Singapore
Standards
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SS IEC 62443-4-1 : 2018
IEC 62443-4-1:2018, IDT
(ICS 25.040.40; 35.030)

SINGAPORE STANDARD

Security for industrial automation and control systems –

Part 4-1 : Secure product development lifecycle requirements

Published by

Enterprise
Singapore

SS IEC 62443-4-1 : 2018
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Part 4-1 : Secure product development lifecycle requirements

ISBN 978-981-48-3539-8

This Singapore Standard was approved on 15 November 2018 by the Manufacturing Standards Committee under the purview of the Singapore Standards Council.

First published, 2019.

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National Foreword

This Singapore Standard was prepared by the Working Group on Cyber Security for Industrial Automation appointed by the Technical Committee on Smart Manufacturing under the purview of the Manufacturing Standards Committee.

This standard is identical with IEC 62443-4-1:2018, “Security for industrial automation and control systems – Part 4-1 : Secure product development lifecycle requirements”, published by the International Electrotechnical Commission.

Where reference to a particular part of IEC 62443 is made, the appropriate Singapore Standard (which is an identical adoption of that part of IEC 62443) shall apply.

This standard is expected to be used by product suppliers. It can provide references to asset owners and system integrators.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

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2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR.*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SECURITY FOR INDUSTRIAL AUTOMATION AND CONTROL SYSTEMS –

Part 4-1: Secure product development lifecycle requirements

FOREWORD

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International Standard IEC 62443-4-1 has been prepared by IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65/685/FDIS	65/688/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62443 series, published under the general title *Security for industrial automation and control systems*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document is part of a series of standards that addresses the issue of security for industrial automation and control systems (IACS). This document describes product development life-cycle requirements related to cyber security for products intended for use in the industrial automation and control systems environment and provides guidance on how to meet the requirements described for each element.

This document has been developed in large part from the Secure Development Life-cycle Assessment (SDLA) Certification Requirements [26] [1] from the ISA Security Compliance Institute (ISCI). Note that the SDLA procedure was based on the following sources:

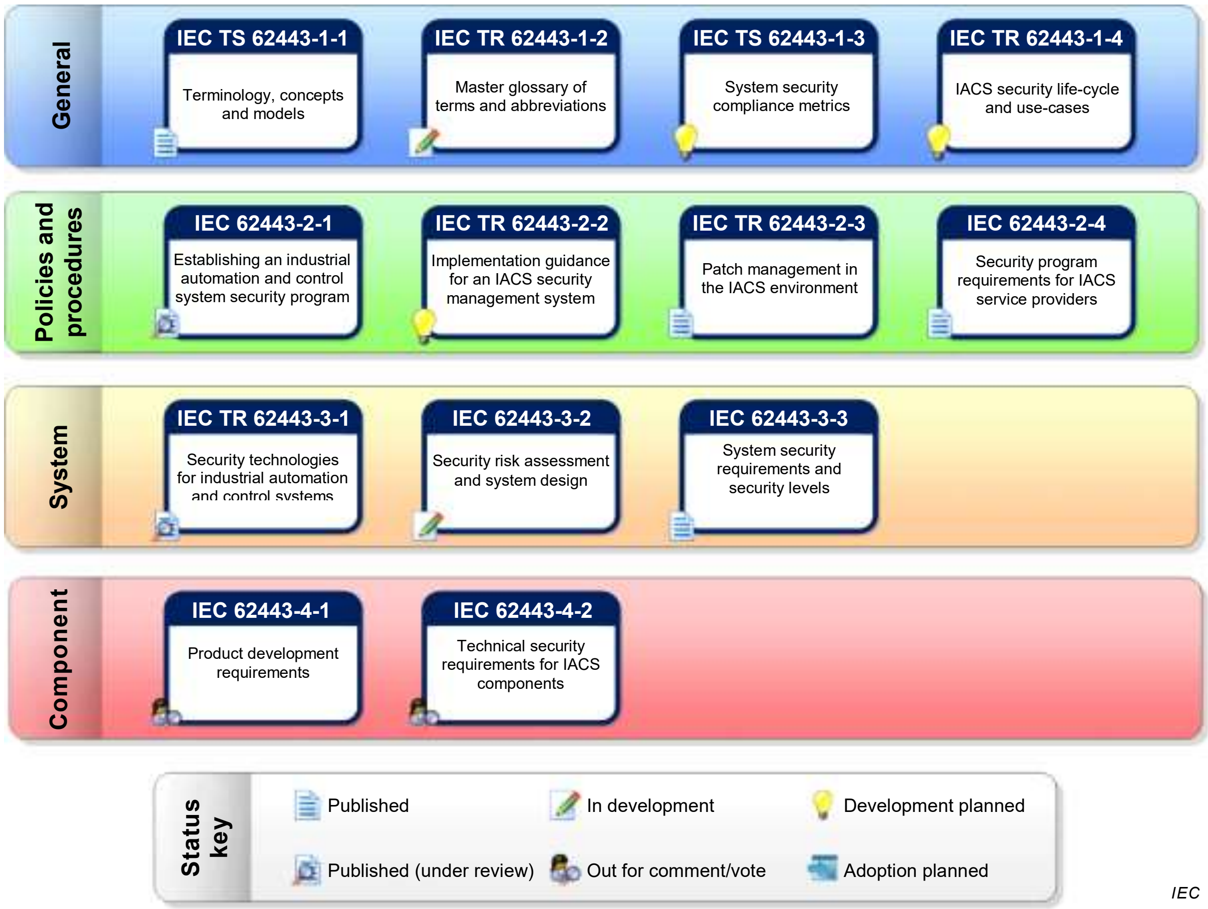
- ISO/IEC 15408-3 (Common Criteria) [18];
- Open Web Application Security Project (OWASP) Comprehensive, Lightweight Application Security Process (CLASP) [36];
- The Security Development Life-cycle by Michael Howard and Steve Lipner [43];
- IEC 61508 Functional safety of electrical/electronic/ programmable electronic safety-related systems [24], and
- RCTA DO-178B Software Considerations in Airborne Systems and Equipment Certification [28].

