SVENSK STANDARD

SS-ISO/IEC 30141, utg 1:2024

Fastställd	Sida	Ansvarig kommitté
2024-09-25	1 (61)	SEK TK IoT

Internet of Things (IoT) – Reference architecture

Internet of Things (IoT) – Reference architecture

Denna svenska standard innehåller den engelska texten i nedan angiven IEC-publikation, utarbetad inom International Electrotechnical Commission, IEC:

– **ISO/IEC 30141, Second edition, 2024 - Internet of Things (IoT) - Reference architecture**

ICS 35.020.00

Denna standard är fastställd av SEK Svensk Elstandard,
som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1042, 172 21 Sundbyberg
Telefon: 08 - 444 14 00.
E-post: sek@elstandard.se. Internet: elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1042
172 21 Sundbyberg
Tel 08-444 14 00
elstandard.se

ISO/IEC 30141

Edition 2.0 2024-08

INTERNATIONAL STANDARD

colour inside

Internet of things (IoT) – Reference architecture

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.020

ISBN 978-2-8322-9193-1

CONTENTS

INTERNET OF THINGS (IoT) – REFERENCE ARCHITECTURE

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO National bodies.
3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO are not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this document.
7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
9) IEC and ISO draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC and ISO take no position concerning the evidence, validity, or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC and ISO had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch and www.iso.org/patents. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 30141 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

This second edition cancels and replaces the first edition published in 2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) conformance with ISO/IEC/IEEE 42010:2022;
b) improved usability;
c) implementation pattern support.

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

Draft	Report on voting
JTC1-SC41/417/FDIS	JTC1-SC41/431/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

IMPORTANT – The "colour inside" logo on the cover page of this document 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

0.1 General

This document is the second edition of the Internet of Things reference architecture (IoT RA). This document is in conformance with ISO/IEC/IEEE 42010:2022 requirements on architecture descriptions that are described in Annex B except for aspects, perspectives, decisions and rationale.

The IoT RA addresses systems that:

- use technology for sensing and operating on physical world entities;
- have components that interact through a digital network.

The IoT RA deals with related issues, like trustworthiness functions regarding both the physical and digital worlds.

This document can be used as a generic normative part of IoT domain-specific reference architectures (DSRAs). IoT DSRAs are in conformance with ISO/IEC/IEEE 42010:2022 requirements on architecture descriptions and enable consistency and alignment with other reference architectures within ISO/IEC JTC 1.

0.2 About Internet of Things (IoT)

IoT has broad implications in industry and society today and is likely to continue to have an impact on many aspects of our lives for many years to come. Various IoT applications and services have adopted IoT techniques to provide capabilities that were not possible earlier. IoT is one of the most dynamic areas of information and communication technologies.

Fundamental to IoT are devices that interact with the physical world. Sensors collect the information about the physical world, while actuators can act upon the physical world. These field devices are connected to the digital world through network connections. Both sensors and actuators can be in many forms such as thermometers, accelerometers, video cameras, microphones, relays, heaters or industrial equipment for manufacturing or process control.

IoT is the base for new business models or offerings and new working methods in industry and in the public sector. IoT is an essential enabler for other computing areas such as digital twins, artificial intelligence, cloud computing, big data, data analysis and more. Many application areas called "smart xxx" such as smart grid, smart cities, and even smart cars use IoT as an important technology capability.

IoT can be combined with other technologies to address complex requirements. For example, IoT can leverage cloud computing, including private cloud, public cloud, hybrid cloud, and multi-cloud, for resource provisioning and management. IoT can benefit from machine learning and big data for the analysis of sensor data to enable rapid decisions for improved control and efficiency. IoT with distributed ledger technology can ensure traceability in applications. IoT can take advantage of edge computing to distribute computing resources near the convergence of information technology and operational technology, where they are needed most. The IoT area continues to grow rapidly, and new IoT application areas continue to be found and invented. This document can serve these new technology and application areas.

0.3 IoT sources of information

For a given application field and purpose, the many IoT standards, guidelines, and initiatives in existence today work well on their own and are used by various IoT stakeholders. As a result, heterogeneity is a prominent aspect of IoT. However, support for the combination and interaction of these heterogeneous resources to enable interoperability and convergence between IoT standards and guidelines is necessary.

