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INTERNATIONAL STANDARD

Internet of things (IoT) and digital twin – Vocabulary

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FOREWORD

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ISO/IEC 20924 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 third edition cancels and replaces the second edition published in 2021. This edition constitutes a technical revision.

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

a) addition of new terms which are used in other ISO/IEC IoT related standards;
b) update of some definitions to align with current usage in IoT standards;
c) extension of digital twin related vocabularies with title and scope changes.

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

Draft	Report on voting
JTC1-SC41/386/FDIS	JTC1-SC41/404/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.

INTERNET OF THINGS (IoT) AND DIGITAL TWIN – VOCABULARY

1 Scope

This document provides a definition of Internet of Things and digital twin along with a set of terms and definitions. This document is a terminology foundation for the Internet of Things and digital twin.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminological 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 General terms

3.1.1
application
software designed to fulfil a particular purpose

[SOURCE: ISO/IEC 24713-2:2008, 4.1, modified – "program or piece of" has been deleted from the beginning of the definition.]

3.1.2
architecture
set of fundamental concepts or properties of an entity in its environment

Note 1 to entry: Governing principles are covered in the architecture description and are not part of the architecture.

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.2, modified – "set of" has been added to the beginning of the definition, "and governing principles for the realization and evolution of this entity and its related life cycle processes" has been deleted from the end of the definition, and Note 1 to entry has been added.]

3.1.3
asset
entity (3.1.17) that has potential or actual value to an individual, an organization, a government, or other groups

3.1.4
availability
property of being accessible and usable upon demand by an authorized *entity* (3.1.17)

Note 1 to entry: *IoT systems* (3.2.15) can include both *human users* (3.1.18) and service components as "authorized entities".

[SOURCE: ISO/IEC 27000:2018, 3.7]

3.1.5
cloud computing
paradigm for enabling *network* (3.1.24) access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on demand

[SOURCE: ISO/IEC 22123-1:2023, 3.1.1, modified – Notes 1 and 2 to entry have been deleted.]

3.1.6
cloud service
one or more capabilities offered via *cloud computing* (3.1.5) invoked using a defined *interface* (3.1.22)

[SOURCE: ISO/IEC 22123-1:2023, 3.1.2]

3.1.7
cloud service provider
party that is acting in a cloud service provider role

[SOURCE: ISO/IEC 22123-1:2023, 3.3.3]

3.1.8
cloud service provider role
CSP role
set of activities that make cloud services available

[SOURCE: ISO/IEC 22123-1:2023, 3.3.15]

3.1.9
component
modular, deployable, and replaceable part of a system

[SOURCE: ISO 14813-5:2010, B.1.31, modified – "that encapsulates implementation and exposes a set of interfaces" has been deleted from the end of the definition.]

3.1.10
confidentiality
property that *information* (3.1.21) is not made available or disclosed to unauthorized individuals, entities, or processes

[SOURCE: ISO/IEC 27000:2018, 3.10]

3.1.11
data
symbol or symbols represented in a digital and formalized manner suitable for communication, storage, interpretation or processing

3.1.12
data store
persistent repository for *data* (3.1.11)

Note 1 to entry: A data store can be accessed by a single *entity* (3.1.17) or shared by multiple entities via a *network* (3.1.24) or other connection.

3.1.13
digital entity
entity (3.1.17) that exists in the digital realm

Note 1 to entry: A digital entity can exist in several forms, including a *cloud service* (3.1.6) or as a *service* (3.1.28) in a data centre, or as a *network* (3.1.24) element or as an *IoT gateway* (3.2.14).

3.1.14
discovery service
service (3.1.28) to find resources, entities or services based on a specification, keywords, search terms, or tags of the desired target

Note 1 to entry: A discovery service can be used by a *human user* (3.1.18) or a *digital user* (3.2.4).

3.1.15
endpoint
component (3.1.8) that exposes and uses one or more *network* (3.1.24) *interfaces* (3.1.22)

3.1.16
endpoint address
<endpoint> character or group of characters that can be used to identify an *endpoint* (3.1.15), which can designate the originating source or destination of *data* (3.1.11) being transmitted

3.1.17
entity
anything (physical or non-physical) having a distinct existence

[SOURCE: ISO/IEC 15459-3:2014, 3.1]

3.1.18
human user
natural person who uses a system

3.1.19
identifier
information (3.1.21) that unambiguously distinguishes one *entity* (3.1.17) from other entities in a given *identity context* (3.1.20)

3.1.20
identity context
environment where an *entity* (3.1.17) can be sufficiently identified by a certain set of its attributes and values

3.1.21
information
data (3.1.11) that within a certain context has a particular meaning

3.1.22
interface
shared boundary between two functional *components* (3.1.8), defined by various characteristics pertaining to the functions, physical interconnections, signal exchanges, and other characteristics

[SOURCE: ISO/IEC 13066-1:2011, 2.15, modified – In the definition, "units" has been replaced by "components"; ", as appropriate" has been deleted from the end of the definition.]

