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Internet of Things (IoT) — Reference Architecture

AS ISO/IEC 30141:2021

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Internet of Things (IoT) — Reference Architecture

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Preface

This Standard was prepared by the Standards Australia Committee IT-042, Internet of Things and Related Technologies.

The objective of this document is to specify a general IoT reference architecture in terms of defining system characteristics, a conceptual model, a reference model and architecture views for IoT.

This document is identical with, and has been reproduced from, ISO/IEC 30141:2018, *Internet of Things (loT) — Reference Architecture*.

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FOREWORD

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International Standard ISO/IEC 30141 was prepared by subcommittee 41: Internet of Things and related technologies, of ISO/IEC joint technical committee 1: Information technology.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

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

INTRODUCTION

IoT has a broad use in industry and society today and it will continue to develop for many years to come. Various IoT applications and services have adopted IoT techniques to provide capabilities that were not possible a few years ago. IoT is one of the most dynamic and exciting areas of ICT. It involves the connecting of Physical Entities ("things") with IT systems through networks. Foundational to IoT are the electronic devices that interact with the physical world. Sensors collect the information about the physical world, while actuators can act upon Physical Entities. 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 controlling. Mobile technology, cloud computing, big data and deep analytics (predictive, cognitive, real-time and contextual) play important roles by gathering and processing data to achieve the final result of controlling Physical Entities by providing contextual, real-time and predictive information which has an impact on physical and virtual entities.

IoT can be integrated into existing technologies. Real-time measurements generated by adding sensors to existing technology can improve its functionality and lower the cost of operations (e.g. smart traffic signals can adapt to traffic conditions, lowering congestion and air pollution). The data generated by IoT sensors can support new business models and tailor products and services to the tastes and needs of the customer. In addition to the applications, the technology needs to support supervision and adaptation of the IoT system itself.

Several forecasts indicate that IoT will connect 50 billion devices worldwide by the year 2020. There are a number of possible application areas, such as smart city, smart grid, smart home/building, digital agriculture, smart manufacturing, intelligent transport system, e-Health. IoT is an enabling technology that consists of many supporting technologies, for example, different types of communication networking technologies, information technologies, sensing and control technologies, software technologies, device/hardware technologies. This document is based on widely used enabling technologies that are defined in standards from several organizations such as ISO, IEC, ITU, IETF, IEEE, ETSI, 3GPP, W3C, etc.

Trustworthiness is recognized as an area of importance, and IoT can leverage current and future best practice. For example, monitoring and analysing deployed IoT systems is essential to maintain reliability and safety and security. Measures such as controlled access can ensure the security of the system.

This document provides a standardized IoT Reference Architecture using a common vocabulary, reusable designs and industry best practices. It uses a top down approach, beginning with collecting the most important characteristics of IoT, abstracting those into a generic IoT Conceptual Model, deriving a high level system based reference model with subsequent dissection of that model into the four architecture views (functional view, system view, networking view and usage view) from different perspectives.

This document serves as a basis from which to develop (specify) context specific IoT architectures and thence actual systems. The contexts can be of different kinds but shall include the business context, the regulatory context and the technological context, e.g. industry verticals, technological requirements and/or nation-specific requirement sets. For more information, see Figure 1.

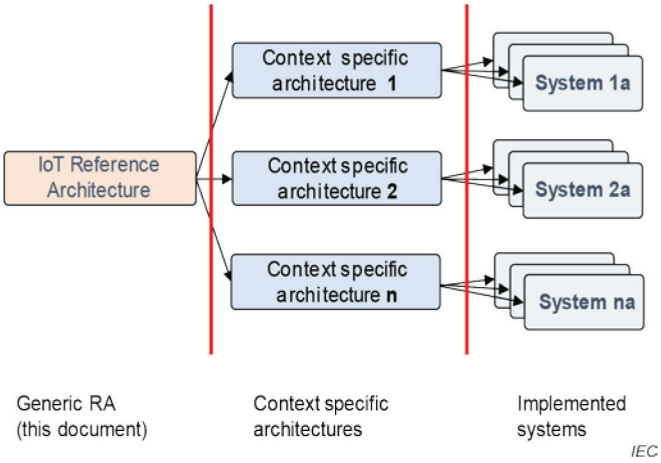

Figure 1 — From generic Reference Architecture to context specific architecture

NOTES

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Internet of Things (IoT) — Reference Architecture

1 Scope

This document specifies a general IoT Reference Architecture in terms of defining system characteristics, a Conceptual Model, a Reference Model and architecture views for IoT.

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) — Definition and vocabulary*[1)]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 20924 apply.

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

- ISO online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

4 Abbreviated terms

5Vs	volume, velocity, veracity, variability, and variety
API	application programming interface
ASD	Application & Service Domain
BSS	business support systems
CMC	Conceptual Model
FQDN	fully qualified domain name
HMI	human machine interface
HTTP	Hypertext Transfer Protocol
HVAC	heating, ventilation and air conditioning
IaaS	infrastructure as a service
ICT	information and communication technologies
IoT	Internet of Things
IoT RA	Internet of Things Reference Architecture
LAN	local area network

1) Under preparation. Stage at time of publication: ISO/IEC CDV 20924:2018.