Stakeholder decisions about both a foundation for long-term investments and durable protection of current cornerstones is more difficult because of uncertainty about resource compatibility.

This document serves as a foundation for creating interoperability and alignment between IoT initiatives. The aim of this document is to bring different views together.

0.4 General principles of a reference architecture

This document is positioned as a reference architecture for IoT systems. It utilizes the terms, definitions, and relationships for best practices in architecture descriptions as outlined in ISO/IEC/IEEE 42010:2022 to:

- establish vocabulary, principles, guidance; and
- provide a description of IoT principles, capabilities, and interactions with the physical and digital worlds.

One of the primary purposes of the IoT RA is to support architects that want to design architectures or reference architectures for IoT systems. Normative parts of the IoT RA can then be included in an architecture closer to the realization of IoT systems.

Figure 1 shows how this document has been specified and how it will be used.

– This document conforms to ISO/IEC/IEEE 42010:2022 requirements for architecture descriptions [1][1] and uses guidelines from the "Best practices and guidelines for RA standards" standing document [2].

– Users of this document apply it to specify an IoT architecture that guides the implementation of an IoT system.

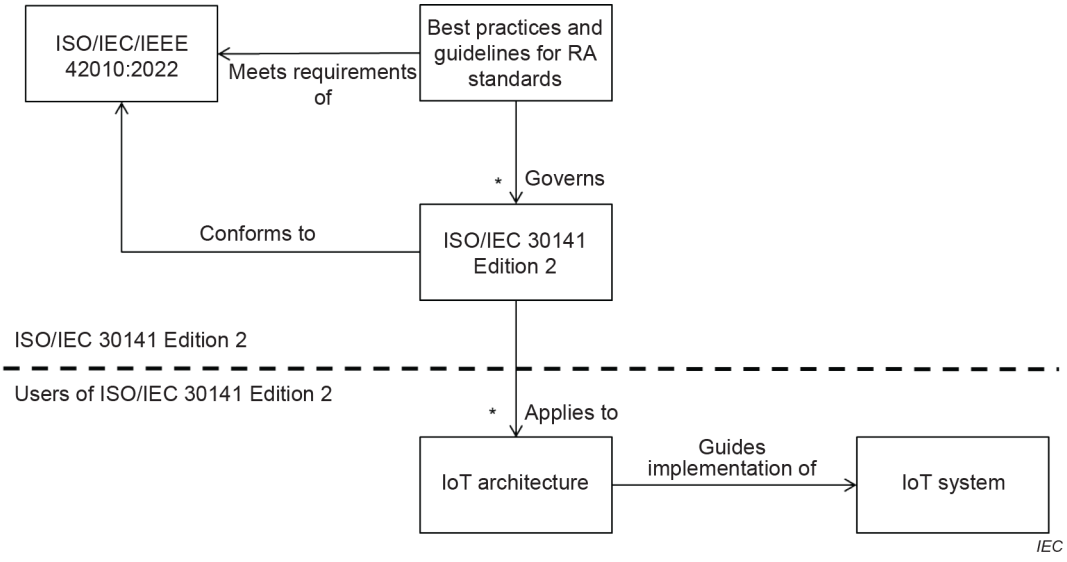

Figure 1 – Using the IoT RA standard

1 Numbers in square brackets refer to the Bibliography.

INTERNET OF THINGS (IoT) – REFERENCE ARCHITECTURE

1 Scope

This document specifies an Internet of Things (IoT) reference architecture (IoT RA). The IoT RA is a generalization of existing practice including the distinguishing characteristics of IoT systems and other fundamental characteristics exhibited by IoT systems. The IoT RA addresses stakeholder concerns related to the business value of IoT systems. The IoT RA also addresses the interactions between the IoT system, the users, and the physical environment. Implementation of IoT systems is also addressed in this document. Among the characteristics specified in the IoT RA are abstract functions within IoT systems and a variety of structures that are used to construct IoT systems.

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 20924, *Internet of Things (IoT) and digital twin – Vocabulary*