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Document description and processing languages — Office Open XML file formats —

Part 2: Open packaging conventions

*Description des documents et langages de traitement — Formats de fichier "Office Open XML" —
Partie 2: Conventions de paquetage ouvert*

ICS: 35.060; 35.240.30

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 29500-2 was prepared by ISO/IEC JTC 1, Information technology, Subcommittee SC 34, Document description and processing languages.

This fourth edition cancels and replaces the third edition (ISO/IEC 29500-2:2012). This fourth edition preserves all previous functionality and adds no new functionality.

The major changes from the previous edition included:

- The clause for conformance ([Clause 6](#) in the preceding editions) was made [Clause 2](#), as instructed by ISO/IEC Directives Part 2.
- [Clause 3](#) (Terms and definitions) was revised by removing terms not used by any normative clauses and then reorganizing terms into groups.
- The subclause for diagram notes (§5.1 in the preceding editions) was removed, since core properties are now defined by prose and schemas rather than by diagrams.
- The clause for acronyms and abbreviations ([Clause 6](#) in the preceding editions) was removed, since it does not make sense for an ISO/IEC standard to define "ISO" and "IEC".
- [Clause 8](#) (Abstract package model) has been completely rewritten. In particular, (1) pack IRIs are defined in this clause rather than in an annex, (2) a new subclause, "Resolving relative references", was added; (3) part Relationship parts and package Relationship parts are distinguished; and (4) base IRIs are clearly defined.
- Removed the option for media type to be an empty string, as this conflicts with the definition of media type in RFC 2046 and the existing regular expression defined in the schema referenced by [C.2](#).
- [Clause 9](#) (Physical package model) has been slightly revised. Interleaving is introduced before logical item names. Percent-encoding and un-percent encoding of non-ASCII characters are explicitly introduced in [Subclause 9.3](#).
- [Clause 10](#) (Core properties) has been rewritten by using prose and schemas rather than diagrams.
- Clause 12 (Digital signatures) has been thoroughly revised. In particular, this clause now makes clear a convention for the choice of algorithms for signature and digest methods, which reflects the ongoing development of algorithms since the first edition of this document.
- [Annex A](#) has been made informative.

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- The normative annex that defined pack IRIs ([Annex B](#) in the preceding editions) has been dropped. Pack IRIs are now defined in [Clause 8](#).
- [Annexes C](#) and [D](#) (in the preceding editions, [Annexes D](#) and [E](#)) no longer define schemas but reference externally defined schemas.
- Guidelines for meeting conformance requirements ([Annex H](#) in the preceding editions) has been dropped.
- Dropped requirements around streaming consumption.
- Wherever possible, requirements on programs are rewritten as those on data.
- [Annex H](#) has been added to depict an example package.
- The Index ([Annex J](#) in the preceding editions) has been deleted.
- Bibliography has been added.

ISO/IEC 29500 consists of the following parts, under the general title *Information technology — Document description and processing languages — Office Open XML File Formats*:

- *Part 1: Fundamentals and Markup Language Reference*
- *Part 2: Open Packaging Conventions*
- *Part 3: Markup Compatibility and Extensibility*
- *Part 4: Transitional Migration Features*

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Introduction

ISO/IEC 29500 specifies a family of XML schemas, collectively called *Office Open XML*, which define the XML vocabularies for word-processing, spreadsheet, and presentation documents, as well as the packaging of documents that conform to these schemas.

The goal is to enable the implementation of the Office Open XML formats by the widest set of tools and platforms, fostering interoperability across office productivity applications and line-of-business systems, as well as to support and strengthen document archival and preservation, all in a way that is fully compatible with the existing corpus of Microsoft® Office documents.

This document includes two annexes ([Annex C](#) and [Annex D](#)) that refer to data files provided in electronic form.

The document representation formats defined by this document are different from the formats defined in the corresponding Part of ECMA-376:2006. Some of the differences are reflected in schema changes, as shown in [Annex G](#) of this document.

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Document description and processing languages — Office Open XML file formats —

Part 2: Open packaging conventions

1 Scope

This document defines a set of conventions for packaging one or more interrelated byte streams (parts) as a single resource (package). These conventions are applicable not only to Office Open XML specifications as described in Parts 1 and 4 of ISO/IEC 29500, but also to other markup specifications.

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.

