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INTERNATIONAL STANDARD

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Internet of things (IoT) – Autonomous IoT object identification in a connected home – Requirements and framework

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FOREWORD

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ISO/IEC 30184 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology.

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

Draft	Report on voting
JTC1-SC41/453/FDIS	JTC1-SC41/469/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.

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INTRODUCTION

The IoT environment has become widespread, dynamic, and complex, and is constantly evolving. IoT objects and their associations to users, or to other objects, should be identified. Current identification approaches rely on proper device categorization based on pre-determined taxonomies. Once categorized, devices advertise themselves to the network. When new types of IoT objects emerge, the taxonomy is renewed and new IDs are assigned.

As a complement to existing solutions, this document simplifies the requirements imposed on devices through the adoption of an autonomous procedure. This method reduces the need for detailed classification, standardization, and certification of device types by eliminating the need for devices to self-identify and advertise.

This document focuses on the requirements and the framework for autonomous identification of IoT objects, especially in connected home environments. The objects in this document include IoT devices and applications. The IoT object identification is to identify the IoT object type and the associations among the IoT objects.

Inspecting data patterns produced by IoT objects allows for autonomous type and association identification. The data patterns may be inspected if the IoT object has given explicit consent. The data patterns to be inspected can be a selected feature from the raw data such as the port number and protocol number. An accumulated feature set over time can also be used – minimum or maximum packet size, average input rate, average inter-arrival times of packets, and so on – if the IoT object gives explicit consent to allow the collection and storage of such data.

By doing so, the need for detailed classification, standardization, and certification of object types is reduced; and devices are relieved from the burdens of identifying and advertising themselves. It will motivate and spread the development of new types of IoT objects. Developments towards heterogeneous IoT objects will enable increased protections for devices and users against malicious attacks, hazards from malfunctions, or health-related critical issues.

INTERNET OF THINGS (IoT) – AUTONOMOUS IoT OBJECT IDENTIFICATION IN A CONNECTED HOME – REQUIREMENTS AND FRAMEWORK

1 Scope

This document specifies the following items for the autonomous IoT object identification in a connected home:

– requirements;
– architecture, functional entities and interfaces;
– operation procedures.

Information model formats, data formats, and identifier assignment are out of scope of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1
autonomous IoT object identification
identification of the *IoT object* (3.11) type and the associations among the IoT objects with limited human intervention

3.2
home
physical structure used as a dwelling place

EXAMPLE A house or an apartment.

Note 1 to entry: A home can be an individual building, part of a larger building or more than one building.

Note 2 to entry: A home can include small business premises, e.g. nursing homes and home offices.

[SOURCE: ISO/IEC 11801-4:2017 [1], 3.1.5, modified – Note 2 to entry has been added.]

3.3
connected home
home that is equipped with a home network

3.4
home network
internal network for information transport in a home or on business premises of similar complexity, providing defined access points and using one or more media in any topology

3.5
fingerprint
digital fingerprint
technology that deploys algorithms that analyse a large number of technical characteristics and settings on devices to generate unique identifiers that can identify a specific computing device producing a machine ID, and which can be personally identifiable

Note 1 to entry: In this document, a fingerprint is a selection of features. It can be an accumulated set of features over time.

[SOURCE: ISO 19731:2017 [2], 3.17, modified – Note 1 to entry has been replaced and Note 2 to entry has been deleted.]

3.6
feature
<machine learning> measurable property of an object or event with respect to a set of characteristics

Note 1 to entry: Features play a role in training and prediction.

Note 2 to entry: Features provide a machine-readable way to describe the relevant objects. As the algorithm will not go back to the objects or events themselves, feature representations are designed to contain all useful information.

[SOURCE: ISO/IEC 23053:2022 [3], 3.3.3]

3.7
ground truth
value of the target variable for a particular item of labelled input data

Note 1 to entry: The term ground truth does not imply that the labelled input data consistently corresponds to the real-world value of the target variables.

[SOURCE: ISO/IEC 22989:2022 [4], 3.2.7]

3.8
identifier
information that unambiguously distinguishes one entity from other entities in a given identity context

[SOURCE: ISO/IEC 20924:2024 [5], 3.1.19]

3.9
IoT application
software functional element specific to the solution of a problem in the IoT environment

Note 1 to entry: An application can be distributed among resources and can communicate with other applications.

[SOURCE: IEC 61800-7-1:2015 [6], 3.2.2, modified – The term and definition have been made specific to the IoT environment.]

3.10
IoT device

endpoint that interacts with the physical world through sensing or actuating

Note 1 to entry: An IoT device can be a sensor or an actuator.

[SOURCE: ISO/IEC 20924:2024 [5], 3.2.11]

3.11
IoT object
IoT device (3.10) and *IoT application* (3.9)

3.12
IoT system
system providing functionalities of IoT

Note 1 to entry: An IoT system can include, but not be limited to, *IoT devices* (3.10), IoT gateways, sensors, and actuators.

[SOURCE: ISO/IEC 20924:2024 [5], 3.2.15]

3.13
machine learning
ML
process of optimizing *model parameters* (3.15) through computational techniques, such that the *model*'s (3.14) behaviour reflects the data or experience

[SOURCE: ISO/IEC 22989:2022 [4], 3.3.5]

3.14
model
physical, mathematical or otherwise logical representation of a system, entity, phenomenon, process or data

[SOURCE: ISO/IEC 22989:2022 [4], 3.1.23]

3.15
model parameter
parameter
internal variable of a *model* (3.14) that affects how it computes its outputs

Note 1 to entry: Examples of parameters include the weights in a neural network and the transition probabilities in a Markov model.

[SOURCE: ISO/IEC 22989:2022 [4], 3.3.8]

3.16
meta-data
data that define and describe other data

[SOURCE: ISO/TR 3985:2021 [7], 3.10]

3.17
personally identifiable information
PII
information that can be used in a given context to identify, contact, or locate a single person, or to identify an individual in context

[SOURCE: ISO 19414:2020 [8], 3.1]