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Geographic information — Preservation of digital data and metadata —

Part 1: **Fundamentals**

Information géographique — Archivage des données numériques et des métadonnées —

Partie 1: Principes fondamentaux

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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Abbreviated terms and conventions ... **8**
4.1 Abbreviated terms ... 8
4.2 Conventions ... 8
5 Conformance ... **9**
6 Preservation ... **9**
6.1 Prioritization ... 9
6.2 Structure ... 9
6.2.1 Data format ... 9
6.2.2 Data structures ... 10
6.2.3 Software and algorithms ... 10
6.2.4 Properties of geospatial data ... 10
6.2.5 Gold copy ... 11
6.3 Rights/licensing ... 11
6.4 Time ... 11
7 Geospatial information model ... **12**
7.1 Overview ... 12
7.2 Designated community ... 14
7.3 Metadata ... 15
7.3.1 Introduction to metadata ... 15
7.3.2 Preservation metadata classes ... 15
7.3.3 Data identifiers ... 16
7.3.4 Data, product and format specifications ... 17
7.3.5 Preservation actions ... 18
7.3.6 Association of resources ... 19
7.3.7 Value and strategy ... 20
7.3.8 Fixity ... 21
7.3.9 Information package description ... 22
7.3.10 Acquisition ... 23
7.3.11 Coordinate reference system ... 24
7.4 Open Packaging Convention (OPC) ... 25
Annex A (normative) **Abstract test suite** ... **27**
Annex B (normative) **Data dictionary** ... **31**
Annex C (informative) **Case-specific archival concept** ... **38**
Annex D (normative) **Functional requirements for a preservation archive** ... **39**
Bibliography ... **41**

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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 voluntary nature of standards, 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 211, *Geographic information/Geomatics*.

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Introduction

Today's information is mostly stored on digital media, which has a shorter lifetime than that of analogue media for a variety of reasons. Unless systematically archived, the storage media will decay and the information is lost. Missing or incorrect metadata describing the format of data can also result in lost digital information. Unfortunately, this daunting scenario occurs often. Consequently, the epoch in which we presently live is sometimes named the "Digital Dark Age".

Traditional archives are facilities or organizations that preserve records, originally generated by or for a government organization, institution, or corporation, for access by public or private communities. The archive accomplishes this task by taking ownership of the records, ensuring they are understandable to the accessing community, and managing them so as to preserve their information content, data integrity and authenticity (ISO 16363/TDR). The major focus for preserving this information has been to ensure that they are on media with long term stability and that access to this media is carefully controlled (ISO 14721).

Geospatial data possess several distinguishing structural characteristics that may include:

— relations to a well-defined section of the Earth;

— exchange by using theme-specific and sophisticated exchange formats;

— links to thematic data (databases);

— transformation between different coordinate reference systems;

— visualization (map output);

— large data volumes;

— existence of several levels-of-detail of the same dataset;

— links between a geospatial dataset and rights.

These distinctive features suggest that geospatial data shall be preserved together with relevant metadata content that fully addresses these structural characteristics.

ISO 14721 defines a reference model for archiving digital information. The application of ISO 14721 is not limited to space data and it is widely used by digital libraries. However, ISO 14721 does not completely cover all the needs for digital data and metadata preservation for geospatial data in general. Therefore, the ISO 19165 series addresses geospatial data, its data model structures, the multiplicity of data formats, and intellectual property rights. ISO 19165 is required by and developed for the geospatial community. ISO/TC 211, Geographic information/Geomatics, has developed the ISO 19100 family of standards dedicated to geographic information. One of them is ISO 19115-1. ISO 19165 is modelled as a specialization of ISO 19115-1. This document is neither a profile nor an implementation of ISO 14721.

Apart from the ISO standards mentioned above, other standards for archival metadata exist. Examples are the provenance family of documents of the W3C[19] and PREMIS, the data dictionary for preservation metadata[17].

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Geographic information — Preservation of digital data and metadata —

Part 1: Fundamentals

1 Scope

This document defines a preservation metadata extension of ISO 19115-1.

It defines the requirements for the long-term preservation of digital geospatial data. These data also include metadata, representation information, provenance, context and any other content items that capture the knowledge that are necessary to fully understand and reuse the archived data. This document also refers to characteristics of data formats that are useful for the purpose of archiving.

Geospatial data are preserved as a geospatial information package (IP). This document defines the requirements of the geospatial archival IP and details of the geospatial submission and the dissemination IPs. A geospatial archival IP is fully self-describing and allows a future reconstruction of the dataset without external documentation. The functional requirements for a preservation archive are defined in Annex D.

This document complements standards developed by ISO/TC 211 as well as other ISO standards such as ISO 14721.

