SLOVENSKI STANDARD
oSIST prEN ISO 21597-1:2018

01-november-2018

Informacijski vsebnik za izročitev podatkov - Specifikacija za izmenjavo - 1. del: Vsebnik (ISO/DIS 21597-1:2018)

Information container for data drop - Exchange specificaton - Part 1: Container (ISO/DIS 21597-1:2018)

Organisation von Daten zu Bauwerken - Informationscontainer zur Datenübergabe (ICDD) - Teil 1: Container (ISO/DIS 21597-1:2018)

Organisation de l'information concernant les travaux de construction -- Conteneur d'information pour extraction de données (ICDD) -- Partie 1: Titre manque (ISO/DIS 21597-1:2018)

Ta slovenski standard je istoveten z: **prEN ISO 21597-1**

<u>ICS:</u>

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
91.010.01	Gradbeništvo na splošno	Construction industry in general

oSIST prEN ISO 21597-1:2018 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 21597-1

ISO/TC **59**/SC **13**

Secretariat: **SN**

Voting begins on:
2018-09-07

Voting terminates on:
2018-11-30

Information container for data drop — Exchange specificaton —

Part 1:
Container

Titre manque —

Partie 1: Titre manque

ICS: 35.240.67; 91.010.01

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 21597-1:2018(E)

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Published in Switzerland

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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).

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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 infromation 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 standard has been developed in response to the need of the construction industry to handle multiple documents as one information delivery or data drop.

Information deliveries are often a combination of drawings, information models (representing built or natural assets in the physical world), text documents, spreadsheets, etc. The ability to specify relationships between information elements in those separate documents can contribute significantly to the value of a data drop. The composition of such a package arises both from the requirements in the process, e.g. delivery of as-built information, and from the specific functional purpose e.g. performing a quantity take-off or communication about issues in 3D models.

This standard provides a specification for an information container. It enables a uniform approach to the way information is organised in data drops, providing a means to create semantic links between concepts in separate documents; it also provides a basis for additional functionality that allows a container to be customised for a given purpose, facilitating innovative software development that that still conforms to the standard.

In Part 1 of this standard, a specification is given for a container that stores documents, along with a means of linking otherwise disconnected data within those documents.

Information container for data drop - Exchange specification - Part 1: Container

1 Scope

This standard defines a generic container format to store a delivered set of documents, including a means to link otherwise disconnected data. In this context, the term document refers to any digital resource that provides information about the built or natural environment, including, but not limited to, any 2D or 3D representation or model, spreadsheet, image or text-based digital resource.

This standard is suitable for all parties dealing with information concerning the built environment, where there is a need to exchange multiple documents and their interrelationships, either as part of the process or as contracted deliverables. The format is intended to use resources either included in the container (such as documents) or referenced remotely (such as web resources). A key feature is that the container can include information about the relationships between the documents. Relevant use-cases reflect the need for information exchange during the entire life cycle of any built asset and may include, but is not limited to, the handover of

1. a published bidding package,
2. required project deliverables at a specific project stage,
3. shared information as background or for further development, or
4. published approval packages.

The container format includes a header file and optional link files that define relationships by including references to the documents, or to elements within them. The header file uniquely identifies the container and its contractual or collaborative intention. This information is defined using the RDF and OWL semantic web standards.

The header file, along with any additional RDF/OWL files or resources, forms a suite that may be directly queried by software. Where it includes link references into the content of documents that don't support standardized querying mechanisms, their resolution may depend on third party interpreters. Alternatively, the link references may be interpreted by the recipient applications, or reviewed interactively by the recipient.

The format can also be used to deliver multiple versions of the same document with the ability to convey the known differences or priority between them.

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, Resource 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

For the purpose 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 http://www.iso.org/obp

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

3.1.1
class
group of resources (either an IRI or a literal) having the same characteristics

3.1.2
container
file that conforms to this standard

3.1.3
container ontology
RDF/OWL file providing the object classes and properties that shall be used to specify the contents of a container

3.1.4
dataset
RDF/OWL file that contains individuals that comply with the classes as specified by the ontologies in the Ontology resources folder

3.1.5
datatype property
OWL property that can relate individuals to literals (e.g. strings, numbers, date types, etc.)

3.1.6
document
fixed and structured amount of information that can be managed and interchanged as a unit between users and systems

Note 1 to entry: This unit may not necessarily be human perceptible. Information is usually stored on a data medium.

Note 2 to entry: Used in this standard to refer to any document that forms part of the payload in the container, including any 2D or 3D models that represent built or natural assets in the physical world; these may be held in any standard or proprietary format.

3.1.7
external document
document located outside the container

3.1.8
index dataset
RDF/OWL file containing an index of the contents of the container

3.1.9
individual
resource that has been placed into an RDF class as an instance of that class

Note to entry: like RDF classes, every OWL class is associated with a set of individuals, called the class extension; the individuals in the class extension are the instances of the class.