Therefore, all these sources can be considered contributing sources to this document.

This document is the part of the IEC 62443 series that contains security requirements for developers of any automation and control products where security is a concern.

Figure 1 illustrates the relationship of the different parts of IEC 62443 that were in existence or planned as of the date of circulation of this document. Those that are normatively referenced are included in the list of normative references in Clause 2, and those that are referenced for informational purposes or that are in development are listed in the Bibliography.

[1] Figures in square brackets refer to the bibliography.


General
IEC TS 62443-1-1
Terminology, concepts and models
IEC TR 62443-1-2
Master glossary of terms and abbreviations
IEC TS 62443-1-3
System security compliance metrics
IEC TR 62443-1-4
IACS security life-cycle and use-cases
Policies and procedures
IEC 62443-2-1
Establishing an industrial automation and control system security program
IEC TR 62443-2-2
Implementation guidance for an IACS security management system
IEC TR 62443-2-3
Patch management in the IACS environment
IEC 62443-2-4
Security program requirements for IACS service providers
System
IEC TR 62443-3-1
Security technologies for industrial automation and control systems
IEC 62443-3-2
Security risk assessment and system design
IEC 62443-3-3
System security requirements and security levels
Component
IEC 62443-4-1
Product development requirements
IEC 62443-4-2
Technical security requirements for IACS components
Status key
Published
In development
Development planned
Published (under review)
Out for comment/vote
Adoption planned

IEC

Figure 1 – Parts of the IEC 62443 series

Figure 2 illustrates how the developed product relates to maintenance and integration capabilities defined in IEC 62443-2-4 and to its operation by the asset owner. The product supplier develops products using a process compliant with this document. Those products may be a single component, such as an embedded controller, or a group of components working together as a system or subsystem. The products are then integrated together, usually by a system integrator, into an Automation Solution using a process compliant with IEC 62443-2-4. The Automation Solution is then installed at a particular site and becomes part of the industrial automation and control system (IACS). Some of these capabilities reference security measures defined in IEC 62443-3-3 [10] that the service provider ensures are supported in the Automation Solution (either as product features or compensating mechanisms). This document only addresses the process used for the development of the product; it does not address design, installation or operation of the Automation Solution or IACS.

In Figure 2, the Automation Solution is illustrated to contain one or more subsystems and optional supporting components such as advanced control. The dashed boxes indicate that these components are “optional”.

NOTE 1 Automation Solutions typically have a single product, but they are not restricted to do so. In some industries, there may be a hierarchical product structure. In general, the Automation Solution is the set of hardware and software, independent of product packaging, that is used to control a physical process (for example, continuous or manufacturing) as defined by the asset owner.

NOTE 2 If a service provider provides products used in the Automation Solution, then the service provider is fulfilling the role of product supplier in this diagram.

NOTE 3 If a service provider provides products used in the Automation Solution, then the service provider is fulfilling the role of product supplier in this diagram.