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 14721:2012, *Space data and information transfer systems — Open archival information system (OAIS) — Reference model*

ISO 19110, *Geographic information — Methodology for feature cataloguing*

ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*

ISO/TS 19115-3, *Geographic information — Metadata — XML schema implementation of metadata fundamentals*

ISO 19157:2013, *Geographic information — Data quality*

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:

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

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

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3.1
access rights information
information that identifies the access restrictions pertaining to the content information, including the legal framework, licensing terms, and access control

Note 1 to entry: Access rights information contains the access and distribution conditions stated within the submission agreement, related to both preservation (by the OAIS) and final usage (by the consumer). It also includes the specifications for the application of rights enforcement measures.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.2
access software
type of software that presents part of or all of the information content of an information object in forms understandable to humans or systems

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.3
archival information package
AIP
information package (3.16), consisting of the *content information* (3.6) and the associated *preservation description information* (PDI) (3.25), which is preserved within an OAIS (3.22)

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.4
AIP edition
AIP whose content information or preservation description information has been upgraded or improved with the intent not to preserve information, but to increase or improve it

Note 1 to entry: This definition only refers to digital migration.

Note 2 to entry: An AIP edition is not considered to be the result of a migration.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 2 to entry.]

3.5
AIP version
AIP whose content information or preservation description information has undergone a transformation on a source AIP and is a candidate to replace the source AIP

Note 1 to entry: An AIP version is considered to be the result of a digital migration.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.6
content information
set of information that is the original target of preservation or that includes part or all of that information

Note 1 to entry: Content information is an information object composed of its content data object and its representation information.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.7
data dictionary
formal repository of terms used to describe data

[SOURCE: ISO 14721:2012, 1.7.2, modified]

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3.8
data dissemination session
delivery of media or a single telecommunications session that provides data to a consumer

Note 1 to entry: The data dissemination session format/contents is based on a data model negotiated between the OAIS and the consumer in the request agreement. This data model identifies the logical constructs used by the OAIS and how they are represented on each media delivery or in the telecommunication session.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.9
data submission session
delivery of media or a single telecommunications session that provides data to an OAIS

Note 1 to entry: The data submission session format/contents is based on a data model negotiated between the OAIS and the producer in the submission agreement. This data model identifies the logical constructs used by the producer and how they are represented on each media delivery or in the telecommunication session.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.10
designated community
identified group of potential consumers who should be able to understand a particular set of information

Note 1 to entry: The designated community may be composed of multiple user communities. A designated community is defined by the archive and this definition may change over time.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.11
digital migration
transfer of digital information, while intending to preserve it, within the OAIS

Note 1 to entry: Digital migration is distinguished from transfers in general by three attributes:

— a focus on the preservation of the full information content that needs preservation;

— a perspective that the new archival implementation of the information is a replacement for the old;

— an understanding that full control and responsibility over all aspects of the transfer resides with the OAIS.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.12
digital object
object composed of a set of bit sequences

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.13
dissemination information package
DIP
information package, derived from one or more AIPs, and sent by archives to the consumer in response to a request to the OAIS

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.14
federated archives
group of archives that has agreed to provide access to their holdings via one or more common finding aids

[SOURCE: ISO 14721:2012, 1.7.2, modified]

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3.15
geographic information system
information system dealing with information concerning phenomena associated with location relative to the Earth

[SOURCE: ISO 19101-1:2014, 4.1.20]

3.16
information package
logical container composed of optional content information and optional associated preservation description information

Note 1 to entry: Associated with this information package is packaging information used to delimit and identify the content information and package description information used to facilitate searches for the content information.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.17
knowledge base
database of knowledge about a particular subject

Note 1 to entry: The database contains facts, inferences, and procedures needed for problem solution [Webster Computer].

Note 2 to entry: The set of information may be incorporated by, or understood by, a person or a system.

[SOURCE: ISO/TS 19101-2:2008, 4.18, modified]

3.18
long term
period of time long enough for there to be concern about the impacts of changing technologies, including support for new media and data formats, and of a changing designated community, on the information being held in an OAIS

Note 1 to entry: This period extends into the indefinite future.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.19
long term preservation
act of maintaining information, independently understandable by a designated community, and with evidence supporting its authenticity, over the long term

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.20
management
<OAIS> role played by those who set overall OAIS policy as one component in a broader policy domain, for example as part of a larger organization

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.21
metadata
information about a resource

[SOURCE: ISO 19115-1:2014, 4.10]

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3.22
open archival information system
OAIS
archive, consisting of an organization, which may be part of a larger organization, of people and systems, that has accepted the responsibility to preserve information and make it available for a designated community

Note 1 to entry: An OAIS Archive meets a set of responsibilities that allows to be distinguished from other uses of the term 'archive'. The term 'open' in OAIS is used to imply that this recommendation and future related recommendations and standards are developed in open forums, and it does not imply that access to the archive is unrestricted.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.23
package description
information intended for use by access aids

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.24
packaging information
information used to bind and identify the components of an information package

EXAMPLE The ISO 9660 volume and directory information is used on a CD-ROM to provide the content of several files containing content information and preservation description information.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to an example.]

