/IEC 7816-11,[1] ISO/IEC 19785-3,[2] ISO/IEC 19795-7[3] and ISO/IEC 24787 include technologies with respect to biometric on-card comparison. The Biometric System-on-Card is not yet covered sufficiently. Industry requires a new International Standard for a fully self-contained Biometric System-on-Card to enable interoperability and define minimum quality criteria allowing reliable operation of such a system.

The physical integration of a biometric sensor in an ISO/IEC 7810 card withstanding torsion and bending tests is technically challenging. This International Standard describes two types of Biometric System-on-Card. Type S1 is a fully flexible card compliant with ISO/IEC 7810 while type S2 intentionally deviates from some of the requirements to size and flexibility, keeping the rest of the requirements intact, including the use of a contactless ICC interface.

Information technology — Biometric System-on-Card —

Part 1:
Core requirements

1 Scope

This part of ISO/IEC 17839 establishes

— functional architecture of a Biometric System-on-Card

— definition of type S1 (fully ISO/IEC 7810 compliant) and type S2 implementation of a Biometric System-on-Card

— sensor types in a Biometric System-on-Card

— minimum requirements to a Biometric System-on-Card with respect to

  — discriminative power (i.e. biometric accuracy criteria)

  — interfaces

  — power supply options

The following aspects are out of scope of this International Standard:

— off-card biometric comparison, storage-on-card

— work-load sharing implementations

— detailed specification and configuration of individual components

This part of ISO/IEC 17839 provides a functional architectural description of a Biometric System-on-Card and describes how the interfaces are mapped using existing commands and data structures from other International Standards.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*

ISO/IEC 7810, *Identification cards — Physical characteristics*

ISO/IEC 7816-1, *Identification cards — Integrated circuit cards — Part 1: Cards with contacts — Physical characteristics*

ISO/IEC 7816-3, *Identification cards — Integrated circuit cards — Part 3: Cards with contacts — Electrical interface and transmission protocols*

ISO/IEC 7816-12, *Identification cards — Integrated circuit cards — Part 12: Cards with contacts — USB electrical interface and operating procedures*

ISO/IEC 14443, *Identification cards — Contactless integrated circuit cards — Proximity cards*

ISO/IEC 15693, *Identification cards — Contactless integrated circuit cards — Vicinity cards*

ISO/IEC 24787, *Information technology — Identification cards — On-card biometric comparison*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37 and the following apply.

3.1
biometric system-on-card
card size device including biometric acquisition, data processing, storage, comparison and decision to compose a complete biometric verification system

Note 1 to entry: Within the scope of this International Standard, system-on-card (SoC) and Biometric System-on-Card (BSoC) are used interchangeably.

Note 2 to entry: Biometric System-on-Card (BSoC) is an architecture introduced in ISO/IEC 24787.

3.2
storage-on-card
system architecture where biometric reference data is stored in an ICC and compared outside of the ICC used as a portable data carrier

3.3
on-approach
starting the biometric system-on-card comparison by means of an action (button or automatic sensor acquisition) with autonomous power supply before the Biometric System-on-Card gets in range of a contactless field of the target application interfacing device

4 Symbols and abbreviated terms

BSoC Biometric System-on-Card

ICC Integrated Circuit Card

5 Functional architecture of a Biometric System-on-Card

5.1 Biometric System-on-Card comparison

ISO/IEC 24787 describes the approaches for storage-on-card, on-card biometric comparison and Biometric System-on-Card.

A Biometric System-on-Card comparison means the whole biometric sample verification process is performed on the card. The process is schematically represented in Figure 1. To perform a biometric system-on-card comparison, a sensor that is built into the card captures the biometric sample and extracts biometric data. The created biometric data are then used for verification. The verification process is executed on-card. The card's security state is updated once the card finishes the verification. No biometric sample or reference data are transferred to or from the card.