FIPS 186-4, *Digital Signature Standard (DSS)*, July 2013

ISO/IEC 29500-3, *Information technology — Document description and processing languages — Office Open XML File Formats, Part 3: Markup Compatibility and Extensibility*

ISO 15836-1, *Information and documentation — The Dublin Core metadata element set — Part 1: Core elements*

ISO 15836-2, *Information and documentation — The Dublin Core metadata element set — Part 2: DCMI Properties and classes*

NIST SP 800-56A Rev. 3, *Recommendation for Pair-Wise Key-Establishment Schemes Using Discrete Logarithm Cryptography*, April 2018

RFC 2046, *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*, The Internet Society, November 1996, N. Freed and N. Borenstein, 1996, <https://www.rfc-editor.org/info/rfc2046>

RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, The Internet Society, January 2005, Berners-Lee, T., R. Fielding, and L. Masinter, 2005, <https://www.rfc-editor.org/info/rfc3986>

RFC 3987, *Internationalized Resource Identifiers (IRIs)*, The Internet Society, January 2005, Duerst, M. and M. Suignard, 2005, <https://www.rfc-editor.org/info/rfc3987>

RFC 5234, *Augmented BNF for Syntax Specifications: ABNF*, The Internet Society, January 2008, D. Crocker and P. Overell, (editors), 2008, <https://www.rfc-editor.org/info/rfc5234>

RFC 6931, *Additional XML Security Uniform Resource Identifiers (URIs)*, The Internet Society, April 2013, D. Eastlake 3rd, <https://www.rfc-editor.org/info/rfc6931>

RFC 7231, *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content*, The Internet Society, June 2014, R. Fielding and J. Reschke, 2014, <https://www.rfc-editor.org/info/rfc7231>

Unicode, *The Unicode Standard*, The Unicode Consortium, <http://www.unicode.org/standard/standard.html>

XML, Extensible Markup Language (XML) 1.0, Fourth Edition. World Wide Web Consortium, 2006, Tim Bray, Jean Paoli, Eve Maler, C. M. Sperberg-McQueen, and François Yergeau (editors). <http://www.w3.org/TR/2006/REC-xml-20060816/>¹⁾

XML Namespaces, Namespaces in XML 1.0 (Third Edition), 8 December 2009. World Wide Web Consortium Tim Bray, Dave Hollander, Andrew Layman, and Richard Tobin (editors). <http://www.w3.org/TR/2009/REC-xml-names-20091208/>

XML Base, W3C Recommendation, 28 January 2009. <https://www.w3.org/TR/2009/REC-xmlbase-20090128/>

XML Schema Part 1: Structures, W3C Recommendation, 28 October 2004. <https://www.w3.org/TR/xmlschema-1/>

XML Schema Part 2: Datatypes, W3C Recommendation, 28 October 2004. <https://www.w3.org/TR/xmlschema-2/>

XML-Signature Syntax and Processing, W3C Recommendation, 12 February 2002. <http://www.w3.org/TR/2002/REC-xmlsig-core-20020212/>

ZIP File Format Specification from PKWARE, Inc. version 6.2.0 (2004), as specified in http://www.pkware.com/documents/APPNOTE/APPNOTE_6.2.0.txt, hereinafter referred to as “ZIP Appnote”²⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in RFC 2046, RFC 3986, and the following apply.

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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>
<https://standards.iteh.ai/catalog/standards/sist/762cc660f-e316-41d5-9b8e-bbb7d367d544/iso-iec-dis-29500-2>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 Basics

3.1.1

byte

sequence of 8 bits treated as a unit

3.1.2

stream

linearly ordered sequence of bytes

3.1.3

behavior

external appearance or action

3.1.4

behavior, application-defined

behavior, implementation-defined

unspecified behavior where each implementation shall document that behavior, thereby promoting predictability and reproducibility within any given implementation

1) Implementers should be aware that a further correction of the normative reference to XML to refer to the 5th Edition will be necessary when the related Reference Specifications to which this International Standard also makes normative reference, and which also depend upon XML, such as XSLT, XML Namespaces and XML Base, are all aligned with the 5th Edition.

2) The supported compression algorithm is inferred from various tables in Annex B.