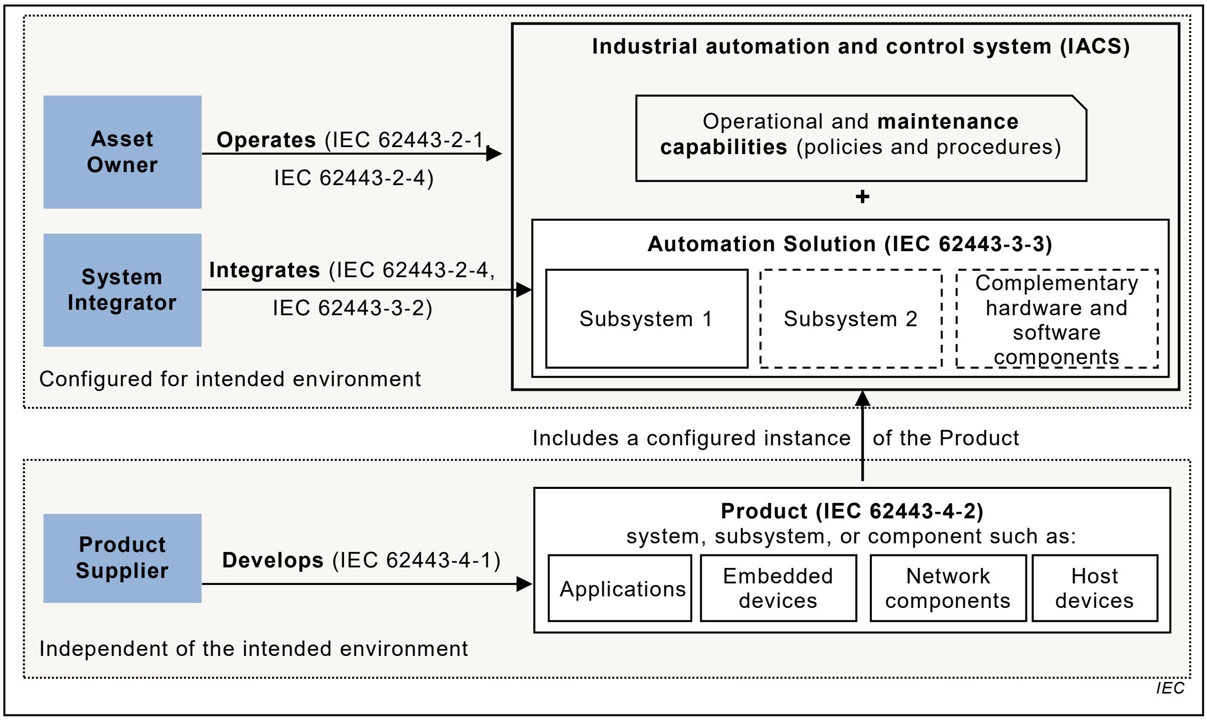

Industrial automation and control system (IACS)
Asset Owner
Operates (IEC 62443-2-1, IEC 62443-2-4)
Operational and maintenance capabilities (policies and procedures)
+
System Integrator
Integrates (IEC 62443-2-4, IEC 62443-3-2)
Automation Solution (IEC 62443-3-3)
Subsystem 1
Subsystem 2
Complementary hardware and software components
Configured for intended environment
Includes a configured instance of the Product
Product Supplier
Develops (IEC 62443-4-1)
Product (IEC 62443-4-2)
system, subsystem, or component such as:
Applications
Embedded devices
Network components
Host devices
Independent of the intended environment
IEC

Figure 2 – Example scope of product life-cycle

SECURITY FOR INDUSTRIAL AUTOMATION AND CONTROL SYSTEMS –

Part 4-1: Secure product development lifecycle requirements

1 Scope

This part of IEC 62443 specifies process requirements for the secure development of products used in industrial automation and control systems. It defines a secure development life-cycle (SDL) for the purpose of developing and maintaining secure products. This life-cycle includes security requirements definition, secure design, secure implementation (including coding guidelines), verification and validation, defect management, patch management and product end-of-life. These requirements can be applied to new or existing processes for developing, maintaining and retiring hardware, software or firmware for new or existing products. These requirements apply to the developer and maintainer of the product, but not to the integrator or user of the product. A summary list of the requirements in this document can be found in Annex B.

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.

IEC 62443-2-4:2015, *Security for industrial automation and control systems – Part 2-4: Security program requirements for IACS service providers*
IEC 62443-2-4:2015/AMD1:2017

[2] Under consideration.