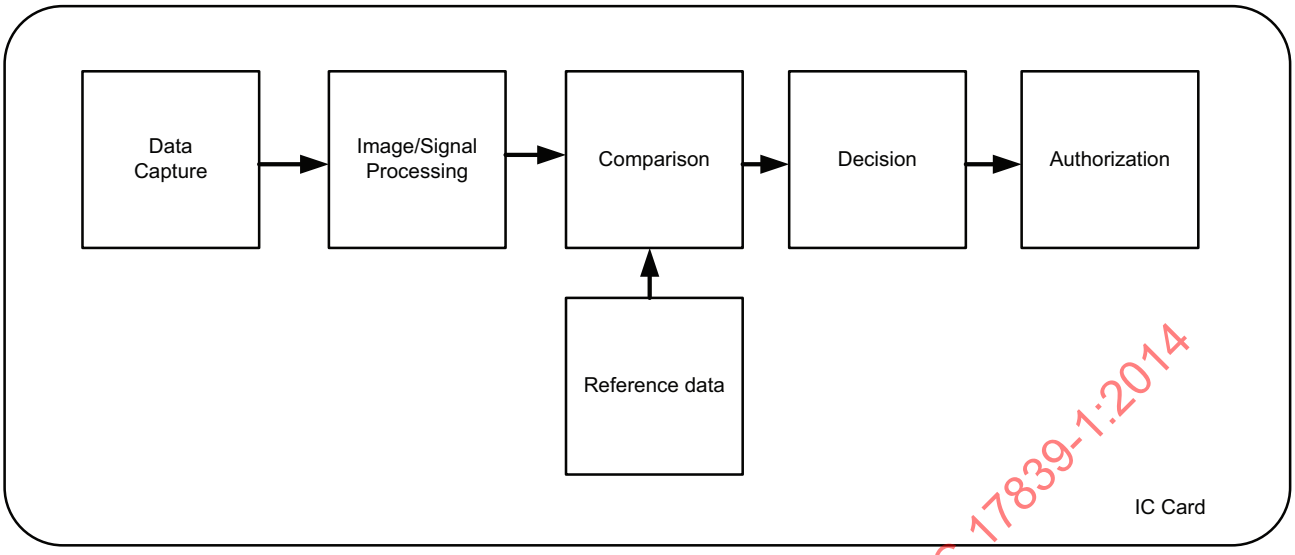

Figure 1 — General architecture for biometric authentication using system-on-card comparison

NOTE The following explanations hold for Figure 1:

Comparison: Algorithmic process to assess the similarity of characteristic features extracted from a current biometric sample with biometric reference data stored in the card – typically resulting in a score.

Decision: Applying the parameters, thresholds and security policy to decide on acceptance or rejection of the biometric system-on-card comparison.

Authorization: Taking appropriate measures based on the outcome of the Decision, which may include changing the security status of the ICC.

5.2 Type S1 Biometric System-on-Card

This International Standard defines two different types of system-on-card: Type S1 and Type S2.

The Type S1 Biometric System-on-Card implements the entities listed in 6.1 while conforming to ISO/IEC 7810 and ISO/IEC 7816-1. The card particularly satisfies the following constraints:

— Dimensions (thickness, width and height) in accordance with the ID-1 format as specified in ISO/IEC 7810

— Card withstands all torsion and bending tests specified in ISO/IEC 7816-1.

— Interface type may be any of the following:

  — Contact interface as specified in ISO/IEC 7816-3

  — USB interface as specified in ISO/IEC 7816-12

  — Contactless interface as specified in ISO/IEC 14443

5.3 Type S2 Biometric System-on-Card

The type S2 Biometric System-on-Card supports only contactless interface specified in ISO/IEC 14443. It intentionally deviates from some of the requirements demanded by ISO/IEC 7816-1 with the following replacement:

— The card thickness is larger than the one defined in ISO/IEC 7810. The exact definition is provided in ISO/IEC 17839-2.