3.1.5**behavior, unspecified**

behavior where this document imposes no requirements

3.2 Abstract package model**3.2.1****part**

stream with a name, a MIME media type and associated common properties

3.2.2**package, abstract**

logical entity that holds a collection of parts and relationships

3.2.3**relationship**

package relationship or part relationship

3.2.4**relationship, package**

connection from a package to a specific part in the same package, or to an external resource

3.2.5**relationship, part**

connection from a part in a package to another part in the same package, or to an external resource

3.2.6**source**

part or package from which a connection is established by a relationship

3.2.7**target**

part or external resource to which a connection is established by a relationship

3.2.8**relationship type**

absolute IRI for specifying the role of a relationship

3.2.9**Relationships part**

part containing an XML representation of relationships

3.2.10**package model, abstract**

abstract model that defines abstract packages

3.2.11**growth hint**

suggested number of bytes to reserve for a part to grow in place

3.2.12**pack scheme**

URI scheme that allows IRIs to be used as a uniform mechanism for addressing parts within a package

3.2.13**pack IRI**

IRI that conforms to the pack scheme

3.2.14**part name**

string that uniquely identifies a part within a package

3.2.15

relationship identifier

string that consists of XML name characters and uniquely identifies a relationship among those from the same source

3.2.16

target mode

mode of resolution of relative references to targets

3.3 Physical package model

3.3.1

physical format

specific file format, or other persistence or transport mechanism

3.3.2

physical package

result of mapping an abstract package to a physical format

3.3.3

physical package model

pair of a physical format and a mapping between the abstract package model and that physical format

3.3.4

piece

portion of a part

3.3.5

logical item

non-interleaved part, a non-interleaved Media Types stream, a piece of an interleaved part, or a piece of an interleaved Media Types stream

3.3.6

physical package item

atomic set of data in a physical package

3.3.7

ZIP item

atomic set of data in a ZIP file that becomes a file when the archive is uncompressed

3.3.8

ZIP file

ZIP file as defined in the ZIP file format specification

3.3.9

simple ordering

defined ordering for laying out the parts in a package in which all the bits comprising each part are stored contiguously

3.3.10

interleaved ordering

defined ordering for laying out the parts in a package in which parts are broken into pieces and “mixed-in” with pieces from other parts

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3.4 Digital signature and thumbnail

3.4.1

signature policy

application-defined policy that specifies what configuration of parts and relationships shall or might be included in a signature and what additional behaviors are required for generating and validating signatures following that signature policy

3.4.2

thumbnail

small image that is a graphical representation of a part or the package as a whole

3.5 Implementations

3.5.1

package implementer

software that implements physical input-output operations on a package according to the requirements and recommendations of this document

4 Notational conventions

The following typographical conventions are used in ISO/IEC 29500:

- a) The first occurrence of a new term not defined in §3 is written in italics.
- b) The tag name of an XML element is written using a distinct style and typeface, as in “The bookmarkStart and bookmarkEnd elements specify ...”
- c) The name of an XML attribute is written using a distinct style and typeface, as in “The dropCap attribute specifies ...”
- d) The value of an XML attribute is written using a constant-width style, as in “The attribute value of auto specifies ...”
- e) The qualified or unqualified name of a simple type, complex type, or base datatype is written using a distinct style and typeface, as in “The possible values for this attribute are defined by the ST_HexColor simple type.”

5 Conformance

A package is of conformance class OPC if it obeys all syntactic constraints specified in this document.

OPC conformance is purely syntactic.

6 Overview

This document describes an abstract package model (§7) and a physical package model (§8) for the use of XML, Unicode, ZIP, and other relevant technologies and specifications to organize the content and resources of a document within a package. The package structure is intended to support the organization of constituent resources for various applications and categories of content. An example package is shown in [Annex H](#).

The abstract package model is a package abstraction that holds a collection of parts and relationships. The parts are composed, processed, and persisted according to a set of rules. Parts can have relationships to other parts or external resources, and the package as a whole can have relationships to parts it contains or to external resources. Parts have MIME media types and are uniquely identified using the well-defined naming rules provided in this document.

The physical package model defines the mapping of the components of the abstract package model to the features of a specific physical format, namely a ZIP file.

This document also describes certain features that might be supported in a package, including *core properties* for package metadata, a thumbnail for graphical representation of a package, and *digital signatures* of package contents. Because this document might evolve, packages are designed to accommodate extensions and to support compatibility goals in a limited way. The versioning and extensibility mechanisms described in ISO/IEC 29500-3 support compatibility between software systems based on different versions of this document while allowing package creators to make use of new or proprietary features.

This document specifies requirements for packages. Conformance requirements are identified throughout this document. A formal conformance statement is given in §5.

7 Abstract package model

7.1 General

This clause introduces abstract packages in terms of parts (§7.2) and relationships (§7.5). It also introduces the pack scheme (§7.3.2).

The purpose of an abstract package is to aggregate constituent components of a document (or other type of content) into a single object. For example, an abstract package holding a document with a picture might contain an XML markup part representing the text of the document and another part representing the picture.

