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Information container for data drop - Exchange specification - Part 2: Dynamic semantics (ISO/DIS 21597-2:2018)

Organisation von Daten zu Bauwerken - Informationscontainer zur Datenübergabe (ICDD) - Teil 2: Dynamische Semantik (ISO/DIS 21597-2:2018)

Organisation de l'information concernant les travaux de construction - Conteneur d'information pour extraction de données (ICDD) - Partie 2: Titre manque (ISO/DIS 21597-2:2018)

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Information container for data drop — Exchange specification —

Part 2: Dynamic semantics

Titre manque —

Partie 2: Titre manque

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 13, *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM).*

ISO 21597 consists of the following parts, under the general title *Information Container for Data Drop – Exchange specification*:

— *Part 1: Container*

— *Part 2: Dynamic semantics*

Introduction

This document has been developed in response to the need of the Construction industry to handle multiple documents and structured data as one integrated information delivery.

In Part 1 of this standard, a specification is given for a container supporting the storage of documents, including the ability to add links between documents.

Part 2 adds the ability to include user-defined schemas (i.e. data models) that capture the semantics of, for example, national or organization-specific standards. This facilitates streamlined data exchange according to these schemas using linked data principles.

The ability to enrich the data contributes significantly to the value of the container, allowing the formalization of data exchanges in the construction sector. For example, users are enabled to specify information deliveries conform to internal standards.

Information container for data drop - Exchange specification - Part 2: Dynamic Semantics

1 Scope

This Part 2 of the ICDD standard adds functionality to the container format specified in Part 1. Part 1 defines a generic container format to store documents using various formats and structure and the ability to provide links between documents or between referable subsets of these documents (documents and datasets are the payload of the container). Building on that foundation, Part 2 of this standard adds the possibility of adding more semantic (meaningful) information to the contents of the container, as well as to the links between pieces of information in the container using Linked Open Data technology.

This standard does not prescribe the structure or format of the documents in the payload.

This standard is suitable for industry sectors such as the built environment, where many different standards are used, where there is a mixture of digital representations of proposed or existing built and natural assets (in open or proprietary formats), requiring the use of legacy systems and the application of different classification systems. This part adds the ability to link, in a semantic and meaningful way, those islands of data represented using different formats and structure. This standard is not meant to replace other standards such as ISO 16739 which is recognized as the standard for describing building objects.

This standard provides two conformance classes. Both conformance classes open the ability to specialize the container for use cases not otherwise handled.

In Conformance Class A, the container format of Part 1 is expanded with an ontology dynamic semantics, providing basic support for creating an information model that captures the required semantics of project, organization or sector standards and agreements. By doing so, it provides building blocks that make it easier to link different sources of information. This is achieved by introducing support for typed entities, typed entity properties and typed relationships between those entities (such as the relationship between an assembly and its parts or between a physical entity and its associated requirements). There is also support for defining provenance, versioning and creating libraries.

In Conformance Class B, the user is offered complete freedom to add user defined ontologies to the container, with the sole condition that it is expressed in RDF/OWL.

The use cases are in line with those of Part 1, but may include numerous extensions. The following list gives some examples:

1. Make use of asset type libraries describing the required properties per asset type
2. Link to a specific classification system, e.g. CoClass, Uniclass or OmniClass™
3. Add the ability for exchanging systems engineering information
4. Link to product requirement libraries
5. Add semantic links (i.e. meaningful links) to and between information provided using existing standards like PLCS, IFC and GML
6. Link to an ontology for Units and Measures, like QUDT
7. Link to one or more Product Catalogues

Since this standard capitalizes on Linked Open Data technology, the header file, along with any additional RDF/OWL files, forms a suite that may be directly queried by software using standard techniques such as SPARQL.

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 21320-1:2015, Information technology — Document Container File — Part 1: Core
http://standards.iso.org/ittf/PubliclyAvailableStandards/index.html

ISO 6707-1, Buildings and civil engineering works — Vocabulary — Part 1: General terms

W3C RDF standard, Recource Description Framework,
https://www.w3.org/standards/techs/rdf#w3c_all

RDF Schema 1.1 - W3C Recommendation 25 February 2014
https://www.w3.org/TR/rdf-schema/

W3C OWL, Web Ontology Language, https://www.w3.org/TR/2012/REC-owl2-syntax-20121211/

W3C XML, Schema Part 2: Datatypes, http://www.w3.org/TR/xmlschema-2/

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

In addition to the terms and definitions given in ISO 21597-1, for the purposes of this document, the following general terms and definitions apply.

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

- ISO Online browsing platform: available at http://www.iso.org/obp

- IEC Electropedia: available at http://www.electropedia.org/.

3.1.1
dynamic semantics ontology
RDF/OWL file providing the object classes and properties that shall be used to specify a user-defined ontology (UDO) that complies with Conformance Class A in this standard

3.1.2
entity
physical, digital, conceptual, or other kind of thing (either real or imaginary) with some fixed aspects

3.1.3
information model
formal model of a bounded set of facts, concepts or instructions to meet a specified requirement

3.1.4
property
named value denoting a characteristic of an entity that has semantic impact

3.1.5
relation
nature of how two entities affect each other including dependencies

3.1.6
user-defined ontology
ontology that adds more semantic (meaningful) information to the contents of the container

3.2 Abbreviated Terms

In addition to the abbreviated terms given in ISO 21597-1, for the purposes of this document, the following abbreviated terms are used to part.

UDO	User-Defined Ontology
QUDT	Quantities, Units, Dimensions and Data Types
PLCS	Product Life Cycle Support

4 Specifications

4.1 Use of RDF, RDFS and OWL constructs

The ontologies specified in this standard use the languages RDF [https://www.w3.org/RDF/], RDFS [https://www.w3.org/TR/rdf-schema/] and OWL [https://www.w3.org/OWL/].

