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Introduction

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For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



JTC1-SC41/521/CD

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SECRETARIAT:

Korea, Republic of

SECRETARY:

Ms Jooran Lee

OF INTEREST TO THE FOLLOWING COMMITTEES:

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

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TITLE:

Internet of things – Interoperability for IoT systems – Part 5: Behavioural and policy interoperability

NOTE FROM TC/SC OFFICERS:

In accordance with SC 41 Resolution #569 (June 2025, Montreal), this document is submitted for CD consultation.

CONTENTS

FOREWORD	3
INTRODUCTION	4
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Symbols (and abbreviated terms)	7
5 Principles for behavioural and policy interoperability	7
5.1 General	7
5.2 Principle: digital representation based on information models	7
5.3 Principle: concept profiles	7
5.4 Principle: single source of truth	7
5.5 Principle: technology neutrality	8
5.6 Principle: behaviour models and policies	8
5.7 Principle: semantic interoperability in the IoT system lifecycle	8
6 Requirements for behavioural and policy interoperability	9
6.1 Requirements on behavioural interoperability	9
6.2 Requirements on policy interoperability	10
7 Framework for interoperability processes	11
7.1 Context for IoT and digital twin interoperability	11
7.1.1 Domain interoperability	11
7.1.2 Cross-domain interoperability	12
7.1.3 Interoperability impact assessment	12
7.1.4 Interoperability assurance	13
7.2 Interoperability work products	13
7.2.1 Concept profiles	13
7.2.2 Constraint profiles	14
7.2.3 Interoperability profiles	15
Annex A (informative) Examples of behavioural and policy interoperability	16
A.1 Example of digital twin interoperability	16
A.2 Example of security and privacy interoperability in health systems	17
A.3 Example of interoperability for AI powered drones	18
A.4 Example of interoperability for metaverse	20
Annex B (informative) Guidance on the interoperability framework	22
B.1 General concepts	22
B.2 Interoperability language	22
B.3 Interoperability points	23
B.4 Interoperability cases	23
B.5 Interoperability profiles	24
Annex C (informative) Declarative semantics as a single source of truth	26
C.1 Semantics	26
C.2 Defining rules	26
C.3 Defining use cases	26
C.4 Defining profiles	27
Bibliography	28
Figures	
Figure 1: Behaviour models and policies	8
Figure 2: Semantic interoperability to support behavioural and policy interoperability	9
Figure 3: Behavioural interoperability case	9
Figure 4: Policy interoperability case	11

54	Figure 5: Community assets for interoperability	11
55	Figure 6: Cross-cutting interoperability	12
56	Figure 7: Conceptual model of concept profiles	14
57	Figure 8: Concept profile management	14
58	Figure 9: Constraint profile	15
59	Figure 10: Integration of concept and constraint in interoperability	15
60	Figure B.1: Constructing interoperability	22
61	Figure B.2: Towards common artefacts	22
62	Figure B.3: Digital twin system interoperability point	23
63	Figure B.4: Data ecosystem interoperability point	23
64	Figure B.5: System of systems interoperability point	23
65	Figure B.6: Smart city interoperability point	23
66	Figure B.7: Example conceptual model for interoperability cases	24
67	Figure B.8: Profiles	24
68	Figure B.9: Models and ontologies in interoperability profiles	24
69	Figure B.10: Integration of consensus in interoperability (example of ontologies)	25
70		
71	Tables	
72	Table A.2: Example of behavioural and policy interoperability for digital twins	16
73	Table A.3: Example of behavioural and policy interoperability for security and privacy	17
74	Table A.4: Example of behavioural and policy interoperability for artificial intelligence	
75	powered drones	18
76	Table A.5: Example of behavioural and policy interoperability for metaverse	20
77		
78		

INTERNET OF THINGS (IOT) AND DIGITAL TWINS – BEHAVIOURAL AND POLICY INTEROPERABILITY

FOREWORD

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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 ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at <http://www.iec.ch/standardsdev/publications>.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

The National Committees are requested to note that for this document the stability date is 20XX..

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INTRODUCTION

Introduction

The use of the Internet of Things (IoT) is increasing every year, in application areas such as manufacturing, healthcare, smart homes and new cross-domain applications related to smart cities (e.g. water, energy, transport, or health).

Interoperability in this context, or *the ability for two or more systems or applications to exchange information and to mutually use the information that has been exchanged* is an essential capability. This includes interoperability both between different IoT systems and also among entities within an IoT system.

The set of ISO/IEC 21823 standards addresses issues that relate to interoperability of the communications between IoT systems entities.

- ISO/IEC 21823-1:2019 describes a general framework for interoperability of IoT systems. This includes a facet model for interoperability which includes 5 facets of interoperability (i.e. transport, syntactic, semantic, behavioural and policy).
- ISO/IEC 21823-2:2020 specifies a framework for the transport facet, to enable information exchange, peer-to-peer connectivity and seamless communication.
- ISO/IEC 21823-3:2021 specifies a framework for the semantic facet based on ontology-driven approaches, to ensure that a common interpretation of the underlying data information model is used. The framework covers both the IoT semantic interoperability process and the IoT semantic interoperability life cycle management.
- ISO/IEC 21823-4:2022 specifies a framework for the syntactic facet based on metamodel-driven approaches, to ensure that the information models' representing formats, structures, and grammar of their modelling languages such as a length of a data string, constraints on data types, and forbidden characters are commonly understood.