3.1.23
interoperability
ability of two or more systems or *applications* (3.1.1) to exchange *information* (3.1.21) and to mutually use the information that has been exchanged

[SOURCE: ISO/IEC 22123-1:2023, 3.6.1]

3.1.24
network
data network
digital network
infrastructure that connects a set of *endpoints* (3.1.15), enabling communication of *data* (3.1.11) between the digital entities reachable through them

3.1.25
physical entity
entity (3.1.17) in the physical world that can be the subject of sensing and/or actuating

Note 1 to entry: In the Internet of Things reference architecture, the physical entity is a thing that can be sensed and/or actuated by IoT devices or IoT systems.

3.1.26
reference architecture
architecture description for a specific subject area that guides and constrains the structure and behaviour of a related set of systems of interest

3.1.27
safety
state in which the risk of harm (to persons) or damage is limited to an acceptable level

[SOURCE: ISO 21101:2014, 3.34]

3.1.28
service
distinct functionality that is provided by an *entity* (3.1.17) through *interfaces* (3.1.22)

[SOURCE: ISO/IEC TR 14252:1996, 2.2.2.46, modified – In the definition, "part of the functionality" has been replaced by "functionality" and "on one side of an interface to an entity on the other side of the interface" has been replaced by "through *interfaces* (3.1.22)".]

3.1.29
service provider
organization that manages and delivers a service or services to customers

[SOURCE: ISO/IEC 20000-10:2018, 3.2.24]

3.1.30
socialized
having organized and constructive behaviour of functions in a system or among systems built with the attributes of the division of labour and the collaboration of tasks

[SOURCE: ISO/IEC TR 30174:2021, 3.4]

3.1.31
stakeholder
individual, organization, or classes thereof, having an interest, right, share, or claim, in an entity of interest

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.17, modified – "role, position" has been deleted from the beginning of the definition; the EXAMPLE has been deleted.]

3.1.32
tag
human- or machine-readable mark, or digital identity used to communicate *information* (3.1.21) about an *entity* (3.1.17)

Note 1 to entry: A tag can contain information that can be read by sensors to aid in identification of the *physical entity* (3.1.25).

3.1.33
trustworthiness
ability to meet stakeholder expectations in a demonstrable, verifiable and measurable way

3.1.34
virtual entity
digital entity that represents a *physical entity* (3.1.25)

3.1.35
wearable device
IoT device designed for operation near to, on, or inside of a body

Note 1 to entry: Wearable devices often have a variety of sensing abilities, but limited power capacity constraining communication and data processing abilities. As critical devices of the IoT, it is considered that the communication between wearable devices and a network might not require any human intervention. Wearable devices include electronic devices usable by humans, animals, and other organisms.

3.2 Internet of Things specific terms

3.2.1
actuating
changing one or more properties of a physical entity in response to an input

[SOURCE: IIC vocabulary v3,0]

3.2.2
actuator
IoT device (3.2.11) that changes one or more properties of a *physical entity* (3.1.25) in response to an input

Note 1 to entry: The change can be nonmechanical in nature.

3.2.3
data acquisition functional system
system for gathering required *data* (3.1.11) from a group of sensors, and assembling them into messages for delivery to another *component* (3.1.8)

[SOURCE: ISO/IEC 30144:2020, 3.3]

3.2.4
digital user
digital entity that uses an IoT system

Note 1 to entry: Digital user includes automation services that act on behalf of *human users* (3.1.18).

3.2.5
electronic label
EL
IoT device which attaches to a physical item having a display for the *information* (3.1.21) about the item and its perceived environment and also having information transmission via a data link

Note 1 to entry: Examples of the information about the item and its perceived environment include, but are not limited to, prices, stock status, promotional advertisement, barcode, two-dimensional code, temperature, humidity, ambient light conditions.

[SOURCE: ISO/IEC 30169:2022, 3.1, modified – The domain tag "<in retail industry>" has been deleted. In the definition, "an RF data link" has been replaced by "a data link".]

3.2.6
electronic label system
ELS
system with a few to a large number of electronic labels designed for IoT applications

[SOURCE: ISO/IEC 30169:2022, 3.2, modified – The domain tag "<in retail industry>" has been removed.]

3.2.7
ELS backend system
subsystem intended to realize the business service functions and the equipment control functions of ELS

Note 1 to entry: The ELS backend system provides unified planning and management services for business activities that utilize the ELS, and it also provides a centralized equipment monitoring service.