An example abstract package is shown in [H.2](#).

7.2 Parts

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7.2.1 General

A part is analogous to a file in a file system or to a resource on an HTTP server.

7.2.2 Part names

7.2.2.1 General

A part shall have a part name, which shall uniquely identify a part within an abstract package.

7.2.2.2 Syntax

A part name shall be a Unicode string that matches the following production rules in the ABNF syntax defined in RFC 5234

```
part_name = 1*( "/" isegment-nz )
isegment-nz = <isegment-nz, see RFC3987, Section 2.2>
```

and that further satisfies the constraints listed below, where an I18N segment is a Unicode string that matches the non-terminal `isegment-nz` and percent-encoding represents a character by the percent character "%" followed by two hexadecimal digits, as specified in RFC 3986

- No I18N segments shall contain percent-encoded forward slash ("/"), or backward slash ("\") characters.
- No I18N segments shall contain percent-encoded characters that match the non-terminal `iunreserved` in RFC 3987.
- No I18N segments shall end with a dot (".") character.

The part name “/_rels/.rels” shall be reserved (§7.5.2.2). Part names in which the second-to-last I18N segment is equivalent to ‘_rels’ and the final segment is equivalent to any string ending with ‘.rels’ shall be reserved (§7.5.2.3).

[Example: The part name “/hello/world/doc.xml” contains three path segments, namely, “hello”, “world”, and “doc.xml”. end example]

[Example: The part name “/é” contains a path segment “é” where é is 'LATIN SMALL LETTER E WITH ACUTE' (U+00E9). end example]

[Note: Path segments are not explicitly represented as folders in the abstract package model, and no directory of folders exists in the abstract package model. end note]

A package implementer is not required to support non-ASCII part names, although doing so is recommended.

7.2.2.3 Part name equivalence and integrity in an abstract package

Equivalence of part names shall be determined by ASCII case-insensitive matching. Such matching compares a sequence of code points as if all ASCII code points in the range 0x41–0x5A (A–Z) were mapped to the corresponding code points in the range 0x61–0x7A (a–z). See [1].

The names of two different parts within an abstract package shall not be equivalent.

[Example: If an abstract package contains a part named “/a”, the name of another part in that abstract package must not be “/a” or “/A”. end example]

For each part name N and string S, let the result of concatenating N, the forward slash, and S be denoted by N[S]. A part name N1 is said to be *derivable* from another part name N2 if, for some string S, N1 is equivalent to N2[S].

[Example: “/a/b” is derivable from “/a” where N is “/a” and S is “b”. end example]

The name of a part shall not be derivable from the name of another part.

[Example: Suppose that an abstract package contains a part named “/segment1/segment2/.../segmentn”. For it not to be derivable, other parts in that abstract package must not have names such as “/segment1”, “/SEGMENT1”, “/segment1/segment2”, “/segment1/SEGMENT2”, or “/segment1/segment2/.../segmentn-1”. end example]

This subclause further introduces recommendations, so that Unicode Normalization Form C (NFC) and Unicode Normalization Form D (NFD) of part names do not cause part-name collisions. [Note: Some implementations of directory structures always apply NFD normalization. end note]

The application of NFC or NFD normalization to the names of two different parts within an abstract package should not yield equivalent strings.

[Example: If an abstract package contains a part named “/é”, where é is 'LATIN SMALL LETTER E' (U+0065) followed by 'COMBINING ACUTE ACCENT' (U+0301), the name of another part in that abstract package should not be “/é”, where é is 'LATIN SMALL LETTER E WITH ACUTE' (U+00E9), or “/É”, where É is 'LATIN CAPITAL LETTER E WITH ACUTE' (U+00C9). end example]

[Example: If an abstract package contains a part named “/Å”, where Å is 'ANGSTROM SIGN' (U+212B), the name of another part in that abstract package should not be “/Å” where Å is 'LATIN CAPITAL LETTER A WITH RING ABOVE' (U+00C5) because U+212B and U+00C5 are normalized to the same character sequence. end example]

A part name N1 is said to be *weakly derivable* from another part name N2 if, for some string S, the result of applying NFC or NFD to N1 is equivalent to the result of applying NFC or NFD to N2[S].

[Example: Consider a part name “/é”, where é is 'LATIN SMALL LETTER E WITH ACUTE' (U+00E9). Another part name “/é/a”, where é is 'LATIN SMALL LETTER E' (U+0065) followed by 'COMBINING