NOTE: It is expected that RDF/OWL will be an important technology and a general platform for Ontologies for the coming decades. Proprietary systems will increasingly adopt RDF/OWL.

In general, when used in the context of the world wide web, these languages use the following principles to support reasoning:

- Open world assumption - the truth of a statement is independent of whether it is known. In other words, not knowing that a statement is explicitly true does not imply that the statement is false;
- No unique names assumption - unless explicitly stated otherwise, it cannot be assumed that resources that are identified by different URIs are different.

The datasets that comply with the ontologies specified in this standard shall use the following interpretation of RDF, RDFS and OWL:

- Closed world assumption - a statement that is true is also known to be true; therefore, conversely, what is not formally specified in a container to be true, is false;
- Unique naming assumption - resources in a container that are identified with different URIs are considered to be different, unless explicitly declared as the same (using the *owl:sameAs* predicate).

Table 1 in ISO 21597-1 (section 4.1) lists the RDF/OWL constructs that are used in this standard and the interpretation to be used when validating the contents of a container. It is noted that, once the content of the container has been validated, the data can be used in an open world context.

4.2 Symbols and notation

Throughout this standard, the structure of the ontologies is illustrated using a UML notation as described in ISO 21597-1 (section 4.2).

In addition to the namespaces listed in ISO 21597-1, Table 1 lists the namespaces and corresponding prefixes used in this standard.

Table 1 - Namespaces and prefixes used in ontologies defined in this standard

Ontology	Prefix	Namespace
Container ontology	ds	http://www.iso-icdd.org/part2/2019/DynamicSemantics
QUDT ontology	qudt	http://qudt.org/schema/qudt

4.3 Conformance classes

This standard distinguishes two conformance classes, A and B. Both conformance classes offer the possibility to add more semantics to the contents of the container by means of the addition of user-defined ontologies (UDOs).

In Conformance Class A, the container format of Part 1 is expanded with an ontology named DynamicSemantics.rdf. Any UDO added to the container shall be an extension based on DynamicSemantics.rdf, meaning that any additional class or property shall be a subclass or subproperty of the classes and properties defined in that ontology. A few examples of such extensions are provided in Annex B.

In Conformance Class B, any UDO may be added to the container. There is no requirement to use the dynamic semantics ontology. The sole condition is that UDOs shall be expressed in RDF/OWL.

See chapter 5 for the detailed requirements of both conformance classes.

4.4 Container structure

The structure of the container shall be the same as that of a Part 1 container. Figure 1 shows the minimum structure of the root of a container.

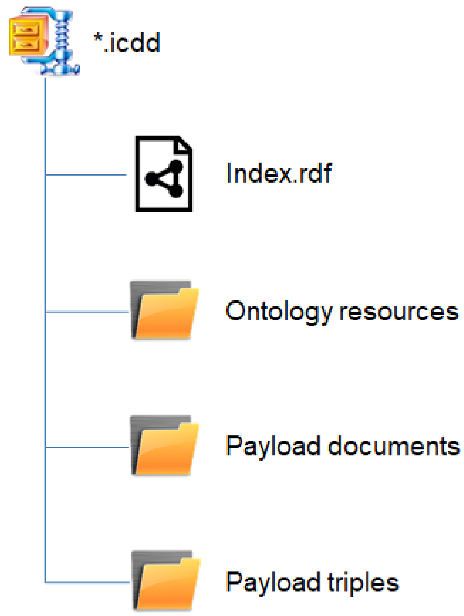

Figure 1 - Minimum structure of the root of a container

In Conformance Class A, the container format of Part 1 is expanded with an ontology named DynamicSemantics.rdf. It shall be included in the 'Ontology resources' folder. Users may also add user defined ontologies (UDOs) that are extensions of DynamicSemantics.rdf.

In Conformance Class B, the DynamicSemantics.rdf ontology may be present in the 'Ontology resources' folder but is not required.

For both conformance classes, UDOs shall be stored in the 'Ontology resources' folder.

Figure 2 shows the minimum content of the 'Ontology resources' folder of a Part 2 container in Conformance Class A.

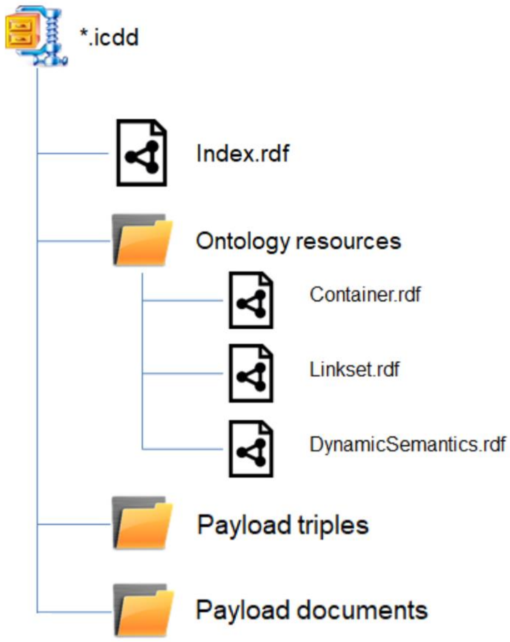

Figure 2 - Minimum content of the Ontology resources folder for Conformance Class A

4.5 Dynamic semantics ontology

4.5.1 Overview

For Conformance Class A, the container format of Part 1 is expanded with an ontology named DynamicSemantics.rdf. It provides a few basic classes and properties that are very common for the construction domain. In this way, a foundation is provided for semantic interoperability among extensions.

Table 2 provides an overview and rationale for the contents of DynamicSematics.rdf.