[SOURCE: ISO/IEC 30169:2022, 3.3]

3.2.8
Internet of Things
IoT
infrastructure of interconnected entities, people, systems and *information* (3.1.21) resources together with *services* (3.1.28) which processes and reacts to information from the physical world and virtual world

3.2.9
IoT component
basic building block of *IoT systems* (3.2.15) that interacts with other IoT components to achieve a set of goals

3.2.10
IoT conceptual model
set of common concepts, structure and behaviours of *IoT systems* (3.2.15)

3.2.11
IoT device
endpoint (3.1.15) that interacts with the physical world through sensing or actuating

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

3.2.12
IoT domain
major functional group of an *IoT system* (3.2.15)

Note 1 to entry: Every *entity* (3.1.17) in an IoT system participates by those domain(s) and is said to be included or contained by that domain.

Note 2 to entry: The IoT domain consists of six domains: user domain, operation and management domain, *application* (3.1.1) and *service* (3.1.28) domain, resource access and interchange domain, sensing and controlling domain, *physical entity* (3.1.25) domain.

3.2.13
IoT environment
boundary containing the *IoT components* (3.2.9), *IoT systems* (3.2.15), and related infrastructure

3.2.14
IoT gateway
entity (3.1.17) of an *IoT system* (3.2.15) that connects one or more proximity *networks* (3.1.24) and the *IoT devices* (3.2.11) on those networks to each other and to one or more access networks with different protocols

3.2.15
IoT system
system providing functionalities of IoT

Note 1 to entry: An IoT system can include, but not be limited to, *IoT devices* (3.2.11), *IoT gateways* (3.2.14), *sensors* (3.2.20), and *actuators* (3.2.2).

3.2.16
IoT trustworthiness
trustworthiness (3.1.32) of an *IoT system* (3.2.15) with characteristics including security, privacy, safety, reliability, and resilience

3.2.17
IoT user
user of an *IoT system* (3.2.15)

3.2.18
network interface
interface enabling an *endpoint* (3.1.15) to access one or more *networks* (3.1.24)

3.2.19
sensing
observing one or more properties of a *physical entity* (3.1.25) and converting those properties into *information* (3.1.21)

[SOURCE: IIC vocabulary v3,0]

3.2.20
sensor
IoT device (3.2.11) with the capability of *sensing* (3.2.19)

[SOURCE: IIC vocabulary v3,0]

3.2.21
socialized IoT system
system providing functionalities of IoT built on *socialized* (3.1.30) capability

Note 1 to entry: A socialized IoT system can include, but not be limited to, *IoT devices* (3.2.11), *IoT gateways* (3.2.14), *sensors* (3.2.20), and *actuators* (3.2.2).

[SOURCE: ISO/IEC TR 30174:2021, 3.5]

3.2.22
transport interoperability
interoperability (3.1.23) where *information* (3.1.21) exchange uses an established communication infrastructure between the participating systems including between *components* (3.1.8) of an *IoT system* (3.2.15)

Note 1 to entry: The term "transport" does not refer to the transport layer of the OSI standard model.

[SOURCE: ISO/IEC 19941:2017, 3.1.3, modified – In the definition, "including between components of an IoT system" has been added. Note 1 to entry has been added.]

3.3 Digital twin specific terms

3.3.1
augmented reality
AR
virtual objects superimposed upon or composited with the real world

Note 1 to entry: Virtual and real-world objects co-exist in augmented reality systems.

[SOURCE: ISO/IEC 30173:–, 3.5.6]

3.3.2
control loop
<digital twin> feedback link between *digital entities* (3.1.13) and *target entities* (3.3.8) whereby the digital entity receives data from the target entity and issues back to the target entity data that are used to modify the behaviour of the target entity

Note 1 to entry: Control loops use engineering control methods for the purpose of automation, e.g. to keep the temperature on an engine under control of a certain limit.

[SOURCE: ISO/IEC 30173:–, 3.1.14]

3.3.3
digital representation
digital entity (3.1.13) representing either a set of properties or behaviours or both of one or more observable elements

[SOURCE: ISO/IEC 30173:–, 3.1.8]

3.3.4
digital twin
DTw
digital representation (3.3.3) of a *target entity* (3.3.8) with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization

Note 1 to entry: Digital twin has some or all of the capabilities of connection, integration, analysis, simulation, visualization, optimization, collaboration, etc.

Note 2 to entry: Digital twin can provide an integrated view throughout the life cycle of the target entity.

[SOURCE: ISO/IEC 30173:–, 3.1.1]

3.3.5
digital twin system
system providing functionalities for the *digital twin* (3.3.4) composed of inter-operating *target entities* (3.3.8), *digital entities* (3.1.13), data connections, and models, *data* (3.1.11) and *interfaces* (3.1.22) involved in the data connection process

[SOURCE: ISO/IEC 30173:–, 3.1.21]

3.3.6
simulation
use of a similar or equivalent system to imitate a real system, so that it behaves like or appears to be the real system

Note 1 to entry: Simulation serves the purpose of analysing the future behaviour of a system, i.e., making predictions, or the purpose of reasoning on the past behaviour in order to analyse failures. For performing simulations, a model is needed together with actualized sets of data and a platform able to execute the simulation.

[SOURCE: ISO/IEC 30173:–, 3.5.4]