— The maximum width and height are as specified in the ID-1 card format in ISO/IEC 7810.

— The card need not conform to the ISO/IEC 7816-1 flexibility requirements.

— The type S2 Biometric System-on-Card supports only contactless interface specified in ISO/IEC 14443.

5.4 Sensor type

The sensors considered in this International Standard include area fingerprint sensors and swipe fingerprint sensors. Other biometric modalities such as voice or dynamic signature may be used in a Biometric System-on-Card with an appropriate sensor.

An area fingerprint sensor captures a finger that is placed flat onto the sensing area while a swipe sensor has a smaller active area and requires the user to move his or her finger over the sensor. The movement is critical to smoothness, speed and pressure. A Biometric System-on-Card with swipe sensor mandatory requires a user feedback in the card itself or in the interfacing device. This may be, e.g. a display, LED or buzzer. The Biometric System-on-Card with area sensor is operated intuitively by placing the finger onto the sensor. User feedback is optional for this kind of technical solution.

6 Power supply

6.1 Introduction

A Biometric System-on-Card typically requires more power than a normal ICC compliant to ISO/IEC 7816 due to the image processing and the sensor hardware. This section defines the power aspects.

6.2 Contacts

The contacts used for type S1 Biometric System-on-Card conform to the specification regarding the voltage and current levels defined in ISO/IEC 7816-3 or ISO/IEC 7816-12 standard.

6.3 Contactless

The contactless power supply may use normal ISO/IEC 14443 or ISO/IEC 15693 capabilities.

If a Biometric System-on-Card requires a shorter working distance to draw more power then that requirement has to be clearly indicated by physical means (such as a printed text or icon), or communicated electronically to the host interfacing device, or both.

6.4 Internal Power Supply

A Biometric System-on-Card with internal power-supply should indicate (by physical or electronic means) the minimum number of verifications before battery recharge or deactivation of the card.

NOTE 1 The Biometric System-on-Card may include a battery or capacitor providing energy to the system.

NOTE 2 A battery-powered Biometric System-on-Card may initiate the authentication process 'on approach' in advance to actually the card being in the field of a contactless reader. The on-approach operation anticipates that the card has an activation button or automated finger-on detection built-in.

7 Infrastructure

A Biometric System-on-Card requires a host interfacing device issuing commands to it. A type S1 BSoC with contact pad can only be used with a small fraction of the existing installed base of card readers. A BSoC with contacts may protrude out enough to allow the acquisition of the user's biometric trait. Dedicated card readers designed to accept a Biometric System-on-Card are not standardized within the scope of this document.

Annex A
(informative)

Motivations for the specification of type S2

A.1 Technical feasibility

Type S1 is a functional extension of an ICC compliant to ISO/IEC 7816 and ISO/IEC 7810. It is technically challenging to embed all the components within a card body and satisfy the thickness and flexibility as specified in ISO/IEC 7810. This relates particularly to the fingerprint sensor. The main stream technology – capacitive silicon fingerprint sensors – may not be suitable for a type S1 Biometric System-on-Card. Silicon becomes flexible when thinned down below 50µm with a grinding process but it will not withstand torsion-and-bending tests as many prototypes from industry leaders have shown. Alternative fingerprint sensors using a flexible substrate like Polymer are under development but not yet available as a mass product. Silicon sensors as a mainstream technology should not be excluded or discriminated by the standard.

A.2 Infrastructure and operation

The existing reader infrastructure is anticipated to remain unchanged and not being adapted to accept contact-based Biometric System-on-Card. In a contactless scenario, the Biometric System-on-Card need not necessarily satisfy the dimensions and mechanical requirements of an ICC compliant to ISO/IEC 7816 to work reliable. It is much easier integrating additional components such as a battery when the thickness is greater than that of an ISO/IEC 7816 card. The type S2 will be stiffer as to avoid breaking of the sensor and due to the increased thickness of the card body.