[SOURCE: https://www.w3.org/TR/owl-ref/]

3.1.10
internal document
document located within the container

3.1.11
link
relation between documents, including between elements in documents

3.1.12
link dataset
RDF/OWL file containing links as defined in this standard

3.1.13
linkset ontology
RDF/OWL file providing the object classes and properties that shall be used to specify links between documents in a container

3.1.14
namespace
group of identifiers for elements and attributes that are collectively bound to a URI such that their use will not cause naming conflicts

3.1.15
object
resource (either an IRI or a literal) assigned as the specified property of the subject in a triple

Note to entry: This term, as used in this standard, is part of the RDF/OWL vocabulary, where each triple consists of a subject, a predicate and an object; a set of such triples is called an RDF graph.

3.1.16
object property
OWL property that links individuals to other individuals

3.1.17
ontology
specification of concrete or abstract things, and the relationships among them, in a prescribed domain of knowledge

Note to entry: The specification should be computer processable.

[ISO/IEC 19763-3:2010, 3.1.1.1]

3.1.18
payload
primary information (in the form of documents and datasets) that is included within the container

Note to entry: this does not include the header file (Index.rdf) or the ontology resource files.

3.1.19
predicate
denotes the relationship between a subject and and an object in an RDF triple, also called a property.

3.1.20
serialisation
file in a particular format that encodes an ontology or dataset

3.1.21
subject
resource (either an IRI or a literal) about which a statement is made in the form of an RDF triple

Note to entry: This term, as used in this standard, is part of the RDF/OWL vocabulary, where each triple consists of a subject, a predicate and an object; a set of such triples is called an RDF graph.

3.1.22
triple
statement in the form subject-predicate-object that expresses a relationship between two resources

3.2 Abbreviated Terms

The following abbreviated terms are used in this document:

DBF	DataBase File
GIS	Geographic Information System
GML	Geography Markup Language
GUID	Globally Unique Identifier
ICDD	Information Container for Data Drop
IFC	Industry Foundation Classes
IRI*	Internationalized Resource Identifier
OWL	Web Ontology Language
RDF	Resource Description Framework
RDFS	Resource Description Framework Schema
SHACL	Shapes Constraint Language
SPARQL	SPARQL Protocol And RDF Query Language
SQL	Structured Query Language

UML	Unified Modeling Language
URI*	Uniform Resource Identifier
URL	Uniform Resource Locator
W3C	World Wide Web Consortium
XML	eXtensible Markup Language
XSD	XML Schema Definition
XSLT	Extensible Stylesheet Language Transformations

NOTE: * IRI is an update of the URI released in 2005. URIs are limited to a subset of the ASCII character. IRIs may contain characters from the Universal Character Set (Unicode/ISO 10646). In this document URIs and IRIs are both used interchangeably with restrict to the above.

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 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.

Table 1 - Listing of constructs used in this standard and their interpretation

Construct	Interpretation
owl:Class	In a dataset within a container, class membership for every individual shall be explicitly asserted, unless implicitly inferred using predicates such as *rdfs:subClassOf* or *owl:equivalentClass*.
rdfs:subClassOf *rdfs:subPropertyOf*	This standard does not deviate from the W3C definitions (https://www.w3.org/TR/rdf-schema/). Statements that may be inferred due to *rdfs:subClassOf* or *rdfs:subPropertyOf* statements shall be regarded as true even if not explicitly asserted. NOTE: statements where a class is mentioned are also true for any of its subclasses. Similarly, statements where a property is mentioned are also true for any of its sub properties.
rdfs:subClassOf [	Within the context of a container, this

rdf:type owl:Class ; owl:unionOf (:X :Y) ;]	construct is interpreted as a restriction, making that class abstract, meaning that any individual of this class must be a member of at least one of the classes listed in the *owl:unionOf* predicate. Where appropriate, this is used in conjunction with the *owl:disjointWith* predicate to force the individual to belong to only one of the classes listed in the *owl:unionOf* predicate.
owl:FunctionalProperty	This standard interprets *owl:FunctionalProperty* as a property with a maximum cardinality of 1
owl:equivalentClass	This standard does not deviate from the W3C definitions (https://www.w3.org/TR/owl-ref) . Statements that may be inferred due to *owl:equivalentClass* statements shall be regarded as true even if not explicitly asserted.
owl:disjointWith	This standard does not deviate from the original definition. Since the property is symmetric it is valid in both directions even if only one direction is asserted in an ontology. An individual that is a member of several classes that are disjoint is invalid.
rdfs:range, rdfs:domain	These statements shall be interpreted as restrictions. It is invalid to have a subject or object of a statement (triple) in a dataset were that individual is a member of a class that does not comply with the *rdfs:range* or *rdfs:domain* declarations of the corresponding *owl:ObjectProperty* or *owl:DatatypeProperty*.
owl:restriction *owl:onProperty* *owl:allValuesFrom* *owl:someValuesFrom* *owl:hasValue* *owl:cardinality* *owl:minCardinality* *owl:maxCardinality*	These statements shall be interpreted as restrictions. Any deviation from the specified restriction within a single container is considered invalid. NOTE: as an example, if *owl:cardinality* is defined as 2, then a dataset that does not contain exactly 2 occurences is not valid.
owl:inverseOf	This standard does not deviate from the original definition. It is recommended that inverse properties are not asserted for individuals in a dataset. If they are asserted, they shall not contradict the assertions made in the opposite direction.