3.25
preservation description information
PDI
information which is necessary for adequate preservation of the content information and which can be categorized as provenance, reference, fixity, context, and access rights Information

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.26
profile
set of one or more base standards or subsets of base standards, and, where applicable, the identification of chosen clauses, classes, options and parameters of those base standards, that are necessary for accomplishing a particular function

Note 1 to entry: A profile is derived from base standards so that by definition, conformance to a profile is conformance to the base standards from which it is derived.

[SOURCE: ISO 19106:2004, 4.5]

3.27
producer
<OAIS> role played by those persons or client systems that provide the information to be preserved

Note 1 to entry: This can include other OAISes or internal OAIS persons or systems.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

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3.28
provenance information
information that documents the history of the content information

Note 1 to entry: This information tells the origin or source of the content information, any changes that may have taken place since it was originated, and who has had custody of it since it was originated. The archive is responsible for creating and preserving provenance Information from the point of Ingest; however, earlier provenance information should be provided by the producer. Provenance information adds to the evidence to support authenticity.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.29
reference information
information that is used as an identifier for the content information

Note 1 to entry: Reference information also includes identifiers that allow outside systems to refer unambiguously to particular content information. An example of reference information is an ISBN.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.30
reference model
framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment

Note 1 to entry: A reference model is based on a small number of unifying concepts and may be used as a basis for education and explaining standards to a non-specialist.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.31
refreshment
digital migration where the effect is to replace a media instance with a copy that is sufficiently exact that all archival storage hardware and software continues to run as before

[SOURCE: ISO 14721:2012, 1.7.2]

3.32
repackaging
digital migration in which there is an alteration in the packaging information of the AIP

[SOURCE: ISO 14721:2012, 1.7.2]

3.33
replication
digital migration where there is no change to the packaging information, the content information, and the PDI

Note 1 to entry: The bits used to represent these information objects are preserved in the transfer to the same or new media instance.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.34
representation information
information that maps a data object into more meaningful concepts

EXAMPLE 1 Representation information for a bit sequence which is a FITS file might consist of the FITS standard which defines the format plus a dictionary which defines the meaning in the file of keywords which are not part of the standard.

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EXAMPLE 2 JPEG software which is used to render a JPEG file; rendering the JPEG file as bits is not very meaningful to humans but the software, which embodies an understanding of the JPEG standard, maps the bits into pixels which can then be rendered as an image for human viewing.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to examples 1 and 2.]

3.35
resolution (of imagery)
smallest distance between two uniformly illuminated objects that can be separately resolved in an image

Note 1 to entry: This definition refers to the spatial resolution.

Note 2 to entry: In the general case, the resolution determines the possibility to distinguish between distinct neighbouring features (objects).

Note 3 to entry: Resolution can also refer to the spectral and the temporal resolution.

[SOURCE: ISO/TS 19130-2:2014, 4.61, modified — addition of Notes 1, 2 and 3 to entry]

3.36
source
document providing legal and/or administrative facts on which the land administration (LA) object [right, restriction, responsibility, basic administrative unit, party, or spatial unit] is based

[SOURCE: ISO 19152:2012, 4.1.21]

3.37
spatial source
source with the spatial representation of one (part of) or more spatial units

[SOURCE: ISO 19152:2012, 4.1.22, modified — The EXAMPLE was deleted.]

3.38
submission agreement
agreement reached, between an OAIS and the producer, that specifies a data model, and any other arrangements needed, for the data submission session

Note 1 to entry: This data model identifies format/contents and the logical constructs used by the producer and how they are represented on each media delivery or in a telecommunication session.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to Note 1 to entry.]

3.39
submission information package
SIP
information package that is delivered by the producer to the OAIS for use in the construction or update of one or more AIPs and/or the associated descriptive information

[SOURCE: ISO 14721:2012, 1.7.2, modified]

3.40
transformation
<OAIS> digital migration in which there is an alteration to the content information or PDI of an archival information package

EXAMPLE Changing ASCII codes to UNICODE in a text document being preserved is a transformation.

[SOURCE: ISO 14721:2012, 1.7.2, modified — Supporting content has been relocated to an example.]

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