This document specifies interoperability covering both the behavioural and the policy facets:

- The behavioural facet provides a framework focusing on expected outcomes when an interaction operation takes place. The framework covers requirements on the process to define and ensure behaviour model(s) of the invoked IoT entity.
- The policy facet provides a framework to ensure that interoperating systems follow applicable regulatory and organizational. The framework covers requirements to defined and ensure conditions and control for use and access.

The increase of the use of the Internet of Things (IoT) also means that more complex systems or systems of systems are involved. For instance, individual IoT appliances for energy management could be integrated to an energy management system in a residential building. The building management system could itself be integrated to a smart grid application at a district level in a city.

To enable this, more and more IoT systems are developed using new architecture patterns:

- at the infrastructure level, e.g. an IoT, edge and cloud continuum,
- at the domain level, e.g., digital twins and digital threads,
- at the data processing, e.g., at a data space level.

Annex A of this document provides guidance on interoperability for such complex systems.

Behavioural and policy interoperability

1 Scope

This part of ISO/IEC 21823 specifies interoperability from a behavioural and policy viewpoint. In this document, the following specifications for interoperability from a policy and behavioural point of view are included:

- a principle of how to achieve behavioural and policy interoperability;
- requirements on information related to behavioural and policy interoperability, and
- a framework for processes on developing information exchange rules from a behavioural and policy viewpoint

2 Normative references

The following document is 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)

ISO/IEC 21823-3:2021 Internet of Things (IoT) - Interoperability for IoT systems - Part 3: Semantic interoperability.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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>

3.1

domain

field of special knowledge

[SOURCE: ISO 1087:2019, 3.1.4, note to entry removed]

3.2

concept

unit of knowledge created by a unique combination of characteristics

[SOURCE: ISO 1087:2019, 3.2.7, note to entry removed]

3.3

concept system

set of concepts (3.2) structured in one or more related domains (3.1) according to the concept relations among its concepts

[SOURCE: ISO 1087:2019, 3.2.28, note to entry removed]

3.4

concept profile

subset of a concept system (3.3) used in an interoperability profile

3.5**information model**

graphical and textual representation of entities and the relationships between them

Note 1 to entry: Can also be known as a data model, a conceptual data model, a logical data model, an entity relationship model, an object class diagram or a database definition.

[SOURCE ISO/IEC 19763-1:2023, 3.17]

3.6**constraint**

restriction on the values permitted for a given collection of data (3.7)

[ISO/IEC TR 10032:2003, 2.17, modified: article 'a' removed]

3.7**data**

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

[SOURCE: ISO/IEC 20924:2024, 3.1.11]

3.8**information**

data (3.7) that within a certain context has a particular meaning

[SOURCE: ISO/IEC 20924:2024, 3.1.21]

3.9**interoperability**

ability of two or more systems or applications to exchange information (3.7) and to mutually use the information (3.8) that has been exchanged

[SOURCE: ISO/IEC 20924:2024, 3.1.23]

3.10**interoperability case**

documented evidence that agreement has been achieved on an interoperability profile (3.12)

3.11**interoperability point**

position in entity of interest where interoperability (3.9) is needed between two components of this entity of interest

EXAMPLE Connection to an IoT device in a home

NOTE 1 to entry The two components are often developed by separate organisations

NOTE 2 to entry When an entity of interest is a system of systems, e.g. a smart grid infrastructure, interoperability points is needed between systems

3.12**interoperability profile**

single document referencing parts of interoperability (3.9) specifications

Note 1 to entry: Specifications include the interoperability facets (syntactic, transport, semantic, behaviour, policy)

3.13**interoperability plan**

planned arrangements for ensuring that interoperability (3.9) is adequately managed in an entity of interest

3.14**behavioural interoperability**

interoperability (3.9) so that the actual result achieves the expected outcome

[SOURCE: ISO/IEC 28123-1:2019, modified: notes are removed]

3.15**policy interoperability**

interoperability (3.9) while complying with the legal, organizational, and policy frameworks applicable to the participating systems

[SOURCE: ISO/IEC 28123-1:2019, modified: notes are removed]

4 Symbols (and abbreviated terms)

For the purpose of this document, the following abbreviations are applied.

CPS Cyber-Physical System

IoT Internet of Things

IT Information Technology

OT Operational Technology

SoS System of Systems

5 Principles for behavioural and policy interoperability**5.1 General**

Clause 5 lists the principles that are applied to achieve behavioural and policy interoperability.

5.2 Principle: digital representation based on information models

A digital representation based on information models is used to specify behavioural and policy interoperability specifications.

This enables the exchange between IoT systems of information on behaviour and policies,

Example: A data processing policy change is described using a standardized information model. The resulting description is digitally transmitted from a system to another system so that both can implement the policy change.

5.3 Principle: concept profiles

Behavioural and policy interoperability specifications are based on concept profiles, or subsets of the concept systems used to describe information models.

Concept profiles delimit the set of concepts that are used in a behavioural and policy interoperability specifications.

Example: A smart energy appliance behavioural and policy interoperability specifications uses a concept profile which is based on the underlying information model based on the IEC 61850 series [9] and on the SAREF for energy ontology [10].

5.4 Principle: single source of truth

A single digital representation of the behavioural and policy specification interoperability, or single source of truth is used as a reference.